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PARASITES OF SOUTH AFRICAN WILDLIFE. III. HELMINTHS OF COMMON REEDBUCK, *REDUNCA ARUNDINUM*, IN NATAL

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ABSTRACT

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Twenty-six common reedbuck, *Redunca arundinum*, were shot in pairs at monthly intervals for 13 consecutive months in the Himeville region of Natal. Ten nematode species, 2 cestodes and 1 trematode were recovered from these animals. *Cooperia yoshidai* was both the most numerous and most prevalent worm and peak burdens occurred during summer.

Thirty-one reedbuck, killed at different intervals in various localities within the St. Lucia Reserve, harboured between 4 and 11 nematode species, 1 cestode and 1 trematode. With the exception of 4 reedbuck shot during January 1987, in which *Haemonchus contortus* was the most abundant worm, *C. yoshidai* was again both the most abundant and most prevalent worm. Peak burdens of this nematode occurred during autumn to spring.

The helminths of 5 impala, *Aepyceros melampus*, also shot in the St. Lucia Reserve were examined. Some of the worm species of impala were also found in the reedbuck from the same locality and the helminths of the 2 antelope species are compared.

An amended list, which includes several new records of the parasites of common reedbuck in South Africa is provided.

INTRODUCTION

The ecology and habits of common reedbuck, *Redunca arundinum*, have briefly been discussed by Horak, Keep, Flamand & Boomker (1988).

The helminth parasites of reedbuck in Africa have been listed by Round (1968). The helminths of these antelope in the Republic of South Africa are given by Mönnig (1924, 1928, 1931, 1939), Ortlepp (1961), Round (1968), Keep (1983) and Boomker, Keep, Flamand & Horak (1984). The present paper provides an amended list of the helminth parasites of reedbuck in the Republic of South Africa.

Howard (1983) required freshly killed reedbuck for his detailed study of the species in Natal, and the opportunity was taken during the later stages of his project to collect the helminth parasites of 26 of the animals from the Himeville region. Permission was also obtained from the Natal Parks, Fish and Game Preservation Board to shoot 31 reedbuck and 5 impala, *Aepyceros melampus*, at different localities in the St Lucia Reserve. The helminths recovered from the reedbuck from the 2 localities and trends in their seasonal abundance are discussed in this paper, while the ectoparasites of the same animals have been recorded by Horak *et al.* (1988).

MATERIALS AND METHODS

The study areas

Both the study areas fall within the summer rainfall region, as illustrated by Reinecke (1983), and have been described by Horak *et al.* (1988).

The animals

Himeville

Two reedbuck, 1 adult and 1 sub-adult were shot each month for 13 consecutive months from May 1983 to May 1984. Their sexes depended on availability and 4 adult males, 9 adult females, 10 sub-adult males and 3 sub-adult females were collected.

The St. Lucia Reserve

One adult male, 1 adult female and 2 juvenile reedbuck of either sex were shot in the Eastern Shores Nature Reserve (ESNR) at 3-monthly intervals from March 1983 to April 1984. A further 2 reedbuck, 1 adult male and 1 adult female and 2 impala were shot in the St. Lucia Game Park during May 1984. Two male reedbuck were shot during August 1984 in an area in the ESNR where buffalo occur and 4 more reedbuck, an adult male, an adult female and 2 juveniles as well as 3 impala were shot at Charters Creek, which lies within the St. Lucia Reserve, during August 1984. Four more reedbuck were shot in the ESNR during January 1987 after a number of animals had been culled because of overpopulation.

Collection of parasites

The lungs, hearts and livers of all the antelope from Himeville were processed for worm recovery as described by Horak (1978) and the abomasa, the small intestines and the large intestines as described by Reinecke (1973).

As a water-bath was not available, the bottles containing the hearts, lungs, livers and digests of the reedbuck from the St. Lucia Reserve were placed in the sun, or, on cold or overcast days, near an open fire until the desired temperature of 40–43 °C was reached. They were then moved into the shade or away from the fire until the temperature dropped by 3–5 °C, whereafter they were shaken and returned to the sun or the fire. After sieving, the residues of the hearts, lungs and livers, as well as the digests were examined *in toto* under a stereoscopic microscope. One aliquot, representing 1/10th of the volume of the ingesta, was made separately for each of the abomasa, small intestines and large intestines and also examined under a stereoscopic microscope.

The adult worms were cleared in lactophenol and identified under a standard microscope with Nomarski's differential interference contrast illumination. The descriptions of the authors listed in Table 1 were used for the identification of the worms. This table also lists the worms recovered to date from common reedbuck in South Africa. In cases where more than 1 species of a genus was encountered, the males, but not the females, were identified specifically. Fourth stage larvae and trematodes were mostly identified only to generic level.

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

Helminth species	First record	Identification
Trematodes		
Paramphistomum spp. Fischoeder, 1901	This paper	Eudardo, 1982
Cestodes		
Cysticercus sp. (*sic*)	Ortlepp, 1961	*
Moniezia benedeni Blanchard, 1891	This paper	Skrjabin & Spasski, 1963
Taenia hydatigena larvae	This paper	Verster, 1969
Nematodes		
Bunostomum cobi Maplestone, 1931	Ortlepp, 1961	*
Bunostomum trigonocephalum Railliet, 1902	Mönnig, 1928	*
Bunostomum sp.	Boomker *et al.*, 1984	†
Cooperia fuelleborni Hung, 1926	Ortlepp, 1961	*
Cooperia neitzi Mönnig, 1932	Ortlepp, 1961	*
Cooperia yoshidai Mönnig, 1939	Mönnig, 1939	Gibbons, 1981
Gaigeria sp. females	This paper	Ortlepp, 1937
Dictyocaulus viviparus Railliet & Henri, 1907	Boomker *et al.*, 1984	Yorke & Maplestone, 1926
Haemonchus contortus Cobb, 1898	Ortlepp, 1961	Gibbons, 1979
Haemonchus vegliai Le Roux, 1929	Ortlepp, 1961	*
Longistrongylus sabie Travassos, 1937	Ortlepp, 1961	*
Longistrongylus schrenki Ortlepp, 1939	Boomker *et al.*, 1984	Gibbons, 1977
Oesophagostomum columbianum Curtice, 1890	Mönnig, 1931	*
Ostertagia ostertagi Ransom, 1907	This paper	Ransom, 1911
Setaria bicoronata Railliet & Henri, 1911	This paper	Yeh, 1959
Setaria boulengeri Thwaite, 1927	Thwaite, 1927	*
Setaria hornbyi Boulenger, 1921	Mönnig, 1924	*
Setaria labiatopapillosa Railliet & Henri, 1911	Veglia, 1919	Yeh, 1959
Trichostrongylus colubriformis Ransom, 1911	Boomker *et al.*, 1984	†
Trichostrongylus falculatus Ransom, 1911	This paper	Ransom, 1911
Trichuris sp. females	This paper	Yorke & Maplestone, 1926

* = After Round (1968). Not found in this survey

† = Not found in this survey

TABLE 2 The helminths recovered from 26 common reedbuck from Himeville

Helminth species	Number of worms recovered			Number of animals infested
	Larvae	Adults	Total	
Paramphistomes	*	1 494	1 494	17
Moniezia benedeni	*	1	1	1
Taenia hydatigena	3	*	3	3
Cooperia yoshidai	317	37 969	38 286	22
Dictyocaulus viviparus	0	203	203	14
Gaigeria sp.	0	50	50	2
Haemonchus contortus	575	1 080	1 655	11
Longistrongylus schrenki	0	2 065	2 065	17
Ostertagia ostertagi	0	101	101	3
Setaria bicoronata	0	54	54	6
Setaria labiatopapillosa	0	1	1	1
Trichostrongylus falculatus	3	75	78	3
Trichuris sp. females	0	25	25	1
Mean nematode burden	34	1 601	1 635	—

* = Not found in reedbuck

— = Not applicable

RESULTS

Himeville

The helminths recovered from reedbuck from this region are listed in Table 2 and their seasonal abundance is graphically illustrated in Fig. 1.

Ten nematode species, 2 cestodes and 1 trematode were recovered. Of these, *Cooperia yoshidai* was both the most abundant and most prevalent nematode. One specimen of *Moniezia benedeni* was found in 1 of the animals and 3 others each harboured 1 larva of *Taenia hydatigena*. Paramphistomes were recovered from 17 animals.

The largest burden of 9 676 worms was recovered from an adult female shot during July 1983 and the smallest burden of 50 worms from a sub-adult male shot during May 1984. Only 1 animal, a sub-adult female shot during August 1983 did not harbour any worms.

The St. Lucia Reserve

The helminths recovered from the reedbuck shot in this reserve are listed in Table 3 and their seasonal abundance is illustrated in Fig. 2.

Nine nematode species, 1 cestode and 1 trematode were recovered from the 19 animals shot from March 1983 to April 1984 in the ESNR. The most abundant worm was *C. yoshidai* and the most prevalent worms were *Haemonchus contortus* and *Longistrongylus schrenki*.

The 4 reedbuck collected during January 1987 from the ESNR harboured only 4 nematodes species, of which

TABLE 3 The helminths recovered from common reedbuck from the St. Lucia Reserve

Helminth species	Number of worms recovered			Number of animals infested
	Larvae	Adults	Total	
Eastern Shores (19 animals)				
Paramphistomes	*	183	183	1
Moniezia benedeni	*	1	1	1
Cooperia yoshidai	4 422	59 114	63 536	16
Dictyocaulus viviparus	0	818	818	17
Gongylonema sp.	0	8	8	2
Haemonchus contortus	12 070	11 716	23 786	18
Longistrongylus schrenki	3 414	5 956	9 370	18
Oesophagostomum columbianum	1	51	52	3
Setaria bicoronata	0	194	194	14
Skrjabinema sp.	0	14 524	14 524	7
Trichuris sp. females	0	25	25	1
Mean nematode burden	1 048	4 863	5 911	
Eastern Shores, buffalo area (2 animals)				
Cooperia yoshidai	401	6 436	6 837	2
Dictyocaulus viviparus	0	311	311	2
Gongylonema sp.	0	7	7	1
Haemonchus contortus	1 803	700	2 503	2
Longistrongylus schrenki	502	1 055	1 557	2
Oesophagostomum sp. females	—	25	25	1
Setaria sp. females	—	6	6	1
Skrjabinema sp.	0	976	976	1
Mean nematode burden	1 353	4 758	6 111	
St. Lucia Game Park (2 animals)				
Cooperia hungi	†	101	101	1
Cooperia yoshidai	†	7 075	7 075	2
Cooperioides hepaticae	†	5	5	1
Cooperia-like	101	9 209	9 310	2
Dictyocaulus viviparus	0	293	293	2
Gongylonema sp.	0	1	1	1
Impalaia tuberculata	0	251	251	2
Longistrongylus schrenki	37	1 536	1 573	2
Oesophagostomum sp.	28	0	28	2
Setaria bicoronata	0	41	41	2
Skrjabinema sp.	0	11 156	11 156	2
Mean nematode burden	83	14 834	14 917	
Charters Creek (4 animals)				
Cooperia yoshidai	17 625	43 164	60 789	4
Dictyocaulus viviparus	0	278	278	4
Haemonchus contortus	1 167	2 330	3 497	4
Longistrongylus schrenki	0	333	333	3
Setaria sp. females	0	61	61	4
Skrjabinema spp.	0	10 650	10 650	1
Mean nematode burden	4 698	14 204	18 902	
Eastern Shores, January 1987 (4 animals)				
Cooperia yoshidai	10	64	74	2
Gaigeria sp. females	0	10	10	1
Haemonchus contortus	40	594	634	4
Longistrongylus schrenki	731	99	830	3
Mean nematode burden	195	192	387	

* = Not found in reedbuck
— = Not applicable
† = Larvae and females counted together as *Cooperia*-like

L. schrenki was the most abundant and *H. contortus* the most prevalent.

Eight nematode species were recovered from the 2 reedbuck from the buffalo area of the ESNR. *C. yoshidai* was the most abundant and together with *H. contortus*, *L. schrenki* and *Dictyocaulus viviparus*, occurred in both antelope.

Eleven nematode species, of which *Cooperia* spp. were the most abundant, were recovered from the reedbuck in the St. Lucia Game Park.

Only 6 nematode species were recovered from the antelope from Charters Creek. *C. yoshidai* was the most numerous and together with *D. viviparus*, *H. contortus* and a *Setaria* sp. occurred in all 4 animals.

The helminths recovered from the impala from the 2 localities are listed in Table 4.

Fifteen species of nematodes and 1 trematode were recovered from the impala from the St. Lucia Game Park. The *Cooperia* spp. together with the 2 *Coo-*

TABLE 4 The helminths recovered from impala from the St. Lucia Reserve

Helminth species	Number of worms recovered			Number of animals infested
	Larvae	Adults	Total	
St. Lucia Game Park (2 animals)				
Paramphistomes	*	1	1	1
Agriostomum sp. females	—	25	25	1
Cooperia fuelleborni	†	84	84	2
Cooperia hungi	†	204	204	2
Cooperia yoshidai	†	1 106	1 106	2
Cooperia spp. females	—	1 884	1 884	2
Cooperioides hamiltoni	†	236	236	2
Cooperioides hepaticae	†	85	85	2
Cooperia-like larvae	135	—	135	2
Dictyocaulus viviparus	0	18	18	1
Gaigeria pachyscelis	0	77	77	1
Haemonchus contortus	193	2 246	2 439	2
Impalaia tuberculata	82	1 795	1 877	2
Longistrongylus schrenki	0	290	290	2
Oesophagostomum sp.	104	50	154	2
Ostertagia sp.	0	153	153	2
Strongyloides papillosus	0	450	450	1
Trichostrongylus spp. females	—	75	75	1
Mean nematode burden	257	4 602	4 859	
Charters Creek (3 animals)				
Cooperioides hamiltoni	0	60	60	3
Haemonchus contortus	166	1 130	1 296	3
Longistrongylus schrenki	397	316	713	1
Trichostrongylus angistris	†	1	1	1
Trichostrongylus thomasi	†	119	119	3
Trichostrongylus instabilis	†	10	10	1
Trichostrongylus spp.	0	247	247	3
Mean nematode burden	187	628	815	

† = Larvae indistinguishable at species level and counted together
— = Not applicable
* = Not found in impala

perioides spp. were the most numerous, followed by *H. contortus*, and *Impalaia tuberculata*. Both antelope were infested with these nematodes.

Seven nematodes were recovered from the impala from Charters Creek. Of these, *H. contortus* was the most numerous, followed by *L. schrenki* and *Trichostrongylus* spp.

DISCUSSION

Himeville

D. viviparus is normally a definitive parasite of cattle and according to Reinecke (1983), it occurs particularly on irrigated pastures in isolated areas in the mist belt of the Drakensberg of Natal and the Transvaal, as well as in the western Cape Province. It has also been recovered from several antelope species, including reedbuck (Horak, De Vos & Brown, 1983; Boomker *et al.*, 1984). *D. viviparus* infestation seems to be common in the Himeville area. This is borne out by the fact that the 2 reedbuck previously examined for parasites (Boomker *et al.*, 1984) as well as 14 out of 26 antelope examined during this survey harboured this worm. A reedbuck from Midmar Dam and 1 from Estcourt, however, did not harbour these parasites (Boomker *et al.*, 1984). The free-living stages of this nematode are sensitive to heat and desiccation but are resistant to cold. Himeville falls within the mist belt of the Natal Drakensberg, where the winters are severe but the summers moderate. These environmental conditions appear to be favourable for the survival of the infective stages of this lungworm (Oakley, 1979; Reinecke, 1983; Boomker *et al.*, 1984).

H. contortus is a parasite of sheep, goats and cattle, but like *D. viviparus* has been recorded from many antelope species (Horak, 1981; Horak, Brown, Boomker, De Vos & Van Zyl, 1982; Horak, De Vos & De Klerk, 1982; Boomker, Du Plessis & Boomker, 1983; Horak *et al.*, 1983; Boomker *et al.*, 1984; Boomker, Horak & De Vos, 1986). According to the criteria set by Horak (1980, 1981), these helminths, together with *C. yoshidai*, and *Setaria bicoronata* could be considered definitive parasites of reedbuck. The occasional parasites seem to be the *Trichuris* spp., and the accidental parasites *O. ostertagi, Setaria labiatopapillosa* and *Trichostrongylus falculatus*.

Of a grand total of 44 166 helminths recovered from the 26 reedbuck, 38 286 were adult *C. yoshidai* and 4th stage *Cooperia* sp. larvae. Large numbers of *C. yoshidai* are to be expected in reedbuck since it is the type host (Mönnig, 1939), and trends in the seasonal abundance of the nematodes of reedbuck in the present survey seem to be due to *C. yoshidai* only.

The largest burden of 9 000 *C. yoshidai* was present in 1 of the animals shot during July 1983 (Fig. 1). The infective larvae of the *Cooperia* spp. are resistant to desiccation and to low temperatures (Reinecke, 1983) and can overwinter on irrigated pastures. Since reedbuck are known to utilize irrigated pastures in this area during winter (Howard, 1983), it is conceivable that the large burden in this animal was acquired from the pastures.

Smaller peaks of *C. yoshidai* were observed in reedbuck during October, November and December 1983 (Fig. 1) and we are of the opinion that these peaks reflect the true situation. This agrees with Hobbs (1961), who recorded peak egg counts due to *Cooperia* spp. in calves in Natal during spring and summer, and with Boomker, Keep & Horak (1987), who recovered peak numbers of a *Cooperia* sp. in bushbuck and grey duiker in the same province during these seasons.

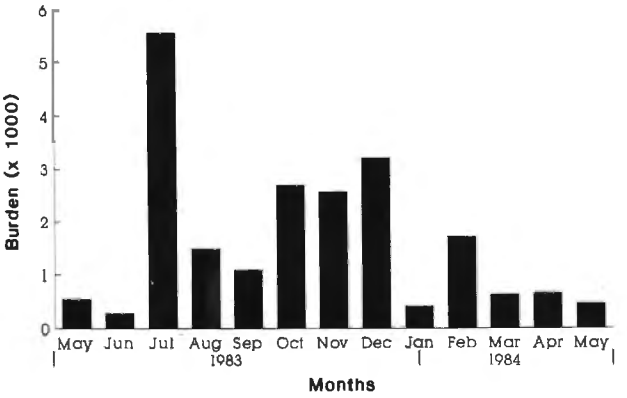

FIG. 1 The seasonal abundance of nematodes in common reedbuck in the Himeville region, Natal

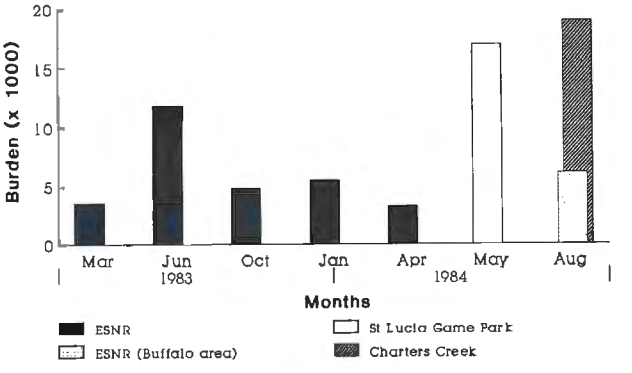

FIG. 2 The seasonal abundance of nematodes of common reedbuck in the St. Lucia Nature Reserve

Three reedbuck harboured only small numbers of *Ostertagia ostertagi*. This appears to be an accidental parasite of these animals and was probably acquired from cattle on the irrigated pastures.

Ortlepp (1939) described *L. schrenki* from a waterbuck, *Kobus ellipsiprymnus*, while Boomker *et al.* (1984) found small numbers of this parasite in reedbuck from Himeville and other regions of Natal. From the present data it appears to be fairly common in the province and should be considered a definitive parasite of reedbuck.

The mean total burden of 1 681 nematodes in the reedbuck is approximately the same as that found by Boomker *et al.* (1984) in reedbuck from other localities on the Natal midlands and should be considered the 'normal' mean burden in areas with a moderate climate.

The St. Lucia Reserve

Reedbuck

The definitive parasites of reedbuck from this locality are the same as those of reedbuck from Himeville. The occasional parasites are *Gongylonema* sp., *Skrjabinema* sp., *Trichuris* sp. and the *Oesophagostomum* spp., while the *Gaigeria* sp. and in the St. Lucia Game Park, *Cooperia hungi*, *Cooperioides hepaticae* and *Impalaia tuberculata* appear to be the accidental parasites.

Out of a grand total of 112 497 worms collected from the 19 animals from the ESNR, 63 533 (56,5 %) were *C. yoshidai* and their 4th stage larvae. In the ESNR (buffalo area) a total of 12 220 worms was recovered, of which 6 838 were *C. yoshidai* and their larvae. No trematodes or cestodes were recovered from the animals from the other localities within the St. Lucia Reserve. The reedbuck at Charters Creek harboured a total of 75 610 worms, of which 60 791 were *C. yoshidai* and their larvae. *C. yoshidai* constituted less than 50 % of the burdens of the reedbuck from the St. Lucia Game Park. Out of a total of 33 890 nematodes, 16 485 were *C. yoshidai* and 11 156 *Skrjabinema* sp.

The seasonal abundance of the helminths recovered from the reedbuck from the various localities within the St. Lucia Game Reserve are illustrated in Fig. 2.

The largest numbers of *C. yoshidai* in the antelope from the ESNR occurred in June 1983 and was due to one animal harbouring more than 10 000 worms. Large burdens of *C. yoshidai* also occurred in the reedbuck from the St. Lucia Game Park shot during May 1984 and in those from Charters Creek, shot in August 1984. From the present limited data it appears that *C. yoshidai* occurs in peak numbers during the cooler months of the year in reedbuck in the ESNR (May–August).

Despite the sensitivity of the free-living stages of *D. viviparus* to desiccation and heat, this nematode was present in the majority of the antelope in the St. Lucia Reserve, where the winters are mild and the summers hot, albeit in slightly smaller numbers than in the Himeville region with its severe winters and mild summers. This is in accordance with Reinecke's (1983) observation that the parasites are rife on irrigated pastures, to which the ESNR with its seasonally inundated grasslands and high rainfall could be likened.

There are 3 known species of *Skrjabinema* that parasitize the ruminants of this country. They are *Skrjabinema ovis*, *Skrjabinema africana* and *Skrjabinema alata* (Mönnig, 1932). As *S. africana* was described from 3 immature females and *S. alata* from 7 females only, we were unable to identify the *Skrjabinema* species found in this survey. These nematodes appear to be apathogenic, despite large numbers being present (11 081 in a reedbuck from the St. Lucia Game Park).

Trichuris sp., *Oesophagostomum columbianum*, and *I. tuberculata* are ubiquitous nematodes that have been recovered from a large variety of antelope (Round, 1968; Boomker, 1977; Gibbons, Durette-Desset & Daynes, 1977; Horak *et al.*, 1983).

C. hungi and *C. hepaticae* are nematodes that are primarily parasites of impala. Their presence in reedbuck in the St. Lucia Game Park is probably due to cross-infestation.

Impala

The 3 impala from Charters Creek harboured considerably fewer worms than the reedbuck. Presumably, this is because impala are mixed feeders, browsing frequently in between grazing periods, while reedbuck will only browse during winter or droughts, when grass is not readily available. We assume that reedbuck ingest more infective larvae on the grazing than do impala.

One of the impala from Charters Creek harboured a single male *Trichostrongylus angistris*, a nematode only recently described from the red duiker, *Cephalophus natalensis*, from this reserve (Boomker & Vermaak, 1986). The nematode has so far been recovered only from red duiker and its presence in impala is therefore a new record.

General considerations

The definitive parasites of reedbuck in Natal appear to be *C. yoshidai*, *D. viviparus*, *H. contortus*, *L. schrenki* and *Setaria* spp., all of which were recovered from antelope from the various localities. In the majority of cases, *C. yoshidai* was both the most abundant and the most

prevalent, with *D. viviparus, H. contortus* or *L. schrenki* occupying second, third or fourth place.

An interesting pattern as regards the total worm burdens from the different localities emerged from this study. The antelope from Himeville had the smallest mean burden, namely, 1 635 worms. We assume that the reedbuck population density in this region is such that the pasture does not become contaminated to any significant degree and that the regular treatment of the domestic stock with anthelmintics indirectly serves to limit the burdens in the antelope. Furthermore, the severe winters in the region cause many of the free-living stages to die.

The reedbuck from the ESNR and the area in the ESNR where buffalo occur had mean burdens of 5 911 and 6 111 worms respectively. The burdens are approximately 3,6–3,7 times that of the reedbuck from Himeville, indicating that the environmental conditions are more suitable for the survival of the free-living stages. It is also possible that because the population density of the reedbuck (0,46 per ha) is higher here than at Himeville, the environment is contaminated to a greater degree, ultimately leading to higher burdens.

The 4 reedbuck shot during January 1987 in the ESNR had a significantly lower total helminth burden, 387 as opposed to the approximately 6 011 worms in the antelope shot earlier. This may have been due to fewer infective larvae on the veld because of a smaller antelope population after some culling had taken place.

The antelope from the St. Lucia Game Park had a larger variety of worms and the mean burden was 14 917. This is approximately 9 times that of the reedbuck from Himeville and 2,5 times that of the antelope from the ESNR. The presence of worms such as *C. hungi, C. fuelleborni, C. hepaticae* and *I. tuberculata*, which are parasites of a number of other antelope species, including impala but excluding reedbuck, indicates that cross-infestation took place to a much greater degree than in the other localities. The Game Park is fenced and the population density of 0,86 reedbuck per ha is such that they, and presumably the other antelope species as well, are infested with each other's worms to a significant degree. It appears that host-specificity is largely absent in this park.

The lack of diversity in helminth species and the large mean burden in the reedbuck from Charters Creek is possibly the result of the few other grazing antelope that occur there as well as the high population density of 0,86 animals per ha. The reedbuck appear to be infested with their own host-specific worms and considering the mean burden of 18 902 worms, which is approximately 11,5 times that of the antelope from Himeville, considerable numbers of infective larvae must continually be present. Although the burden consists mainly of *C. yoshidai*, of which the pathogenicity is unknown, we are of the opinion that too many reedbuck are present and that some animals may have to be removed.

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