

***Nematodirus wittenbergi* sp. n.**  
**(Nematoda, Trichostrongyloidea)**  
**from a domestic goat in Israel**

by Guta WERTHEIM and Marie-Claude DURETTE-DESSET

**Abstract.** — *Nematodirus wittenbergi* sp. n., from the intestine of a domestic goat *Capra hircus* in Israel, is described. The species is characterized by pronounced sexual dimorphism of the cuticle. In the posterior fifth of the male body a striated, apron-like expansion of the cuticle extends over the entire latero-ventral surface. No such expansion is found in the female. The female is opisthodelphic and both branches of the ovejector, vestibules and sphincters are parallel, posterior to the vulva. Conspecific males and females were matched by the character of the synlophe in the anterior part of the body as well as by the shape and size of the esophagointestinal valve. The parasite population of the goat intestine contained also *Trichostrongylus vitrinus* Loos, 1905, *Nematodirus ibicis* Biocca, Balbo and Constantini, 1983, and a few males and females of *Nematodirus* sp. Many specimens of this population contained round or oval lens shaped lesions in the hypodermis and muscles thought to be caused by a parasite (virus or bacterium?).

**Résumé.** — *Nematodirus wittenbergi* n. sp. (Nematoda, Trichostrongyloidea) parasite d'une chèvre domestique en Israël. — Description de *Nematodirus wittenbergi* n. sp. parasite de l'intestin grêle d'une chèvre domestique, *Capra hircus*, en Israël. L'espèce est caractérisée par un important dimorphisme sexuel au niveau de la cuticule. Une expansion cuticulaire existe sur le cinquième postérieur de la surface latéro-ventrale du mâle et est absente chez la femelle. La femelle est opistodelphique ; les deux branches de l'ovéjecteur sont parallèles et dirigées vers l'arrière du corps. Dans la partie antérieure du corps, le synlophe est identique chez les deux sexes. L'espèce est également caractérisée par la forme et la taille de la valvule œsophago-intestinale. D'autres Trichostrongyles ont été identifiés dans la faune parasitaire de cette chèvre : *Trichostrongylus vitrinus* Loos, 1905, *Nematodirus ibicis* Biocca, Balbo et Constantini, 1983, et quelques ♂ et ♀ de *Nematodirus* spp. De nombreux spécimens présentaient dans l'hypoderme et les muscles des lésions rondes ou ovales dues, peut-être, à un parasite (virus ou bactérie?).

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INTRODUCTION

A population of about 180 trichostrongylid nematodes, recovered from the intestine of a domestic goat *Capra hircus* in Israel, was studied. Most of the worms recovered (123 males and 18 females) represent a new species of *Nematodirus* described in this paper. Of the remaining specimens, eighteen were *Trichostrongylus vitrinus* Loos, 1905, and three

(1 ♂, 2 ♀) were *Nematodirus ibicis* Biocca, Balbo and Constantini, 1983 ; the latter species was characterized by 14 and 16 cuticular ridges in the male and female respectively as well as by the size of the posterior, glandular part of the oesophagus. Several specimens of Nematodes could be identified to genus only because of poor state of preservation.

METHODS : Whole specimens were studied in lactophenol. Free-hand cross sections were made with a mounted razor blade. Drawings were made with a camera lucida. All measurements are in millimeters unless otherwise indicated.

### ***Nematodirus witenbergi* sp. n.**

#### DESCRIPTION (based on 14 males and 7 females)

Small, slender, mostly straight worms ; of over 100 males examined only 3 were coiled in two, three or seven coils ; no coils were seen in the females. Body cuticle smooth except for the longitudinal ridges. Cephalic inflation consisting of a globular anterior part and a posterior cylindrical part. Inflation transversely striated (fig. 1 A, B). Mouth simple, 0.012-0.014 in diameter, *corona radiata* of 60-65 denticles. Cephalic sense organs of the usual *Nematodirus* type : six papillae in the internal circle, of which the latero-median are adjacent to the amphids ; six papillae in the external circle, the two medio-dorsal and two medio-ventral each adjacent to one of four cephalic papillae and flanked by a sclerotized support (fig. 1 C).

Esophageal tooth 0.018-0.020 longs. Esophago-intestinal valve of three disc-shaped oval or almost rectangular lobes, 0.032-0.034 long, 0.020-0.023 wide (fig. 1 A).

#### *Male* (Holotype followed by range of paratypes in parenthesis)

Length : 7.9 (7.8-10.7) ; width : 0.08 (0.078-0.100) at base of esophagus ; 0.154 (0.112-0.180) in middle of body ; 0.112 (0.110-0.142) in front of bursa. Cephalic inflation 0.050 (0.045-0.058) in diameter ; 0.090 (0.082-0.100) long. Width of head 0.034 (0.030-0.048) ; nerve ring 0.280 (0.270-0.330) from anterior end ; excretory pore 0.140 (0.087-0.140) anterior to base of esophagus ; deirids on the level of the excretory pore. Esophagus 0.480 (0.480-0.640) long.

The longitudinal ridges begin about 50  $\mu$ m from the anterior end. The synlophe at this point consists of six ridges ; their number increases posteriorly to nine ventral and nine dorsal ridges, perpendicular to the body surface and extending for 80 % of body length. There is a medio-lateral gradient in the size of the ridges ; the dorsalmost and ventralmost being the highests. The cuticle along the lateral lines is not ridged (fig. 1 K). In the posterior 17,7 % (15.2-28.0 %) of the body and up to 0.200 (0.070-0.260) in front of the copulatory bursa, the cuticle forms a transversely striated, latero-ventral expansion encircling the body like an apron (fig. 1 M). In whole mounts the expansion appears as a lateral ala 0.018-0.020 wide (fig. 2 A). Twelve low, narrow ridges are found on the dorsal surface of this body region. The copulatory bursa is symmetrical 0.420 wide, 0.130-0.140 high with the

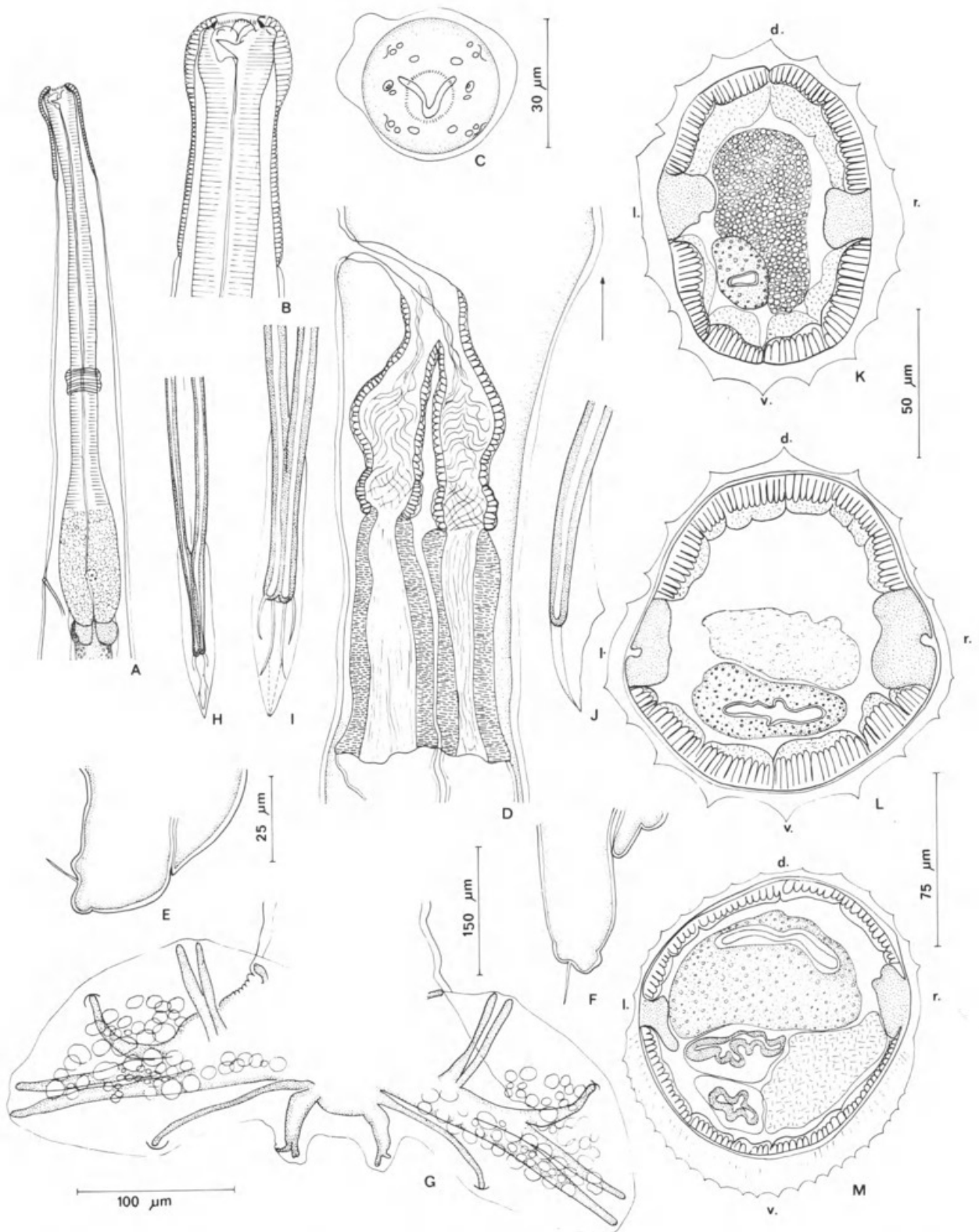


FIG. 1. — *Nematodirus witenbergi* sp. n. : A and B, anterior end of female, lateral view ; C, head, apical view ; D, ovejector and region of vulva ; E, F, posterior end of females ; G, copulatory bursa, ventral view ; H, I, J, posterior end of spicules (H, I, frontal view ; J, lateral view) ; K, M, cross sections of male (K, middle of body ; M, posterior 1/5 of body) ; L, cross section of female, middle of body.

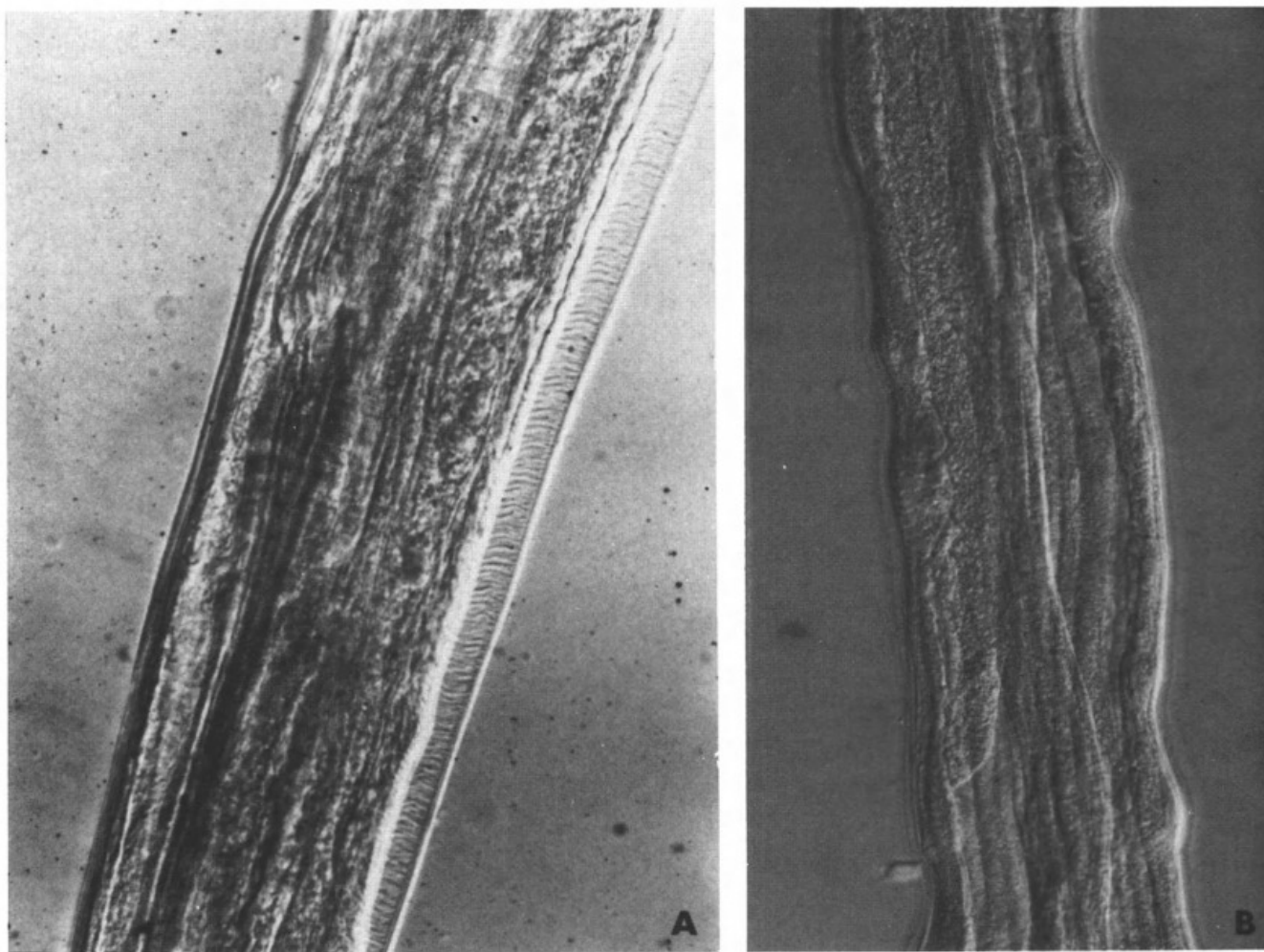


FIG. 2. — A, side view of male showing ventral expansion anterior to copulatory bursa ;  $\times 200$  ; B, parasitic lesion in hypodermis and muscles (arrows) ;  $\times 196$ .

lateral lobes ovally elongated ; the dorsal lobe is distinctly set off and indented to form two lobules, each indentation about half the length of the dorsal ray. Ray 2 shorter than ray 6. Rays 5 and 6 diverging at their extremity. Ray 8 long and slender. The two branches of the dorsal ray are stout and divided at their extremity into two branches, the external ones bend laterally. Ornamental bosses numerous extending between ray 4 and 6 (fig. 1 G).

Spicules filiform, subequal, 0.878 (0.832-0.990) long ; proximal ends separated for 0.123 (0.078-0.220) of their length ; united by a membrane over a length of 0.220 (0.145-0.220) and running separate for a length of 0.450 (0.450-0.495) where they become fused forming a common tip 0.070-0.080 long of which half consists of a thin pear shaped membrane (fig. 1 I, J).

*Female* (Allotype followed by range of paratypes in parenthesis)

Length : 8.4 (8.6-10.9) ; width : 0.070 (0.075-0.098) at base of esophagus ; 0.310 (0.310-0.350) anterior to vulva ; 0.240 (0.240-0.300) on the level of vulva. Cephalic infla-



tion 0.042 (0.040-0.048) in diameter and 0.080 (0.080-0.098) long. Head 0.030 (0.027-0.030) wide. Nerve ring 0.250 (0.220-0.320) from anterior end. Excretory pore 0.020 (0.020-0.105) anterior to base of esophagus. Deirids on the level of excretory pore. Esophagus 0.540 (0.510-0.600) long.

Synlophe, resembling that of the anterior part of the male, consisting of 22 ridges perpendicular to the body and not extending posterior to vulva (fig. 1 L). Vulva 31 % (24-39 %) of body length from posterior end. Both branches of the ovejector parallel, posterior to vulva. Vestibules 0.240 (0.190-0.270) long ; sphincters 0.080-0.090 in diameter ; infundibula 0.280 (0.280-0.350) long. One-two eggs in each uterine branch ; eggs 0.190-0.230 long ; 0.118-0.138 wide. Tail 0.070 (0.045-0.090) long ; the whip-like appendage 0.020-0.022 long.

HOST : *Capra hircus*.

LOCALITY : Israel (no further data available).

LOCALISATION : intestine.

TYPE MATERIAL : 1 ♂ holotype, 1 ♀ allotype and 5 ♂, 3 ♀ paratypes, n° MNHN 440 MC (Muséum national d'Histoire naturelle, Paris).

Many worms had round or ovale, lens-shaped lesions in the hypodermis and muscles layers thought to be caused by a parasite (bacterium or virus?) (fig. 2 B). Up to 70 lesions, 3 to 12  $\mu$ m in diameter, were counted in one male specimen. In many of the affected specimens of *Nematodirus* sp. n., the cuticle was broken at one point, at the base of the copulatory bursa or in the region of the vulva. These breaks could be caused during fixation because of weakening of the cuticle in the affected specimens.

The description is based on unbroken, well preserved specimens. The sample was collected by the late G. WITENBERG in 1927 and the new species is named *N. witenbergi* in his memory.

## DISCUSSION

The presence of perioral denticles (*corona radiata*), a dorsal ray divided at its base, a synlophe with ridges perpendicular to the body and a whip-like caudal appendage in the female, place this species in the genus *Nematodirus* (cf. DURETTE-DESSET, 1983). The ventro-lateral cuticular expansion in the male and the opisthodelphic female reproductive system distinguish *Nematodirus witenbergi* from all other species of the genus.

One opisthodelphic female of *N. filicollis* is mentioned in a footnote by MAUPAS and SEURAT (1912 : 630) in their paper on *N. mauritanicus*. The authors consider this single specimen anomalous.

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