"High water quality" can be defined as a set of preferable (to humans) biotic and chemical parameters of water. Currently, the main biotic factor which hinders water quality is the presence of cyanobacteria (photosynthetic bacteria) that often produce toxins. The dominance of cyanobacteria in the phytoplankton is often associated with anthropogenic changes of environment, mainly with the nutrient enrichment (eutrophication) of water bodies caused by industrial, domestic or agricultural run-off. Aside from eutrophication, the rise of surface water temperature (caused by global climate change) is an additional factor promoting cyanobacterial dominance and persistence. It is predicted that in the near future cyanobacteria blooms will be even more frequent, will last longer, and will appear earlier in the vegetation season.

The growth of cyanobacteria is not limited by top-down interactions since very few planktonic animals are able to feed on them. This is due to their toxicity, low nutritional value and poor manageability, which constitute effective protection against grazing. *Daphnia* are among the few potential grazers, but still the negative impact of cyanobacteria on *Daphnia* performance/fitness is apparent. While the effects of cyanobacteria presence (i.e. reduced fitness of individuals of *Daphnia* followed by diminishing of both the occurrence and the biomass of large bodied *Daphnia* in zooplankton community) are well described, not much is known about the mechanisms and pathways responsible for observed final effects. There is a great body of work describing the impact of toxic cyanobacteria or pure cyanotoxins on *Daphnia* fitness yet, cyanobacterial blooms are never built only of toxic strains and the fraction of toxin-producing strains can change during a single blooming event. For a full understanding of the complexity of *Daphnia* – cyanobacteria interactions, it is crucial to describe the effects of non-toxic cyanobacteria as well. There are still major gaps in our understanding of *Daphnia* - cyanobacteria interactions, especially (i) the ways by which cyanobacteria (especially non-toxic strains/species) suppress the fitness of *Daphnia*, and (ii) the outcome of the simultaneous exposition of *Daphnia* to cyanobacteria and elevated temperature. The comprehensive answer to the very basic question, namely: "**Why is cyanobacteria presence so bad for *Daphnia*?**" is yet to be found.

Success of a single genotype of *Daphnia* ("fitness of the genetic lineage") depends on survival and on final reproductive success. In the presence of non-toxic cyanobacteria survival of animals is usually relatively high, thus we hypothesize that **the presence of non-toxic cyanobacteria strongly affects the reproduction-related traits of *Daphnia*** and that **elevated temperature will strengthen the restraining effect of cyanobacteria**.

The study will combine the classic ecological approach (life-table experiments) with intravital physiological measurements and the newest molecular methods. In this study we aim to determine which features of *Daphnia* can be affected by cyanobacteria and/or elevated temperature and explain the physiological basis of observed changes. We will perform experiments during which the key life history parameters of *Daphnia* like: age and size at maturation, number of offspring, and growth rate will be observed. We will determine if (under stress) mothers increase the provisioning of eggs/newborns in essential compounds (increased investment in "quality" of offspring). We will also test the ability to produce the dormant stages (highly resistant dormant stages allow to "escape in time and in space" i.e.. allowing survival of *Daphnia* in harsh conditions and serving as a dispersal/migratory propagules) We will also perform physiological measurements of feeding rate and metabolic rate (which will allow us to determine the energetic budget of animals exposed to two stress factors e.g. poor quality food and elevated temperature). Finally we will observe the changes at molecular level – we will analyze the gene expression pattern (this will allow us to determie which metabolic pathways are affected by the presenco of cyanobacteria and/or elevated temperature).

We will determine how the forecasted global climate change can affect the dynamic of *Daphnia* - cyanobacteria interactions. This will aid in forecasting the effects of global climate changes on the functioning of freshwater ecosystems

Using clonal organisms like *Daphnia* will allow us to determine the variability of responses of single genotype in response to the simultaneous effects of two freshwater stress factors i.e. cyanobacteria presence and raised temperature. The interclonal comparisons will allow us to assess the variability in the populations of *Daphnia*, which selection can act upon.

Understanding the mechanisms responsible for suppressing *Daphnia* 's ability to control cyanobacteria blooms is the first step in creating the effective methods of encouraging the growth of *Daphnia* populations, and enhancing the grazing capability of *Daphnia* which in turn could lead to developing biological methods of controlling cyanobacterial blooms.