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Parasites of South African wildlife. XIV. Helminths of nyalas (*Tragelaphus angasii*) in the Mkuzi Game Reserve, KwaZulu-Natal

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ABSTRACT

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The helminths of 58 nyalas *(Tragelaphus angasii)* culled in the Mkuzi Game Reserve, KwaZulu-Natal, during March 1991, and six culled during March 1994, were collected, identified and counted. Of these, an as yet undescribed *Camelostrongylus* sp., *Cooperia hungi*, an *Onchocerca* sp., *Strongyloides papillosus* and *Moniezia benedeni* are new parasite records.

The individual nematode burdens of the antelope examined during March 1991 varied from one to 2 327, and the total mean adult gastro-intestinal-nematode burden was 586. Those examined during March 1994 had burdens that varied from 322 to 1 778, with a mean of 854. The two *Camelostrongylus* spp. were the most prevalent nematodes in the nyalas culled during 1991, while the trematode *Cotylophoron jacksoni* was most prevalent in those culled during 1994. The most numerous nematode in nyala calves during 1991 was a *Cooperia rotundispiculum* race, while the two *Camelostrongylus* spp. were most numerous in the adult and sub-adult nyalas from both surveys.

No clear trends between rainfall and nematode burdens were evident, nor was there any correlation between faecal nematode egg counts and nematode burdens. Contrary to what was observed in an earlier survey, female nyalas had larger nematode burdens than the males.

Keywords: Helminths, nyala, parasites, *Tragelaphus angasii*, wildlife

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INTRODUCTION

The internal parasites of nyalas (*Tragelaphus angasii*) were listed by Dixon (1964), Round (1968), Vincent, Hitchins, Bigalke & Bass (1968), Keep (1971), Boomker (1986), Boomker, Horak & De Vos (1986) and Boomker, Horak & Flamand (1991). The last-named authors reported on the helminths of 77 nyalas in four nature reserves in KwaZulu-Natal, including Mkuzi Game Reserve.

As part of the ongoing surveys of the helminth parasites of wild animals in South Africa, culling programmes of nyalas in the Mkuzi Game Reserve, northern KwaZulu-Natal, were attended during March

1991 and March 1994, and the helminth parasites of 58 and of six nyalas, respectively, collected. In this paper, the results of these collections are presented and compared with those of the previous survey conducted in this reserve. An amended host-parasite list is also provided.

MATERIALS AND METHODS

The geophysiology of the Mkuzi Game Reserve has been described by Boomker *et al.* (1991). In summary, the Reserve (27°33′–27°46′S; 32°07′–32°19′E, altitude 130–300 m), is approximately 25 091 ha in extent and situated in north-eastern KwaZulu-Natal. The vegetation of the higher altitudes is classified as Lowveld, while that of the lower altitudes consists of Coastal Forest and Thornveld (Acocks 1988). Rain falls mostly during summer, and summers are hot and often humid, while winters are mild. Frost seldom occurs.

A total of 58 nyalas, comprising 24 adults, 12 sub-adults and 22 calves, were shot during March 1991. The gastro-intestinal tracts (excluding the fore-stomachs) of 26 of these antelope were processed for helminth recovery, as described by Boomker, Horak & De Vos (1989) and the mucosae digested. Helminths were collected only from the abomasa and the proximal one-third of the small intestines of the remaining 32 antelope, and the respective mucosae digested. Neither the hearts, lungs nor livers of these antelope were examined for the presence of helminths.

Separate aliquots, each representing one-tenth of the volume of the ingesta of the abomasa, small intestines and large intestines, were made and examined under a stereoscopic microscope. The mucosal digests were examined *in toto*. All the worms were removed, identified and counted.

Faecal specimens were collected from the rectums of the antelope and duplicate faecal nematode egg counts were done, according to Reinecke's (1961) modification of the McMaster technique of Gordon & Whitlock (1939).

Three adult male and three adult female nyalas were processed for helminth recovery during March 1994, as described by Boomker *et al.* (1989). However, separate aliquots, representing only one-twentieth of the respective ingesta, were examined. The hearts and livers were not examined and the mucosae of the large intestines were not digested. Faecal specimens for nematode egg counts were not collected.

A number of the distomes recovered from the nyalas were dehydrated in graded ethyl alcohol and embedded in paraffin wax. Ventral and sagittal serial sections, 5 µm thick, were cut of the entire trematode, stained with Masson's trichrome stain (Bancroft & Stevens 1982) and mounted in Canada balsam.

Fragments of the cestode recovered from one of the nyalas examined during March 1991, were stained with aceto-alum-carmine stain. Gravid proglottides were compressed between two glass slides for better observation of the shape of the eggs.

All the helminths were identified under a standard microscope in accordance with the descriptions provided by the authors listed in Table 1.

RESULTS

The rainfall during the two months preceding and the month of parasite collection for the March 1983 as well as the 1991 and 1994 surveys, is presented in Fig. 1.

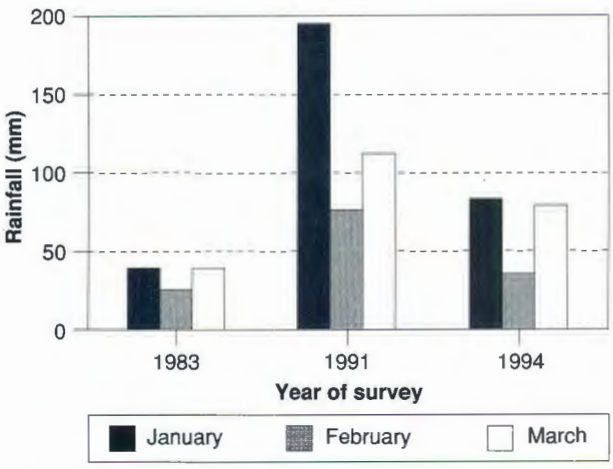

FIG. 1 Rainfall during the two months preceding and the month during which parasites were collected for each of the 1983, 1991 and 1994 surveys of the helminths of nyalas in Mkuzi Game Reserve

The *Camelostrongylus* spp. were the most numerous and accounted for 88,7% of the total adult nematode burden of the adult nyalas examined during March 1991. They were also the most prevalent, occurring in 23 out of the 24 antelope. *Paracooperia horaki* was next most numerous and prevalent (Table 2).

The sub-adult nyalas examined during March 1991 harboured three nematode genera, and seven identified to the species level. The *Camelostrongylus* spp. were the most numerous, accounting for 70 % of the adult nematode burden. They were also the most prevalent, occurring in all 12 antelope (Table 3).

Nyala calves examined during March 1991, harboured the largest variety of helminths. The two *Cooperia* spp. were the most numerous, and accounted for 47,7% of the total adult nematode burden, followed by the two *Camelostrongylus* spp. (31,4%) and *P. horaki* (10%). However, the *Camelostrongylus* spp. were the most prevalent, occurring in 20 out of the 22 antelope.

TABLE 1 Amended list of the helminth parasites of nyalas, *Tragelaphus angasii*, with reference to the first record and the authors of the descriptions used to assist with the identifications

Helminth species	First record	Identification
Trematodes		
Calicophoron calicophorum (Fischoeder, 1901) Näsmark, 1937	Ortlepp pers. comm [a]	-
Cotylophoron cotylophorum (Fischoeder, 1901) Stiles & Goldberger, 1910	Ortlepp pers. comm [a]	-
Cotylophoron jacksoni Näsmark, 1937	Dixon 1964	Eduardo 1985
Paramphistomum microbothrium (Fischoeder, 1901)	Dixon 1964	-
Schistosoma mattheei Veglia & Le Roux, 1929	Boomker *et al.* 1991	-
Cestodes		
Moniezia benedeni (Moniez, 1879) Blanchard, 1891	This paper	Taylor 1928
Taenia sp. larvae	Boomker *et al.* 1991	-
Thysaniezia sp.	Boomker *et al.* 1991	-
Nematodes		
Camelostrongylus harrisi (Le Roux, 1930) Durette-Desset, 1989	Vincent *et al.* 1968	Le Roux 1930
Camelostrongylus sp.	This paper	Boomker, unpublished data
Cooperia hungi Mönnig, 1931	This paper	Gibbons 1981
Cooperia rotundispiculum Khalil & Gibbons, 1980	Boomker 1991	Boomker 1991
Dictyocaulus viviparus (Bloch, 1782) Railliet & Henry, 1907	Keep 1971	-
Elaeophora sagittus (Von Linstow, 1907) Anderson & Bain, 1976	Ortlepp 1961	-
Gaigeria pachyscelis Railliet & Henry, 1910	Boomker *et al.* 1991	Levine 1980
Gongylonema verrucosum (Giles, 1982) Neumann, 1984	Vincent *et al.* 1968	-
Gongylonema sp.	Boomker *et al.* 1991	-
Haemonchus vegliai Le Roux,1929	Boomker *et al.* 1991	Gibbons 1979
Haemonchus sp.	Keep 1971	-
Impalaia tuberculata Mönnig, 1924	Boomker *et al.* 1991	Boomker 1977
Oesophagostomum sp.	Boomker *et al.* 1991	-
Onchocerca sp.	This paper	Anderson & Bain 1976
Paracooperia horaki Boomker, 1986	Boomker 1986	Boomker 1986
Setaria africana (Yeh, 1959) Ortlepp, 1961	Yeh 1959	Yeh 1959
Setaria labiatopapillosa (Perroncito, 1882) Railliet & Henry, 1911	Mönnig 1931	Yeh 1959
Setaria sp.	Boomker *et al.* 1991	Yeh 1959
Strongyloides papillosus (Wedl, 1856)	This paper	Ransom 1911
Teladorsagia trifurcata (Ransom, 1907)	Keep 1971	-
Trichostrongylus deflexus Boomker & Reinecke, 1989	Boomker *et al.* 1991	Boomker & Reinecke 1989
Trichostrongylus falculatus Ransom, 1911	Boomker *et al.* 1991	Ransom 1911

[a] As communicated to Round (1968)
- Not found in this survey

One trematode species, one nematode genus and three nematode species were recovered from the adult nyalas culled during March 1994. *Cotylophoron jacksoni* occurred in all six of the antelope, while the two *Camelostrongylus* spp. were the most numerous nematodes, comprising 91% of the total adult nematode burden. Together with *P. horaki*, the *Camelostrongylus* spp. were the most prevalent nematodes, each occurring in five antelope (Table 3).

The results of the faecal nematode egg counts are presented in Table 4.

The numbers of helminths collected during March 1983, and the 1991 and 1994 surveys are compared in Table 5. From this table it is clear that the 1991 survey yielded the largest variety of helminths.

DISCUSSION

Five new helminths can be added to the existing list of parasites of nyalas. These are the *Camelostrongylus* sp., *Cooperia hungi*, an *Onchocerca* sp., *Strongyloides papillosus* and *Moniezia benedeni*.

Camelostrongylus harrisi is a common parasite of nyalas and has been found in all the previous surveys (Boomker *et al.* 1986, 1991). The recent discovery of a new species is in line with the concept of major and minor species as observed between *Teladorsagia circumcincta* and *Teladorsagia trifurcata* of sheep (Lancaster & Hong 1981). *Camelostrongylus harrisi* would appear to be the major species in nyalas, because its numbers were 20–30% higher than

TABLE 2 Helminths recovered from 58 nyalas culled during March 1991

Helminth species	Number of helminths recovered			Number of animals infected
	Larvae	Adults	Total	
Adults (24 animals)				
Camelostrongylus harrisi	0	4 733	4 733	23
Camelostrongylus sp.	0	2 997	2 997	22
Cooperia hungi	0	20	20	1
Cooperia rotundispiculum	0	211	211	2
Cooperia females	0	73	73	3
Cooperia type larvae	390	–	390	2
Gaigeria pachyscelis	0	1	1	1
Ostertagia type larvae	84	–	84	5
Onchocerca sp.	–	1	1	1
Paracooperia horaki	0	679	679	16
Mean nematode burden	20	363	383	
Subadults (12 animals)				
Camelostrongylus harrisi	0	3 201	3 201	12
Camelostrongylus sp.	0	2 072	2 072	12
Cooperia hungi	0	869	869	2
Cooperia rotundispiculum	0	637	637	4
Cooperia type larvae	22	–	22	1
Haemonchus vegliai	0	36	36	3
Ostertagia type larvae	284	–	284	6
Paracooperia horaki	0	713	713	8
Setaria africana	0	3	3	3
Trichostrongylus deflexus	0	3	3	1
Mean nematode burden	25	628	653	
Calves (22 animals)				
Cotylophoron sp. immature	1	0	1	1
Moniezia benedeni	0	1	1	1
Camelostrongylus harrisi	0	3 749	3 749	20
Camelostrongylus sp.	0	1 821	1 821	20
Cooperia hungi	0	2 280	2 280	14
Cooperia rotundispiculum	0	6 169	6 169	14
Cooperia type larvae	1 395	–	1 395	7
Gaigeria pachyscelis	0	23	23	2
Haemonchus vegliai	0	460	460	9
Impalaia tuberculata	420	1 173	1 593	6
Ostertagia type larvae	50	–	50	4
Paracooperia horaki	0	1 774	1 774	19
Setaria sp.	0	1	1	1
Strongyloides papillosus	0	163	163	5
Trichostrongylus deflexus	0	11	11	1
Trichostrongylus falculatus	0	96	96	5
Trichostrongylus females	0	10	10	1
Mean nematode burden	85	806	891	

– Not applicable

those of the new species in all the surveys conducted. Together with a *Cooperia rotundispiculum* race and *P. horaki*, the two *Camelostrongylus* spp. were the definitive parasites of nyalas in the 1983 survey (Boomker *et al.* 1991). The 1991 and 1994 surveys confirm this observation.

Cooperia hungi is a common parasite of impalas, *Aepyceros melampus* (Horak 1978) and should be regarded as an accidental parasite of nyalas. The worms were found only in the 1991 survey, and then mostly in calves. The presence of *Strongyloides papillosus* only in calves, and then only in low numbers, suggests that this infestation may be milk-borne, as proposed for impalas (Horak 1978) and kudus (Boomker *et al.* 1989). Both the *Onchocerca* sp. and *Moniezia benedeni* can be regarded as accidental parasites.

TABLE 3 Helminths recovered from six adult nyalas culled during March 1994

Helminth sp.	No. of helminths recovered			No. of nyalas infected
	Larvae	Adults	Total	
Cotylophoron jacksoni	0	1 901	1 901	6
Camelostrongylus harrisi	0	3 019	3 019	5
Camelostrongylus sp.	0	1 649	1 649	5
Camelostrongylus females	–	20	20	1
Cooperia rotundispiculum	0	120	120	1
Paracooperia horaki	0	317	317	5
Mean nematode burden	0	854	854	

– Not applicable

TABLE 4 Total adult female nematode and total nematode burdens, and faecal nematode egg count of nyalas culled during March 1991

Female nyalas					Male nyalas				
Animal number and age	Total adult female nematode burden	Total nematode burden	Faecal nematode egg count (eggs/g)		Animal number and age	Total adult female nematode burden	Total nematode burden	Faecal nematode egg count (eggs/g)	
			Count 1	Count 2				Count 1	Count 2
Adults					Adults				
5	74	144	0	0	4	33	57	0	0
6	152	250	0	0	7	46	48	0	200
13	471	891	0	0	19	66	82	0	0
15	178	279	0	0	20	85	195	0	0
27	395	730	0	0	23	155	223	0	0
32	18	61	200	300	26	134	198	0	0
33	340	648	300	100	28	0	1	0	0
36	54	96	0	0	30	294	686	0	0
39	249	359	0	0	41	71	179	0	0
42	679	1 047	0	0	43	49	61	0	0
48	329	586	0	0	47	226	343	0	0
50	399	552	200	100					
55	524	891	0	0					
Mean	297	503	54	38	Mean	105	188	0	18
Subadults					Subadults				
31	50	136	0	0	10	242	444	0	0
38	691	1 143	200	100	17	33	44	0	0
44	704	1 129	0	0	29	572	1 083	200	200
45	270	782	0	0	37	239	392	0	0
54	350	774	0	100	51	191	337	0	0
					53	523	898	300	200
					56	299	369	0	0
Mean	413	793	40	40	Mean	300	510	71	57
Calves					Calves				
1	821	1 506	200	0	3	151	218	0	0
2	30	61	0	0	8	276	584	0	0
14	501	957	800	600	9	461	944	0	0
18	1 355	2 327	100	200	11	212	317	0	0
24	593	860	0	0	12	421	598	0	0
25	475	807	0	0	16	206	364	0	0
40	337	751	0	0	21	911	1 743	0	0
49	351	710	200	200	22	176	366	300	400
52	756	1 342	200	300	34	95	210	0	0
57	881	1 662	400	200	35	268	584	0	0
58	145	239	200	300	46	282	579	0	0
Mean	568	1 020	191	164	Mean	314	592	27	36

TABLE 5 Comparison of the results of the helminth surveys of nyalas conducted during March 1983, 1991 and 1994

Helminth species	Results of surveys conducted		
	1983 (n = 4)	1991 (n = 58)	1994 (n = 6)
Paramphistomes	3 432	1	1 901
Moniezia benedeni	–	1	–
Cooperia rotundispiculum	2 040	7 017	120
Cooperia hungi	–	3 169	–
Cooperia spp. females	–	73	–
Cooperia type larvae	0	1 807	–
Elaeophora sagittus	0	–	–
Gaigeria pachyscelis	1	24	–
Haemonchus vegliai	75	496	–
Haemonchus larvae	0	–	–
Impalaia tuberculata	0	1 173	–
Impalaia larvae	0	420	–
Camelostrongylus harrisi	15 331 [a]	11 683	3 019
Camelostrongylus sp.	112	6 890	1 649
Camelostrongylus females	–	–	20
Ostertagia type larvae	100	418	–
Onchocerca sp.	–	1	–
Paracooperia horaki	802	3 166	317
Setaria sp.	4	1	–
Setaria africana	–	3	–
Strongyloides papillosus	–	163	–
Trichostrongylus deflexus	–	14	–
Trichostrongylus falculatus	44	96	–
Trichostrongylus spp. females	–	10	–
Mean adult gastro-intestinal nematode burden	4 601	586	854

– Not found during that particular survey
[a] One animal harboured 13 293 *Camelostrongylus* spp. adults

Although good rain fell during January 1991, it did not appear to affect the mean adult nematode burden of the adult nyalas. It might, however, have affected the burdens in the younger animals, because in the subadults and calves they were 1,7 and 2,3 times, respectively, that of the adult nyalas. In the 1983 survey, male nyalas had larger burdens than the females (Boomker *et al.* 1991). However, in both the 1991 and 1994 surveys, the females had the larger burdens, but since only small numbers of helminths were involved, the differences are probably not significant.

It is clear that little correlation exists between the total female or total helminth burdens, and faecal nematode egg counts of nyalas. Similar results have been obtained for kudus in the Kruger National Park (Boomker *et al.* 1989), thereby indicating that faecal egg counts should not be used to determine the nematode population status of antelope in game reserves.

On comparing the results of the 1983, 1991 and 1994 surveys, it is apparent that the nyalas culled during 1983 had the largest mean burden, but this is owing to one of the antelope harbouring a large number of *Camelostrongylus harrisi*. If this animal is left out of the calculations, the mean adult nematode burden becomes 1 227, which is not much larger than the 854 of the 1994 survey. The nyalas culled during 1991 had the largest variety of helminths and the smallest burdens, while the six antelope culled during 1994 had the smallest variety of helminths and a mean burden intermediate to that of the other groups. This may have been brought about by climatic conditions or a slight overpopulation of nyalas during 1983. However, the magnitudes of the total burdens are insignificant, and when the species diversity is taken into account, they should in no way be detrimental to the antelope.

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