423

NOAA Technical Report NMFS Circular 423

Marine Flora and Fauna of the Northeastern United States Crustacea: Cumacea

Les Watling

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U.S. DEPARTMENT OF COMMERCE
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Marine Flora and Fauna of the Northeastern United States. Crustacea: Cumacea

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April 1979

U.S. DEPARTMENT OF COMMERCE
Juanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration
Richard A. Frank, Administrator
Terry L. Leitzell, Assistant Administrator for Fisheries

National Marine Fisheries Service

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FOREWORD

This issue of the "Circulars" is part of a subseries entitled "Marine Flora and Fauna of the Northeastern United States." This subseries will consist of original, illustrated, modern manuals on the identification, classification, and general biology of the estuarine and coastal marine plants and animals of the northeastern United States. Manuals will be published at irregular intervals on as many taxa of the region as there are specialists available to collaborate in their preparation.

The manuals are an outgrowth of the widely used "Keys to Marine Invertebrates of the Woods Hole Region," edited by R. I. Smith, published in 1964, and produced under the auspices of the Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Mass. Instead of revising the "Woods Hole Keys," the staff of the Systematics-Ecology Program decided to expand the geographic coverage and bathymetric range and produce the keys in an entirely new set of expanded publications.

The "Marine Flora and Fauna of the Northeastern United States" is being prepared in collaboration with systematic specialists in the United States and abroad. Each manual will be based primarily on recent and ongoing revisionary systematic research and a fresh examination of the plants and animals. Each major taxon, treated in a separate manual, will include an introduction, illustrated glossary, uniform originally illustrated keys, annotated check list with information when available on distribution, habitat, life history, and related biology, references to the major literature of the group, and a systematic index.

These manuals are intended for use by biology students, biologists, biological oceanographers, informed laymen, and others wishing to identify coastal organisms for this region. In many instances the manuals will serve as a guide to additional information about the species or the group.

Geographic coverage of the "Marine Flora and Fauna of the Northeastern United States" is planned to include organisms from the headwaters of estuaries seaward to the approximately 200-m depth on the continental shelf from Maine to Virginia, but may vary somewhat with each major taxon and the interests of collaborators. Whenever possible representative specimens dealt with in the manuals will be deposited in the reference collections of major museums in the region.

After a sufficient number of manuals of related taxonomic groups have been published, the manuals will be revised, grouped, and issued as special volumes. These volumes will thus consist of compilations of individual manuals within phyla such as the Cnidaria, Arthropoda, and Mollusca, or of groups of phyla.

CONTENTS

Marine Flora and Fauna of the Northeastern United States. Crustacea: Cumacea[1]

LES WATLING[2]

ABSTRACT

This manual includes an introduction on the external and interanl morphology, development, life history, ecology and distribution, an illustrated key, an annotated systematic list, a selected bibliography, and an index to the 34 species of cumacean peracarid crustaceans occurring in waters shallower than 200 m from Nova Scotia to Chesapeake Bay.

INTRODUCTION

Cumaceans are small (1-10 mm in length) peracarid crustaceans which are found in all seas from the shallowest brackish waters to depths greater than 7,000 m. Jones (1969) listed 770 known species belonging to 82 genera. Of these, 257 were known from a single sample and 169 from single specimens. The cumaceans from the northeastern United States are reasonably well known, at least in nearshore and continental shelf waters. This is due primarily to the efforts of Sars (1871, 1900), Calman (1912), and Zimmer (1943). Zimmer (in prep.) listed 49 species which had been found in the region from Newfoundland to south of Cape Hatteras in shallow to abyssal waters. The 34 species occurring in waters shallower than 200 m from Nova Scotia to Chesapeake Bay are treated in the present account. Workers interested in North American species outside this region should consult Zimmer (1944), Bacescu (1971), and Watling (1977) for subtropical and tropical species, and Jones (1969, 1973), Bacescu (1972), Bacescu and Muradian (1974a, b) and Reyss (1974a, b) for recently described deepwater species.

The Cumacea are an order of the Superorder Peracarida in the Subclass Malacostraca. They are distinguished from other peracarids in having the following combination of features: the carapace is fused dorsally with the first three or four, or rarely six thoracic somites; the telson is present, reduced, or incorporated into the last abdominal somite; the eyes are fused dorsally; the second antennae lack an exopodite; and pleopods are absent in the female (with one exception) and often reduced in number or absent in the male.

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EXTERNAL MORPHOLOGY

The carapace (Fig. 1, c) is fused with at least the first three thoracic somites, rarely with as many as six, and is strongly extended laterally to form a branchial cavity. Anteriorly, each side of the carapace is produced in the form of pseudorostral lobes (Fig. 1, pl). The two pseudorostral lobes project forward in contact with, but not fused with each other to form a pseudorostrum. Often, projecting anteriorly beyond the pseudorostrum are the tips of the branchial exopodites of the first maxilliped. These come together anteriorly, and with the pseudorostrum form the siphon(s), or exhalant canal for the respiratory current. In some genera, for example, *Eudorella* and *Eudorellopsis*, the pseudorostral lobes are reflexed upwards and no pseudorostrum is apparent although a siphon is still formed. Other features of the carapace include the antennal notch (an) located below the pseudorostrum, and the frontal lobe (fl) from which the ocular lobe protrudes anteriorly. The carapace may be either completely smooth or variously sculptured with grooves, ridges, spines, or tubercles, and may be more or less covered with hairs.

The cephalothorax consists of the carapace and the free (uncovered) thoracic somites (Fig. 1, T4, T8). The latter may also be variously ornamented, occasionally bearing spines dorsally or along the lateral margins, and in many cases having minutely or coarsely serrate anterior margins. The abdomen or pleon (PL1, PL6) consists of six somites of which the fifth is usually the longest. In some families a variable number of pleonal somites bear posteroventral appendages, the pleopods. The sixth pleonal somite never has pleopods but bears paired uropods (Fig. 1, u) and, in three families, an independent telson (t). In the remaining families, the telson is coalesced with the sixth pleonal somite. The anus and associated protective flaps are located either terminally on the sixth pleonal somite or at the base of the telson.

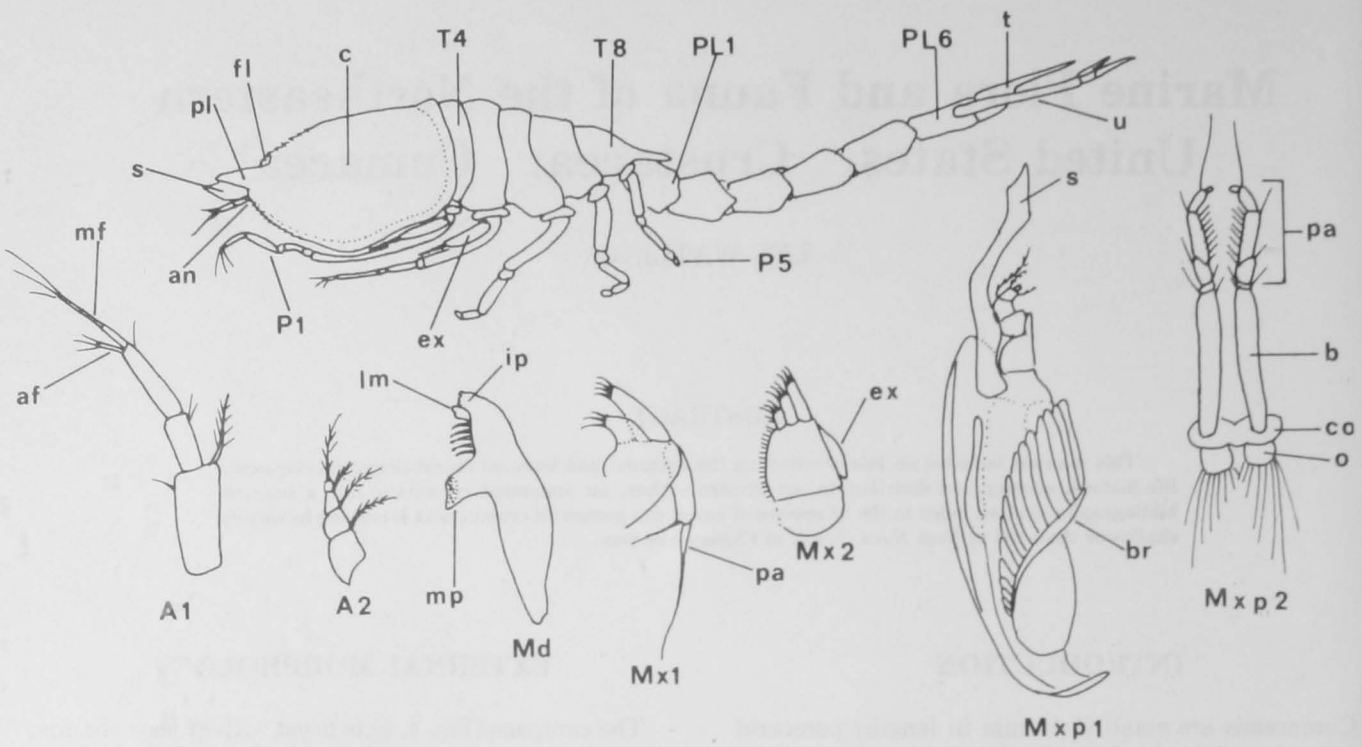


Figure 1.—Side view of a cumacean and the seven anterior appendages. A1, antenna 1; A2, antenna 2; Md, mandible; Mx1, maxilla 1; Mx2 maxilla 2; Mxp1, maxilliped 1; Mxp2, maxilliped 2; P1, pereopod 1; P5, pereopod 5; PL1, pleon somite 1; PL6, pleon somite 6; T4, thoracic somite 4; T8, thoracic somite 8; af, accessory flagellum; an, antennal notch; b, basis; br, branchial apparatus; c, carapace; co, coxa; ex, exopod; fl, frontal lobe; ip, incisor process; lm, lacinia mobilis; mf, main flagellum; mp, molar process; o, oostegite; pa, palp; pl, pseudorostral lobe; s, siphon; t, telson; u, uropod.

The first antenna (antennula) (Fig. 1, A1) consists of a three-articled[3] peduncle, the third article of which bears two rami. The longer of these rami is referred to as the main flagellum (mf) and may consist of, at most, six articles. The other ramus, the accessory flagellum (af), is usually shorter and may have as many as four articles although most frequently it is uniarticulate and occasionally absent.

The second antenna (antenna) (Fig. 1, A2) is rudimentary in the female but, with one exception, is strongly developed in the male. In the female the antenna may consist of one to five articles; in the male there is a five-articled peduncle which bears a multiarticulate flagellum.

The mandible (Fig. 1, Md) in cumaceans is a simple structure. It consists of one article, lacking a palp. A strong molar process (mp) and a more or less toothed incisor process (ip) characterize its structure. On the left mandible, near the incisor process, is a small movable tooth called the lacinia mobilis (lm) which is a feature peculiar to all peracarids.

The first maxilla (maxillule) (Fig. 1, Mx1) is a small flattened appendage located just ventral to the labium. It consists of a three-articled protopod, the first and third articles of which bear terminally setose or spinose lobes termed endites, and a uniarticulate, backwardly directed palp (pa).

The second maxilla (maxilla) (Fig. 1, Mx2) consists of a three-articled protopod, of which only the third article bears an endite. On the outer side of the third article is a thin, half-oval plate, which is the reduced exopod.

The first maxilliped (Fig. 1, Mxp1) is in reality the highly modified first thoracic appendage, or thoracopod. It normally consists of seven articles. The coxa bears the epipod, modified as a branchial apparatus. This structure, which may be very elaborate, is composed of an anteriorly directed siphonal part (s), and a backwardly directed branchial part. The latter bears the branchial lobules (br) (gills) arranged either in a simple row or an open spiral. The remainder of the appendage extends forward and aids in the manipulation of food in the vicinity of the mouth.

The second maxilliped (Fig. 1, Mxp2) is the modified second thoracopod. This appendage is characterized by its elongate basis (b), which may be longer than the remainder of the leg. In some species the ischium may be absent. The coxae (co) of this appendage pair are usually contiguous along the midline of the body and in females bear posteriorly directed setose lobes which are thought to be rudimentary oostegites (o).

The third maxilliped (Fig. 2, Mxp3) (thoracopod 3) consists of the usual seven articles, and in many species bears a natatory exopod (ex). Here, as with the previous

[3]The divisions of a crustacean appendage have variously been referred to as segments, joints, articles, or podomeres. Since these divisions should not be considered as segments (a term which is more properly applied to the subdivisions of the body), nor as joints (which are, in fact, the flexible parts of the exoskeleton which facilitate bending) the terms article or podomere are preferred.

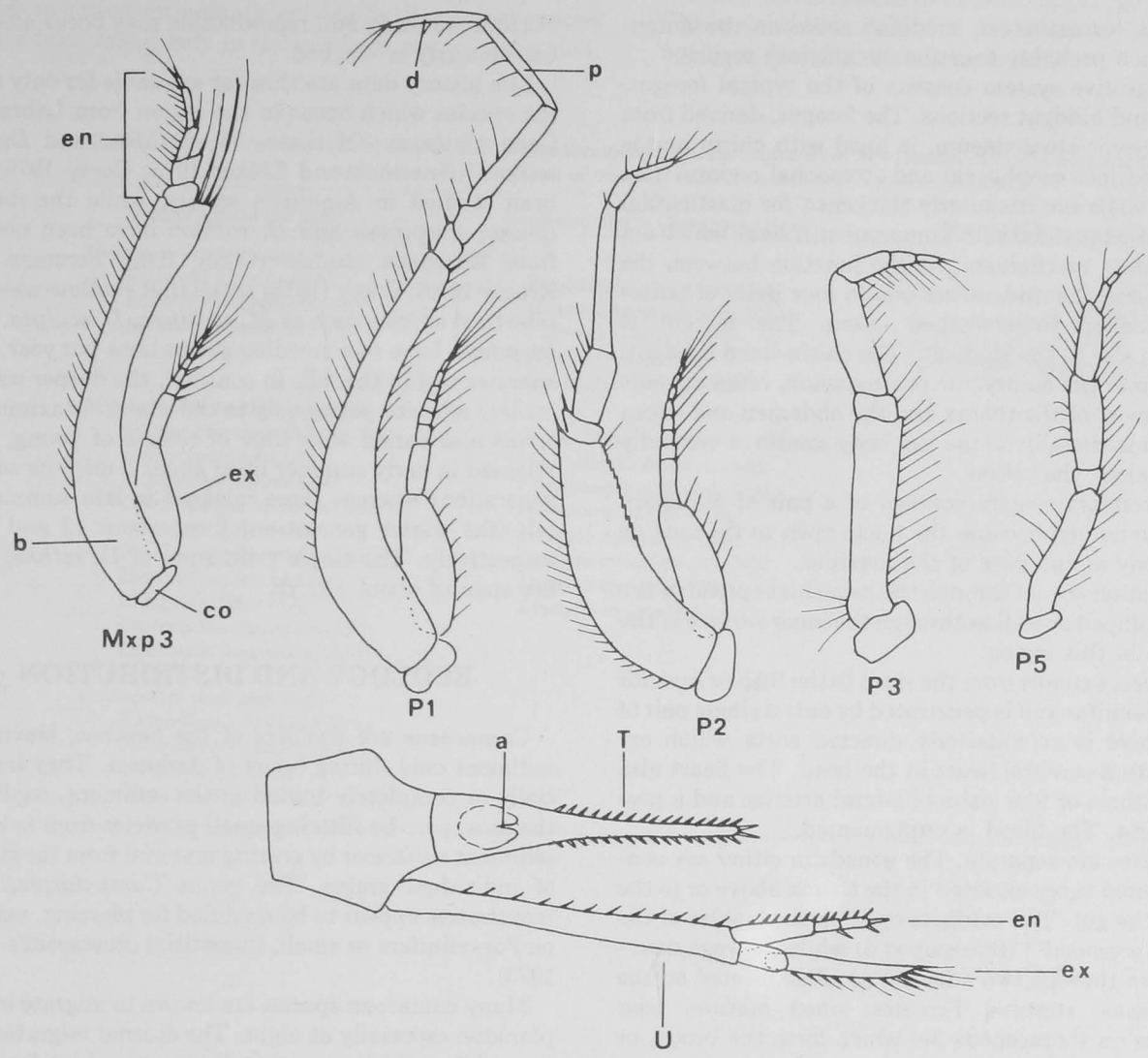


Figure 2.—Thoracic appendages, telson, and uropod of a cumacean. Mxp3, maxilliped 3; P1, 2, 3, 5, pereopods 1-3, 5; T, telson; U, uropod; a, anus; b, basis; co, coxa; d, dactyl; en, endopod; ex, exopod; p, propodus.

appendage, the basis (b) is often much longer than the remainder of the leg. It should also be noticed that the exopod is attached to the basis proximally and the remainder of the leg, which is considered to be the endopod, is attached distally.

The remaining five pairs of thoracopods (4-8), pereopods 1-5, (Fig. 2, P1-3, 5), are fundamentally similar in structure to the third maxilliped, consisting of two protopod and five endopod articles. An exopod may be present on any of these legs except the last. The first two pairs of pereopods are generally directed forward, the last three pairs posteriorly.

The pleopods are always absent in females and may either be present or absent in males. There may be a maximum of five pairs, but three, two, or one pair also occur. They are attached ventrally on the posterior margin of each somite and consist of a coxa, basis, and two rami which bear long, plumose setae. In immature males the rami are not fully developed and the plumose setae are absent.

The last pair of appendages are the uropods (Fig. 2, U). They consist of an uniarticulate peduncle which bears a two-articled outer ramus (exopod, ex) and an inner ramus (endopod, en) of one to three articles.

Paired penes are known only from two deep-sea genera, *Archaeocuma*, from the Peru Trench, and *Campylaspenis* from off Cape Hatteras, both occurring at below 3,000-m depth. In *Archaeocuma* the lobes are short, conical, and well separated, whereas in *Campylaspenis* there is a single, very long bifid lobe. In both cases the penes are located between the bases of pereopod 5.

INTERNAL MORPHOLOGY

The nervous system consists of a supraesophageal ganglionic mass and a ventral chain of 17 paired ganglia. The ganglia of the mouthparts and the first maxilliped are close together, but the following 13 pairs remain well separated with the members of each pair nearly fused in the midline. The sessile compound eyes are coalesced dorsally in the midline. Other sense organs include the

esthetascs (or asthetes), modified setae on the antennules which probably function as olfactory organs.

The digestive system consists of the typical foregut, midgut, and hindgut sections. The foregut, derived from the embryonic stomodaeum, is lined with chitin and is subdivided into esophageal and stomachal regions. The stomach walls are irregularly thickened for mastication and are also provided with numerous stiff setae which act as a filtering mechanism. At the junction between the stomach and the midgut are one to four pairs of posteriorly directed finger-shaped caeca. The midgut is similar in size to the stomach. The chitin-lined hindgut, derived from the embryonic proctodaeum, often extends through most of the thorax and the abdomen and opens either ventrodistally on the last body somite or ventrally midway along the telson.

The excretory system consists of a pair of maxillary glands, so-named because the ducts open to the outside of the body at the base of the maxillae.

Respiration occurs through the branchial epipod of the first maxilliped as well as through the inner surface of the carapace in this region.

The heart extends from the third to the fifth or seventh thoracic somites and is penetrated by only a single pair of ostia. There is an anteriorly directed aorta which expands into a cerebral heart in the head. The heart also gives off three or four pairs of lateral arteries and a posterior aorta. The blood is unpigmented.

The sexes are separate. The gonads in either sex consist of paired tubes situated in the thorax above or to the sides of the gut. The oviducts open on the insides of the coxae of pereopod 3 (thoracopod 6) while the vasa deferentia open through two adjacent papillae located on the last thoracic sternite. Females, when mature, bear oostegites on thoracopods 3-6 which form the brood, or incubatory, pouch.

DEVELOPMENT AND LIFE HISTORY

Gnewuch and Croker (1973) observed in the laboratory mating of the intertidal species *Mancocuma stellifera*. They noted that in all cases the female moulted prior to oviposition, which occurred 12-96 h later. Presumably the eggs were fertilized as they were released into the marsupium. No other observations of mating in cumaceans have been made although several instances of precopula have been noted from field collections.

Eggs are carried in the brood pouch where they hatch as a nauplius and remain to moult three more times, finally reaching the manca stage. The manca resembles the adult but lacks the last pair of pereopods. The young now leave the brood pouch and moult several more times until the subadult ("Vorbereitungstadium" in the papers of Zimmer) is reached. At this stage, the gonads begin to mature and the secondary sexual characters become apparent. The animal then moults to the adult stage (from Zimmer the "Brutkleid" stage for the female and "Hochzeitkleid" stage for the male) where the secondary sex characters are fully developed and reproduction occurs. Further moulting and reproduction may occur after sexual maturity is reached.

Life history data are thus far available for only four of the species which occur in the region from Labrador to Cape Hatteras. Of these, *M. stellifera* and *Diastylis sculpta* (Gnewuch and Croker 1973; Corey 1976) have been studied in American waters, while the data for *Iphinoe trispinosa* and *D. rathkei* have been obtained from European studies (Corey 1969; Forsman 1938; Krüger 1940). Corey (1976) noted that shallow-water and intertidal species such as *M. stellifera, D. sculpta,* and *I. trispinosa* have two breeding generations per year, in the summer and in the fall. In contrast, the deeper water *D. rathkei* released young only in the winter. Maximum life spans also varied with time of release of young. Those released in early summer lived about 5 mo (the summer generation) whereas those released in late summer and fall (the winter generation) lived about 12 and 9 mo, respectively. The single generation of *D. rathkei* had a life span of about 1½ yr.

ECOLOGY AND DISTRIBUTION

Cumaceans are dwellers of the benthos, leaving the sediment only during hours of darkness. They live partially or completely buried in the sediment, feeding for the most part by filtering small particles from below the sediment surface or by grazing material from the surfaces of individual grains. The genus *Campylaspis*, whose mouthparts appear to be modified for piercing, may feed on Foraminifera or small, interstitial crustaceans (Jones 1973).

Many cumacean species are known to migrate into the plankton especially at night. The diurnal migration pattern of *D. rathkei* was critically examined by Anger and Valentin (1976). They noted that moulting occurred only in the plankton, and also, perhaps as a response to predation pressures, only at night. In fact no *D. rathkei* was observed to leave the sediment during the day. Mating also occured during a short nocturnal swarming period.

Most cumacean species inhabit sediments whose grains lie within a narrow size range. On the continental shelf off the Ivory Coast, LeLoeuff and Intes (1972) found only 2 of the 19 species with wide sediment grain-size tolerances. Most species in fact will not settle on sediment whose grains are too fine or too coarse. Dixon (1944) suggested that since the respiratory current comes through the sediment in which the animal is buried, a preponderance of fine grains could cause clogging of the respiratory and particle filter-feeding apparatus. Wieser (1956) suggested that the preference of *Cumella vulgaris* for a certain substratum was dependent on the amount and sort of food available.

The depth and latitudinal distributions of the 34 species considered in this study are outlined in Table 1. Four species are found in brackish waters, and nine others in nearshore shallow marine waters. With the exception of four species whose distributions include the

continental slope, the remaining species are found at mid- to outer continental shelf depths. Seventeen species have been found only in the northern part of the region, while 13 others ranged from north of George's Bank to off Chesapeake Bay; only 4 of the species considered have not been found north of the region.

Table 1.—Depth and latitudinal distribution of cumaceans found in the region from Newfoundland to off Chesapeake Bay. (AA = amphi-Atlantic; B = found in brackish water; NA = North American endemic).

George's Bank and north	Newfoundland to Chesapeake Bay	Maine to Chesapeake Bay
Nearshore shallow water:		
Eudorella difficilis (NA)	*Pseudoleptocuma minor* (NA)	*Cyclaspis pustulata* (B, NA)
Eudorella emarginata (AA)	*Mancocuma stellifera* (B, NA)	*Cyclaspis varians* (B, NA)
Eudorella truncatula (AA)	*Eudorella pusilla* (NA)	*Leucon americanus* (NA)
	Diastylis polita (NA)	*Almyracuma proximoculi* (B, NA)
	Oxyurostylis smithi (NA)	
Mid- to outer continental shelf:		
Iphinoe trispinosa (AA)	*Eudorella hispida* (NA)	
Leucon nasicoides (AA)	*Eudorellopsis deformis* (AA)	
Campylaspis affinis (AA)	*Campylaspis rubicunda* (AA)	
Lamprops quadriplicata (NA)	*Petalosarsia declivis* (AA)	
Lamprops fuscata (AA)	*Diastylis abbreviata* (NA)	
Brachydiastylis resima (AA)	*Diastylis quadrispinosa* (NA)	
Diastylis lucifera (AA)	*Diastylis cornuifer* (NA)	
Diastylis rathkei (AA)	*Diastylis sculpta* (NA)	
Leptostylis ampullacea (AA)		
Leptostylis longimana (AA)		
Continental shelf and slope:		
Eudorellopsis biplicata (NA)		
Eudorellopsis integra (NA)		
Leucon nasica (AA)		
Diastylis goodsiri (AA)		

KEY TO CUMACEA

1 With independent telson (Figs. 2, 21, 23) 19

1 Without independent telson (Figs. 3, 6) 2

2 (*1*) Endopod of uropod consists of 1 article (Fig. 3) 3

2 (*1*) Endopod of uropod consists of 2 articles (Fig. 8) 7

3 (2) Exopod on P1 only 4

3 (2) Exopod on at least P1 and P2 5

(3) Endopod of uropod with lateral spines (Fig. 3) ..... *Cyclaspis varians*

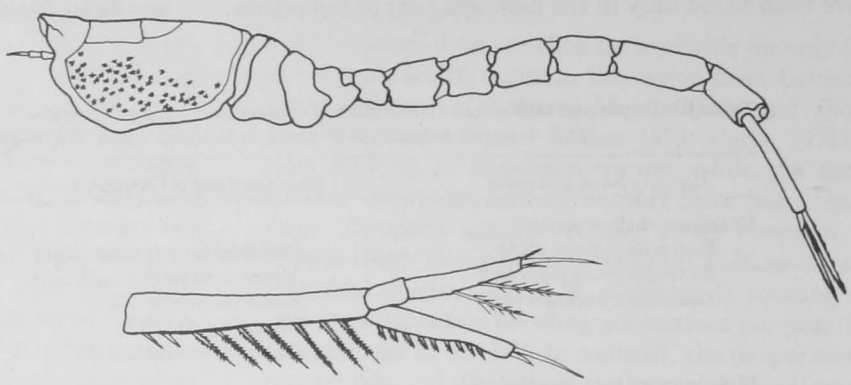


Figure 3.—*Cyclaspis varians*, side view and uropod.

4 (3) Endopod of uropod without lateral spines (Fig. 4) ..... *Cyclaspis pustulata*

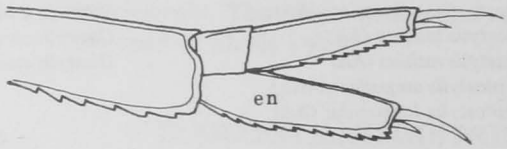


Figure 4.—*Cyclaspis pustulata*, uropod.

5 (3) Carapace with posterodorsal, laterally directed horns; outer margin of uropod inner ramus curved (Fig. 5) ..... *Almyracuma proximoculi*

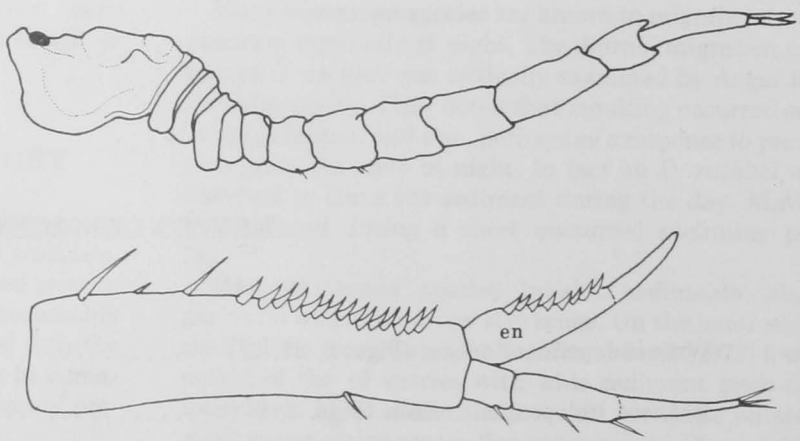


Figure 5.—*Almyracuma proximoculi*, side view and uropod.

5 (3) Carapace posterodorsally smooth, rounded; outer margin of uropod inner ramus straight 6

6 (5) Mxp3, 4th article as long as wide; uropod peduncle serrate along inner margin (Fig. 6) .... *Campylaspis rubicunda*

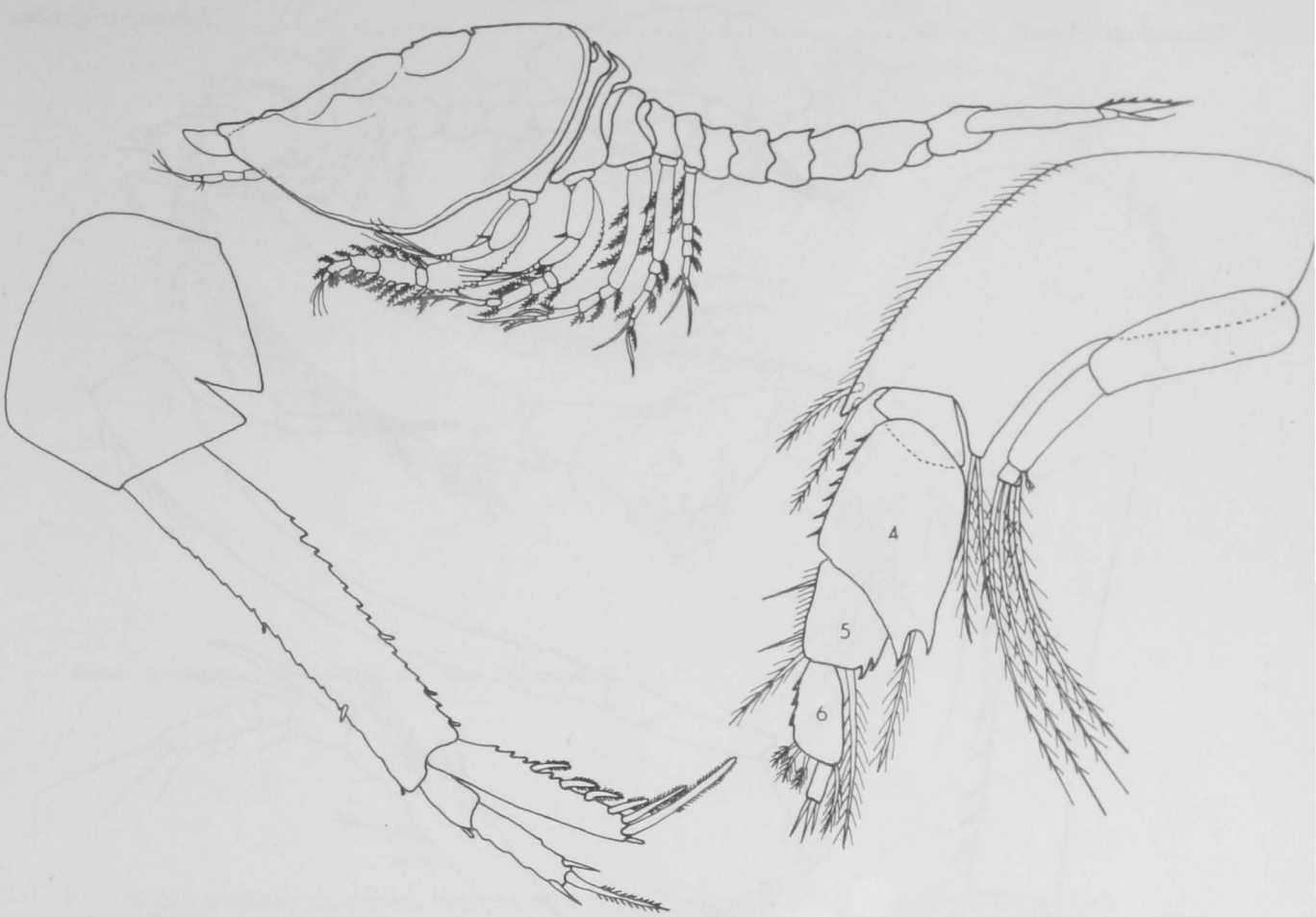


Figure 6.—*Campylaspis rubicunda*, side view, uropod, and maxilliped 3.

6 (5) Mxp3, 4th article twice as long as wide; uropod peduncle smooth, not serrate along inner margin (Fig. 7) . . . . . *Campylaspis affinis*

Figure 7.—*Campylaspis affinis*, uropod and maxilliped 3.

(2) Exopod on P1 only (Fig. 8) ..... *Iphinoe trispinosa*

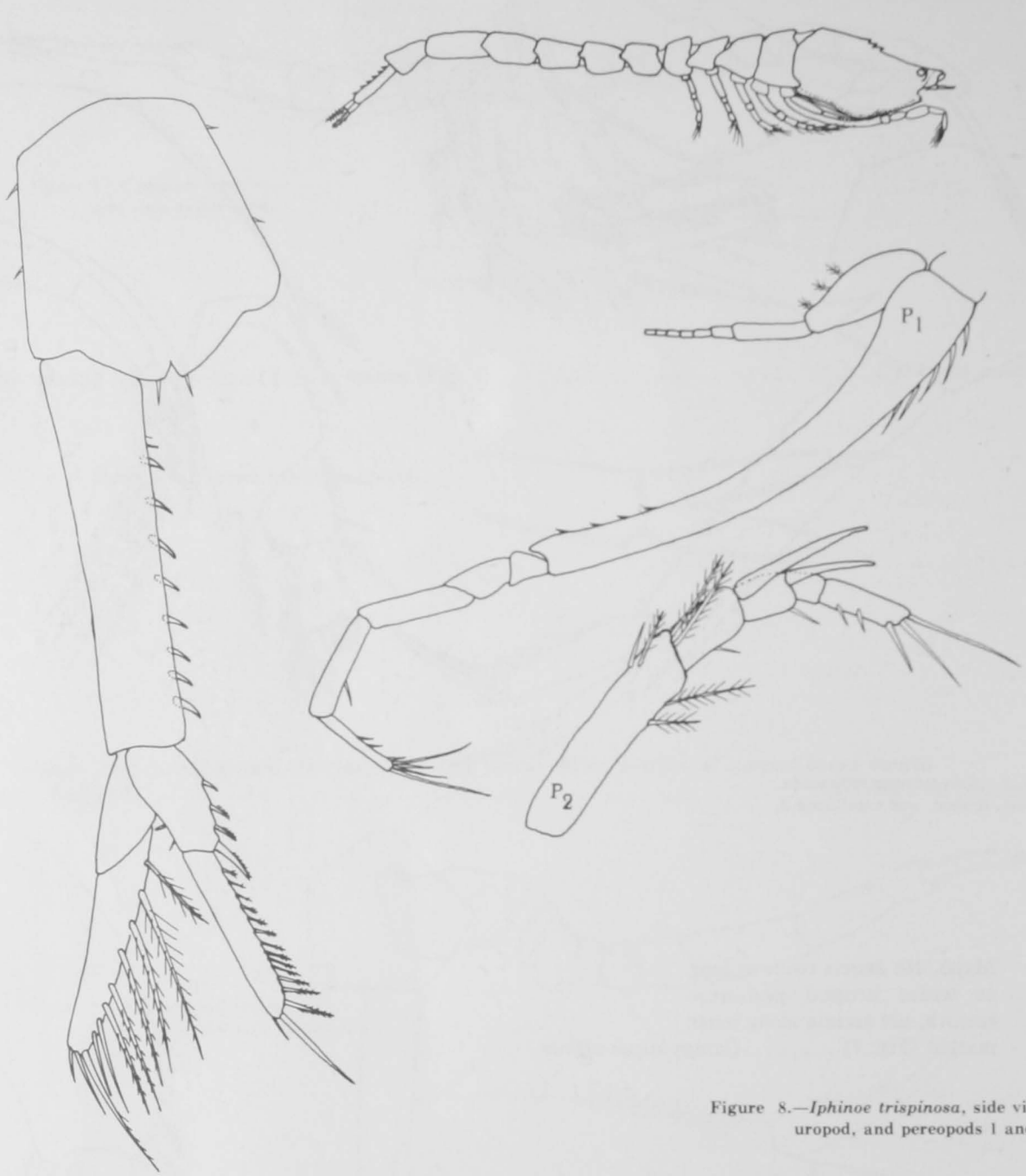


Figure 8.—*Iphinoe trispinosa*, side view, uropod, and pereopods 1 and 2.

(2) Exopod on at least P1 and P2 8

8 (7) Pseudorostrum distinct and produced either anteriorly or dorsally (Figs. 11, 14) 10

8 (7) Pseudorostrum weak; carapace blunt anteriorly (Fig. 9) 9

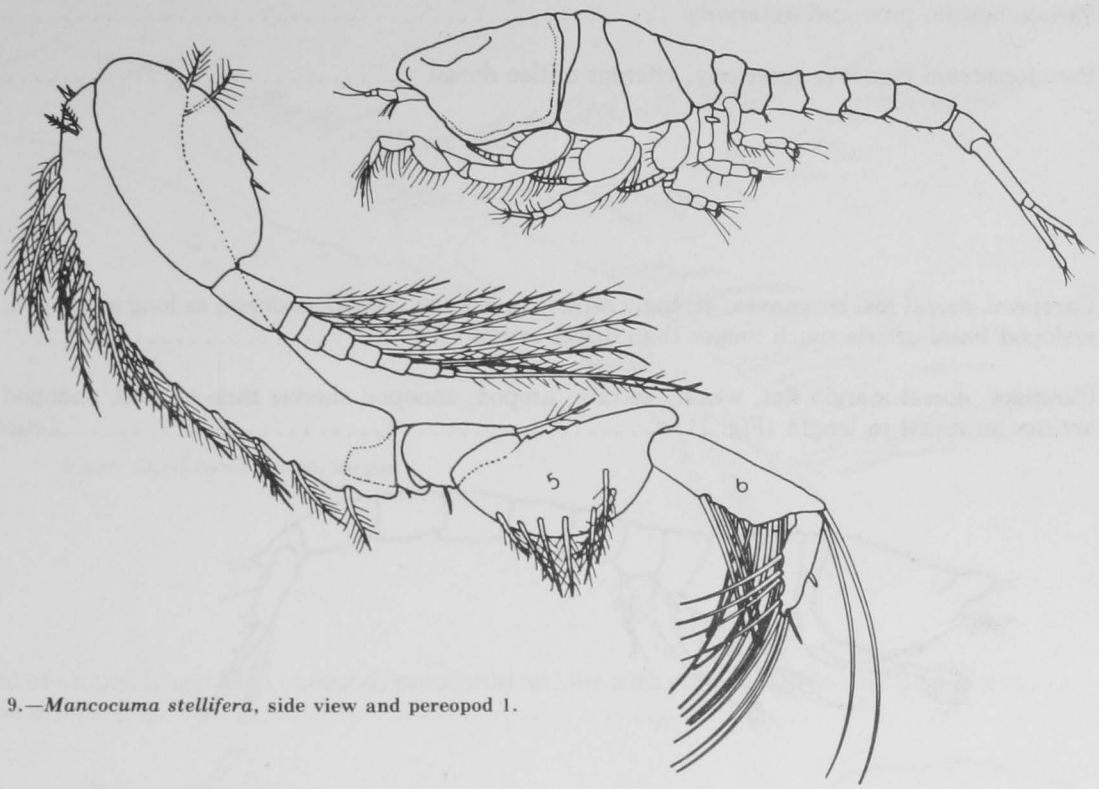


Figure 9.—*Mancocuma stellifera*, side view and pereopod 1.

9 (8) P1, article 5 medially expanded, twice as wide as article 6; male with 2 pairs of pleopods which are rudimentary (Fig. 9). ..... *Mancocuma stellifera*

9 (8) P1, article 5 not expanded, only slightly wider than article 6; male with 3 pairs of normal pleopods (Fig. 10) ..... *Pseudoleptocuma minor*

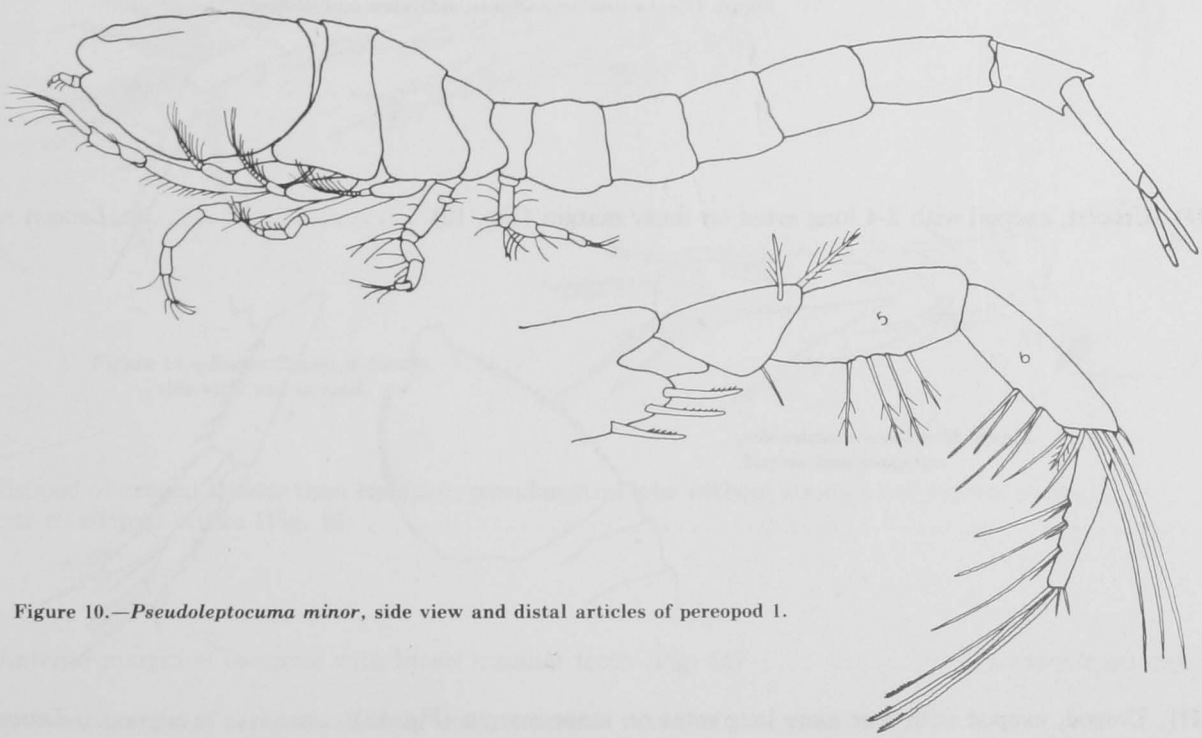


Figure 10.—*Pseudoleptocuma minor*, side view and distal articles of pereopod 1.

0 (*8*) Pseudorostrum produced anteriorly 11

0 (*8*) Pseudorostrum truncate anteriorly, efferent orifice dorsal 13

1 (*10*) Carapace, dorsal margin convex, strongly serrate in female; uropod, endopod as long as exopod, endopod basal article much longer than distal article (Fig. 12) 12

1 (*10*) Carapace, dorsal margin flat, weakly serrate; uropod, endopod shorter than exopod, endopod articles subequal in length (Fig. 11) ..... *Leucon americanus*

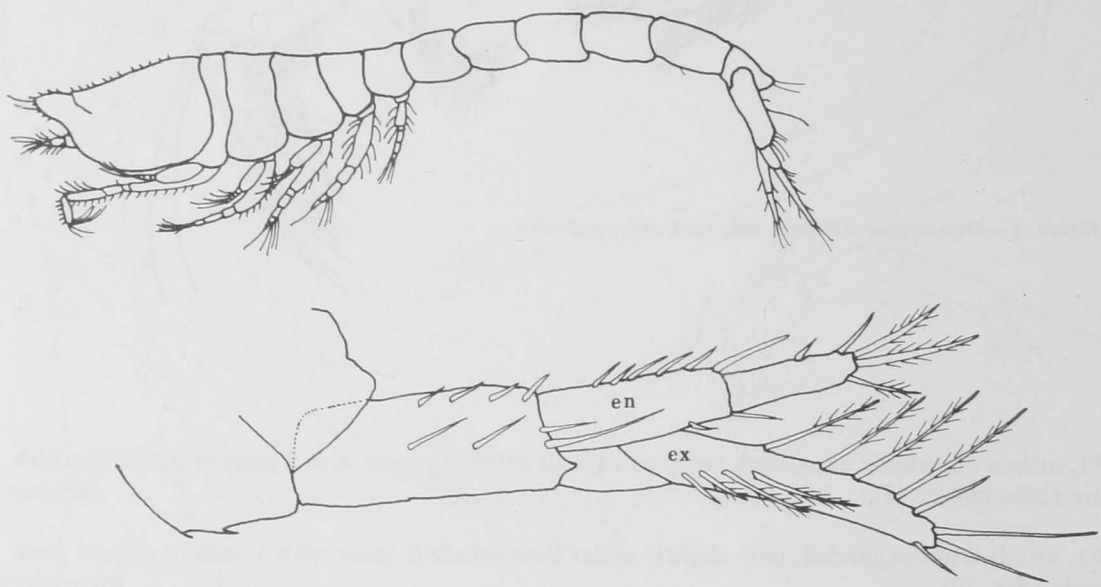


Figure 11.—*Leucon americanus*, side view and uropod.

12 (*11*) Uropod, exopod with 2-4 long setae on inner margin (Fig. 12) ..... *Leucon nasicoides*

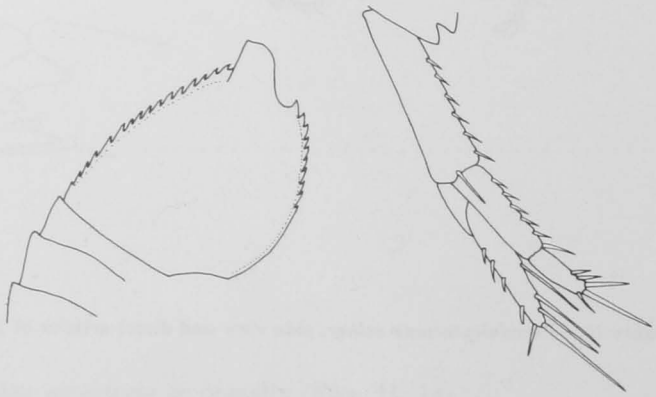


Figure 12.—*Leucon nasicoides*, carapace and uropod.

12 (*11*) Uropod, exopod with 8 or more long setae on inner margin (Fig. 13) ..... *Leucon nasica*

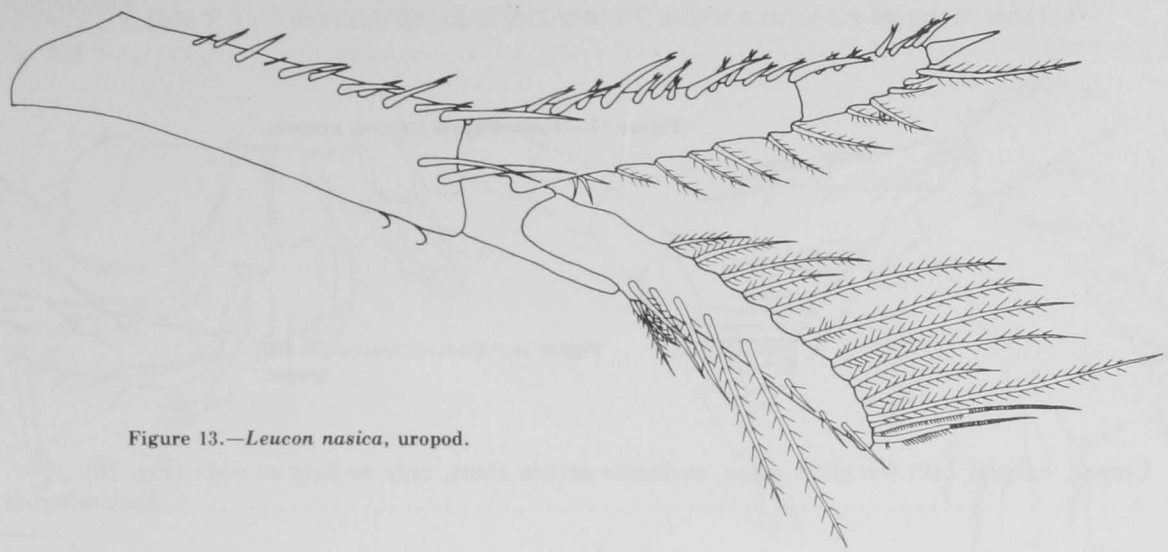


Figure 13.—*Leucon nasica*, uropod.

13 (*10*) Exopod of uropod longer than endopod; pseudorostral lobe with strong erect process posterior to efferent orifice (Fig. 14) 14

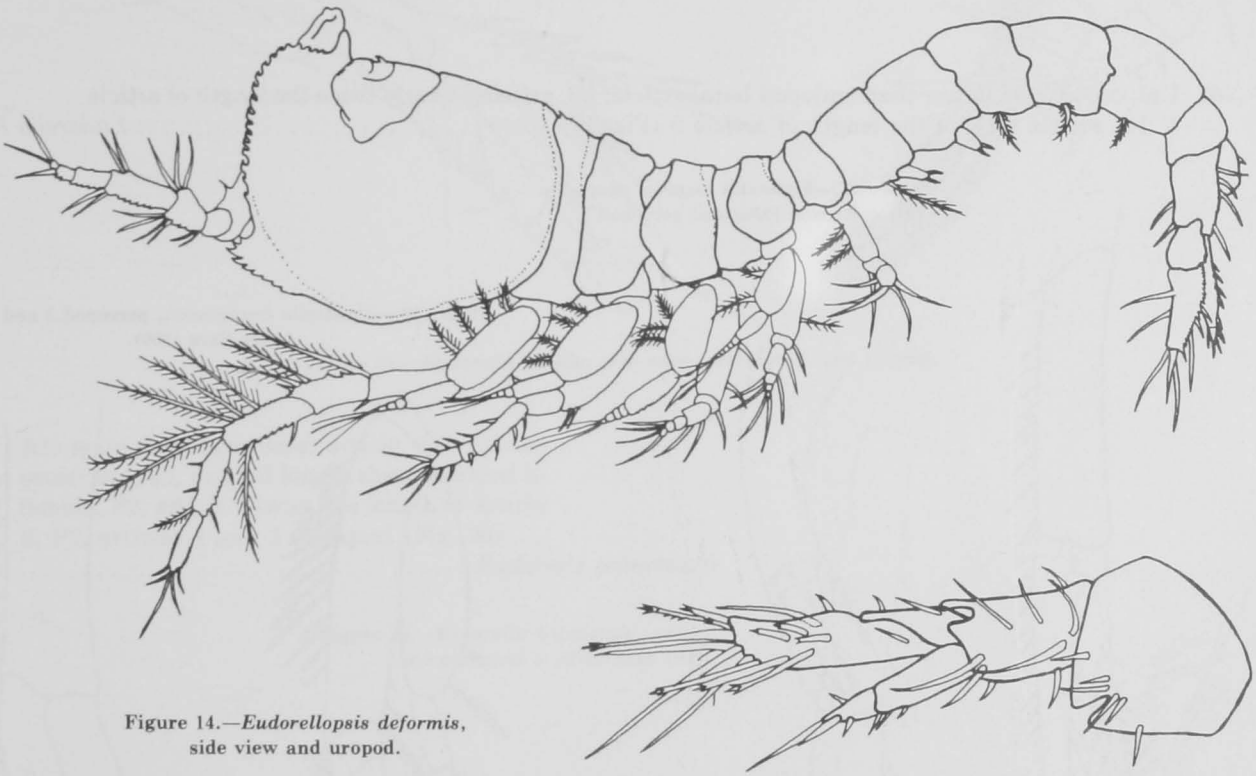


Figure 14.—*Eudorellopsis deformis*, side view and uropod.

13 (*10*) Exopod of uropod shorter than endopod; pseudorostral lobe without strong erect process posterior to efferent orifice (Fig. 19) 16

14 (*13*) Anterior margin of carapace with broad lamellar teeth (Fig. 14) ..... *Eudorellopsis deformis*

14 (*13*) Anterior margin of carapace smooth, without teeth 15

15 (*14*) Uropod, exopod with several long setae, peduncle article twice as long as wide (Fig. 15) ... . *Eudorellopsis integra*

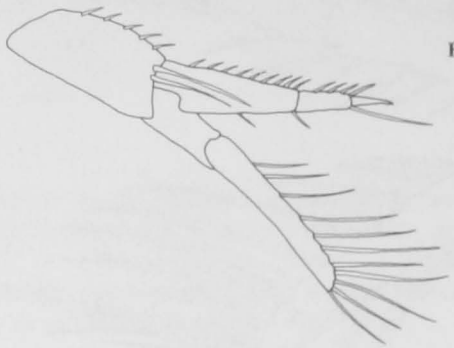


Figure 15.—*Eudorellopsis integra*, uropod.

Figure 16.—*Eudorellopsis biplicata*, uropod.

15 (*14*) Uropod, exopod with few short setae, peduncle article short, only as long as wide (Fig. 16) . ..... *Eudorellopsis biplicata*

16 (*13*) Uropod, exopod medial margin with 7 or more long setae 17

16 (*13*) Uropod, exopod medial margin with less than 6 long setae 18

17 (*16*) Uropod, exopod longer than endopod basal article; P2, article 5 nearly twice the length of article 4; P3, article 4 twice the length of article 3 (Fig. 17) ..... *Eudorella hispida*

Figure 17.—*Eudorella hispida*, uropod (after Hansen 1920) and pereopod 3.

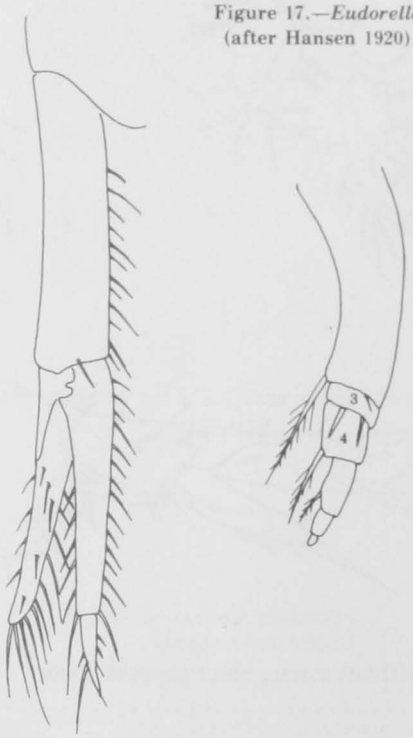
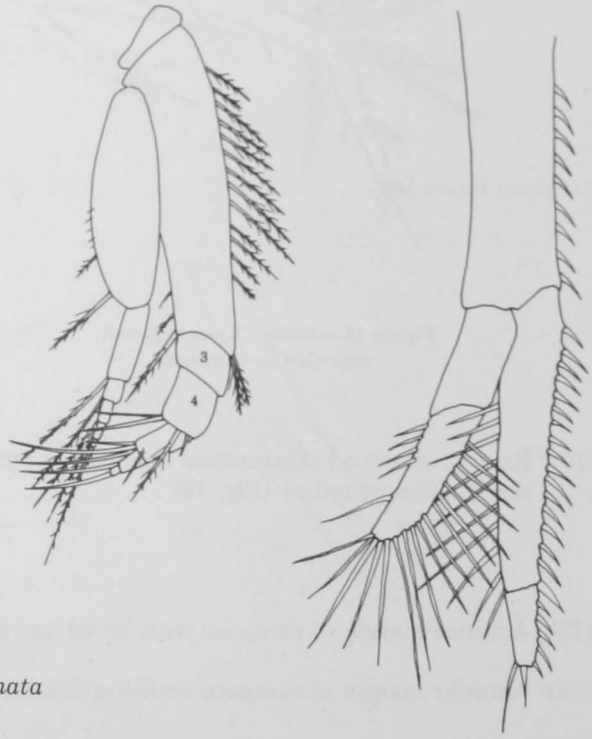


Figure 18.—*Eudorella emarginata*, pereopod 3 and uropod (after Sars 1900).



17 (*16*) Uropod, exopod shorter than endopod basal article; P2, article 5 approximately equal in length to article 4; P3, articles 3 and 4 subequal in length (Fig. 18) ..... *Eudorella emarginata*

18 (*16*) A1, main flagellum basal article without lateral setae; uropod, exopod shorter than endopod in female; P2, article 7, 1½ times the length of article 6; P3, article 4 twice the length of article 3 (Fig. 19) ..... *Eudorella pusilla*

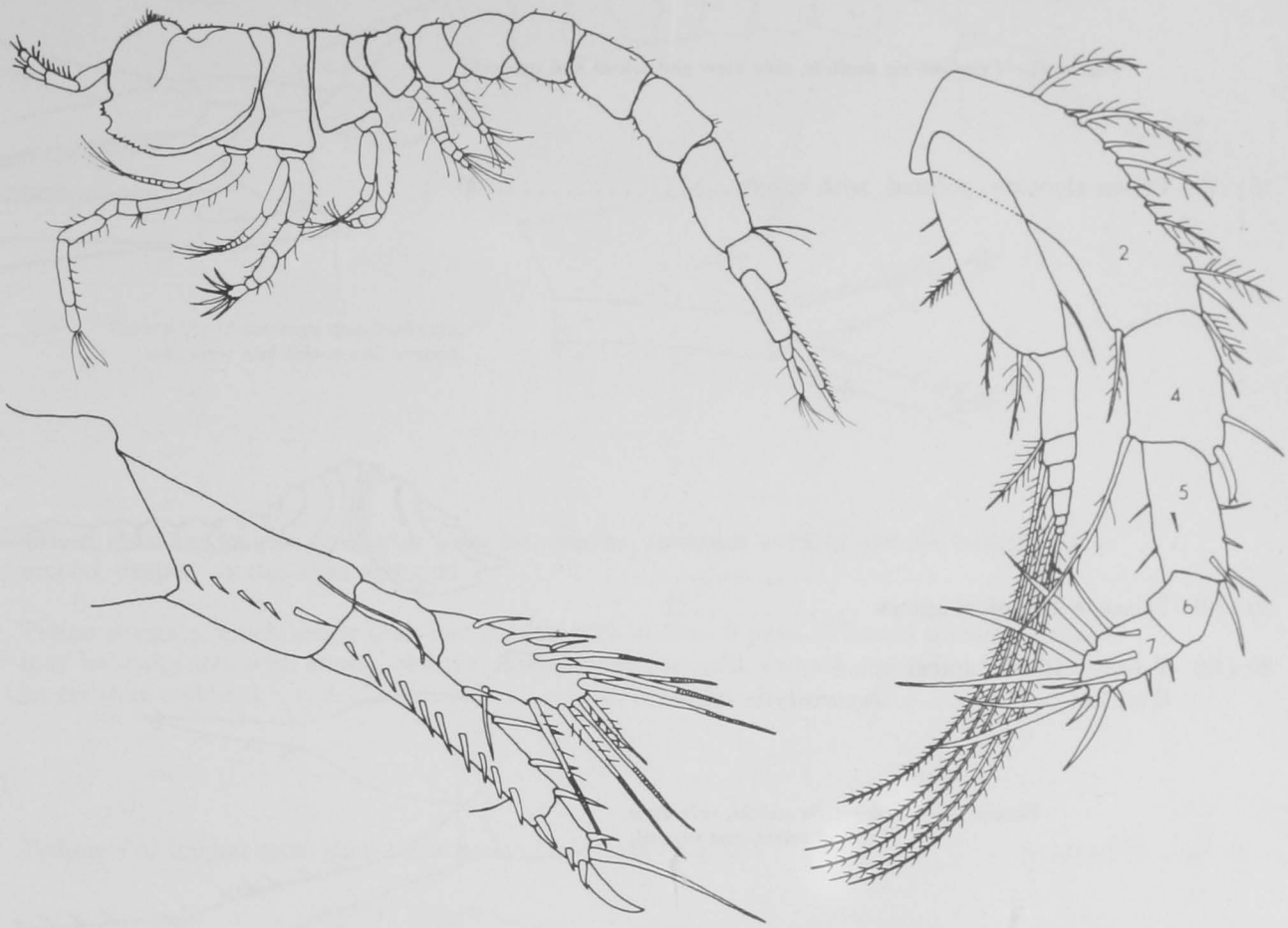
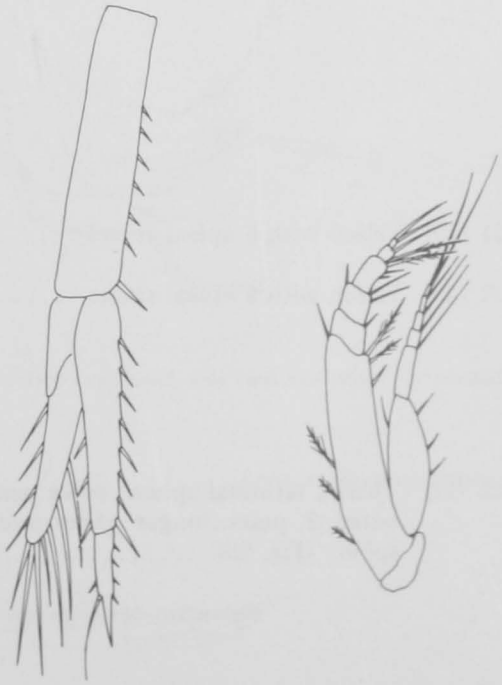


Figure 19.—*Eudorella pusilla*, side view, pereopod 2, and uropod.

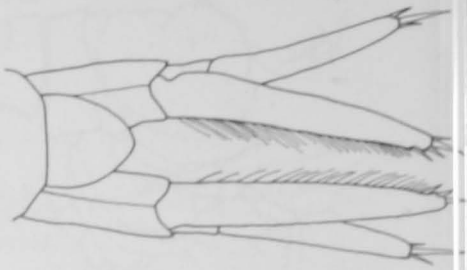
18 (*16*) A1, main flagellum basal article with lateral setae; uropod, exopod longer than endopod in female; P2, article 7 twice the length of article 6; P3, articles 4 and 3 subequal (Fig. 20) .. .. *Eudorella truncatula*

Figure 20.—*Eudorella truncatula*, uropod and pereopod 3 (after Sars 1900).

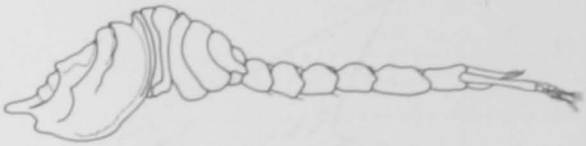


19 (*1*) Telson short, rounded, without spines (Fig. 21) ..... *Petalosarsia declivis*

Figure 21.—*Petalosarsia declivis*, side view and telson and uropods.



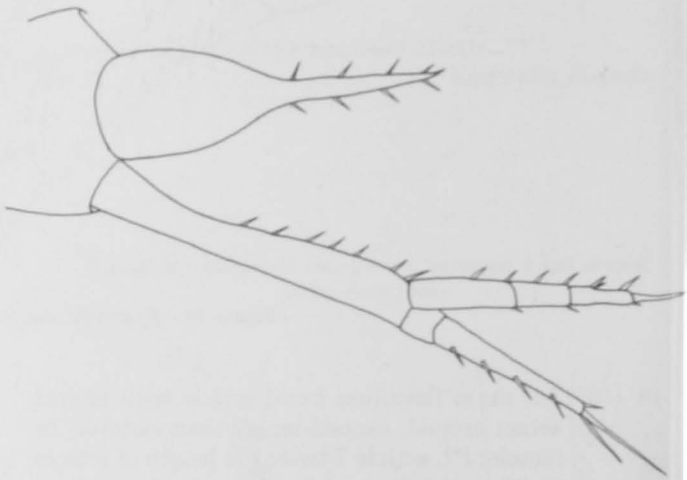
19 (*1*) Telson elongate, pointed, with spines 20



20 (*19*) Telson with apical spines 21

20 (*19*) Telson without apical spine (Fig. 22) ..... *Oxyurostylis smithi*

Figure 22.—*Oxyurostylis smithi*, side view and telson and uropod.



21 (*20*) Telson with 5 apical spines 22

21 (*20*) Telson with 2 apical spines 23

22 (*21*) Telson, terminal spines, outer pair or outer 2 pairs longer than middle spine (Fig. 23) ..... *Lamprops fuscata*

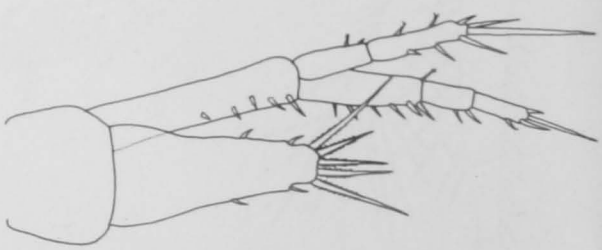


Figure 23.—*Lamprops fuscata*, telson and uropod.

22 (*21*) Telson, terminal spines, outermost and middle spines approximately equal in length (Fig. 24) ..... *Lamprops quadriplicata*

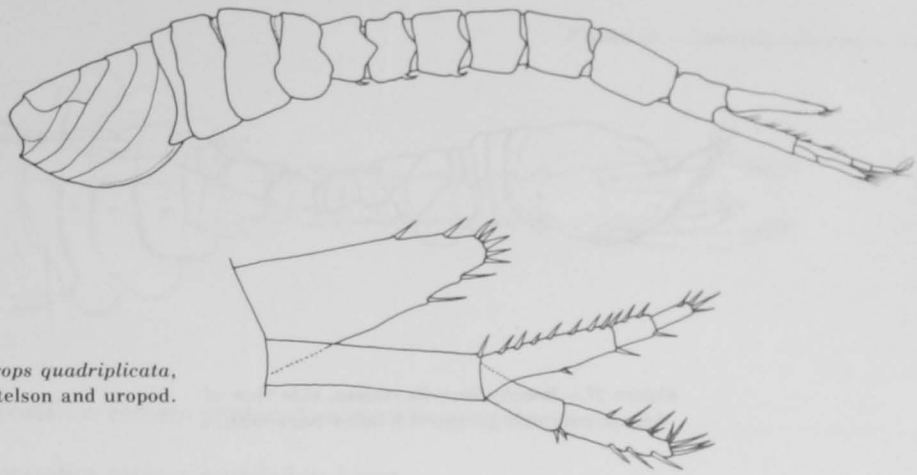


Figure 24.—*Lamprops quadriplicata*, side view and telson and uropod.

23 (*21*) Telson short, as long as or shorter than last somite; caparace without oblique lateral ridges; uropod, exopod shorter than endopod 24

23 (*21*) Telson elongate, much longer than last somite, with at least 3 pairs of lateral spines; carapace may be sculptured with strong, oblique, lateral ridges; uropod, exopod generally as long as or longer than endopod 25

24 (*23*) Peduncle of uropod more than twice as long as telson (Fig. 25) ..... *Leptostylis longimana*

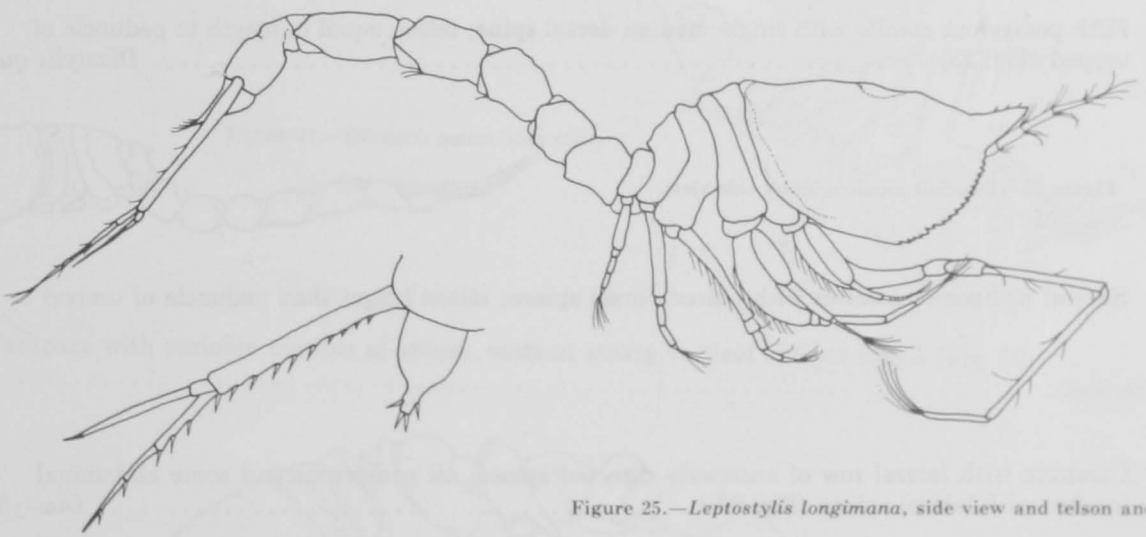
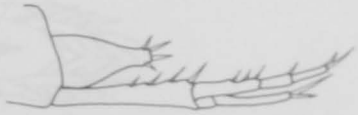


Figure 25.—*Leptostylis longimana*, side view and telson and uropod.

24 (*23*) Peduncle of uropod only slightly longer than telson (Fig. 26) ..... *Leptostylis ampullacea*

Figure 26.—*Leptostylis ampullacea*, telson and uropod.



25 (23) Female with upturned rostrum; male P2, article 6 extending distally as a spinous process (Fig. 27) ..... *Brachydiastylis resima*

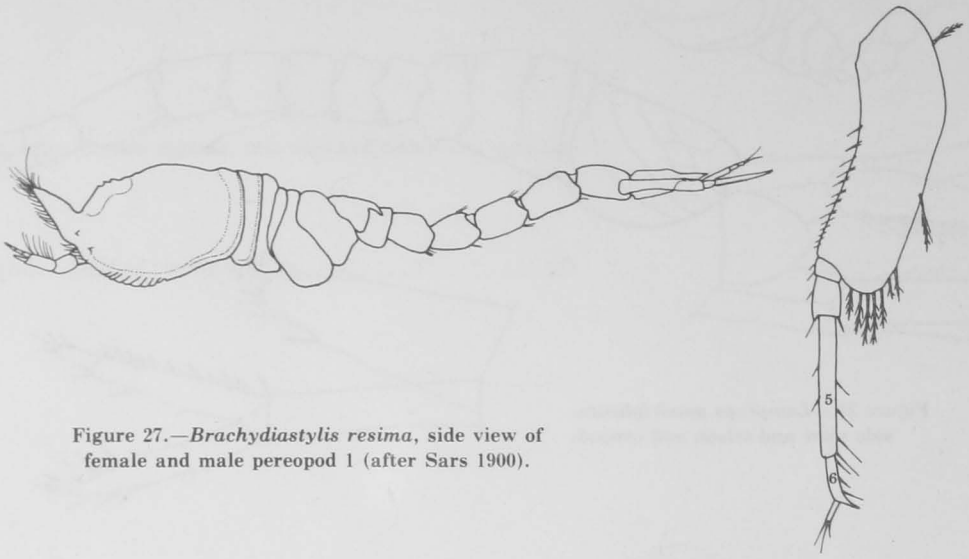


Figure 27.—*Brachydiastylis resima*, side view of female and male pereopod 1 (after Sars 1900).

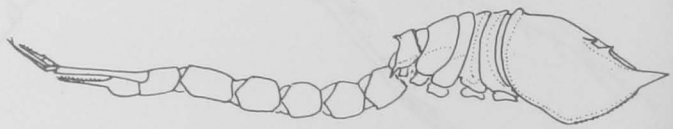
25 (23) Female rostrum extends straight anteriorly; male P2, article 6 without distal spinous process 26

26 (25) Fifth pedigerous somite with dorsal median spine or pair of spines; carapace without oblique lateral ridges 27

26 (25) Fifth pedigerous somite without dorsal spines; carapace may have oblique lateral ridges 29

27 (26) Fifth pedigerous somite with single median dorsal spine; telson equal in length to peduncle of uropod (Fig. 28) ..... *Diastylis quadrispinosa*

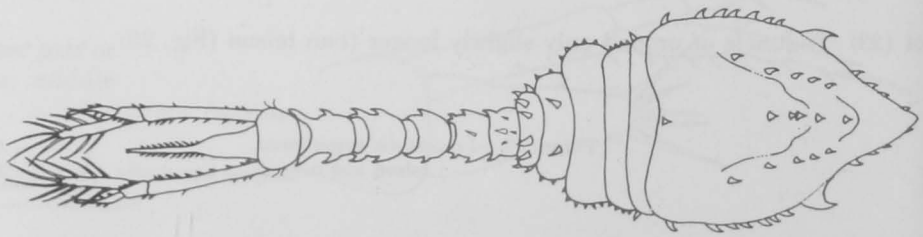
Figure 28.—*Diastylis quadrispinosa*, side view.



27 (26) Several pedigerous somites with paired dorsal spines; telson longer than peduncle of uropod 28

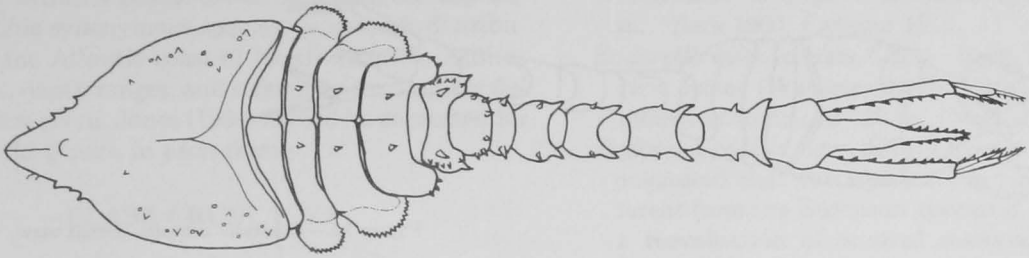
28 (27) Carapace with lateral row of anteriorly directed spines; all pedigerous and some abdominal somites with lateral spines (Fig. 29) ..... *Diastylis cornuifer*

Figure 29.—*Diastylis cornuifer*, dorsal view.



28 (27) Carapace without lateral row of spines; pedigerous somites serrate along lateral margins but lacking spines (Fig. 30) ..... *Diastylis abbreviata*

Figure 30.—***Diastylis abbreviata***, dorsal view.



29 (*26*) Pedigerous somite 5 posterior corners produced as narrow elongate processes 30

29 (*26*) Pedigerous somite 5 posterior corners rounded or blunt 31

30 (*29*) Carapace without spines, but sculptured with strong vertical oblique ridges (Fig. 31) ..... *Diastylis polita*

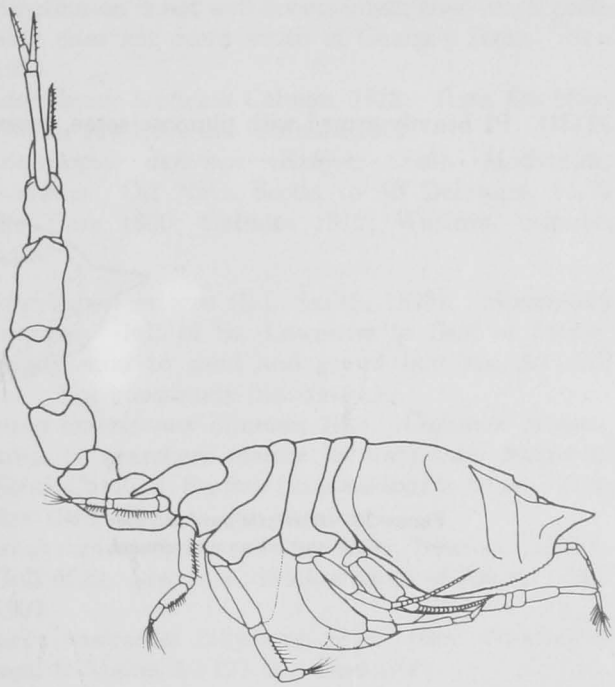


Figure 31.—***Diastylis polita***, side view.

30 (*29*) Carapace with variable number of spines, without strong vertical oblique ridges (Fig. 32) .. .. *Diastylis rathkei*

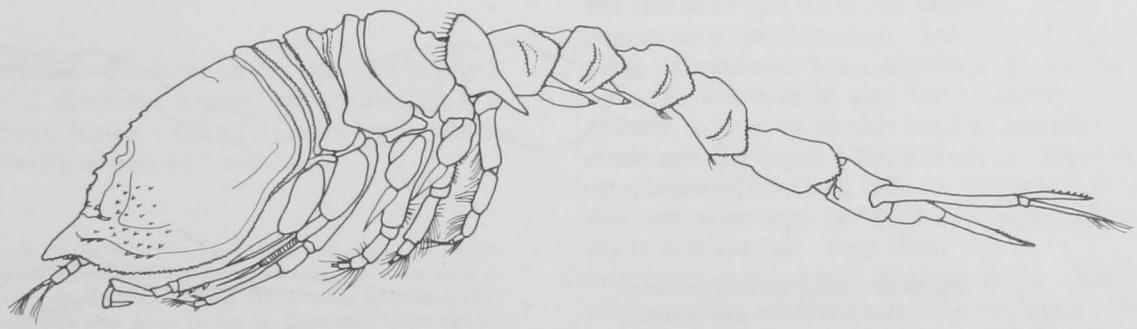


Figure 32.—***Diastylis rathkei***, side view.

31 (29) Carapace sculptured with strong vertical oblique lateral ridges (Fig. 33) ..... *Diastylis sculpta*

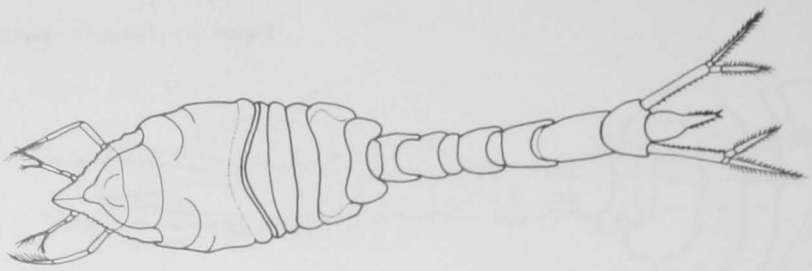
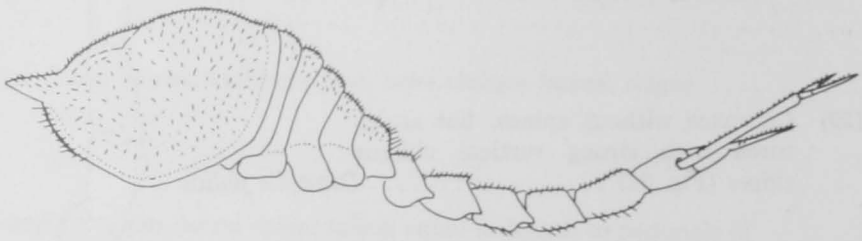


Figure 33.—*Diastylis sculpta*, dorsal view.

31 (29) Carapace without strong vertical oblique lateral ridges 32

32 (31) P1 heavily armed with plumose setae, telson with at least 12 pairs of lateral spines (Fig. 34) ..... *Diastylis goodsiri*



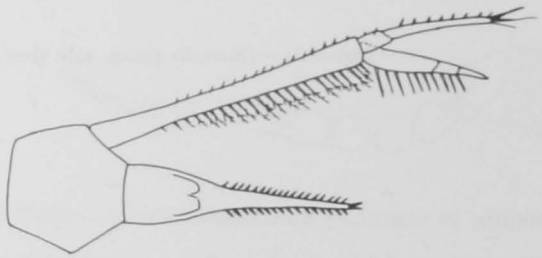
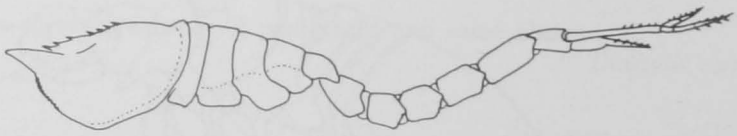


Figure 34.—*Diastylis goodsiri*, side view and telson and uropod.

32 (31) P1 with few plumose setae, telson with few (4 or 5) pairs of lateral spines (Fig. 35) ..... *Diastylis lucifera*



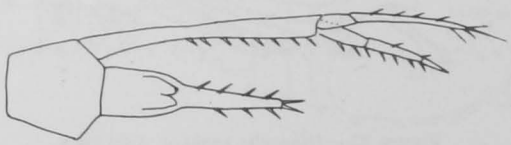


Figure 35.—*Diastylis lucifera*, side view and telson and uropod.

ANNOTATED SYSTEMATIC LIST

The following is a list of the Cumacea from this region arranged systematically according to family, with genera listed alphabetically within a family, and similarly for the species within a genus. Notes on distinguishing features, possible synonymous species, geographic distribution along the Atlantic coast of North America, habitat preferences, depth ranges, and references to complete descriptions are given. Jones (1969) should be consulted for keys to world genera in each family.

CLASS CRUSTACEA

Order Cumacea

Family Bodotriidae. No independent telson; generally 5 pairs, occasionally 3, 2, or 0 pairs of pleopods in males; exopodites on thoracic appendages in the combinations 2 normal and 2 rudimentary, 3 normal and 2 rudimentary, or 4 normal and 1 rudimentary; inner ramus of uropods of 1 or 2 articles.

Subfamily Bodotriinae. Only first pair of pereopods with exopods; 5 pairs of pleopods in males.

Cyclaspis pustulata Zimmer, 1943. Known only from 18-m depth in Chesapeake Bay. Specimens very small, 2 mm in length. Zimmer.[4]

Cyclaspis varians Calman, 1912. Common. From Sheepscot River, Maine, to Chesapeake Bay, primarily in mesohaline waters. Surface (in plankton) to 20 m. Calman 1912.

Iphinoe trispinosa (Goodsir, 1843). A northern species occurring sporadically in the northern part of our region. Surface to 150 m. Sars 1900; Corey 1969.

Subfamily Mancocuminae. Exopods on more than the first pair of pereopods; less than 5 pairs of pleopods in males.

Pseudoleptocuma minor (Calman, 1912). Until recently considered to belong in the genus *Leptocuma*. Common. Gulf of St. Lawrence to Chesapeake Bay in fully marine water. On clean sandy bottoms, 8-25 m. Calman 1912; Watling 1977.

Mancocuma stellifera Zimmer, 1943. Abundant in selected localities. This species is probably identical to *M. altera* Zimmer, 1943. Gulf of St. Lawrence to Chesapeake Bay. Intertidal sandy beaches to shallow subtidal, marine and estuarine. Zimmer, see footnote 4.

Family Leuconidae. No independent telson; 2 (rarely 1 or 0) pairs of pleopods; thoracic exopodites, male 5 (rarely 3) pairs, female 4 (rarely 3) pairs; inner ramus of uropod nearly always of 2 articles.

Eudorella difficilis Blake, 1929. Rare. Not in key. Recorded only from Maine. Muddy bottoms, 10-15 m. Blake 1929. May be synonymous with *E. pusilla*.

Eudorella emarginata (Krøyer, 1846). Rare. Newfoundland to Cape Cod. Sandy mud bottoms, 20-60 m. Sars 1900; Calman 1912.

Eudorella hispida Sars, 1871. Rare. Nova Scotia to off New Jersey (Watling unpubl. data). Usually taken on muddy bottoms, 10-120 m. Sars 1871; Calman 1912.

Eudorella pusilla Sars, 1871. Common. Calman (1912) suggested that this species was not significantly different from the European species *E. truncatula* but, in a reevaluation of original material of both species, Zimmer (see footnote 4) noted consistent differences separating the two species. Gulf of St. Lawrence to off New Jersey (Watling, unpubl. data). Mud, sand, and gravel bottoms, 2-100 m. Calman 1912; Zimmer, see footnote 4. Male not adequately described.

Eudorella truncatula (Bate, 1855). Rare. Because of the difficulties in separating this species from *E. pusilla* its distribution is not well documented; however, it probably does not occur south of George's Bank. Sars 1900.

Eudorellopsis biplicata Calman, 1912. Rare. Off Nova Scotia, 100-1,600 m. Calman 1912.

Eudorellopsis deformis (Krøyer, 1846). Moderately common. Off Nova Scotia to off Delaware, 15-75 m. Sars 1900; Calman 1912; Watling, unpubl. data.

Eudorellopsis integra (S.I. Smith, 1879). Moderately common. Gulf of St. Lawrence to Gulf of Maine. Sandy mud to sand and gravel bottoms, 50-1,500 m. (Not adequately illustrated.)

Leucon americanus Zimmer, 1943. Common in estuarine to nearshore marine habitats from Maine to South Carolina. Surface (in plankton) to 50 m. Zimmer 1943; Zimmer, see footnote 4.

Leucon nasica (Krøyer, 1841). Rare. Newfoundland to Gulf of St. Lawrence. Shallow water to 700 m. Sars 1900.

Leucon nasicoides Lilljeborg, 1855. Rare. Newfoundland to Maine, 50-120 m. Sars 1900.

Family Nannastacidae. No independent telson; no pleopods in males; thoracic exopodites, male 5 (rarely 4 or 3) pairs, female generally 3 (rarely 4 or 0) pairs; inner ramus of uropod of one article.

Almyracuma proximoculi Jones and Burbanck, 1959. Common. Massachusetts to North Carolina. In locations of very low or highly fluctuating salinity, 1-10 m on muddy sand to gravelly bottoms. Jones and Burbanck 1959; Boesch and Diaz 1974.

Campylaspis affinis Sars, 1870. Calman (1912) referred five specimens from off Martha's Vineyard, Mass., (65 m) to this species. Sars 1900.

Campylaspis rubicunda (Lilljeborg, 1855). Moderately common. Gulf of Maine to off New Jersey (Watling, unpubl. data). Fine sandy mud and shell bottoms, 12-65 m. Sars 1900.

[4]This manuscript, prepared by Zimmer in 1938, was sent to the Smithsonian Institution for publication, but for various reasons it was never issued. A partial synopsis was subsequently published by Zimmer (1943). In 1975 the manuscript was given to me by Thomas E. Bowman for further editing. It is planned to submit the edited manuscript under Zimmer's name to the Smithsonian Contributions to Zoology.

Family Lampropidae. Telson present, usually with 3 or more terminal spines; 3 or 0 pairs of pleopods in males; thoracic exopodites, male 5 pairs, female 3 normal and 2 rudimentary, rarely 2 normal or 2 normal and 2 rudimentary pairs; inner ramus of uropod of 3 articles.

Lamprops quadriplicata S.I. Smith, 1879. Common. Calman (1912) noted that the features used to distinguish this species from the European *L. fasciata* Sars, 1863, were considerably variable, and consequently he suggested the two species may be synonymous. From off Newfoundland to Massachusetts, 2-65 m. (Not adequately illustrated.)

Lampropos fuscata Sars, 1865. Rare. Newfoundland to Nova Scotia. Shallow water to 150 m. Sars 1900.

Family Pseudocumatidae. Telson present, small; 2 pairs of somewhat rudimentary pleopods in males; thoracic exopodites, male 5 pairs, female 3 normal and 2 rudimentary pairs; inner ramus of uropods of 1 article.

Petalosarsia declivis (Sars, 1865). Common. Off Newfoundland to off Delaware (Watling, unpubl. data). Surface (plankton) to 160 m. Sars 1900.

Family Diastylidae. Telson present, with 2 or 0 terminal spines; 2 or 0 pairs of pleopods in males; thoracic exopodites, male 5, rarely 3 pairs, female 3 normal, 3 normal and 2 rudimentary, or rarely 2 normal or 0 pairs; inner ramus of uropod of 2 or 3 articles, rarely of one article.

Brachydiastylis resima (Krøyer, 1846). Rare. Off Nova Scotia, 100 m. Sars 1900.

Diastylis abbreviata Sars, 1871. Rare. Gulf of Maine to off New Jersey, 30-70 m. Zimmer, see footnote 4.

Diastylis cornuifer (Blake, 1929). Moderately common. This species was described from the Mount Desert region of Maine, and was subsequently documented from Casco Bay, Maine, and the Cape Cod region by Zimmer. Gulf of Maine to off New Jersey (Watling, unpubl. data), 2-200 m. Zimmer, see footnote 4. (There are no complete figures of *D. cornuifer*.)

Diastylis goodsiri (Bell, 1855). Rare in the New England region, being found only in deeper water (150-400 m) from off Nova Scotia. Sars 1900.

Diastylis lucifera (Krøyer, 1841). Rare. Nova Scotia to Gulf of Maine, 10-140 m. Sars 1900.

Diastylis polita (S.I. Smith, 1879). Common. Newfoundland to off Delaware (Watling, unpubl. data). Surface to 300 m, but most common in waters of 20-40 m. Calman, 1912. (There are no complete figures of *D. polita*.)

Diastylis quadrispinosa (Sars, 1871). This species was considered by Calman (1912) to be synonymous with *D. bispinosa* (Stimpson, 1853) but he chose not to use the older name. Since the name *D. quadrispinosa* is so widely used it has been adopted here. Extremely abundant; from off Nova Scotia to Cape Hatteras. Muddy to clean sand and gravel bottoms, surface (plankton) to 200 m. Calman 1912.

Diastylis rathkei (Krøyer, 1841). Zimmer (1926, 1930) divided this species into *D. rathkei* and *D. glabra*, each with several geographic subspecies. For this study it was not possible to demonstrate consistent differences between these two forms and therefore *D. glabra* is considered here to be a morphological variant. Rare in the Newfoundland to Nova Scotia region, 75-200 m. Calman 1912; Zimmer 1926, 1930.

Diastylis sculpta Sars, 1871. Common. Prince Edward Island (Northumberland Straits) to off New Jersey (Watling, unpubl. data). Most commonly 7-65 m, occasionally to 400 m; sand and gravel to sandy mud bottoms. Sars 1871; Calman 1912.

Leptostylis ampullacea (Lilljeborg, 1855). Rare. Gulf of Maine, 18-165 m. Sars 1900; Zimmer, see footnote 4.

Leptostylis longimana (Sars, 1865). Rare. Maine to Massachusetts, 21-125 m. Sars 1900.

Oxyurostylis smithi Calman, 1912. Common. Maine to Louisiana, estuarine and marine. Surface to 45 m. Calman 1912.

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SYSTEMATIC INDEX

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COORDINATING EDITOR'S COMMENTS

Publication of the "Marine Flora and Fauna of the Northeastern United States" is most timely in view of the growing universal emphasis on environmental work and the urgent need for more precise and complete identification of coastal organisms than has been available. It is mandatory, wherever possible, that organisms be identified accurately to species. Accurate scientific names unlock the great quantities of biological information stored in libraries, obviate duplication of research already done, and often make possible prediction of attributes of organisms that have been inadequately studied.

Les Watling began his studies on cumaceans while at the College of Marine Studies, University of Delaware, where he received his doctoral degree. In 1975 he joined the faculty of the Oceanography Department, University of Maine, at Orono, where the manual on cumaceans was completed. Besides his continuing work with cumaceans, Watling also is engaged in studies of the systematics and ecology of amphipod crustaceans as well as in quantitative aspects of marine benthic ecology.

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HO, JU-SHEY. Copepoda: Lernaeopodida and Sphyriidae.	406	PB 280040/AS
HO, JU-SHEY. Copepoda: Cyclopoids Parasitic on Fishes.	409	PB 281969/LL
CRESSEY, ROGER F. Crustacea: Branchiura.	413	PB 222923/5ST
BOVEE, EUGENE C., and THOMAS K. SAWYER. Protozoa: Sarcodina: Amoebae.	419	
WATLING, LES. Crustacea: Cumacea.		

ERRATA

NOAA Technical Report NMFS Circular 401: Fisheries and Fishery Resources of New York Bight, by J. L. McHugh

Page 1, footnote 2: Contribution 000 should read: Contribution 179
Page 46, left column, paragraph 3, line 7: (McHugh 2976b) should read: (McHugh in press b)

NOAA Technical Report NMFS Circular 413: Marine Flora and Fauna of the Northeastern United States. Crustacea: Branchiura, by Roger F. Cressey

Page 6, line 3, right side: Correct scientific name to read: *Argulus stizostethi*
Page 6, line 4, right side: Correct scientific name to read: *Argulus catostomi*

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