

***Trichodectes pinguis* (Phthiraptera: Ischnocera: Trichodectidae) and *Haemaphysalis erinacei* (Acari: Ixodida: Ixodidae) infestation on brown bears in Erzurum province**

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Abstract: Brown bears (*Ursus arctos*), which host various ectoparasites, are the largest carnivores in Türkiye. The present study represents tick and louse species found in brown bears in Erzurum. Four brown bears (3 dead, 1 alive) were brought to the parasitology laboratory and four brown bears were examined in terms of ectoparasite infestation. Transparency protocol was applied for louse samples, and species identification of all ectoparasites was performed under a stereo microscope. All lice and ticks were identified as *Trichodectes pinguis* and *Haemaphysalis erinacei*, respectively. There are limited studies concerning wildlife animal ectoparasites in Türkiye, especially on bears.

Keywords: Brown bear, *Haemaphysalis erinacei*, *Trichodectes pinguis*, *Ursus arctos*, wildlife.

Erzurum ilindeki boz ayılarında *Trichodectes pinguis* (Phthiraptera: Ischnocera: Trichodectidae) ve *Haemaphysalis erinacei* (Acari: Ixodida: Ixodidae) enfestasyonu

Özet: Bozayılar Türkiye'deki en büyük karnivorlardır ve birçok farklı ektoparazite konaklık yapmaktadırlar. Bu çalışmada, Erzurum ilindeki bozayılarda bulunan ektoparazit türleri sunulmuştur. Ektoparaziter muayene amacıyla bozayılar (3 ölü, 1 canlı) parazitoloji laboratuvarına getirildi. Bit türlerinin teşhisi amacıyla şeffaflandırma protokolü uygulandı. Bit ve kene türlerinin tür teşhisleri stereo mikroskop altında gerçekleştirildi. Dişi ve erkek bitler *Trichodectes pinguis* olarak teşhis edildi. Bir dişi ve bir erkek kene *Haemaphysalis erinacei* olarak tespit edildi. Türkiye'de özellikle ayılarda olmak üzere yabani hayvanların ektoparazitlerine yönelik az sayıda çalışma bulunmaktadır.

Anahtar kelimeler: Bozayı, *Haemaphysalis erinacei*, *Trichodectes pinguis*, *Ursus arctos*, vahşi yaşam.

Introduction

Brown bears (*Ursus arctos*) are the largest carnivores in Türkiye. They have widespread habitat in the Black Sea and Eastern Anatolia Regions. The bear population in Türkiye varies between 3,400-4,000, and the majority of this population is located in the Eastern Anatolia Region (Ambarlı et al., 2016). Wild animals carry a large number of ectoparasites that are not threatening to their health (Durden, 2001). However, they can cause adverse effects on animal

health by causing anemia, dermatitis, alopecia, skin sensitization, reduced growth rates, secondary infections, the transmission of pathogens, reduced reproductive success, and triggering inflammatory reactions (Durdan, 2001; Rakotonanahary et al., 2017). *Trichodectes* spp. (Phthiraptera: Ischnocera: Trichodectidae) can infest many animals, including bears (Durdan, 2001). There are a few studies about *Trichodectes pinguis* (*T. pinguis*) on bears around the world (Rogers & Rogers, 1976; Yokohata et al., 1990) and a study in Türkiye (Dik & Kılınç, 2015). Though the disease risk caused by chewing louse on brown bears is not known clearly, a previous study reported a case of alopecia and hyperpigmentation caused by chewing louse on bears (Esteruelas et al., 2016). Ticks can be vectors for some protozoans such as *Babesia* sp. and *Hepatozoon ursi*, which were detected in previous studies on bears (Ikawa et al., 2011; Kubo et al., 2008; Orkun & Emir, 2020). In this study aimed to identify the louse and tick species infesting in brown bears in Erzurum province of Türkiye.

Case Description

Brown bears (3 dead, 1 alive) that were found in the Yakutiye, Pasinler, and Uzundere districts of Erzurum were brought to the parasitology laboratory for ectoparasitic examinations. One of brown bear was alive and it was a cub. Therefore, ectoparasites were collected directly without the need for sedation. Ectoparasites were collected from bears with forceps and they were examined under a stereo microscope (Nikon, SMZ 745T, Japan). Transparency protocol was applied for species identification in lice. Lice were kept in 10% KOH solution for 24-48 hours and then in distilled water for 24 hours. It was again passed through the alcohol series (30-70-80-96%) every 24 hours. They were mounted on slides in entellan (Hopkins, 1954). Species identification of tick samples and lice was performed under a stereo microscope (Nikon, SMZ745T, Japan), and light microscope (Nikon, Eclipse Ci, Japan), respectively in accordance with morphological criteria (Dik & Kılınç, 2015; Estrada-Peña et al., 2017; Kusakisako et al., 2022).

Three of the four brown bears were observed to be infested with at least one ectoparasite species. Male and female lice that were collected from two adult bears were identified as *T. pinguis* (Figure 1). A female and a male tick were collected from a baby bear and they were identified as *Haemaphysalis erinacei* (*Hae. erinacei*) (Figure 2). There was no coinfection by ticks and lice.

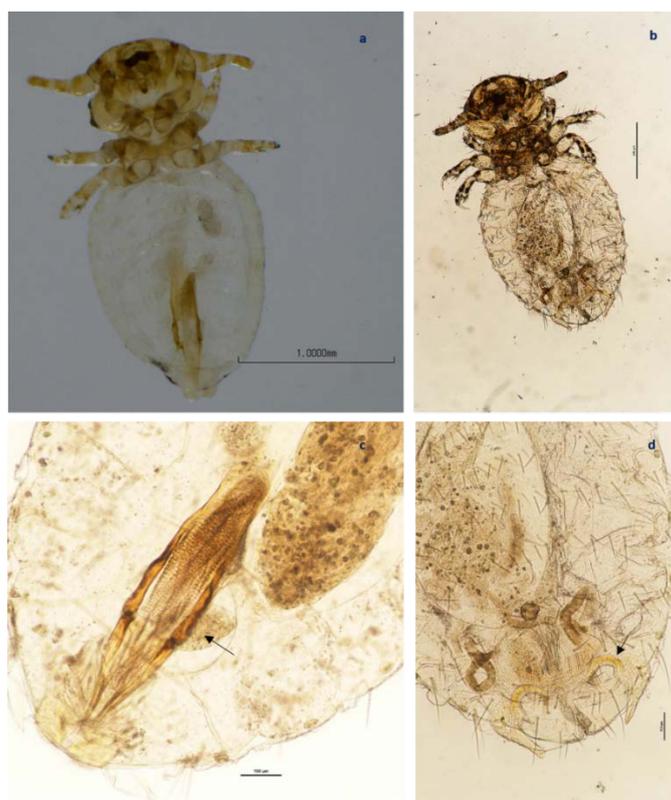


Figure 1. *T. pinguis*, **a:** male, **b:** female, **c:** spiculum (black arrow), **d:** spermatheca (black arrow).

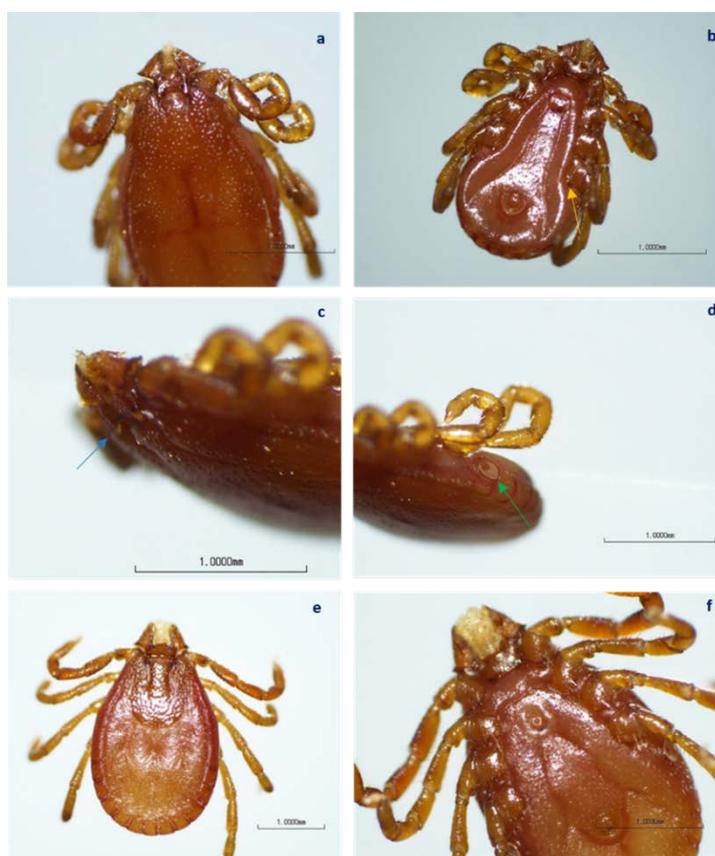


Figure 2. *Haemaphysalis erinacei*, Male; **a:** dorsal view, **b:** ventral view (spur on coxa IV (yellow arrow)), **c:** dorsal cornua (blue arrow), **d:** stigma (green arrow), Female; **e:** dorsal view, **f:** ventral view, **g:** female

Discussion

Wild animals and their ectoparasites play an important role as reservoirs and/ or vectors of zoonotic agents for humans and domestic animals (Morse, 1995). Limited studies are available regarding ectoparasites on wild mammals in Türkiye (Aydin et al., 2011; Dik & Yamaç, 2017; Orkun & Vatansever, 2021). Besides, studies on the presence of *T. pinguis* (Dik & Kılınç, 2015) and *Hae. erinacei* (Girişgin et al., 2018) in brown bears are limited. In the present study, *T. pinguis* and *Hae. erinacei* in brown bears were reported for the first time in Erzurum. *Trichodectes pinguis* has been reported from bears in this study for the second time in Türkiye. In a previous study, it was detected on a brown bear in Van province (Dik & Kılınç, 2015). *Haemaphysalis erinacei*, a three-host tick species, has been detected in foxes, hedgehogs, and rabbits in studies conducted on different wild animals in Türkiye (Estrada-Peña et al., 2017; Girişgin et al., 2018; Hoogstraal, 1959). Although it mostly affects hedgehogs and small and medium-sized mammals that hunt hedgehogs, there are studies showing that it also infests bears (Girişgin et al., 2018; Kolonin, 2007). Studies on bear ectoparasites in Turkey are limited due to the danger of bear attacks, geographical difficulties, and hunting ban (Dik & Kılınç, 2015).

Conclusion

In today's world, human beings are involved in wildlife for sport, picnics, finding new agricultural areas, and hunting. Therefore, it is necessary to investigate wild animals' ectoparasites, which are possible vectors and/or reservoirs for pathogens some of which are zoonotic. Although studies on wildlife are limited, the necessity of more studies in this area comes to the forefront due to the increase in the population of wild animals which are under protection.

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Ethical Statement

Ethical approval was obtained from the Ataturk University Animal Research Local Ethics Committee (Approval no: 2015/ 27) for the study.

Conflict of Interest

The authors declared that there is no conflict of interest.

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References

- Ambarlı, H., Ertürk, A., & Soyumert, A. (2016). Current status, distribution, and conservation of brown bear (Ursidae) and wild canids (gray wolf, golden jackal, and red fox; Canidae) in Turkey. *Turkish Journal of Zoology*, 40, 944-956. <https://doi.org/10.3906/zoo-1507-51>
- Aydın, M.F., Balkaya, İ., Aktaş, M., & Dumanlı, N. (2011). Erzurum ilinde üç kırmızı tilkide (*Vulpes vulpes*) kene (Ixodoidea) ve pire (Siphonaptera) türleri. *Türkiye Parazitoloji Dergisi*, 35(2), 110-113. <https://doi.org/10.5152/tpd.2011.27>
- Dik, B., & Kılınç Ö.O. (2015). First case of *Trichodectes pinguis* (Phthiraptera: Ischnocera: Trichodectidae) on a Bear (*Ursus arctos*) in Turkey. *Türkiye Parazitoloji Dergisi*, 39, 313-315. <https://doi.org/10.5152/tpd.2015.4040>
- Durden, L.A. (2001). Lice (Phthiraptera). In: Samuel, W.M., Pybus, M.J., Kocan, A.A. (Ed.), *Parasitic Diseases of Wild Mammals* (pp. 3e17). Iowa State University Press.
- Esteruelas, N.F., Malmsten, J., Bröjer, C., Grandi, G., Lindström, A., Brown, P., Swenson, J.E., Evans, A.L. & Arnemo, J.M. (2016). Chewing lice *Trichodectes pinguis pinguis* in Scandinavian brown bears (*Ursus arctos*). *International Journal for Parasitology: Parasites and Wildlife*, 5, 134-138. <https://doi.org/10.1016/j.ijppaw.2016.02.002>
- Estrada-Peña, A., Mihalca, A.D., & Petney, T.N. (2017). *Ticks of Europe and North Africa*. Springer.
- Girişgin, A., Çimenlikaya, N., Bah, S., Aydın, A., & Girişgin, O. (2018). Türkiye’de Bazı Yabani Memelilerde Bulunan Dış Parazit Türlerinin İlk Kayıtları. *Uludağ Üniversitesi Veteriner Fakültesi Dergisi*, 37(2), 133-136.
- Hoogstraal, H. (1959). Biological observations on certain Turkish *Haemaphysalis* ticks (Ixodoidea-Ixodidae). *Journal of Parasitology*, 45(2), 227-232. <https://doi.org/10.2307/3286538>
- Hopkins, G. H. E. (1954). Notes on some *Mallophaga* from bears. *The Entomologist*, 87, 140-146.
- Ikawa, K., Aoki, M., Ichikawa, M. & Itagaki, T. (2011). The first detection of *Babesia* species DNA from Japanese black bears (*Ursus thibetanus japonicus*) in Japan. *Parasitology International*, 60, 220-222. <https://doi.org/10.1016/j.parint.2011.02.005>
- Kolonin, G.V. (2007). Mammals as hosts of Ixodid ticks (Acarina, Ixodidae). *Entomological Review*, 87, 401-412. <https://doi.org/10.1134/S0013873807040033>
- Kubo, M., Uni, S., Agatsuma, T., Nagataki, M., Panciera, R. J., Tsubota, T., Nakamura, S., Sakai, H., Masegi, T. & Yanai, T. (2008). *Hepatozoon ursi* n. sp. (Apicomplexa: Hepatozoidae) in Japanese black bear (*Ursus thibetanus japonicus*). *Parasitology International*, 57, 287-294. <https://doi.org/10.1016/j.parint.2008.01.002>
- Kusakisako, K., Niiyama, H., Asano, E., Haraguchi, A., Hakozaki, J., Nakayama, K., Nakamura, S., Shindo, J., Kudo, N., & Ikadai, H. (2022). Morphological and molecular phylogenetical identification of *Tricodectes pinguis* from Japanese black bears (*Ursus thibetanus japonicus*) in Aomori Prefecture, Japan. *The Journal of Veterinary Medical Science*, 84(7), 1015-1018. <https://doi.org/10.1292/jvms.22-0107>
- Morse, S.S. (1995). Factors in the emergence of infectious diseases. *Emerging Infectious Diseases*, 1, 7-15.
- Orkun, O., & Emir, H. (2020). Identification of tick-borne pathogens in ticks collected from wild animals in Turkey. *Parasitology Research*, 119, 3083-3091. <https://doi.org/10.1007/s00436-020-06812-2>
- Orkun, O., & Vatansever, Z. (2021). Rediscovery and first genetic description of some poorly known tick species: *Haemaphysalis kopetdaghica* Kerbabaev, 1962 and *Dermacentor raskemensis* Pomerantzev, 1946. *Ticks and Tick-borne Diseases*, 12(4), 101726. <https://doi.org/10.1016/j.ttbdis.2021.101726>
- Rakotonanahary, R. J., Harrison, A., Maina, A. N., Jiang, J., Richards, A. L., Rajerison, M., & Telfer, S. (2017). Molecular and serological evidence of flea-associated typhus group and spotted fever group rickettsial infections in Madagascar. *Parasites & Vectors*, 10, 125. <https://doi.org/10.1186/s13071-017-2061-4>
- Rogers, L.L., & Rogers, S.M. (1976). Parasites of Bears: A review. *Bears: their biology and management*, 411-430.
- Yokohata, Y., Fujita, O., Kamiya, M., Fujita, T., Kaneko, K. & Ohbayashi, M. (1990). Parasites from the Asiatic black bear (*Ursus thibetanus*) on Kyushu Island, Japan. *Journal of Wildlife Diseases*, 26, 137-138. <https://doi.org/10.7589/0090-3558-26.1.137>