



Italian marine Gastrotricha: IV. Four new species of Chaetonotida

MARIA BALSAMO

Dipartimento di Scienze della Produzione Animale,
Università di Udine,
via S. Mauro 2, I-33010 Pagnacco (Udine, Italy)

WILLIAM D. HUMMON

Department of Biological Sciences, Ohio University,
OH 45701- Athens (U.S.A.)

M. ANTONIO TODARO

PAOLO TONGIORGI

Dipartimento di Biologia Animale, Università di Modena,
via Università 4, I-41100 Modena (Italy)

ABSTRACT

Four new marine species of Gastrotricha Chaetonotida from the Italian coasts are described and figured: *Aspidiophorus lamellophorus*, *Chaetonotus (Euchaetonotus) magnificus*, *C. (E.) mediterraneus*, *Halichaetonotus italicus*.

KEY WORDS: KEY WORDS: Gastrotricha - Chaetonotida - Italian meiofauna - Mediterranean fauna - Benthos - Taxonomy.

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INTRODUCTION

This is the fourth of a series of papers, which describe several new species of marine gastrotrichs from Italian coasts that our group discovered in sandy samples collected during the summers of 1989-1991. Here we concentrate on four new species of Chaetonotida. The other three previous papers have reported the description of seven species of chaetonotids (Hummon *et al.*, 1992) and fourteen species of macrodasyids (Hummon *et al.*, 1993, 1996).

MATERIALS AND METHODS

The readers should refer to our previous papers for collecting sites, and sampling and study methods. Two additional sites are here added to the previous list: Campania - Bagnara, locality of Castellvolturno (Caserta) (41°03' N; 13°53' E) littoral and sublittoral, collection made in July 1989 by Group 3 (see Hummon *et al.*, 1993); Tuscany - Castiglione della Pescaia (Grosseto) (42°45' N; 10°51' E) littoral and sublittoral, collection made in June 1989 by Group 1. The set of morphological symbols and conventions, and the key to ecological characteristics used in the text are given in Hummon *et al.* (1992, Table IIA, B).

Abbreviations: L, littoral sample; PhJIn, pharyngo-intestinal junction; PhCv, pharyngeal chevron; SL, sublittoral sample.

TAXONOMIC ACCOUNT

Order Chaetonotida Remane, 1925
[Rao & Clausen, 1970]

Family CHAETONOTIDAE Zelinka, 1889
sensu Hummon, 1974

Genus *Aspidiophorus* Voigt, 1904

Aspidiophorus lamellophorus n. sp.
(Fig. 1)

Diagnosis - A small *Aspidiophorus* with total length to 109 μ m; PhJIn at U32; head three-lobed bearing cephalion and one pair of small pleuria; well-defined trunk follows minor neck constriction; furca short, 15 μ m, indenting to U87; ratio of fleshy:naked portion almost 2:3. Body enveloped by 23 columns (17 dorsal, 3+3 lateral) of about 50 stalked, rhomboidal scales of equal size over the body, and by two columns (1+1 ventrolateral) of 43-45 hydrofoil scales with rectangular lamellae. Ventrally, the intercilary field has 5-11 alternating columns of 35 keeled scales, and a pair of elongate ovoid scales occurs near the anus. At the ventral posterior end two elliptical scales are located respectively the one between each ciliary band and the adjacent column of hydrofoil scales, and the other, smaller, on the fleshy part of each furcal branch. Ventral ciliature forms two separate longitudinal bands. Subcylindrical pharynx, 34 μ m long.

Etymology - From the Latin "*lamella*", thin sheet, and "*ferre*", to carry, referring to the presence of the lamellar hydrofoil scales.

Description - The description is based on an adult specimen, 109 μ m in total length. Pharyngo-intestinal junction (PhJIn) at U32. Head slightly three-lobed with a

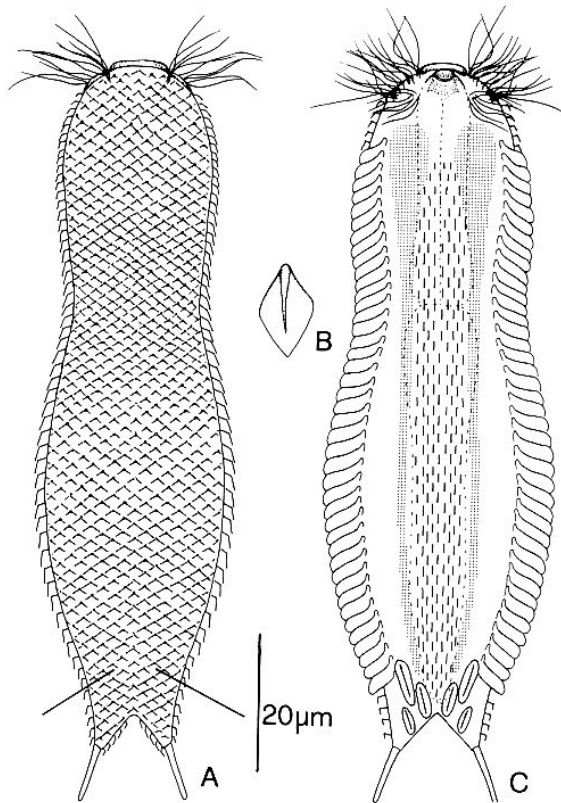


Fig. 1 - *Aspidiophorus lamellophorus* n. sp. A, dorsal view; B, dorsal scale; C, ventral view. Dotted mimics the locomotory ciliation.

cephalion 8.2 μm wide, and two small pleuria. A hypostomion was not seen. Body small, robust, with well-defined trunk and caudal base; widths of head/neck/trunk/caudal base are as follows: 22.7/18.0/27.2/15.5 μm at U11/U31/U60/U86, respectively. Furca short, 15 μm , with adhesive tubes of 9.0 μm . On either side of the head below are many sensory cilia, ranging from 4 to 13 μm in length; those above form a tuft at either side of the cephalion, 10 to 13 μm in length. A pair of dorsal tactile bristles, 12.5 μm long, arises near the posterior end at U81.

Cuticular armature: the body is enveloped by 23 columns (17 dorsal, 3+3 lateral) of about 50 pedunculated scales each, which extend posteriorly to cover the fleshy portion of the furca. Scales are rhomboidal in shape and of equal length over the entire body, 2.5-3.0 μm , except on the posterior end where they appear slightly smaller. A ventrolateral column of 43-45 hydrofoil scales occurs on each side: they project posterolaterally as rectangular lamellae 5.5 μm long. The ventral interciliary field shows 5 increasing to 11 alternating columns of 35 small, rounded scales with spiny process, that extend from U11 to U83. Three pairs of elliptical keeled scales occur at the ventral posterior end: one, 6.0 μm in length, is adjacent to the anus; another,

4.0 μm , lies on the fleshy portion of the furcal branches and the third, 7.2 μm , is between the ciliary bands and the columns of hydrofoil scales.

Ventral ciliation: paired longitudinal bands extend from U8 to U81; each is broad anteriorly but narrows posteriorly from the pharyngeal region; the bands remain separated throughout their length; cilia are short, ca. 3-4 μm .

Digestive tract: the mouth is subterminal and of medium width, 3.6 μm ; the subcylindrical pharynx is 34 μm in length and 6.6 μm in diameter in its central part, with a swelling at both ends, 9.0 μm wide. The anus opens ventrally at U88.

Protonephridia: a fairly well-defined protonephridium lies at either side of the foregut region.

Reproductive tract: specimens observed were in the parthenogenetic phase.

Ecology - Frequency of occurrence: sparse in littoral fine sand samples from the northern Adriatic Sea. Abundance: rare in samples where found.

Distribution - Type locality: Friuli - Mouth of the Isonzo river (lat. 45°45' N; long. 13°31' E) (L).

Remarks - Within the genus *Aspidiophorus*, rhomboidal scales regularly arranged are present in *A. marinus*, *A. mediterraneus* and *A. paramediterraneus*, but none of these species, nor other *Aspidiophorus* species, bears ventrolateral hydrofoil scales. Moreover, the morphology of the ventral posterior end of these specimens appears different from those of all the other co-generic ones.

Genus *Chaetonotus* Ehrenberg, 1830

Subgenus *Euchaetonotus* Schwank, 1990

Chaetonotus (Euchaetonotus) magnificus n. sp.
(Fig. 2)

Diagnosis - A small *Chaetonotus* of the *Euchaetonotus* subgenus; total length to 108 μm ; PhJIn at U32; head slightly five-lobed bearing cephalion, two pairs of pleuria and hypostomion; head, neck and trunk well-defined; furca long, 20 μm , indenting to U82; ratio of fleshy:naked portions 2:3. Body enveloped by 11 columns (5 dorsal, 1+1 lateral), each of 11-12 large, round to ovoid scales having long, thick spines with obliquely notched or blade-like apices; two posterior large, ovoid, and double-keeled scales bearing a pair of tactile bristles; two elongate keeled scales form an arc dorsally along the inner edge of the furcal base, and one ovoid scale bearing a short robust spine arises on each lateral side of the furcal base. The ventrolateral scales (2+2 columns) are three-lobed with long notched spines in the lateral columns, round with short simple spines in the ventral columns. The interciliary field has up to 25 rectangular plates in the pharyngeal region, followed by 5 alternating columns of round, smooth scales; a pair of elliptical spined scales occurs near the anus. A small subtriangular keeled scale occurs on the fleshy portion of each furcal branch. Ventral ciliation forms two separate longitudinal bands. Cylindrical pharynx, 31 μm long.

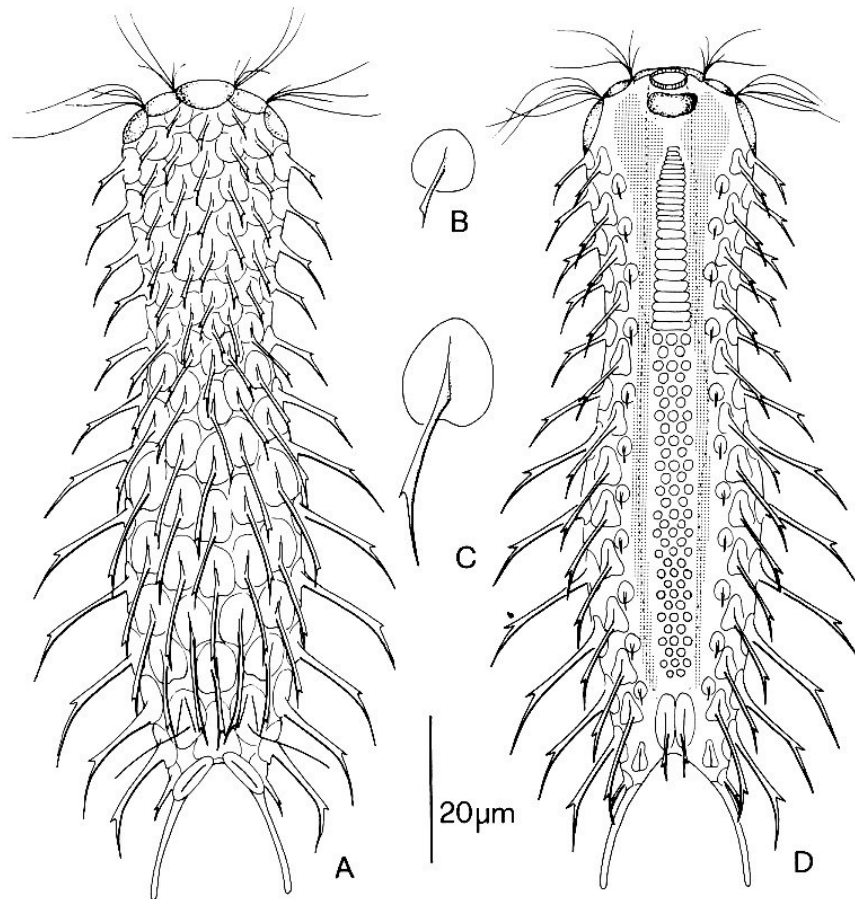


Fig. 2 - *Chaetonotus (Euchaetonotus) magnificus* n. sp. A, dorsal view; B and C, dorsal scales; D, ventral view. Dotting mimics the locomotory ciliature.

Etymology – From the Latin “*magnificus*” referring to the remarkable look of the species.

Description – The description is based on an adult specimen, 108 μm in total length; pharyngo-intestinal junction (PhJI) at U32. Head slightly five-lobed, with a cephalion 8 μm in width, two large pleuria per side, and a rectangular hypostomion, 2 μm in length \times 4 μm in width. Body short, slender, with well-defined head, neck, trunk and caudal base, which measure in width 22.5/17.0/24.0/15.0 μm at U08/U30/U53/U78, respectively; long furca, 20 μm , that indents medially to U82, and is formed by a short fleshy base for one third and two thin adhesive tubes for the distal two-thirds, 12 μm . On either side of the head are two distinct tufts of 4-5 cilia widely varying in length, the anterior ranging from 3 to 14 μm and the posterior from 6 to 19 μm . One pair of dorsal tactile bristles, 13 μm in length, is borne at U77 by a pair of large, round, and double-keeled scales.

Cuticular armature: the body is enveloped by 11 columns (5 dorsal, 1 + 1 lateral, 2 + 2 ventrolateral) of

11-12 spined scales each. The dorsal and lateral scales of the head and neck region are round, 3.0-4.4 μm , and partially overlapping; those covering the trunk region are ovoid to heart-shaped, 5.0-7.5 μm in length, and non-overlapping. All the scales bear long and thick spines with obliquely notched or blade-like apices, except for the last but one scales of the three median columns, which are only keeled, and the last scale of the central column, which is three-lobed and completely smooth. Dorsal spines range in length from 3.5 μm on the head, to 10 μm on the neck, to 11.3-14 μm on the trunk; the lateral ones are longer, ranging from 7.0 to 16.9 μm . At the posterior end, two elongate and keeled scales form an arc along the inner edge of the furcal base, while two ovoid scales provided with short and robust notched spines, 3.7 μm , cover its lateral sides. The two ventrolateral columns are composed of three-lobed scales, 3.0-4.5 μm in length, bearing very thin spines with notched apices, which increase in length from 5.6 to 11.6 μm ; the scales of the two columns lying just outside the ciliary bands are small, 2-3 μm in diameter, with short,

simple spines, 2.0-2.5 μm . The ventral interciliary field is covered with about 25 rectangular plates on the pharyngeal region, and with five alternating columns of about 20 round, smooth scales on the intestinal region. Plates increase in size up to 1.5 μm in length and 5 μm in width at the end of the pharyngeal region; all the round scales have the same diameter, 1.5 μm . Two ovoid, keeled scales, 8.5 $\mu\text{m} \times 3.0 \mu\text{m}$, occur near the anus and bear notched spines, 3 μm long, which protrude into the intrafurcal space; a small, three-lobed and keeled scale is located on the fleshy portion of each furcal branch.

Ventral ciliation: paired longitudinal bands extend from U03 to U74; each is broadly club-shaped anteriorly, but narrows considerably from the posterior pharyngeal region; the bands approach each other immediately behind the hypostomion, but remain separate there, as they do throughout their entire length.

Digestive tract: the mouth is subterminal and of medium width, 5.7 μm . The cylindrical pharynx is 31 μm

long, and 6.5 μm wide. The anus opens ventrally at U78.

Reproductive tract: only parthenogenetic specimens were observed, with small oocytes.

Ecology - Frequency of occurrence: sparse to occasional in littoral fine-medium sand samples of the central Tyrrhenian Sea. Abundance: rare to scarce in samples where found.

Distribution - Type locality: Tuscany - Castiglione della Pescaia, (42°45' N; 10°51' E) the public beach (L). Other locations: Circeo (L), Serapo (L) (see Table 1 and Fig. 1 of Hummon *et al.*, 1992).

Remarks - Within the subgenus *Euchaetonotus*, large, ovoid scales and very thick spines with notched apices characterize *Chaetonotus antipai* and *C. apolemmus*. However, both these species have a higher number of scales per column, 18-20 *vs* 11-12, and a clearly dissimilar morphology of the dorsal and ventral posterior ends.

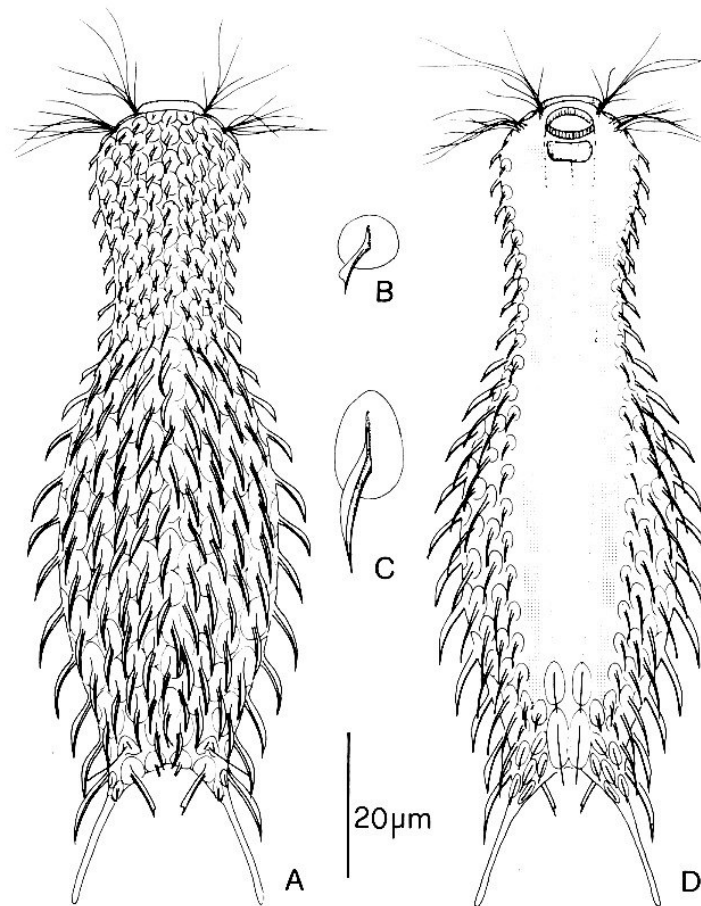


Fig. 3 - *Chaetonotus* (*Euchaetonotus*) *mediterraneus* n. sp. A, dorsal view; B and C, dorsal scales; D, ventral view. Dotting mimics the locomotory ciliation.

Chaetonotus (Euchaetonotus) mediterraneus
n. sp. (Fig. 3)

Diagnosis – A small *Chaetonotus* of the *Euchaetonotus* subgenus, with total length to 112 µm; PhJIn at U30; head slightly five-lobed, bearing a large cephalion, two pairs of pleuria and hypostomion; head, neck and trunk well-defined; furca of medium length, 22.6 µm, indenting to U89; ratio of fleshy:naked portion 1:2. Body enveloped by 17 columns (9 dorsal, 1 + 1 lateral) each of 19-20 round to elliptical scales with a weak keel extending in a long simple spine; dorsal and lateral spines bear a narrow lamellar expansion. Two pairs of round scales on the dorsal edge of the furca, the medial one with short spines and the lateral one carrying long notched spines. Four small, keeled scales located dorsally just at the base of each adhesive tube. Of the ventrolateral columns, the two more ventral per side only occur in the trunk region and are composed of 10 spined scales each. Interciliary field bare. Ventrally, two pairs of pear-shaped scales with a keel extending in spiny process occur near the anus; four small, elliptical, and spined scales lie on the fleshy base of each furcal branch. Ventral ciliature forms two longitudinal bands that are connected behind the hypostomion.

Etymology – The species name alludes to its type locality.

Description – The description is based on an adult specimen, 112 µm in total length; pharyngo-intestinal junction (PhJIn) at U30. Head slightly five-lobed, with a cephalion 9.0 µm wide, two pleuria per side and a rectangular hypostomion behind the mouth, 3.0 µm in length × 6.5 in width. Body small, robust, with well-defined head, neck, trunk and caudal base, whose widths are 20.6/15.2/27.0/15 µm at U08/U34/U55/U81, respectively; furca of medium length, 22.6 µm, U-shaped and indenting medially to U89; adhesive tubes attain 15.4 µm in length. On either side of the head are two distinct tufts of five-six cilia each; the anterior tufts include two-three very long cilia, 17.6-18.0 µm. A pair of dorsal tactile bristles, 8-10 µm long, is borne at U78 by two small, sub-triangular, and double-keeled scales.

Cuticular armature: the body is enveloped by 17 non-overlapping columns (7 dorsal, 1 + 1 lateral) of 18-20 spined scales each. Dorsal and lateral scales are round on the head, 3.5-4.0 µm in diameter, and elliptical on the trunk, 4.0-6.2 µm in length; they all have a weak keel extending in a simple, thick, and curved spine, which is provided with a narrow lamellar expansion anteriorly along its whole length. The length of the spines increases from the head, 2.4-3.5 µm, to the trunk, 9.2 µm. The last spine of each lateral column, arising at U82, is particularly long, 11.4 µm. At the dorsal posterior end, a series of four keeled and spined scales edge the furcal indentation: the lateral scales are larger, 3.6-3.8 µm, and bear distally notched spines, 5.4 µm long; the medial ones, 2.2-2.5 µm, have simple spines of 2.5 µm. Additionally, a couple of small, keeled scales delimit distally the fleshy part of each furcal branch. The spines of the ventrolateral columns (3 + 3) have no lamellae and decrease in length from the lateral to ventral side. The ventral interciliary field is bare. At the ventral posterior end, two pairs of pear-shaped, keeled scales, 7.2 µm in length, with short spines, 4 µm, occur near the anus.

Four small, elliptical, and spined scales, 2.5-3.5 µm cover the ventral base of each furcal branch.

Ventral ciliation: paired longitudinal bands extend from U5 to U75; each is wider in the head region and narrows from the neck region; the rows are connected behind the hypostomion, but remain separate throughout the rest of their length; cilia are short, ca. 6-7 µm.

Digestive tract: the mouth is subterminal and wide, 7.5 µm. The pharynx, 26.3 µm in length, is subcylindrical with a slight anterior swelling where two cuticular rods occur; anus opens ventrally at U75.

Reproductive tract: all the specimens observed were in parthenogenetic phase and no spermatozoa were seen.

Ecology – Frequency of occurrence: sparse in littoral and shallow sublittoral fine-medium sand samples along the western coast of Italy; sparse in littoral fine sand elsewhere. Abundance: rare to scarce in samples where found.

Distribution – Type locality: Liguria - Albisola (44° 18' N; 0.8° 21' E) (SL) (see Hummon *et al.*, 1996). Other locations: Porto Nuovo (SL), Pozzuoli (SL).

Remarks – The only species of the subgenus *Euchaetonotus* with dorsal spines bearing lamellar expansions is *Chaetonotus tempestivus*. However, many morphological features distinguish the latter species, like its peculiar pleuria, the different arrangement of scales at the posterior dorsal and ventral end, and the shape of the lamellar expansions of the spines that are also much shorter (cf. Mock, 1979, Fig. 18). Dorsal lamellar expansions are present also in some species of the genus *Halichaetonotus*, like *H. jucundus* and *H. paradoxus*, but they always coexist with similar expansions of the ventrolateral scales (hydrofoil scales), which have an hydrodynamic function and characterize all the species of this genus.

Genus *Halichaetonotus* Schrom, 1972

Halichaetonotus italicus n. sp.
(Figs 4, 5)

Diagnosis – A small *Halichaetonotus*, with total length to 114 µm; PhJIn at U28; head slightly three-lobed, with cephalion, and two pairs of small pleuria; hypostomion not seen; head and trunk well-defined; furca, 20.7 µm, indenting to U84; ratio of fleshy:naked portions 3:5. Body enveloped by 19 columns (9 dorsal, 1 + 1 lateral) each of 17-19 round to elliptical scales with prominent keels; a pair of hemi-elliptical, keeled scales on the dorsal fleshy furcal base; two ventrolateral columns (1 + 1) of 16 round hydrofoil scales with spinous lamellae; 6 (3 + 3) ventral columns of round, small scales with tiny spines. The interciliary field is bare; ventrally, a pair of elliptical keeled scales occur near the anus, and two small keeled scales per side lie on the inner edge of the furcal base. Ventral ciliature in two bands connected behind the mouth. Pharynx 29.7 µm, with two swellings; PhCv present. Hermaphroditic species with a large X-organ and thread-like spermatozoa.

Etymology – The species name refers to the geographical location of the type locality.

Description – The description is based on an adult,

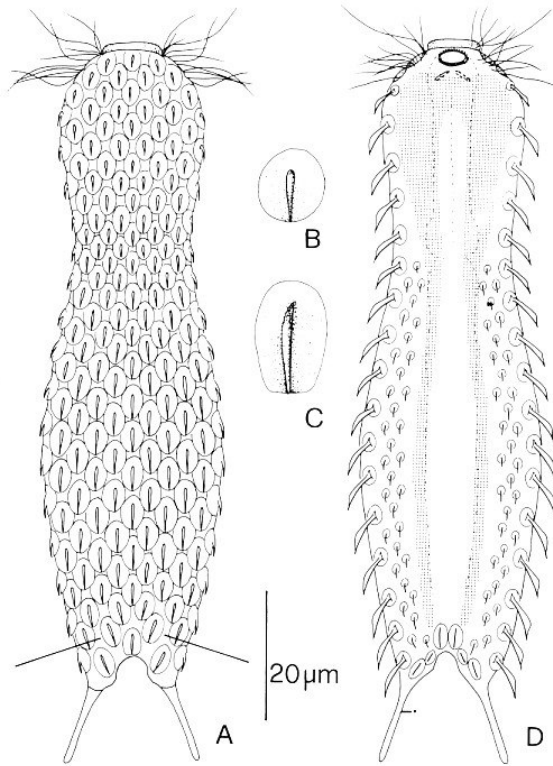


Fig. 4 - *Halicbaetonotus italicus* n. sp. A, dorsal view; B and C, dorsal scales; D, ventral view. Dotting mimics the locomotory ciliature.

hermaphroditic specimen, 114 µm in total length; pharyngo-intestinal junction (PhJIn) at U28. Head three-lobed, with a cephalion 9 µm wide, and two very small pleuria per side; a hypostomion was not observed. Body small, slender, with head and trunk well-defined; widths of head/neck/trunk/caudal base are 23/19/29/14 µm at U10/U27/U57/U91, respectively; furca 18 µm long, which indents medially at U84 and has long adhesive tubes, 12.6 µm. On either side of the head are two tufts of cilia connected with one another by some short cilia: the anterior comprises five cilia, 3-15 µm in length, and the posterior five-six cilia, 10-14 µm. One pair of dorsal bristles, 8 µm long, arises at U83.

Cuticular armature: the body is enveloped by 19 columns (9 dorsal, 1 + 1 lateral) of 17-19 round to elliptical, keeled scales, 3-5 µm long, and slightly overlapping. Posteriorly, a pair of hemi-elliptical, keeled scales, 4.7 µm in length, cover the dorsal side of the fleshy furcal base. The two (1 + 1) ventrolateral columns are composed of 17 small, round hydrofoil scales, 2.5-3.0 µm in diameter, bearing small spinous lamellae, 5.7-7.0 µm long. The other ventrolateral columns (3 + 3) occur bilaterally throughout the trunk region, between the hydrofoil scales and the ciliary bands: each column is made of 10-12 small, round scales, 1-2 µm in diameter,

with short and thin spines, 1-2 µm. The interciliary field is bare; a pair of elliptical keeled scales, 4.1 µm long, occur near the anus, and two small, keeled scales, 1.5-2.5 µm, lie along each medial edge of the furcal base.

Ventral ciliation: paired longitudinal bands extend from U05 to U81; each is broader anteriorly but narrows from the anterior intestinal region; the bands meet medially behind the mouth; cilia are 7-9 µm in length.

Digestive tract: the mouth is subterminal and of medium width, 5 µm; the pharynx, 29 µm in length, is 5.5 µm wide in the middle region, but shows swellings at both ends, 7.5 µm wide the anterior and 9.5 µm the posterior; a well-developed pharyngeal chevron (PhCv) is present anteriorly; the anus opens ventrally at U81.

Reproductive tract: one of the specimens observed was in hermaphroditic phase, showing a large, bilobate X-organ surrounding the posterior intestine, and two clews of thread-like spermatozoa lateral to the mid-intestine (Fig. 5); immature oocytes were seen laterally along the posterior half of the intestine.

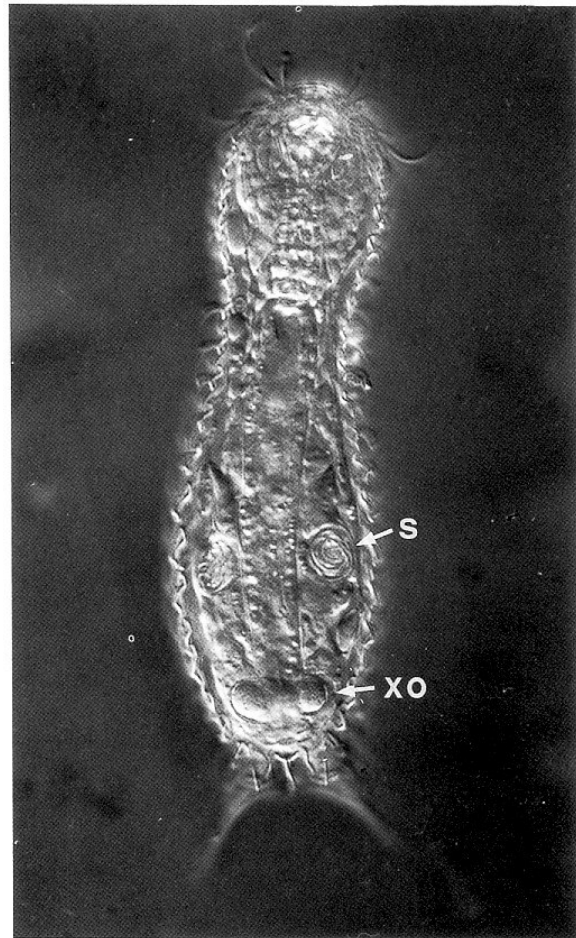


Fig. 5 - *Halicbaetonotus italicus* n. sp. Habitus of the hermaphroditic specimen; s, spermatozoa; xo, X-organ (Nomarski optics, $\times 1100$).

Ecology – Frequency of occurrence: sparse in littoral fine sand of the central Adriatic Sea and in shallow sublittoral fine sand of the central Tyrrhenian Sea. Abundance: rare to scarce in samples where found.

Distribution – Type locality: Apulia - Torre Fortore (41°56' N; 15°21'E), north of Lesina, beyond the lagoon of Lesina (L). Other location: Bagnara (SL).

Remarks – The suboval shape and the well-developed keel of the dorsal scales, as well as their regular arrangement approach these specimens to *Halichaetonotus riedli*, *H. decipiens* and *H. thalassopais*. The latter two species have also the same number of columns and of scales per column, and similar main metric parameters. However, all these species differ from the specimens observed in the morphology of the ventral posterior end. Similar hydrofoil scales are described for *H. pleuracan-*

thus, which is however a much larger species (150-170 µm total length *vs* 104-114 µm), and bears also dorsal scales morphologically different.

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