

Global changes in climate, pollution and introduction of invasive alien species are caused by human activities such as energy production, land use and transportation. These changes affect wild organisms in a variety of ways. For example, the direction and intensity of organisms competition strongly depend on ambient temperature. Accidental or deliberate introduction of invasive species into non-native environment drastically affect local organisms. In the worst case invasive species can lead to local species extinctions and hence impact whole biodiversity. It is therefore important to improve our understanding and reduce the impact of these global changes.

The aim of the project is to understand how combined effects of human-caused environmental disturbances affect local species that play important ecological role in both aquatic and terrestrial habitats. In particular, I will study whether a predation risk caused by native perch and invasive signal crayfish impact population condition of European damselfly blue-tailed damselfly in ambient and increased temperature conditions. I will consider different populations of the damselfly, separated by a distance of 2000 km, because these populations of the same species might react differently to native and invasive predators as well as changes in thermal conditions caused by global warming. Damselfly larvae are important intermediate predators in aquatic food webs, feeding on variety of small animals including mosquito larvae, and are themselves food of predators such as fish and crayfish. Similarly, adult damselflies are predations insects that hunt for other flying insects, and are themselves food in terrestrial food web.

Egg clutches of the blue-tailed will be collected from northern and central Europe natural populations. During the laboratory experiments I will grow damselflies in ambient temperature and increased temperature that is within a range of predicted temperatures by 2100. I will expose eggs and larvae (aquatic phases) to native perch or invasive signal crayfish odours and note whether these non-lethal cues emitted by predators affect damselfly traits that are linked to damselflies reproduction. I will measure damselfly larval development time and growth rate, adult size, activity and foraging rate, pathogen resistance, cell damage caused by free radicals and energy storage. It has been shown that these traits in prey can be affected by the presence of predators in the surrounding environment. Yet, it is still unclear whether odours emitted by invasive predators are detected by prey in egg and larval stages, and if so, whether predator cue recognition influence adult condition.

The project will allow to draw important conclusions and connotations. The results will clarify to what extent differences in adult reproductive conditions are due to direct environmental conditions experienced during the adult stage, e.g. experience of ambient and increased temperatures driven by climate change, and to what extent to the effects of previous exposure to native and invasive predators during egg and larval development. In other words, I will clarify if delayed consequences of native and invasive predator cues experienced by prey during egg and larval development shape adult condition that affects reproduction.