P1.07: Wacker, A. & Martin-Creuzburg, D.; PhDstudents: Schälicke, S. & Raatz, M.; University of Potsdam & University of Konstanz: Trait heterogeneity effects on trophic interactions: the role of essential nutrients.

In aquatic ecosystems, climate change is promoting the formation of phytoplankton blooms, which are increasingly dominated by cyanobacteria. Because cyanobacteria are low in polyunsaturated fatty acids and sterols, this altered phytoplankton composition affects biochemical food quality for consumers with potential implications for ecological interactions. In the project we investigated the effects of biochemical food quality on zooplankton traits and fitness responses. Different genotypes of related rotifer species, and phytoplankton species differing in polyunsaturated fatty acids and sterol composition, served as model organisms.
In a series of standardized laboratory experiments and chemostat experiments, the biochemical food quality effects on rotifer fecundity, survival rates, and population growth rates, were identified, thereby additionally considering interactive effects across a wide range of food quantities (Schaelicke et al. 2019a). In addition, the availability of biochemical nutrients directly influenced the fitness variation between species and among strains of a species. We found that co-limitation by food quantity and biochemical food quality resulted in variations in fitness responses of rotifers that were greater within a species than between species (Schaelicke et al. 2019b). Additionally, dietary availability polyunsaturated fatty acids in rotifers were differently adjusted between species and strains. This indicates inter- and intraspecific differences in physiological traits, such as the retention, allocation, or bioconversion capacity of polyunsaturated fatty acids, within the studied rotifer genus (Schaelicke et al. 2020). Accordingly, polyunsaturated fatty acids available in the diet represent important factors influencing fitness responses of rotifers. The experimental results were coupled with several modeling studies, in which we studied versatile factors that can be attributed to the structure of individual organisms, defense and attack mechanisms, and environmental influences. We established a model system for studying predator-prey dynamics to examine the feeding relationship between phytoplankton as prey and zooplankton as predators thereby considering biochemical food quality as an important trait (e.g., Raatz et al. 2017, 2018). The model revealed that providing essential resources to competitors or predators may be a strategy that prey species use to protect themselves from extinction. Therefore, the project outcomes clearly demonstrate that biochemical diet quality is an environmental factor that can have strong effects on traits and fitness responses of consumers. Furthermore, biochemical nutrient availability can mediate variation in traits and fitness responses among species or strains. Consequently, biochemical food quality has implications for community structures and dynamics.

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