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Italian marine Gastrotricha: II. One new genus and ten new species of Macrodasyida

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ABSTRACT

A new genus, *Dendropodola*, and species, *D. transitionalis*, are described in the family Dactylopodolidae. Three new species, *Cephalodasys hadrosomus, Mesodasys adenotubulatus*, and *Mesodasys ischiensis*, are described in the family Lepidodasyidae. And, six new species, *Pseudostomella etrusca, Ptychostomella tyrrhenica, Tetranchyroderma heterotubulatum, Tetranchyroderma hypopsilancrum, Tetranchyroderma pachysomum*, and *Tetranchyroderma thysanophorum*, are described in the family Thaumastodermatidae. All were collected in littoral and shallow sublittoral sediments along the Italian coastline of the Mediterranean Sea and its adjacent waters.

KEY WORDS: Gastrotricha - Macrodasyida - Italian meiofauna - Mediterranean fauna - Taxonomy.

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INTRODUCTION

The first species of marine Gastrotricha that was reported for Italy was described by Claparède (1867) from the harbor of Naples as *Hemidasys agaso*. Though others have searched for it, no one has since seen this enigmatic animal. Subsequently, several workers have studied in the region of Naples and the Tyrrhenian Sea: Remane (1927a, b, 1951), Wilke (1954), Papi (1957), Boaden (1965a, b), Clausen (1965), Renaud-Mornant (1968), Hummon (1977), Todaro *et al.* (1988), Balsamo *et al.* (1992), Todaro (1992), and Todaro *et al.* (1992). Some have worked in the Adriatic Sea: Grünspan (1908), De Zio & Grimaldi (1964), Schrom (1966a, 1970, in Riedl 1970), Tongiorgi & Balsamo (1984), and Hummon *et al.* (1990). Others have worked in the Ligurian Sea: Gerlach (1953), Luporini *et al.* (1971, 1973a, b), Luporini & Tongiorgi (1972), and Tongiorgi (1975), and in the Ionian Sea: Balsamo & Todaro (1987). Despite this work, most of which was completed well before 1985, it is interesting to note that neither these nor any other reference on marine gastrotrichs from France, Croatia, Algeria, or Tunisia appeared in a recent review on the meiobenthos of the Mediterranean Sea (Soyer, 1985). In fact, there was no mention in the review of the presence of the phylum Gastrotricha in the region.

Prior to our current extensive study, more was already known about the marine gastrotrich fauna of Italy than of any other country in the Mediterranean. Some 92 species were already known from 42 sites in Italy (52 Macrodasyida, representing 17 of the 25 genera then known the world over, plus 40 Chaetonotida, representing all 10 of the genera that have marine representatives). Our work of 1989 (summer) increased the species known to 144 (74 Macrodasyida; 70 Chaetonotida) from 109 sites. For perspective, this can be compared with our present information for the British Isles – 117 total species (73 Macrodasyida; 44 Chaetonotida) from 137 sites – and for the remainder of northern Europe – 146 total species (78 Macrodasyida; 68 Chaetonotida) from 222 sites [WDH, unpublished data].

The present study is part of a larger program of biogeographic and faunistic surveys whose goal is to improve our knowledge about the nature, origin and distribution of the Italian fauna. In 1988 we began an extensive study of the species that live along the entire Italian coastline as part of our preparation for a volume of the *Fauna d'Italia* which we will write on the Gastrotricha. Thus far, we have found numerous species of both macrodasyids and chaetonotids that are new to the Italian fauna or new to science. The first results of this research are presented in the present paper and in those of Hummon *et al.* (1992), Balsamo *et al.* (1992), Todaro (1992), and Todaro *et al.* (1992).

This is the second of a series of papers, which will describe a total of about 40 new species from Italy that we discovered during our work in the summer of 1989. Here we concentrate on macrodasyid species. The first

Fig. 1 - Italy, showing sampling locations (circles) for species listed in Table I, and in Table I of Hummon *et al.* 1992.

paper (Hummon *et al.*, 1992) considered species in the order Chaetonotida; further papers will describe additional species in the orders Macrodasyida and Chaetonotida, respectively. In each case, we will attempt to clarify the literature as we report our findings. Biogeographical data for the species described here are presented in the distribution section for each species, while a summary of information regarding locations and collectors is given in Hummon *et al.* (1992) and in Figure 1 and Table I of the present paper. The vast amount of biogeographical data on previously described species that we have gathered, and continue to collect, will be published separately. Data in tabular form for all species are available from the authors on request, for the use of persons working with marine Gastrotricha who need cross-referenced information about species and sites.

In the present paper, a new genus, *Dendropodola* and species *D. transitionalis* are described in the family Dactylopodolidae. Three new species, *Cephalodasys hadrosomus, Mesodasys adenotubulatus*, and *Mesodasys ischiensis*, are described in the family Lepidodasyidae. Six new species, *Pseudostomella etrusca, Ptychostomella tyrrhenica, Tetranchyroderma heterotubulatum, Tetranchyroderma hypopsilancrum, Tetranchyroderma pachysomum*, and *Tetranchyroderma thysanophorum*, are described in the family Thaumastodermatidae.

MATERIALS AND METHODS

This second paper, describing some new species of macrodasyid gastrotrichs from the Italian coastline, follows our first contribution on Chaetonotida to which the reader should refer for sampling and study methods, and for the list of the collecting sites (cf. Hummon *et al.*, 1992: Fig. 1 and Table I). In the present paper we just give the list of the collecting sites not mentioned before (Table I and Fig. 1). The set of morphological symbols and conventions, and the key to the ecological characteristics used in the text are given in Table IIa and b.

TABLE I - *Locations in Italy at which species of Macrodasyida have been found, along with sites collected and persons involved in the collections (see also Hummon* et al., *1992; Table I).*

Location		
TUSCANY		
La **B**iodola (Isola d'Elba)	42°,48'N; 10°,15'E	LS G # 5
Castiglione della Pescaia (Grosseto)	42°,45'N; 10°,51'E	LS G # 1
Lacona (Isola d'Elba)	42°,45'N; 10°,19'E	S G # 5
LATIUM		
Montalto Marina (Civitavecchia)	42°,20'N; 11°,33'E	LS G # 10
CAMPANIA		
Lacco **A**meno (Isola d'Ischia)	40°,45'N; 13°,53'E	M G # 12
*Casamicciola (Isola d'Ischia)	40°,44'N; 13°,54'E	LS G # 3
Licola (Napoli)	40°,25'N; 14°,58'E	LS G # 12
LUCANIA		
Lido di **P**olicoro (Metaponto)	40°,11'N; 16°,44'E	LS G # 2
APULIA		
Peschici (Testa del Gargano)	41°,56'N; 16°,00'E	LS G # 10
VENETO		
Alberoni (Venezia)	45°,21'N; 12°,19'E	L Schrom

For simplicity, the collecting sites are given in the text in abbreviate form by the name the capital letter of which is in bold-face type in the Table.
*, Type locality for one of the new species described herein.
Sites sampled: L = Littoral; S = Shallow sublittoral (usually 1.5 m, sometimes 0.8-3 m water depth); M = Medium sublittoral (4-10 m water depth).
Collections made by: Groups #1,2 - VI, VII.1989 (WDH, MAT, PT & Maria Balsamo); Group #3 - VIII.1989 (WDH & MAT); Group #4 - IX.1989 (MAT & Maria Balsamo; see also Todaro & Balsamo, in press); Groups #5, 6, 7, 8 - IX.1989, V, VI, IX.1990 (MAT, PT & Maria Balsamo; see also Balsamo *et al.*, 1992); Group #9 (MAT & PT; see also Todaro, 1992); Groups #10, 11, - VI. VII.1991 (MAT & Wayne A. Evans); Group #12 - VIII.1991 (WDH, MAT & Margaret R. Hummon).

TABLE IIA - *Key to morphological symbols and conventions.*

Lt:	Length, total, from anterior tip of head to posterior tip of caudum and its adhesive tubes
U:	Percentage units of Lt from anterior to posterior
PhJIn:	Junction between pharynx and intestine
TbA:	Adhesive tubes of the anterior series
TbL:	Adhesive tubes of the lateral series, including dorso- and ventrolateral elements, but not tubes of strictly dorsal (TbD) or ventral (TbV) series, or peculiar tubes, such as «dohrni», «cirrata», or «prostobuccantia» tubes
TbP:	Adhesive tubes of the posterior series
Columns:	longitudinal in orientation
Rows:	transverse in orientation

TABLE IIB - *Key to ecological characteristics.*

Frequency of a species from among a sample series:

Sparse:	less than 10% of samples
Occasional:	10-30% of samples
Common:	30-60% of samples
Usual:	more than 60% of samples

Abundance of a species among other species of a sample:

Rare:	less than 1% of a sample
Scarce:	3-5% of a sample
Numerous:	10-20% of a sample (often a sub-dominant)
Prevalent:	more than 30% of a sample (usually a co-dominant or dominant)

TAXONOMIC ACCOUNT

Order **Macrodasyida** Remane, 1925
[Rao & Clausen, 1970]

Family DACTYLOPODOLIDAE Strand, 1929

Dendropodola n. gen.

Diagnosis - A member of the Dactylopodolidae with body subdivided into head, neck, body and caudal peduncle. Tactile hairs, ventral locomotor ciliation, and epidermal glands may be various; pharyngeal pores of the digestive system typically open behind the level of the neck constriction. Adhesive tubes: anterior (TbA), 1 per side; lateral (TbL), 3 or more per side; posterior (TbP), 2 or more per side, one arising in association with the proximal end of the caudal peduncle and at least one associated with a furcette at its distal end. Reproductive organs unknown at this time.

Remarks - This genus lies between *Dendrodasys* and *Dactylopodola* in the family Dactylopodolidae, having characters of both, as well as others that are unique. Like *Dendrodasys* are the arrangements of its TbA and TbP, including the presence of a caudal peduncle; like *Dactylopodola* are, its head-neck-trunk body conformation and TbL arrangement. Of the remaining characters, with only one species known at this time and that one species known only from a subadult, it is unclear which characters will prove to be generic, i.e. those that will be found in other species that have yet to be discovered or to be assigned to this genus, and which belong solely to the type species.

Dendropodola transitionalis n.sp.
Fig. 2

Diagnosis - A *Dendropodola*, with a subadult length of 175 µm; PhJIn at U43; body with well-defined head, neck, trunk and short caudal peduncle. Sensory hairs elongate, several per side laterally, evenly spaced from about U10 to U75, and twice that many dorsally, scattered from about U05 to U95. Glands: numerous per side in lateral columns, with fewer present in dorsal columns. Adhesive tubes: TbA, 1 per side, flanked by a short sensory cone that is tipped with a cilium; TbL, 3 per side, inserting ventrolaterally in the mid-body region, the 1st further from the 2nd than the 2nd from the 3rd; TbP, 2 per side, one arising from the posterior trunk just before the caudal peduncle, the other located at the apices of the furcette, which arises distally from the short caudal peduncle; morphology of TbA and TbP differ from TbL. Ventral locomotor cilia: paired longitudinal tracts that join fore and aft. Reproductive organs unknown at this time.

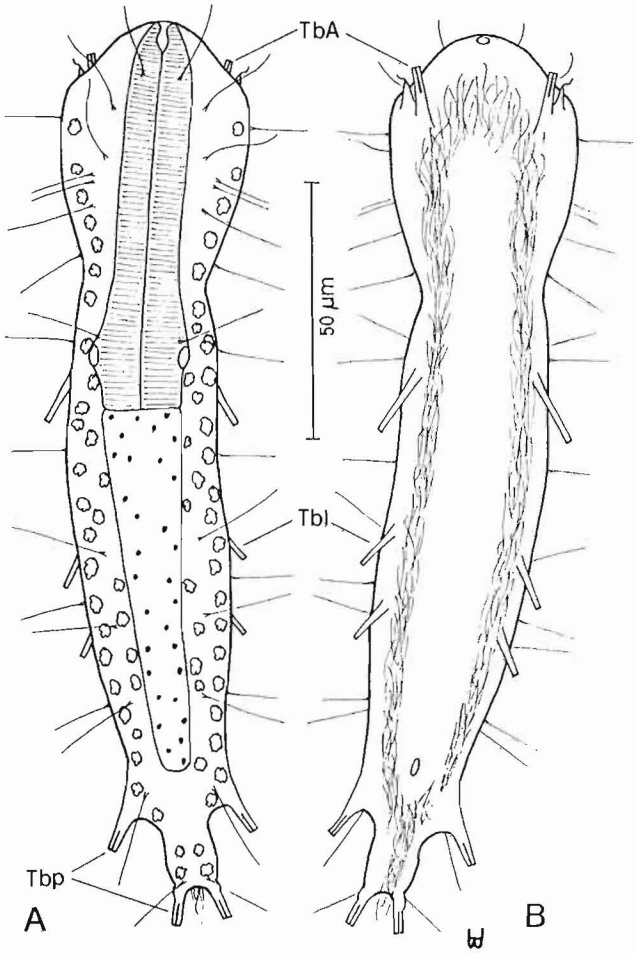

Fig. 2 - *Dendropodola transitionalis* n. gen, n.sp. A, dorsal view, showing details of the body conformation, the lateral and dorsal sensory hairs, the glands, the digestive tract, and the posterior adhesive tubes (TbP); B, ventral view, showing details of the mouth and anus, the ventral locomotor ciliary field, the anterior adhesive tubes (TbA) and sensory cones, and the lateral (TbL) and posterior adhesive tubes.

Etymology - The name represents the transitional state that this species occupies between species of the genera *Dendrodasys* and *Dactylopodola*.

Description - The description is based on but a single subadult specimen, 175 µm in total length. Pharynx 77 µm in length; pharyngeo-intestinal junction at U43. Body short, robust, with well-defined head, neck, trunk and caudal peduncle; widths of head/neck/trunk/caudal base are as follows: 37/24/30/9 µm at U10/U29/U57/U89, respectively; caudum well-defined, with a short, relatively broad peduncle (8-10 µm wide by 20 µm long),

including a small furca (= a furcette) distally that indents medially to U96. Sensory hairs are elongate, with 6 per side laterally (8-14 μm in length), evenly spaced from U12 to U74, and twice that many dorsally (12-20 μm in length), scattered from U06 to U95; those on the head are more flexible than those on the trunk. Glands are numerous (2-3 μm in diameter), 26-28 per side in lateral columns extending from U11 to U95, and 6-8 in dorsal columns extending from U39 to U82. Longitudinal muscles are probably striated.

Adhesive tubes: there is 1 anterior tube (TbA) per side, 12 μm in length, inserting directly on the body surface at U08, about halfway between the midline and the lateral head border; exterior to the TbA and diagonally in front of it is a sensory cone, 5 μm in length and 3 μm wide at the base, tipped with a 3 μm-long cilium. There are 3 lateral tubes (TbL) per side, 13, 10 and 8 μm in length respectively and inserting ventrolaterally at U37, U55 and U65. Dorsal tubes (TbD) are absent, as are lateral tubes in the strictest sense. There are 2 posterior tubes (TbP) per side: one, 10 μm in length, arising from the posterior trunk just in front of the caudal peduncle, the other, 8 μm long, located at the apices of the furcette, which arises distally from the 20 μm-long caudal peduncle. The TbL appear to have a different morphology than the TbA and TbP, the former seeming less obviously to be of the duo-gland form (see Tyler & Rieger, 1980, Fig. 1c) than the latter.

Ventral ciliation: paired longitudinal tracts extend from U08 to U85, each narrow in breadth (ca. 5 μm) and sparsely covered with elongate cilia (8-12 μm in length); they meet medially in front of the TbA and again behind the anus, after which they continue as a single column of the same width onto the caudal peduncle to the level of the furcette.

Digestive tract: the mouth is narrow (2 μm in width), buccal cavity narrow, goblet-shaped; the pharynx is narrow, its pores opening at the level of the neck constriction (U29); the intestine is medium in breadth (10-12 μm), narrowing somewhat to the rear (6-10 μm); the anus opens ventrally at U82.

Reproductive tract: no information.

Distribution: Type locality - TUSCANY: Mortelliccio [lat. 42°, 56' N; long. 10°, 41' E], the beach being approached by means of a coastal road that parallels State Route 1, some 4 km northwest of Follonica (L) [see Fig. 1 in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in fine littoral sand; Abundance - rare in samples where found.

Remarks - Based on our knowledge of members of this family, adult specimens may reach 350 μm in total length, or roughly four to five times the pharynx length.

Taxonomic affinities - Dendropodola transitionalis has the mosaic features that are characteristic of transitional species. Of the kindred species known, it is most closely aligned in body conformation with *Dactylopodola indica* (Rao & Ganapati, 1968), the latter having head, neck, trunk and caudal peduncle regions, as well as the lateral adhesive tubes that are characteristic of that genus. However, *Dactylopodola indica* lacks the ventral cephalic sensory cone of *Dendropodola transitionalis* and also possesses more adhesive tubes in each series (2 TbA, 5 TbL and 4 TbP per side), all of the TbP being associated with posterior borders of the caudal lobes, with no tubes being associated with the proximal end of the caudal peduncle. The difference in numbers of TbL are not necessarily a problem, since these tubes are often added relatively late in the maturation process, and it is possible that *Dendropodola transitionalis* too will have a larger number in roughly the same locations if it doubles its subadult size at sexual maturity; it might add a 4th tube behind the present 3rd tube and then a 5th tube just in front of or behind the postulated 4th tube. But, this does not hold for either the TbA or the TbP, which if few in number are established earlier in life.

The nearest species of *Dendrodasys* to *Dendropodola transitionalis* is *Dendrodasys pacificus* Schmidt, 1974. *Dendrodasys pacificus* has a somewhat comparable body conformation to *Dendropodola transitionalis* and agrees with it with respect to TbA and TbP, but lacks the ventral cephalic sensory cone, all TbL, and has two rather than one TbP at the tip of each furcal branch. Indeed, none of the species of *Dendrodasys* that we presently know have the ventral cephalic sensory cone or anything other than two TbP at the tip of each furcal branch.

Family LEPIDODASYIDAE Remane, 1926

Genus *Cephalodasys* Remane, 1926

Cephalodasys hadrosomus n.sp.

Figs 3, 4

Diagnosis - A *Cephalodasys*, to 322 μm or more in length; PhJIn at U47; body short, thick, with more-or-less parallel sides. Head with a dorsal broad transverse band of cilia from U04 to U11, not connecting with the ventral locomotor cilia; sensory hairs short, 8-9 per side in lateral and dorsal colums, evenly spaced from U16 to U93, hairs in the two columns alternating with one another. Glands are numerous, ca. 50 per side in lateral columns. Adhesive tubes: TbA, 6 per side; TbL absent; TbP 13 in a single arc bordering the caudum, with 6 additional tubes forming a second arc, inserting posterioventrally. Ventral locomotor cilia: paired longitudinal tracts that join in mid-intestinal region and continue onto the caudum. Reproductive system: testes unknown; egg large, dorsal.

Etymology - The name refers to the thick, compact body (*hadros*, Gk. stout; *soma*, Gk. body) of the animal.

Description - The description is based on but a single adult specimen, 322 μm in total length. Pharynx 152 μm in length; pharyngeo-intestinal junction at U47. Body

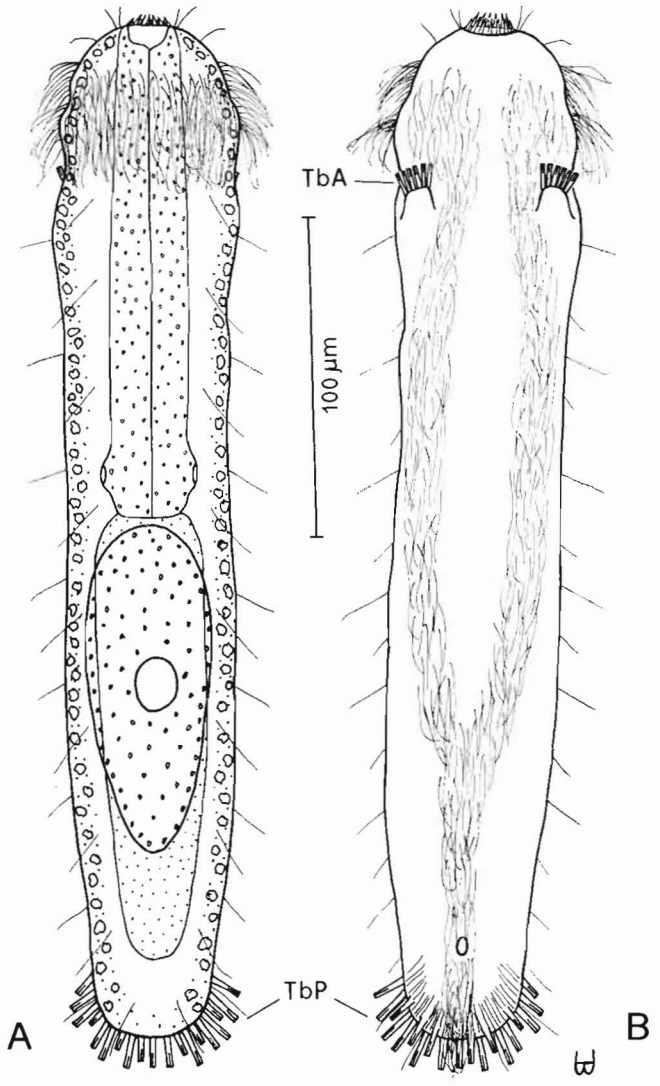

Fig. 3 - *Cephalodasys hadrosomus* n.sp. A, dorsal view, showing details of the body conformation, the lateral and dorsal sensory hairs, the glands, the digestive tract, the female reproductive system, and the posterior adhesive tubes (TbP); B, ventral view, showing details of the mouth and anus, the ventral locomotor ciliary field and the anterior (TbA) and posterior adhesive tubes.

short, compact and robust, with a head that is not well-demarcated and nearly parallel sides; widths of head/neck/trunk/caudal base are as follows: 57/53/54/37 µm at U10/U13/U60/U90, respectively; caudum rounded. Head with paired lateral tufts and a broad transverse band of cilia (18-20 µm in length) from U04 to U11, not connecting with the ventral locomotor cilia laterally; sensory hairs are short, with 8-9 per side in two columns, lateral (10-12 µm in length) and dorsal (18-20 µm in length), evenly spaced from U16 to U93. Glands are numerous (3-5 µm in diameter), ca. 50 per side in lateral columns extending from U01 to U94.

Adhesive tubes: there are 6 anterior tubes (TbA) per side, 8 µm in length, inserting on fleshy hands which attach to the ventral body surface at U17. Lateral (TbL) and dorsal tubes (TbD) are absent. There are 20 posterior

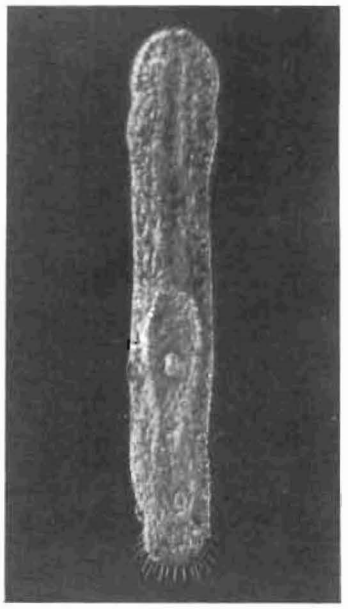

Fig. 4 - *Cephalodasys hadrosomus* n. sp., habitus. Nomarski optics, ×200.

tubes (TbP), 9-13 µm in length, which form two arcs, one with 13 tubes bordering the caudum posteriorly, and a second with 7 additional tubes that insert posterioventrally. Both TbA and TbP are obviously of the duo-gland form (see Tyler & Rieger, 1980, Fig. 1c).

Ventral ciliation: paired longitudinal tracts, separate from the lateral and dorsal head cilia, that extend from U04 onto the caudum at U97, each broader in front of the fleshy hands that bear the anterior adhesive tubes than behind, where they form tracts 10-12 µm in breadth that bear cilia 12-16 µm in length and join medially in the mid-intestinal region and continue as a single tract of the same width past the anus and onto the caudum.

Digestive tract: the mouth is of medium width (12 µm), buccal cavity broad, but shallow; the pharynx is broad (22-24 µm), its pores opening with lateral swellings at U43; the intestine is even broader in front (33 µm), narrowing gradually to the rear (ca. 20 µm), beyond which it is rounded like the caudum; the anus opens ventrally at U88.

Reproductive tract: probably protogynous hermaphrodites; no information regarding testes or ovaries *per se*; large, well developed egg (102 × 39 µm; germinal vesicle, 14 µm diameter) lies dorsal in the anterior intestinal region.

Distribution: Type locality - APULIA: Santa Maria di Leuca [lat. 39°, 47' N; long. 18°, 18' E], just northwest from the cape of the same name, that lies south of Lecce (M) [see Fig. 1 in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in medium to coarse sublittoral sand, mixed with shell and coral gravel, at 4 m water depth; Abundance - rare in samples where found.

Remarks - Based on our knowledge of members of this genus, adult specimens may reach 500 µm in total length, or at least three times the pharynx length.

Taxonomic affinities - *Cephalodasys hadrosomus* is the shortest, most compact species yet described for the genus. It is most closely related to *C. pacificus* Schmidt, 1974, differing from all other species in that they lack lateral (and dorsal) adhesive tubes. *C. hadrosomus* and *C. pacificus* are animals of about the same range of total length, but the former has a less well-demarcated head than the latter, has a much longer relative pharynx length, lacks an outward flare of the trunk at the base of the caudum and possesses a second arc of posterior adhesive tubes that inserts posterioventrally.

Genus *Mesodasys* Remane, 1951

Mesodasys adenotubulatus n.sp.

Fig. 5

Diagnosis - A *Mesodasys*, to 980 µm or more in length; PhJIn at U43; body strap-shaped, caudum narrow but rounded. Head with a dorsal transverse row of cilia at U02, not connecting with the ventral locomotor cilia; sensory hairs short, in lateral (32 per side) and dorsal columns (21 per side), evenly spaced from U06 to U98. Glands are numerous, ca. 35 per side in lateral columns. Adhesive tubes: TbA, 20 in a continuous arc that merges with the ventrolateral columns; TbL with 15 tubes per side (U24-U79) and TbV, with ca. 75 tubes per side (U04-U96), the tubes of both series varying in size and arrangement; TbP 8 in a single arc bordering the caudum. Ventral locomotor cilia: continuous field U08-U60, splitting thereafter to form a central (to U98) and paired lateral (to U96) tracts. Reproductive system: paired testes with vasa deferentia that join posteriorly at U85, behind which is a caudal organ; egg large, dorsal, in the anterior intestinal region.

Etymology - The name refers to the numerous (*àden*, Gk. abundance of) adhesive tubes borne in the lateral and ventrolateral series.

Description - The description is based on an adult specimen, 980 µm in total length. Pharynx 424 µm in length; pharyngeo-intestinal junction at U43. Body elongate, strap-shaped, with an indistinct head; widths of head/neck/trunk/caudal base are as follows: 81/78/106/26 µm at U08/U11/U71/U98, respectively; caudum narrow but rounded posteriorly. Head with scattered tactile hairs, including 4 laterally directed hairs per side at U03-U05, and a broad transverse row of cilia (30-32 µm in length) at U02, not connecting with the ventral locomotor cilia laterally; sensory hairs are short forming two columns, lateral (32 per side, 15-18 µm in length) and dorsal (21 per side, 24-28 µm in length), more or less evenly spaced from U06 to U98. Glands are numerous (6-10 µm in diameter), ca. 35 per side in lateral columns extending from U06 to U97.

Adhesive tubes: there are 20 anterior tubes (TbA), 7-10 µm in length, forming a continuous transverse arc behind the mouth, one that merges laterally with the foremost tubes of the paired ventral columns. Lateral columns of tubes (TbL), 15 per side, occur from U24 to U79. Extending beyond the TbL both fore and aft, where they meet the TbA and nearly meet the TbP, are paired columns of ventral tubes (TbV), ca. 75 per side, occurring from U04 to U96. Tubes of both TbL and TbV vary in size (6-18 µm in length) and arrangement. There are 8 (4 medial and 2 + 2 lateral) posterior tubes (TbP), 10-12 µm in length, form a single arc that borders the caudum, the tubes being inserted beneath the caudum.

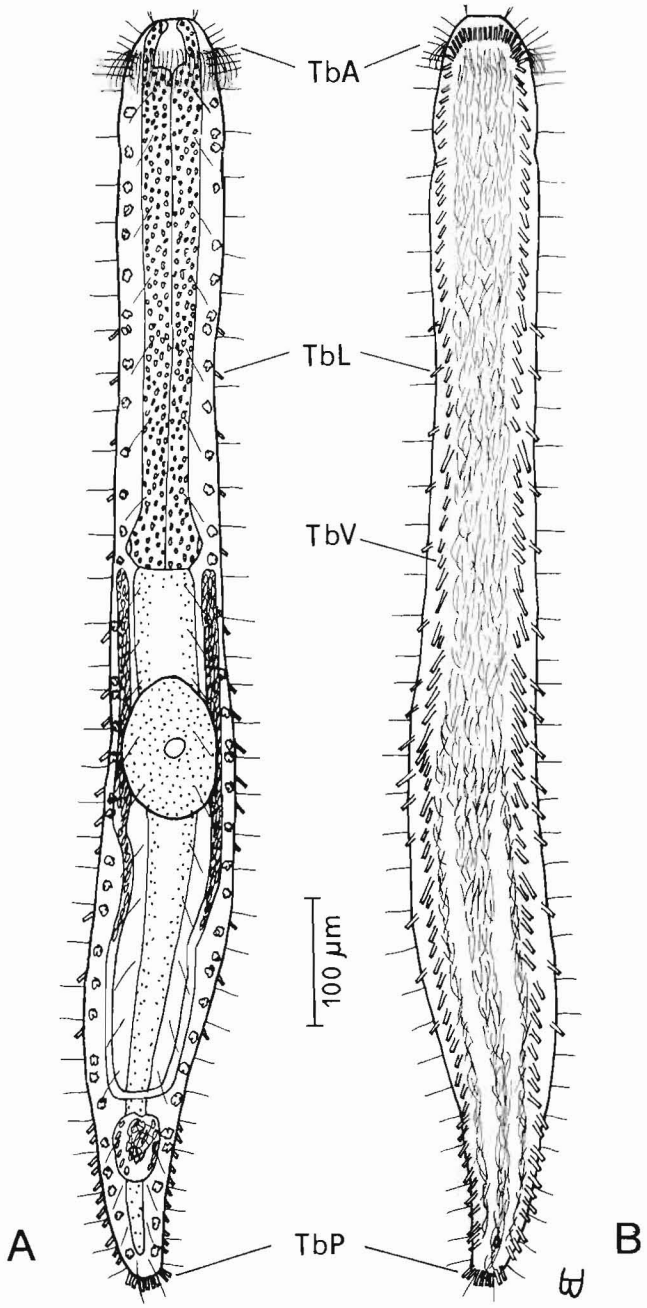

Fig. 5 - *Mesodasys adenotubulatus* n. sp. A, dorsal view, showing details of the body conformation, the lateral and dorsal sensory hairs, the glands, the digestive tract, and the male and female reproductive systems, and the lateral (TbL) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the mouth and anus, the ventral locomotor ciliary field and the anterior (TbA), lateral, ventral (TbV) and posterior adhesive tubes.

Ventral ciliation: beginning behind the arc of anterior adhesive tubes but separate anteriorly from the lateral and dorsal head cilia, a single field (42-56 μm in width) extends from U08 to U60; the field splits in the mid-intestinal region to form one central tract (30 reducing gradually to 10 μm in width) that extends to U98, and paired lateral tracts (6 μm in width) that extend onto the caudum at U96; individual cilia are 28-30 μm in length.

Digestive tract: the mouth is narrow (6 μm), but extensible, buccal cavity broad and deep (to 25 μm width, 37 deep); the pharynx is broad anteriorly (45 μm), narrowing somewhat toward the rear (36 μm), its basal pores opening with lateral swellings at U42; the intestine is broad in front (45 μm), narrowing gradually to the rear (ca. 11 μm), beyond which it is rounded like the caudum; the anus opens ventrally at U97.

Reproductive tract: simultaneous hermaphrodites; elongate testes from U43 to ca. U63, with vasa deferentia continuing rearward and then joining at U85; sperm appear small, elongate-ovoid (8 × 1 μm), with about three-fourths spiraled when mature and the other fourth bearing a short flagellum; a caudal organ with an anterior notch (52 × 36 μm), occurs at U86-U91, and often contains sperm; large, well-developed egg (110 × 75 μm; germinal vesicle, 13 μm diameter), the egg lying dorsal in the anterior intestinal region.

Distribution: Type locality - CAMPANIA: Chiaia [lat. 40°, 44' N; long. 13°, 51' E], just northeast of the port facilities at Forio, on the Island of Ischia, near Naples (S). Other Italian locations: Cefalù (S), Circeo (S), and Scissura (S) [see Fig. 1 in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in fine to medium sublittoral sand, at 1.5-3 m water depth, along the Tyrrhenian coast of Italy; Abundance - rare to scarce in samples where found.

Remarks - Specimens of Lt = 500 μm have only 10 TbA and only 4 TbP; TbL and TbV are also proportionately reduced in numbers. Largest egg seen in an adult specimen was 150 × 75 μm (germinal vesicle 20 μ, in diameter). Several specimens were observed and videotaped by W. D. Hummon and M. R. Hummon in February 1992, on both sides of a small tombolo along the Mediterranean coast of Israel at 'Atlit, some 15 km south of Haifa (lat. 32°, 43' N; long. 34°, 53' E). The largest specimen had a Lt = 960 μm and a pharynx length = 350 μm; reproductive organs were not evident.

Taxonomic affinities - Mesodasys adenotubulatus has the longest pharynx length as a proportion of total body length of any species yet described for the genus. It is most closely related to *M. littoralis* Remane, 1951 and *M. hexapodus* Rao & Ganapati, 1968, differing from other species in the genus in having a narrow, rounded caudum. *M. adenotubulatus* differs from *M. littoralis* and *M. hexapodus* in having a larger number of anterior adhesive tubes (TbA), and in having ventral (TbV) as well as lateral columns (TbL) of adhesive tubes, the ventral columns being comprised of tubes in great abundance.

Mesodasys ischiensis n.sp.

Fig. 6

Diagnosis - A *Mesodasys*, to 1200 μm or more in length; PhJIn at U35; mouth opens through a hyaline protrusion; body strap-shaped, caudum flared with a rounded border. Head with a transverse row of cilia at U02, not connecting with the ventral locomotor cilia; sensory hairs short, in lateral (32-33 per side), dorsolateral (26-28 per side) and dorsal columns (25 per side), evenly spaced from U03 to U98. Glands are numerous, ca. 85 per side in lateral columns. Adhesive tubes: TbA, 14 in a continuous arc that abuts with the lateral columns; TbL with 30-32 tubes per side (U02-U95), TbDl with 27-28 tubes per side (U03-U96), TbD with 11 tubes per side (U16-U92), and TbV with 105-115 tubes per side (U04-U96), the ventral tubes occurring in a column 1-3 tubes in width; TbP 36 in a single arc bordering the flared caudum. Ventral locomotor cilia: continuous field U04-U44, splitting thereafter to form paired lateral tracts (to U98). Reproductive system: unknown.

Etymology - The name refers to the Island of Ischia, on which the species was first found.

Description - The description is based on a subadult specimen, 1200 μm in total length. Pharynx 448 μm in length; pharyngeo-intestinal junction at U35. Body elongate, strap-shaped, with no neck constriction; widths of head/trunk/ caudal base are as follows: 70/112/46 μm at U04/U45/U97, respectively; caudum flared with a rounded posterior margin. Head with a transverse row of cilia at U02, not connecting with the ventral locomotor cilia laterally; sensory hairs are short forming three columns, lateral (32-33 per side, 18-20 μm in length), dorsolateral (26-28 per side, 32-40 μm in length) and dorsal (25 per side, 38-50 μm in length), more or less evenly spaced from U03 to U98. Glands are numerous (8-16 μm in diameter), ca. 85 per side in lateral columns that extend from U03 to U97 and are two abreast in the pharyngeal region and less regular in the intestinal region.

Adhesive tubes: there are 14 anterior tubes (TbA), 10-12 μm in length, form a continuous transverse arc behind the mouth, one that abuts but does not really merge laterally with the foremost tubes of either the lateral or the ventral series. Lateral columns of tubes (TbL) have 30-32 per side (U02-U95), dorsolateral columns (TbDl) 27-28 per side (U03-U96), dorsal columns (TbD) 11 per side (U16-U92) and ventral columns (TbV) 105-115 per side (U04-U96). The ventral tubes occur in a column 1 tube in width (U04 to U20), 2 tubes in width (to U54) and 3 tubes in width (to U96). The tubes are mostly 15-18 μm in length, though some in the dorsolateral series may reach 22 μm, and are more or less regular in arrangement. There are 36 posterior tubes (TbP) of similar length occurring in a single crowded arc bordering the flared posterior part of the caudum, the tubes being inserted beneath the caudum.

Ventral ciliation: beginning behind the arc of anterior adhesive tubes but separate anteriorly from the lateral

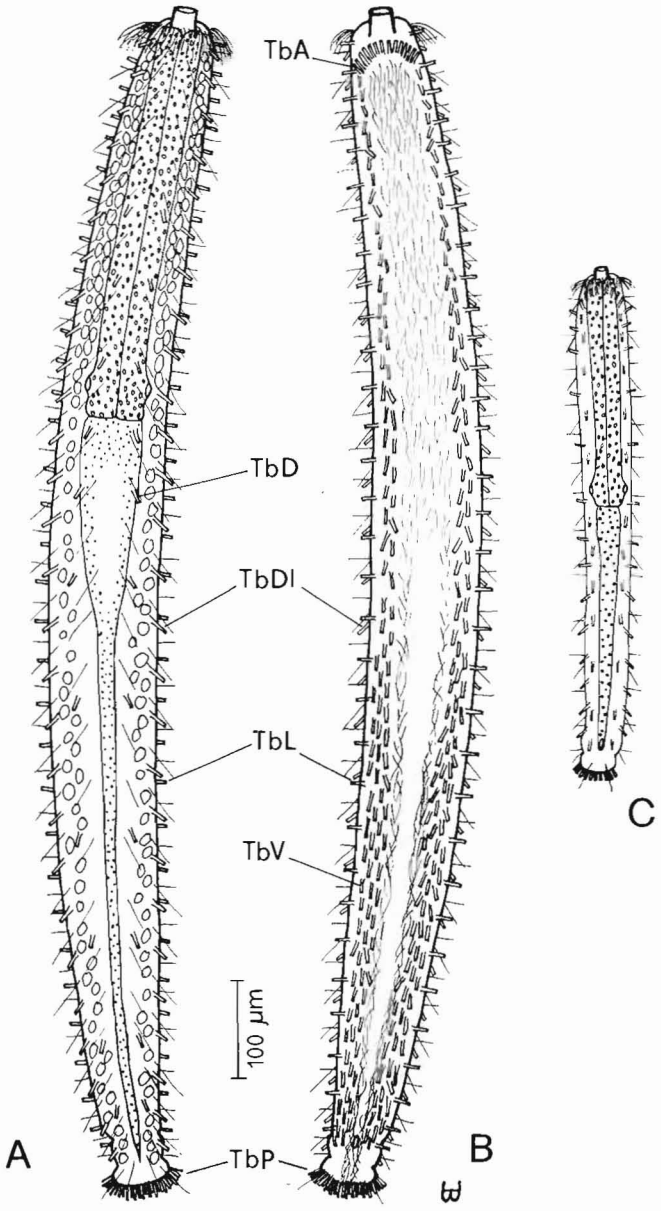

Fig. 6 - *Mesodasys ischiensis* n.sp. A, dorsal view, showing details of the body conformation, the lateral and dorsal sensory hairs, the glands, the digestive tract, and the lateral (TbL), dorsolateral (TbD1), dorsal (TbD) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the mouth and anus, the ventral locomotor ciliary field and the anterior (TbA), lateral, ventral (TbV) and posterior adhesive tubes; C, composite of a juvenile.

and dorsal head cilia, a single field (ca. 50 µm in width) extends from U04 to U44; the field splits in the anterior intestinal region to form paired lateral tracts (6 µm in width) that extend onto the caudum at U98; individual cilia are 22-26 µm in length.

Digestive tract: the mouth, 18 µm in width, opens through a cylindrical hyaline protrusion; the pharynx is constant in width (45-48 µm), except for the lateral swellings associated with the basal pharyngeal pores at U32; the intestine is broad in front (60 µm), narrowing quickly over its first quarter and remaining constant in width thereafter (16 narrowing to 11 µm); the anus opens ventrally at U95.

Reproductive tract: no information.

Distribution: Type locality - CAMPANIA: Casamicciola (Porto d'Ischia) [lat. 40°, 44' N; long. 13°, 54' E], just west of the port facilities, on the Island of Ischia, near Naples (S). Other locations: Bagnetielli (M) and Ischia porto (S), also positioned along the north coast of the Island of Ischia [see Fig. 1 and Table I in this paper and Table 1 in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in fine sublittoral sand, at 1.5-6 m water depths; Abundance - rare to scarce in samples where found.

Remarks - Based on our knowledge of members of this genus, adult specimens may reach 1800 µm in total length, or at least four times the pharynx length. The hyaline mouth protrusion is reminisent of that first found in the genus *Neodasys* (see Remane, 1927a, 1961) but even more, because it is entire and not comprised of fused sections, it reminds one of the genus *Prostobuccantia* (see Evans & Hummon, 1991).

Taxonomic affinities - *Mesodasys ischiensis* is most closely related to *M. laticaudatus* Remane, 1951, differing from other species in the genus in having a flared caudum. *M. ischiensis* differs from *M. laticaudatus* in having a hyaline mouth protrusion and a larger number of anterior (TbA) and posterior (TbP) adhesive tubes, and in having ventral (TbV) as well as lateral (TbL), dorsolateral (TbD1) and dorsal (TbD) columns of adhesive tubes, the ventral columns being comprised of tubes in greatest abundance.

Family THAUMASTODERMATIDAE Remane, 1929

Genus *Pseudostomella* Swedmark, 1956

Pseudostomella etrusca n.sp.
Figs 7, 8

Pseudostomella sp., Luporini, Magagnini & Tongiorgi, 1973a: p. 281, figs 7-8.

Diagnosis - A *Pseudostomella*, with an adult length to 410 µm; PhJIn at U39; head with fleshy preoral palps curving around forward, body with graceful lines and a bilobed caudum. Sensory hairs and papillae occur on dorsal and ventral borders of the preoral palps, hairs sparse but evenly spaced on the body, forming lateral columns from about U17 to U95. Glands are few (12-15 per side), asymmetrically scattered along most of the length of the body. Cuticular armature of pentancres, small throughout, wrapping onto the ventrolateral surfaces of the body. Adhesive tubes: TbA, 4 per side, all lateral at U10-U14; TbL, 14 per side, 13 of similar length evenly spaced in the trunk region from U40 to U87, and a large one at U93; TbD, 1 per side, robust, inserting on posteriolateral surface of the preoral palps at U10; TbV absent; TbP, 4 per side, 2 + 1 forming one foot of the bilobed caudum and the other one flanking each foot medially. Ventral locomotor cilia: a continuous field of transverse rows covering the entire ventral surface. Reproductive system: testis on right, egg dorsal in mid-body.

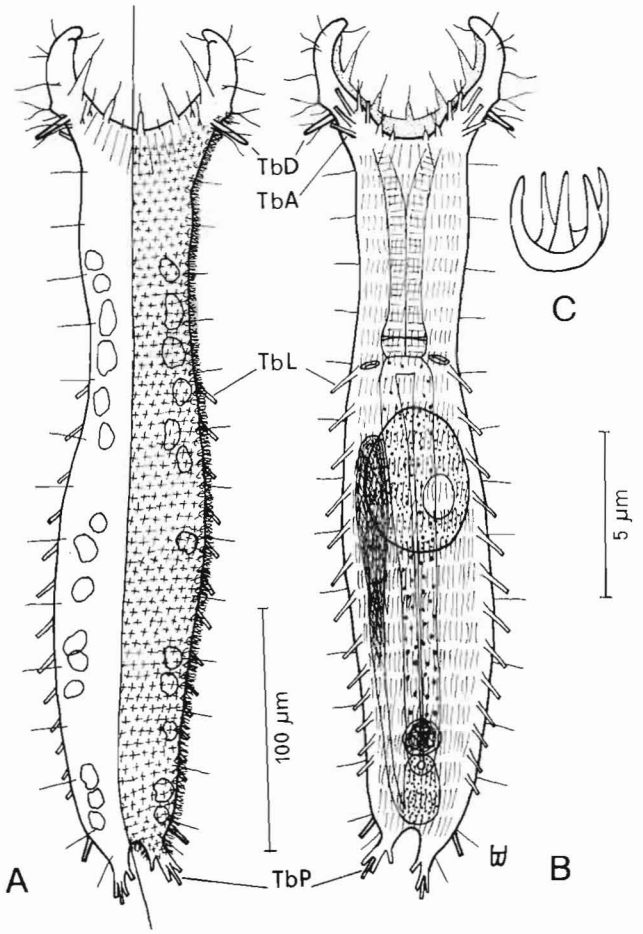

Fig. 7 - *Pseudostomella etrusca* n.sp. A, dorsal view, showing details of the body conformation, including the preoral palps, the pattern of cuticular armature on the right half of the body, the lateral sensory hairs, the glands, and the lateral (TbL), dorsal (TbD) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the preoral palps, oral opening, digestive tract and anus, the male and female reproductive systems, the ventral locomotor ciliary field and the anterior (TbA), lateral, dorsal and posterior adhesive tubes: C, a pentancre.

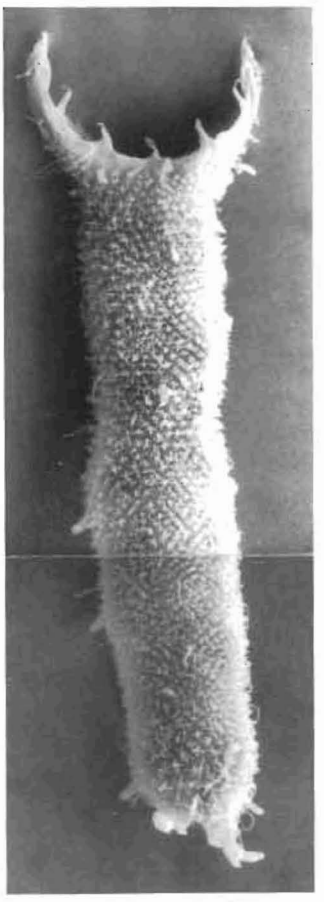

Fig. 8 - *Pseudostomella etrusca* n. sp., dorsal view. S.E.M., ×280.

Etymology - The epithet refers to the Etruria, the ancient name of the Tuscany, the region in which it was first found.

Description - The description is based on an adult specimen, 360 µm in total length. Pharynx 89 µm in length, in this family to be measured from the ventral border of the oral opening to the pharyngeo-intestinal junction; pharyngeo-intestinal junction at U39. Head with fleshy preoral palps curving around forward, the dorsal border projecting just beyond the ventral; body with graceful lines narrowing gradually to a bilobed caudum; widths of oral opening/at neck behind palps, PhJIn/trunk/caudal base are as follows: 55/47, 43/60/23 µm at U12/U17, U34/U59/U96, respectively. Sensory hairs and papillae occur on dorsal and ventral borders of the preoral palps; hairs are scattered on the dorsal, lateral and ventral surfaces of the palps; dorsally there are 5 papillae, 10-18 µm in length, symmetrically arranged about the inner border of the palps in a 2 + 1 + 2 pattern, smaller medially, largest laterally, and also 2 smaller papillae per side on the dorsal surface (lateral to several ridges that radiate backward from the center of the palp complex); ventrally there are 6 papillae, 5-8 µm in length, symmetrically arranged more centrally about the inner border of the palps in a 3 + 3 pattern (located forward or lateral to a few ridges that radiate backward from the center of the palp complex), smaller medially, largest laterally (amid the anterior adhesive tubes); all papillae are tipped with 1-2 sensory hairs; other sensory hairs (14 per side, U17-U95) form lateral columns that are evenly spaced; individual hairs are ca. 13 µm long. Glands are few, 12-15 per side, mixed in size (from 7 µm diameter up to 15 × 8 µm), irregular in shape, and asymmetrically scattered in lateral columns along the posterior half of the pharynx and the entire trunk, from U27 to U91.

Cuticular armature: small but thick pentancres, with curved grasping tines, as tall as wide; small (ca. 3 µm from one tine to its opposite, as measured from above) over all the body, wrapping around onto the ventrolateral surfaces; anterior most border of ancres extends onto the posteriolateral surfaces of the preoral palps; posterior most ancres extend onto the caudum.

Adhesive tubes: there are 4 anterior tubes (TbA) per side, one 8 and three 11 µm in length, inserting directly

on the body surface at U10-U14; all are lateral and form an anteriolaterally directed arc, the full arc being comprised of papillae (p) and adhesive tubes (t) in a p + p + t- + p + 3t pattern. There are 14 lateral tubes (TbL) per side, 13 evenly spaced in the trunk region from U40 to U87, decreasing gradually in length from 14 to 9 μm, and a larger one, 11 μm in length, located at U93. There is one robust dorsal tube (TbD) per side, 18 μm in length, that is posteriolaterally directed and inserts on the trailing surface of each preoral palp at U10. Ventral tubes (TbV) are absent. The caudum indents medially to U94 and is formed by two feet, with fleshy lobes proximally and 2 adhesive tubes (TbP) distally that are fused at their bases, together with a thinner mid-dorsal tube which projects beyond them from between and is characteristic of many species in the family; one additional posterior tube, 5 μm in length, flanks each foot medially.

Ventral ciliation: a continuous field of cilia arranged in transverse rows that covers the entire ventral surface from just behind the anterior adhesive tubes to the base of the caudal feet; individual cilia are ca. 7 μm in length.

Digestive tract: the oral opening is broad (ca. 40 μm in width), with preoral palps extending forward beyond the mouth from U00 to U12 and a short oral hood extending from U12 to U14; the pharynx narrows over its anterior half to 13-15 μm, its pores opening basally at U37; the intestine is broadest anteriorly (22 μm), narrowing gradually over its length (to 12 μm); the anus opens ventrally at U86.

Reproductive tract: simultaneous hermaphrodites; a solitary elongate testis occurs on the right side (viewed from above); it opens into the posterior end of an oblong caudal organ, which in turn connects with a bladder-like frontal organ that often contains sperm; the egg (60 × 43 μm; germinal vesicle oblong, 18 × 12 μm) is situated mid-dorsally above the anterior half of the intestine.

Distribution: Type locality - TUSCANY: Castiglione della Pescaia [lat. 42°, 45' N; long. 10°, 51' E], west of Grosseto [S]. Other locations: Cannelle (S), Cefalù (S), Cuma (S), Donoratico (S), Feniglia (S), Fetovaia (S), Giannella (S), Licola [not Nicola, as in Papi, 1957] (S), Montalto (S), Paestum (S), Pini (S), Pisa (L), Procida (S), San Remo (S) [see Fig. 1 and Table 1 in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in medium littoral sands, but occasional in fine to medium sublittoral sands, at 1.5-3 m water depths, along the west coast of Italy; Abundance - often scarce to numerous in samples where found.

Remarks - This species was originally found by Luporini *et al.* (1973a) in medium sands of a protected littoral habitat, but we have found it in none of our littoral samples. It is difficult to distinguish between ventral papillae of the preoral lobes and the TbA; likewise the TbL are often difficult to discern, since some may be tucked underneath, where they follow the lateral body contour. We found paired protonephridia at the level of the PhJIn (see Fig. 7B).

Taxonomic affinities - *Pseudostomella etrusca*, like *P. plumosa* Ruppert, 1970, is a large animal (ca. 400 μm) for this genus, but *P. etrusca* lacks the plume-like ancres of the latter. Like *P. indica* Rao, 1970, it has many TbL, and with *P. cataphracta* Ruppert, 1970, it becomes only the second species to be described in the genus to bear pentancres, but *P. etrusca* lacks the TbV that are present in both of these species and also lacks the accessory TbP that occur medially between the feet in *P. indica* and laterally alongside the feet in *P. cataphracta*.

Genus *Ptychostomella* Remane, 1926

Ptychostomella tyrrhenica n.sp.

Figs 9, 10

Diagnosis - A *Ptychostomella*, with an adult length to 185 μm; PhJIn at U38; body with parallel sides and a short, bilobed caudum. Sensory hairs abundant on oral hood; they are evenly spaced, forming lateral, dorsolateral and dorsal columns from about U13 to U94. Glands are numerous, 32 or more per side, the lateral most giving an undulating appearance to the lateral body contours, and the others, of two kinds, scattered laterally to dorsally along the length of the body. Cuticular armature absent. Adhesive tubes: TbA, 4 per side, a small one medially and 3 larger ones laterally; TbD absent; TbL, 3 per side, a small one anteriorly and 2 large ones in the mid- and posterior body regions; TbV, 5 per side, forming a pattern of 1 + 2 + 2 in the intestinal region; TbP, 5 per side, 2 forming one foot of the bilobed caudum and the other 3 flanking the foot laterally. Ventral locomotor cilia: unified field of transverse rows, broader in the pharyngeal than the intestinal region. Reproductive system: testis on right, caudal and frontal organs, egg dorsal and left-rear.

Etymology - The name comes from the Tyrrhenian Sea, whose shores appear to be the home of this magnificent animal.

Description - The description is based on an adult specimen, 170 μm in total length. Pharynx 45 μm in length, in this family to be measured from the ventral border of the oral opening to the pharyngeo-intestinal junction; pharyngeo-intestinal junction at U38. Body short, with parallel but slightly undulating sides and a short, bilobed caudum; widths of oral opening/at neck/trunk/caudal base are as follows: 36/30/30-32/20 μm at U10/U14/U18-77/U93, respectively. Sensory hairs abundant on oral hood (6-12 μm in length), with one pair at U09 of stouter construction than the others; paired tufts of cilia occur laterally at U09 (4-9 μm in length) and U12 (6-8 μm in length); other sensory hairs form lateral (9 per side, U15-U91), dorsolateral (6 per side, U13-U94), and dorsal (5 per side, U17-U85) columns that are evenly spaced within columns, but differ between columns; individual hairs are usually 10-14 μm in length. Glands are numerous, 32 or more per side, several in lateral columns that give an undulating appearance to the lateral body contours, and the others, some thicker walled than others, scattered laterally to dorsally along the length of

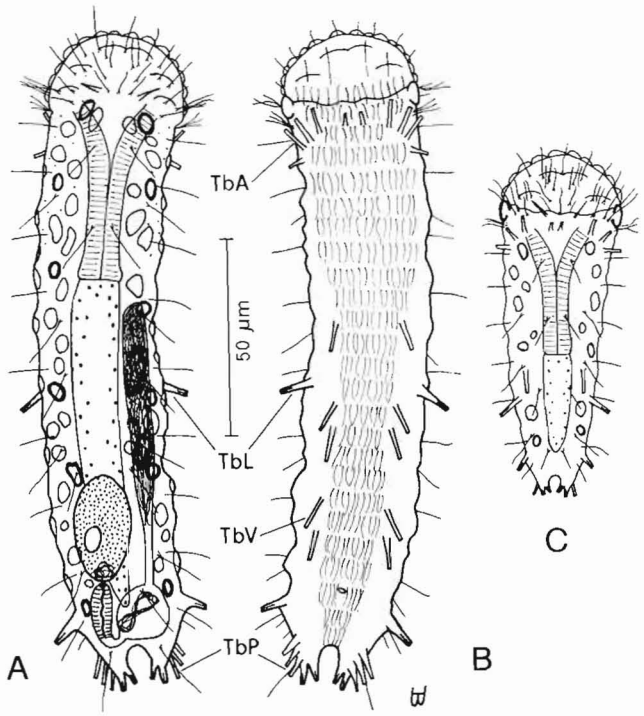

Fig. 9 - *Ptychostomella tyrrhenica* n.sp. A, dorsal view, showing details of the body conformation, the lateral, dorsolateral and dorsal sensory hairs, the glands, the digestive tract, the male and female reproductive systems, and the lateral (TbL) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the mouth and anus, the ventral locomotor ciliary field and the anterior (TbA), lateral, ventral (TbV) and posterior adhesive tubes; C, composite of a juvenile.

the body from U11 to U88; glands vary in size (round, 4 µm diameter to oblong, 8 × 3 µm) and shape.

Cuticular armature: absent.

Adhesive tubes: there are 4 anterior tubes (TbA) per side, inserting directly on the body surface at U15-U18, one 4 µm in length medially and three 6-7 µm in length laterally. There are 3 lateral tubes (TbL) per side, 4, 9 and 8 µm in length respectively and inserting ventrolaterally at U19, U54 and U88. Dorsal tubes (TbD) are absent. There are 5 ventral tubes (TbV) per side, 8-10 µm in length, form a pattern of 1 + 2 + 2 in the intestinal region (U45, U57-U61 and U71-U77). The caudum indents medially to U94 and is formed from two feet, with fleshy lobes proximally and two adhesive tubes (TbP) distally that are fused at their bases; the feet in this case lack the thinner mid-dorsal tube which projects beyond them from between and is characteristic of many species in the family; 3 additional posterior tubes flank each foot laterally. The latter 2 TbL per side and the 2 TbP that form the caudal feet are obviously of the duo-gland form (see Tyler & Rieger, 1980, Fig. 1c).

Ventral ciliation: a continuous field of cilia arranged in transverse rows that extend from the ventral border of the oral opening to the base of the caudal feet, being broadest in the pharyngeal region (24-26 µm in width), and narrowing in two stages toward the rear (10-13 and

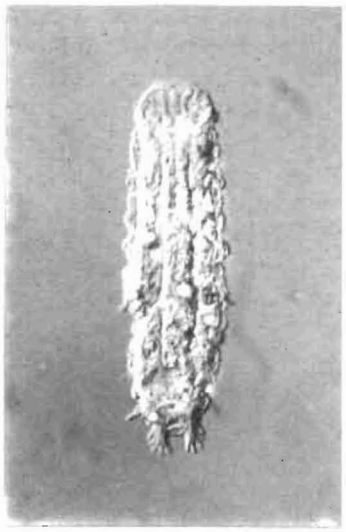

Fig. 10 - *Ptychostomella tyrrhenica* n. sp., habitus. Nomarski optics, ×280.

5-6 µm, respectively); individual cilia are 4-5 µm in length.

Digestive tract: the oral opening is broad (33 µm in width), with oral hood extending forward above the mouth from U00 to U11; the pharynx narrows over its anterior half to 8-9 µm, its pores opening basally at U37; the intestine is medium in breadth (10-12 µm) over most of its length, narrowing somewhat to the rear (3 µm); the anus opens ventrally at U87.

Reproductive tract: simultaneous hermaphrodites; a solitary elongate testis occurs on the right side (viewed from above); it opens behind to a bladder-like caudal organ (on the right) that often contains wiggling sperm and appears to be connected transversely to a muscularized frontal organ (on the left); the latter opens anteriorly just behind the egg; the egg (28 × 15 µm; germinal vesicle 6 × 4 µm) is situated dorsally on the middle left side, above the rear two-fifths of the intestine.

Distribution: Type locality - TUSCANY: Castiglione della Pescaia [lat. 42°, 45' N; long. 10°, 51' E], west of Grosseto [S]. Other locations: Biodola (S), Cefalù (S), Chiaia (S), Citara (S), Spiaggia degli Inglesi (M), Ischia porto (S), Luna (S), Paestum (L estuary, S), Palinuro (S), Procida (S), San Remo (S), Scissura (S), Serapo (L), and S. Vito (S) [see Fig. 1 and Table I in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in fine littoral sands, but occasional to common in fine sublittoral sands, at 1.5 to 5 m water depth, along the west coast of Italy; Abundance - often numerous to prevalent in samples where found.

Remarks - Juveniles have been seen as small as 89 µm in total length, with pharynx length of 36 µm. These and subadults cannot be mistaken for any other species, since they have all of the characters of the adults, except that

the proportions are different and the number of adhesive tubes fewer on each side: 4 rather than 5 TbA, 1 rather than 5 TbV and 1 rather than the 3 TbP that border the caudal feet laterally and none medially. We have only found this species twice in the littoral region, once at Serapo on a typical beach and the other time at Paestum; there it occurred amid fine sands where freshwater from a creek joined the sea, with water overlying the sand and interstitial water within the sand both being measured at less than 1 ppt salinity.

Taxonomic affinities - *Ptychostomella tyrrhenica*, like *P. pectinata* Remane, 1926, *P. ommatophora* Remane, 1927a and *P. mediterranea* Remane, 1927a, is an animal of small size (less than 400 µm). But, *P. tyrrhenica* lacks the eye spots and the column of 18 TbL per side distributed along the intestinal region of *P. ommatophora*; it lacks the pectinate sculpturing of the lower oral margin and the cluster of 7 small tubes that accompany the single large TbL in the anterior intestinal region of *P. pectinata*; it lacks the plump trunk and the series of 6 TbD per side of *P. mediterranea*; and, it lacks the 2-4 TbP per side that occur along the medial margins of the caudal feet in all three of the above named species, while possessing a series of 5 TbV that are not found in any other species in the genus.

Genus *Tetranchyroderma* Remane, 1926

Tetranchyroderma heterotubulatum n.sp.

Figs 11, 12

Diagnosis - A *Tetranchyroderma*, with an adult length to 330 µm; PhJIn at U33; head double-lobed, body with graceful lines and a short, bilobed caudum. Sensory hairs thick on the head margin, sparse but evenly spaced on the body, forming lateral and dorsolateral columns from about U07 to U97. Glands are few (11 per side), mixed in size and scattered along the length of the body. Cuticular armature of tetrancres, small at both ends of the body, but medium sized in the middle. Adhesive tubes: TbA, 3 per side, one medial at U05 and 2 lateral at U05-U06; TbL, 8 per side, a small one at U13, and 7 of different lengths more or less evenly spaced in the trunk region from U36 to U87; TbD, 2 per side, robust, at U55 and U85; TbV absent; TbP, 5 per side, 2 forming one foot of the bilobed caudum and the other 3 flanking each foot, 1 laterally and 2 medially. Ventral locomotor cilia: a continuous field of transverse rows covering the entire ventral surface. Reproductive system: testis on right, egg in dorsal mid-body on left.

Etymology - The name refers to the variability in size of the lateral and the dorsal adhesive tubes (*heteros*, Gk. different; *tubus*, Lat. pipe).

Description - The description is based on an adult specimen, 330 µm in total length. Pharynx 95 µm in length, in this family to be measured from the ventral border of the oral opening to the pharyngeo-intestinal junction; pharyngeo-intestinal junction at U33. Head with broader secondary ventrolateral lobes; body with graceful lines narrowing gradually to a short, bilobed caudum; widths of oral opening/at neck behind lobes, PhJIn/trunk/caudal base are as follows: 48/44, 39/57/19

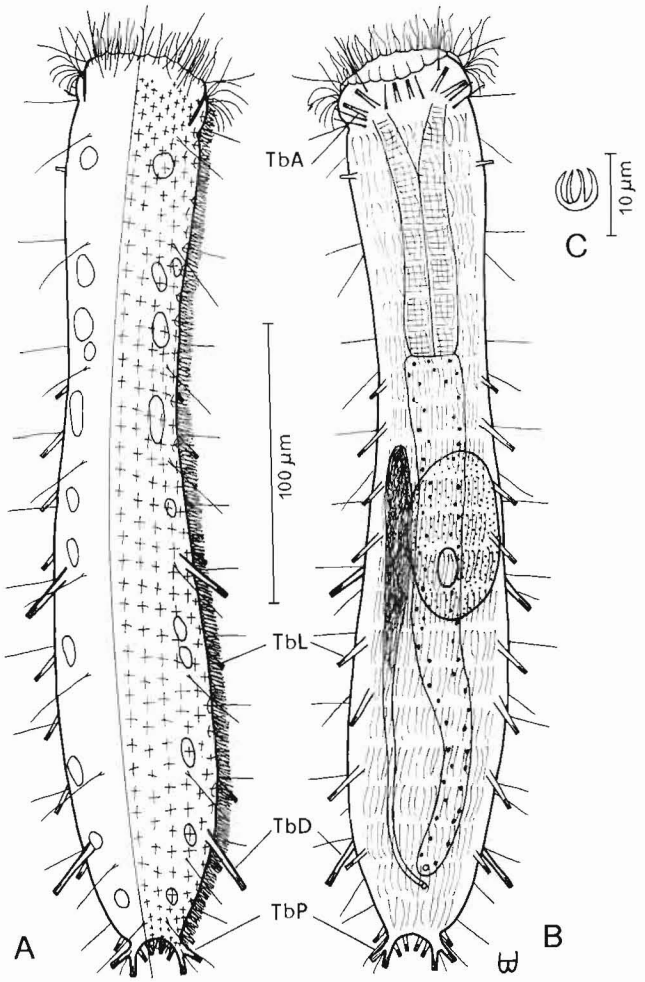

Fig. 11 - *Tetranchyroderma heterotubulatum* n.sp. A, dorsal view, showing details of the body conformation, the pattern of cuticular armature on the right half of the body, the lateral and dorsolateral sensory hairs, the glands, and the lateral (TbL), dorsal (TbD) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the oral opening, digestive tract and anus, the male and female reproductive systems, the ventral locomotor ciliary field and the anterior (TbA), lateral, dorsal and posterior adhesive tubes; C, a tetrancre.

µm at U05/U07, U33/U77/U96, respectively. Sensory hairs include a fringe around the oral opening (ca. 3 µm in length) and a second row just behind the leading edge of the oral hood (ca. 15 µm long), with several others of similar lengths aggregated laterally, a tuft of about 8 cilia of the same length inserting laterally between the two head lobes at U03, and 3 thicker hairs (8 µm in length) interspersed among the anterior adhesive tubes ventrally; other sensory hairs form lateral (11 per side, U05-U93) and dorsolateral (10 per side, U08-U97) columns that are evenly spaced within columns; individual hairs are ca. 14 µm long in the lateral columns and 26 µm in the dorsolateral columns. Glands are few, 11 per side, mixed in size (from 6 µm diameter up to 16 × 5 µm), irregular in shape, and scattered laterally along the body length from U10 to U92.

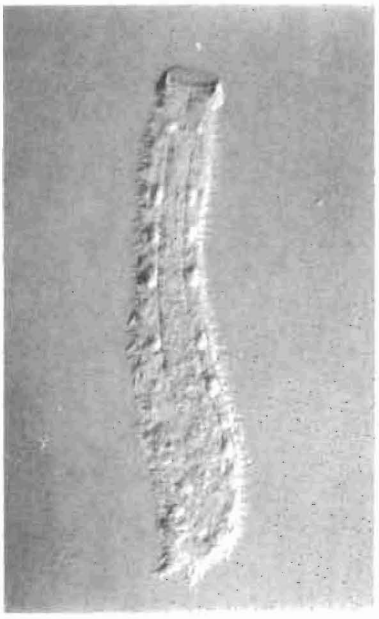

Fig. 12 - *Tetranchyroderma heterotubulatum* n.sp., habitus. Nomarski optics, ×230.

Cuticular armature: thick tetrancres with curved grasping tines, as tall as wide; small (ca. 1-2 μm from one tine to its opposite, as measured from above) at both ends of the body, but medium in size (ca. 5 μm) throughout most of the middle portion of the body; anterior most border of ancres forms a W-shape on either side of the head, not a plain transverse row, posterior most ancres extend onto the caudum.

Adhesive tubes: there are 3 anterior tubes (TbA) per side, inserting directly on the body surface at U05-U06; one 7 μm in length occurs medially, and two 7 μm in length occur laterally. There are 8 lateral tubes (TbL) per side, one 6 μm in length occurring at U13, and 7 others varying in length from 7 to 15 μm (mostly 7-8 or 13-15 μm) occurring more or less evenly spaced in the trunk region from U36 to U87. There are 2 dorsal tubes (TbD) per side, robust, 22-24 μm in length, and located laterally at U55 and U85. Ventral tubes (TbV) are absent. The caudum indents medially to U96 and is formed by two feet, with fleshy lobes proximally and 2 adhesive tubes (TbP) distally that are fused at their bases; the feet lack the thinner mid-dorsal tube which projects beyond them from between and is characteristic of many species in the genus; 3 additional posterior tubes, 6 μm in length, flank each foot, 1 laterally and 2 medially. All adhesive tubes are obviously of the duo-gland form.

Ventral ciliation: a continuous field of cilia arranged in transverse rows that covers the entire ventral surface from just behind the anterior adhesive tubes to the base of the caudal feet; individual cilia are ca. 10 μm in length.

Digestive tract: the oral opening is broad (38 μm in width), with oral hood extending forward above the mouth from U00 to U03; the pharynx narrows over its anterior half to 17-18 μm, its pores opening basally at U32; the intestine is broadest anteriorly (20 μm), narrowing gradually over its sinuous length (to 9 μm); the anus is round and opens ventrally at U88.

Reproductive tract: simultaneous hermaphrodites; a solitary elongate testis occurs on the right side (viewed from above); it appears to open to the exterior just behind the anus; neither the caudal organ nor the frontal organ were seen; the egg (60 × 32 μm; germinal vesicle oblong, 14 × 7 μm) is situated mid-dorsally above the second fifth of the intestine.

Distribution: Type locality - FRIULI: Month of the River Isonzo [lat. 45°, 45' N; long. 13°, 31' E], accessible by boat from Trieste (L). Other locations: Bagnetielli (M), Torre al Bagno (M), Biodola (S), Cannelle (S), Cataldo (S), Spiaggia degli Inglesi (M), Ischia porto (S), Luna (S), Porto Nuovo (S), Paestum (S), Palinuro (S), Policoro (S), Serapo (L, S), Vado (S), Baia Verde (S) [see Fig. 1 and Table I in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in fine to medium littoral sands, but sparse to occasional in fine to medium coarse detrital sublittoral sands, at 1.5 to 8 m water depth, mostly along the west coast of Italy; Abundance - scarce to numerous in samples where found.

Remarks - The anterior most border of ancres while normally forming a sharply W-shape on either side of the head, in some individuals the border looks more smoothly sinuous. One specimen found by Todaro *et al.* (1992) at Cannelle that we consider to be of this species was Lt = ca. 350 μm; the specimen had the double head lobes and much the same body conformation, but differed in having an additional tube per side laterally in the TbA group, in lacking the anterior most TbL, but possessing about 6 short dorsolateral tentacles at U20, U38, U46, U53, U61 and U70. Unfortunately, it had a badly developed caudum, but another specimen had 2 additional tubes in the TbP group (one each medially and laterally to each caudal foot).

Taxonomic affinities - *Tetranchyroderma heterotubulatum* is most closely related to *T. apum* Remane, 1927 and *T. massiliense* Swedmark, 1956, in having a full dorsal covering of tetrancres, and caudal feet each comprised of two fused tubes. *T. heterotubulatum* alone of these three species has secondary head lobes. *T. apum* alone has dorsal head tentacles and has caudal feet that barely project beyond the lengths of the medial TbP. *T. massiliense* is very close to *T. heterotubulatum* in its general body shape and in both the numbers and pattern of distribution of adhesive tubes. The dorsal tentacles on the trunk of *T. massiliense* were interpreted by Swedmark to be sensory and the caudal feet are very long and thin, whereas the dorsal structures on the trunk of typical *T. heterotubulatum* are clearly duo-gland adhesive tubes and the caudal feet short, with a fleshy extension of the trunk proximally.

Tetranchyroderma hypopsilancrum n.sp.
Figs 13, 14

Tetranchyroderma sp. 1, Schrom, 1972: p. 303, fig. 6.

Diagnosis - A *Tetranchyroderma*, with an adult length to 625 µm; PhJIn at U19; body with parallel sides and a short, bilobed caudum. Sensory hairs are evenly spaced, forming lateral and dorsolateral columns from about U05 to U99. Glands are numerous, 32-34 per side, and unevenly spaced along the length of the body. Cuticular armature of small tetrancres, usually restricted to longitudinal strips or, even further, to lateral epaulets in the pharyngeal region. Adhesive tubes: TbA, 5 per side, one medial at U06 and 4 lateral at U05-U07; TbL, 24 per side, a small one at U08 and 23 larger tubes, evenly spaced in the intestinal region from U22 to U93; TbD and TbV absent; TbP, 4 per side, 2 forming one foot of the bilobed caudum and the other 2 flanking the foot medially: Ventral locomotor cilia: a continuous field of transverse rows covering the entire ventral surface. Reproductive system: testis on right, egg dorsal and central.

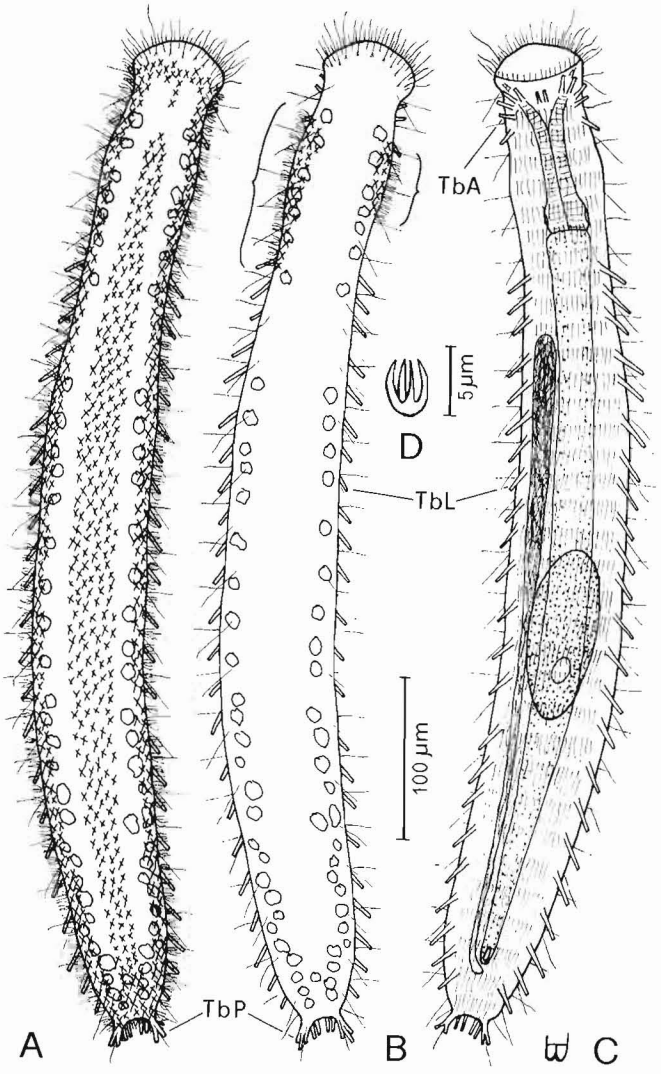

Fig. 13 - *Tetranchyroderma hypopsilancrum* n.sp. A, dorsal view, showing the pattern of extensive cuticular armature characteristic of Adriatic specimens, and one pattern of feet; B, dorsal view showing details of the body conformation, two patterns of reduced cuticular armature characteristic of specimens from the Tyrrhenian and Ligurian coasts, as well as the cephalic, and the lateral and dorsolateral sensory hairs, the glands, and the lateral (TbL) and posterior (TbP) adhesive tubes, with a second pattern of feet; C, ventral view, showing details of the oral opening, digestive tract and anus, the male and female reproductive systems, the ventral locomotor ciliary field and the anterior (TbA), lateral (TbL) and posterior (TbP) adhesive tubes; D, a tetrancre with separate scale bar.

Etymology - The name refers to bareness that results from a reduction in hooked spines (in this case tetrancres) on the dorsal body surface (*hypo*, Gk. less than; *psilos*, Gk. bare; *ankyra*, Gk. hook).

Description - The description is based on an adult specimen, 625 µm in total length. Pharynx 122 µm in length, in this family to be measured from the ventral border of the oral opening to the pharyngeo-intestinal junction; pharyngeo-intestinal junction at U19. Body elongate, with more or less parallel sides and a short, bilobed caudum; widths of oral opening/at neck/trunk/caudal base are as follows: 58/48/60-72/24 µm at U03/U06/U29-87/U97, respectively. Sensory hairs include a fringe of short hairs around the oral opening (5-6 µm in length); and many longer hairs on the oral hood (16-28 µm in length); other sensory hairs form lateral (ca. 26 per side, U04/U97) and dorsolateral (ca. 20 per side, U05-U99) columns that are evenly spaced within columns, but differ between columns; individual hairs are usually 15-18 µm in length laterally or 22-25 µm in length dorsolaterally. Glands are numerous, 32-34 per side, and unevenly spaced laterally to dorsally along the length of the body from U07 to U97; glands vary in size (6-13 µm) and shape.

Cuticular armature: thick tetrancres, with nearly straight tines, half again as tall as wide; small (ca. 4 µm from one tine to its opposite, as measured from above), but appearing even smaller relative to the overall body size, restricted in this specimens to lateral epaulets in the pharyngeal region with perhaps 18 ancres per sides (see the left side of the specimen in Fig. 13B, dorsal view). Different patterns of cuticular armature were also observed: cf. *Remarks*.

Adhesive tubes: there are 5 anterior tubes (TbA) per side, inserting directly on the body surface, one medial at U06, 11 µm in length, and 4 somewhat more lateral at U05-U07, 10 µm in length. There are 24 lateral tubes (TbL) per side, a small one at U08, 10-11 µm in length, and 23 larger tubes, evenly spaced in the intestinal region from U22 to U93, 19-22 µm in length. Dorsal (TbD) and ventral (TbV) tubes are absent. The caudum indents medially to U98 and is formed from two feet, with fleshy lobes proximally and 2 adhesive tubes (TbP) distally that are fused at their bases; the feet usually lack the thinner mid-dorsal tube which projects beyond them from between and is characteristic of many species in the family; 2 additional posterior tubes, 8 µm in length, flank each foot medially.

Ventral ciliation: a continuous field of cilia arranged in transverse rows that covers the entire ventral surface from the anterior adhesive tubes to the base of the caudal feet; individual cilia are 16-20 µm in length.

Digestive tract: the oral opening is broad (52 µm in width), with oral hood extending forward above the mouth from U00 to U04; the pharynx narrows over its

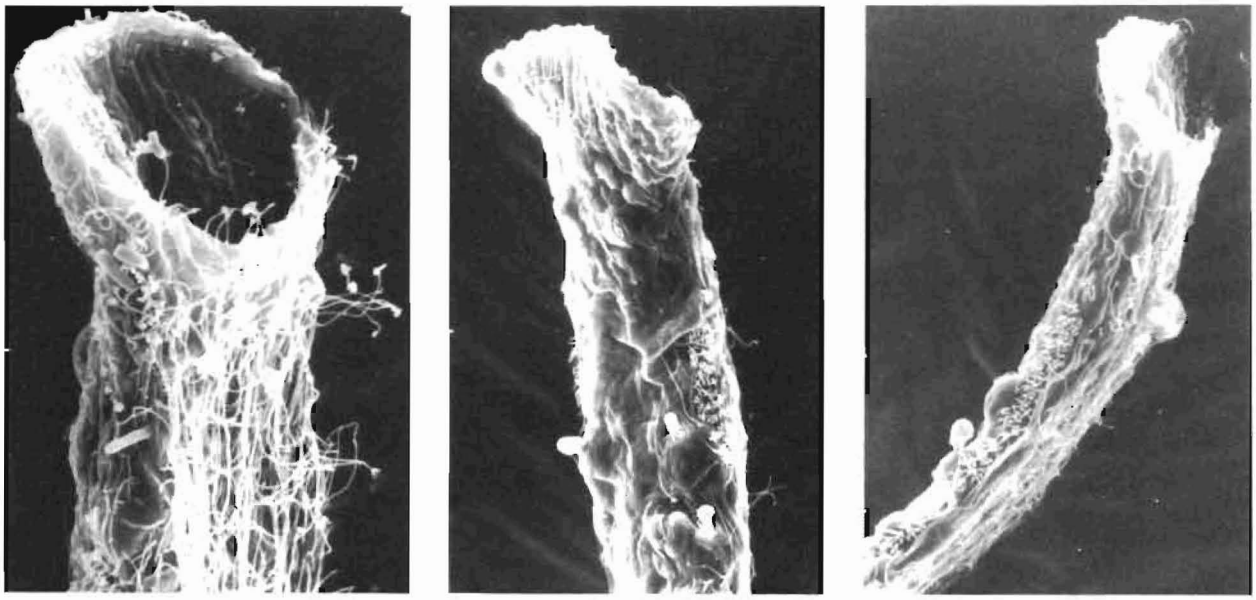

Fig. 14 - *Tetranchyroderma hypopsylancrum* n. sp. From left to right: ventral view of the head, S.E.M., ×640; and two different patterns of the cuticular armature, S.E.M., ×320.

anterior half to 16-18 μm, its pores opening basally at U17; the intestine is broad (24-28 μm) over most of its length, narrowing somewhat to the rear (7 μm); the anus opens ventrally at U91.

Reproductive tract: simultaneous hermaphrodites; a solitary elongate testis occurs on the right side (viewed from above); it appears to open to the exterior just behind the anus; neither the caudal organ nor the frontal organ were seen; the egg (108 × 40 μm; germinal vesicle 13 μm in diameter) is situated mid-dorsally above the middle third of the intestine.

Distribution: Type locality - TUSCANY: Mortelliccio [lat. 42°, 56' N; long. 10°, 41' E], the beach being approached by means of a coastal road that parallels State Route 1, some 4 km northwest of Follonica [S]. Other locations: Alberoni (L), Alimini (S), Donoratico (S), Feniglia (L), Paestum (S), Peschici (S), Torregaveta (S), Baia Verde (S), Vieste (S) [see Fig. 1 and Table I in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in fine littoral sands, but sparse to occasional in fine to medium sublittoral sands, at 1.5 to 3 m water depth, along the entire coast of Italy; Abundance - often numerous to prevalent in samples where found.

Remarks - We regard this species to be identical with Spec. I of Schrom, 1972: p. 303, Fig. 6, based on similar patterns of anterior (TbA), lateral (TbL) and posterior (TbP) adhesive tubes. His specimens had a pharynx slightly shorter than ours, in animals half the length, with several fewer TbL than ours, but with 6 TbP between the caudal feet compared with the 4 in our specimens, and no glands. Our specimens had tetrancres of comparable size, but the pattern varied considerably – from extensive lateral and sometimes medial stripes (we saw no diagonal or transverse stripes) to abbreviated lateral stripes or small epaulets of 18-36 ancres per side in the pharyngeal region (compare the two sides of our Fig. 13B, dorsal view, the right side in this respect being more like spec. III of Schrom, 1972: p. 306, Fig. 8). Several of our specimens had only one or two ancres per side (not figured), and a few were entirely devoid of ancres (also not figured, specimens being identified by means of adhesive tube numbers/pattern). It was usual for Tyrrhenian and Ligurian specimens to be more scantily clad than those from the Adriatic. One of our specimens had only 3 TbP between the caudal feet, while another had the third dorsal tube protruding from between the toes of each foot (see Fig. 13B) that is characteristic of the genus.

Taxonomic affinities - *Tetranchyroderma hypopsilancrum* clearly belongs to the enigmatic group of species that are scantily clad with ancres (those we call «bikini-'trichs»). These species as we conceive them are morphologically variable, but within certain limits. They are more variable with respect to the numbers than the pattern of adhesive tubes, but they may be quite variable with respect to both the extent and pattern of their ancrous covering (or lack thereof). The only other species thus far described from this group is *T. boadeni* Schrom in Riedl, 1970, which differs from *T. hypopsilancrum* in the pattern of both TbA and TbL, as well as in the pattern, though not the extent, of its ancrous covering. Specimens of *T. boadeni* we have seen fit Schrom's description quite closely, with tubes of the anterior series all pointing forward and tubes of the lateral series being spread sparsely throughout the pharyngeal region, though with minor variabilities in the pattern, less so for the extent, of tetrancres dorsally.

Tetranchyroderma pachysomum n.sp.
Fig. 15

Diagnosis - A *Tetranchyroderma*, with an adult length to 300 μm; PhJIn at U48; body thick, with inflated trunk and a short, bilobed caudum on either side of an indented posterior. Sensory hairs are evenly spaced, forming lateral and dorsolateral columns from about U07 to U93. Glands are few (12 per side), large and concentrated in the intestinal region. Cuticular armature of tetrancres, small at both ends of the body, but large in the middle. Adhesive tubes: TbA, 9 per side, one medial at U13 and a cluster of 8 lateral at U13-U15; TbL, 45 per side, a small one at U17 and 44 larger tubes, more or less evenly spaced in the trunk region from U27 to U95; TbD, 1 per side, robust, at U23; TbV, 6 per side in a cluster at U83-U87; TbP, 6 per side, 2 + 1 forming one foot of the bilobed caudum and the other 3 flanking each foot medially. Ventral locomotor cilia: a continuous field of transverse rows covering the entire ventral surface. Reproductive system: testis on right, egg dorsal and central.

Etymology - The name refers to the thick, robust appearance of this species (*pachys*, Gk. thick; *soma*, Gk. body).

Description - The description is based on but a single adult specimen, 250 μm in total length. Pharynx 80 μm in length, pharyngeo-intestinal junction at U48. Body short, thick, with inflated trunk that narrows quickly to the base of a short, bilobed caudum on either side of posterior that is indented medially; widths of oral opening/at neck/trunk/caudal base are as follows: 60/55/88/25 μm at U08/U14/U55/U96, respectively. Sensory hairs include a fringe around the oral opening (ca. 6 μm in length dorsally, 2 μm ventrally) and a second row just behind the leading edge of the oral hood (ca. 12 μm long), with several of varying lengths aggregated laterally, one pair at U07 being longer (24 μm) and of stouter construction than the others, and 1 longer hair (9 μm in length) inserted in front of the lateral anterior adhesive tubes ventrally; other sensory hairs form lateral (10 per side, U10-U93) and dorsolateral (10 per side, U07-U93) columns that are evenly spaced within columns; individual hairs are ca. 9 μm long in the lateral columns and 20 μm in the dorsolateral columns. Glands are few, 12 per side, large in size (up to 15 × 10 μm), irregular in shape, and concentrated laterally in the intestinal region from U41 to U89.

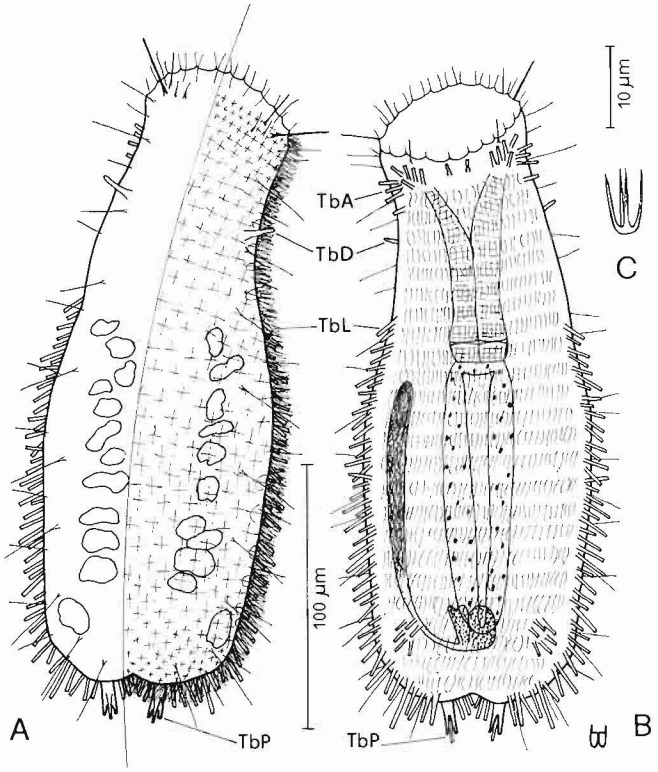

Fig. 15 - *Tetranchyroderma pachysomum* n.sp. A, dorsal view, showing details of the body conformation, the pattern of cuticular armature ont the right half of the body, the lateral and dorsolateral sensory hairs, the glands, and the lateral (TbL), dorsal (TbD) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the oral opening, digestive tract and anus, the male reproductive system, the ventral locomotor ciliary field and the anterior (TbA), lateral, dorsal, ventral and posterior adhesive tubes; C, a tetrancre.

Cuticular armature: thin, delicate tetrancres, with nearly straight tines, nearly twice as tall as wide; small (ca. 2 μm from one tine to its opposite, as measured from above) at both ends, but large (ca. 7 μm) throughout most of the middle portion of the body.

Adhesive tubes: there are 9 anterior tubes (TbA) per side, inserting directly on the body surface at U13-U15; one 5 μm in length occurs medially, and eight 5-7 μm in length occur laterally, seven forming an arc that faces from front around to side, with the eighth in the center. There are 45 lateral tubes (TbL) per side, one 5 μm in length occurring at U17, and 44 others varying in length from 5 to 17 μm (mostly 8-12 μm) occurring more or less evenly spaced in the trunk region from U27 to U95. There is one dorsal tube (TbD) per side, robust, 12 μm in length, and located laterally at U23. There are 6 ventral tubes (TbV) per side, 6-7 μm in length, which form a cluster laterally at U83-U87 that is directed diagonally outward to the rear. The caudum indents medially to U94 between and even beyond the two feet from which it is formed; each foot lacks fleshy lobes, being comprised solely of two adhesive tubes (TbP) that are fused at their bases, with a thinner mid-dorsal tube projecting beyond them from between; 3 additional posterior tubes, 5-8 μm in length, flank each foot medially.

Ventral ciliation: a continuous field of cilia arranged in transverse rows that covers the entire ventral surface from just behind the anterior adhesive tubes to the base of the caudal feet; individual cilia are short, ca. 6 μm in length.

Digestive tract: the oral opening is broad (56 μm in width), with oral hood extending forward above the mouth from U00 to U11; the pharynx narrows over its anterior half to 18-20 μm, its pores opening basally at U40; the intestine is broad (20-28 μm) over most of its length, narrowing somewhat to the rear (14 μm); the anus opens ventrally at U83.

Reproductive tract: probably protandric, later simultaneous, hermaphrodites; a solitary elongate testis

occurs on the right side (viewed from above); it appears to connect with a medial caudal organ and a frontal organ that lies on the same side as the testis; caudal and frontal organs are both very compact, the former bulbous, the latter elongate with an opening to the fore; no egg was seen, either because one had not yet been produced or because one had just been laid and another had not yet been produced.

Distribution: Type locality - TUSCANY: Secche della Meloria [lat. 43°, 32' N; long. 10°, 16' E], off Leghorn [Livorno] (S). Other locations: Leuca (M), Zuccale (M) [see Fig. 1 in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - sparse in medium to coarse sublittoral sands, at 1.5 to 4 m water depth, along the west and south coasts of Italy; Abundance - scarce in samples where found.

Remarks - The specimen found off Leuca was 300 µm in total length and was simultaneously hermaphroditic, having both testis and an egg. Particular care must be given to determining whether or not ventral adhesive tubes occur in specimens of this genus, as they are difficult to resolve without a combination of differential interference contrast optics and good specimen preparations.

Taxonomic affinities - *Tetranchyroderma pachysomum* is most closely related to *T. littoralis* Rao, 1981 and *T. thysanogaster* Boaden, 1965 in having both tetrancres and rows or clusters of TbV. All three are robust species, but *T. littoralis* and *T. thysanogaster* both lack the anterior TbD and the medially indented posterior end. *T. littoralis* alone of the three species lacks caudal feet altogether, while *T. thysanogaster* has a relatively shorter pharynx than *T. pachysomum*.

Tetranchyroderma thysanophorum n.sp.

Figs 16, 17

Diagnosis - A *Tetranchyroderma*, with an adult length to 460 µm; PhJIn at U35; body elongate, trunk moderately inflated, with a short bilobed caudum. Sensory hairs are evenly spaced, forming lateral, dorsolateral and dorsal columns from about U08 to U97; 8 elongate filaments trail from the trunk on either side at U58-U92. Glands are many (36-38 per side), variable in size and scattered in lateral and dorsal columns from U10-U95. Cuticular armature of pentancres with an elongate central tine, small at both ends of the body, but medium in the mid-section. Adhesive tubes: TbA, 6 per side, one medial at U10 and a cluster of 5 lateral at U09-U11; TbL, usually ca. 44 per side, a small one at U14 and 43 larger tubes, more or less evenly spaced in the trunk region from U24 to U94; TbD absent; TbV, 1 per side, long, posteriorly directed, inserting at U69; TbP, 5 per side, 2 forming one foot of the bilobed caudum and the other 3 flanking each foot medially. Ventral locomotor cilia: a continuous field of transverse rows covering the entire ventral surface. Reproductive system: testis short, on right; egg dorsal in mid-intestinal region, on left.

Etymology The name refers to the fringe of filaments that are borne along the lateral edges in the posterior

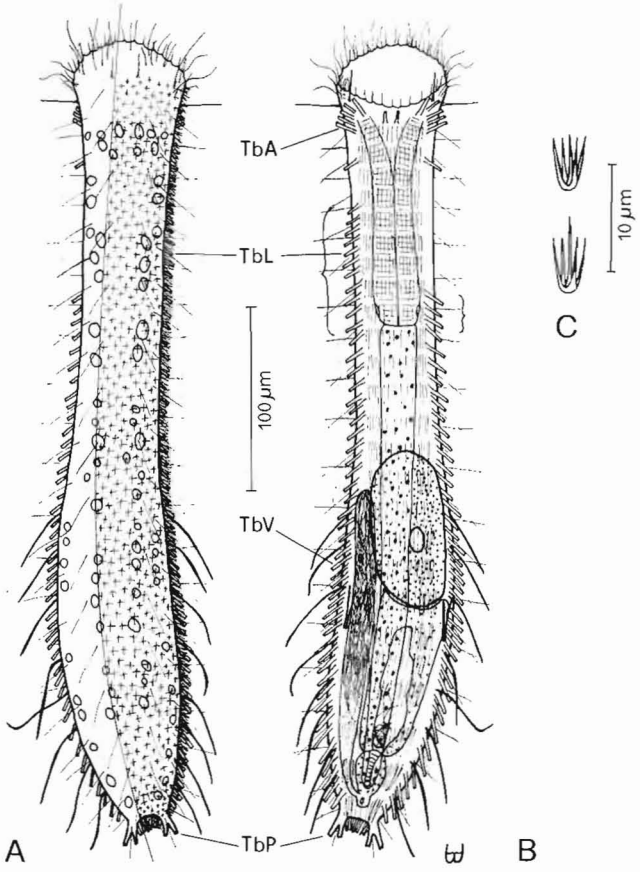

Fig. 16 - *Tetranchyroderma thysanophorum* n.sp. A, dorsal view, showing details of the body conformation, the pattern of cuticular armature on the right half of the body, the lateral, dorsolateral and dorsal sensory hairs, the glands, and the lateral (TbL) and posterior (TbP) adhesive tubes; B, ventral view, showing details of the oral opening, digestive tract and anus, the male and female reproductive systems, the ventral locomotor ciliary field and the anterior (TbA), lateral, ventral (TbV) and posterior adhesive tubes; C, a pentancre.

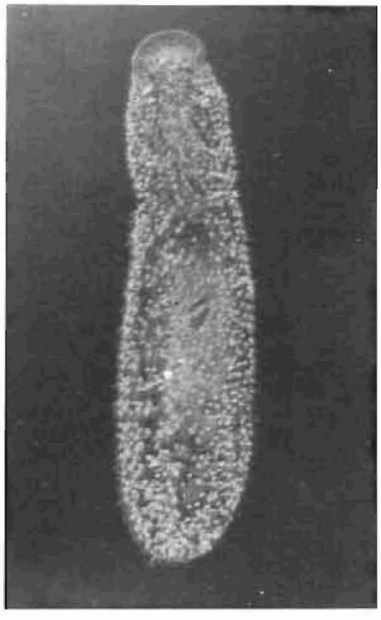

Fig. 17 - *Tetranchyroderma thysanophorum* n. sp., n. sp., habitus. Nomarski optics, ×160.

third of the trunk in this species (*thysanos*, Gk. fringe; *phoreus*, Gk. bearer).

Description - The description is based on an adult specimen, 460 μm in total length. Pharynx 125 μm in length; pharyngeo-intestinal junction at U35. Body elongate, moderately inflated trunk that narrows gradually to the base of a short, bilobed caudum; widths of oral opening/at neck/trunk/caudal base are as follows: 64/46-48/66/22 μm at U06/U17-48/U72/U96, respectively. Sensory hairs include a fringe around the oral opening (5-7 μm in length) and a second transverse row just behind the leading edge of the oral hood (ca. 15 μm long), with several of varying lengths aggregated laterally, one pair at U04 being longer (32 μm) than the others, and 1 thicker hair (18 μm in length) inserted in front of the lateral anterior adhesive tubes ventrally; other sensory hairs form lateral (20 per side, U08-U96), dorsolateral (20 per side, U09-U98) and dorsal (10 per side, U06-U94) columns that are evenly spaced within columns; individual hairs are 16-22 μm long in the lateral and dorsal columns and 24-28 μm in the dorsolateral columns. Eight elongate filaments, 35-45 μm in length, trail from the trunk on either side at U58-U92. Glands are many, 36-38 per side, large in size (up to 15 × 10 μm), irregular in shape, and concentrated laterally in the intestinal region from U41 to U89.

Cuticular armature: thin, delicate pentancres, with nearly straight tines, nearly twice as tall as wide, but in most specimens with the central tine exceeding the surrounding four by one fourth their length; small (ca. 2-3 μm from one tine to its opposite, as measured from above) at both ends of the body, but larger (ca. 5-6 μm) throughout most of the middle portion of the body; anterior most border of ancres forms more or less a transverse row, posterior most ancres extend onto the caudum.

Adhesive tubes: there are 6 anterior tubes (TbA) per side, inserting directly on the body surface at U09-U11; one 7 μm in length occurs medially, and five 8-13 μm in length occur laterally, forming an arc that faces from front around to side. There are 44 lateral tubes (TbL) per side, one 11 μm in length occuring at U14, and 43 others varying in length from 8 to 17 μm (mostly 12-15 μm) occuring more or less evenly spaced in the trunk region from U24 to U94 (see the right side of the specimen in Fig. 11, dorsal view). Dorsal tubes (TbD) are absent. There is one ventral tube (TbV) per side, 25 μm in length, which is difficult to see because it lies longitudinally just inside the lateral trunk wall, inserting at U69. The caudum indents medially to U97 and is formed by two feet, with fleshy lobes proximally and 2 adhesive tubes (TbP) distally that are fused at their bases; the feet lack the thinner mid-dorsal tube which projects beyond them from between and is characteristic of many species in the genus; 3 additional posterior tubes, 5-9 μm in length, flank each foot medially.

Ventral ciliation: a continuous field of cilia arranged in transverse rows that covers the entire ventral surface from just behind the anterior adhesive tubes to the base of the caudal feet; individual cilia are short, ca. 14 μm in length.

Digestive tract: the oral opening is broad (60 μm in width), with oral hood extending forward above the mouth from U00 to U08; the pharynx narrows over its anterior half to 22 μm, then expands gradually to 28 μm, its pores opening basally at U33; the intestine narrows gradually throughout its length (20 μm in front to 8 behind); the anus opens ventrally at U92.

Reproductive tract: simultaneous hermaphrodites; a solitary testis, of relatively short length, occurs on the right side (viewed from above); it connects with a medial caudal organ and that to a frontal organ which lies on the left side with the egg; caudal organ is oblong (25 × 17 μm), with a longitudinal channel inside that has cross-striated walls, and exits just behind the anus at U94; frontal organ is large (84 × 27 μm posteriorly to 38 anteriorly), diffuse and sac-like, with an interior cavity that may contain sperm, its fore end extending to encompass the rear of the egg; the egg (90 × 42 μm; germinal vesicle is oblong, 14 × 8 μm) is situated dorsally on the left side above the middle of the intestine.

Distribution: Type locality - TUSCANY: Castiglione della Pescaia [lat. 42°, 45' N; long. 10°, 51' E], west of Grosseto [S]. Other locations: Lacco Ameno (M), S. Andrea (S), Bagnetielli (M), Biodola (S), Camerota (S), Cefalù (S), Fetovaia (S), Spiaggia degli Inglesi (M), Ischia porto (S), Lacona (S), Mortola (S), Pozzuoli (S), Recisello (S), Scissura (S), Serapo (S), Zuccale (M) [see Fig. 1 and Table I in this paper and Table I in Hummon *et al.*, 1992].

Ecology: Frequency of occurrence - occasional in fine to coarse gravely sublittoral sands, at 1.5 to 6 m water depth, along the Tyrrhenian coast of Italy; Abundance - often numerous and sometimes prevalent in samples where found.

Remarks - This is another species that shows considerable variability in a few characters. The specimen described was typical, having 43 TbL in the main series, with only 3 of those anterior to the PhJIn (see the right side of the specimen in Fig. 11, ventral view); other specimens had 4 to 5, or even as many as 11 anterior to the PhJIn, with as many as 51 in the main series (see the left side of the same figure). Some specimens had as many as 7 TbA and 12 TbP inserting between the caudal feet (not figured). As in *Tetranchyroderma hypopsilancrum*, a few specimens of *T. thysanophorum* had the third dorsal tube protruding from between the toes of each foot (not figured). In most specimens, the central tine of the pentancre exceeded the other four in length by one fourth (see Fig. 11C, lower), but in a few specimens the central tine was nearly twice as long as the others (not figured), while is some specimens the tines were all of the same length (see Fig. 11C, upper). The number of lateral trunk filaments was usually 8, but only 4 to 6 could be located in a few specimens.

Taxonomic affinities - *Tetranchyroderma thysanophorum* in its typical form is the only species that lacks (1) head tentacles, has (2) trailing trunk filaments, (3) pentancres whose mid-tine exceeds the others in length, lacks (4) TbL over most of the pharyngeal region and (5) TbD entirely, has (6) a single TbV per side, and has (7) a prominent caudum with feet each comprised of two fused tubes, and with 6 tubes in the medial space. *T. suecicum* Boaden, 1960 and *T. quadritentaculatum* Todaro *et al.*, 1992 both have (1) head tentacles; no other species thus far described has (2) trailing trunk filaments; only *T. polyacanthum* Remane, 1927 of species thus far described has (3) pentancres whose mid-tine exceeds the others in length; *T. hirtum* Luporini *et al.*, 1973a, *T. megastomum* (Remane, 1927) and *T. polypodium* Luporini *et al.*, 1971 have (4) TbL over most of the pharyngeal region and (6) lack TbV entirely, while *T. coeliopodium* Boaden, 1963 and *T. pacificum* Schmidt, 1974 both have (6) multiple TbV per side and have (7) the third dorsal tube protruding from between the toes of each foot.

REFERENCES

Balsamo M., Todaro M. A., 1987 - *Aspidiophorus polystictos*, a new marine species (Gastrotricha, Chetonotida) and its life cycle. Boll. Zool., *54*: 147-153.

Balsamo M., Todaro M. A., Tongiorgi P., 1992 - Marine gastrotrichs from the Tuscan Archipelago (Tyrrhenian Sea). II. Chaetonotida, with description of three new species. Boll. Zool., *59*: 487-498.

Boaden P. J. S., 1960 - Three new gastrotrichs from the Swedish west coast. Cah. Biol. mar., *1*: 397-406.

Boaden P. J. S., 1963 - *Tetranchyroderma coeliopodium* n. sp., a marine intertitial gastrotrich from Ireland. Ann. Mag. nat. Hist., *6*: 375-379.

Boaden P. J. S., 1965a - Two new interstitial Gastrotricha of the family Thaumastodermatidae. Pubbl. Staz. zool. Napoli, *34*: 219-225.

Boaden P. J. S., 1965b - Interstitial fauna from Porto Paone. Pubbl. Staz. zool. Napoli, *34*: 235-239.

Claparède E., 1867 - Miscellanées zoologiques, III. Type d'un nouveau genre de Gastérotriches. Ann. Sci. nat., *8*: 16-23; Pl. 4, Figs. 5-9.

Clausen C., 1965 - New interstitial species of the family Thaumastodermatidae (Gastrotricha Macrodasyoidea). Sarsia, *21*: 23-36.

De Zio S., Grimaldi P., 1964 - Ricerche sulla distribuzione ed ecologia di *Batillipes pennaki* Marcus in una spiaggia pugliese (Heterotardigrada). Cah. Biol. mar., *5*: 271-285.

Evans W. A., Hummon W. D., 1991 - A new genus and species of Gastrotricha from the Atlantic coast of Florida, U.S.A. Trans. Am. Microsc. Soc., *110*: 321-327.

Gerlach S., 1953 - Gastrotrichen aus dem Küstengrundwasser des Mittelmeeres. Zool. Anz., *150*: 203-211.

Grünspan T., 1908 - Beiträge zur Systematik der Gastrotrichen. Zool. Jahrb. Syst., *26*: 214-256; Taf. 18-19.

Hummon W. D., 1977 - Introgressive hybridization between two intertidal species of *Tetranchyroderma* (Gastrotricha, Macrodasyida. Mikrofauna Meeresbodens, *61*: 107-130.

Hummon W. D., Balsamo M., Todaro M. A., 1992 - Italian marine Gastrotricha: I. Six new and one redescribed species of Chaetonotida. Boll. Zool., *59*: 499-516.

Hummon W. D., Todaro M. A., Balsamo M., Tongiorgi P., 1990 - Effect of pollution on marine Gastrotricha in the northwestern Adriatic Sea. Mar. Pollut. Bull., *21*: 241-243.

Luporini P., Magagnini G., Tongiorgi P., 1971 - Contribution à la connaissance des Gastrotriches des côtes de Toscane. Cah. Biol. mar., *12*: 433-455.

Luporini P., Magagnini G., Tongiorgi P., 1973a - Gastrotrichi macrodasioidei delle coste della Toscana. Pubbl. Staz. zool. Napoli, *38* (1970): 267-288.

Luporini P., Magagnini G., Tongiorgi, P., 1973b - Chaetonotoid Gastrotrichs of the Tuscan coast. Boll. Zool., *40*: 31-40.

Luporini P., Tongiorgi P., 1972 - Observation au microscope à balayage de quelques Gastrotriches Chaetonotoides. Cah. Biol. mar., *13*: 299-303.

Papi F., 1957 - Tre nuovi Gastrotrichi mediterranei. Pubbl. Staz. zool. Napoli, *30*: 176-183.

Rao G. C., 1970 - Three new interstitial gastrotrichs from Andhra Coast, India. Cah. Biol. mar., *11*: 109-120.

Rao G. C., Ganapati P. N., 1968 - Some new interstitial gastrotrichs from the beach sands of Waltair coast. Proc. Indian Acad. Sci., *67B*: 35-53.

Rao G. C., 1981 - Three new gastrotrichs from Orissa Coast, India. Bull. Zool. Surv. India, *3*: 137-143.

Remane A., 1926 - Morphologie und Verwandtschaftsbeziehungen der aberranten Gastrotrichen. I. Z. Morphol. Ökol. Tiere, *5*: 625-754.

Remane A., 1927a - Neue Gastrotrichen Macrodasyoidea. Zool. Jahrb. Syst., *54*: 203-242.

Remane A., 1927b - Gastrotricha. *In*: G. Grimpe (ed.), Die Tierwelt der Nord- und Ostsee, *10* (7d), pp. 1-56.

Remane A., 1951 - *Mesodasys*, ein neues Genus der Gastrotricha Macrodasyoidea aus der Kieler Bucht. Kieler Meeresforsch., *8*: 102-105; Taf. 29.

Remane A., 1961 - *Neodasys uchidai* nov. spec., eine zweite *Neodasys*-Art (Gastrotricha Chaetonotoidea). Kieler Meeresforsch., *17*: 85-88.

Renaud-Mornant J., 1968 - Présence du genre *Polymerurus* en milieu marin, description de deux espèces nouvelles (Gastrotricha, Chaetonotoidae). Pubbl. Staz. zool. Napoli, *36*: 141-151.

Riedl R., 1970 - Gastrotricha. *In*: R. Riedl (ed.), Flora und Fauna der Adria, 2 Auflage. Paul Parey, Hamburg Berlin, pp. 216-218 (see also 1983, 3 Auflage, pp. 228-231).

Ruppert E. E., 1970 - On *Pseudostomella* Swedmark 1956 with descriptions of *P. plumosa* nov. spec., *P. cataphracta* nov. spec. and a form of *P. roscovita* Swedmark 1956 from the west Atlantic coast. Cah. Biol. mar., *11*: 121-143.

Schmidt P., 1974 - Interstitielle Fauna von Galapagos. IV. Gastrotricha. Mikrofauna Meeresbodens, *26*: 1-76.

Schrom H., 1966 - Gastrotrichen aus Feinsanden der Umgebung von Venedig. Boll. Mus. civ. St. nat. Venezia, *17*: 31-45.

Schrom H., 1972 - Nordadriatische Gastrotrichen. Helgoländer wiss. Meeresunters., *23*: 286-351.

Soyer J., 1985 - Mediterranean Sea meiobenthos. *In*: M. Moraitou-Apostolopoulou & V. Kiortsis (eds), Mediterranean marine ecosystems. Plenum, New York, pp. 85-108.

Todaro M. A., 1992 - Contribution to the study of the Mediterranean meiofauna: Gastrotricha from the Island of Ponza, Italy. Boll. Zool., *59*: 321-333.

Todaro M. A., Balsamo M., Tongiorgi P., 1992 - Marine gastrotrichs from the Tuscan Archipelago (Tyrrhenian Sea). I. Macrodasyida, with description of three new species. Boll. Zool., *59*: 471-485.

Todaro M. A., Tongiorgi P., Balsamo M., 1988 - *Tetranchyroderma sardum*, a new species of the family Thaumastodermatidae. Boll. Zool., *55*: 171-174.

Tongiorgi P., 1975 - Two interesting Macrodasyoidea (Gastrotricha) from the coast of Tuscany. Boll. Zool., *42*: 275-278.

Tongiorgi P., Balsamo M., 1984 - A new *Tetranchyroderma* species (Gastrotricha, Macrodasyoidea) from the Adriatic coast. Boll. Zool., *51*: 335-338.

Tyler S., Rieger G. E., 1980 - Adhesive organs of Gastrotricha: I. Duogland organs. Zoomorphologie, *95*: 1-15.

Valbonesi A., Luporini P., 1984 - Researches on the coast of Somalia. Gastrotricha Macrodasyoidea. Monit. zool. ital., *19*, Suppl. 1: 1-34.

Wilke U., 1954 - Mediterrane Gastrotrichen. Zool. Jahrb. Syst., *82*: 497-550.