STUDIES ON THE PARASITES OF ZEBRAS 1. NEMATODES OF THE BURCHELL'S ZEBRA IN THE KRUGER NATIONAL PARK

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ABSTRACT

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Nineteen species of gastro-intestinal nematodes were recovered from 10 Burchell's zebra. These include: Cyathostomum alveatum, C. montgomeryi and C. tetracanthum; Cylicocyclus auriculatus, C. gyalocephaloides, C. insigne and C. triramosus; Cylicodontophorus schürmanni and Cylicodontophorus n.sp., Cylicostephanus bidentatus, C. calicatus and C. minutus; Poteriostomum ratzii, Craterostomum acuticaudatum, Triodontophorus minor, Habronema majus, H. muscae, H. zebrae, and Draschia megastoma, as well as Cylindropharynx spp. The highest burdens encounteed were those of Cylicocyclus triramosus (159 491), Cylindropharynx (19875), Cylicocyclus auriculatus (15 792), Cylicostephanus calicatus (16 658) and Cyathostomum tetracanthum (13 723). The nematodes consistently present in all zebras were: Cylicostephanus calicatus, Cylindropharynx spp. and Draschia megastoma.

Introduction

In 1909, Leiper recorded the first nematodes from zebras as well as the first nematode from Burchell's zebra, viz, *Strongylus vulgaris*. Theiler's (1923) study of the nematodes of equines included nematodes collected at post-mortem from 3 zebras. Prior to Theiler's study (Boulenger, 1920; Turner, 1920; Vevers, 1920; Yorke & Macfie, 1920) and the studies of others listed by Round (1968), records of nematodes from zebras consisted of isolated reports. In 1978, the opportunity presented itself of studying the helminths of zebra in greater detail, and particular attention was given to worm burdens, seasonal prevalence and life cycle studies. Scialdo, Reinecke & De Vos (1982) reported on the seasonal prevalence of the helminths. This paper deals with the specific identification of the helminths.

MATERIALS AND METHODS

The study area as well as the method of collection of nematodes from the 10 zebras was described by Scialdo *et al.* (1982).

The descriptions used for the identification of the specimens are compiled in Table 1.

RESULTS

Nine genera of nematodes in the families Strongylidae and Spiruridae were identified to specific level. The presence of these 18 species in the caecum, ventral or dorsal colon in the 4 colts and 6 stallions examined is indicated in Table 2, while the total worm burdens, number of zebras positive and range of these species are recorded in Table 3.

(a) Cyathostominae

The genus Cyathostomum is represented by 3 species. Cyathostomum alveatum and Cyathostomum montgomeryi were consistently present in most zebra. Although Cyathostomum tetracanthum was recovered in only 4 zebra, the mean worm burdens far exceeded those of the former 2 species.

In the genus Cylicocyclus, both Cylicocyclus auriculatus and Cylicocyclus triramosus were recovered both in greater numbers and from more animals than Cylicocyclus gyalocephaloides and Cylicocyclus insigne, and these were present in 1 and 2 animals respectively.

TABLE 1 Descriptions used in the identification of nematodes in Burchell's zebra

	Boulenger (1917)	Boulenger (1920)	Cram (1924)	Ihle (1925)	Kotlán (1920a,b)	Lichtenfels (1975)	Looss (1900a,b)	Looss (1902)	Ortlepp (1938)	Ortlepp (1962)	Popova (1955)	Popova (1958)	Theiler (1923)	Yorke & MacFie (1918)	Yorke & MacFie (1920)
Cyathostominae Cyathostomum alveatum Cyathostomum montgomeryi Cyathostomum tetracanthum Cylicocyclus auriculatus Cylicocyclus gyalocephaloides Cylicocyclus triramosus Cylicodontophorus schürmanni Cylicostephanus bidentatus Cylicostephanus calicatus Cylicostephanus minutus Poteriostomum ratzii Strongylinae Craterostomum acuticaudatum Triodontophorus minor Spiruridae Draschia megastoma Habronema majus Habronema muscae "Кайконета» zehrae	+	+	+	+	+	+ + + + + + + + + + + + + + + + + + + +	+	+	+	+	+	+++++++++++++++++++++++++++++++++++++++	+ + + + + + + + + + + + + + + + + + + +	+	+

TABLE 2 Habitat of nematodes in the caecum, ventral and dorsal colon of Burchell's zebra

	C	olt	1	C	olt	2	C	olt	3	C	olt	4	Sta	llio	n 1	Şta	llio	n 2	Sta	llio	n 3	Sta	llio	n 4	Sta	llio	n 5	Sta	llio	n (
	C^1	V ²	D^3	С	V	D	С	V	D	С	V	D	С	V	D	C	V	D	С	V	D	С	V	D	С	V	D	С	V	D
Cyathostominae								_				-																		Г
Cyathostomum alveatum	-		-	+	_		+	_	_	+	-		+		-	+	_	-	_	_	-	-	-	-	+	- 1	-	-		+
Cyathostomum montgomeryi	-	+	—	-	+	+	-	-	-	+	+			-	-	-	+	+	_	_	-	-	+	+	-	+	-	-	-	-
Cyathostomum tetracanthum	-	—	—	+	+	+	-	-	-	—	-		-	+		-	+	+	_	+	-	-	-	—	-	-		-		-
Cylicocyclus auriculatus	-	-	-	-	+	+	-	-	+	-	-	-	-	+	i — I	-	+	+	-	-	-	—	-	-	-	-	-	-	-	-
Cylicocyclus gyalocephaloides	-	-	l –	-	+	-	-	-	-	—	-	-	-	-	-	-	-	-	_	-		-		-	-	-	-	-	-	-
Cylicocyclus insigne	1-	-	<u> </u> –	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	_	-	—	-	-	-	-	-	-	-	-	-
Cylicocyclus triramosus	-	+	-	+	+	+	-	+		1 —	+	-	-	+	-	-	+	+	-	-	-	-		-		+		-	-	-
Cylicodontophorus schürmanni	-	+		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	+
Cylicodontophorus n. sp.	-	-	-	-	-		-	-	-		+	-	-	-	- 1	-	_	- 1	-	_	-	-		-	-	-	_	-	-	-
Cylicostephanus bidentatus	-	-	+		-	_	<u> </u>	-		-	_	+	-	+	+	-	+	+	-	+	+	_	-	+	-	-	-	- 1	-	+
Cylicostephanus calicatus	+		-	-	+	+	-	+	-	+	+	-	+	+	****	+	+	_	_	+	+	-	+	+	+	+	-	+	+	-
Cylicostephanus minutes	-	-	-	_		_	j –	-		_	+	-		-	_	-	-	- 1		-	-	_	Ī -	-	_	-	-	_		1
Cylindropharynx spp.	-	-	+	_	+	+	-	-	_		+	+		_	+	-	+	+		_	-	-	+	+	-	+	+	_		+
Poteriostomum ratzii	-	-	-	-	_	-	-	-	-	-	-	+	_	-	_	-	-	_	-	-	-	_	-	-	-	-	+	_		_
Strongylinae			١.						١.	l		١.								_		_	_	+	_	_	_	_	_	+
Craterostomum acuticaudatum	-	-	+	-	-	_	-	-	+	-	-	+	-	_	+	-	_	_		1	_	_	_	+	_	_	_	_	_	_
Triodontophorus minor	-	-	i –	-	_	-	-	-	-	-	+	-	i –	-	+	-	+	+	- 1	-	Ι-,	_	-		-	_	_	-	_	1

C1 = Caecum

 V^2 = Ventral colon

 D^3 = Dorsal colon

Low numbers of Cylicodontophorus schürmanni were present in 4 zebras. A total of 40 worms representing a new species of Cylicodontophorus were recovered from Colt 4

Cylicostephanus calicatus was the predominant species of this genus. Cylicostephanus bidentatus occurred in 7 animals, while 6 and 4 Cylicostephanus minutus were recovered from Colt 4 and Stallion 6 respectively.

Low numbers of *Poteriostomum ratzii* occurred in 2 zebras.

(b) Strongylinae

Craterostomum acuticaudatum was recovered in 6 out of the 10 zebras, while Triodontophorus minor was present in low numbers in 3 zebras. The genus Strongylus was represented by S. asini, S. edentatus and S. vulgaris. The prevalence of these 3 is discussed by Scialdo et al. (1982).

(c) Spiruridae

Habronema zebrae was present in high numbers in all but 1 zebra. Both Habronema muscae and Habronema majus occurred in smaller numbers in 8 zebras. Draschia megastoma was consistently present in all of the zebras.

DISCUSSION

This is the first report of *Cylicostephanus bidentatus* from the zebra. Theiler (1923) and Mönnig (1926) recorded *Cyathostomum tetracanthum* from the zebra, but their record was omitted by Round (1968) from his check list of helminth parasites of African mammals.

Theiler (1923) reported Cylicostephanus calicatus as one of the 3 commonest strongyles present in horses in South Africa. She mentions that C. calicatus is prevalent in the dorsal colon of the horse, donkey and mule, but is not present in the zebra. However, in the present investigation, this strongyle was recovered in large numbers from all the zebras and also from the dorsal colon in 3 out of 10 of the zebras. C. calicatus is a small strongyle (4-6 mm) and can easily be missed on macroscopic examination. Theiler (1923) stated that in an annual collection smaller worms were less well represented at the end of the year. She felt there was a strong possibility that "towards the end of the year the worms were collected less conscientiously than during the first few months". She further stated, that the larger worms could have been collected even in a quick search, "large forms (worms) ... which one would be liable to pick out in but

a hasty and superficial search". The material Theiler (1923) studied originated from 3 zebras only, and this factor, as well as the lack of standardized methods of collection, could account for the rarity of this species in her investigation.

Ogbourne (1978) reported the distribution of 21 species of strongyles in the large intestine of the horse in England. Poteriostomum ratzii, Cylicocyclus insigne and Cylicostephanus minutus were the only 3 species recorded by Ogbourne that were also found in these zebra. In the present study the recovery of P. ratzii from the dorsal colon confirms Ogbourne's findings, but Cylicocyclus insigne was present in the ventral and Cylicostephanus minutus in both the ventral and dorsal colon, while Ogbourne found the habitat to be the dorsal colon and caecum respectively.

Six strongyle species had a preference for one of the 3 divisions of the large intestine, either the caecum, the ventral or the dorsal colon. Cyathostomum montgomeryi was recovered from the dorsal and ventral colon, while Cyathostomum alveatum was found predominantly in the caecum. Cylicostephanus bidentatus and T. minor appear to have a predilection for both the ventral and dorsal colon, while Craterostomum acuticaudatum and the genus Cylindropharynx are found mainly in the dorsal colon.

The highest mean worm burdens encountered were those of *Cylicocyclus triramosus*, *Cylindropharynx* spp., *Cylicocyclus auriculatus*, *Cylicostephanus calicatus* and *Cyathostomum tetracanthum*. The 5 youngest zebras had far lower burdens of *Cylindropharynx* than the 5 oldest zebras.

Ogbourne (1978) reports that 4th stage larvae (L_4), over-wintering in the caecal and colonic wall, emerge in the spring to develop into adults. The result is a high nematode egg production in horses at that time of year. Scialdo et al. (1982) observed a similar phenomenon. In August (winter), large numbers of 4th stage larvae were observed in the gut wall and 5th stage larvae free in the lumen wall, while in the following month (September) there were few larval stages but many adults in copulo free in the lumen of the gut. It would appear that the larvae from the previous month had developed into adults.

Certain aspects of the taxonomy of these nematodes require further investigation. *Cylicodontophorus* n. sp. has still to be described and the *Cylindropharynx* spp.

TABLE 3 Total worm burdens of nematodes in Burchell's zebra*

	Colt 1	Colt 2	Colt 3	Colt 4	Stallion 1	Stallion 2	Stallion 3	Stallion 4	Stallion 5	Stallion 6	Total burden	Number of zebras positive	Range
Cyathostominae Cyathostomum alveatum Cyathostomum montgomeryi Cyathostomum tetracanthum Cylicocyclus auriculatus Cylicocyclus gyalocephaloides Cylicocyclus insigne Cylicodontophorus schürmanni Cylicodontophorus schürmanni Cylicostephanus bidentatus Cylicostephanus ainutus Cylicostephanus minutus Cylindropharyux spp.	870 	551 5 167 13 723 15 792 1 5 793 1 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	17 1 610 	1 063 1 518 40 40 40 40 40 7	- 92 -2 28 32 1	388 1 943 3 107 5 086 6 992 6 992 1 959 16 658 17 187	7 370 	2 182 	2 814 4 219 	2 081 	6 969 14 390 24 206 22 490 1 579 169 892 169 892 2 086 2 086 2 086 2 086 3 996 8 996	r944-2r4-r0102	1-2 814 9-5 167 6-13 723 2-15 792 1-636 5-159 491 1-10 4-1 959 3-16 658 4-6 63-19 875
Strongylinae Craterostomum acuticaudatum Triodontophorus minor	12		001	20 5	7 1	1		15	11	К	152	36	2-100 1-5
Spiruridae Draschia megasioma Habronema majus Habronema zebrae		145 1 243 1 244 1 864	317 15 16 72	31	56 10 82 82	1173	1 159 708 106 41	953 80 80 40 10	493 180 78	228	4 558 2 246 1 617 2 833	01 8 8 6	7-1173 4-1243 16-1244 10-1864

* These data differ from those reported by Scialdo et al. (1982) (which dealt with generic identification only) That material was discarded and specific identification is based on the remainder of the material

must be redescribed in greater detail, as the present descriptions are inadequate for specific identification. It appears Cylicostephanus calicatus fits all the characteristics described by Kotlán (1920a,b), Theiler (1923), Popova (1958) and Lichtenfels (1975) except for one. In the specimens from the present investigation there were no genital appendages on the dermal cone of the male. In the opinion of J. Ralph Lichtenfels (personal communication, 1982), this may represent a new subspecies. Further study, which should include a comparison with specimens from the horse, is necessary. The H. muscae recovered resembles that described from the horse. Two differences are that the spicules of the male are in the ratio of 3:1 and not 5:1, and the vagina of the female is shorter than recorded by Theiler (1923) and Lichtenfels (1975).

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