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PARASITES OF SOUTH AFRICAN WILDLIFE. XIII. HELMINTHS OF GREY RHEBUCK, *PELEA CAPREOLUS*, AND OF BONTEBOK, *DAMALISCUS DORCAS DORCAS*, IN THE BONTEBOK NATIONAL PARK

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ABSTRACT

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A total of 25 grey rhebuck, *Pelea capreolus*, and 16 bontebok, *Damaliscus dorcas dorcas*, were shot for parasite recovery at bi-monthly intervals in the Bontebok National Park, south-western Cape Province, from February 1983 to December 1983 and February 1983 to February 1984, respectively.

The grey rhebuck and the bontebok each harboured 9 nematode species and the latter animals 1 cestode species. *Ostertagia hamata* was most abundant and most prevalent in the grey rhebuck and *Longistrongylus curvispiculum* and *Nematodirus spathiger* in the bontebok. *Longistrongylus schrenki* is recorded for the first time in grey rhebuck, and *Trichostrongylus falculatus* and *Moniezia expansa* in bontebok. The total nematode burdens of the bontebok were considerably larger than those of the grey rhebuck.

No clear pattern of seasonal abundance for the helminths of either host species was evident.

INTRODUCTION

Currently, grey rhebuck are confined to certain areas within the Republic of South Africa, as well as Lesotho and Swaziland. Their distribution within these countries is discontinuous and patchy, depending on the presence of suitable habitats. The largest numbers occur in the eastern and southern parts of South Africa, particularly in Natal and the eastern, southern and south-western Cape Province (Smithers, 1983). Grey rhebuck are usually associated with rocky hills and mountain slopes and plateaux with good grass cover (Smithers, 1983). They live in small family parties of up to 12 individuals and appear to be independent of a water supply (Smithers, 1983).

Dorst & Dandelot (1972) state that grey rhebuck are entirely grazers, a view also held by other authors (Smithers, 1983; Bothma & Van Rooyen, 1989). However, Esser (1973) and Ferreira (1983), have shown that grey rhebuck are browsers. Beukes (1988) studied the rumen contents of these antelope in the Bontebok National Park (BNP), south-western Cape Province and found that, on average, it consisted of 96,9 % dicotyledonaceous plants. Contrary to common belief therefore, grey rhebuck have conclusively been shown to be browsers in those areas in which their feeding habits have been studied.

Before 1980, only 3 helminth parasites had been recorded from these animals and none from within the South African borders. Mönnig (1932) recorded *Haemonchus bedfordi, Oesophagostomum columbianum* and *Ostertagia circumcincta* from grey rhebuck shot in Swaziland during 1931. Round (1968), however, lists Mönnig's (1932) records as originating from South African antelope, but states that no locality was given for the rhebuck from which *Oesophagostomum columbianum* was recovered.

Boomker, Horak & De Vos (1981) described *Paracooperioides peleae* from grey rhebuck collected in the BNP and Horak, De Vos & De Klerk (1982) found *Haemonchus contortus* with exceptionally long spicules, as well as *Longistrongylus curvispiculum, Longistrongylus namaquensis, Ostertagia hamata, Paracooperioides peleae, Nematodirus spathiger, Trichostrongylus falculatus, Trichostrongylus pietersei* and *Trichostrongylus rugatus* in the same animals. Boomker, Horak, Gibbons & De Vos (1983) subsequently described the long spicule type of *H. contortus* found in these animals. No other records pertaining to the helminths of these antelope in South Africa could be found in the literature.

Bontebok are confined to the south-western Cape Province and are considered the most uncommon antelope in the southern African subregion (Smithers, 1983).

They are a diurnal, gregarious species, of which the social organisation consists of territorial males, female herds and bachelor groups (Smithers, 1983). They are entirely grazers, showing a preference for short grass (Nolte, 1973, cited by Smithers, 1983).

Van der Walt & Ortlepp (1960) found 'lungworms and conical flukes' *(sic)* in bontebok that died during their translocation from Bredasdorp to the current BNP. In 1961, Ortlepp listed the helminths and in 1962 described 2 new lungworms, *Protostrongylus capensis* and *Pneumostrongylus cornigerus*, recovered from these antelope.

Round (1968) erroneously listed *H. contortus, Trichostrongylus axei* and *Trichostrongylus colubriformis* as occurring in bontebok; they were in fact recovered from blesbok (Martinaglia, 1937, cited by Verster, Imes & Smit, 1975). In the section on the host/parasite check list by country, however, Round (1968) omits these nematodes from the list for bontebok.

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TABLE 1 Amended list of the helminth parasites of grey rhebuck in the Bontebok National Park, 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		
Fasciola hepatica Linnaeus, 1758	Boomker, 1990	*
Nematodes		
Dictyocaulus sp. females	Horak *et al.*, 1982[1]	*
Haemonchus contortus, long spicule type Boomker, Horak, Gibbons & De Vos, 1983	Horak *et al.*, 1982[1]	Boomker *et al.*, 1983[2]
Longistrongylus curvispiculum (Gibbons, 1973) Gibbons, 1977	Horak *et al.*, 1982[1]	Gibbons, 1977
Longistrongylus namaquensis (Ortlepp, 1963) Gibbons, 1977	Horak *et al.*, 1982[1]	Gibbons, 1977
Longistrongylus schrenki Ortlepp, 1939	This paper	Gibbons, 1977
Nematodirus spathiger (Railliet, 1896) Railliet & Henry, 1909	Horak *et al.*, 1982[1]	Becklund & Walker, 1967
Ostertagia hamata Mönnig, 1932	Horak *et al.*, 1982[1]	Mönnig, 1932
Paracooperioides peleae Boomker, Horak & De Vos, 1981	Boomker *et al.*, 1981	Boomker *et al.*, 1981
Trichostrongylus deflexus Boomker & Reinecke, 1989	Boomker, 1990	*
Trichostrongylus falculatus Ransom, 1911	Horak *et al.*, 1982[1]	Ransom, 1911
Trichostrongylus pietersei Le Roux, 1932	Horak *et al.*, 1982[1]	*
Trichostrongulus rugatus Mönnig, 1925	Horak *et al.*, 1982[1]	Mönnig, 1925

[1] Horak, De Vos & De Klerk, 1982

[2] Boomker, Horak, Gibbons & De Vos, 1983

* Not found in this survey

TABLE 2 Amended list of the helminth parasites of bontebok in the Bontebok National Park, with reference to the first record and the authors of the descriptions used to assist with the identification

Parasite	First Record	Identification
Trematodes		
Paramphistomum microbothrium Fischoeder, 1901	Ortlepp, 1961	*
Cestodes		
Taenia hydatigena, larvae	Verster *et al.*, 1975	*
Moniezia expansa (Rudolphi, 1810) R. Blanchard, 1891	This paper	Spassky, 1963
Nematodes		
Agriostomum equidentatum Mönnig, 1929	Horak *et al.*, 1982[1]	*
Cooperia curticei (Giles, 1892) Ransom, 1907	Horak *et al.*, 1982[1]	*
Cooperia hungi Mönnig, 1931	Ortlepp, 1961	*
Cooperia neitzi Mönnig, 1930	Verster *et al.*, 1975	*
Bronchonema magna Mönnig, 1932	Verster *et al.*, 1975	*
Haemonchus sp.	Verster *et al.*, 1975	*
Haemonchus contortus, long spicule type Boomker, Horak, Gibbons & De Vos, 1983	Horak *et al.*, 1982[2]	*
Impalaia tuberculata Mönnig, 1924	Verster *et al.*, 1975	*
Longistrongylus curvispiculum (Gibbons, 1973) Gibbons, 1977	Horak *et al.*, 1982[1]	Gibbons, 1977
Longistrongylus namaquensis (Ortlepp, 1963) Gibbons, 1977	Horak *et al.*, 1982[1]	Gibbons, 1977
Nematodirus spathiger (Railliet, 1896), Railliet & Henry, 1909	Verster *et al.*, 1975	Becklund & Walker, 1967
Ostertagia hamata Mönnig, 1932	Verster *et al.*, 1975	*
Pneumostrongylus cornigerus Ortlepp, 1962	Ortlepp, 1962	*
Protostrongylus capensis Ortlepp, 1962	Ortlepp, 1962	Ortlepp, 1962
Strongyloides sp.	Verster *et al.*, 1975	*
Trichostrongylus axei (Cobbold, 1879) Looss, 1905	Horak *et al.*, 1982[1]	Ransom, 1911
Trichostrongylus falculatus Ransom, 1911	This paper	Ransom, 1911
Trichostrongylus pietersei Le Roux, 1932	Horak *et al.*, 1982[1]	Le Roux, 1932
Trichostrongylus rugatus Mönnig, 1925	Verster *et al.*, 1975	Mönnig, 1925

[1] Horak, Brown, Boomker, De Vos & Van Zyl, 1982

[2] Horak, De Vos & De Klerk, 1982

* Not found in this survey

Verster *et al.* (1975) recovered 2 nematode genera, 4 nematode species and the larval stage of *Taenia hydatigena* from bontebok, which died shortly after being translocated to the National Zoological Gardens, Pretoria. Horak, De Vos & De Klerk (1982) subsequently added *H. contortus* (long spicule race), and *Trichostrongylus axei* was added by Horak, Brown, Boomker, De Vos & Van Zyl (1982), who, at the time, did not indicate that it was a new parasite record for these antelope.

In this paper *Longistrongylus schrenki* is added to the list of helminths of grey rhebuck, and *Monieza expansa* and *Trichostrongylus falculatus* to that of bontebok. the seasonal abundance of nematodes in grey rhebuck and bontebok in the BNP during 1983 is also discussed.

MATERIAL AND METHODS

Study area

The geophysiology of the BNP has been described in some detail by Beukes (1988). In summary, the Park (34° 03′ S; 20° 30′ E; Alt.

90-200 m) is 2 812 ha in extent and is situated in Coastal Renosterbosveld (Acocks, 1988) near the town of Swellendam. In addition to bontebok and grey rhebuck, the BNP also contains red hartebeest, *Alcelaphus buselaphus,* steenbok, *Raphicerus campestris,* Cape grysbok, *Raphicerus melanotis,* common duikers, *Sylvicapra grimmia,* bushbuck, *Tragelaphus scriptus* and about 4 springbok, *Antidorcas marsupialis.*

The animals

Four grey rhebuck were shot in the BNP at bimonthly intervals from February 1983 to December 1984. An attempt was made to secure an adult male, an adult female, and a juvenile and a lamb of either sex during each collection. During February 1983, however, 5 antelope were shot in the Park and their worms, as well as those of an animal that was run over by a car just outside the Park, collected. During December 1983 only 3 grey rhebuck were shot. A total of 25 antelope were shot, of which 10 were adult males, 7 adult females, 4 subadult or juvenile males, 1 subadult female and 3 female lambs.

Two bontebok, one juvenile and one adult of either sex were shot at the same times as the grey rhebuck, except during June 1983 and February 1984 when 4 antelope were shot. A total of 16 antelope, consisting of 3 adult males, 5 adult females, 1 subadult male, 5 juvenile males and 2 juvenile females were processed for helminth recovery.

Collection and identification of parasites

The parasites were collected in the field as described by Horak (1978).

One aliquot, representing $^{1}/_{10}$th of the volume of the ingesta, was made for each of the abomasa, small intestines and large intestines of the antelope. All these aliquots were examined under a stereoscopic microscope, and the worms counted and removed.

Washings of the hearts, livers and lungs, as well as the digests of the mucosa of the abomasa and small and large intestines, collected as described by Horak (1978), were examined *in toto,* and all the worms counted, removed and identified. *Protostrongylus capensis* were not counted individually, as they are extremely difficult to remove from the lungs.

The nematodes were cleared in lactophenol and phenolalcohol, and identified under a standard microscope with differential interference illumination, using the description of the worms provided by the authors listed in Tables 1 & 2. These tables also list the helminth parasites of grey rhebuck and bontebok recorded to date.

Where males of more than 1 species of a particular nematode genus were present, the females were proportionately allocated to the respective species.

RESULTS

The numbers of helminths recovered and their prevalence in grey rhebuck are given in Table 3, and those of bontebok in Table 4. The total nematode burdens according to host age and sex of grey rhebuck and bontebok are presented in Tables 5 & 6,

TABLE 3 Helminths recovered from 25 grey rhebuck in the Bontebok National Park

Helminth species	Number of worms recovered			Number of animals infected
	Larvae	Adults	Total	
Haemonchus contortus, long spicule type	20	2 110	2 130	11
Longistrongylus curvispiculum	*	172	172	7
Longistrongylus namaquensis	*	746	746	8
Longistrongylus schrenki	*	8	8	1
Nematodirus spathiger	1 027	504	1 531	8
Ostertagia hamata	*	5 409	5 409	21
Ostertagia-type larvae	329	—	329	8
Paracooperioides peleae	0	2 838	2 838	18
Trichostrongylus falculatus	0	1 753	1 753	6
Trichostrongylus rugatus	0	2	2	1
Total nematode burden	1 376	13 542	14 918	
Mean nematode burden	55	542	597	

— Not applicable

* Larvae indistinguishable at species level and counted together as *Ostertagia*-type

TABLE 4 Helminths recovered from 16 bontebok in the Bontebok National Park

Helminth species	Number of worms recovered			Number of animals infected
	Larvae	Adults	Total	
Moniezia expansa	‡	1	1	1
Longistrongylus curvispiculum	*	52 636	52 636	12
Longistrongylus namaquensis	*	577	577	6
Longistrongylus sp. larvae	2 458	—	2 458	7
Nematodirus spathiger	2 006	27 561	29 567	12
Protostrongylus capensis	—	†	†	5
Trichostrongylus axei	0	249	249	7
Trichostrongylus falculatus	0	477	477	2
Trichostrongylus pietersei	0	465	465	2
Trichostrongylus rugatus	0	4 151	4 151	4
Total nematode burden**	4 464	86 116	90 580	
Mean nematode burden**	279	5 382	5 661	

— Not applicable

* Larvae indistinguishable at species level and counted together as *Longistrongylus* larvae

** Excluding *Protostrongylus capensis*

‡ Larva does not occur in ruminants

† Present

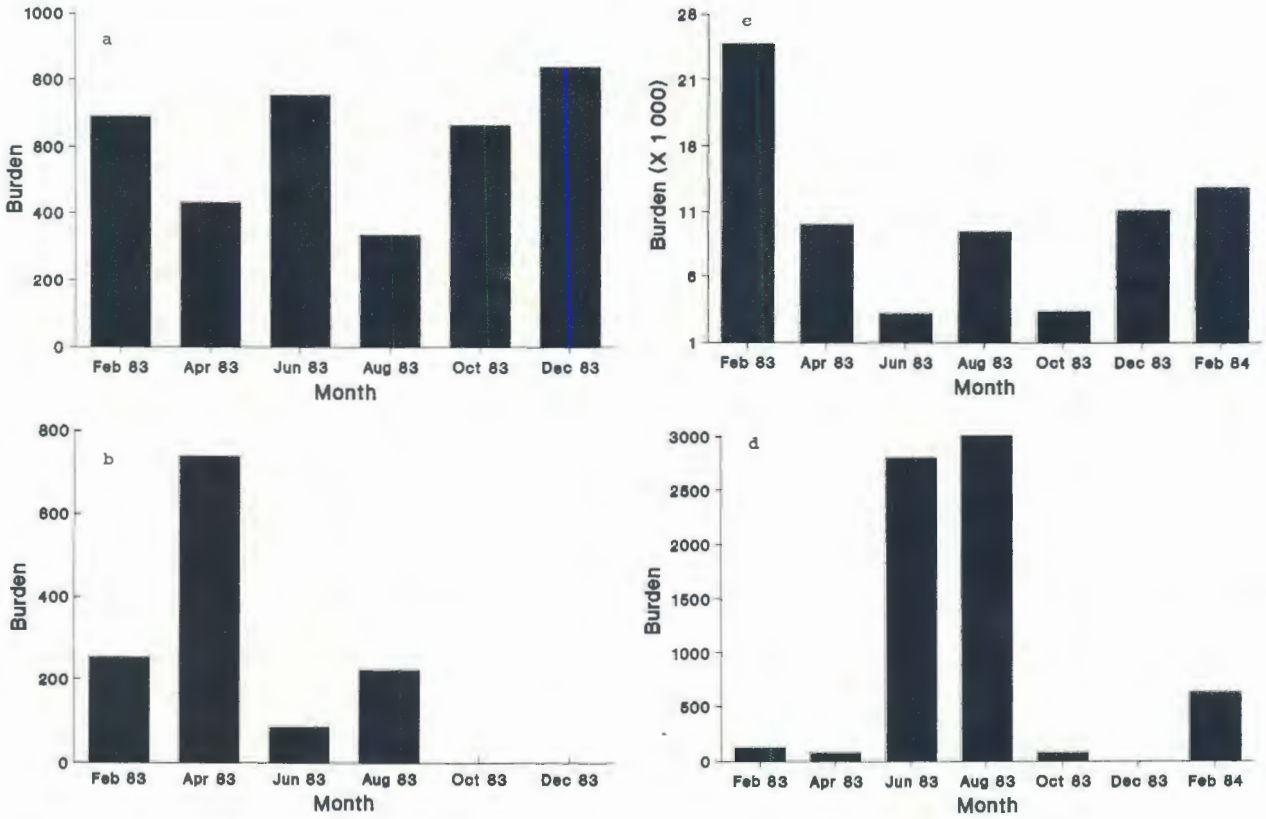

FIG. 1 The mean bi-monthly number of adult nematodes recovered from:
a. Adult grey rhebuck
b. Juvenile grey rhebuck
c. Adult bontebok
d. Juvenile bontebok

respectively. The seasonal abundances of adult and fourth stage nematodes in adult and juvenile grey rhebuck and those in adult and juvenile bontebok are graphically illustrated in Fig. 1 & 2. The mean bi-monthly total adult nematode burdens of the 2 antelope species, irrespective of age or sex, are compared in Fig. 3.

Grey rhebuck

The most abundant helminths of grey rhebuck were also the most prevalent. In descending order, they were *Ostertagia hamata, Paracooperioides pèleae* and the long spicule type of *H. contortus.*

The mean nematode burden of adult female antelopes was approximately double that of the males. There was little difference between the mean burdens of the adult males and the juvenile antelope, but the mean burden of the 3 lambs (102 worms) was about $^{1}/_{10}$th that of the adult females.

In adult grey rhebuck, adult nematode burdens exceeded 600 worms during February, June, Octo-

TABLE 5 The total nematode burdens of 25 grey rhebuck in the Bontebok National Park according to host age and sex

Date	Lamb	Juvenile		Adult		Mean monthly burden
	Female	Male	Female	Male	Female	
Feb. 83	232	273	—	293†	2 080	577
Apr. 83	—	764*	—	440	421	597
Jun. 83	72	104	—	535	975	422
Aug. 83	3	—	442	361*	—	292
Oct. 83	—	—	—	287*	1 094*	691
Dec. 83	—	—	—	1 361*	730	1 151
Total burden	307	1 905	442	5 872	6 394	
Mean burden	102	476	442	534	1 066	

† Mean of three antelope
* Mean of two antelope
— No animal of this age or sex examined

TABLE 6 The total nematode burdens of 16 bontebok in the Bontebok National Park according to host age and sex[1]

Date	Juvenile		Adult		Mean monthly burden
	Male	Female	Male	Female	
Feb. 83	126	—	—	25 352	12 739
Apr. 83	76	—	—	11 278	5 677
Jun. 83	2 794	—	3 453*	2 671	3 093
Aug. 83	2 994	—	—	10 764	6 879
Oct. 83	—	78	3 375	—	1 727
Dec. 83	—	0	—	11 213	5 607
Feb. 84	628	—	12 981	—	6 805
Total burden	6 618	78	23 262	61 278	
Mean burden	1 324	39	5 816	12 256	

[1] Excluding *Protostrongylus capensis*
* Mean of two antelope
— No animal of this age or sex examined

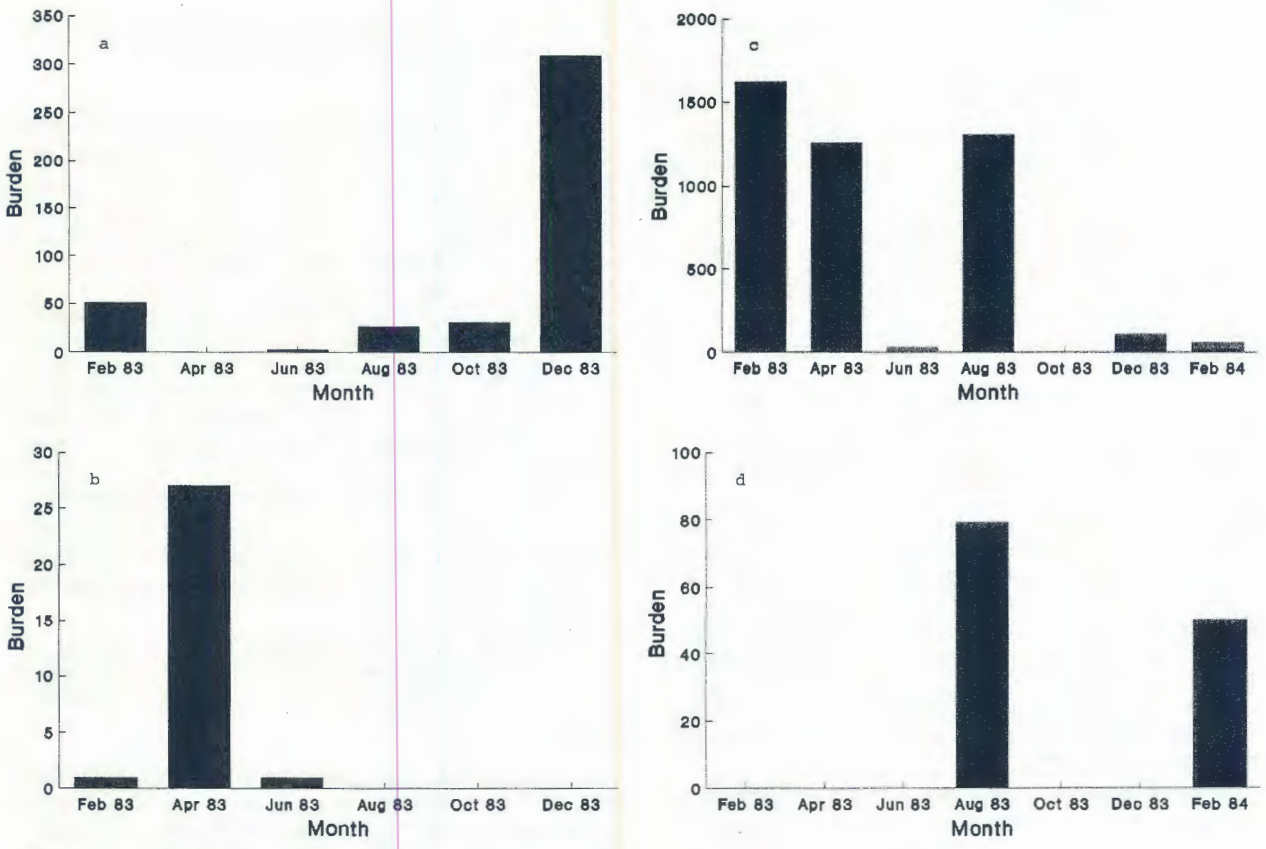

FIG. 2 The mean bi-monthly number of 4th stage larvae recovered from:
a. Adult grey rhebuck
b. Juvenile grey rhebuck
c. Adult bontebok
d. Juvenile bontebok

ber and December 1983. The burden during February consisted mostly of *Ostertagia hamata* and the long spicule type of *H. contortus,* that during June of *Ostertagia hamata,* that during October of *Ostertagia hamata* and the *Trichostrongylus* spp., while the composition of the December burden was equally divided between *Ostertagia hamata,* the *Trichostrongylus* spp. and the long spicule type of *H. contortus.* A peak in larval nematode burdens occurred only in December 1983 and was due to 1 rhebuck harbouring 776 fourth stage *Nematodirus* sp. larvae.

Adult and larval nematode burdens in juvenile rhebuck peaked during April 1983 and this was due to *Ostertagia hamata* and *Ostertagia*-type larvae.

Individual helminth burdens were generally low and varied from 3 in a female lamb shot during August 1983 to 2 080 in an adult female shot during February of the same year.

Bontebok

L. curvispiculum and *N. spathiger* were the most abundant and the most prevalent worms.

In adult bontebok, adult nematode burdens exceeded 9 000 worms during February, April, August and December 1983, and February 1984. The burden in February 1983 was due to 7 348 *Longistrongylus* spp. and 14 926 *N. spathiger* in 1 animal. The burdens during April and August were mostly due to *Longistrongylus* spp., that during December to a combination of *Longistrongylus* spp. and *N. spathiger,* and that during February 1984 to *Longistrongylus* spp. Larval burdens exceeded 1 000 during February, April and August 1983.

Peak adult nematode burdens occurred in juvenile bontebok during June and August 1983 and were due to *Longistrongylus* spp. Small numbers of fourth stage larvae, consisting of *Nematodirus* and *Ostertagia*-type larvae, were recovered during

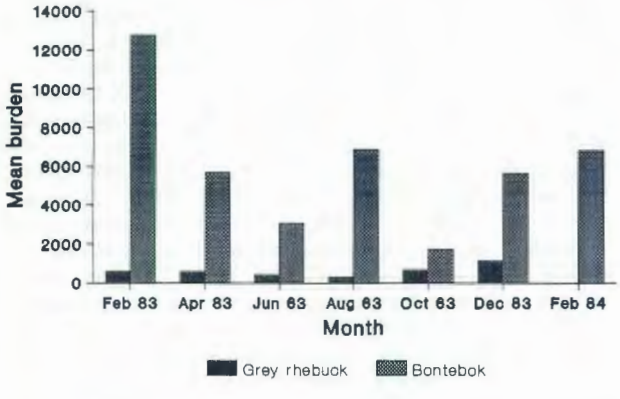

FIG. 3 Comparison of the mean bi-monthly nematode burdens of grey rhebuck and bontebok, irrespective of host age or sex. No grey rhebuck were shot during February 1984

August 1983 and of *Ostertagia*-type larvae during February 1984.

Adult female bontebok harboured the largest mean burden; it was more than double that of the adult males. Juvenile bontebok harboured approximately $^{1}/_{4}$ the mean burden of the adult males, and about $^{1}/_{10}$th the burden of the adult females.

Individual helminth burdens varied from 76 in a juvenile male shot during April 1983 to 25 352 in an adult female shot during February 1983.

Discussion

Grey rhebuck

Since *Ostertagia hamata* and *Paracooperioides peleae* occur in relatively large numbers in the majority of the population, we consider them to be definitive parasites of grey rhebuck in the BNP. The long spicule type of *H. contortus* should also be included as a definitive parasite as it was recovered only from grey rhebuck in this study. In previous studies greater numbers were recovered from bontebok, its only other known host (Horak, De Vos & De Klerk, 1982). In view of its fairly recent discovery (Horak, De Vos & De Klerk, 1982; Boomker, Horak, Gibbons & De Vos, 1983) we are of the opinion that this nematode has only recently evolved and is currently adapting in its definitive host, the grey rhebuck.

The occasional parasites of grey rhebuck are *N. spathiger, L. curvispiculum* and *L. namaquensis. N. spathiger* and *L. curvispiculum* occurred in smaller numbers and in fewer grey rhebuck than in bontebok, while *L. namaquensis* occurred in almost equal numbers in both host species and in approximately the same percentage of hosts.

Trichostrongylus falculatus could possibly also be classified as an occasional parasite of grey rhebuck, while the remaining nematodes should be considered accidental parasites.

When compared with browsing antelope previously studied (Boomker, Du Plessis & Boomker, 1983; Boomker, Keep, Flamand & Horak, 1984; Boomker, Horak & De Vos, 1986, 1989; Boomker, Keep & Horak, 1987; Boomker, Horak & MacIvor, 1989; Boomker, 1990; Boomker, Horak & Flamand, 1991 a, b; Boomker, Booyse & Keep, 1991; Boomker, Booyse & Braack, 1991), grey rhebuck harbour an unique helminth fauna. Worms common to the other browsers, such as *Haemonchus vegliai,* a race of *Cooperia rotundispiculum* (Boomker, 1990), *Ostertagia harrisi, Cooperia neitzi* and *Cordophilus sagittus* were not found. The reason for this appears to be the completely different vegetation type in the BNP. The browsers previously examined are all found in well-wooded habitats, which possibly favour the survival of infective larvae. The vegetation of the BNP consists of low and sparsely distributed scrub and sparse grass cover, and the infective larvae are probably more exposed. Only those species that are adapted to these conditions will survive. In addition, the winters are cold and wet and little rain falls during the warm to very hot summer months.

The helminth burdens of the grey rhebuck are small, and, considering the helminth species diversity, of little or no pathological importance.

Bontebok

The definitive parasites of bontebok appear to be *L. curvispiculum* and *N. spathiger* as these were present in large numbers and the majority of bontebok were infected. *Trichostrongylus rugatus* should be considered an occasional parasite, for although only 4 of 16 animals were infected their burdens were high. The remaining nematodes, with the exception of *Protostrongylus capensis,* should, because of the generally small proportion of animals infected and small burdens, be considered accidental parasites, acquired either from grey rhebuck or from the other antelope species in the BNP. Although not present in many bontebok, *Protostrongylus capensis* is a host-specific parasite (Boomker, 1990), since it occurs only in bontebok.

On average, the juvenile bontebok had smaller nematode burdens than the adults, possibly indicating that burdens are cumulative and increase with the age of the animal.

The mean adult nematode burdens of the bontebok in this survey are similar to those determined by Horak, Brown, Boomker, De Vos & Van Zyl (1982).

General

Horak, Brown, Boomker, De Vos & Van Zyl (1982) found *Bronchonema magna* in 1 of 9 bontebok examined during September 1975 and all 8 examined during December 1979. They stated that the infection probably came with the introduction of springbok, which are also good hosts for this nematode. A notable finding in the present survey is the complete absence of *B. magna* in all the bontebok examined. Virtually all springbok were removed from the BNP during the early 1980's. It is possible that unfavourable summer climate and the absence of a better host than bontebok, caused the subsequent decline in the infection rate.

H. contortus with the long spicules seems to have a seasonal prevalence similar to typical *H. contortus* in the summer rainfall areas, in that the adult worms increase during summer and peak numbers are present during December–January (Reinecke, 1983). We cannot offer an explanation for this phenomenon as environmental conditions in the study area during summer are hot and dry and do not favour the survival of the free-living stages.

The finding of Horak, Brown, Boomker, De Vos & Van Zyl (1982) that more than 60 % of the total *Longistrongylus* spp. burdens of the bontebok examined during December 1979 were in the fourth stage of larval development was not confirmed in this study. No fourth stage larvae were recovered from the animals processed during December 1983, and only 9,5 % and 0,4 % of the total *Longistrongylus* spp. burdens of the antelope shot during February 1983 and 1984, respectively, were in the fourth stage of larval development. Furthermore, from the data obtained in this study, the *Longistrongylus* spp. appear to have a non-seasonal abundance and were present in fairly large numbers during all seasons.

L. curvispiculum was found for the first time in South Africa by Horak, Meltzer & De Vos (1982) and Horak, Brown, Boomker, De Vos & Van Zyl (1982), who recovered it from springbok and bontebok in the BNP. This nematode seems to prefer grazers to browsers, as is evident from the results of this survey. The first record of this nematode in browsing antelope is that of Horak, De Vos & De Klerk (1982), who found it in grey rhebuck, also in the BNP. Outside the BNP it has to the best of our knowledge only been found in blesbok in the Golden Gate Highlands Park in the north-eastern Orange Free State (Horak, Brown, Boomker, De Vos & Van Zyl, 1982).

L. namaquensis was originally described from a sheep in the north-western Cape Province, and has subsequently been found in small numbers in springbok, bontebok and grey rhebuck in the BNP (Horak, De Vos & De Klerk, 1982; Horak, Meltzer & De Vos, 1982; Horak, Brown, Boomker, De Vos & Van Zyl, 1982). This nematode does not appear to have a preferred host in the BNP, since similar numbers were recovered from grey rhebuck and bontebok. It has not been recorded from browsers outside the BNP.

N. spathiger probably occurs in the greatest numbers in animals in the Cape Province (Horak, 1981), where it is encountered in sheep (Viljoen, 1964, 1969), goats (Boomker, Horak & MacIvor, 1989) and several antelope species (Horak, De Vos & De Klerk, 1982; Horak, Meltzer & De Vos, 1982; Horak, Brown, Boomker, De Vos & Van Zyl, 1982; Boomker, Horak & MacIvor, 1989). It is probably an occasional parasite of browsing antelope, but a definitive one of grazers, as is evident from the numbers of worms recovered from the 2 host species in the BNP.

Horak, Brown, Boomker, De Vos & Van Zyl (1982) and Verster *et al.* (1975) found large numbers of *N. spathiger* in the bontebok they examined. Similar results were obtained during this survey. The observations of the former authors, that a degree of arrested development in the fourth larval stage occurred during December, could again not be confirmed, as only 6 fourth stage larvae were recovered during December 1983. Conversely, 40 % of the total *Nematodirus* burden of the antelope shot during August 1983 were fourth stage larvae, possibly indicating that climatic conditions were favourable for the mass hatching of *Nematodirus* eggs and survival of the free-living stages.

From the results obtained in this survey, *Ostertagia hamata* appears to have a non-seasonal abundance. This is contrary to the behaviour of the other members of the genus and the closely related genus *Teladorsagia,* which, in this country, are more abundant during winter (Reinecke, 1983).

Verster *et al.* (1975) found fairly large numbers of *Ostertagia hamata* in the bontebok they examined. No *Ostertagia hamata* were, however, recovered from bontebok in a subsequent survey (Horak, Brown, Boomker, De Vos & Van Zyl, 1982), nor were they recovered in this survey. It appears that *Ostertagia hamata,* which was originally described from a springbok (Mönnig, 1932), is unable to exist in bontebok. However, Horak, Meltzer & De Vos (1982) found only 1 of 4 springbok they examined in the BNP to be infected with adult worms. Grey rhebuck, therefore, would seem to be the true host of this nematode.

Paracooperioides peleae apparently also has a non-seasonal occurrence.

Only *Protostrongylus capensis* was recovered in this survey, but both this nematode and *Pneumostrongylus cornigerus* were originally described from bontebok (Ortlepp, 1962).

Trichostrongylus falculatus occurs more commonly in the arid regions of the country (Horak, 1981) and was present in small numbers in grey rhebuck and in even smaller numbers in bontebok, only during summer. Our findings in this survey indicate that this nematode may prefer browsers to grazers, as approximately 4 times as many worms were recovered from the grey rhebuck as from the bontebok. In addition, 6 grey rhebuck (24 %) were infected, but only 2 bontebok (12,5 %).

Trichostrongylus rugatus is an accidental parasite of grey rhebuck, and is slightly more common in bontebok.

The presence of *Trichostrongylus axei* in bontebok indicates contact with domestic ruminants, as it is generally absent in regions where domestic ruminants do not occur. It apparently prefers grazing antelope as hosts (Horak, 1978; Horak, Brown, Boomker, De Vos & Van Zyl, 1982; Horak, Meltzer & De Vos, 1982; Anderson, 1983).

Trichostrongylus pietersei is a little-known parasite that has been found in sheep (Rossiter, 1964), goats (Horak, Knight & Williams, 1991) and common duiker (Boomker, Horak & MacIvor, 1989). It has previously been recovered from bontebok in the BNP (Horak, Brown, Boomker, De Vos & Van Zyl, 1982) and it seems to prefer the eastern and south-western Cape Province (Horak, 1981).

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