BOTHNIAN BAY LIFE

For the good of the shared sea

Bothnian Bay

Bottenviken Life Perämeri

Cooperation for the good of the sea

BOTHNIAN BAY IS THE NORTHERNMOST basin of the Baltic Sea, and a unique sea area. As a result of the Ice Age, land rises and shoreline shifts gradually farther to the sea, islands are born and merged with the continent. Only a few species live in the brackish water and fresh water fishes thrive. Icebreakers have to assist ships during the winter when the sea can be ice-covered for even half a year.

Because of its northern location, small water volume and scarcity of species, Bothnian Bay is very sensitive to human impact. There are large population centres and heavy industry along the coast. Also the activities on the surrounding land areas affect the state of the sea. The environmental state of the Bothnian Bay is monitored on a regular basis. Many different parties, such as national and regional environmental authorities, industry and municipal wastewater treatment plants, participate in the monitoring. The problem has been the incoherence of the gathered information and partly its difficult accessibility.

The Bothnian Bay
Catchment area 280 100 km^2
Water area 36 800 km^2
Water volume 1 490 km^3
Mean depth 40 m
Maximum depth 148 m
Treshold depth of
the Quark 25 m
Mean fresh
water flow 115 km^3/v

In order to make the information exchange more efficient and to harmonize monitoring and management of this sensitive sea area, the Bothnian Bay Life project was started in late 2001. The total project budget was 1.05 million euros, half of which was provided by EU Life Environment. The project was implemented by the Regional Environment Centers of North Ostrobothnia, Western Finland and Lapland and the County Administrative Boards of Norrbotten and Västerbotten, and participated by several actors of the area.

The results of the project that ended in January 2005 are

- Bothnian Bay Environmental Information Database
- Water Quality and Ecosystem Model for three coastal areas
- Information Exchange System for metal industry
- Action Plan for the Bothnian Bay
- Versatile exhibition on the environmental state of the Bothnian Bay

The project supports the implementation of the Water Framework Directive in the Bothnian Bay region, and the development of Integrated Coastal Zone Management.

Cover photo Mauri Hietala

Photo Mauri Hietala

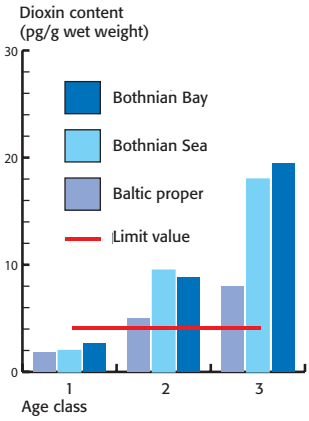
State of the environment – a common concern

HARMFUL SUBSTANCES are brought to the sea from industry and settlements, with river waters and as atmospheric deposition. They have precipitated to the bottom of the sea for decades. However, the work done for the environment has produced results. For example, seals and white-tailed eagles have gotten better from their alarming condition during the 1960s and 1970s. Also the lead content of fishes has decreased. Nevertheless, there are still problems related to harmful substances, such as the high dioxin content of salmon and Baltic herring. New compounds are also taken into use, the long-term environmental effects of which are not yet known.

One concern, particularly on the Finnish side, is eutrophication. Agriculture, forestry, peat production and scattered settlements increase the leaching of nutrients. Also industry and population centres release nutrients and oxygen-depleting substances. The Finnish coast is shallow and its water exchange less effective than that on the open Swedish coast. There are also more settlements and agriculture on the Finnish side. Thus the risks for eutrophication are greater. On the open sea, the mass occurrences of algae are rare and there is generally enough oxygen in the bottom of the sea.

Many rivers emptying into the Bothnian Bay have been harnessed for hydropower. Wind power construction is increasing, the coast has long been exploited in construction and there is pressure for other forms of natural resource use as well. Ship traffic and boats cause also loading. Land uplift increases need for dredging. New species enter the region as a result of human activity, which at worst can lead to one of the original species disappearing. There are plenty of common challenges!

Photo Knut Revne



The dioxin content of the Baltic herring *exceeds the limit value set by EU. The concentrations are higher in the older fish.*

Photo Anne Laine

Environmental information on the Internet

DURING THE BOTHNIAN BAY LIFE PROJECT, environmental information concerning the Bothnian Bay was compiled as one database that would be open to all. The database is based on Finnish and Swedish national and regional environmental monitoring data, as well as on statutory control and loading information. So far the database is available in Finnish and Swedish.

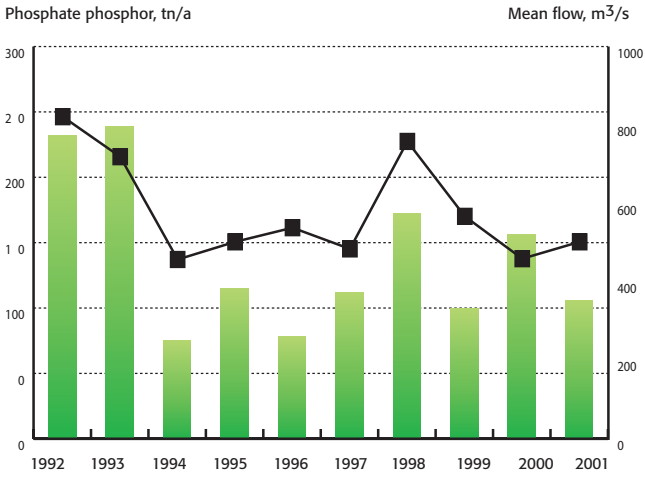
For the first time there is information available on the whole Bothnian Bay region concerning

- water quality in the measuring points along the coast and the open sea
- loading caused by industry and municipal wastewater treatment plants
- discharge and material transport of rivers

In the database, one can also familiarize oneself with the follow-up and monitoring programs and land use on river catchment areas.

During the project, the patrol boat Turva of the Finnish Frontier Guard was fitted with an automatic water quality measuring system, the results of which supplement the database. Information is gathered on seawater temperature, salinity and chlorophyll-a content. Furthermore, the system takes water samples. The results can be utilized for example in evaluating the long-term eutrophication and saline pulses from the Baltic Sea.

The database will be updated on a yearly basis and Turva's monitoring will also continue as part of the Bothnian Bay monitoring after the project has ended. More information in Katajisto & Laine 2004. Bothnian Bay Life – Environmental Information Database. Regional Environment Publications 368. Available also on the Internet: www.ymparisto.fi/julkaisut.



***The rivers** are the largest source of nutrients. The River Kemijoki alone brings great amounts of phosphate phosphor (bars) into the sea each year. The data from the Bothnian Bay Database.*

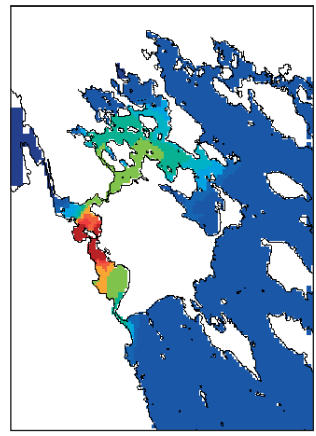
Modelling the effects of loading

AS A PART OF THE BOTHNIAN BAY LIFE PROJECT, a water quality and ecosystem model was designed for the Bothnian Bay. The target areas are the sea areas off the coasts of Pietarsaari and Piteå and the Kemi–Tornio–Haaparanta area. The model is primarily intended for the use of the parties participating the project.

In water quality modeling, fluctuations in the amount of nutrients and different kinds of algae in the water are calculated. These fluctuations are caused by external factors such as point and non-point loading and the wind and internal factors including e.g. the temperature stratification and salinity of water. The water quality model can be used in comparing the consequences of different ways of implementing a certain action. These actions include, for instance, selecting the place for an extension of an industrial plant or an outlet pipe.

In water ecosystem modeling, the transport of nutrients usable for algae, their binding into algal biomass, release from dead algal biomass and sedimentation is calculated. With the ecosystem model the changes in nutrient content and in the amount of algae can be examined in various loading and weather conditions.

The model can be used in assessing and illustrating the loading coming from different sources and the changes in it. The model serves also the planning of water protection and land use.



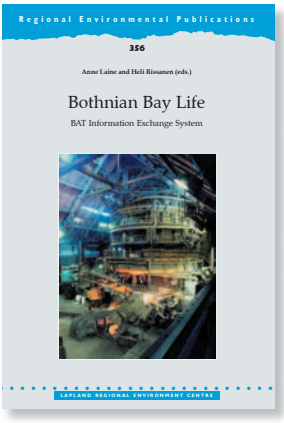
***A scenario of leakage** of sewage in the Piteå modeling area in early autumn.*

Photo Anne Laine

Information exchange between industry and authorities

* *BAT = Best Available Technology*
*** BREF document = BAT Reference Document*

THE BOTHNIAN BAY LIFE PROJECT DEVELOPED a BAT* information exchange system for metal industry in the region. The core of the system is a database in which the processes and the purification methods of different industrial plants are compared to BREF documents**. The database includes comparable information on the emissions and on the actions the plants have taken in order to reduce their emissions. The database also includes data concerning the plants' emission permits.



The network created between the metal industry and authorities around the Bothnian Bay during the project provides a good basis for BAT information exchange. Making the information exchange more efficient supports the implementation of the EU IPPC Directive, the goal of which is to minimize or prevent emissions to the air, water and soil as well as the production of waste in the EU countries.

More information in Laine & Rissanen (eds.) 2004. Bothnian Bay Life – BAT Information Exchange System. Regional Environmental Publications 356. Available also on the Internet: www.ymparisto.fi/julkaisut.

Photo Mauri Hietala

Guidelines for future actions

BOTHNIAN BAY LIFE PROJECT has gathered information on the Bothnian Bay, its environmental problems and pressures as well as its present monitoring. Based on this, a comprehensive picture has been formed of the environmental state of the Bothnian Bay. Additionally, changes have been suggested to the current monitoring and guidelines have been created for environmental management. All this has been compiled as the Bothnian Bay Action Plan. In addition to environmental authorities and the representatives of the municipalities and industry in the region, several actors and experts in the region have also contributed to its compilation by participating the workshops and the enquiry.

In managing environmental problems, the Action Plan emphasizes five themes:

- decreasing the eutrophication
- prevention of harmful substances and reducing their effects
- comprehensive regional planning
- sustainable exploitation of natural resources
- readiness for invasive species

In the Action Plan, establishing and extending cooperation concerning environmental issues, making participation easier for citizens and developing various forms of cooperation are considered especially important. The poster exhibition on the Bothnian Bay and its current state is one of the project's results. Its aim is to increase environmental awareness.

The Action Plan will be published as a report: Kronholm et al. (eds.) 2005. Bottenviken Life - Handlingsprogram för Bottenviken (Swedish version) / Perämeri Life - Perämeren toimintasuunnitelma (Finnish version). Länstyrelsen i Norrbottens län. Rapportserie 1/2005. Available also on the Internet: www.ymparisto.fi/julkaisut in Finnish with an English summary.

Photo Arto Lehto

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Industries: Stora Enso Oyj, Veitsiluoto; Oy Metsä-Botnia Ab, Kemi; Outokumpu Stainless Oy, Tornio; UPM-Kymmene Oyj, Pietarsaari; Packaging Munksund AB, Piteå; Kappa Kraftliner, Piteå; Billerud Karlsborg AB, Kalix; Stora Enso Oyj, Oulu; Boliden Kokkola Oy, Kokkola; OMG Kokkola Oy, Kokkola; Rautaruukki Oyj, Raahe; SSAB Tunnplåt AB, Luleå; Boliden Mineral AB, Rönnskär, Skellefteå

Other actors: The Finnish-Swedish Frontier Rivers Commission, The Council of Oulu Region, The Water Protection Association of Ostrobothnia

Consults and other cooperation parties: Finnish Environmental Institute and EIA Ltd (The Bothnian Bay Model), IVL Swedish Environmental Research Institute Ltd (BAT Information Exchange System) and the Finnish Coast Guard (automatic monitoring)

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