

Endoparasites in Captive Indian Star Tortoise (*Geochelone elegans*)

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ABSTRACT

The study was carried out in the captive Indian Star Tortoises (*Geochelone elegans*) from different captive facilities such as Chennai Snake Park Trust, Guindy and Arignar Anna Zoological Park, Vandalur. The endoparasitic prevalence was assessed with the faecal samples collected from captive Star Tortoises reared at various captive facilities. Overall only one type of endoparasite were observed such as *Strongyles* (85.19%) *Strongyles* were observed in CSPT, Guindy and AAZP, Vandalur. Endoparasites positivity at CSPT, Guindy (n=6) and AAZP, Vandalur (n=21) were 100 per cent (n=6), and 80.95 per cent (n=17) respectively. The statistical analysis revealed that there was no significant difference ($P \geq 0.05$) between different captive facilities in occurrence of endoparasites in captive Star Tortoises. The mean \pm SEM values of EPG for *Strongyle* eggs were 1600.00 ± 342.54 in CSPT, Guindy and 166.66 ± 33.33 in AAZP, Vandalur.

Key words: Endoparasitic fauna, Star Tortoises

Introduction

All members of true tortoises come under the family *Testudinidae* which comprising of 12 genera with 40 living species are found throughout tropic, subtropic and temperate world. Many of these species are commonly found in the pet trade (Mader, 1996). The Indian freshwater turtles and land tortoises comprises of 16 species of freshwater and semi aquatic batagurines (*Emydidae*), 6 species of softshell turtles (*Trionychidae*) and 4 species of land tortoises (*Testudinidae*) (Choudhury and Bhupathy, 1993). Indian Star Tortoise (*Geochelone elegans*), the land tortoise, is one of the important species of che-

lonians (Order- *Testudines*) which inhabit a variety of dry vegetation types, including scrublands, grasslands, desert, edges and agricultural landscapes of fields, hedgerows and plantations (de Silva, 2003 and Fyfe, 2007).

In India, Indian Star Tortoises are found in different geographic areas which includes North-Western India (Gujarat, Rajasthan), Eastern and Southern areas from Kerala, Tamil Nadu, Andhra Pradesh and Eastern Karnataka to Madhya Pradesh, Orissa; adjoining South-Eastern Pakistan and throughout Sri Lanka (IUCN, 2016). Indian Star Tortoises feed mainly on herbaceous vegetation, different types of grasses and fruits supplemented with some animal

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matter (Das, 1991 and de Silva, 2003).

Wildlife diseases are a growing concern worldwide. This is particularly true now a days, when emerging diseases are shared by both animals (domestic as well as wild animals) and humans. The occurrence of multiple diseases among captive chelonians is significantly noticed due to globalization efforts, climate change etc. Hence, a better understanding of disease occurrence in chelonians is highly required, most of the information with regard to the pathogens causing diseases in wild animals especially among the chelonians are highly lacking in India.

Surveillance of wildlife diseases must be considered equally as important as surveillance and the control of diseases in domestic animals, in order to keep satisfactory animal health which requires a conscious effort to be carried out on the part of the animal keepers and effective collaboration between all departments related to animal care, veterinary medicine and forest science.

Hence, the endoparasites to be investigated in this study will be of useful in framing suitable management related measures in the captive Star Tortoises of India as well as other countries. This study will bring to lime light about various endoparasitic agents related to health and diseases among captive Star Tortoises. Captive Star Tortoises are susceptible to many parasitic infections mainly endoparasites which includes major nematodes and protozoan parasites. This study helps in identification of these parasites and providing accurate therapeutic and management measures to prevent the infection in captive conditions.

Materials and Methods

Total twenty-seven faecal samples were collected in small containers with 10 per cent formalin for endoparasitic examination and the sample details are given in Table 1.

Table 1. Details of sample collection

Sl. No.	Place of sample collection	Number of Faecal samples collected
1	Chennai Snake Park Trust (CSPT), Guindy, Chennai, Tamil Nadu	6
2	Arignar Anna Zoological Park (AAZP), Vandalur, Chennai, Tamil Nadu	21
	Total	27

These faecal samples were analyzed by both Qualitatively (centrifugal sedimentation and floatation technique) and quantitatively (eggs per gram of faeces (EPG) as described by Soulsby (1982).

Qualitative analysis

Centrifugal sedimentation technique

Approximately 2g of faeces were taken in a 100ml beaker and thoroughly mixed with about 10 to 15 ml of tap water. The mixture was strained through a tea-strainer into a cup and then it was transferred into a centrifuge tube. The centrifuge tubes were placed in a balanced state and centrifuged for 2-4 minutes at 1500 rpm. Then, the supernatant was discarded, leaving 1-2 ml of supernatant without disturbing the sediment at bottom. A small drop from thoroughly homogenized sediment was taken on clean glass slide and was observed under both low and high power objectives of microscope.

Floatation technique

Faecal samples were taken in a 100 ml beaker and were thoroughly emulsified with about 10 to 15 ml of saturated solution of sodium chloride (specific gravity of 1.18 to 1.20). The mixture was strained through a strainer into a cup and then, it was transferred into a floatation tube till the mixture reaches the brim of the tube and forms a positive meniscus and was left undisturbed for 15 minutes. The tip of the positive meniscus was gently touched by a clean cover slip and then the cover slip was placed on a clean slide and the slide was examined microscopically under both low and high power objectives.

Quantitative analysis

One gram of faecal sample was mixed with 4-5ml of saturated solution of sodium chloride and was strained through tea-strainer into a floatation tube and volume was adjusted upto 12ml with saturated salt solution and kept for 10 minutes undisturbed. From this, 0.3 ml of suspension was added to two chambers of McMaster slide and the total eggs were counted and multiplied by 50 and thus, the number of eggs per gram of faeces (EPG) was calculated. The EPG was estimated to ascertain the parasitic load of the faecal samples of captive Star tortoises during this study. Nematode eggs were identified by the shape, size and other species specific characters of the particular parasitic egg (Soulsby, 1982; Fowler, 1986 and Mader, 2006). The findings of this study

carried out with captive Star Tortoises were subjected to statistical analysis as described by Snedecor and Cochren (1994) using CHI square test.

Results and Discussion

A total of six faecal samples were collected from Star Tortoises at Chennai Snake Park Trust (CSPT), Guindy and all of them were found positive for endoparasitic infections (Table 2). *Strongyle* eggs were identified from all the six (100%) faecal samples from Star tortoises (Plate 1 and Table 2). All the Star Tortoises (100%) kept in captivity at CSPT, Guindy were found to harbour only one type of endoparasite.

The results of endoparasitic positivity in faecal samples of captive Star tortoises reared at Arignar Anna Zoological Park (AAZP), Vandalur were presented in Table 2. Among the twentyone faecal samples from captive Star tortoises, *Strongyle* eggs were identified in seventeen (80.95%) samples (Plate 1). The overall Star tortoises (85.19%) reared at CSPT, Guindy and AAZP, Vandalur were found to harbour only one type of endoparasite.

The statistical analysis revealed that there was no significant difference ($P \geq 0.05$) between different captive facilities in occurrence of endoparasites in

captive Star Tortoises (Table 2).

The mean \pm SEM (Standard Error Mean) values of EPG in captive Star Tortoises for all the endoparasitic fauna encountered were presented with regard to different captive facilities (Table 2). Similarly, the mean EPG values were revealed in Figure 1. The mean \pm SEM values of EPG for *Strongyle* eggs were 1600.00 \pm 342.54 in CSPT, Guindy and 166.66 \pm 33.33 in AAZP, Vandalur.

The encountering of the endoparasitic fauna in the captive Star Tortoises during the study was in agreement with the findings reported by Rataj *et al.* (2011) who encountered various endoparasitic fauna in tortoises like star tortoise and further, Mader (1996) revealed about the findings of various internal parasites affecting the reptiles including the chelonians.

The EPG values of the different endoparasitic fauna of Star Tortoises were furnished in Table 3. The encountering of *Strongyles* in this study with the captive Star Tortoises was in agreement with the report presented by Rataj *et al.* (2011) who quoted the occurrence of *Strongylid* nematodes in chelonians including Star Tortoises and also noted among *Strongylid* nematode *Camallanus* spp. were most frequently present in tortoises.

Jeyathilakan (2015) reported the occurrence of

Table 2. Endoparasitic positive percentage in captive Star Tortoises from different captive conditions

Sl. No.	Place	Number of Samples Collected	Number of Samples Positive (%)	Chi Square (χ^2) Value
1.	Chennai Snake Park Trust, Guindy	6	6 (100%)	1.58 ^{NS}
2.	Arignar Anna Zoological Park, Vandalur	21	17 (80.95%)	
	Total	27	23 (85.19%)	

NS- Not Significant

Fresh faecal sample from a Star Tortoise at CSPT, Guindy



Endoparasites in Captive Star Tortoises
Strongyle egg (40X)

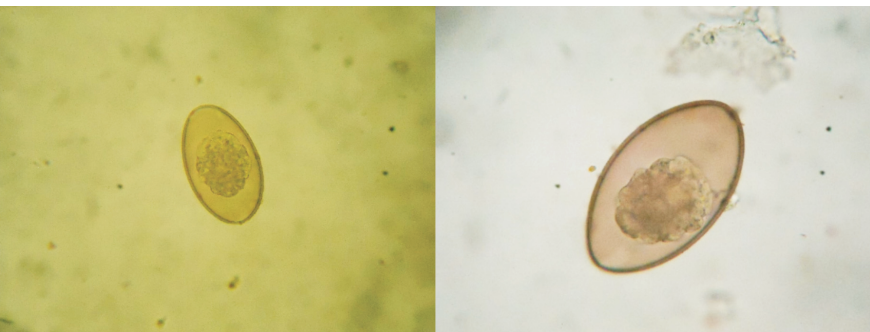
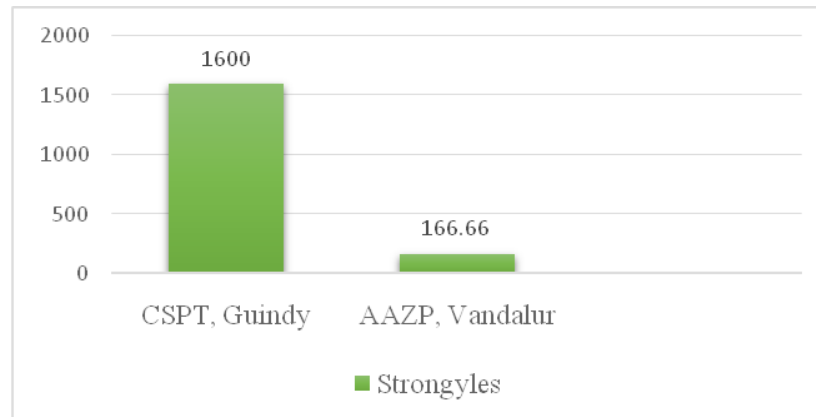


Plate 1

Table 3. EPG Values of endoparasites of Captive Star Tortoises from different captive conditions

Places	<i>Strongyles</i> Mean \pm SEM
Chennai Snake Park Trust, Guindy (n=6)	1600.00 \pm 342.54 (n=6)
Arignar Anna Zoological Park, Vandalur(n=21)	166.66 \pm 33.33 (n=9)

**Fig. 2.** Mean EPG Values of Captive Star Tortoises from different captive conditions

Camallanus trispinosus in a captive Indian Star Tortoise (*Geochelone elegans*) from Chennai Snake Park Trust (CSPT), Guindy which was one of the study place for this research.

Several features like type of feed materials offered routinely, variations in the climatic characteristics of localities, nature of substrate used in the concerned enclosure, type of cage-model, flooring pattern in the enclosures *etc.* could be attributed as the etiological factors for the existing occurrence of parasitic conditions associated with Strongyloid nematodes in all these places under study.

The strict management measures were required to be followed, whenever there were deviations in the health status of the Star Tortoises reared under captive conditions.

The encountering of different endoparasitic fauna like Strongyloid nematodes in captive Star Tortoises under study warranted the use of appropriate anthelmintic therapy in captive Star Tortoises. Drugs with broad spectrum activity like fenbendazole or specific anti nematode drugs like pyrantal pamoate can be used. Ivermectin group of drugs are not recommended in chelonians as they cause toxicity and death (Teare and Bush, 1983).

Periodical faecal examination should be carried out to assess the endoparasitic burden in Star Tortoises. Therapy should always be followed by faecal

examination to monitor the drug therapy. Emphasis on the maintenance of strict hygiene was recommended to prevent the occurrence of *Strongyle* group of parasites in reptiles, as stated by Wilson and Carpenter (1996).

Apart from the therapy of the suitable anthelmintic drugs, change of substrate also needed to be carried out in captive Star Tortoises enclosure. Since, most of the parasites might get associated with cross-transmission co-exhibits related to accommodation of different species of reptiles shall be avoided. Precautions like usage of gloves or footwear shall be emphasized among the workers who are involved in the routine daily husbandry practices in various captive Star Tortoises enclosures.

Newly caught or brought Star Tortoises should be kept for quarantine of minimum 30 days which is same for most of reptiles (Miller, 1996) and thoroughly examined clinically in order to rule out the endoparasitic evidences and other pathogens affecting them. Identification of the specific parasitic evidence in affected captive Star Tortoises appeared to be a must in order to be able to bring about the suitable remedial measures in affected Star Tortoises which were reared at different captive places.

The water samples from captive Star Tortoise enclosure should be replaced daily because even though Star Tortoises are land tortoises, some have

a peculiar habit of defecating in the water trough within the enclosure which was observed during the study period, this leads increase of endoparasites load in water, which become potential infectious source to other Star Tortoises and also handlers and keepers of Star Tortoises.

Finally, it is more important to provide nutritious and proper diet and maintaining the preferred optimal thermal zone and humidity in the Star Tortoises enclosure as they are more sensitive to these, especially juveniles (Mckinney, 2014).

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