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RESEARCH

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Intestinal parasites in captive mugger crocodiles (*Crocodylus palustris*) in south India

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ABSTRACT

Coprological samples of captive mugger crocodiles (*Crocodylus palustris*) were randomly collected (N=102) from Snake Park, Guindy (N=36), Arignar Anna Zoological Park, Vandalur (N=44) and Amaravathy Crocodile farm (N=22) and screened for evidence of intestinal parasites using fecal sedimentation and flotation technique. Quantitative analysis of fecal samples was not performed for this study. The fecal samples collected were on random sampling basis under captive environment condition, irrespective of their sex, since both male and female are reared in the confined area. The samples were collected among the adult group of crocodiles (> 8 ft) in length bearing an average weight of 500 pounds. Parasitic fauna evidenced trematode eggs including Renifers which were predominant in Snake Park, Guindy (36.1%) and Amaravathy Crocodile farm (22.7%), and nematode eggs, *Dujardinascaris* sp., in Arignar Anna Zoological Park, Vandalur (36.4%). There were mixed infection between *Dujardinascaris* sp., (11.4%) and Renifers (5.6%). *Ophiotaenia* sp. was also found in a few samples. *Polydelphis* sp. was found in Amaravathy farm (13.7%). Renifers (19.6%) and *Dujardinascaris* sp. (21.6%) were found in mugger crocodiles from all these three locations. Mixed infection of sporulated coccidian oocyst (4.9%) *Isospora* sp. and *Eimeria* sp. were found in Snake Park Guindy and Amaravathy Crocodile farm. Snake Park, Guindy and Amaravathy Crocodile farm had the habit of feeding fishes to this crocodile resulting in the transmission of trematode and cestode.

Key words: Mugger Crocodiles, Renifers, *Dujardinascaris* sp., *Ophiotaenia* sp.,*Polydelphis* sp., India

INTRODUCTION

In nature, reptile might harbor a variety of parasites due to their behaviors. The parasitic burdens are often heavy and might be invaded by some larval or adult stages. In zoo, captivity condition caused stress of animals and this will change the host-parasite relationship leading to a disease. It has been reported that wild and captive reptiles were infected and infested with

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a great variety of parasites (Momin et al., 1990). Many parasites are responsible for illness and death in captive reptiles. The difference of the host-parasite relationship between captive and wild reptiles might be one of important factors. Although reptiles in the wild do not have any stresses, they obviously do not undergo the stresses of captivity. In captivity, we confine the reptiles in most cases, to relatively small areas thus contributing to the increased parasite load (Mader, 1996), especially of those parasites with direct life cycles. Nematodes with direct life cycle were found to be most predominant helminth infection. Cestodes and trematodes were poorly represented in the geographic distribution as their occurrence is primarily determined by the invertebrate intermediate host (Tandon et al., 2005). The variation in the diet of wild reptiles is also advantageous. The reptiles might harbor parasites for considerable lengths of time before showing signs of illness. Clinical signs might be seen later when some predisposing factors compromise the host immunity. The present study focused on the screening of coprological samples to identify parasitic fauna of mugger crocodiles under captive condition.

MATERIALS AND METHODS

Samples Collection

The study was conducted during the winter season from November 2006 to January 2007, under captive condition for a period of 3 months in three different regions of Tamilandu. Coprological examination of samples were performed in mugger crocodiles reared at Snake Park, Guindy (N=36), Arignar Anna Zoological Park, Vandalur (N=44), and Amaravathy Crocodile farm (N=22) and hence a total number of 102 samples were obtained in labeled containers. The fecal samples collected were on random sampling basis under captive environment condition, irrespective of their sex, since both male and female are reared in the confined area. The samples were collected among the adult group of crocodiles (> 8 ft) in length and an average weight of 500 pounds.

Fecal examination

Fecal examination for parasites was performed using sedimentation and fecal flotation technique (Soulsby, 1982).

The simple test tube flotation method is a qualitative test for the detection of nematode and cestode eggs and coccidia oocysts in the feces. Nematode and cestode eggs and coccidia oocysts were identified by the shape, size, and other species specific characters of the particular parasitic ova (Rosenthal, 1997).

RESULTS

The result of fecal examination showed the highest percentage of Renifers egg in captive mugger crocodiles at Snake Park, Gunidy **(**36.1%) andAmaravathy Crocodile farm (22.7%). *Dujardinascaris* sp. was mostly found at Arignar Anna Zoological Park, Vandalur (36.4%) (Table 1). *Ophiotaenia* sp. was also found in samples from Snake Park, Gunidy (8.3%) and Amaravathy Crocodile farm (13.7%). *Polydelphis* sp. was only found in Amaravathy Crocodile farm. Evidences of mixed infection and coccidian parasites were shown in Table 1. Eggs of Renifers, *Dujardinascaris* sp., *Ophiotaenia* sp., *Polydelphis* sp., sporulated oocysts of *Isospora* sp. and *Eimeria* sp. are presented in Figs. (1-6).

DISCUSSION

Generally, eggs of Renifers were reported in wild and captive snakes (Marcus, 1981). However, the present study supported Mader (1996) who quoted that all of the flukes found in crocodilians were digenetic, since the snail was the intermediate host. Fowler (1986) and Telford (1971) also stated that the Renifers were digenetic trematodes commonly encountered in wild and captive snakes and reptiles.

Very low pH of crocodile's gastric juice is similar to that found in sharks and was assigned as the correlated factor (Marcus, 1981). The genus *Ophiotaenia* of the order Proteocephalidea was also mentioned by Fowler (1986). The eggs in this study were identified by the presence of the characteristic oncospheres in fecal samples.

Table 1 Intestinal parasites in captive mugger crocodiles (*Crocodylus palustris*)

No.	Parasites	Snake park	Arignar Anna Zoological park	Amaravathy Crocodile farm	Mean Total
1	Renifers	13 (36.1%)	2 (4.5%)	5 (22.7%)	20 (19.6%)
2	*Ophiotaenia* sp.	3 (8.3%)	Nil	3 (13.7%)	6 (5.9%)
3	*Dujardinascaris* sp.	2 (5.6%)	16 (36.4%)	4(18.1%)	22 (21.6%)
4	*Polydelphis* sp.	Nil	Nil	3 (13.7%)	3 (2.9%)
5	*Isospora* sp.	2 (5.6%)	3 (6.8%)	Nil	5 (4.9%)
6	*Eimeria* sp.	3 (8.3%)	4(9.1%)	3 (13.7%)	10(9.8%)
7	*Isospora* sp.+ *Eimeria* sp.	3 (8.3%)	2 (4.5%)	Nil	5 (4.9%)
8	I. Renifers + *Ophiotaenia* sp.	2 (5.6%)	Nil	Nil	2 (2.0%)
	II .*Dujardinascaris* sp. + *Isospora* sp. + *Eimeria* sp.	Nil	4(11.4%)	Nil	5 (4.9%)
9	Negative cases	8 (22.2%)	12(27.3%)	4(18.1%)	24 (23.5%)
Total number of fecal samples examined		**36 (100%)**	**44 (100%)**	**22 (100%)**	**102 (100%)**

Fig 1 Eggs of Renifers in mugger crocodile (400x)

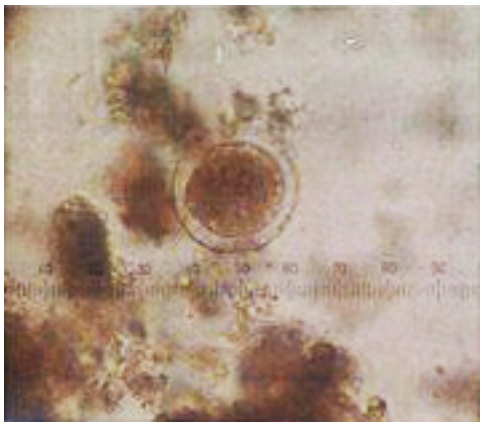

Fig 2 *Dujardinascaris* sp. egg in mugger crocodile (400x)

However, no adult tapeworm was found in crocodiles' fecal samples during the study period. The absence of eggs of *Ophiotaenia* sp. might be attributed to no feeding of fish to crocodiles at Arignar Anna Zoological Park, Vandalur, unlike the case with Snake Park at Guindy and Amaravathy crocodile farm.

For the examination of fecal samples of mugger crocodiles (n=102) from Arignar Anna Zoological Park, Vandalur, Snake Park, Guindy, and Amaravathy crocodile farm, it was demonstrated that eggs of *Dujardinascaris* sp. were recognized in most of the fecal samples examined and this result was in agreement with the findings of Sprent (1977) who reviewed the ascaridoid nematodes of reptiles and amphibians. The same genus was

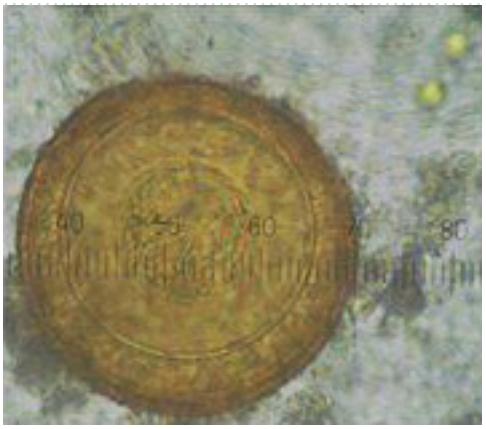

Fig 3 ***Ophiotaenia*** **sp. egg in mugger crocodile (400x)**

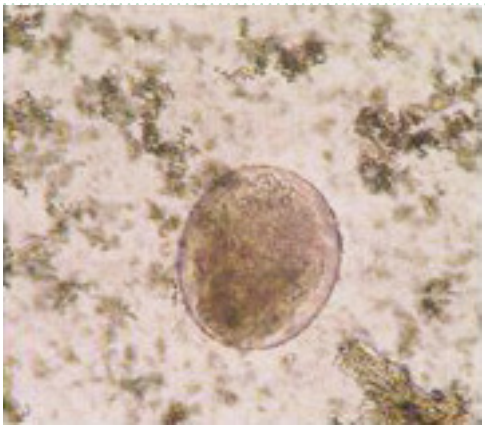

Fig 4 ***Polydelphis*** **sp. egg in mugger crocodile (400x)**

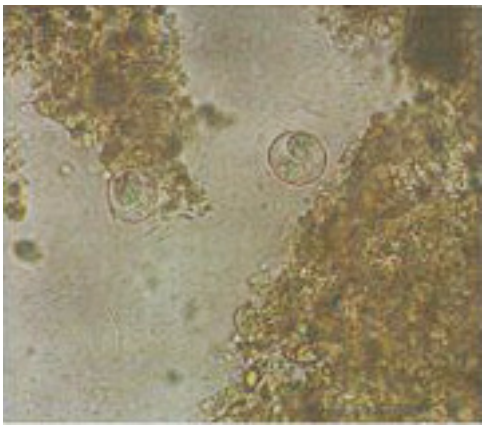

Fig 5 ***Isospora*** **sp. oocyst in mugger crocodile (400x)**

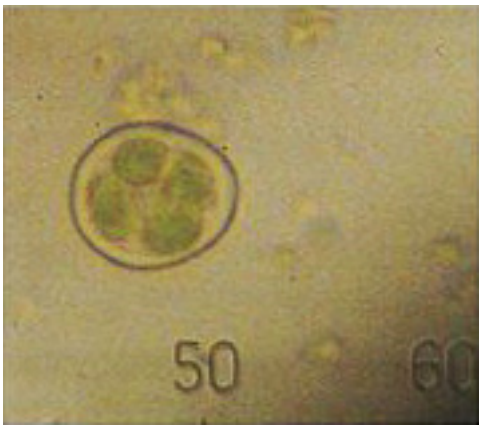

Fig 6 ***Eimeria*** **sp. oocyst in mugger crocodile (400x)**

reported in reptiles (Hazen *et al*., 1978; Junker and Boomker, 2006). Mader, (1996) also stated that *Dujardinascaris* and *Paratrichosoma* were the two significant genera found in crocodilians. Ladds and Sims (1990) reported eggs of *Dujardinascaris* sp. in 41% crocodiles examined. Goldberg *et al*. (1991) indicated that crocodilians could become infected at an early age.

Oocysts of *Isospora* sp. and *Eimeria* sp. was also found in fecal samples of crocodiles in this study. Occurrence of coccidian oocysts as found in this study was in accordance with the reports provided by Momin *et al*. (1990) who found *Isospora* sp. in intestines and *Eimeria* sp. in gall bladder, bile ducts and intestinal epithelium of crocodiles, lizards and snakes. However, no symptoms were found in this study.

Mixed infections were found to be common in crocodiles of Snake Park (5.6%) and Zoological Park (11.4%) and might be expected to make unfavorable immuno-compromise in the severely affected crocodiles, which might have more vulnerability to diseases.

Hence, periodical sampling, assessment of the degree of parasitism, monitoring the clinical signs pertaining to occurrence of parasites and appropriate deworming schedules will be useful for the control parasitic infections in these crocodiles.

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REFERENCES

1. Fowler ME. Zoo and Wild animal Medicine. 2nd ed. Philadelphia: W.B.Saunders Co; 1986.
2. Goldberg SR, Bursey CR, Aquino-shuster AL. Gastric nematodes of the Paraguayan caiman, *Caiman yacare* (Alligatoridae). J Parasitol. 1991;77(6)**:**1009-11.
3. Hazen TC, Aho JM, Murphy TM, Esch GW, Schmidt GD. The parasitic fauna of the American alligator (*Alligator mississippiensis*) in the South Carolina. J Wildl Dis. 1978;14(4): 435-9.
4. Junker K, Boomker J. Check-list of the pentastomid parasite in crocodilians and freshwater chelonians. Onderstepoort J Vet Res. 2006;73(1):27-36**.**
5. Ladds PW, Sims LD. Diseases of young captive crocodiles in Papua New Guinea. Aust Vet J. 1990;67(9)**:**323-30.
6. Mader DR. Reptile Medicine and Surgery. London: W.B. Saunders Co; 1996. p.185-203.
7. Marcus LC. Veterinary Biology and Medicine of Captive Amphibians and Reptiles. London: Lea and Febiger. 239 p.
8. Momin RR, Pethkar DK, Sabapura RH. Parasites of Reptiles. Zoos' Print Journal. 1990;5(10): 20-4.
9. Rosenthal KL. Practical Exotic Animal Medicine. New Jersey: The Compendium Collection; 1997. 75 p.
10. Soulsby EJL. Helminths, arthropods and protozoa of domesticated animals. 6th ed. London: Bailliere, Tindall and Cassell Ltd.; 1982.
11. Sprent JFA. Ascaridoid nematodes of amphibians and reptiles: Dujardinascaris. Supplementary review article. J Helminthol. 1977;51:251-85.
12. Tandon V, Kar PK, Das B, Sharma B, Dorjee J. Preliminary survey of gastro-intestinal helminth infection in herbivorous livestock of mountainous region of Bhutan and Arunachal Pradesh. Zoos' Print Journal. 2005;5:1867-8.
13. Telford SR. Parasitic diseases of Reptiles. JAVMA. 1971;159:1644-52.