HELCOM Integrated Thematic Assessment of Biodiversity and Nature Conservation in the Baltic Sea

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Biodiversity and nature conservation: A segment of the Baltic Sea Action Plan

The main goal of the biodiversity segment of the BSAP is to:

Reach a favourable conservation status of Baltic biodiversity.

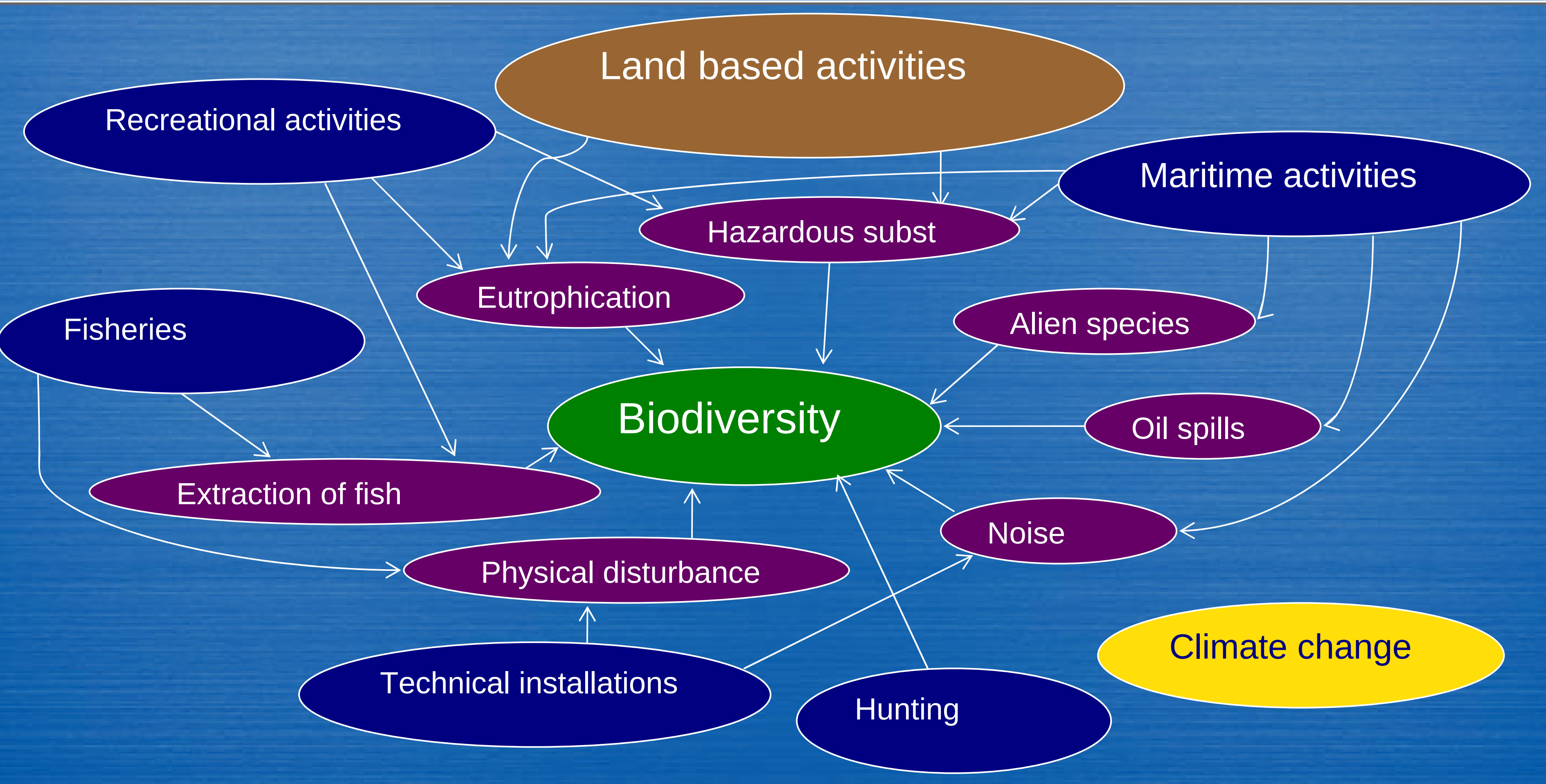
with the following ecological objectives:

- Natural marine and coastal landscapes,
- Thriving and balanced communities of plants and animals,
- Viable populations of species.

Goal of the assessment:

- Assess the status of biodiversity and nature conservation.
- Identify the causes behind the status.

Biodiversity and human pressures



Biodiversity in the Baltic Sea

Characteristics of the Baltic Sea of particular importance for biodiversity:

- Brackish water system – unique traits, relatively limited number of species.
- Decreasing number of species in the south to north direction.
- Sub-regional-specific chemical and physical properties – regional specific diversity.
- Overall about 4000 known species.

How do you measure biodiversity?

- Ecologists typically analyse the richness (number of species in an area) or evenness (relative abundance of each species) represented by a diversity index.
- From a management perspective indicators of ecosystem “health” are more commonly used e.g. key species/communities/habitats, sensitive species/communities/habitats.

Landscapes and habitats of the Baltic Sea

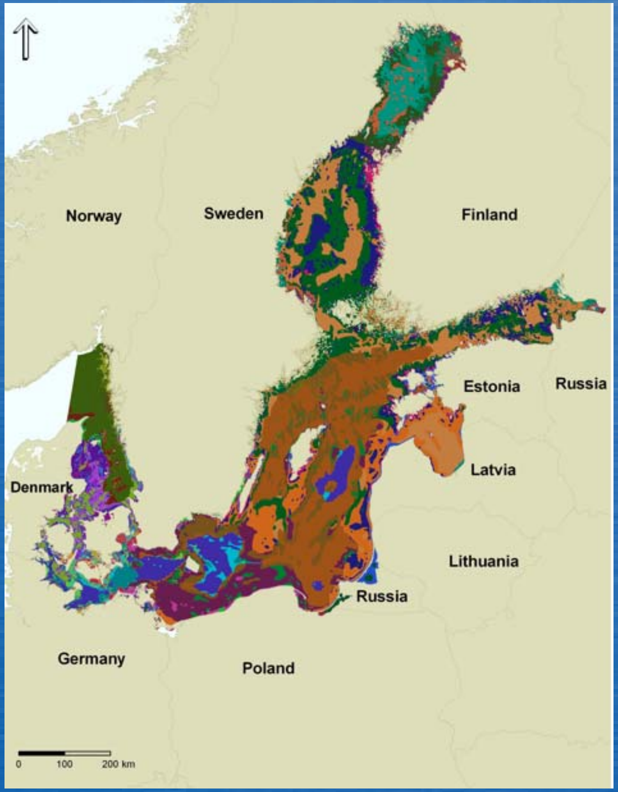
60 marine benthic landscapes have recently been outlined in the Baltic Sea area (BSR INTERREG IIIB “BALANCE” project).

The landscape maps are important tools for

- The marine spatial planning process.
- To identify areas of high seabed complexity.
- To select Baltic Sea Protected Areas.

The biotopes and habitats of the Baltic Sea are:

- All threatened and declining to some degree.
- The situation is of particular concern for offshore waters below the halocline, lagoons and estuaries, and benthic biotopes such as seagrass beds and macrophyte meadows.



Benthic marine landscape map of the Baltic Sea.
Source: BALANCE, Al-hamdani & Reker 2007.

Changes in the communities of the Baltic Sea

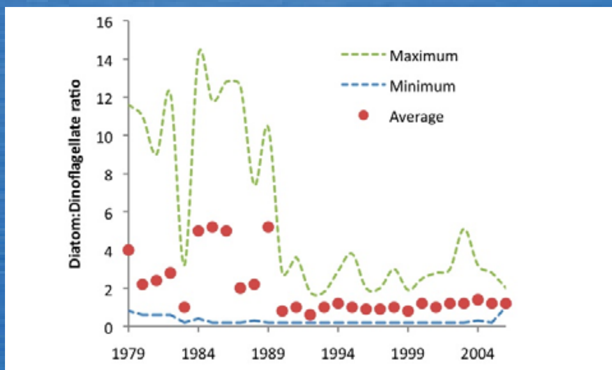
- The communities of the Baltic Sea, ranging from phytoplankton to fish, have changed considerably during the last 30 years.

- Climate driven changes in the Baltic Sea area have caused decreased salinity in the deep waters and increased temperature in surface waters of the central Baltic Sea during the same time period.

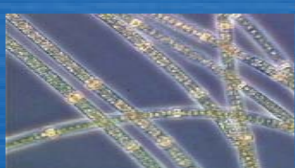
- A temperature increase has been observed in several coastal areas.

- The communities and species of the Baltic Sea are sensitive to changes in salinity and temperature.

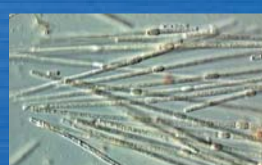
Phytoplankton



Mean, maximum and minimum diatom to dinoflagellate biomass ratios in February-May in the southern and central Baltic Proper, 1979-2006.



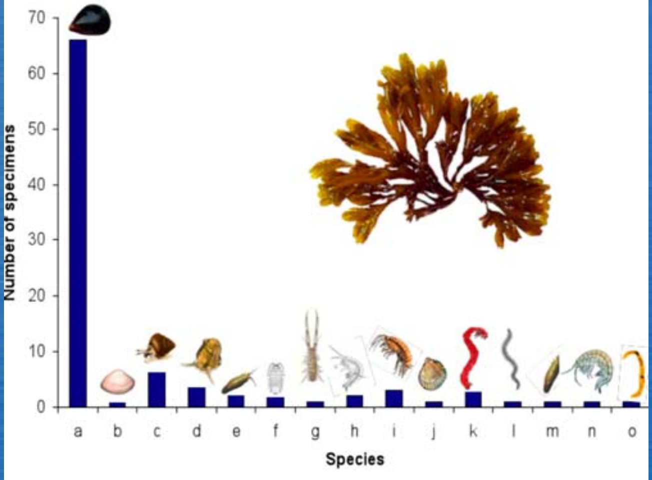
Nodularia spumigena



Aphanizomenon flos-aque

Observation:	**Tentative cause:**
A shift in dominance from diatoms to dinoflagellates during spring bloom periods.	Climate related? (increased temperature)
Establishment and range expansion of new species, several potientially toxic bloom formers.	Climate related? Eutrophication?
Seen over a longer time-period, an increase in cyanobacterial abundance.	Eutrophication

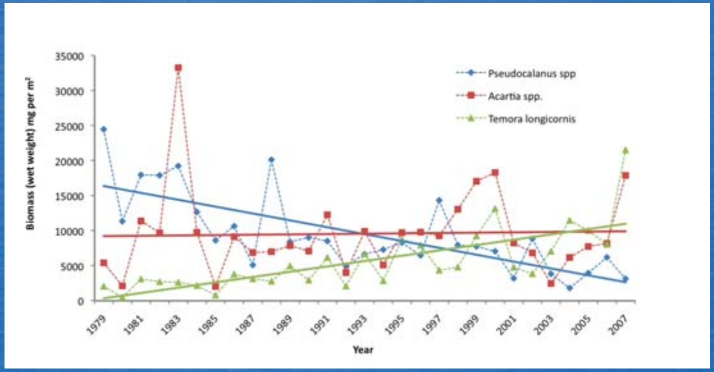
Habitat forming species e.g. bladder wrack, eelgrass, *Furcellaria*, stoneworts, mussels



Number of associated species living on one *F. vesiculosus* plant (collected from west coast of Saaremaa island from a depth of 5.8 m in 2007). *a - Mytilus trossulus, b - Macoma balthica, c - Hydrobia ulvae, d - Theodoxus fluvitailis, e - Idotea baltica, f - Jaera albifrons, g - Corophium volutator, h - Gammarus juv., i - Gammarus salinus, j - Cerastoderma galucum, k – Chironomidae, l - Hediste diversicolor, m - Idotea baltica, n - Gammarus oceanicus, o – Oligochaeta.*

Observation:	**Tentative cause:**
Bladder wrack: Decreased distribution and disappearance, particularly in locally polluted areas in the Baltic Proper and the southern Baltic Sea.	Eutrophication Pollution Physical disturbance
Bladder wrack: Recent increase in depth extension in the northern Baltic proper and Åland Sea.	Local eutrophication and pollution abatement?

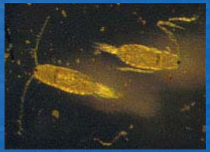
Zooplankton



Biomass of copepods *Pseudocalanus* spp., *Temora longicornis* and *Acartia* spp. in the Northern Baltic Proper. FIMR monitoring data 1979-2007, annual sampling (August) of HELCOM monitoring stations.

Pseudocalanus sp.

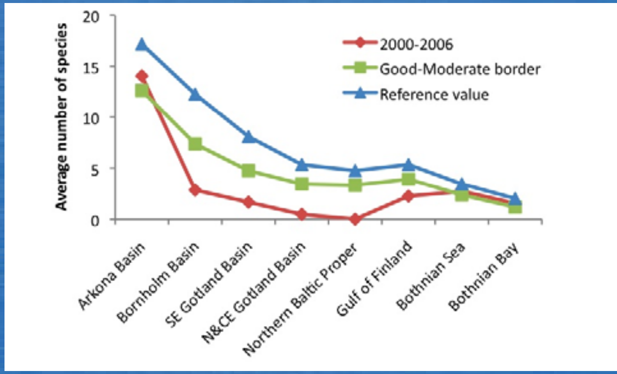
Temora sp.



Acartia sp.

Observation:	Tentative cause:
A shift in dominance from *Pseudocalanus* to *Temora* and *Acartia* in the Baltic Proper, Southern Baltic Sea and Gulf of Finland.	Climate related (reduced salinity) Eutrophication? (via oxygen depletion) Predation? (by the increasing sprat population)
Changes in the zooplankton community has effected the condition of the herring and sprat stock.	-

Benthic invertebrate community



Reference values, the border between good and moderate, and status for the period (2000-2006) depicted as the average number of species.

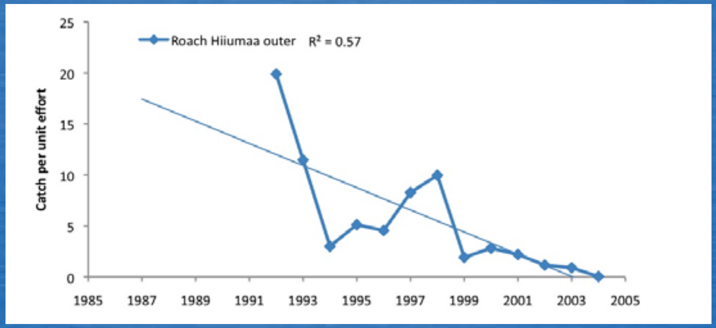
Macoma balthica

Monoporeia affinis

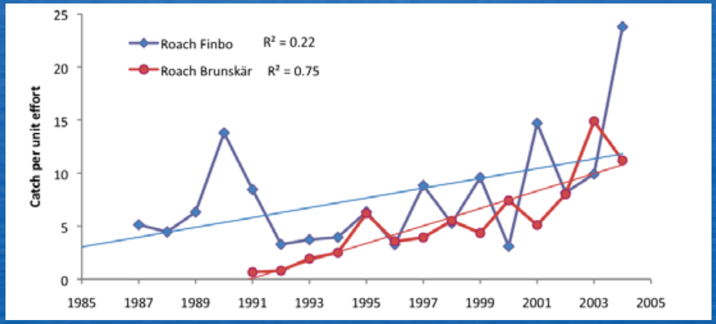
Saduria entomon

Observation:	**Tentative cause:**
A reduction in the number of species in the Baltic Proper and Gulf of Finland.	Oxygen deficiency Eutrophication
Change in community composition in the Baltic Proper and Gulf of Finland.	Climate related (reduced salinity)
Periods of zero presence.	Oxygen deficiency Eutrophication

Fish



Significant negative trend in catch per unit effort (CPUE) of roach (*Rutilus rutilus*) in the west-Estonian archipelago sea, 1992-2004 (from HELCOM 2006b).

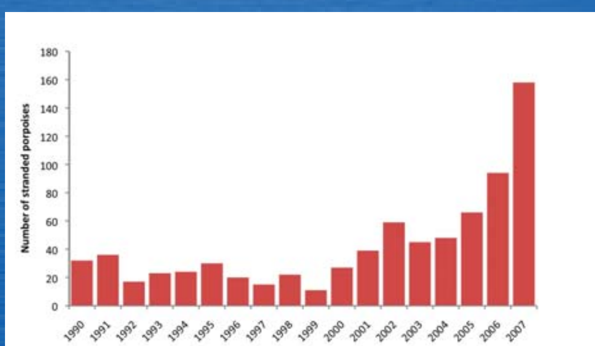


Significant positive trends in catch per unit effort (CPUE) of roach (*Rutilus rutilus*) in the Archipelago Sea, 1987-2004 (from HELCOM 2006b).

Observation:	**Tentative cause:**
Decrease in cod stock, increase in sprat stock since the 1980s.	Overfishing Climate related (reduced salinity, increased temperature)
Decrease of coastal fish stocks in many areas.	Overfishing
Increase of perch and roach in coastal areas.	Eutrophication, Climate related (increased temperature)
Several stocks of migratory fish species in a poor condition.	Damming or blocking of migratory pathways
Signs of cascading effects.	Overfishing

Harbour porpoise

Harbour porpoise at the German Baltic Sea coast.



Number of stranded (including by-caught) harbour porpoises recorded at the German Baltic Sea coast.

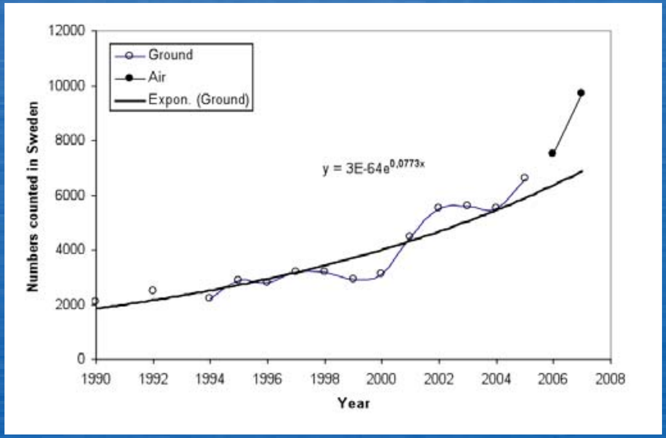
Observation:	Main threats:
A decrease in harbour porpoise densities from the Kattegat and eastward. Sighting and strandings indicate presence in many parts of the Baltic Sea.	-
Low abundance in the Baltic Proper (only a few hundred?)	By-catch Prey depletion Noise pollution Chemical pollution

Seals

Ringed seal

Grey seal

Harbour seal

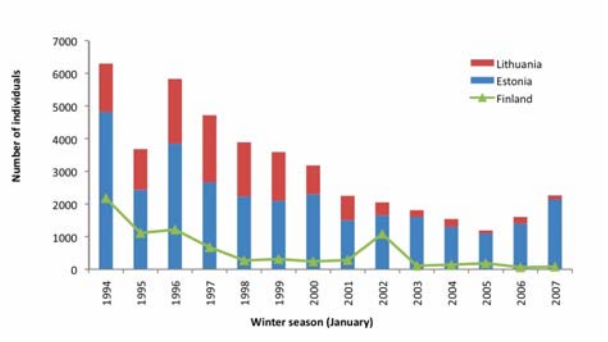


Numbers of grey seals counted along the Swedish coast, 1990-2007.

Observation:	**Main threats:**
Ringed seals: Total population 6500-7000. Zero growth rate in GoF and GoR.	Global warming By-catch Chemical pollution
Grey seals: Total population 22 000. Growing close to maximum growth rate. Not established throughout its natural distribution.	By-catch Chemical pollution
Harbour seals: Baltic Proper: 600-1000 S. Baltic &Kattegat: 10 000.	By-catch Chemical pollution Prey depletion

Birds

The population development of the White-tailed Eagle in the western Baltic 1973-2007.



Wintering Steller's Eiders in Estonia and Lithuania, and migrating birds at Hanko-Helsinki, Finland, 1994-2007.

Observation:	**Tentative cause:**
Increase in the population of:	
White-tailed eagle	Protective measures
Great cormorant	Protective measures
Barnacle goose	?
Decline in the population of:	
Eider	Predation, disease, drowning in fishing gear, oiling
Steller's eider	?
Long-tailed duck	Oiling
Dunlin	Habitat loss
	Climate change

BEAT - an indicator based tool for assessing biodiversity in the Baltic Sea

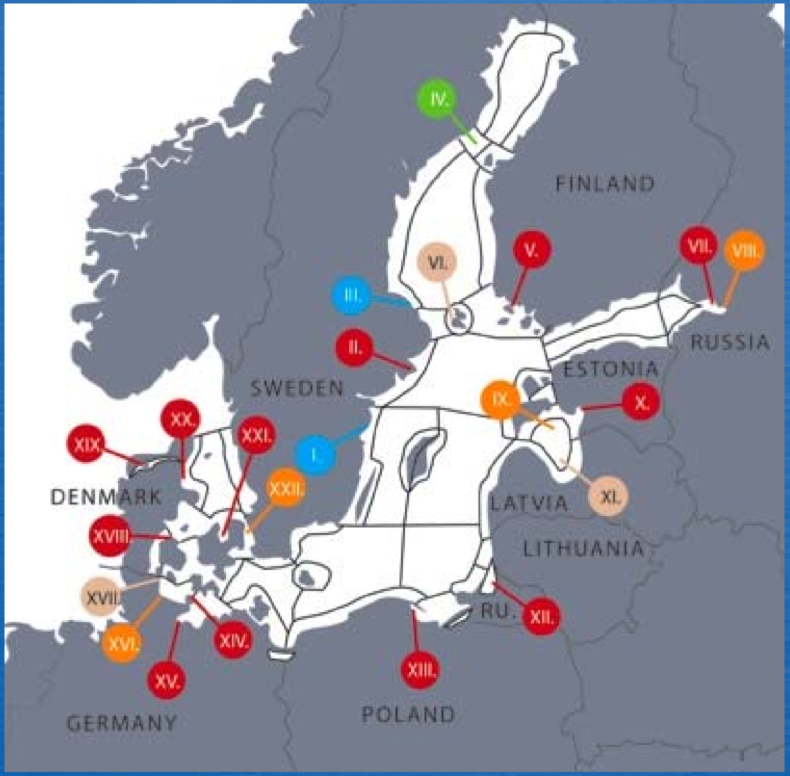
What is the overall status of Baltic Sea biodiversity?

- Tested through the use of an indicator based assessment tool - BEAT.
- BEAT requires that references levels, current status, and acceptable deviation can be provided for each indicator used in the assessment.
- Reference level can be based on e.g. historical values, modelling, undisturbed areas, expert judgement.
- The tool calculates the ratio between reference conditions and current state and has 5 classes for indicator status:

  Bad, poor, moderate = unfavourable conservation status
  Good, high = favourable conservations status.

Application of BEAT for biodiversity assessments

- The tool has been tested through 22 case studies, each case based on 6-20 indicators.
- The indicators used have covered macrophytes, zoobenthos, zooplankton, coastal fish, phytoplankton, birds, supporting features (chl a, oxygen concentration, salinity, nutrients).
- For future biodiversity assessments a set of indicators has to be defined, reference levels and acceptable deviations must be established, and a biodiversity monitoring programme should be considered.



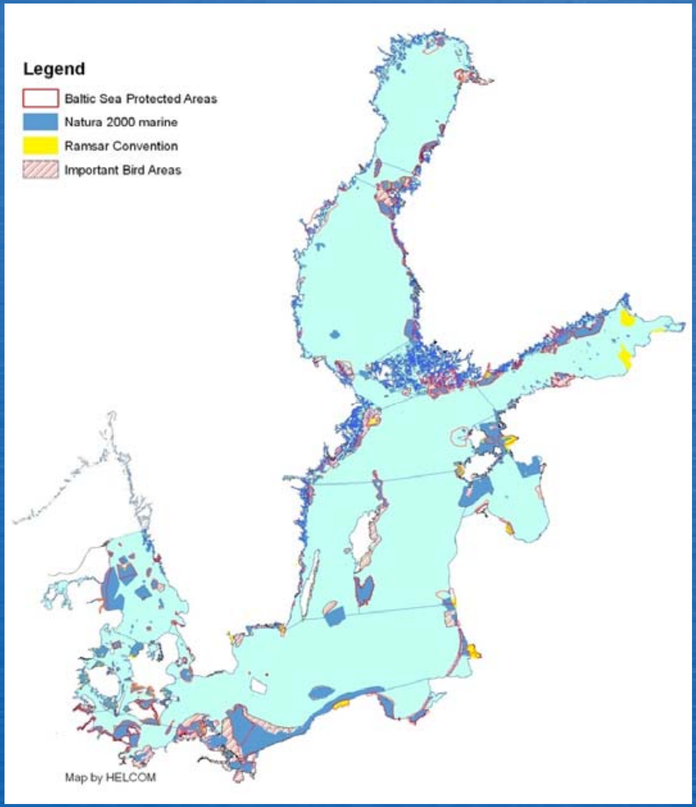
Bad Poor Moderate Good High

The network of Baltic Sea Protected Areas

Is the network of BSPAs ecologically coherent?

Approaches used:

- The HELCOM BSPA database to analyse what is within the BSPAs.
- The marine landscape maps to analyse how well these landscapes are covered by the BSPAs.



Overview of protected areas in the sub-regions of the Baltic Sea area, as of January 2009.

Ecological coherence of the BSPA network

Adequacy in terms of size and location:

- + Most sites designated so far are >3000 m^2.
- – The network covers less than 10% of the entire Baltic Sea and the coverage of sites differs significantly between coastal and offshore waters, sub-regions and countries.

Representation of species, habitats and landscapes:

- – 29 of the 61 threatened and/or declining species in the Baltic Sea are not included in the current BSPA network.
- – Marine landscapes types are particularly poorly represented in the the deep waters dominated by hard clay and mud.

Ecological coherence of the BSPA network, continued

Replication of species, habitats and landscapes:

- \+ Replication of many and landscape types is adequate in the current BSPA network.
- − Hard clay and bedrock landscapes have relatively few replicates.
- − Information on species and habitat distribution is insufficient.

Connectivity between the individual protected areas:

- \+ The BSPA network is relatively well connected when it comes to species with long dispersal distances.
- − It does not sufficiently support connectivity of the short and mid-distance dispersers.

Reduce human pressures

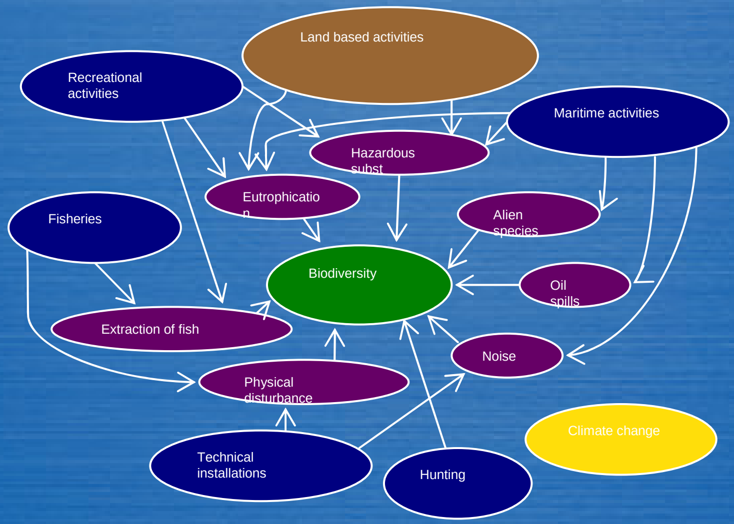
Although it is not possible to distinguish the relative or absolute impact of human pressures on the status of biodiversity, it is clear that human pressures are at a magnitude that effects biodiversity negatively.

- Implement the agreed provisional country-wise reductions of the nutrient load included in the BSAP to reduce the impact of eutrophication.
- Implement an ecosystem approach to fisheries management, as agreed in the BSAP, to ensure that fishing is conducted with minimal impact on individual species as well as the ecosystem as a whole.
- Follow up integrated coastal zone management as recommended in HELCOM Rec. 24/10 and the EU Rec. (2002/413/EC) to reduce impacts of physical disturbance in the coastal zone
- Implement the agreed targets of the maritime and hazardous substance segment of the BSAP to limit the introduction of alien species and negative effects of toxic substances.
- Increase the knowledge on cause-effect pathways and relative contribution of human pressures to find the most cost-effective measures.

Enhance policy integration

The status of biodiversity is determined by the cumulative and synergetic effects of human pressures and policy integration is therefore required to safeguard biodiversity.

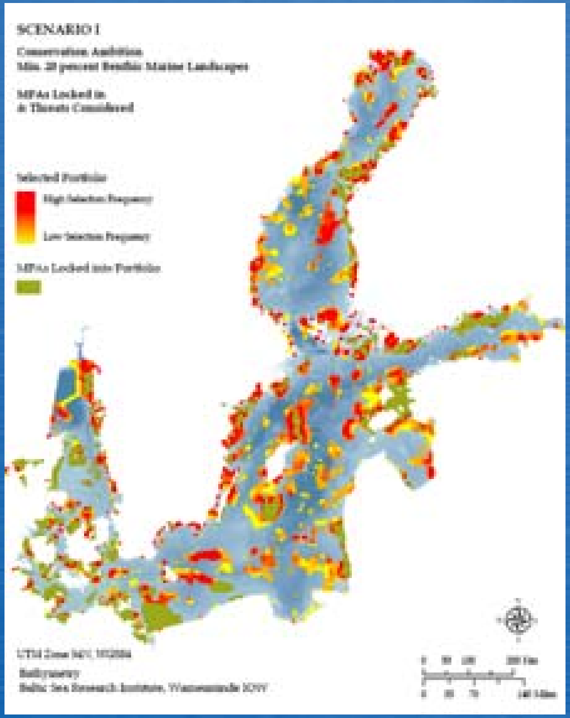
- Use marine spatial planning as a practical tool for implementing policy integration.
- Continue to develop marine landscape and habitat maps to support the marine spatial planning process.
- HELCOM has already started, in accordance with the BSAP, a project to develop broad-scale, cross-sectoral, marine spatial planning principles based on the Ecosystem Approach.



Improve the BSPA network

The current network of BSPAs is not ecologically coherent.

- Designate all Natura 2000 sites as BSPAs and designate additional offshore areas as BSPAs.
- Develop and implement management plans for all BSPAs.
- Increase knowledge on the distribution of species, habitats and landscapes.
- Use a regional and systematic approach when selecting protected areas to maximise the chance of creating a BSPA network that meets the conservation targets.



MARXAN ”best portfolio”. The set of selected areas fits best with the chosen targets for the network. From Liman et al. 2008.