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**Gonionchus ecuadoriensis sp. n.**

**Paper prepared as**

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(submitted)

Description of *Gonionchus ecuadoriensis* sp. n., (Nematoda: Xyalidae) a dominant species on Ecuadorian sandy beaches.

## Summary

*Gonionchus ecuadoriensis* sp. n. is described from intertidal zone of an Ecuadorian sandy beach, and is characterised by the longitudinal ornamentations starting at the cervical region and continuing throughout the body to the tip tail; unarmed buccal cavity; equal spicules and the gubernaculum with a small dorsal apophysis. *Gonionchus ecuadoriensis* sp. n. closely resembles *Gonionchus longicaudatus* (Ward, 1972). *Gonionchus ecuadoriensis* sp. n., however has a smaller amphid diameter (2-3 vs 9  $\mu\text{m}$ ) in the males and 3-4 vs 7  $\mu\text{m}$  in the females; a shorter tail length (77-104  $\mu\text{m}$ ) in the males compared to *G. longicaudatus* (179  $\mu\text{m}$ ). A dichotomous identification key of the genus *Gonionchus* is provided to separate the thirteen species into two groups, principally on the presence or absence of longitudinal ornamentations.

**KEYWORDS** - free-living marine nematodes, new species, identification key, Ecuador.

## INTRODUCTION

The Xyalidae, together with the Monhysteridae and Sphaerolaimidae, constitute the Monhysteroidea (LORENZEN, 1978), and are consistent in possessing a single outstretched ovary. LORENZEN (1994), in his phylogenetic analysis of the Adenophorea, established the monophyly of the Xyalidae species by the constant location of the anterior testis on the left and the posterior testis when present on the right side of the intestine.

In the Xyalidae the cuticle is always annulated; the six outer labial and the four cephalic setae are situated at the same level, sometimes with additional cephalic setae in the same crown. Occasionally eight groups of subcephalic setae develop. There may be one or two testes, the anterior one lying to the left of the intestine, the posterior (if present) to the right, but the single anterior outstretched ovary is positioned on the left side of the intestine. The secretory-excretory system is absent in most cases.

*Gonionchus* species have the cuticle annulated and may have longitudinal ridges; anteriorly extended hyaline lips with the labial setae appearing as pointed extensions; buccal cavity spacious, and can have two ventrosublateral teeth; tail long and conical, without terminal setae.

*Gonionchus ecuadoriensis* sp. n. is described as a part of the project on environmental management in the Ecuadorian sandy beaches. The main diagnostic features of the new species are related to the cuticle; cephalic region, amphideal fovea; pharyngeal and tail region in male and female. A dichotomous identification key of the genus *Gonionchus* is provided to separate the thirteen species into two groups, principally on the presence or absence of longitudinal ornamentations.

## Materials and Methods

Samples were collected at low tide level of the intertidal zone of San Pedro de Manglaralto beach at the Ecuadorian coast (1°56'30" S and 80°43'30" W); plastic cores (surface 10 cm<sup>2</sup>) were used to a depth of 10 cm in the sediment. The samples were fixed with hot (60°C) 4% formaldehyde seawater solution, neutralised with lithium carbonate (LiCO<sub>3</sub>). Nematodes were extracted by decantation and centrifugation with Ludox HS 40 (Heip *et al.*, 1985), and collected on a 38 µm sieve. The organisms were stained with 1% Rose Bengal. The nematodes were transferred through a series of glycerol-ethanol solutions (De Grisse, 1969 & Vincx, 1996) and mounted on aluminum Cobb slides. Measurements and drawings were taken using a camera lucida microscope Olympus CH30RF200. All measurements (not ratios) are in micrometers (µm) (ratios are given by De Man) and all curved structures are measured along the arc. Type material is deposited in the Zoology Museum voor Dierkunde of Ghent University, Belgium (UGMD 104055, 104056 and 104057).

***Gonionchus ecuadoriensis*<sup>1</sup> sp. n.**

(Figures 6.7-6.9)

**Measurements**

See Table 6.4.

**Description**

*Male*: Body elongated and cylindrical; tail tapering with cylindrical end part. Cuticle prominently annulated; annules *ca* 2  $\mu$ m broad. Longitudinal ornamentation (as rod-like structures) starting at *ca* 24 longitudinal ridges in cervical region and decreasing in number to *ca* 12 in the anal region; ridges present until tail tip.

Six lips very high, weakly cuticularised. Each lip consisting of a basal part, which is separated from an apical part by a rather well pronounced boundary. Apical part ending in a flap-like protrusion. Six internal labial setae 6-8  $\mu$ m long, projecting from outer anterior wall of basal part of lips. Six external labial setae 10  $\mu$ m long and not segmented; four cephalic setae (6-8  $\mu$ m length) at same level of former. Subcephalic setae absent. Somatic setae scarce.

Amphideal fovea circular (2-3  $\mu$ m diam. or 11-17% of cbd) situated between 9-14  $\mu$ m from anterior end.

Buccal cavity unarmed, short and conical. Pharynx cylindrical and muscular throughout its length and partly surrounding buccal cavity; lumen of pharynx is well cuticularised. Cardia 10  $\mu$ m long. Nerve ring at 28-29% of pharyngeal length from anterior end. Ventral gland and pore not observed.

Dioecious with anterior testis on left side of intestine and posterior testis on right side of intestine. Sperm cells amoeboid (6  $\mu$ m diameter) with round, dense nucleus. Spicules equal (22-33  $\mu$ m), slightly curved, cephalated proximally; partly protruded after fixation in the specimens examined. Gubernaculum (11  $\mu$ m) surrounding distal part of spicules

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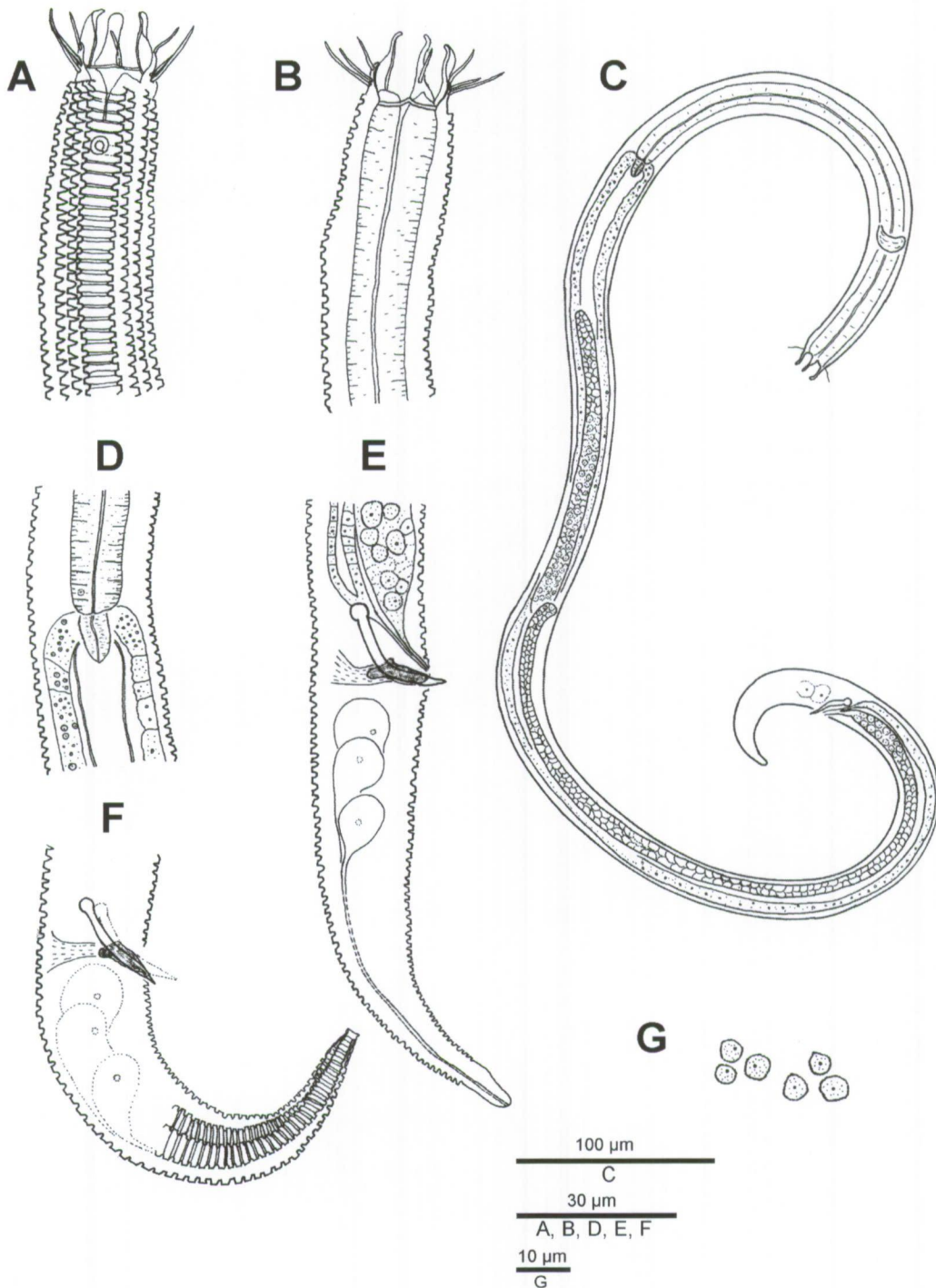
<sup>1</sup> Etymology: the species are dedicated to Ecuador the country of the type locality.

and with small dorsal apophysis. Tail 77-104  $\mu\text{m}$  long, conical at first, then cylindrical and with longitudinal ornamentations. Three caudal gland cells observed. No terminal setae.

*Female:* External morphology similar to male. Only differences from male are mentioned. Amphideal fovea (3-4  $\mu\text{m}$  diam.), situated between 4-5  $\mu\text{m}$  from anterior end, occupying about 14-18% of corresponding body diam. Reproductive system monodelphic with outstretched anterior ovary situated to left side of intestine. Two pre vaginal gland cells observed. Tail with 72-91  $\mu\text{m}$  long.

	Holotype	Males	Females
n		7	4
L	1012	1050.3 $\pm$ 17.6 (1005-1120)	1119.0 $\pm$ 32.6 (1043-1192)
a	44.0	47.0 $\pm$ 1.3 (44.0-52.5)	39.6 $\pm$ 0.9 (38.4-42.2)
b	3.6	3.8 $\pm$ 0.1 (3.6-3.9)	3.1 $\pm$ 0.1 (2.9-3.2)
c	11.8	11.8 $\pm$ 0.4 (10.7-13.1)	13.3 $\pm$ 0.4 (12.6-14.5)
c'	4.1	4.0 $\pm$ 0.2 (3.4-4.9)	3.7 $\pm$ 0.1 (3.4-3.9)
Spic	22	27.2 $\pm$ 1.8 (22-33)	
V			85.1 $\pm$ 0.8 (84-87)

Table 6.4 Measurements of *Gonionchus ecuadoriensis* sp. n. (all measurements in  $\mu\text{m}$ ).



**Figure 6.7** *Gonionchus ecuadoriensis* sp. n. Male. **A:** Head end holotype ♂<sub>1</sub>; **B:** Buccal cavity holotype ♂<sub>1</sub>; **C:** Total view holotype ♂<sub>1</sub>; **D:** Cardiac region holotype ♂<sub>1</sub>; **E:** Copulatory apparatus paratype ♂<sub>2</sub>; **F:** Tail region holotype ♂<sub>1</sub>; **G:** Sperm cells holotype ♂<sub>1</sub>. Arrows indicate the position of the sperm cell in the testis.

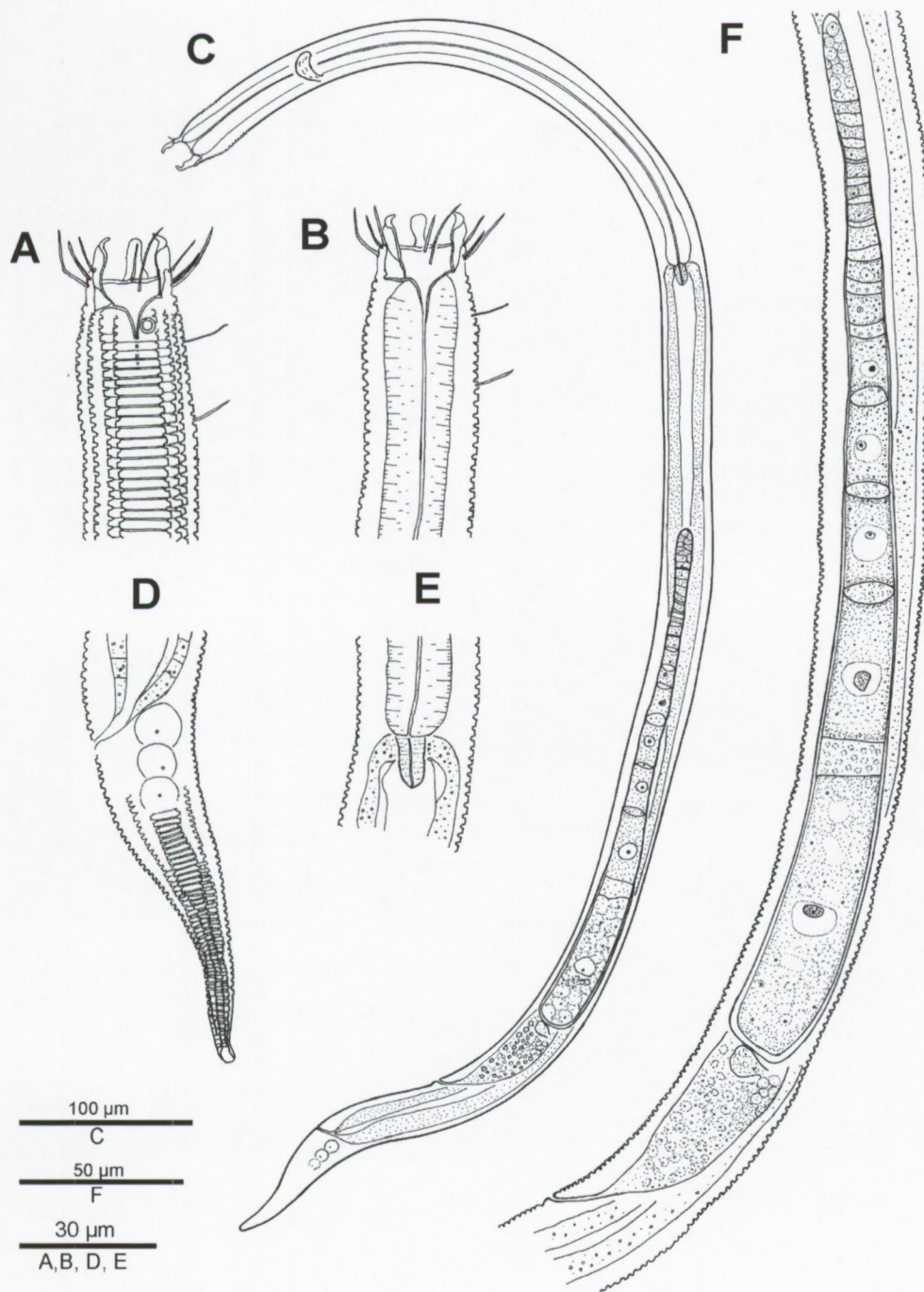


Figure 6.8 *Gonionchus ecuadoriensis* sp. n. Female. A: Head end; B: Buccal cavity; C: Total view; D: Tail region; E: Cardial region; F: Vulva region.



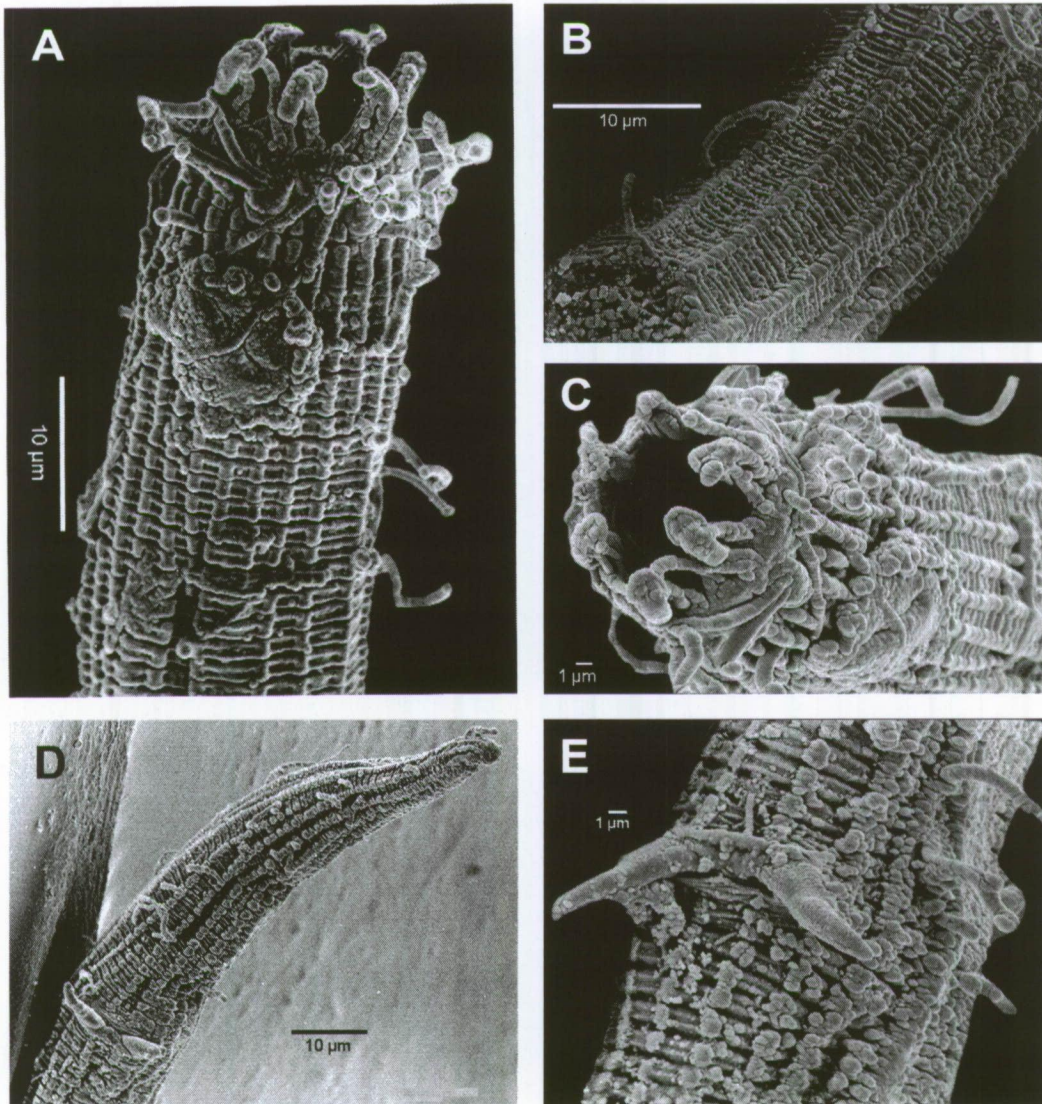


Figure 6.9 *Gonionchus ecuadoriensis* sp. n. A: Head; B: Cuticle ornamentations; C: Buccal cavity and lips; D: Spicular apparatus; E: Tail region.

### Diagnosis and relationships

*Gonionchus ecuadoriensis* sp. n. is characterised by longitudinal ornamentations (as rod-like structures) starting in the cervical region and continuing throughout the body to the tail tip, spicules equal and cephalated and the gubernaculum with a small dorsal apophysis.

*Gonionchus ecuadoriensis* sp. n. closely resembles *Gonionchus longicaudatus* (Ward, 1972) because the cuticle with longitudinal ornamentations and the absence of ventrosublateral teeth in the buccal cavity. However the size of the amphideal fovea of *G. ecuadoriensis* sp. n. is smaller (diameter= 2-3  $\mu\text{m}$  in the males and 3-4  $\mu\text{m}$  in the females) compared to *G. longicaudatus* (diameter= 9  $\mu\text{m}$  in the males and 7  $\mu\text{m}$  in the females). *Gonionchus ecuadoriensis* sp. n. has a shorter tail (77-104  $\mu\text{m}$ ) in the males, compared to *G. longicaudatus* (179  $\mu\text{m}$ ).

### Type host and locality

Low zone of the intertidal of San Pedro de Manglaralto beach (1°56'30" S and 80°43'30" W) in front of the CENAIM (Centro Nacional de Acuicultura e Investigaciones Marinas) at the Guayas province of the Ecuadorian coast. Fine to medium sand with median particle diameter of the sand fraction= 201  $\mu\text{m}$ ; % silt= 1.6; no gravel. Collected on 25 August 1999.

### Type material

Seven males and four females. Holotype ♂<sub>1</sub> (slide No. UGMD 104055) Paratypes: ♂<sub>2-7</sub> (slides No. UGMD 104055 and UGMD 104057), ♀<sub>1-4</sub> (slides No. UGMD 104056 and UGMD 104057).

**Key for identification of *Gonionchus* Species**

1	Cuticle with longitudinal ornamentations .....	2
-	Cuticle without ornamentations .....	6
2	Buccal cavity with 2 ventrosublateral teeth .....	3
-	Buccal cavity unarmed .....	4
3	Circa 12 ridges in cervical region, tip tail lacking ornamentations .....	<i>G. heipi</i> VINCX, 1986
-	Circa 24-28 ridges in cervical region and decreasing to ca 12 to anal region and continuous to tip tail.....	<i>G. alastairi</i> STEWART AND NICHOLAS, 1994
4	Amphideal fovea ca 50% cbd in males and 25% cbd in females .....	<i>G. sensibilis</i> LORENZEN, 1977
-	Amphideal fovea 11-30% cbd in males and 14-23% in females .....	5
5	Amphideal fovea 2-3 µm diam. ... ..	<i>G. ecuadoriensis</i> sp. n.
-	Amphideal fovea 7-9 µm diam .....	<i>G. longicaudatus</i> (WARD, 1972)
6	Spicules equal .....	6
-	Spicules unequal .....	<i>G. inaequalis</i> WARWICK AND PLATT, 1973
7	Gubernaculum with apophysis .....	8
-	Gubernaculum inconspicuous or without apophysis .....	11
8	Spicules distally bifid .. ..	9
-	Spicules not bifid .....	10
9	Tail long and filiform .....	<i>G. cumbraensis</i> BENWELL, 1981
-	Tail short and conical .....	<i>G. africanus</i> VINCX AND FURSTENBERG, 1988
10	Circa 28 µm between anterior end and amphid .....	<i>G. intermedius</i> JENSEN, 1986

- Circa 18  $\mu\text{m}$  between anterior end and amphid  
.....*G. australis* STEWART AND NICHOLAS, 1994
- Circa 8  $\mu\text{m}$  between anterior end and amphid  
.....*G. latentis* FADEEVA, 1984
- 11 Cephalic setae ca 50% of length of external labial setae  
.....*G. paravillosus* BLOME, 1982
- Cephalic setae ca 75% of length of external labial setae  
.....*G. villosus* COBB, 1920

## DISCUSSION

Up to now, the genus *Gonionchus* contains thirteen species (including *Gonionchus ecuadoriensis* sp. n.) which can be separated into two groups: a group of eight species without longitudinal ornamentations, i.e., *G. africanus* VINCX AND FURSTENBERG, 1988; *G. australis* STEWART AND NICHOLAS, 1994; *G. cumbraensis* BENWELL, 1981; *G. inaequalis* WARWICK AND PLATT, 1973; *G. intermedius* JENSEN, 1986; *G. latentis* FADEEVA, 1984; *G. paravillosus* BLOME, 1982 and *G. villosus* COBB, 1920 and an other group with five species having longitudinal ornamentations: *G. alastairi* STEWART AND NICHOLAS, 1994; *G. ecuadoriensis* sp. n.; *G. heipi* VINCX, 1986; *G. longicaudatus* (WARD, 1972) and *G. sensibilis* LORENZEN, 1977.

The similarity of the eight species of the first group (excluding *G. inaequalis* which has unequal spicules) is striking. *Gonionchus cumbraensis* and *G. africanus* differ from *G. villosus* by the bifid distal end of the spicules and by the possession of a gubernacular apophysis. *Gonionchus villosus* differs from *G. paravillosus* by the length of the cephalic setae to the external labial setae (75% vs 50%).

*Gonionchus villosus sensu* VINCX, 1981, from specimens of the Southern Bight of the North Sea, was synonymised with *G. cumbraensis* by the presence of an obvious gubernacular apophysis (which indicates the difference with the original description of *G. villosus* COBB, 1920).

The presence or absence of marginal tubes in the pharynx in *G. intermedius* was not used in this paper to distinguish them from the other *Gonionchus* species, because probably this structure was not observed nor mentioned in some of the descriptions. *Gonionchus intermedius* differs from *G. latentis* and *G. australis* in the distance between the anterior end and the amphid (28, 18 and 8  $\mu\text{m}$  respectively).

*Gonionchus ecuadoriensis* sp. n. differs from the species included in the second group as follows: in *Gonionchus heipi* and *G. alastairi* with buccal cavity having two ventrosublateral teeth, also in *G. heipi* the longitudinal ornamentation starts at irregular levels anteriorly and does not continue in the tail tip and the anterior border of the cervical annules cover the posterior border of the preceding annules; *G. alastairi* has longer spicule length than *G. ecuadoriensis* sp. n. (60  $\mu\text{m}$  vs. 22-33  $\mu\text{m}$ ); *G. sensibilis* shows sexual dimorphism in the size of amphideal fovea (50% cbd in the males and 25% cbd in the females) and *G. longicaudatus* with amphideal fovea having longer diam. (9 vs 2-3  $\mu\text{m}$  in the males and 7 vs 3-4  $\mu\text{m}$  in the females).

## **Acknowledgements**

This study was made possible by financial support for VLIR-ESPOL program. We are greatly indebted to the CENAIM foundation for their logistic facilities. Thanks to Rita Van Driessche for the preparation of SEM photos.