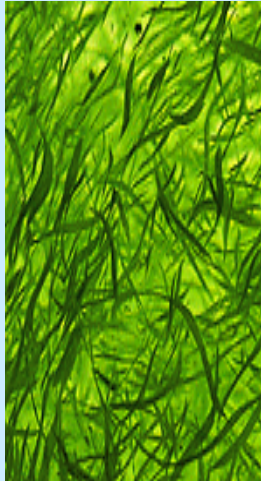


Assessment of the Eutrophication Status and Related Ecological Quality Objectives within the OSPAR Convention

NOS SCIENCE SEMINAR SERIES

NOAA
Silver Spring / MD
October 31, 2002

Uli Claussen
Federal Environmental Agency, Germany



OSPAR Convention for the Protection of the North-East Atlantic

The Oslo-Paris Convention (OSPAR), a Regional Convention for the Protection of the Marine Environment of the North-East Atlantic provides the following Guiding Principles:

- The Precautionary Principle
- Preventive Action should be taken
- Measures should, as a priority, be taken at source
- The Polluter Pays Principle



OSPAR Strategy to Combat Eutrophication

To combat eutrophication in the OSPAR maritime area to achieve and maintain a healthy marine environment where eutrophication does not occur by 2010 latest.

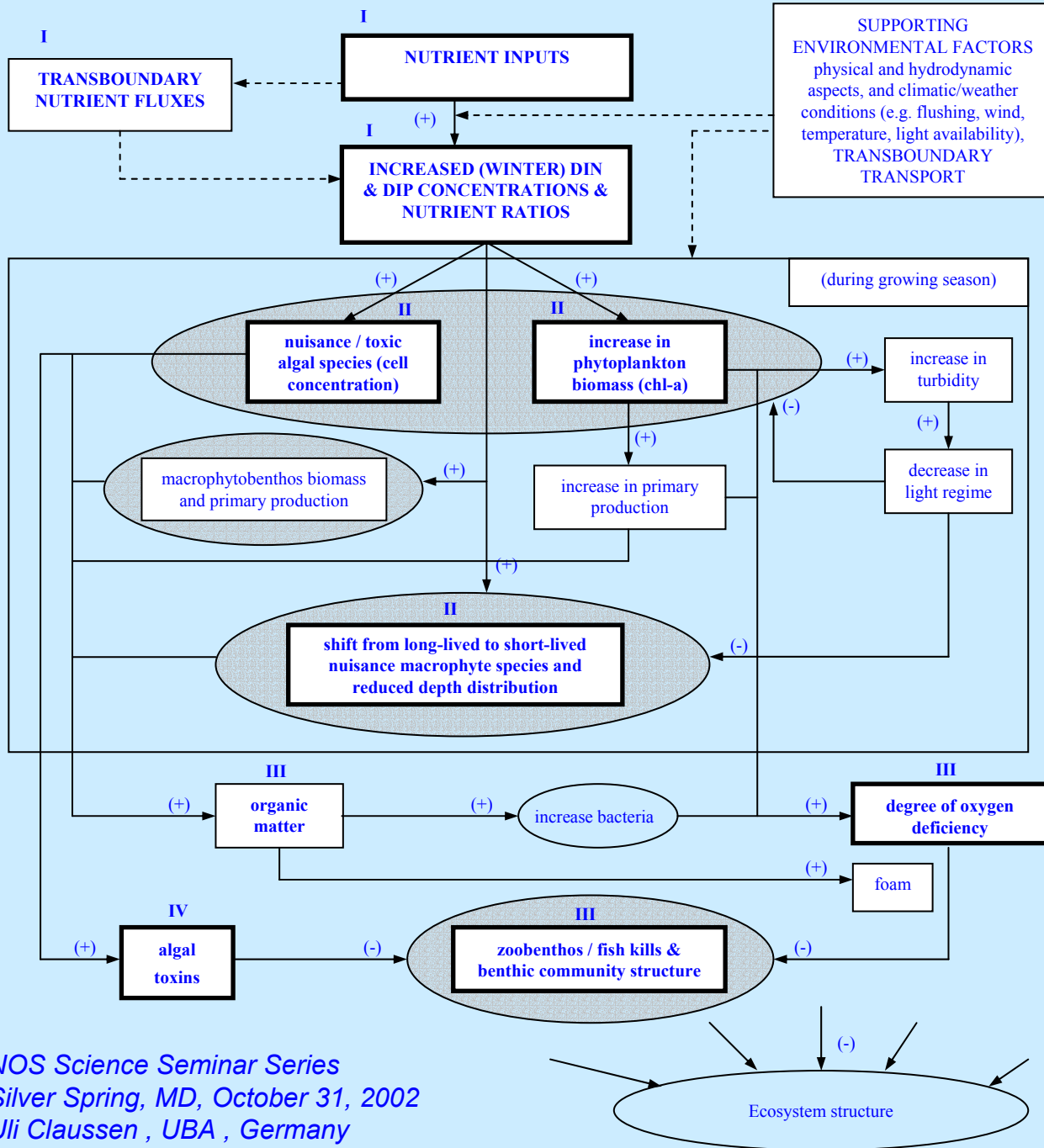
Areas for which action is needed will be selected by the *Common Procedure for the Identification of the Eutrophication Status*.



Definiton of Eutrophication by OSPAR

“*Eutrophication*” means the enrichment of water by nutrients causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned, and therefore refers to the undesirable effects resulting from *anthropogenic* enrichment by nutrients.



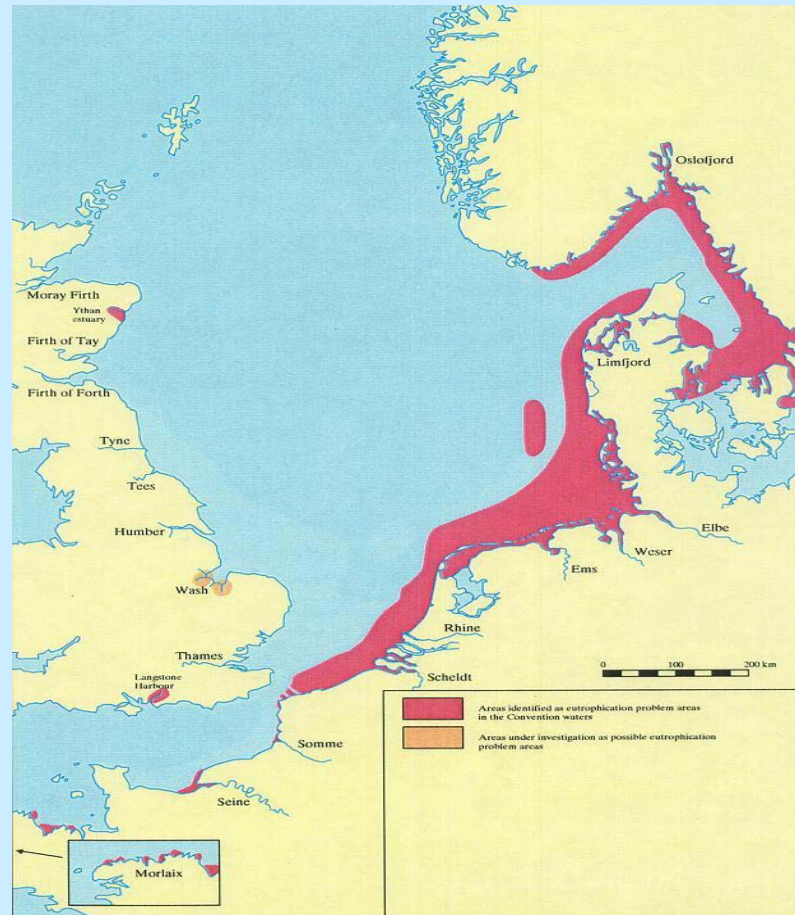


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The
 Eutrophication
 Process;
 Interrelations
 between the
 Elements
 (OSPAR 2002)

Eutrophication Problem Areas in the Greater North Sea Identified by Contracting Parties (OSPAR 1992)



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The OSPAR Common Procedure

OSPAR adopted the *Common Procedure* for the Identification of the Eutrophication Status.

This procedure comprises two steps:

- The *Screening Procedure* (“broad brush“) as a first step to identify obvious non-problem areas;
- The *Comprehensive Procedure* which should enable the classification into the following three classes:
 - * Problem Area
 - * Potential Problem Area
 - * Non-Problem Area



Classification of Eutrophication

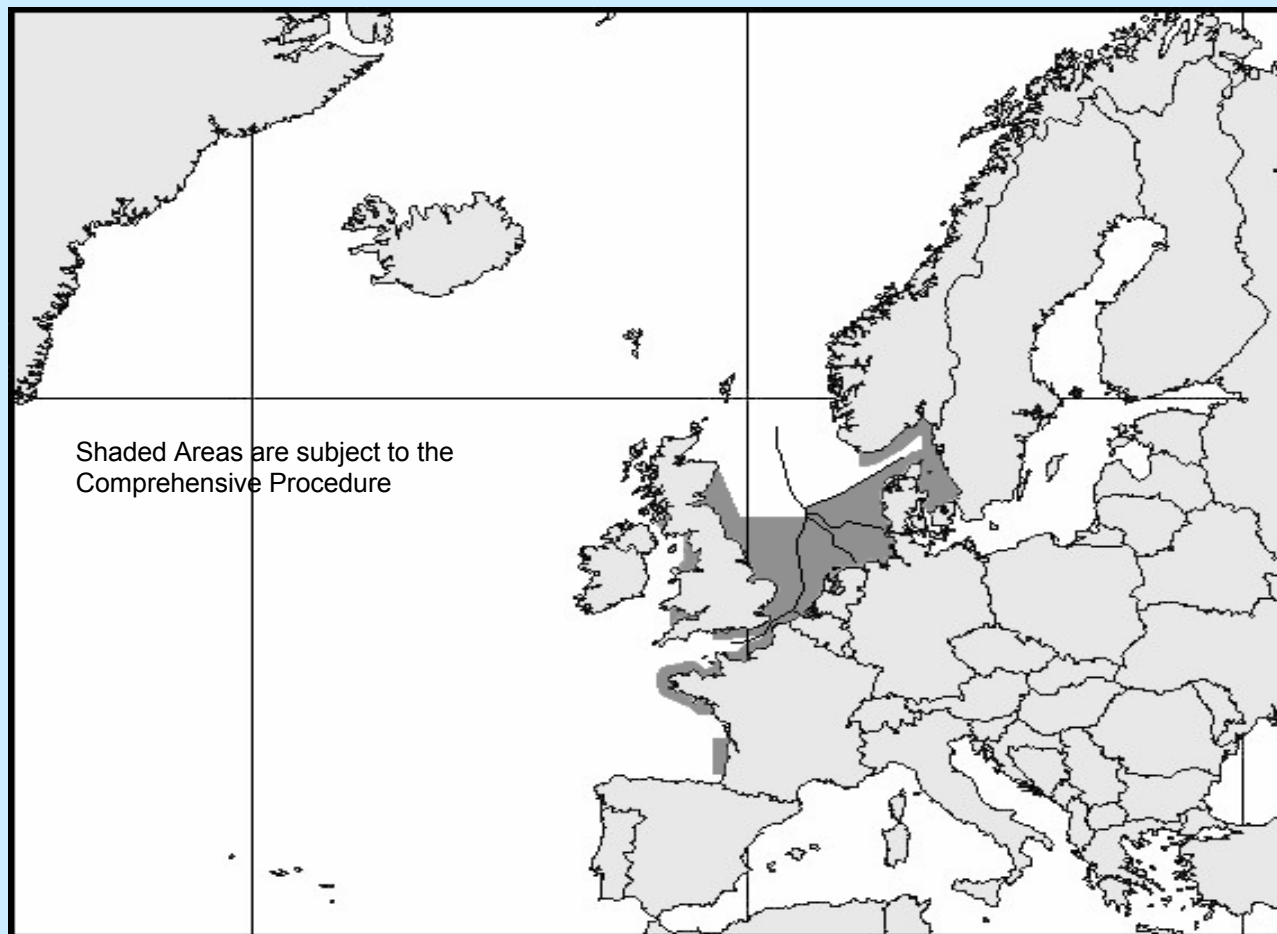
An integrated assessment scheme for a classification of eutrophication has been developed and agreed within OSPAR.

The different assessment parameters have been incorporated into the following categories:

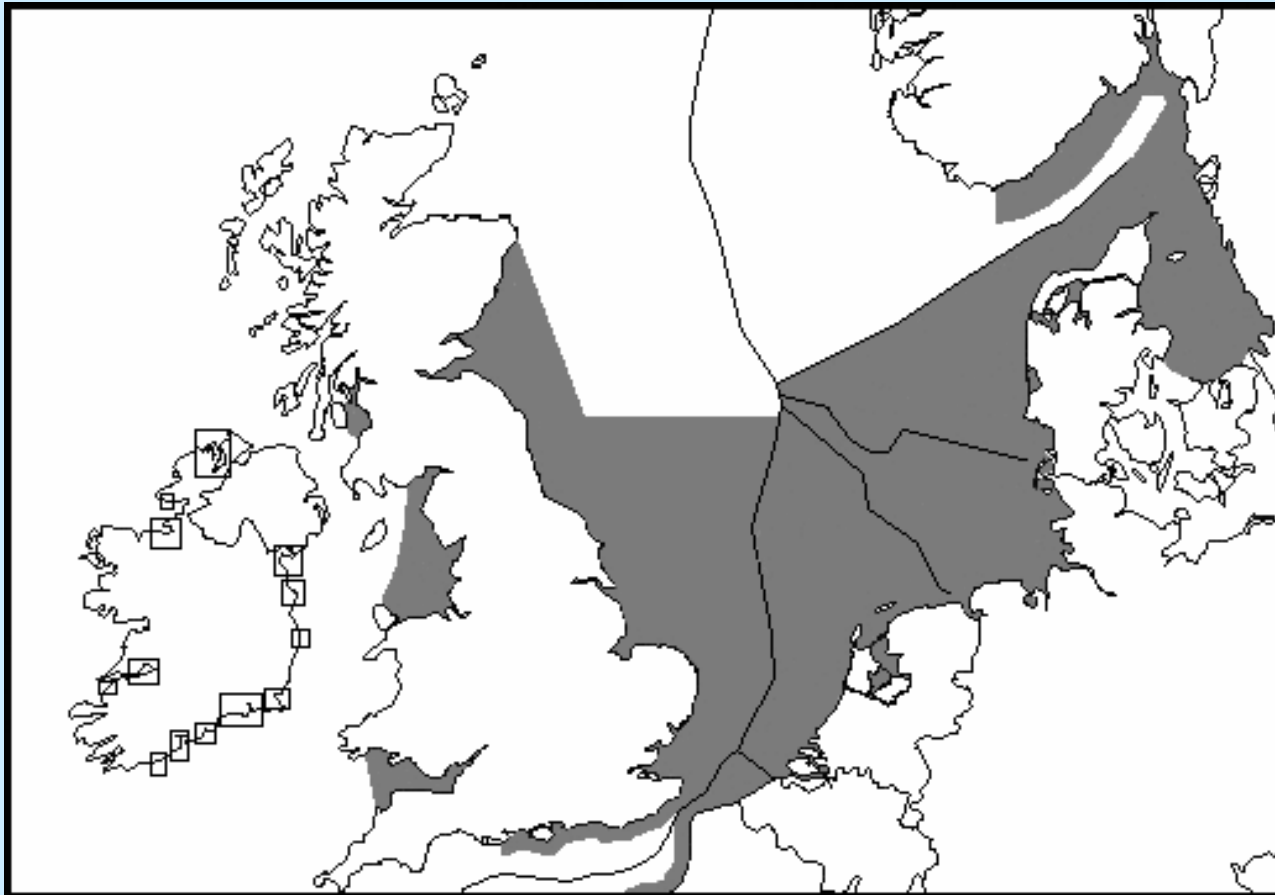
- **Degree of nutrient enrichment (e.g. nutrient inputs, nutrient concentrations, N/P ratios);**
- **Direct effects (e.g. algal blooms, occurrence of macrophytes);**
- **Indirect effects/other possible effects (e.g. oxygen deficiency).**



Areas Subject to the Comprehensive Procedure



Areas Subject to the Comprehensive Procedure



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The Agreed Harmonised Assessment Criteria of the Comprehensive Procedure

Category I:

Degree of Nutrient Enrichment

- **Riverine total N and total P inputs and direct discharges:**
Elevated inputs and/or increased trends (compared with previous years)
- **Winter DIN and/or DIP concentrations:**
Elevated level(s) (defined as concentration > 50 % above salinity related and/or region specific background concentration)
- **Increased winter N/P ratio (Redfield N/P = 16):**
Elevated cf. Redfield (> 25)



The Agreed Harmonised Assessment Criteria of the Comprehensive Procedure

Category II

Direct Effects of Nutrient Enrichment (during growing season)

- **Maximum and mean Chlorophyll a concentration:**
Elevated level (defined as concentration > 50 % above spatial (offshore) / historical background concentrations)
- **Region/area specific phytoplankton indicator species:**
Elevated levels (and increased duration)
- **Macrophytes including macroalgae (region specific):**
Shift from long-lived to short-lived nuisance species (e.g. *Ulva*, *Enteromorpha*)

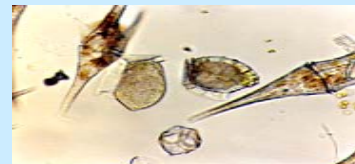
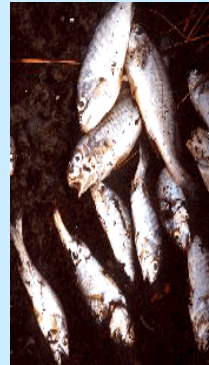


The Agreed Harmonised Assessment Criteria of the Comprehensive Procedure

Category III/IV

Indirect/Other Possible Effects of Nutrient Enrichment (during growing season)

- **Degree of oxygen deficiency:**
Decreased levels (< 2 mg/l: acute toxicity; 2 - 6 mg/l: deficiency)
- **Changes/kills in zoobenthos and fish kills:**
Kills (in relation to oxygen deficiency and/or toxic algae)
Long term changes in zoobenthos biomass and species composition
- **Organic carbon/Organic matter**
Elevated levels (relevant in sedimentation areas)
- **Algal toxins (DSP/PSP mussel infection events):**
Incidence (related to phytoplankton indicator species)



Eutrophication Classification according to OSPAR

Category I Degree of Nutrient Enrichment	Category II Direct Effects	Category III and IV Indirect Effects/ Other Possible Effects	Classification
+	+ and/or	+	Problem Area
-	+ and/or	+	Problem Area*
+	-	-	Potential Problem Area
-	-	-	Non-Problem Area

(+) = Increased trends, elevated levels, shifts or changes in the respective assessment parameters in Table 1

(-) = Neither increased trends nor elevated levels nor shifts nor changes in the respective assessment parameters in Table 1

* Caused by transport from other parts of the maritime area

Note: Categories I, II and/or III/IV are scored '+' in cases where one or more of its respective assessment parameters is showing an increased trend, elevated level, shift or change.



Identification of the Eutrophication Status of the OSPAR Maritime Area

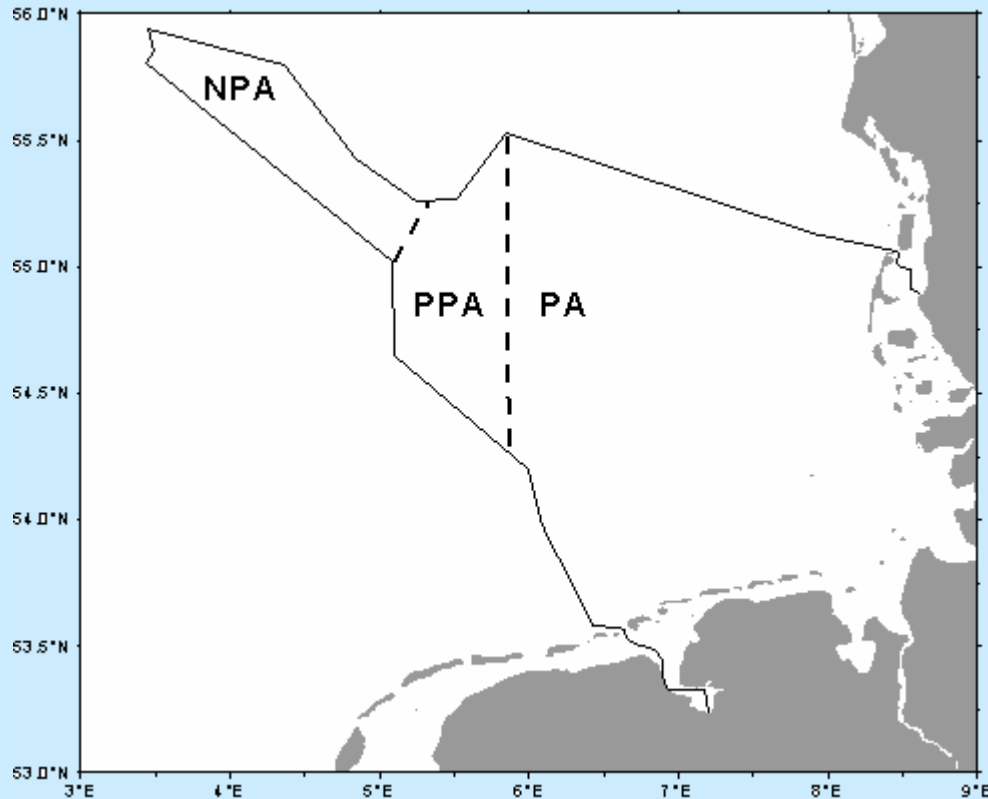
Contracting Parties concerned are invited to undertake their national comprehensive assessments of the eutrophication status of their waters taking into account the harmonised criteria during 2002.

Preparation of an overall report on the first harmonised assessment of the eutrophication status of the OSPAR maritime area for the OSPAR Ministerial Meeting in Bremen in June 2003.

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First Eutrophication Classification of the German Bight according to OSPAR



Classification of the German Part of the OSPAR Maritime Area:

- Problem Area (PA)
- Potential Problem Area (PPA)
- Non-Problem Area (NPA)

(cf. BROCKMANN et al. 2002)



The Source- and Target-Oriented Approach of the OSPAR Strategy to Combat Eutrophication

The Strategy comprises an integrated target- and source-oriented approach. The main elements of the target-oriented approach are as follows:

- **Evaluation of the situation in the maritime area that is expected following the implementation of agreed measures.**
- **Development, where possible, of an agreed procedure to derive ecological quality objectives aimed at avoiding harm to marine ecosystems.**
- **Development of appropriate assessment criteria (especially for non-problem areas) in the Common Procedure.**
- **Setting of intermediate targets, in order to work towards attaining such objectives.**



Current Status of Ecological Quality Objectives for the Greater North Sea with Regard to Eutrophication

The integrated set of EcoQOs for nutrients and eutrophication effects has been selected from the agreed common assessment criteria:

- Winter DIN & DIP concentrations
- Phytoplankton chlorophyll-a
- Phytoplankton indicator species
- Oxygen deficiency and
- Benthic communities (as effected by eutrophication)



The Integrated Set of EcoQOs with Regard to Eutrophication

- Winter DIN and DIP concentrations should remain below elevated levels (defined as $> 50\%$ above salinity related and/or region specific natural background concentration);
- Phytoplankton chlorophyll *a* (averaged over the growing season and the salinity range) should remain below elevated levels;
- Eutrophication indicator phytoplankton species, specific to the region or area, should remain below nuisance or potentially toxic levels (and increased duration);
- Oxygen concentration (after following for any decrease as an indirect effect of nutrient enrichment) should remain above a region-specific level (e.g in the range of 4 - 6 mg O₂/L);
- There should be no kills in benthic and fish species as a result of eutrophication related oxygen deficiency.



Use of the EcoQOs with Regard to Eutrophication

- **The outcome of the Common Procedure gives an impression of how far the set of EcoQOs with regard to eutrophication is met for the OSPAR Convention Area.**
- **This result also shows to what extent the overall objective of the OSPAR Strategy to Combat Eutrophication is met and will be met by 2010.**

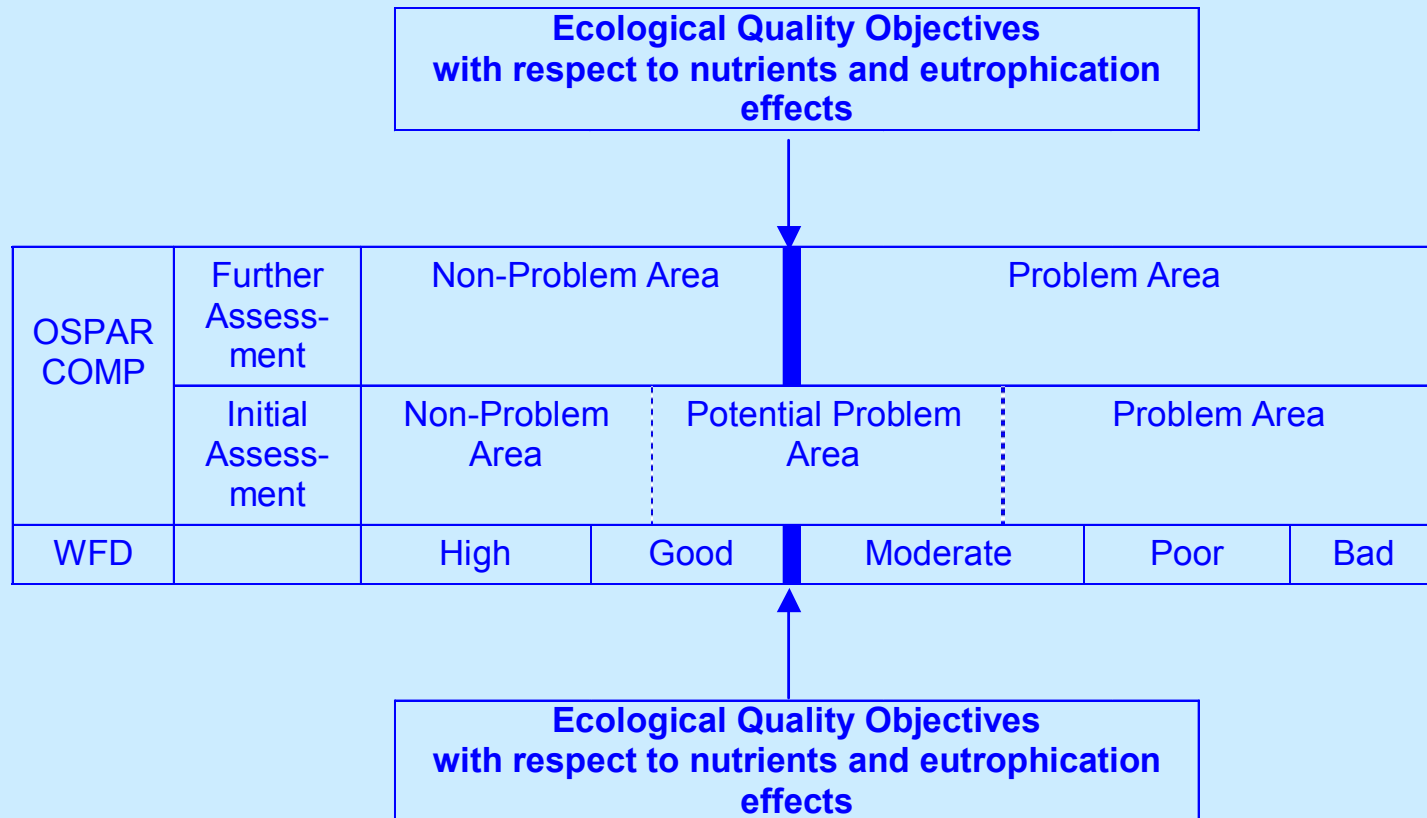


Future Work Related to EcoQOs

- The overall general ecological objective is to achieve by the year 2010 a healthy marine environment where eutrophication does not occur.
- Therefore for the currently proposed integrated set of EcoQOs a conceptual framework has to be developed for their use and implementation in the context of the OSPAR Strategy to Combat Eutrophication.
- During this process the interlink with the classification within the EU WFD has to be considered.



Integration of the OSPAR Common Procedure and the EU-WFD with Respect to Eutrophication



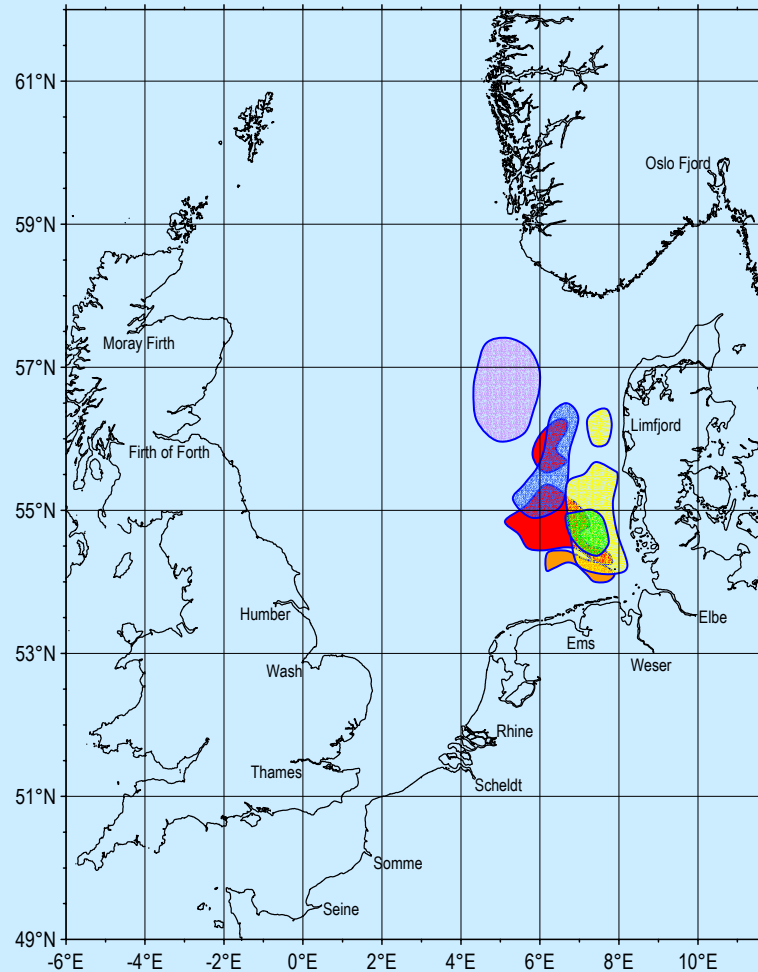
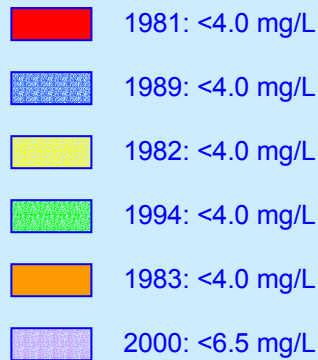
Outlook

- Preparation of the first harmonised assessment report of the Eutrophication Status of the OSPAR Maritime Area according to the Comprehensive Procedure and based on national reports
- Adjustment of the Eutrophication Assessment of OSPAR and the EU-WFD
- Implementation of the OSPAR Strategy to Combat Eutrophication and the EU-WFD

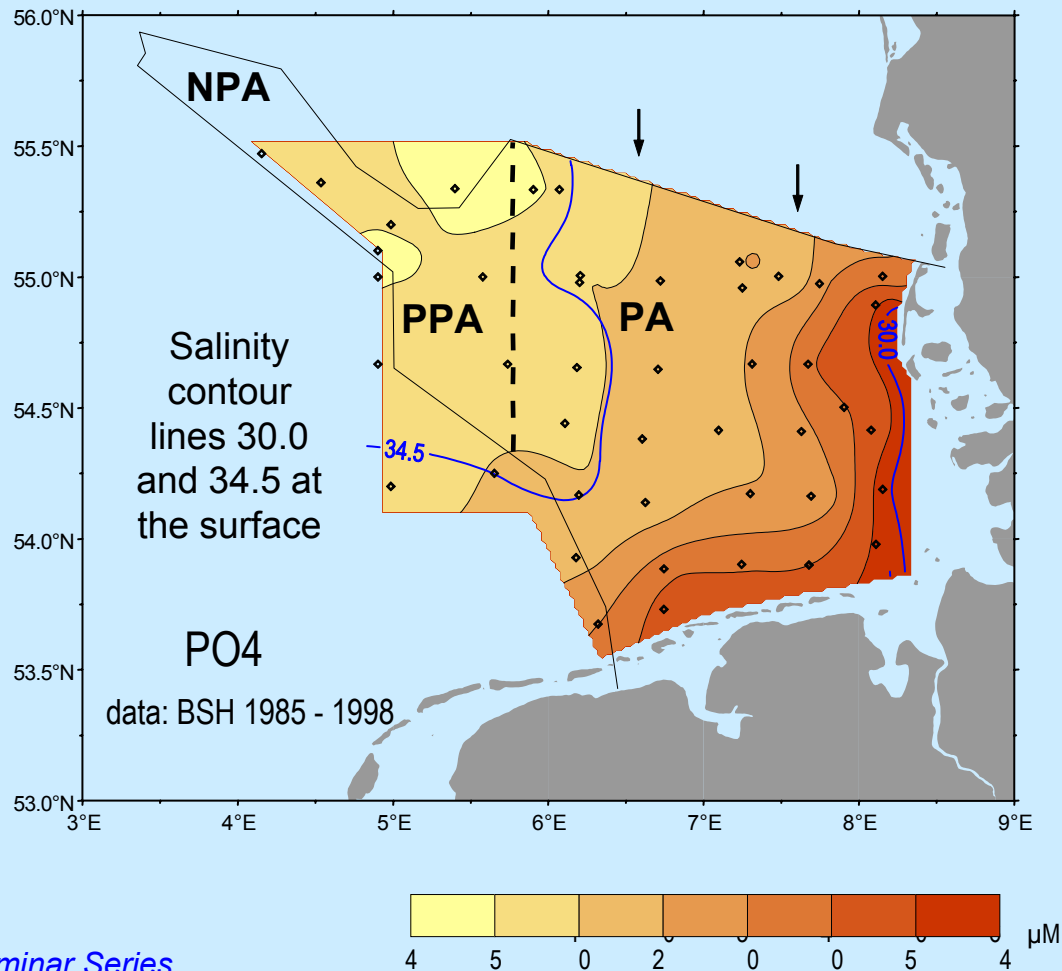


Areas with Oxygen Deficiency in the North Sea

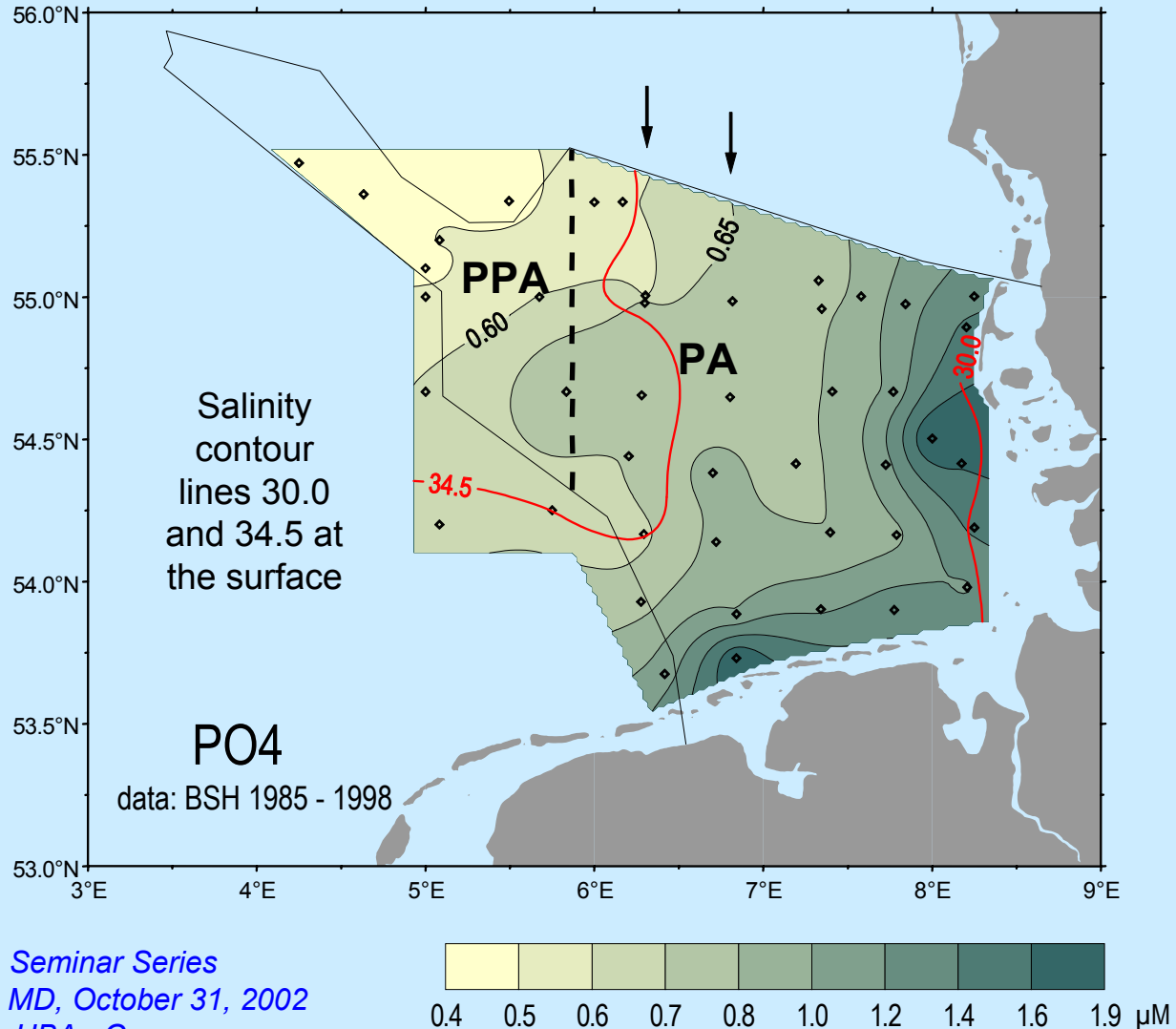
Occasional Observations by German Research Vessels since 1981



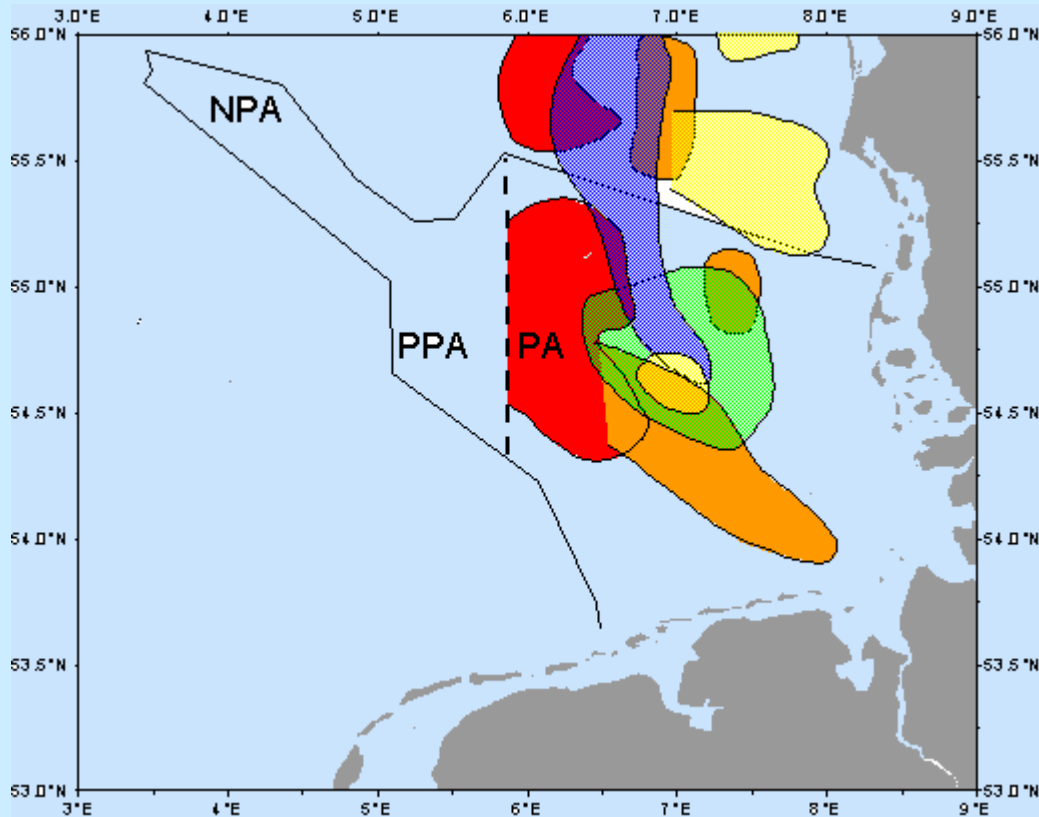
Classification of the German OSPAR Maritime Area (DIN)



Classification of the German OSPAR Maritime Area (PO_4)

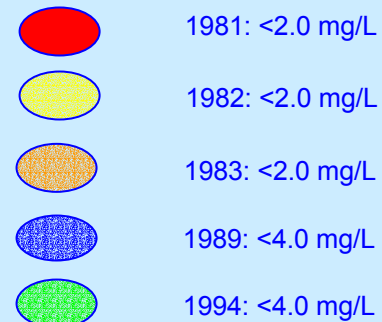


Classification of the German OSPAR Maritime Area (Oxygen)



Classification of German territorial waters into:

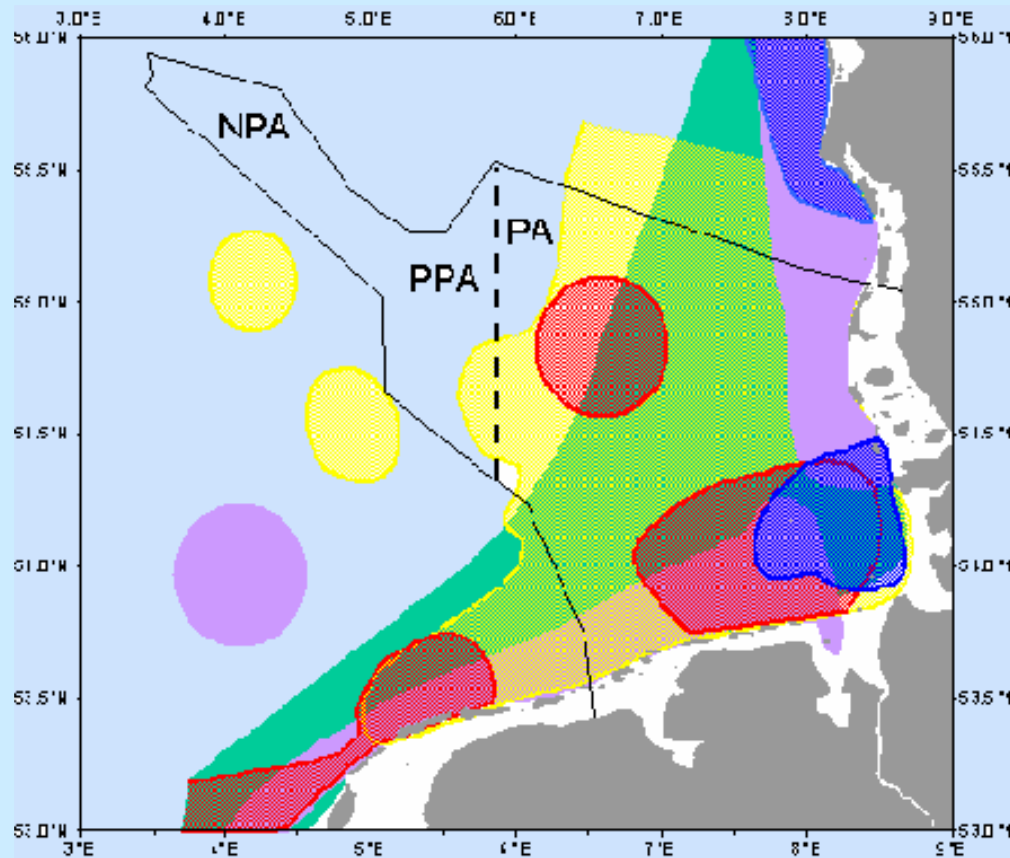
- Problem Areas (PA)
- Potential Problem Areas (PPA)
- Non-Problem Areas



Since 1981 eventually observed oxygen depletion in the bottom water



Classification of the German OSPAR Maritime Area (Phytoplankton)



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