

Enchodelus repis sp. n. and comments on *E. laevis* Thorne, 1939 and *E. microdoroides* Baqri & Jairajpuri, 1974 (Nematoda : Dorylaimoidea) from Korea

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Summary — *Enchodelus repis* sp. n. is characterized by small and strongly curved body, vulva surrounded by cuticular flaps, cuticle wrinkled near vulva in most females, odontostyle 7-9 μm , odontophore 14-19 μm , single guiding ring, male with two to six ventromedian supplements, and conical arcuate tail. *E. laevis* Thorne, 1939 is redescribed and male is described for the first time. *E. knuppenburgensis* Altherr in Altherr & Delamare Deboutteville, 1972 is considered conspecific with *E. laevis*. Additional measurements of *E. microdoroides* Baqri & Jairajpuri, 1974 population are provided.

Résumé — *Enchodelus repis* sp. n. et observations sur *E. laevis* Thorne, 1939 et *E. microdoroides* Baqri & Jairajpuri, 1974 (Nematoda : Dorylaimoidea) — *Enchodelus repis* sp. n. est caractérisé par un corps court et fortement courbé, la vulve comportant des volets paravulvaires, la cuticule plissée au voisinage de la vulve chez la plupart des femelles, l'odontostyle long de 7-9 μm , l'odontophore long de 14-19 μm , l'anneau-guide simple, le mâle comportant deux à six suppléments ventromédians et la queue conique, recourbée. *E. laevis* Thorne, 1939 est redécrit, et le mâle décrit pour la première fois. *E. knuppenburgensis* Altherr in Altherr & Delamare Deboutteville, 1972 est considéré comme synonyme de *E. laevis*. Des mensurations sont données pour une population de *E. microdoroides* Baqri & Jairajpuri, 1974.

Key-words : *Enchodelus*, Korea, nematodes.

Three *Enchodelus* Thorne, 1939 species were found in an unidentified moss sample collected near Kaesong, Korea. Specimens of all these species have structureless green material in the intestine suggesting they are parasites of the moss.

These nematodes were killed by pouring hot 2 % formaldehyde over specimens collected in a very small drop of water, fixed in this solution for about a week, then processed to glycerine according to a methanol-glycerine modification of Seinhorst procedure. The measurements were taken with an ocular micrometer at the magnification 1000 \times .

Enchodelus repis * sp. n.

(Figs 1, 2, 4 A)

MEASUREMENTS

Females (paratypes : n = 25) : L = 0.81-1.12 (1.00 \pm 0.08) mm; a = 20-29 (25 \pm 1.8); b = 4.0-5.1 (4.6 \pm 0.3); c = 20.3-26.8 (24.1 \pm 1.7); c' = 1.5-2.2 (1.8 \pm 0.2); V = 50-57 (53.7 \pm 1.7); body width at

vulva = 35-42 (39.6 \pm 2.6) μm ; body width at anus = 21-27 (23.4 \pm 2.0) μm ; odontostyle = 7-9 (7.9 \pm 0.5) μm , odontophore = 14-19 (16.8 \pm 1.4) μm , total stylet = 23-27 (25.1 \pm 1.1); oesophagus = 196-236 (215 \pm 10.3); tail = 31-51 (41.5 \pm 4.7) μm ; DO = 69-73 (71.2 \pm 0.9); DN = 75-78 (76.8 \pm 1.0); S₁O = 83-86 (84.0 \pm 1.0); S₁N = 84-87 (85.0 \pm 0.9); S₂O = 91-96 (93.0 \pm 1.5); S₂N = 90-95 (92.0 \pm 1.8).

Males (paratypes : n = 15) : L = 0.85-1.07 (0.96 \pm 0.06) mm; a = 24-29 (27 \pm 1.5); b = 4.2-4.9 (4.5 \pm 0.2); c = 19.1-25.2 (22.3 \pm 1.6); c' = 1.5-1.7 (1.6 \pm 0.1); maximum body width = 31-40 (36 \pm 2.6) μm ; body width at cloacal opening = 25-29 (27 \pm 1.2) μm ; odontostyle = 7-9 (8.1 \pm 0.5) μm ; odontophore = 14-19 (17.1 \pm 1.5) μm ; total stylet = 23-27 (25.5 \pm 1.2) μm ; oesophagus = 197-229 (213 \pm 9.1) μm ; tail = 38-46 (42.3 \pm 2.4) μm ; spicule along arc = 37-41 (39.8 \pm 2.0) μm .

Holotype (female) : L = 0.99 mm; a = 22; b = 4.7; c = 24.0; c' = 1.7; V = 54; body width at vulva 44 = μm ; body width at anus = 25 μm ; odontostyle = 8 μm , odontophore = 17 μm ; oesophagus = 210 μm ; tail = 41 μm ; DO = 72; DN = 79; S₁O = 86; S₁N = 85; S₂O = 93; S₂N = 92.

* Derived from the name of Prof. Regina Pisarska, entomologist, who has collected moss sample in Korea and expresses author's appreciation for bringing this material.

Allotype (male): L = 0.99 mm; a = 27; b = 4.7; c = 22.3; c' = 1.7; maximum body width = 36 μ m; body width at cloacal opening = 27 μ m; odontostyle = 8 μ m; odontophore = 16 μ m; oesophagus = 212 μ m; tail = 44 μ m; spicule = 41 μ m; ventromedian supplements = 4; DO = 73; DN = 80; S₁O = 83; S₁N = 84; S₂O = 92; S₂N = 92.

DESCRIPTION

Adults: Body curved ventrad, the posterior part bent more strongly. Cuticle about 1.5 μ m thick, smooth when viewed under light microscope. Subcuticular layer delicately striated. Lip region offset and narrower than adjacent body (sometimes less so). Lip region width 10-11 μ m. Lips amalgamated, rounded. Lip papillae large, dome shaped, cephalic papillae not distinct. Amphidial aperture about 6-7 μ m. Guiding ring single, 6 μ m from anterior end. Odontostyle thin, 0.7-0.9 of head width long, with aperture of about 0.2-0.25 of its length. Odontophore devoid of sclerotized flanges, 1.6 (1.4-1.8) of head width long. Oesophagus starts to widen at 63 (60-65) % and attains its full width at 74 (69-78) % of its length. Intestine filled, at least partly, with green structureless substance. Cylindroid crystals of various thickness seen in intestine of most specimens regardless of sex or age. Sometimes these crystals fill entire intestine width indicating they were formed within gut. Tail conical, bent ventrad to various degree, tip rounded to finely rounded almost pointed. Single caudal pore, very indistinct, could be detected in most specimens on each subdorsal tail sector. Cuticle thickness at the tail end 7 (3-13) μ m, depending on the elongation of the terminal part of tail.

Female: Vulva surrounded by cuticular flaps, cuticle between flaps usually wrinkled, occasionally flaps with 1-2 wrinkles. Genital branches paired, recurved; out of 27 females 12 have both branches on the left side of body, 11 on the right side, and four had anterior branch on the right and posterior on the left side. Vagina 17-20 μ m long, it is 41-49 % of body width. Cuticular sclerotization near vagina not refractive. Uterus composed of two parts: near vagina it is a spacious sac built

of more or less rounded to hexagonal cells, then it forms a narrow tube probably surrounded by muscles. More distally uterus expands into a chamber in which a rigid tube, also termed sphincter, is observed. Intra-uterine eggs (n = 8) measure 67 (61-70) \times 30 (27-33) μ m. Most egg bearing females have one egg, but one female with three eggs and another one with four eggs were seen. An aberrant bivulval female was observed (V = 53 and 56). Each vulva leads to a vagina and then to the common uterus. This female was functional as an egg was observed in uterine sac. Prerectum length 65 (50-82) μ m or 2.8 (2.2-3.9) and rectum 19-24 μ m or 0.8-0.9 of anal body width.

Male: Testes two, opposed, join in a non-muscular *vas deferens*. Four ejaculatory glands seen on each body side. Rectal glands poorly visible, located dorsally from spicules. Spicules rather plump, strongly curved, 1.5 (1.3-1.6) of anal body width long. Distance between cloaca (C) and first ventromedian supplement (S₁), and then between subsequent supplements in males with various supplement number is shown in Table 1. Prerectum 64 (41-81) μ m long.

TYPE HABITAT AND LOCALITY

Unidentified moss in a deciduous forest near Kaesong, Kores.

TYPE SPECIMENS

Holotype female, allotype male and paratypes (26 females, 14 males and 4 juveniles) deposited at the nematode collection of the Instytut Zoologii PAN, Warszawa, Poland. Two females and one male paratypes in each of the following centers: Nematology Department, Agricultural University, Wageningen, the Netherlands, and Institute of Zoology, University of Gent, Belgium. Seven females and four males paratypes in author's collection.

DIAGNOSIS AND RELATIONSHIPS

Small species with strongly arcuate body when relaxed. Odontostyle 7-9 μ m, odontophore 14-19 μ m. Vulva with distinct cuticular flaps, cuticle mostly wrin-

Table 1. Distance between ventromedian supplements in *Enchodelus repis* sp. n. males.

Number of ventromedian supplements	Distance between supplements (μ m)						Cloacal opening to anteriormost supplement
	C-S ₁	S ₁ -S ₂	S ₂ -S ₃	S ₃ -S ₄	S ₄ -S ₅	S ₅ -S ₆	
2 (n. 1)	41	23					64
4 (n. 8)	48 (45-56)	12 (10-15)	14 (11-20)	16 (9-21)			91 (82-98)
5 (n. 6)	45 (41-50)	10 (8-12)	11 (10-13)	12 (9-14)	13 (11-15)		91 (80-96)
6 (n. 2)	44, 48	7, 11	9, 12	11, 12	12, 15	10, 12	99, 104

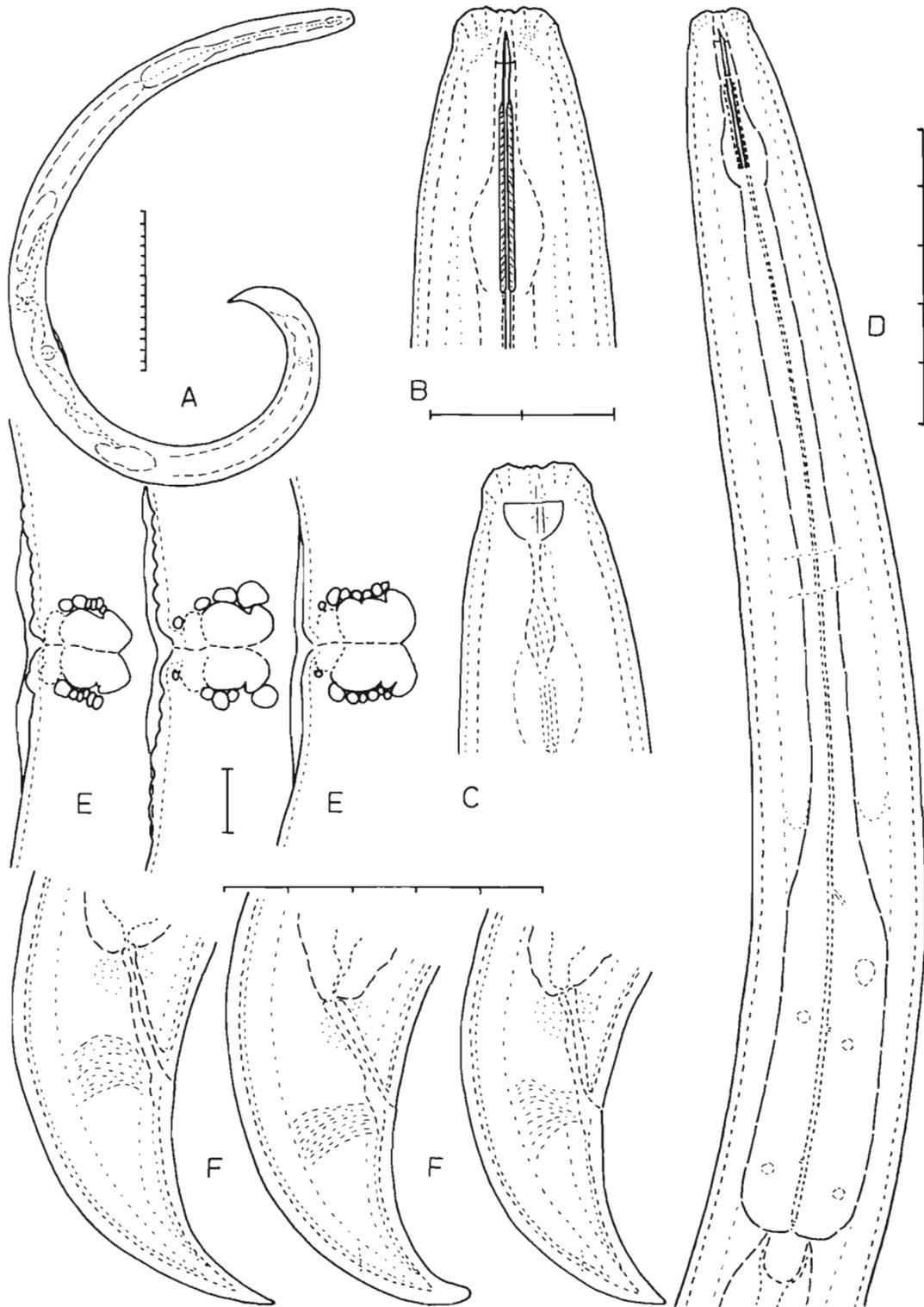


Fig. 1. *Enchodelus repis* sp. n. female. — A : Entire body; B : Head; C : Head showing amphid; D : Oesophageal region; E : Vulval region; F : Tail. (Smallest unit of scale bar = 10 μ m.)

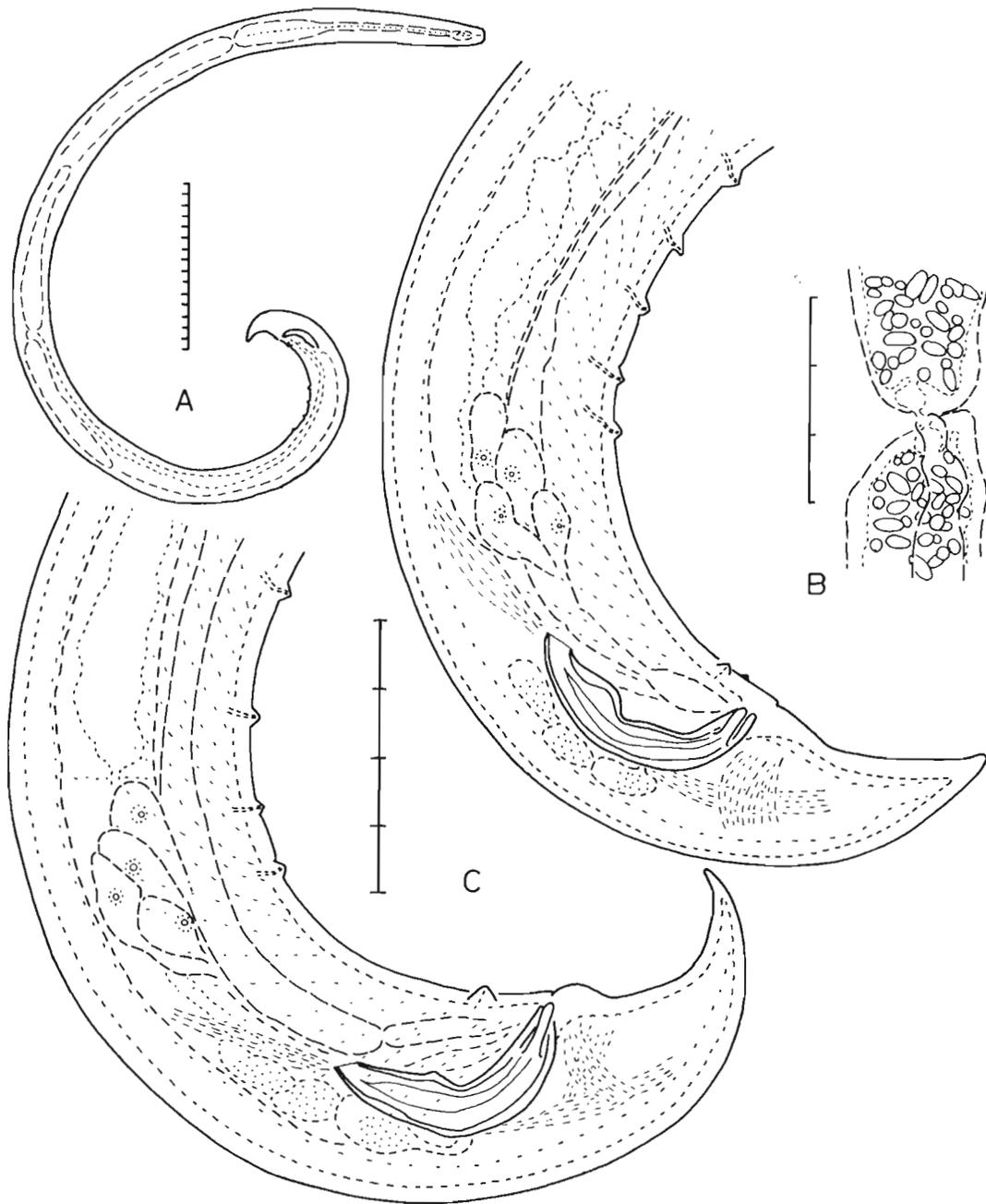


Fig. 2. *Enchodelus repis* sp. n. male. — A : Entire body; B : Junction of testes; C : Tail. (Smallest unit of scale bar = 10 μ m.)

kled near vulva, sometimes smooth. Tail conical and bent ventrad. Male with two to six, mostly four or five, ventromedian supplements.

Having conical arcuate tail and wrinkled cuticle near vulva *E. repis* should be compared with *E. microdorus* Schiemer, 1965, *E. iuventutis* (Andrássy, 1971) Loof,

1989, *E. vulvostriatus* (Stefanski, 1924) Loof, 1989 and *E. ebsaryi* Loof, 1989.

Two males of *E. microdorus* from Austria served as a basis for description of this species (Schiemer, 1965) and these can be differentiated from *E. repis* males by having double guiding ring. Male and females of this species

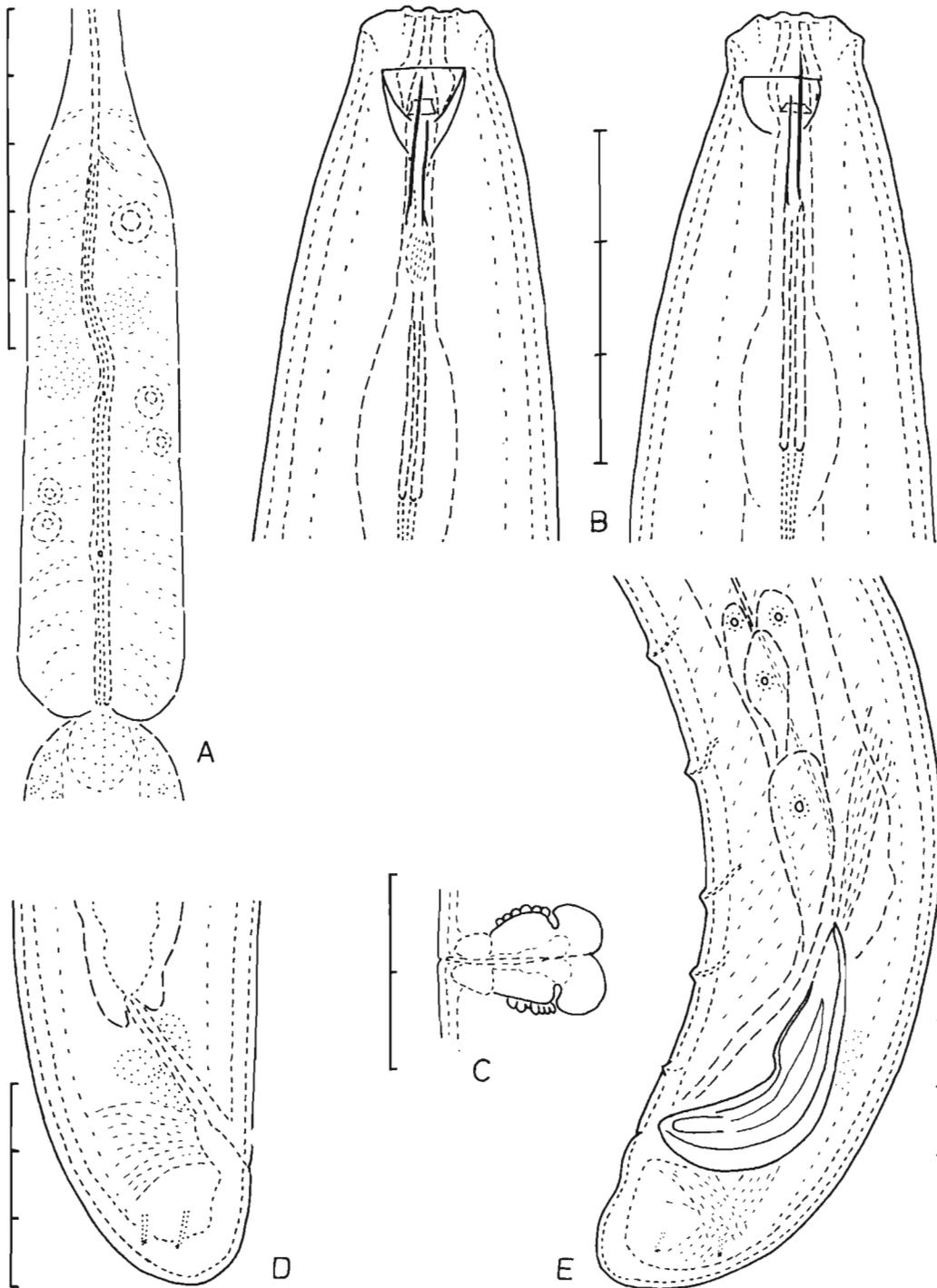


Fig. 3. *Enchodelus laevis* Thorns, 1939. — A : Posterior part of cesophagus; B : Head; C : Vagina; D : Female tail; E : Male tail. (Smallest unit of scale bar = 10 μ m.)

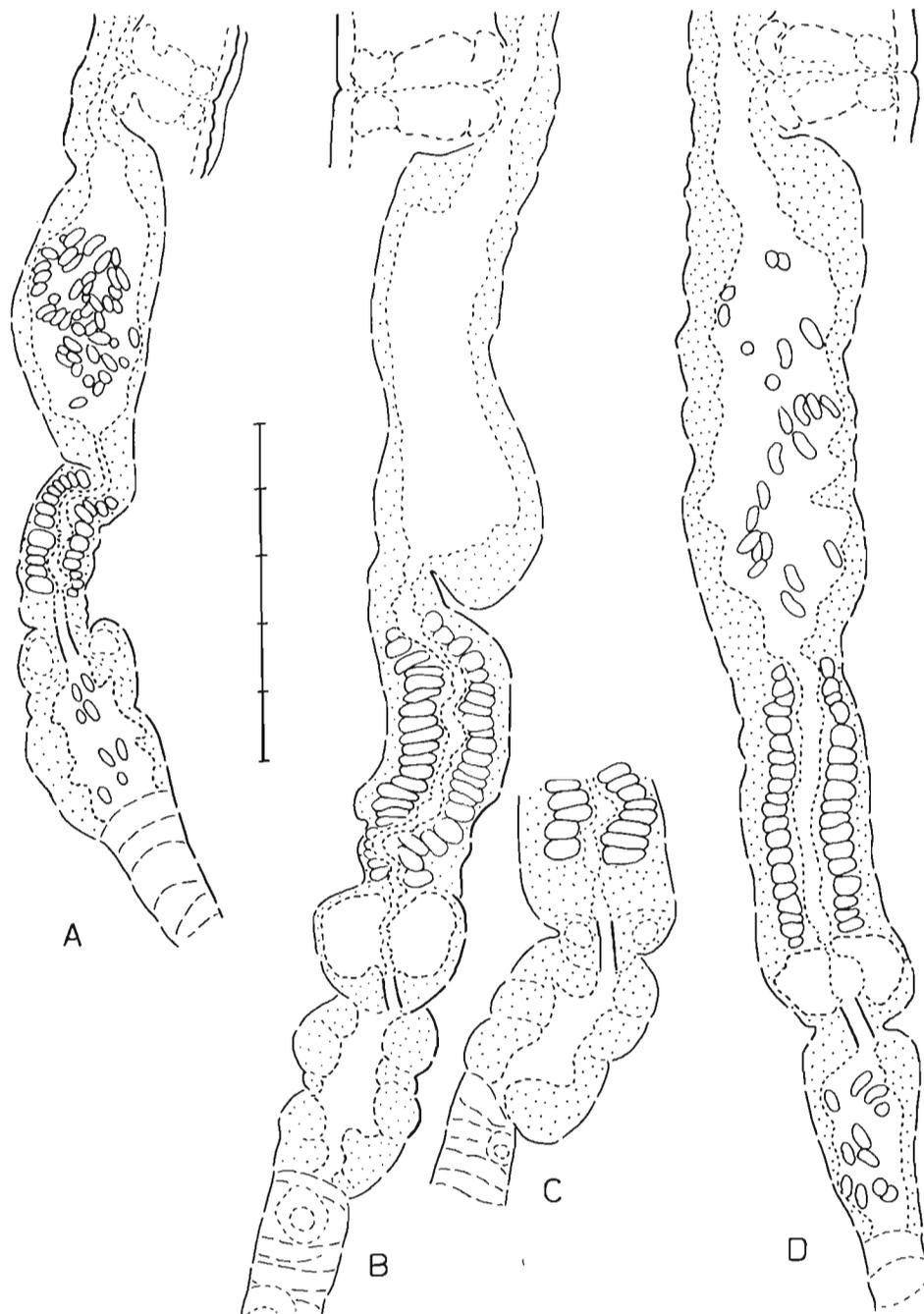


Fig. 4. Part of female reproductive system showing uterus and rigid tube sphincter between uterus and *pars dilatata*. — A : *Enchodelus repis* sp. n.; B, C : *E. microdoroides* Baqri & Jairajpuri, 1974; D : *E. laevis* Thorne, 1939. (Smallest unit of scale bar = 10 μ m.)

were redescribed by Vinciguerra and de Francisci (1973) using specimens from Toscana, Italy. Accepting the Italian specimens are conspecific with the Austrian ones, the differences are noted in the advulval structure : the

cuticle is wrinkled in *E. microdorus* but the advulval flaps are lacking, while these are distinct in *E. repis*; the sclerotized plates near vulva are very refractive in *E. microdorus* and very indistinct in *E. repis*. These differ-

ences were observed in *E. microdorus* specimens kindly made available for comparison by Prof. M. T. Vinciguerra.

E. iuventutis is longer, has shorter tail, more anterior vulva and longer spicules. In *E. iuventutis* L = 1.42-1.65 mm, c = 43-55, c' about 1, V = 47-51, spicule = 50-54. Beside that *E. iuventutis* lack ad vulval flaps and sclerotizations near vulva are more distinct.

E. vulvostriatus, as redescribed by Andrassy (1971), is larger, has longer odontophore and total odontostylet, and longer spicules. In *E. vulvostriatus* L = 1.25-1.98 mm, odontophore = 21-23 μ m, total stylet length = 30-31 μ m. Other characters of *E. vulvostriatus* that differentiate this species from *E. repis* are : lip region continuous with body contour, cuticle 3-4 μ m thick, cuticular sclerotizations near vulva strongly refractive.

E. ebsaryi has longer body, odontostyle, rectum and spicules : L = 1.4-2.2 mm, odontostyle = 8-12 μ m; rectum = 38-45 μ m or 1.2-1.5 of anal body width long; spicule = 50-58 μ m. *E. ebsaryi* has distinct triangular and sclerotized vulval plates and 8-12 supplements, these characters further differentiate the compared species.

The species with wrinkled cuticle near vulva were placed in the genus *Rhysocolpus* Andrassy, 1971. Loof (1989) discussed and synonymised *Rhysocolpus* with *Enchodelus* Thorne, 1939, although this action has not been accepted by Eliava and Eliashvili (1990). Presence of *E. repis* females with or without cuticular wrinkles near vulva supports Loof's (1989) conclusion.

***Enchodelus laevis* Thorne, 1939,
= *E. knuppenburgensis* Altherr in Altherr
& Delamare Deboutteville, 1972, n. syn.
(Figs 3, 4 D)**

MEASUREMENTS

Female (n = 5) : L = 1.09 (1.02-1.16) mm; a = 21 (18-24); b = 4.8 (4.5-5.1); c = 61.5 (55-75); c' = 0.6-0.7; V = 47.6 (45-52); body width at vulva = 51.9 (48-55) μ m; body width at anus = 27.2 (25-29) μ m; odontostyle = 13.2 (12-14) μ m; odontophore = 24.4 (23-27) μ m; total stylet = 38.0 (36-39) μ m; oesophagus = 229 (222-237) μ m; tail = 17.9 (15-20) μ m; DO = 67.2 (66-71); DN = 71.2 (69-75); S₁O = 78.5 (75-82). S₁N = 80.1 (76-83); S₂O = 90.6 (88-95); S₂N = 89.9 (88-93).

Male (n = 1) : L = 1.00 mm; maximum body width = 41 μ m; body width at cloacal opening = 28 μ m; odontostyle = 13 μ m, odontophore = 24 μ m, total stylet = 37 μ m; oesophagus = 237 μ m; tail = 22 μ m; a = 27; b = 4.2; c = 46; c' = 0.8; spicule along arc = 45 μ m.

DESCRIPTION

Female : Body slightly ventrally arcuate. Cuticle about

1.5-2 μ m thick, unstriated. Lip region 12-13 μ m wide, offset, although the degree depends on microscope focusing because of large angular cephalic papillae. Lip papillae large, dome shaped. Amphidial aperture 5-7 μ m. Guiding ring double; 8-9 μ m from anterior end. Odontostyle about 1.5 μ m wide, the ventral side posteriorly forked but the dorsal not so when viewed laterally. Odontostyle 1-1.2 and total stylet 3-3.2 of head width long. Intestinal wall cells filled with green or yellowish-green granules, but not the lumen of intestine. Cylindrical crystals seen in intestine of one female, near junction of intestine and preectum. Vulval cuticularized plates more or less rounded, indistinct, not much refractive. Female tail with two papillae on each body side. Cuticle 6-7 μ m thick on tail end.

Male : Adcloacal pair of papillae and 9 ventromedian supplements. The distance between cloaca and S₁ = 26 μ m; S₁-S₂ = 12 μ m; S₂-S₃ = 19 μ m; S₃-S₄ = 19 μ m; S₄-S₅ = 20 μ m; S₅-S₆ = 22 μ m; S₆-S₇ = 20 μ m; S₇-S₈ = 24 μ m; and S₈-S₉ = 18 μ m. Four ejaculatory glands at each body side distinct.

REMARK

The male of *E. laevis* was not known, and the examined specimen fits well to the described as *E. knuppenburgensis* Altherr in Altherr & Delamarre Deboutteville, 1972. Altherr mentioned ten supplements, which is not considered distinctly different from nine observed herein. Therefore, the two species are synonymized. Their possible identity was already suggested by Altherr.

***Enchodelus microdoroides*
Baqri & Jairajpuri, 1974
(Fig. 4 B & C)**

MEASUREMENTS

Female (n = 15) : L = 1.10-1.29 (1.20 \pm 0.05) mm; a = 20-26 (22.5 \pm 1.7); b = 4.1-4.8 (4.3 \pm 0.2); c = 52-73 (58.8 \pm 5.4); c' = 0.6-1.0 (0.7 \pm 0.1); V = 45-50 (47.7 \pm 1.9); body width at vulva = 48-61 (53.8 \pm 3.7) μ m; body width at anus = 23-33 (29.4 \pm 3.0) μ m; odontostyle = 37-45 (40.7 \pm 2.4) μ m; odontophore = 40-48 (44.9 \pm 2.2) μ m; total stylet = 81-97 (86.8 \pm 4.2) μ m; oesophagus = 266-291 (276 \pm 8.6) μ m; tail = 17-24 (20.6 \pm 1.8) μ m; DO = 68-72 (69.7 \pm 1.4); DN = 75-79 (76.7 \pm 1.2); S₁O = 78-90 (83.2 \pm 3.8); S₁N = 79-88 (84.3 \pm 3.1); S₂O = 89-95 (90.6 \pm 1.8); S₂N = 88-94 (90.1 \pm 1.7).

This species has been described by Baqri and Jairajpuri (1974) and Ahmad and Jairajpuri (1980) and the measurements presented above add to our knowledge of the species variability limits.

A bivulval female was observed, the two vaginae were joined by a common uterus. The vulvae positions were V = 47 and 59.

This is new geographical record of species previously known from India only.

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