Research Area **Ecology and Evolution**

PARIS LODRON UNIVERSITY SALZBURG

MSc-PhD Seminar SS 2025 (LVA 230.341 and 796.301)

June 23rd, 2025 – Room HS 436

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

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13:00 – 13:15 **Welcome (Jan Habel)**

Session 1 **Chairs: Anja Hörger / Raimund Tenhaken**

13:15 – 13:30 **Valentin Weiss**

Integrating phylogenetics and ecological niche modeling to illuminate the divergence history of two malagasy sister species of *Bulbophyllum* sect. *calamaria*

13:30 – 13:45 **Julia Witter**

Pollination and communication ecology of exotic spreadings

13:45 – 14:00 **Manuel Ankel**

Large-scale monitoring of Austrian wild bees: insights into the first results

14:00 – 14:15 **Florian Hohenberger**

Mechanisms driving zooplankton species composition of high alpine lakes

Coffee break (14:15 – 14:45, 30 Minutes)

Session 2 **Chairs: Bea Apfelbeck / Stephen Wickham**

14:45 – 15:00 **Daniel Lukic**

Mind the gaps? Handling missing data in the phylogenetic analysis of trichodes using historical DNA

15:00 – 15:15 **Christoph Schöndorfer**

Population genomics of the scarce fritillary (*Euphydryas maturna*) with a focus on conservation of the local metapopulation

15:15 – 15:30 **Gladys Kungu**

Effects of forest degradation on the diet composition, quality and availability in a tropical understory bird

15:30 – 15:45 **Caoimhe Abdul-Wahab**

Dispersal behaviour of an afrotropical forest bird species in response to habitat degradation

15:45 – 16:00 **Closing remarks (Ulrike Berninger)**

After the SE: optional get-together with drinks and snacks

Abstracts SE Diss / MSc SS 25 → in alphabetical order

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

DISPERSAL BEHAVIOUR OF AN AFROTROPICAL FOREST BIRD SPECIES IN RESPONSE TO HABITAT DEGRADATION

Predominantly found in tropical regions, species with slow life histories and complex social systems are at increasing risk of decline due to habitat loss and degradation. Dispersal timing is a central component for the formation of groups in cooperatively breeding species, yet it remains unclear whether and to what extent social species can adapt dispersal behaviours to novel environmental selection pressures. Building on previous work with the Placid greenbul, a cooperative breeding tropical bird, this study will incorporate experimental methods to determine causal relationships between habitat degradation, physiology and dispersal behaviour. Using radio telemetry to track dispersal movement and corticosterone implants to simulate physiological responses to low habitat quality and assess the effects on natal dispersal behaviour, adult aggression and cooperative dynamics. It is expected that corticosterone-implanted subordinates will have earlier dispersal. The study will identify key pathways through which habitat degradation impacts dispersal strategies and our understanding of decision making in maintaining group-living and cohesion within cooperative breeders. These insights are applicable across taxa and ecological contexts, particularly with increasing anthropogenic driven environmental changes.

Ankel, Manuel, AG Dötterl, manuel.ankel@plus.ac.at

Stefan Dötterl, Jana Petermann

LARGE-SCALE MONITORING OF AUSTRIAN WILD BEES: INSIGHTS INTO THE FIRST RESULTS

Wild bees are one of the most important groups of pollinators. This is since their pollination service is crucial for ecosystem stability and the yield of various crop plants. Bee communities change along climatic gradients (e.g., longitude, latitude, altitude), the type of land use (farmland versus grassland versus protected areas) and landscape composition (habitat availability). However, quantitative large-scale data on wild bee communities across cultural landscapes are mostly lacking. This is also true for Austria, which holds the highest diversity of wild bees in Central Europe (c. 700 species). We collected data on wild bees and their plant hosts on over 200 plots throughout the Austrian agricultural landscape using a standardized transect method. Overall, we visited over 2000 transects in 2023 and 2024, covering grassland, farmland and conservation areas. Data will be used to explore how different types of land use, habitats and environmental gradients shape wild bee communities and bee-flower networks. This knowledge is essential for preserving wild bees and the pollination service they provide. Here, we will present the first preliminary results of the project.

Hohenberger, Florian, florian.hohenberger@plus.ac.at

Stephen Wickham, Ulrike G-Berninger

MECHANISMS DRIVING ZOOPLANKTON SPECIES COMPOSITION OF HIGH ALPINE LAKES

Zooplankton species in high alpine lakes face harsh conditions in extreme environments, with low productivity and short ice-free periods. Due to warming in alpine regions these hostile environments are rapidly changing, with earlier ice out, increasing water temperatures, and potential changes in productivity and accessibility. This has the possibility to both create habitats more amenable to lowland zooplankton species and to provide more opportunities for lowland species to colonize these habitats, leading to alternate species composition in the lakes. Within a transdisciplinary project, potential barriers to colonization (competitive exclusion, harsh environments), as well as the concept of species sorting within the zooplankton community of the lakes of the National Park Hohe Tauern, Austria, have been investigated, with the following hypotheses: 1. When large zooplankton species are already present in a lake, they can preclude invasion by new lowland species through competitive exclusion. 2. The hostile environment (low temperature and productivity, high turbidity) of some high alpine lakes is limiting the colonization success of invading species. 3. Species sorting occurs, in that the species or clones found in a lake are those best adapted to the habitat in which they were found. Based on the results of the long-term monitoring of 18 lakes of the National Park Hohe Tauern, Austria, model lakes were chosen and the water and species from these lakes used to run experiments in the lab under controlled conditions. The results of the first experiments testing our hypotheses will be presented.

Kung'u, Gladys Nyakeru, gladys.kungu@stud.plus.ac.at

Jan Christian Habel, Beate Apfelbeck

EFFECTS OF FOREST DEGRADATION ON THE DIET COMPOSITION, QUALITY AND AVAILABILITY IN A TROPICAL UNDERSTORY BIRD

Land use change poses the main threat to forest ecosystems and species dependent on them. Recent evidence indicates that ongoing degradation of the remaining primary forests will amplify species loss, particularly among highly specialized, low-mobility fauna. Additionally, climate change may intensify these impacts by interacting with degradation. One mechanism by which degradation and weather can contribute to species decline is through alteration of prey composition and availability. However, some studies suggest that degraded habitats may also expand prey options for some species, though whether this translates to high prey quality remains unclear. In this study we aim to investigate how habitat degradation and weather conditions influence prey availability for an insectivorous forest specialist, the placid greenbul (*Phyllastrephus cabanisi placidus*). Specifically, we will assess prey composition (prey type), quality (prey size) and availability (abundance) from fecal samples and videos of parents feeding nestlings. Habitat degradation is quantified using high-resolution canopy structure metrics derived from airborne light detection and ranging (LiDAR). Preliminary data exploration shows that placid greenbuls exhibit preference for specific arthropod prey orders, with notable difference between adults and nestlings.

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Jonas Eberle, Jan Christian Habel

MIND THE GAPS? HANDLING MISSING DATA IN THE PHYLOGENETIC ANALYSIS OF TRICHODES USING HISTORICAL DNA

Museomics, the use of historical DNA from natural history specimens, provides valuable genomic data that successfully complement molecular studies across taxa. *Trichodes* beetles, which include many difficult-to-collect species are well-suited for phylogenomic analysis using dry-preserved samples. However, the resulting low-quality sequence data are gappy and prone to errors. Previous studies have shown that nonrandom missing data can introduce artifacts, leading to incorrect topologies under maximum likelihood, falsely elongated branches, and rogue taxa that change placement across replicate analyses and destabilize trees. This raises a key question: how much missing data can be tolerated to accurately estimate the phylogeny of *Trichodes*? To address this, we investigated a dataset consisting of 61% sequences from dry-preserved samples with missing data levels ranging from 20% to 80%. Further analyses will include the impact on phylogenetic inference using both maximum likelihood and Bayesian approaches. Topologies will be compared for robustness, support values, and presence of rogue taxa. This study aims to contribute to existing knowledge on best practices for utilizing historical DNA in museomics and to provide the first comprehensive phylogenetic hypothesis of *Trichodes*.

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Jan Christian Habel, Jonas Eberle

POPULATION GENOMICS OF THE SCARCE FRITILLARY (*EUPHYDRYAS MATURNA*) WITH A FOCUS ON CONSERVATION OF THE LOCAL METAPOPULATION

With the growing availability of high-quality reference genome assemblies and the application of next-generation sequencing techniques, population genomics can now precisely address key issues in conservation – even on small spatial scales, such as the metapopulation level of butterflies. The scarce fritillary (*Euphydryas maturna*) is a highly endangered and protected butterfly species that inhabits open-canopy woodlands and is currently restricted to only four known populations in Germany. In this study, we sampled the metapopulation in the district of Berchtesgadener Land and the adjacent Untersberg-Vorland (Salzburg) to assess population structure, genetic differentiation, and migratory rates, with the aim of evaluating connectivity between subpopulations. Whole-genome sequencing was performed on 39 individuals sampled across six subpopulations, resulting in a SNP catalog of 29,274 neutral, unlinked genome-wide markers. Preliminary results indicate that the Untersberg-Vorland functions as a main source population, with low genetic differentiation observed among subpopulations (F_{ST}: 0.02–0.10).

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Hans-Peter Comes, Matthias Affenzeller

INTEGRATING PHYLOGENETICS AND ECOLOGICAL NICHE MODELING TO ILLUMINATE THE DIVERGENCE HISTORY OF TWO MALAGASY SISTER SPECIES OF BULBOPHYLLUM SECT. CALAMARIA

Bulbophyllum occultum and *B. bicoloratum* are two epiphytic orchid species native to the well-known biodiversity hotspot Madagascar. Despite phylogeographic and genetic studies, a solid phylogenetic framework to test their sister-species relationship remains lacking and their range limits and ecological niches under current and past climates are also poorly understood. To address both genetic and environmental differentiation, genetic data from both species from multiple populations (plus outgroups), will be used to assess relationships and estimate divergence time. Additionally, cluster analysis of climate data and ecological niche models for present and past climates will test for historical allopatric divergence during cooler, drier periods and assess current range distribution. Preliminary analyses show that rainfall patterns, more than temperature, shape the species' climatic niches. *B. occultum*, the widespread species, occupies a broader climatic range, favoring humid eastern habitats. However, niche overlap between the species is greater than previously believed, particularly in Madagascar's central and the seasonal northern rainforest. Despite overlap, palaeo-niche models may still support historical climate-driven range shifts, promoting isolation and allopatric divergence.

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Stefan Dötterl, Jan Christian Habel

POLLINATION AND COMMUNICATION ECOLOGY OF EXOTIC SPREADINGS

As a result of human activities within a highly globalised world, an increasing number of species have been introduced into non-native regions in recent decades, with some of them becoming invasive and affecting native species negatively. *Megachile sculpturalis* is the first invasive bee species in Europe and visits a wide range of native and ornamental plant species for nectar and pollen, among them the invasive kudzu (*Pueraria montana var. lobata*). This dissertation aims to understand the visual and chemical communication between *M. sculpturalis* and selected host plants and its role for the sexual reproduction of kudzu.

Olfactory (flower scent) and visual (colour) cues of important floral foraging resources of *M. sculpturalis* in Europe will be investigated, and the physiological and/or behavioural responses of *M. sculpturalis* to these visual and olfactory cues will be determined. Additionally, I will investigate the breeding system of kudzu in Europe and how *M. sculpturalis* and other flower visitors contribute to the reproductive success of this plant species.