FWF Project V233-B17



UV stress in alpine lakes: *hsp* gene expression in copepods

Solar ultraviolet radiation (UVR, 280-400 nm) is a key parameter in alpine lakes because its intensity increases with elevation and due to the high water transparency of these generally small and shallow aquatic systems. Planktonic organisms living in alpine lakes are exposed to high levels of UVR, but they have adapted to the harsh environmental conditions through strategies that reduce the risk of UV-induced damage. The copepod *Cyclops abyssorum tatricus*, a widespread zooplankton species in the Central Eastern Alps, is highly resistant to UVR when residing in UV-transparent habitats, while populations from glacially turbid lakes show low UV protection. Compared to the relatively well known direct and indirect effects of UVR on freshwater zooplankton, responses at the molecular level have been scarcely investigated in these organisms.

The major aim of this project is to provide insight into the role of UV-induced molecular response mechanisms in freshwater zooplankton using nucleic acid-based techniques. I will test how stress protein gene expression in copepod populations changes in response to different levels of UV stress in laboratory and in situ experiments. In detail, dose- and depth-dependent variations, as well as diurnal and seasonal changes in stress protein gene expression will be studied in copepod populations from alpine lakes of different UV transparency.

Expression of four principal heat shock protein genes (*hsp20*, *hsp60*, *hsp70* and *hsp90*) will be quantified using real-time RT-PCR. Photo-protective compounds (mycosporine-like amino acids, carotenoids) and the antioxidant capacity of the copepods will be measured to evaluate the level of UV protection in the diverse *C. abyssorum tatricus* populations.

The anticipated results will shed new light onto how organisms living in these sensitive environments will respond to expected changes in water transparency by glacial retreat and other climate-driven changes.

Research articles:

Tartarotti B., Trattner F., Remias D., Saul N., Steinberg C.E.W. and R. Sommaruga (2017) Distribution and UV protection strategies of zooplankton in clear and glacier-fed alpine lakes. *Scientific Reports*. DOI: 10.1038/s41598-017-04836-w

Kammerlander B., Koinig K.A., Rott E., R. Sommaruga, Tartarotti B., Trattner F. and B. Sonntag (2016) Ciliate community structure and interactions within the planktonic food web in two alpine lakes of contrasting transparency. *Freshw. Biol.* 61: 1950-1965.

Tartarotti B., Saul N., Chakrabarti S., Trattner F., Steinberg C.E.W. and R. Sommaruga (2014) UV-induced DNA damage in *Cyclops abyssorum tatricus* populations from clear and turbid alpine lakes. *J. Plankton Res.* 36(2): 557-566.

Press articles:

Die Presse, 4/2017: Wie UV-Strahlung winzige Krebschen stresst (In German)

TV Program on Servus TV „Blaue Wunder - geheimnisvolle Bergseen“ (30 November 2012)