

SIX MEIOBENTHIC HARPACTICOIDA  
(CRUSTACEA, COPEPODA)  
FROM NORTH CAROLINA BEACHES

by

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Résumé

Les Harpacticoïdes méiobenthiques (Crustacea, Copepoda) des sables de la zone intercotidale de Caroline du Nord.

Cinq espèces nouvelles de Harpacticoïdes, *Noodtiella enertha* n. sp., *Psyllocamptus carolinensis* n. sp., *Pseudoleptomesochrella bisetosa* n. sp., *Interleptomesochra boguensis* n. sp. et *Leptastacus jeneri* n. sp. sont décrits. Les *Psammotopa vulgaris* Pennant, du Massachusetts et de la Caroline du Nord font l'objet d'une comparaison et d'une redescription. Toutes les espèces décrites sont signalées des sables de la zone intercotidale au voisinage de Morehead City, Caroline du Nord.

Introduction

Sutcliff (1950), Coull and Lindgren (1969), Coull and Vernberg (1969, 1970), Hamond (1972) and Coull (1971, 1973, 1973a, 1973b, 1973c) report on the planktonic, symbiotic and sublittoral harpacticoid copepods of the North Carolina coast. This paper deals with six free-living species collected during a systematic and ecological survey of the North Carolina marine sandy-beach Harpacticoida (Lindgren, 1972).

Field studies were conducted from mid-1969 through mid-1971. The described species were collected (Fig. 1) from Iron Steamer Pier beach (76° 50' 00" W, 34° 41' 30" N) and/or Bogue Sound beach (76° 43' 10" W, 34° 43' 10" N) near Morehead City, N.C. Iron Steamer Pier beach, fully exposed to the Atlantic Ocean, had a tidal range of about 1.5 m vertically and 45 m horizontally while the semiprotected Bogue Sound beach had a tidal range of about one meter vertically and 20 m horizontally.

The following classification and descriptive terminology are adopted from Lang (1948, 1965). The abbreviations used include:  $A_1$  = antennula,  $A_2$  = antenna, Md = mandible, Mxl = maxillula, Mx = maxilla, Mxp = maxillipede,  $P_1$ - $P_6$  = leg 1 - leg 6. Length measurements of the copepod exclude the rostrum, head appendages and caudal rami. All figures were prepared with the aid of phase microscopy and a camera lucida.

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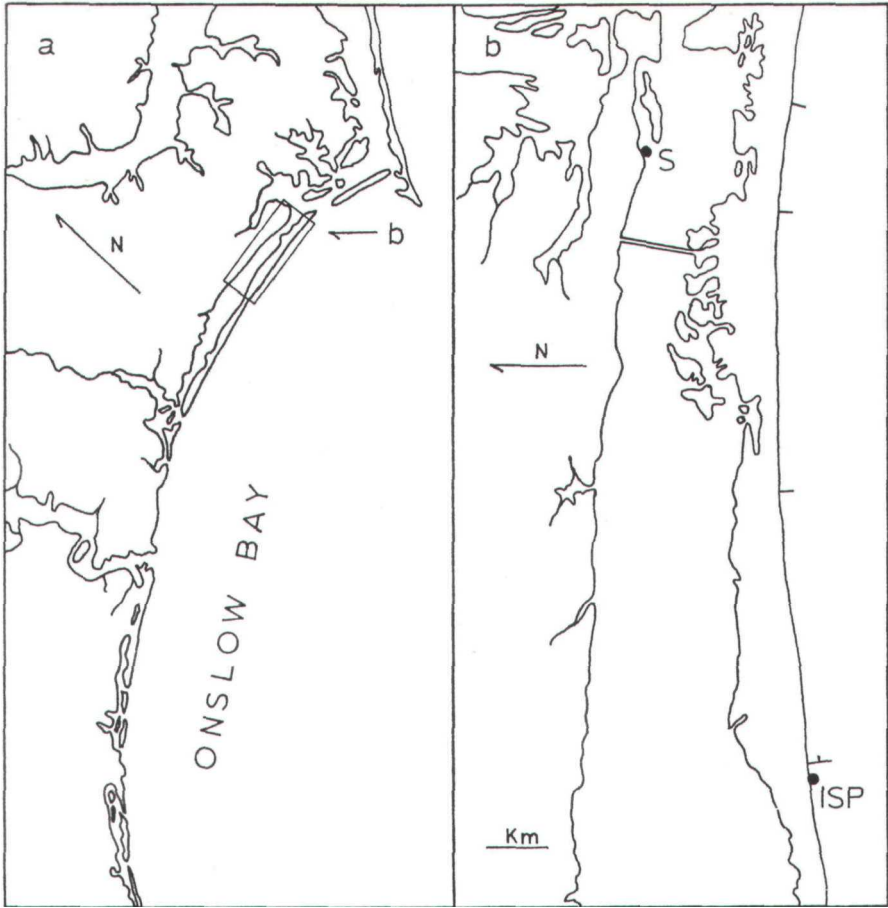


FIG. 1

Locations of sampling sites investigated in this study:

- a. Onslow Bay, North Carolina, U.S.A. Box indicates position of map b.  
 b. Location of Bogue Sound beach (S) and Iron Steamer Pier beach (ISP) sampling sites.

## DESCRIPTION OF SPECIES

Family ECTINOSOMIDAE Sars, Olofsson

Genus *Noodtiella* Wells, 1965

*Noodtiella enertha* n. sp.

Material: 10 ♀♀, 8 ♂♂. Holotype 1 ♀, U.S.N.M. ; paratypes 6 ♀♀  
 6 ♂♂, U.S.N.M.

Description:

*Female* (Fig. 2-3). Length, 0.33 mm, fixed in 4 p. 100 formaldehyde. Body slender and vermiform, almost seven times as long as

wide. Cephalothorax, excluding rostrum, equal in length to next two and one-half somites combined. Rostrum (Fig. 2g) well developed, curved downward. Genital double-somite laterally divided. Furcal

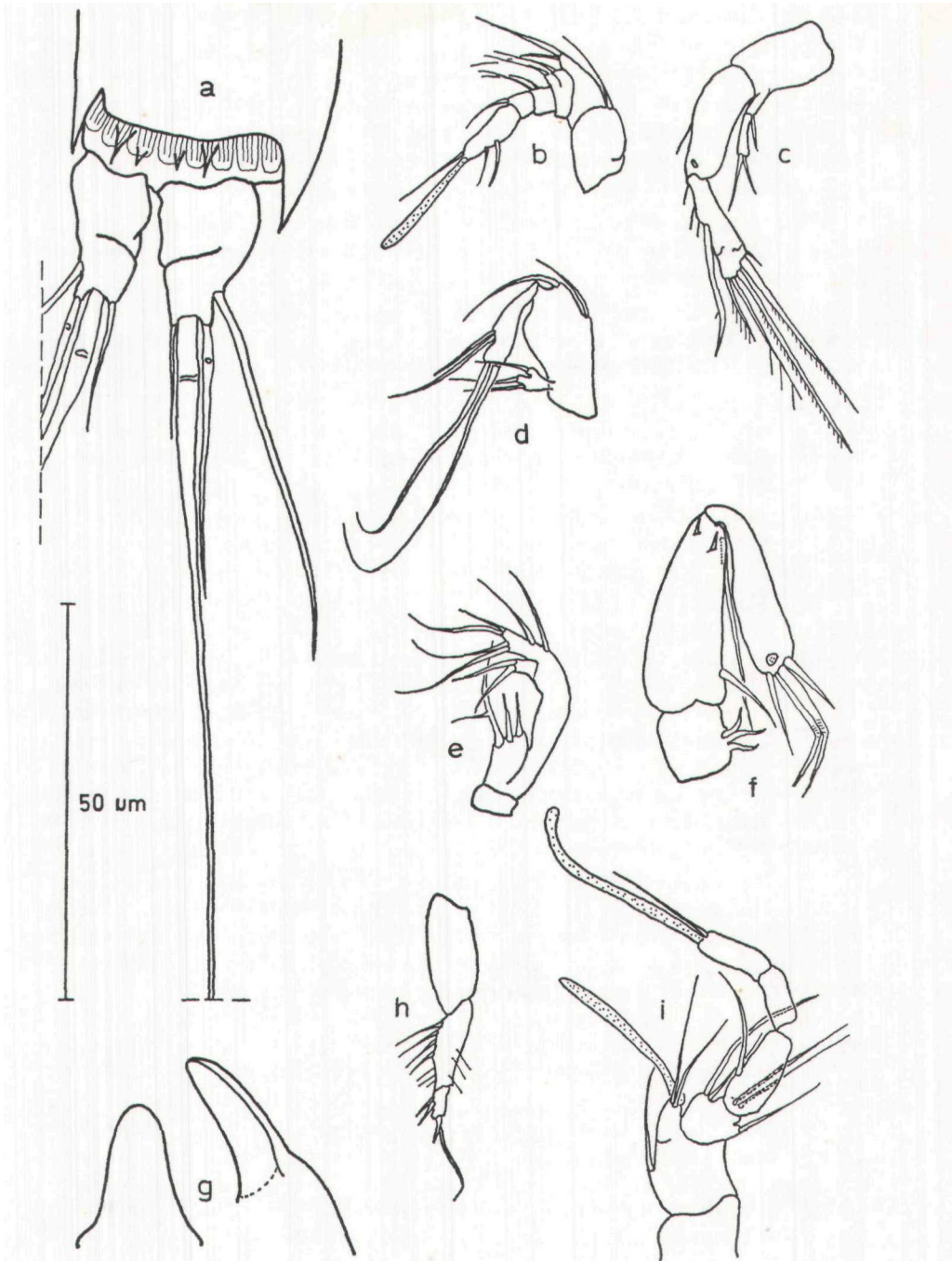


FIG. 2

*Noodtiella enertha* n. sp.

Female: a, furca; b, A<sub>1</sub>; c, A<sub>2</sub>; d, Md palp; e, Mx<sub>1</sub>; f, Mx<sub>2</sub>; g, rostrum; h, Mx<sub>1</sub>.  
Male: i, A<sub>1</sub>.

rami (Fig. 2a) twice as long as wide, attenuated; each terminating in three apical and one lateral setae, middle apical seta very long.

A<sub>1</sub> (Fig. 2b) 6-segmented. First and last segments longest and subequal in length. Aesthetasc on end of last segment.

A<sub>2</sub> (Fig. 2c) 3-segmented. Basis apparently bare. Endopodite first segment with single outer margin seta; terminal segment with three, outer margin, dwarfed setae proximal to one large seta originating from half length of segment; four apical setae. Exopodite 2-segmented, originating from basis, first segment with single distal seta and terminal segment with two simple apical setae.

Md (Fig. 2d) precoxa not seen. Coxa-basis with two outer margin setae. Endopodite with two outer and two apical setae. Exopodite with three setae.

Mxl (Fig. 2e) precoxa with three spines. Coxa-basis-endopodite confluent; two outer margin setae and four terminal setae present. Exopodite with two setae.

Mx (Fig. 2f) 3-segmented. Syncoxa with three spines. Basis with inner margin spine near base and single spine near joint with endopodite. Endopodite large single segment with four apical setae, middle two geniculate.

Mxp (Fig. 2h) basis bare. First endopodite segment spinose along inner margin, three spinules on outer margin, terminal segment with two inner margin spinules and two apical setae.

P<sub>1</sub> (Fig. 3a) coxa bare. Basis with simple lateral spine. Exopodite of three equal segments; inner margin bare except for long seta on middle segment; outer margin spinose; terminal segment with two apical and one lateral seta. Endopodite 3-segmented, first segment equal in length to next two segments combined, third segment twice length of middle segment; first segment with long inner margin distal seta, both margins spinose; second segment with two spinules on outer margin, inner margin bare; third segment with two inner margin setae, two apical setae, one subapical lateral seta and two small outer margin spinules.

P<sub>2</sub>-P<sub>4</sub> (Fig. 3b-d) coxae bare. Basis with small outer spine. Exopodite 3-segmented, extending to middle of terminal endopodite segment; first segment longest; outer margin spinose; inner margins with distal spines on first and second segments; terminal segment with two apical and one lateral setae. Endopodite 3-segmented; outer margin spinose; first segment with two inner margin spines; middle segment bare; terminal segment with six setae, two medial, two apical, one lateral, and one central setae. Spine and setal formula in Table 1.

P<sub>5</sub> (Fig. 3e) baseoendopodite reaches half length of exopodite; heavy short lateral spine and two medial setae, more medial seta five times as long as more lateral setose confluent medial-seta. Exopodite with three setae; short confluent medial spine, strong lateral seta four times as long as well developed middle seta.

*Male.* Length, 0.30 mm, fixed in 4 p. 100 formaldehyde. Smaller body and most appendages similar to female. Sexual dimorphism in A<sub>1</sub> genital segmentation, and P<sub>5</sub> and P<sub>6</sub>.

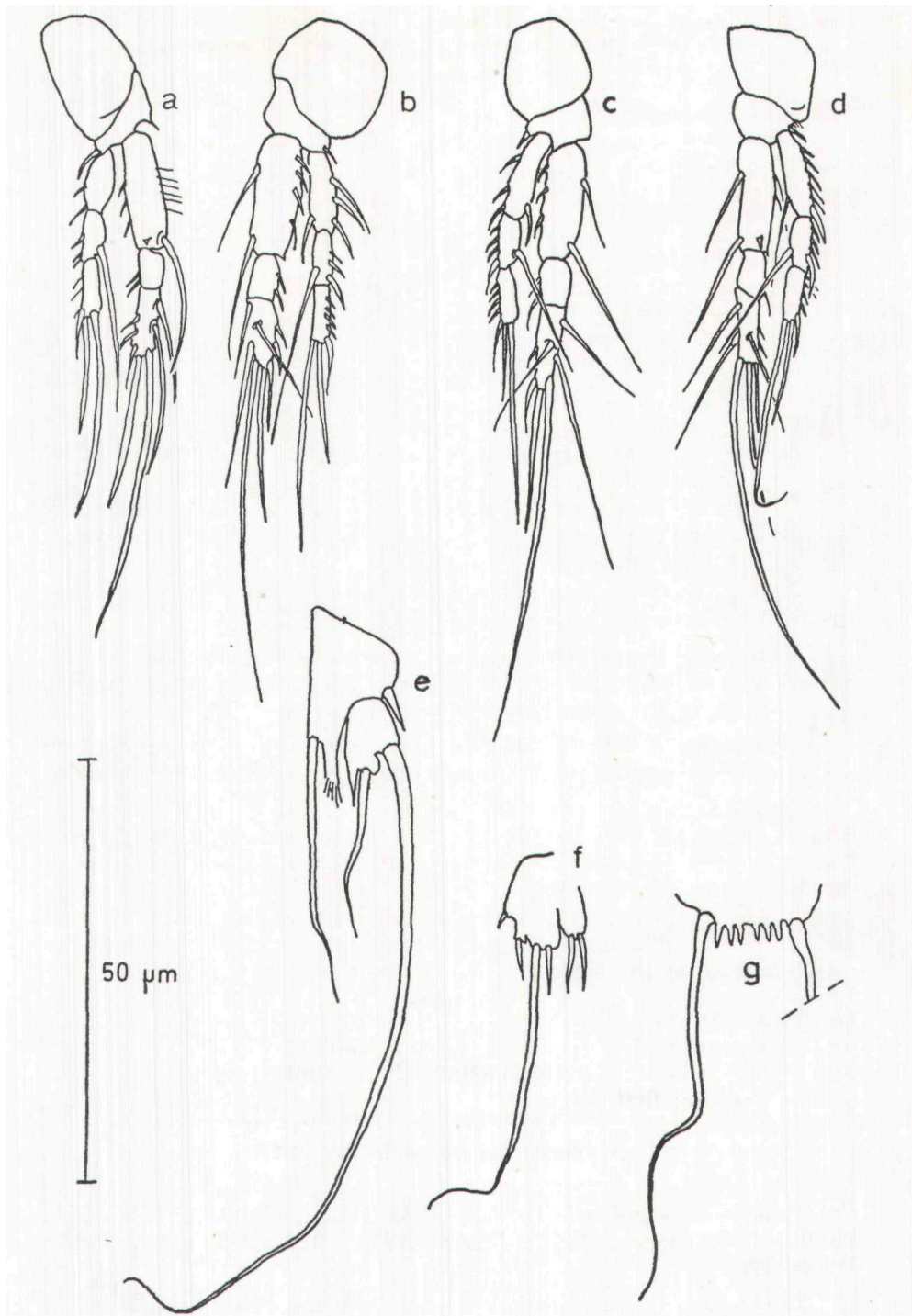


FIG. 3

*Noodtiella enertha* n. sp.

Female: a-e, P<sub>1</sub>-P<sub>5</sub>  
Male: f-g, P<sub>5</sub> and P<sub>6</sub>.

TABLE 1  
Setal formulae of the species of *Noodtiella* (Ectinosomidae).

|  | P <sub>2</sub> |         | P <sub>3</sub> |         | P <sub>4</sub> |         |
|--|----------------|---------|----------------|---------|----------------|---------|
|  | Exp.           | End.    | Exp.           | End.    | Exp.           | End.    |
| <i>N. arenoselelloid.es</i><br>(Noodt), 1958 | 1.1.022        | 1.121   | 1.1.022        | 1.121   | 1.1.022        | 1.121   |
| <i>N. problematicum</i><br>(Rouch), 1962     | 0.1.021        | 1.120   | 0.1.021        | 1.121   | 0.1.021        | 1.121   |
| <i>N. lusitanica</i> Wells,<br>1965          | 0.1.021        | 1.221   | 0.1.021        | 1.221   | 0.1.021        | 1.221   |
| <i>N. iscensis</i> (Wells),<br>1965          | 0.1.021        | 1.1.120 | 0.1.021        | 1.1.221 | 0.1.021        | 1.1.221 |
| <i>N. intermedia</i> Wells,<br>1967          | 1.1.022        | 1.1.121 | 1.1.022        | 1.1.121 | 1.1.022        | 1.1.121 |
| <i>Noodtiella enertha</i><br>n.sp.           | 1.1.021        | 2.0.221 | 1.1.021        | 2.0.221 | 1.1.021        | 2.0.221 |

A<sub>1</sub> (Fig. 2i) 6-segmented, and haplocer. Second and terminal segments bear aesthetascs.

P<sub>5</sub> (Fig. 3f) baseopodite confluent with exopodite, with small lateral seta and two equal medial setae. Exopodite with three setae, medial seta long and supple.

P<sub>6</sub> (Fig. 3g) with single long lateral seta. Confluent rami joined by plate with six teeth on distal border.

Etymology: the specific name, *enertha*, refers to the species described here as inhabiting the ground beneath the beach surface (Gr. *enerthe*, in the ground, beneath).

Distribution: *Noodtiella enertha* n. sp. was very abundant in Iron Steamer Pier beach and also present in the Bogue Sound beach slope.

Discussion: no new species have been reported since the recent generic diagnosis (Wells, 1967). *Noodtiella enertha* n.sp. differed from the other members of the genus in the setation and armature of the legs, uniquely including two inner margin spines on the endopodite first segments. The genus is easily recognized by the characteristic prehensile maxilla with a strong one-segmented endopodite about as long as the basis.

#### Family DIOSACCIDAE Sars

Genus *Psammotopa* Pennak, 1942

*Psammotopa vulgaris* Pennak

*Psammotopa vulgaris* Pennak, 1942, 1942a; Chapuis, 1953, 1954; Coull, 1970; Harris, 1972; Masry, 1970; Renaud-Debyser, 1963; Wells, 1963.

Distribution: this species is reported from the eastern and western North Atlantic, as well as the Mediterranean Sea.

All records, with the exception of Coull (1970), are from exposed sandy beaches. The North Carolina specimens were common on Iron Steamer Pier beach and the high-tide level slope of Bogue Sound beach.

Discussion: a comparison of a 1968 collection of 32 *Psammotopa* individuals from Nobska beach (type locality) indicated that the specimens from North Carolina (Fig. 4-5) were similar to the Massachusetts specimens in all morphological details. However, these exhibited several morphological differences when compared with the description

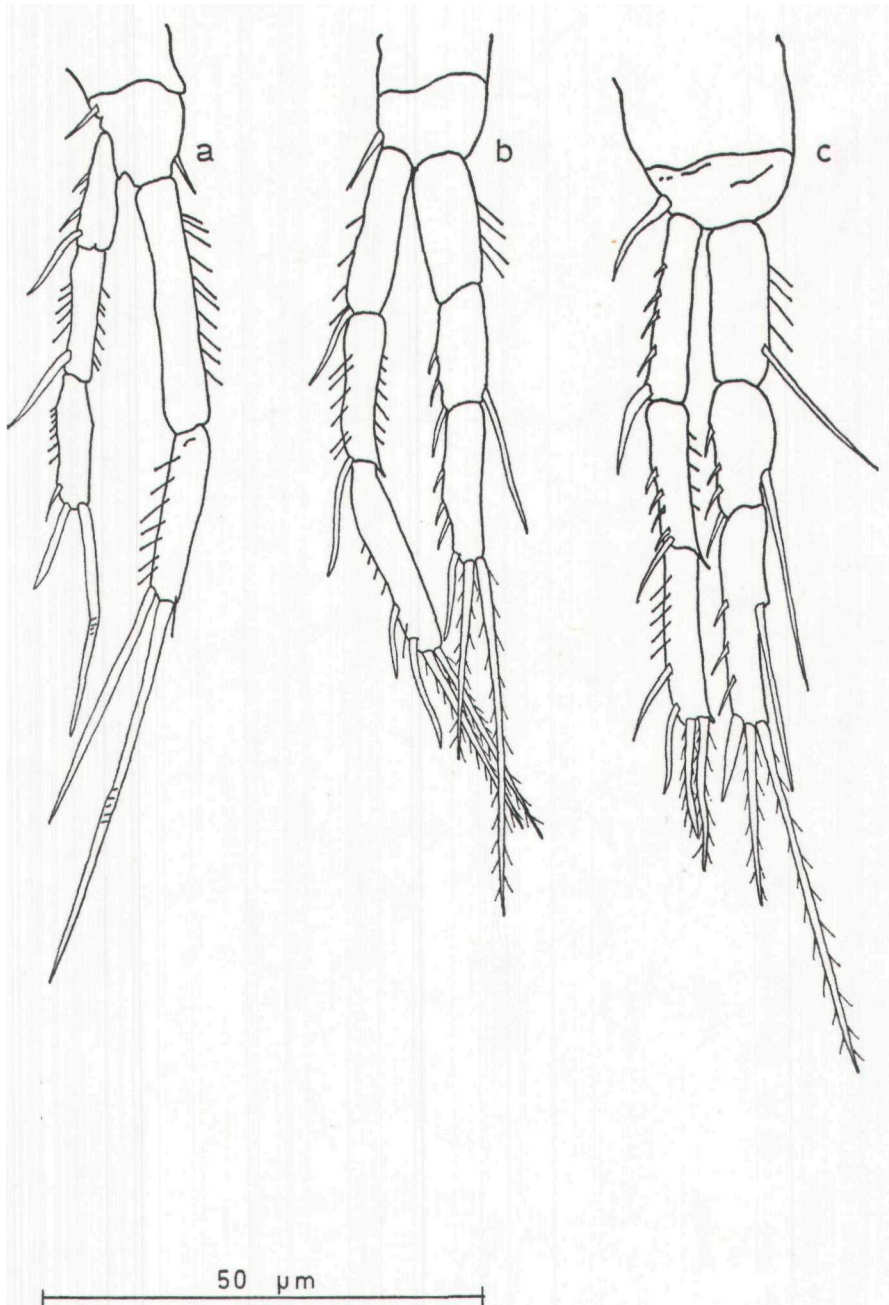


FIG. 4

*Psammotopa vulgaris* Pennak

Female: a-c, P<sub>1</sub>-P<sub>2</sub>.

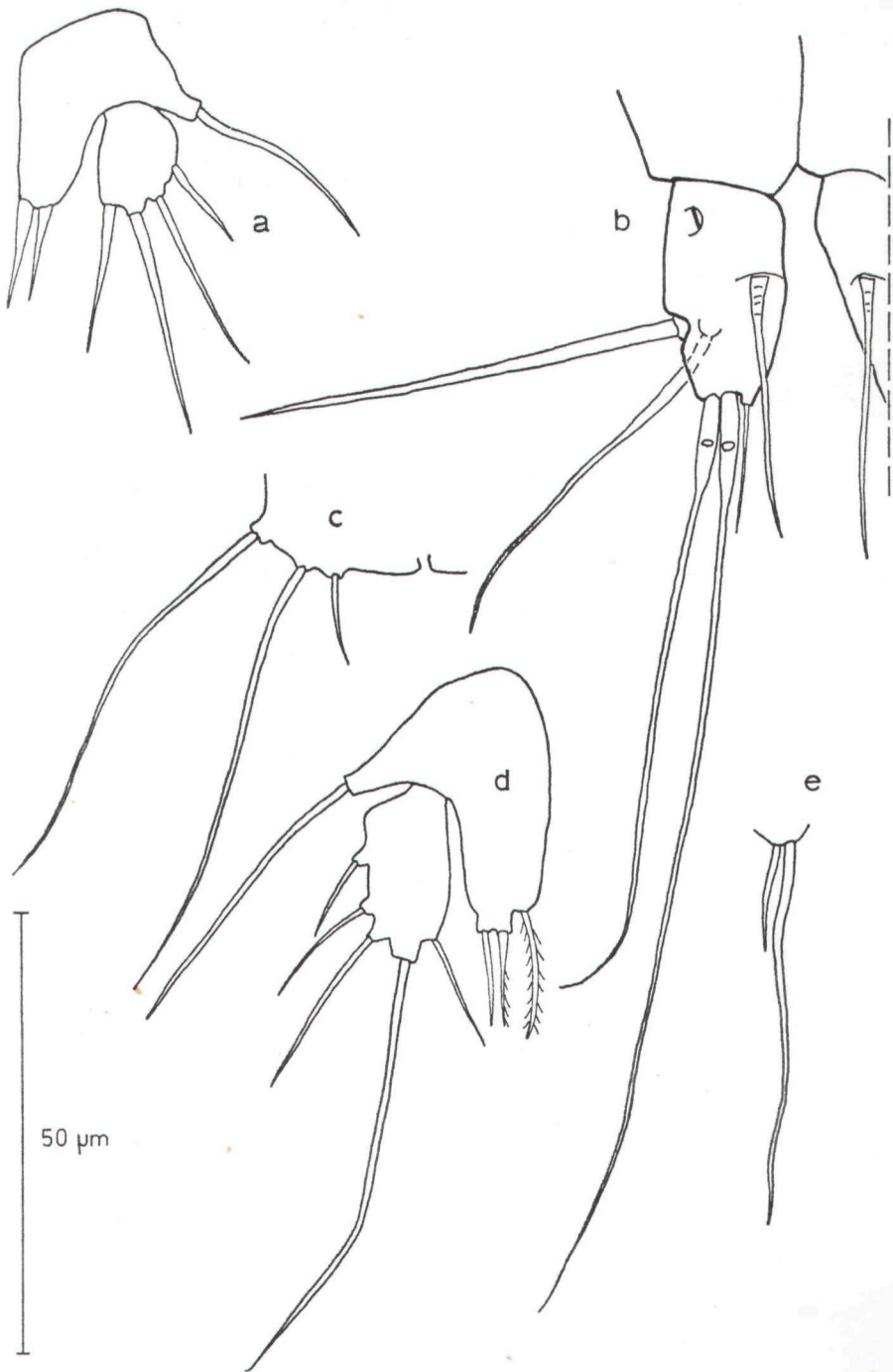


FIG. 5

*Psammotopa vulgaris* Pennak

Female: b, furca; d, P<sub>5</sub>; e, P<sub>6</sub>.

Male: a, P<sub>5</sub>; c, P<sub>6</sub>.



of the Pennak (1942) specimens. The most significant differences were in the swimming legs, and the sexually dimorphic  $P_5$  and  $P_6$ , which are described below.

$P_1$  (Fig. 4a) consisted of two basal joints and two rami. The setation on the exopodite of the present specimens was notably different from Pennak's description of Woods Hole individuals. Pennak (p. 284) reported one straight and one geniculate setae on the tip of each ramus; all the present specimens carried three major setae, two terminal and one on the distal lateral margin.

$P_2$  (Fig. 4b) was distinctly different from that figured by Pennak. The median margins of the exopodite segments were unarmed except for fine spinules on the middle segment. However, a very small distal spike continuous with the median border of the middle segment was present. The North Carolina specimens were thus similar to the other species in the genus in lacking a major spine on the median margin of the middle segment. Also, there was some variation in the  $P_2$  endopodite, with some gravid females in both the North Carolina and the Nobska Beach collections exhibiting two segments rather than three.

$P_3$  (Fig. 4c) was also different from the original description. The last segment of the exopodite had two strong lateral spines in addition to two terminal plumose setae. The median margin was armed with fine spinules on the middle segment, as in  $P_2$  and  $P_4$ .

$P_5$  (Fig. 5d) of the female had an inner expansion of the baseopodite, bearing two terminal setae and one recessed medial seta. The exopodite was fully twice as long as its greatest width and bore five setae along the distal and lateral margins.  $P_5$  (Fig. 5a) of the male strongly resembled Pennak's description of the female appendage. The female of the present specimens had a very reduced  $P_6$  (Fig. 5e); however, the male  $P_6$  (Fig. 5c) was very similar to that figured by Pennak (1942, Plate I, Fig. 20) for the female.

Although the present *Psammotopa* specimens were morphologically different from the description by Pennak, comparison with individuals from the type locality and with specimens prepared by Pennak left no doubt that the North Carolina population was *P. vulgaris*. Geddes (1968) recently placed *Psammotopa* in the Family Diosaccidae, resolving an enigma which had persisted for some time (Lang, 1965).

Family AMEIRIDAE Monard, Lang

Genus *Psy/Jocamptus* T. Scott, 1899

*Psyllocamptus carofinensis* n. sp.

Material: 8 ♀♀, 1 ♂♂. Holotype 1 ♀, U.S.N.M.; paratypes 6 ♀, 6 ♂, U.S.N.M.

**Description:**

**Female (Fig. 6-8).** Length, 0.72 mm, fixed in 4 p. 100 formaldehyde. Body slender and vermiform, about six times as long as

wide. Cephalothorax, excluding rostrum, equal in length to next three somites combined. Rostrum (Fig. 6d) triangular in ventral view. Genital double-somite undivided. Furcal rami (Fig. 6a) slightly longer

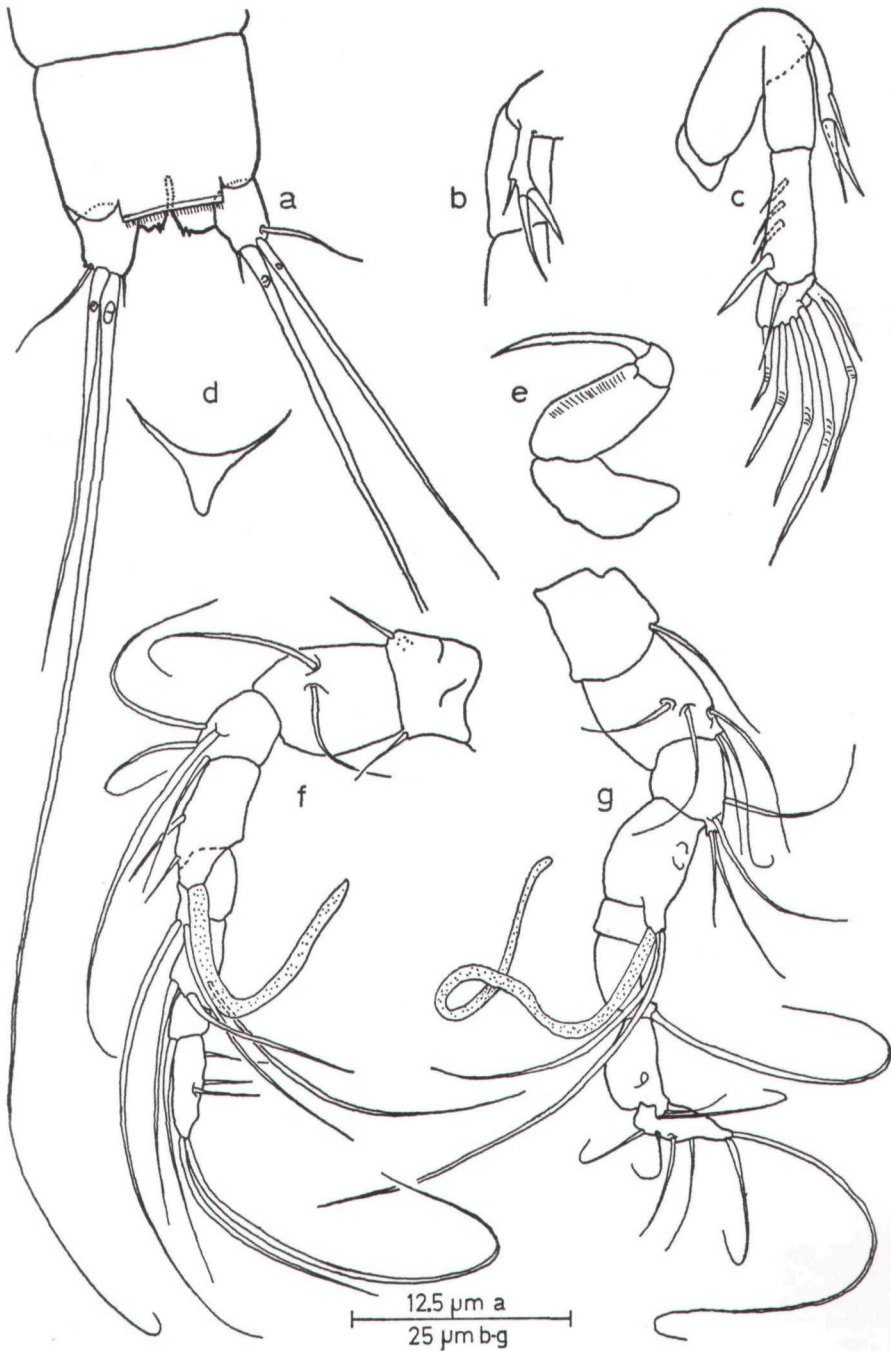


FIG. 6

*Psyllocamptus carolinensis* n. sp.

Female: a, furca; b, A<sub>3</sub> exopodite; c, A<sub>2</sub>; d, rostrum; e, Mxp; f, A<sub>1</sub>.  
 Male: g, A<sub>1</sub>.

than wide; each terminating in two strong setae, medial seta three times as long as more lateral terminal-seta; one lateral and one medial dwarfed seta.

A1 (Fig. 6f) 8-segmented. Second segment twice length of first; fourth segment with aethetasc.

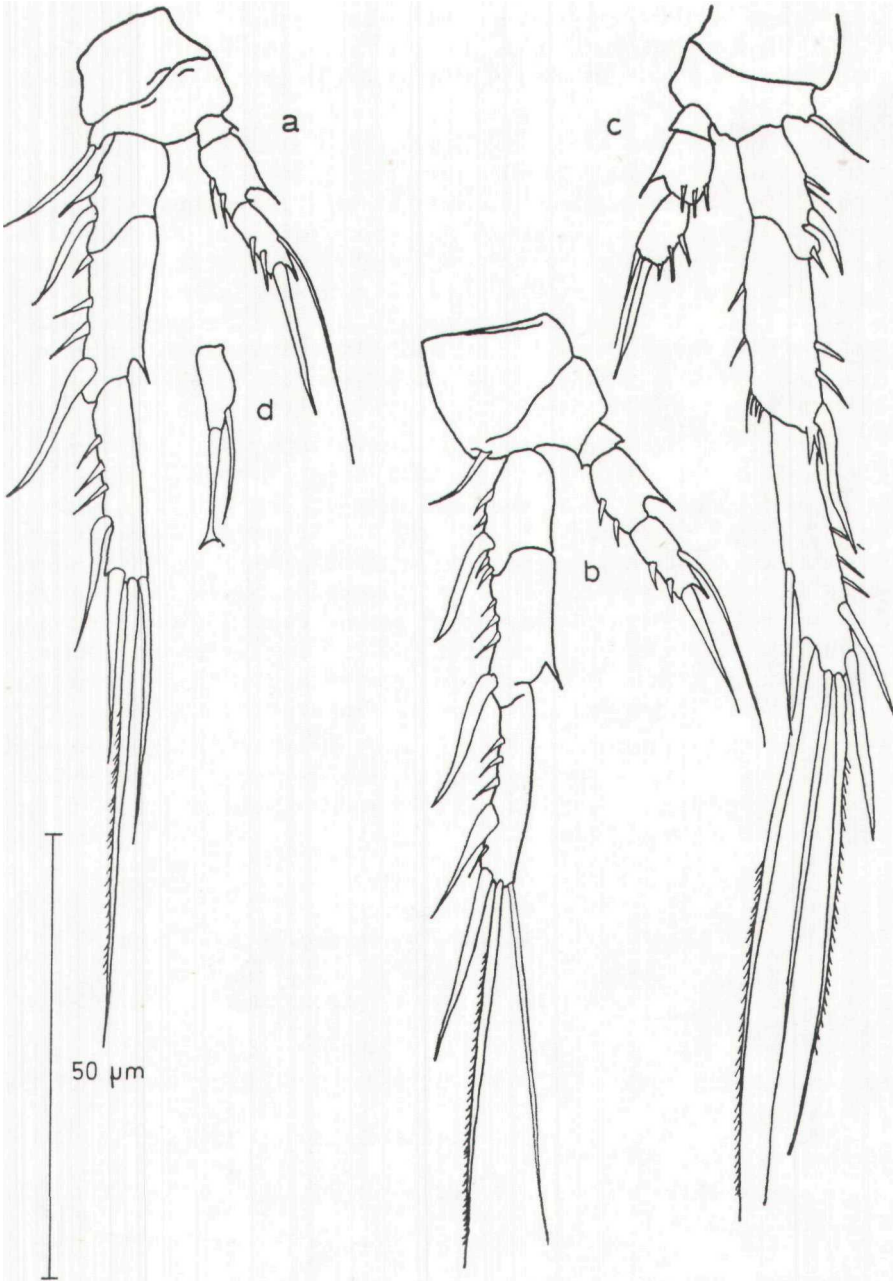


FIG. 7

*Psyllocamptus carolinensis* n. sp.

Female: a, P<sub>1</sub>; b, P<sub>2</sub>; c, P<sub>4</sub>.

Male: d, P<sub>6</sub> endopodite.

A<sub>2</sub> (Fig. 6b-c) 4-segmented. Coxa small and bare. Basis subequal to first endopodite-segment length, apparently bare. Terminal endopodite-segment half again as long as first endopodite-segment, most ventral seta divided into two branches near base, total of five geniculate setae. Exopodite single segment furnished with two terminal and one subterminal setae.

Mxp (Fig. 6e) prehensile. Basis about equal in length to first endopodite segment, bare. First endopodite segment with fine hirsute fringe next to inner margin; second segment bare except for strong curved claw.

P<sub>1</sub> (Fig. 8a) coxa bare. Basis with large medial and simple lateral spines; minute rows of spinules proximal to medial spine, exopodite and endopodite first segments. Exopodite of three segments, terminal segment half again as long as either more proximal segments; first and second segments furnished with lateral spine distal to two spinules, lateral margins bare; terminal segment with two lateral spines, two subapical setae and one apical spine. Endopodite 2-segmented, outer margins with many spinules; first endopodite segment with long seta from half length of inner margin, terminal segment with one geniculate and one simple apical setae.

P<sub>2</sub> and P<sub>3</sub> (Fig. 7b-a) coxae bare. Basis with simple lateral spine. Exopodite 3-segmented; inner margins bare. Second segment half again as long as length of first, and terminal segment half again as long as length of second segment. First and second segments with larger distal spine on outer margin, terminal segment with one lateral seta, one subapical lateral seta and two apical setae. Endopodites 3-segmented, extending to middle of second exopodite-segment; first endopodite bare and short, middle and terminal segments subequal in length; medial margins bare, outer margin setose; terminal segment armed with strong apical spine and long inner margin seta.

P<sub>4</sub> (Fig. 7c) similar to P<sub>2</sub> and P<sub>3</sub> with exceptions of inner margin spinules on middle exopodite segment and presence of two medial, two apical and two lateral setae on terminal exopodite-segment. Spine and setal formula in Table 2.

TABLE 2  
Setal formulae of the species of *Psyllocamptus* (Ameiridae).

|  | P <sub>2</sub> |         | P <sub>3</sub> |         | P <sub>4</sub> |         |
|--|----------------|---------|----------------|---------|----------------|---------|
|  | Exp.           | End.    | Exp.           | End.    | Exp.           | End.    |
| <i>Ps. propinquus</i><br>(T. Scott), 1895            | 0.0.023        | 0.0.120 | 0.0.023        | 0.0.120 | 0.0.223        | 0.0.120 |
| <i>Ps. minutus</i> Sars, 1911                        | 0.0.023        | 0.0.120 | 0.0.023        | 0.0.120 | 0.0.223        | 0.0.120 |
| <i>Ps. bermudae</i> Willey,<br>1930                  | 0.0.023        | 0.0.120 | 0.0.023        | 0.0.120 | 0.0.223        | 0.0.120 |
| <i>Ps. monachus</i><br>Chappuis, 1938                | 0.0.023        | 0.0.110 | 0.0.022        | 0.0.120 | 0.0.223        | 0.0.120 |
| <i>Ps. triarticulatus</i> Lang,<br>1965              | 0.0.023        | 0.0.210 | 0.0.023        | 0.0.210 | 0.0.223        | 0.0.210 |
| <i>Ps. quinquispinosus</i><br>Coull, 1970            | 0.0.023        | 0.0.210 | 0.0.023        | 0.0.210 | 0.0.223        | 0.0.210 |
| <i>Psyllocamptus caroli-</i><br><i>nensis</i> n. sp. | 0.0.022        | 0.0.110 | 0.0.022        | 0.0.110 | 0.0.222        | 0.0.110 |

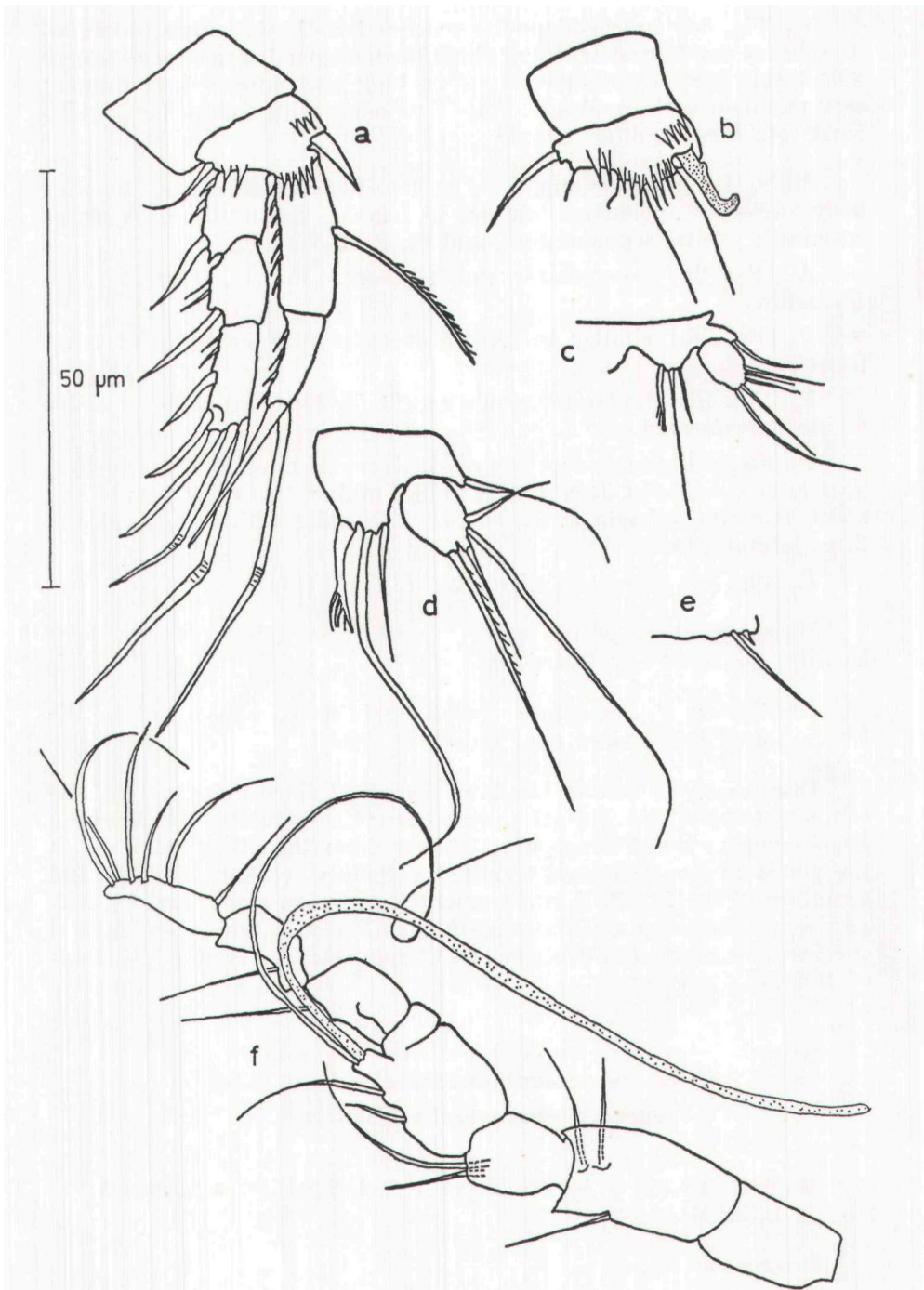


FIG. 8

*Psyllocamptus carolinensis* n. sp.

female: a, P<sub>1</sub>; d, P<sub>5</sub>.

Male: b, P<sub>1</sub> basis; c, P<sub>5</sub>; e, P<sub>6</sub>.

*Pseudoleptomesochrella bisetosa* n. sp.

Male: f, A<sub>1</sub>.

P<sub>5</sub> (Fig. 8d) baseoendopodite reaches two-thirds length of exopodite, bears one lateral seta and three medial apical setae, most lateral apical seta simple, middle seta very long and supple, inner apical seta modified with comb-like tip. Exopodite with four setae; innermost seta hirsute, other simple.

*Male.* Length, 0.58 mm, fixed in 4 p. 100 formaldehyde. Smaller body and most appendages similar to female. Sexual dimorphism in antennule genital segmentation, and P<sub>1</sub>, P<sub>3</sub>, P<sub>5</sub> and P<sub>6</sub>.

A<sub>1</sub> (Fig. 6g) 8-segmenter and haplocer. Fourth segment bears aesthetasc.

P<sub>1</sub> (Fig. 8b) similar to female except for inner spine of basis transformed.

P<sub>3</sub> (Fig. 7d) similar to female except for terminal spine of endopodite transformed.

P<sub>5</sub> (Fig. 8c) baseoendopodite reaches one-third length of exopodite; bear lateral seta and three medial setae; middle two setae simple and short, most medial seta as in female. Exopodite with two apical and three lateral setae.

P<sub>6</sub> (Fig. 8e) furnished with simple lateral seta.

Etymology: the specific name, *carolinensis*, alludes to the type locality, the Nord Carolina coast.

Distribution: *Psyllocamptus carolinensis* n. sp. was found in the Bogue Sound beach slope near mean sea level.

Discussion: one species has been described since the review of the genus by Lang (1965), *Ps. quinquiespinosus* Coull (1970) from Jamaica. *Psyllocamptus carolinensis* n. sp. differs from the other members of the genus in the decreased terminal segments setation of P<sub>2</sub>-P<sub>4</sub> and armature of the P<sub>5</sub>. P<sub>1</sub> is two-segmented as in *Ps. monachus*, *Ps. bermudae*, *Ps. minutus* and *Ps. propinquus*. Perhaps, the closest related species is *Ps. monachus* described by Chappuis (1938) from adult males of Italy.

#### Genus *Pseudoleptomesochrella* Lang, 1965

##### *Pseudoleptomesochrella bisetosa* n. sp.

**Material:** 12 ♀♀, 8 ♂♂. Holotype 1 ♀, U.S.N.M. ; paratypes 6 ♀♀ 6 ♂♂, U.S.N.M.

#### **Description:**

*Female* (Fig. 9-10). Length, 0.43 mm, fixed in 4 p. 100 formaldehyde. Body slender and vermiform, about six times as long as wide. Cephalothorax, excluding rostrum, equal in length to next two somites combined. Rostrum not defined. Genital double-somite undivided. Furcal rami (Fig. 9a) long as proximal width, slight distal taper; each terminating in two strong setae, medial seta twice as long as more

lateral terminal-seta; one dorsal, one lateral, and one smaller medial setae.

A<sub>1</sub> (Fig. 9b) 8-segmented. First and third segments subequal in length, second segment half again as long; fourth segment with aesthetasc and very long supple seta.

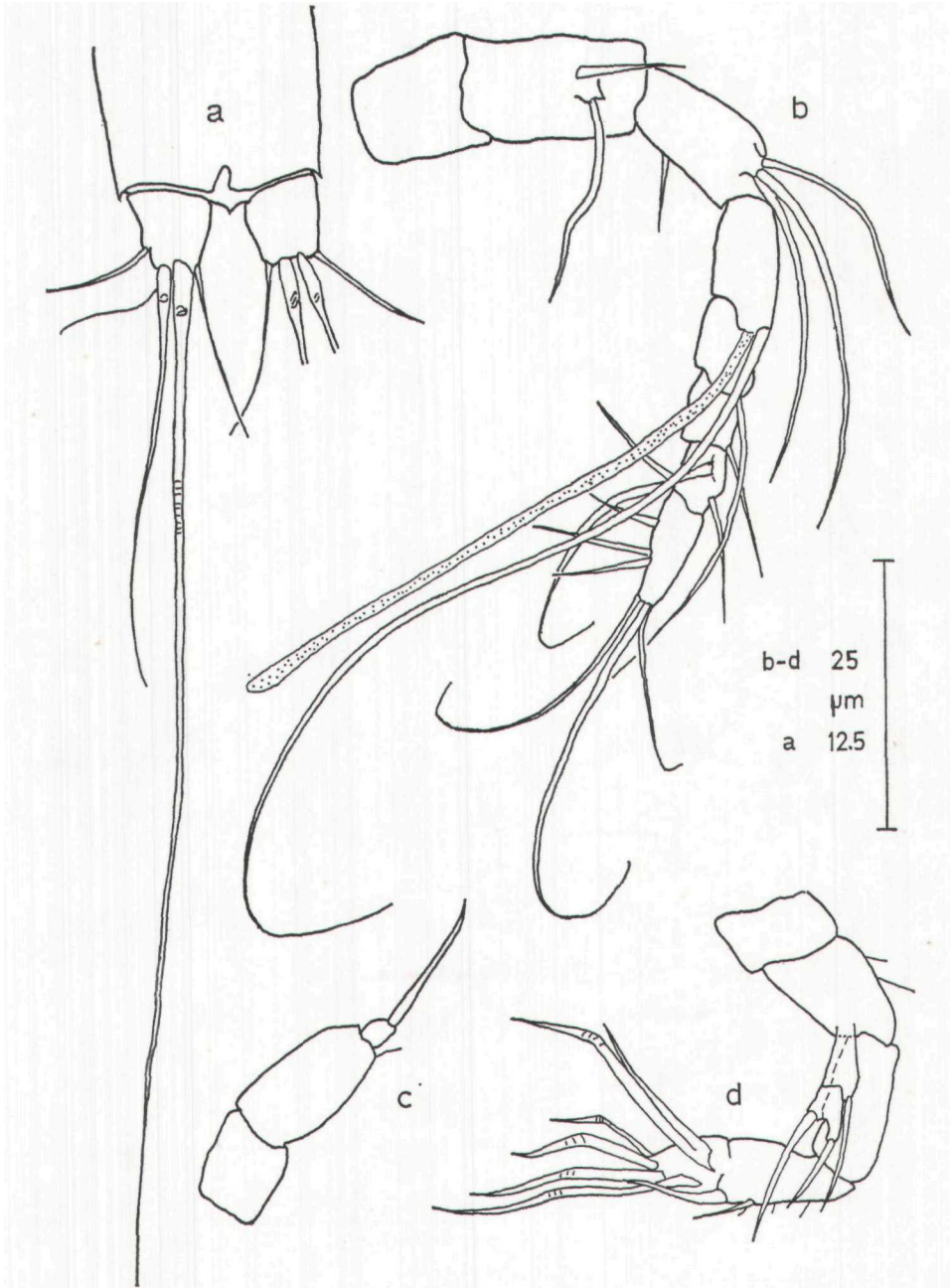


FIG. 9

*Pseudoleptomesochrella bisetosa* n. sp.

Female: a, furca; b, A<sub>1</sub>; c, Mxp; d, A<sub>2</sub>.

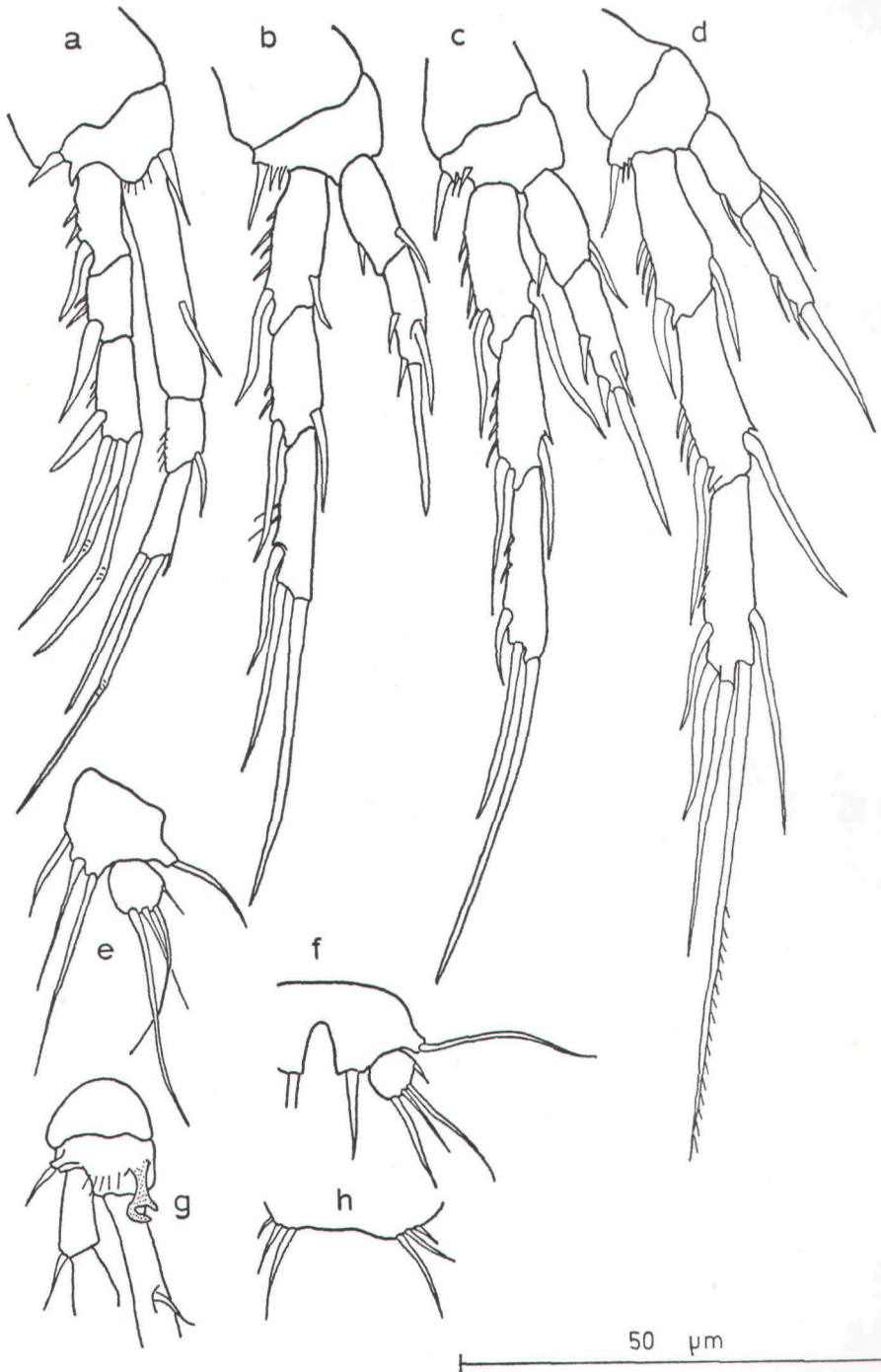


FIG. 10

*Pseudoleptomesochrella bisetosa* n. sp.Female: a-e, P<sub>1</sub>-P<sub>6</sub>.Male: f, P<sub>6</sub>; g, P<sub>1</sub> basis; h, P<sub>6</sub>.



A<sub>2</sub> (Fig. 9d) 4-segmented. Coxa small and bare. Basis slightly smaller than first endopodite segment, two hairs on anterior edge. Terminal endopodite-segment half again as long as first endopodite-segment, most ventral seta divided into two branches near base, total of five geniculate setae. Exopodite 2-segmented; first segment twice length of second and furnished with one simple seta on distal end, terminal segment with two simple setae on separate bases.

Mxp (Fig. 9c) prehensile. Basis half length of first endopodite segment, bare. Outer margin of first endopodite segment with single hair-like seta on distal end; second segment bare except for strong curved claw.

P<sub>1</sub> (Fig. 10a) coxa bare. Basis with large medial and lateral spines, minute row of spinules on distal border above endopodite. Exopodite of three equal length segments; first and second segments with lateral spine distal to two spinules, lateral margins bare; terminal segment with two lateral spines and two apical geniculate setae. Endopodite 3-segmented; first segment three times length of second segment, terminal segment slightly longer than middle segment. First endopodite segment bare except for medial spine two-thirds distal of segment length. Second segment with lateral distal spines and four medial spinules. Terminal segment with two apical setae. Most lateral seta geniculate.

P<sub>2</sub>-P<sub>4</sub> (Fig. 10b-d) coxae bare. Basis with lateral spine proximal to two small spinules. Exopodite 3-segmented; lateral margins spinose; first two segments subequal and with lateral and medial distal spines; terminal segment with two outer margin setae and one apical seta; P<sub>4</sub> with two inner margin setae on terminal segment. Endopodites 2-segmented; first segment bare except for one lateral and one medial distal setae; second segment with two outer margin setae and large apical seta; P<sub>2</sub> and P<sub>3</sub> with inner margin seta, absent in P<sub>4</sub>. Spine and seta formula in Table 3.

TABLE 3  
Setal formulae of the species of *Pseudoleptomesochrella* (Ameiridae).

|   | P <sub>2</sub> |       | P <sub>3</sub> |       | P <sub>4</sub> |       |
|---|----------------|-------|----------------|-------|----------------|-------|
|   | Exp.           | End.  | Exp.           | End.  | Exp.           | End.  |
| <i>Ps. halophila</i> (Noodt),<br>1952                   | 1.1.013        | 1.110 | 1.1.012        | 1.110 | 1.1.212        | 1.110 |
| <i>Ps. marina</i> (Chappuis<br>et Rouch), 1961          | 1.1.021        | 0.010 | 1.1.021        | 0.010 | 1.1.212        | 1.010 |
| <i>Ps. br.evifurca</i> (Wells),<br>1961                 | 1.1.013        | 1.110 | 1.1.012        | 1.110 | 1.1.212        | 1.110 |
| <i>Ps. pontica</i> Apostolov,<br>1969                   | 1.1.022        | 1.110 | 1.1.012        | 1.110 | 1.1.122        | 1.110 |
| <i>Pseudoleptomesochrella</i><br><i>bisetosa</i> n. sp. | 1.1.012        | 1.110 | 1.1.012        | 1.112 | 1.1.212        | 1.012 |

P<sub>5</sub> (Fig. 10e) baseoendopodite reaches half of exopodite, with one lateral and three medial setae. Exopodite with three apical setae and small lateral seta.

*Male.* Length, 0.36 mm, fixed in 4 p. 100 formaldehyde. Smaller body and most appendages similar to female. Sexual dimorphism in antennule, genital segmentation, and P<sub>1</sub>, P<sub>5</sub> and P<sub>6</sub>.

A<sub>1</sub> (Fig. 8f) 8-segmented and haplocer. Fourth segment with aesthetasc.

P<sub>1</sub> (Fig. 10g) similar to female except for inner spine of basis transformed. P<sub>1</sub>-P<sub>4</sub> otherwise as in female.

P<sub>5</sub> (Fig. 10f) baseoendopodite reaches one-third of exopodite, with one lateral and one medial setae. Exopodite wide as long, with three distal setae and one lateral seta.

P<sub>6</sub> (Fig. 10h) with three bare setae increasing medially in length.

**Etymology:** the specific name, *bisetosa*, alludes to the unique terminal segment of P<sub>2</sub>-P<sub>4</sub> with two outer setae.

**Distribution:** *Pseudoleptomesochrella bisetosa* n. sp. was relatively common on the high-tide slope of Bogue Sound beach but a single individual was also found on Iron Steamer Pier beach.

**Discussion:** one species, *Ps. pontica* Apostolov (1969), has been described since the recent description of the genus by Lang (1965). *Pseudoleptomesochrella bisetosa* n. sp. differs from the other members of the genus in the endopodite armature of P<sub>1</sub>-P<sub>4</sub> and in the setation of P<sub>5</sub>. Exopodite armatures and P<sub>5</sub> are most similar to *Ps. marina* described from two male specimens by Chappuis and Rouch (1961).

#### Genus *Interleptomesochra* Lang, 1965

##### *Interleptomesochra boguensch* n. sp.

Material: 7 ♀♀, 10 ♂♂. Holotype 1 ♀, U.S.N.M. ; paratypes 6 ♀♀ 6 ♂♂, U.S.N.M.

##### Description:

*Female* (Fig. 11-12). Length, 0.40mm, fixed in 4 p. 100 formaldehyde. Body slender and vermiform, about eight times as long as wide. Cephalothorax excluding rostrum, equal in length to next two somites combined. Rostrum short, wide as long, and rounded on distal end. Genital double-somite undivided. Furcal rami wide as long; each terminating in two strong setae, medial seta twice as long as more lateral hirsute terminal seta. Anal operculum quadrangular in dorsal view, less than half length of telson.

A<sub>1</sub> (Fig. 11c) 8-segmented. Segments one to three subequal in length, remaining segments shorter; fourth segment with aesthetasc.

A<sub>2</sub> (Fig. 11a) 4-segmented. Coxa small and bare. Basis equal in length to endopodite segments; single hair on anterior edge. Terminal segment of endopodite with seven setae, most ventral seta two parts near base. Exopodite two-segmented; first segment five times as long as second and with one hirsute seta near distal end, terminal segment with two simple setae.

Mxp (Fig. 11b) prehensile. Basis with fine spinules ventrally. Outer margin of first endopodite segment with single hair-like seta fourfifths of length toward distal end; second segment bare, with strong claw.

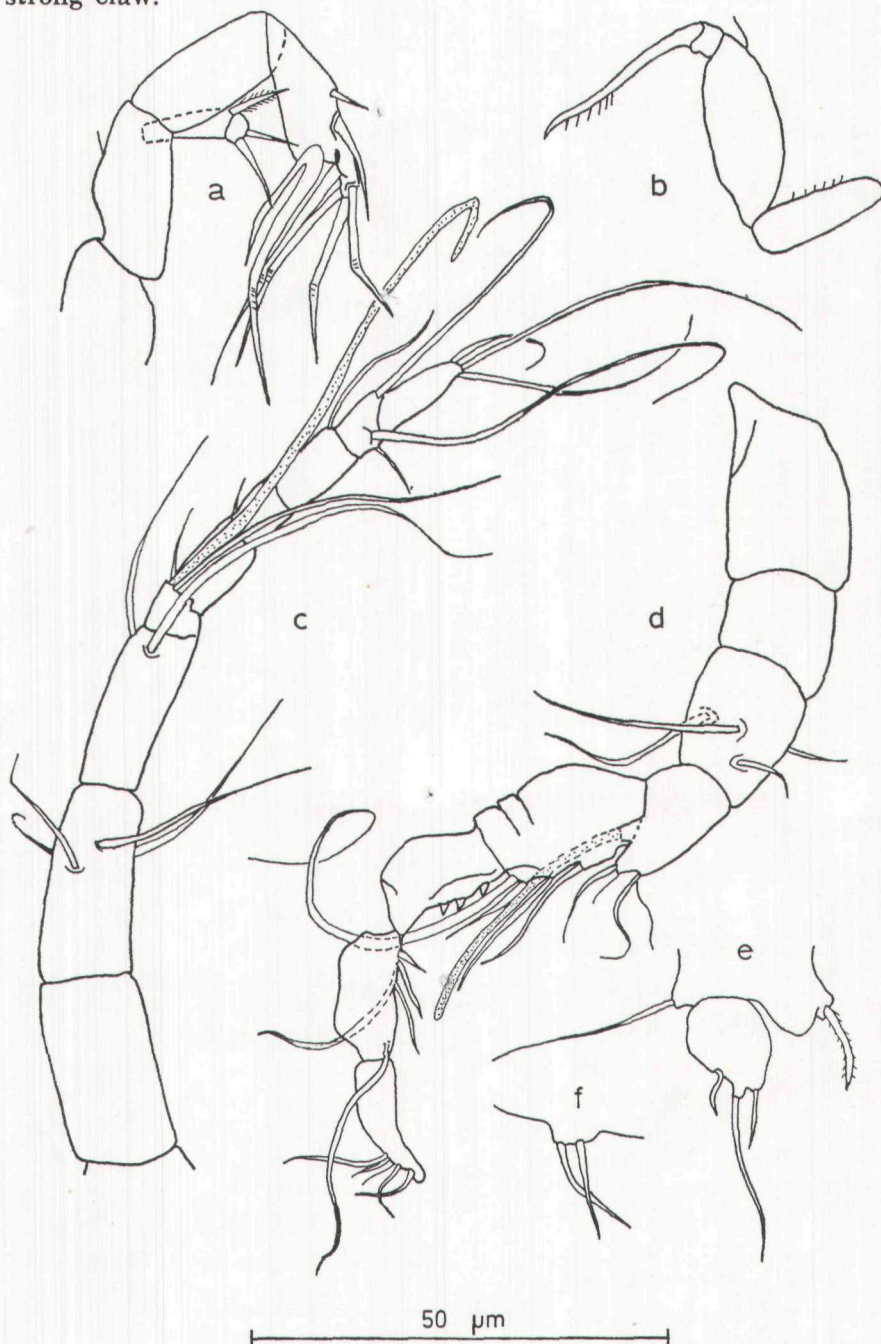


FIG. 11

*Interleptomesochra boguensis* n. sp.

Female: a, A<sub>2</sub>; b, Mxp; c, A<sub>1</sub>.  
Male: d, A<sub>1</sub>; e, P<sub>5</sub>; f, P<sub>6</sub>.

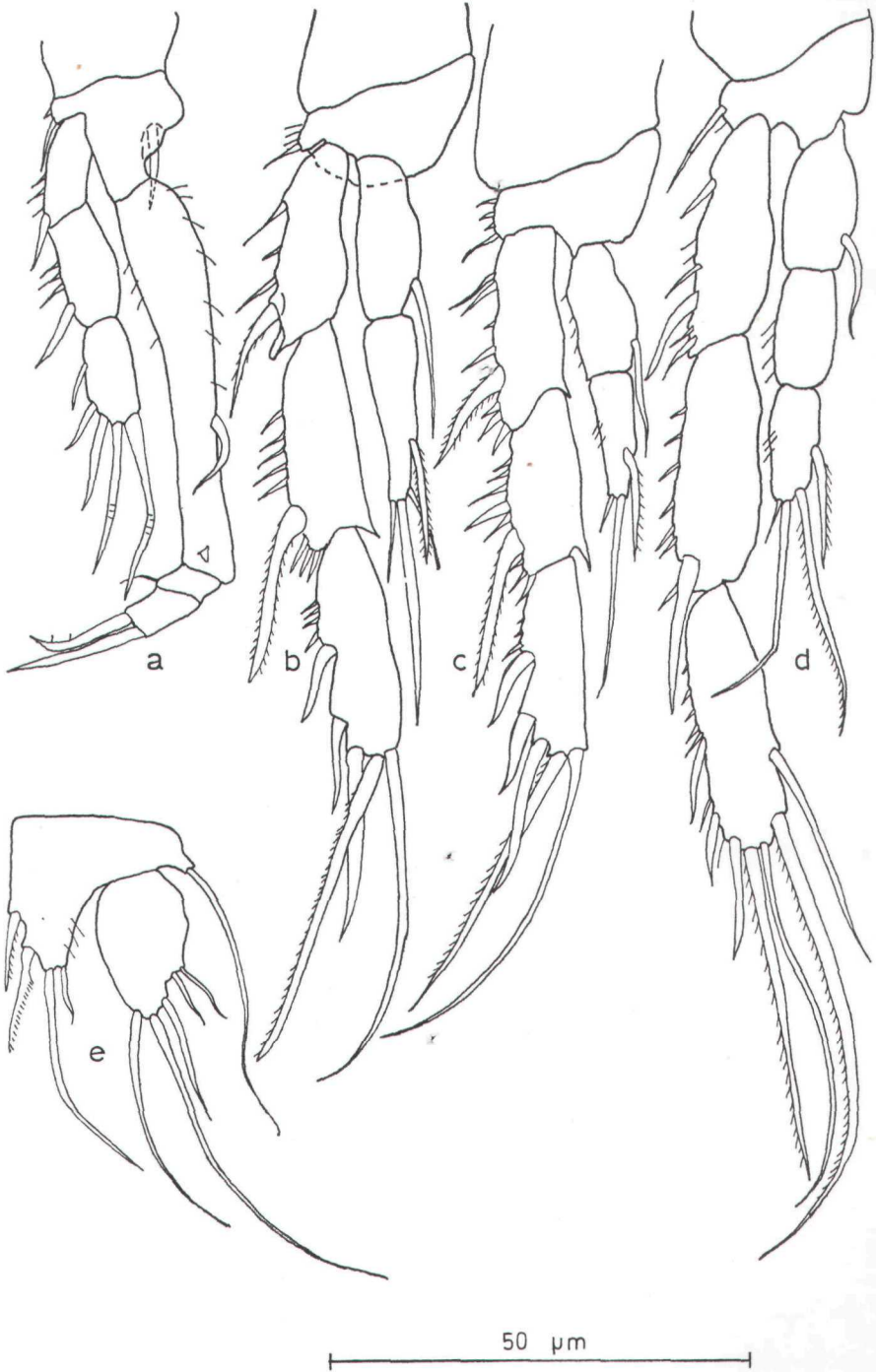


FIG. 12

*Interleptomesochra boguensis* n. sp.Female: a, P<sub>1</sub>; b, P<sub>3</sub>; c, P<sub>2</sub>; d, P<sub>4</sub>; e, P<sub>5</sub>.

P<sub>1</sub> (Fig. 12a) coxa bare. Basis with large robust medial spine, minute outer spinules, and outer seta from half length of first exopodite segment. Exopodite of three equal length segments; first and second segments with lateral spine distal to several spinules; terminal segment with two distal geniculate setae and three more lateral setae. Endopodite 3-segmented; first segment more than four times length of other two segments combined; middle segment two-thirds length of terminal segment. First endopodite segment with hair-like spinules on both longitudinal borders, outward curved spine two-thirds of length on medial border. Second segment bare except for small spine on lateral border, terminal segment with two spiniform apical setae.

P<sub>2</sub>-P<sub>4</sub> (Fig. 12b-d) coxae bare. Basis with several diminutive outer spinules and small outer seta. Three exopodite segments about equal length, spinulose along lateral border, first and second segments with lateral distal spine; all terminal segments with two apical and three outer spines. Endopodites two-, two-, and three segmented, respectively, extending to distal one-third of second exopodite-segment. Seta and spine formula in Table 4.

TABLE 4  
Setal formulae of the species of *Interleptomesochra* (Ameiridae).

|  | P <sub>2</sub> |       | P <sub>3</sub> |       | P <sub>4</sub> |         |
|--|----------------|-------|----------------|-------|----------------|---------|
|  | Exp.           | End.  | Exp.           | End.  | Exp.           | End.    |
| <i>I. attenuata</i> (A. Scott),<br>1896              | 0.1.023        | 0.120 | 0.1.023        | 0.120 | 0.1.222        | 0.1.020 |
| <i>I. tenuicornis</i> (Sars),<br>1911                | 0.0.023        | 1.020 | 0.0.023        | 1.120 | 0.0.223        | 1.0.220 |
| <i>I. eulittoralis</i> (Noodt),<br>1952              | 0.0.023        | 1.020 | 0.0.023        | 1.020 | 0.0.223        | 1.0.210 |
| <i>I. elongata</i> (Bozic),<br>1955                  | 0.0.023        | 1.020 | 0.0.023        | 1.120 | 0.0.223        | 1.0.220 |
| <i>I. reducta</i> Lang, 1965                         | 0.0.023        | 0.010 | 0.0.023        | 0.020 | 0.0.123        | 0.0.020 |
| <i>I. noodti</i> Galhano, 1968                       | 0.0.023        | 1.111 | 0.0.023        | 1.121 | 0.0.223        | 1.0.121 |
| <i>Interleptomesochra</i><br><i>boguensis</i> n. sp. | 0.0.023        | 1.120 | 0.0.023        | 1.120 | 0.0.223        | 1.0.120 |

P<sub>5</sub> (Fig. 12e) baseoendopodite reaching slightly distal to middle of exopodite, bearing five setae; two medial setae spinulose, most apical and lateral setae very long. Triangular exopodite length less than twice width; two apical and three lateral setae.

*Male.* Length, 0.35 mm, fixed in 4 p. 100 formaldehyde. Smaller body and most appendages similar to female. Sexual dimorphism in antennule, genital segmentation, and P<sub>5</sub> and P<sub>6</sub>.

A<sub>1</sub> (Fig. 11d) eight-segmented and haplocer. Fourth segment with aesthetasc.

P<sub>5</sub> (Fig. 11e) baseoendopodite reaches half of exopodite, with one lateral and one medial setae. Exopodite half again as long as wide, with three setae.

P<sub>6</sub> (Fig. 11f) small, wider than long, two setae.

**Etymology :** the specific name, *boguensis*, alludes to the type locality, the Bogue Sound estuary.

**Distribution :** *Interleptomesochra boguensis* n. sp. was present at all stations on Bogue Sound beach but most common between mean sea level and mean low tide level.

**Discussion :** the species, *I. noodti* Galhano (1968), has been described since the recent description of the genus by Lang (1965). *Interleptomesochra boguensis* n. sp. differs from the other members of the genus in the combined endopodite armature of P<sub>1</sub>-P<sub>4</sub> and in the setation of P<sub>5</sub>.

Family **CYLINDROPSYLLIDAE** Sars, Lang

Genus *Leptastacus* T. Scott, 1906

*Leptastacus jenniferi* n. sp.

**Material:** 10 ♀♀, 10 ♂♂. Holotype 1 ♀, U.S.N.M. ; paratypes 6 ♀♀, 6 ♂♂, U.S.N.M.

**Description :**

*Female* (Figs. 13-15). Length, 0.30 mm, fixed in 4 p. 100 formaldehyde. Body cylindrical, slender and vermiform. Cephalothorax, excluding rostrum, half again as large as succeeding somite. Rostrum large, bare, narrow, rounded at tip. Genital double-somite subdivided ventrally. Furcal rami (Fig. 13a, g) slightly divergent, more than twice as long as greatest width, tapering to sharp upward-hooked spine; dorsal surface with seta arising from middle one-fifth from posterior; ventral surface bare; median surface with two setae arising one-sixth of length from posterior, one twice as long as other and one-third length of dorsal seta; lateral surface with single distal seta, half again as long as dorsal seta; strong proximal seta arising from base of furcal spine, divided into strong and weak parts near base. Anal operculum with four equal spinules on each side of medial division.

A<sub>1</sub> (Fig. 13b) 7-segmented. Second segment longest, about twice as long as third segment; fourth segment with aesthetasc; terminal segment similar in length to third segment and equal in length to preceding two segments combined.

A<sub>2</sub> (Fig. 13e) 3-segmented. Coxa small and bare. Exopodite minute single segment with two short simple setae. Endopodite short with six setae, most proximal seta irregular and robust, furnished with spinules near middle of length.

Md (Fig. 13f) praecoxa dentate. Exopodite 2-segmented with two terminal setae.

Mx<sub>1</sub> (Fig. 13c) praecoxa and coxa well armed. Basis with apparently three terminal setae plus two setae slightly more proximal.

Mx (Fig. 13d) syncoxa with three endites, most distal endite with strong claw. Basis with strong claw twice as large as on preceding endite. Endopodite furnished with three terminal setae.

Mxp (Fig. 14e) basis bare. Outer edge of first endopodite segment hirsute; second segment bare, armed with claw and seta characteristic of genus.

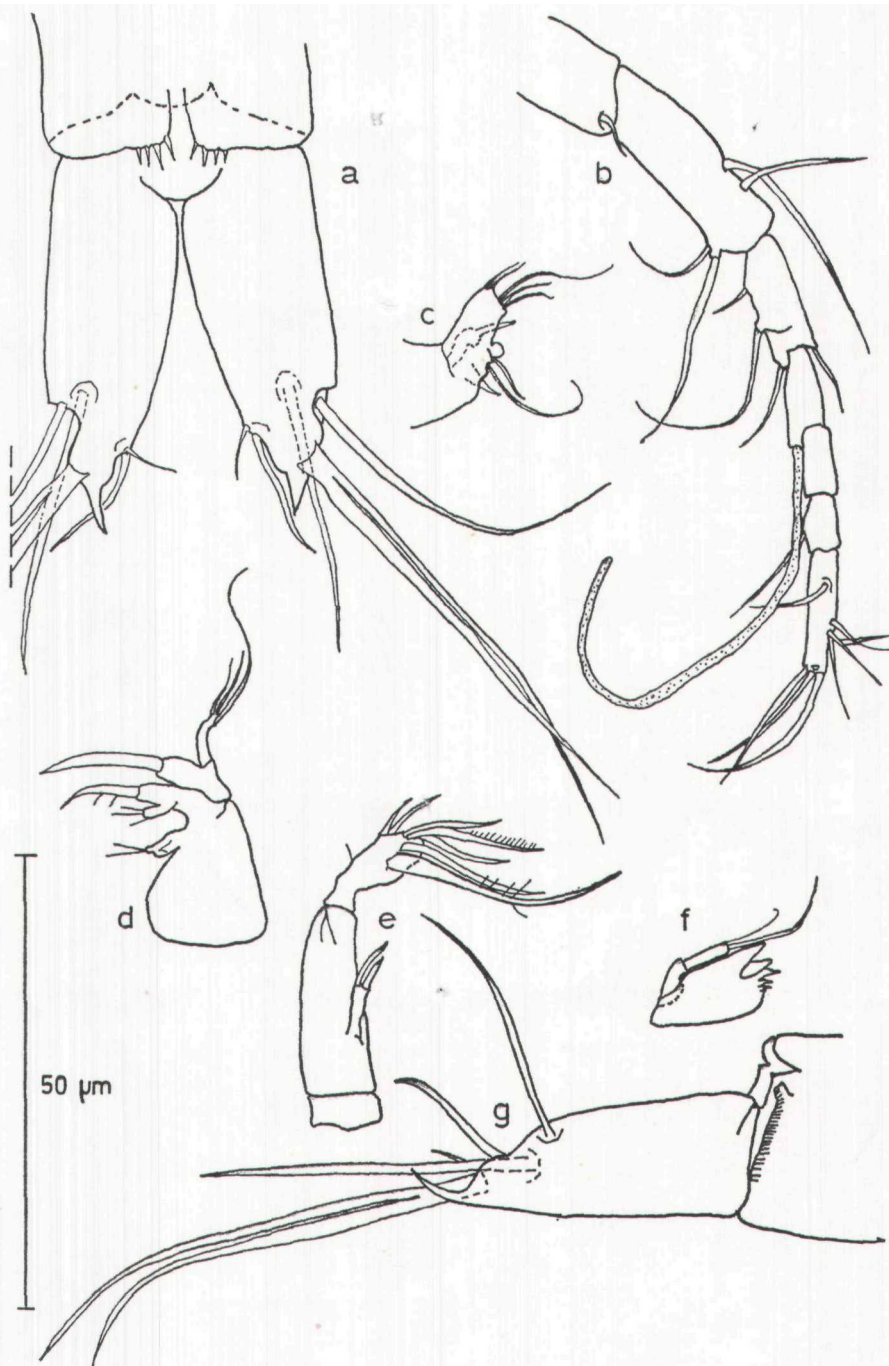


FIG. 13

*Leptastacus jeneri* n. sp.

Female: a, furca; b, A<sub>1</sub>; c, Mx<sub>1</sub>; d, Mx; e, A<sub>2</sub>; f, Md; g, furca.

P<sub>1</sub> (Fig. 14a) coxa bare. Basis with small outer seta. Three exopodite segments about equal in length, hirsute along lateral border, first and second segments with lateral distal spine; terminal segment

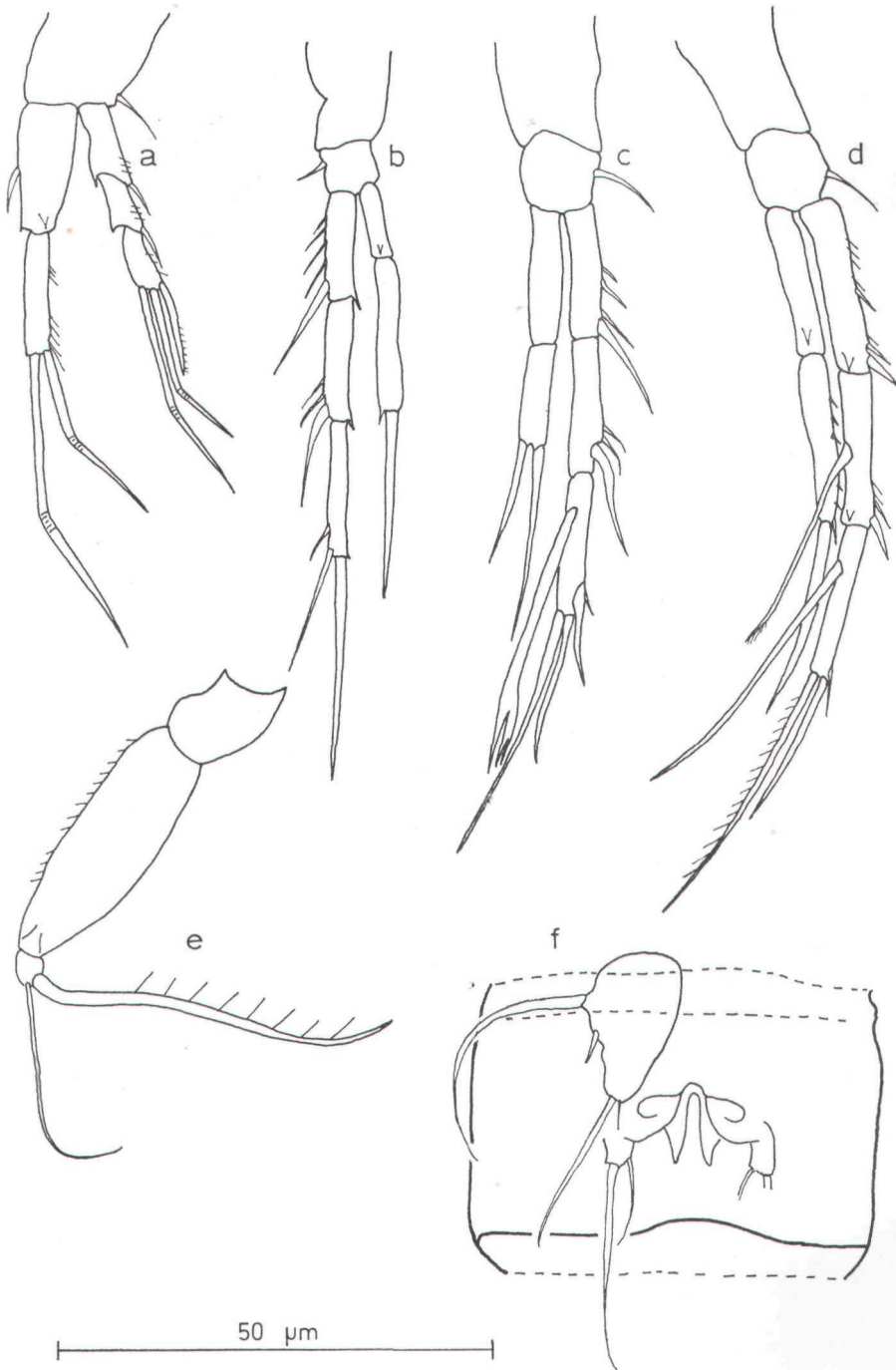


FIG. 14

*Leptastacus jenneri* n. sp.

Female: a-d, P<sub>1</sub>-P<sub>4</sub>; e, Mxp; f, P<sub>5</sub> and P<sub>6</sub>, genital segment.



with two distal geniculate setae and one more lateral spine. Combined exopodite segments extend to middle of terminal endopodite segment. First endopodite segment bare except for medial seta half of length from basis. Second endopodite segment furnished with two long geniculate terminal setae and spinules along lateral border.

P<sub>2</sub>-P<sub>4</sub> (Fig. 14b-d) coxae bare. Basis with distinct outer seta. Exopodite segments several times longer than wide; combined length increases posteriorly; spinulose along lateral margins. Endopodites two-segmented, extending about to end of second exopodite-segment. Seta and spine formula in Table 5.

TABLE 5  
Setal formulae of the species of *Leptastacus* (Cylindropsyllidae).

|   | P <sub>2</sub> |       | P <sub>3</sub> |       | P <sub>4</sub> |       |
|---|----------------|-------|----------------|-------|----------------|-------|
|   | Exp.           | End.  | Exp.           | End.  | Exp.           | End.  |
| <i>L. macronyx</i> (T. Scott),<br>1892                              | 0.0.021        | 1.010 | 0.0.121        | 1.010 | 0.1.221        | 0.010 |
| <i>L. laticaudatus</i><br>Nicholls, 1935                            | 0.0.021        | 1.010 | 0.0.121        | 1.010 | 0.1.221        | 0.010 |
| <i>L. rostratus</i> Nicholls,<br>1939                               | 0.0.021        | 1.010 | 0.0.121        | 1.010 | 0.1.221        | 0.020 |
| <i>L. nicholli</i> (Krishnas-<br>wamy), 1951                        | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |
| <i>L. aberrans</i> Chappuis,<br>1953                                | 0.0.021        | 0.010 | 0.0.121        | 0.010 | 0.0.121        | 0.010 |
| <i>L. minutus</i> Chappuis,<br>1954                                 | 0.0.021        | 1.010 | 0.1.121        | 0.020 | 0.1.121        | 0.020 |
| <i>L. acuticaudatus</i><br>Krishnaswamy, 1957                       | 0.0.012        | 0.010 | 0.0.112        | 0.020 | 0.1.112        | 0.010 |
| <i>L. euryhyalinus</i><br>Krishnaswamy, 1957                        | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |
| <i>L. wieseri</i> Chappuis,<br>1958                                 | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |
| <i>L. macronyx</i> (T. Scott)<br>var. <i>pontica</i> Griga,<br>1962 |                |       | 0.0.121        | 0.020 | 0.1.221        | 0.010 |
| <i>L. delamarei</i> Rouch,<br>1962                                  | 0.0.021        | 0.010 | 0.0.121        | 0.010 | 0.1.121        | 0.010 |
| <i>L. incurvatus</i> Lang,<br>1965                                  | 0.0.021        | 1.010 | 0.1.121        | 1.020 | 0.1.221        | 0.020 |
| <i>L. constrictus</i> Lang,<br>1965                                 | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |
| <i>L. mozambicus</i> Wells,<br>1967                                 | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |
| <i>L. japonicus</i> Ito, 1968                                       | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |
| <i>L. operculatus</i> Masry,<br>1970                                | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.011 |
| <i>Leptastacus jenneri</i><br>n. sp.                                | 0.0.021        | 0.010 | 0.0.121        | 0.020 | 0.1.121        | 0.010 |

P<sub>5</sub> (Fig. 14f) twice longer than broad, triangularly tapering posteriorly; lateral edge with one very long seta and another shorter seta, about one-third and one-half length from proximal border respectively; single long terminal seta with short spinule at base; medial border base.

Genital field with pair of lateral appendages, each with one long terminal seta twice length of other more lateral seta.

*Male.* Length, 2.9 mm, fixed in 4 p. 100 formaldehyde. Slightly smaller body and most appendages similar to female. Sexual dimorphism in antennule, P<sub>3</sub> endopodite, genital segmentation, and P<sub>5</sub> and P<sub>6</sub>.

A<sub>1</sub> (Fig. 15a) 7-segmented and haplocer. Fourth segment with aesthetasc.

P<sub>3</sub> (Fig. 15b) endopodite 2-segmented, terminal segment with one slender short seta, and one strong curved claw or spine.

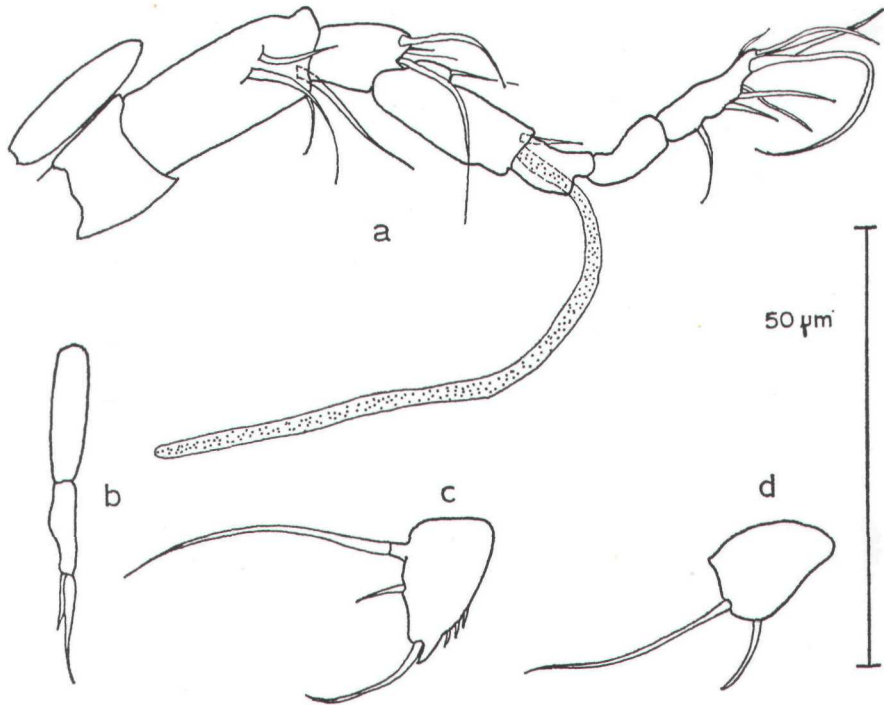


FIG. 15

*Leptastacus jeneri* n. sp.

Male: a, A<sub>1</sub>; b, P<sub>3</sub> exopodite; c, P<sub>5</sub>; d, P<sub>6</sub>.

P<sub>5</sub> (Fig. 15c) shorter than female but with similar lateral setation; subterminal seta half as long as large lateral seta; three spinules along lateral distal border.

P<sub>6</sub> (Fig. 15d) bare except for one terminal seta half length of other lateral seta.

*Etymology:* the specific name, *jeneri*, is dedicated to Professor Charles E. Jenner, University of North Carolina, Chapel Hill.

*Distribution:* *Leptastacus jeneri* n. sp. was abundant in both Iron Steamer Pier and Bogue Sound beach slopes.

Discussion: *Leptastacus jenneri* n. sp., *L. mozambicus*, *L. constrictus*, *L. japonicus* and *L. euryhalinus* are similar in setal formulae, modified male P<sub>3</sub> endopodites, triangularly produced P<sub>5</sub> and furcal rami which taper posteriorly. *Leptastacus jenneri* n. sp. was distinguished from the other above species by the unique lack of medial setae on the female P<sub>5</sub>, structure of the male P<sub>5</sub> and P<sub>6</sub>, and setation of the furcal rami including a hooked posterior end.

### Summary

Five new species of harpacticoid copepods, *Noodtiella enertha* n. sp., *Psyllocamptus carolinensis* n. sp., *Pseudoleptomesochrella bisetosa* n. sp., *Interleptomesochra boguensis* n. sp., and *Leptastacus jenneri* a. sp. are described from sandy beaches near Morehead City, North Carolina. *Psammotopa vulgaris* Pennak from the Massachusetts type locality and from North Carolina are compared and redescribed.

### Zusammenfassung

Meiobenthische Harpacticoiden (Crustacea, Copepoda) eines lotischen Sandstrandes in North Carolina.

Der Autor beschreibt fünf neue Harpacticoiden-Arten, nämlich *Noodtiella enertha* n. sp., *Psyllocamptus carolinensis* n. sp., *Pseudoleptomesochrella bisetosa* n. sp., *Interleptomesochra boguensis* n. sp. und *Leptastacus jenneri* n. sp. Ausserdem wird *Psammotopa vulgaris* Pennak vom locus typicus in Massachusetts bzw. von North Carolina verglichen und neu beschrieben. Alle Arten stammen von einem lotischen Sandstrand bei Morehead City, North Carolina.

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