Assessment of Climate Change for the Baltic Sea Basin - The BACC Project - 22-23 May 2006, Göteborg, Sweden

Climate-related Change in Marine Ecosystems

2) Consequences of Climate Change - Plankton and Benthos

Table 1: Concentrations of dissolved trace metals in the Baltic Sea are several times higher than in the North Atlantic (HELCOM 2004).

Element	North Atlantic	Baltic Sea	Factor
Hg	0,15 - 0,3	5 - 6	~ 20
Cd	4 ± 2	12 - 16	~ 4
Pb	7 ± 2	12 - 20	~ 3
Cu	75 ± 10	500 - 700	~ 10
Zn	10 - 75	600 - 1000	~ 10 - 50

Fig. 2: Increased blooms of cyanobacteria are an expected consequence of climate change. Photo: Riku Lumiaro.

Fig. 4: Species composition of zooplankton is expected to change as aconsequence of climate change. The common jellyfish (*Aurelia aurita L.*) is swaying over underwater meadow of a freshwater grass (*Myriophyllum sp.*) in the Northern Baltic archipelago. Photo: Jukka Nurminen.

Fig. 6: The bivalve, *Macoma baltica* is one of the predominant species of macrofauna on well oxygenated sediments in the Baltic Sea. Photo: Illpo Vuorinen.

Increased Vulnerability to Contaminants

Most animals live at the edge of their physiological tolerance.

Higher temperature and lower salinity would

- Impact on acclimation capacity
- Reduce general fitness
- Enhance metabolic rates and enzyme activities

Lower salinity results in higher metal uptake.

Bacteria

- Increase in temperature stimulates metabolic processes
- Implication for the functioning of marine system
- Global consequences for the carbon cycle

Phytoplankton

- Warming will inhibit cold water species
- Warming will enhance warm-water species
- Reduced ice cover and earlier stabilization of the water column will shift the start of spring bloom
- Biomass and species composition will change
- Increase in cyanobacteria blooms

Zooplankton

- Salinity controls the Baltic Sea biodiversity, also in zooplankton
- Temperature change affects growth and reproduction
- Decreasing salinity, increasing eutrophication, temperature and stratification favor the microbial loop
- Shift in abundance affects growth and condition of the most important fish stocks

Benthos

- Particle sedimentation, resuspension rates, current velocity, temperature, salinity and oxygen conditions contribute to uneveness in distribution
- Biomass increase due to increased deposition of organic material (increased primary production due to eutrophication)

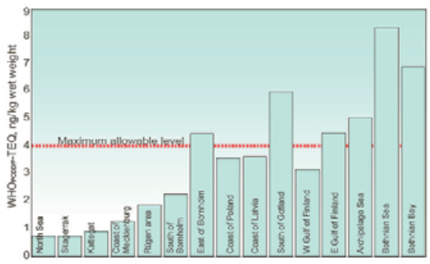

Fig. 1: Dioxin content in the Baltic herring is exceeding the allowable maximum in the Northern parts of the Baltic Sea.

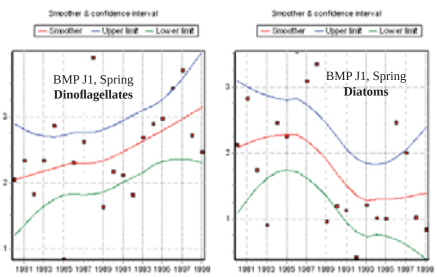

Fig. 3: Biomass and species composition of phytoplankton is expected to change as a consequence of climate change, recent changes in long term records show the extent of variation (Wasmund and Uhlig, 2003).

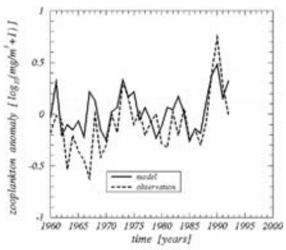

Fig. 5: Long-term record of a copepod, *Acartia sp.* common in surface layers shows an increase, resulting from increased phytoplankton production or higher temperature, or both. (Dippner et al. 2000).

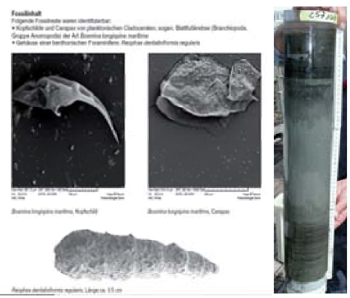

Fig. 7: Microfossils in sediments demonstrate alternating freshwater (Cladoceran remains, upper panels) and marine (Foraminiferans, below) stages in the Baltic Sea history (by courtesy Thomas Leipe).

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