JOHANNES GUTENBERG UNIVERSITÄT MAINZ

FACHBEREICH 10 BIOLOGIE

iomE
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MSc project:

The evolution of social complexity in colonial insects

Background

Ants, bees or wasps are famous for living in complex societies that can consist of less than 100 or more than 20 million individuals. The complexity of these societies is highly variable, with some showing a sophisticated division of labour of specialised workers, whereas others show only weak behavioural and morphological specialisation. Likewise, some species show large differences between the queen and workers, whereas others have only a negligible queen-worker dimorphism.

It remains unclear how these differences in social complexity can be explained and how the traits we use to quantify complexity correlate. For example, do larger colonies have a more advanced division of labour?

Studies exploring the links between these traits have so far yielded contradictory findings and included only a limited number of taxonomic groups. Including more taxonomic groups and species would be important to identify general patterns associated with the evolution of social complexity.

The project

We are looking for a highly motivated and communicative student to compile a dataset from published literature (and possibly collect data from the field) that includes ants, bumblebees, honeybees, stingless bees and wasps. The student will learn to use modern phylogenetic tools to address two main questions (the phylogenetic trees are already available):

1. Which features of social complexity (e.g. colony size, worker specialisation, queen size, genetic diversity) correlate with each other?
2. Which features are causal drivers of social complexity and which ones are a consequence of increased complexity? Which condition was present in the ancestors of present day species?

For more information, contact Christoph Grüter (cgrueter@uni-mainz.de)

Key references:

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Fjerdingstad EJ, Crozier RH (2006) The evolution of worker caste diversity in social insects. *American Naturalist* 167:390-400

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