S.Afr.J.Wildl.Res. 1998, 28(1)

Short Communication

The distribution and seasonal changes of louse populations on impala *Aepyceros melampus*

Sonja Matthee* and I.G. Horak
Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, 0110, South Africa.

D.G.A. Meltzer
Price Forbes Chair in Wildlife Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, 0110, South Africa.

Received 21 August 1996; accepted 25 February 1998

Five louse species were collected from the hides of 45 impala ewes *Aepyceros melampus* examined in sets of 15 during three sampling periods in the Northern Province, South Africa. These were *Damalinia aepycerus, Damalinia elongata, Linognathus aepycerus, Linognathus nevilli* and an unidentified *Linognathus* sp. The aims of the study were to determine whether lice infesting impala exhibit preferences for specific sites on the host's body and also to determine the role of season in louse abundance. *D.aepycerus* was predominantly present on the body and tail. *L.aepycerus* showed no distinct distribution pattern and *L.nevilli* was most abundant on the hind feet.

Keywords: impala, lice, preferred sites, seasonal abundance.

* To whom correspondence should be addressed.

Lice are generally not considered economically important ectoparasites of wildlife. However, large numbers of lice are frequently recorded on young and old animals in poor health and animals under stress related conditions (Kettle 1984). Various studies of the ectoparasites of southern African wildlife also include lice and some of these make mention of seasonality (Horak 1982; Horak, Sheppey, Knight & Beuthin 1986; Horak, Boomker, De Vos & Potgieter 1988; Boomker, Horak, Booysen & Meyer 1991; Horak, Boomker & Flamand 1995a; Horak, De Vos & Braack 1995b). However, limited information is available on the predilection sites of the various louse species occurring on these ungulates. Impala *Aepyceros melampus* are medium-sized herbivores and are widely distributed throughout the north-eastern parts of South Africa (Skinner & Smithers 1990). They act as hosts for a number of lice and ixodid tick species (Ledger 1980; Theiler 1962). The data presented in this paper forms part of a larger study of ectoparasites on impala, with the main focus on ticks (Matthee, Meltzer & Horak 1997). The objectives of the present study were to determine the species composition and numbers of lice on impala, their preferred sites on the host's body and whether the season of the year influenced their numbers and distribution.

Letaba Ranch (23°31'- 23°49'S, 30°59'- 31°09'E) is 35 250 ha in extent and is situated in the Northern Province of South Africa. The ranch is located in a summer rainfall region with a mean annual precipitation of 500mm and mean atmospheric temperatures ranging between 10°C and 35°C. The vegetation of the ranch is classified as predominantly Mopane Veld (Acocks 1988). Fifteen impala ewes, of various age classes were collected on each of three occasions: July 1994, October 1994 and February 1995. Shortly after they were shot the animals were transported to a skinning-shed where they were weighed and then aged according to the criteria of Roettcher & Hofmann (1970) and Spinage (1971). The animals were skinned and one half of each skin was divided into six anatomical sites:

1) Head (muzzle, face and pinna);
2) Neck;
3) Front Leg - including upper and lower legs;
4) Hind Leg - including upper and lower legs;
5) Body (sternum, abdomen and rest of body);
6) Tail - half the tail, tail brush, upper and lower perineum.

Each of the six sites was excised with a scalpel and subjected to the ectoparasite recovery technique of Horak, Meltzer & De Vos (1982) which entails submersion in a tick-detaching agent followed by scrubbing with a steel brush to remove ectoparasites. Scrubbings were sieved and the sieve contents placed in separately labelled bottles and preserved with formalin. The same excised pieces of skin were subsequently subjected to the digestion technique of Van Dyk & McKenzie (1992). This technique makes use of a 10% NaOH solution resulting in the removal and partial digestion of the hair. The solution containing the hair and parasites was then sieved and the sieve contents collected and preserved as previously described. Even though the scrubbing technique only removes a portion of the lice population, this technique does not damage the integument of the parasites and thus facilitates identification of the different lice species. The digestion technique, however, may damage the lice's integument but results in the collection of all the lice. The lice collected were identified and counted making use of a stereoscopic microscope.

Five louse species were recovered from the impala. In order of abundance these are: *Linognathus nevilli, L.aepycerus, Damalinia aepycerus, D.elongata* and an undescribed *Linognathus* species (Table 1). Too few *D.elongata* and lice of the *Linognathus* sp. were collected to enable conclusions to be drawn on the predilection sites or seasonal trends of these species.

Table 1 The total numbers and proportions of lice collected from 45 impala at Letaba Ranch (n=number of impala infested)

Lice	Nymphs	Adults	Total	Proportion	n
Damalinia aepycerus	353	366	689	13%	40
Damalinia elongata	17	40	57	2%	10
Linognathus aepycerus	833	1055	1888	37%	45
Linognathus nevilli	1026	1343	2369	47%	43
Linognathus sp.	25	4	29	1%	8

The numbers of nymphs and adults of each species were pooled as a correlation exists between each of these stages on the six sites ($P<0.5$). *D.aepycerus* was found predominantly on the body and the tail (Table 2). *L.aepycerus* was present on

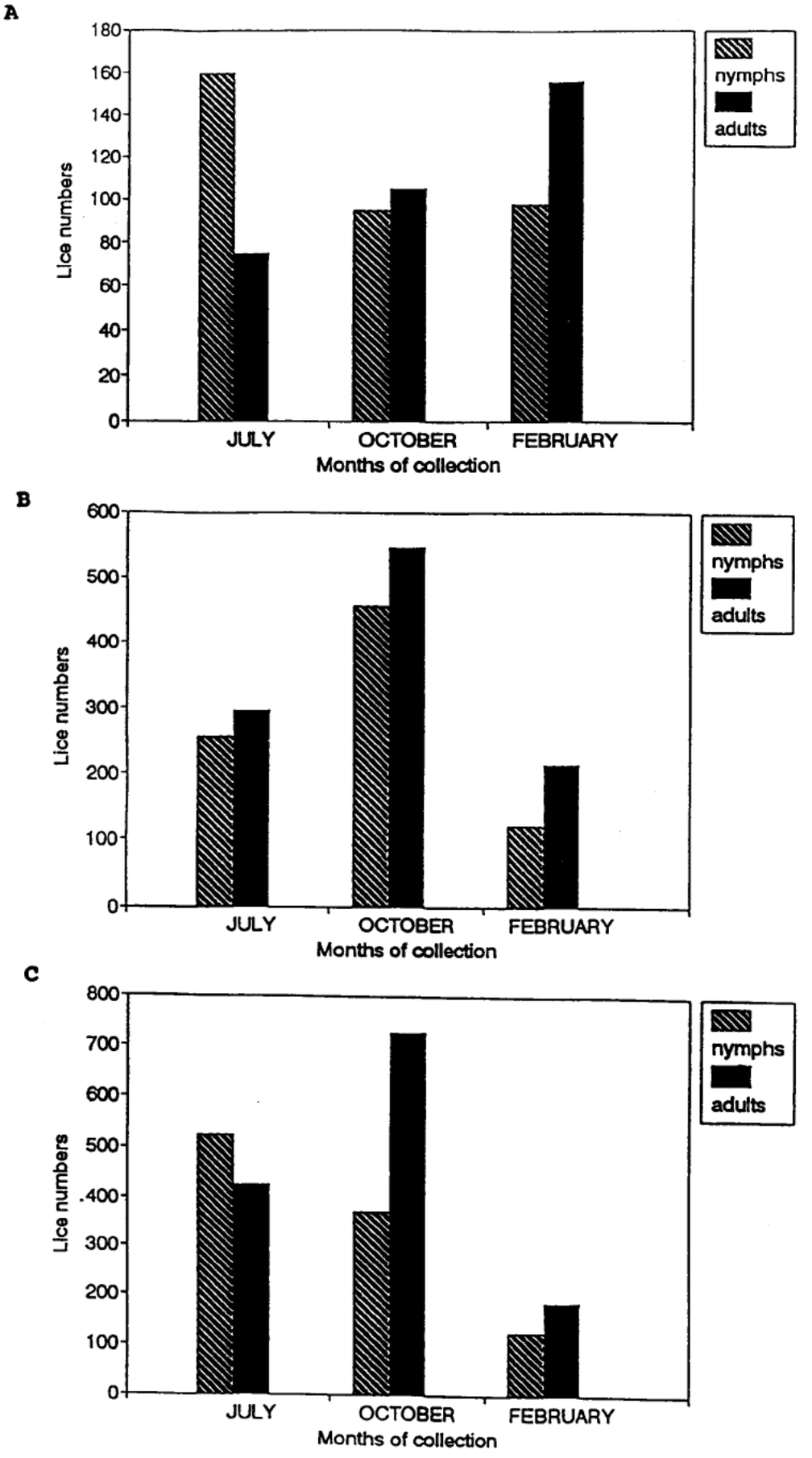

Figure 1 The seasonal abundance of A) *Damalinia aepycerus*, B) *Linognathus aepycerus* and C) *L.nevilli*

all sites and despite the largest number being recorded on the body no specific preference was evident (Table 2). The greatest number of *L.nevilli* was collected from the hind legs (Table 2).

Table 2 The distribution of lice on different body parts of impala (n=45) sampled on Letaba Ranch

	Total number of ticks					
Species	Head	Neck	Body	Front leg	Hind leg	Tail
Damalinia aepycerus	4	8	416	10	3	248
Linognathus aepycerus	349	198	755	198	300	88
Linognathus nevilli	15	17	48	77	2053	159

Peak burdens of *D.aepycerus* nymphs were recorded in July followed by a decrease in both October and February. The number of adults of this species increased during July and peaked in February (Figure 1). Although the adults of *L.aepycerus* were more numerous than the nymphs at each of the three collection times, they and the nymphs exhibit the same seasonal trends' peaking in October (Figure 1). The nymphs of *L.nevilli* peaked in July and decreased thereafter to February. The adults increased from July with a peak in October but had decreased markedly by February (Figure 1).

L.nevilli was the most abundant louse on impala at Letaba Ranch, followed by *L.aepycerus*, which was also the most prevalent, and by *D.aepycerus*. In addition an as yet undescribed *Linognathus* species was also recovered in the present study. Contrary to the findings of another study on impala, conducted in the southern Kruger National Park, in which *D.elongata* was the most abundant louse (Horak, Fourie & Van Zyl 1995c), the latter species was found in very small numbers in this study. At Nylsvley Nature Reserve in the Northern Province *D.aepycerus* was most abundant on impala followed by *L.aepycerus* (Horak 1982). It is thus apparent that the species composition of louse populations on impala differ from region to region.

Although very few adults of a *Damalinia* sp. were collected from kudu in the Kruger National Park (Horak 1992 unpublished data) the greatest number of these were recovered from the tail. In the present study large numbers of *D.aepycerus* were present on the tail, but a slightly larger number were also collected from the body. Large numbers of *L.aepycerus* were collected from the body, but the total area of this site in comparison with the other sites must be taken into account. This lice species displayed no preference for a specific site on the impala. The presence of *L.nevilli* on the legs is not surprising as Ledger (1973) originally described and recorded *L.nevilli* from around the feet of impala. One can only surmise as to why the hind legs are preferred to the fore legs.

Lice were mostly present on sites such as the body and tail, and even the fetlock, that are densely covered with hair. This presumably provides them with a suitable micro-environment, protecting them against grooming and extreme low and high temperatures and facilitating oviposition (Murray 1956). Murray (1960) also noted that when sheep were exposed to atmospheric temperatures of 28°C the temperature near the skin of the body was higher than 38°C, whereas that of the legs was lower. This temperature difference has an apparent effect on the distribution of louse species on the animal's body.

The three most abundant louse species exhibited different seasonal trends. The large adult *D.aepycerus* population in February was probably responsible for the eggs which subsequently gave rise to the predominantly nymphal population in July. This returned to an equal proportion of nymphs and adults in October. It would appear as if the life-cycle of *L.aepycerus* continued throughout the year with nymphs continuously being translated into adults, the most productive period being between July and October and the least between October and February. A large number of *L.nevilli* eggs appear to have hatched in June-July resulting in the predominantly nymphal population which progressed to a predominantly adult population in October. Both *L.aepycerus* and *L.nevilli* experienced severe population declines between October and February. These might be the result of harsh physical conditions, such as very high atmospheric temperatures and increased rainfall, which are characteristic for this time of year. The peak in activity of both *L.aepycerus* and *L.nevilli* during the cooler months is in agreement with previous studies on blue wildebeest, *Connochaetes taurinus*, and warthog, *Phacochoerus aethiopicus*, in Mpumalanga (Horak, De Vos & Brown 1983; Horak *et al.* 1988), grey rhebok, *Pelea capreolus*, in the Western Cape Province (Horak *et al.* 1986), sheep in Australia (Murray & Gordon 1969) and cattle in New Zealand (Chalmers & Charleston 1980). The months of peak abundance on the blue wildebeest and warthog are also the months during which the veld is in poor condition and at its driest. It seems likely that during these times when herbage is less abundant, animals would spend more time searching for food and feeding and less on grooming (Horak *et al.* 1988). This and the thicker and longer haircoat in winter could lead to an increase in the numbers of lice on the host.

Acknowledgements

The authors wish to express their appreciation to the manager of Letaba Ranch at the time, Mr. Ian McFadyen, and to Prof. Hennie Groeneveld and Dr. Mike van der Linde for assistance with the manuscript, and to the University of Pretoria, for providing financial support for this study.

References

ACOCKS, J.P.H. 1988. *Veld types of South Africa with accompanying veld type map.* 3rd edn. Memoirs of the Botanical Survey of South Africa. No.57, X +146pp.

BOOMKER, J., HORAK, I.G., BOOYSEN, D.G. & MEYER, S. 1991. Parasites of South African wildlife. VIII. Helminth and arthropod parasites of warthogs, *Phacochoerus aethiopicus*, in the eastern Transvaal. *Onderstepoort J.Vet.Res.* 58: 195-202.

CHALMERS, K. & CHARLESTON, W.A.G. 1980. Cattle lice in New Zealand: observations on the prevalence, distribution and seasonal patterns of infestation. *N.Z.Vet.J.* 28: 198-200.

HORAK, I.G. 1982. Parasites of domestic and wild animals in South Africa. XV. The seasonal prevalence of ectoparasites on impala and cattle in the Northern Transvaal. *Onderstepoort J.Vet.Res.* 49: 85-93.

HORAK, I.G., MELTZER, D.G.A. & DE VOS, V. 1982. Helminth and arthropod parasites of springbok, *Antidorcas marsupialis*, in the Transvaal and western Cape Province. *Onderstepoort J.Vet.Res.* 49: 7-10.

HORAK, I.G., DE VOS, V. & BROWN, M.R. 1983. Parasites of

domestic and wild animals in South Africa. XVI. Helminth and arthropod parasites of blue and black wildebeest (*Connochaetes taurinus* and *Connochaetes gnou*). *Onderstepoort J.Vet.Res.* 50: 243-255.

HORAK, I.G., SHEPPEY, K., KNIGHT, M.M. & BEUTHIN, C.L. 1986. Parasites of domestic and wild animals in South Africa. XXI. Arthropod parasites of vaal ribbok, bontebok and scrub hares in the western Cape Province. *Onderstepoort J.Vet.Res.* 53: 187-197.

HORAK, I.G., BOOMKER, J., DE VOS, V. & POTGIETER, F.T. 1988. Parasites of domestic and wild animals in South Africa. XXIII. Helminth and arthropod parasites of warthogs, *Phacochoerus aethiopicus*, in the eastern Transvaal Lowveld. *Onderstepoort J.Vet.Res.* 55: 145-152.

HORAK, I.G., BOOMKER, J. & FLAMAND, J.R.B. 1995a. Parasites of domestic and wild animals in South Africa. XXXIV. Arthropod parasites of nyalas in north-eastern KwaZulu-Natal. *Onderstepoort J.Vet.Res.* 62: 171-179.

HORAK, I.G., DE VOS, V. & BRAACK, L.E.O. 1995b. Arthropod burdens of impalas in the Skukuza region during two droughts in the Kruger National Park. *Koedoe*, 38: 65-71.

HORAK, I.G., FOURIE, L.J. & VAN ZYL, J.M. 1995c. Arthropod parasites of impalas in the Kruger National Park with particular reference to ticks. *S.Afr.J.Wildl.Res.* 25: 123-126.

KETTLE, D.S. 1984. Phthiraptera. In: Medical and Veterinary Entomology, 1st edn, Ch. 19. Croom Helm, Sydney.

LEDGER, J.A. 1973. A new species of *Linognathus* (Phthiraptera: Linognathidae) from the feet of an African antelope. *J.Ent.Soc.Sth.Afr.* 36: 125-129.

LEDGER, J.A. 1980. The arthropod parasites of vertebrates in Africa south of the Sahara. Vol IV. Phthiraptera (insecta). Publication No. 56 of the South African Institute for Medical Research, Johannesburg.

MATTHEE, S., MELTZER, D.G.A. & HORAK, I.G. 1997. Sites of attachment and density assessment of ixodid ticks (Acari: Ixodidae) on impala (*Aepyceros melampus*). *Exp.Appl.Acarol.* 21:179-192.

MURRAY, M.D. 1956. The distribution of the eggs of mammalian lice on their hosts. III. The distribution of the eggs of *Damalinia ovis* (L.) on the sheep. *Aust.J.Zool.* 5: 173-182.

MURRAY, M.D. 1960. The ecology of lice on sheep. I. The influence of skin temperature on populations of *Linognathus pedalis* (Osborne). *Aust.J.Zool.* 8: 349-356.

MURRAY, M.D. & GORDON, G. 1969. Ecology of lice on sheep. VII. Population dynamics of *Damalinia ovis* (Schrank). *Aust.J.Zool.* 17: 179-186.

ROETTCHER, D. & HOFMANN, R.R. 1970. The ageing of impala from a population in the Kenya Rift Valley. *E.Afr.Wildl.J.* 8: 37-42.

SKINNER, J.D. & SMITHERS, R.H.N. 1990. The mammals of the Southern African subregion. University of Pretoria, Pretoria, South Africa, 771p.

SPINAGE, C.A. 1971. Geratodontology and horn growth of the impala (*Aepyceros melampus*). *J.Zool.,Lond.* 164: 209-225.

THEILER, G. 1962. The Ixodoidae parasites of vertebrates in Africa south of the Sahara (Ethiopian Region). Project S. 9958. *Report to the Director of Veterinary Services, Onderstepoort.* Mimeographed

VAN DYK, P.J. & MCKENZIE, A.A. 1992. An evaluation of the effectivity of the scrub technique in quantitative ectoparasite ecology. *Exp.Appl.Acarol.* 15: 271-283.