

Observations on *Paraplectonema* Strand, 1934 and description of *Leptoplectonema fuegoense* n.g., n. sp. (Nematoda : Leptolaimidae)

August COOMANS and Dewey J. RASKI

Instituut voor Dierkunde, K. L. Ledeganckstraat 35, 9000 Gent, Belgium and Department of Nematology, University of California, Davis, CA 95616, USA.

SUMMARY

Leptoplectonema fuegoense n.g. n. sp. is described from Southern Chile. The genus belongs to Leptolaimidae and comes close to *Leptolaimus* from which it is differentiated by a very elongated cardia, presence of a prominent dorsal pore at cardia level and lack of an excretory system. The long cardia is reminiscent of *Paraplectonema* and the new leptolaimid was first assigned to the latter genus. A detailed comparison with *P. pedunculatum* (Hofmänner, 1913) has revealed important differences. The generic diagnosis of *Paraplectonema* has been emended and a key to the species is given.

RÉSUMÉ

Observations sur Paraplectonema Strand, 1934 et description de Leptoplectonema fuegoense n.g., n. sp. (Nematoda : Leptolaimidae)

Description est donnée de *Leptoplectonema fuegoense* n.g., n. sp. provenant du sud du Chili. Ce genre, qui appartient aux Leptolaimidae, est proche de *Leptolaimus* dont il diffère par un cardia très allongé, la présence d'un important pore dorsal situé au niveau du cardia et l'absence de système excréteur. Le cardia allongé rappelle le genre *Paraplectonema* où l'espèce avait été d'abord rangée. Une comparaison avec *P. pedunculatum* (Hofmänner, 1913) a toutefois révélé des différences importantes. La diagnose du genre *Paraplectonema* est émanée et une clé des espèces est proposée.

A survey of nematodes at Orange Bay, Hoste Island, Southern Chile, carried out in 1983, yielded a number of interesting nematodes. Full details of the sampling sites were reported earlier (Raski, Luc & Valenzuela, 1985). The sampling area was rich in humus, the soil well drained but quite moist with fresh water from frequent precipitation.

This paper reports on a leptolaimid nematode first considered to represent a species of *Paraplectonema* Strand, 1934. Comparisons with a species of the latter genus revealed that the Chilean specimens represent a new genus and new species. In order to make a detailed comparison a redescription of *P. pedunculatum* (Hofmänner, 1913) was necessary.

Specimens from Chile sieved from soil were killed in hot water, fixed and stored in 4 % formaldehyde and later transferred to FAA and processed to glycerin. Specimens of *Paraplectonema pedunculatum* were extracted from bulk sediment samples from fresh water, fixed with cold formalin to a final percentage of about 4 % formaldehyde.

Specimens of both species studied were prepared for

SEM according to the technique described in Luc, Coomans and Sarr (1987).

Paraplectonema Strand, 1934

DIAGNOSIS

Leptolaimidae. Medium sized nematodes with annulated cuticle provided with a protruding lateral field and sparsely distributed, short body setae. Four short cephalic setae. Amphidial fovea oval to cryptospiral, located just behind cephalic setae. Stoma long and narrow, tubiform. Pharynx cylindrical with valveless, pyriform terminal bulb. Cardia elongate cylindrical with intestine attached at posterior extremity. Excretory system consisting of a well-developed ventral gland with long, posteriorly convoluted, cuticularized excretory canal which opens to the exterior in the neck region. Female reproductive system paired, with reflexed ovaries. Male monorchic; with tubiform, sclerotized, protrusible supplements. Spicules ventrally arcuate. Gubernaculum with two posterior apophyses. Tail with conical anterior half and cylindrical posterior half, ending in a short spinneret.

TYPE SPECIES

- P. pedunculatum* (Hofmänner, 1913) Strand, 1934
- = *Plectus pedunculatus* Hofmänner, 1913
- = *Plectus pedunculatus* Hofmänner, 1913
- = *Paraplectus pedunculatus* (Hofmänner, 1913) Filipjev, 1930
- = *Cylindrolaimus aberrans* Micoletzky, 1915

OTHER SPECIES

- P. multitubiferum* (Imamura, 1931) Loof & Jairajpuri, 1965
- = *Plectus multibulbiferus* Imamura, 1931
- P. canadianum* Hopper, 1968

REMARKS

Loof and Jairajpuri (1965) transferred *Plectus multibulbiferus* Imamura, 1931 to *Paraplectonema* and suggested its synonymy with *P. pedunculatum*. Andrassy (1984) accepted this view.

We disagree mainly on the basis of the far more anterior position of the excretory pore in *P. multitubiferum* (see Fig. 17a in Imamura, 1931) and that males in this species are common, whereas they are absent in the true *P. pedunculatum*. Other differences are more doubtful, e.g. : lateral field extending only till anus, no setae on body in *P. multitubiferum*.

Paraplectonema shares an excretory system with posteriorly convoluted excretory canal with Plectidae and with the genus *Pakira* Yeates, 1967 (see Heyns & Coomans, 1990). The genus fits best in the Leptolaimidae as first proposed by Hopper (1968).

***Paraplectonema pedunculatum* (Hofmänner, 1913)**
Strand, 1934
(Figs 1 & 2)

MEASUREMENTS

See Table 1

DESCRIPTION

Female : Body about 1 mm long and moderately slender; variously curved upon fixation; cylindrical, narrowing anteriorly and more so in the posterior third of the body, indented at vulva. Cuticle annulated with annuli averaging 2 µm in width, but markedly wider on ventral side of tail. Annuli may appear subdivided by a shallow transverse groove. Especially near the head end the annuli are separated from each other by a rather deep groove. Short somatic setae are scattered over the body, in total numbering 10-11 as indicated in Fig. 1A (arrow-heads). Usually three (exceptionally four) in the neck region, with the first (exceptionally a second) lateral to lateroventral in the region anterior to the nerve ring, the

second lateroventral close to the level of the excretory pore and the third laterodorsal just in front of the pharyngeal bulb. The latter is the most constant in position. Between cardia and anus there are 4-6 setae and this variation can be found also between the two body sides of a single specimen; of these 1-3 are late-

Table 1

Dimensions of females of *Paraplectonema pedunculatum* and *Leptoplectonema fuegoense* n. sp.

	<i>P. pedunculatum</i>	<i>L. fuegoense</i> n. sp.	
		Paratypes	Holotype (female)
L (mm)	1.05 ± 0.04 (0.99 - 1.10)	0.619 ± 0.027 (0.60 - 0.67)	0.60
a	31.3 ± 0.9 (30 - 32)	29.2 ± 3.37 (25 - 33)	33
b	6.15 ± 0.67 (5.0 - 6.6)	4.6 ± 0.11 (4.5 - 4.8)	4.5
c	5.61 ± 0.14 (5.4 - 5.8)	4.19 ± 0.14 (4.0 - 4.4)	4.2
c'	9.48 ± 0.79 (8.5 - 10.3)	11.92 ± 1.23 (9.9 - 13.4)	13.4
V	43.4 ± 1.83 (41 - 46)	47.1 ± 0.70 (46 - 48)	48
V'	52.8 ± 2.22 (50 - 56)	61.8 ± 1.18 (60 - 63)	63
V (µm)	456.0 ± 12.06 (440 - 474)	291.2 ± 8.68 (283 - 307)	289
V-a (µm)	407.0 ± 33.50 (370 - 456)	180.5 ± 14.30 (168 - 206)	171
G ₁ (µm)	141.25 ± 10.21 (125 - 153)	57.4 ± 3.72 (52 - 62)	55
G ₁ %	13.85 ± 1.60 (11.3 - 15.7)	9.26 ± 0.47 (8.6 - 10.0)	9.1
G ₂ (µm)	132.75 ± 6.06 (125 - 142)	57.2 ± 9.62 (45 - 70)	45
G ₂ %	12.58 ± 0.83 (12 - 14)	9.2 ± 1.34 (7.5 - 11.4)	7.5
Neck (µm)	164.5 ± 5.85 (157 - 172)	134.0 ± 2.68 (131 - 139)	134
Ant. end to bulb end (µm)	144.75 ± 5.21 (139 - 153)	113.0 ± 1.41 (111 - 115)	113
Bulb-width (µm)	19.25 ± 1.09 (18 - 21)	10.32 ± 0.56 (9.5 - 11.0)	9.5
Cardia-length (µm)	19.25 ± 0.83 (18 - 20)	21.16 ± 1.90 (19.0 - 24.5)	20.5
Rectum (µm)	34.0 ± 1.41 (32 - 35)	19.3 ± 2.40 (17 - 23.5)	20
Rectum in a.b.w.	1.78 ± 0.11 (1.67 - 1.94)	1.56 ± 0.20 (1.30 - 1.80)	1.80
Nerve ring (µm)	86.0 ± 3.67 (80 - 89)	72.2 ± 1.47 (70 - 74)	73
Tail (µm)	187.2 ± 8.84 (173 - 197)	147.1 ± 6.56 (139 - 158)	144

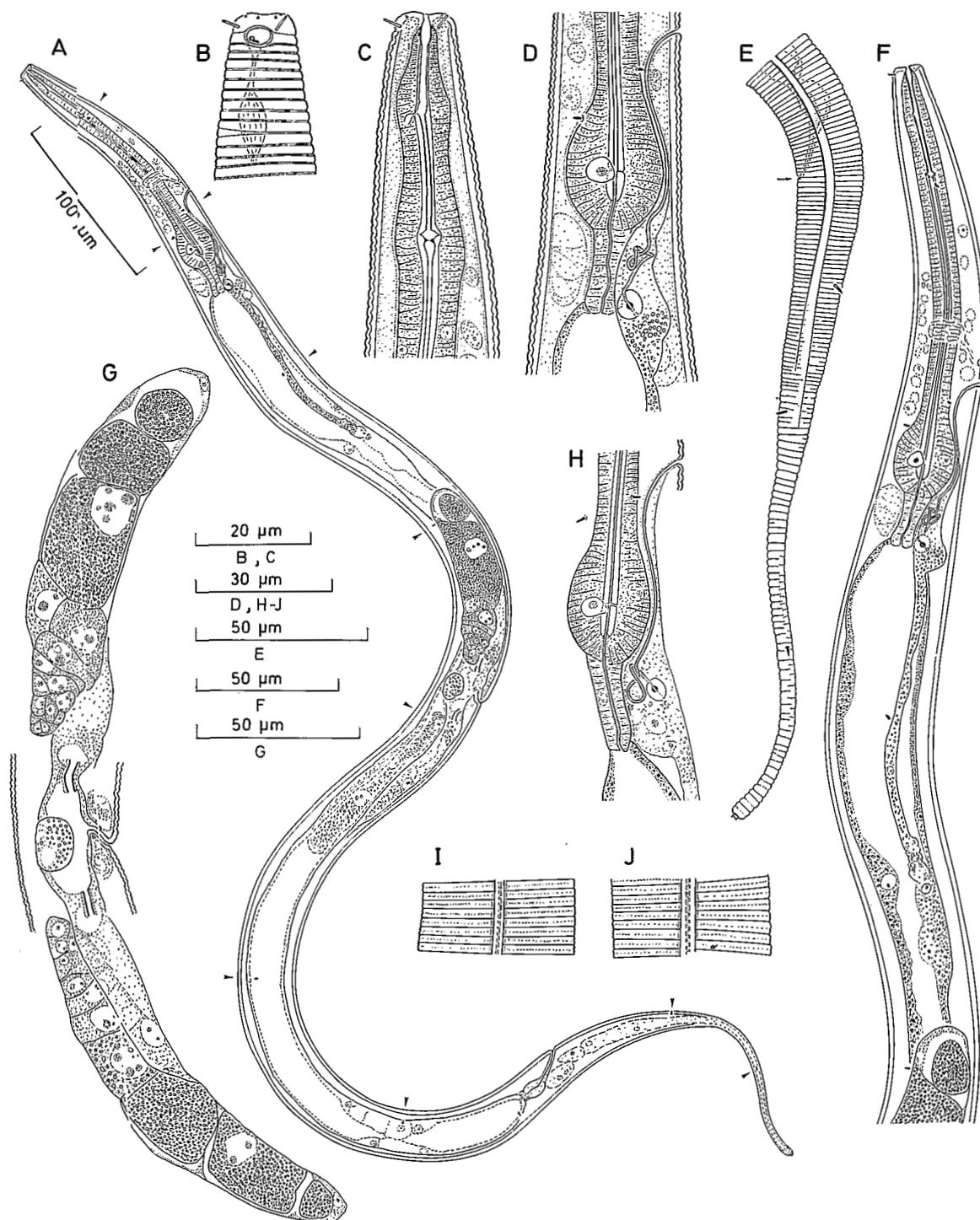


Fig. 1. *Paraplectonema pedunculatum*. A : Entire female; B : Head end, surface view; C : Same in median view; D : Posterior neck region; E : Tail in surface view; F : Anterior body region showing the entire excretory system; G : Female reproductive system; H : Pharyngeal bulb, cardia and excretory duct; I, J : Cuticular annulation.

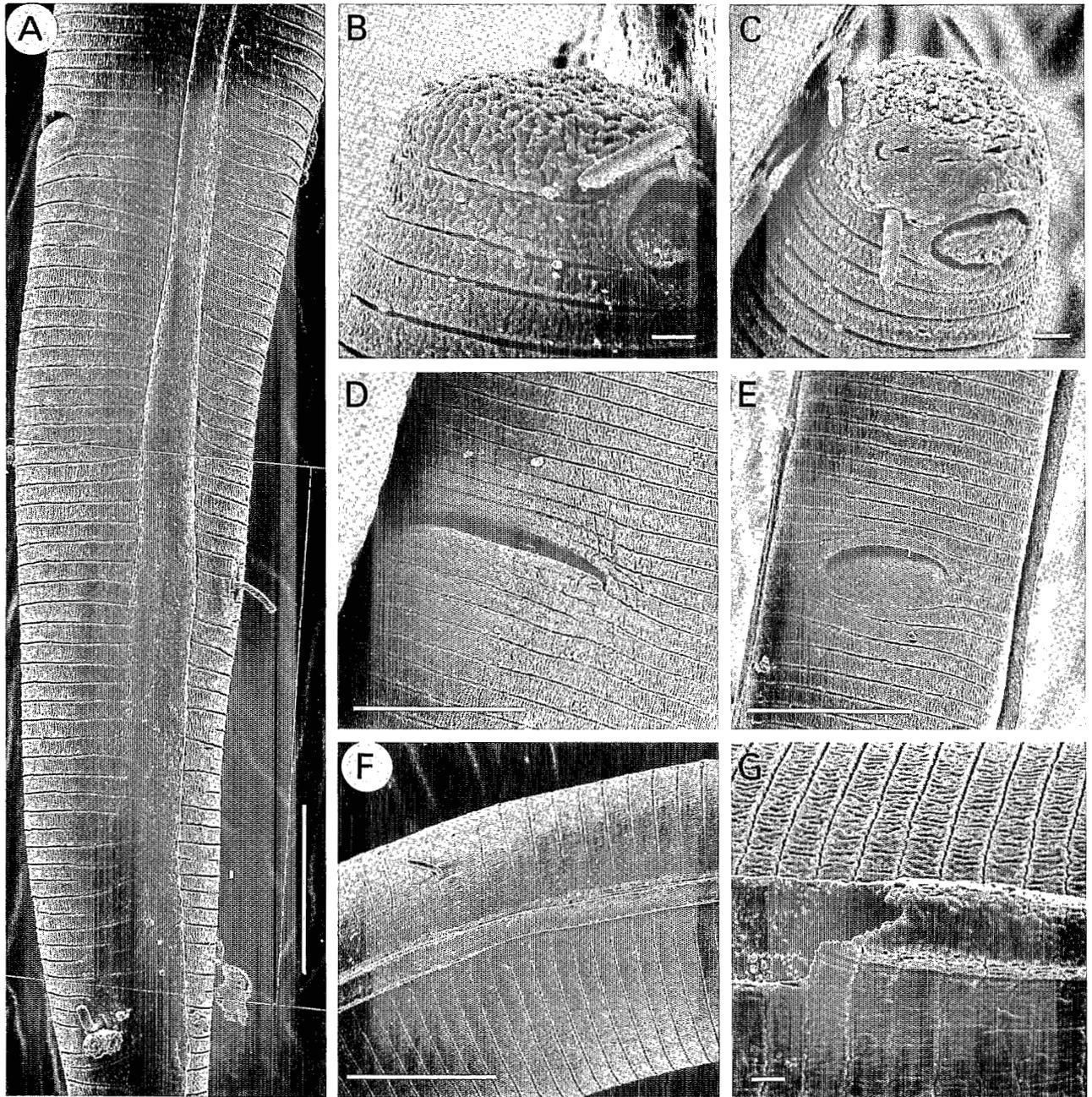


Fig. 2. *Paraplectonema pedunculatum*. A : Anterior part of tail; B, C : Head end (arrowheads indicate labial papillae); D : Vulva; E : Anus; F : Cuticle with lateral field in preanal region (seta is the laterodorsal seta close to the rectum in Fig. 1A); G : Lateral field with outer cuticle partly removed. (Bars : A, D, E, F = 10 μ m; B, C, G = 1 μ m.)

roventral and 2-4 laterodorsal. On the tail there are : *i*) one subdorsal seta on the left side, *ii*) a pair of subventral setae close to the end of the conical part, and *iii*) a pair of lateral setae about halfway the cylindrical part. Lateral field 2-2.5 μm wide, seemingly consisting of two ridges, separated by an equally wide groove, as seen under the light microscope, but in fact consisting of a single inflated ridge as seen under SEM, beginning at the level of the nerve ring and extending over the anterior half of the tail where it flattens out and disappears. The ridge of the lateral field overlies a groove and this apparently creates the idea of the two ridges separated by a median groove seen under the light microscope. Lip region truncate, 11-11.5 μm wide, with amalgamated lips, bearing six labial papillae and four, about 3 μm long, slender cephalic setae. Amphidial fovea oval, about 5 μm wide, its anterior margin in between the cephalic setae, but completely surrounded by the locally expanded first body annulus; *canalis amphidialis* departing from dorso-caudal side of fovea, extending backward over four annuli and leading to the *fusus* which extends over five annuli. Stoma about 40 μm or 3.5-4 times the lip region width long, narrow, tubiform, surrounded by pharyngeal tissue; ending in a glottoid apparatus consisting of a wider chamber with three dentiform projections. Pharynx muscular, cylindrical over most of its length, widening posteriorly to a pyriform bulb without valves, but with slightly thicker cuticular lining showing a transverse break about in the middle of the bulb. Three gland nuclei recognisable in the bulb. Dorsal pharyngeal gland opening into stoma some 1.5 lip region widths behind head end. A pair of ventrosublateral glands probably opening just in front of nerve ring. Pharyngo-intestinal junction (cardia) elongate cylindrical, as long as bulb is wide; non-muscular. Intestine with wide lumen, separated from rectum by a sphincter-like constriction. Proximal part of rectum wide, distal part narrow. Anus crescent shaped with thick posterior lip. Nerve ring surrounding pharynx at 63.5 (59.5-67.4) % of neck length. Excretory pore opening one annulus wide, about halfway between nerve ring and pharyngeal bulb, leading to a cuticularized excretory duct that first bends inward, then runs close to the ventral side of the posterior pharynx and subsequently becomes highly convoluted opposite the cardia before it ends in a valve-like structure that connects to the extremely elongated glandular part of the ventral gland cell; the latter may reach as far as the anterior genital branch. Reproductive system with the anterior ovary reflexed to the right and the posterior one to the left side. Oviducts rather wide and poorly differentiated, reaching about halfway of mature ovaries. Both oviducts connect to the common uterus through narrow cuticularized tubes. A large gland occurs at both sides dorsolaterally from the uterus. Vagina short, narrow and usually inclined anteriorly. Vulva a transverse slit that may be inside a slight depression. The nuclei of maturing and ripe

oocytes contain several nucleoli and mature oocytes are often subdivided in two or three parts. No sperm present in female genital tract. Tail elongate, at first conical but cylindrical in its posterior half, latter part with broad ventral and obscure dorsal annulation. Tips sometimes slightly wider, provided with a very short spinneret.

Male : Unknown.

REMARK

In all four specimens studied there was a pigment accumulation at the dorsal posterior side of the fovea, just above the pore of the *canalis amphidialis* (see also Bongers, 1988). We believe this to be an artefact for the following reasons : *i*) the pigment is attached to the outside of the amphid, *ii*) a similar pigment was, in some specimens, present in the mouth opening, in the spinneret and/or at the tip of the somatic setae.

LOCALITY AND HABITAT

Freshwater, Oostvaardersplassen, The Netherlands (*Rec. & leg.* Dr. T. Bongers, Wageningen) collected 1-7-1986.

Key to the species of *Paraplectonema*

1. Excretory pore anterior to nerve ring, at about four head widths from anterior end; males common, with 13 tubular supplements *P. multitubiferum*
- Excretory pore behind nerve ring, at 9-10 head widths from anterior end 2
2. Tail 270-360 μm ; $c = 3.3-4.2$; males common, with 9 tubular supplements *P. canadianum*
- Tail 170-210 μm ; $c = 5-6$; males absent *P. pedunculatum*

Leptoplectonema n.g.

DIAGNOSIS

Leptolaimidae. Small nematodes with annulated cuticle and obscure lateral field. One pair of setiform deirids halfway between nerve ring and end of pharyngeal bulb. Well developed lateral epidermal glands present throughout the body length and opening through prominent pores. Dorsal body pore connected with an adjacent dorsal organ at base of neck. Four short cephalic setae. Amphidial fovea circular, situated at about one lip region width behind lip region. Stoma tubiform, poorly defined, with a short, wider cheilostome. Pharynx cylindrical with small pyriform, valveless terminal bulb. Cardia a very long cylinder with intestine attached at its posterior extremity. Excretory system apparently lacking. Female reproductive system paired with reflexed ovaries. Male unknown. Tail ventrally arcuate, gradually tapering and ending in a short tubiform spinneret.

TYPE AND ONLY SPECIES

Leptoplectonema fuegoense n.g. n.sp.

RELATIONSHIPS

The new genus combines characters of the genera *Paraplectonema* Strand, 1934 (e.g. elongated cardia) and *Leptolaimus* de Man, 1876 (e.g. shape and position of amphid, presence of numerous epidermal glands with cuticular pores) and this is reflected in the name *Leptoplectonema*. The new genus can be separated from *Paraplectonema* by the more posterior position of the amphid, the presence of a dorsal organ with pore opposite the cardia, the apparent lack of an excretory system, the presence of numerous epidermal glands, combined with a setiform deirid and by the poorly developed lateral field. It can be separated from *Leptolaimus* by its very elongated cardia, presence of a dorsal pore and lack of an excretory system.

Most species of *Leptolaimus* have a short cardia, but a few have an elongated one, e.g. *L. plectoides* Chitwood, 1951, *L. vinnulus* Vitiello, 1974 and males of *L. pumicosus* Vitiello, 1970.

Leptoplectonema n.g. resembles members of the Plectidae Örley, 1880 in possessing a combination of numerous lateral body pores and a setiform deirid, but it differs from them in lacking a valvular apparatus in the pharyngeal bulb and an excretory system with convoluted cuticularized duct.

The lack of denticulated ridges in the basal bulb, shape of stoma, shape and position of amphid, presence of a spinneret, absence of an excretory system and paired gonads separate the new genus from *Chronogaster* Cobb, 1913.

Finally it should be mentioned that the only other nematode so far reported possessing a dorsal body pore in the cardia region is *Prismatolaimus* de Man, 1880 (see Coomans & Raski, 1988). The phylogenetic importance of this character is at the moment difficult to assess, but it nevertheless adds more weight to the position of *Prismatolaimus* inside Leptolaimina or Araeolaimida rather than in Enoplina (Lorenzen, 1981; Coomans & Raski, 1988).

Because of the lack of males in the only species of *Leptoplectonema* it is at present difficult to propose a closest relative. The best candidate, however, seems to be *Leptolaimus*.

*Leptoplectonema fuegoense** n.g. n. sp.
(Figs 3 & 4)

MEASUREMENTS

See Table 1.

* The specific name is derived from "Tierra del Fuego" to which the type locality belongs.

DESCRIPTION

Female: Body less than 0.7 mm long and moderately slender; ventrally curved upon fixation, especially so in the tail region; tapering towards both ends, but more so posteriorly. Cuticle annulated, with annuli averaging 1.5 µm in width. Lateral field obscure, consisting of an interruption of the body annulation, beginning irregularly at level of nerve ring. The cuticle bears 64.4 (55-77, n = 5) lateral body pores, connected with epidermal glands. In most specimens the glands are very conspicuous due to intense vacuolization. The pores are in a more or less staggered row in the neck region, where 14.0 (12-16) occur, and then in pairs or alternating in the main part of the body, where there are 45.6 (33-56) pores with 20.4 (15-25) anterior to the vulva and 25.4 (18-31) between vulva and anus. Finally there are 4.8 (4-6) pores on the tail. About halfway between isthmus and pharyngeal bulb there is, at each body side, a small lateral to laterodorsal seta, which is considered to be a deirid comparable to that found in plectids. A prominent dorsal pore connected with a "dorsal organ" is present in all specimens studied opposite the base of the cardia. Lip region rounded-truncate, 4.8 (4.5-5.0) µm wide, with partly amalgamated lips, bearing six papillae with apical pores and four about 3 µm long cephalic setae. Amphidial fovea circular but occasionally cryptospiral, 3.4 (3.0-3.5) µm wide, situated at 6.9 (6.5-7.0) µm or 1.4-1.5 lip region widths from the anterior end; its anterior margin 6-8 rings behind the lip region. The fovea extends over 3-5 body annuli. The *canalis amphidialis* opens in the fovea at the dorsocaudal side. Stoma tubiform and very narrow except for the slightly wider cheilostome; without apparent glottoid apparatus and posterior end therefore difficult to define. Pharynx muscular, cylindrical over most of its length, widening posteriorly to a short (= less than one body width), pyriform, valveless bulb. Cuticular lining of bulb with a transverse interruption. Three gland nuclei visible in bulb; dorsal pharyngeal gland opening 16-16.5 µm or 3.3 (3.1-3.6) lip region widths from anterior end. Pharyngo-intestinal junction very elongate, cylindrical throughout or expanding slightly where it meets the intestine, 21.0 (19-25) µm or twice as long as the pharyngeal bulb is wide; non-muscular. Intestine with a rather wide lumen. Anus crescent shaped, with thick, corrugated posterior lip.

Nerve ring surrounding pharynx at 53.9 (52.7-55.6) % of neck length. Ventral gland, excretory duct and pore apparently lacking. Reproductive system paired, with anterior ovary reflexed to the right and the posterior one to the left side. Oviducts rather wide and poorly differentiated, reaching about halfway of mature ovaries. Both oviducts connect to the common uterus through a constriction, which is surrounded at both sides by a gland (hence four glands in total). Uterus a wide chamber leading to a short (1/4-1/3 of body width)

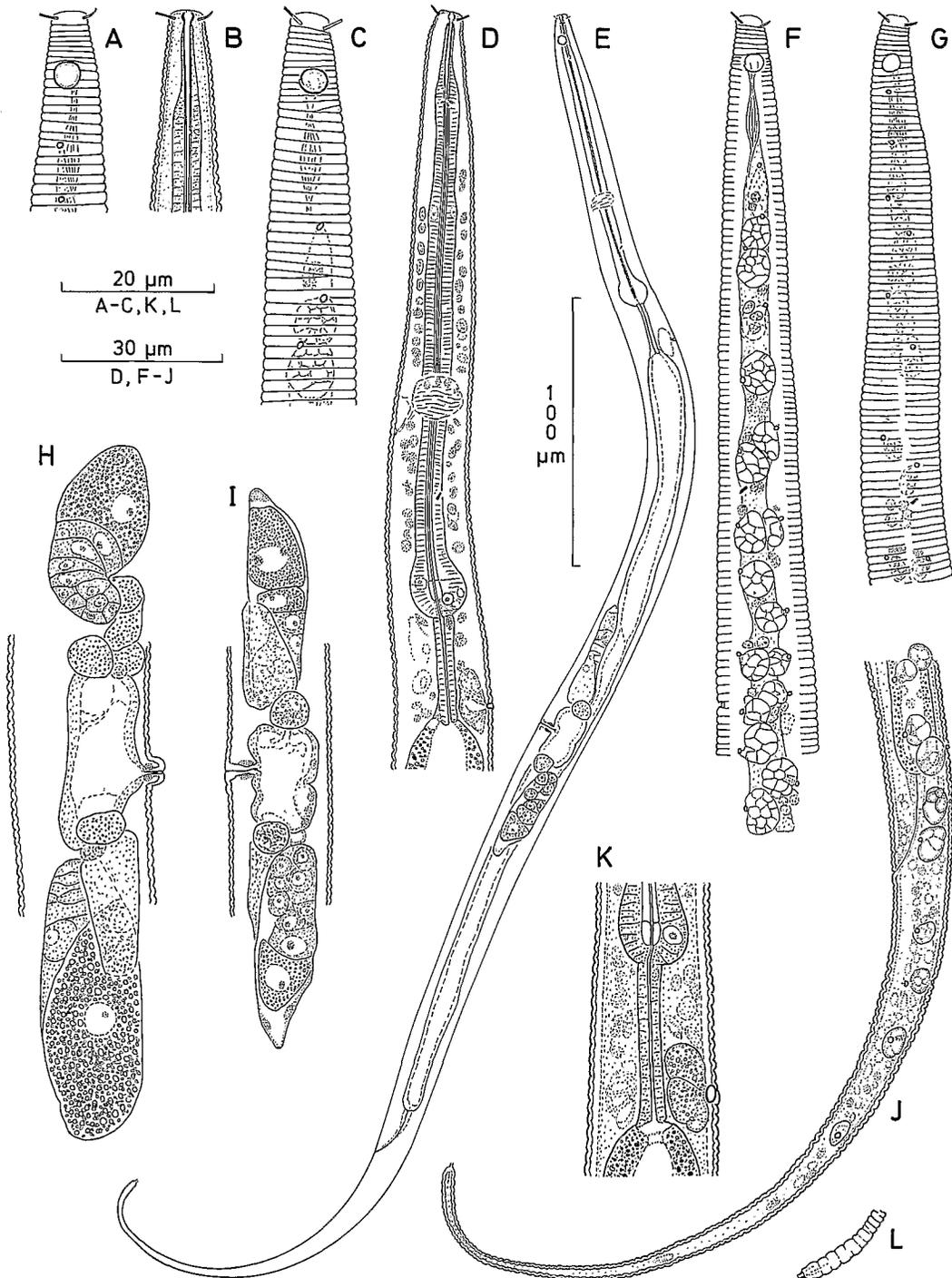


Fig. 3. *Leptoplectonema fuegoense* n.g. n. sp. A : Head end, surface view; B : Same in median view; C : Anterior end, surface view; D : Neck region; E : Entire female; F : Neck region with lateral chord; G : Anterior neck region, surface view; H, I : Female reproductive system; J : Tail region; K : Cardia region with dorsal organ and pore; L : Tail tip.

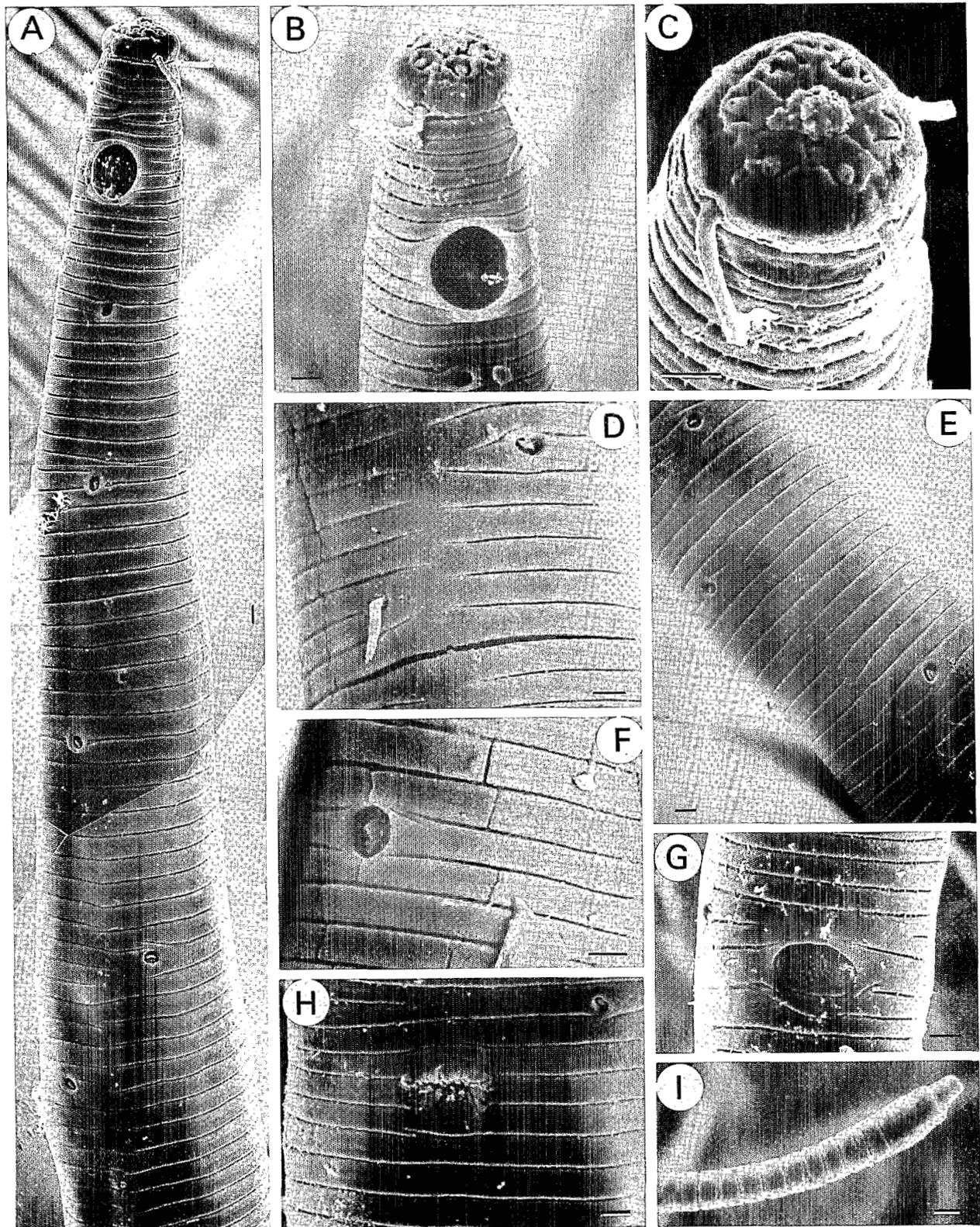


Fig. 4. *Leptoplectonema fuegoense* n.g. n. sp. A : Anterior body region; B : Head region; C : Head end; D : Body pore, deirid and lateral field; E : Anterior end of lateral field and body pores; F : Dorsal pore; G : Anus; H : Vulva; I : Tail tip. (Bars = 1 μ m.)

and narrow vagina. Vulva a transverse slit, protrusible together with vagina (compare Figs 3I and 3H). Nuclei of maturing oocytes usually with one, occasionally with two nucleoli. One of the females contained an egg measuring $43 \times 19 \mu\text{m}$. No sperm or spermatheca present. Tail elongate, ventrally arcuate, tapering gradually, but sometimes slightly expanding just before tip which is provided with a short tubiform spinneret.

Male : Unkown.

TYPE LOCALITY AND HABITAT

Orange Bay, Hoste Island, Chile. Moist soil beneath deep tundra. Collected on 20 January 1983 by D. J. Raski.

OTHER LOCALITY AND HABITAT

Large meadow of deep tundra near guest house in Puerto Williams, on Beagle Canal, Isla Navarino, Chile. Collected 21 January 1983 by D. J. Raski.

TYPE SPECIMENS

Holotype (female) on slide number 2634, University of California Nematode Collection, Davis, California, USA; three paratype females distributed as follows : one female on slide number 2635 UCNC, Davis, California and two females, Nematode Collection, Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium.

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