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# Description of *Aphasmatylenchus liberiensis* n. sp., and observations on the other species of the genus *Aphasmatylenchus* Sher, 1965 (Nematoda: Hoplolaimidae)

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**Summary** – The population from Liberia reported as *Aphasmatylenchus nigeriensis* by Vovlas *et al.* (1991) is considered to be a new species and is described and illustrated here as *A. liberiensis* n. sp. Its primary distinguishing characteristics are the unsectored first lip annulus, the absence of sperm in the female genital tract, and the absence of males. Light and scanning electron microscopy observations were conducted on West African *Aphasmatylenchus* populations and the head patterns for all members of the genus are illustrated. Variability of external morphological characteristics was very low and the genus appears homogeneous in general morphology with the exception of the configuration of the first lip annulus. Fasciculi were observed for the first time in *A. nigeriensis* from south-western Ivory Coast, and filiform appendices similar to the appendices previously identified in the genus *Radopholus* were detected on the edge of the anterior cloacal lip of *A. straturatus* and *A. variabilis;* the presence of nerves in these structures cannot be ascertained with SEM. © Elsevier - ORSTOM

**Résumé** – ***Description d'*Aphasmatylenchus liberiensis *n. sp. et observations sur les autres espèces du genre* Aphasmatylenchus *Sher, 1965 (Nematoda: Hoplolaimidae)*** – La population d'*Aphasmatylenchus* précédemment identifiée comme *A. nigeriensis* par Vovlas *et al.* (1991) est considérée comme une nouvelle espèce, décrite et illustrée ici comme *A. liberiensis* n. sp. ; ses principaux caractères distinctifs sont le premier anneau céphalique non divisé, l'absence de spermatozoïdes dans le tractus génital de la femelle et l'absence de mâles. Des observations en microscopie électronique à balayage et optique ont été conduites sur des populations ouest-africaines d'*Aphasmatylenchus* ; la morphologie externe de la capsule céphalique est schématisée pour toutes les espèces du genre. La variabilité des structures externes est très faible, à l'exception de la configuration du premier anneau céphalique. Des fasciculi ont été observés pour la première fois chez *A. nigeriensis* provenant du Sud-Ouest de la Côte d'Ivoire, tandis que des appendices filiformes ont été détectés sur la marge de la lèvre cloacale antérieure chez *A. straturatus* et *A. variabilis*, appendices précédemment identifiés dans le genre *Radopholus* ; la présence de nerfs dans ces structures ne peut pas être confirmée au microscope électronique à balayage. © Elsevier - ORSTOM

**Keywords:** *Aphasmatylenchus*, Hoplolaimidae, Liberia, morphology, nematode, new species, SEM, variability.

The genus *Aphasmatylenchus* Sher, 1965 currently includes three species (*A. nigeriensis*, Sher, 1965, *A. straturatus* Germani, 1970, and *A. variabilis*, Germani & Luc, 1984) that occur mainly in West Africa (Baujard & Martiny, 1995). The population of this genus reported from Liberia by Vovlas *et al.* (1991) under the name *A. nigeriensis* is here described as *A. liberiensis* n. sp. Measurements and description are also given for the population of *A. nigeriensis* found in south-western Ivory Coast by Fortuner and Couturier (1983). *A. nigeriensis* and *A. straturatus* have been previously studied under scanning electron microscopy (SEM) (Sher & Bell, 1975; Germani, 1977; Van den Berg & Cadet, 1991), but no SEM data were published for *A. variabilis*. SEM observations on three species of the genus were conducted according to the method of Baujard and Pariselle (1987) to characterize the new species and to determine interspecific variability in the cuticular morphology and the configuration of the first lip annulus.

The type population of *A. liberiensis* n. sp. was collected by Dr F. Lamberti in Liberia. Specimens of *A. straturatus* and *A. variabilis* were collected from the type locality and at Nebe, Senegal, respectively; they were cultured in the laboratory as previously described (Baujard, 1995; Baujard & Martiny, 1995). Specimens used in this study were fixed in 4% formaldehyde + 1% propionic acid and infiltrated with glycerine for examination with light microscope. Previous SEM illustrations of lip configuration (Sher & Bell, 1975; Van den Berg & Cadet, 1991) were used for comparison as well as unpublished microphoto-

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graphs of *A. nigeriensis* kindly supplied by Dr M. Mundo-Ocampo.

***Aphasmatylenchus liberiensis* n. sp.**
= *A. nigeriensis apud* Vovlas, Troccoli & Lamberti, 1991
(Figs 1-4)

MEASUREMENTS

See Table 1.

DESCRIPTION

*Female:* Body C-shaped. Lateral field with four incisures; outer bands crenate or incompletely areolated; central band with areolations only in anterior and caudal regions. Body annuli 1.9 ± 0.2 (1.2-2.2) µm wide. Lip region with 7-8 annuli, hemispherical in profile 10 ± 0.5 (9.8-11) µm wide, 7 ± 0.8 (6-8) µm high; face view with unsectored first lip annulus and long slit-like amphidial apertures on the lateral edges of hexagonal labial disc. Labial scleroti-

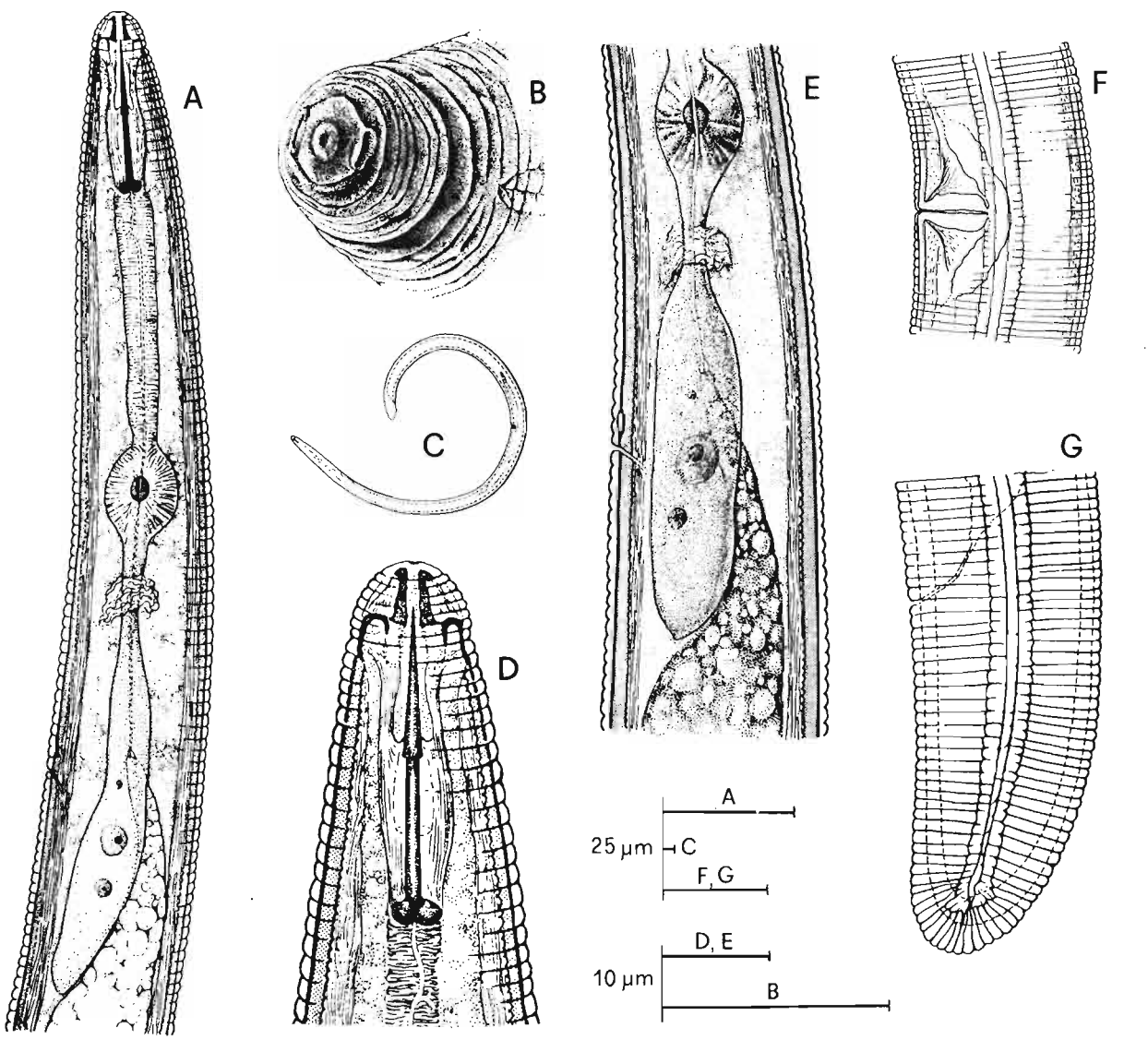


***Fig. 1.*** Aphasmatylenchus liberiensis *n. sp. A: Female pharyngeal region; B: Lip region; C: Entire female; D: Anterior body portion; E: Median and basal oesophageal bulb; F: Vulva; G: Tail (From Vovlas* et al., *1991 - courtesy* Nematologia mediterranea*).*

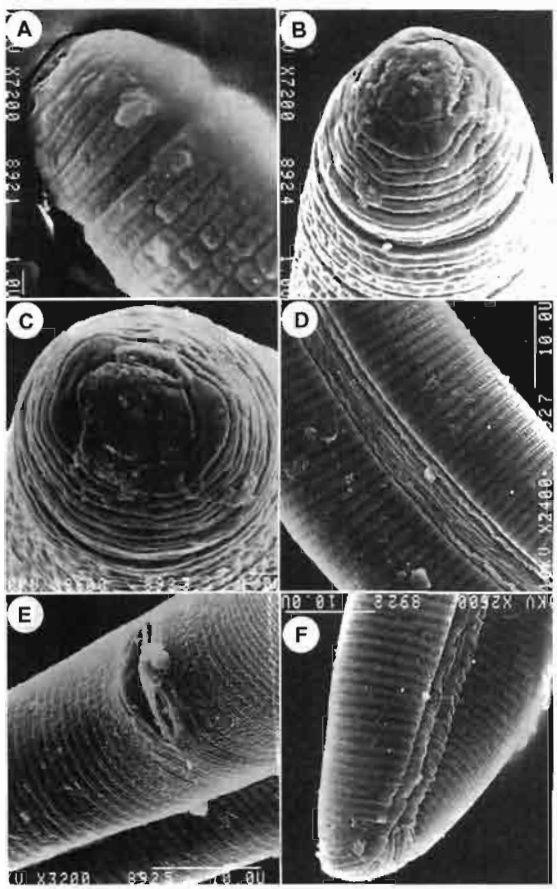


***Fig. 2.*** Aphasmatylenchus liberiensis *n. sp. females. A, B, C: Head, sublateral and in face view, respectively, D: Lateral field at mid body; E. Vulva, ventral view, F: Tail, lateral view (Scale bars: A-C=1 µm; D-F = 10 µm).*

zation conspicuous with relatively long posterior ring. Stylet strong; knobs rounded, sloping backwards, 4.5 ± 0.3 (4.4-5) µm wide. DGO 9.4 ± 0.4 (5.3-10.6) µm from stylet base. Excretory pore located at level of, or slightly posterior to oesophago-intestinal junction. Hemizonid distinct, two annuli long, immediately anterior to the excretory pore. Oesophagus strongly developed; median bulb 83 ± 3 (77-88) µm from anterior end, with oesophageal glands ventrally overlapping intestine along 1-1.5 body width; nucleus of the dorsal gland large, posterior to the oesophago-intestinal junction; nuclei of the subventral glands anterior and posterior to the dorsal gland nucleus. Two genital branches; spermatheca observed in only four specimens, oval to rectangular; no sperm in the female genital tract. Tail elongate-cylindrical, more curved dorsally, with hemispherical and striated terminus.

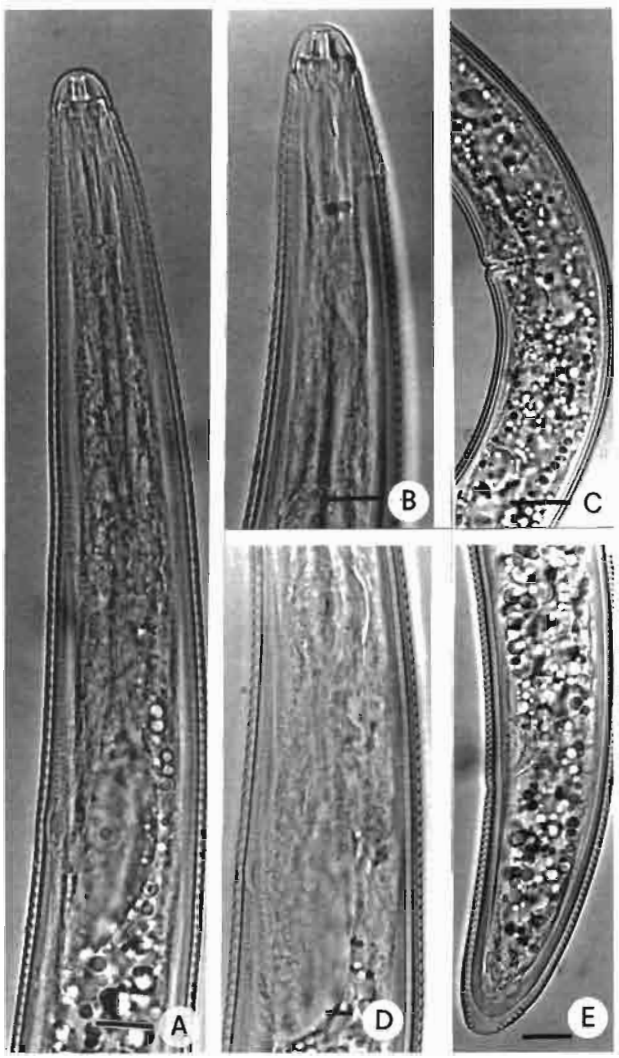


***Fig. 3.*** *Light micrographs of* Aphasmatylenchus liberiensis *n. sp. A: Pharyngeal region; B: Anterior body portion; C: Vulval region; D: Median and basal oesophageal bulb; E: Posterior body portion (Scale bar = 25 µm).*

*Male:* not found.

TYPE LOCALITY AND HABITAT

Natural habitat with unidentified vegetation, at Nangota, Liberia.

TYPE SPECIMENS

Holotype female and additional paratypes at Istituto di Nematologia Agraria CNR Bari, Italy; paratype females deposited in the following collections: University of California, Davis, CA, USA; USDA Nematode Collection, Beltsville, MD, USA; Entomology and Nematology Department, Rothamsted Experimental

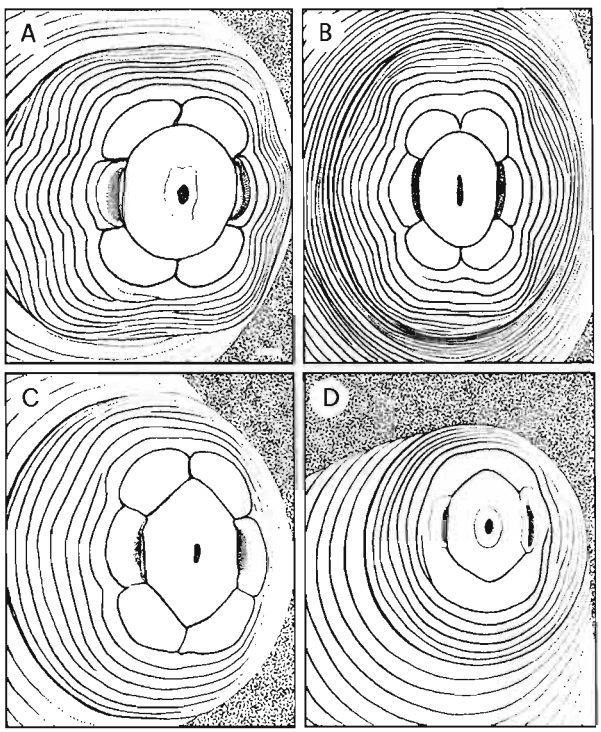


***Fig. 4.*** *Head patterns in the genus* Aphasmatylenchus. *A:* A. straturatus*; B:* A. variabilis*; C:* A. nigeriensis*; D:* A. liberiensis *n. sp. (Scale bar = 1 µm; D: From Vovlas* et al.*, 1991, courtesy* Nematologia mediterranea*).*

Station, Harpenden, UK; Muséum National d'Histoire Naturelle, Paris, France; and Nematode Collection of the Department of Nematology, Land-bouwuniversiteit, Wageningen, The Netherlands.

DIAGNOSIS AND RELATIONSHIPS

*Aphasmatylenchus liberiensis* n.sp. is characterized by the head structures (unsectored first lip annulus, shape of the sclerotized basal plate of the cephalic framework), weak and irregular areolations of the outer bands of the lateral fields, absence of sperm, and males probably absent.

*Aphasmatylenchus liberiensis* n. sp. differs from the three other species in the genus by *i*) the unsectored first lip annulus (vs. with six sectors), *ii*) the relatively long posterior ring of the basal plate of the cephalic framework (vs. very short in *A. straturatus* and *A. variabilis* and short in *A. nigeriensis*), *iii*) the weak areolations in the two outer bands of the lateral fields (vs. strong and regular), and *iv*) the absence of sperm in the female genital tract and absence of males (vs. presence).

***Table 1.*** *Morphometrics of* Aphasmatylenchus liberiensis *n. sp. females (All measurements in µm).*

| | Holotype | Paratypes |
|---|---|---|
| n | 1 | 22 |
| L | 1470 | 1249 ± 205 (980-556) |
| a | 30 | 30 ± 3.5 (25-38) |
| b | 8.7 | 7.3 ± 1 (5.6-8.9) |
| c | 29 | 21 ± 2.4 (19-29) |
| c' | 2.1 | 1.7 ± 0.4 (1.5-2.4) |
| V | 55 | 53 ± 1.8 (50-56) |
| Body diam. | 41 | 42 ± 8 (29-52) |
| Oesophagus length | 170 | 168 ± 8 (151-179) |
| Ant. end to excret. pore | 145 | 140 ± 11 (125-160) |
| Stylet length | 28 | 28 ± 0.5 (27-29) |
| Tail length | 67 | 56 ± 9 (48-70) |
| Body anal diam. | 42 | 32 ± 6 (26-42) |
| Ant. gonad | 252 | 249 ± 15* (239-260) |
| Post. gonad | 248 | 251 ± 9** (245-258) |
| Body annules width | 1.8 | 1.9 ± 0.2 (1.7-2.2) |

* n=11; ** n=8.

### *Aphasmatylenchus nigeriensis* Sher, 1965
(Fig. 4C)

MEASUREMENTS

*Females* (n = 4): L = 0.91-1.15 mm; a = 21-25; b = 9.1-9.8; b' = 6.4-7.2; c = 15.8-25; c' = 1.1-1.8; V = 52.5-54; stylet length = 29-30.7 µm; tail length = 43-60 µm; number of tail annuli = 29-38; DGO = 8.6-9.6 µm; number of head annuli = 9-10.

REMARKS

The morphological and anatomical characteristics of these female specimens are the same as those described for the type population (Sher, 1965) and for a population from French Guyana (Van den Berg &

Cadet, 1991). Spermathecae are filled with small rounded sperm. Fasciculi with numerous anastomoses are present in all specimens. Males were not found.

Specimens originated from soil from Taï forest, south-west of Ivory Coast (Fortuner & Couturier, 1983).

### *Aphasmatylenchus straturatus* Germani, 1970
(Table 2; Figs 5-7)

Cuticle marked by transverse annulation, each annulus bearing longitudinal striations (Figs 5-7) except on the edges of the bursa (Fig. 6G-H). Female head rounded to trapezoidal, separated from the rest of the body by a slight (64% of the specimens; n=39) or a distinct (36%) constriction (Fig. 5A, C, E). Male head continuous (45% of the specimens; n=20) or more spherical and well separated from the rest of the body (55%). Head of both sexes not regularly circular but with six more or less pronounced longitudinal bulges aligned with the lip sectors. Head with eight to thirteen annuli in females, nine to twelve annuli in males (Table 2). First cephalic annulus with labial disc circular to oval in females and males; six labial sectors always clearly marked, four submedian sectors more developed than lateral sectors (Fig. 5B, D, F, H, J); in one male, dorsal submedian lip sectors completely separated from each other (Fig. 5J). Lateral fields with three bands (four incisures) completely areolated (Figs 6A, C; 7A, B, D, E). Vulva a transverse slit, with non prominent lips; epiptygma present, not or slightly protruding out of the vagina (Fig. 6A-E), appearing as a flattened tube (see arrow on Fig. 6D, E). Female tail subcylindrical to slightly conoid (Fig. 7A-B) in 67% of the specimens (n=39); tails of the other specimens with indentation (Fig. 7E) or outgrowth on dorsal (Fig. 7D) or ventral (Fig. 7C) side of the tail. Bursa enveloping tail tip (Fig. 6F); spicules sligthly curved ventrally (Fig. 6G-H); anterior cloacal lip provided with several filiform appendices

***Table 2.*** *Number (%) of head annuli in females and males of* Aphasmatylenchus straturatus *and* Aphasmatylenchus variabilis.

| Number of head annuli | *A. straturatus* | | *A. variabilis* | |
|---|---|---|---|---|
| | Females | Males | Females | Males |
| (n) | 38 | 12 | 9 | 23 |
| 7 | 0 | 0 | 22 | 0 |
| 8 | 8 | 0 | 34 | 35 |
| 9 | 21 | 41 | 0 | 35 |
| 10 | 31 | 17 | 22 | 26 |
| 11 | 24 | 25 | 22 | 4 |
| 12 | 8 | 17 | 0 | 0 |
| 13 | 8 | 0 | 0 | 0 |

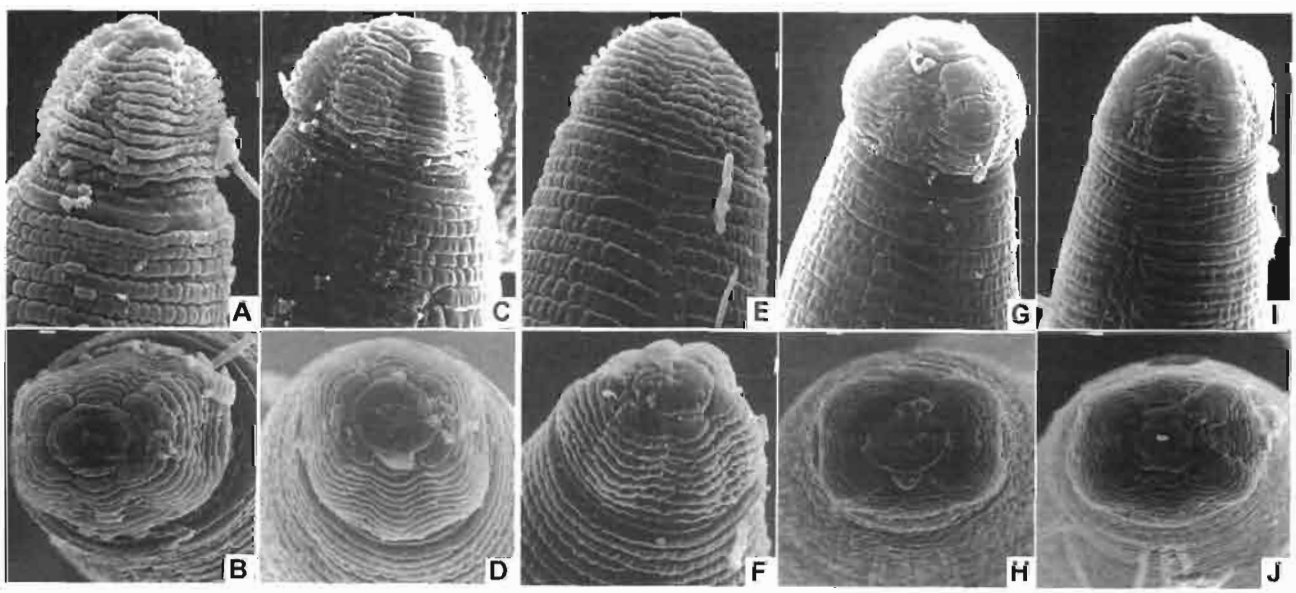


***Fig. 5.*** Aphasmatylenchus straturatus *female (A-F) and male (G-J) heads in lateral (above)) and in face (below) views; A-B, C-D, E-F, G-H, I-J: Lateral and in face views of the same specimen, respectively (Scale bars = 1 µm).*

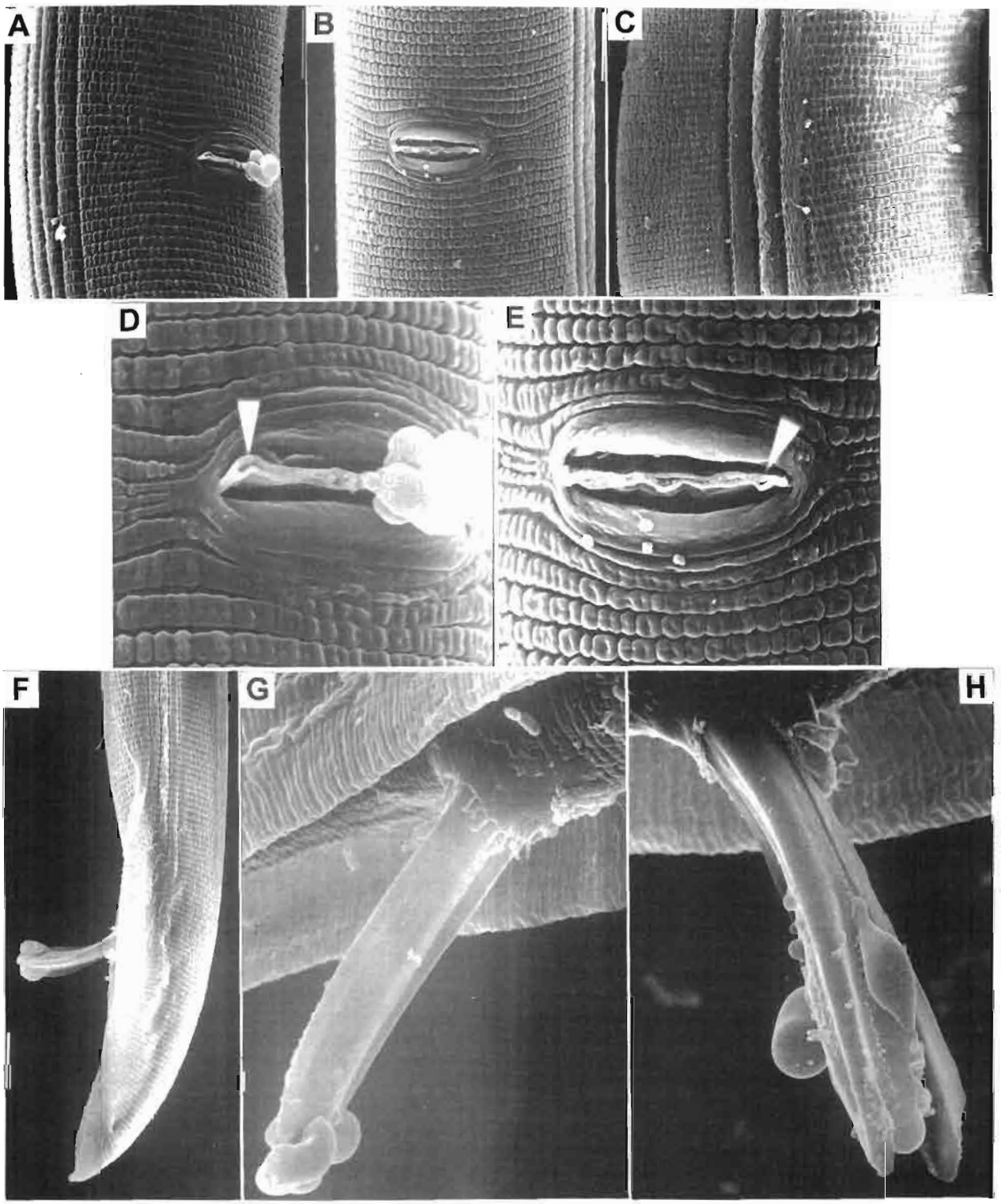


***Fig. 6.*** Aphasmatylenchus straturatus *vulva (A-E), male tail (F), and spicules (G-H) (Scale bars: A-C, F = 10 µm; D, E, G, H = 1 µm; in D and E arrowheads show the tubular structure of the epiptygma).*

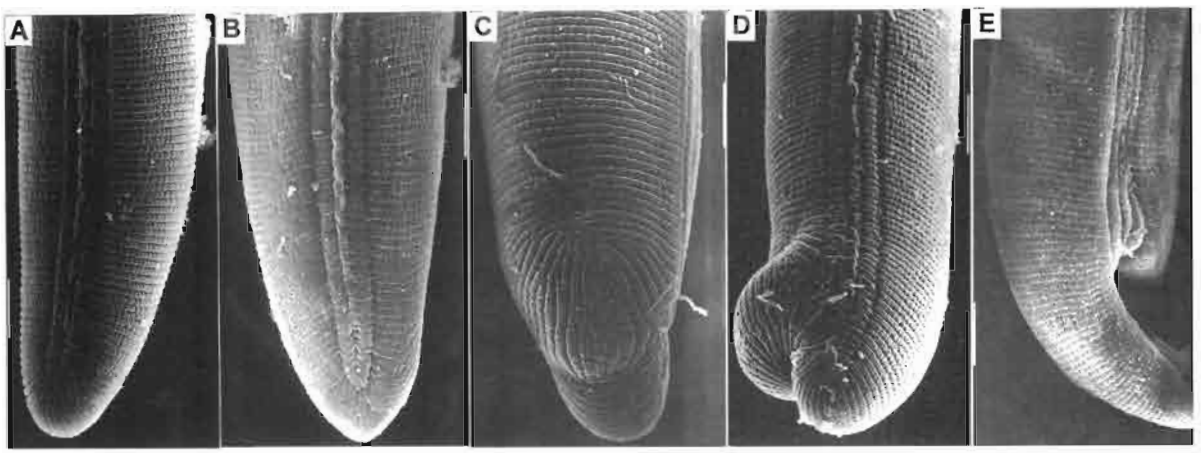


***Fig. 7.*** Aphasmatylenchus straturatus *female tails (A-E) (Scale bars = 10 µm).*

(Fig. 6H, G); gubernaculum protruding out of the cloaca, with two well developed titillae on the lateral sides (Fig. 6H).

No variability in the morphological characters other than what is described above was observed; the intraspecific variability of external morphology seems to be very low.

### *Aphasmatylenchus variabilis* Germani & Luc, 1984

(Figs 8-10)

Female head rounded (78% of the specimens; n=18) or squarish (22%) in lateral view (Fig. 8C, E, G), trapezoidal in ventral or dorsal view (Fig. 8A), continuous (Fig. 8E) or separated from the rest of the

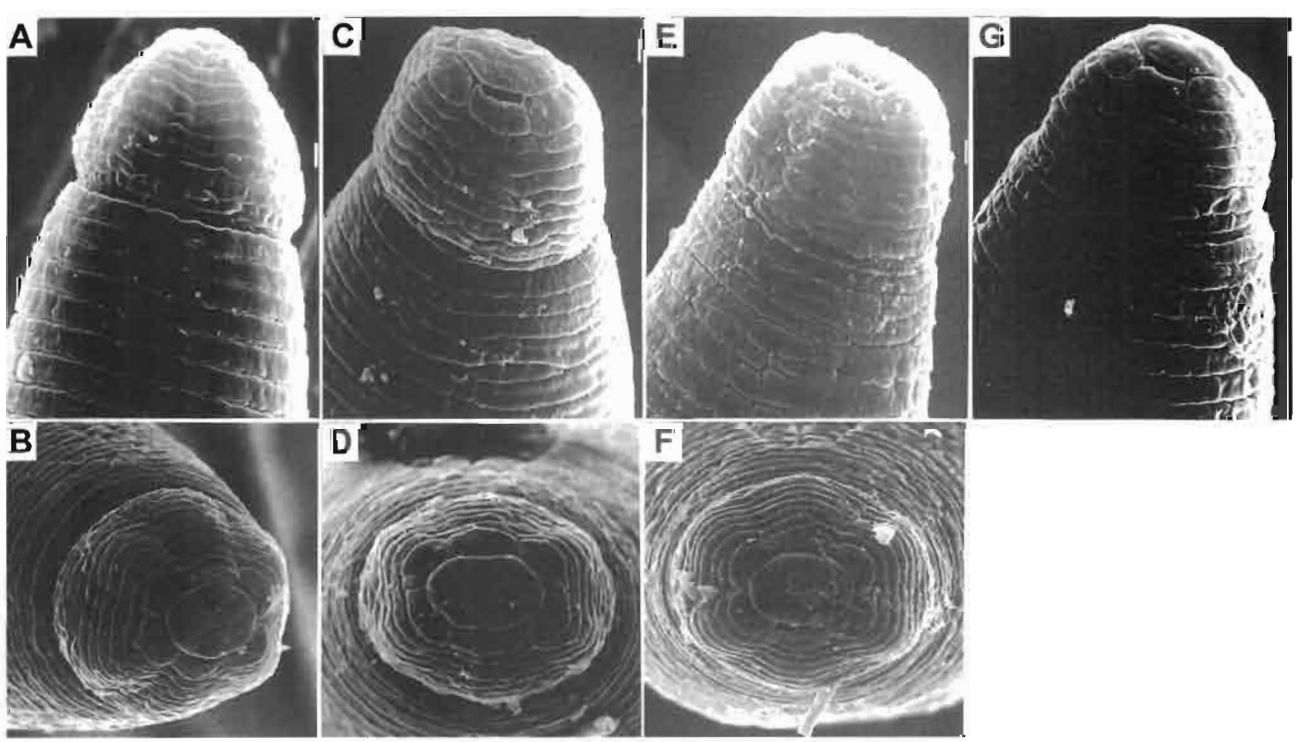


***Fig. 8.*** Aphasmatylenchus variabilis *females. A-G: Heads in lateral (above) and in face (below) views; A-B, C-D, E-F: Lateral and in face views of the same speciemen, respectively (Scale bars: A-G = 1 µm).*

body by a slight constriction. Male head spherical in front view, squarish in lateral view (Fig. 10A, C), continuous (12% of the specimens; n=23; Fig. 10C) or separated (88%; Fig. 10A) from the rest of the body by a constriction. Head of both sexes not regularly circular but with six more or less pronounced longitudinal bulges aligned with the lip sectors clearly marked in males. Head with seven to eleven annuli in females, eight to eleven annuli in males (Table 2). First cephalic annulus with circular to oval labial disc in females and males; six labial sectors always clearly marked, the four submedian sectors more developed in females and equally (69% of the specimens; n=16) or more developed (31%) than the lateral ones (Figs 8B, D, F; 9B, D); in males, the submedian lip sectors are more or less separated dorsally and ventrally (Fig. 9B, D). Lateral fields with three bands (four incisures) completely areolated (Figs 9A-C, E, F). Vulva a transverse slit, with slightly or not prominent (Figs 9A, B); epiptygma present, not or slightly protruding out of the vagina (Fig. 9A-D), appearing as a flattened tube (see arrow on Fig. 9D). Female tail subcylindrical (Fig. 9E-G); in one specimen, outgrowth occurred on tail (Fig. 9G). Bursa enveloping tail tip with or without distal notch (Fig. 10E, G); spicules sligthly curved ventrally (Fig. 10F, H); anterior cloacal lip provided with several filiform appendices (Fig. 10F, H); gubernaculum protruding out of the cloaca, with two well developed titillae on the lateral sides (Fig. 10H).

No variability in the morphological characters other than what is described above was observed; the

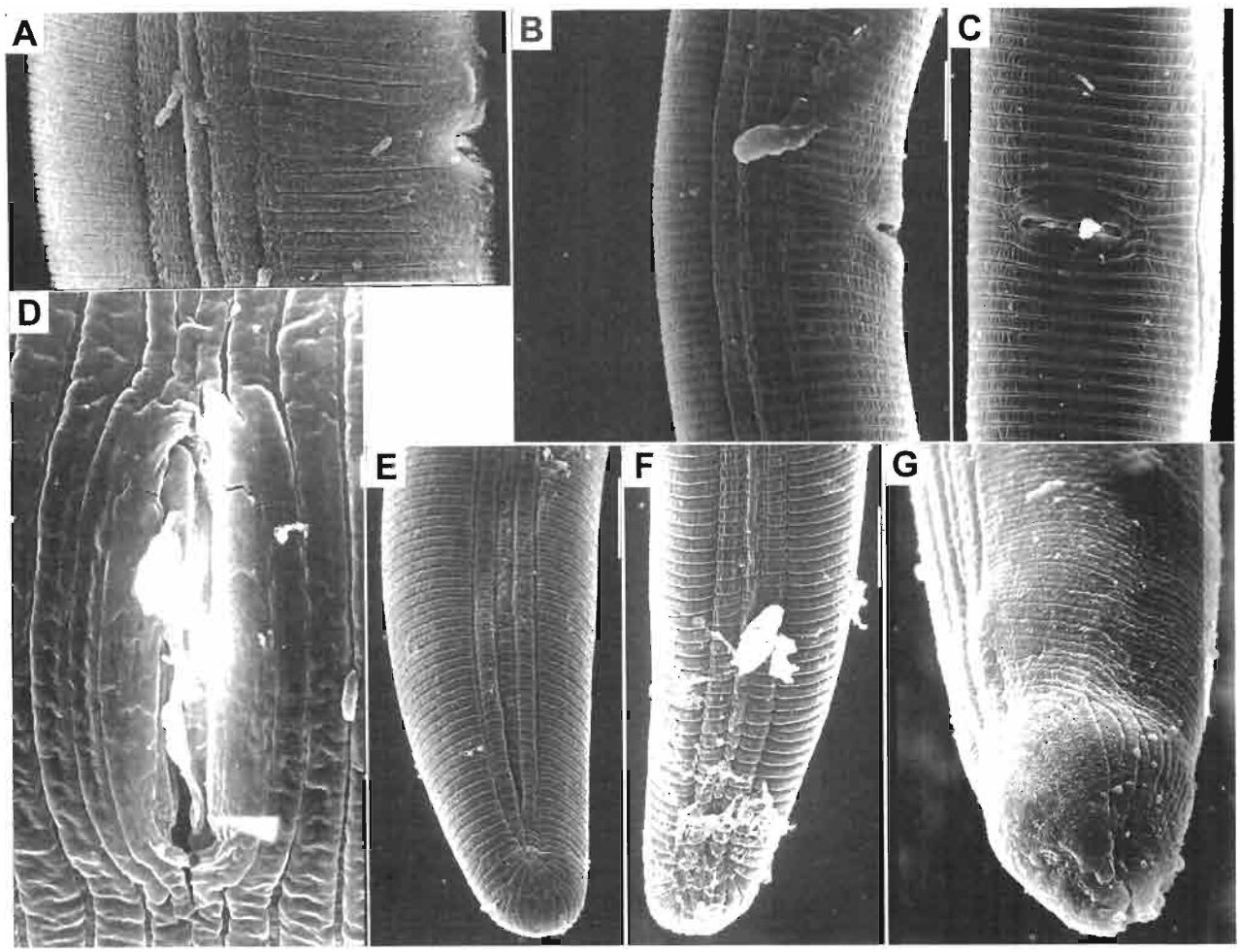


***Fig. 9.*** Aphasmatylenchus variabilis *females. A-D: Vulvar region; E-G: Tails (Scale bars: A-C, E-G = 10 µm; D = 1 µm; in D arrowhead shows the tubular structure of the epiptygma).*

intraspecific variability of external morphology seems to be very low.

## Discussion

The first lip annulus is divided into sectors in some but not all species of the genus *Aphasmatylenchus* (Fig. 4), and also of the genera *Helicotylenchus* (Fortuner, 1987) and *Plesiorotylenchus* Vovlas, Castillo & Lamberti, 1993. As far as we can tell from the few SEM studies published so far, all the species of the other genera in the subfamily Hoplolaiminae have the first labial annulus divided into six sectors (Fortuner, 1987).

Fasciculi are observed for the first time in *A. nigeriensis*. The presence/absence of fasciculi was used in part by Germani and Luc (1984) to differentiate *A. variabilis* from the other species described at that time in the genus, but the intraspecific variability of this character makes it of doubtfull validity for species characterization. However, is is not variable within the individual populations described so far for species of the genus *Aphasmatylenchus*.

The tubular structure of the epiptygma previously described in other genera of the Hoplololaiminae (Baujard *et al.*, 1990, 1991; Baujard & Mounport, 1990; Mounport *et al.*, 1991) is here reported in the genus *Aphasmatylenchus*.

Presence of filiform appendices (hypoptygmata) on the edge of the anterior cloacal lips is reported for the first time in Hoplolaimidae. Similar structures were described in populations of *Radopholus citrophilus* by

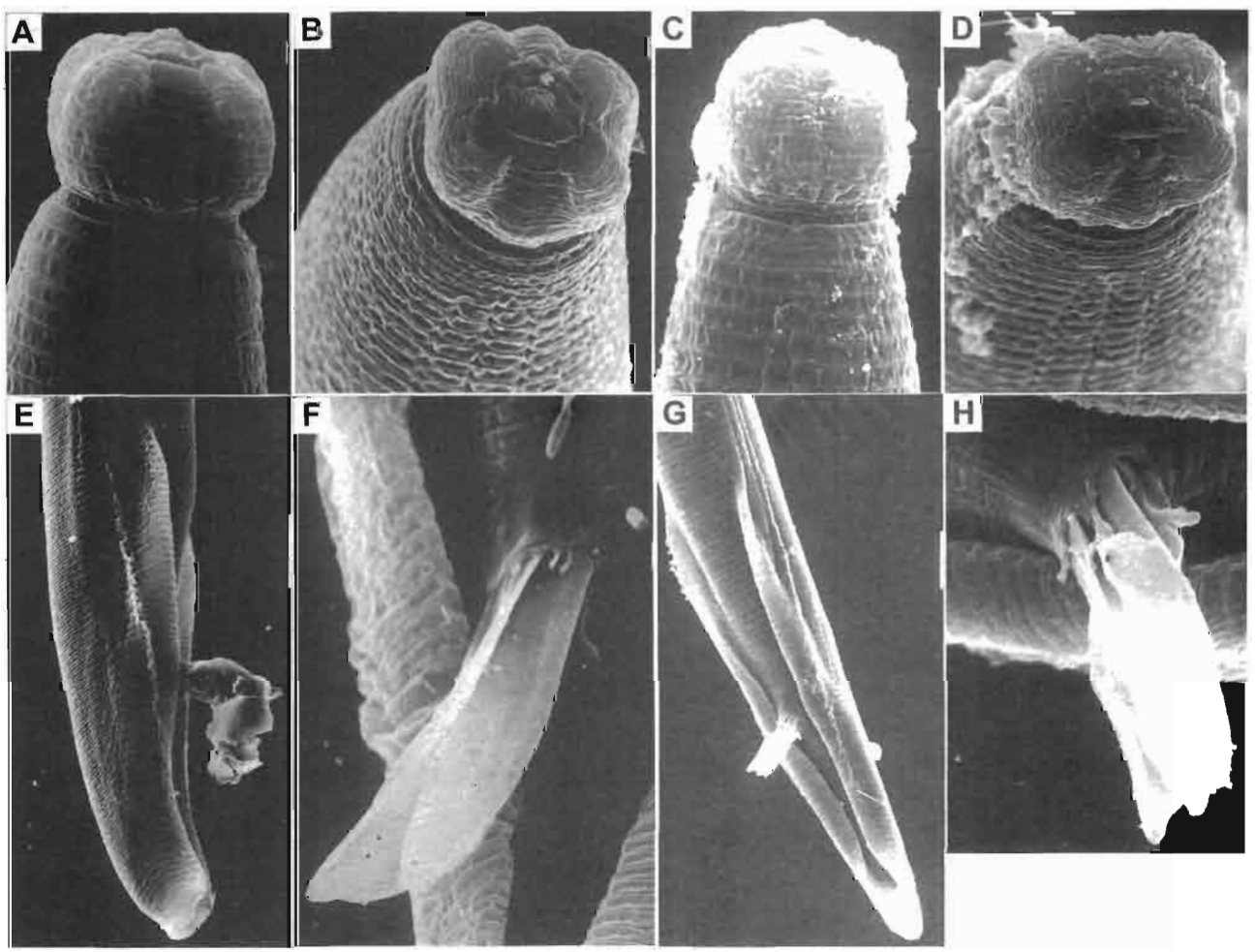


***Fig. 10.*** Aphasmatylenchus variabilis *males. A-D: Heads in lateral and in face views (A-B, C-D: lateral and in face views of the same specimen, respectively); E-G: Tails; F-H: Spicules (Scale bars: A-D, F, H = 1 µm; E, G = 10 µm).*

Huettel and Yaegashi (1988) and *R. similis* by Valette *et al.* (1998); the former authors considered that they were in fact genital papillae and called them "anterior hypoptygmata". The present SEM observations did not confirm the nervous origin of these structures.

**Acknowledgments**

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