

Institute: Institute of Environmental Sciences

Topic: Nutritional ecology of bees: balancing bee nutrient demands and nutrient supply with a diversity of pollen sources

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Background information:

For bees, pollen quality determines the overall quality of the larval food, influences the development of individuals and shapes their populations. Not all plants produce pollen that satisfies the nutritional requirements of bees, and we do not know how different plant pollens impact bees' nutritional demands. Our understanding of the differential contribution of various nutrients to bees' growth and development is minimal.

The framework of ecological stoichiometry is a promising approach to this issue. It allows questions about the most basic mechanism that shapes the nutritional ecology of bees, i.e., balancing the larval diet to enable larval growth, and development.

The main question to be addressed in the project:

The goal of this project is to determine the nutritional limitations imposed on wild bees by the lack of nutritionally balanced pollen. Therefore, we will (i) determine the nutritional value of the pollen produced by various plant species and (ii) estimate the nutritional needs of different species of wild bees. Finally, the combination of both research aims will enable us to (iii) assess nutritional bottlenecks as determinants of the biodiversity of wild bee species.

Information on the methods/description of work:

We will characterize the stoichiometry of multiple elements for bees and pollen. Within the framework of ecological stoichiometry, the nutritional demand of the bees will be compared with the nutritional supply of the pollen to study if and how the local flora community influence bee communities and populations via the presence or absence of plant species that supply stoichiometrically adequate pollen for bees.

Additional information:

Required: (1) Master's level in the studies in the field related to the project's scope; (2) academic-level knowledge in ecology, evolution and physiology; (3) general experience and interest in any field of ecology; (4) basic knowledge of statistics; (5) fluency in English.

Preferred:

experience in publishing scientific results; strong motivation to learn programming in R.

Personal qualities:

(1) effective communication; (2) interpersonal abilities and the ability to work well with others; (3) computer and technical literacy; (4) problem-solving/creativity; (5) skills in planning and organizing; (6) reliability, diligence, and punctuality; (7) the ability to critically evaluate the obtained results; and (8) willingness to actively participate in conferences, festivals and other forms of dissemination of the project's results and preparation of scientific publications in English at a high, international level.

Place/name of potential foreign collaborator:

Technical university of Munich, Germany / Prof. Dr. Sara Diana Leonhardt

References:

Filipiak, M., Woyciechowski, M., & **Czarndeski, M.** (2021). Stoichiometric niche, nutrient partitioning and resource allocation in a solitary bee are sex-specific and phosphorous is allocated mainly to the cocoon. *Scientific Reports*, 11(1), 652. <https://doi.org/10.1038/s41598-020-79647-7>

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