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Occurrence of ascarid infection in wild felines across different forest ranges in The Nilgiris, Tamil Nadu, India

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Abstract

The paper presents the findings of a systematic study on the occurrence of ascarid infection in wild felines during postmortem examination observed over a period of one year across different forest ranges in the Nilgiris district of Tamil Nadu, India. A total of 25 wild felines comprising of nine tigers and 16 leopards were screened during the fifteen months period from December 2023 to March 2025. Detailed postmortem examination was conducted by the forest veterinary officer following standard procedures. The worms were collected, labelled, processed as per standard procedures, identified and photographed. Toxocara cati and Toxascaris leonina were the ascarids recorded. Out of the 25 wild felines, six were found infected with ascarids (24%) which included three tigers (33.33%) and three leopards (18.75%). Out of the six infected animals, four were males (66.66%) and two were females (33.33%). Three of the infected animals were below one year of age (50%) and three were of five and above five years of age (50%). Coinfection with T. cati and T. leonina was observed in only one animal which was a five-year-old female tiger. T. cati worms were brownish yellow to cream coloured. A total of 53 ascarid worms were recovered out of which 48 were from tigers and 5 were from leopards. Infected tigers were from Nilakotai (n=2) and Kothagiri (n=1) forest ranges and infected leopards were from Kothagiri (n=1), Pandalur (n=1) and Udagai North (n=1) forest ranges. Gastritis and enteritis were appreciated in infected animals according to the location of the worms. The findings revealed that ascarid infection occurs among wild felines in different forest ranges of The Nilgiris, Tamil Nadu, India in both male and female animals of different age groups. The present observations on the occurrence of ascarid infections will be important to map the status of these nematodes in wild felines and to frame strategies for control of ascarids in these animals.

Keywords: *Occurrence, Toxocara cati, Toxascaris leonina, wild felines, The Nilgiris*

Wild felines such as tiger, lion, leopard, panther, cheetah, leopard cat etc. are one among the valuable fauna in the forests of India. They are crucial to healthy ecosystems, acting as apex predators regulating prey populations, maintaining biodiversity, and contributing to the overall stability of their habitats (Shrivatsav and Singh, 2012). Healthy wild cat populations signal a healthy ecosystem, indicating sufficient prey, biodiversity, and overall ecological integrity. Several factors such as diseases, habitat fragmentation, poaching, territorial fights etc. threaten these animals and

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therefore it is crucial to preserve the population of these big cats (Varun, 2005). Parasitic helminths play a major role in affecting the health status of wild felines. It is important to study the parasitic dynamics in wild populations, especially predatory animals, as parasites can transfer to domestic animals and even humans (Shirbhate, 2008; Marathe *et al*., 2002). Several endoparasites (flukes, tapeworms, nematodes), ectoparasites (arthropods and acarines) and protozoa affect wild felines. Among helminths, ascarids are important and they cause high morbidity and mortality especially in young animals sometimes leading to loss of the entire litter of young ones. There are several reports on ascarid infections in wild felines and these observations are either based on faecal examinations or necropsy findings. Ascarid infections caused by *T. cati* have been observed in tigers (Gonzalez *et al*., 2007; Pradhan *et al*., 2011; Bhattacharya *et al*., 2012) and leopards (Youssefi *et al*., 2010; Esfandiari *et al.,* 2010) on necropsy observations. Nashirudullah and Chakraborty (2001) during necropsy reported *T. canis* in a Bengal tiger, *T. leonina* in a Bengal tiger and a lion and *T. cati* in a leopard. Ascarid infections have also been reported in other feline species such as Leopard cat (Easwaran *et al*., 2003), golden cat (Patnaik and Acharjyo, 1970), snow leopard (Maity *et al*., 1994), Tsushima leopard cat (Yasuda *et al.*, 1993), African lion (Rimfa *et al*., 2019), puma (Quadros *et al*., 2022) and Eurasian lynx (Virta *et al*., 2022). Chakraborty and Maity (1995) observed *T. canis* in five wolf pups (one and half months old) which died at Darjeeling Zoo. *Toxocara mystax* from tiger, leopard, jungle cat, leopard cat and *T. transfuga* from Himalayan brown bear, sloth bear and red panda have also been reported (Choudhury, 2001). *Toxocara* sp. are therefore cosmopolitan nematode parasites of a variety of wild feline hosts. Complex environmental changes have promoted increasing contact between wildlife, domestic animals and humans that can enhance the risk of pathogen spill over especially with zoonotically important nematodes such as ascarids. Multiple modes of infection including the contribution of several paratenic hosts which are favourable prey animals in the wild harbouring the infective larval stages of ascarids in their tissues effectively transfer the infection to wild feline predators. A collaborative approach between wildlife biologists and parasitologists is therefore needed to understand the significance of wild life parasites such as ascarids in wild felines.

The Nilgiris Biosphere Reserve is situated in the Nilgiris Mountains of the Western Ghats in the state of Tamil Nadu, South India and is home to several mammals including a very good population of wild felines such as tigers, leopards, leopard cats and panthers. Though there are several reports on ascarid infection in wild felines from different parts of the country and abroad, a detailed systematic study on this infection in wild felines is very limited. Therefore, the present systematic study was undertaken to investigate the occurrence of ascarid infection in wild felines over a fifteen months period through postmortem examination in different forest ranges of the Nilgiris district, Tamil Nadu, India.

Materials and methods

Study area

The study was conducted in The Nilgiris which lies at the juncture of the Western Ghats and the Eastern Ghats. Its latitudinal and longitudinal coordinates are 11°12 N to 11°37 N and 76°30 E to 76°55 E, respectively (Fig. 1). Due to its high altitude, the Nilgiris has a significantly cooler climate than the surrounding plains. The region receives substantial rainfall throughout the year, with monsoon seasons impacting the weather. It experiences summer, monsoon and winter seasons. The summer starts from March and extends up to June, followed by the monsoon season from July to September and the winter season is from October to February months. During summer the temperature reaches a maximum of 25°C (77°F) and a minimum of 10°C (50°F). During winter the maximum temperature is 20°C (68°F) and the minimum 0°C (32°F). The average annual rainfall of The Nilgiris is 1,920.80 mm. Thirteen different forest ranges were included in the study. The ecosystem of the study areas included tropical evergreen forests, Montane sholas and grasslands, semi-evergreen forests, moist deciduous forests, dry deciduous forests and thorn forests. Though it was a forest area, recreational activities, trekking activities and tourism had increased in the recent years.

Fig. 1 Location map of the study area

Study animals

A total of 25 wild felines comprising of nine tigers and 16 leopards were screened during the fifteen months study period from December 2023 to March 2025 during post mortem examination. The animals screened were from different forest ranges of the Nilgiris, *viz*., Singara, Ovalley, Cherambadi, Kundha, Udagai North, Segur, Masinagudi, Gudalur, Bitherkadu, Pandalur, Kothagiri, Nilakottai and Theppakadu.

Occurrence study across different age, sex and forest ranges of wild felines

The details of age, sex and forest ranges of the infected wild felines was recorded in order to find out the age-wise, sex-wise and forest range-wise distribution of parasites.

Collection of worms

Detailed postmortem examination was conducted by the forest veterinary officer following standard procedures. During post mortem examination, the entire digestive system was carefully screened for pathological lesions and presence of worms. All the worms recovered were stored in separate sterile plastic containers with 10% formalin, labelled and despatched to the Department of Veterinary Parasitology, Veterinary College and Research Institute, Theni for processing and species identification. The label included details such as the date of post mortem examination and sample collection, forest range where the post mortem was conducted, information about the animal (species, age and sex), details of worms collected, location of worms and the sample identification number.

Once the samples were received, the details were recorded. The worms from different wild felines were counted separately and recorded. A total count of worms was made and male and female worms were separated and counted. Worms were then examined for gross morphological features and then processed by dehydrating in ascending grades of alcohol and cleared using carbolic acid. Cleared specimens were mounted in DPX and examined under stereoscope and light microscope and morphological characteristics were recorded. Photographs of gross worms were taken using NIKON Digital camera-mirrorless-Z5 model with NIKKOR Z-24-70 MM F/4S lens. Photographs of mounted specimens in microscopic slides were taken using Trinocular microscope (Lawrence and Mayo-Lynx, CAT. No: LM-52-3000, Sl. No: 500700) under 4x magnification with photomicrograph and computer attachment.

Results and discussion

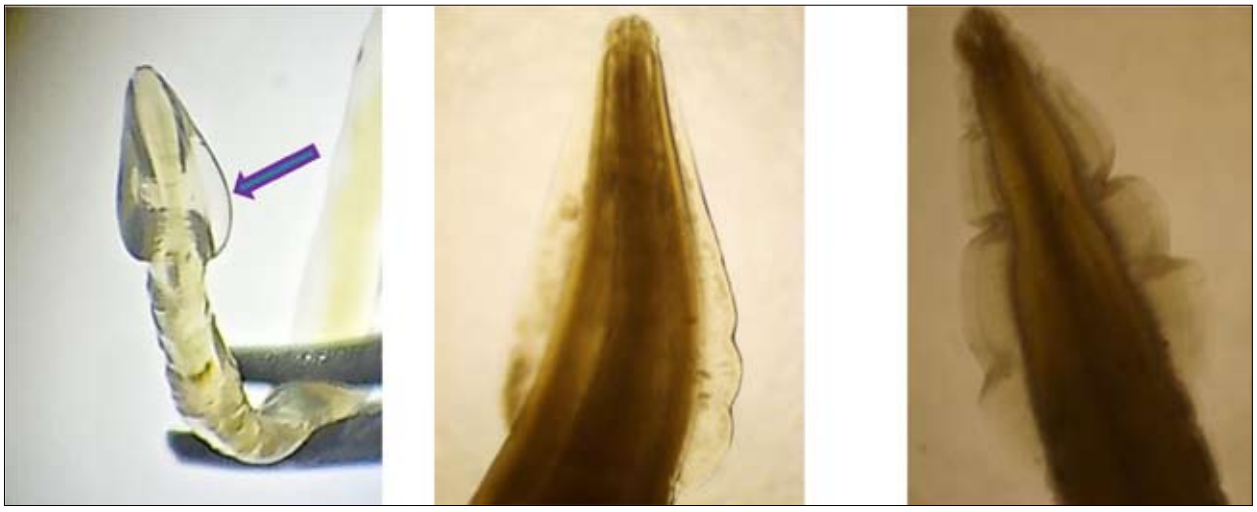
Morphological features of ascarid worms and ova

Ascarid worms recovered from the wild felines were identified as *T. cati* and *T. leonina* morphologically. Coinfection with *T.cati* and *T. leonina* was observed in only one animal which was a 5-year-old female tiger. The ascarid worms were brownish-yellow to cream coloured and males were smaller than females (Fig. 2). *Toxocara cati* worms were brownish-yellow to cream-colored, males were 5-6 cm long, while females measured 8-10 cm length. Mouth was surrounded by three lips. A prominent, broad, “arrow-shaped” or “cobra-like” cervical alae was characteristic (Fig. 3a, 3b). Anterior end had three “lips” characteristic of ascarids (Fig. 4a). Caudal end of male was slightly curved with a digitiform appendage and paired spicules, whereas female worms had a straight caudal end (Fig. 5). Eggs were elliptical, dark brown, and had a pitted shell (Fig 6a).

(2a)

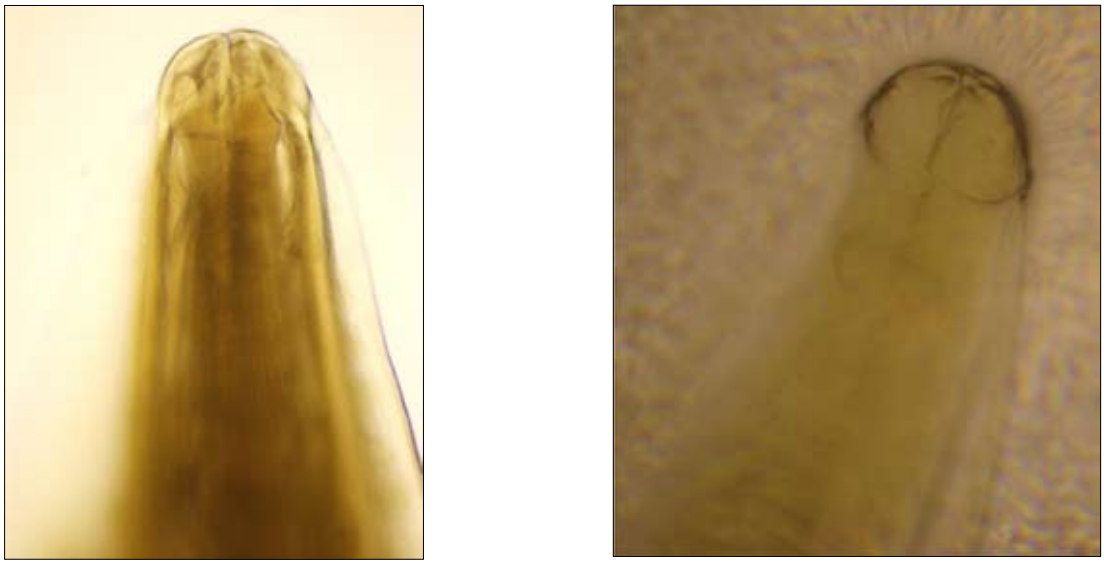
(2b)

Fig. 2. Ascarid worms from wild felines-Gross (2a), smaller male and larger female ascarid worms (2b)



(3a) (3b) (3c)

Fig. 3. Cranial end of *T. cati* showing the prominent, broad, "arrow-shaped" or "cobra-like" cervical alae viewed under stereoscope (3a) and microscope-4X (3b) and cranial end of *T. leonina* showing pronounced, long, narrow, lanceolate (spear shaped) cervical alae (4X) (3c)



(4 a) (4 b)

Fig. 4. Mouth of ascarids surrounded by lips (a. *T. cati,* b. *T. leonina*)

Toxascaris leonina worms were cream coloured, males measured from 5-7 cm in length whereas females measured 9-10 cm. The cervical alae were more pronounced, long, narrow, lanceolate (spear shaped) tapering gradually into the body (Fig 3c). Tail was gradually tapering. Mouth was surrounded by three lips (Fig 4b). Males had no finger like projection at the caudal end. Eggs were sub-spherical and translucent with a thick and smooth shell (Fig 6b).

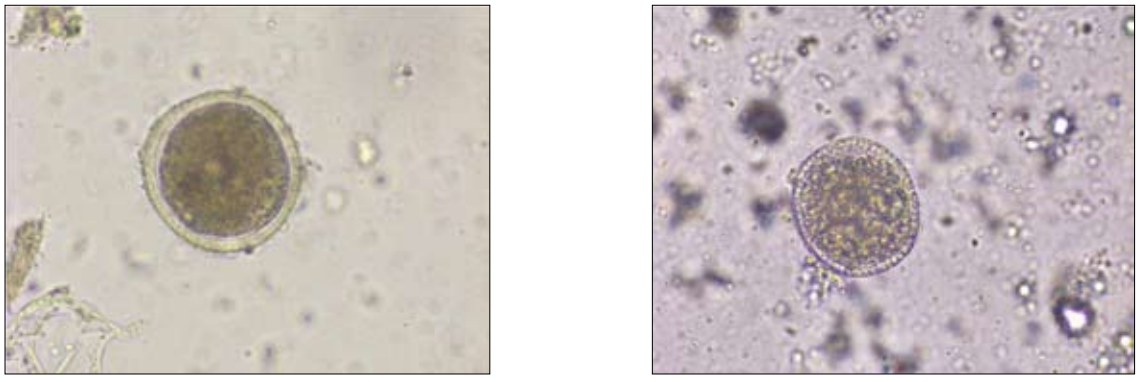
The gross as well as microscopic features of male and female *T. cati* and *T. leonina* worms matched with the observations of Bhattacharya *et al.* (2012), Soulsby (1982), Kumar *et al.* (2019), Nashirudullah and Chakraborty (2001), Alexander *et al.* (2017), Esfandiari *et al.* (2010), Gallas and Silveira (2013) and Okulewicz *et al.* (2012).

Occurrence of ascarid infection

Out of 25 wild felids comprising of nine tigers and 16 leopards, 6 (24%) were found infected with ascarids. Out of nine tigers, three (33.33%) and out of 16 leopards, three (18.75%) were found infected with ascarids (Table 1). Ascarid infections in wild felines have been reported in India and abroad based on necropsy findings and faecal examinations. *Toxocara cati* has a world-wide distribution and occurs in the small intestine of felines. Previous reports of *T.cati* in wild felines include those of Bhattacharya *et al.* (2012) who observed *T. cati* in a 16-year-old male tiger at the Sundarbans Tiger Reserve, West Bengal, Pradhan *et al.* (2011) who reported *T. cati* infection in an Indian tiger in high altitude zoo, Darjeeling, West Bengal, Gonzalez *et al.* (2007) who reported higher prevalence of *T. cati* in Siberian tiger and Shirbhate (2007) who recorded a

(5a) (5b)

Fig. 5. Caudal end of *T. cati* male which was slightly curved with a digitiform appendage and paired spicules (5a) and female *T. cati* with straight caudal end (5b)



(6a) (6b)

Fig. 6. Egg of *T. cati* (6a) and *T. leonina* (6b)-40X

higher prevalence of *T. cati* infection over other helminths in tigers of Melghat tiger reserve. In Leopard, *T. cati* was reported by Youssefi *et al.* (2010). In Assam state zoo, *T. canis* was reported in Bengal Tiger by Nashirudullah and Chakraborty (2001) during necropsy and they also reported *T. leonina* in necropsy of Bengal tiger and lion and *T. cati* in leopard. In the present study, the occurrence of *T. cati* was observed in both tigers and leopards whereas *T. leonina* was observed only in one infected tiger. Kumar *et al.* (2019) recorded *T. canis* from a 19 year old captive male leopard maintained at Gopalpur Zoological Park, Himachal Pradesh. Niranjan *et al.* (2022) observed the prevalence of *T. cati* to be 33.33% in leopards at Nainital Zoological Park (September 2016-April 2017). Thawait *et al.* (2014) reported 10% prevalence of *T. cati* in leopard whereas 6.7% prevalence of *T. cati* in Royal Bengal tiger from Rajkot zoological park was recorded by Parsani *et al.* (2001) and occurrence of *T. cati* in Royal Bengal tiger from M.C. Zoological Park, Chhatbir, Punjab was reported by Singh *et al.* (2006). The present study reports 33.33% infection in tigers and 13.33% infection in leopards with *Toxocara* sp. Variations in occurrence in the present study could be attributed to soil contamination with faeces containing ascarid eggs clogged or attached to soil in common dwelling places shared between infected and healthy animals, variation in susceptibility etc. Ascarid eggs are known for their survival in harsh environments for a long time and wild felines could have been exposed constantly to the infection. Occurrence of ascarid infections in wild felines in studies from abroad seems to be higher. Quadros *et al.* (2022) reported 56.35% *T. cati* infection in Cougar, 22.34% in Jaguarundi and 21.32% in Oncilla in Brazil based on necropsy findings during the period from 2007 to 2012. Gallas and Silveira (2013) reported 66.6% infection with *T. cati* in leopards and 60% infection in Puma observed during necropsy in Brazil. Peng *et al.,* 2020 observed 77.42% of *T. cati* infection in wild Amur tigers in China observed over a period of five years (2012-2016) based on faecal examination. Ozkan (2018) observed *Toxocara* sp. in tiger cubs in Turkey based on faecal examination. Virta *et al.* (2022) reported 84.3% prevalence of *T. cati* infection in Eurasian lynx observed from 1999 to 2015 in 2756 animals in Finland. The present study reported a lower level of *T. cati* infection compared to these observations and these variations could be due to geographic conditions, monsoon, seasons, conducive

conditions for the parasites, host immune status and environmental factors.

The worms were found in intestine or in both intestine and stomach (Fig. 7, 8). In the eight months old female leopard, five years old male leopard, five years old female tiger and 10 years old male tiger, the ascarids were found in the intestine whereas in the five months old male tiger and eight months old male leopard, the worms were found in both stomach and intestine. Bhattacharya *et al.* (2012) observed *T. cati* worms in the stomach and duodenum of a 16 years old male tiger. Chowdhury (2001) and Nashiruddullah and Chakraborty (2001) observed *T. canis* from the intestine of lion, tiger and other wild felines and *T. leonina* from small intestine of lion, tiger, leopard, snow leopard, fox, fishing cat and leopard cat. Kumar *et al.,* 2019 collected a heavy load of *T. canis* worms from the stomach and intestine of a 19 years old captive male leopard. Yasuda *et al.* (1993) recovered two *T. cati* worms from the stomach of one Tsushima leopard cat and 34 worms from stomach and 37 worms from small intestine of another Tsushima leopard cat in Japan. Gallas and Silveira 2013 found *T. cati* worms in stomach and intestine of leopards and puma in Brazil. In the present study, both the animals which had worms distributed in both stomach and intestine were young animals whereas the adult infected animals had worms in intestine only. The worms found in the stomach may be on the migratory process towards intestine when the observation was made.

A total of 53 ascarid worms were recovered out of which 48 were from tigers and five were from leopards. Out of the 53 worms, 21 (39.62%) were male worms and 32 (60.37%) were female worms. In tigers, out of the 48 worms, 21 (43.75%) were males and 27 (56.25%) were females. The heavily infected animal was a five year old female tiger which harboured 40 worms (18 males and 22 females) in the intestine. The least infection was seen in the 10 years old male tiger with three worms (one male and two females) with all worms found in intestine. A total of five worms were collected from infected leopards and all worms were females. The eight months old male infected leopard harboured three female worms out of which one was in stomach and two were in intestine. The eight months old female leopard and the other infected five years old male leopard each had a single female worm in the intestine.

Intensity of ascarid infection in wild felines has showed variations. Bhattacharya *et al.* (2012) recovered 121 *T. cati* worms from a 16 years old male tiger which was very high compared to the observations in the present study. Singh *et al.* (2006) opined that in general, intensity of parasitic infection in older felines was significantly lesser than in their younger counterparts. However, in the present study the heavily infected wild feline was a five years old female tiger and young infected animals had very low number of worms which is in conformation with the observations of Wallach and Boever (1983). Gallas and Silveira (2013) observed an average of 22.5 *T. cati* worms/animal in leopards and pumas in Brazil. Virta *et al.* (2022) observed mean *T. cati* intensity of 21.2 in Eurasian lynx (observed from 1999-2015 in 2756 animals). The variations in the burden of parasites could depend on the length of time since infection was acquired and proximity to infective sources such as contaminated soil, paratenic hosts and fomites (Williams and Thorne 1996). The degree of parasitism may also be influenced by micro and macro climate of the environment, population size, sex and age group of wild felines available, feeding pattern, nutritional status, epidemiology of ascarids, susceptibility and concurrent diseases etc. and prevalence of paratenic hosts such as rodents.

In the present study, ascarid worms recovered from all the wild felines were morphologically identified as *T. cati* and *T. leonina*. Coinfection with *T.cati* and *T. leonina* was observed in only one animal which was a five year old female tiger. All worms recovered from the other two infected tigers and three infected leopards were *T. cati.* Out

Fig.7. Location of ascarids in the stomach of a 5 months old male Tiger *in situ*

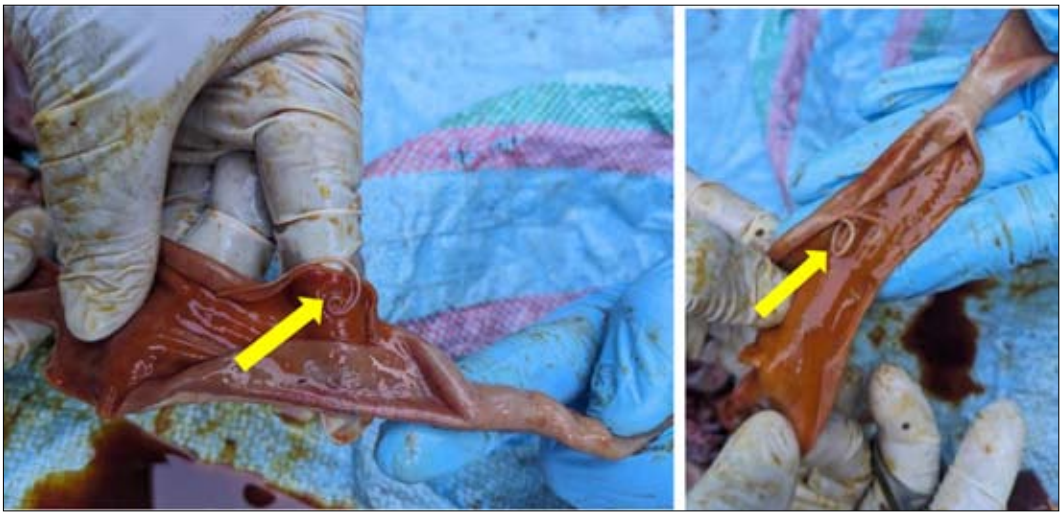


Fig. 8. Location of ascarids in the intestine of an 8 months old male Leopard *in situ*

of the total 53 ascarids recovered from both the species of wild felines, 43 were *T.cati* (81.13%) and 10 were *T. leonina* (18.86%). In the present study, the predominant species of ascarid infecting wild felines therefore was *T. cati.* Nashiruddullah and Chakraborty (2001) observed that *T. leonina* was the most common ascarid in tigers and lions but in the present study all infected animals harboured only *T. cati* and mixed infection with *T. cati* and *T. leonina* was observed in only one tiger. The species-specific differences in *T. cati* and *T. leonina* infection between tigers and leopards could be possibly related to evolution of these species in different habitats (Natalia *et al.* 2017). However mixed infections with both *T. cati* and *T. leonina* have been reported by Kahn and Line (2005) and Okulewicz *et al.* (2012) and they opined that co-occurrence of *T. cati* and *T. leonina* in wild felines could depend on climate, environmental conditions, age of the hosts and season.

Out of the 53 ascarid worms collected from wild felines, 21 were male worms (39.62%) and 32 were female worms (60.37%). In tigers, out of the 48 ascarid worms, 21 (43.75%) were male worms and 27 (56.25%) were female worms. In leopards, all five worms collected were female worms (100%). With respect to the species of ascarids, out of 43 *T. cati* worms, 17 were male worms (39.53%) and 26 were female worms (60.46%) and out of 10 *T. leonina* worms, four were males (40%) and six were females (60%). The observations in the present study are close to the observations of Quadros *et al.* (2022) who reported that 55.84% (110 out of 197) *T. cati* worms recovered from puma and leopard were female worms and 44.16% (87 out of 197) were male worms. These variations in the number of male and female worms could be due to genetic factors.

Occurrence of ascarid infection with respect to gender, age of animals and forest ranges

Out of the six infected animals, four were males (66.66%) and two were females (33.33%), three were below one year of age (50%) and three were of five and above five years of age (50%). The occurrence rate in males and females was 66.6% and 33.3%, respectively in both tigers and leopards. With respect to age, in tigers one infected animal was less than one year and other two were five and above five years of age. Among the infected leopards, two animals were below one year, while the third one was five years of age. Nashiruddullah and Chakraborty (2001) opined that *T. leonina* causes morbidity in all age groups and mortality in young ones of wild felines. Sex specific differences between parasite diversity exist in wild cats. In the present study, out of the six infected wild felines, four were males (66.66%). However, observation by Virta *et al.* (2022) on *T. cati* infection in Eurasian lynx did not show any statistically significant differences between sexes of animals. Probable reasons for occurrence of male biased parasitism are hypothesized as either by ecological or physiological factors. These causes may be related to endocrine system, immune system, behavioural, territorial, movement, social or diet related. The association of testosterone and immune system may cause a higher susceptibility to parasitic infections in sexually matured males in wild life (Krone *et al.* 2008). With respect to the age of wild felines with ascarid infections, Virta *et al.* (2022) had observed a negative association between age of lynx and *T. cati* abundance with lower infection in older animals compared to younger animals. Female animals aged 9-15 years had higher infection rates while the abundance was not related to sex in males. In the present study, it was observed that intensity of infection with ascarids was lower in young animals whereas it was interesting to note that a five-year-old female tiger harboured 40 worms and on the other hand a five-year-old female leopard had only one worm. The variations in the occurrence of ascarid infections and the intensity of infection among wild felines with respect to age could be attributed to the immune status, physiological status, resistance to infection, nutritional status, transmission of infection, stress factors of the animals and other environmental factors.

Table 1. Details of ascarid infection in Tigers and Leopards from different forest ranges of The Nilgiris

S. No.	Wild animal species	Forest Range	Details of animal (Age and gender)	Location of ascarid worms	Species	Details of worms		
						Male	Female	Total
1.	Tiger	Kothagiri	5 months, male	Stomach and intestine	*T. cati*	2	3	5 (2 in stomach and 3 in intestine)
2.	Tiger	Nilakottai	5 years old, female	Intestine	*T. cati* and *T. leonina*	18 (14 *T. cati* and 4 *T. leonina*)	22 (16 *T. cati* and 6 *T. leonina*)	40 (30 *T. cati* and 10 *T. leonina*)
3.	Tiger	Nilakottai	10 years old, male	Intestine	*T. cati*	1	2	3
Total (Tiger)						**21**	**27**	**48**
4.	Leopard	Kothagiri	5 years old, male	Intestine	*T. cati*	-	1	1
5.	Leopard	Udagai North	8 months old, male	Stomach and intestine	*T. cati*	-	3	3 (1 in stomach and 2 in intestine)
6.	Leopard	Pandalur	8 months old, female	Intestine	*T. cati*	-	1	1
Total (Leopard)						**-**	**5**	**5**
Grand Total						**21**	**32**	**53**

In the present study, the animals positive for ascarid infection were observed from four forest ranges viz., Kothagiri, Nilakottai, Pandalur and Udagai North. Out of the six animals found positive for ascarids, two were from Kothagiri (33.33%), two were from Nilakottai (33.33%), one was from Udagai North (16.66%) and one was from Pandalur (16.66%) forest ranges. The occurrence of ascarid infections in wild felines across different forest ranges could be attributed to the diversity in geoclimatic conditions, survivability of life cycle stages of ascarids in the soil and environment, availability of susceptible hosts, status of nutrition, season and environment. The forest ranges in the study area, the Nilgiris receive rainfall during the monsoon season from June to September months every year and sufficient moisture conditions are available which are conducive for the eggs of ascarids which remain viable for several months and could be potential sources of infection to wild felines.

Pathological observations in ascarid infected wild felines

In infected wild felines, gastritis and enteritis were appreciated according to the location of the ascarid worms. Bhattacharya *et al.* (2012) observed inflammation and sporadic thickening of intestinal mucous membranes, anaemic visible mucosa, slight enlargement and mottling of liver with partial congestion and necrotic foci in a *T. cati* infected 16 years old male tiger. Kumar *et al.* (2019) observed thickened mucosa in stomach with multifocal areas of erosions and ulceration, catarrhal to haemorrhagic enteritis in leopards infected with *T. canis.* Rimfa *et al.* (2019) observed hyperaemia in stomach and intestine of a four-year-old African lioness with toxocarosis. Other than gastritis and enteritis, no other pathological changes were appreciated in the ascarid infected wild felines in the present study. Presence of ascarids in large numbers may be the prime cause of gastritis and enteritis in wild felines leading to gastrointestinal disturbances, morbidity and mortality.

Free ranging wild felines feed on diverse prey species and parasitism may be equally diverse. Wild felines have a generalized diet eating any small vertebrates, a characteristic that may be associated to a high level of *T. cati* infection compared to other hosts. The difference found may be associated to life cycle of the ascarids and availability of hosts infected with ascarids in different environments. In the life cycle of *Toxocara,* the definitive host may be infected through ingestion of paratenic hosts (invertebrates or vertebrates) or during transmammary transmission contributing an important pathway (Anderson, 2000). It is hard to understand that tigers which are solitary carnivores having a big habitat range (400-600 sq.km) gets infected with *T. cati* which is generally a monoxenous nematode. Paratenic hosts therefore play a vital role here. Tigers show strong preference for wild boar as diet which is the most frequently consumed prey and there is good population of wild boars in The Nilgiris. Wild boars consume rodents and earthworm in their diets which could transmit ascarid infections easily. Leopards are known to kill and consume domestic dogs and cats from villages adjoining forest areas (Shirbhate, 2007), which is quite common in the study area and they also consume a variety of potential paratenic hosts especially young wild felines (out of curiosity or as prey and consume full or parts of paratenic hosts) which could be a source of infection. The co-evolution between parasites and hosts helps in the successful survival of the parasites. The results of the present study demonstrates that ascarid infection with

T. cati and *T. leonina* occurs in apex predators such as tigers and leopards in different forest ranges across The Nilgiris, Tamil Nadu irrespective of age, sex and forest range observed over a period of fifteen months. The present data will assist wildlife health officials in mapping the occurrence of ascarid infections in wild felines and in formulating necessary control and preventive measures to protect these valuable animals from the potentially fatal effects of ascarids.

Conclusion

The present data records the occurrence of ascarid infections wild felids across different forest ranges of the Nilgiris, Tamil Nadu. The influence of climatic factors, contamination of soil with ascarid eggs, multiple transmission modes, involvement of potential paratenic hosts as prey species etc. needs to be explored. Zoonotic importance of these ascarids and transmission of infection to wild felines during visits to locations of their feline and canine domestic counterparts for preying as well cannot be ignored. These data gathered in the present study will help zoologists, veterinarians, parasitologists and allied professionals for understanding ascarid infections in wild felines and to design suitable control strategies which will be highly essential for the development of disease control campaigns in wild felines in future.

Conflict of interest

The authors declare that they have no conflict of interest.

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