

Insect Family Life and Social Behaviour

Available at Zoological Institute, University of Basel

Master-projects on cooperation, conflict resolution and chemical communication in insect families are available at the group of Prof. Mathias Kölliker, Zoological Institute, University of Basel, Switzerland (www.evolution.unibas.ch/koelliker). We experimentally address questions on the evolution of cooperation and conflict inside animal families using the common earwig (*Forficula auricularia*) as experimental system. Two possible Master-projects are described below, but there are additional possibilities for experimental studies in this system (including one applied project in collaboration with FiBL Frick and Agroscope Changins-Wädenswil on the role of earwigs in control of pest species in fruit orchards). The details of the project will be developed together with the Master student.

If you have a BSc in a relevant field, want to pursue an MSc in Animal Biology, have a keen interest in studying animal behaviour from an evolutionary perspective and want to work experimentally in this area, please contact me by e-mail (mathias.koelliker@unibas.ch).



Female earwig tending her newly hatched nymphs. She protects them against predation and provides food.

Project 1. Chemical communication and conflict resolution in earwig families

Communication is one possibility for resolving social conflicts such as the one between caring parents and offspring. The evolutionary conflicts make communication systems prone to cheating, which raises questions about the evolution of honest signalling. Insects are famous for their use of chemical communication (pheromones) in an astonishing variety of functional contexts ranging from species recognition to social parasitism. Our research showed that chemical signals by offspring affect maternal care and reproduction in earwigs. Earwig nymphs secrete condition-dependent cuticular hydrocarbons (CHCs; waxy components) on their cuticle. In this project, the Master student will experimentally test in more detail the functional role of CHCs as (honest?) chemical signals in earwig family interactions. The project will involve behavioral experimentation/observation, exposure experiments using nymph extracts and synthetic compounds, as well as analytical work using Gas-Chromatography/Mass-Spectrometry. Alternatively, a project on chemical communication between siblings is also possible.

Project 2. The functional significance of maternal egg-care

Female earwigs tend their eggs in a highly pathogenic environment: in burrows in the soil where fungi spores and bacteria are abundant. The care for clutches of eggs is the most widespread form of parental care in arthropods. One well understood function of egg-care is the protection of eggs against egg predators, but much less is understood in how females protect eggs from infections in this harsh environment. In this project, the master-student will carry out experiments to elucidate the function of maternal egg care and investigate the behavioural and chemical mechanisms by which females counter infections of their eggs. The project will involve behavioral experimentation/observation, as well as analytical work using Gas-Chromatography/Mass-Spectrometry.