MEIOBENTHIC HARPACTICOIDA (CRUSTACEA, COPEPODA) FROM THE NORTH CAROLINA CONTINENTAL SHELF

by

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Résumé

Les Harpacticoïdes méiobenthiques (Crustacea, Copepoda) du Plateau continental de la Caroline du Nord.

L'auteur décrit les Copépodes Harpacticoides récoltés sur le plateau continental de la Caroline du Nord (jusqu'à 100 m de profondeur). Ils ont été pêchés au cours de l'étude du méiobenthos du plateau continental, du talus continental et de l'étage bathyal, entre la Caroline du Nord et les Bermudes. 111 espèces ont été trouvées dont 11 nouvelles et une sous-espèce. Deux genres nouveaux sont également décrits. Les formes nouvelles sont les suivantes : *Ellucana secunda* n. sp., *Danielssenia eastwardae* n. sp., *Melima bisetosa* n. sp., *Schizopera carolinensis* n. sp., *S. anomala* n. sp., *Fearia prima* n. gen., n. sp., *Tetragoniceps bookhouti* n. sp., *Phyllopodopsyllus parafurciger carolinensis* n. ssp., *Rhizothrix spinosa* n. sp. et *Tryphoema riedli* n. sp.

Ellucana est élevée au rang de genre en y incluant *E. longicauda* Sewell et *E. secunda* n. sp. Les deux nouveaux genres, *Fearia* et *Cylinula* semblent intermédiaires entre les genres antérieurement connus. *Rhizothrix spinosa, R. pubescens* Por et *R. quadriseta* Wells pourraient être également considérés comme des formes intermédiaires entre *Rhizothrix* et *Tryphoema.*

Introduction

Sharpe (1910), Wilson (1932a, 1932b), Pennak (1942a, 1942b) and Yeatman (1963) report on the free-living harpacticoid copepods of the United States east coast. Except for the work of these four authors, the eastern U.S. marine harpacticoid fauna has been neglected. This paper deals with specimens collected on the North Carolina shelf (to 100 m) during a shelf, slope and deep sea study of the meiobenthos between North Carolina and Bermuda. I have reported on the Bermudian harpacticoids elsewhere (Coull, 1969a, 1969b, 1970a; Coull and Herman, 1970) as well as a North Carolinian estuarine form (Coull and Lindgren, 1969).

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Sediment samples containing the forms listed herewith were collected from the R/V EASTWARD (Duke University) and S.S. ADVANCE II (Cape Fear Technical Institute), with a Higgins meiobenthic sled at the locations illustrated (Fig. I) and listed (Table 1).

TABLE 1

List of stations, date of collection, location, depth and sediment median grain size.

Station	Date	Position	Depth (m)	Sediment (median grain size - μ)
1	3 Feb. 1969	33° 38.0' N 77° 38.5' W	20	910
2	3 Feb. 1969	33° 53.0' N 77° 16.0' W	31	762
3	3 Feb. 1969	34° 35.0' N 76° 46.5' W	14	
4	27 Nov. 1968	34° 28.6' N 76° 43.5' W	21	385
5	4 Feb. 1969	34° 22.0' N 76° 34.5' W	31	
6	27 Nov. 1968	34° 23.7' N 76° 26.3' W	17	
7	20 Apr. 1969	34° 15.4' N 76° 10.0' W	50	365
8	20 Apr. 1969	34° 12.7' N 76° 05.5' W	90	1810
9	27 Nov. 1968	34° 25.0' N 76° 13.0' W	31	
10	25 Nov. 1968	34° 26.2' N 76° 16.3' W	30	340
11	27 Nov. 1968	34° 30.2' N 75° 55.2' W	60	405
12	4 Feb. 1969	34° 36.9' N 76° 25.1' W	20	330
13	25 Nov. 1968	34° 45.0' N 75° 45.0' W	41	450
14	25 Nov. 1968	34° 49.0' N 75° 40.0' W	43	465
15	26 Nov. 1968	34° 56.0' N 75° 25.0' W	100	1530
16	24 Apr. 1969	36° 00.0' N 75° 20.0' W	19	365
17	24 Apr. 1969	36° 00.0' N 74° 57.3' W	50	240
18	24 Apr. 1969	35° 58.5' N 74° 47.4' W	100	470

A total of 111 species were found of which 11 are new species and one a new sub-species. Two new genera are also described. The species list below indicates where each form was found and the total number identified. Representatives of each new species and most other species have been deposited at the United States National Museum and, when adequate numbers were available, in the Duke University Marine Laboratory Reference collection.

The nomenclature, phylogeny and descriptive terminology used throughout are adopted from Lang (1948, 1965). All figures have been prepared with the aid of a camera lucida. The abbreviations used throughout the paper are: A_1=antennule, A_2=antenna, Md.=mandible, Mx.=maxilla, Mxl.=maxillula, Mxp.=maxillipede, P_1 - P_5=leg 1 - leg 5. All measurements refer to the length of the copepod not including the rostrum, antennules and caudal rami.

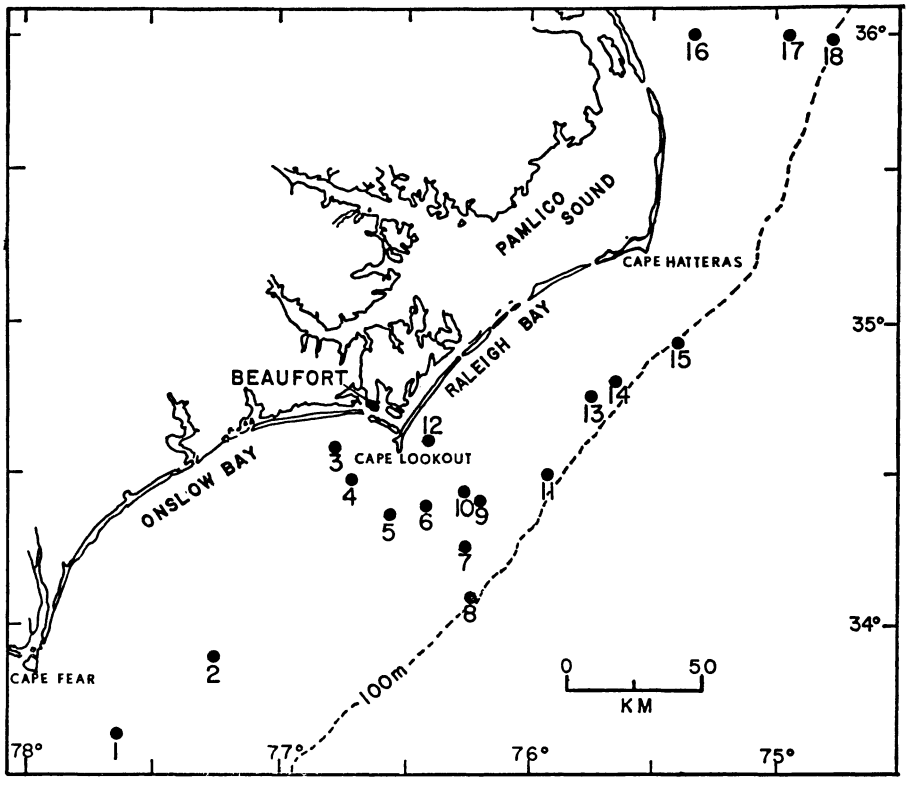


FIG. I
Area of study with station locations.

DESCRIPTIONS OF NEW SPECIES

Family **CANUELLIDAE** Lang 1948, Por 1967

Genus ***Ellucana*** Sewell 1940

syn. ***Canuella (Ellucana)*** Sewell 1940

Ellucana secunda n. sp. (Fig. II-III)

Material: 12♀♀, 8♂♂. Holotype 1♀, U.S.N.M. No. 128161 ; paratypes 6♀♀, 2♂♂, U.S.N.M. No. 128162.

Type locality: North Carolina Continental Shelf (Stations 9, 10, 13 in this paper). I have also collected 5 females in Barbados, W.I. (Coull, 1970b).

Description

Female: based on ovigerous female, 0.93 mm. Body shape of typical family form. First leg bearing segment fused with the cepha-

Species list

* designates new species

Species	Stations	Total #
Longipediidae		
Longipedia helgolandica (Klie)	2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14	129
Canuellidae		
**Ellucana secunda* n. sp.	9, 10, 13	20
Ectinosomidae		
Ectinosoma tenuipes T. & A. Scott	1, 2, 6, 7, 8, 10, 14, 16	55
E. normani Boeck	11	1
Halectinosoma kunzi Lang	6, 10	6
H. neglectum (Sars)	3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 17, 18	79
H. chrystalli (T. Scott)	15	1
H. distinctum (Sars)	10	8
H. angulifrons (Sars)	18	1
H. proximum (Sars)	16, 17, 18	5
H. curticorne (Boeck)	10	1
H. sarsi (Boeck)	3, 9, 10, 11	44
H. gothiceps (Giesbrecht)	14	1
H. finmarchicum (T. Scott)	1	1
Bradya (B.) congenera Sars	7	9
B. (B.) macrochaeta Sars	9, 15, 16	17
B. (B.) proxima T. Scott	5	11
B. (P.) dilatata Sars	17	2
Pseudobradya exilis Sars	13	1
P. similis (T. & A. Scott)	14	2
P. quoddiensis Willey	5	7
P. pulchella Sars	16	2
Hastigerella psammae (Noodt)	4, 12, 14	6
Tetanopsis sp.	18	1
Tachidiidae		
Euterpina acutifrons (Dana)	10, 13, 14	4
**Danielssenia eastwardae* n. sp.	14	5
D. stefanssoni Willey ?	10	1
Thompsonula curticauda (Wilson)	3, 5, 17	67
Harpacticidae		
Harpacticus tenellus Sars	14	1
Zausodes arenicolus Wilson	1, 2, 3, 4, 5, 7, 9, 12, 13, 14, 16	101
Zaus sp.	9	1
Tisbidae		
Tisbe furcata (Baird)	10	3
Peltidiidae		
Peltidium ovale Thompson & A. Scott	2, 11, 14	5
Paraltheutha villosa (Brady)	6	1
Thalestridae		
Diarthrodes aegideus (Brian)	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14	788
D. pygmaeus (T. & A. Scott)	15	3
Rhynchothalestris rufocincta (Brady)	2, 4, 6, 9, 13, 14	17
Parastenheliidae		
Parastenhelia spinosa (Fisher)	13, 14	38
Diosaccidae		
Stenhelia (St.) divergens Nicholls	16	2
S. (D.) arenicola Wilson	2, 3	3
S. (D.) cornuta Lang	7	3
S. (D.) normani polluta Monard	2, 3, 5, 9, 11, 12, 14	130
S. (D.) reflexa Brady & Robertson	17	3
**Melima bisetosa* n. sp.	2, 9, 11, 13, 14	31
Diosaccus valens (Gurney)	15	1
Robertsoni knoxi (Thompson & A. Scott)	6, 7, 10, 11, 13, 14	57
Pseudomesochra media (Sars)	11	2
Amphiascus hirtus Gurney	2, 15	3
A. varians (Norman & T. Scott)	9, 11, 13, 14	126
A. tenellus Sars	13	37
A. caudaespinosus Brian	2, 12	23

Species	Stations	Total #
A. tenuiremis (Brady & Robertson)	18	4
Paramphiascopsis soyeri (Lang)	7, 11	5
P. pallidus (Sars)	14	6
Bulbamphiascus imus (Brady)	2, 3	29
Robertgurneya rostrata (Gurney)	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18	217
Typhlamphiascus lamellifer (Sars)	8, 10, 4	6
Ryncholagena pestai (Monard)	1, 2, 12, 13, 14	88
Amphiascoides subdebilis (Willey)	8	3
Paramphiascella robinsoni (A. Scott)	1, 15	12
P. intermedia (T. Scott)	11, 14	7
Haloschizopera junodi (Monard)	4, 9, 10, 11, 13, 15	67
H. bulbifer (Sars)	18	8
Schizopera sp.	18	2
**S. carolinensis* n. sp.	4, 7, 13, 14, 15	156
**S. anomala* n. sp.	1, 2, 11, 12, 14	23
Ameiridae		
Ameira parvula (Claus)	1, 2, 9, 14	25
A. divagans Nicholls	12	6
Ameiropsis mixta Sars	11	5
Psyllocamptus minutus minutus (Sars) ..	1, 10, 14	10
Sarsameira elongata (Sars)	17, 18	13
Paramesochridae		
Paramesochra heloglandica Kunz	7, 12, 14, 18	46
Scottopsyllus minor (T. & A. Scott)	12	4
Apodopsyllus africanus Kunz	12, 14	4
Kliopsyllus constrictus (Nicholls)	2, 9	2
Tetragonicipitidae		
**Fearia prima* n. g., n. sp.	1	9
**Tetragoniceps bookhouti* n. sp.	8, 13, 14	21
Phyllopodopsyllus bradyi (T. Scott)	18	9
**P. parafurciger carolinensis* n. ssp.	1, 2, 8, 12, 13, 14	218
Canthocamptidae		
Mesochra pygmaea (Claus)	1, 2, 3, 4, 5, 6, 7, 9, 10, 11 13, 14, 15 18	208
Orthopsyllus linearis (Claus)	13, 14	12
Cylindropsyllidae		
**Cylinula proxima* n. g., n. sp.	12, 13, 14	18
Evansula incerta (T. Scott)	1, 12	3
Stenocaris kliei Kunz	1, 7, 14	14
S. minor (T. Scott)	13	2
Leptastacus macronyx (T. Scott)	1, 3, 4, 7, 13, 14, 18	329
L. abberans Chappuis	1	3
L. laticaudatus laticaudatus Nicholls	1	1
Leptopontia curvicauda T. Scott	18	1
Arenopontia stygia Noodt	18	5
A. arenardia (Pennak)	1	1
Cletodidae		
**Cletodes pseudodissimilis* n. sp.	2, 4, 5, 7, 9, 11	27
C. tenuips T. Scott	4, 7, 10, 15	14
C. longicaudatus (Boeck)	2, 5, 8, 11	17
C. longifurca Lang	18	1
C. limicola limicola Brady	14	3
Enhydrosoma bucholtzi (Boeck)	10	1
E. curvirostre (T. Scott)	14	1
E. propinquum (Brady)	4, 5, 7, 9, 10, 13	60
**Rhizothrix spinosa* n. sp.	1, 2, 3, 5, 13, 14	36
R. scotti Lang	2	1
R. gracilis (T. Scott)	12, 14	6
**Tryphoema riedli* n. sp.	7	5
Eurycletodes (O.) similis (T. Scott)	14	1
Laophontidae		
Laophonte cornuta Philippi	1, 2, 7, 13, 14, 16	25
L. adduensis Sewell	10	3
Paralaophonte congenera congenera (Sars)	8, 11	7
P. brevirostris fissirostris (Willey)	4, 9, 10, 13, 14	87
Esola longiremis (T. Scott)	14	11
Normanella minuta (Boeck)	2	1
N. mucronata typica Sars	1, 4, 5, 8, 10, 11, 14	29

lothorax. The body devoid of ornamentation. Caudal rami (Fig. II, 2) widely divergent, 2½ times as long as wide at base. Two principal terminal setae; one dorsal and one lateral seta insert at 3/4 the length.

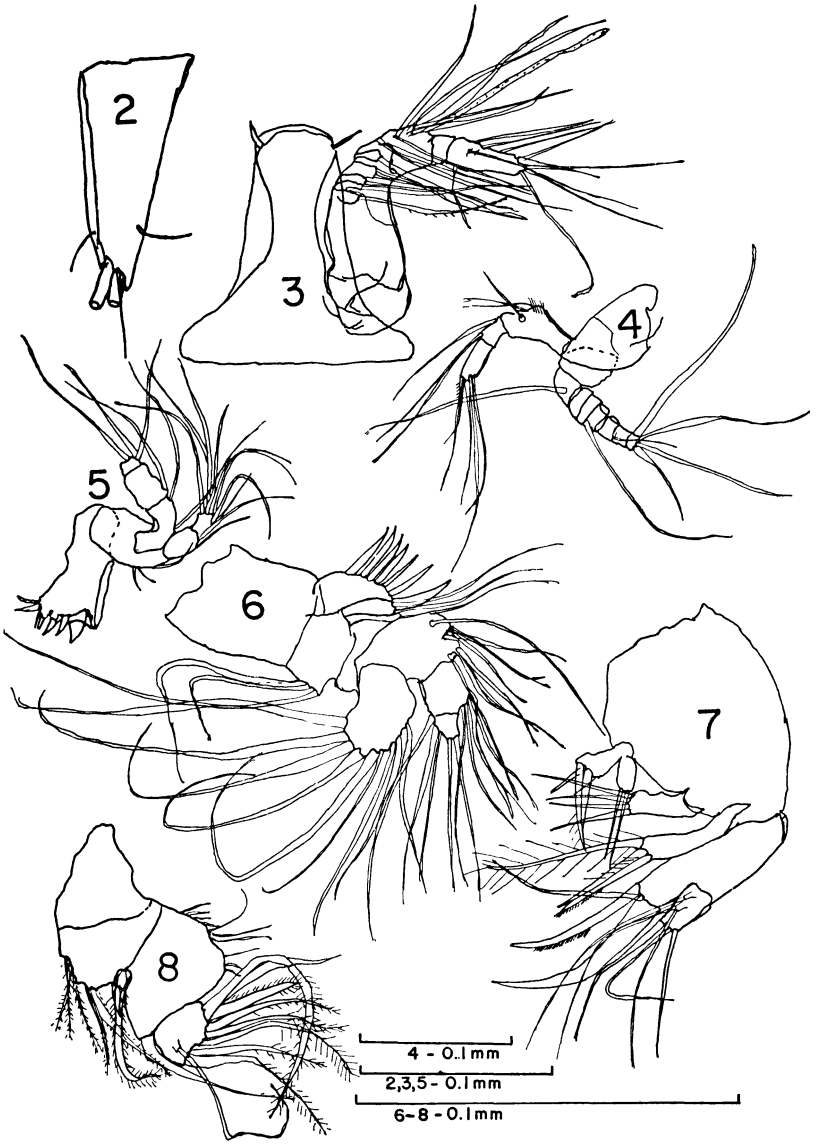


FIG. II
Ellucana secunda n. sp. ♀.
2, Caudal ramus; 3, rostrum and A_1; 4, A_2; 5, Md.; 6, Mxl.; 7, Mx.; 8, Mxp.

Rostrum large, broadly rounded proximally and with two sensilla setae on either side of tip (Fig. II, 3).

A_1 (Fig. II, 3), 4 (indistinctly 5)-segmented with many setae. Aesthetasc on segment 2(3).

A_2 (Fig. II, 4), 3-segmented, with basis. Expopod, 7-segmented; segment 2 and 4 with inner setae, terminal segment with 4 setae.

Md. (Fig. II, 5), complex cutting edge, many accessory spines and

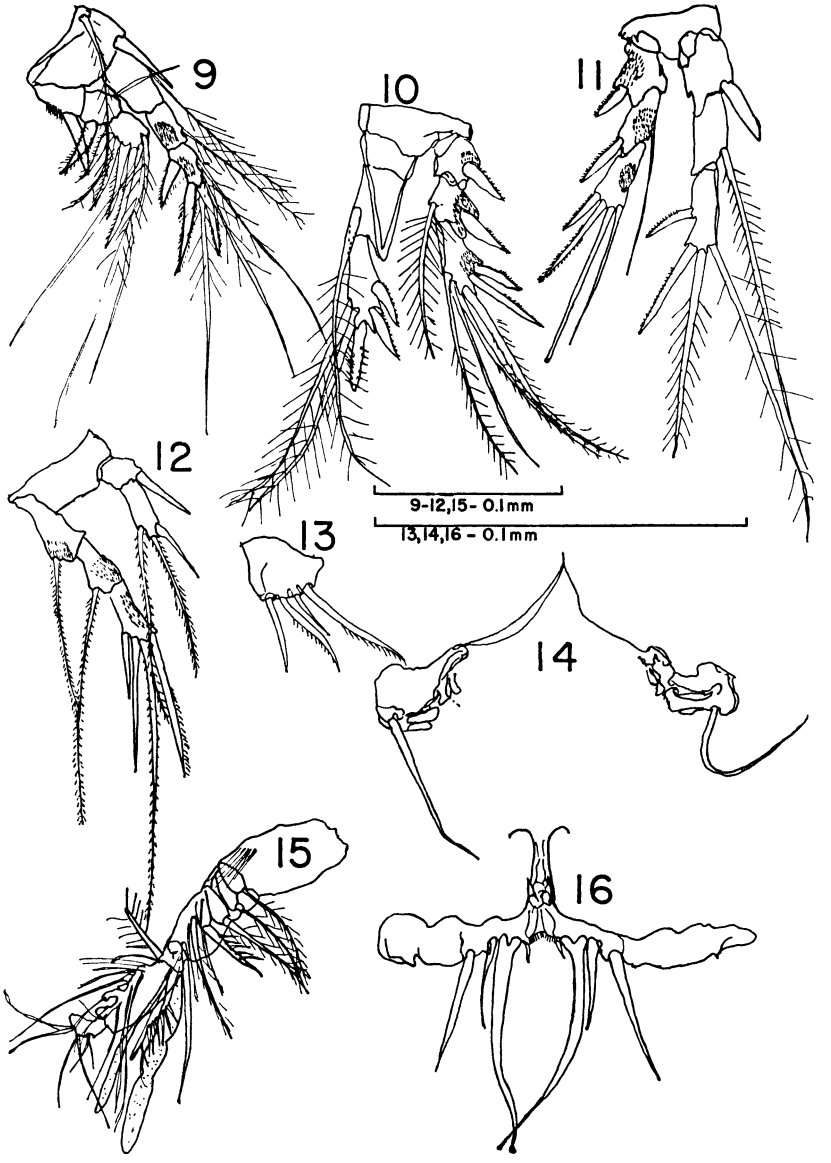


FIG. III
Ellucana secunda n. sp.
♀ : 9, P_1; 10, P_2; 11, P_3; 12, P_4; 13, P_5; 14, genital field.
♂ : 15, A_1; 16, genital field.

setae. Coxa-basis with 3 setae. Endopod 2-segmented. First segment with 2 setae, terminal segment with 8. Exopod poorly 3-segmented, terminally with 3 setae.

Mxl. (Fig. II, 6), pre-coxal arthrite with strong spines. Coxa-basis terminally with 2 setae, laterally with 3. Endopod 3-segmented: first segment the largest with 7 setae, second segment smaller with 5 setae, third segment smallest with 5 setae. Exopod, one-segmented with 9 setae.

Mx. (Fig. II, 7), syncoxa with 3 endites. The proximal most bifid: one part with 4 setae, the other with 2; middle one with 4 setae; distal one terminally with 3 plumose setae. Basis terminally with a claw, a setose seta and a genticulate seta. Endopod one segmented with 6 terminal setae.

Mxp. (Fig. II, 8), coxa with 4 plumose spines and one plumose seta. Basis with a spine and 2 setae. One-segmented endopod with one surface and 8 terminal setae.

P_1 (Fig. III, 9), both rami 3-segmented. Endopod longer than exopod. Exopod reaching only to middle of second endopodite segment. Endopod terminally with 6 setae and spines in all, exopod terminally with 7.

P_2 (Fig. III, 10), both rami 3-segmented. Exopod shorter than endopod; last exopod segment as long as first two combined. First endopod segment very short. Outer distal corner of second segment drawn out as a broad, blunt projection. No inner seta on the first endopod segment.

P_3 (Fig. III, 11), both rami 3-segmented. Setation as figured.

P_4 (Fig. III, 12), endopod 2-segmented, exopod 3-segmented. Setation as figured and as listed below:

Setal Formula - *Ellucana secunda* n. sp.

	Exp.	End.
P_1	0.1.7	1.1.6
P_2	0.1.6	0.1.5
P_3	0.1.4	1.1.4
P_4	0.0.4	-.1.3

P_5 (Fig. III, 13), confluent baseoendopodite and exopod forming a single plate, with 4 setae.

Genital field (Fig. III, 14), a single non-plumose seta laterally, very much like that of *Canuellina femur* Por (1967).

Male: description based on mature male 0.84 mm.

Only A_1 and genital field show signs of sexual dimorphism.

A_1 (Fig. III, 15), 4 (indistinctly 5)-segmented and haplocer. Double aesthetasc on segment 3 (4).

Genital field (Fig. III, 16), quite complex, with 3 strong setae distally. The innermost large and scimitar-shaped, no setae are plumose.

Etymology

The specific name, *secunda,* refers to the species described here as the second (or following, *lat.*) species in the genus.

Remarks

Ellucana has been a problematic genus in any attempt to satisfactorily elucidate the complicated systematics of the Canuellidae. Several errors appear in the literature regarding Sewell's (1940) supposed sub-genus. Bodin (1967, p. 8) states that Lang (1948) rejected the sub-genus *Canuella* (*Ellucana*) and therefore *C.* (*Ellucana*) *longicauda* Sewell is simply *Canuella longicauda.* Lang (1948), however, does not refer to the species nor the sub-genus nor does he reference Sewell's paper and therefore could not have rejected Sewell's sub-genus. Por (1967, Table 3) lists the setal formula of the P_4 endopod of *Ellucana longicauda* Sewell as -.0.3; examination of Sewell's text-Fig. 3H (1940, p. 137) illustrates that the formula is -.1.3. Por (1967) also misspells the genus in Table 3 and on p. 104.

Por's (1967) revision of the Canuellidae indicates that the one unifying feature of the genus *Canuella* is the "individualized first thoracic segment." *Ellucana,* therefore, cannot be a sub-genus of *Canuella,* as the first leg-bearing segment in *Ellucana* is fused to the cephalothorax. (I thank Dr. Por for confirming this diagnosis.) Subsequently *Ellucana* is hereby raised to the genus level.

Ellucana is most probably related to *Canuellina* Gurney, even though the 2-segmented P_4 endopod links it to *Sunaristes* through *Sunaristes dardani* Humes and Ho (1969). *Canuellina* and *Ellucana* are both free-living and exhibit similar reductions in setation of the swimming legs, especially P_2 and P_3 and, whereas the P_4 setation is further reduced in *Canuellina,* it is the segmentation of the endopod that is reduced in *Ellucana.* The genital fields of both genera, important taxonomic characters, are very similar and also serve to link the two.

Ellucana secunda differs from the genotype, *E. longicauda,* in the segmentation of the maxillula endopod; setation of the maxillula coxa-basis and exopod; endopod of the maxilla setation; segmentation and setation of the P_2 endopodite (short proximal segment with no inner seta and outer distal corner produced in *E. secunda*) ; P_5 shape and genital field. Perhaps, if *E. longicauda* is rediscovered and all body parts are described, the two species may prove to be conspecific. However, because of the present apparent differences between the two species, they must remain separate.

Family TACHIDIIDAE Sars 1909, Lang 1948

Genus ***Danielssenia*** Boeck 1872

Since Lang's (1948) review of the genus, three new species have been described: *D. intermedia* Wells (1965), *D. spinipes* Wells (1967) and *D. minuta mihi* (1969b). Wilson (1966) has also redescribed *D. stefanssoni* Willey.

Danielssenia eastwardae n. sp. (Fig. IV-V).

Material: 4♀♀, 1♂. Two females have been deposited at the United States National Museum. Holotype: 1♀, U.S.N.M. No. 128163; paratype, 1♀, U.S.N.M. No. 128164.

Type locality: 34° 49.0' N, 75° 40.0' W, 43 m, North Carolina Continental Shelf (Station 14 of this paper).

Description

Female: based on mature female, length 0.97 mm. Body broadened and dorsal-ventrally depressed. The rostrum is large and broad and the sides taper to the cephalothoracic attachment. The body and all appendages are heavily spinulose and resemble *D. spinipes* Wells (1967). Caudal rami (Fig. IV, 17), broader than long with 2 principal terminal setae, 3 median and 3 lateral setae as well as several spinules.

A_1 (Fig. IV, 18), 6-segmented. First 3 segments subequal in length, aesthetasc on fourth segment, terminal setae heavily spinulose.

A_2 (Fig. IV, 19), 2-segmented with a coxa. Exopod 3-segmented: first 2 with one seta each, the terminal with 4 setae. Second endopod segment with circum-segmented band of long spinules. Terminally with 5 genticulate setae, 3 plumose spines and 4 small plain setae. Except for the total number of terminal setae, very much like *D. spinipes*.

Md (Fig. IV, 20), pre-coxa large, elongate. Bidentate pars incisiva, with 2 other small teeth on cutting edge. Coxa-basis short, with row of spinules on inner edge. Exopod and endopod close together, 2-segmented. First endopod segment with 2 non-plumose setae, terminal segment with 2 setae. First exopod segment bare, second very short and terminating with 3 setae.

Mxl. (Fig. IV, 21), pre-coxal arthrite with 4 setose spines and 2 small setae. Coxa with 3 terminal setae, endopod also with 3.

Mx (Fig. IV, 22), syncoxa with 3 endites. Basis with terminal claw and several small setae. Endopod with 2 setae.

Mxp. (Fig. IV, 23), prehensile. Basis with long partially spinose seta at inner distal corner. First endopod segment bears row of long spinules along inner edge, the second segment is modified as a claw.

P_1 (Fig. IV, 24), 2-segmented endopod, 3-segmented exopod. Setation as figured.

P_2 (Fig. IV, 25), P_3 (Fig. V, 26), P_4 (Fig V, 27), all with 3-segmented rami. The setation as figured and listed below:

Setal Formula - *Danielssenia eastwardae* n. sp.

	Exp.	End
P_2	1.1.223	1.2.221
P_3	1.1.323	1.1.321
P_4	1.1.323	1.1.221

P_5 (Fig. V, 28), with distinct rami. The baseoendopodite with 4 spinulose setae, the exopod with 4 spinulose setae and one small plain

seta. The exopod with 2 rows of spinules: one (heavy spinules) midway around the ramus and another (fine spinules) near the base.

Male: Description based on mature male, 0.73 mm.

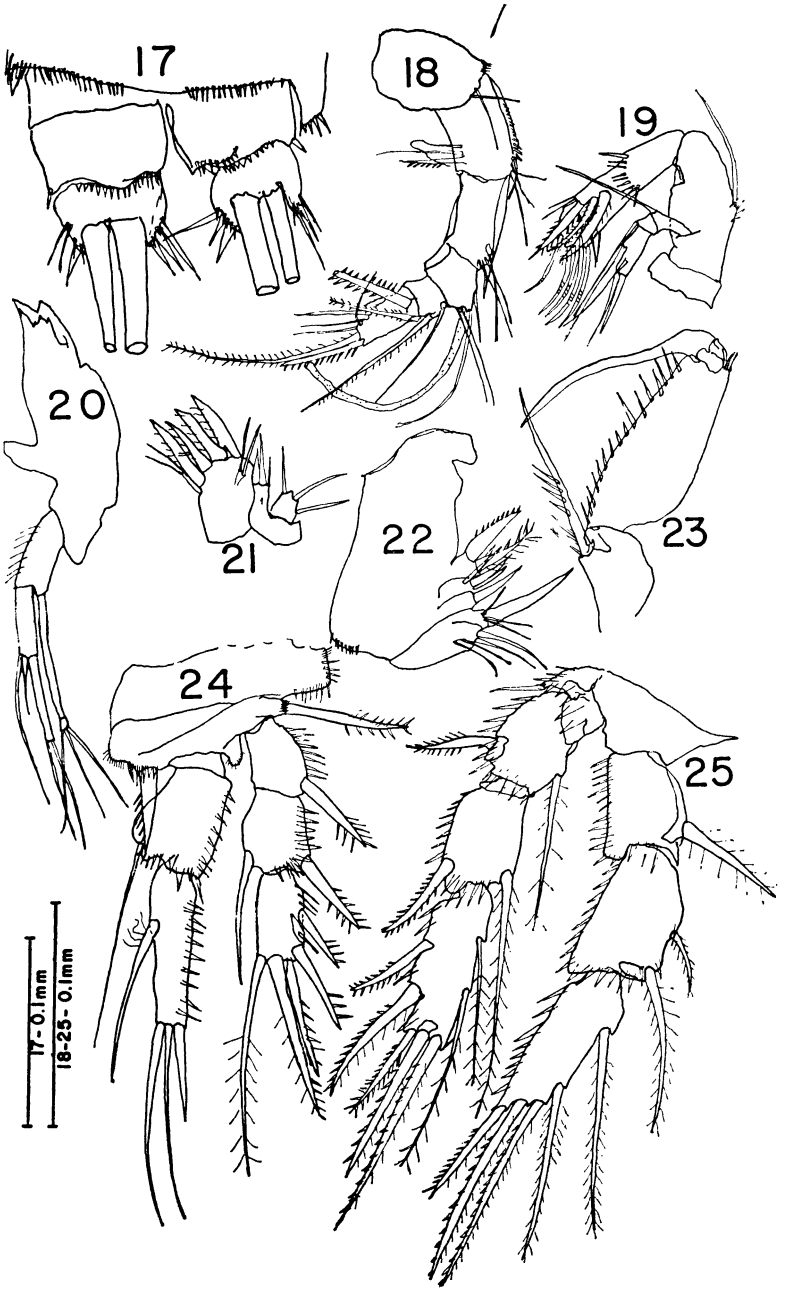
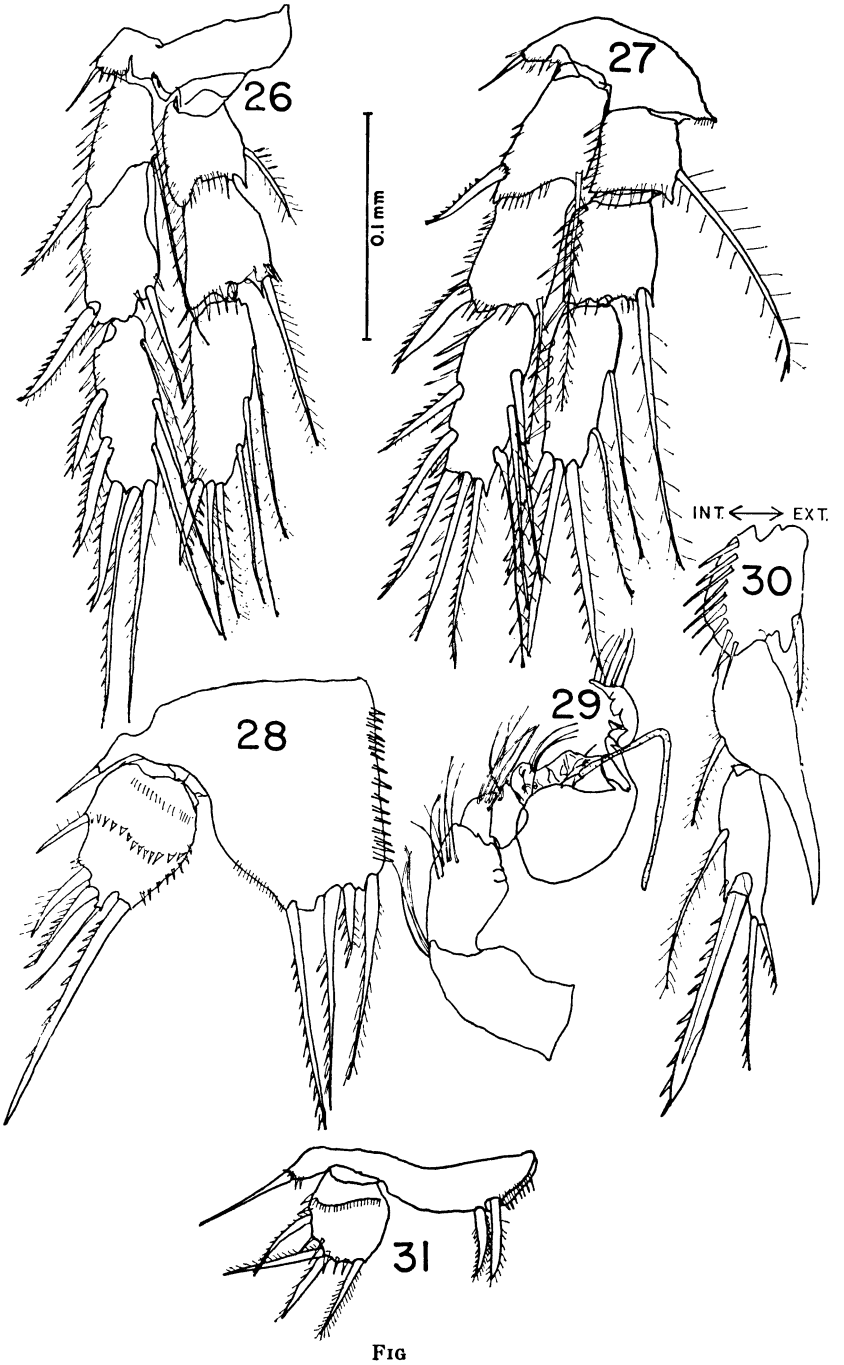


FIG. IV

Danielssenia eastwardae n. sp. ♀.

17, Last abdominal somite and caudal rami; 18, A_1; 19, A_2; 20, Md.; 21, Mxl.; 22, Mx.; 23, Mxp.; 24, P_1; 25, P_2.

A_1 (Fig. V, 29), 5 (indistinctly 6 -segmented and haplocer. Aesthetasc on fourth (fifth) segment.



FIG

Danielssenia eastwardae n. sp.

♀: 26, P_3; 27, P_4; 28, P_5.
♂: 29, A_1; 30, P_2 endopod; 31, P_5.

A_2, oral parts, P_1, P_2 exopod, P_3, P_4 and caudal rami exactly the same as the female.

P_2 endopod (Fig. V, 30), sexually dimorphic. The outer distal edge of the second segment transformed into a dentiform projection. Terminal segment with 4 setae, one of which is thick and heavily spinulose.

P_5 (Fig. V, 31), separate rami. Baseoendopodite with spinulose medial margin and 2 thick spinulose setae. Exopod with 4 setae, one spine and several spinules terminally and transverse row of spinules circumscribing the ramus.

Etymology

The species name, *eastwardae,* is in honor of the Duke University ship from which it was collected, the R/V caps.

Remarks

D. eastwardae differs from all the others in the genus in the presence of an inner seta on the first segment of the P_2 - P_4 exopods combined with the presence of 2 inner setae on Ri_2 of P_2. I (Coull, 1969b) have discussed and listed setal formulae earlier and *D. eastwardae* singularly exhibits these combined characteristics. Only *D. spinipes, D. intermedia* Wells (1965) and *D. stefanssoni* Willey (Wilson, 1966) have the inner setae on Re_1 of P_2 - P_4, while only *D. perezi* Monard has 2 setae on Ri_2 of P_2. The somitic ornamentation is very much like that of *D. spinipes* whereas the 4 setae on the male P_5 exopod link it closely to *D. intermedia* Wells (1965). But because of significant differences in setal formula, mouth parts, and size it is reported here as a new species.

The separation of the genera *Danielssenia* and *Psammis* has been discussed by Wells (1965, 1967) and he asserts that *D. intermedia* approximates the *Psammis* condition with four setae on the P_5 exopodite of the male, similar to that of *D. eastwardae*. However, *D. eastwardae* exhibits so many other features characteristic of *Danielssenia,* swimming legs, mouth parts, antennule and antenna segmentation that it must be included in *Danielssenia.* I propose that the confluent baseoendopodite exhibited by all known *Psammis* (*P. longisetosa* Sars, *P. borealis* Klie, *P. kliei* Smirnov and *P. longifurca* Bodin) be used to separate the two genera and not the variable number of setae on the male P_5 exopod.

Family DIOSACCIDAE Sars 1909

Genus *Melima* Por 1964

Since Por (1964) created this genus, this is the first new species to be added.

Melima bisetosa n. sp. (Fig. VI)

Material: 31♀♀. Holotype 1♀, U.S.N.M. No. 128165; paratypes 6♀♀, U.S.N.M. No. 128166.

Type locality: North Carolina Continental Shelf (Stations 2, 9, 11, 13, 14 this paper).

Description

Female: based on mature female, length 0.47 mm. Body pyriform, robust, typically *Stenhelia.* Body segments bare of ornamentation (Fig. VI, 32). Prominent rostrum, attenuated distally, with 2 minute setae and strongly emarginated tip (Fig. VI, 33). Caudal rami (Fig. VI, 32, 34), two times as long as wide at the base, inner edge slightly concave. Two principal terminal setae, inner one longer than outer. One dorsal, one lateral and one median seta situated at distal end. Anal operculum finely spinulose.

A_1 (Fig. VI, 35), 8-segmented, first 2 segments equal in length. Fourth segment bears an aesthetase.

A_2 (Fig. VI, 36), 2-segmented with 3-segmented exopod. Second endopod segment with 3 small lateral setae and 5 terminal setae (4 of which are genticulate). First, second and third exopod segments with 2, 1 and 2 setae respectively.

Md. (Fig. VI, 37), with tri-dentate pars incisiva, coxa basis with two setae. Exopod and endopod with 4 setae each. Terminal endopod seta is the typically *Stenhelia-Melima* prolonged endite.

Mxl. (Fig. VI, 38), pre-coxal arthrite with 2 surface setae and 6 strong terminal spines. Coxa with 3 and basis with 5 terminal setae. Endopod spatulate in shape with 4 terminal setae, the lateral most of which is plumose. Exopod with 2 strong apical setae.

Mxp. (Fig. VI, 39), basis with 2 setae and a spine. Endopod prehensile, 2-segmented. First segment with inner seta, second segment modified as claw.

P_1 (Fig. VI, 40), typically *Melima,* highly aberrant and specialized. Endopod 2-segmented, exopod 3-segmented. First endopod segment long and broad with very small inner seta in distal portion. Second segment, reduced in size, bean-shaped with 2 irregularly shaped setae and a small internal seta.

P_2 (Fig. VI, 41), P_3 (Fig. VI, 42), P_4 (Fig. VI, 43), all with 3-segmented rami. Terminal exopod segments with 2 outer setae. The setal formula of *M. bisetosa* n. sp. is given below with that of the only other known species in the genus, *M. caulerpae* Por 1964.

	P_2		P_3		P_4	
	Exp.	End.	Exp.	End.	Exp.	End.
M. bisetosa n. sp.	1.1.122	1.1.021	1.1.322	1.1.230	1.1.322	1.1.230
M. caulerpae Por	1.1.022	1.1.021	1.1.122	1.1.230	1.1.322	1.1.230

P_5 (Fig. VI, 44), exopod oblong with 4 distal and one inner setae. Baseoendopodite bare with 4 terminal setae.

Male: unknown.

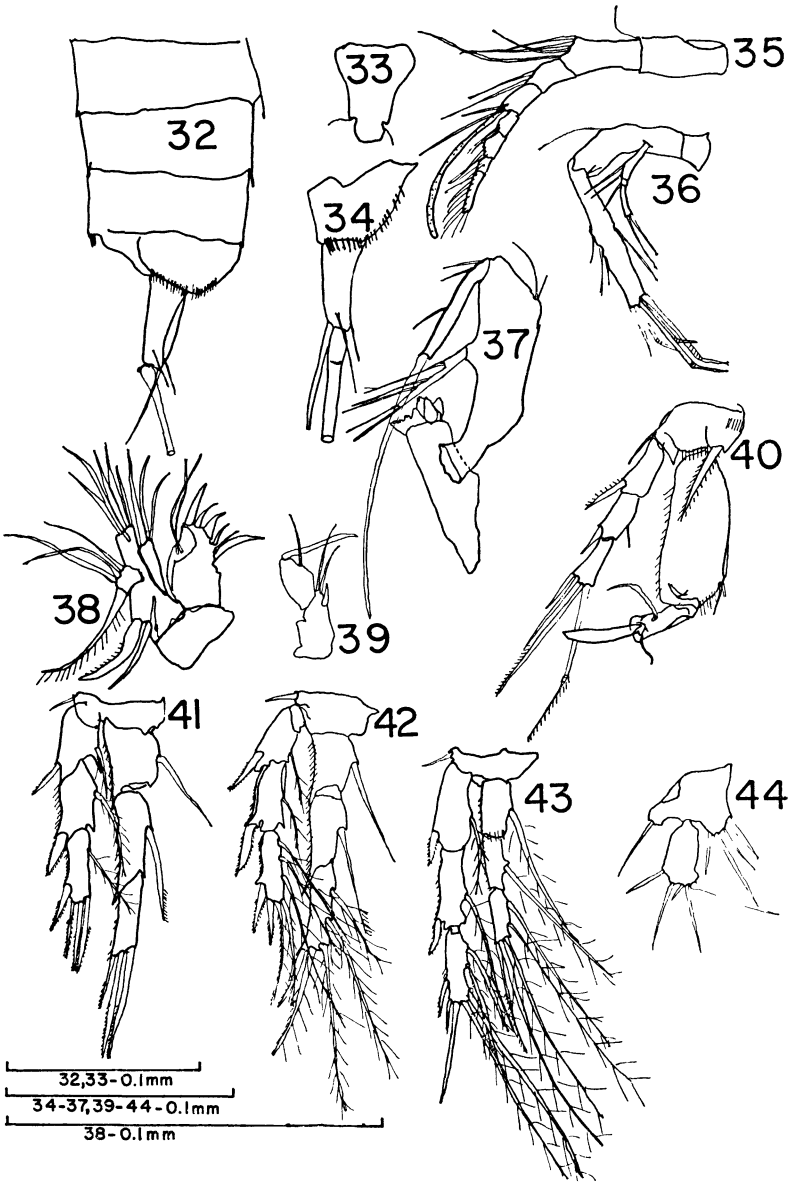


FIG. VI
Melima bisetosa n. sp. ♀.

32, Last 3 abdominal somites and caudal rami; 33, rostrum; 34, caudal ramus; 35, A_1; 36, A_2; 37, Md.; 38, Mxl.; 39, Mxp.; 40, P_1; 41, P_2; 42, P_3; 43, P_4; 44, P_5.

Etymology

The trivial name, *bisetosa,* alludes to the two setae on the first segment of the antennal exopodite.

Remarks

M. bisetosa differs from the genotype (*M. caulerpae*) in the following: (1) number of setae on segment one of antennal exopodite (2 vs. 1); (2) number of setae on segment three of antennal exopodite (2 vs. 3); (3) body size (0.49 mm vs. 0.39 mm); (4) maxillipede armature (strong prehensil vs. reduced apical armature); (5) presence of inner setae on Re_2 P_1; and (6) setal formulae. Thus, *M. bisetosa* is reported here as a new species.

Genus **Schizopera** Sars 1905

Since Lang's (1965) review of the genus, the following species have been added: *S. varieseta* Bozic (1964), *S. bozici* (Bozic, 1964), *S. kunzi* and *S. varnensis* Apostolov (1967), *S. borutzkyi* Montschenko (1967), *S. tarichaena* Por (1968) and *S. indica* Rao and Ganapati (1969).

Schizopera carolinensis n. sp. (Figs. VII-VIII)

Material: 109♀♀, 36♂♂, 11 copepodites. Holotype 1♀, U.S.N.M. No. 128167; paratypes 4♀♀ and 5♂♂, U.S.N.M. No. 128168.

Type locality: North Carolina Continental Shelf (Stations 4, 7, 13, 14, 15 this paper).

Description

Female: based on an ovigerous female, length 0.39 mm. Body slender, tapering behind. Last three segments with continuous rows of lateral and ventral spinules. Remainder of body not ornamented. Anal operculum dentate (Fig. VII, 45). Caudal rami (Fig. VII, 45) slightly broader than long with two principal terminal setae, the inner one longer than the outer. Laterally with two setae, one very long and one short and strong. A dorsal seta inserts at 9/10 the length, the inner distal edge with four spinules and two small setae. Rostrum almost lancelot in form, reaching beyond end of first antennule segment (Fig. VII, 46).

A_1 (Fig. VII, 46), 8-segmented, first segment longest. Fourth segment with an aesthetasc and equal in length with the third. No plumose setae.

A_2 (Fig. VII, 47), with allobasis. Allobasis longer and wider than endopod. Two-segmented exopod, first segment 3 times as long as the second, each with but one seta. Endopod with spinules and one seta on anterior edge, terminally with 6 setae, 3 of which are genticulate.

Md. (Fig. VII, 48), precoxa with tridentate pars incisiva. Coxa basis bare except for terminal setae. Endopod with 4 setae and much larger than the exopod bearing 2 setae.

Mxl. (Fig. VII, 49), precoxal arthrite with 4 terminal teeth-like spinules on distal edge and one seta on dorsal side. Coxa with 2 terminal setae, basis with 4, exopod and endopod obsolete.

Mx. (Fig. VII, 50), syncoxa with 3 endites. Distal endite extremely small with one seta, middle and proximal endite with 2 setae each.

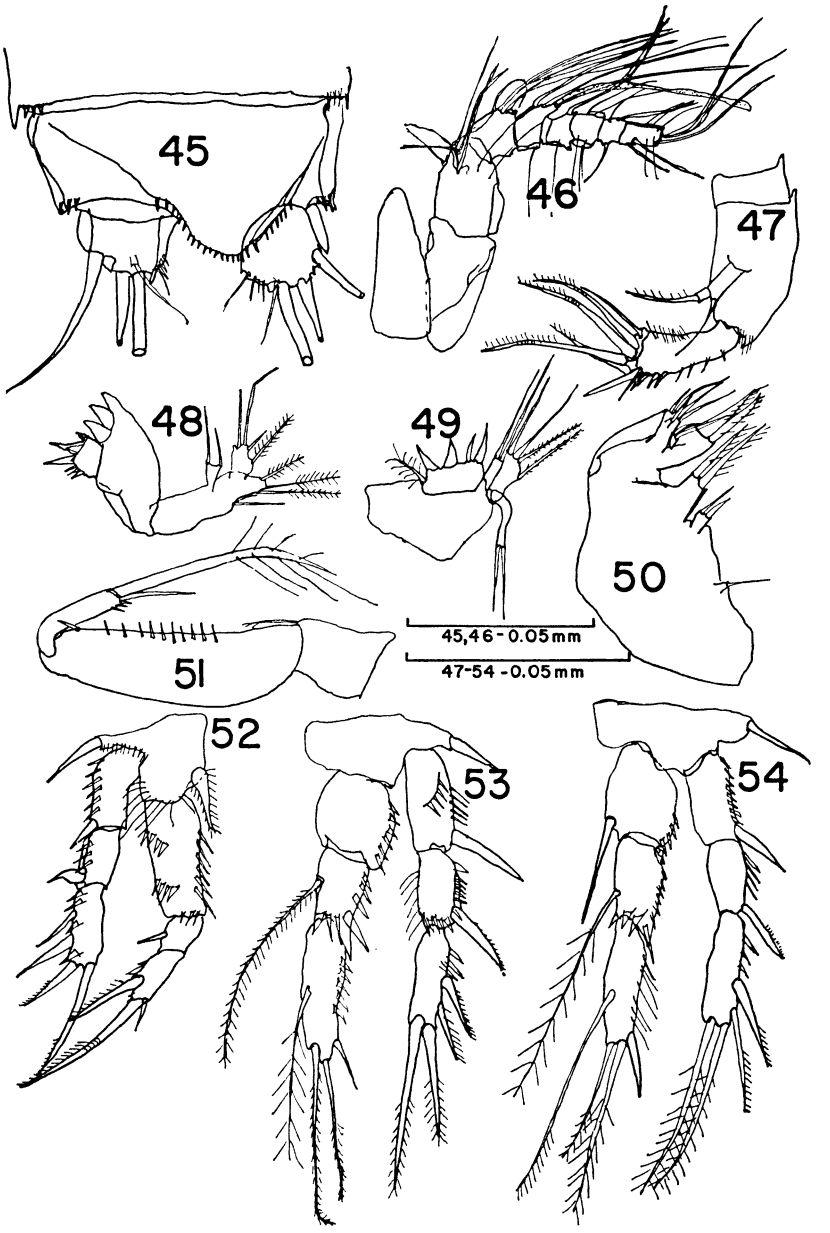


FIG. VII

Schizopera carolinensis n. sp. ♀.

45, Last abdominal somite and caudal rami; 46, rostrum and A_1; 47, A_2; 48, Md.; 49, Mxl.; 50, Mx.; 51, Mxp.; 52, P_1; 53, P_2; 54, P_3.

Basis terminally with 2 claw-like setae and one surface seta. Endopod with 4 terminal and one surface setae.

Mxp. (Fig. VII, 51), basis short with one seta at inner distal corner. First exopod segment with row of spinules on inner edge. Second segment 2/5 as long as first. Terminally with 3 spinules, one seta and a long setose claw.

P_1 (Fig. VII, 52), 3-segmented rami. Exopod terminating with 4 setae, endopod with 2. Setation as figured.

P_2 (Fig. VII, 53), P_3 (Fig. VII, 54), P_4 (Fig. VIII, 55) all with 3-segmented rami. Setation as figured and listed below:

Setal Formula - *Schizopera carolinensis* n. sp.

	Exp.	End.
P_2	0.0.022	0.1.121
P_3	0.0.022	1.1.121
P_4	0.0.022	1.1.121

P_5 (Fig. VIII, 56), with distinct rami, baseoendopodite extending almost to end of exopod with 2 inner plumose setae and one plumose and one bare terminal seta; outer one much shorter than inner. Exopod rectangular in shape, two times as long as wide, with 5 marginal setae; 3 laterally inserted (2 of which are plumose), one terminally inserted (plumose) and one medially inserted.

Male: description based on mature male 0.35 mm.

A_1 (Fig. VIII, 57), 8-segmented and haplocer.

A_2 oral parts, P_1, P_2 exopod P_3, P_4 and caudal rami exactly the same as the female.

P_2 endopod (Fig. VIII, 58), dimorphic as figured. Second and terminal segment with 2 claw-like inner setae. Laterally with two small spinules, an inner seta and a terminal seta.

P_5 (Fig. VIII, 59), baseoendopodite with 2 terminal laterally plumose setae of subequal length. Exopod with 5 setae: 3 lateral (the middle one very small) and 2 terminal (the inner much shorter than the plumose outer).

Etymology

The specific name, *carolinensis,* alludes to the type locality, the North Carolina Continental Shelf.

FIG. VIII

Schizopera carolinensis n. sp.

♀: 55, P_4; 56, P_5.
♂: 57, A_1; 58, P_2 endopod; 59, P_5.

Schizopera anomala n. sp. ♀.

60, Exp. A_2; 61, P_2; 62, caudal ramus (lateral view); 63, last abdominal somite and caudal ramus (lateral view); 64, last abdominal somite and caudal rami (dorsal view).

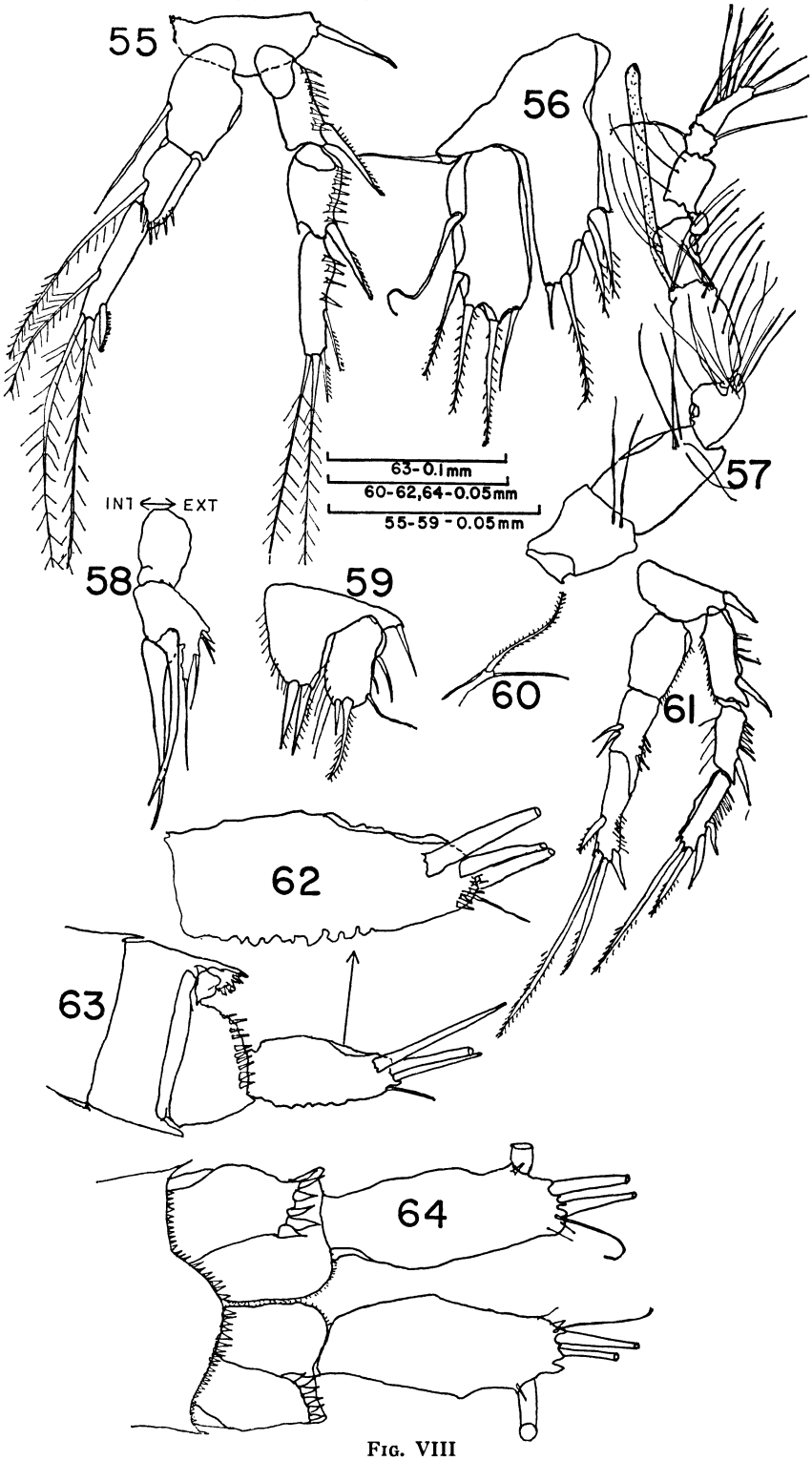

55
56
57
63-0.1mm
60-62,64-0.05mm
55-59-0.05mm
INT ⟷ EXT
58
59
60
61
62
63
64

FIG. VIII

Remarks

Three previously known *Schizopera* have four setae on the third segment of the P_4 endopod: *S. parvula* Noodt (1955), *S. varieseta* Bozic (1964) and *S. indica* Rao and Ganapati (1969). Bozic (1964), however, recorded this situation on only one leg of his monotypic species; the other leg had two setae. Noodt (1955) describes only the male of *S. parvula.* The male *S. carolinensis* n. sp. differs from *S. parvula* in the P_2 endopod, P_2 exopod setation, number of endites on the maxilla, length and shape of furca, comparative lengths of P_4 rami, and caudal rami ornamentation. *S. carolinensis* differs from *S. varieseta* and *S. indica* in setal formulae, maxillipede shape and ornamentation, setation of the P_5 exopod and shape and ornamentation of the caudal rami. Because of the numerous and significant differences between *S. carolinensis* n. sp. and the most closely related species it is reported here as a new species.

Schizopera anomala n. sp. (Fig. VIII)

Material: 19♀♀, 2♂♂, 2 copepodites. Holotype 1♀, U.S.N.M. No. 128169; paratypes 5♀♀ and 1♂, U.S.N.M. No. 128170.

Type locality: North Carolina Continental Shelf (Stations 1, 2, 11, 12, 14 this paper).

Description

Female: based on ovigerous female, length, 0.50 mm. *S. anomala* n. sp. is exactly like the preceding species, *S. carolinensis* n. sp., in all but four aspects: size, exopod of A_2, P_2 and furca. Only these differences will be illustrated and/or discussed. The remainder of the body parts are the same as those of *S. carolinensis.*

Exopod A_2 (Fig. VIII, 60), one-segmented with 2 setae, the outermost plumose.

P_2 (Fig. VIII, 61), similar to that of *S. carolinensis* except for relative length of all setae and the 2 inner setae on the second endopod segment.

Setal Formula - *Schizopera anomala* n. sp.

	Exp.	Enp.
P_2	0.0.022	0.2.121
P_3	0.0.022	1.1.121
P_4	0.0.022	1.1.121

Caudal rami (Figs. VIII, 62, 63, 64), 2½ times as long as wide. Lateral and medial margin irregular. Large seta extending laterally. Two principal terminal setae, the inner 2 times as long as the outer which is of similar size to the large lateral seta. Dorsal setae at 9/10 the length and a small medial seta at 4/5 the length.

Male: smaller than female, 0.45 mm, but similar in all but A_1, P_2 endopod and P_5, which are like those of the male *S. carolinensis.*

Etymology

The specific name, *anomala,* from the Greek, different or irregular, referring to the unusual margin and shape of the caudal rami.

Remarks

The same raison d'etre separating *S. carolinensis* from the remainder of the genus applies to *S. anomala. S. anomala* is separated from *S. carolinensis* by the characters mentioned above: size, exopod A_2, P_2, and furca.

Family TETRAGONICIPITIDAE Lang 1948

Fearia n. gen.

The generic diagnosis coincides with that of its sole and type species and must, therefore, be considered preliminary.

Remarks

This genus differs from all the others in the family in the location of the antennule spur: midway on the first antennule segment and pointing medially. It appears to be most closely related to *Tetragoniceps* in structure of the swimming legs, P_5, and caudal rami, but, since the one unifying feature of *Tetragoniceps* is the location of the antennule spur, the present species is put into a new genus. The gender is feminine.

Fearia prima n. gen. n. sp. (Figs IX-X)

Material: 3♀♀, 6♂♂. Holotype 1♂, U.S.N.M. No. 128171.

Type locality: 33° 38.0' N, 77° 38.5' W, North Carolina Continental Shelf (Station 1 in this paper), depth 20 m.

Description

Female: based on mature female, length 0.79 mm. Body slender, slightly tapered distad, almost exactly like *Tetragoniceps.* No somitic ornamentation, anal operculum present and not ornamented (see male, Fig. X, 82). Caudal rami (Fig. IX, 65), pear-shaped, as long as wide at the base. One dorsal seta inserting at 2/3 the length, and 2 small setae on either side of the one principal terminal seta. Rostrum small, broadly rounded (Fig. IX, 66).

A_1 (Fig. IX, 66), 8-segmented. First segment with small unguiform process medially at ½ the length. Fourth and eighth segment with aesthetascs.

A_2 (Fig. IX, 67), with distinct basis. First endopod segment bare, second segment with 2 setae on inner edge, 6 terminal setae (3 genticulate) and a row of circumscribing spinules. Exopod one-segmented with 2 terminal and one lateral seta.

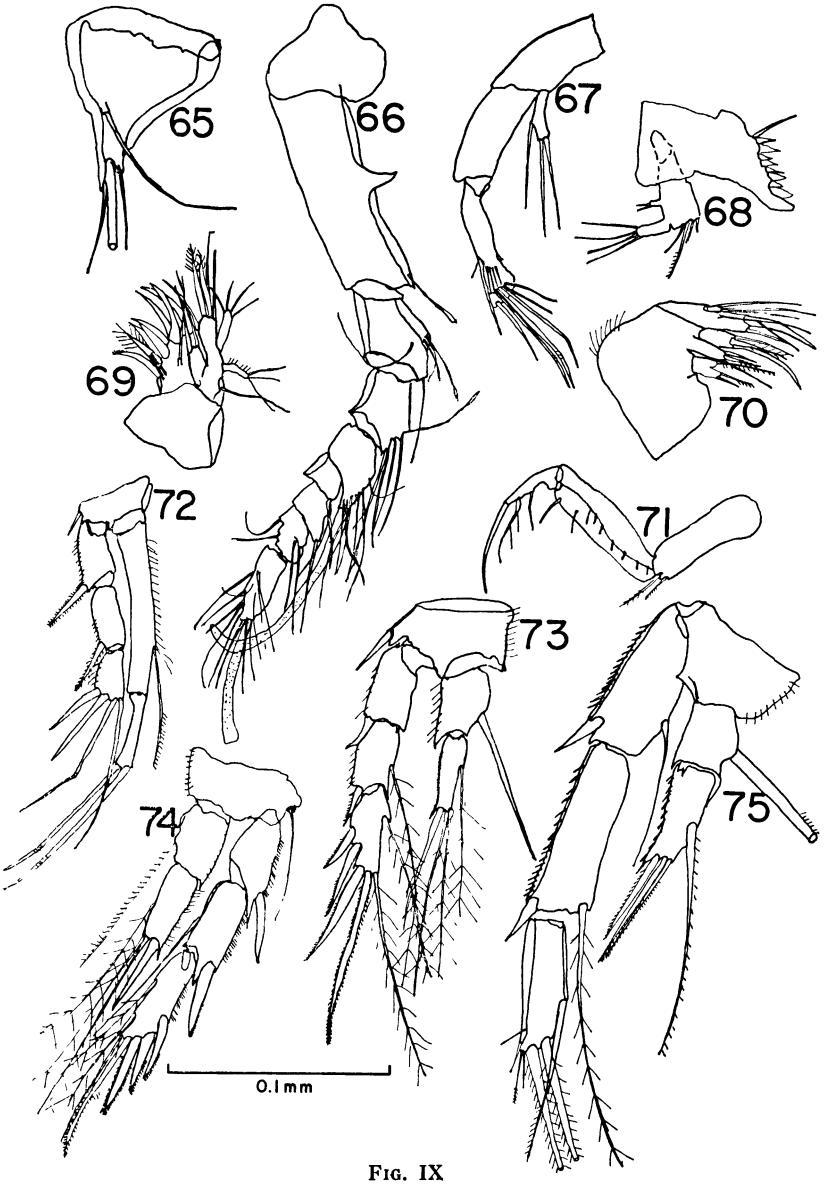


FIG. IX
Fearia prima n. g., n. sp. ♀.
65, Caudal ramus; 66, rostrum and A_1; 67, A_2; 68, Md.; 69, Mxl.; 70, Mx.; 71, Mxp.; 72, P_1; 73, P_2; 74, P_3; 75, P_4.

Md. (Fig. IX, 68), pre-coxa bidentate with 5 large accessory spines and one seta. Coxa-basis large with 4 setae. Endopod, one-segmented with 4 terminal setae. Exopod minute with 2 small setae.

Mxl. (Fig. IX, 69), pre-coxal arthrite with 8 strong setae and several accessory spinules. Coxa with 2 terminal setae. Basis terminally with 4 setae. Exopod with 3 hair-like setae, endopod with 4.

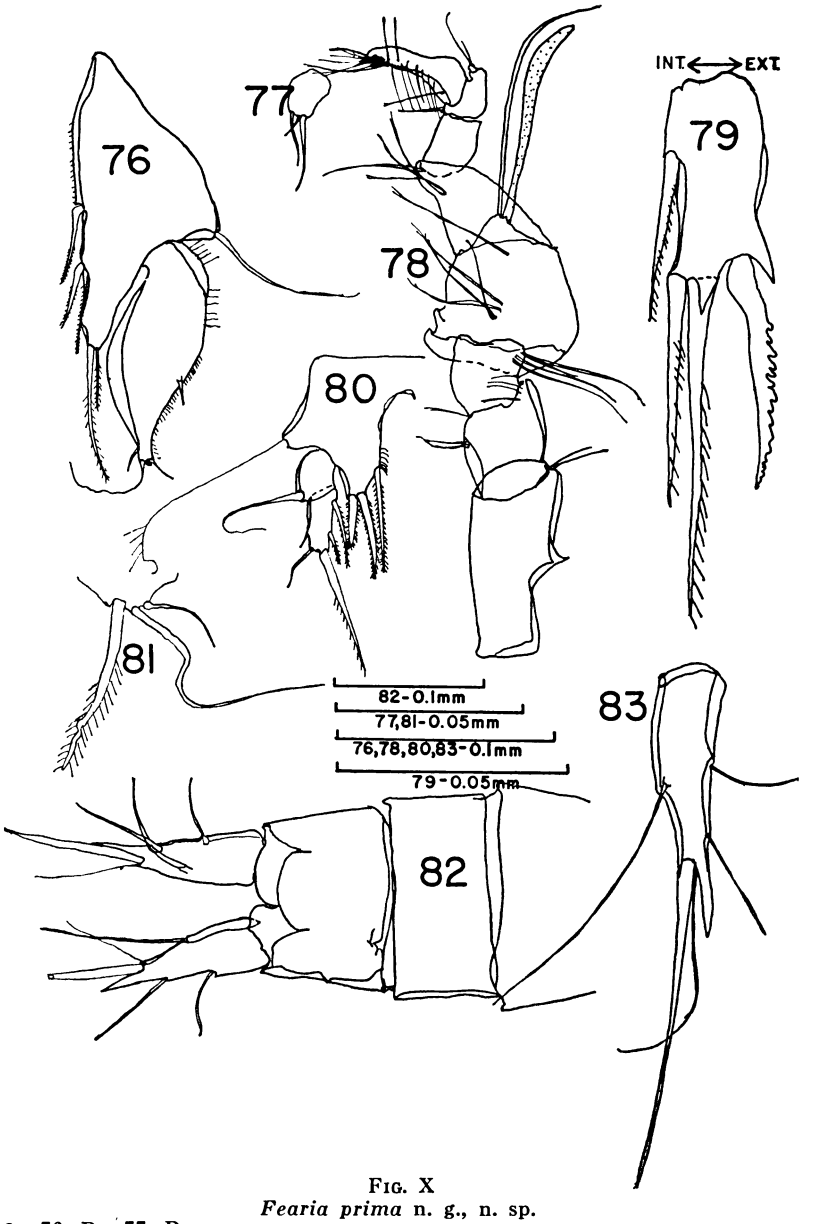


FIG. X
Fearia prima n. g., n. sp.
♀: 76, P_5; 77, P_6.
♂: 78, A_1; 79, End. P_3; 80, P_5; 81, P_6; 82, last three abdominal somites and caudal rami; 83, caudal ramus.

Mx. (Fig IX, 70), syncoxa with 3 endites each with 3 setae and spines in all. Basis terminally with claw-like spine and another seta. Endopod small with 3 setae terminally.

Mxp. (Fig. IX, 71), basis terminally with 2 setae on inner edge. First endopod segment with inner spinulose edge. Second segment terminally with claw-like seta, medially with 2 setose spines.

P_1 (Fig. IX, 72), 2-segmented endopod, 3-segmented exopod, first endopod segment with one median seta at 2/3 length, terminal segment with 2 genticulate setae. Exopod terminally with 4 setae, 2 of which are genticulate.

P_2 (Fig. IX, 73), P_3 (Fig. IX, 74), and P_4 (Fig. IX, 75), all with 3-segmented exopods and 2-segmented endopods. Setation as figured and as listed below. P_4 is much longer than P_2 and P_3.

Setal Formula - *Fearia prima* n. gen. n. sp.

	Exp.	End.
P_2	0.1.123	1.121
P_3	0.1.223	1.121
P_4	0.1.223	1.121

P_5 (Fig. X, 76), distinct rami. Both rami elongate and styliform distally. Inner expansion of baseoendopodite reaching beyond middle of exopod. Baseoendopodite with 3 inner and 2 terminal setae. Inner terminal seta plumose. Exopod with one short inner seta, one short outer seta and 2 terminal setae.

P_6 (Fig. X, 77), small and rectangular with 3 terminal setae, the middle one very short.

Male: description based on mature male, 0.61 mm.

A_1 (Fig. X, 78), 7 (indistinctly 8)-segmented and haplocer. Aesthetasc on segment 4.

A_2, oral parts, P_1, P_2, P_3 exopod, and P_4 exactly the same as the female.

P_3 endopod (Fig. X, 79), one-segmented with 4 setae, external seta with teeth-like dentations on external margin.

P_5 (Fig. X, 80), separate rami. Exopod 2-segmented, first segment externally with a seta, second segment with one short external, one short and one long terminal and 2 short medial setae. Baseoendopodite reaching beyond first exopod segment with one medially inserted and 2 terminal setae.

P_6 (Fig. X, 81), small plate with 3 setae, innermost longest, outermost plumose.

Caudal rami (Figs. X, 82, 83), four times as long as wide at the widest point. A dorsal seta inserts at ½ the length. Lateral setae at ½ and 4/5 the length. Outer distal corner dentiform. One principal and one slender terminal seta.

Etymology

The generic name, *Fearia,* refers to the type locality near Cape Fear, North Carolina and the specific name, *prima,* to this being the first species in the genus.

Genus ***Tetragoniceps*** Brady 1880

Since the last review of this genus (Lang, 1948) the following species have been described: *T. truncata* and *T. longicaudata* Nicholls (1939), *T. arenicolus* Krishnaswamy (1957), *T. bergensis* Por (1965) and *T. brownei* Wells (1967).

Tetragoniceps bookhouti n. sp. (Figs. XI-XII)

Material: 12♀♀, 9♂♂. Holotype, 1♂, U.S.N.M. No. 128173; paratypes, 3♀♀, 3♂♂, U.S.N.M. No. 128174.

Type locality: North Carolina Continental Shelf (Stations 8, 13, 14 this paper).

Description

Female: based on ovigerous female, length 0.65 mm. Body typically *Tetragoniceps,* slender with no demarcation between metasome and urosome. No somitic ornamentation. Anal operculum present and finely spinulose. Caudal rami (Fig. XI, 84) 4 times as long as wide at the widest portion (proximal end). One principal terminal seta, one dorsal seta and 2 lateral setae. Rostrum (Fig. XI, 85) small and broadly rounded.

A_1 (Fig. XI, 85), 8-segmented. First segment elongate with unguiform projection at outer distal corner. Aesthetascs on segments 4 and 8.

A_2 (Fig. XI, 86), with distinct basis. First endopod segment bare, second segment with 3 surface, 2 inner and 6 terminal setae. Exopod one-segmented with 2 setae, the outer one confluent with the segment.

Md. (Fig. XI, 87), pre-coxa bidentate with several accessory spinules and dentations. Coxa-basis with 3 setae. Endopod with 2 inner and 4 terminal setae. Exopod short with one small inner and 2 terminal setae.

Mxl. (Fig. XI, 88), pre-coxal arthrite separate from the pre-coxa, with 7 setae and spines in all. Coxa with 4 and basis with 6 terminal setae. Endopod with 4 terminal setae.

Mx. (Fig. XI, 89), syncoxa with 3 endites, the proximal one cleft. Basis with a claw-like spine and a seta. Endopod one-segmented with 3 terminal setae.

Mxp. (Fig. XI, 90), prehensile. Basis with single seta at inner distal corner. First endopod segment with 2 spinules on inner edge. Second segment with 2 inner setae and a single terminal genticulate seta.

P_1 (Fig. XI, 91), 2-segmented endopod, 3-segmented exopod. Exopod terminally with 4 setae. First endopod segment with median plumose seta at 2/3 the length, segment 2 terminally with 2 genticulate setae.

P_2 (Fig. XI, 92), P_3 (Fig. XI, 93), and P_4 (Fig. XI, 94), all with 3-segmented exopods and 2-segmented endopods. Setation as figured and as listed below. P_4 is much longer than P_2 and P_3.

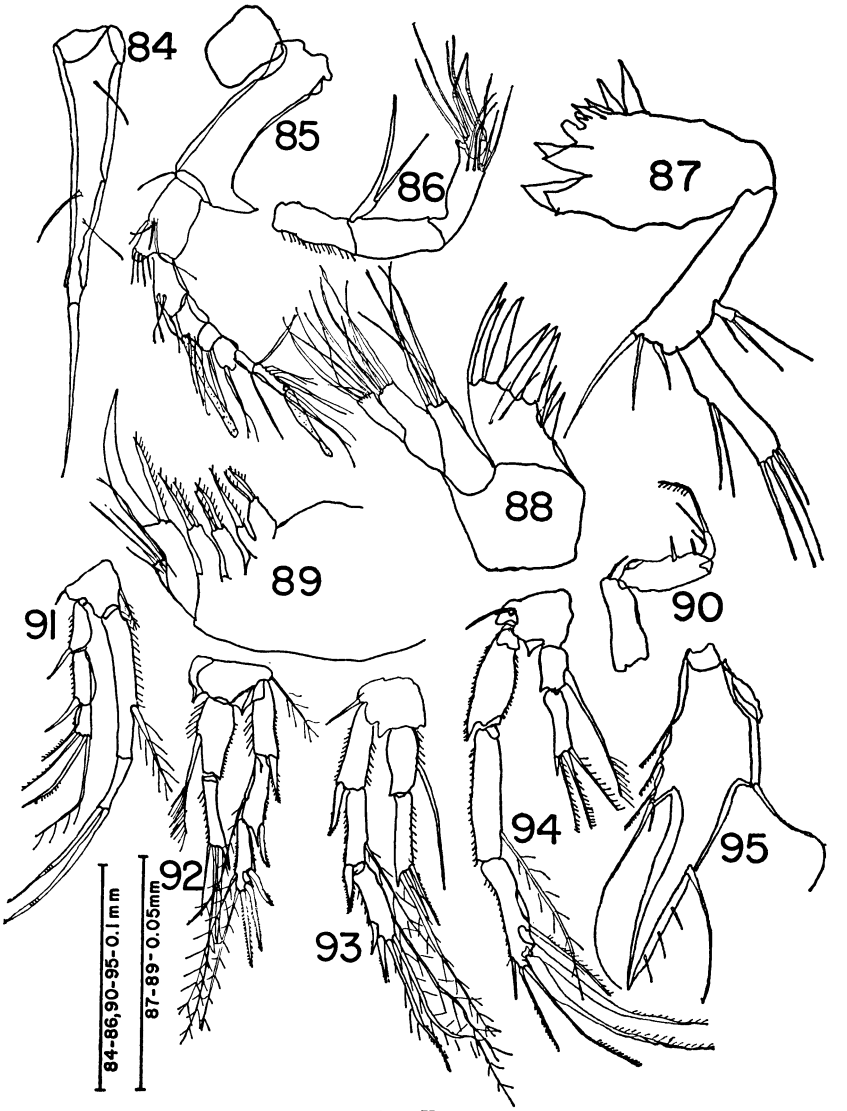


FIG. XI
Tetragoniceps bookhouti n. sp. ♀.

84, Caudal ramus; 85, rostrum and A_1; 86, A_2; 87, Md.; 88, Mxl.; 89, Mx.; 90, Mxp.; 91, P_1; 92, P_2; 93, P_3; 94, P_4; 95, P_5.

Setal Formula - *Tetragoniceps bookhouti* n. sp.

	Exp.	End.
P_2	0.1.122	1.3
P_3	0.1.122	1.3
P_4	0.1.122	1.3

P_5 (Fig. XI, 95), confluent rami, tapering distally to a point. Baseoendopod portion with 4 inner setae, exopod portion with one strong and 3 small outer setae.

Male: Description based on a mature male, 0.55 mm.

A_1 (Fig. XII, 96), 6-segmented and haplocer. First segment with typical pointed projection at outer distal angle.

A_2, oral parts, P_1, exopod P_2, P_3, P_4 and caudal rami exactly the same as the female.

P_2 endopod (Fig. XII, 97), 2-segmented. First segment with one inner seta. Second segment dimorphic with only 2 terminal setae, the outer one scimitar-shaped.

P_5 (Fig. XII, 98), rami separate. Baseoendopodite terminally with 3 plumose setae. Exopod hook-shaped with 3 slender setae on the outer edge.

P_6 (Fig. XII, 99), 3 setae, none plumose.

Etymology

The specific name is in honor of Dr. C. G. Bookhout, long time director of the Duke University Marine Laboratory and the Cooperative Program in Biological Oceanography.

Remarks

T. bookhouti, most closely resembles *T. malleolatus* Brady. Only in *T. malleolatus, T. dubius* Thompson and A. Scott and *T. bookhouti* n. sp. is the female P_5 fused. The distinctive shapes of both the male and female P_5 of *T. malleolatus* and *T. bookhouti* link these two most closely together. The two species differ in setation of the antennal exopod (*T. bookhouti* has only 2 setae), size, setation of the swimming legs, and setation of the female P_5 exopod portion.

Genus ***Phyllopodopsyllus*** T. Scott 1906

Since Lang's (1965) revision of the genus, several species have been added: *P. danielae* Bodin (1964), *P. tristanensis* Wiborg (1964), *P. biarticulatus* Wells (1967), *P. ponticus* Apostolov (1968), *P. bahamensis* Geddes, *P. opistoceratus* Geddes, *P. parafurciger* Geddes (1968), *P. hermani mihi* (1969a) and *P. paraxenus mihi, P. chavei mihi* (1970a).

Phyllopodopsyllus parafurciger carolinensis n. ssp. (Fig. XII)

Material: 111♀♀, 88♂♂, 19 copepodites. Holotype 1♀, U.S.N.M. No. 128175; paratypes 15♀♀, 15♂♂, U.S.N.M. No. 128176.

Type locality: North Carolina Continental Shelf (Stations 1, 2, 8, 12, 13, 14 this paper).

Description

Female: length 0.45 mm. The furcal rami are the only female characters which differ from *P. parafurciger* Geddes (1968).

Fu. (Fig. XII, 100 and 101), two times as long as wide at the widest part. Inner margin strongly convex, almost lamellifer. Two

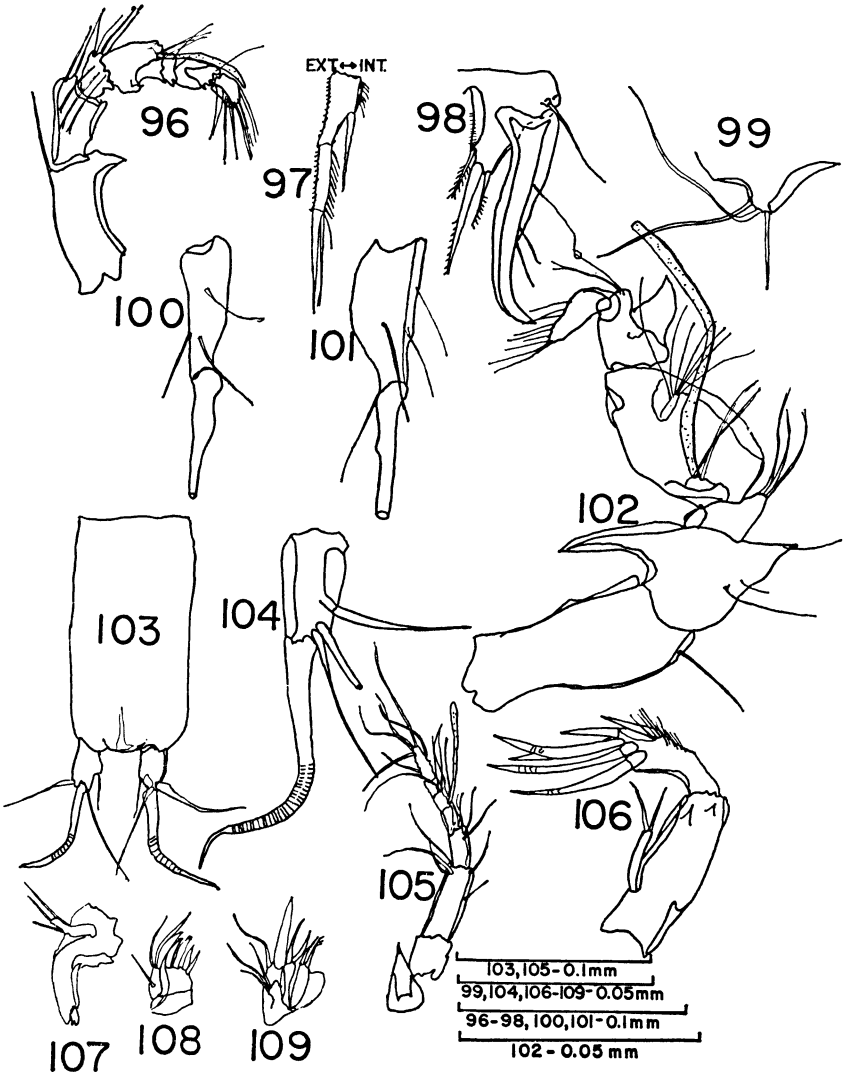


FIG. XII

Tetragoniceps bookhouti n. sp. ♂.

96, A_1; 97, P_3 endop; 98, P_5; 99, P_6.

Phyllopodopsyllus parafurciger carolinensis n. ssp.

100, Caudal ramus ♀ (lateral view); 101, caudal ramus ♀ (dorsal view); 102, A_1 ♂.

Cylinula proxima n. g., n. sp. ♀.

103, Last abdominal somite and caudal rami; 104, caudal ramus; 105, A_1; 106, A_2; 107, Md.; 108, Mxl.; 109, Mx.

lateral setae insert at 2/5 and 2/3 of the way along, a dorsal seta inserts at 2/3 the length. Terminal seta well developed, of characteristic form: slightly bulbous at base followed by an irregular margin and a gradual taper.

Male: smaller and slightly more slender than the female, length 0.40 mm. Differing from *P. parafurciger* only in the structure of the A_1.

A_1 (Fig. XII, 102), 6-segmented and haplocer. Unguiform process on second segment, fourth segment greatly expanded with aesthetasc. Fifth segment with hook-like structure. (*P. parafurciger* does not have this hook on segment 5.)

Remarks

Although the furcal rami have long been important characters in species determination within the genus, it does not seem warranted to create a new species only on this character. The taxonomic significance of the hook on segment 5 of the male A_1 is not known and will not be considered.

I have thoroughly examined many of the North Carolinian specimens and consistently find differences in only these two characters. From the setation of the mouth parts to the shape and size of the male furca, every appendage, spine and ornament agrees with Geddes' Bahamian specimens except for the two above mentioned characters. I propose to call the Bahamian specimens *P. parafurciger parafurciger* and the North Carolinian specimens *P. parafurciger carolinensis* n. ssp.

Family CYLINDROPSYLLIDAE Sars 1906, Lang 1948

Cylinula n. gen.

The generic diagnosis coincides with that of the sole and type species and must therefore be considered preliminary.

Remarks

This new genus appears to be intermediate between *Cylindropsyllus* and *Evansula,* thus the generic name. The obsolete maxillipede, setal formula and 2-segmented P_2-P_4 endopods are characters typical of *Cylindropsyllus.* However, the prehensile 2-segmented P_1 endopod, longer than the 3-segmented exopod, links the new genus to *Evansula.* Because of these major differences from either genus, it is reported here as a new genus and species. The gender is feminine.

Cylinula proxima n. gen. n. sp. (Figs. XII-XIII)

Material: 11♀♀, 7♂♂. Holotype 1♀, U.S.N.M. No. 128177; paratypes 4♀♀, 3♂♂, U.S.N.M. No. 128178.

Description

Female: based on ovigerous female, length 0.61 mm. Body slender, very slight distal taper. Body somites bare of ornamentation; general body shape of *Cylindropsyllus.* Last abdominal segment (Fig. XII, 103) and genital segment are formed of 2 fused segments. Caudal rami (Fig. XII, 103 and 104) slightly divergent with one dorsal and 2 lateral setae. A single short principal terminal seta, genticulate. Rostrum (Fig. XII, 105) pointed and small.

A_1 (Fig. XII, 105), 7-segmented, second segment 2 times as long as others. Aesthetasc on fourth segment.

A_2 (Fig. XII, 106), with allobasis. Endopod terminates with 5 setae. Exopod like that of *Cylindropsyllus remanei* Kunz (1949): one-segmented with 2 terminal setae.

Md. (Fig. XII, 107), with bidentate pars incisiva. Palp one-segmented, with one lateral and 2 terminal setae.

Mxl. (Fig. XII, 108), pre-coxal arthrite with one straight and 2 setae. Basis terminating in a claw-like seta. Endopod with 3 setae. Endopod represented by a single seta.

Mx. (Fig. XII, 109), syncoxa with 2 endites, each terminating in 2 setae. Basis terminating in a claw-like seta. Endopod with 3 setae.

Mxp. not present.

P_1 (Fig. XIII, 110), 2-segmented prehensile endopod terminating with one genticulate and one claw-like seta. Exopod 3-segmented terminating in 4 setae (inner 2 genticulate).

P_2 (Fig. XIII, 111), P_3 (Fig. XIII, 112), P_4 (Fig. XIII, 113), all with 3-segmented exopods and 2-segmented endopods. The setal formula is exactly the same as that of *Cylindropsyllus laevis* Brady and is listed below with that of *C. laevis* and *C. remanei.*

	P_2		P_3		P_4	
	Exp.	End.	Exp.	End.	Exp.	End.
Cylindropsyllus laevis Brady	0.0.022	1.010	0.0.122	0.020	0.0.122	0.010
C. remanei Kunz	0.0.111	1.010	0.0.112	0.011	0.0.211	0.010
Cylinua proxima n. g. n. sp.	0.0.022	1.010	0.0.122	0.020	0.0.122	0.010

P_5 (Fig. XIII, 114), each side a single plate with 8 non-plumose setae.

Genital field (Fig. XIII, 115), like that of *Cylindropsyllus laevis.*

Male: Description based on mature male, 0.54 mm.

A_1, (Fig. XIII, 116), 6-segmented and haplocer, aesthetasc on segment three.

A_2, oral parts, P_1, P_4 and caudal rami, same as the female.

P_2 (Fig. XIII, 117), same as female except the inner terminal seta of the exopod is expanded.

P_3 (Fig. XIII, 118), exopod same as female. Endopod modified as figured.

P_5 (Fig. XIII, 119 and 120), each side a single plate as in female,

with 6 setae (119) or 5 setae (120). Of the 7 available males, 6 had the arrangement noted in Fig. XIII, 119 (6 setae) while one had 5 setae on P_5 (Fig. XIII, 120).

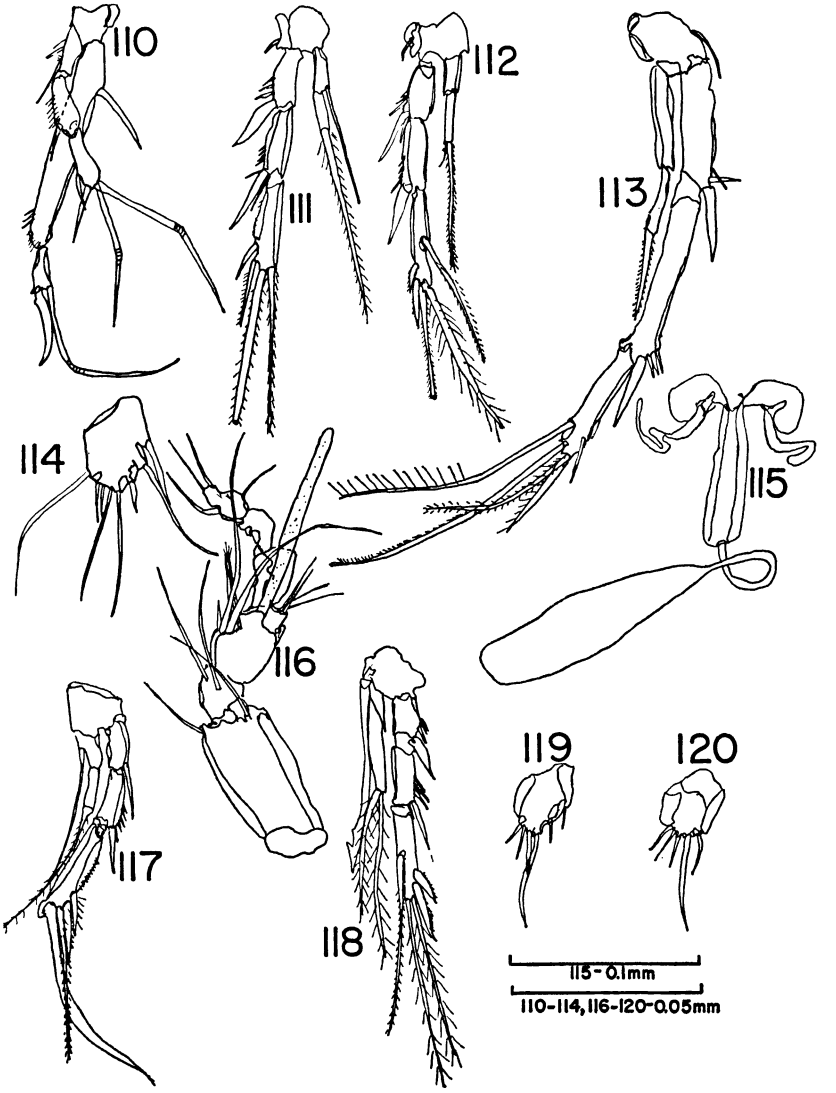


FIG. XIII
Cylinula proxima n. g., n. sp.
♀: 110, P_1; 111, P_2; 112, P_3; 113, P_4; 114, P_5; 115, genital field.
♂: 116, A_1; 117, P_2; 118, P_3; 119, P_5; 120, P_5.

Etymology

The specific name, *proxima,* is chosen to indicate how closely related this species is to its generic namesakes, *Cylindropsyllus* and *Evansula.*

Family CLETODIDAE T. Scoot 1904

Genus *Cletodes* Brady 1872

Since Lang's (1965) key to the genus, the following species have been added: *C. reyssi* Soyer (1964), *C. latirostris* Drzycimski (1967), *C. spinulipes* and *C. yotabis* Por (1967).

Cletodes pseudodissimilis n. sp. (Figs. XIV-XV)

Material: 21♀♀, 6♂♂. Holotype 1♀, U.S.N.M. No. 128179; paratypes 5♀♀, 2♂♂, U.S.N.M. No. 128180.

Type locality: North Carolina Continental Shelf (Stations 2, 4, 5, 7, 9, 11, this paper).

Description

Female: based on mature female, length 0.60 mm. Body distinctly segmented. Thoracic segments bordered with row of spinules. Setigerous process on abdominal segments one through 3. Anal operculum and last abdominal somite spinulose (Fig. XIV, 121). Caudal rami pyriform-shaped, about as long as wide at the widest part. Outer edge convex in proximal, concave in distal portion. Dorsal keel runs ½ the length. Lateral seta and spinulose margin at start of taper. Dorsal seta at 2/3 the length. One principal terminal seta. Rostrum distinct, broadly rounded and pitted on the surface (Fig. XIV, 122).

A_1 (Fig. XIV, 122,), 5-segmented, aesthetasc on third segment, fourth segment very short.

A_2 (Fig. XIV, 123), with allobasis. Endopod terminally with 5 setae. Anterior edge with row of spinules, which gradually increase in size. Exopod reduced to small knot-like structure with one finely plumose terminal seta.

Md. (Fig. XIV, 124), pre-coxa with bidentate pars incisiva and another row of teeth behind. Coxa-basis with 5 plumose setae.

Mxl. (Fig. XIV, 125), pre-coxal arthrite with 4 claw-like spines and one surface seta. Coxa with a single terminal seta. Basis with 5 short terminal setae. Exopod missing. Endopod has two plumose setae.

Mx. (Fig. XIV, 126), syncoxa with 2 endites, each with 3 setae. Basis terminally with 2 claw-like setae. Endopod represented by small knot with 2 setae.

Mxp. (Fig. XIV, 127), coxa small. Basis with one small seta at inner distal corner. First endopod segment with row of spinules on inner edge. Second segment bare, terminally with claw-like spine and 3 spinules along concave inner edge.

P_1 (Fig. XIV, 128), 2-segmented endopod, 3-segmented exopod. Exopod terminally with 4 setae, endopod with 3. Setation as figured.

P_2 (Fig. XIV, 129), P_3 (Fig. XIV, 130), and P_4 (Fig. XV, 131), all with 2-segmented endopods and 3-segmented exopods. The setation as figured and as listed below:

Setal Formula: *Cletodes pseudodissimilis* n. sp.

	End.	Exp.
P_2	0.020	0.1.022
P_3	0.021	0.1.022
P_4	0.121	0.1.022

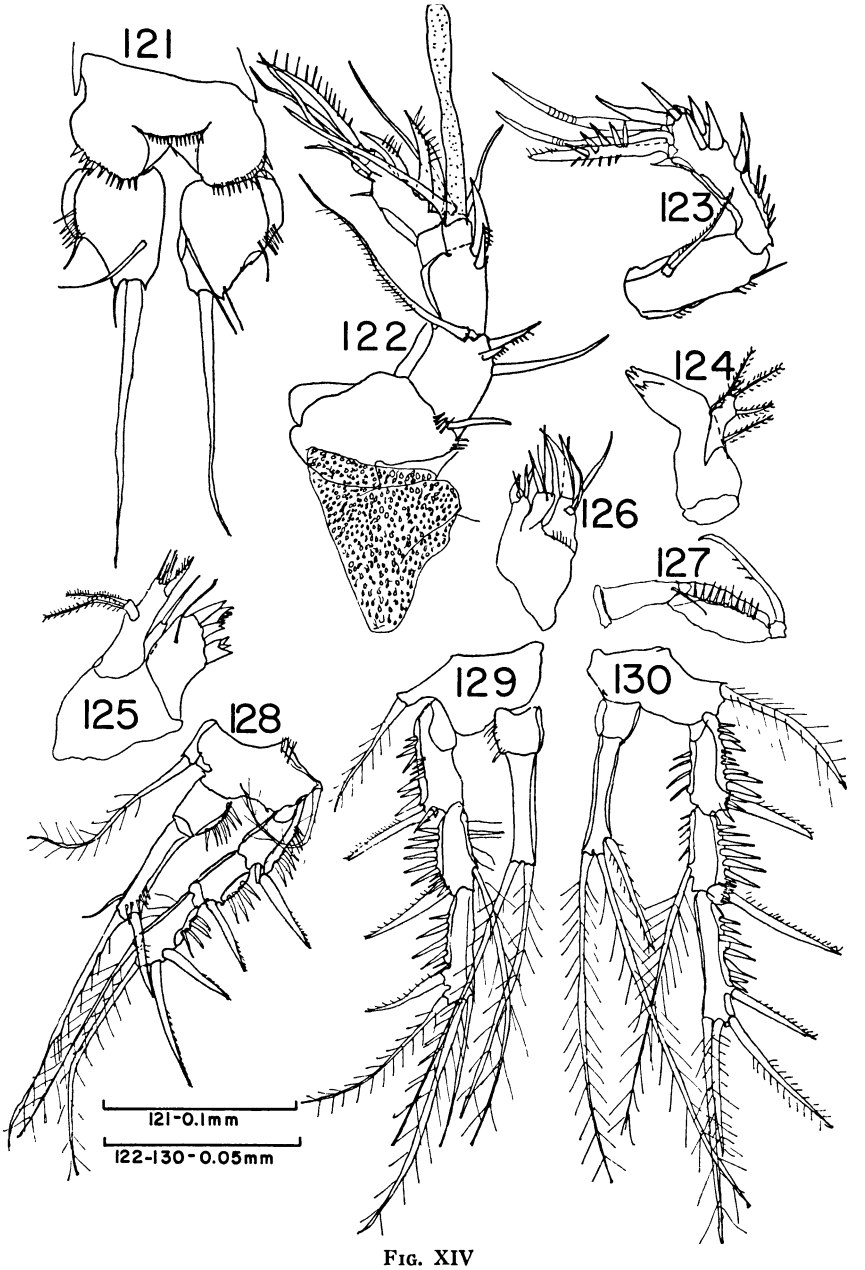


FIG. XIV

Cletodes pseudodissimilis n. sp. ♀.

121, Last abdominal somite and caudal rami; 122, rostrum and A_1; 123, A_2; 124, Md.; 125, Mxl.; 126, Mx.; 127, Mxp.; 128, P_1; 129, P_2; 130, P_3.

P_5 (Fig. XV, 132), with separate rami. Baseoendopodite with three major setae: innermost very strong, terminal and outermost plumose. Exopod 4-5 times as long as wide, margins spinulose with one terminal, one inner and 3 outer plumose setae.

Male: based on mature male 0.52 mm. The general body shape

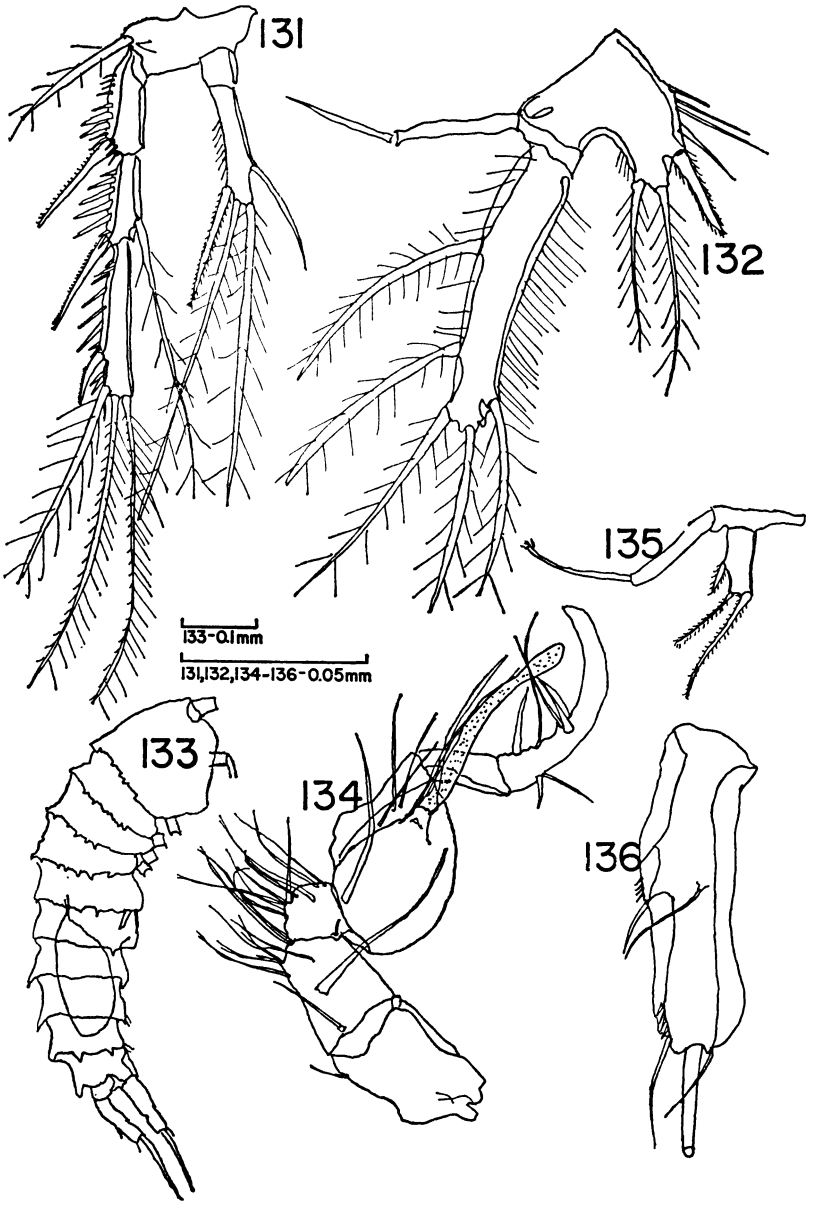


FIG. XV
Cletodes pseudodissimilis n. sp.

♀: 131, P_4; 132, P_5.
♂: 133, Whole mount from right; 134, A_1; 135, P_5; 136, caudal ramus.

and somitic arrangement is shown in the whole mount drawing (Fig. XV, 133).

A_1 (Fig. XV, 134), 6-segmented and haplocer, fourth segment bears aesthetasc.

A_2, oral parts and swimming legs same as female.

P_5 (Fig. XV, 135), very small. No inner baseoendopodite expansion. Exopod rectangular with one small outer and 2 terminal plumose setae.

Caudal rami (Fig. XV, 136), 4 times as long as wide at the widest part. Dorsal seta inserts at ½ the length. Lateral setae at ½ the length and just above the principal terminal seta. The outer margin concave, then convex and then concave. Inner margin slightly expanded in distal portion.

Remarks

Three species in the genus exhibit 2, 3 and 4 setae on the terminal segments of the P_2-P_4 endopodites respectively: *C. dissimilis* Willey, *C. spinulipes* Por and *C. pseudodissimilis* n. sp. *C. pseudodissimilis* differs from the two previously known species primarily in the shape of the female caudal rami (in which *C. pseudodissimilis* n. sp. resembles that of *C. limicola* Brady) and by the fact that sexual dimorphism also appears in the caudal rami (a rare trait in this genus; as far as I know, only *C. longifurca* Lang illustrates this dimorphism). The deceptive character is the male dimorphic caudal rami, which resemble those described by Willey (1935) for the female *C. dissimilis*. If one were allowed to examine only the male of the new species described here, it could easily be mistaken for *C. dissimilis*. However, since the other differences between *C. dissimilis* and *C. pseudodissimilis* (maxillula setation, hair-like setation on swimming legs) occur in both sexes, *C. pseudodissimilis* is reported here as a new species.

Genus ***Rhizothrix*** Brady and Robertson 1875

Since Wells' (1963) key to the genus two species have been added: *R. pubescens* Por (1959) and *R. quadriseta* Wells (1967).

Rhizothrix spinosa n. sp. (Fig. XVI)

Material: 31♀♀, 5♂♂. Holotype 1♀, U.S.N.M. No. 128181; paratypes 9♀♀, 2♂♂, U.S.N.M. No. 128182.

Type locality: North Carolina Continental Shelf (Stations 1, 2, 3, 5, 13 and 14 this paper).

Description

Female: based on mature female, length 0.55 mm. Body distinctly segmented, entire body finely pubescent. Anal operculum dentate (Fig. XVI, 137). Caudal rami, finely haired on surfaces, heavily spinu-

lose on lateral and median edges. One lateral and 2 dorsal setae. Two principal terminal setae. Rostrum (Fig. XVI, 138), broadly rounded, tapering and indented proximally. Indentation pubescent.

A_1 (Fig. XVI, 138), 4-segmented, first segment 2 times longer than any other. Second and fourth segment with strong spines with accessory spinules. Segment 3 with aesthetasc.

A_2 (Fig. XVI, 139), with allobasis. Allobasis with one internal seta and spinules surrounding exopod. Second endopod segment terminally with 3 strong spines and 2 genticulate spines and several smaller spinules. Exopod one-segmented with row of spinules around middle and with 4 marginal setae.

Md. (Fig. XVI, 140), pre-coxa well developed with bidentate pars incisiva. Another set of blunt teeth behind, with a pinnate spine and seta near the cuting edge. Coxa-basis circumscribed with spinules, terminally with one strong spinulose spine. Endopod one-segmented with a strong inner spinulose spine, a small inner spinule, 4 terminal non-plumose setae and outer spinulose edge. Exopod reduced to a single spinule.

Mxl. (Fig. XVI, 141), pre-coxal arthrite with 8 terminal setae and spines in all. Row of spinules 2/3 the way along. Coxa with 2 terminal setae. Basis 2-segmented, terminally with 4 setae, exopod and endopod reduced to one and 2 setae respectively. Spinules present on basis.

Mx. (Fig. XVI, 142), syncoxa space with 2 endites. Basis with terminal claw-like spine and seta. Endopod spinulose with 2 setae and small spinule.

Mxp. (Fig. XVI, 143), basis bare. First endopod segment finely spinulose on inner convex margin. Second segment claw-shaped, with one small seta.

P_1 (Fig. XVI, 144), 2-segmented endopod, second segment 3-4 times as long as the first. Terminally with 2 long setae, with brush-like tip ("pinselborste" of Lang 1948). 3-segmented exopod, all segments of relatively equal length. Terminal segment with 4 setae, the inner 2 long with brush-like tip. Remainder of setation as figured.

P_2-P_4 (Fig. XVI, 145), all 3 appendages exactly the same. Endopods 2-segmented, second segment 2 times as long as first. Exopods 3-segmented, subequal in length. Segments of both rami, heavily spinulose. Setal formula for P_2-P_4: exp. 0.0.022, end. 0.111.

P_5 (Fig. XVI, 146), baseoendopodite of both sides confluent, each side with 5 plumose setae equal in length. Entire baseoendopodite finely spinulose, outer edge heavily spinulose. Exopod separate, with 5 setae, the inner and outermost very short, the innermost but one longest: all plumose.

Male: description based on mature male 0.50 mm. Only A_1 and P_5 are dimorphic.

FIG. XVI

Rhizothrix spinosa n. sp.

♀: 137, Last abdominal somites and caudal rami; 138, rostrum and A_1; 139, A_2; 140, Md.; 141, Mxl.; 142, Mx.; 143, Mxp.; 144, P_1; 145, P_2; 146, P_5.

♂: 147, A_1; 148, P_5.

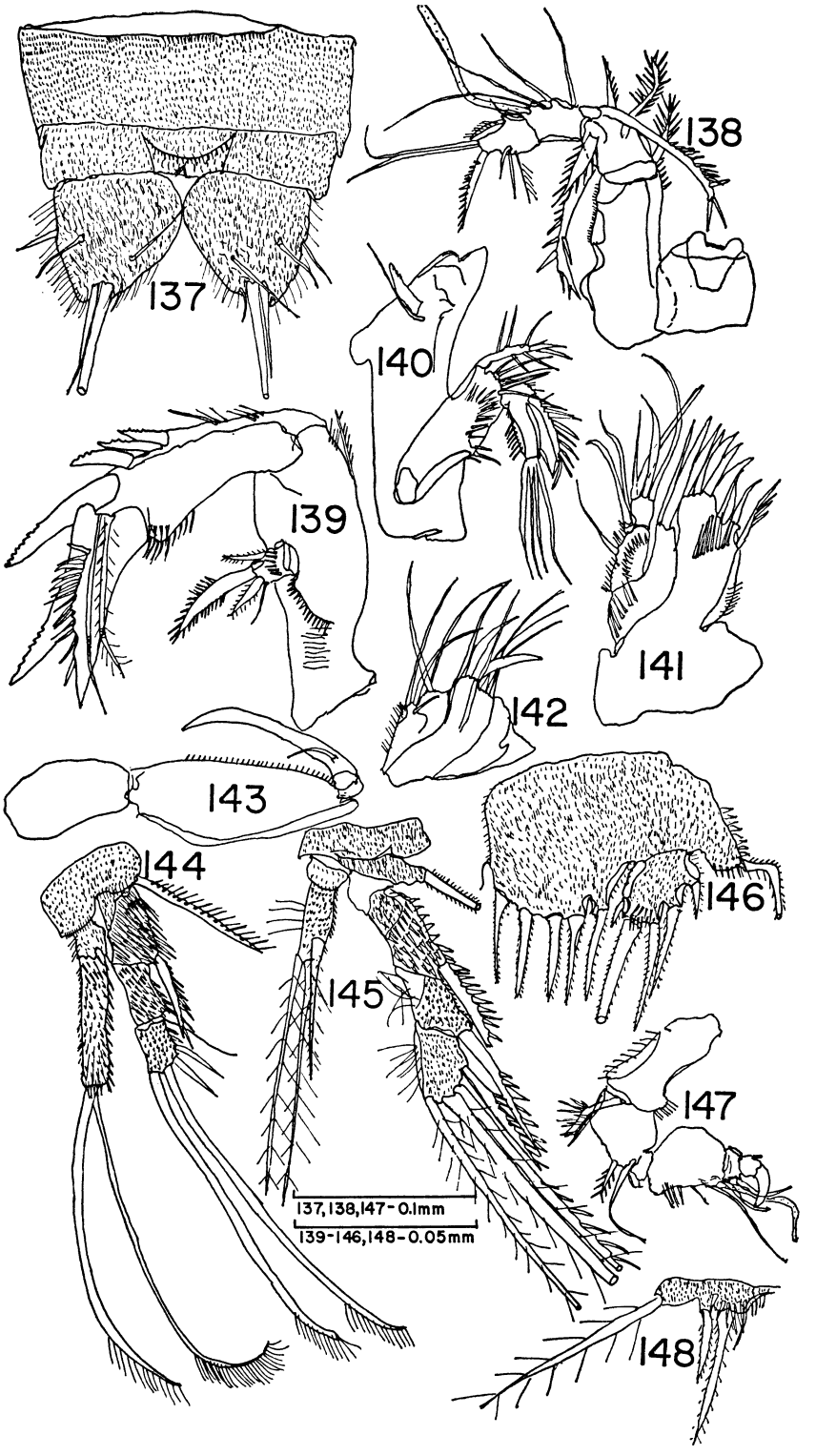

137
138
140
139
141
142
143
144
146
145
147
137,138,147-0.1mm
139-146,148-0.05mm
148

FIG. XVI

A_1 (Fig. XVI, 147), 6 (indistinctly 7)-segmented and haplocer. Aesthetasc on greatly expanded fourth segment.

P_5 (Fig. XVI, 148), confluent rami, forming a small plate with 4 setae, the innermost one very small. Spinules present on surface.

Etymology

The specific name, *spinosa,* denotes the spinulose ornamentation of the body and appendages.

Remarks

Within the true genus *Rhizothrix* (see Wells 1963 and Lang 1965 for generic designations), two previously known species exhibit the combination of 4 setae on the A_2 exopod and distinct rami of the female P_5: *R. pubescens* Por and *R. quadriseta* Wells. *R. spinosa* n. sp. differs from these two species primarily in setation of the swimming legs, especially the P_4 endopod, which has 4 setae in the two previously known species and 3 in *R. spinosa*; mouth part setation and P_5 setation (the male and female of *R. quadriseta,* the male of *R. pubescens*).

Interestingly, all three of these species exhibit dense clothing of the body with fine hairs, a condition typically characteristic of *Tryphoema.* The possibility that these three *Rhizothrix,* with somewhat reduced setation of the swimming legs, separate P_5 rami, 4 setae on the A_2 exopod and finely haired bodies (typically *Tryphoema* characteristics), but with 3-segmented endopods of P_2-P_4 (characteristically *Rhizothrix*), represent the link between the two genera cannot be overlooked.

Genus ***Tryphoema*** Monard 1926

Since Wells' (1963) key to the genus, *T. lusitanica* (Wells and Clark, 1965) and *T. scilloniensis* (Wells, 1968) have been added.

Tryphoema riedli n. sp. (Fig. XVII)

Material: 23♀♀, 2♂♂. Holotype 1♀, U.S.N.M. No. 128183 (Remainder on slides in author's collection).

Type locality: Station 7 in this paper (34° 15.4' N, 76° 10.0' W, 90 m).

Description

Female: based on mature female 0.48 mm. Body distinctly segmented, entire body covered with fine hair-like setation (Fig. XVII, 149). Anal operculum present. Caudal rami (Fig. XVII, 149, 150) pyriform, as long as broad at base, finely haired. One principal terminal seta, very short and plumose. Margins spinulose, outer distal corner produced into rounded spinulose lobe, separate from

remainder of ramus. Rostrum (Fig. XVII, 151) tapers proximally to broad apex. Surface pitted, apex spinulose.

A_1 (Fig. XVII, 151), 5-segmented, all segments approximately equal in length. Fifth segment digitiform with heavy spinulose spines, fourth with the aesthetasc.

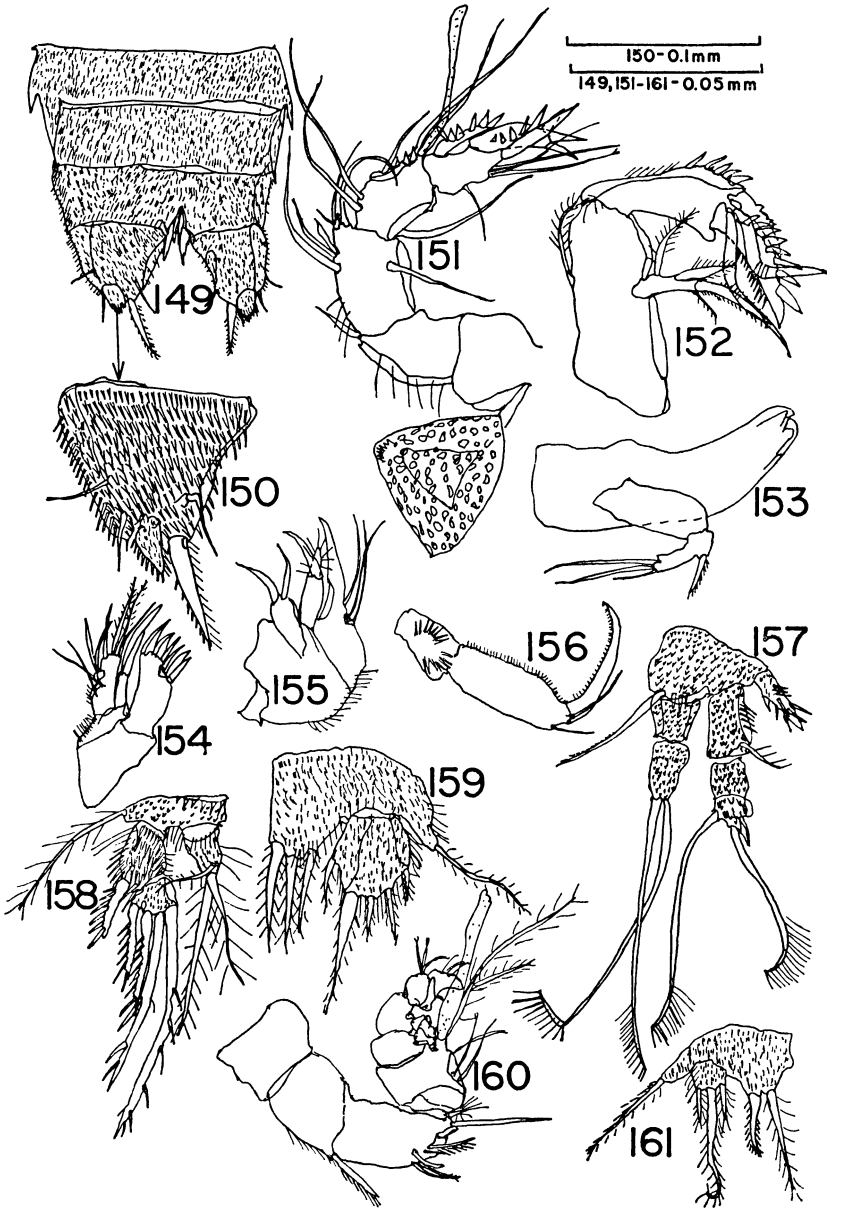


FIG. XVII

Tryphoema riedli n. sp.

♀: 149, Last 3 abdominal somites and caudal rami; 150, caudal ramus; 151, rostrum and A_1; 152, A_2; 153, Md.; 154, Mxl.; 155, Mx.; 156, Mxp.; 157, P_1; 158, P_3; 159, P_5.

♂: 160, A_1; 161, P_5.

A_2 (Fig. XVII, 152), very much like that of *Rhizothrix spinosa* n. sp. Allobasis with one plumose internal seta and the one-segmented exopod. Second endopod segment spinulose on inner edge, terminating in 2 strong heavily spined setae and 2 genticulate setae. Exopod with 4 plumose setae.

Md. (Fig. XVII, 153), large pre-coxa and bidentate pars incisiva. Coxa basis bare. Endopod with one inner and 3 terminal setae.

Mxl. (Fig. XVII, 154), pre-coxal arthrite with 8 setae and spines. Coxa with 2 terminal setae. Basis terminally with 4 setae. Endopod and exopod with 2 setae each.

Mx. (Fig. XVII, 155), syncoxa with 2 endites. Basis terminally in a single claw-like spine. Endopod small with 2 setae.

Mxp. (Fig. XVII, 156), basis short, heavily spinulose. First endopod segment with fine spinules on inner convex margin and small seta at outer distal corner. Second segment claw-shaped, with small seta at base.

P_1 (Fig. XVII, 157), 3-segmented exopod, 2-segmented endopod. Both rami terminally with 2 "pinselborste" setae.

P_2, P_3, P_4 (Fig. XVII, 158), all with 2-segmented exopods and one-segmented endopods. Setation exactly the same in all three legs, i.e. exp. 0.022, end. —.120.

P_5 (Fig. VII, 159), separate rami but baseoendopodite of each side fused, with 3 plumose setae. Exopod with 5 plumose setae, innermost but one larger than the other 4.

Male: description based on mature male, 0.44 mm. Dimorphism present in only the A_1 and P_5.

A_1 (Fig. XVII, 160), 6-segmented and haplocer. Fourth segment greatly expanded bears an aesthetasc.

P_5 (Fig. XVII, 161), separate rami, but both baseoendopodite of both sides confluent. Inner expansion of baseoendopodite with 2 plumose setae. Exopod small with 3 plumose setae.

Etymology

The specific name, *riedli,* is dedicated to Professor Rupert Riedl, University of North Carolina, Chapel Hill.

Remarks

Wells (1968) compares *T. scilloncensis* with the remainder of the genus and lists the setal formulae for the five previously known species. *T. riedli* n. sp. differs from all the known species primarily in the setation of the P_5: *T. riedli* n. sp. is the only species with 3 setae on the inner expansion of of the baseoendopodite, which, in this genus, is very important and warrants specific identity. I should also add that the antennule was examined very carefully for the small fourth segment Wells (1968) found on *T. scilloniensis:* it was not present in *T. riedli.*

Acknowledgements

Gratefully acknowledged are Dr. Rupert Riedl, for the use of an excellent microscope, Dr. F. D. Por, for spending several hours with me and examining several of the specimens discussed in this paper and Dr. Jackson O. Blanton for use of the original Figure 1. This research was done while I held a Postdoctoral Award in the Cooperative Program in Biological Oceanography at the Duke University Marine Laboratory. The Cooperative program is supported by National Science Foundation Grant GB-8189.

Summary

Harpacticoid copepods collected on the North Carolina Continental Shelf (to 100 m) during a shelf, slope and deep-sea study of the meiobenthos between North Carolina and Bermuda are presented. One hundred and eleven species were found, of which 11 are new species and one a new sub-species. Two new genera are also described. The new forms are as follows: *Ellucana secunda* n. sp., *Danielssenia eastwardae* n. sp., *Melima bisetosa* n. sp., *Schizopera carolinensis* n. sp., *S. anomala* n. sp., *Fearia prima* n. gen. n. sp., *Tetragoniceps bookhouti* n. sp., *Phyllopodopsyllus parafurciger carolinensis* n. spp., *Cylinula proxima* n. gen. n. sp., *Cletodes pseudodissimilis* n. sp., *Rhizothrix spinosa* n. sp. and *Tryphoema riedli* n. sp.

Ellucana is raised to the generic level to include *E. longicauda* Sewell and *E. secunda* n. sp. The two new genera, *Fearia* and *Cylinula,* appear to be intermediates between existing genera. *Rhizothrix spinosa* n. sp., *R. pubescens* Por and *R. quadriseta* Wells may also be considered as forms intermediate between the genera *Rhizothrix* and *Tryphoema.*

Zusammenfassung

Die meisobenthischen Harpactoiden (Crustacea, Copepoda) des kontinentalen Plateaus von Nord-Karolina.

Der Autor beschreibt die Harpactoiden Copepoden die auf dem kontinentalen Plateau von Nord-Karolina bis zu 100 m Meerestiefe gesammelt wurden. Das Material wurde im Verlaufe einer Untersuchung des Meiobenthos des kontinentalen Plateaus, der kontinentalen Böschung und des bathyalen Niveaus zwischen Nord-Karolina und den Bermuden gesammelt. 111 Arten wurden festgestellt, von denen 11 neu sind, sowie eine Subspecies. Es werden ebenfalls zwei neue Gattungen beschrieben. Die neuen Formen sind die folgenden : *Ellucana secunda* n. sp., *Danielssenia eatwardae* n. sp., *Melima bisetosa* n. sp., *Schizopera carolinensis* n. sp., *S. anomala* n. sp., *Fearia prima* n. gen. n. sp., *Tetragoniceps bookhouti* n. sp., *Phyllopodopsyllus parafurgicer carolinensis,* n. ssp., *Cylinula proxima* n. gen. n. sp., *Cletodes pseudodissimilis* n. sp., *Rhizothrix spinosa* n. sp., und *Tryphoema riedli* n. sp.

Ellucana wird zum Rang einer Gattung erhoben, die *E. longicauda* Sewell und *E. secunda* n. sp. umfasst. Die zwei neuen Gattungen, *Fearia* und *Cylinula* scheinen intermediär zu sein zwischen den früher bekannten Gattungen. *Rhizothrix spinosa, R. pubescens* Por und *R. quadriseta* Wells könnten ebenfalls als intermediäre Formen zwischen *Rhizothrix* und *Tryphoema* aufgefasst werden.

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