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A new species of Xenotrichulidae (Gastrotricha) from southern and southeastern USA

William D. HUMMON[1] and M. Antonio TODARO[2]
(1) *Department of Biological Sciences, Ohio University, Athens, Ohio 45701, U.S.A.*
E-mail: hummon@ohio.edu; fax: 001-740-593-0300
(2) *Dipartimento di Biologia Animale, Università di Modena e Reggio Emilia, via Campi, 213/d, 41100 Modena, Italy*

Abstract: A new gastrotrich, *Xenotrichula paralineata* sp. nov., is described from the Gulf coast at Biloxi, Mississippi. The species is characterized as the only medium sized xenotrichulid species, lacking tentacles, that has locomotor cirri of similar size, pedunculated dorsal scales, ovoid pluria, an oval patch of 14 transverse scales atop the head, 9 medial scales per furcal branch, cirri beneath the gut at U47, and a furcal indentation to U82. It is here distinguished from its Mediterranean sibling species, *Xenotrichula lineata* Schrom, 1972.

Résumé : *Une nouvelle espèce de Xenotrichulidae (Gastrotricha) des côtes sud et sud-est des USA*. Un nouveau gastrotriche, *Xenotrichula paralineata* sp. nov., récolté dans le Golfe de Biloxi, Mississippi, est décrit. L'espèce est caractérisée comme la seule espèce de taille moyenne chez les Xénotrichulides, sans tentacules, porteuse de cirres locomoteurs de mêmes tailles, d'écailles dorsales pédonculées, de pluria ovoïdes, d'un groupe oval de 14 écailles transverses au sommet de la tête, de 9 écailles médianes par branche furcale, de cirres au-delà de la gouttière à U47 et d'une indentation furcale jusqu'à U82. L'espèce est ici différenciée de son espèce jumelle méditerranéenne *Xenotrichula lineata* Schrom, 1972.

*Keywords***:** Gastrotricha • Xenotrichulidae • Meiofauna • Systematics • Italy • U.S.A. • New species

Introduction

Xenotrichula lineata Schrom, 1972 (p. 307, Fig. 9) was described from the littoral beach at Alberoni, Litorale di Lido, Venice (outside the barrier beach that bounds the lagune east of the city) in the northern Adriatic. Evans et al. (1993) in studies of Italian marine Gastrotricha videotaped two records of *Xenotrichula lineata* from the littoral beach at Bibione, Lido del Sale, Venice, near its type locality at Alberoni. Meanwhile, two photos of a subadult xenotrichulid, identified as *Xenotrichula lineata*, were published by Ruppert (1979, Fig. 26d, e) from a littoral beach at Bogue Inlet, Emerald Isle, North Carolina in the southeastern USA. Even more recently, Todaro et al. (1995; p. 115) reported Ruppert's species from Biloxi West, Mississippi and South Padre Island, Texas along the coast

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of the Gulf of Mexico, USA. Based on Todaro's rather complete photographic record from the littoral beach at Biloxi W, Mississippi, Hummon has illustrated this species, which we think deserves a separate species designation, one we propose to call *Xenotrichula paralineata* sp. nov.

Materials and Methods

Collections of sandy sediment, taken from the littoral and/or sublittoral sites at 2 locations, yielded the species in question. Littoral samples were taken at mean tide level, either by digging a hole 30 cm deep and spooning sand from the bottom or by thrusting a hand-held piston corer (2.5 cm i.d.) and removing the bottom 5 cm of sand. Sublittoral samples were taken at 1.5 to 2.0 m water depth, using a 1.5 liter plastic scoop. Sediments were placed in 200 ml plastic bags and returned to the lab within 48 h, where the bags were kept in a cold room and processed within one week. Specimens were extracted by the narcotization-decantation technique of Pfannkuche & Thiel (1988), using a 7% $MgCl_2$ solution. Relaxed living specimens were observed, identified and photographed using differential interference (DIC) optics on a Nikon Microphot-FZA microscope. Dates and locations of collection and results of temperature, salinity, granulometry and suspended matter are given in Todaro et al. (1995).

Morphological symbols and conventions are as follows: Lt: Total length, from anterior tip of head to posterior tip of caudum and its adhesive tubes; LPh: Length, pharynx from anterior tip of head to PhJIn; PhJIn: Junction between pharynx and intestine; U: Percentage units of Lt from anterior to posterior X 100; Columns: longitudinal in orientation; Rows: transverse in orientation; ^: Type locality.

Taxonomic Results

ORDER CHAETONOTIDA Remane, 1925
[Rao & Clausen, 1970]
Suborder Paucitubulatina d'Hondt, 1971
Family Xenotrichulidae Remane, 1927
Subfamily Xenotrichulinae Ruppert, 1979
Genus *Xenotrichula* Remane, 1927

Xenotrichula paralineata sp. nov.
(Figs 1, 3-4)

Xenotrichula lineata of Ruppert, 1977: Fig. 9a; of Ruppert, 1979: p. 27, Fig. 26d-e; of Todaro et al. 1995: p. 115.

Diagnosis

A medium sized xenotrichulid species, lacking tentacles, that has locomotor cirri of similar size, pedunculated dorsal scales, ovoid pluria, an oval patch of 14 transverse scales with oblique scalelets laterally atop the head, 9 medial scales per furcal branch, cirri beneath the gut at U47, and a furcal indentation to U82.

Etymology

The name refers to its initially having been confused with its trans-Atlantic sibling species, *Xenotrichula lineata.*

Description

Adult [from MS, Figures 1, 3-4]: Lt < 185 µm; L to PhJIn 51 µm at U27. Body medium, weakly ten-pin shaped, with short furca. Anterior head profile incurved medially, in association with a terminal mouth, then curving back laterally to form ovoid pluria; neck constriction moderate; trunk plump, terminating in a furca that indents medially to U82; furcal branches are scaled proximally (67%) and naked distally (33%). Widths of head/pluria, neck, trunk, furcal base/tips, and their locations along the body length are: 36/38, 29, 47, 25/38 at U06/16, 25, 54, 84/100.

Cuticular armature. Cephalion absent; hypostomium bidentate. A longitudinally oval patch (23 x 45 µm) atop the head bears 14 transverse ridge-like scales lying behind one another from U05 to U21, each with oblique edges laterally, along with 3 sets of edges in front that lack transverse ridges; lateral to the patch are 4 columns per side of pedunculated scales that continue over the remaining dorsal body surface and onto the furcal base, with 13 (neck)-17(trunk) alternating longitudinal columns of ca. 65 pedunculated scales each, having round base plates and broadly ovate endplates, that run from U02 to U83; these scales are smaller on the neck than on the trunk. Ventral scales have 6 alternating longitudinal columns of broadly rhomboidal plate-like scales that cover the ventral surface from U45 to U83, with an additional column of 45 "hydrofoil" scales laterally on each side that run from U11 to U83. Furcal branches bear simple overlapping scales proximally, 9 on the medial surface of each.

Ciliature. Oral bristles several per side (L = 2-3 µm) with several more (L = 3-5 µm) at the edges of each plurion. Cephalic cirral tufts 3 per side, each comprised of several cilia that vary in length, with two tufts projecting dorsolaterally, one (L < 20 µm) inserting on either side of the midline, a second (L < 30 µm) inserting behind the junction of head and plurion, and a third (L < 20 µm) that trails from the outer edge of each plurion. Dorsal sensory bristles 4 per side (L = 5-8 µm), one on the neck, one on the mid-trunk, a third on the hind-trunk and the fourth on the proximal furca (at U22, U52, U78 & U86 respectively). Ventral locomotor cirri are of similar size; longitudinal bands run the

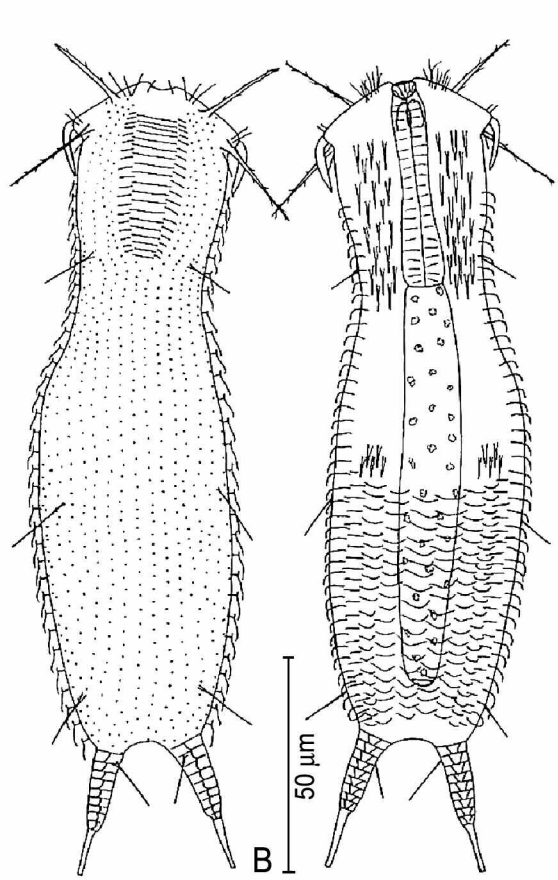

Figure 1

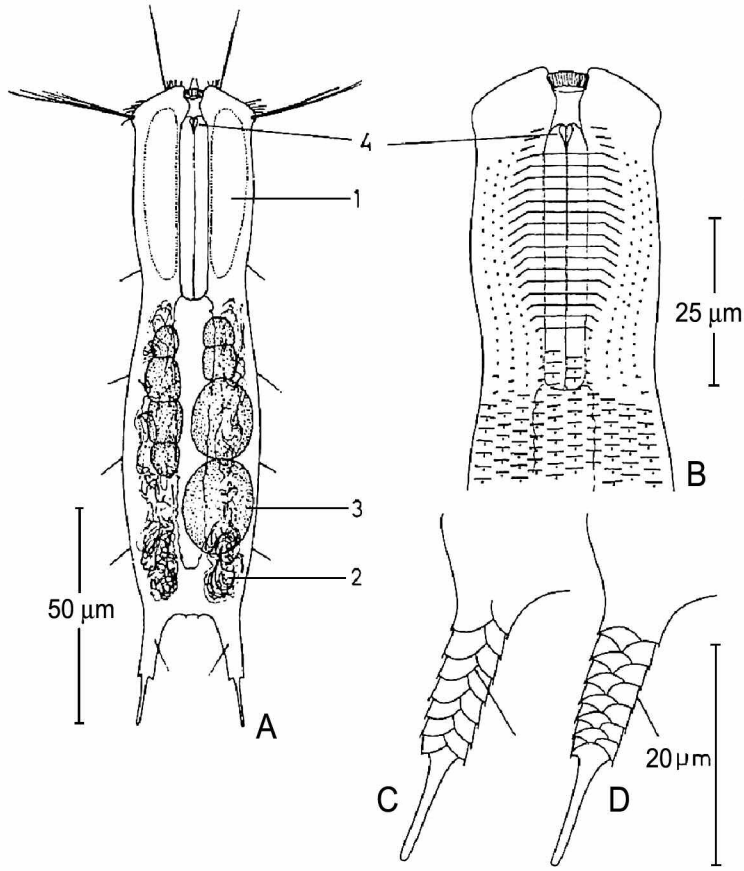

Figure 2 (A-D)

Figures 1 & 2. Line drawings of *Xenotrichula paralineata* sp. nov. (Fig. 1 left: dorsal/ventral), and of *Xenotrichula lineata* Schrom, 1972 (Fig. 2 right: A-D), Figs. 1 and 2A to the same scale.

Figures 1 & 2. Dessins au trait de *Xenotrichula paralineata* sp. nov. (Fig. 1 gauche : dorsale/ventrale) et de *Xenotrichula lineata* Schrom, 1972 (Fig.2 droite : A-D). Les figures 1 et 2A sont à la même échelle.

length of the pharynx, with several cirri (perhaps only 3) per side in the mid-gut region at U45.

Digestive tract. Mouth terminal, diameter 5 µm; mouth tube ribbed; pharynx lacks bulbs; intestine of similar width throughout, narrowing slightly to the rear; anus ventral at ca. U75.

Reproductive tract. Presumed hermaphroditic; testes lie lateral to the gut.

Ecology

Sparse in frequency of occurrence (less than 10% of samples), rare in abundance (less than 1% of a sample); littoral in medium to fine sand, at MHW-MLW, 10-30 cm sand depth, and sometimes sublittoral in shallow well sorted fine sand at 1.5-2.0 m water depth.

Geographical Distribution

Atlantic North-West - North America: *Mississippi* (^Biloxi West 30°32'N/88°56'W), *North Carolina* (Bogue Inlet), Texas (South Padre Island).

Remarks

Regarding "type" material, the specimen from which the photos were taken is not longer extant, however the photos in Figures 3 and 4 can be used as vouchers. We can treat the maturing subadult [from NC] that is deposited in the American Museum of Natural History, New York, [cited by Ruppert as "Neotype AMNH 88"] as our holotype: Lt < 109 µm; L to PhJIn 38 µm at U32. Widths of pluria/head, neck, trunk, furcal base/tips, and their locations along the body length are: 25/22, 18, 26, 14/30 at U09/17, 27, 56, 83/100. The specimen was in early stages of spermatogenesis, an indication of protandry.

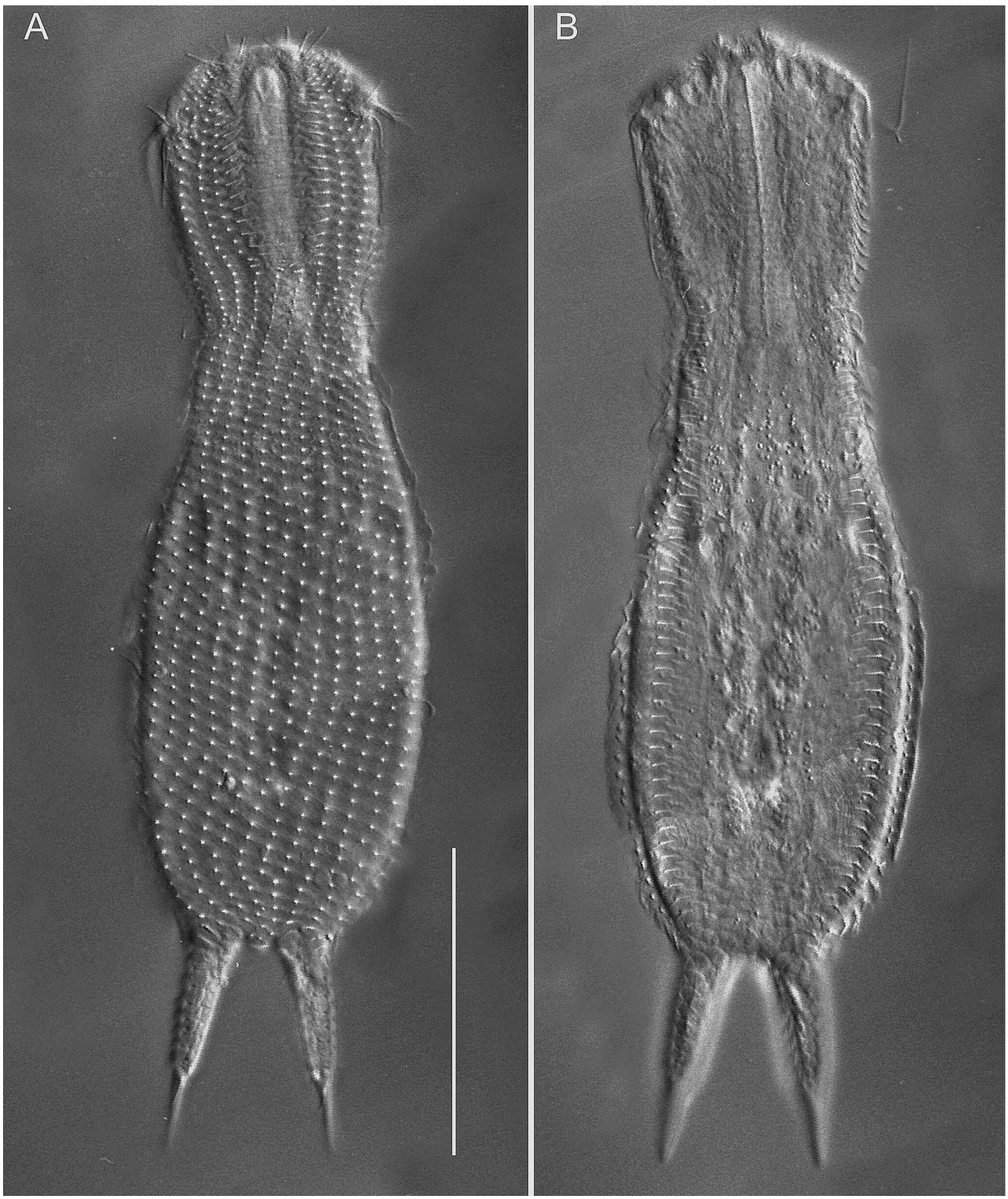

Figure 3. *Xenotrichula paralineata* sp. nov. DIC micrographs, Lt ~180 µm. dorsal (left), ventral (right).
Figure 3. *Xenotrichula paralineata* sp. nov. Micrographies DIC, Lt ~ 180 µm. Vue dorsale (gauche), vue ventrale (droite).

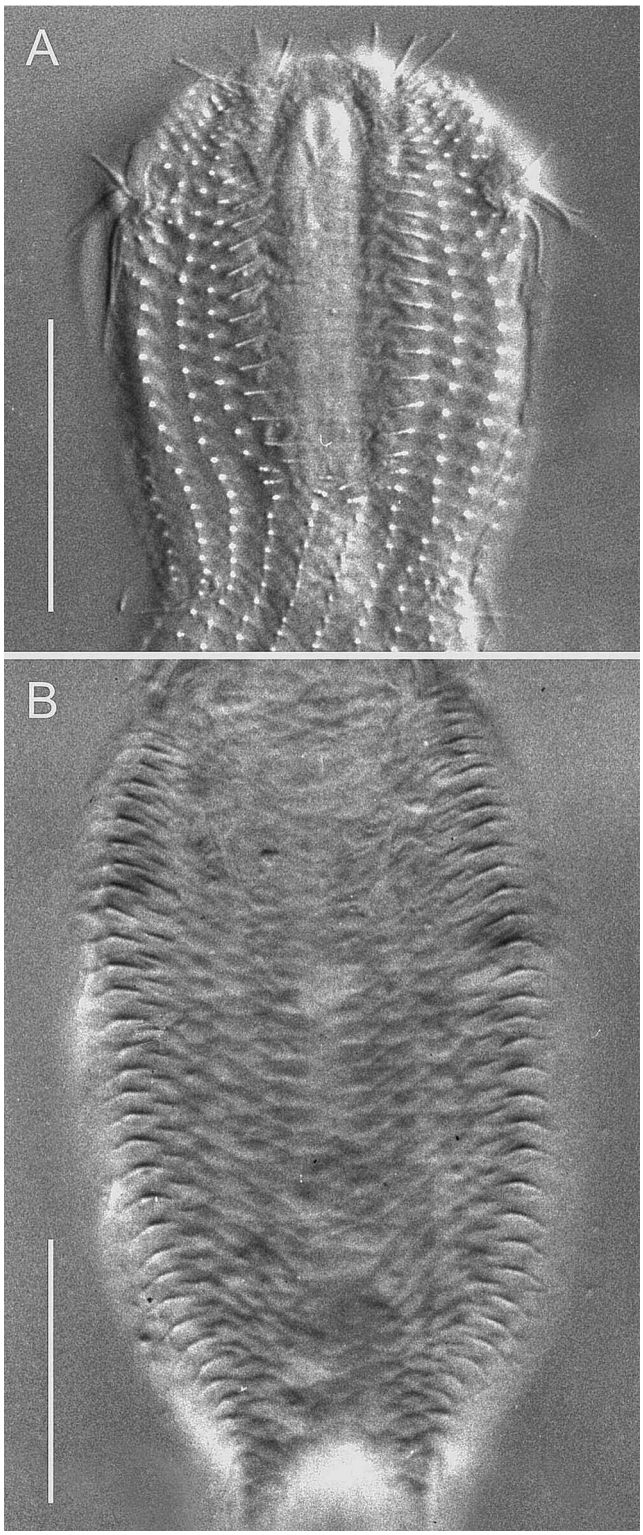

Figure 4. *Xenotrichula paralineata* sp. nov. DIC micrographs of **A.** Oval patch atop the head; **B.** ventral surface of trunk. Scale bar = 25 µm

Figure 4. *Xenotrichula paralineata* sp. nov. Micrographie DIC **A.** Partie ovale au sommet de la tête ; **B.** Surface ventrale du tronc. Echelle = 25 µm.

Because we are distinguishing *Xenotrichula paralineata* from its Mediterranean sibling species, *Xenotrichula lineata* Schrom, 1972, we provide here comparable information for the elder sib.

Xenotrichula lineata Schrom, 1972 redescribed

Xenotrichula lineata Schrom, 1972: 307, Fig. 9; Todaro et al., 2001.
Xenotrichula lineata of Hummon et al., 2005: Two videos on the server: http://hummon-nas.biosci.ohiou.edu.

Description

Adult: Lt 135-145 µm (n = 9) [from Alberoni, Figure 2], Lt 157-159 µm (n = 2) [from Bibione, see videos]; L to PhJIn 44-48 µm at U33. Body small, weakly ten-pin shaped, with short furca. Anterior head profile incurved medially, in association with a terminal mouth, then curving back laterally to form ovoid pluria; neck constriction slight; trunk svelte, terminating in a furca that indents medially to U83; furcal branches are scaled proximally (64%) and naked distally (36%). Widths of head/pluria, neck, trunk, furcal base/tips, and their locations along the body length are: 27/28, 23, 31, 21/25 at U04/17, 31, 57, 82/100.

Cuticular armature. Cephalion absent; hypostomium not seen. A longitudinally oval patch (17 x 32 µm) atop the head bears 16 transverse ridge-like scales lying behind one another from U05 to U29, each with oblique edges laterally, along with 3 sets of edges in front that lack transverse ridges; lateral to the patch are 4 columns per side solely of peduncules that on the trunk grade into truly pedunculated scales, having round base-plates, peduncles and end-plates (the only part as seen from above being a transverse ridge, lying just in front of the next peduncle to the rear); these scales are smaller on the rear of the trunk, giving way to bare peduncles that continue onto the furcal base, with 12 alternating longitudinal columns of ca. 65 scales each from U07 to U84. Ventral scales not noted, but ca. 28 “hydrofoil” scales per side run from U34 to U85. Furcal branches bear 6 scales on their medial surfaces.

Ciliature. Oral bristles 5-6 per side (L = 2-3 µm) and 5-6 (L = 3-5 µm) at the edges of each plurion. Cephalic cirri 2 per side, projecting dorsolaterally, one (L < 20 µm) of 3-4 cilia inserts just outside the cephalion, the other (L < 30 µm) of 5-6 cilia inserts behind the junction of head and plurion. Dorsal sensory bristles 5 per side (L = 5-7 µm), one on the neck, three on the trunk and one on the proximal furca at U27, U44, U57, U71 & U87. Ventral locomotor cirri are of similar size; longitudinal bands run the length of the pharynx, with several cirri per side in the mid-gut region at U48-U50.

Digestive tract. Mouth terminal, diameter 5 µm; mouth tube ribbed; pharynx lacks bulbs, but bears paired "trophi"-shaped cuticular hooks anteriorly; intestine of similar width throughout, narrowing slightly to the rear; anus ventral at ca. U75.

Reproductive tract. Hermaphroditic; testes lie lateral to the gut; developing eggs lie laterally above the midgut, several per side, the largest to the rear, reaching 22 x 16 µm or more in size.

Ecology

Occasional in frequency of occurrence (10-30% of samples), scarce in abundance (3-5% of a sample); medium sand, littoral at MTL-MLW.

Geographical Distribution

Mediterranean Sea - Europe: *Italy* (^Alberoni 45°21'N/12°19'E, Bibione).

Remarks

Two digital videos (see under #694 MPEG-2 156 mb, MPEG-4 [=WMV] 13 mb; #695 MPEG-2 158 mb, MPEG-4 [=WMV] 9 mb) from Bibione, Italy are available on the server, http://hummon-nas.biosci.ohiou.edu at Ohio University, Athens, Ohio, USA.

Discussion

Xenotrichula lineata is the only small sized (Lt < 160 µm) xenotrichulid species, lacking tentacles, that has locomotor cirri of similar size, pedunculated dorsal scales, ovoid pluria, an oval patch of 16 transverse scales atop the head, 6 medial scales per furcal branch, cirri beneath the gut at U48-U50, and a furcal indentation to U83. Adult *X. paralineata* are slightly larger than *X. lineata*, though had we sufficient specimens of each their size ranges would certainly overlap. *X. paralineata* also has 14 transverse scales in the patch atop the head, and 9 medial scales per furcal branch, as opposed to 16 transverse head scales and 6 medial furcal scales for *X. lineata*. Such deep morphological surveys (Hummon, 1971) as this are necessary before multi-regional cosmopolitanism can be confirmed or, in the present case, rejected.

There are 8 species in the subfamily Xenotrichulinae that have such patches of transverse scales atop the head, 5 of 11 among *Heteroxenotrichula** and 3 of 16 among *Xenotrichula*: *X. lineata*, *X. paralineata* and the *X. bispina* Mock, 1979 (p.17). The latter species is by far the largest species of the three (Lt = 200-235 µm, LPh = 57-59 µm with the PhJIN at about U30), and while similar in overall configuration, it has a heart-shaped hypostomion and the transverse scales of its dorsal cephalic patch are discontinuous from one side to the other and lack oblique elements (Mock, 1979). Hence, we conclude that *X. paralineata* is distinct from *X. lineata* and is not to be confused with any other species in the genus.

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**Xenotrichula simplex* Mock, 1979: 23 has such a dorsal cephalic patch, but must be transferred to the genus *Heteroxenotrichula* as *Heteroxenotrichula simplex* (Mock, 1979) because of its short tentacles, the shape of its pharynx with miniscule sub-terminal mouth, the large proportion of its furcal branch that is scaled, and the 25-30 similarly large "gleich großen" cirri in its sub-pharyngeal locomotor tract (not figured) compared with the small cirri in the mid-trunk region (figured, but not large); probably unseen by Mock were tiny cirri inserting in front of the locomotor tract in the pharyngeal region, though we will never know unless the species is recorded again.