Seroprevalence and Geographical distribution of Selected Infectious and Parasitic Diseases in Wild Carnivores in Greece: A Retrospective Study (2020-2025)

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Introduction

The urbanization and the subsequent increased presence of wild animals in urban and peri-urban environments present new challenges for public and veterinary health, particularly in relation to the increased transmission of infectious and parasitic diseases among wildlife, domestic animals, and humans. (Tsokana et al., 2024; Bradley et al., 2007).

Due to its ecological conditions, Greece serves as a hospitable habitat for over 27000 species of wild fauna, with more than 4000 of which being considered endemic (Legakis et al., 2018). Noteworthily, this country serves as a crossroad among different dispersion routes (Legakis et al., 2018). Close contact between wild animals, pets and people is also reported in Greece (Liatis et al., 2017). Wild carnivores, such as red foxes and golden jackals, due to their diverse feeding strategies and adaptability, thrive in cities and suburban habitats (Tsokana et al., 2024). The aforementioned data underline the importance of studying the occurrence of transmissible diseases of Greek wildlife and in the present study, the seroprevalence and geographical distribution of selected zoonotic and veterinary-relevant pathogens in red foxes (*Vulpes vulpes*), golden jackals (*Canis aureus*), European badgers (*Meles meles*) and European stone martens (*Martes foina*) across Greece are presented.

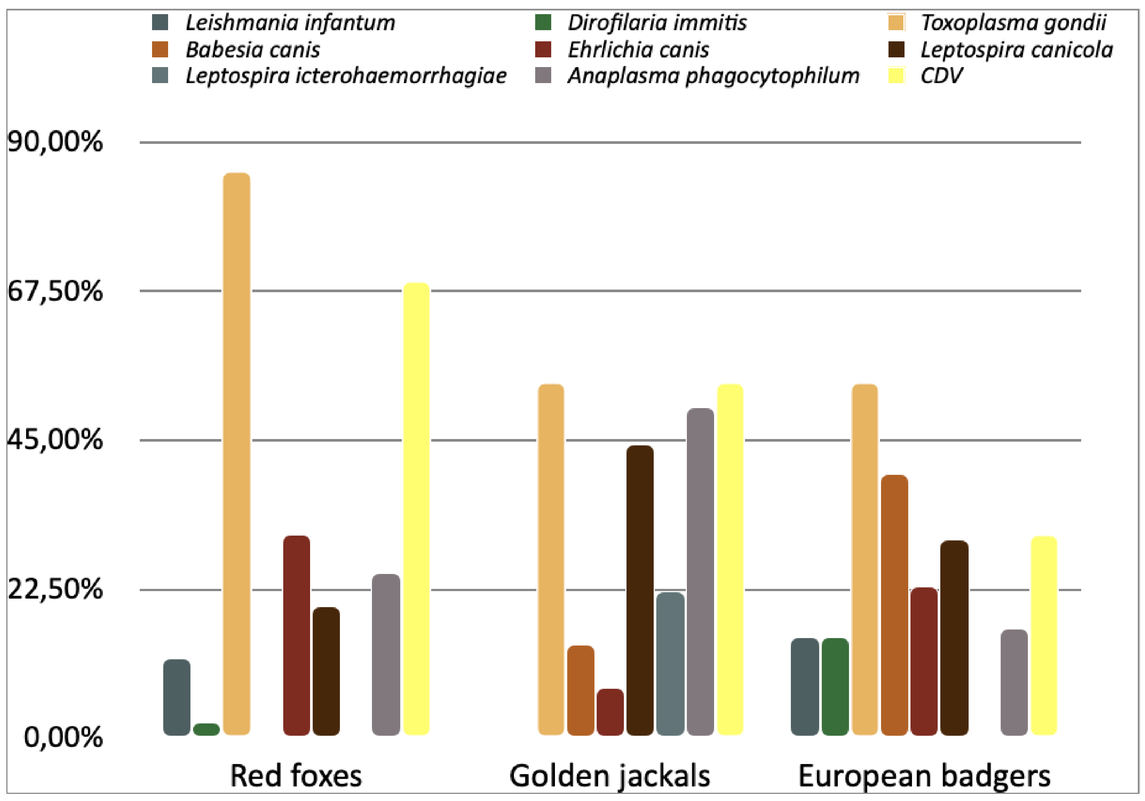
Methodology

A total of 71 wild carnivores - including red 42 foxes (*Vulpes vulpes*), 13 golden jackals (*Canis aureus*), 13 European badgers (*Meles meles*) and 3 European stone martens (*Martes foina*) - were examined. These animals were admitted for various reasons to ANIMA - The Hellenic Wildlife Care Association (Athens) between 2020 and 2025 and originated from eight distinct geographic regions of Greece; Macedonia, Epirus, North and South Aegean, Thessaly, Peloponnese, Crete, and Central Greece. Blood serum samples were analyzed at the veterinary diagnostic laboratory "VET IN PROGRESS PLUS" (Athens) using indirect immunofluorescence assays (IFA, IgG and IgM) for the detection of antibodies against Leishmania infantum, *Toxoplasma gondii*, *Neospora caninum*, *Babesia canis*, *Ehrlichia canis*, *Leptospira canicola*, *Leptospira icterohaemorrhagiae*, *Anaplasma phagocytophilum*, and Canine Distemper Virus (CDV). The presence of *Dirofilaria immitis* antigen was assessed using ELISA.

Results

Seroprevalence rates varied among pathogens: 10% (7/70) for *L. infantum*, 73.2% (52/71) for *T. gondii*, 0% (0/71) for *N. caninum*, 17.6% (3/17) for *B. canis*, 23.9% (17/71) for *E. canis*, 30.5% (11/36) for *Leptospira* canicola., 5.5% (2/36) for *Leptospira icterohaemorrhagiae* 35.3% (6/17) for *A. phagocytophilum*, 57.7% (41/71) for CDV, and 4.5% (3/67) for *D. immitis*.

The histogram below presents the seroprevalence of the studied infectious and parasitic diseases in red foxes, golden jackals and European badgers.



Regarding the three (3) European stone martens that were examined, two (2) of them were tested seropositive for *Toxoplasma gondii*, one (1) for CDV, one (1) for *Leptospira canicola* and one (1) for *Anaplasma phagocytophilum*.

The map above presents the geographical regions of Greece were seropositive wild carnivores were detected.

Discussion - Conclusion

The most prevalent pathogen isolated in the current study was *T. gondii, which has a well-established zoonotic potential*. Likewise, antibodies to *Toxoplasma gondii* have also been detected in remarkably high incidence in wild carnivores from Spain (Sobrino et al., 2007). The second most frequent causative agent detected in the present survey was the highly pathogenic CDV, which has been reported to cause mortality in wild carnivores and threaten their conservation (Oleaga et al., 2021). Noteworthily, in accordance to the present study, *Babesia canis* has not been detected in red foxes from Romania either (Lesiczka et al., 2023), whilst the 64.1% of them have been found positive for *Babesia vulpes*. Subsequently, studies regarding the prevalence of *Babesia vulpes* in red foxes in Greece are warranted, as foxes, which are the most widely distributed free-ranging wild carnivores in the world (Lesiczka et al., 2023), could facilitate the transmission of this parasite to dogs.

Notably, this study documents the first confirmed cases of *D. immitis* infection in *Meles meles* and Babesia canis in *Canis aureus* in Greece. Furthermore, this was the first time that *Martes foina* individuals were found seropositive for Toxoplasmosis, CDV, Leptospirosis and Anaplasmosis in Greece.

The aforementioned data highlight the need for integrated One Health approaches in wildlife management and disease control.

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