

**Institute:** Institute of Environmental Sciences

**Topic:** The diversity, distribution, and ecological dynamics of insect microbiomes

**Name of supervisor:** dr hab. Piotr Łukasik  
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**Background information (max 200 words):**

Insects frequently associate with microbes, forming different types of symbiotic associations that often play major roles in the insect biology. We know that the microbiome abundance, composition and roles vary among insect species, but they also differ among populations, sampling dates, and among individuals sampled from a population at the same time. However, our understanding of the microbiome diversity patterns across insects, and factors that influence them, remains very limited. The goal of the proposed project is a comprehensive survey of microbial symbioses across large numbers of diverse insects. As a source of material, we will use existing insect collections from Sweden and Greenland, obtained in collaboration with Sweden-based biodiversity surveys, and will collect additional samples. We will characterize them using innovative high-throughput sequencing-based approaches, custom bioinformatics solutions, and advanced statistical models. These approaches will allow us to understand the microbiome composition across the taxonomic diversity of insects, and to describe the seasonal changes, geographic variation, and the effects of environmental factors on microbiomes of selected, broadly distributed species.

**The main question to be addressed in the project:**

The Ph.D. Student will address a series of questions about factors that drive the abundance and composition of microbial symbionts across diverse insects

**Information on the methods/description of work:**

Initially, the student will work on the analysis of existing, extensive marker gene amplicon datasets for diverse Swedish and Greenland insects, developing and consolidating their bioinformatics skills, and aiming to use these data to address some of the broad questions in the field of symbiosis. Later, depending on interests and research funding, they may participate in field collections, laboratory work, analysis of expanding marker gene datasets, phylogenomics and comparative genomics characterization of broadly distributed microbial clades, or development and implementation of statistical models. The student will be encouraged to work closely with other team members and Polish and international project collaborators.

**Additional information:**

The successful candidate will have an M.Sc. degree in a relevant field by September 2022; a demonstrated interest in Evolution, Entomology, Microbiology, and/or Genomics; experience with, or a keen interest in learning, Bioinformatics and Computational Biology; and strong English language, communication, and organizational skills. Previous experience with insect ecology, evolution and especially symbioses, molecular biology, microbiome surveys, phylogenomics and/or comparative genomics, and modelling skills, as well as the willingness to travel, are advantageous. For more information regarding the project and the research group please check [www.symbio.eko.uj.edu.pl](http://www.symbio.eko.uj.edu.pl)

**Place/name of potential foreign collaborator:**

Tomas Roslin, Swedish Agricultural University  
Otso Ovaskainen, University of Jyväskylä, Finland

**References:**

Moran N.A., McCutcheon J.P. & Nakabachi A. (2008): Genomics and evolution of heritable bacterial symbionts. *Annual Review of Genetics* 42:165-190, doi:10.1146/annurev.genet.41.110306.130119.  
Perreau, J. & Moran, N. A. (2021): Genetic innovations in animal–microbe symbioses. *Nat. Rev. Genet.* 1–17, doi:10.1038/s41576-021-00395-z.  
Sudakaran S., Kost C., Kaltenpoth M. (2017): Symbiont acquisition and replacement as a source of ecological innovation. *Trends in Microbiology* 25:375-390, doi:10.1016/j.tim.2017.02.014