Open Bachelor and Master Topics

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Evolutionary Biology and Ecology

https://www.bio1.uni-freiburg.de/oeko/niehuis-lab/sann-lab

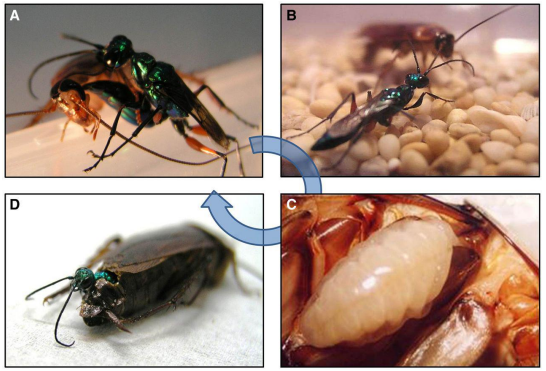
T2: Investigating the microbiome diversity of the jewel wasp *Ampulex compressa* across life stages.

Background

The cockroach-hunting wasp *A. compressa* undergoes an ontogenetic dietary during development: Adult wasps feed mainly on pollen and nectar while their larvae feed on paralyzed cockroaches. The parasitoid larva firstly feeds as an ectoparasite and later as an endoparasitoid on the roaches' body. Pupation and hatching takes place in the cockroach itself. Microbial gut communities are important for nutrition and pathogen resistance in many living species. Sequencing the metagenome of midgut symbionts could reveal insight into mutualistic functions governed by gut-associated microbial communities.

Project work and aim of the study

This project aims to study the microbiome of A. compressa adults and larave to compare its diversity across different life stages and populations.



- Extracting total microbial DNA from *A. compressa* midguts
- high throughput 16S Amplicon generation and sequencing of the V4 region
- processing and data analyses of 16S rRNA gene sequences
- Cluster and Compare operational taxonomic units (OTUs)
- Preparation of a manuscript for publication

lab work & Bioinformatics

Figure by: Libersat F & Gal R (2013). What can parasitoid wasps teach us about decision-making in insecJournal of Experimental Biology, 216(1), 47-55.

T3: Studying the evolution of mitogenomes across representative apoid wasp species.

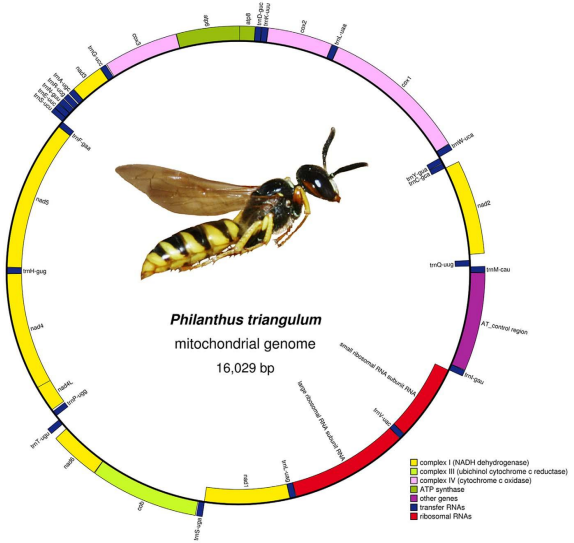
Background

Mitochondrial sequences are a common by-product obtained from NGS sequencing and this sequencing data has been employed to reconstruct mitogenomes of several animal taxa. The mitogenome has features other than DNA sequence data that can be phylogenetically informative, such as gene rearrangements, inversions, translocations and random insertions.

Project work and aim of the study

Construction and comparison of mitogenomes across diverse apoid wasps by using NGS sequencing data

- Extracting mitochondrial reads from transcriptomic and genomic NGS sequencing data
- mapping of raw reads against a reference mitogenome
- Data analysis and evaluation of recovered mitogenomes
- Preparation of a manuscript for publication



Bioinformatics

Figure: Kaltenpoth M et al., (2012). PloS one, 7(3), e32826

T1: Dinner is served – Do apoid wasp and bee larvae eat whatever is put in front of them?

Background

Apoid wasps are the closest relatives of bees. Both groups differ significantly in their feeding habits: Adult apoid wasps and bees mainly feed on pollen and nectar while their larvae feed on different food resources. Apoid wasps hunt and collect other arthropods (aphids, spiders, etc.) as larvae provision. In contrast, almost all bees species provide their larvae with pollen, nectar or floral oils as food resource. Exceptions are only known for few species of the genus *Trigona* which feed on carrion or rotten fruits.

Project work and aim of the study

How strictly follow apoid wasp and bee larvae their known feeding habitat?

- Provide bee and apoid wasp larvae with diverse food resources and observe food intake behaviour
- Observe developmental success (pupation) based on different food resources
- Compare head morphology of bee and apoid wasps larvae during development
- Preparation of a manuscript for publication

Behaviour & Morphology

Picture of *Trypoxylon*: www.fotocommunity.de/photo/spinnen-grabwespe-trypoxylon-figulus-mit-bernhard-m/33652890