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CERCOPITHIFILARIA LEPORINUS n. sp. (NEMATODA : FILARIOIDEA) FROM THE SNOWSHOE HARE (*Lepus americanus* Erxleben) (Lagomorpha) in Canada

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SUMMARY. *Cercopithifilaria leporinus* n. sp. from the subcutaneous tissues of the trunk of snowshoe hares (*Lepus americanus* Erxleben) in Ontario and Alberta, Canada, is described. This is the only species of *Dipetalonema* — like filarioid known from lagomorphs. It is distinguished from other species of *Cercopithifilaria* by its small size, numerous mucrons on the female tail, vulva leading into a large, spherical vestibule and the pattern of papillae on the male tail. Eight species of filarioids, representing four genera, are now known from lagomorphs. *Dirofilaria timidi* Gubanov and Fedorov, 1966 is considered as a *species inquirenda*.

Cercopithifilaria leporinus n. sp. (Filaire-Nematode) du Lièvre (*Lepus americanus* Erxleben) lagomorphe au Canada

RÉSUMÉ. *Cercopithifilaria leporinus* n. sp., parasite sous-cutané du tronc chez les lièvres d'Amérique (*Lepus americanus* Erxleben) en Ontario et Alberta, Canada, est décrit. Il représente la premières espèce de filaires de la lignée *Dipetalonema* connue chez les Lagomorphes. Il se distingue par sa petite taille, la présence de nombreux mucrons sur la queue des femelles, la présence d'un grand vestibule sphérique dans le vagin, et la distribution des papilles sur la queue des mâles. Huit espèces de filaires dans quatre genres sont connues chez les Lagomorphes. *Dirofilaria timidi* Gubanov et Fedorov, 1966 est considéré comme un *species inquirenda*.

Introduction

Filarioid nematodes found in subcutaneous tissues of snowshoe hares (*Lepus americanus* Erxleben) in Ontario and Alberta, Canada, represent a new species of *Cercopithifilaria* (Eberhard, 1980) Bain, Baker, and Chabaud, 1982, described herein.

Methods and materials

Wild snowshoe hares were shot in Ontario on Manitoulin Island in July, 1979 and near Lindsay in February and March, 1980 and in Alberta near Ft. Saskatchewan,

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Nestow, and Muskeg Lake in November and December, 1980. Carcasses were skinned and the subcutaneous tissues examined for nematodes. Nematodes recovered were fixed in hot glycerin-alcohol and cleared for examination in glycerin. Skin snips from various regions of the body and small pieces of lung tissue were teased in physiological saline on glass slides. The slides were then examined with a compound microscope for microfilariae.

Specimens used for scanning electron microscopy were transferred from glycerin to distilled water for two hours, then fixed in 2.5% cacodylate buffered glutaraldehyde for one hour and 1% cacodylate buffered osmium tetroxide for 12 hours. They were mounted on metal stubs, coated with gold-palladium and scanned using the JEOL JSM 35-C scanning electron microscope.

Results

Cercopithifilaria leporinus n. sp. *(fig. 1-23, table I)*

General : Filarioidea, Onchocercidae (Leiper, 1911) Chabaud and Anderson, 1959, Onchocercinae, Leiper 1911, *Cercopithifilaria* (Eberhard, 1980) Bain, Baker and Chabaud, 1982. Small, slender nematodes ; gravid females 2-3 times length of mature males. Cuticle thick, smooth, with fine transverse striations. Anterior end slightly bulbous. Cephalic extremity bluntly rounded, with slightly developed, laterally elongate cephalic shield. Cephalic shield bearing amphids, four minute, external labial papillae, and four small, pedunculate cephalic papillae. Oral opening small and circular. Buccal cavity present, anterior portion short, narrow, with delicate cuticular wall, posterior portion longer, broader, dorsal-ventrally elongate with thick, curved, sclerotized walls forming a precœsophageal ring. Oesophagus short, not divided into muscular and glandular portions, distinctly separated from intestine. Excretory pore not observed. Caudal end tapered. Phasmids opening at tips of small, cuticular subterminal cones.

Male : (measurements given are those of holotype, measurements of other specimens are given in *Table I*) Length 8.8 mm. Maximum width 112 μm near midbody. Width of body at 50 μm behind anterior extremity 98 μm, at nerve ring 90 μm. Nerve ring 154 μm from anterior extremity. Oesophagus 366 μm long and 28 μm wide. Posterior end of body spirally coiled in 1 to 2 turns. Anus 214 μm from posterior extremity. Area rugosa present, consisting of transverse bands of small, longitudinally elongate bosses, commencing 1.53 mm anterior to anus, terminating 0.48 mm anterior to anus. Perianal, postanal, and subterminal caudal papillae present. *Perianal group* : single, mid-ventral, sessile papilla immediately anterior to anus ; 2-3 small, sessile to semi-pedunculate papillae immediately posterior to anus ; 5-6 medium sized pedunculate papillae lateral or slightly posterior to anus. *Postanal group* : 1-2 large, pedunculate papillae located subventrally, one on either side, approximately midway between anus and posterior extemity. *Subterminal group* : 3-5 variably sized occasionally double, semi-pedunculate papillae in two subventral

rows. Caudal extremity terminating in cuticular cone and two cuticular petaloid appendages. Narrow caudal alae present. Spicules dissimilar and unequal. Left spicule 252 μm long, divided into shaft and lamina. Shaft 118 μm long, granular in appearance strongly sclerotized. Lamina 134 μm long, non-granular in appearance and delicate. Proximal portion of lamina complex and twisted, distal portion simple and rod-like. Right spicule 94 μm long, simple, non-granular in appearance, and strongly sclerotized except for right distal half which is weakly sclerotized. Spicule ratio : 2.7 : 1.0. Gubernaculum absent.

TABLE I. — Major dimensions, in μm unless otherwise stated (range, followed by mean in parentheses), of *Cercopithifilaria leporinus* n. sp. from *Lepus americanus* from Lindsay, Ontario (paratype specimens) and Alberta. *Lepus americanus* from Ontario were collected in February and March 1980 ; *L. americanus* from Alberta were collected in November and December 1980.

	Ontario (paratypes)		Alberta	
	male (N = 3)	female[1] (N = 12)	male (N = 5)	female[2] (N = 6)
total length (mm)	9.6-10.3 (9.9)	19.4-25.0 (21.8)	7.1-9.9 (8.3)	12.2-17.6 (14.8)
maximum width	100-114 (105)	144-180 (159)	94-100 (97)	104-136 (117)
width at 50 μm	84-86 (85)	100-114 (105)	72-80 (77)	76-96 (85)
width at nerve ring	64-78 (73)	86-102 (95)	64-70 (67)	68-82 (74)
width behind vulva		124-174 (147)		108-124 (115)
nerve ring*	144-170 (157)	176-210 (192)	120-160 (140)	122-152 (137)
oesophagus**	458-474 (466)	470-626 (530)	280-430 (380)	316-440 (392)
width of oesophagus	20-34 (27)	22-34 (28)	24-30 (27)	24-28 (25)
anus+	216-276 (236)	284-376 (317)	188-224 (204)	240-350 (281)
vulva*		646-870 (739)		520-700 (578)
area rugosa (mm)				
shortest	1.19-0.34++		1.08-0.27	
longest	1.48-0.28++		1.38-0.35	
average	1.37-0.32++		1.24-0.32	
right spicule**	80-100 (87)		80-96 (86)	
left spicule**	280-284 (282)		250-280 (262)	
lamina	144-150 (146)		130-144 (139)	
shaft	134-138 (136)		116-136 (122)	
spicule ratio	2.8:1.0-3.6:1.0 (3.3:1.0)		2.6:1.0-3.5-1.0 (3.1:1.0)	

* distance from anterior extremity
** length
\+ distance from posterior extremity
++ distance anterior to anus of anterior and posterior borders
[1] gravid females
[2] non-gravid females

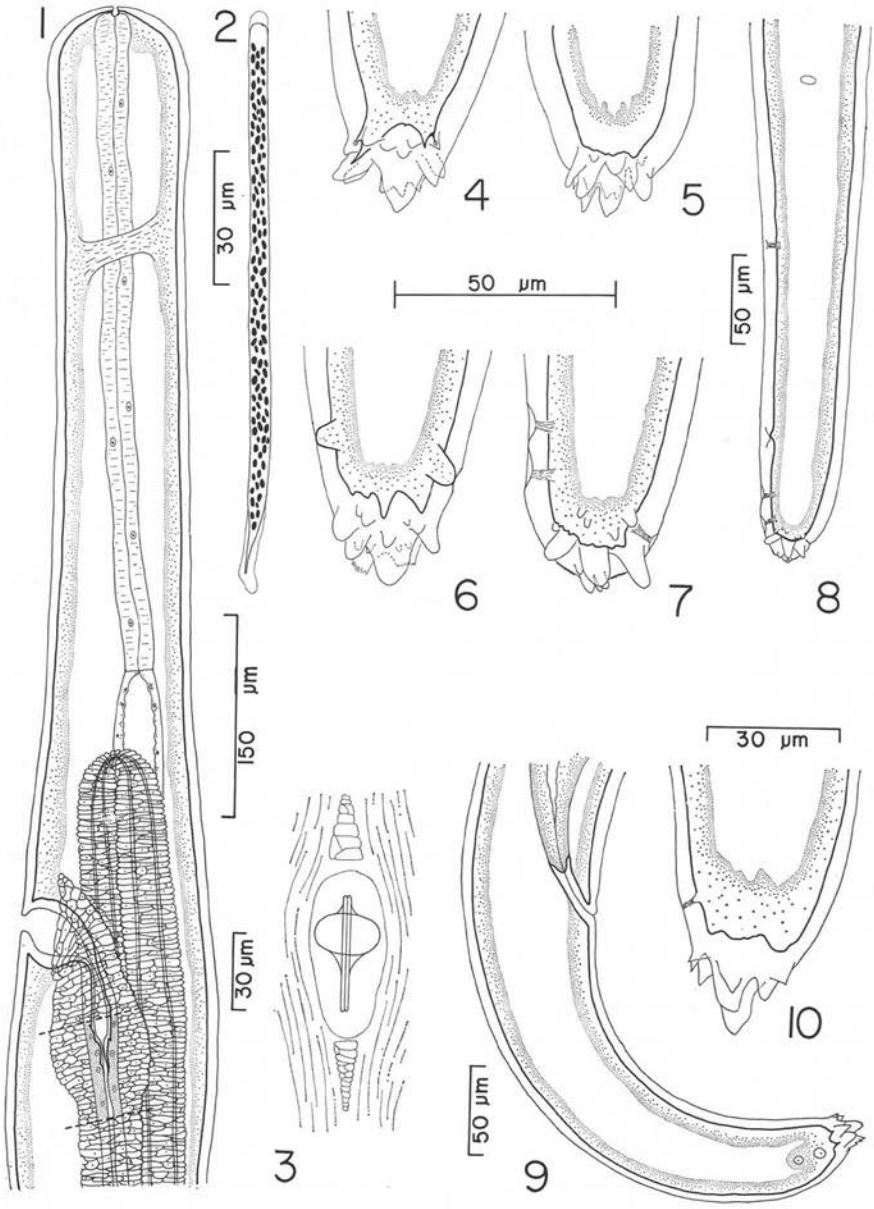

FIG. 1-10. — *Cercopithifilaria leporinus* n. sp.

1. Anterior end of female, lateral view. — 2. Microfilaria, from vagina of female. — 3. Vulva, ventral view. — 4-7. Posterior extremity of female, ventral view. — 8. Posterior end of female, ventral view. — 9. Posterior end of female, lateral view. — 10. Posterior extremity of female, lateral view.

Female : (measurements given are those of allotype, measurements of other specimens are given in *Table I*) Length 24.0 mm. Maximum width 176 μm near midbody. Width of body at 50 μm behind anterior extremity 110 μm, at nerve ring 100 μm, swollen to 174 μm slightly posterior to vulva. Nerve ring 190 μm from anterior extremity. Oesophagus 594 μm long and 26 μm wide. Vulva postoesophageal, 796 μm from anterior extremity. Vulva large, oval in shape, opening into a large spherical vestibule with thick cuticular walls. Rear portion of vestibule and anterior-most portion of vagina surrounded by thick muscular layer to form prominent ovejector. Posteriorly, muscular layer around vagina decreasing gradually in thickness and terminating slightly anterior to junction of vagina and uterus. Vagina extending short distance posteriorly, then bending anteriorly and extending for short distance before turning posteriorly and joining uteri. Total length of vagina indeterminable because of convolutions. Didelphic and opisthodelphic. Anus 356 μm from posterior extremity. One postdeirid occasionally present in left or right lateral field, approximately midway between anus and posterior extremity. Single, lateral papilla occasionally present posterior to postdeirid. One to two lateral, subterminal papillae occasionally present. One to three lateral, postdeirid-like, subterminal structures occasionally present. Posterior extremity complex, with terminal cuticular cone and two cuticular petaloid appendages. Numerous, variably sized, cuticular mucrons located subterminally, ventral and dorsal to terminal cone.

Microfilaria : (3 specimens from vagina of females which had been fixed in glycerin-alcohol) Length 118, 120, 125 μm. Width of anterior three-quarters of body 4-5 μm, tapering to sharply pointed tail. Delicate sheath present. Cuticle with fine transverse striations. Anterior end bluntly rounded.

Type host : *Lepus americanus* Erxleben (Leporidae).

Location in host : subcutaneous connective tissues of trunk.

Type locality : Lindsay, Ontario, Canada.

Other localities : Manitoulin Island, Ontario ; Ft. Saskatchewan, Nestow, and Muskeg Lake, Alberta, Canada.

Specimens : Specimens were deposited in the United States National Museum (USNM).

1) holotype — USNM 77334
2) allotype — USNM 77335
3) paratypes — USNM 77336
4) additional specimens (from Alberta) — USNM 77337

Etymology : from the Latin "leporinus" meaning "of a hare".

Diagnosis : *Cercopithifilaria leporinus* n. sp. is readily distinguished from the 13 other species in the genus (see Bain *et al.*, 1982) and from the numerous other species in *Dipetalonema sensu lato* by its small size, the numerous mucrons on the female tail, vulva leading into a large, spherical vestibule and the pattern of papillae on the male tail.

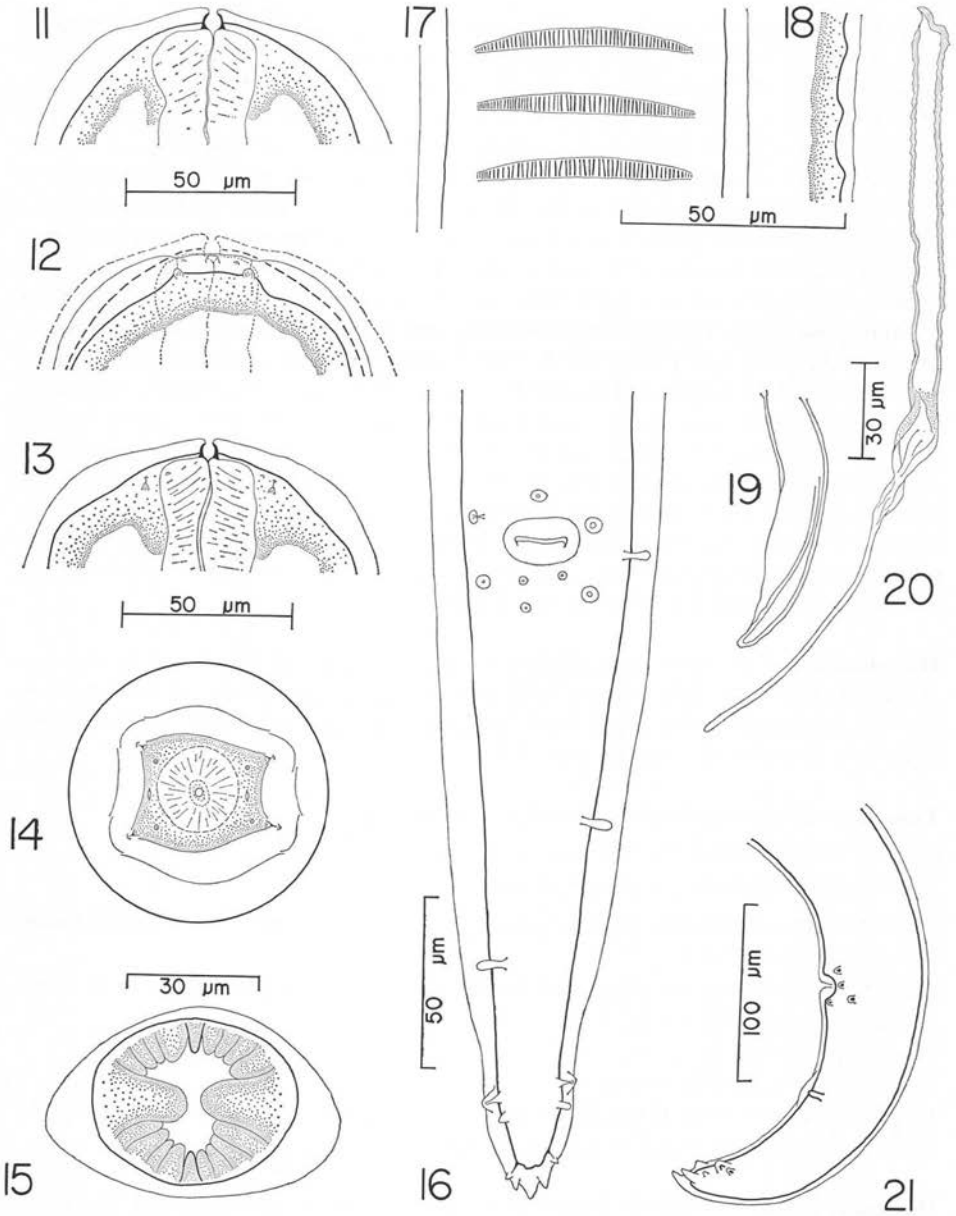

FIG. 11-21. — *Cercopithifilaria leporinus* n. sp.

11-12. Cephalic extremity of female, lateral view. — 13. Cephalic extremity of female, ventral view. — 14. Cephalic extremity of female, *en face* view. — 15. Cross section of male tail. — 16. Posterior end of male, ventral view. — 17. *Area rugosa*, ventral view. — 18. *Area rugosa*, lateral view. — 19. Right spicule, lateral view. — 20. Left spicule, lateral view. — 21. Posterior end of male, lateral view.

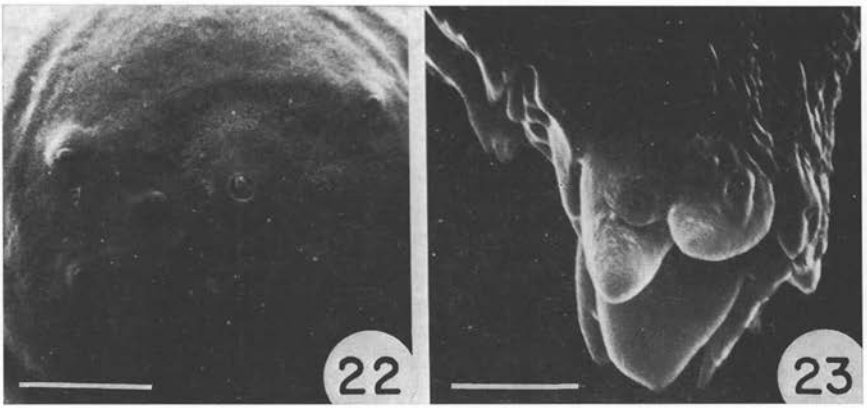

FIG. 22-23. — *Cercopithifilaria leporinus* n. sp.
22. Cephalic extremity, female, *en face* view. SEM. Bar = 25 µm. — 23. Caudal extremity, female, lateral view. SEM. Bar = 5 µm.

Comments : *Cercopithifilaria leporinus* was extremely difficult to locate in the snowshoe hare because of its small size and location in subcutaneous tissues. Thus, prevalence and intensity are not known.

Both live and calcified *C. leporinus* were found, although the latter occurred infrequently. Gravid females were found only in hares collected in Ontario in February and March, 1980. Female nematodes from hares collected in Alberta in November and December, 1980 were not gravid, although males containing sperm were present. These immature females were smaller than females from hares collected in late winter in Ontario *(Table I)*. Only non-gravid females were found in the hare collected on Manitoulin Island in July, 1979.

Microfilariae were not observed in skin snips or lung blood of infected hares.

Discussion

Cercopithifilaria leporinus n. sp. from snowshoe hares *(Lepus americanus)* is easily accommodated in the genus *Cercopithifilaria* (Eberhard, 1980) as emended by Bain *et al.* (1982). This genus contains those *Dipetalonema* — like species having a narrow, undivided (or divided but short) œsophagus ; a very small buccal cavity ; a short, stout right spicule which lacks a shaft ; and caudal papillae which are frequently reduced in number and grouped near the anus.

It is not known why microfilariae of *C. leporinus* were not found in either blood or skin of hares having gravid female nematodes. A similar absence of microfilariae of *C. kenyensis* (Eberhard, 1980) in baboons *(Papio anubis)* and of *Dasypafilaria averyi* (Eberhard, 1982) in armadillos *(Dasypus novemcinctus)* was noted by Eberhard (1980 ; 1982). It is possible that an insufficient quantity of blood from hares was examined. Microfilariae of *C. didelphis* (Esslinger and Smith, 1979) occur in low

numbers in the blood of opossums *(Didelphis virginiana* and *D. marsupialis)* and demonstration of their presence requires concentration and lysis of blood with 2% formalin (Esslinger and Smith, 1979). It is also possible that microfilariae of *C. leporinus* do not occur in either blood or skin of hares during the winter. Spratt and Varughese (1975) found that the microfilariae of *C. johnstoni* (Mackerras, 1954) are present or most numerous in the skin of rats *(Rattus fuscipes* and *R. lutreolus)* during specific seasons of the year.

The presence of a sheath around the microfilariae of *C. leporinus* should not be used as a diagnostic character of this species. Microfilariae were obtained from the vagina of female *C. leporinus*. Moorhouse *et al.* (1979) found that microfilariae of *Josefilaria mackerrasae* Moorhouse, Bain, and Wolf, 1979 obtained from the vagina of females were sheathed but that those in the skin of bats *(Macroderma gigas)* were both sheathed and unsheathed.

The following eight species of filarioids are now known from lagomorphs : *Cercopithifilaria leporinus* n. sp. ; *Micipsella numidica* (Seurat, 1917) Seurat, 1921 ; *Micipsella indica* Rao, 1938 ; *Micipsella brevicauda* Lyons and Hansen, 1961 ; *Brugia buckleyi* Dissanaike and Paramananthan, 1961 ; *Dirofilaria scapiceps* (Leidy, 1886) Yorke and Maplestone, 1926 ; *Dirofilaria uniformis* Price, 1957 ; and *Dirofilaria timidi* Gubanov and Fedorov, 1966 *species inquirenda*. This latter species is incompletely described and it is difficult to ascertain its proper generic placement. However, it does not belong in *Dirofilaria* and thus is regarded herein as a *species inquirenda*.

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