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DISSERTATION TITLE: *Dissolved Organic Matter and Ultraviolet Radiation in Freshwater Ecosystems: Interactive Effects on Zooplankton*

The increase of dissolved organic matter (DOM) and the associated water browning across Nordic freshwater ecosystems in the last decades has received strong scientific attention. A direct consequence of water browning is the increased absorption of light. In his PhD thesis, Raoul Wolf investigated the effect interaction of DOM and harmful ultraviolet radiation (UVR) on zooplankton to decipher the biological effects of water browning.

The thesis explores the combined effects of increasing DOM and UVR on zooplankton in freshwater ecosystems. UVR damages cells and genetic material, and therefore the UVR-absorption by DOM can have positive effects. However, DOM may be photo-activated by UVR, resulting in the formation of reactive oxygen species (ROS), which can be biologically harmful.

The first experimental studies investigated the combined effects of DOM and UVR on the genetic integrity of model organism *Daphnia magna*. Interestingly, the combination of both (i.e., ROS formation) induced the strongest DNA damages. It was also shown that UVR influences the swimming behavior of *Daphnia magna*, and these effects can be buffered by DOM. Based on these results, the potential biological effects of radiation and DOM were calculated, based on data from numerous Nordic lakes. In natural systems, there is a predicted high production of harmful radicals at the very surface of the water column, but this effect declines sharply with depth. Therefore, water browning can be considered an effective protection against UVR in freshwater systems. In another study, the ecosystem effects of water browning were investigated in alpine areas, where water browning promotes the habitat expansion of the UVR-sensitive phantom midge larvae *Chaoborus nyblaei*. This has negative consequences for its prey, the Arctic fairy shrimp *Branchinecta paludosa*. While water browning will be beneficial for some species, this likely comes at the cost of other species.

The results of this thesis demonstrate some of the complex consequences of water browning in natural freshwater systems and provides new insights into direct and indirect consequences of UVR in this context.