Master/Bachelor Thesis: Trace elements analysis in Swiss roe deer, lynx and wolves to assess pollution along a Swiss food chain (Interdisciplinary)

Background and research question: Trace elements are usually found in soils at background (trace) levels but can also be found in very high levels in some areas and can thus represent an environmental issue threatening the health of the soil but also of the animals leaving nearby. These high levels can be anthropogenic (man-made) or geogenic (natural accumulation). Trace elements can be essentials (Mo, Mn, Se…) or toxic (As, Sb, Hg, Cd…) and some essential trace elements can also be toxic at higher concentrations (Co, Zn, Cu…) . These compounds are grouped under the name "Potentially toxic trace Elements" or PTTEs. Very little knowledge is available on how these trace elements accumulate up the food chain, especially in higher predators. Here, we will use an existing project funded by BAFU aimed at understanding the bioaccumulation and biomagnification of mercury (Hg) to also study a range of other PTTEs in animal tissues collected and stored in a database for over 10 years. The research questions we aim to answer are the following:

Which PTTEs can be found in wild roe deer, lynx and wolves? Are the levels increasing with the trophic level? Are there differences between populations of roe deer and lynx (e.g. Jura lynx population vs Alp lynx population)? Can we see a temporal trend over the past decade?

Project: The student will have access to the freezers of the Centre for Fish and Wildlife Health (FiWi) at UniBern where all the samples are stored. The samples will be then processed and analyzed in the Environmental chemicstry laboratory (eLAB) of the Institute of Geography (GIUB) using advanced analytical equipment for which the student will be trained. He/she will work in close collaboration with a PhD student working on the Hg project. This project is interdisciplinary and involves researchers from the FiWi and from the GIUB. The project may include direct sampling in the field, for example during a hunting campaign for roe deer, if possible and if the student wishes to.

Aims: Determine the trace element levels in animal tissues and assess biomagnification, temporal trends and populations differences as well as potential risks to top-predators.

Learning goals: The candidate will learn laboratory and sampling techniques (trace element extraction and analyses). She/he will learn how to manage her/his own Thesis project (laboratory work, data analysis, interpretation, writing and presenting).

Prerequisite: For GIUB students, the candidate will have attended the course "Introductory laboratory techniques in physical geography" at the bachelor level. Candidates that have attended either Soil Biogeochemistry, Seminar in Soil Science, Lab course in Soil Biogeochemistry and Advanced Lab Methods in Physical geography I or II will be preferred.

Supervision and contact for more info: Prof. Adrien Mestrot adrien.mestrot@giub.unibe.ch and Prof.Marie-Pierre Ryser marie-pierre.ryser@vetsuisse.unibe.ch

Eurasian lynx (*Lynx lynx*)
(pikist.com)

Wolf (*Canis lupus*)
(pikist.com)

Roe deer (Capreolus capreolus)
(pikist.com)