

PARASITES OF SOUTH AFRICAN WILDLIFE. X. HELMINTHS OF RED DUIKERS, *CEPHALOPHUS NATALENSIS*, IN NATAL

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ABSTRACT

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The helminths of the following red duikers, *Cephalophus natalensis*, were examined: 24 from 3 game reserves in Natal and 1 that had originated from Charters Creek, Natal, shortly before it died in the National Zoological Gardens, Pretoria. The 21 animals from Charters Creek harboured 16 nematode species, a nematode genus, 2 cestode species and paramphistomes. The 2 red duiker from Fannies Island harboured 4 nematode species, 3 nematode genera and 1 cestode species, while the single red duiker from Ndumu was infected with 3 nematode species. The antelope from the National Zoological Gardens, Pretoria, harboured 2 nematode species, 1 nematode genus and 1 cestode species.

A race of *Cooperia rotundispiculum* was the most abundant nematode in duikers from all the reserves. *Hyostrongylus rubidus* is a new parasite record in South Africa and in red duikers, and was present in 80 % of the antelope. Although primarily a parasite of swine, *Hyostrongylus rubidus* should be regarded as a definitive parasite of these antelope.

INTRODUCTION

Red duikers are small antelope that are confined to thick scrub and evergreen forests of the eastern parts of Natal and a small area on the southern slopes of the Soutpansberg in the northern Transvaal (Smithers, 1983). They are considered rare and their status is precarious because of the rapid destruction of their natural habitat (Smithers, 1983).

Very little is known about their ecology, but Pienaar (1963) and Heinichen (1972) state that they either occur singly or in temporary pairs, or a female may be accompanied by her offspring. They are shy and secretive and are found near permanent surface water. They are believed to be territorial and they use communal dung heaps (Heinichen, 1972). Red duiker are delicate browsers feeding on fallen leaves, fruits, seeds and shoots of at least 11 species of plants (Pienaar, 1963; Heinichen, 1972).

Few helminths have been recorded from red duikers. Round (1968) lists only *Oesophagostomum roscoei* and an *Onchocerca* sp. from these antelope in Zambia. Boomker, Keep, Flamand & Horak (1984) recorded the worms from 2 animals from Charters Creek and Boomker & Vermaak (1986a, b) described *Trichostrongylus angistris* and *Trichostrongylus anomalus* from the same animals.

Because several red duikers at Charters Creek in the St. Lucia Nature Reserve had severe eye lesions and some of these were totally blind, 2 males were shot during March 1983. The cause of the lesions could not be determined from these animals and several more were collected. This explains the irregularity with which the animals were obtained.

MATERIALS AND METHODS

Study areas

Charters Creek (28° 14' S; 32° 25' E, altitude 0–100 m) and Fannies Island (28° 7' S; 32° 25' E, altitude 0–100 m) are rest camps situated on the western shores of Lake St. Lucia, and are part of the Lake St. Lucia Nature Reserve. This large reserve is classified as the Zululand Palm Veld subdivision of Coastal Thornveld and Coastal communities (Acocks,

1988). The annual rainfall varies from 650 to 1 000 mm, most of which falls in summer. Summers are hot and humid and winters are mild. Frost seldom occurs.

Ndumu Game Reserve, situated in the extreme north of Natal (32° 09'–32° 21' E; 26° 50'–26° 56' S, altitude 30–100 m), comprises an area approximately 11 000 ha in extent. The Park shares a common boundary of approximately 22,5 km with southern Mozambique in the north, and 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.

Survey animals

Nine male and 12 female red duikers of different ages were shot at irregular intervals from July 1984 to April 1987 at Charters Creek. For comparative purposes, 1 male and 1 female red duiker were shot at Fannies Island during April 1987.

A female red duiker was shot during December 1985 at Ndumu because of its severely debilitated condition.

When a single antelope died during May 1987 in the National Zoological Gardens, Pretoria, shortly after having been translocated from Charters Creek, its carcass was presented to us for internal parasite recovery.

Parasite collection

All the antelope were processed for helminth recovery as described by Boomker, Horak & De Vos (1989). The helminths were identified with the aid of the descriptions of the worms by the authors listed in Table 1. This table also lists the helminths recorded to date from red duikers.

RESULTS

The helminths recovered from the red duikers from the various localities and the number of animals infected are presented in Table 2.

Charters Creek

Sixteen nematode species, a nematode genus, 2 cestode species, and paramphistomes were recovered. Of these a *Cooperia rotundispiculum* race and *Trichostrongylus angistris* were the most prevalent nematodes, followed by *Hyostrogylus rubidus*, *Ostertagia harrisi* and *Trichostrongylus anomalus*. The remaining nematode species were present in less than 50 % of the antelope.

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TABLE 1 Amended list of the helminth parasites of red duikers from Natal, with reference to the first record and the authors of the descriptions used to assist with the identification of the worms

Parasite	First record	Identification
Trematodes		
Paramphistomes	This paper	Eduardo, 1982
Cestodes		
<i>Moniezia benedeni</i> (Moniez, 1879) R. Blanchard, 1891	This paper	Spassky, 1963
<i>Stilesia hepatica</i> Wolffhügel, 1903	This paper	Spassky, 1963
Nematodes		
A race of <i>Cooperia rotundispiculum</i> Gibbons & Khalil, 1980	Boomker <i>et al.</i> , 1984	Boomker <i>et al.</i> , 1984
<i>Cooperia yoshidai</i> Mönning, 1939	This paper	Gibbons, 1981
<i>Dictyocaulus viviparus</i> (Bloch, 1882) Railliet & Henry, 1907	This paper	Yorke & Maplestone, 1926
<i>Haemonchus contortus</i> (Rudolphi, 1803) Cobb, 1898	Boomker <i>et al.</i> , 1984	Gibbons, 1979
<i>Hyostromylus rubidus</i> (Hassal & Stiles, 1892) Hall, 1921	This paper	Levine, 1980
<i>Impalaia tuberculata</i> Mönning, 1923*	This paper	Boomker, 1977
<i>Longistromylus schrenki</i> (Ortlepp, 1939) Ortlepp, 1963	This paper	Gibbons, 1977
<i>Ostertagia harrisi</i> Le Roux, 1930	Boomker <i>et al.</i> , 1984	Le Roux, 1930
<i>Teladorsagia circumcincta</i> (Stadelmann, 1894) Drózd, 1965	This paper	Ransom, 1911
<i>Setaria cornuta</i> (Von Linstow, 1904) Railliet & Henry, 1911	This paper	Desset, 1966
<i>Setaria scalprum</i> (Von Linstow, 1908) Railliet & Henry, 1911	Boomker <i>et al.</i> , 1984	Yeh, 1959
<i>Strongyloides papillosus</i> (Wedl, 1856) Ransom, 1911	This paper	Ransom, 1911
<i>Trichostrongylus angistris</i> Boomker & Vermaak, 1986**	Boomker <i>et al.</i> , 1984	Boomker & Vermaak, 1986a
<i>Trichostrongylus anomalus</i> Boomker & Vermaak, 1986**	Boomker <i>et al.</i> , 1984	Boomker & Vermaak, 1986b
<i>Trichostrongylus axei</i> (Cobbold, 1879) Looss, 1905	This paper	Ransom, 1911
<i>Trichostrongylus thomasi</i> Mönning, 1932	This paper	Mönning, 1932, 1933
<i>Trichuris</i> sp. Roederer, 1761	This paper	Yorke & Maplestone, 1926

* Mönning (1923), when naming this nematode, provided the principal measurements but did not illustrate the nematodes. A more detailed description, including illustrations, was published by Mönning (1924)

** Boomker, Keep, Flamand & Horak (1984) classified these helminths as *Trichostrongylus capricola* and *Trichostrongylus vitrinus* but stated that they did not exactly fit the description and could prove to be new species. These were subsequently described (Boomker & Vermaak, 1986a, b)

The *Cooperia rotundispiculum* race was the most abundant, followed by *Trichostrongylus angistris*, *Trichostrongylus anomalus*, *Ostertagia harrisi*, *Hyostromylus rubidus* and *Trichostrongylus axei*.

Paramphistomes were the only trematodes present, and *Moniezia benedeni* and *Stilesia hepatica* the only cestodes.

The largest nematode burden (8 295) was recovered from an old male shot during July 1984 and the smallest burden of 105 nematodes from an adult female shot during April 1987.

Fanies Island

Four nematode species, 3 nematode genera and 1 cestode species were recovered. The *Cooperia rotundispiculum* race was the most abundant, followed by *Trichuris* sp., *Ostertagia* sp. females and *Hyostromylus rubidus*.

Ndumu

Several broken ribs and a broken leg, probably sustained in a car accident, were noticed at the autopsy of this duiker.

Only 3 nematode species, of which the *Cooperia rotundispiculum* race was the most abundant, were recovered.

Pretoria Zoological Gardens

Two nematode species, of which the *Cooperia rotundispiculum* race was the most abundant, a nematode genus and 1 cestode were recovered.

DISCUSSION

Since the previous reports on the helminths of red duiker (Boomker *et al.*, 1984; Boomker & Vermaak, 1986a, b), several new helminths can be added to the existing list. They are the paramphistomes, *M. benedeni*, *Stilesia hepatica*, *Cooperia yoshidai*,

Dictyocaulus viviparus, *Hyostromylus rubidus*, *Impalaia tuberculata*, *Longistromylus schrenki*, *Setaria cornuta*, *Strongyloides papillosus*, *Teladorsagia circumcincta*, *Trichostrongylus axei*, *Trichostrongylus thomasi* and *Trichuris* sp.

The *Cooperia rotundispiculum* race recovered in the present survey is identical to that recovered from several antelope species, including bushbuck and common duiker in Natal (Boomker *et al.*, 1984; Boomker, Keep & Horak, 1987; Boomker, Booyse & Keep, 1991; Boomker, Booyse & Braack, 1991).

The genus *Hyostromylus* was represented by three species, namely *Hyostromylus gabonensis* Durette-Desset & Chabaud, 1974 from *Hyemoschus aquaticus*, *Hyostromylus moreli* Durette-Desset & Denke, 1978 from *Lepus capensis* and *Hyostromylus rubidus* (Hassal & Stiles, 1892) Hall, 1921 from pigs. The first two species have since been placed in the genus *Cervicaprastrongylus* Gibbons & Khalil, 1982. The genus *Hyostromylus* now consists of *Hyostromylus rubidus*, which is the type and only species.

Hyostromylus rubidus was recovered only from the duikers from the Lake St. Lucia area, which includes Charters Creek and Fanies Island. The duiker that died in the zoological gardens is included here. This nematode is a stomach parasite of pigs throughout the world (Levine, 1980). It has been recorded from cattle (Da Costa & Benevenga, 1971, cited by Levine, 1980) but Round (1968) does not mention its occurrence in any of the African antelope. The nematode has also not been recorded from domestic pigs slaughtered at the Pretoria Municipal Abattoir (Horak, 1978), nor was it found in warthogs from the eastern Transvaal (Ortlepp, 1964; Horak, Boomker, De Vos & Potgieter, 1988; Boomker, Horak, Booyse & Meyer, 1991). *Hyostromylus rubidus* has, however, been found in 4 of 7 bushpigs, *Potamochoerus porcus*, from Cape Vidal, on the eastern shore of Lake St. Lucia (Boomker & Flamand, unpublished data, 1988). No other references

TABLE 2 Helminths recovered from 25 red duiker from various parts of Natal

Locality and helminth species	Number of worms recovered			Number of animals infected
	Larvae	Adults	Total	
Charters Creek (21 animals)				
Paramphistomes	0	2 065	2 065	8
<i>Moniezia benedeni</i> (scolecex)	#	6	6	3
<i>Stilesia hepatica</i>	#	Fragments	—	4
<i>Cooperia rotundispiculum</i>	928	18 958	19 886	20
<i>Cooperia yoshidai</i>	19	408	427	2
<i>Dictyocaulus viviparus</i>	0	28	28	4
<i>Haemonchus contortus</i>	211	242	453	9
<i>Hyostrongylus rubidus</i>	0	1 313	1 313	17
<i>Impalaia tuberculata</i>	0	77	77	5
<i>Longistrongylus schrenki</i>	*	13	13	1
<i>Ostertagia harrisi</i>	*	1 781	1 781	14
<i>Teladorsagia circumcincta</i>	*	72	72	2
<i>Ostertagia</i> type larvae	188	—	188	6
<i>Setaria cornuta</i>	0	3	3	2
<i>Setaria scalprum</i>	0	6	6	2
<i>Setaria</i> spp. females	0	5	5	2
<i>Strongyloides papillosus</i>	0	22	22	2
<i>Trichostrongylus angistris</i>	0	12 042	12 042	20
<i>Trichostrongylus anomalus</i>	0	4 046	4 046	13
<i>Trichostrongylus axei</i>	0	1 060	1 060	1
<i>Trichostrongylus thomasi</i>	0	3	3	1
<i>Trichuris</i> sp. females	—	30	30	3
Mean nematode burden	64	1 910	1 974	
Fanies Island (2 animals)				
<i>Moniezia benedeni</i> (scolecex)	#	9	9	2
<i>Cooperia rotundispiculum</i>	0	176	176	2
<i>Haemonchus contortus</i>	0	30	30	1
<i>Hyostrongylus rubidus</i>	0	44	44	2
<i>Impalaia</i> sp. females	—	10	10	1
<i>Ostertagia</i> sp. females	—	80	80	1
<i>Trichostrongylus anomalus</i>	0	18	18	2
<i>Trichuris</i> sp.	0	160	160	2
Mean nematode burden	0	259	259	
Ndumu (1 animal)				
<i>Cooperia rotundispiculum</i>	0	557	557	—
<i>Impalaia tuberculata</i>	0	1	1	—
<i>Ostertagia harrisi</i>	0	1	1	—
Mean nematode burden	0	559	559	
Pretoria Zoological Gardens (1 animal)				
<i>Moniezia benedeni</i> (scolex)	#	1	1	—
<i>Cooperia rotundispiculum</i>	0	310	310	—
<i>Hyostrongylus rubidus</i>	0	9	9	—
<i>Setaria</i> sp. female	—	1	1	—
Mean nematode burden	0	320	320	
Total nematode burden (25 red duikers)	1 348	46 467	47 815	
Mean total nematode burden (25 red duikers)	50	1 721	1 771	

Not found in ruminants

— Not applicable

* 4th stage larvae: specific identification not possible; recorded as *Ostertagia* type larvae

pertaining to this nematode in any animal in South Africa could be found in the literature, and it seems that the nematode represents a new record for South Africa, as well as red duikers. The nematode's presence in fairly large numbers in almost 80 % of the red duikers renders it a definitive parasite of these antelope.

In view of their abundance and the number of hosts infected, *Ostertagia harrisi*, *Trichostrongylus angistris* and *Trichostrongylus anomalus* should also be considered as definitive parasites.

Yeh (1959) considered *Setaria cornuta* (Von Linstow, 1899), *Setaria caelum* (Von Linstow, 1904), *Setaria transversata* (Von Linstow, 1907) and *Setaria sandersoni* Baylis, 1936 as conspecific and states: 'I have chosen *Artionema caelum* as type, because

both male and female type specimens are available and in good condition, and the host is known. *A. caelum* was chosen rather than the senior member, *F. [ilaria] cornuta*, of which only one complete male is available, in poor condition, and the host is an unknown species of antelope'. Desset (1966), however, disagrees with Yeh's (1959) opinion and retains the name *Setaria cornuta* for these nematodes, which, under the rules of zoological nomenclature, is correct. It has been recorded from common duikers (Ortlepp, 1961), and red duikers and suni (This survey; Boomker, Booysse & Braack, 1991.)

The occasional parasites appear to be *Haemonchus contortus* and *I. tuberculata*, while the accidental parasites seem to be *D. viviparus*, *L.*

schrenki, *Teladorsagia circumcincta*, *Strongyloides papillosus*, *Trichostrongylus axei*, *Trichostrongylus thomasi* and *Trichuris* sp.

As the survey was not conducted on a strictly seasonal basis, no clear pattern of seasonal abundance was evident, but relatively large numbers of nematodes were consistently found in the duikers shot during November of each year.

The generally small helminth burdens of red duikers probably results from their making use of communal dung heaps, which would confine the free-living infective larvae to a particular area. Despite the visits to these heaps, it is unlikely that the duikers would acquire large burdens, since the composting effect would kill many nematode eggs and free-living stages. During the wet season the remaining infective larvae will move laterally and horizontally, and natural curiosity or hunger could entice a red duiker, particularly one that has recently arrived in a territorium, to examine the dung heaps and feed on vegetation nearby, thus acquiring an infection.

Since few antelope were examined from 3 of the 4 localities, statistical testing of the mean nematode burdens was considered but not thought feasible. However, the mean burden of the antelope shot at Charters Creek during March 1983 was considerably larger than that of any of the antelope from this or the other localities.

The relatively larger burdens generally harboured by the antelope from Charters Creek are ascribed not only to the larger variety and higher population densities of other antelope species that occur here, but also to the population density of red duikers. Cross-infection apparently took place regularly, as is evident from the variety of helminth species recovered. In addition, the climatic conditions around the lake are more suitable for prolonged survival of infective stages than at the drier Ndumu. Although Fannies Island has a climate similar to Charters Creek, few other antelope species are present and cross-infection probably took place to a lesser degree. We are also of the opinion that the mean nematode burden of the red duikers from this locality is unlikely to be an accurate reflection of the actual situation, since few animals were processed for helminth recovery.

The *Cooperia rotundispiculum* race, *Ostertagia harrisi* and *Trichostrongylus angistris* are peculiar to browsing antelope, and were probably acquired from bushbuck or nyala, which abound in the St. Lucia Nature Reserve and Ndumu. With the exception of *Trichostrongylus axei* and *Teladorsagia circumcincta*, all the occasional and accidental parasites of red duikers were also recorded from reedbuck, *Redunca arundinum*, and impala from the St. Lucia Nature Reserve (Boomker, Horak, Flamand & Keep, 1989), and were possibly acquired by red duiker from these antelope.

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