



Is it possible to counteract coastal eutrophication in the Baltic Sea through biomanipulation of fish stocks?

Since the 50-60ties the negative consequences of eutrophication have increased and fish stocks have diminished in the Baltic Sea. Are there connections between these two phenomena? Could management of the fish stocks be part of a solution to the eutrophication problem? These issues are studied in the project "Mitigating eutrophication effects by means of biomanipulation", using massive stocking of (a total of 900,000) pikeperch.

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Project duration: 1 January 2008 – 31 December 2011, 1 October 2007 – 31 December 2010 (control study)

Background

Fishing and eutrophication may interact in a synergistic manner, leading to deteriorated water quality with increased algal blooms as a consequence. The problem of harmful algal blooms can be intensified by intensive fisheries for piscivorous fish. This is a potential problem in the Baltic Sea as the cod stock has been drastically reduced and the effects are known to have cascaded through the food web. Decreased stocks of piscivorous fish may thus strengthen the effects of eutrophication.

Small-scale experiments in lakes suggest that removal of top-predatory fish results in trophic cascades with increased abundance of small fish feeding on zooplankton, and an increased production of phytoplankton, with turbid water and algal blooms as some of the consequences. Taking measures to strengthen the populations of large predatory fish may thus, besides the obvious effects on fisheries, potentially have positive effects on water quality and ecosystem status.

Objectives

The primary objective of the project is to understand the role of food web interactions in shaping the coastal water quality of the Baltic Sea. With this knowledge it will be possible to evaluate

the extent to which eutrophication can be counteracted by managing piscivorous fish. The results from the study will eventually be used to influence Baltic fisheries management.

Method

The project is carried out through a whole-bay experiment in the Stockholm Archipelago (Himmerfjärden Bay), where large quantities of pikeperch are stocked to a well studied coastal area. The hypothesis is that these predatory fish should reduce the density of small zooplankton-eating fish and that this will allow zooplankton to increase and graze down the phytoplankton. This grazing will clear the water and counteract the effects of eutrophication. The effects of this biomanipulation will be studied at an ecosystem level, with primary focus on fish, zoo- and phytoplankton and also water quality. Concurrently with this study, a background documentation of the Lumparn Bay in the Åland Islands has been initiated as a control study. The project is planned for two phases, each of four years. The first phase is described above. The second phase will be conducted if the first phase is successful and will include extended monitoring of biomanipulation effects in Himmerfjärden and a full-scale biomanipulation also of Lumparn.

Current activities:

Current activities in Himmerfjärden include hydroacoustic assessment of fish densities, test fishing with gill nets, analyses of pikeperch diets, genetic mapping of pikeperch, stocking of 290,000 young-of-the-year pikeperch (all tagged), quantitative samplings of phyto- and zooplankton together with hydrographic parameters and nutrients. Many of the activities are the result of cooperation with other research and monitoring projects which are conducted in the same area.