

Institute of Environmental Sciences

**Topic:** The ecological dynamics of insect microbiomes

**Name of supervisor:** dr hab. Piotr Łukasik  
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**Background information:**

Insects frequently associate with microbes, forming different types of symbiotic associations that often play critical roles in insect biology. We know that the microbial abundance, community 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 abundance and diversity patterns across insects, and factors that drive these patterns, remain very limited.

The goal of the proposed project is a broad, comprehensive survey of insect microbial symbioses. We will do this in close collaboration with Insect Biome Atlas (IBA), a project that samples flying insects at hundreds of sites in Sweden and Madagascar. We will use large numbers of insects from that collection for the microbiome characterization using high-throughput next-generation sequencing. This approach will allow us to understand the microbiome composition across the taxonomic diversity of insects and 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 the questions of how the microbiomes vary across insect diversity, space, and time, and how host-specific symbiotic microbes are.

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

The student's main task will be the bioinformatic analysis of large amounts of insect microbiome composition and abundance data. They may also participate in phylogenomics and comparative genomics characterization of broadly distributed microbial clades. They will be encouraged to contribute to field collections, to work with international collaborators on the selection and preparation of insect specimens for the microbiome characterization, and to participate in high-throughput sample processing and next-generation sequencing library preparation. The student will be encouraged to work closely with other team members and project collaborators, including Insect Biome Atlas consortium members in Sweden and Dr. Brandon Cooper at the University of Montana, U.S.A.

**Additional information (e.g. Special requirements from the student):**

The successful candidate will have an M.Sc. degree in a relevant field by September 2020. They will be able to demonstrate 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 in ecology, evolution and especially symbioses, molecular biology, microbiome surveys, phylogenomics and/or comparative genomics, and willingness to travel are advantageous.

For more information about the project and the research group, please check [symbio.eko.uj.edu.pl](http://symbio.eko.uj.edu.pl)

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

Fredrik Ronquist, Swedish Museum of Natural History

Brandon Cooper, University of Montana, U.S.A.

**References:**

Moran N.A., McCutcheon J.P. & Nakabachi A. (2008): Genomics and evolution of heritable bacterial symbionts. *Annual Review of Genetics* 42:165-190.

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Oliver K.M., Smith A.H., Russell J.A. (2014): Defensive symbiosis in the real world—advancing ecological studies of heritable, protective bacteria in aphids and beyond.

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Turelli M., Cooper B.S., Richardson K.M., et al. (2018): Rapid global spread of wRi-like *Wolbachia* across multiple *Drosophila*. *Current Biology* 28:963-971.

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