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First Report of *Spirometra* Procercoid Parasitism in *Cyclops* from Tanzania

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

A survey was carried out on natural infection of *Spirometra* procercoids in *Cyclops* from water ponds in Tarangire National Park, Tanzania. *Cyclops* collected from ponds in Tarangire National Park were examined for the presence of procercoids in their body cavities. The *Cyclops* were anaesthetized with carbonated water and examined under compound microscope. *Spirometra* procercoids were found in the body cavity of naturally infected *Cyclops*. The procercoids was elongate, had calcareous corpuscles and mean measurements were 101.7µm in length and 71.7 µm in width. The procercoids seems to concur with *S. erinacei* procercoid. This is a first record of *Spirometra* procercoid in *Cyclops* from Tanzania.

Keywords: Spirometra; Procercoid; Cyclops, Tanzania.

1. INTRODUCTION

Spirometra is an intestinal tapeworm of wild and domesticated carnivores that is most commonly seen in Asian countries [1]. Humans become infected by eating raw and undercooked meats of plerocercoid-infected animals (frog, snake and etc.), by placing the raw meats on open wounds, skin ulcers, and eyes, and by drinking water contaminated with procercoid-infected *Cyclops* spp. [1]. *Spirometra* species have two intermediate hosts in their life-cycle [2]. Adult *Spirometra* spp. are found in the small intestine of the definitive host [3]. The eggs are shed in the faeces after being discharged from the uterine pore of adult worms. The life-cycle of

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Spirometra spp. starts from the stage of an egg. When eggs are discharged out they are not embryonated (undeveloped). They start embryonation after reaching water. The egg hatches in water, releasing a free swimming coracidium. The coracidium is ingested by the first intermediate host, copepod of the genus *Cyclops*, and develops into a procecoid. The first intermediate host is a copepod (planktonic freshwater crustacean) in which coracidia develop into procercoid larvae (the first larval stage). When the infected copepod is swallowed by a second intermediate host, such as an amphibian or reptile [4,5], the procercoid larvae penetrate the intestinal tract and transform to plerocercoids (spargana), which then migrate and settle in other organs and tissues [6,7,8]. If the flesh of the second intermediate host is ingested by the definitive host cats, dogs, wild felides and raccoon the plerocercoid attaches to the intestine and develops into an adult worm [3,9,10]. The different stages in the life-cycle of *Spirometra* are used for identification of the parasite. However, there are no reports about the natural infection of the first intermediate host (*Cyclops*) with *Spirometra* procercoid in Tanzania. Therefore, the aim of this study was to find out parasitism of *Spirometra* procercoids in *Cyclops* spp.in Tanzania.

2. MATERIALS AND METHODS

Cyclops were collected from eight sites in Tarangire National Park (Fig.1). They were preserved in a plastic container and transported to the laboratory. In the laboratory water containing *Cyclops* was poured in a Petri dish and examined under dissecting microscope. *Cyclops* were picked with a Pasture pipette placed on a slide with a drop of water then a drop of carbonated water was added and cover slip was placed onto it. The slide with *Cyclops* was examined under compound microscope mounted with ocular micrometer. The *Cyclops* found to harbor procercoid in their body cavity were recorded, measurements of length, width and pictures were taken (Fig.2).

A total of 84 *Cyclops* were examined for the infection with procercoids. Out of these 6 (7.14%) were infected with procercoids as shown in (Table 1). The procercoid is seen in the body cavity of the *Cyclops* (Fig.2). The procercoid are elongated, with calcareous corpuscles and the body surface is smooth. The measurements of the procercoids are given in (Table 2). The length of the body is from 80-120 µm and width from 40-90µm. Each infected *Cyclops* carried only one procercoid.

Table 1. Natural infection of *Cyclops* with procercoids

Site collected *Cyclops*	No. of *Cyclops* examined	Positive	Negative
Sirale	16	0	16
Kuro	16	0	16
Boundary	14	0	14
River Tarangire	3	0	3
Public area	12	4	8
Matete	7	0	7
Matete	6	0	6
Near camp site	10	2	8
Total	**84 (100%)**	**6 (7.14%)**	**78 (92.86%)**

Table 2. Measurements of the procercoids from naturally infected *Cyclops*

No.of procercoid recovered	Length (µm)	Width (µm)
1	100	70
2	80	40
3	120	90
4	110	80
5	90	50
6	110	80
Mean	**101.7**	**71.7**
Range	**80-120**	**40-90**

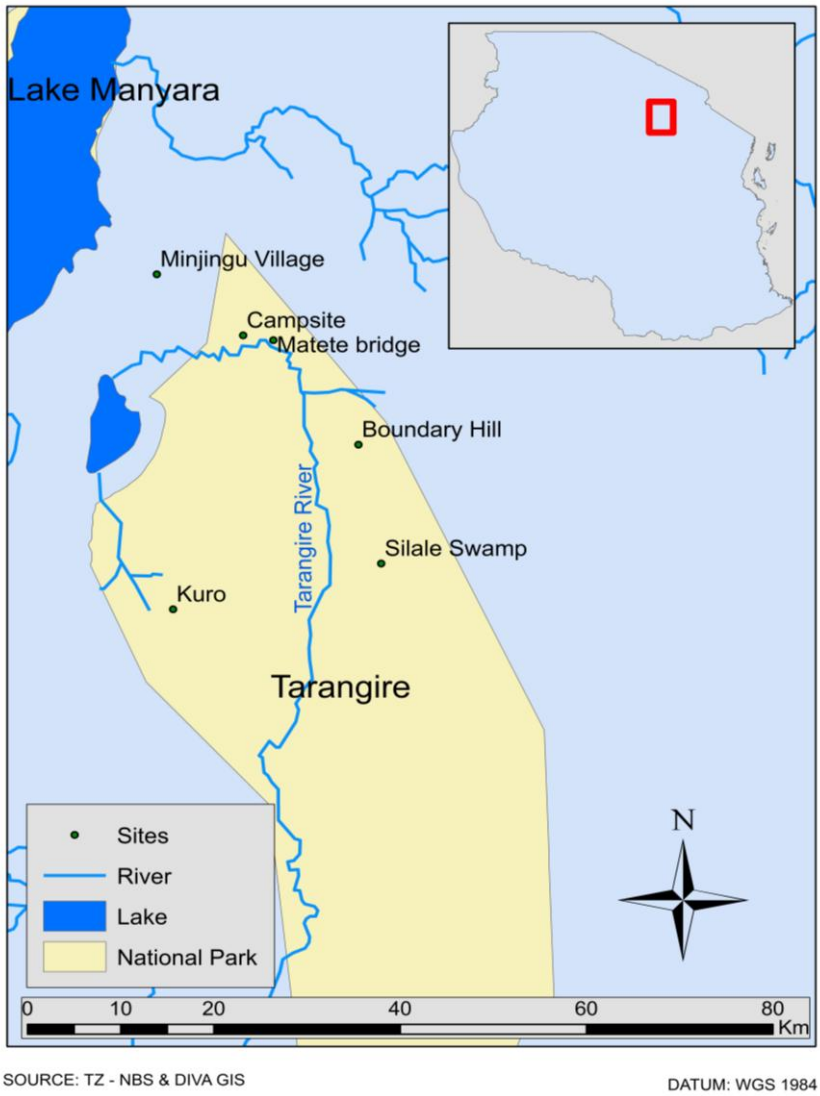

Fig. 1. Map of Tarangire National Park showing sites where *Cyclops* were collected. Map of Tanzania on top right shows the location of Tarangire National Park

Fig. 2. Coracidia in the body cavity of *Cyclops*. (Arrow showing procercoid, elongated in the body cavity of *Cyclops*)

3. DISCUSSION

The *Cyclops* are fresh water dwellers which are an important part of aquatic food chain, and have a role as vectors of diseases. The faeces from infected animals contaminate water sources and the *Spirometra* eggs are released into the water system where they hatch into coracidia. Coracidia are free swimming, which in turn infect the free living *Cyclops*. Once the coracidium is ingested by *Cyclops*, it penetrates the intestinal wall into the abdominal cavity, where develop into the procercoid. Lee et al. [3] established the role of *Cyclops* as the first intermediate host for *Spirometra* infections. He also reported that *C. affinis, C. leuckarti, C. serrulatus* served as the first intermediate hosts of *Spirometra.* In the present study it was observed that not all *Cyclops* examined were infected, only 7.14% of the *Cyclops* carried procercoids. Each infected *Cyclops* carried only one procercoid. *Spirometra* contrasts with *Diphyllobothrium latum* the plerocercoid which develops only in fish. The preferred copepod host of *Diphyllobothrium latum* is cold water *Diaptomus*, while that of *Spirometra* is the warm water *Cyclops* [11]. This suggests that *Cyclops* examined for natural infection had *Spirometra* procercoids. However, more work has to be carried out in order to determine the *Cyclops* species found in Tanzania.

4. CONCLUSION

The present study aims to find out parasitism of Spirometra procercoids in Cyclops spp. in Tanzania. The results have shown *Cyclops* are the first intermediate hosts in the life cycle of *Spirometra* species in Tanzania.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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