Parasites of South African wildlife. XV. Helminths of scrub hares, *Lepus saxatilis* in the Kruger National Park

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ABSTRACT

BOOMKER, J., HORAK, I.G. & BOOYSE, D.G. 1997. Parasites of South African wildlife. XV. Helminths of scrub hares, *Lepus saxatilis*, in the Kruger National Park. *Onderstepoort Journal of Veterinary Research*, 64:285—290

A total of 145 scrub hares from three localities in the Kruger National Park were examined for helminths: 124 at Skukuza, 15 at Shingwedzi, and three each at Pretoriuskop and Pafuri. *Trichostrongylus deflexus* was the most prevalent and most abundant nematode, and was collected from hares from all four localities. *Trichostrongylus falculatus* was present in three localities. *Trichostrongylus thomasi* and *Dermatoxys vlakhaasi* occurred only at Skukuza in 50 and 23 %, respectively, of the hares examined. The cestode *Mosgovoyia pectinata* and the nematode genus *Impalaia* were each recovered from three localities and *Cooperia hungi* from two. There was no apparent seasonal pattern of abundance of the worms, and the intensities of infection of male and female hares were similar. With the exception of *D. vlakhaasi*, all the helminths recovered in this study represent new records for scrub hares in South Africa.

Keywords: Helminths, *Lepus saxatilis*, parasites, scrub hares, wildlife

INTRODUCTION

Scrub hares, *Lepus saxatilis*, are widely distributed throughout Africa except in forested areas. In southern Africa they are absent from the western coastal desert and the eastern coastal forests as well as from the arid country bordering the Orange River (Skinner & Smithers 1990). They prefer savannah woodland or scrub where there is grass cover, but they do not occur on open grassland. They are common in agriculturally developed areas, especially those where crops are grown, and in derelict lands where there is bush regeneration. Scrub hares are mostly nocturnal and apparently sensitive to the weather, as they are not in evidence on cold nights. They are grazers, living on the leaves, stems and rhizomes of preferably green grass (Skinner & Smithers 1990).

The helminth parasites of hares have received little attention in this country. Ortlepp (1937, 1938b) described *Dermatoxys vlakhaasi* and *Inermicapsifer leporis*, from Cape hares, *Lepus capensis*, and Neitz (1965) lists *Coenurus serialis* collected from an unspecified hare by Ortlepp (1938a). This paper records the helminths collected from scrub hares at four localities in the Kruger National Park.

MATERIALS AND METHODS

Survey localities and animals

The hares examined in this survey are the same as those from which ectoparasites were collected at Shingwedzi, Pafuri and Pretoriuskop, and during the first two years of the ectoparasite survey at Skukuza (Horak, Spickett, Braack & Penzhorn 1993; Louw, Horak & Braack 1993). These authors also provide details on the vegetation types of the localities. The

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Accepted for publication 30 October 1997—Editor

particulars of the hares available to us and the localities at which they were collected are provided in Table 1.

All hares were processed for helminth recovery as described by Boomker, Horak & De Vos (1989), but digests of the mucosae of the stomach and intestines were not done. Female *Trichostrongylus* spp. were proportionally assigned to the males that occurred in each host. However, some hares harboured only female *Trichostrongylus* spp. and these have not been assigned to a species.

The ecological terms used here are in accordance with those of Margolis, Esch, Holmes, Kuris & Schad (1982) and the term 'average' is defined as the total number of parasites from all the hosts divided by the number of hosts in which the parasites are present.

RESULTS

Skukuza

The climatological data for Skukuza are graphically represented in Fig. 1. The average monthly intensities of the helminth infections are listed in Table 2 and the monthly fluctuations in the total *Trichostrongylus* spp. burdens are graphically illustrated in Fig. 2.

Six nematode species and one cestode species were collected from these hares. Of the nematodes *Trichostrongylus deflexus* (prevalence 96,8 %, range 40–9 563) was the commonest, followed by *Trichostrongylus thomasi* (prevalence 50,4 %, range 23–1 796), *Trichostrongylus falculatus* (prevalence 48,0 %, range 28–2 693), *Impalaia tuberculata* (prevalence 32,0 %, range 10–520) and *Dermatoxys vlakhaasi* (prevalence 23,3 %, range 1–120). Two hares each harboured 20 *Cooperia hungi*. One hare harboured 60 female *Trichostrongylus* spp. that could not be assigned to a species, one a single *Trichostrongylus* sp. larva, and another 20 *D. vlakhaasi* larvae. Three hares, one a juvenile female, the others two adult males, had no worms, while the range varied from 40–9 900 worms in the 121 (97,6 %) animals that were infected. The cestode *Mosgovoyia pectinata* was present in 22 hares (prevalence 17,7 %, range 1–17).

None of the helminths showed discernible seasonal trends, neither according to rainfall nor to minimum or maximum temperatures, and the intensities of infection between male and female hares, although very variable, were similar.

The prevalences of trichostrongylid nematodes in hares at Skukuza are compared in Table 3 with those in kudus, *Tragelaphus strepsiceros*, examined south and west of Skukuza from April 1981 to March 1983 (Boomker *et al.* 1989), and in impalas, *Aepyceros melampus* (Boomker, Horak & De Vos, unpublished data 980), and warthogs, *Phacochoerus africanus* (Horak, Boomker, De Vos & Potgieter 1988). The impalas and warthogs were examined from January 1980 to January 1981 and both species were shot in the same locality as the hares.

The scrub hares and impalas harboured five helminth species, and hares, kudus and warthogs harboured four species in common.

Pretoriuskop

Only *I. tuberculata* (prevalence 100 %, range 4–400), *T. deflexus* (prevalence 66 %, range 89–244), *T. falculatus* (prevalence 66 %, range 95–671) and *M. pectinata* (prevalence 66 %, range 1–14) were present in hares from this locality.

Shingwedzi

The average bimonthly burdens of the 15 hares from this locality are listed in Table 1. Four species of nematodes were collected, of which *I. tuberculata* (range 20–80) and *T. deflexus* (range 20–144) were both present in nine hares, *T. falculatus* in five, unidentified *Trichostrongylus* spp. females in two, and *C. hungi* in one. Fourteen hares harboured nematodes and a single animal two *M. pectinata*. No seasonal pattern of abundance was evident for either the individual nematode species or the entire worm burdens.

Pafuri

One of the three hares harboured 340 *T. deflexus* only, while no worms were present in the remaining two animals.

DISCUSSION

With the exception of *D. vlakhaasi*, all the helminths recovered in this study represent new parasite records for scrub hares in South Africa. *D. vlakhaasi* was originally described from a Cape hare by Ortlepp (1937) as *Heteroxinema vlakhaasi*. However, Quentin (1975) transferred this species to the genus *Dermatoxys*, a parasite exclusive to the Leporidae. Its presence in scrub hares is therefore to be expected and it should be regarded as a definitive parasite.

C. hungi is primarily a parasites of antelopes, in which it occurs commonly but in varying numbers, impala being the preferred hosts (Table 2). It was encountered in only one out of 41 warthogs examined in the Northern Province (Boomker, Horak, Booyse & Meyer 1991) and in none in the Kruger National Park (Horak *et al.* 1988). In view of its low prevalence and low intensity in the monogastric herbivores, including hares, it should be considered an accidental parasite in these animals.

I. tuberculata was originally described from an impala (Mönnig 1924). Subsequently it has been collected from a variety of antelopes (Boomker 1977, 1991) as well as from warthogs (Horak *et al.* 1988; Boomker *et al.* 1991). It was also recovered in very low numbers from all six red rock rabbits, *Pronolagus* sp., examined in Kenya by Fukumoto, Kamiya & Suzuki (1980) and should be considered a definitive parasite of hares and possibly rabbits. Its wide host spectrum indicates its tolerance of a variety of physiological environments.

Trichostrongylus spp. utilize a large variety of terrestrial vertebrates, notably birds and herbivorous mammals, as hosts. They seem to have evolved separately in domesticated and in wild animals, where different species occupy the same niches (Anderson 1992). For instance, *Trichostrongylus axei* is found in the abomasa of sheep, goats and cattle and the stomachs of domestic pigs and horses (Reinecke 1983), and *T. thomasi* in the abomasa of several wild ruminants (Boomker 1991) and the stomachs of warthogs (Horak *et al.* 1988; Boomker *et al.* 1991), zebras (Krecek, Malan, Reinecke & De Vos 1987) and now hares.

The presence of *Trichostrongylus* spp. in hares and rabbits is well known. Fukumoto *et al.* (1980) recorded *Trichostrongylus colubriformis* in 100 % *Pronolagus* sp. but the maximum number of worms collected from a single host was only 31, which is considerably fewer than the various *Trichostrongylus* spp. recovered from hares from all the localities in this study. Boag (1987) records the prevalence of *Trichostrongylus retortaeformis* in *L. capensis* and *Oryctolagus cuniculus* in Scotland as being 73,8 % and 80 %, respectively. The maximum number of worms he collected was 2 730 from a hare and 4 325 from a rabbit. Allgöwer (1992) found the same parasite in 92 % of *Lepus europaeus* in the upper Rhine Valley, Germany. These figures are reasonably similar to those for the hares from Skukuza.

In the Kruger National Park, scrub hares and impalas are the preferred hosts of *T. deflexus*, and warthogs

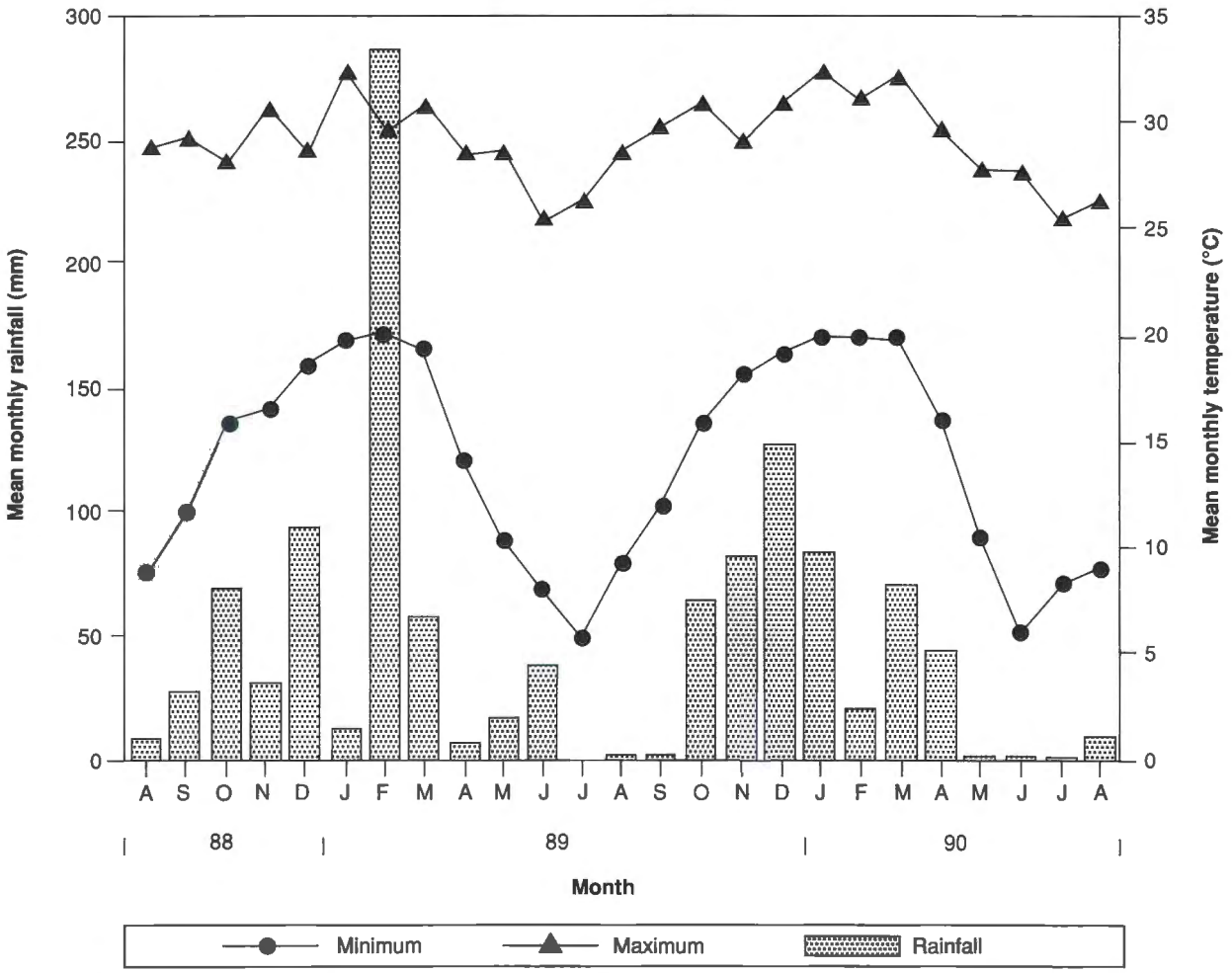

FIG. 1 Mean monthly rainfall, and mean monthly minimum and maximum temperatures measured at Skukuza for the period August 1988 to August 1990

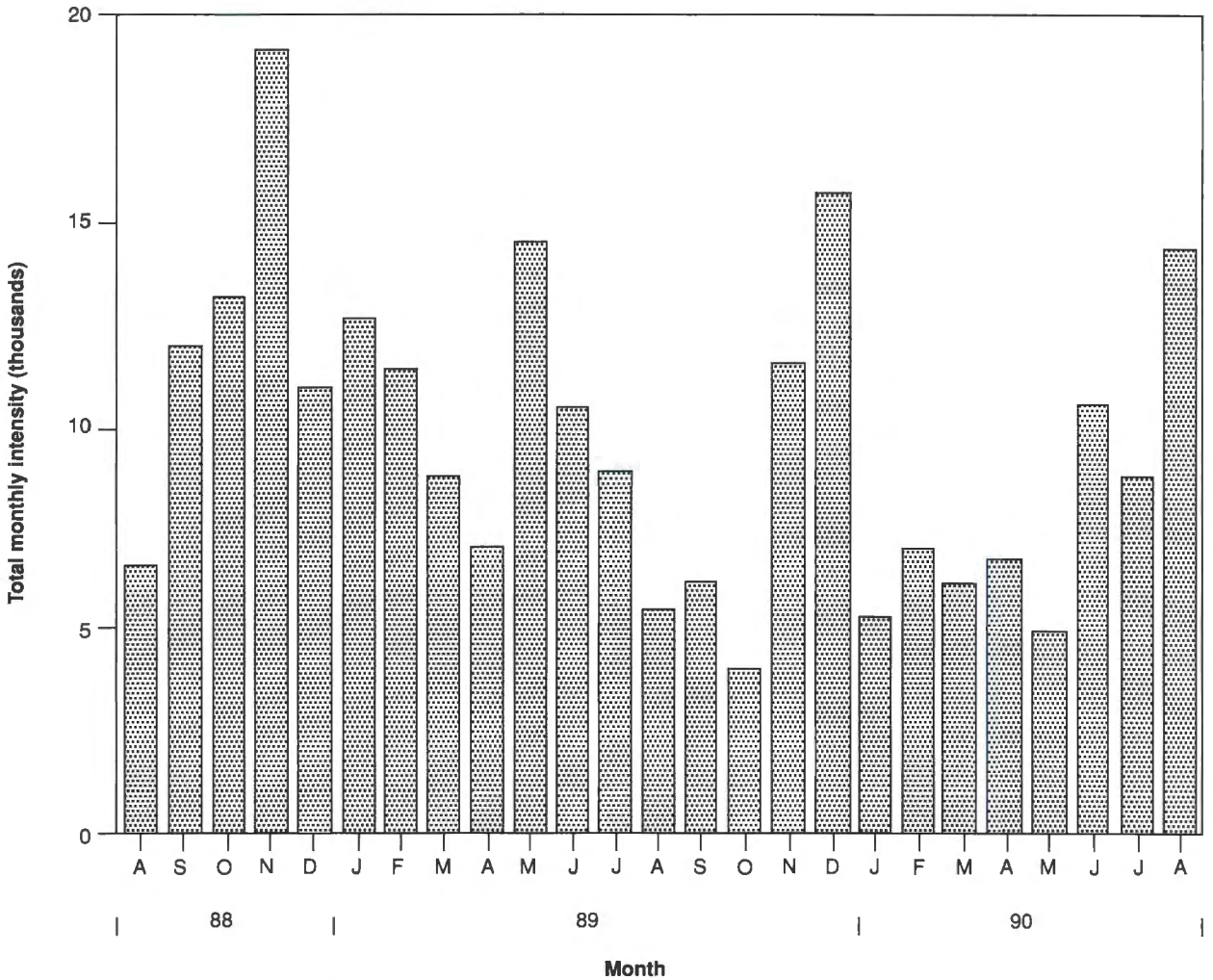

FIG. 2 Monthly fluctuations of the total *Trichostrongylus* spp. burdens of scrub hares at Skukuza during the period August 1988 to August 1990

TABLE 1 Collection data of scrub hares in the Kruger National Park

Locality	Grid reference	Section of Park	Frequency	Date collected	Ages and sex[b]				Number collected
					JF	SAF	AF	AM	
Skukuza	24°58′S,31°36′E	South	Five per month[a]	Aug 1988 – Aug 1990	2	–	35	87	124
Pretoriuskop	25°10′S,31°16′E	Sout-hwest	In one month	June 1989	–	–	2	1	3
Shingwedzi	23°07′S,31°26′E	North	Three bimonthly	Aug 1989 – Aug 1990	–	1	10	4	15
Pafuri	23°27′S,31°19′E	Far north-east	One per month	Feb 1990 – Apr 1990	–	1	2	–	3

[a] Excepting August 1988 when four were examined
[b] JF = Juvenile female; SAF = Sub-adult female; AF = Adult female; AM = Adult male

the preferred host of *T. thomasi*, while kudus appear to be poor hosts for *T. falculatus* and apparently do not harbour *T. thomasi* (Table 2). The high prevalence and incidence of *T. thomasi* in warthogs is surprising because it is considered a definitive parasite of wild ruminants. It now seems possible that the nematode is primarily a parasite of the monogastric herbivores and has secondarily adapted to ruminants.

The anoplocephalid tapeworm *M. pectinata* is a cosmopolitan parasite of the Lagomorpha and is the only one of the five species of the genus that occurs in

TABLE 2 The average monthly or bimonthly intensities of nematode infections of scrub hares, *Lepus saxatilis*, from Skukuza and Shingwedzi, Kruger National Park

Locality and month collected[a]	*Cooperia hungi*	*Impalaia tubercula*		*Trichostrongylus*				*Dermatoxys vlakhaasi*		Average monthly total nematode burden
		Adults	Larvae	*deflexus*	*falculatus*	*thomasi*	Females	Adults	Larvae	
Skukuza										
Aug. 1988: Males (3)	0	114	0	1 004	0	0	130	8	0	1 256
Females (1)	0	40	0	2 090	0	0	0	1	0	2 131
Sep. 1988: Males (5)	0	42	2	2 378	0	9	0	0	10	2 440
Oct. 1988: Males (3)	0	27	0	3 588	0	86	0	0	40	3 740
Females (2)	0	5	0	1 067	0	23	0	0	10	1 105
Nov. 1988: Males (3)	0	13	0	2 557	0	110	0	0	0	2 680
Females (2)	10	10	0	5 519	0	22	0	0	0	5 560
Dec. 1988: Males (2)	0	0	0	2 500	0	0	0	20	0	2 520
Females (3)	0	0	0	1 927	0	53	0	13	0	1 993
Jan. 1989: Males (2)	0	60	0	3 274	0	177	0	90	0	3 600
Females (3)	7	67	0	1 894	0	19	0	0	0	1 987
Feb. 1989: Males (5)	0	12	0	2 209	0	63	0	0	0	2 284
Mar. 1989: Males (4)	0	45	0	1 966	18	91	0	0	0	2 150
Females (1)	0	120	0	340	0	0	0	0	0	460
Apr. 1989: Males (3)	0	13	7	166	81	0	0	7	0	273
Females (2)	0	0	0	2 911	191	48	0	0	0	3 140
May 1989: Males (2)	0	0	0	1 682	1 402	97	0	10	0	3 191
Females (3)	0	7	0	2 432	168	106	0	0	0	2 713
Jun. 1989: Males (4)	0	0	0	2 101	318	81	0	0	0	2 500
Females (1)	0	0	0	175	245	0	0	0	0	420
Jul. 1989: Males (3)	0	0	0	1 883	348	16	0	7	0	2 253
Females (2)	0	0	0	703	206	152	0	0	0	1 061
Aug. 1989: Males (3)	0	20	0	1 265	131	17	20	0	0	1 453
Females (2)	0	10	0	529	0	72	0	0	0	610
Sep. 1989: Males (2)	0	0	0	1 805	59	306	0	10	0	2 180
Females (3)	0	20	0	563	29	8	0	7	0	627
Oct. 1989: Males (4)	0	5	0	793	163	30	0	5	0	995
Females (1)	0	0	0	0	0	0	0	0	0	0
Nov. 1989: Males (5)	0	116	0	2 010	226	64	0	4	0	2 420
Dec. 1989: Males (2)	0	0	0	2 431	626	124	0	0	0	3 180
Females (3)	0	93	0	2 426	634	33	0	0	0	3 186
Jan. 1990: Males (2)	0	0	0	486	18	37	0	0	0	540
Females (3)	0	27	0	1 232	153	15	0	0	0	1 427
Feb. 1990: Males (5)	0	0	0	965	267	186	0	0	0	1 388
Mar. 1990: Males (5)	0	52	0	1 173	0	47	0	8	0	1 280
Apr. 1990: Males (5)	0	8	0	1 126	89	122	0	0	0	1 344
May 1990: Males (3)	0	0	0	807	40	0	0	0	0	847
Females (2)	0	0	0	731	379	70	0	0	0	1 180
Jun. 1990: Males (5)	0	20	0	1 528	539	21	0	36	0	2 144
Jul. 1990: Males (3)	0	40	0	992	348	130	0	0	0	1 510
Females (2)	0	0	0	1 902	191	27	0	20	0	2 140
Aug. 1990: Males (4)	0	10	0	1 609	550	475	0	5	0	2 650
Females (1)	0	60	0	1 423	2 312	44	0	20	0	3 859
Shingwedzi										
Aug. 1989	0	80	0	110	60	0	0	0	0	250
Oct. 1989	0	33	0	63	47	0	60	0	0	203
Dec. 1989	0	40	0	102	36	0	60	0	0	238
Feb. 1990	40	40	0	70	0	0	0	0	0	150
Apr. 1990	0	40	0	20	0	0	0	0	0	60

[a] Figures in brackets indicate number of animals examined

TABLE 3 Comparison of the prevalence of the commonly shared trichostrongylid nematodes of scrub hares, warthogs, kudus and impalas

Host species	Helminth species and prevalence (%)				
	Cooperia hungi	*Impalaia tuberculata*	*Trichostrongylus*		
			deflexus	*falculatus*	*thomasi*
Scrub hares (*n* = 124)	1,6	32,3	96,8	48,4	50,8
Warthogs (*n* = 28)	–	3,6	14,3	3,6	75,0
Kudus (*n* = 96)	8,2	25,8	43,3	6,2	–
Impalas (*n* = 142)	87,3	72,5	86,6	24,6	57,0

Africa. It represents a new parasite record for scrub hares in this country.

ACKNOWLEDGEMENTS

We wish to thank the National Parks Board for placing the hares at our disposal, Dr L.E.O. Braack and Mr I. de Beer of the Parks Board, and Miss H. Heyne and Mr A.M. Spickett of the Onderstepoort Veterinary Institute, who assisted with the collection of the hares and the helminths. This study was funded by the Foundation for Research Development, the University of Pretoria, the Medical University of Southern Africa and the National Parks Board.

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