

## *Tridentulus*, a new genus of Monhysteridae (Nematoda) from the Galápagos archipelago

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### Abstract

*Tridentulus* n. gen. is described from Isla Floreana, the Galápagos and its type and only species *Tridentulus floreanae* EYUALEM & COOMANS, 1995) n. comb. redescribed. *Tridentulus* n. gen., comes close to the genera *Monhystera* BASTIAN, 1865, *Eumonhystera* ANDRÁSSY, 1981 and *Sinanema* ANDRÁSSY, 1960, but, differs from all of them in a combination of two characteristics i.e. in having three small denticles situated posteriorly at the base of the stoma and an outstretched female reproductive system. The taxonomic position of the genus *Sinanema* is also questioned.

**Key words:** *Tridentulus* n. gen., Monhysteridae, freshwater nematodes, Galápagos, taxonomy, redescription.

### Introduction

These specimens were first encountered during the course of a study in 1993 of freshwater nematodes from the Galápagos archipelago. They showed characteristics of two monhysterid genera, *Monhystera* BASTIAN, 1865 and *Eumonhystera* ANDRÁSSY, 1981. Subsequently, therefore, the species was categorized under the closest genus, *Monhystera*, mainly based on the position of the amphids (see EYUALEM & COOMANS, 1995). In doing so we actually had created a lump of the two genera, *Monhystera* and *Eumonhystera*. Our own subsequent work (EYUALEM & COOMANS, in press) revealed the distinct nature of the two closely related genera. Hence, seen in the light of our present day knowledge, the clear differences between the two genera need to be maintained especially as reflected by the absence/presence of crystalloid bodies. Such a notion triggered the re-examination of the type population as well as the additional specimens of this intermediate species which were at our disposal. This revealed that these populations not only represented the new species already described but also a new genus we propose to erect here.

The detailed descriptions of the study areas and materials and methods employed are given in EYUALEM & COOMANS (1995).

### *Tridentulus* n. gen.

#### DIAGNOSIS

Monhysteridae. Small animals. Cuticle finely annulated, with numerous somatic setae. Amphids circular and small, at 0.8-1.3 lip region widths from anterior body end. Lip region continuous with the rest of the body. Sensilla in two circlets, an inner ring of six setiform papillae and an outer ring of six labial and four shorter cephalic setae. Oral aperture 4-6  $\mu\text{m}$  wide. Stoma short, "V"-shaped with three small denticles, one slightly anteriorly situated dorsal and two slightly posteriorly situated ventrosublateral. Pharynx more or less cylindrical with slightly expanding base. Cardia with a ventrally situated gland. Ventral gland cell body well developed, situated on ventral side and extending to the right side of the body. A hyaline-looking coelomocyte on the left lateral side of the body, at 0.75-1.00 corresponding body width posterior to base of pharynx. Female reproductive system prodelphic, monodelphic with outstretched ovary. Numerous small, hyaline coelomocytes between ovary and uterus. Uterus short. Vulva posterior to middle. Tail elongate conoid for most part. Vulva-anus distance nearly as long as tail length. Spinneret always directed towards the ventral side. Crystalloid bodies absent.

#### Type and only species

*Tridentulus floreanae* (EYUALEM & COOMANS, 1995), n. comb.

Syn. *Monhystera floreanae* EYUALEM & COOMANS, 1995.

#### RELATIONSHIPS

The presence of round amphids, six labial setae longer than the four cephalic ones, "V"-shaped stoma surrounded by pharyngeal tissue, prodelphic, monodelphic reproductive system situated opposite the right side of the intestine, outstretched ovary, ventral gland situated on the anterior part of the intestine, caudal glands opening through a common pore, absence of terminal setae, and the freshwater environment where it is recorded

undoubtedly places this genus in the family Monhysteridae DE MAN, 1876, *sensu* LORENZEN (1981 & 1994). Apart from the Monhysteridae, however, in having three denticles in the stoma and circular amphids, this genus comes close to two other genera i.e. *Rogerus* HOEPLI & CHU, 1934 and *Sinanema* ANDRÁSSY, 1960 in the family Rhabdolaimidae CHITWOOD, 1951 *sensu* LORENZEN (1981 & 1994). Unlike our new genus, the genus *Rogerus* is characterized by having a large dorsal tooth as compared to the subventral ones, elongated, tubular stoma, didelphic reproductive system and long spinneret (HOEPLI & CHU, 1932; ANDRÁSSY, 1984). The genus *Sinanema* is characterized by having three small denticles in the most anterior part of the stoma and reflexed ovary, and its taxonomic position is unclear. LORENZEN (1981) included nine genera in the family Monhysteridae DE MAN, 1876 but, he did not include the genus *Sinanema* in this family even with his wrong assumption of outstretched ovary as its characteristic. On the other hand he grouped the family Rhabdolaimidae, under which he categorized the genus *Sinanema*, under the suborder Leptolaimina based on the fact that "some of the species have antidromously reflexed ovaries and because the vestibulum does not have twelve ribs (rugae)". In fact in doing so LORENZEN might have categorized the genus *Sinanema*, a genus with reflexed ovary, under its right category, the Leptolaimina, for the genus is characterized as such by a reflexed ovary. Although whether it is antidromously or homodromously reflexed is not clearly known. Observation of illustrations in the original description of the type species gives the impression of antidromously reflexed ovary. JACOBS (1987) in his monographic work on the family transferred the genus *Sinanema* from the Rhabdolaimidae to Monhysteridae, to accommodate all species in the family with reflexed ovary and denticle in the stoma. The transfer of *Sinanema* to the family Monhysteridae, a family characterized by outstretched ovary, is questionable when seen in the light of the importance of the reproductive system in establishing phylogenetic relationships within the Nematoda (LORENZEN, 1981 & 1994). Therefore, JACOBS' (1987) decision needs to be reconsidered. According to JACOBS (1987) the family Monhysteridae consists of 12 valid genera. He identified the genera *Sitadevinema* KHERA, 1971 and *Anguimonhystera* ANDRÁSSY, 1981 *genera inquirerendae*. The only genus in the family Monhysteridae *sensu* JACOBS (1987) with three denticles in the stoma is *Sinanema*. Our new genus differs from the genus *Sinanema* in having outstretched ovary and denticles situated posteriorly at the base of the stoma.

Compared to the genera in the family Monhysteridae with outstretched ovary, *Tridentulus* n. gen. comes close to three, *Sitadevinema*, *Monhystera* and *Eumonhystera*, with a closer resemblance to the latter two.

Unlike our new genus, the genus *Sitadevinema* is characterized by long body [Length = 1960.0-2210.0  $\mu\text{m}$  v. 554.0  $\mu\text{m}$  (492.0-634.0  $\mu\text{m}$ ) in our new genus], three plates, each about 8.0  $\mu\text{m}$  long (from original illustration by KHERA, 1971) in the "V"-shaped, big stoma (11.0-13.0

$\mu\text{m} \times 20.0\text{-}22.0 \mu\text{m}$ ), very posteriorly situated vulva [V% = 82.0-86.0 v. 62.0 (59.7-70.1) in our new genus], lack of ventral gland (prominent in our genus), and in having long tail compared to vulva-anus distance [Tail L/vulva-anus distance = 3.0 v. 1.0 (0.9-1.1) in our new genus]. The genera *Monhystera* and *Eumonhystera* share many similar characteristics such as the presence of a ring of perioral platelets, a structure reported only from the two genera in the whole family (JACOBS, 1987; EYUALEM & COOMANS, 1995), making identification between the two genera difficult. They are identified at the moment based solely on the presence/absence of crystalloid bodies, present in the former but absent in the latter. Although ANDRÁSSY (1981) singled out the ratio of spicule length to anal body width to be a useful character in the identification of these two genera, nevertheless, the rarity of males especially in the genus *Eumonhystera*, where only five out of 23 species are described with males, makes it almost impossible to use this character. The characteristics used to identify the two genera as well as the new genus are summarized in Table 1. In some of its characteristics the new genus falls in between the two known genera. The absence of crystalloid bodies and its small size bring it closer to *Eumonhystera*, but, the position of the amphids makes the new genus closer to *Monhystera*, while the length of tail compared to vulva-anus distance and the width of oral aperture are intermediate. The presence of three denticles in the stoma and spinneret with convex dorsal and concave ventral parts, however, make it different from both genera.

We have given serious consideration to the nature of the stoma i.e. presence, absence and number of denticles especially in the genus *Monhystera* before we decided to make this proposal, for some species of this genus depict one denticle of a similar size as in the new genus on the dorsal sector of the stoma. Our studies on the genus *Monhystera* hitherto (EYUALEM & COOMANS, in press), however, have shown only either the absence of a denticle (Figs 2E-F) or at most only one dorsal denticle at the base of the stoma (Fig. 2C), and no species in this genus was found to be characterized by having three denticles in the stoma.

#### ***Tridentulus floreanae***

(EYUALEM & COOMANS, 1995) n. comb.

(Figs 1 & 2)

For measurements and some of the figures refer to EYUALEM & COOMANS (1995, pages 30-32).

#### REDESCRIPTION

##### *Female:*

Body after fixation more or less straight or slightly undulating with dorsally or ventrally curved posterior end, maximum body width between pharynx and vulva. Cuticle thin (0.5-0.8  $\mu\text{m}$ ). Scanning electromicrographs show

Table 1.

Characteristics that have been used in the identification of the two genera, *Monhystera* and *Eumonhystera*, compared to the characteristics of *Tridentulus* n. gen.

	<i>Monhystera</i>	<i>Eumonhystera</i>	<i>Tridentulus</i> n. gen.
Crystalloids	Present	Absent	Absent
Female tail length (T L) compared to vulva-anus distance (V-A)	usually T L < V-A	T L > V-A	T L = V-A
Distance of amphids from anterior body end	< 1.2 LRW*	≥ 1 LRW	0.8-1.3 LRW
Width of oral aperture	4.0-7.0 μm	< 5.0 μm	4.0-6.0 μm
Shape of tail tip	slightly but noticeably swollen	spindle shaped	swollen on the dorsal side
Body size	700-1500 μm	600-900 μm	492-634 μm
Number of denticles in stoma	0-1 (dorsal when present)	0	3 (one dorsal two ventrosublateral)

\* LRW = lip region width

a faintly striated outer layer (10-12 striae in 5.0 μm). Somatic setae distribution variable; on pharynx, 11-12 and 9-14 on the left and right sides respectively; on tail, 7-9 and 7-8 on the left and right sides respectively; most anterior somatic setae situated 21-23 μm from anterior body end. Crystalloid bodies absent.

A first ring of six inner setiform papillae (slightly less than or equal to 1.0 μm long) and a second ring of six outer labial (5.0-6.0 μm long) and four shorter cephalic setae on the truncate lip region. Lip region continuous with the rest of the body. A ring of perioral platelets surrounds the 4.0-6.0 μm wide mouth opening; lip region height 3.0-3.5 μm. Cheilostome wider than long with prominently refractive lining. Remainder of stoma short "V"-shaped, demarcation in some specimens unclear due to open pharyngeal lumen. At the base of the stoma, 7.5-9.0 μm from anterior body end, on the dorsal sector is situated a denticle, just immediately posterior (about 0.5-1.0 μm) to this dorsal denticle (9.0-10.0 μm from anterior body end) are two ventrosublaterally situated denticles. The dorsal and ventrosublateral denticles have a more or less similar size; denticle tip sharp and optically refractive, base wider; ampulla of dorsal pharyngeal gland canal close to dorsal denticle base. Amphidial fovea narrow (2-3 μm in diameter), circular, anterior margin of fovea situated at 0.8-1.3 lip region widths from anterior body end; *fusus amphidialis* often unclear. Ocelli not seen. Pharynx muscular, more or less cylindrical, with slightly expanding base. Pharyngeal gland canal well developed, starting point and end of canal unclear, in most specimens coiled in the posterior part of pharynx, passes as single canal parallel to the lumen extending up to nerve ring area; gland nuclei unclear. Nerve ring at 47.8-60.9% pharyngeal length.

Cardia mushroom shaped, wider than long, component cells clear only in some specimens, composed of three (?)

layers of cells; an anterior less granular pair that appear as small notches, forming a close contact with the posterior end of the pharyngeal lumen, the second and third pairs, together form the most extended umbrella shaped part of the cardia; membrane separating these second and third pairs of cells faintly detectable. On the ventral side of the cardia is situated a granular and well developed gland cell whose anterior side is socketed to the cardiac cells, its posterior part (7.0-9.0 μm long) sticks out of the cardia extending posteriorly to reach the anterior side of the ventral gland cell.

Ventral gland cell body well developed, situated on the ventral side and extending to the right side of the body over about 0.6-0.8 of the corresponding body width posterior to base of pharynx. The membrane of the ventral gland on its right posterior side is in close contact with a cell of similar nature but of about half magnitude. Whether this cell is part of a compartmented ventral gland cell or represents a separate coelomocyte is unclear. At a similar distance from the pharyngeal base on the left side of the body is invariably present a coelomocyte of a similar appearance but more oval in shape. Canal and ampulla of ventral gland cell not observed.

Intestine with two well defined zones, an inner non granular brush border and an outer granulated part filled with brown inclusions. Anterior part of intestine forming a weakly demarcated progaster with narrow lumen (4.0-6.0% corresponding body width), posterior part of intestine with wider lumen (20.0-26.0% corresponding body width). Intestine terminating in a short tongue shaped internal process; sphincter cell nuclei clear. Rectum as long as anal body width [1.03 (0.96-1.15) times anal body width], with open lumen, and two fairly clear dorsal gland cells and a less clear ventral gland cell.

Reproductive system prodelphic, monodelphic, situated on the right side of the intestine. Germinal zone oogonia

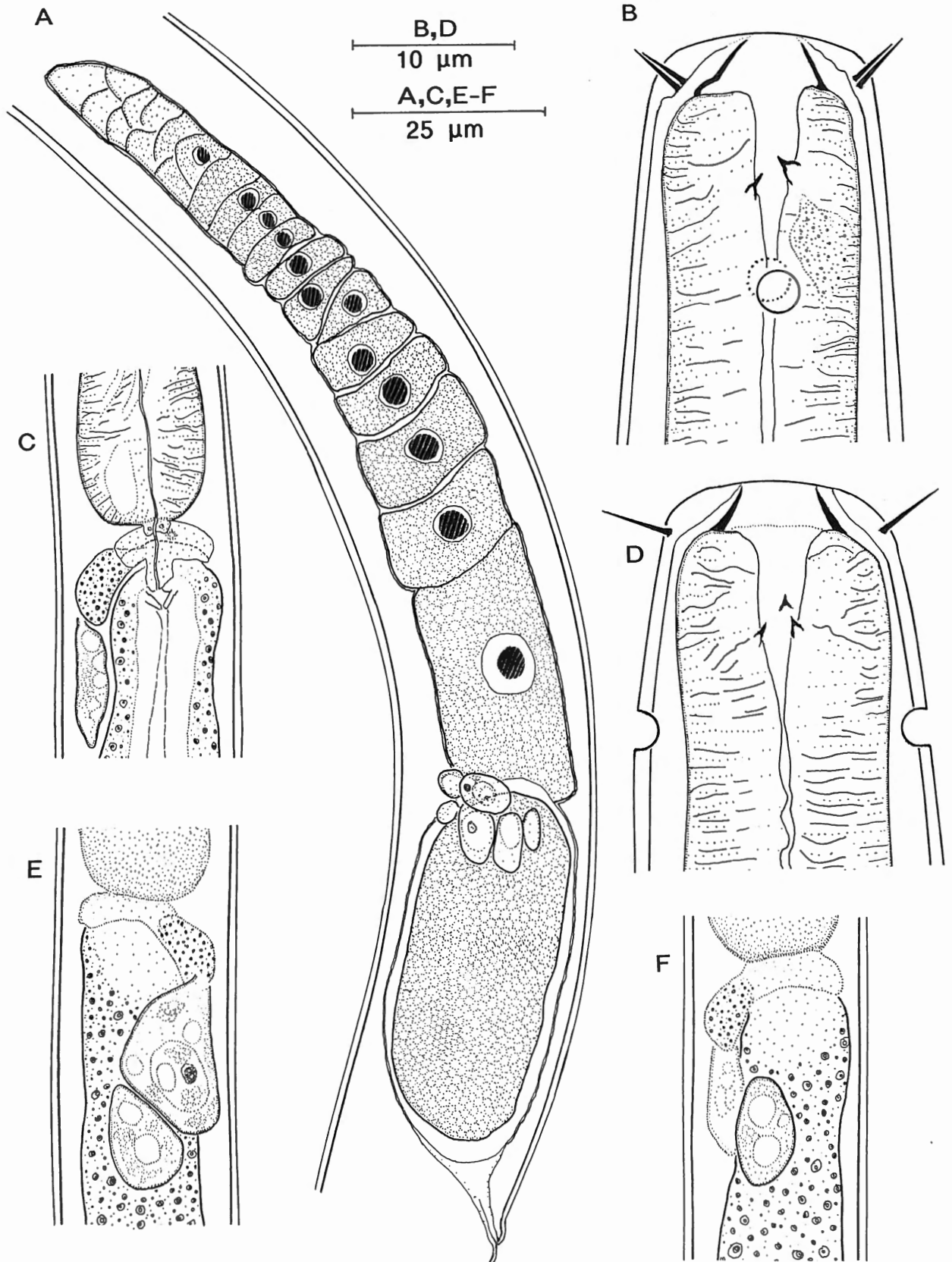


Fig. 1. – *Tridentulus floreanae* (EYUALEM & COOMANS, 1995), female, A: Reproductive system; B & D: Lateral and ventral views of anterior body end, respectively, showing the slightly anterior dorsal and the posterior ventrosublateral denticles; C: Lateral view of cardiac region showing posterior part of pharynx, cardia and associated gland, ventral gland, and anterior part of intestine; E: Right lateral side of cardiac region showing ventral gland and associated cell (coelomocyte?); F: Left lateral view of cardiac region showing a coelomocyte.

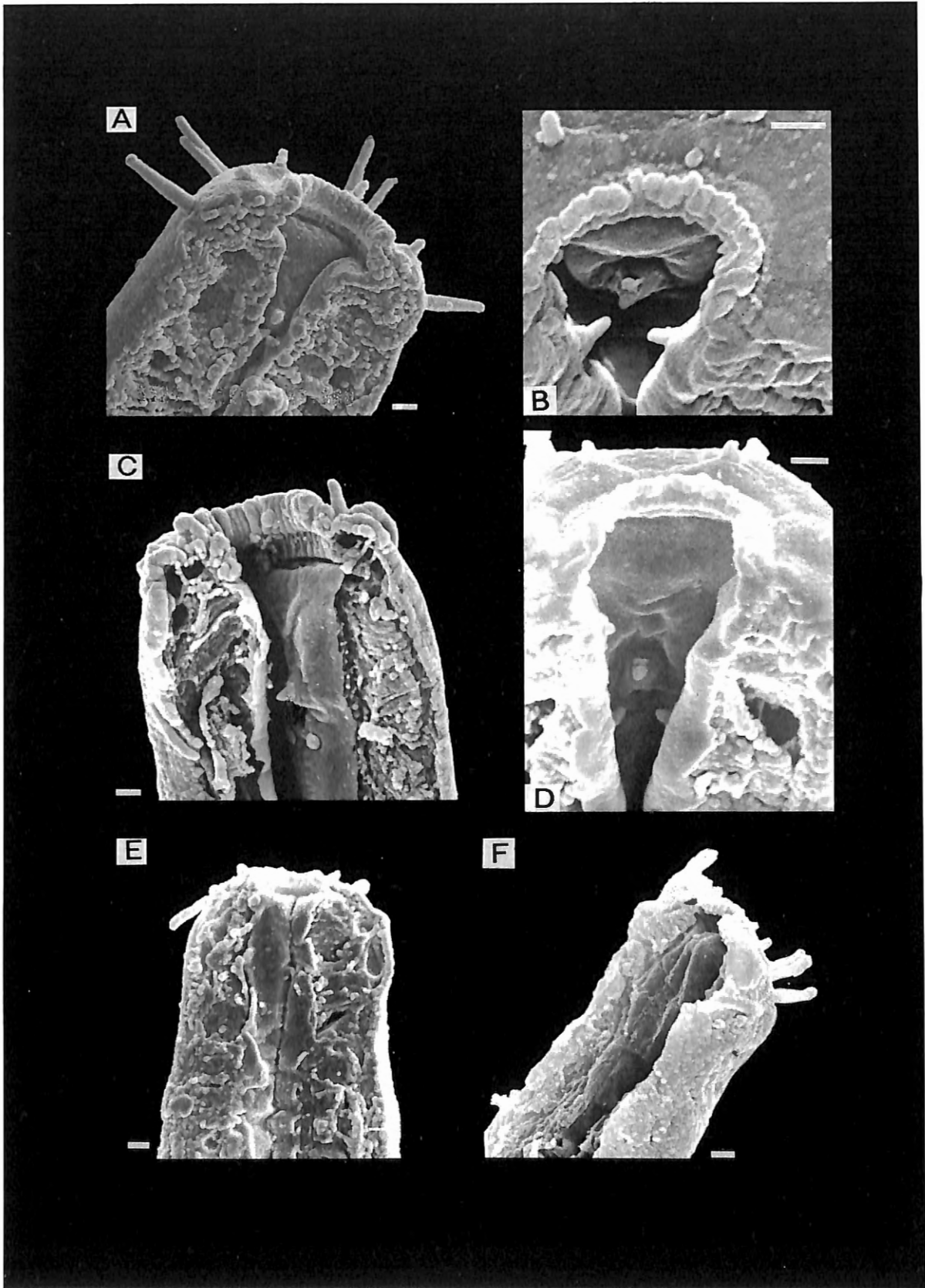


Fig. 2. – Scanning electromicrographs, A-B & D, *Tridentulus floreanae* (EYUALEM & COOMANS, 1995), female, A, B & D: Longitudinal sections of the anterior body end showing the three denticles, one anterior dorsal and two slightly posterior ventrosublateral at the base of the stoma; C: *Monhystera* spec., (a species described in EYUALEM & COOMANS, in press), female, showing the only dorsal denticle in the stoma; E-F, *Monhystera somereni* ALLGÉN, 1952, female, dorsal and ventral sides, respectively, showing the absence of a denticle in the stoma. (Scale bar = 1 μm).

arranged in one or two or rarely in many rows; terminating in a cap cell. Growth zone with a single row of continuously enlarging oocytes. Oviduct short and inconspicuous. Between ovary and uterus are situated many small, oval and hyaline coelomocytes. In the absence of an oocyte in the uterus these coelomocytes appear to be situated between the ovary and vagina. Uterus short and inconspicuous in the absence of an oocyte or egg, as long as oocyte or egg in the presence of either of the two. Vagina faintly detectable, sphincter muscles inconspicuous. Vulva posterior to middle, crescent shaped, its sides curving posteriad. Post vulval gland cell absent.

Tail elongate conoid for about two-thirds of its length, more or less straight or dorsally or ventrally curved; about ten rectal lengths long. Subterminal setae invariably present, situated 7.0-9.0  $\mu\text{m}$  from posterior body end. Two of the three caudal glands clear, each terminating in an ampulla, followed by a common chamber that opens through a spinneret. Tail tip dorsally convex, ventrally concave (cf. Figs 18 C, F-H in EYUALEM & COOMANS, 1995).

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