http://dx.doi.org/10.1590/1678-4162-12968

Arq. Bras. Med. Vet. Zootec., v.75, n.4, p.715-720, 2023

Post-release challenges: case report of parasitosis by *Ancylostoma* sp. in a giant anteater (*Myrmecophaga tridactyla*)

[*Desafios pós-soltura: relato de caso de parasitose por* Ancylostoma *sp. em tamanduá-bandeira (*Myrmecophaga tridactyla*)*]

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ABSTRACT

The giant anteater (*Myrmecophaga tridactyla*) is classified as vulnerable to extinction. Here, we report the occurrence of ancylostomiasis in a young male *Myrmecophaga tridactyla*. The animal was raised from a puppy in captivity with management directed toward rehabilitation and monitored soft release. Five months after release, significant weight loss was noted in the individual, who was captured for examinations, with detection of *Ancylostoma* sp. in coproparasitological analysis. Although common in domestic carnivores, this is the first report of hookworm disease in free-ranging giant anteaters. Due to the stress factor arising from adapting to the challenges in the new environment, long-term post-release monitoring of animals undergoing rehabilitation is extremely important to increase the chance of survival of individuals. The giant anteater was released after treatment with vermifuge composed of fenbendazole, pyrantel pamoate, and praziquantel.

Keywords: parasitology, hookworm, one health, threatened species, Xenarthra

RESUMO

*O tamanduá-bandeira (*Myrmecophaga tridactyla*) está classificado como vulnerável quanto ao risco de extinção. O objetivo deste trabalho é reportar a ocorrência de ancilostomíase em um macho jovem da espécie. Trata-se de um indivíduo que foi criado desde filhote em cativeiro, com manejo direcionado para a reabilitação e a soltura branda. Durante o monitoramento, cinco meses após a soltura, observou-se que o animal havia perdido peso, por isso ele foi capturado para avaliação médica veterinária, e constatou-se parasitismo por* Ancylostoma *sp. no exame coproparasitológico. Apesar de apresentar ocorrência comum em carnívoros domésticos, este é o primeiro relato de ancilostomíase em tamanduá-bandeira em vida livre. Devido ao estresse de adaptação, juntamente com os desafios do novo ambiente, a monitoração pós-soltura a longo prazo é de extrema importância para aumentar a chance de sobrevivência dos animais. O indivíduo foi solto após tratamento com vermifugação com a associação de fembendazol, pamoato de pirantel e praziquantel.*

Palavras-chaves: parasitologia, ancilostomíase, saúde única, espécies ameaçadas, Xenarthra

INTRODUCTION

The giant anteater (*Myrmecophaga tridactyla* Linnaeus 1758) belongs to the superorder Xenarthra, order Pilosa and is classified as vulnerable to extinction (Miranda *et al.*, 2014). In this regard, rehabilitation projects for endangered species are important tools for conservation programs for native fauna and as a source of knowledge of the specimens (Pérez *et al.*, 2015).

Xenarthras medicine is under development and there is still a demand for information. Oliveira *et al.* (2020) investigated endoparasites in

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Submitted: January 11, 2023. Accepted: March 7, 2023

carcasses of two species of anteaters found on highways in the state of Minas Gerais, Brazil. In the case of the phylum Nematoda, the authors described the occurrence of *Physaloptera magnipapilla* in 50% of specimens of *Tamandua tetradactyla* and 66.66% of *M. tridactyla*. In specimens of the latter group, *Graphidiops dissimilis* was also found in 33.33% of the individuals. The dissemination of health data from wild animals supports veterinary medicine and the conservation of species, in addition to helping to understand the importance of native fauna in the context of One Health.

In the case of the species *M. tridactyla*, there is only one report of the occurrence of *Ancylostoma* sp. in an adult captive and descriptions of this parasite in free-living specimens are unknown. The present study describes the first diagnosed case of *Ancylostoma* sp. in a young *M. tridactyla* after a rehabilitation process and monitored release.

CASUISTRY

A *M. tridactyla* puppy was rescued after being hit by a vehicle with its mother, which died. Based on the weight of 1.2kg and body size, the estimated age was about one month. The animal received parental care with management directed to rehabilitation by the TamanduASAS (Wild Animal Release Areas) project, from the Instituto Estadual de Florestas, Uberlândia, MG, Brazil.

At approximately nine months of age, the animal was transferred to the rehabilitation enclosure on the rural property Retiro Águas Vivas, in the city of Uberlândia, MG (-18.82378, -48.11153), Brazil. The enclosure has approximately 300 m², has a water surface, grassy soil substrate for foraging, and shelter, in accordance with the recommendations of current legislation (Instituto…, 2015).

Laboratory tests were performed on the animal 12 days before release, when it was estimated to be one year old (Table 1). These results presented values within the reference standards for the weight and age of the species in captivity (Sanches *et al.*, 2013). Furthermore, the coproparasitological evaluation by the methods of Willis (1921) and Faust *et al.* (1939) did not detect gastrointestinal parasites.

Table 1. Hemogram of *Myrmecophaga tridactyla* in rehabilitation process, before release and after release

			Before	After capture[2]	
	Unit	Reference[1]	release	Day 3	Day 11
Erythrocytes	millions/mm^3	2.05-2.67	2.53	3.11	2.6
Hemoglobin	g/dL	10.6-12.9	12.2	12	11.9
Hematocrit	%	35.44-40.1	30.7	34.4	29.5
MCV	fl	146.12-184.11	121	111	110
MCH	pg	46.11-56.02	45.2	40.2	40.7
MCHC	%	29.15-33.26	39.8	34	34.6
Absolut Leukogram					
Total Leukocytes	/mm^3	5590-18140	11500	12700	11500
Segmented neutrophils	/mm^3	3910-13880	7820	8636	4945
Banded neutrophils	/mm^3	0	0	127	115
Eosinophils	/mm^3	80-1860	920	635	2530
Basophils	/mm^3	0	0	0	0
Lymphocytes	/mm^3	1070-2530	2300	3175	3910
Atypical lymphocytes	/mm^3	0	0	0	0
Monocytes	/mm^3	90-290	460	127	0
Platelets	x10^3/mm^3	123.45±31.36	122	222	148
Coproparasitological diagnosis					
Willis method*	eggs/field	0	0	> 5	1

[1] Sanches *et al.* (2013); [2] Willis method (1921) with evaluation of ten fields.

On June 10, 2019, the soft release of the *M. tridactyla* was performed, at approximately one year of age, with a weight of 28.5kg and body score 4/5. The animal was monitored by telemetry and GPS Iridium (Model TGW-4470-4 Telonics Inc, Mesa, Arizona, USA) adapted for the species, in partnership with Projeto Bandeiras & Rodovias. In June, July, and August 2019, 1L of post-release feed supplementation was offered daily, consisting of a mixture of premium cat food (Three Cats Filhotes®, Hercosul Alimentos, Ivoti, RS, Brazil) and water. In September, supplementation began to be offered on alternate days.

After five months of release, during the monitoring (Bushnell H2O, Overland Park, KS, USA), we noticed weight loss of the animal, evidenced by the wide strips of the tracker harness (Fig. 1). Therefore, daily supplementation was resumed in October. On the thirtieth day of the same month, it was decided to capture the animal during monitoring for complementary exams and more detailed physical evaluation, since it was not very active, with a loose tracker harness, bristly hairs, and half-closed eyelids.

Figure 1. Monitoring of the *Myrmecophaga tridactyla.* Note the weight loss evidenced by the wide strips of the tracker harness.

On physical evaluation after capture, the animal weight was 26kg, body score 2/5, body temperature of 36ºC, and no signs of dehydration. Due to the reduction in body score, a vitamin complex (Bionew®, Vetnil, Louveira, SP, Brazil) was administered in a volume of 0.2mL/kg, intramuscularly (IM). A blood sample was collected for laboratory tests and the blood count showed neutrophil left shift and lymphocytosis. Cylindrical worms were observed in freshly excreted fecal samples in the enclosure, which were collected and sent for coproparasitological analysis, with high counts (more than five eggs/field, in ten analyzed fields) of *Ancylostoma* sp. by the Willis method (1921). Due to its poor state of health, it was decided to keep the anteater in the rehabilitation enclosure for veterinary therapeutic assistance.

The animal was treated on the day of capture with a vermifuge based on 40mg/mL fenbendazole, 144mg/5mL of pyrantel pamoate, and 10mg/mL praziquantel (Vetmax®, Vetnil, Louveira, SP, Brazil), with two administrations of 20mL, orally (OR), for five days. As there is no indication for the use of this drug for *M. tridactyla*, the dose was determined based on allometric extrapolation, with the domestic dog (*Canis familiaris*) as a model animal. Oral administrations were made with the mixture of drugs in 90mL pots of yogurt for human consumption, strawberry flavor, and observation of complete ingestion by the animal.

On the eleventh day after capture, the anteater presented diarrhea and a new, fresh fecal sample was collected, with a result of low (one egg in at

least one of the ten evaluated fields) presence of *Ancylostoma* sp. by the Willis (1921) method. A new blood sample was performed, which showed eosinophilia, moderate lymphocytosis, left shift, and monocytopenia. In addition, the tracker with VHF-GPS Iridium was adjusted and a second dose of the vitamin complex was administered.

The animal remained in the rehabilitation enclosure for 13 days and there was no weight gain during this period. In addition, signs of stress were observed, with pacing behavior. Since verminosis was controlled and no benefits were observed in weight gain in captivity, associated with the stereotype of stress, we decided to release the *M. tridactyla*. After this new release, the animal was monitored twice a week. Weight gain was observed from the adjustment of the tracker on the chest during the following seven months. In the moments of observation in activity, the anteater showed a pattern of locomotion without alteration, eyes open, and absence of bristling hairs.

Eleven months after the second release, it was possible to observe the animal defecating during monitoring and a fresh fecal sample was collected. On that day, the animal was alert, active, and without signs of weight loss, as the tracker was well adjusted to the thorax. In the coproparasitological test, a high count of *Ancylostoma* sp. and moderate (two to five eggs/field) of *Giardia* sp., according to Willis (1921) and Faust *et al.* (1939) methods, was noted. Since the animal had a satisfactory body score of 3/5 and there were no clinical signs of endoparasitosis, such as apathy, diarrhea, or anorexia, it was decided not to perform any intervention.

To aid in post-release monitoring of the specimen, two camera traps (model 119837C, Bushnell, Overland Park, Kansas, USA) were also installed, one close to the main door of the rehabilitation enclosure, and the other next to the feeder for supplementation, approximately 50 meters from the enclosure. Through the analysis of the images, the presence of domestic dogs and cats was observed near the feeders (Fig. 2).

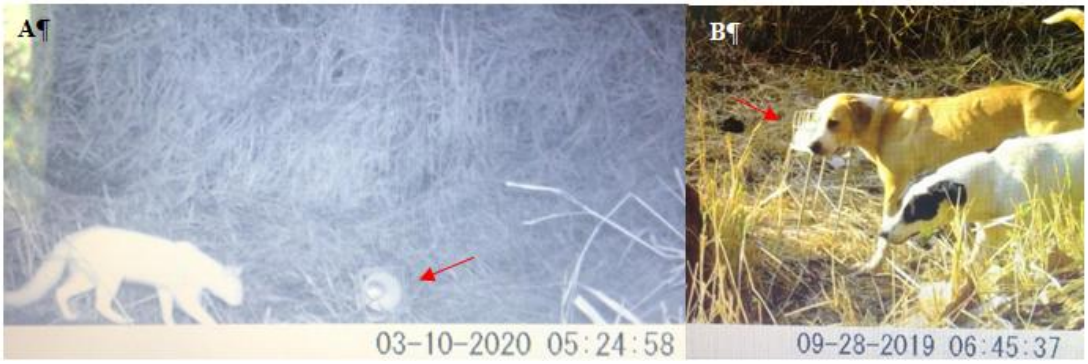

Figure 2. Images of camera traps with the register of cats (A) and dogs (B) near the feeders (arrows) of a *Myrmecophaga tridactyla* in rehabilitation process.

DISCUSSION

The rescue of orphaned puppies of *M. tridactyla* born in the wild and sent for parental care is a relatively common casuistic in environmental agencies in Brazil (Silva, 2022). Pérez *et al.* (2015) report that the survival rate of rehabilitated individuals of this species in the Ibera Natural Reserve, Argentina, is approximately 76%, and that the return of these specimens to the wild has contributed to the animal welfare and ecological restoration of the species in the region.

Despite the existence of previous studies that diagnosed the occurrence of helminths in *M. tridactyla*, parasitological research on Xenarthras remains scarce and this is the first report on the presence of *Ancylostoma* sp. in an infected free-living individual. Analyses of gastrointestinal parasites in the species described the presence of protozoa, nematodes, cestodes, and acanthocephalans. The most common findings are from the phylum Nematoda, with reports of the genera *Trichuris*, *Strongyloides*, *Ascaris*, *Primasubulura*, *Moniliformis*, *Physaloptera*, and *Bradypostrongylus* (Diniz *et al.*, 1995; Vicente *et*

al., 1997; Marinho and Valdes, 2012; Oliveira *et al.*, 2020).

Diniz *et al.* (1995) recorded 48.5% of captive anteaters with positive fecal samples for helminths, however, clinical signs were observed only in individuals newly admitted to the institution. Additionally, Seltmann *et al.* (2019) warned that juvenile cheetahs (*Acinonyx jubatus*) were more parasitized by *Ancylostoma* sp. than adults, which they correlated with the fact that the immune system is not yet fully efficient at this stage of the animal's life. In the case of the *M. tridactyla* in this report, in addition to being a young specimen, it is believed that the stress generated by the adaptation to free life and the diversification of the diet may have led to immunosuppression, which predisposed the increase in the parasite load and clinical manifestation in the first months after release.

There is only one report of the occurrence of *Ancylostoma* sp. in a captive adult female of *M. tridactyla*. The authors pointed to the substrate as a possible source of contamination, but did not detail clinical signs, time in captivity, or quarantine exams (Marinho and Valdes, 2012). In the present report, the pre-release coproparasitological tests of the *M. tridactyla* were negative, therefore, it is assumed that the parasitic contamination occurred in the wild, having as a source other species of wild or domestic mammals.

As in the previous study with *M. tridactyla* (Marinho and Valdes, 2012), it was not possible to determine the species of *Ancylostoma* involved in the infection. A previous study in the city of Uberlândia with domestic dogs detected *Ancylostoma caninum* in 19.4% of the animals (Heukelbach *et al.*, 2012). However, due to the presence of domestic and wild fauna in the release area, future studies are recommended for identification of *Ancylostoma* species circulating in the region.

Regarding other Xenarthras species, Ezquiaga *et al.* (2014) pointed to the genus *Ancylostoma* as the least prevalent in free-ranging hairy armadillos (*Chaetophractus vellerosus*) in Argentina. The authors correlated the occurrence of this parasitosis with the presence of dogs in the area, which was also not excluded in the present report, since there were records of the presence of domestic dogs and cats near the supplementation feeders.

Another important point to discuss is the treatment performed in the giant anteater after capture. Castro *et al.* (2020) demonstrated that the isolated use of fenbendazole drastically reduced the infestation in dogs, but still with detection of the parasite in examination. A similar fact was observed in the anteater in this study, in which after two doses of anthelmintic, there were still eggs of *Ancylostoma* sp. in the feces, with detection also in the examination 11 months after the second release. On the other hand, the decision not to treat *M. tridactyla* parasitized by *Ancylostoma* sp. after the second release was also followed by Seltmann *et al.* (2019) in cheetahs. The authors choose not to deworm wild felids parasitized in Namibia, since the animals did not show clinical signs. The authors highlighted the need for further studies on the impact of subclinical parasites in the conservation of wild animals.

CONCLUSION

Despite being a common parasite in domestic carnivores, this is the first report of the detection of *Ancylostoma* sp. in *M. tridactyla* in the wild. The inclusion of long-term post-release monitoring with periodic health evaluations is important to support the development of initiatives and priorities for national action plans of various kinds, as well as gathering relevant information for the promotion of One Health.

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