RUHR-UNIVERSITÄT BOCHUM

The effect of phenotypic plasticity and clonal sorting on ecological and evolutionary dynamics in bi- and tri-trophic systems

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Background

Predation is a primary force during eco-evolutionary change. Therefor prey species have evolved different inducible defense strategies. These adaptions lead to changed phenotypes which reduce predation risks. In bitrophic interactions, inducible defenses have been shown to stabilize community structures as they dampen predator-prey oscilliations. However, some predators have evolved inducible counter strategies , which partly allow to overcome these prey defenses. While selection among organisms has been identified as a major drive of eco-evolutionary changes, the role of phenotypic plasticity in prey and predator organisms is not totally explored yet.
We will work with an algae-ciliate-system because in a number of ciliate protists predator-induced defenses have been described. Especially the freshwater species of the genus Euplotes are known to express these defenses in morphology and behaviour in response to their predators.

Work program

The project will look at the effects of phenotypic plasticity of traits on community and population dynamics in a tri-trophic system with algae as food, herbivorous ciliates as primary consumer and their ciliate predators. We study a system with algae as food source (*Chlorogonium elongatum*), different phenotypically plastic strains of *Euplotes octocarinatus* as herbivors and *Lembadion bullinum* and *Stenostomum sphagnetorum* as plastic and non-plastic top predators. Chemostat experiments will reveal effects of trait variation in bi-and tri-trophic systems.

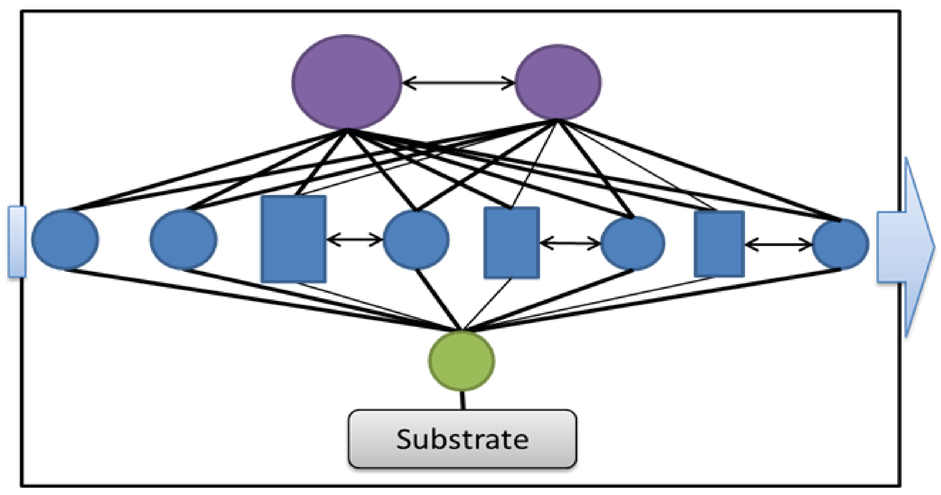

Figure 1: Tri-trophic chemostat system with plasticity on both higher trophic levels. Top predators (purple) graze herbivors (blue) which graze on autotrophs (green). Circles represent the undefended stage whereas the rectangles represent the defended stage. Top predator respond to inducible defenses with inducible offenses (larger sizes, purple). A mixture of different herbivor clones differ in their level of plasticity (blue). Autotroph algae (green) serve as food source.

Status Quo

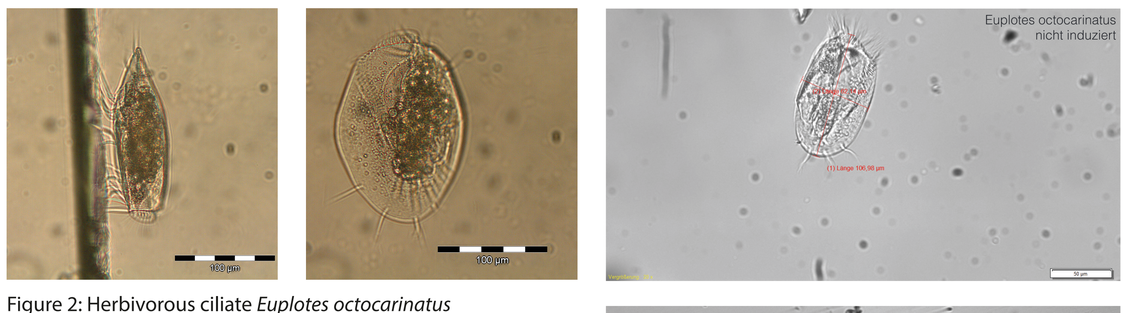

Figure 2: Herbivorous ciliate *Euplotes octocarinatus*

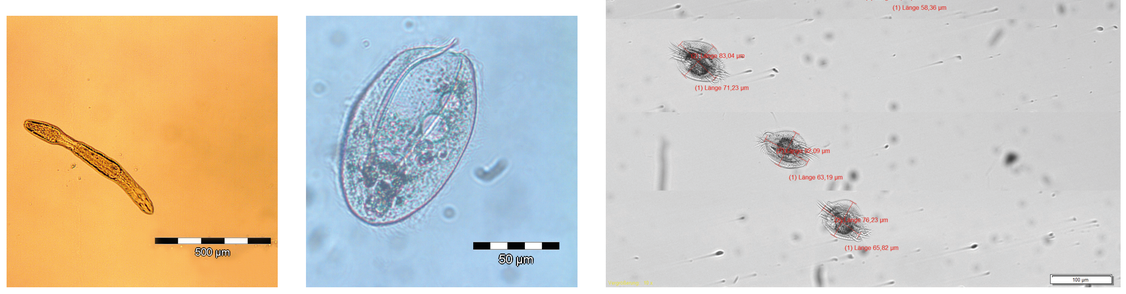

Figure 3: Non-plastic and plastic predator *Stenostomum spp* (left picture) and *Lembadion bullinum* (right picture)

Figure 4: Morphogenetic transformation in *Euplotes octocarinatus*. Development of protective lateral wings in the presence of *L. bullinum*.

- we succesfully isolated strains of *Euplotes*, *Lembadion* and *Stenostomum* from the field
- keep them in artificial SMB medium at 20° C , all stock cultures run stable
- we are able to grow monoclonal cultures
- 15 strains *Euplotes*, 15 strains *Lembadion*, 3 strains *Stenostomum* and several back up cultures
- defense reactions of *Euplotes* by co-culturing with both predators were verified
- measurements of cell dimensions have been performed, using the computer-based image analysis system CellD
- DNA analysis (RAPD fingerprinting) of the different *Euplotes* strains has recently started

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Flexibility matters: Interplay between trait diversity and ecological dynamics using aquatic communities as model systems (DynaTrait)