GASTROINTESTINAL AND RESPIRATORY PARASITES SURVEY IN WILD AFRICAN LIONS (*PANTHERA LEO*) FROM NIASSA NATIONAL RESERVE, MOZAMBIQUE – PRELIMINARY RESULTS

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Summary

The African lion (*Panthera leo*) is an iconic species of the African continent, classified as vulnerable by the IUCN. Infectious diseases are one main threat for the survival of this species. However, the impact of parasitic infections has been overlooked and poorly documented. In order to characterise the parasitological fauna of these animals, a study was carried out in the Niassa National Reserve (NNR), Northern Mozambique, where a large population of lions lives. In partnership with the Niassa Lion Project and the administration of the Niassa Reserve, 44 lion faecal samples were collected in an area of 600 km² (Concession L5-South), and later processed and analysed at the Laboratory of Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, Lisbon University. Results show that 65.9 % (29/44) of the samples were infected with parasites, namely 47.7 % for *Toxocara* sp., 31.8 % for *Aelurostrongylus* sp., 25 % for *Spirometra* sp., 27.3 % for Taeniidae, 18.2 % for *Paramphistomum* sp. and 13.6 % for *Linguatula* sp. Out of the 29 positive samples, 72 % (21/29) were co-infected, registering double infection in 21 % (6/29), triple in 34 % (10/29), quadruple in 10 % (3/29) and fivefold in 7 % (2/29). These results are consistent with previous studies performed in the African continent, with the exception of *Linguatula* sp., which had not yet been reported in wild lions.

Introduction

The Niassa National Reserve (NNR) is one of the largest, most remote and least known conservation areas in the World, located in the far North of Mozambique. This Reserve stretches over 42,000 km^2, representing the conservation area with the highest density of wildlife in the country, with particular relevance for its African lion population (*Panthera leo*), with an estimated size of 1000 to 1200 individuals (NIASSA CARNIVORE PROJECT, 2013). For this reason, the Niassa National Reserve is considered a stronghold for the species (RIGGIO *et al.*, 2012) and represents one of the few areas in the World where the species has a chance of long-term survival. According to The IUCN Red List of Threatened Species, *P. leo* is mostly in decline throughout its range. The African lion is a species classified as vulnerable by the IUCN and is protected by CITES Appendix II. The main threats to its survival are conversion and destruction of habitat, prey depletion and indiscriminate killing (IUCN, 2014). Diseases may contribute to the reduction of animal populations and biodiversity loss. There is currently little information on parasitic diseases in wild lions, although their parasitological fauna is considered to be very different from that reported in lions kept in zoos (SCOTT, 1988; MÜLLER-GRAF, 1995). In order to characterise the diversity and the level of parasitism of African lions in NNR, a study

was developed in a partnership with the Niassa National Reserve Management authority (a co-management agreement between Wildlife Conservation Society and the Ministry of Tourism) and the Niassa Lion Project, which has been based in Niassa National Reserve since 2003.

Material and methods

Between October and November 2014, 44 lion faecal samples were identified and collected from the field, in an area with approximately 600 km^2 (L5-South Concession) of the NNR. Multiple sampling of the same animal(s) was possible, as the source of faecal samples was not known. Samples were located by a local tracker and lion field worker, stored in dry conditions, transported in plastic bags to the base camp of Niassa Lion Project and kept in a cool place until transported by plane to Portugal. Samples were analysed between 15 to 30 days after collection at the Laboratory of Parasitology and Parasitic Diseases, CIISA-FMV-ULisboa, using the following coprological methods according to THIENPONT *et al.* (1986) and BOWMAN (2014): qualitative natural sedimentation and Willis flotation (for isolating helminth eggs and protozoan oocysts); McMaster quantitative method (to assess the number of eggs per gram of faeces, EPG); and Baermann technique (for the search of first stage larvae (L1) of pulmonary nematodes).

Results

A total of 65.9 % (29/44) of the samples were positive considering all the coprological techniques. A wide range of parasites was observed (figure 1), belonging to genus *Toxocara* 47.7 % (21/44), *Aelurostrongylus* sp. 31.8 % (14/44), *Spirometra* sp. 25 % (11/44), *Taeniidae* family 27.3 % (12/44), *Paramphistomum* sp. 18.2 % (8/44) and *Linguatula* sp. 13.6 % (6/44).

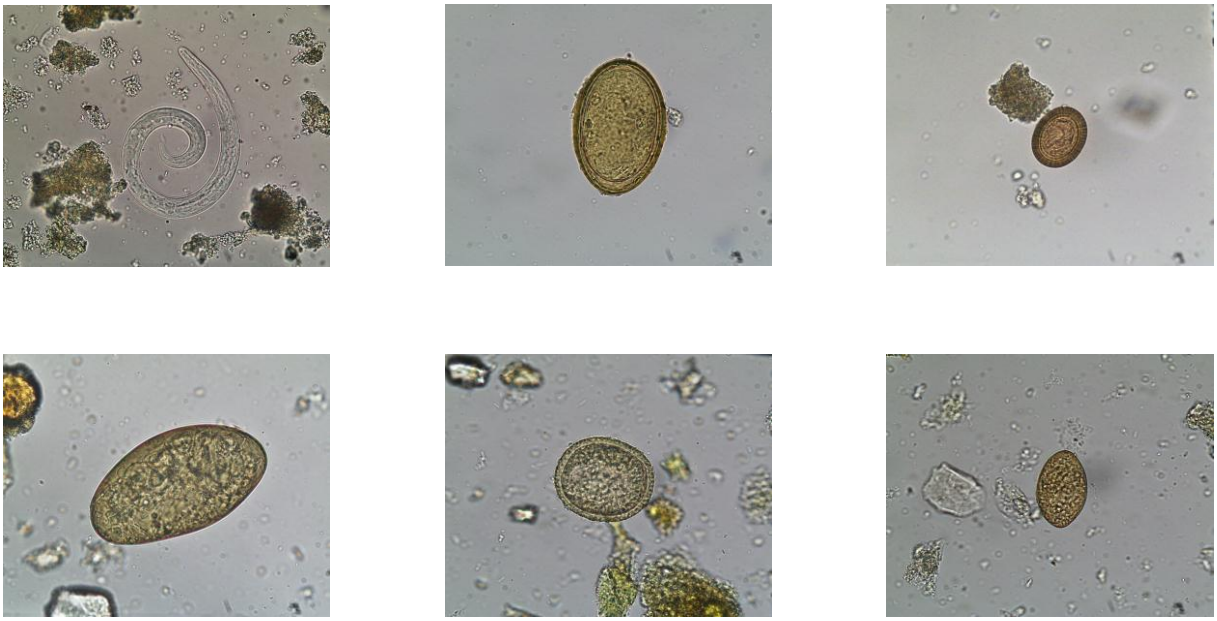

Fig. 1: Left to right, top row: Aelurostrongylus sp. (L1 Larvae - 260 µm x 2.5 µm, 40x), Linguatula sp. (Egg - 80 µm x 53 µm, 40x), Taeniidae (Egg - 39 µm x 32.5 µm, 40x). Bottom row: Paramphistomum sp. (Egg - 120 µm x 67.5 µm, 40x), Toxocara sp. (Egg - 63 µm x 55 µm, 40x), Spirometra sp. (Egg - 57 µm x 35 µm, 40x). (Photos: Lajas LM)

Out of the 29 positive samples, 28 % (8/29) were infected by a single species of parasite and the remaining 72 % (21/29), were co-infected with two, 21 % (6/29), three, 34 % (10/29), four, 10 % (3/29) and even five, 7 % (2/29) distinct parasites. The most common co-infection was the one caused by *Aelurostrongylus* sp. and *Toxocara* sp., 57 % (12/21).

Discussion

The number of parasite species identified in this study was higher than previously found in Namibia by SMITH and KOK (2006) and lower than those found in Zambia by BERENTSEN *et al.* (2012) and in Tanzania by MÜLLER-GRAF (1995) and BJORK *et al.* (2000). *Toxocara* sp. (47.7 %) was the most prevalent parasite in our study, in comparison with the studies of MÜLLER-GRAF (1995), MÜLLER-GRAF *et al.* (1999) BJORK *et al.* (2000) and BERENTSEN *et al.* (2012), who documented *Spirometra* sp. as the most common parasite. The registered prevalence of 32 % for *Aelurostrongylus* sp. in this work was higher than previously described 20 % (BJORK *et al.* 2000) and 21 % (BERENTSEN et al., 2012). The prevalence of Taeniidae eggs, 27.2 %, is intermediate between BERENTSEN *et al.* (2012) (80 %), MÜLLER-GRAF *et al.* (1999) (58 %) and BJORK *et al.* (2000) (15 %). The prevalence of 13.6 % for *Linguatula* sp. represents the first documentation of this parasite species in *P. leo* in the wild, since only two authors reported this parasite as a potential cause of disease in African lions (YOUNG, 1975; MUKARATI *et al.*, 2013). The presence of *Paramphistomum* sp., was considered pseudo-parasitism, as a result of hunting wild ruminants, in particular buffalos. The diet of these big cats is probably the source of most of the parasitic forms found, although it is not possible to establish a direct link between the identified parasites and the prey species they belong to. *Toxocara* sp. was the most prevalent parasite, probably due to its direct life cycle, but also due to the chance of ingesting paratenic hosts with larval stages. The parasite species found in this study may have been influenced by the weather condition of the dry season (with extremely high temperatures and very low humidity), causing dehydration of the samples taken from the field. This fact probably mirrors a potential sub-characterisation of parasitic load, suggesting that prevalence of some parasites found in this study may be higher Ancylostomatid eggs with its thin capsule were not found, probably because high temperatures made impossible the survival of hookworm eggs. However, the high prevalence of *Toxocara* sp. (a parasite with direct life cycle) and *Aelurostrongylus* sp. (with indirect life cycle) is remarkable. That could be related also with high animal density in that area, or probable inter-transmissibility of these nematodes among big carnivores living in this ecosystem. Wild animals can be natural hosts of many parasite species and other infectious agents, which usually do not cause disease until other triggering factors arise (MUNSON *et al.*, 2008). Due to their life cycles and host-parasite interactions, we consider high loads of *Toxocara* sp. and *Aelurostongylus* sp. to be a potential cause of disease in lions. Further studies on the pathological effects of these parasites in wild lions are needed. The identification of the parasitic elements was based on morphometric analysis and comparison with current literature, which allowed the identification until genus level. Molecular analysis is under progress in order to enable an accurate and complete identification. This qualitative study represents the first survey on the population of African lions from NNR and Mozambique and is also one of the few ever undertaken within the parasitology of African lions in the wild.

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