

SwissFungi and Ecological Genetics Group

Swiss Federal Institute for Forest, Snow and Landscape Research WSL

On the recording of the Swiss fungi flora and the study of their ecological processes in the laboratory and in experiments

Overview

Fungi form a separate kingdom next to plants and animals with a huge wealth of species and forms. Worldwide there exist about 160'000 described species and many times more undescribed species. Fungi occur in practically all habitats and are essential for a functioning ecosystem.

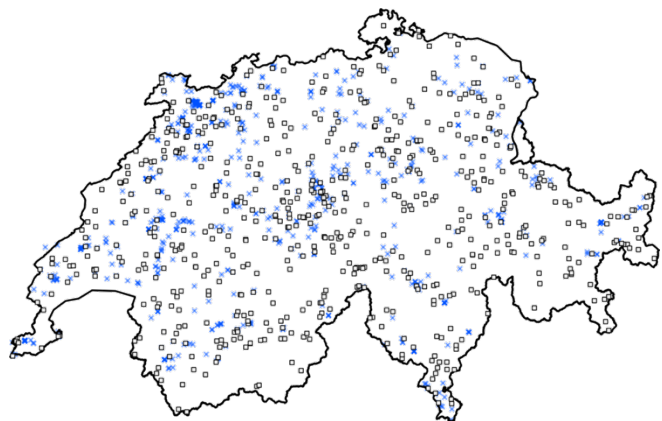
For example, they play a central role as decomposers of plant material for carbon and nutrient cycling, as mycorrhizal symbionts of plants for a more efficient nutrient and water uptake, as mutualistic endophytes of internal plant tissues (e.g., to defend against pathogens), as a food base for various mammals, insects, and orchids, as responsible for the formation of microhabitats such as tree cavities, and, paradoxically, as plant parasites for a healthy and diverse ecosystem. Invasive fungi, so-called neomycetes, such as the ash wilt pathogen *Hymenoscyphus fraxineus*, on the other hand, can severely destabilize entire ecosystems.

Research in the field

SwissFungi - the national data and information center for the documentation, promotion and research of the Swiss fungi flora - is pursuing various projects to record fungal diversity in Switzerland. With nearly 10,000 known species, fungi are also among the most species-rich groups of organisms in Switzerland and play key ecological roles.

Currently, the Red List of Threatened Species is being revised - it should not only provide information on the development of the species already evaluated, but also create a better data basis for previously unclassified species with targeted field surveys.

Field work for this large-scale project has been underway throughout Switzerland since the summer of 2021. Professional mycologists of the SwissFungi team, including Dr. Artemis Treindl, systematically carry out mapping work on a total of 634 trial plots from the end of July to November. The occurrence of as many fungal species as possible is recorded via smartphone app, based on the observation of their fruiting bodies. Many fungal species cannot be identified macroscopically in the field - in which case samples are collected, taken away and later re-determined microscopically or analyzed genetically. In addition, spore traps are set up on the plots to provide information about the fungal diversity in the air.



The experimental plots for the revision of the Red List are distributed throughout Switzerland (black squares)



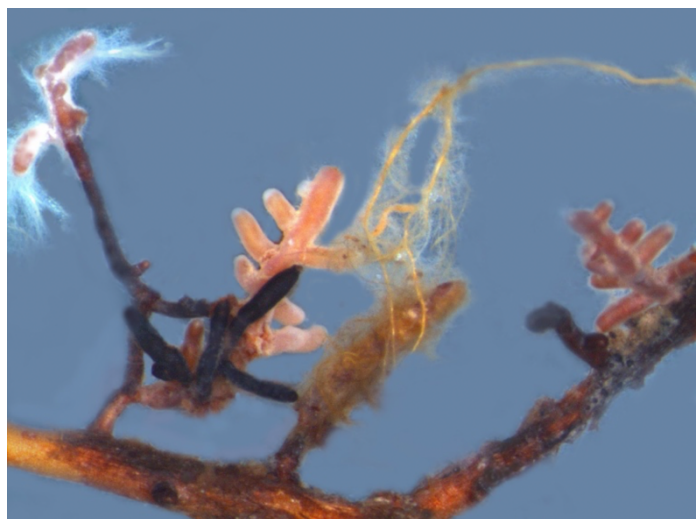
Hiking to a test plot in a pine forest in the Swiss National Park

The fieldwork takes place in all biogeographical regions, altitudes and ecological habitats (e.g. mountain forests, alpine meadows, high moors...) and often leads to little known and visited corners of Switzerland. These months of careful collecting are both a scientific method and an intimate engagement with the landscape, the local ecosystem and the fungal organism. An important part of this residency is accompanying the field research; this means several days of travel to the experimental sites, hikes and overnight stays in the vicinity. Since

it is quite common to spend 10 hours outside on your feet during fieldwork, a certain amount of physical stamina and weather resistance is important. For researchers like Artemis Treindl, the many hours spent outdoors also provide an opportunity to reflect on the value and meaning of monitoring, to realize that it is a snapshot that creates a context to something that happened before and then also projects into a future. A kind of timeline is created, and changes in the environment become comprehensible. Enough food for discussion - to ask questions, test methods, and explore together across the disciplines.

Forschung im Labor

The Ecological Genetics group, which is also part of WSL and led by Dr. Martina Peter, investigates ecological processes in populations of plants, mycorrhizal fungi and animals using molecular genetic methods, complemented with experiments. Martina Peter's research focuses on different aspects of the symbiotic interaction between forest trees and mycorrhizal fungi and their role for forest ecosystems in a changing environment. As the interface between plants and soil, mycorrhizal fungi link above- and below-ground processes, forming a large network that connects trees in a forest. A tree can interact with hundreds of species of mycorrhizal fungi, which in turn interact with the roots of different trees. The researchers are trying to find out what role this diversity and network play in forest functioning and how mycorrhizal communities and populations are affected by and adapt to changing conditions such as climate-induced drought.



Collaborating

The residency provides a framework for getting to know the fungal organism as holistically as possible in its scientific context and, in doing so, to engage with a range of questions, processes and actors as well as infrastructures and spaces. The research in the field and in the laboratory or on the WSL campus in Birmensdorf will complement and inspire each other. As the field research will take place exclusively from the end of July - November, a first phase of the residency will take place within this period (i.e. from October 2023 onwards at the latest). A second phase focusing on the lab will have to happen from December 2023 or early 2024 onwards.

From the perspective of SwissFungi, the Ecological Genetics group and WSL in general, there is an interest in understanding natural processes but also in challenging one's own way of looking at them. The framework of a scientific work may often be clearly defined, but the motivation stems from one's own curiosity and the scientific method always benefits from creative impulses. The encounter and collaboration between artists and scientists offers the ideal opportunity to engage in a change of perspective on the one hand and to explore entirely new perspectives together on the other.

The fungus as a study organism forms - growing, networking and decomposing - many possible points of access and contact. Accompaniment during fieldwork offers an intimate entry into the subject, because joint research in the field is an intensive time of observation. An observation of the mushrooms but also of nature as a whole and an observation of oneself in it. It opens the space for personal and transdisciplinary exchange, for joint, but of course also individual observation, analysis and interpretation.

Website SwissFungi:

<https://swissfungi.wsl.ch/en/index.html>

Website Ecological Genetics group:

<https://www.wsl.ch/en/about-wsl/organisation/research-units/biodiversity-and-conservation-biology/ecological-genetics.html>

Literature

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