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GASTROINTESTINAL HELMINTHS OF THE COUGAR, *FELIS CONCOLOR* L., IN NORTHEASTERN OREGON

R. L. Rausch,[1] C. Maser,[2] and E. P. Hoberg[1]

ABSTRACT: Helminths of nine species were identified from 39 cougars obtained in northeastern Oregon (Wallowa, Baker, and Union counties), viz., *Taenia omissa* Lühe, 1910 (100%); *T. ovis krabbei* Moniez, 1879 (61%); *T. hydatigena* Pallas, 1776 (10%); *Mesocestoides lineatus* (Goeze, 1782) (5%); *Toxascaris leonina* (von Linstow, 1902) (69%); *Toxocara cati* (Schrank, 1788) (15%); *Physaloptera praeputialis* von Linstow, 1889 (13%); *Pterygodermatites affinis* (Jägerskiöld, 1904) (ca. 2%); and *Trichinella* sp. (larvae) (ca. 2%). In addition, undeveloped cestodes of the genus *Taenia* in 26 animals had lost rostellar hooks and could not be identified. Host-records, prevalence, and biological characteristics of some of the helminths are discussed.

INTRODUCTION

The study of helminths in the cougar was begun by Diesing (1850), based on material collected by Johann Natterer in Brazil earlier in the 19th century. Additional species have since been reported from this felid, but only small numbers of animals from widely separated localities have been available for examination. With the generous cooperation of the Oregon Department of Fish and Wildlife, we obtained a series of cougars from Wallowa, Baker, and Union counties in northeastern Oregon. The present paper reports helminthological findings in 39 animals for which complete viscera were available.

MATERIALS AND METHODS

Most of the animals were killed by hunters during December of the years 1976–1978; one was killed illegally, and three were removed as potential threats to livestock. The numbers examined by year were: 1976, four (3 males, 1 female); 1977, 16 (11 males, 5 females); 1978, 19 (9 males, 10 females). Hunters were required to bring animals to an office of the Oregon Department of Fish and Wildlife within 48 hr. Viscera were removed from carcasses and frozen for later examination. The heart, liver, and lungs were examined macroscopically. Samples of diaphragm were examined microscopically for the presence of larvae of *Trichinella* sp. The stomach, small intestine, and large intestine were opened separately in water, after which large helminths were removed and preserved; the residue was examined for small specimens with aid of a dissecting microscope.

Nematodes were cleared in glycerin or phenol. Cestodes were stained in acetic carmine, processed by standard methods, and mounted permanently. In the case of *Taenia* spp., each rostellum was mounted separately, with application of pressure to cause the hooks to lie flat. Undeveloped cestodes lacking rostellar hooks usually were not identifiable. For helminths of the three most commonly occurring species, differences in prevalence and intensity of infection were evaluated by χ^2 analysis and by means of the Mann-Whitney *U*-test. Differences between the years 1977 and 1978 (animals of both sexes combined) and between sexes (all years) were compared. The small size of the sample did not justify such comparisons for helminths of other species.

Representative specimens have been deposited in the U.S. National Parasite Collection (Beltsville, Maryland 20705, USA), as follows: *Taenia omissa*, No. 76313; *Taenia ovis krabbei*, No. 77073; *Taenia hydatigena*, No. 77072; *Mesocestoides lineatus*, No. 77070; *Toxascaris leonina*, No. 77077; *Toxocara cati*, No. 77078; *Physaloptera praeputialis*, No. 77079; *Pterygodermatites affinis*, No. 77076; and *Trichinella* sp., No. 77071.

RESULTS AND DISCUSSION

Helminths of nine species were recorded from the 39 cougars examined. Data concerning the occurrence of those inhabiting the gastrointestinal tract of the host are summarized in Table 1. In addition, larvae of *Trichinella* sp. were found in one animal. Two animals contained only one species of helminth, *Taenia omissa*. Helminths of two or more species (maximum 6) occurred in the remaining 37 animals (95% of the total). Differences in prevalence and intensity between the years 1977 and 1978 and between sexes were not significant. Sex- and age-composition of populations of nematodes of the three most commonly occurring species are shown in Table 2.

Cestodes of the genus *Taenia* were present in all of the cougars, with numbers ranging from 15 to 153 ($\bar{x} = 61$). Some proportion of undeveloped cestodes (from 1 to 28 in individual animals) in 26 of the 39 cougars had lost the

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TABLE 1. Occurrence of gastrointestinal helminths in 39 cougars obtained from northeastern Oregon in 1976–1978.

Species	Prevalence	Numbers of animals infected								
		1[a]	2	3	4	5	6	7	8	9
1 *Taenia omissa* Lühe, 1910	100%	39	24	4	26	2	5	27	6	1
2 *Taenia ovis krabbei* Moniez, 1879	61%		24	4	24	1	3	16	4	0
3 *Taenia hydatigena* Pallas, 1776	10%			4	4	0	1	2	0	0
4 *Taenia* spp. indet.	67%				26	2	3	18	5	0
5 *Mesocestoides lineatus* (Goeze, 1782)	5%					2	0	2	2	0
6 *Physaloptera praeputialis* von Linstow, 1889	13%						5	3	0	0
7 *Toxascaris leonina* (von Linstow, 1902)	69%							27	3	1
8 *Toxocara cati* (Schrank, 1788)	15%								6	0
9 *Pterygodermatites affinis* (Jägerskiöld, 1904)	<2%									1

[a] 1–9 = species of helminth.

rostellar hooks and could not be identified. Immature specimens of *Taenia omissa* lacking rostellar hooks were distinguishable by the relative width and characteristic shape of the strobila. *Taenia omissa* occurred in all, ranging in number from one to 141 ($\bar{x} = 54$). *Taenia ovis krabbei*, the second most common cestode, was identified from 24 (61%) of the animals; numbers ranged from one to 28 ($\bar{x} = 10$). This appears to be the first record of this cestode from the cougar. *Taenia hydatigena* was present in four animals (10%), with one or two specimens in each ($\bar{x} < 2$). This cestode has been reported previously by Cowan (1946) from three of four cougars from Vancouver Island.

Mesocestoides lineatus was present in two animals (5%), with one and 11 specimens. Most, if not all, of these cestodes had gravid segments. This appears to be the first record of a cestode of the genus *Mesocestoides* from the cougar.

Toxascaris leonina was the most common nematode, occurring in 27 (69%) of the animals, with numbers ranging from one to 47 ($\bar{x} = 9$). Natural infections of cougars by *T. leonina* have not been reported, but it has been found in animals in zoos. *Toxocara cati* occurred in only six animals (15%), with numbers ranging from one to six ($\bar{x}$ = ca. 3). Again, previous records have involved animals in zoos (Sosnowski, 1973). *Physaloptera praeputialis* was present in

TABLE 2. Occurrence by sex and age of some nematodes in 39 cougars in northeastern Oregon.

Species	Cougars infected		Number of nematodes	
	Number	Percentage	Range	Mean
Toxascaris leonina				
Total present	27	69	1–47	9.2
Mature males	20	51	1–23	5.0
Mature females	21	54	1–14	4.9
Immature males	3	8	1–2	1.7
Immature females	11	28	1–11	3.2
Toxocara cati				
Total present	6	15	1–6	2.7
Mature males	2	5	1	—
Mature females	5	13	1–5	2.2
Immature males	1	3	2	—
Immature females	1	3	1	—
Physaloptera praeputialis				
Total present	5	13	1–28	10.4
Mature males	4	10	1–7	4.2
Mature females	4	10	1–21	8.7

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five animals (13%), with numbers ranging from one to 28 ($\bar{x} = 10$). This nematode has been reported from the cougar in West Virginia by Morgan (1946). *Pterygodermatites affinis* was represented by a single, immature female. This is the first record of this nematode from the cougar. A few larvae of *Trichinella* sp. were found in the diaphragm of a single animal. None was fully encysted, apparently indicating a recently acquired infection.

Of the helminths known from the cougar in North America, six species might be expected to be of regular occurrence in this mammal: *Taenia omissa*, *Mesocestoides lineatus*, *Toxascaris leonina*, *Toxocara cati*, *Physaloptera praeputialis*, and *Trichinella* sp. The intermediate or paratenic hosts of these helminths, with the possible exception of those of *P. praeputialis*, are those mammals that make up the major part of the diet of cougars. Larval stages of taeniid cestodes of at least two additional species must be frequently ingested as well, but development of their strobilar stage probably is inhibited.

Taenia omissa alone appears to be host-specific. Lühe (1910) reported immature (or undeveloped) specimens from the little spotted cat, *Felis tigrina* Schreber, and the jaguarundi, *Felis yagouaroundi* Geoffroy, in Brazil. It has not been reported in the Nearctic from the bobcat, *Felis rufa* Schreber, which is sympatric with the cougar over the greater part of its range in North America, nor from the lynx, *Felis lynx* L., which is sympatric with the cougar at the northern limits of its range. Holmes and Podesta (1968) reported a single, immature specimen of *T. omissa* from a wolf, *Canis lupus* L., in Alberta. No information is available concerning prevalence of the larval stage of *T. omissa* in the cervids that make up the bulk of the diet of cougars throughout the year (Robinette et al., 1959; Hornocker, 1970; Spalding and Lesowski, 1971; Toweill and Meslow, 1977). In northeastern Oregon, from examination of gastric contents of 64 cougars, remains of mule deer, *Odocoileus hemionus* (Rafinesque), and wapiti, *Cervus elaphus* L., occurred with a frequency of 60% and 18%, respectively (C. Maser and R. Rohweder, unpubl. data). The high prevalence of *T. omissa* and the presence of strobilae differing in degree of development indicated that the cysticerci are frequently ingested.

Lühe (1910) described *T. omissa* on the basis of specimens erroneously identified by Diesing (1850, p. 519) as *T. crassicollis* Rudolphi [=*T. taeniaeformis* (Batsch, 1786)] from *F. concolor* in Brazil. The recognition of the occurrence of *T. omissa* in the Nearctic was hampered by the description of *T. lyncis* Skinker, 1935, based on specimens of both *T. omissa* and *T. rileyi* Loewen, 1929 (cf. Skinker, 1935). The larval stages of the two species, occurring respectively in cervids and in rodents, also had been confused. Riser (1956) established that *T. lyncis* was a composite species. The rostellar hooks of *T. omissa* and *T. rileyi* are very similar, but the strobilae are distinguished by well defined differences in arrangement of genital organs and in form of the gravid uterus (Rausch, 1981).

The first record of *T. omissa* in North America is provided by Skinker's figure (1935, Pl. 20, Fig. 3) of part of a strobila, labelled *T. lyncis*, but precise information concerning the origin of the cestode was not included. The figure illustrated part of a strobila from *F. concolor hippolestes* Merriam, a subspecies occurring in west-central North America. Skinker also reported cysticerci from white-tailed deer, *Odocoileus virginianus* (Zimmermann), and a mule deer, which, on the basis of host-occurrence and form of rostellar hooks, are identifiable as larvae of *T. omissa*. Subsequently, strobilar and/or larval stages of this cestode have been reported from British Columbia (Adams, 1966; Holmes and Podesta, 1968; Verster, 1969), Alberta (Holmes and Podesta, 1968), and California (Riser, 1956). Recently, we recorded it from a cougar killed in northwestern Washington (Skagit County). In addition to the type material from Brazil, *T. omissa* has been recorded in South America from cougars or deer in Paraguay (Schmidt and Martin, 1978), Colombia (Rausch, 1981), and apparently also from Venezuela (López-Neyra and Díaz-Ungria, 1958).

The remaining species of the group considered to be typical of the helminth-fauna of the cougar are not host-specific. *Mesocestoides lineatus* occurs as well in carnivores of the families Canidae, Procyonidae, and Mustelidae. It exhibits morphologic variation, apparently host-induced (Shults, 1970). In their monograph of the Mesocestoidata, Chertkova and Kosupko (1978) considered all nominal species of *Mesocestoides* occurring in fissiped carnivores in the

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Nearctic, other than *M. lineatus* and *M. kirbyi* Chandler, 1944, to be *species inquirendae*. Infective larvae of *M. lineatus* occur in small mammals and in birds.

Toxascaris leonina is a common nematode in wild canids and felids, particularly in regions at northern latitudes. *Toxocara cati* is known only from members of the family Felidae (Sprent, 1956). Infection of the final host of these nematodes may take place through ingestion of embryonated eggs or of second-stage larvae in the tissues of mammals (Sprent, 1956, 1959). *Physaloptera praeputialis* has been reported from various mammals of the families Canidae, Felidae, and Viverridae (Morgan, 1946). Insects (Orthoptera) serve as intermediate hosts (Petri and Ameel, 1950; Zago, 1962). Whether mammals may serve as paratenic hosts is apparently unknown. *Trichinella* sp. presumably is acquired through consumption of tissues of other carnivores. Remains of coyotes, *Canis latrans* Say, were present in stomach-contents of two of 62 cougars examined by Spalding and Lesowski (1971) in British Columbia, but dietary data now available do not provide an explanation for the high rates of infection reported for cougars in some regions. Larvae of *Trichinella* sp. have been reported from three of six cougars examined in Montana (Winters, 1969); from 36 (54%) of 66 in the northern Rocky Mountains (Montana, Idaho, and Wyoming) (Worley et al., 1974); and from two of 11 in the east Kootenay area of British Columbia (Schmitt et al., 1976).

The diet of cougars is sufficiently varied to ensure the ingestion of infective larvae of various helminths that do not develop to the sexually reproductive state. In addition to deer, cougars prey on such mammals as beavers, *Castor canadensis* Kuhl, porcupines, *Erethizon dorsatum* (L.), and leporids (Robinette et al., 1959; Spalding and Lesowski, 1971). Remains of porcupines and varying hares, *Lepus americanus* Erxleben, occurred with frequencies of 14% and 6%, respectively, in gastric contents of 64 animals examined by Maser and Rohweder (unpubl. data). On the Olympic Peninsula (Washington), feces of cougars were found to contain remains of rodents of the genera *Aplodontia*, *Tamiasciurus*, *Glaucomys*, *Neotoma*, *Peromyscus*, and *Microtus* (Young and Goldman, 1946).

Cestodes of two species, *Taenia ovis krabbei* and *T. hydatigena*, are characteristic helminths of carnivores of the genus *Canis*. Two biological strains of each have been distinguished, with larval stages occurring respectively in cervids and domestic ruminants. Those involving domestic ruminants as intermediate hosts appear to have been derived from the naturally occurring strains in cervids. The cestode formerly designated *T. krabbei* Moniez, 1879 was recognized as a subspecies of *T. ovis* (Cobbold, 1869) by Verster (1969). The two strains of *T. hydatigena* have not received formal infraspecific designations.

Cysticerci of both *T. ovis krabbei* and *T. hydatigena* have been reported from mule deer in Oregon by Shaw et al. (1934). The high prevalence of the latter in cougars in northeastern Oregon indicates that deer are commonly infected. The cysticerci of *T. ovis krabbei* localize in the musculature. All of our specimens of *T. ovis krabbei* were undeveloped; the longest measured 228 mm, with about 220 segments. Strobilae of this cestode reared experimentally in a dog infected by cysticerci from naturally infected moose, *Alces alces* (L.), attained a length of about one meter at 81 days post-exposure (Rausch, unpubl. data). Dollfus (1944) obtained undeveloped strobilae (185–240 mm in length) of *T. ovis* from a cougar that died in a zoo in France. The subspecies in this case was presumably *T. o. ovis*. The strobilae of *Taenia hydatigena* were smaller and less well developed than those of *T. ovis krabbei*. In mule deer, the cysticerci of this cestode are commonly encysted in the omentum or attached to serosal surfaces. Cysticerci of *T. hydatigena* occur commonly in cervids of various species. Cowan (1946) found 33 (82%) of 40 mule deer examined in British Columbia to be infected.

Larval stages of two additional cestodes, *Taenia serialis* (Gervais, 1847) and *Taenia rileyi*, not recorded by us, conceivably could be ingested by cougars. Wild canids (*Canis* spp.) are the characteristic final hosts of *T. serialis*, of which the larval stage occurs in leporids. The rostellar hooks of *T. serialis* resemble those of *T. ovis krabbei*, but are smaller. No overlap in lengths of rostellar hooks was observed when we compared hooks of the latter with those of *T. serialis* reared experimentally in dogs. *T. rileyi* is a nearctic species that appears to be host-specific for felids of the subgenus *Lynx* (Rausch, 1981). Usual intermediate hosts are

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rodents, including species of *Aplodontia*, *Tamiasciurus*, and *Neotoma*. The rostellar hooks of *T. rileyi* closely resemble those of *T. omissa*, and we have been unable to distinguish the two species reliably on the basis of hooks alone. Lengths of large and small hooks overlap, but those of *T. rileyi* may have smaller mean lengths. Based on series of fully developed cestodes of the two species (Rausch, 1981), large hooks of *T. rileyi* ranged in length from 219 to 250 μm ($\bar{x}$ = 235), and small hooks, from 161 to 196 μm ($\bar{x}$ = 176). For *T. omissa*, the respective ranges were 232 to 254 μm ($\bar{x}$ = 244) and 182 to 210 μm ($\bar{x}$ = 192). Hooks of the *omissa*-type from a large series of cestodes from cougars in northeastern Oregon exhibited the following ranges: large hooks, 223 to 273 μm (n = 282; $\bar{x}$ = 249); small hooks, 165 to 223 μm (n = 336; $\bar{x}$ = 194.8). The possibility that some of the smallest undeveloped cestodes in the cougars represented *T. rileyi* cannot be excluded, but there is no indication that this cestode is capable of normal development in this felid.

The remaining helminth recorded, *Pterygodermatites affinis*, in North America is a characteristic nematode in coyotes, in which it is most prevalent in regions to the south of Oregon. Infective larvae of this nematode have been reported in reptiles (Srivastava, 1940). Two morphologically very similar species, *Rictularia cahirensis* and *R. affinis*, from "Katze" and "Fuchs," respectively, in Egypt, were distinguished by Jägerskiöld (1904), who later (1909) published detailed descriptions. Type specimens of these and of *R. splendida* Hall, 1913, described from the coyote in Colorado, were compared by Gibbs (1957), who concluded that they could not be distinguished morphologically. Gibbs' conclusion was supported by the findings of Young and Pence (1979), who studied numerous specimens from coyotes in Texas. In a systematic revision of nematodes in the family Rictulariidae, Quentin (1969) transferred various species, including the aforementioned three, to the genus *Pterygodermatites* Wedl, 1861, and also designated *P. affinis* as the type of a new subgenus, *Multipectines* Quentin, 1969. With reference to the conclusions of Gibbs (1957), Quentin (1969, p. 104) considered *P. cahirensis* and *P. splendida* to be synonyms of *P. affinis*. Thus, *P. affinis*, rather than *P. cahirensis*, appears to be the applicable name of this nematode.

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LITERATURE CITED

ADAMS, J. R. 1966. Taeniids from *Lynx* in British Columbia with a comment on *Taenia monostephanos* von Linstow and other taeniids with a single crown of hooks. *In* Proc. First Int. Congr. Parasitol., Vol. 1. Pergamon Press, Milano, pp. 480–481.

CHERTKOVA, A. N., AND G. A. KOSUPKO. 1978. Tetrabotriaty i Mezotsestoidaty—Lentochnye gel'minty ptits i mlekopitaiushchikh. Podotriad Mesocestoidata Skriabin, 1940. *In* Osnovy Tsestodologii, Vol. 9, K. M. Ryzhikov (ed.). Nauka, Moskva, pp. 118–229.

COWAN, I. MCT. 1946. Parasites, diseases, injuries, and anomalies of the Columbian black-tailed deer, *Odocoileus hemionus columbianus* (Richardson), in British Columbia. Can. J. Res., D 24: 71–103.

DIESING, C. M. 1850. Systema Helminthum, Vol. 1. Wilhelm Braumüller, Vindobonae, 679 pp.

DOLLFUS, R.-PH. 1944. Sur les cestodes de *Puma concolor* (L.). Bull. Mus. Nat. Hist. Nat., 2me Sér. 16: 316–320.

GIBBS, H. C. 1957. The taxonomic status of *Rictularia affinis* Jägerskiöld, 1909, *Rictularia cahirensis* Jägerskiöld, 1909, and *Rictularia splendida* Hall, 1913. Can. J. Zool. 35: 405–410.

HOLMES, J. C., AND R. PODESTA. 1968. The helminths of wolves and coyotes from the forested regions of Alberta. Can. J. Zool. 46: 1193–1204.

HORNOCKER, M. G. 1970. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. Wildl. Monogr. 21, pp. 4–39.

JÄGERSKIÖLD, L. A. 1904. [Ueber einige Rictularien aus Aegypten und dem Sudan.] (Abstract of report before Nat.-Vetensk. Studentsällsk., Uppsala, 6 November 1903.) Zool. Anz. 27: 660.

———. 1909. Nematoden aus Aegypten und dem Sudan (Eingesammelt von der Schwedischen Zoologischen Expedition). I. *Rictularia* und *Dichelyne*. Results of the Swedish Zool. Exped. Egypt and White Nile 1901 under the direction of L. A. Jägerskiöld, part 2, Uppsala, pp. 1–66.

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LÓPEZ-NEYRA, C. R., AND C. DÍAZ-UNGRIA. 1958. Cestodes de Venezuela. V. Cestodes de vertebrados Venezolanos. (Segundo nota.) Novedades Cien., s. Zool. 23, 41 pp.

LÜHE, M. 1910. Cystotänien aus südamerikanischer Feliden. Zool. Jahrb., Suppl. 12, pp. 687–710.

MORGAN, B. B. 1946. The Physaloptera (sic) (Nematoda) of carnivores. Trans. Wis. Acad. Sci. Arts Lett. 36: 375–388.

PETRI, L. H., AND D. J. AMEEL. 1950. Studies on the life cycle of *Physaloptera rara* Hall and Wigdor, 1918, and *Physaloptera praeputialis* Linstow, 1889. J. Parasitol. 36(Sect. 2): 40.

QUENTIN, J.-C. 1969. Essai de classification des nématodes rictulaires. Mém. Mus. Nat. Hist. Nat., Sér. A 54: 55–115.

RAUSCH, R. L. 1981. Morphological and biological characteristics of *Taenia rileyi* Loewen, 1929 (Cestoda: Taeniidae). Can. J. Zool. 59: 653–666.

RISER, N. W. 1956. The hooks of taenioid cestodes from North American felids. Am. Midl. Nat. 56: 133–137.

ROBINETTE, W. L., J. S. GASHWILER, AND O. W. MORRIS. 1959. Food habits of the cougar in Utah and Nevada. J. Wildl. Manage. 23: 261–273.

SCHMIDT, G. D., AND R. L. MARTIN. 1978. Tapeworms of the Chaco Boreal, Paraguay, with two new species. J. Helminthol. 52: 205–209.

SCHMITT, N., J. M. SAVILLE, L. FRIIS, AND P. L. STOVELL. 1976. Trichinosis in British Columbia wildlife. Can. J. Public Health 67: 21–24.

SHAW, J. N., B. T. SIMMS, AND O. H. MUTH. 1934. Some diseases of Oregon fish and game and identification of parts of game animals. Oreg. Agric. Exp. St. Bull. 322, 23 pp.

SHULTS, L. M. 1970. *Mesocestoides kirbyi* and *M. lineatus*: Occurrence in Alaskan carnivores. Trans. Am. Microsc. Soc. 89: 478–486.

SKINKER, M. S. 1935. Two new tapeworms from carnivores and a redescription of *Taenia laticollis* Rudolphi, 1819. Proc. U.S. Nat. Mus. 83: 211–220.

SOSNOWSKI, A. 1973. Parasitische Nematoden bei wilden Feliden. Zool. Garten, N.F. 43: 204–209.

SPALDING, D. J., AND J. LESOWSKI. 1971. Winter food of the cougar in south-central British Columbia. J. Wildl. Manage. 35: 378–381.

SPRENT, J. F. A. 1956. The life history and development of *Toxocara cati* (Schrank 1788) in the domestic cat. Parasitology 46: 54–78.

———. 1959. The life history and development of *Toxascaris leonina* (von Linstow 1902) in the dog and cat. Parasitology 49: 330–371.

SRIVASTAVA, H. D. 1940. An unrecorded spirurid worm, *Rictularia cahirensis* Jägerskiöld, 1904, from the intestine of an Indian cat. Indian J. Vet. Sci. Anim. Husb. 10: 113–114.

TOWEILL, D. E., AND E. C. MESLOW. 1977. Food habits of cougars in Oregon. J. Wildl. Manage. 41: 576–578.

VERSTER, A. 1969. A taxonomic revision of the genus *Taenia* Linnaeus, 1758 s. str. Onderstepoort J. Vet. Res. 36: 3–58.

WINTERS, J. B. 1969. Trichiniasis in Montana mountain lions. Bull. Wildl. Dis. Assoc. 5: 400.

WORLEY, D. E., J. C. FOX, AND J. B. WINTERS. 1974. Prevalence and distribution of *Trichinella spiralis* in carnivorous mammals in the United States northern Rocky Mountain region. *In* Proc. Third Int. Conf. Trichinellosis. C. W. Kim (ed.). Intext Educational Publ., New York, pp. 597–602.

YOUNG, S. P., AND E. A. GOLDMAN. 1946. The Puma—Mysterious American Cat. Dover Publications, New York, 358 pp.

YOUNG, V. E., AND D. B. PENCE. 1979. Redescription and notes on the ecology of *Pterygodermatites* (*Multipectines*) *cahirensis* (Jägerskiöld, 1909) Quentin, 1969 (Nematoda: Rictulariidae) from west Texas carnivores. Proc. Helminthol. Soc. Wash. 46: 28–35.

ZAGO, H. 1962. Contribuição para o conhecimento do ciclo evolutivo de *Physaloptera praeputialis* von Linstow, 1889 (Nematoda: Spiruroidea). Arq. Zool. Estado S. Paulo 11: 59–98.

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