

**Institute:** Institute of Environmental Sciences

**Topic:** Investigating interspecific and intraspecific diversity, distribution, and transmission of endoparasites in sympatric wild carnivores

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**Background information:**

Parasites are important in biology, and nematodes are one of the many taxa parasitising vertebrates. Nematodes, members of Filarioidea, Thelaziidae, Ascarididae, Ancylostomatidae, Trichuridae, and Gnathostomatidae families are reported as zoonotic disease-causing agents in both wild and domestic carnivores and humans. Human activities affecting wild environments have enhanced the epidemiological impact of parasitic diseases (Otranto & Deplazes, 2019).

While a strong emphasis is put on the studies of transmission of zoonotic nematodes to humans, the most common sources of information are veterinary case reports. Thus, there is an urgent need for research on the proper taxonomic identification of zoonotic nematodes and their transmission between sympatric carnivores. Large carnivores such as gray wolf (*Canis lupus*), brown bear (*Ursus arctos*), and lynx (*Lynx lynx*) are still abundantly present in Poland, offering a unique opportunity to study the distribution and diversity of nematodes transmitted between them. For taxonomic identification and transmission mapping of parasitic nematodes, modern high-throughput sequencing technologies are powerful, cost- and labour-effective. These technologies can be used for taxonomic identification and specifically to detect haplotypes of the same species to map transmission (Chen et al., 2022; Rothmann & de Waal, 2017).

**The main question to be addressed in the project:**

The project aims to assess the diversity and distribution of parasitic gastrointestinal nematodes in sympatric carnivorous species at high taxonomic resolution *via* emerging modern DNA barcoding and next generation sequencing techniques. Initially, work will focus on the development and optimisation of these techniques to enhance their efficiency and accuracy. Then, the project will investigate the interspecific and intraspecific transmission of parasitic gastrointestinal nematodes in sympatric carnivores.

**Information of the methods/description of work:**

The workflow of the project is:

- I) Establishing high-throughput amplicon-based survey(s) that covers a big taxonomic spectrum of nematode clades and the host species (wild carnivores).
- II) Identifying gastrointestinal nematode diversity within sympatric large (*Canis lupus*, *Lynx lynx*, *Ursus arctos*) and medium sized carnivores (*Vulpes vulpes* and *Martes spp.*) from collected faecal samples, or future collections.
- III) Analysing the data to delineate transmission of gastrointestinal nematodes among sympatric wild carnivores.

**Additional information:**

Previously collected samples from a wide range of carnivore species are available, enabling a rapid start. It is possible to collect new samples, and the applicant for this position should be willing to collaborate with expert Polish partners in the field during the sample collection process. Furthermore, the applicant should have a solid understanding of molecular biology and genetics laboratory techniques and be prepared to work with others in the laboratory. The candidate's ideas will be supported, and they will be assisted in applying for new project grants.

**Name of potential foreign collaborator:**

Dr. Tim R. Hofmeister, Swedish University of Agricultural Sciences, Sweden

**References:**

[1] Chen, Q., Wang, X., Li, C., Wu, W., Zhang, K., Deng, X., Xie, Y., & Guan, Y. (2022). Investigation of Parasitic Nematodes Detected in the Feces of Wild Carnivores in the Eastern Qinghai-Tibet Plateau, China. *Pathogens*, 11(12), 1520. <https://doi.org/10.3390/pathogens11121520>

- [2] Otranto, D., & Deplazes, P. (2019). Zoonotic nematodes of wild carnivores. *International Journal for Parasitology: Parasites and Wildlife*, 9, 370–383. <https://doi.org/10.1016/j.ijppaw.2018.12.011>
- [3] Rothmann, W., & de Waal, P. J. (2017). Diversity of *Spirocerca lupi* in domestic dogs and black backed jackals ( *Canis mesomelas* ) from South Africa. *Veterinary Parasitology*, 244, 59–63. <https://doi.org/10.1016/j.vetpar.2017.07.026>