**Incidence of parasitic infection in captive wild animals in Bhagwan Birsa Biological Park, Ormanjhi, Ranchi, Jharkhand, India**

**Abstract**

The current study was conducted to determine the incidence and spectrum of gastrointestinal parasitic infections among captive wild animals housed in Bhagwan Birsa Biological Park, Ormanjhi, Ranchi, Jharkhand. Faecal samples were examined from a diverse range of species to identify the prevalence of helminths and protozoan parasites using direct and flotation methods. The findings indicate a measurable presence of parasitic infections in the zoo environment, predominantly *Toxocara spp*. and *Taenia spp.,* with a noted correlation to felid species. This study underscores the importance of routine parasitological surveillance and tailored anthelmintic protocols to maintain animal health in captive settings.

The study was conducted to know the incidence of gastrointestinal parasites of captive wild animals at Bhagwan Birsa Biological park Ormanjhi, Ranchi, Jharkhand.

**Keywords** : Capitive wild animals, carnivores, parasitic infection, Bhagwan Birsa Biological Park

**Introduction**

Zoos serve as vital institutions for wildlife conservation, education, and research. They provide sanctuary and medical care for animals, particularly endangered and vulnerable species. However, maintaining animal health in captivity presents unique challenges, especially concerning parasitic infections, which can compromise animal welfare and conservation goals.

Parasitic infections are among the most prevalent health problems in zoo environments due to factors such as restricted mobility, artificial diets, and increased exposure to contaminated substrates (Rahman et al., 2023). Wild animals naturally harbour a wide range of parasites, including gastrointestinal helminths (nematodes, cestodes, trematodes), protozoa (such as Giardia, Cryptosporidium etc), and ectoparasites (mites, fleas, ticks etc). In natural ecosystems, parasitic infections often remain subclinical due to ecological balance and the host’s evolved immunity. However, in zoos, stress-induced immunosuppression and environmental contamination can exacerbate susceptibility, leading to clinical disease outbreaks (Zhang et al., 2025).

The zoonotic potential of several parasites—especially *Toxocara* and *Taenia* spp.—warrants regular monitoring and effective management. These parasites can be transmitted to humans, posing public health risks, particularly to zoo workers and visitors. As such, there is a need for routine parasitological assessments, hygienic measures, and systematic deworming protocols (Dashe & Berhanu, 2020).

This study aimed to assess the incidence of gastrointestinal parasites among captive animals in Bhagwan Birsa Biological Park (BBBP), thereby contributing to the body of knowledge on zoo parasitology in India and informing future control strategies.The primary aim of zoos is to furnish a secure and regulated environment for animals, particularly those endangered or threatened. Wild animals can host a plethora of parasites, ranging from internal parasites like worms, protozoa, and flukes to external parasites such as ticks, fleas, and lice (*Mir et al* 2016). Vigilantly monitoring parasite burdens in wild animals is crucial for comprehending population and ecosystem health. It aids in detecting disease outbreaks and tracking shifts in parasite distribution. Managing parasite burdens in wild animals poses challenges. Strategies may involve habitat management, stress reduction, vaccination initiatives, and targeted treatment of individual animals or populations. Some studies have uncovered that gastrointestinal parasites of wild animals in captivity encompass zoonotic species, thereby raising public health concerns (Levecke *et al.,* 2007). Additionally, it's noteworthy that certain parasites of wild animals can infect humans and domestic animals, posing risks to public health and livestock. Parasitic ailments often pose significant concerns in zoo animals due to heightened environmental contamination from animals confined in close quarters (Gracenea *et al.,* 2002). In the wild, animals possess some innate resistance against parasitic ailments, and a state of equilibrium typically exists between the parasite and the host, seldom leading to harmful infections unless stressed. However, in captivity, wild animals may succumb to parasitic infections due to environmental stressors such as alterations in living conditions and spatial limitations. The chronic stress of captivity renders animals more susceptible to parasitic infections as their immune systems weaken. In India, only a limited number of systematic studies have been conducted on parasitic diseases in wildlife. To gain a deeper insight into the prevalence of endoparasites affecting zoo animals, this study endeavors to investigate the occurrence of helminth parasites among animals in Bhagwan Birsa Biological Park, Ormanjhi, Ranchi ( *Gimah et al* 2025).

**Materials and methods**

**Study site**

The study site was Bhagwan Birsa Biological Park, Ranchi, commonly known as Bhagwan Birsa Zoo, Ranchi. It stands as one of the most picturesque and progressive zoological parks in India, covering a total area of 104 hectares, adorned with naturally grown forests and water bodies. Situated approximately 20 kilometers from Ranchi city, the capital of Jharkhand, the zoo is home to around 1450 wild animals representing 83 distinct species, including mammals, reptiles, and birds. Enclosures undergo regular cleaning with requisite prophylactic measures. These measures include routine deworming, foot dips installed at the zoo entrance and within each enclosure. The zoo operates as a closed system, with no introduction of external animals. Standard sanitary protocols involve biannual anthelmintic administration in April and November, with Piperazine administered for birds (at a dosage of 40-60 ml in 2 liters of water), Fenbendazole for larger carnivores and herbivores (Mariana 2024), and Closantel for hippopotamuses, administered at appropriate dosages relative to body weight.

**Animals sampled**

A total of 31 faecal samples were collected in six month interval from fourteen distinct species of captive animals, including Civet cat (*Viverr azietha*), spotted deer (*Axis porcinus*), lion (*Panthera leo*), tiger (*Panthera tigris*), elephant (*Elephas maximus*), peacock (*Parvo crestatus*), fox (*Vulpes vulpes*), wolf (*Canis lupus*), leopard (*Panthera pardus*), bear (*Ursusa mericanus*), hyena (*Hyaena hyaena*), buck (*Odocoileus virginianus*), mouse deer (*Tragulus javanicus*), and leopard cat (*Prionailurus bengalensis*) (**Table 1**). Fresh samples were individually collected in labelled plastic sample cups for each species and subsequently transferred to the laboratory of the Department of Parasitology, College of Veterinary Science and Animal Husbandry, for parasitological examination and pathogen identification. Endoparasites were identified utilizing direct and indirect methods as described by Soulsby (1982). In the direct smear method, a small amount of faeces was mixed with a drop of saline on a microscopic slide, covered with a cover slip, and examined under a microscope. While in floatation method faeces were mixed with a high specific gravity solution (saturated salt) allowing parasite eggs and oocyst to float to the surface, where they were collected on a cover slip and examined microscopically.

**Results and Discussion**

Species-wise Infection Patterns

*Toxocara spp*. eggs were observed in faecal samples from hyena (100%), jungle cat (100%), male tiger (100%), and female leopard (20%). This nematode is particularly concerning due to its zoonotic nature and association with larva migrans in humans (Akinnubi et al 2020).

*Taenia spp.* eggs were detected in male leopard (33.33%) and female tigers (33.33%), representing cestode infections that may result in severe intestinal pathology.

The remaining 24 samples showed no parasitic infections, suggesting effective anthelmintic regimens and good enclosure hygiene. Notably, pooled samples from species such as jackals, wolves, elephants, and birds (peacocks) were negative, which reflects the efficacy of prophylactic interventions and environmental sanitation.

**Prevalence Summary Table**

**Analysis and Implications**

Felids (leopards, tigers, jungle cats) exhibited higher infection rates, which can be attributed to their diet, grooming behaviour, and enclosure types that may allow parasite survival. The detection of *Toxocara* *spp* in these species is of particular concern due to its potential for causing visceral and ocular larva migrans in humans. Zoo staff and visitors are at risk if sanitation is compromised.

*Taenia spp*., often transmitted through the ingestion of intermediate hosts, points to potential contamination in food or exposure to infected prey. Regular inspection of food sources and quarantine protocols for newly introduced animals are critical preventive measures.

Although deworming with Fenbendazole and Piperazine has demonstrated effectiveness, emergence of drug resistance is a potential threat. There is an increasing need for faecal egg count reduction tests (FECRT) to evaluate drug efficacy and detect resistance.

Among the fourteen species of captive animals surveyed in this study, 18 (58.06%) were felids (Moudgil et al 2014), 2 (6.4%) were rodents, 5 (16.12%) were ungulates, 1 (3.22%) were from the ursidae family, 1 (3.22%) were from the hyaenidae family, 3 (9.6%) were from the canidae family, and 1 (3.22%) were from the phasianidae family.

Out of the 31 faecal samples examined, 6 tested positive for parasitic ova/oocysts of different species (Rahman *et al* 2023), indicating an overall prevalence of 22.58%. The observed parasites included *Toxocara spp* (12.90%, 4 out of 31) and *Taenia spp* (9.67%, 3 out of 31). Specifically, hyena (100%), male tiger (100%), jungle cat (100%), and female leopard (20%) tested positive for *Toxocara spp* eggs, while male leopard (33.33%) and female tiger (33.33%) tested positive for *Taenia spp* eggs. The remaining 24 faecal samples tested negative for any parasitic eggs or oocysts. Routine deworming, employing Piperazine for birds (at a dosage of 40-60 ml in 2 liters of water) and Fenbendazole for various species such as tiger, leopard, lion, hyena, jackal, wolf, bear, elephant, black buck, spotted deer, sloth bear, bear cub, jungle cat, civet cat, and leopard cat (at a dosage of 7.5 mg/kg body weight), proved effective for these twenty-four wild animals. Fenbendazole usage has been demonstrated to effectively combat endoparasites in wild animals (Goossens *et al*., 2013). Similarly, Piperazine serves as an effective anthelmintic against *Ascaridia galli* in domestic fowl (Nilsson and Alderin, 1988).

Table 1: Sample Details with positive for parasitic ova/oocysts of different species

|  |  |  |  |
| --- | --- | --- | --- |
| **Animals** | **no of sample** | **no of positive sample(%)** | **findings** |
| Himalayan bear(pooled sample) | 1 | 0 | negative |
| Hyena (pooled sample) | 1 | 1(100) | eggs of *Toxocara spp* |
| Lion (male) | 2 | 0 | negative |
| Lion (female) | 1 | 0 | negative |
| Leopard(male) | 3 | 1(33.33) | eggs of *Taenia spp* |
| Leopard(female) | 5 | 1(20) | eggs of *Toxocara spp* |
| Tiger (male) | 1 | 1(100) | eggs of *Toxocara spp* |
| Tiger (female) | 6 | 2(33.33) | eggs of *Taenia spp* |
| Jackal (pooled sample) | 1 | 0 | negative |
| Wolf(pooled sample) | 1 | 0 | negative |
| Elephant | 2 | 0 | negative |
| Black buck (pooled sample) | 1 | 0 | negative |
| Leopard cat (pooled sample) | 1 | 0 | negative |
| Jungle cat (pooled sample) | 1 | 1(100) | eggs of *Toxocara spp* |
| Mouse deer | 1 | 0 | negative |
| Fox (pooled sample) | 1 | 0 | negative |
| Spotted deer | 1 | 0 | negative |
| Peacock | 1 | 0 | negative |

Anthelmintic treatments represent a crucial tool in the management and reduction of endoparasite loads in animals when utilized judiciously. However, their effectiveness can be influenced by various factors, including anthelmintic resistance, correct administration procedures, timing of treatment, animal-specific factors (such as age, weight, and overall health), and environmental management practices (e.g., pasture rotation, manure handling, grazing strategies, etc.). Over time, certain parasite populations may develop resistance to specific anthelmintic classes, rendering them ineffective. This resistance can arise due to factors like inadequate dosing, frequent or inappropriate anthelmintic usage, or genetic variations within the parasite population. Hence, it's imperative to monitor and manage anthelmintic resistance through appropriate treatment strategies, rotation of anthelmintic classes, and regular faecal egg count testing.

Anthelmintics must be administered correctly, adhering to the recommended dosage and route of administration for the specific product and target species. Under-dosing or improper administration can result in suboptimal efficacy, allowing parasites to survive and propagate, potentially leading to treatment failure. Treatment planning should be strategic, considering the lifecycle of target parasites. For instance, certain anthelmintics may exhibit greater efficacy when administered during specific stages of the parasite’s lifecycle, when they are most susceptible to the medication.

Animal-specific factors, such as age, weight, and overall health status, play a significant role in the effectiveness of anthelmintic treatment. Young animals or those with compromised immune systems may be more susceptible to parasitic infections, necessitating more frequent or specialized treatment protocols. Effective environmental management practices, including pasture rotation, proper manure handling, and strategic grazing techniques, complement anthelmintic treatment efforts and contribute to reducing overall parasite burdens. These practices help mitigate re-infection and limit the spread of parasites within animal herds or flocks.

Consulting with a veterinarian is essential for accurate diagnosis, appropriate treatment selection, and guidance on proper administration and management practices to optimize the effectiveness of anthelmintic treatments in animals. Regular monitoring, including faecal egg counts and post-treatment efficacy testing, serves as valuable tools for assessing the efficacy of anthelmintic treatment regimens.

**Conclusion**

This study highlights a moderate prevalence of gastrointestinal parasitic infections among captive wild animals in Bhagwan Birsa Biological Park, with felids showing a higher susceptibility. The findings emphasize the significance of ongoing parasitological surveillance, tailored anthelmintic protocols, and comprehensive environmental management to control parasite transmission in zoological settings.

Sustainable parasite control in zoos must integrate pharmacological, ecological, and educational approaches. With rising concern about zoonoses and drug resistance, a multidisciplinary and proactive strategy will be essential to safeguard both animal and public health.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT) and text- to- image generators have been used during the writing or editing of this manuscript.

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