Notes and records

Cross-sectional survey of gastro-intestinal parasites of Grevy's zebras in southern Samburu, Kenya

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Introduction

Disease can pose a serious threat to endangered species, occasionally causing sudden and unexpected local declines in abundance (Cleaveland *et al.*, 2002). However, the risk posed by diseases in the struggle to conserve endangered species is usually overlooked until a major problem occurs. The rapid decline in the population of the endangered Grevy's zebras (*Equus grevyi*) over the last century has caused great concern among conservationists (Nelson & Williams, 2003). Data on parasites that infect these equids is lacking (Radcliffe & Osofsky, 2002). As part of our long-term research, we sought to determine and document gastro-intestinal parasites that infect these equids in community pastoral lands in southern Samburu Kenya (Fig. 1).

Materials and methods

This study was conducted on community land in southern Samburu (Fig. 1) from March 2003 to October 2004. Southern Samburu was chosen for this study because it is home to at least half of the wild Grevy's zebra population (Williams & Low, 2004). In addition, majority of these equids are found 'in community owned land where they interact with man, livestock and other wild animals. Faecal samples of Grevy's zebras were collected opportunistically whenever these equids were observed defecating during monthly population censuses. Other herbivorous mammals within 400 m from Grevy's zebras were noted. Faecal samples were collected in poly-pot bottles containing 10% buffered formalin as a preservative. Modified formol-ether sedimentation method (Richie, 1948) was used to deposit the eggs, cysts and hatched larvae of gastro-intestinal parasites. A gram of faecal sample was emulsified in 10% formalin and then suspension was strained through a brush wire sieve to remove debris. From the suspension, 7 ml were put into a test tube and 3 ml of ether was added followed by centrifugation at 1610 rpm for 10 min. This formed a floating fatty plug and debris, which was dislodged using an applicator stick. The resulting supernate was discarded. The remaining sediment was thoroughly mixed after which a drop was transferred onto a glass microscope slide and covered with a 22 mm cover slip ready for examination (at ×10 and ×40 objectives). Lugol's iodine solution (0.15%) was used to stain one while the other was left unstained. Parasite occurrences (based on the isolation of either worms or their eggs) and frequencies were recorded and expressed as a percentage of samples containing the parasite. In addition, the mean number of parasite species per sample was determined. Chi-square was used to test whether parasitic infection was independent of the individual's sex and age.

Results

A total of 51 faecal samples were analysed for gastro-intestinal parasites. These comprised of 25, 11, 3, 2, 1 and 9 samples from adult males, adult females, juvenile males, foals and unidentified individuals, respectively. Ninety per cent of these samples had gastro-intestinal parasites with a mean of 2.7 (±0.20 SEM) parasite species per faecal sample. Table 1 shows the parasites observed and their frequency of occurrence in Grevy's zebra faeces. In most cases, it was not possible to identify the parasite beyond genus level. *Trichostrongylus* were

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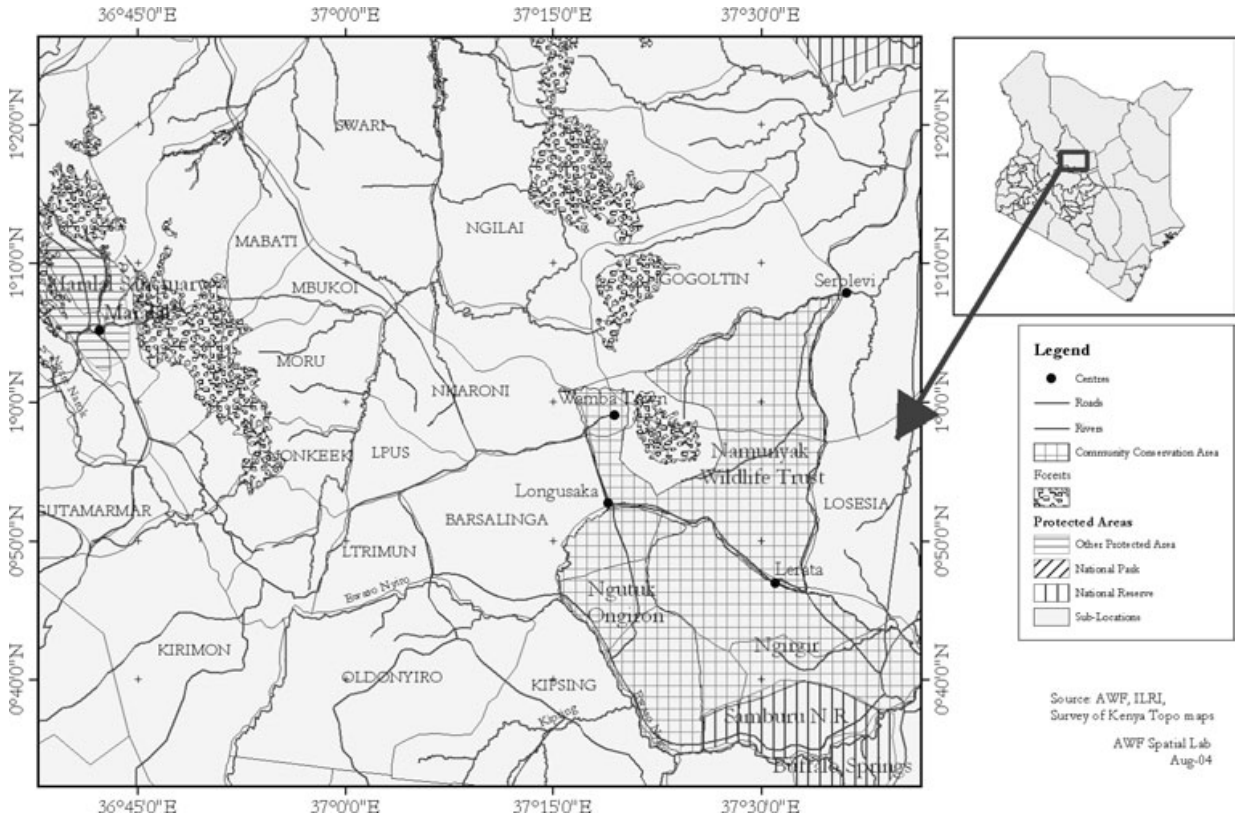

Fig 1 Study Area – Southern Samburu, Kenya

Table 1 Percentage frequency of occurrence of gastrointestinal parasites found in faecal samples of Grevy's zebras in Southern Samburu, Kenya (n = 51 faecal samples)

	Age/sex category (n)						
Parasite species	Und (9)	Adm (25)	Adf (11)	Inf (2)	Juv (4)	Total (51)	Percentage occurrence
Trichostrongylus sp. eggs	9	21	7	1	2	40	78.4
Oesophagostomum sp.	7	13	6	0	3	29	56.9
Haemonchus contortus	9	14	4	0	1	28	54.9
Parascaris sp.	3	8	4	0	3	18	35.3
Nematodius	7	7	2	0	1	17	33.3
None	0	2	1	1	1	5	9.8
Entamoemba coli cysts	0	4	0	0	0	4	7.8
Balantidium coli cysts	1	2	1	0	0	4	7.8
Entamoemba histolytica cysts	2	0	0	0	0	2	3.9
Isospora belli	1	0	0	0	0	1	2.0
Dictyocanlus sp.	1	0	0	0	0	1	2.0

Und, unidentified individuals; Adm, adult male; Adf, adult female; Juv, juvenile; Inf, infant.

the most frequent parasites occurring in 78% of the samples. Other parasites occurring in high frequencies were *Oesophagostomum*, *Haemonchus contortus*, *Entamoemba coli* cysts and *Balantidium coli* cysts. Parasite infection rates were independent of sex and age ($P < 0.05$).

Table 2 Animals within 400 metres from Grevy's Zebras in Southern Samburu, Kenya ($n = 722$ sightings

Name		Percentage of sightings in which animal was also present
Common name	Scientific name	
Plains zebras	*Equus Burchelli* Gray	17.5
Camels	*Camelus bactarius* Linnaeus	11.9
Cattle	*Bos Taurus* Linnaeus	11.9
Goats/sheep	*Capra hircus* Linnaeus *Ovis aries* Linnaeus	11.4
Grants gazelle	*Gazella granti* Brooke	10.5
Grenuk	*Litocranius walleri* Brooke	3.9
Thomson's gazelle	*Gazella thomsonii* Günther	3.9
Oryx	*Oryx gazella beisa* Linnaeus	2.3
Donkey	*Equus asinus* Linnaeus	2.0
Elephants	*Loxodonta Africana* Linnaeus	1.3
Impala	*Aepyceros melampus* Lichtenstein	1.2

Cattle and camels were the livestock species mostly encountered utilizing the same areas with Grevy's zebras (Table 2). Other species were goats, sheep and donkeys. Wild animals mostly encountered utilizing the same areas with Grevy's zebras were plains zebras, Grants gazelles and Grenuks, among others (Table 2).

Discussion

Preliminary results on gastro-intestinal parasites of Grevy's zebras revealed the presence, in Grevy's zebras faeces, of parasites, which are also important in other wild animals, human and livestock. Although *Trichostrongylus* was encountered in 78% of the faecal samples examined, there its impact on equids is not known. *H. contortus* which was present in 55% of the faecal samples examined in this study is highly pathogenic to small ruminants and is the most economically important nematode in sheep and goats (Grootenchuis, 1999; Riou, Guégnard, Vern & Kerboeuf, 2003). *B. coli* and *Entamoemba histolytica* cause amoebic dysentery and balantidiasis, respectively both of which are zoonotic waterborne infections in man (Schuster & Visvesvara, 2004). *Entamoemba coli* is also an important diarrhoeal pathogen in man (Okeke *et al.*, 2003). Data on the impact of these parasites on Grevy's zebras is lacking.

Grevy's zebras were frequently seen in the same areas with plains zebras, camels, cattle, goats/sheep and Grants gazelles (Table 2). Grevy's zebras, other wild animals and man share the same limited water sources. Human population in Samburu district grew from 77,000 in 1979 to 142,000 in 1999 (Central Bureau of Statistics, 2004). In rural Samburu landscape, human waste is disposed in the bush and people bathe in the water sources that wild and domestic animals rely on. These poor sanitary habits coupled with rapid increase in human population in the study area create fertile grounds for zoonotic parasitic infections like *E. coli*, *E. histolytica* and *B. coli* to flourish. Future work should focus on determining the gastro-intestinal parasites that infect other wild animals, man and livestock in the study area. Such a study should also incorporate a component of public health and water quality assessment.

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References

Central Bureau of Statistics (2004) Statistical Abstract. Government Printer, Nairobi, Kenya.

Cleaveland, S., Hess, G.R, Dobson, A.P., Laurenson, M.K., McCallum, H.I., Roberts, M.G. & Woodroffe, R. (2002) The role of pathogens in biological conservation. In: The Ecology of Wildlife Diseases (Eds P. J. Hudson, A. Rizzoli, B. T. Grfenfell, H. Heesterbeek and A. Dobson). Oxford University Press Inc., New York, pp. 139–150.

Grootenchuis, J.G. (1999) 25 years of Wildlife Disease Research in Kenya. Kenya Agricultural Research Institute, Nairobi, Kenya.

Nelson, A.P.W., Williams, S.D. (2003) Grevy's Zebra Survey: Kenya 2000. Final report. Kenya Wildlife Service, Nairobi, Kenya.

Okeke, I.N., Ojo, O., Lamikanra, A., Kaper, J.B. (2003) Etiology of acute diarrhea in adults in southwestern Nigeria. *J Clin Microbiol.* **41**, 25–30.

Radcliffe, R.M. & Osofsky, S.A. (2002) Disease concerns for wild equids. In: Equids: Zebras, Asses, and Horses: Status Survey and Conservation Action Plan (Ed. P. D. Moehlman). IUCN/SCC Equid Specialist Group, IUCN (The World Conservation Union), Gland Switzerland and Cambridge, pp. 124–152.

RICHIE, L.S. (1948) An ether sedimentation technique for routine stool examination. *Bull. U. S. Army Med. Dep.* **8,** 326.

RIOU, M.F., GUÉGNARD, VERN, Y.L., KERBOEUF, D. (2003) Modulation of the multidrug resistance (MDR) system in the nematode *Haemonchus contortus* by changing cholesterol content: effects on resistance to anthelmintics. *J. Antimicrob. Chemother.* **52,** 180–187.

SCHUSTER, F.L & VISVESVARA, G.S. (2004) Amebae and ciliated protozoa as causal agents of waterborne zoonotic disease. *Vet. Parasitol.* **126,** 91–120.

WILLIAMS, S & LOW, B. (2004) Grevy's Zebra Conservation: Proceedings of a Workshop. Mpala Research Centre, Kenya.

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