Prevalence of *Spirometra* species and other gastrointestinal helminths in wild lions (*Panthera leo*) in Tarangire National Park, northern Tanzania

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To assess the prevalence of *Spirometra* species and other gastrointestinal helminths in wild lions (*Panthera leo*) in Tarangire National Park in northern Tanzania. Faecal samples from seven lions were examined by using floatation and sedimentation methods. Three taxa of intestinal helminths were identified. The parasite genera observed were *Spirometra*, Toxocara and Taenidae with their prevalence of 100%, 71.4% and 42.8%. The results showed that the prevalence rate of *Spirometra* by sedimentation method was 100% (7 infected samples). Single infections (100%) showed higher results than mixed infection. Floatation method (salt solution SG 1.210) showed high prevalence for Toxocara and sugar solution (SG 1.459) for Taenidae. The study revealed that *Spirometra* sp. was one of the most frequently detected gastrointestinal helminths, which is an important source of zoonotic helminthes and provides baseline data for future studies.

Key words: Gastrointestinal helminths, *Panthera leo*, Tarangire National Park

INTRODUCTION

Lions and other felines and canines act as definitive hosts for many parasites, some of which are responsible for several zoonotic diseases. The cestodes and nematodes have been reported in the intestine of wild and zoo lions worldwide (Round, 1968; Bwangamoi, 1970; Rodgers, 1974; Gaur, 1979; Prescott, 1981; Sharma, 1983; Ogungbade, 1984; Ghoshal, 1988; Müller-Graf, 1995; Berentsen, 2012). In these previous studies, the commonly occurring gastrointestinal parasite species reported were *Spirometra*, Toxocara, Taeniidae.

In Southern Africa, free-ranging lions have been reported to be infected with gastrointestinal parasites: *Toxocara*, *Taeniid*, *Ancylostoma*, *Dirofilaria*, *Dipyldium*, *Gnathostoma* (Le Roux, 1958). In India and Australia reports on zoo and circus lions showed that were infected with *Spirometra*, *Toxocara* and *Ancylostoma* sp. (Ogungbade, 1984; Hiregougar, 1975; Pande, 1970; Pallerdy, 1974).

In Tanzania, reports on gastrointestinal parasites in free-ranging lions in Serengeti National Park showed that lions were infected with different parasites of the orders *Protozoa*, *Trematoda*, *Cestoda*, *Nematoda*, *Acanthocephala*, and *Arthropoda*. The parasites observed were *Eimeria* sp., *Giardia* sp., *Isospora* sp., *Sarcocyst* sp., *Taeniidae*, *Ancylostoma*, *Capillaria*, *Toxocara*, *Trichuris*, and *Acanthocephala* (Mueller-Graf, 1995; Dinnik, 1972; Sachs, 1968).

The current study, reports the prevalence of the helminth parasites in the lions of Tarangire National Park in northern Tanzania.

MATERIALS AND METHODS

Study area

The study was a cross sectional conducted in Tarangire National Park in Tanzania. Tarangire National Park is one of the National Parks in Tanzania located in Babati
District (Figure 1). It is the sixth biggest National Park in Tanzania. The park has a land size of 2850 km², located 118 km Southwest of Arusha. It lies at Latitude 4° 0' 0" S and Longitude 36° 0' 0" E. Animals found in the park are elephants, wildebeest, zebra, buffalo, impala, gazelle, hartebeest and eland.

Faecal sampling and preservation

In conducting the study, a cross-sectional design in which data was collected as a single point and time (Thrusfield, 2005) was used.

Sampling of faeces (fresh stool) from lions (Panthera leo) of Tarangire National Park was carried out with the help of staff from Tanzania Wildlife Research Institute, Arusha and Tarangire Lion Research Project, Tarangire. Two methods were used to collect faecal samples (i) Invasive collection of faecal samples from the rectum after the animal was immobilized (Figure 2). Immobilization was done by using Ketamin at a dose of 3 ml intramuscularly (Manufacturer-Kyron Laboratories (Pty) Ltd). Only one faecal sample was collected from one individual. (ii) Opportunistic sampling of faeces from the ground where has been deposited by using gloved hands. Six samples were collected from individuals observed defecating. The collected samples were kept in labelled plastic bags, preserved in cool box with ice cubes then transported by bus from Arusha to the laboratory at Sokoine University of Agriculture, Morogoro where was stored at refrigerated temperature (4°C) for a maximum of two days before processing. Parasitological laboratory analysis of faecal samples to detect the presence of stomach and intestinal eggs (cestodes and nematodes) in the samples was carried out by two techniques: sedimentation and floatation as described by Soulsby (1982) and Urquhart (1987).

RESULTS

A total of 3 parasite species were present in the faecal samples of 7 lions. The parasite species were identified based on their presence of characteristic helminth ova. The parasite species identified were Spirometra, Toxocara and Taeniidae. The seven lions examined harboured at least one of the parasite identified. Among the parasitic infections, the prevalence of each parasite investigated Spirometra (100%) was the most common followed by Toxocara (71.4%) and Taeniidae (42.8%), as
Table 1. Helminths found in wild lions in Tarangire National Park, northern Tanzania.

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of lions positive</th>
<th>Infection rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirometra</em></td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>Toxocara</td>
<td>5</td>
<td>71.4%</td>
</tr>
<tr>
<td>Taeniidae</td>
<td>3</td>
<td>42.8%</td>
</tr>
</tbody>
</table>

Table 2. Polyparasitism of gastrointestinal helminths in wild lions in Tarangire National Park

<table>
<thead>
<tr>
<th>Lion</th>
<th>Parasite species infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lion 1</td>
<td><em>Spirometra</em>, Toxocara</td>
</tr>
<tr>
<td>Lion 2</td>
<td><em>Spirometra</em>, Toxocara, Taeniid</td>
</tr>
<tr>
<td>Lion 3</td>
<td><em>Spirometra</em>, Toxocara</td>
</tr>
<tr>
<td>Lion 4</td>
<td><em>Spirometra</em>, Toxocara</td>
</tr>
<tr>
<td>Lion 5</td>
<td><em>Spirometra</em>, Toxocara, Taeniid</td>
</tr>
</tbody>
</table>

presented in Table 1. In the lions, single parasite infection was observed in 28.6% of the animals while multiple parasite infections were observed in 71.4% of the animals examined as shown in Table 2. Majority of these with multiple infections 71.4% had 2-3 parasite species per individual animal. Two methods floatation and sedimentation were used to diagnose the parasite ova as shown in Table 3. Floatation method (Sugar solution S.G. 1.459) diagnosed two different species while Sedimentation and floatation (Salt solution S.G. 1.210) each diagnosed only one species of parasite.

DISCUSSION

In this study, we evaluated the prevalence of *Spirometra* sp. and other intestinal helminthes in 7 wild lions in Tarangire National Park as such data was not available. Faecal sample of 7 wild lions (*P. leo*) revealed natural infection with *Spirometra*, *Toxocara* and *Taeniidae* species. The finding is similar to that of survey of wild lions in Serengeti and Ngorongoro Crater (Müller-Graf, 1995). In the report from Serengeti National Park and Ngorongoro Crater it was stated that *Spirometra* sp.
Table 3. Method used in relation to the number of parasite species diagnosed.

<table>
<thead>
<tr>
<th>Method</th>
<th>Lions diagnosed with parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spirometra</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>7</td>
</tr>
<tr>
<td>Floatation (Salt solution SG 1.210)</td>
<td>0</td>
</tr>
<tr>
<td>Floatation (Sugar solution SG 1.459)</td>
<td>5</td>
</tr>
</tbody>
</table>

occurred in 63% of the wild lions (Müller-Graf, 1995). The overall prevalence of *Spirometra* sp. in wild lions in our study is comparable to that of gastrointestinal parasites previously reported in wild lions (Sachs, 1968; Round, 1968; Dinnik, 1972; Rogers, 1974; Young, 1975; Bwangamoi, 1990; Müller, 1995).

A number of previous observations in different parts have demonstrated gastrointestinal parasites in lions (Ortlepp, 1937; Dinnick, 1972; Gaur, 1979; Prescott, 1981; Sharma, 1983; Ogungbade, 1984). In this study, the gastrointestinal parasites observed in lions agrees with the previous workers.

Mixed parasitism involving more than one helminth genera was common in the present study and is in agreement with earlier reports (Young, 1975; Bwangamoi, 1990; Müller-Graf, 1995).

The prevalence of 100% of *Spirometra* in the present study is higher than the prevalence of 63% obtained in Serengeti and Ngorongoro Crater (Müller-Graf, 1995). The higher prevalence in this result than those obtained in Serengeti and Ngorongoro Crater could be the infection rate of *Spirometra* to other animals that lions feed is very high. Lions not only kill their own prey but also scavenge from other predators and eat animals that have died from disease and other causes (Schaller, 1972). Lions in the park feed mainly on wildebeest (*Connochaetes taurinus*), zebra (*Equus burchelli*), wart-hog (*Phacochoerus aethiopicus*), buffalo (*Syncerus caffer*), Thomson's gazelle (*Gazella thomsoni*) and topi (*Damaliscus korrigum*) (Scheel, 1993). In the present study the lions were demonstrated to be infected with gastrointestinal parasites, the infection could have been from animals they killed. Thus, individual lions are highly exposed to infection from the animals they kill for their prey.

Recovery of gastrointestinal parasites in lions has been demonstrated by using formal-ether technique (Müller-Graf 1995). In the present study two methods: floatation and sedimentation were used. Sedimentation technique demonstrated high recovery rate of *Spirometra* eggs. The results presented have shown that, following the techniques used in this study, sedimentation is a better technique to recover *Spirometra* eggs from faecal samples of lions.

Conclusion

Natural gastrointestinal helminth parasite infections were common in this study. The present study contributes baseline data for prevalence of gastrointestinal parasite species in lions in Tanzania. Many of the gastrointestinal parasites identified in this study have been reported by other researchers to be zoonotic. Though the study animals were asymptomatic at the time of faecal sampling, these may be potential danger to humans, livestock and other wildlife as they come close to human habitats. Control measures should be taken in order to protect humans in the areas surrounding the National Park.

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