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PARASITES OF SOUTH AFRICAN WILDLIFE. XII. HELMINTHS OF NYALA, *TRAGELAPHUS ANGASII*, IN NATAL

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The helminths of 77 nyala, *Tragelaphus angasii*, from 4 game reserves in Natal, were collected, counted and identified. Ten nematode species and 4 nematode genera, a trematode species and paramphistomes, and 2 cestode genera were recovered from the antelope. Of these, a *Cooperia rotundispiculum* race, *Gaigeria pachyscelis*, a *Gongylonema* sp., *Haemonchus vegliai*, *Impalaia tuberculata*, an *Oesophagostomum* sp., a *Setaria* sp., *Trichostrongylus deflexus*, *Trichostrongylus falculatus*, the larval stage of a *Taenia* sp., a *Thysaniezia* sp. and *Schistosoma mattheei* are new parasite records for this host.

Individual nematode helminth burdens varied from 3 to 13 493 and the total mean nematode burden was 700. The mean burdens of nyala from Mkuzi were the largest and those from animals from the Umfolozi Game Reserve and the False Bay Park the smallest.

Ostertagia harrisi was the most prevalent nematode, and it was also the most numerous in nyala from Umfolozi, Mkuzi and False Bay. A race of *Cooperia rotundispiculum* was the most numerous in nyala from Ndumu.

No clear-cut trends in the seasonal abundance could be discerned for any of the worm species recovered in this study.

INTRODUCTION

Nyala, *Tragelaphus angasii* Gray, 1849 are medium-sized antelope that show the most pronounced sexual dimorphism of all the South African antelopes (Smithers, 1983). Adult males are about 112 cm at the shoulder, with a mean mass of 108 kg. They are slatey-grey, verying to dark brown or even black or tan depending on the direction of the light (Tello & Van Gelder, 1975). The younger males have up to 14 vertical white stripes on the body, while older individuals have only 3 or 4, or no stripes at all. There is a distinct white chevron on the top of the muzzle and only the males carry horns (Smithers, 1983).

The females are distinctly smaller, measuring 97 cm at the shoulder, with a mean mass of 62 kg. They are bright chestnut, with up to 18 white vertical stripes on the body. The white chevron on the muzzle and white spots on the haunches may or may not be present (Smithers, 1983).

Nyala are gregarious, occurring in transient herds of up to 30 animals (Tello & Van Gelder, 1975). They are not territorial and occupy overlapping home ranges (Smithers, 1983).

These antelope are predominantly browsers, feeding on the leaves, twigs, flowers, bark and fruit of more than 108 species of dicotyledonaceous plants (Tello & Van Gelder, 1975). Grass is also eaten, especially when fresh and sprouting after rains (Smithers, 1983). Stomach contents of nyala in the Hluhluwe Game Reserve consisted of 70 % browse and 30 % grass (Vincent, Hitchins, Bigalke & Bass, 1968)

Where water is available, nyala drink regularly, but it is apparently not an essential requirement, as they also occur in areas where it is only available seasonally (Smithers, 1983).

Nyala have a restricted habitat and they are usually found in thickets in dry savannah woodland or riverine woodland. Although they do occur in open grassland, they do so only to graze on the new flush after rains, and are seldom more than a few hundred metres away from thickets (Tello & Van Gelder, 1975; Smithers, 1983). Nyala are quite adaptable, and encroaching bush on abandoned cultivated lands provides an ideal habitat (Tello & Van Gelder, 1975). In South Africa, these antelope occur naturally in the Limpopo valley in the northern Transvaal; south of this, along the Mozambique border in the Kruger National Park to about 24° 30′ S; and in Natal in the northern regions, including the Ndumu, Mkuzi, Hluhluwe, Umfolozi and St. Lucia Game Reserves. They are also present on privately owned game ranches wherever the habitat is suitable.

The internal parasites of nyala are not well known, despite the antelopes' relative abundance in the Republic of South Africa. Round (1968) lists *Calicophoron calicophorum, Cotylophoron cotylophorum, Paramphistomum microbothrium, Cordophilus sagittus, Setaria africana and Setaria labiatopapillosa,* but states that no indication is given of the locality from which *Setaria labiatopapillosa* was derived. Dixon (1964) lists *Calicophoron calicophorum, Cotylophoron jacksoni* and *Paramphistomum microbothrium* as occuring in nyala in the Mkuzi Game Reserve. Vincent *et al.*, (1968) list *'Ostertagia harisi* (from Oesophagus), *Gongylonema verucosum* (from small intestine)' (*sic*), *P. microbothrium* and *Paramphistomum* sp. from the rumen and reticulum of nyala from Hluhluwe. Keep (1971) added *Dictyocaulus viviparus, Haemonchus* sp. and *Ostertagia trifurcata,* Boomker (1986) *Paracooperia horaki* from nyala from some Natal game reserves and Boomker, Horak & De Vos (1986) the helminths of 2 nyala shot at Pafuri in the northern part of the Kruger National Park. The latter antelope harboured only *Haemonchus vegliai* and a race of *Cooperia rotundispiculum.*

As part of the ongoing survey of the helminth parasites of wild animals in South Africa, the helminths of 77 nyala culled in 4 game reserves in northern Natal were collected. An amended parasite list for these antelope, which includes several new re-

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cords, is provided and the patterns of seasonal abundance of the nematode parasites from nyala from the various localities are discussed.

MATERIALS AND METHODS

The study areas

Umfolozi

The Umfolozi Game Reserve (Umfolozi) (28° 12′–28° 21′ S; 31° 42′–31° 59′ E) comprises about 47 753 ha of hilly country, 130–600 m above sea level. Two vegetation types are recognised, viz., Zululand Thornveld along the slopes and crests of the hills and Lowveld in the valleys (Acocks, 1988). Both browse and grazing are plentiful. The annual rainfall varies from 500 to 750 mm and falls mainly in summer. Summers are hot and winters cool to mild, and frost seldom occurs.

Umfolozi is arbitrarily divided into two areas; a wilderness or no-cull, area where no culling of animals is allowed and which comprises most of the valleys and riverine forest, and an 'open', or cull, area, consisting mostly of thick scrub on the slopes of the hills, where animals are regularly culled and caught for translocation. The main study area was the cull area of Umfolozi.

An attempt was made to obtain 1 adult male, 1 adult female and 1 juvenile nyala of either sex from the cull area each month from March 1983 to April 1984. However, none were shot during August, September and November 1983, and only 1 during each of May 1983 and January 1984. Only 2 antelope per month were shot during April, October and December 1983 and February 1984 but 4 were collected during March 1984. Twenty-six nyala were shot, of which 9 were adult males, 11 adult females, 4 juvenile males and 2 juvenile females.

Bi-monthly collection of nyala was attempted in the no-cull area of Umfolozi from May 1983 to January 1984; nyala were, however, only shot during May, June, August and October 1983 and January 1984. Fourteen nyala were collected, of which 5 were adult males, 4 adult females and 5 juvenile females.

Mkuzi

The Mkuzi Game Reserve (Mkuzi), which is approximately 25 091 ha in extent, is situated in the so-called Maputaland (27° 33′–27° 46′ S; 32° 07′–32° 19′ E, altitude 130–300 m), and extends from the eastern foothills of the Lebombo mountain range westwards into the Makatini flats. The vegetation of the higher areas is classified as Lowveld, while that at lower altitudes consists of the Zululand Palm Veld subdivision of Coastal Forest and Thornveld (Acocks, 1988). Rain falls mostly in summer and varies from 500 to 750 mm. Summers are hot and often humid and winters are mild. Frost seldom occurs.

Twenty nyala were shot during March, June, July and October 1983, and January and May 1984. Of these, 7 were adult males, 5 adult females, 5 juvenile males and 3 juvenile females.

Ndumu

The Ndumu Game Reserve (Ndumu), which comprises approximately 11 000 ha, is situated in the extreme north of Natal (26° 50′–26° 56′ S 32° 09′–32° 21′ E; altitude 30–100 m) and shares a common boundary in the north with southern Mozambique. Ndumu falls within the Lowveld subtype of Tropical Bush and Savannah (Acocks, 1988). The rainfall varies from 500 to 750 mm *per annum* and falls mostly in summer. Summers are hot and humid and winters are mild; frost does not occur.

Fourteen nyala, 5 adult males, 3 adult and 1 old female, 1 juvenile male and 4 juvenile females, were shot in this reserve at irregular intervals from April 1983 to May 1984.

False Bay Park

One male and 2 female nyala were shot during April 1987 in False Bay Park (27° 55′ S; 32° 23′ E, altitude 0–100 m), which is situated on the western shores of Lake St. Lucia, an area classified as the Zululand Palm Veld subdivision of Coastal Thornveld and Coastal communities (Acocks, 1988). The annual rainfall of 650–1 000 mm falls mostly during the hot, humid summers. Winters are mild and frost seldom occurs.

Collection and identification of parasites

The helminths of all the antelope were collected as described by Boomker, Horak & De Vos (1989) and were identified using the descriptions provided by the authors listed in Table 1. This table also lists the helminth parasites of nyala recorded to date.

RESULTS

The numbers of helminths recovered and their prevalence is presented in Table 2. Excluding the nyala from False Bay, the total adult nematode burdens are listed in Table 3 according to locality, host age and sex. The seasonal abundance of nematodes of nyala from Umfolozi is illustrated in Fig. 1 and that of nyala from Mkuzi and Ndumu in Fig. 2.

Umfolozi

Seven nematode species and 3 genera, paramphistomes and *Schistosoma mattheei*, and the larva of a *Taenia* species were recovered from the animals from the cull area. Of these, *O. harrisi* was the most abundant, followed by the *C. rotundispiculum* race, *P. horaki* and *H. vegliai*.

O. harrisi was the most prevalent nematode and occurred in 24 nyala, followed by *P. horaki* (11 antelope), the *C. rotundispiculum* race (10 antelope) and *H. vegliai* (6 antelope).

The paramphistomes were the most abundant trematodes and occurred in 10 nyala.

The individual adult nematode burdens varied from 3 to 3 280 and only 2 nyala did not harbour any worms (Table 3). The adult nematode burden was larger in the male animals than in the females. Comparison with the younger animals is not possible, because too few were collected.

Six species of nematodes, a nematode genus and paramphistomes were recovered from the nyala shot in the no-cull area. Those helminths that were common to nyala from both the cull and the no-cull areas occurred in the same order of abundance in both areas. *O. harrisi* was again the most prevalent nematode (12 nyala), followed by the *C. rotundispiculum* race and *P. horaki* (5 nyala each).

TABLE 1 Amended list of the helminth parasites of nyala in the Republic of South Africa, with reference to the first record and the authors used to assist with the identification

Parasite	First Record	Identification
Trematodes		
Calicophoron calicophorum (Fischoeder, 1901) Näsmark, 1937	Ortlepp (pers. comm.)[2]	*
Cotylophoron cotylophorum (Fischoeder, 1901) Stiles & Goldberger, 1910	Ortlepp (pers. comm.)[2]	*
Cotylophoron jacksoni Näsmark, 1937	Dixon, 1964	*
Paramphistomum microbothrium Fischoeder, 1901[1]	Ortlepp (pers. comm.)[2]	*
Paramphistomum microbothrium Fischoeder, 1901	Dixon, 1964	*
Schistosoma mattheei Veglia & Le Roux, 1929	This paper	Veglia & Le Roux, 1929
Cestodes		
Taenia sp. larvae	This paper	Verster, 1969
Thysaniezia sp.	This paper	Spassky, 1963
Nematodes		
Cooperia rotundispiculum race Khalil & Gibbons, 1980	This paper	Boomker, 1991
Cordophilus sagittus (Von Linstow, 1907) Mönnig, 1926	Ortlepp, 1961	Mönnig, 1926
Dictyocaulus viviparus (Bloch, 1782) Railliet & Henry, 1907	Keep, 1971	Levine, 1980
Gaigeria pachyscelis Railliet & Henry, 1910	This paper	Levine, 1980
Gongylonema verrucosum (Giles, 1892) Neumann, 1984	Vincent *et al.*, 1968	*
Gongylonema sp.	This paper	Levine, 1980
Haemonchus vegliai Le Roux, 1929	This paper	Gibbons, 1979
Haemonchus sp.	Keep, 1971	*
Impalaia tuberculata Mönnig, 1924	This paper	Boomker, 1977
Oesophagostomum sp.	This paper	
Ostertagia harrisi Le Roux, 1930	Vincent *et al.*, 1968	Le Roux, 1930
Ostertagia trifurcata Ransom, 1907	Keep, 1971	*
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.	This paper	Yeh, 1959
Trichostrongylus deflexus Boomker & Reinecke, 1989	This paper	Boomker & Reinecke, 1989
Trichostrongylus falculatus Ransom, 1911	This paper	Ransom, 1911

[1] This record may precede the one of Dixon (1964)

[2] Personal communication to M. C. Round, date not given

* Not found in this survey

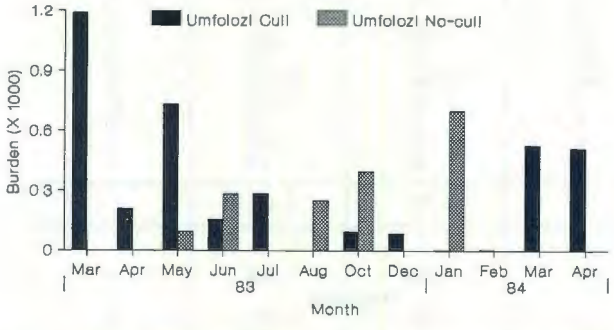

FIG. 1 The seasonal abundance of adult nematodes of nyala from the Umfolozi Game Reserve

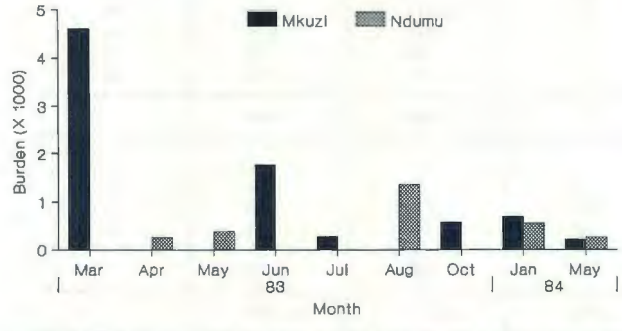

FIG. 2 The seasonal abundance of adult nematodes of nyala from the Mkuzi and Ndumu Game Reserves

The individual adult nematode burdens varied from 28 to 1 085 and 2 nyala did not have any worms. There was virtually no difference between the mean nematode burdens of the adult and young animals, it being 606 and 664, respectively.

Mkuzi

Of the 9 nematode species, 1 nematode genus and the paramphistomes recovered from the nyala from this locality, *O. harrisi* was the most abundant, followed by the *C. rotundispiculum* race, the paramphistomes and *P. horaki* (Table 2). *O. harrisi* was the most prevalent, occurring in 19 of the 20 nyala, followed by *P. horaki* (13 antelope), the paramphistomes (12 antelope), the *C. rotundispiculum* race (10 antelope) and *Setaria* sp. (6 nyala).

Individual adult nematode burdens varied from 58 to 13 493 and all nyala were infected. As was the case with the antelope from Umfolozi cull area, the males and the adult animals harboured the larger mean adult nematode burdens, but again, too few young animals were examined.

Ndumu

Six nematode species, 2 nematode genera, 1 cestode genus and paramphistomes were recovered from these nyala. The *C. rotundispiculum* race was the most abundant, followed by *O. harrisi,* the paramphistomes, *P. horaki* and *H. vegliai. O. harrisi* was the most prevalent, occurring in all 14 nyala, followed by the *C. rotundispiculum* race and *P. horaki* (9 antelope each), and a *Setaria* sp. (7 antelope).

The individual adult nematode burdens varied from 10 to 4 536 and all antelope were infected. The juvenile females harboured the largest mean adult nematode burden and the juveniles combined also harboured larger burdens than the adult antelope.

False Bay

These nyala harboured only 2 nematode species and a nematode genus, of which *O. harrisi* was the most abundant and most prevalent. Only 1 nyala

TABLE 2 The helminth parasites recovered from nyala from different localities in South Africa

Locality and helminth species	Number of worms recovered			Number of animals infected
	Larvae	Adults	Total	
Umfolozi, cull area (26 animals)				
Paramphistomes	#	1 585	1 585	10
Schistosoma mattheei	#	5	5	1
Taenia sp. larva	1	#	1	1
Cooperia rotundispiculum race	*	827	827	10
Cooperia type larvae	0	—	—	1
Dictyocaulus viviparus	0	3	3	2
Gaigeria pachyscelis	0	75	75	2
Gongylonema sp.	0	27	27	3
Haemonchus vegliai	1	264	265	6
Impalaia sp.	25	0	25	1
Oesophagostomum sp. male	—	1	1	1
Ostertagia harrisi	36	8 261	8 297	24
Paracooperia horaki	*	549	549	11
Trichostrongylus falculatus	0	57	57	3
Mean nematode burden	6	387	393	
Umfolozi no-cull area (14 animals)				
Paramphistomes	#	194	194	2
Cooperia rotundispiculum race	*	1 442	1 442	5
Cooperia type larvae	51	—	51	2
Gaigeria pachyscelis	0	25	25	1
Haemochus vegliai	0	100	100	1
Ostertagia harrisi	31	2 195	2 226	12
Paracooperia horaki	*	566	566	5
Setaria sp.	0	1	1	1
Trichostrongylus deflexus	0	105	105	4
Mean nematode burden	6	317	323	
Mkuzi (20 animals)				
Paramphistomes	#	5 577	5 577	12
Cooperia rotundispiculum race	*	6 288	6 288	10
Cooperia type larvae	277	—	277	4
Cordophilus sagittus	0	32	32	2
Gaigeria pachyscelis	0	1	1	1
Haemonchus vegliai	34	249	283	5
Impalaia tuberculata	50	50	100	1
Ostertagia harrisi	190	19 840	20 030	19
Paracooperia horaki	*	1 602	1 602	13
Setaria sp.	0	12	12	6
Trichostrongylus deflexus	0	339	339	2
Trichostrongylus falculatus	0	45	45	2
Mean nematode burden	28	1 423	1 451	
Nduma (14 animals)				
Paramphistomes	#	1 204	1 204	4
Thysaniezia sp.	#	Fragments		1
Cooperia rotundispiculum race	*	5 021	5 021	9
Cooperia type larvae	25	—	25	1
Cordophilus sagittus	0	3	3	3
Dictyocaulus viviparus	0	8	8	2
Haemonchus vegliai	85	3	88	2
Ostertagia harrisi	14	2 971	2 985	14
Paracooperia horaki	*	874	874	9
Setaria sp.	0	33	33	7
Trichostrongylus sp. females	—	51	51	2
Mean nematode burden	9	640	649	
False Bay (3 animals)				
Cooperia rotundispiculum race	0	71	71	1
Ostertagia harrisi	110	720	830	3
Setaria sp.	0	4	4	2
Mean nematode burden	37	265	302	
Total nematode burden (all reserves)	1 034	54 271	55 305	
Mean total nematode burden (all reserves)	13	687	700	

Not found in ruminants
— Not applicable
* Larvae indistinguishable at species level. Counted together as *Cooperia* spp.

TABLE 3 The total adult nematode burdens of each age group of male and female nyala from the Umfolozi, Mkuzi and Ndumu Game Reserves

Locality	Date	Adult		Juvenile		Calf		Mean monthly burden
		Male	Female	Male	Female	Male	Female	
Umfolozi cull area	Mar 83	3 280	93	193	–	–	–	1 189
	Apr 83	81	339	–	–	–	–	210
	May 83	732	–	–	–	–	–	732
	Jun 83	255	218	–	–	0	–	158
	Jul 83	441	126	289	–	–	–	285
	Oct 83	181	13	–	–	–	–	97
	Dec 83	–	109	–	67	–	–	88
	Jan 84	–	3	–	–	–	–	3
	Feb 84	8	0	–	–	–	–	4
	Mar 84	236	786	913	–	–	171	527
	Apr 84	1 448	34	–	48	–	–	510
Mean helminth burden		740	172	465	58	0	717	
Umfolozi no-cull area	May 83	–	193	–	0	–	–	97
	Jun 83	788	40	–	–	–	28	285
	Aug 83	675	85	–	–	–	0	253
	Oct 83	81	251	–	864	–	–	399
	Jan 84	312	–	–	1 085	–	–	699
Mean helminth burden		464	142	–	650	–	14	
Mkuzi	Mar 83	13 493	743	2 087*	–	–	–	4 603
	Jun 83	–	–	3 416	–	111	–	1 764
	Jul 83	295	243	–	–	–	–	269
	Oct 83	510	1 013	179	–	–	–	567
	Jan 84	525*	697	923	–	–	753	685
	May 84	365	219	–	58	–	200	211
Mean helminth burden		2 619	583	1 738	58	111	477	
Ndumu	Apr 83	391*	–	–	–	–	10	264
	May 83	–	–	–	383	–	–	383
	Aug 83	324	97	–	2 487*	–	–	1 349
	Jan 84	–	540	628	–	453	–	540
	May 84	524	126*	–	–	–	–	259
Mean helminth burden		408	222	628	1 786	453	10	

– No animal of this age or sex shot

* Mean burden of 2 antelope

harboured the *C. rotundispiculum* race and a *Setaria* sp. was present in 2.

Individual adult nematode burdens varied from 124 to 500 and all 3 nyala were infected.

DISCUSSION

The *C. rotundispiculum* race recovered from many of the nyala is clearly distinguishable from typical *C. rotundispiculum*, as described by Gibbons & Khalil (1980) (Boomker, 1991), and is identical to that found in bushbuck, red and blue duikers and suni from Natal (Boomker, Keep, Flamand & Horak, 1984; Boomker, Horak & Flamand, 1991; Boomker, Booyse & Keep, 1991; Boomker Booyse & Braack, 1991).

Umfolozi, Mukuzi and Ndumu

The helminths recovered from nyala from these 3 reserves are almost similar in their relative abundance and prevalence. *O. harrisi, P. horaki* and the *C. rotundispiculum* race should be considered the 3 major nematode species, and, according to the criteria set by Horak (1980), should be classified as definitive parasites.

H. vegliai and possibly the *Setaria* sp. from the antelope from Mkuzi, should be considered occasional parasites, while the remaining nematodes should be classed as accidental parasites.

Although more helminth species were recovered from the animals in the cull area, the worms occurred in small numbers in only a few nyala.

The mean nematode burden in the nyala from Mkuzi was about double that of the animals from Ndumu and slightly more than 3,5 times that of the nyala from the two areas within Umfolozi. However, if the large burden (13 293) of *O. harrisi* that was recovered from only 1 of the nyala is considered abnormal and ignored, the burden is approximately double that of the nyala in Umfolozi; it is then mostly due to *C. rotundispiculum* and *O. harrisi*, and is ascribed to the climate that prevailed at the time of the study.

Cordophilus sagittus was not present in any animals from Umfolozi, but were found in 2 and 3 nyala from Mkuzi and Ndumu, respectively. This may be due to the absence of the vector, which is assumed to be a tabanid fly (Boomker *et al.*, 1989).

D. viviparus was found in 2 nyala from the cull area in Umfolozi and from 2 in Ndumu. The reason for this peculiar distribution in 2 widely different vegetation and climatic types is unknown.

False Bay

The mean helminth burden is approximately one fifth that of the nyala from Mkuzi, about half of that of the nyala from Ndumu and slightly less that that from the nyala from both areas in Umfolozi.

As is evident from Table 2, the nyala from this locality harboured few helminth species. This is probably due to minimal cross-infection because of the few other antelope species occurring in this reserve.

General

The differences in the helminth species composition of the nyala in the Natal reserves are thought to be due to the number of antelope species in the various reserves. This is particularly true for such worms as *Impalaia tuberculata,* the *Trichostrongylus* spp. and *Gaigeria pachyscelis,* which are more often found in grazing antelope (Boomker, 1977; Horak, 1980; Horak, De Vos & Brown, 1983; Boomker *et al.*, 1989).

The total mean burdens of the animals did not differ significantly when compared by means of the Student t-test ($P < 0,3$).

No clear-cut trends in the seasonal abundance of any of the worms were encountered in this study. Peak worm burdens occurred during March 1983 and January 1984 in nyala shot in the cull and no-cull areas of Umfolozi, respectively. The former peak was due to 1 animal harbouring large numbers of *O. harrisi* and the latter to 1 animal having a large number of the *C. rotundispiculum* race.

Peak burdens were seen in nyala from Mkuzi during March 1983 and Ndumu during August 1983; the former was due to *O. harrisi* in 1 nyala and the latter to the *C. rotundispiculum* race, also in 1 animal.

Only in 1 prime adult male nyala shot during March 1983 in Mkuzi was a very high helminth burden encountered. This animal harboured 13 493 nematodes of which 13 293 were *O. harrisi*. However, it showed no ill effects of the infection, and one could deduce that either *O. harrisi* is only mildly pathogenic, or that nyala are tolerant to its effects.

It appears that male nyala in Umfolozi, Ndumu and Mkuzi carry larger burdens than the females, irrespective of their age. However, as too few juveniles and calves were collected, especially from Umfolozi, the data are inconclusive for the sexes.

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