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## CRICONEMATIDS FROM PERU WITH A DESCRIPTION OF *OGMA ANDENSE* SP. N.

by  
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**Summary.** Soil samples collected in the Peruvian highlands and forests from natural habitats and cultivated fields in 1987, yielded five species of Criconematidae. One of them is described as a new species belonging to the genus *Ogma* Southern, 1914. *Ogma andense* sp. n. is closely related to *O. decalineatum* (Chitwood, 1957), Andrassy, 1979, distinguished mainly by the shorter stylet 45-50  $\mu$ m vs. 66-86  $\mu$ m. The original and subsequent descriptions of *Criconema* (*Nothocriconema*) *mutabile* (Taylor, 1936) De Grisse et Loof 1965; *Mesocriconema peruensisforme* (De Grisse, 1967) Loof et De Grisse, 1989; *Discocriconemella replecta* Pinochet et Raski, 1976 and *Hemicriconemoides mangiferae* Siddiqi, 1961 are amplified and supplemented with light microscope and scanning electron microscope illustrations. The morphometrical descriptive characteristics of the Peruvian populations extend the known range of variability for these species.

The present article deals with five species of Peruvian Criconematidae belonging to the genera *Criconema*, *Mesocriconema*, *Discocriconemella*, *Hemicriconemoides* and *Ogma*.

A new species is described within the genus *Ogma* Southern 1914: *Ogma andense* sp. n., while the original description of *M. peruensisforme* De Grisse, 1967 (based only on a single female), is amplified and supplemented. Morphometrical data and SEM morpho-anatomy is also provided for *Criconema* (*Nothocriconema*) *mutabile*, *D. replecta* and *H. mangiferae*. Soil samples were collected by one of us (A.C.) in highland and forest soils, during a survey undertaken in Peru in 1987. The specimens used in this study were fixed in 4% formaldehyde and processed to dehydrated glycerin (Seinhorst, 1959). Wergin's methods (1981) were used for the preparation of nematodes for SEM observations. Nematodes were coated with gold and observed with a Jeol 50-A Stereoscan electron microscope at 5 kV accelerating voltage.

### Description

#### *OGMA ANDENSE* sp. n. (Table I; Figs 1-2)

Body slightly curved ventrally, tapering slightly anteriorly, more so posteriorly to a conical tail. Labial region truncate with two labial annuli equal in size 10-12  $\mu$ m wide. "En face" view SEM observations illustrated in Fig. 2 A,B show that the two subventral submedian lobes are

connected ventrally forming a rectangular oral disc, bearing the centrally located oral opening. The slit-like amphidial apertures open on the lateral edges of the rectangular oral disc. Stylet moderately robust, knobs anteriorly directed  $6.7 \pm 0.3$  (6.3-7.7)  $\mu$ m across. The body annuli  $4.3 \pm 0.3$  (3.8-5)  $\mu$ m are slightly retractorse and marked with ten longitudinal rows of scales at mid body. Distance between rows of scales  $11 \pm 0.8$  (9-13)  $\mu$ m at mid body. Excretory pore 3-5 annuli posteriorly to pharynx base. Vulva at 13th-16th annulus from terminus, closed with vulvar lips slightly protruding from the body and with its anterior flap slightly overlapping the posterior one. Spermatheca present, full of sperms. Ovary outstretched. The anal aperture is located 5-6 annuli posterior the vulval opening between two ventral rows of scales. The conical tail tapers uniformly and ends with a small conical terminal annulus.

Male: not found.

**Diagnosis.** *Ogma andense* sp. n. is distinguished by its smooth large scales, arranged in ten rows. Cephalic region with two annuli, equal in size. Total body length = 316-380  $\mu$ m; stylet = 45-50  $\mu$ m; R = 78-90; Rv = 13-16; Ran = 8-10.

**Relationships.** *Ogma andense* sp. n. closely resembles *O. decalineatum* (Chitwood, 1957) Andrassy, 1979 in shape and number of scales but it differs from this species by the shorter stylet (45-50 vs. 61-85  $\mu$ m).

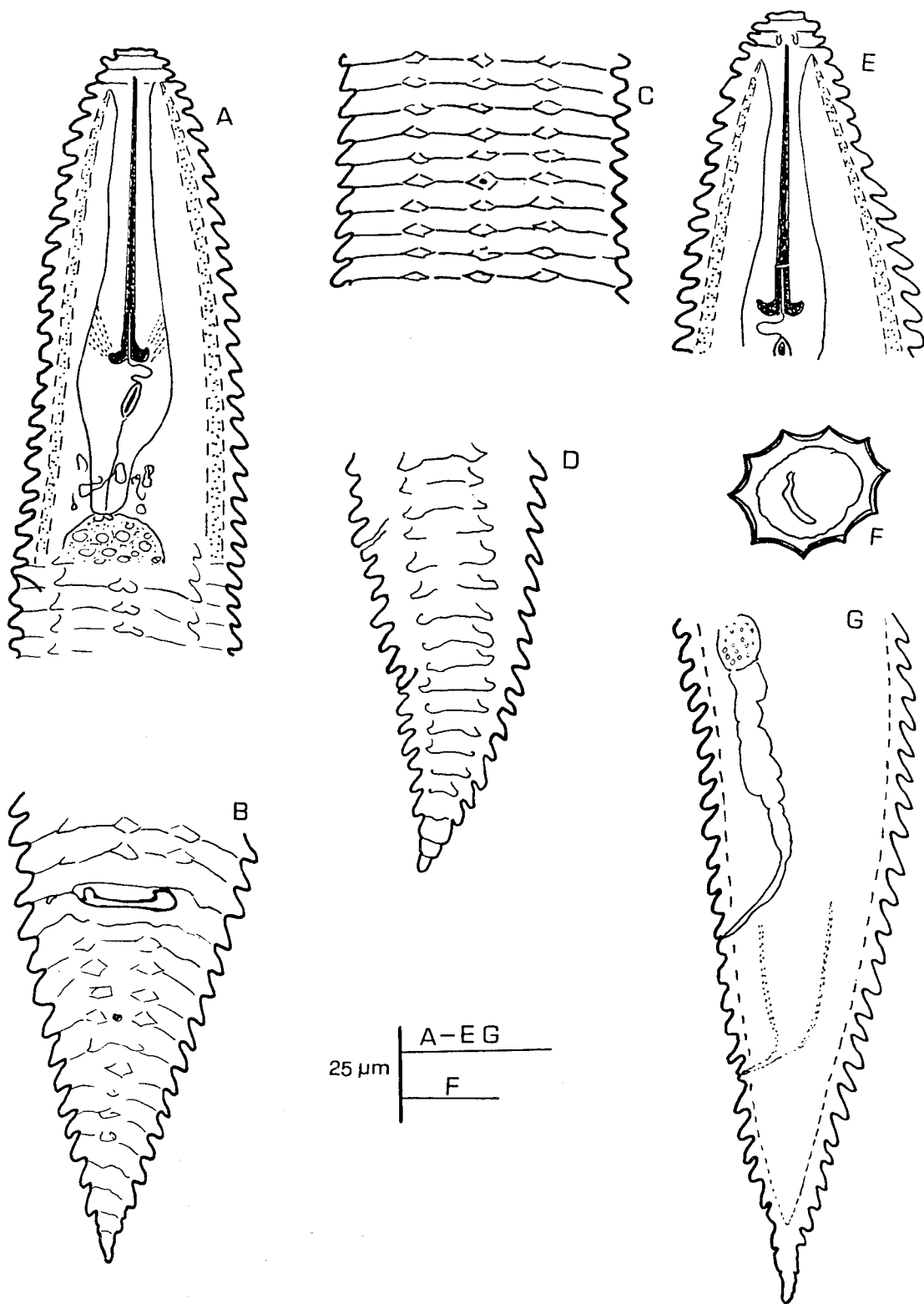


Fig. 1 - *Oigma andense* sp. n. A, oesophageal region; B,D,G, posterior body part (ventral and lateral view); C, annuli structures at mid body; E, anterior end; F, cross section at mid body.

*Type locality.* Specimens collected from forest soil 3 Km north of San Luis de Shuaro, La Merced (Junin), Peru.

*Etymology.* The name of this species is taken from the Andes mountain region in which it was collected.

*Type designation.* The holotype female and 15 paratypes have been deposited at the Istituto di Nematologia Agraria del Consiglio Nazionale delle Ricerche, Bari, Italy. A slide with two or three females has been sent to each of the following institutions:

Departamento de Fitopatologia, Universidad Nacional Agraria, La Molina, Lima, Peru;

Plantenziektenkundige Dienst, Wageningen, The Netherlands;

Nematode collection, Davis, California, USA;

Nematology collection of Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, England;

Museum d'Histoire Naturelle, Lab. des Vers, Paris, France.

*MESOCRICONEMA PERUENSIFORME*  
(De Grisse, 1967) Loof *et* De Grisse, 1989 (Figs 3-4)

*Females* ( $n = 12$ ).  $L = 509 \pm 20.1$  (460-535)  $\mu\text{m}$ ; maximum body width =  $54 \pm 4.3$  (49-63)  $\mu\text{m}$ ; pharynx =  $144 \pm 5.6$  (136-154)  $\mu\text{m}$ ; excretory pore from anterior end =  $151 \pm 7.3$  (136-166)  $\mu\text{m}$ ; stylet =  $88 \pm 2.5$  (83-92)  $\mu\text{m}$ .

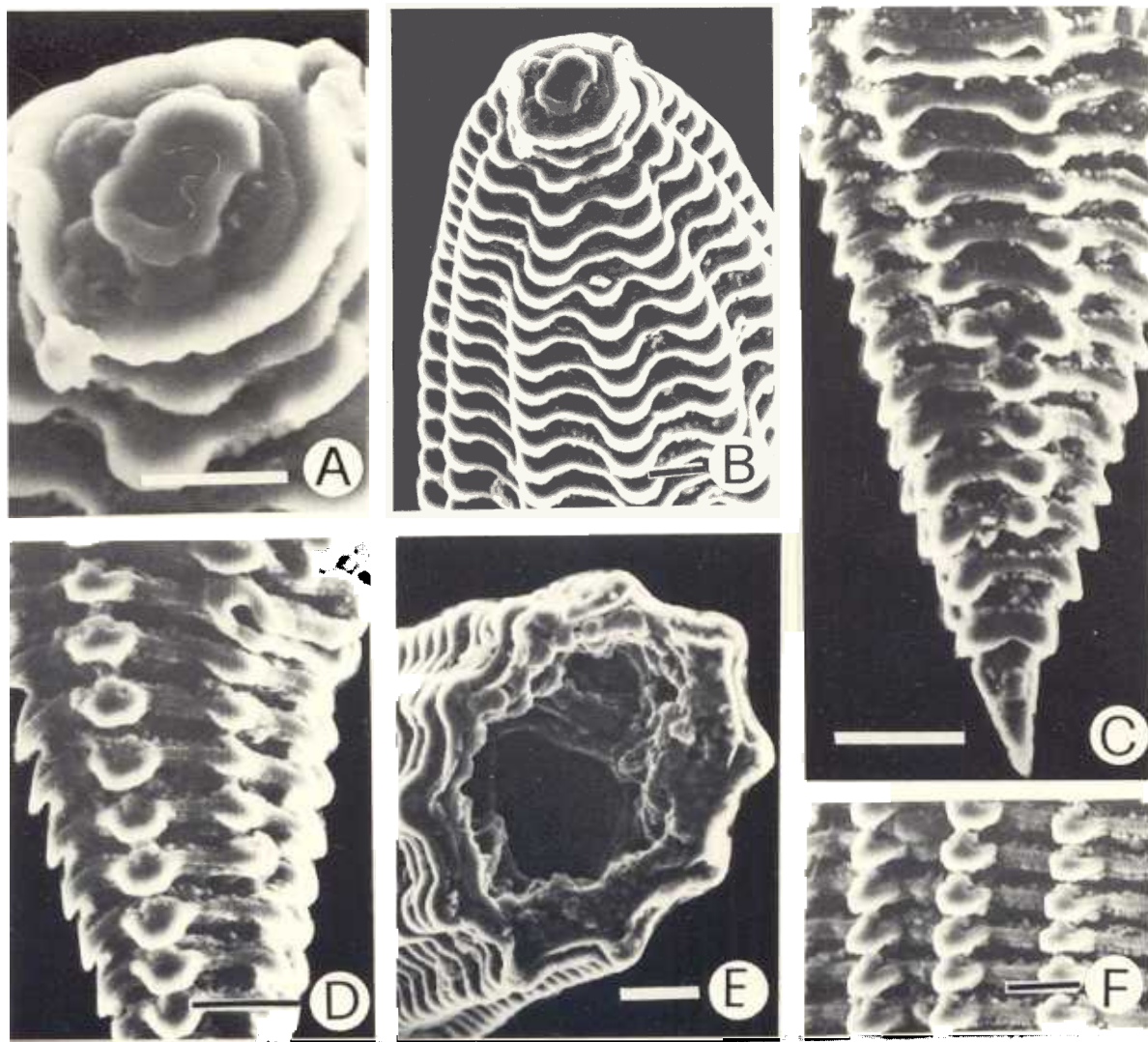


Fig. 2 - SEM photomicrographs: *Ogma andense* sp. n. A,B, labial disc (face view and profile); C, posterior body (ventral-view); D, vulval area (lateral-ventral view); E, cross section at mid body; F, annuli structures (Scale bars = 10  $\mu\text{m}$ ).

Ratios:  $a = 9.3 \pm 0.8$  (7.8-10.6);  $b = 3.5 \pm 0.2$  (3.2-3.7);  $c = 20 \pm 2.8$  (16-25);  $V = 92 \pm 1.0$  (89-95);  $R = 72 \pm 1.5$  (70-75);  $Rst = 14 \pm 0.6$  (13-15);  $Roes = 21 \pm 0.6$  (20-22);  $Rex = 22 \pm 0.8$  (21-24);  $Rv = 5 \pm 0.4$  (5-6);  $Ran = 3 \pm 0.4$  (3-4); tail length =  $26 \pm 3.2$  (21-31)  $\mu\text{m}$ ;  $VL/VB = 44 \pm 2.6$  (39-49);  $St \% L = 17 \pm 0.7$  (16-19);  $St \% Es = 61 \pm 1.3$  (59-63).

**Description.** Body ventrally arcuate after fixation, tapering slightly at both ends. Rare anastomoses. Body annuli  $7.4 \pm 0.3$  (7-8)  $\mu\text{m}$  rounded with smooth posterior margins. Labial region with large submedian lobes and two anterior directed labial annuli. "En face" view shows oral aperture as a narrow slit, labial disc conspicuous, elevated and large amphidial apertures at the lateral margins of labial disc. Stylet well developed, knobs  $11.6 \pm 0.8$  (10-12.6)  $\mu\text{m}$  across and anteriorly directed. Pharynx typical for family. Excretory pore 2-3 annuli posterior from base of pharynx. Ovary single outstretched. Spermatheca small, empty or filled with sperms. Vulva open, anterior lip slightly overlapping with two more or less pointed lobes in

ventral view (Fig. 4H). Tail bluntly rounded. Anus on 3-4th annulus from terminus. Terminal annulus rose-like (Fig. 4G)

*Male:* not found.

**Habitat and locality.** Specimens collected from forest soil 3 Km north of San Luis de Shuaro, La Merced (Junin), Peru.

**Discussion.** Since its original description this species has been reported, without morphometrical data, only from Brazil (Ferraz, 1980) from the rhizosphere of *Bachioria* sp. in Minas Gerais state.

**CRICONEMA (NOTHOCRICONEMA) MUTABILE**  
(Taylor, 1936) De Grisse *et* Loof, 1965 (Figs 5; 7 A-C)

*Females* ( $n = 10$ ).  $L = 406 \pm 21.7$  (350-456)  $\mu\text{m}$ ; maximum body width =  $33 \pm 1.8$  (30-37)  $\mu\text{m}$ ; pharynx =  $99 \pm 3.3$  (95-104)  $\mu\text{m}$ ; excretory pore from anterior end =

TABLE I - Measurements of 19 females of *Ogma andense* sp. n. from Peru.

Morphological characters	Holotype	Range min-max	Average (n = 18)	Standard deviation
<i>Measurements in <math>\mu\text{m}</math>:</i>				
L	370	316-380	341	17.1
body width	42	38-46	41	1.9
oesophagus length	80	73-84	79	4.0
excretory pore from ant. end	98	90-112	100	5.7
stylet length	48	45-50	47	0.2
first labial annulus width	12	10-13	11	0.7
tail length	39	28-41	33	3.6
<i>Annuli numbers:</i>				
R	87	78-90	85	3.2
Rst	14	12-16	15	0.9
Roes	20	18-24	21	1.4
Rex	27	25-29	27	1.0
Rv	16	13-16	15	0.8
Ran	10	8-10	9	0.6
<i>Percentages:</i>				
V	83	81-86	83	2.1
St % L	13	12-15	13	0.7
St % oes	60	55-67	60	3.4
<i>Ratios:</i>				
a		7-9	8	0.5
b		3.8-4.6	4.2	0.2
c		9-12	10	0.9
VL/VB		1.5-2.2	1.9	0.2

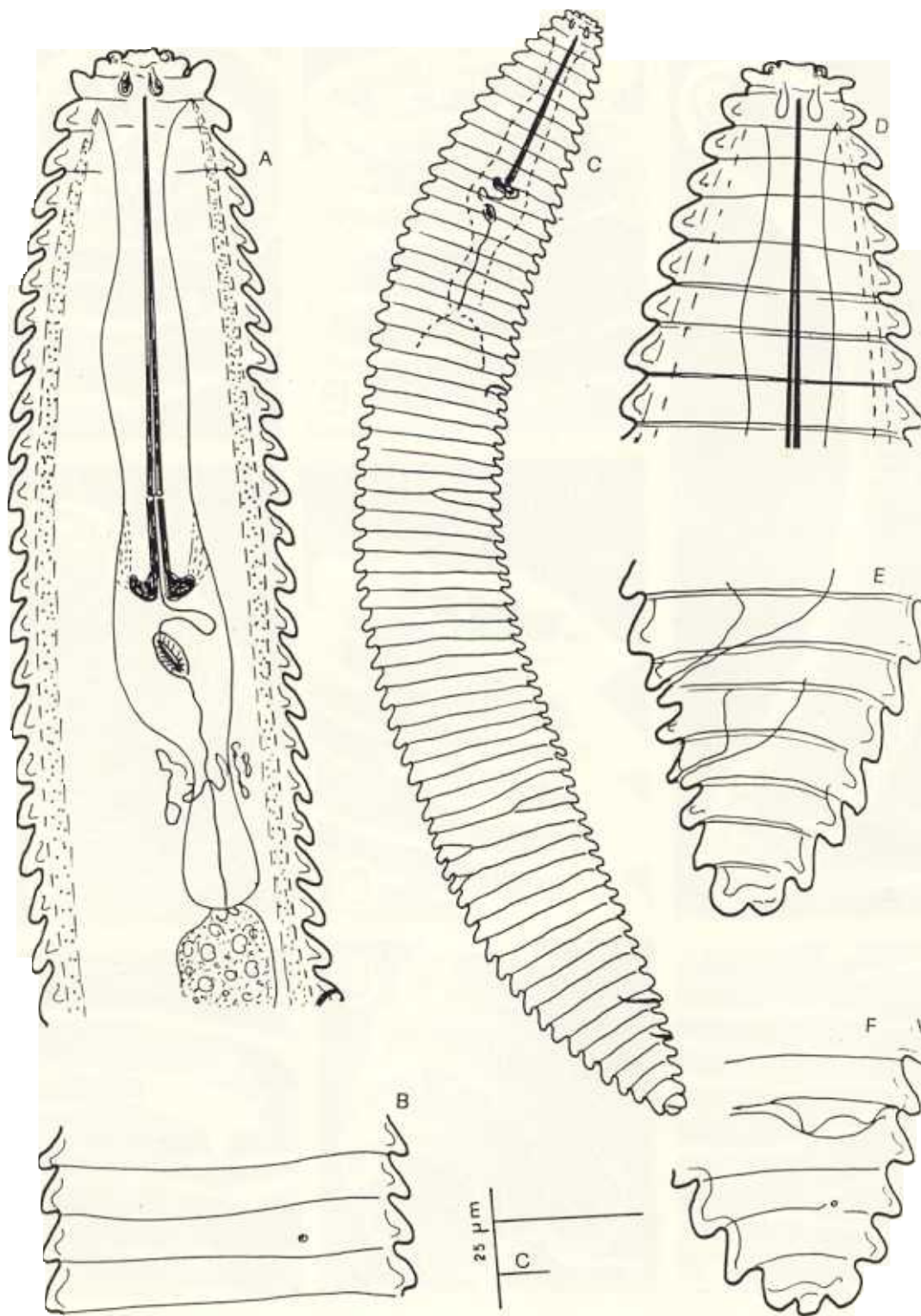


Fig. 3 - *Mesocriconema peruensiforme*. Female: A, oesophageal region; B, excretory pore (ventral view); C, entire female; D, anterior end; E, F, posterior body part (lateral and ventral view).



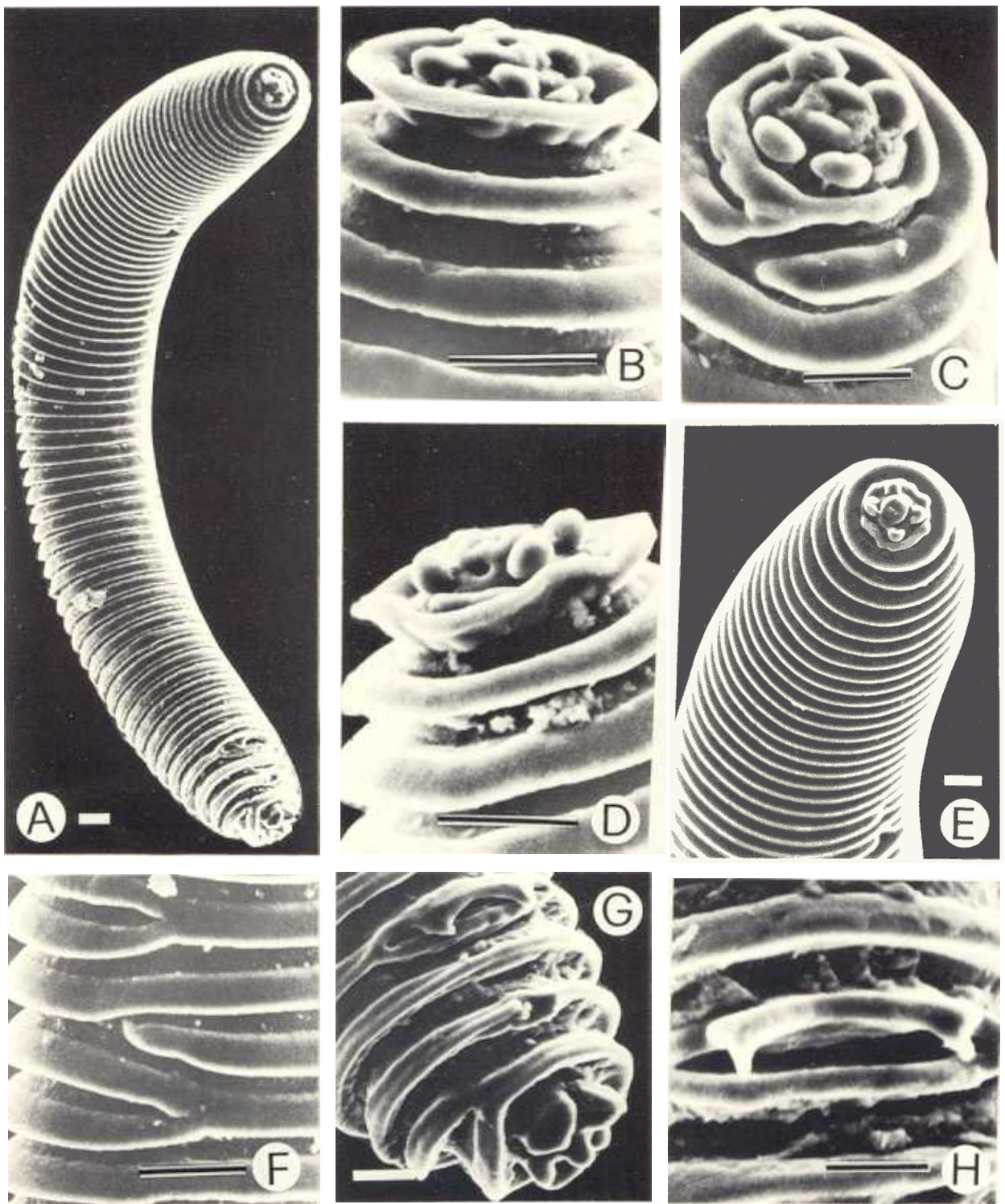


Fig. 4 - SEM photomicrographs of *Mesocriconema peruensiforme*. A, entire female; B, C, D, anterior end from different angles; E, body part; F, anastomosed annuli; G, posterior body (ventral view); H, vulva (scale bars = 10  $\mu$ m).

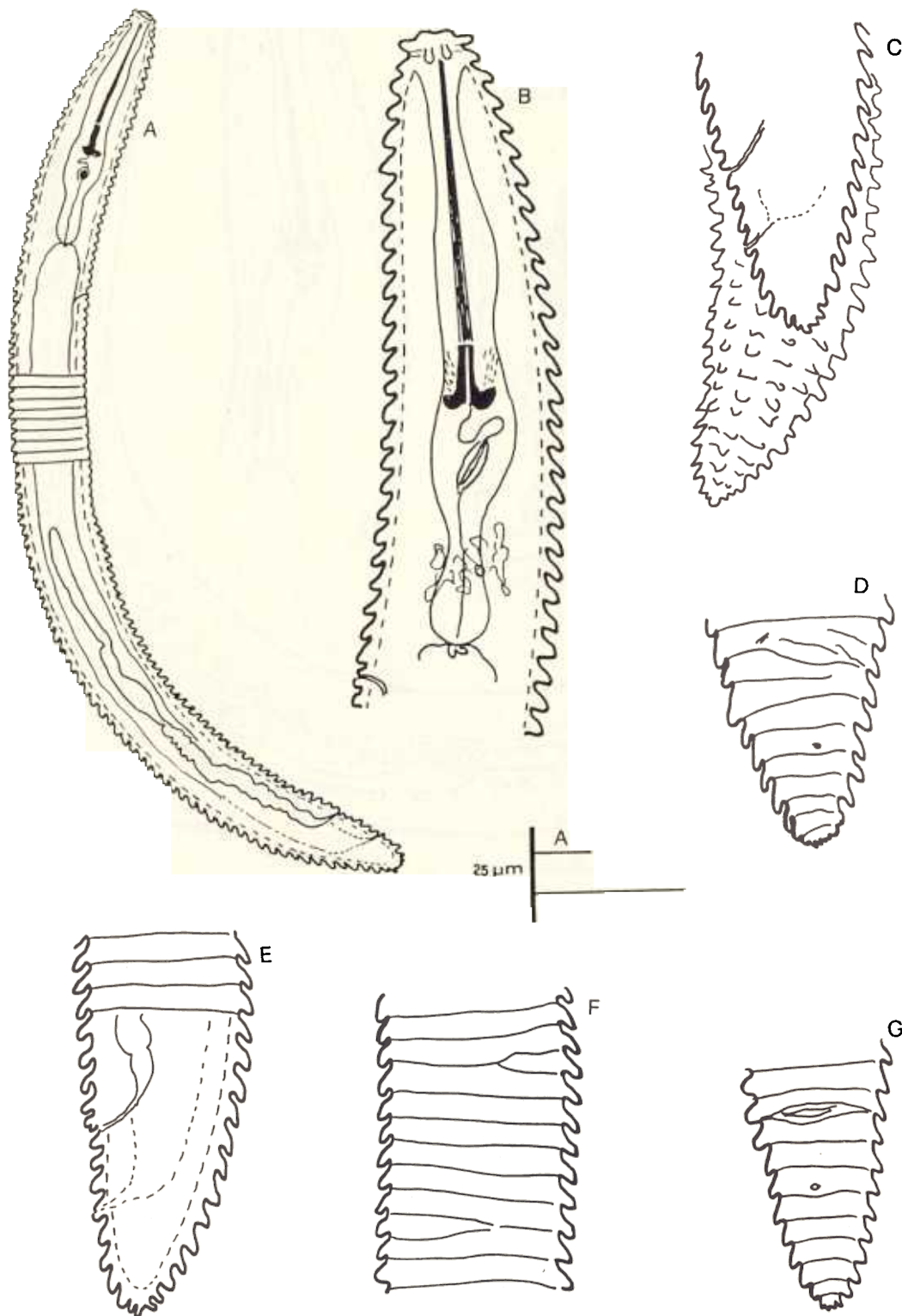


Fig. 5 - *Criconema (Nothocriconema) mutabile*: A, entire female; B, oesophageal region; C, female posterior body enclosed in the juvenile cuticle; D, E, G, posterior body part (lateral and ventral view); F, anastomosed annuli.

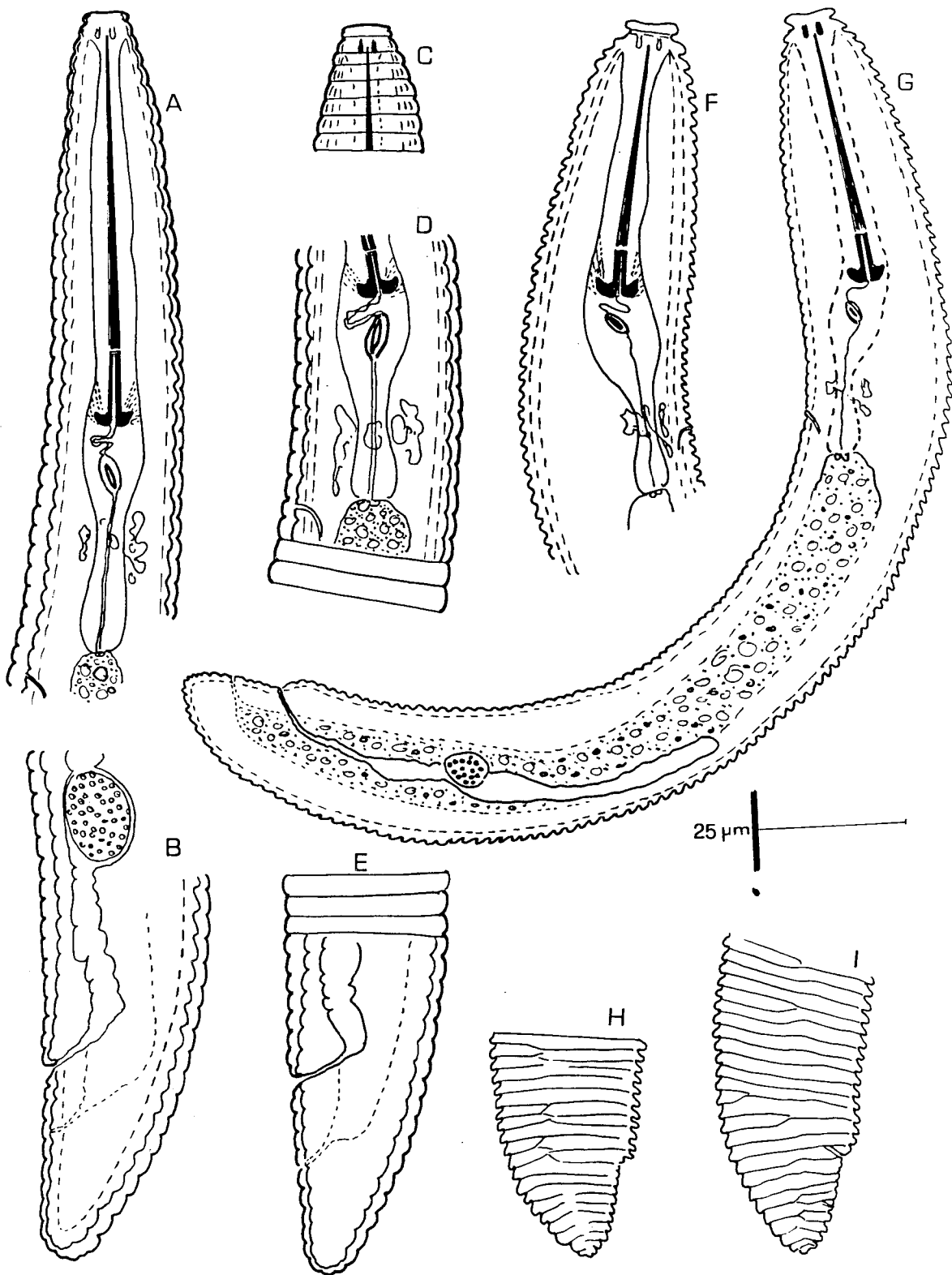


Fig. 6 - *Hemicriconemoides mangiferae* (A-F) and *Discocriconemella replecta* (G-I). A, F, oesophageal region; C, anterior end; D, basal oesophageal bulb region; B, E, posterior body (lateral view). G, entire female; H, I, posterior body (lateral view with numerous anastomoses and the conspicuous restriction of the body diameter at the level of vulva).



115  $\pm$  4.7 (105-122)  $\mu$ m; stylet = 58  $\pm$  1.7 (56-61)  $\mu$ m. Ratios: a = 12  $\pm$  0.9 (11-14); b = 4.0  $\pm$  0.3 (3.2-4.3); c = 24  $\pm$  2.2 (22-28); V = 92  $\pm$  0.9 (90-93); R = 99  $\pm$  5.3 (86-108); Rst = 15  $\pm$  0.9 (14-17); Roes = 24  $\pm$  1.3 (22-26); Rex = 28  $\pm$  0.4 (27-30); Rv = 9  $\pm$  0.7 (8-10); Ran = 6  $\pm$  0.7 (5-7); tail length = 17  $\pm$  1.7 (14-19)  $\mu$ m; VL/VB = 1.3  $\pm$  0.2 (1.1-1.5); St % L = 14  $\pm$  0.9 (13-15); St % oes = 58  $\pm$  1.9 (55-62); body annuli = 4.5  $\pm$  0.5 (4-5.3)  $\mu$ m.

**Discussion.** This species has been reported from South America: in Argentina, Venezuela and Peru (Loof, 1964; Raski and Golden, 1966; Doucet, 1980). Morphometrical data of our population from Chucuito (Puno) correspond well with previous descriptions of the species particularly with the values given in the original description by Taylor, 1936.

**Habitat and locality.** Soil from potato, barley and broad bean cultivated fields in rotation, collected at Chucuito (Puno), Peru.

**DISCOCRICONEMELLA REPLECTA** Pinochet *et* Raski, 1976 (Fig. 6 F-I)

**Females** (n = 8). L = 235  $\pm$  8.9 (219-245)  $\mu$ m; maximum body width = 26  $\pm$  1.7 (23-28)  $\mu$ m; pharynx = 80  $\pm$  3.5 (76-87)  $\mu$ m; excretory pore from anterior end = 78  $\pm$  5.5 (70-85)  $\mu$ m; stylet = 46  $\pm$  1.0 (44-47)  $\mu$ m. Ratios: a = 8.8  $\pm$  0.4 (8.3-9.5); b = 2.9  $\pm$  0.1 (2.8-3.1); c = 33  $\pm$  3.9 (27-39); V = 93  $\pm$  0.4 (92-93); R = 111  $\pm$  2.5 (107-114); Rsf = 21  $\pm$  1.0 (19-22); Roes = 36  $\pm$  1.3 (35-39); Rex = 32  $\pm$  1.2 (30-34); Rv = 12  $\pm$  0.9 (11-13); Ran =

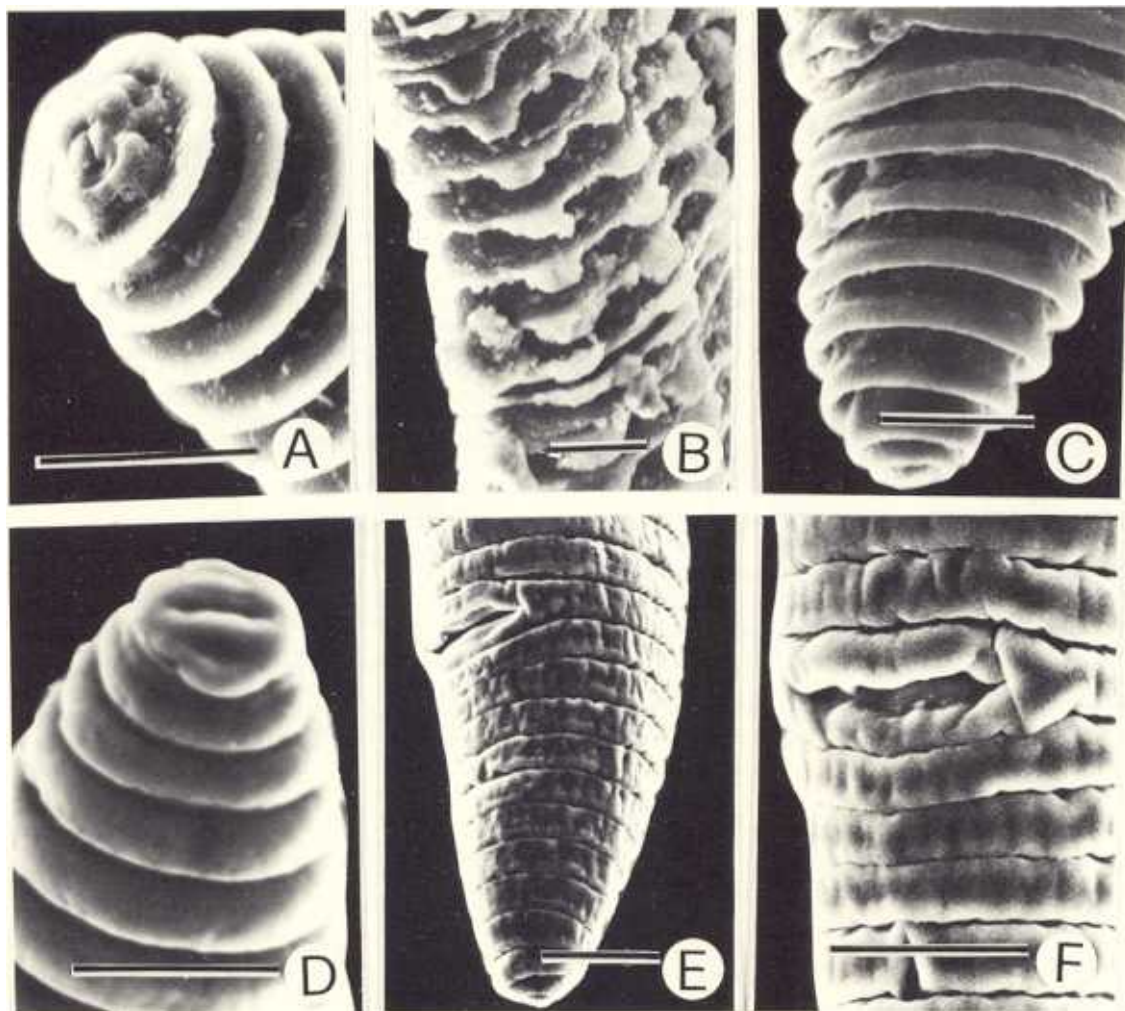


Fig. 7 - SEM photomicrographs of *Criconema* (*Nothocriconema*) *mutabile* (A-C) and *Hemicriconemoides mangiferae* (D-F). A: Anterior end; B, juvenile cuticular structures; C, posterior body part (latero-ventral view). D, anterior end; E, posterior body part (latero-ventral view); F, vulva (scale bars = 10  $\mu$ m).

6 ± 0.7 (5-7); tail length = 7.0 ± 1.0 (5.6-8.9) µm; VL/VB = 0.8 ± 0.04 (0.8-0.9); St % L = 19 ± 0.7 (18-20); St % oes = 57 ± 2.5 (53-60).

**Discussion.** This species was originally described from Porto Alegre, Brazil and differentiated by the authors from *D. limitanea* (Luc, 1959) De Grisse et Loof, 1965 by the shorter stylet among others characters. Chawla and Samathanam (1980) synonymized the two species but Raski and Luc (1987) did not agree with this opinion and considered the two species distinct, particularly by unique characters within the genus (the conspicuous constriction of the female body at level of vulva). In our population the body is strongly contracted ventrally (13-15%) at the vulva and regarding other morphometrical data it shows no differences with the original description and closely resembles the Brazilian (Bahia State) populations reported by Loof and Sharma (1980).

**Habitat and locality.** specimens collected from tropical wet forest soil at Yanamono, Iquitos (Loreto), Peru.

#### **HEMICRICONEMOIDES MANGIFERAE Siddiqi, 1961** (Figs 6 A-E; 7 D-F)

**Females** (n = 10). L = 467 ± 24.7 (429-530) µm; maximum body width = 27 ± 1.2 (25-29) µm; pharynx = 107 ± 4.4 (98-112) µm; excretory pore from anterior end = 118 ± 5.6 (112-132) µm; stylet length = 67 ± 3.5 (62-73) µm. Ratios: a = 17 ± 1.3 (16-21); b = 4.3 ± 0.2 (4-5); c = 22 ± 1.4 (20-25); V = 92 ± 0.7 (91-93); R = 127 ± 3.6 (123-135); Rst = 20 ± 0.9 (19-22); Roes = 29 ± 1.3 (27-31); Rex = 32 ± 1.4 (30-35); RV = 11 ± 0.7 (10-12); Ran = 7 ± 0.5 (7-8); tail length = 21 ± 1.7 (18-25) µm; body annulus = 3.9 ± 0.2 (3.4-4.3) µm.

**Discussion.** Our specimens show no differences with all previous descriptions and correspond very well with *H. mangiferae* populations from Venezuela (Dasgupta et al., 1969). SEM morpho-anatomy presents useful characteristics to distinguish the species such as the body annuli between vulva and anus, vulvar sheath and tail shape.

**Habitat and localities.** Pisco (Ica), in rhizosphere of *Musa* sp.; Ica (Ica) in rhizosphere of *Vitis vinifera*; Colca

(Ancash), in rhizosphere of *Zea mais*; Catac (Ancash), in rhizosphere of Gramineae; 20 Km South of Huaras (Ancash), in soil from the rhizosphere of *Eucalyptus* sp. and grass species, at more than 4000 m altitude.

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