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Case Report

Multiparasitism in the Endangered Marbled Polecat (*Vormela peregusna*): A Case Report

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Abstract

The marbled polecat *(Vormela peregusna)* is classified as an endangered species within the small mammal group. In this report a young, injured male marbled polecat was brought to the Wildlife Protection, Rescue, Rehabilitation Application and Research Center of Kafkas University from the Sarıkamış district. Ectoparasitic examination revealed a flea sample identified as *Nosopsyllus fasciatus*. *Macracanthorhynchus* sp., belonging to the phylum *Acanthocephala*, and *Eimeria* sp. were detected in the examination of the fecal samples collected from the animal. This is the first documented report of these parasites observed in marbled polecat from Türkiye.

Keywords: *Eimeria* sp, *Macracanthorhynchus* sp, Marbled polecat, *Nosopsyllus fasciatus, Vormela peregusna*

Introduction

Vormela peregusna (Güldenstaedt, 1770), commonly known as the marbled polecat, is a small carnivore mammal belonging to the family Mustelidae [1-3], which has attracted scientific interest because of its ecological significance and conservation status. The International Union for Conservation of Nature (IUCN) has classified *Vormela peregusna* as vulnerable, with the species facing various threats, including habitat loss and anthropogenic pressures [3,4]. In addition to habitat loss, infections caused by various pathogens also contribute to population decline. Epidemiological data on marbled polecats, which serve as reservoirs for pathogens of medical and veterinary significance, are limited [5]. The geographic distribution of marbled polecats encompasses Central Asia, Europe, Mongolia, and Northern China [1,2].

Marbled polecats are known hosts for various pathogens, including *Rickettsia raoultii*, which has been detected in ticks infesting these animals [6]. Previous studies have reported various pathogens such as bacteria, helminths [7] and coccidian agents [8] in polecats; however, *Macracanthorhynchus*, a parasite of wild boars, has been detected in mustelids (European polecats) [7].

Fleas are common ectoparasites that can infest marbled polecats, potentially leading to discomfort and secondary infections. In a study focusing on flea surveillance in wild mammals, including marbled polecats, it was noted that these animals are often hosts for various flea species, which can affect their overall health and reproductive success [9]. Limited information is available regarding the marbled polecat, although phylogenetic and ecological considerations suggest susceptibility to a similar suite of diseases, and particular regional endemism [8].

This reports the first documented occurrence of *Nosopsyllus fasciatus*, *Macracanthorhynchus* sp., and *Eimeria* sp. in marbled polecat, contributing to the limited wildlife data for this species.

Case History

This report was prepared with the permission of the Republic of Türkiye Ministry of Agriculture and Forestry General Directorate of Nature Conservation and National Parks with the number E-21264211-288.04-16070652.

The material of the report was a severely injured young male marbled polecat, which was rescued from a canine attack by citizens in the Sarıkamış district of Kars and subsequently brought to the Wildlife Protection, Rescue, Rehabilitation Application, and Research Center of Kafkas University. Clinical examination revealed severe dehydration and a closed femoral fracture.

The flea sample was washed with distilled water and clarified in 10% potassium hydroxide (KOH) solution for 24 to 48 h. Subsequently, it was immersed in 70% and 99% alcohol series for 24 h, prepared with Canada balsam, and dried in an oven at 55ºC for approximately 15 days. The flea sample was examined under a light microscope at 4x and 10x magnification.

Macroscopic examination of the fecal sample revealed one helminth belonging to the phylum *Acanthocephala*, and the parasite sample was examined under a stereomicroscope. The fecal sample was subjected to flotation with zinc sulfate ($ZnSO_4$) and sedimentation with tap water, followed by microscopic examination at 10x and 40x magnification. Unsporulated oocysts were observed in the sample; therefore, potassium dichromate was added, and the oocysts were allowed to sporulate in an oven at 37ºC. Additionally, the sample was agitated three to four times daily to ensure oxygenation and sporulation.

Based on the morphological characteristics and measurements of the flea sample [10], it was identified as *Nosopsyllus fasciatus* (female), commonly known as the northern rat flea *(Fig. 1)*.

The helminth sample belonging to the phylum *Acanthocephala* was found to have a relatively damaged head and was identified as a male *Macracanthorhynchus*

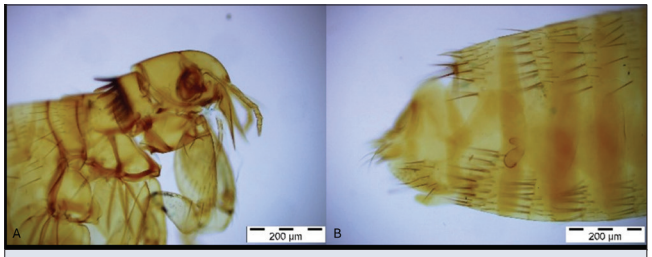

Fig 1. *Nosopsyllus fasciatus* fleas. **A**- Head, **B**- Abdomen

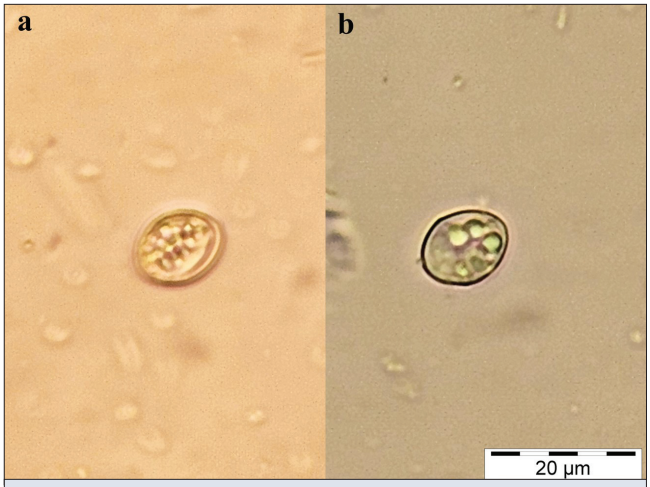

Fig 2. *Eimeria* sp. oocyst. **a**- (12.1x14.3 µ); Unsporulated oocyst, **b**- (11.4x13.2 µ); sporulated oocyst

sp. based on its morphological characteristics [11,12]. No eggs of this helminth were observed in the feces. The morphological features and structures of the sporulated oocysts were measured and identified [13] as *Eimeria* sp. *(Fig 2)*. The number of oocysts per gram of feces was determined using the Modified McMaster Technique, and the oocyst count was found to be <50 g/oocysts.

Discussion

Flea infestations have ecological implications that extend beyond individual health effects. Elevated flea burdens can potentially affect the overall fitness of marbled polecat, particularly its survival and reproductive success. This is especially relevant in the context of conservation efforts because maintaining healthy populations of marbled polecats is essential for ecosystem balance [9]. *Nosopsyllus fasciatus,* frequently observed in urban and rural environments, is renowned for its broad distribution and adaptability to areas where rodent hosts thrive [14].

This flea species is particularly significant in the context of zoonotic diseases, as it can serve as a vector for various pathogens. In a study conducted in China, four flea species, *Echidnophaga oschanini*, *Xenopsylla conformis conformis*, *X. gerbilli minax* and *Nosopsyllus laeviceps laeviceps*, were found to be dominant on marbled polecats and *Pulex irritans* was observed for the first time in marbled polecat. Furthermore, studies have demonstrated that *N. fasciatus* can transmit *Rickettsia* species, causing diseases in both animals and humans [6,15]. The presence of these pathogens in fleas collected from rodents indicates a risk of transmission to other species that may prey on or come into contact with infested rodents [5,6].

Coccidiosis caused by *Eimeria furonis*, *E. ictidea* [8], *Isospora eversmanni,* and *I. pavlovskyi* [16] in mustelids has been previously reported, but no data were found for

marbled polecat. The broader implications of *Eimeria* spp. as a pathogen in wildlife, due to its habitat conditions and host interactions, suggest that these parasites may pose a risk to the health of marbled polecats. Further research is needed to investigate the prevalence, ecological effects, and impact of *Eimeria* spp. in this species.

Macracanthorhynchus sp. is a thorny- or spiny-headed acanthocephalan parasite of swine worldwide. Adult worms can affect a wide range of hosts including canids, birds, and humans [11,17]. Its presence has been reported in foxes as wild carnivores, primarily in wild boars globally, and exclusively in wild boars in Türkiye [18,19]. However, this parasite has not yet been detected in mustelids or polecats.

According to the report data, multiparasitism was observed in marbled polecat, which was identified as a potential new host for each detected parasite. The findings also emphasize the importance of understanding the health and disease dynamics associated with marbled polecat, particularly in the context of wildlife conservation and management strategies.

Declarations

Availability of Data and Materials: The data of this case report are available from the correaponding author (N. Ölmez) upon reasonable request.

Conflict of Interest: The authors declared that there is no conflict of interest.

Declaration of Generative Artificial Intelligence (AI): The authors declare that the report and/or figures were not written/created by AI and AI-assisted technologies.

Author Contributions: NÖ investigated and designed the report. EEE and BB collected samples. NÖ and NA analysed the data. BS, YK, and GTT confirmed the data. NÖ wrote the original drafting. NÖ, BS, and YK edited and finalized the draft. All authors have read and approved the final version of the manuscript.

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