LIMNOTIP – Biodiversity dynamics and tipping points in our future freshwater ecosystems

The accelerating loss of biodiversity has affected organisms in all ecosystem types and recent reports suggest that freshwater species are lost at a rate higher than in any other biome. Freshwater ecosystems provide a wide array of ecosystem services for humans, including harvestable goods, water supply, water storage, as well as sites for recreational activities. Nevertheless, freshwater ecosystems have been heavily affected by human activities during the last century, including increasing nutrient loading, habitat destruction and infiltration of pesticides. Eutrophication continues to be a major and severe environmental threat to freshwater ecosystems, and recent studies have suggested that the negative effects of nutrient enrichment on lake algal dynamics may become increasingly problematic as a result of climate change.

In shallow lakes, one of the most important effects of eutrophication is abrupt regime shifts : pristine lakes reach a "tipping point" and change from a clear-water state with lush stands of submerged plants to turbid conditions with dense algal blooms. Reaching such a tipping point generally results in a dramatic decline in biodiversity and, further, the value of the lakes as providers of goods and services. Hence, there is a great challenge for the future in meeting the needs for improved knowledge on the mechanisms behind regime shifts from single system levels to aggregated system levels in freshwater ecosystems and under what circumstances they occur. It is also obvious that freshwater ecosystems are far from isolated, pristine entities, but that they are tightly coupled with human systems and that studies of these social-ecological systems (SES) are of utmost importance if we are to understand our future.

LIMNOTIP addresses the ecological and social mechanisms behind tipping points, biodiversity loss and water resource deterioration in different climate change scenarios. These scenarios will serve as a basis for social-ecological modelling and studies of both land use and management of ecosystem services for different regions in Europe to allow for proactive decision-making. This will be reached by analysis of decadal time series of freshwater ecosystems along a latitudinal gradient of Europe and a follow up of these trends in an experimental study. These studies will allow providing regional-specific recommendations, e.g. assessing whether resilience and rate of biodiversity changes differ between climate zones and between pristine and strongly affected catchments and lakes. The outcome of these empirical studies will, in concert, feed into social-ecological modelling providing scenarios and decision support with a clear and critical empirical validation.

Partners:
University of Lund, SWEDEN, coordinator
Forschungsverbun Berlin e.V., GERMANY
Leibniz-Institute of Freshwater Ecology and Inland Fisheries, GERMANY
University of Oslo, NORWAY
Wasserkluster-Lunz, AUSTRIA

Duration: 11-2012 to 10-2015
Total grant: €720 242
Further information: Lars-Anders Hansson (lars-anders.hansson@biol.lu.se)