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Author(s): Bruce C. Coull and Zinntae Zo
Source: *Transactions of the American Microscopical Society*, Vol. 99, No. 1 (Jan., 1980), pp. 32-43
Published by: [Wiley](#) on behalf of [American Microscopical Society](#)
Stable URL: <http://www.jstor.org/stable/3226078>
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REVISION OF *LAOPHONTINA* (COPEPODA: HARPACTICOIDA), INCLUDING THREE NEW SPECIES AND A KEY¹

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COULL, B. C. & ZO, Z. 1980. Revision of *Laophontina* (Copepoda: Harpacticoida), including three new species and a key. *Trans. Amer. Micros. Soc.*, 99: 32–43. *Laophontina* is not a well known harpacticoid genus. Until now there were but three extant species. However, on the southeastern United States continental shelf we encountered three additional species and describe them herein. *L. triarticulata* n. sp. is unique in that it has P₂ and P₃ endopods and a 3-segmented P₃ exopod. *L. variabilis* n. sp. also has P₂ and P₃ endopods but the number of P₃ endopod segments is variable (1 or 2). Of the three new species, *L. reducta* n. sp. is most like the previously known *Laophontina* species in swimming leg segmentation, but is unique because it lacks a P₄ endopod. To include the two new species with P₂ and P₃ endopods (*L. triarticulata* n. sp.; *L. variabilis* n. sp.) in *Laophontina* we provide an expanded generic diagnosis. A key to the six known species of *Laophontina* is given.

During an investigation on the meiofauna of the Southeastern United States continental shelf we collected three new species of *Laophontina* at various locations (Fig. 1). This find doubles the number of known species in the genus (from three to six) and suggests that the genus is more widespread than previously thought.

Laophontina includes those Laophontidae with greatly reduced segmentation of the P₂–P₄, strong dorsal dentiform projections on the caudal rami and usually pedunculate terminal caudal rami setae. Lang (1965), in redefining the genus, stated that the P₂ had an exopodite represented by a seta and no endopodite, the P₃ a 1-segmented exopodite and no endopodite, and the P₄ a 3-segmented exopodite in the female (2- or 3-segmented in the male). However, Wells' (1967) *L. distincta* did not fit this restricted generic designation (it had a 1-segmented P₂ exopodite and non-pedunculate caudal rami setae) yet it was included in *Laophontina*. None of our new species described herein fit Lang's (1965) generic diagnosis. We include them in *Laophontina* rather than to erect a new genus (or genera); they possess several characteristics of the genus *Laophontina*: reduced P₂–P₄ segmentation, dorsal dentiform projection on the caudal rami, and pedunculate terminal caudal rami setae.

We describe *L. triarticulata* n. sp., *L. variabilis* n. sp., and *L. reducta* n. sp., provide a table of the salient morphological features, and a key to the six known species.

¹ Contribution No. 308 from the Belle W. Baruch Institute for Marine Biology and Coastal Research, University of South Carolina. This paper is, in part, based on a research program conducted by Ecological Services, Texas Instruments Inc., and is supported by the Bureau of Land Management, U.S. Department of the Interior, under contract No. AA550-CT7-2. We acknowledge BLM for publication approval, Dr. Mallory May, Program Manager, and many colleagues at TI's Ecological Services Division for their support.

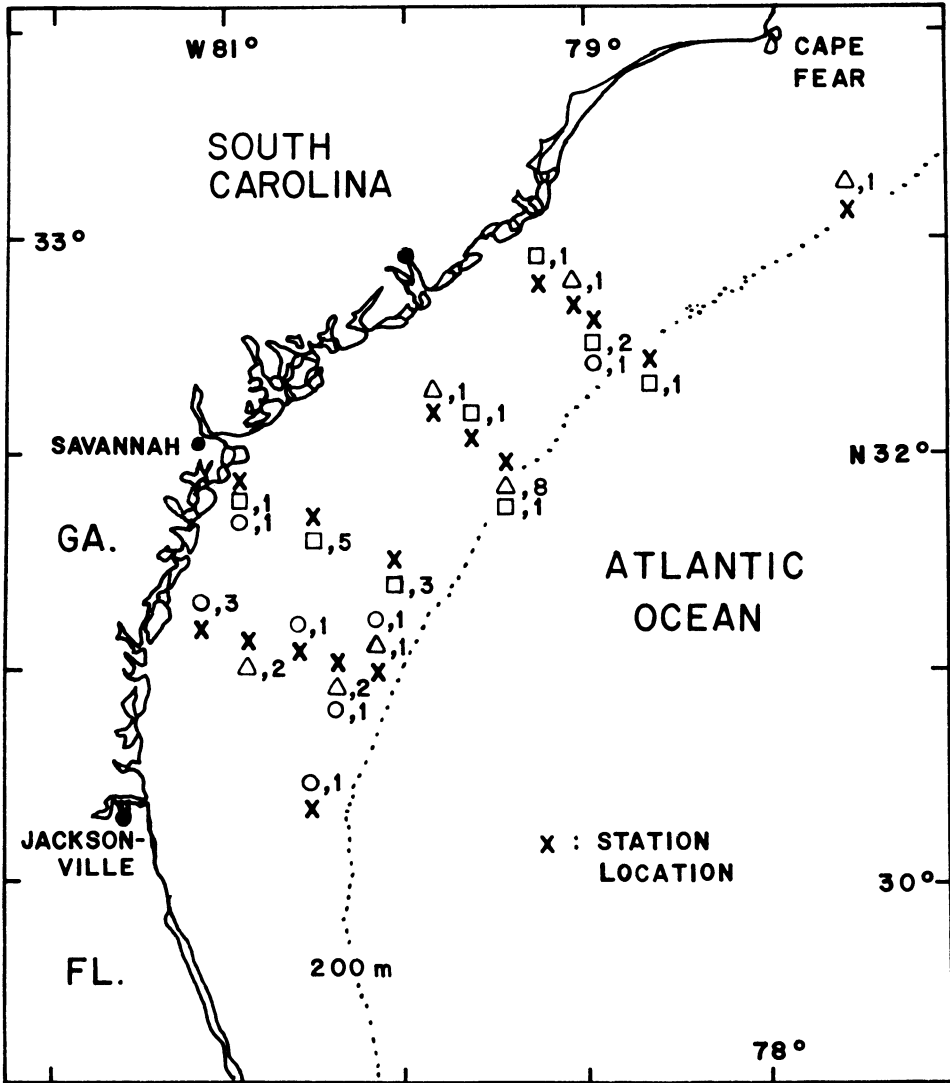


FIG. 1. Study area map with station locations from which the new species were collected: Δ, *L. triarticulata* n. sp.; □, *L. variabilis* n. sp.; O, *L. reducta* n. sp. Numbers of individuals are followed by the species symbol which is positioned above or below the station location.

The nomenclature and descriptive terminology are adopted after Lang (1948, 1965). All figures have been drawn with a camera lucida. Abbreviations used throughout the paper are: A₁, antennule; A₂, antenna; Benp., baseopodopodite; CR, caudal ramus (i); Enp., endopodite; Exp., exopodite; Md., mandible; Mx., maxilla; Mxl., maxillula; Mxp., maxilliped; P₁–P₆, leg 1–leg 6. Length measurements do not include the antennules or caudal setae.

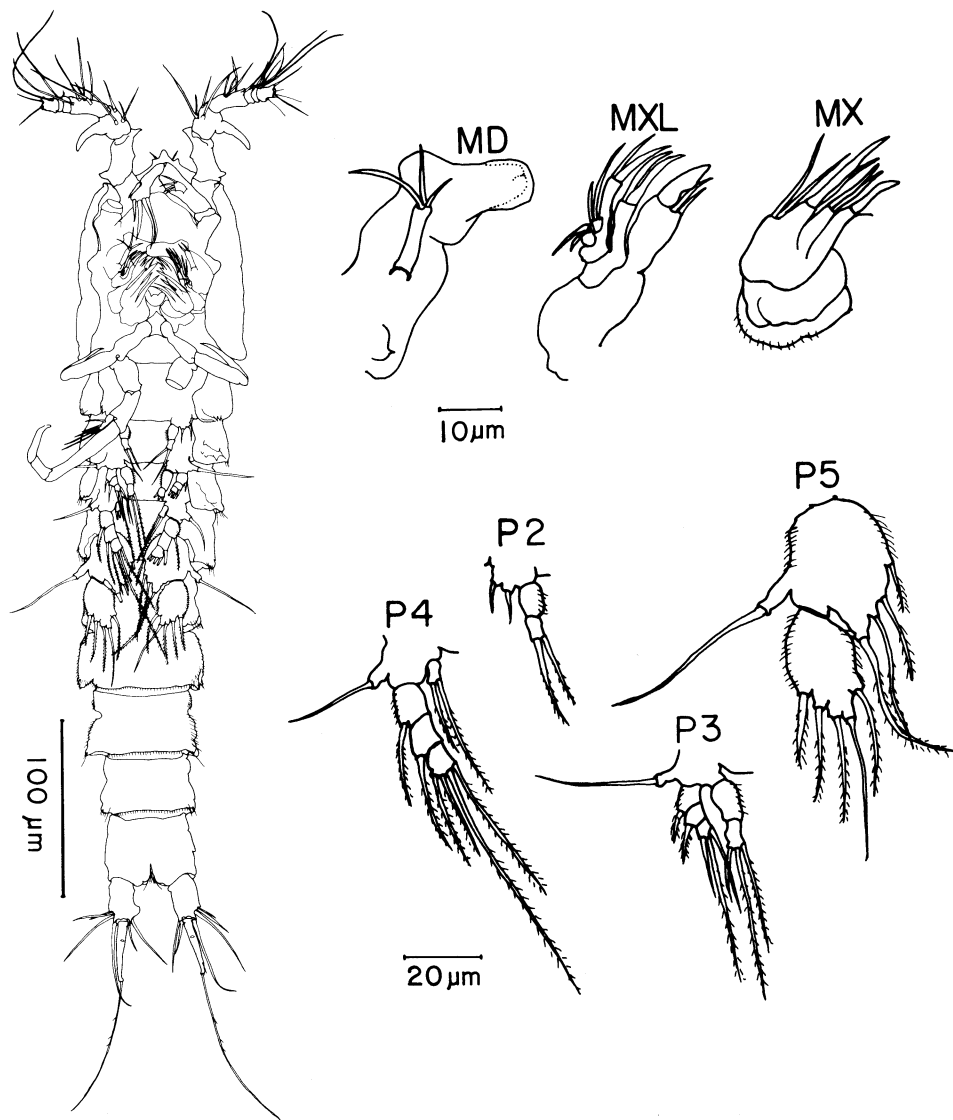


FIG. 2. *Laophontina triarticulata* ♀ (Whole mount in ventral view).

Family Laophontidae T. Scott 1904

Genus *Laophontina* Norman & T. Scott 1905, emended

The following new species have been added since Lang (1948): *L. acantha* male by Noodt (1955); female *L. acantha* by Wells and Clark (1965) and *L. distincta* by Wells (1967).

Since Lang's (1948) generic diagnosis and revision (Lang 1965) changes have been made (Wells 1967) and are being made in this paper, thus necessitating the following new diagnosis: Body cylindrical, segments without chi-

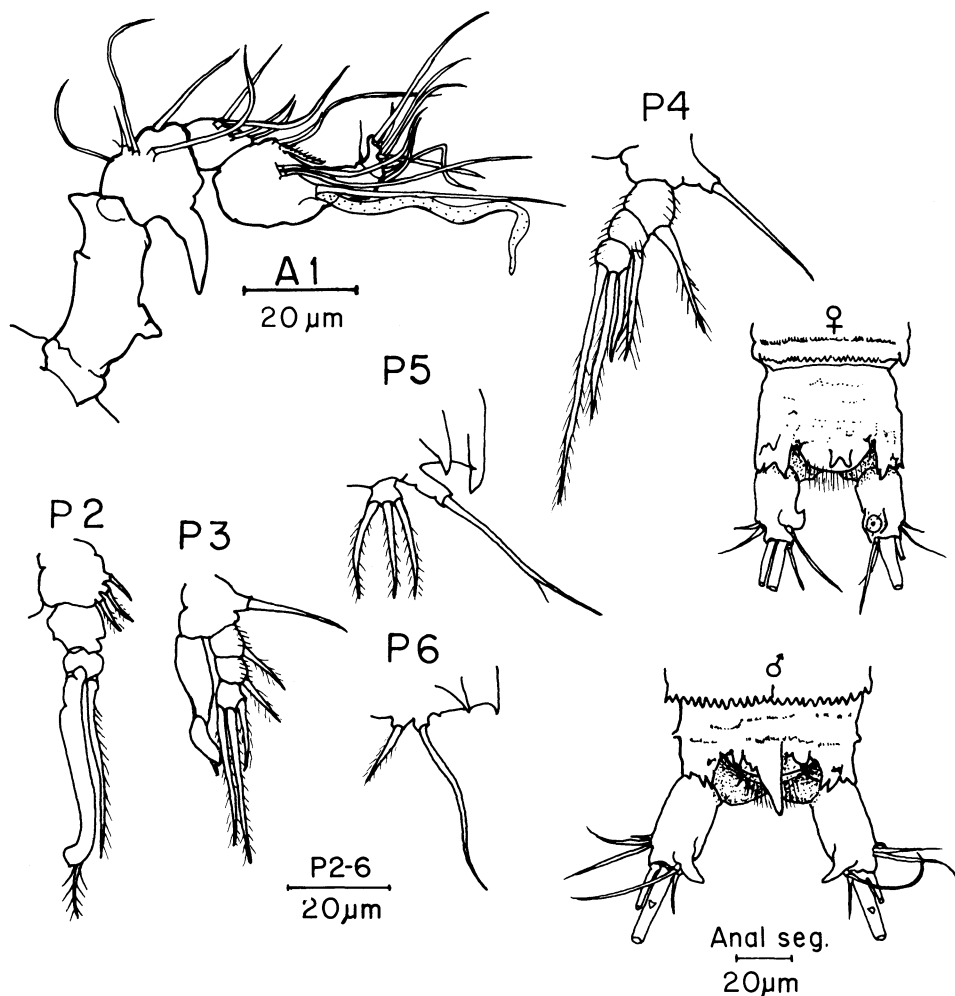


FIG. 3. *Laophontina triarticulata* ♂ and dorsal view of anal segment ♀, ♂.

tinous spines. CR cylindrical, at least 2 times as long as wide, with dorsal dentiform projection in distal one third. Principal terminal CR setae usually pedunculate. A₁ ♀ 5 or 6 segments, with large dentiform projection on second segment. Aesthetasc on segment 4. Exp. A₂ 1-segmented with 3 or 4 setae. Md. palp 1 or 2-segmented with 3 or 4 setae. Mxl. well developed with 1–3 precoxal arthrite spines, coxa and basis with 2 setae, Exp. 1 segment, Enp. 1 segment or as 2 setae. Mx. with 3 endites. Mxp. well developed, prehensile. P₁ Enp. prehensile terminating in claw. P₁ Exp. 1 segment. P₂ ♀ Exp. 1 segment or represented by 1 or 2 setae. P₂ ♀ Enp. absent or 1 or 2 segments. Exp. P₃ ♀ 1–3 segments, Enp. P₃ ♀ 0–2 segments. Exp. P₄ ♀ 2 or 3 segments; Enp. P₄ 1 segment or represented by a seta. P₅ ♀ distinct with 3 or 4 setae on Benp., 4 or 5 setae on Exp. A₁ ♂ haplocer. Setae of P₂ may be dimorphic; P₃ and P₄ are always

dimorphic. P₅ ♂ fused or distinct; when fused with 3 setae; when distinct Benp. with no setae, Exp. with 3 setae.

Laophontina triarticulata n. sp.
(Figs. 2, 3)

Material. 7 ♀♀, 2 ♂♂. Holotype ♀, USNM No. 173454; Paratypes 2 ♀♀, 1 ♂, USNM No. 173455.

Type-locality. 31°06'N, 81°08'W, depth 11 m, median grain size, 0.55 mm, southeastern United States continental shelf (see Fig. 1).

Description

Female. Based on a mature female, length 0.43 mm. Body cylindrical, gradually tapering. Anal operculum (Fig. 3) with forked spine and minute hairs. CR longer than broad with 3 small lateral and 2 small medial setae and dorsal projection in terminal one third. Principal terminal setae pedunculate (Fig. 2).

A₁ (Fig. 2). 6-segmented, large dentiform projection pointing laterally on second segment.

A₂ (Fig. 2). Precoxa with bidentate *pars molaris*. Palp 1-segmented with 3 terminal setae.

Mxl. (Fig. 2). Precoxal arthrite with spine and setae. Coxa and basis each with 2 terminal setae. Exp. and Enp. each 1-segmented with 2 terminal setae.

Mx. (Fig. 2). Syncoxa with 2 endites each with 2 setae. Basis with terminal claw and a seta. Enp. represented by 2 setae.

Mxp. (Fig. 2, see whole mount). Prehensile.

P₁ (Fig. 2, see whole mount). Enp. strong, 2-segmented, terminating in single claw (typically laophontid). Exp. 1-segmented with 2 terminal and 3 outer setae.

P₂ (Fig. 2). Exp. represented by a single seta. Enp. 2-segmented with 2 terminal setae (See Table I for setal formula).

P₃ (Fig. 2). Exp. 3-segmented, Enp. 2-segmented (Table I for setal formula).

P₄ (Fig. 2). Exp. 3-segmented, Enp. 1-segmented (Table I for setal formula).

P₅ (Fig. 2). Benp. with 4 setae, Exp. with 5 setae.

Male. Based on a mature male, 0.40 mm. The male differs from the female in size, A₁, P₂, P₃, P₄, P₅, P₆ and anal operculum (Fig. 3). We are not absolutely certain that the male described below is indeed the male of *L. triarticulata* n. sp. We describe it together with the female described above because in both sexes the P₃ exopod is 3-segmented (Table I). Three-segmented P₃ exopods occur in no *Laophontina* and thus we believe them to be the same species.

A₁ (Fig. 3). 6-segmented and haplocer.

P₂ (Fig. 3) Exp. represented by 2 setae. Enp. 2-segmented, terminal segment with an inner robust club-shaped seta which terminates in a short plumose spine and a long outer plumose seta.

P₃ (Fig. 3). Exp. 3-segmented with 3 terminal setae. Enp. 2-segmented, terminal segment foot-shaped with a minute spine at apex.

P₄ (Fig. 3). Exp. 3-segmented with 3 terminal setae. Enp. absent.

P₅ (Fig. 3). Inner expansion Benp. absent. Exp. with 3 terminal setae of equal length.

P₆ (Fig. 3). Two setae.

TABLE I
Summary of salient morphological features of the known species of *Laophontina*.

Species	A ₁ ♀			A ₂ Exp.			P ₁			Setal Formulae ♀			P ₁ ♀			Setal Formulae ♂			P ₁ ♂									
	No. Segs.	No. Setae	Exp.	No. Setae	Exp.	Exp.	No. Setae	Exp.	Exp.	P ₂	P ₃	P ₄	Exp.	Exp.	Exp.	No. Setae	Exp.	Exp.	P ₂	P ₃	P ₄	Exp.	Exp.	Exp.	No. Setae	Exp.	Exp.	
<i>dubia</i> Norman & T. Scott 1905	6	3-4 ¹	5	1-2s ²	—	.020	—	0.0.011	.110	4:4	1-2s	—	.020	—	0.0.011	.010	unknown	—	—	—	—	—	—	—	—	—	—	—
<i>acantha</i> Noodt 1955 ³	6 ⁴	4	4	2s	—	.020	—	0.120	.020	3:5	2s	—	.020	—	0.010	—	fused:3	—	—	—	—	—	—	—	—	—	—	
<i>distincta</i> Wells 1967	6	4	4	.210	—	.310	—	0.022	.020	4:5	.210	—	.030	—	0.30	—	0:3	—	—	—	—	—	—	—	—	—	—	
<i>triariculata</i> n. sp.	6	4	5	1s	0.110	0.0.111	0.111	0.0.121	.020	4:5	2s	2 segs. (modif.)	0.0.021	0.010	0.0.021	—	0:3	—	—	—	—	—	—	—	—	—	—	
<i>variabilis</i> n. sp.	6	4	5	1s	.010	0.021	.020 ⁵	0.0.121	.020	4:5unknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknownunknown
<i>reducta</i> n. sp.	5	4	6	2s	—	.022	1s	0.0.121	1s	3:5	2s	—	.022	1s	0.0.021	1s	fused:3	—	—	—	—	—	—	—	—	—	—	

¹ Lang (1948) in his generic diagnosis based only on *L. dubia* states A₂ exopod with 4 setae, but the figure of *L. dubia* shows 3 setae.
² 's' means the ramus is represented by setae(c). The number preceding 's' refers to the number of setae.
³ Female information from Wells and Clark (1965).
⁴ Originally described as 5 segments by Wells & Clark (1965) corrected to 6 segments by Wells (1967).
⁵ Segmentation varies between and within specimens (see Table II).

TABLE II

Number of endopodite segments on the right and left P₃ (viewed ventrally) of 8 specimens of *Laophontina variabilis* n. sp.

Specimen	No. Segments P ₃ Endopodite	
	Left	Right
1	2	1
2	(not visible)	2
3	1	1
4	1	2
5	2	2
6	1	2
7	2	2
8	2	2

Etymology. The specific name, *triarticulata*, refers to the 3-segmented P₃ exopod.

Remarks. *L. triarticulata* n. sp. is the only species having 3-segmented P₃ exopods. The presence of any P₂ or P₃ endopods is unique in the genus (cf. *L. variabilis* n. sp.). Moreover, since sexual dimorphism of the P₂ endopod is extremely rare in the Laophontidae (only *Donsiella* has a transformed P₂ endopod) and *L. triarticulata* has modified male P₂ endopods, we seriously considered erecting a new genus to include *L. triarticulata*. However, the male P₂ of *L. triarticulata* is 2-segmented (like the female); the modifications are with setae and a nonsegmented pattern. Such setal modifications are known in several laophontid genera (e.g., *Heterolaophonte*, *Paralaophonte*) and therefore are not unique. *L. triarticulata* has many characters of *Laophontina*; e.g., uniquely shaped segments 1 and 2 of A₁; setae as exopods of P₂ (male and female); P₄ segmentation and setation; structure and setation of the female and male P₅; strong dorsally directed dentiform projections on the CR and pedunculate caudal setae. Thus, we include the new species here and expand the generic diagnosis to include it, rather than erecting a new monotypic genus. Possibly, *L. triarticulata* n. sp. will indeed prove to be anomalous and require generic status. We feel that to do so now would be premature.

Laophontina variabilis n. sp.
(Fig. 4)

Material. 8 ♀♀. Holotype ♀, USNM No. 173456. Paratypes 2 ♀♀, USNM No. 173457.

Type-locality. 31°06'N, 80°21'W, depth 32 m, median grain size 0.46 mm, southeastern United States continental shelf (see Fig. 1).

Description

Female. Based on a mature female, length 0.41 mm. Body cylindrical, gradually tapering, anal operculum with large spine. CR longer than broad with 2 lateral and 3 terminal setae. Principal terminal setae pedunculate; CR have a dorsally projecting dentiform projection on terminal one-third (Fig. 4).

A₁ (Fig. 4). 6-segmented, large dentiform projection on segment 2.

A₂ (Fig. 4). Exp. 1-segmented with 4 setae (Same as *L. triarticulata* n. sp.).

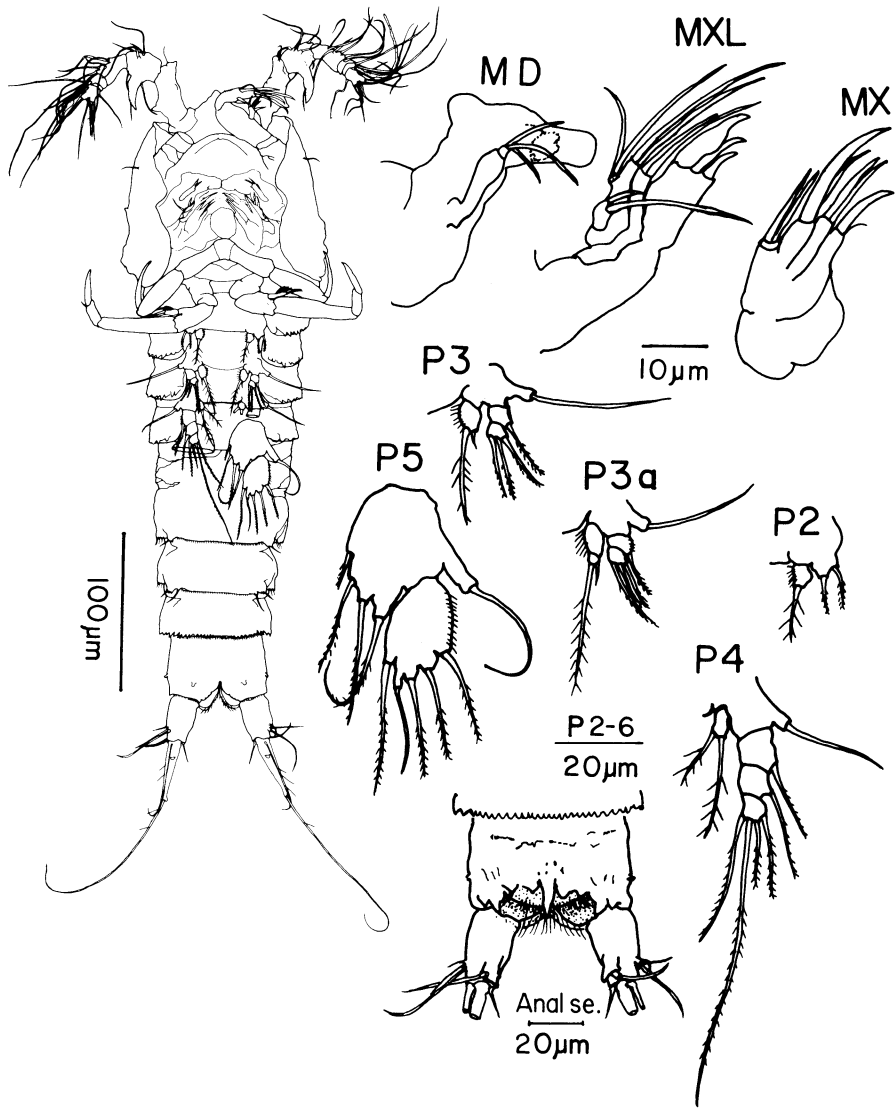


FIG. 4. *Laophontina variabilis* ♀ (Whole mount in ventral view), and dorsal view of anal segment.

Md. (Fig. 4). Precoxa with bidentate *pars molaris*. Palp 2-segmented with 3 terminal setae.

Mxl. (Fig. 4). Precoxal arthrite with 3 spines. Coxa and basis each with 2 terminal setae. Exp. and Enp. each 1-segmented with 2 terminal setae.

Mx. (Fig. 4). Syncoxa with 2 endites. Basis with terminal claw and 1 seta. Enp. of 1 minute segment with 2 setae.

Mxp. (Fig. 4). Prehensile.

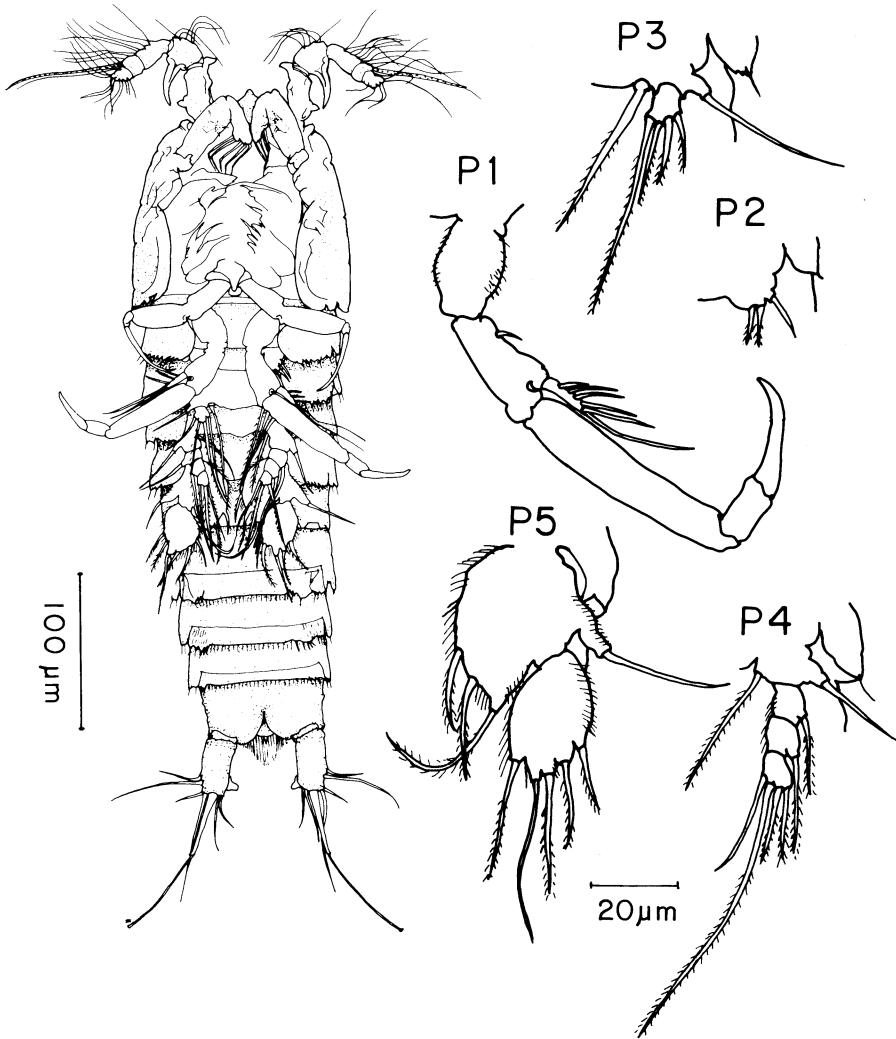


FIG. 5. *Laophontina reducta* ♀ (Whole mount in ventral view).

P₁ (Fig. 4). Typically laophontid in form. Exp. 1-segmented with 2 terminal and 3 outer setae.

P₂ (Fig. 4). Exp. represented by 2 setae. Enp. 1-segmented; single seta terminally (Table I).

P₃ (Fig. 4). There is variability within, and between individuals in segmentation of the Enp. Some individuals have 2-segmented Enp. (P_{3a}, Fig. 4). Some have 1-segmented Enp. (P₃, Fig. 4) and some have 1-segmented Enp. on one side of the body and 2-segmented Enp. on the other. Table II lists the segmentation for 8 specimens collected. In all cases the Exp. is 2-segmented with 3 terminal setae (Table I).

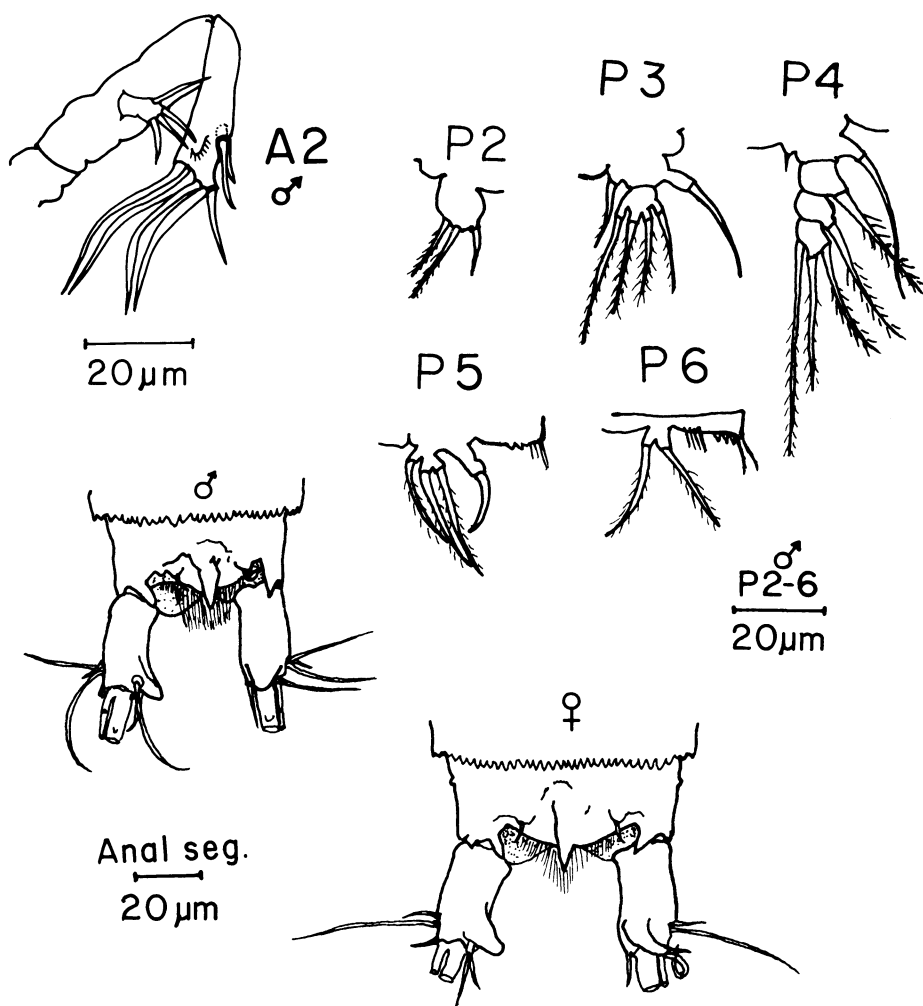


FIG. 6. *Laophontina reducta* ♀ and dorsal view of anal segment ♀, ♂.

P₄ (Fig. 4) Exp. 3-segmented with 4 terminal setae. Enp. 1-segmented with 2 terminal setae (Table I).

P₅ (Fig. 4). Benp. and Exp. distinct. Exp. with 5, Benp. with 4 setae.

Male. Unknown.

Etymology. The specific name, *variabilis*, refers to variable segmentation of the P₃ Enp.

Remarks. *L. variabilis* is the only species to have one-segmented P₂ Enp., 2-segmented P₃ Exp. and 1(2)-segmented P₃ Enp.

Laophontina reducta n. sp.

(Figs. 5, 6)

Material. 15 ♀♀, 8 ♂♂. Holotype ♀, USNM No. 173458. Paratypes 2 ♀♀, 2 ♂♂, USNM No. 173459.

Type-locality. 32°16'N, 79°25'W, depth 43 m, median grain size, 0.45 mm, southeastern United States continental shelf (see Fig. 1).

Description

Female. Based on a mature female, 0.44 mm. Body as in Fig. 5. Anal operculum with row of small spines (Figs. 5, 6). CR 2 times as long as broad, with dorsal dentiform projection. Principal terminal CR setae pedunculate. (Fig. 5).

A₁ (Fig. 5). 5-segmented, dentiform projection on segment 2.

A₂ (Fig. 5, male Fig. 6). Exp. 1-segmented with 4 setae.

Md., Mxl., Mx., Mxp. as in *L. variabilis* n. sp.

P₁ (Fig. 5). Typically laophontid. One-segmented Exp. with 2 terminal and 4 outer setae.

P₂ (Fig. 5). Exp. represented by 2 setae. Enp. lacking (Table I).

P₃ (Fig. 5). Exp. 1-segmented with 4 setae, Enp. represented by a single seta (Table I).

P₄ (Fig. 5). Exp. 3-segmented, Enp. as a single seta (Table I).

P₅ (Fig. 5). Benp. with 3 setae, Exp. with 5.

Male. Based on a mature male, 0.33 mm. The male differs from the female in size, A₁, P₃, P₄, P₅, and P₆.

A₁. 6-segmented and haplocer.

P₃ (Fig. 6). Like female except that the seta representing Enp. is much shorter.

P₄ (Fig. 6). Like female except that terminal Exp. segment has 3 setae, and seta representing Enp. is very small.

P₅ (Fig. 6). Benp. and Exp. fused. Exp. part represented by 3 setae.

P₆ (Fig. 6). Two setae.

Etymology. The species name, *reducta*, refers to the reduced number of segments (5) in the A₁ and the absence of a P₄ Enp.

Remarks. *L. reducta* n. sp. is more like the previously known *Laophontina* than either *L. triarticulata* n. sp. or *L. variabilis* n. sp., because the P₂ is represented only by a seta, and there is a 1-segmented P₃ Exp. However, the A₁ is 5-segmented (all other species are 6-segmented), the P₃ Enp. is represented by a seta (Enp. absent in *dubia*, *acantha*, and *distincta*, 2-segmented in *triariculata*, and 1–2-segmented in *variabilis*), and the P₄ Enp. is represented by a seta (it is 1-segmented in all other species).

KEY TO THE SPECIES (BOTH SEXES) OF *LAOPHONTINA* NORMAN & T. SCOTT

- 1. Exp. P₄ 3-segmented 2
- Exp. P₄ 2-segmented 4
- 2. Exp. P₃ 1-segmented 3
- Exp. P₃ 2-segmented *L. variabilis* n. sp.
- Exp. P₃ 3-segmented *L. triarticulata* n. sp.
- 3. Enp. P₃ absent but represented by a seta *L. reducta* n. sp.
- Enp. P₃ absent and no seta(e) *L. dubia* Norman & T. Scott
- 4. Exp. P₂ represented by seta(e) only *L. acantha* Noodt
- Exp. P₂ 1-segmented *L. distincta* Wells

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**POTOMACUS POTTSI THOMPSON, 1967
(SCUTICOCILIATIDA, CILIOPHORA):
STOMATOGENESIS WITH REDESCRIPTION
OF THE MICROSTOME TROPHONT¹**

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RAMSEY, J., BROWNLEE, D. & SMALL, E. B. 1980. *Potomacus pottsi* Thompson, 1967 (Scuticociliatida, Ciliophora): Stomatogenesis with a redescription of the microstome trophont. *Trans. Amer. Micros. Soc.*, 99: 43–51. *Potomacus pottsi* isolated from the Rhode River, Chesapeake Bay, was fixed and stained by a modified Bodian protargol technique. A detailed redescription of the morphology of the microstome form is given. The stomatogenic sequence is described with special reference to ontogeny of the microstome opisthe buccal structures. The concept of a tripartite haplokinety is supported.

Potomacus pottsi, originally described by Thompson (1967), has been placed by Small (1967) in the order Scuticociliatida, suborder Philasterina, family Uronematidae. More recently Corliss (1977) placed the ciliate in the family Philasteridae.

A complete redescription of the microstome form is considered necessary to more easily comprehend the ultrastructural complexities being examined by one of us (J.M.R.), as well as to provide a basis for a possible shift in assignment to a more appropriate taxonomic group. As stressed by Small & Coats (1977) taxonomic assignment of the ciliates of this order is integrally associated with the ontogeny of opisthe buccal structures. Unfortunately, such ontogenetic information as that provided via stomatogenic studies is meager for the majority of Scuticociliates.

As Thompson originally noted, *P. pottsi* is a facultative polymorphic ciliate

¹ We are grateful to Dr. R. R. Colwell for supplying stock cultures of *Vibrio* sp., strain IORRIO and to Dr. D. W. Coats for his advice and criticism.

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