Applied evolutionary ecology

Evolutionary ecology is a research field that addresses the evolutionary consequences of interactions within and between species, as well as between organisms and their abiotic environment. In addition, it addresses what evolutionary processes that have caused the variation in species and ecological interactions that we see in nature. Originally, evolutionary processes were considered to only act on very long term timescales but we know today, that these processes could be studied also in contemporary time. Human activities have tremendous impact on biodiversity; species need to adapt to new environmental conditions following e.g., habitat degradation, pollution or climate changes, to not go extinct. Indeed, humans have been considered as the strongest evolutionary force on Earth and rapid, contemporary evolution is especially common in systems affected by human impact. By studying evolutionary ecology in environments under human impact, for example agricultural production systems or urban environments, we can thus learn about evolutionary processes in real time.

An understanding of evolutionary ecology could, however, also be useful in applied fields such as pest management. Pesticide resistance is, for example, a problem that is caused by the strong evolutionary selection pressure that pesticide application has on the pest. By considering ecological and evolutionary processes when developing and applying pest control, we may be able to improve the management. For example, we may be able to avoid or slow down resistance development by using combinations of control measures or by taking advantage of processes such as gene flow. Evolutionary and ecological knowledge could, however, also be used in order to optimise the usage of natural enemies as biocontrol or in predicting how interactions between plants, pests and beneficial organisms may be affected by climate changes.

The overall aim of my research is to understand what shapes the natural variation in plant-insect interactions, with a focus on species interactions in environments under extensive human impact. The purpose is both to better understand evolutionary ecological processes and to contribute to the development of sustainable plant protection. In this lecture, I use three of my current research projects; on management of invasive species, on pesticide resistance development and on urban integrated pest management, to exemplify how ecological and evolutionary perspectives could be integrated in solutions to applied challenges. In addition, I discuss how the projects could involve social science studies to investigate the dynamics between society, ecology and evolution.