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PREVALENCE OF NASAL BOTS (DIPTERA: OESTRIDAE) IN SOME ZAMBIAN HARTEBEEST

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Abstract: Nine Lichtenstein's hartebeest *(Alcelaphus lichtensteini)* were sampled for nasal bots (*Oestrinae*) in a woodland area of central western Zambia. Larvae of the genera *Gedoelstia, Oestrus* and *Kirkioestrus* were found in mixed infestations in the nasal cavities and paranasal sinuses. A maximum count of 252 larvae was recorded from one head but no obvious pathogenicity was detectable in this or any other hartebeest. The significance of these findings is discussed in relation to the host specificity of the nasal bots and to gedoelstial myiasis of domestic livestock in the area where they interact with infected hartebeest.

INTRODUCTION

Lichtenstein's hartebeest (*Alcelaphus lichtensteini)* harbours a number of species of nasal bots[13] some of which may be pathogenic to cattle.[1] This report describes the results of an initial survey carried out as part of a study of the role of antelope as potential reservoirs of parasites and diseases of cattle in some areas of Zambia where these bovids live close together.[6] Although hartebeest in Zambia now are largely restricted to National Parks and Game Management Areas, they are in fairly close proximity to domestic livestock in some regions. Thus, in the area described, villages with cattle and goats occur within 20 km of the unfenced boundary of Kafue National Park and opportunities exist for the exchange of parasites between hartebeest and these domestic animals—particularly those parasites with a winged dispersive phase.

MATERIALS AND METHODS

The area investigated is on the western boundary of Kafue National Park. It consists of a strip 5 km wide extending 100 km southwards from the Tatayoyo Gate (on the Lusaka-Mongu road) on the eastern extremity of Western Province, Zambia at approximately 15° 30' S and 25° 40' E. This boundary of Kafue N.P. is marked only by a graded road and animals cross freely in and out of the Park. Hartebeest often are seen 50 km west of the Park boundary where domestic livestock graze. The area is a miombo woodland dominated by *Julbernardia* and *Brachystegia* spp.[5] The mean annual rainfall is approximately 800 mm and occurs from November to April. Other potential antelope hosts for nasal bots in the area are wildebeest *(Connachaetes taurinus)* as well as roan and sable antelope (*Hippotragus equinus* and *H. niger).*

During April and May, 1976, nine adult Lichtenstein's hartebeest were shot in the study area. Heads were separated from the carcasses and stored in plastic bags until dissection was possible. The technique of dissection was similar to that used for wildebeest[6] in which the "nose" was separated from the cleaned head and then further divided and set aside. The extensive frontal sinuses were exposed by shipping away the dorsal surface of the frontal bones from the anterior (cut) surface above the third molars to the bases of the horns. The maxillary, lachrymal, orbital and frontal sinuses were then searched for oestrid larvae as well as the sections of "nose", the trachea and oesophagus. Mature larvae were set aside on damp sand for pupation while all other larvae were preserved in 70% ethanol for later examination. Larvae were identified using the keys of Zumpt[13] and Wetzel and Bauristhene[11] while the flies which emerged were identified according to Zumpt[13,14] and Basson *et al.*[4] Younger hartebeest were aged by Mitchell's technique[8] and the teeth wear on older animals was compared with skulls of known age.

RESULTS

The following parasites of the subfamily *Oestrinae*[13] were identified from third stage larvae and reared adults: *Gedoelstia cristata* Rodhain and Bequaert, *Oestrus aureoargentatus* Rodhain and Bequaert, *O. macdonaldi* Gedoelst (=*O. bassoni* Zumpt), *O. variolosus* (Loew) and *Kirkioestrus* sp. near *minutus* (Rodhain and Bequaert).

G. hassleri Gedoelst was probably present although no flies of this species emerged; the two species of *Gedoelstia* and their hybrids[4] are sufficiently indistinguishable as larvae to be uncertain without the presence of adults for species identification. Only 28 flies emerged from a total harvest of 972 third instar larvae. This gives a recovery rate of 2.9%, which is not unusually low for Oestridae because they are notoriously hard to rear.[13]

First instar larvae were found in the sinuses and nasal cavities of most heads; those of two samples are recorded in Table 2. Second instar larvae of *Gedoelstia* and *Oestrus/Kirkioestrus* were found in all of the heads; however, the species present are not distinguishable at this stage. The distribution of third instar larvae is given in Table 1; most of these were located in the major compartments and cornual extensions of the frontal sinuses.

The numbers of larvae in each head are not given here (except for the highest and lowest counts, Table 2) because in most animals total counts were not possible due to differential losses of larvae for various reasons associated with sampling. Nevertheless Table 2 gives the range of larval densities encountered and represents two complete counts. Similarly, the mean densities cannot be calculated from these data. The most frequently occurring third instar larvae in the nine heads were those of *Gedoelstia* spp. The relative abundance of third instar larvae in the pooled samples was *Gedoelstia* : *O. macdonaldi* : *Kirkioestrus* : *O. aureoargentatus* : *O. variolosus* in the approximate ratio of 60:40:34:7:1.

No obvious pathogenicity was observed. In three cases, decomposing mature third instar larvae of *Gedoelstia* were present in the lachrymal sinuses and these were surrounded by muco-purulent material. Hartebeest no. 1 had a catarrhal sinusitis in the anterior (supra-orbital) compartment of the right frontal sinus which nevertheless contained live larvae. There was no noticeable thickening of the mucosa of the sinuses in animals with heavy parasite loads.

TABLE 1. Distribution of the species of nasal bots found in the paranasal sinuses of Lichtenstein's hartebeest in Zambia.

No.	Sample Date	Est. age in years	Presence of third instar larvae					
			Sex	*Gedoelstia**	*O. aureo.*	*O. macdon.*	*O. variol.*	*Kirkio.***
1	13 April	2	F	+	—	+	—	+
2	29 April	3	M	+	+	+	+	—
3	30 April	1.5	M	+	+	—	—	+
4	30 April	3	F	+	—	+	—	+
5	30 April	2	F	+	+	+	—	+
6	19 May	2	M	+	—	+	+	+
7	19 May	2	F	+	—	+	+	+
8	25 May	4	M	+	+	+	—	+
9	26 May	5	M	+	+	+	+	+

* Includes *G. cristata*, *G. hassleri* and their hybrids.

** *Kirkioestrus* sp. near *minutus*.

TABLE 2. Total counts of oestrid larvae in the paranasal sinuses of Lichtenstein's hartebeest in Zambia: highest and lowest examples.

	Lowest Count No. 1	Highest Count No. 9	Maximum in any head
First instar larvae			
*Gedoelstia**	0	3	3
*Oestrus***	2	7	8
Second instar larvae			
*Gedoelstia**	1	8	15
*Oestrus***	6	52	52
Third instar larvae			
*Gedoelstia**	20	44	88
O. aureoargentatus	0	31	31
O. macdonaldi	13	69	71
O. variolosus	0	4	4
Kirkioestrus sp.	24	34	45
TOTAL	66	252	

* *G. cristata, G. hassleri* and their hybrids.

** *Oestrus* spp. and *Kirkioestrus* sp. which are indistinguishable at this stage.

DISCUSSION

The above species all have been recorded previously from Lichtenstein's hartebeest though not specifically from Zambia.[13] The species of *Kirkioestrus* may prove to be *K. minutus* but some abnormalities of wing venation and body colouration of the three reared flies cannot be clarified until a larger range of adults is available from this locality. Mixed infections of nasal bots are not uncommon in alcelaphine antelopes,[7,9,13] but the regular appearance of five (or six including *G. hassleri)* species (Table 1) is not often recorded. The production of flies from these larvae implies that *A. lichtensteini* is a natural host for all the species as they were able to complete their metamorphosis. While *Gedoelstia* spp., *O. aureoargentatus* and *O. variolosus* have been found in the paranasal sinuses of wildebeest in the same area and *Kirkioestrus* sp. may also occur in this antelope,[7,9,13] *O. macdonaldi* has not been found in any other antelope nearby. The nearest record of this species is in tsessebe *(Damaliscus lunatus)* from Liuwa Plain some 300 km westwards. *O. macdonaldi* also has been recorded from *A. lichtensteini* near Ngoma in the southern part of Kafue N.P., 120 km south-east of the study area, but not in wildebeest, roan or sable antelope. Thus, it is likely that *O. macdonaldi* is restricted to hartebeest in this region while other nasal bots are not host specific within the Alcelaphinae and Hippotraginae.[7,9,13]

No correlation could be found between the various combinations of oestrid species present in the hartebeest (Table 1) and their hosts' age, sex or body condition. This implies that the larviposition of the flies is random in respect to the antelope and not affected by prior infestation of the host or by any host defence mechanism such as that found in *Hypoderma* infections. In contrast to the situation in *Hypoderma* and *Oedemagena*[13] the oldest host animal here had the highest and most diverse parasite load (no. 9 in Tables 1 and 2). The concurrent presence of all three larval instars supports the contention of Wetzel[9] that there is no seasonality in *Oestrus* spp. in southern Africa and of Howard[6] that there is no seasonality in *Gedoelstia* spp. in Zambia. However, further samples are required to confirm a lack of seasonality for all three genera.

Few accounts have been published of the density of oestrid larvae in antelope. Zumpt[13] stated of *O. aureoargentatus* that over 100 larvae "of this and other oestrid species" were commonly found in one host animal. Wetzel[9] found mixed infections of from 80 to 180 oestrid larvae in the nasal cavities and sinuses of 10 wildebeest in the Kruger National Park, South Africa. The densities reported here extend this range, but this is not surprising as the cornual compartments of the frontal sinuses are larger in *A. lichtensteini* than in wildebeest. The larvae in hartebeest no. 9 must represent a density close to the maximum as there was little area of the mucosa in the frontal sinuses that was not occupied by bots. Further speculation is not possible without total counts of larvae that give means and variances.

Present knowledge of the effects of oestrid larvae on their antelope hosts has been adequately summarised.[2,9,13] In general these parasites are considered to have little pathogenic affect while in their normal hosts. However, in abnormal hosts they may do considerable damage. In gedoelstial myiasis of sheep, goats and cattle, *Gedoelstia* spp. cause serious damage and high mortality[3] while hardly affecting wildebeest and hartebeest.[2] *Gedoelstia* spp. represent a possible threat to livestock production in the area and the hartebeest can be regarded as a reservoir of these parasites. The significance of this is not yet known and gedoelstial myiasis in domestic stock has not so far been officially recorded in Zambia; but this is no certain indication of its absence.[6] Recent reports of "bulging eye disease" in village cattle in the area described are being investigated as they may be evidence of gedoelstiasis.[3]

Gedoelstia and *Oestrus* also have been implicated in human ophthalmomyiasis in southern Africa[10,12] but this is a rarely reported involvement. *Kirkioestrus* sp. and *Oestrus* spp. are probably of little consequence to either the antelope or the domestic animals in the study area.

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