

The impact of partner diversity and mate availability on plant-pollinator network structure and plant fitness

The *Plant Conservation and Population Biology* research group is looking for a highly motivated PhD student to contribute to the group's prolific research activities. Being part of the Division of Ecology, Evolution and Biodiversity Conservation of KU Leuven, the major study interests of the research group include the effects of global environmental change (habitat fragmentation, pollution, climate change) on mycorrhizal symbioses and plant-pollinator interactions, the evolution of plant mating systems, and the role of environmental variables contributing to speciation in plants. We advocate a multi-disciplinary research approach that combines extensive field surveys with state-of-the-art molecular tools and greenhouse and field experiments to elucidate the impact of various environmental factors on the ecology and evolution of plants.

Project

A classic prediction of co-evolutionary theory is that mutualists should restrict their associations to a limited number of high-quality partners in order for the interaction to remain stable. However, in practice most mutualists either simultaneously or sequentially associate with multiple partners that confer the same reward. One of the best-known mutualisms is between plants and animal pollinators. In this mutualism, generalist plants that have multiple pollinators are expected to have a fitness advantage compared to specialist plants that have few pollinators due to different processes (e.g. sampling effects, portfolio effects, complementarity). Yet, fitness costs in generalists may arise by associating with multiple pollinators, for example as a result of pollen (and ovule) discounting or stigma clogging (or improper pollen transfer). Moreover, these effects can be expected to depend on the availability and abundance of the various partners, which are likely to vary across populations within the landscape and therefore to affect interactions between partners (network structure) and plant fitness. How partner availability shapes network structure and plant fitness remains poorly understood.

The major aim of this study is to investigate the relationship between partner availability and diversity, network structure and individual plant fitness in coastal dune slacks. We will take advantage of the highly fragmented dune area along the Belgian coast, where both plant and insect diversity and abundance depend on the size and isolation of dune slack patches. We predict that, due to a limited number of pollinators, plant-pollinator networks will develop into more generalist systems in the more fragmented dune slacks, yet that this results in decreased plant fitness. We further predict that plants with specialized pollination systems will suffer larger fitness costs than generalist plants and therefore are more susceptible to fragmentation than generalist plants.

The successful candidate will construct and analyze plant-pollinator networks using a novel meta-barcoding approach across a range of fragmented dune slacks varying in size and spatial isolation. Next, he/she will assess the effects of network structure and niche breadth on pollen deposition (contribution of conspecific and heterospecific pollen) and fitness (seed set and quality) in both specialist and generalist plant species. Ultimately, the results of this project will contribute to a better understanding

of the unique biodiversity of coastal dune slacks which, due to human modification of the environment, are in decline in Europe.

The project contains a large amount of field work that combines observational surveys (assessment of insect and plant diversity) with experimental (pollination) research. Besides, a substantial amount of lab-work is required, including molecular metabarcoding of pollen and insect determination. Experience with both field and lab work is an asset.

Profile

- You have obtained an EU MSc degree in Biology or Bioscience Engineering or equivalent degree with great honor (magna cum laude).
- You have a vivid interest in the processes affecting the ecology and evolution of plant species and have a good field knowledge of both plants and insects.
- You are interested in plant-pollinator interactions and the factors affecting the structure of these interactions.
- You have some experience with or interest in molecular analyses and/or bioinformatics.
- You're prepared to spend longer times (several weeks) in the field.

Offer

- A competitive full-time PhD scholarship (net scholarship of ~2.100 euro/month) for four years, after a positive evaluation after nine months.
- Additional benefits in terms of health insurance, reduced public transport prices, free bicycle use, access to university sports facilities, and child care opportunities.
- Potential to follow academic, thematic and skills training courses at KU Leuven.
- A dynamic, informal work environment in a strong team.

Interested?

Send your cv and motivation letter to Prof. Hans Jacquemyn (hans.jacquemyn@kuleuven.be). This vacancy has opened June 12th and will be closed when a suitable candidate has been selected.