Research Area **Ecology and Evolution**

MSc-PhD Seminar WS 2025/2026 (LVA 796.300 and 230.340)

January 30th, 2026 – Room H340G3.C-006

Hosts: Supervisors of MSc- and PhD-projects, Dept. Environment and Biodiversity

09:00 – 09:15 **Welcome (Ulrike Berninger)**

Session 1 (Ecology and evolution of plants) **Chair: Anja Hörger, Daniel Remias**

09:15 – 09:30 **Dominique Groffman**
Evolutionary and ecological drivers and consequences of clonality in an alpine-arctic lineage

09:30 – 09:45 **Lothar Götz**
Cobalt stress in *Micrasterias denticulata*: cellular responses, ultrastructural alterations and detoxification mechanisms

09:45 – 10:00 **Katharina Harter**
Geosphere-biosphere interactions: how a landslide shapes plant communities and ecosystem functions

10:00 – 10:15 **Anna Götz**
Future range shifts and diversity patterns of Antarctic lecideoid lichens under climate change scenarios

Coffee break (10:15 – 10:45, 30 Minutes)

Session 2 (Ecology of animals) **Chair: Beate Apfelbeck, Sabine Agatha**

10:45 – 11:00 **Caoimhe Abdul-Wahab (online)**
An experimental study of dispersal strategies in a cooperative breeding Afrotropical forest species

11:00 – 11:15 **Ella Averdunk**
How does a temperature increase from 9 °C to 15 °C affect the metabolism of burbot (*Lota lota*)?

11:15 – 11:30 **Laura Höfle**
Human-mediated dispersal of zooplankton: assessing potential transport pathways in the Hohe Tauern National Park

11:30 – 11:45 **Maximilian Schröcker**
Alpine mass movements and their impact on arthropod communities

Short break (11:45 – 12:00, 15 Minutes)

Session 3 (Ecology and evolution of insects) **Chair: Karin Gross, Jonas Eberle**

12:00 – 12:15 **Corinna Etl**

Chemical ecology and evolution of generalist and specialized fly pollination systems

12:15 – 12:30 **Julia Witter**

Olfactory and visual communication between the invasive bee *Megachile sculpturalis* and its host plants

12:30 – 12:45 **Manuel Ankel**

Bee abundance and species richness along climatic and landscape gradients: a large-scale study across Austria

12:45 **Closing remarks (Jan Habel)**

Abstracts (order as above)

Dominique Groffman, AG Evolution and Systematics of Plants, dominique.groffman@plus.ac.at
Andreas Tribsch, Ovidiu Paun (University of Vienna)

EVOLUTIONARY AND ECOLOGICAL DRIVERS AND CONSEQUENCES OF CLONALITY IN AN ALPINE-ARCTIC LINEAGE

Flowering plants display an extraordinary range of reproductive strategies. Sometimes, fertile flowers are partially or fully replaced by clonal diaspores, a phenomenon known as pseudovivipary. Shifts towards clonality have profound implications for the evolution and persistence of a population. This dissertation will investigate the evolutionary and ecological drivers and consequences of pseudovivipary using the *Stellaris* clade of the arctic-alpine genus *Micranthes* (Saxifragaceae) as a model. Our primary study system is the pseudoviviparous variant of *M. stellaris* found in glacial refugia of the southeastern Alps. To begin, low-coverage whole-genome sequencing and demographic modelling will be leveraged to examine whether population isolation during the Last Glacial Maximum drove pseudovivipary to fixation. Then, selection during secondary contact will be estimated using clinal analysis in transitional zones. Relative fitness measurements will also be integrated with ecological niche modelling to disentangle environmental versus historical drivers of clonality. Finally, candidate genetic mechanisms will be identified through comparative whole genome scans. By combining population genomics and biogeography, this project will elucidate how diversity in reproductive mode in flowering plants has evolved and is able to persist in dynamic alpine ecosystems.

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Raimund Tenhaken, Daniel Remias, (Ursula Lütz-Meindl)

COBALT STRESS IN *MICRASTERIAS DENTICULATA*: CELLULAR RESPONSES, ULTRASTRUCTURAL ALTERATIONS AND DETOXIFICATION MECHANISMS

Cobalt is an essential micronutrient for plants and algae and is involved in chlorophyll biosynthesis and photosynthesis but becomes toxic at elevated concentrations. The present study focuses on cobalt uptake and intracellular distribution in the model alga *Micrasterias denticulata*, which is excellently suited for investigating metal effects at the cellular and ultrastructural level. The effects of cobalt on growth, morphogenesis, physiology and ultrastructure were analyzed using short-term and long-term exposure regimes. Cell vitality and cell division rates were assessed by FDA staining and cell counts, respectively, photosynthetic efficiency (Fv/Fm) by chlorophyll fluorescence, photosynthesis and respiration by a Clark-type oxygen electrode. Intracellular lipids were visualized by CLSM/Nile Red staining. Ultrastructural alterations and intracellular cobalt localization were investigated by TEM in combination with EELS. Short-term cobalt exposure disturbed cell growth and morphogenesis, whereas long-term treatment inhibited cell division and induced pronounced reorganization of the endomembrane system and mitochondrial alterations. Key findings include the formation of cobalt-rich crystalline structures within vacuoles as a central intracellular detoxification mechanism and a pronounced extrusion of lipid bodies originating from the chloroplast.

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Jana Petermann, Andreas Tribsch

GEOSPHERE-BIOSPHERE INTERACTIONS: HOW A LANDSLIDE SHAPES PLANT COMMUNITIES AND ECOSYSTEM FUNCTIONS

Landslides can reshape the (micro)topography, which offers new niches for biodiversity. As a part of the movemont project, this Master thesis analyses plant biodiversity and ecosystem functions (herbivory and primary production) of the Toma hills, which were formed by the Wildalpen landslide in Styria. On six Toma hills environmental data (slope, temperature, conductivity, pH and soil humidity) were taken, vegetation assessments were conducted and biomass and herbivory were measured in June and July 2024. In total, 147 plant species were found. First results show that the biomass and the pH are higher on the Toma hills than on control plots. Soil humidity is lower on Toma hills. Further analyses of insect communities on Toma hills (BSc thesis by Eva Thiel) and the results of this Master thesis will contribute information on how geodiversity may shape biodiversity in our landscapes.

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Ulrike Ruprecht, Wolfgang Trutschnig

FUTURE RANGE SHIFTS AND DIVERSITY PATTERNS OF ANTARCTIC LECIDEOID LICHENS UNDER CLIMATE CHANGE SCENARIOS

Rock-dwelling lecideoid lichens are a major and diverse component of Antarctic terrestrial ecosystems, uniquely adapted to extreme environmental conditions. Ongoing climate change is expected to alter their distributions as species track suitable climatic niches. Here, we present a circum-Antarctic assessment of lecideoid lichen diversity and project future distributional changes under contrasting climate scenarios.
Fungal (mycobiont) and algal (photobiont) partners from circum-Antarctic sampling were classified using DNA barcoding. Climatic niches were modelled for nine common mycobiont species and four photobiont OTUs and projected across four Antarctic bioregions under three Shared Socioeconomic Pathways (SSP1-2.6, SSP3-7.0, SSP5-8.5).
DNA barcoding identified 34 lecideoid lichen species associated with nine photobiont OTUs, including three previously undescribed *Lecidella* species.
Models consistently predict range expansion rather than habitat loss under future warming. Expansion patterns differ between maritime and continental Antarctica, with the largest gains projected for inland ice-free areas, particularly the Transantarctic Mountains. Although expansion is generally greatest under SSP5-8.5, some photobionts gain more suitable habitat under SSP3-7.0.
Overall, future warming is likely to create new inland habitats for lecideoid lichens, with important implications for Antarctic biodiversity.

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Beate Apfelbeck, Jan Habel, Luc Lens (Ghent University)

AN EXPERIMENTAL STUDY OF DISPERSAL STRATEGIES IN A COOPERATIVE BREEDING AFROTROPICAL FOREST SPECIES

Within the age of the Anthropocene, habitat degradation is a world-wide issue, reducing habitat quality for many endemic species, resulting in behavioural changes. Delayed dispersal of juveniles is a crucial behaviour for the formation of cooperative breeding groups in social species. The Placid Greenbul, a cooperative breeding species, has been monitored within Taita Hills in SE Kenya, an area that has undergone rapid habitat degradation. Ring recovery data shows that subordinates disperse earlier in heavily degraded habitat. It is hypothesised that habitat degradation drives earlier dispersal, but it is unclear whether dispersal decision is made by the subordinate or by a breeding adult within the flock. Furthermore, it is unclear when during the nonbreeding season dispersal takes place. We use radio telemetry to monitor dispersal behaviours throughout the nonbreeding season and corticosterone implants to experimentally replicate degraded habitat quality for male subordinates. Preliminary data suggest that during the nonbreeding season subordinates engage in “foray” behaviours, may use different areas within the territory than breeding adults and that dispersal likely takes place at the end of the nonbreeding season.

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Ulrike Berninger, Franz Lahnsteiner (BAW Scharfling)

HOW DOES A TEMPERATURE INCREASE FROM 9°C TO 15°C AFFECT THE METABOLISM OF BURBOT (*LOTA LOTA*)?

Climate change-driven warming of freshwater habitats is likely to challenge the thermal tolerance of cold-water species such as burbot (*Lota lota*).
The aim of the project is to investigate how a temperature increase from 9°C to 15°C affect growth, oxygen availability and metabolism of *Lota lota*.
The study design includes the analysis of previously collected samples (2024) and active sampling in 2025.
Parameters assessed include physiological changes such as weight, length and CF and HIS rates, as well as blood cell counts, hemoglobin concentration, liver glycogen and triglyceride content, as well as digestive enzyme activity (proteases, lipases, peptidases).
Methodologies include microscopic image analysis for hematology, spectrophotometric assays, and upcoming descriptive statistics to compare treatment groups. Results are expected to suggest temperature-induced differences in metabolic rate and tissue energy reserves. The findings will contribute to a better understanding of the physiological plasticity of *Lota lota* under moderate warming and help assess the species' vulnerability in the context of climate change and fisheries management.

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Ulrike Berninger, Stephen Wickham

HUMAN-MEDIATED DISPERSAL OF ZOOPLANKTON: ASSESSING POTENTIAL TRANSPORT PATHWAYS IN THE HOHE TAUERN NATIONAL PARK

High alpine lakes are fragile ecosystems whose biodiversity is defined by strong environmental factors and physical isolation. Besides climatic changes, the anthropogenic spread of aquatic microorganisms can represent an additional dispersal pathway. The aim of this study is to investigate whether zooplankton and protists can be passively transported by visitors of the Hohe Tauern National Park, and how these taxa can be classified in comparison to existing zooplankton communities in high alpine lakes. Therefore, 113 samples of shoe profiles and dog fur were collected along hiking trails in 3 alpine valleys near 13 lakes. The samples were cultured to reactivate viable stages and analyzed using stereo and light microscopy on live and preserved material. Preliminary results show that living organisms were detected in most samples, particularly rotifers and ciliates. After species identification, the transported taxa will be compared with zooplankton communities in the studied lakes using long-term data, and differences in ecological characteristics and habitat requirements will be evaluated. This approach will identify taxa likely to colonize high alpine lakes and those excluded by biological constraints or topographical barriers.

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Maria Frankova, Jana Petermann, Jonas Eberle

ALPINE MASS MOVEMENTS AND THEIR IMPACT ON ARTHROPOD COMMUNITIES

While glacier formation and melting formed the Alps over a long process, more random and shorter events such as geological mass movements altered the landscape. Although such geological events are initially a wave of destruction, they leave behind a new and more heterogeneous habitat compared to stable sites, providing niches for a broader species community. While most studies focused on plant species, the effects on arthropods were hardly examined, leaving the value of mass movement areas for arthropods biodiversity unknown. This study investigates the effects of mass movements on arthropod communities and additionally evaluates ecosystem functions such as predation. Arthropods were collected in 2023 in 12 mass movement and control areas of various categories in the Austrian geoparks Ore of the alps and Karawanks using pitfall traps and insect nets. Compared to stable locations, areas with mass movements generally had higher pH values and higher minimum moisture levels. In creep zones, average temperature and moisture values were higher and had greater tree canopy cover, while landslides were on average colder and drier, had less tree canopy cover and lower vegetation height. Further, the species identification of arthropods and the evaluation of ecosystem functions are currently in progress.

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Stefan Dötterl, Andreas Tribsch

CHEMICAL ECOLOGY AND EVOLUTION OF GENERALIST AND SPECIALIZED FLY POLLINATION SYSTEMS

Flies (Diptera) play key roles in many ecosystems, yet their importance as pollinators has long been underestimated. In the context of global declines of bee populations, non-bee pollinators have received increasing scientific attention. This dissertation investigates the evolution, chemical diversity, and functional significance of floral scents in specialized and generalized fly pollination systems. Across four chapters, the thesis (1) examines the evolution of floral scent chemistry and associated pollination systems in the species-rich tropical aroid genus *Anthurium* using comparative and phylogenetic approaches, (2) identifies behaviorally active floral volatiles attracting fly pollinators of *Anthurium ravenii* through field bioassays, (3) explores deceptive chemical strategies, including potential pheromone mimicry, involved in psychodid-fly pollination of *Arum maculatum*, and (4) analyzes host plant preferences and network structure of syrphid flies versus wild bees across agricultural landscapes in Austria. Together, these studies provide new insights into the evolution of fly-mediated pollination, the role of floral scent in shaping plant–pollinator interactions, and the ecological relevance of non-bee pollinators.

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OLFACTORY AND VISUAL COMMUNICATION BETWEEN THE INVASIVE BEE *MEGACHILE SCULPTURALIS* AND ITS HOST PLANTS

Non-native species are increasingly being introduced into new areas, some of which becoming invasive. *Megachile sculpturalis*, the first invasive bee in Europe, introduced from East Asia, visits a wide range of European and Asian host plants in Europe. To test the hypothesis that the plants visited by the bee have similar floral visual and olfactory cues, we analysed the floral colour and scent of 16 European and Asian host plants. Additionally, we modelled, how the floral colours and which of the floral scents are perceived by the bee. We found a dominance of bee UV-blue flowers, but highly diverse floral scents. Many scent compounds released by the plants and perceived by the bee are common among flower scents. Overall, our data suggest that the bees has a quite specialized search image when it comes to floral colours, but a generalist search image when it comes to floral scent cues. Future experiments will determine the relative importance of scent and colour cues for host plant finding of *M. sculpturalis* and identify individual scent compounds attractive to the bee.

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BEE ABUNDANCE AND SPECIES RICHNESS ALONG CLIMATIC AND LANDSCAPE GRADIENTS: A LARGE-SCALE STUDY ACROSS AUSTRIA

Bees are the most important pollinators and play an essential role for ecosystems. Although it is well known that the local occurrence of bees is shaped by biotic and abiotic parameters, our understanding of how these parameters shape bee communities along large geographic gradients and among different landscapes is limited. To address this gap, we used a standardized approach to collect bees on 78 plots across Austria and tested, how bee abundance and species richness vary and are shaped by temperature, flower availability and landscape diversity. We found that bee abundance and species richness increase from West to East. Statistical models revealed that bee abundance is strongly driven by annual mean temperature, which increases from West to East, and by flower cover. Bee species richness is linked to bee abundance and shaped by landscape diversity. Overall, our results suggest that the strong temperature gradient across Austria has a direct effect only on bee abundance, which itself affects species richness. However, independent of geographic origin, flower cover and landscape diversity have positive effects on bee abundance and species richness, respectively.