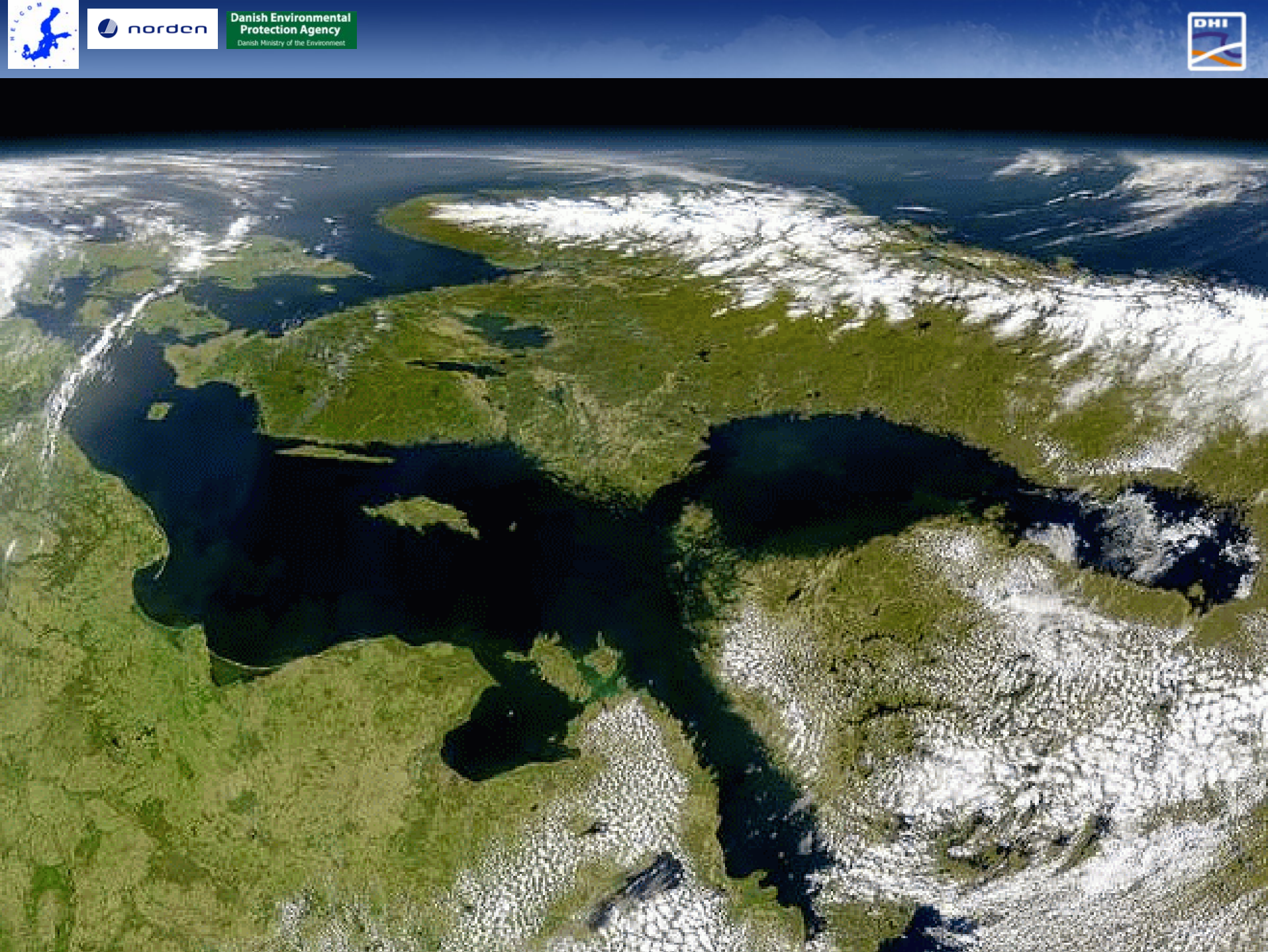
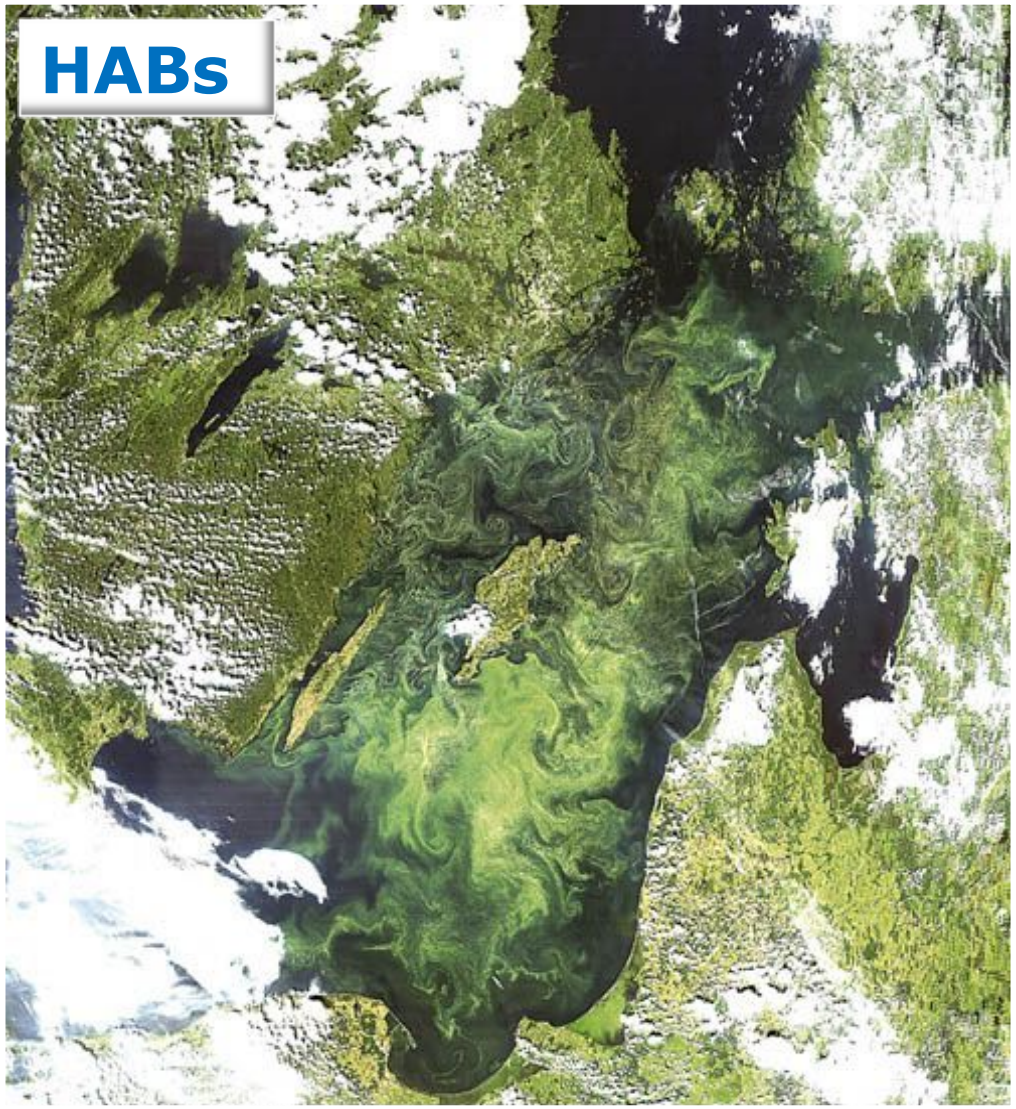

HELCOM
norden
Danish Environmental Protection Agency
Danish Ministry of the Environment
DHI

Eutrophication – at the surface

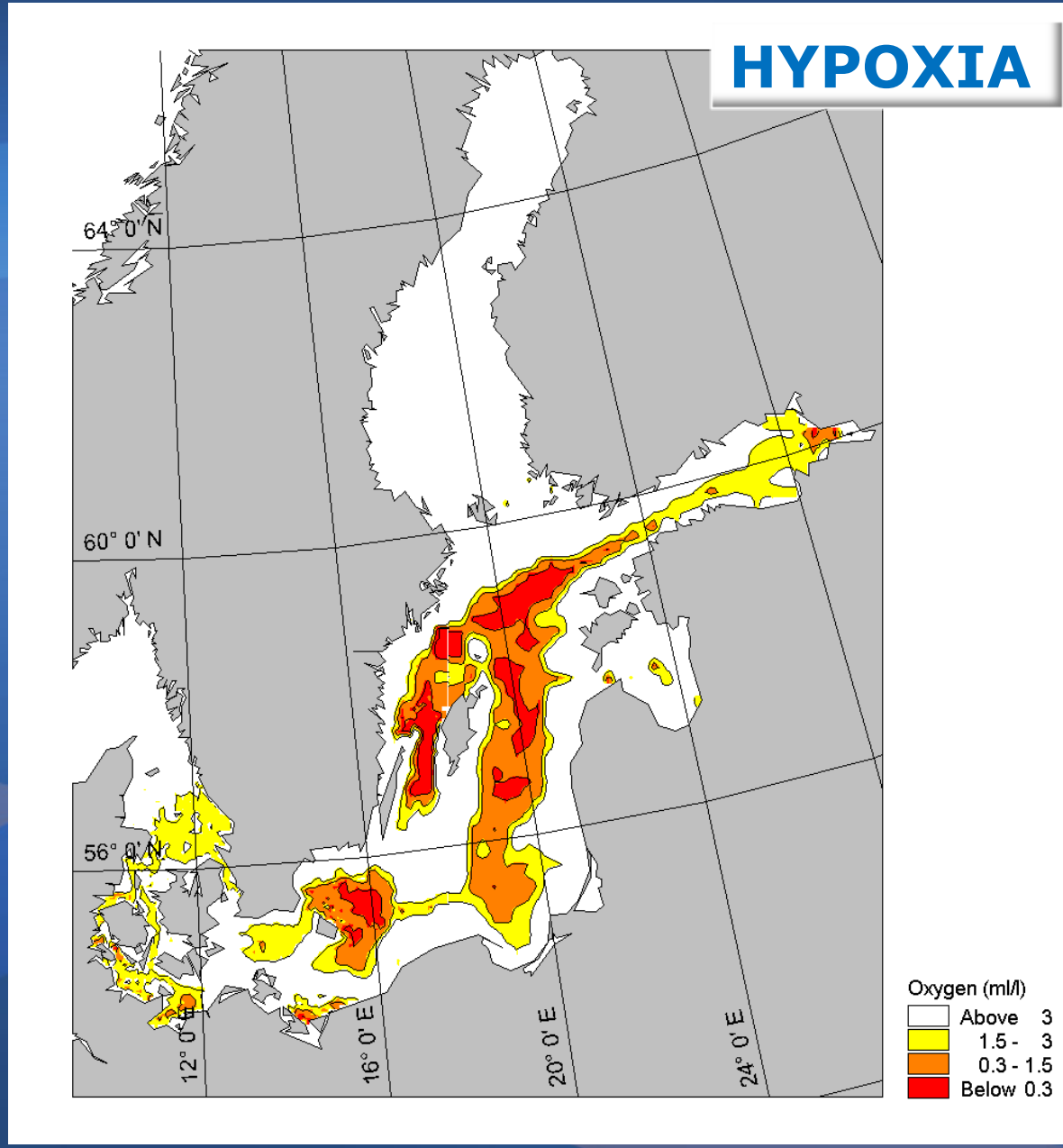


Sources:
NOAA (satellite image)
and HELCOM (2009)

Eutrophication – below the surface

Sources:

Sehested Hansen et al. (2007) and HELCOM (2009)



Eutrophication in the Baltic Sea:

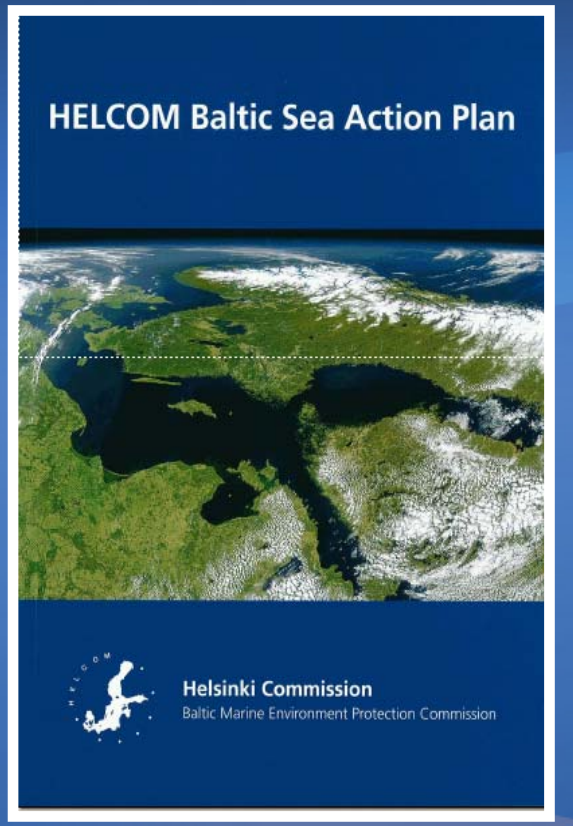
Status assessment, confidence assessment and perspectives

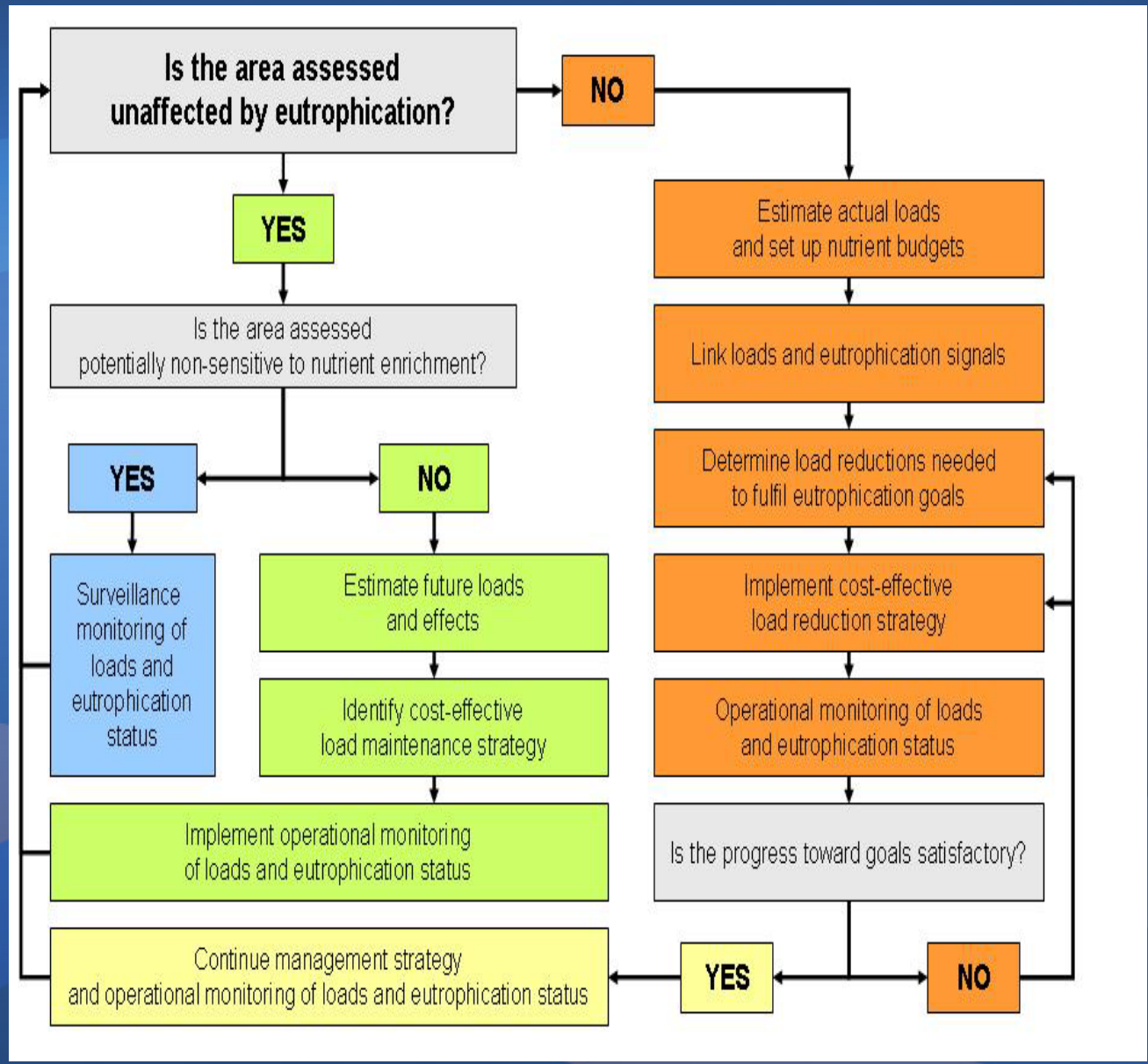
Jesper H. Andersen, DHI

HELCOM EUTRO-PRO project manager

4th HELCOM Stakeholder Conference, 3 Mach 2009, Helsinki, Finland

The Baltic Sea Action Plan 2007





Sources:
HELCOM (2007) and HELCOM (2009)

HELCOM EUTRO and HELCOM EUTRO-PRO

- Linked to HELCOM BSAP and HELCOM's Monitoring and Assessment Strategy
- An important component of the Adaptive Management Cycle
- The work has been funded by:
  - HELCOM
  - Danish Environmental Protection Agency
  - Danish Spatial and Environmental Planning Agency
  - Nordic Council of Ministers
  - DHI Water • Environment • Health

- The following persons have contributed to the HELCOM EUTRO and HELCOM EUTRO-PRO activities:
  - Juris Aigars, Philip Axe, Mats Blomqvist, Uwe Brockmann, Jacob Carstensen, Uli Claussen, David Connor, Jan Ekebom, Anders Erichsen, Peter Henriksen, Bertil Håkansson, Vivi Fleming-Lehtinen, Jens Brøgger Jensen, Marko Järvinen, Hermanni Kaartokallio, Henning Karup, Samuli Korpinen, Aiste Kubiliute, Pirjo Kuuppo, Maria Laamanen, Ela Łysiak-Pastuszak, Juha-Markku Leppänen, Georg Martin, Ciarán Murray, Flemming Møhlenberg, Bärbel Müller-Karulis, Samuli Neuvonen, Tonny Niilonen, Alf Norkko, Günther Nausch, Heikki Pitkänen, Johnny Reker, Tuija Ruoho-Airola, Roger Sedin, Camilla Trolle, Anna Villnäs, Norbert Wasmund, Fred Wulff & Gunni Ærtebjerg

What are we talking about?

… a few words about:
Definitions,
causes,
direct signals, and
indirect signals

Definition ...

Eutrophication (noun):

An increase in the supply of organic matter (Nixon, 1995)

Causes:

- nutrient enrichment (N, P, organic matter)

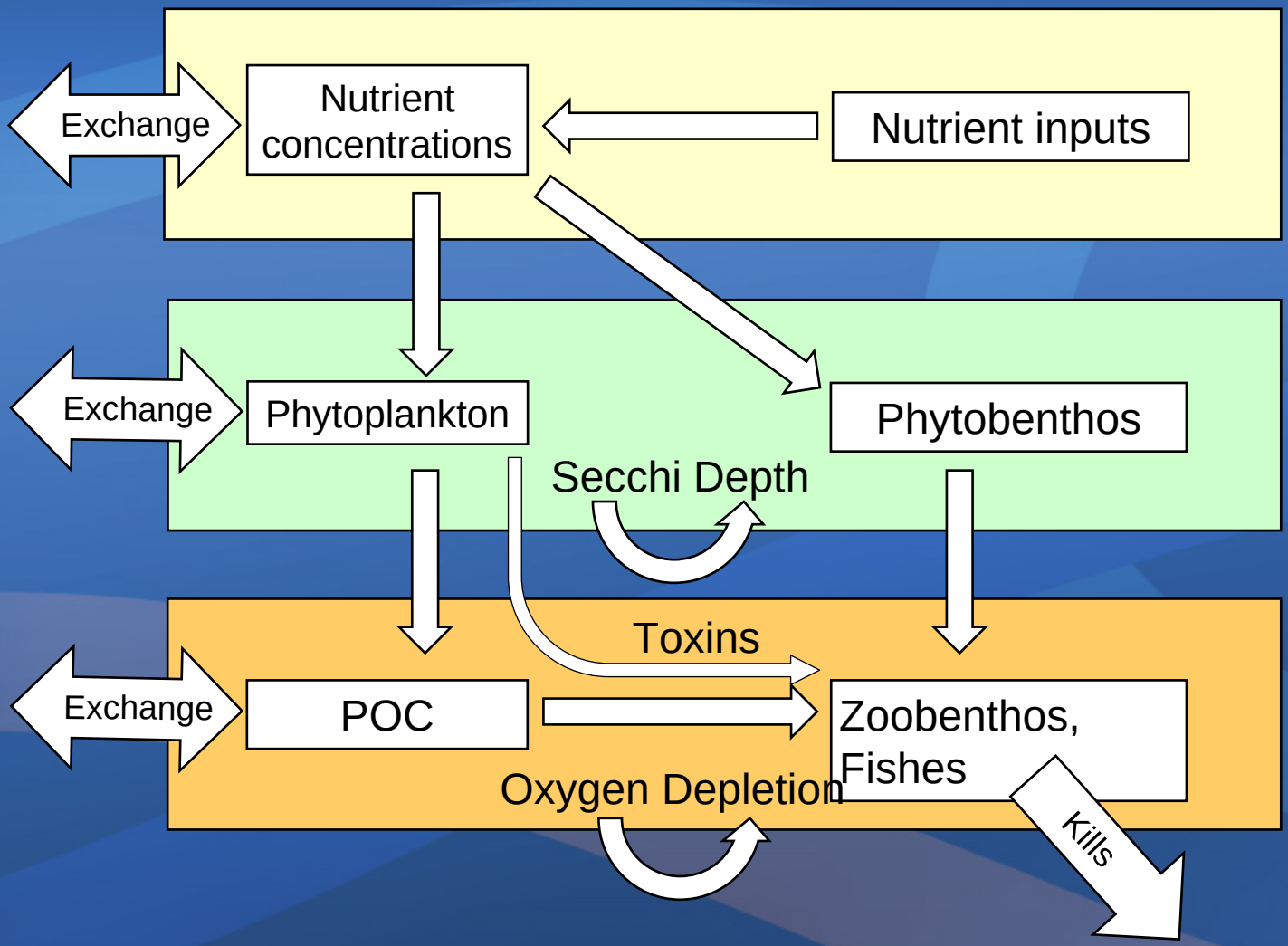
Direct effects:

- accelerated growth of algae and macrophytes

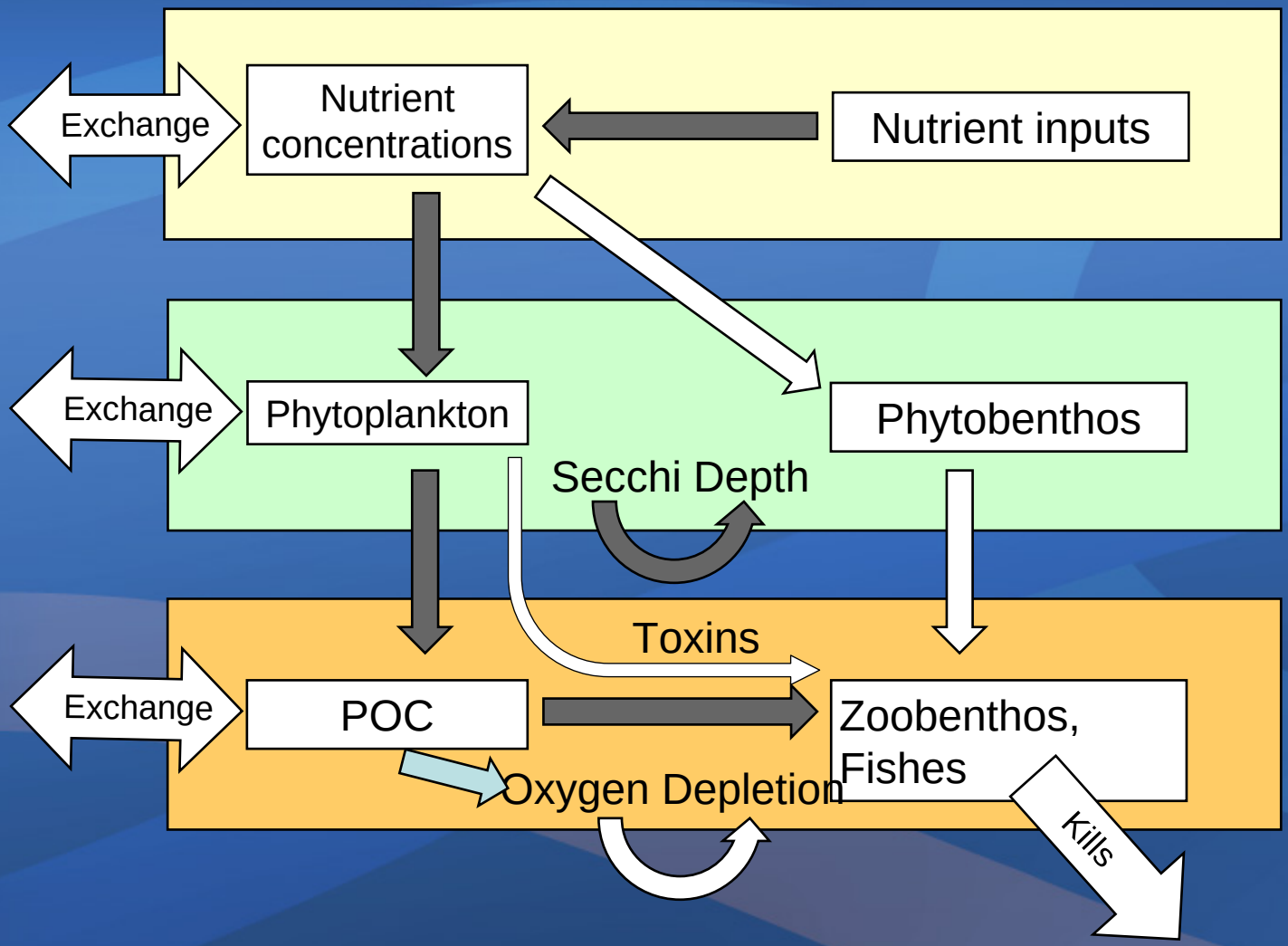
Indirect effects:

- undesirable disturbance of ecosystems (composition of flora & fauna, death of fish and other species by oxygen depletion & toxins)

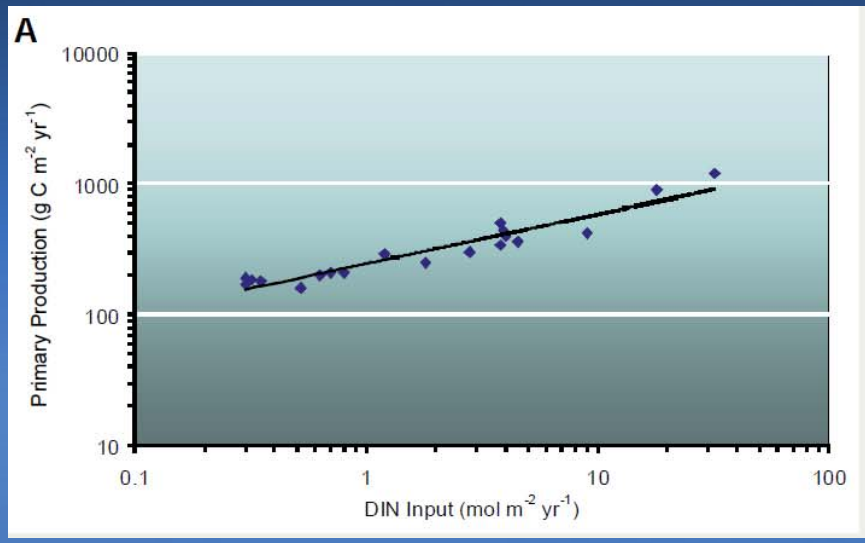
Eutrophication processes

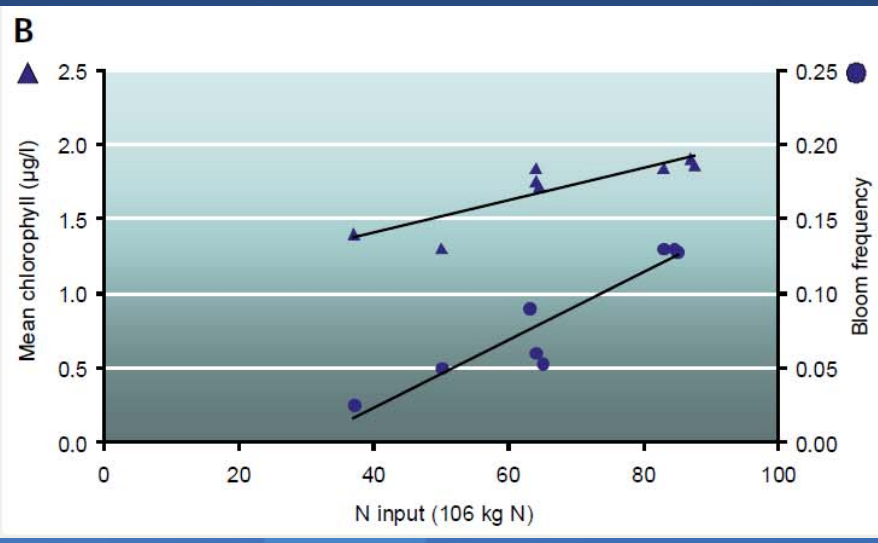


Eutrophication effects



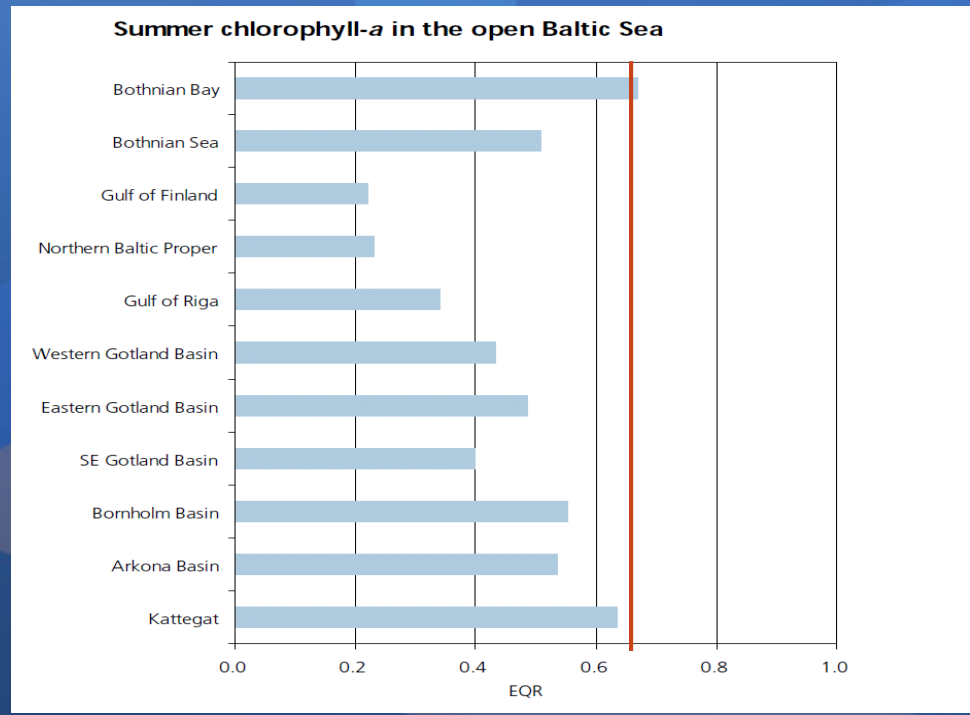
Direct signals



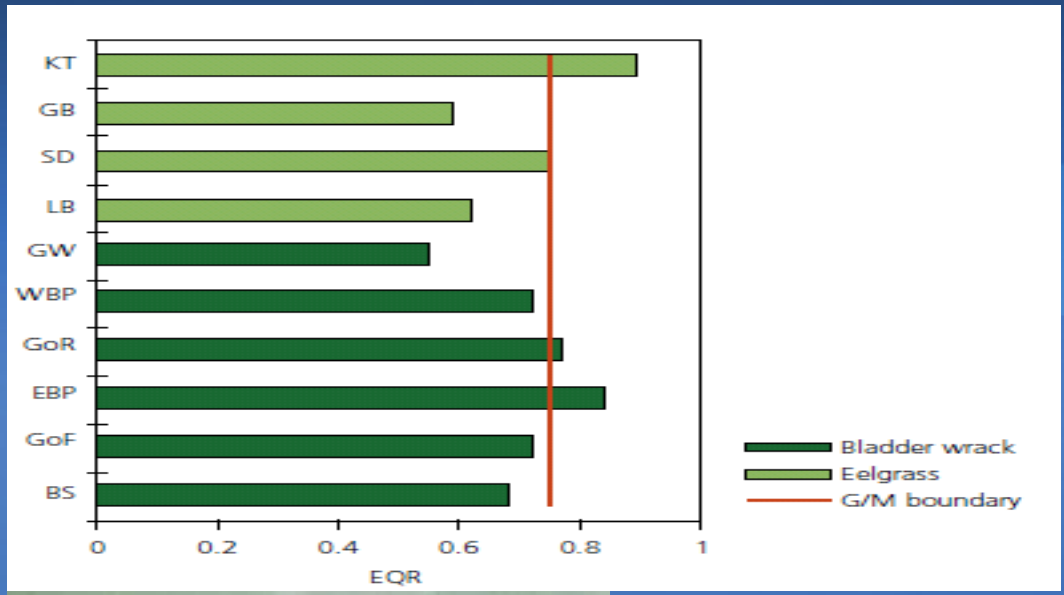


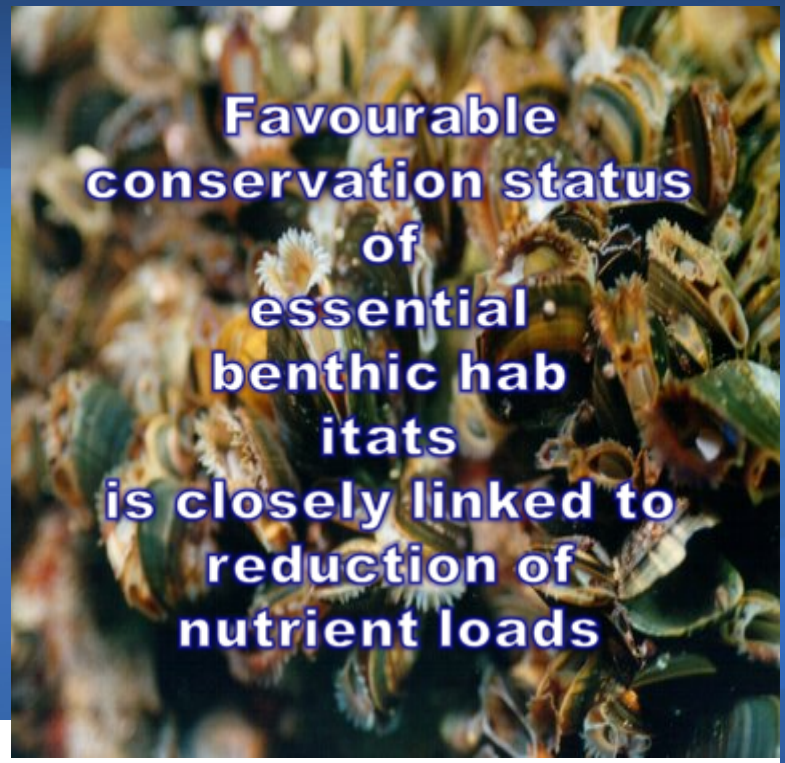
Alleviation of eutrophication requires a balanced and strategic apparoach to control both nitrogen and phosphorus appropriately

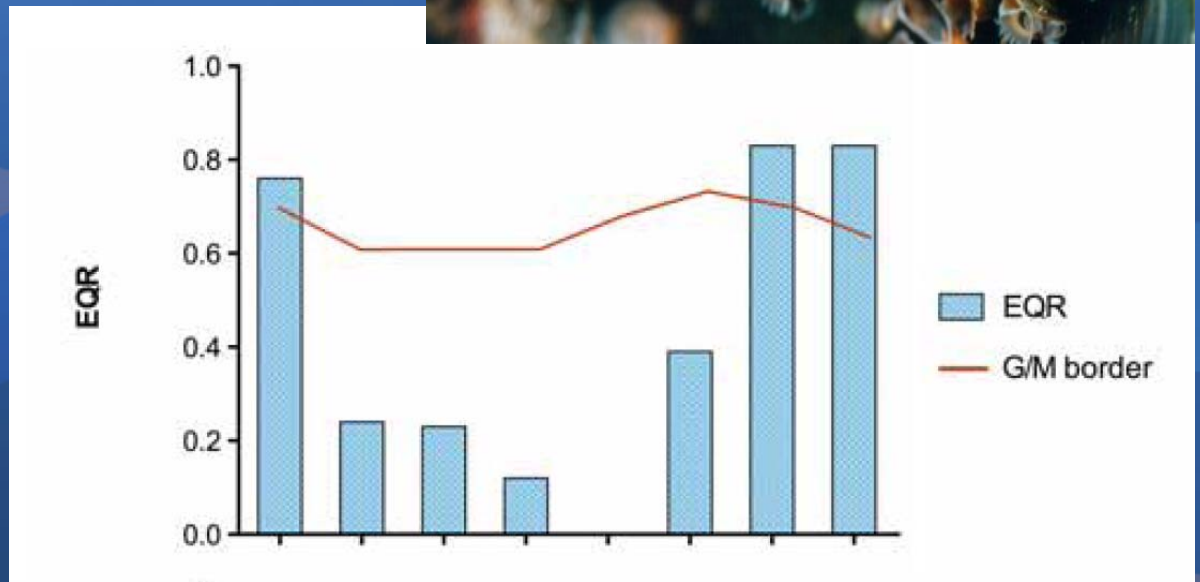
HELCOM (2009) and Conley et al. (2009)



Indirect signals







Causes

Table 5.1 Waterborne inputs of nitrogen and phosphorus to the Baltic Sea in 2006.

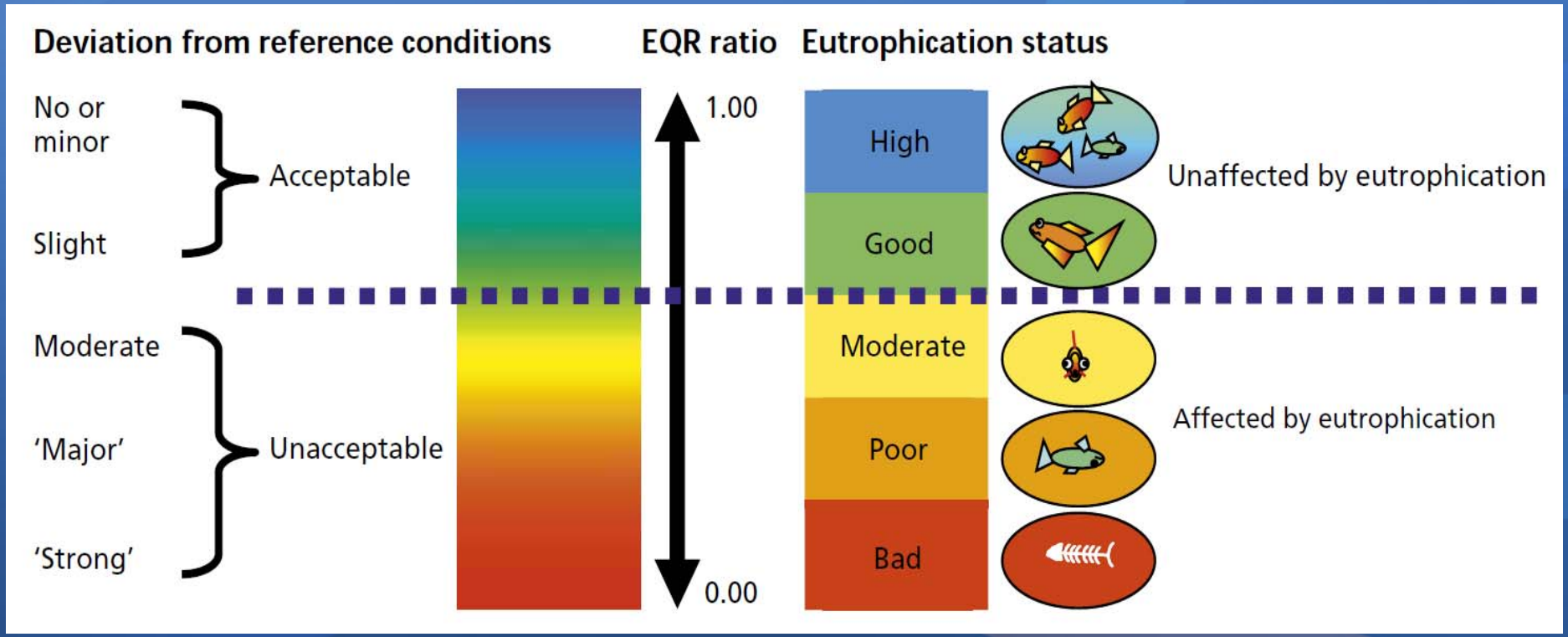
	Area	TN	TN load/area	TP	TP load/area
		t	t km^{-2}	t	t km^{-2}
1	Gulf of Bothnia	109,069	0.94	4,612	0.04
2	Gulf of Finland	129,671	4.38	5,006	0.17
3	Gulf of Riga	58,417	3.58	2,659	0.16
4	Baltic Proper	227,838	1.03	12,875	0.06
5	Danish Straits	102,395	2.41	2,835	0.07
	Total	**627,390**	–	**27,987**	–

Linking it all together

… from indicators
to
indicator-based assessment and classification of eutrophication status

HELCOM's eutrophication assessment

1. Assess the eutrophication status in the whole Baltic Sea on the basis of a harmonized approach
2. The above is not trivial, since we have to link the HELCOM BSAP (open waters) and the EU WFD (coastal waters)



Source: HELCOM (2009)

The HELCOM Eutrophication Assessment Tool

The HEAT is on:

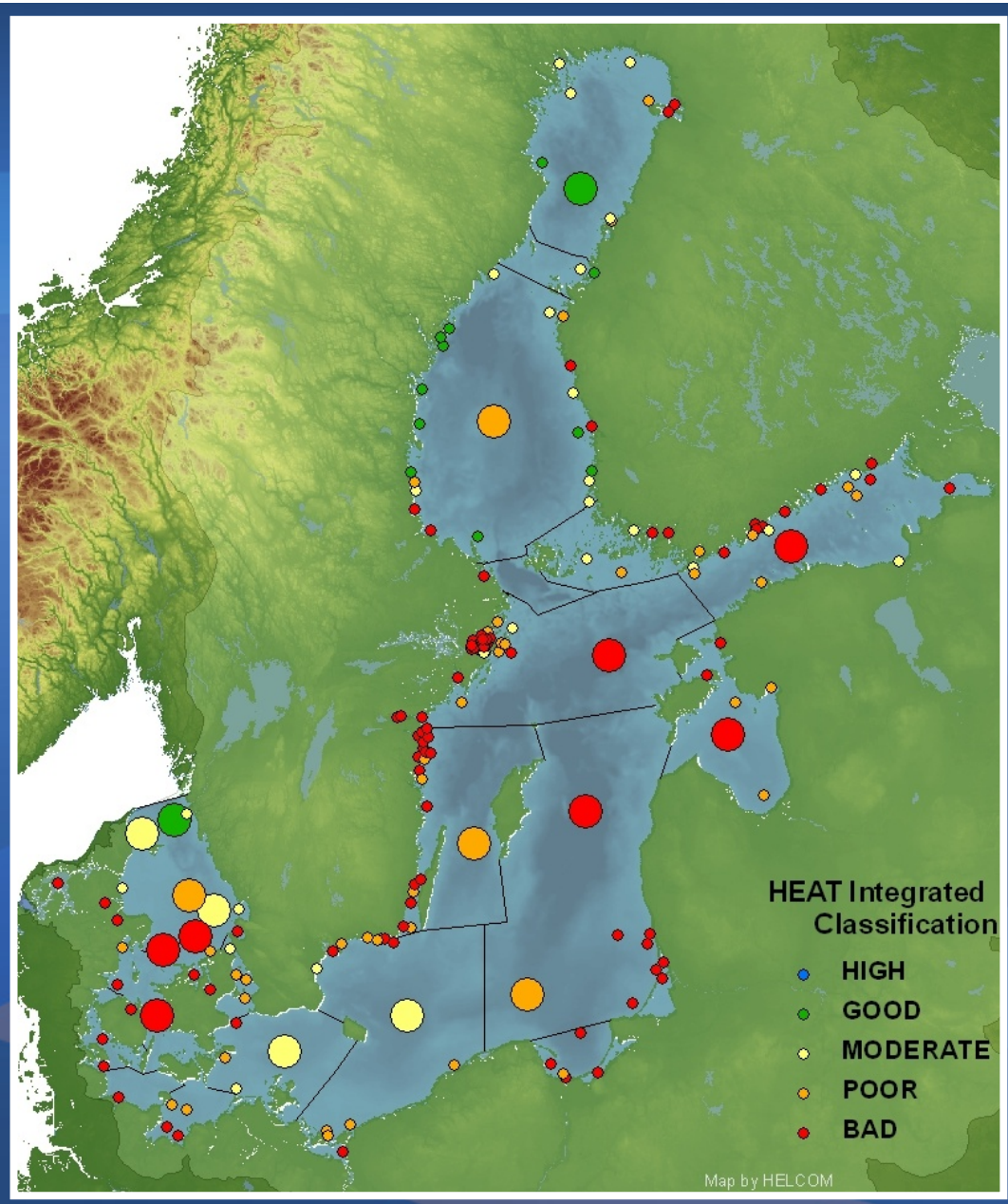
- Based on **RefCon** and definition of acceptable deviation (**AcDev**) and actual status (**AcStat**) *sensu* the WFD
- Results are expressed as a **Ecological Quality Ratio** (EQR = the ratio between **RefCon** and **AcStat**)
- Different **AcDev**`s can be used, but **50%, 25%** and **Baltic WFD GIG** derived values are normally used, the latter for coastal waters
- **Quality Elements** *sensu* the WFD
- The **"One out - All out"** principle is used correctly *sensu* the WFD
- 5 classes (**high**, **good**, **moderate**, **poor** and **bad**) *sensu* the WFD
- Interim 'Confidence assessment' by scoring and weighting of **RefCon**, **AcDev** and **AcStat**

HEAT – an example, one out of 189

- **Odense Fjord, the Danish case study for the WFD Pilot River Basin Management Plans**

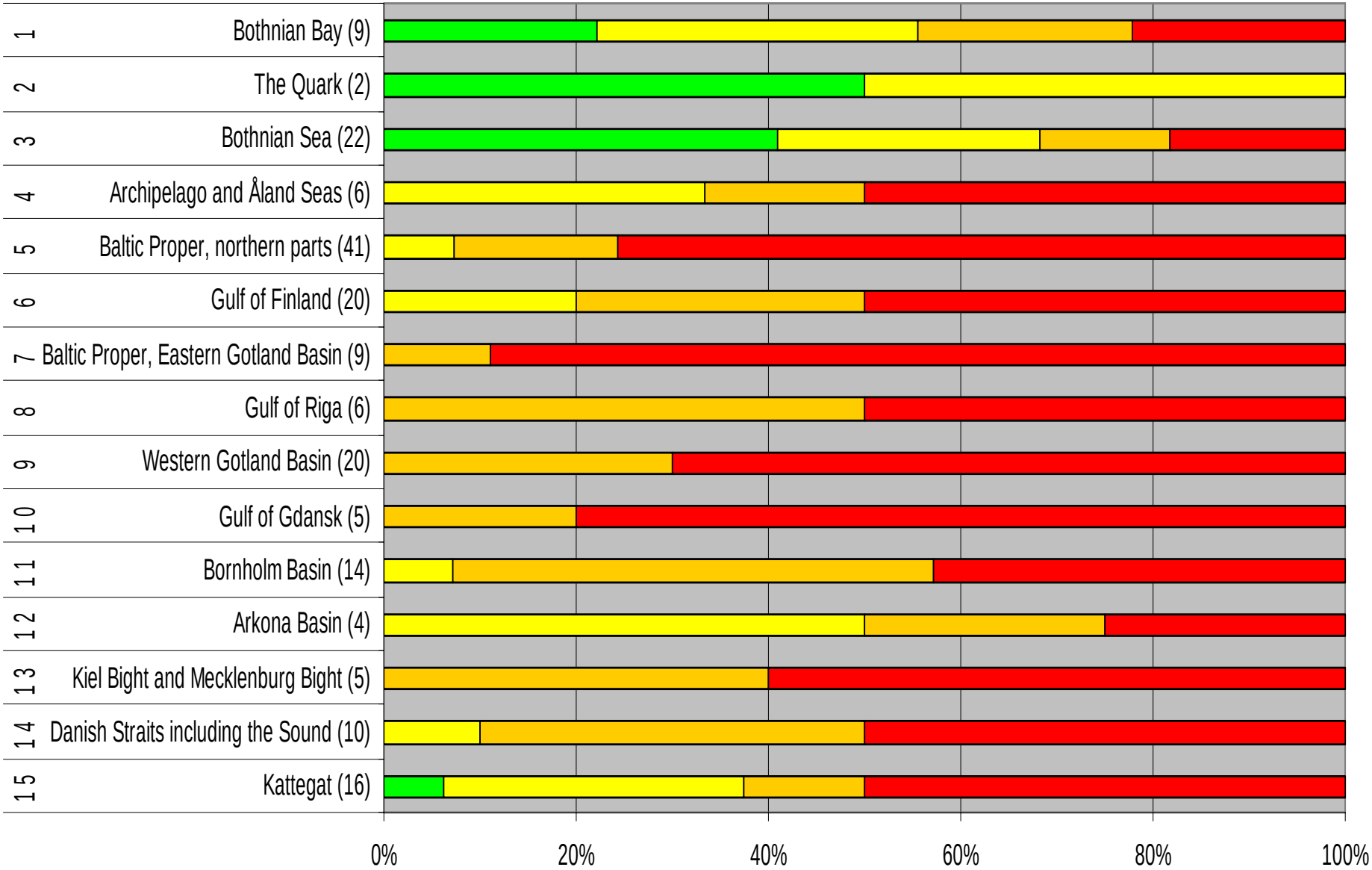
HEAT – final classifications (2001-2006)

- **189 areas:**
  - **17 open basins**
  - **172 coastal areas**
- **Unaffected by eutrophication (13):**
  - **2 open basins**
  - **11 coastal areas**
- **Affected by eutrophication (176):**
  - **15 open basins**
  - **161 coastal areas**



Source: HELCOM (2009)

HEAT - basin-wise summary of classifications



Source: HELCOM (2009)

So far so good…

… but can we trust our Baltic Sea-wide classification of eutrophication status?

…let’s check it out!

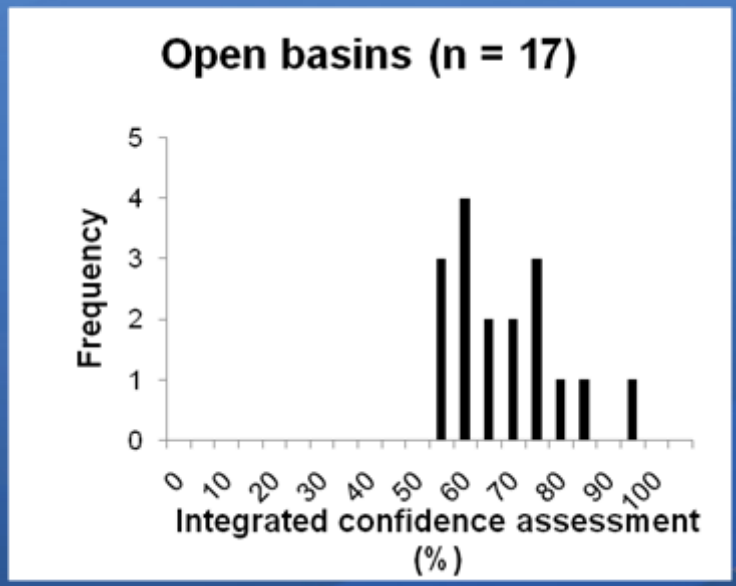
Principles for interim confidence assessment

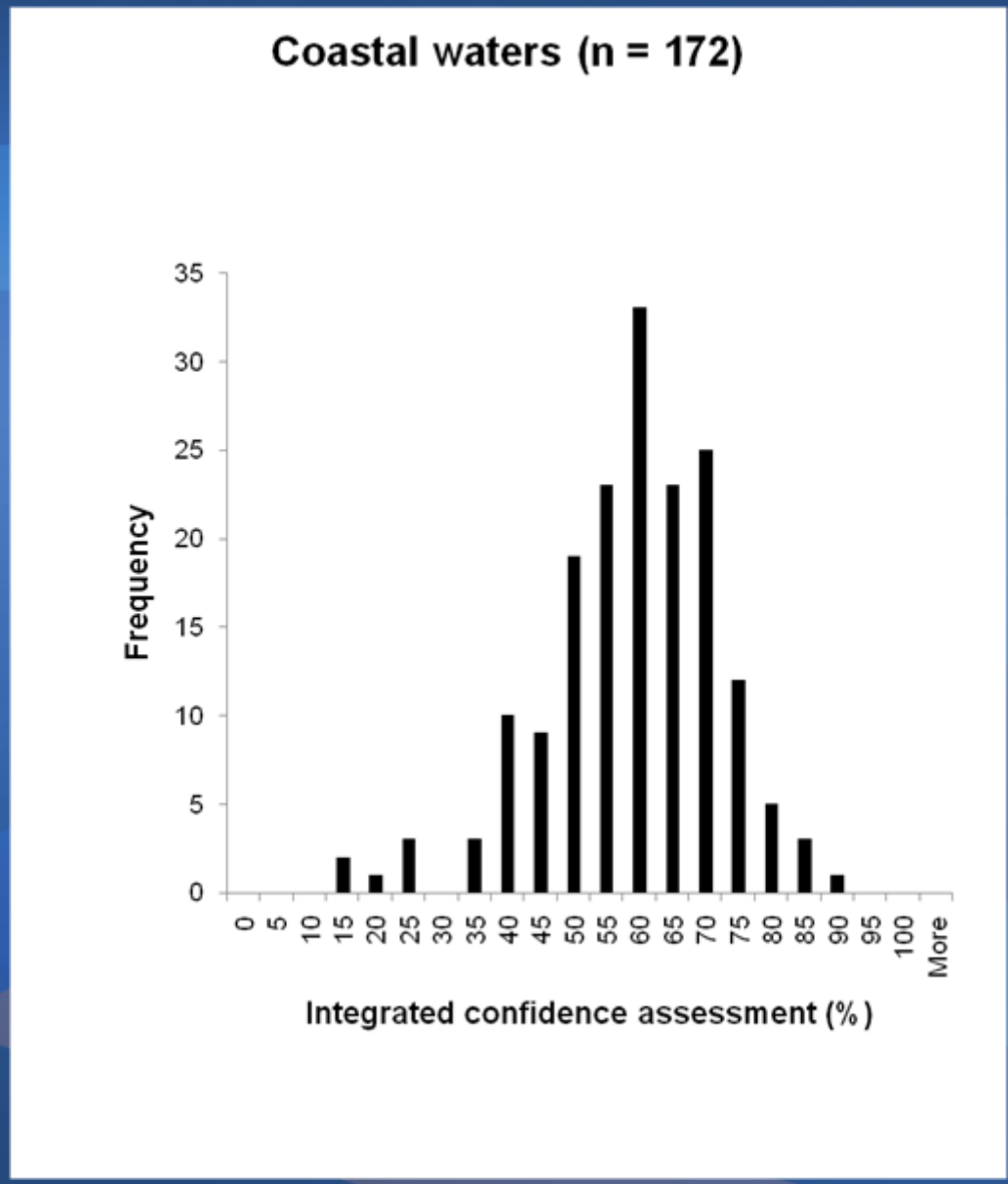
- Originating from the NMR CONFIRM project
- Based on scoring of indicators
- RefCon, AcDev, and AcStat, are scored with respect to:
  - extraordinary quality
  - acceptable quality
  - poor quality

  } 'indicator confidence'
- 'Indicator confidence' is combined per quality element
- Quality elements are combined into a interim 'confidence assessment':
  - Class I = 100-75% = extraordinary quality
  - Class II = 75-50% = acceptable quality
  - Class III = 50-0% = poor quality

Source: Andersen et al. (in prep.)

HEAT – interim confidence assessment (1/3)



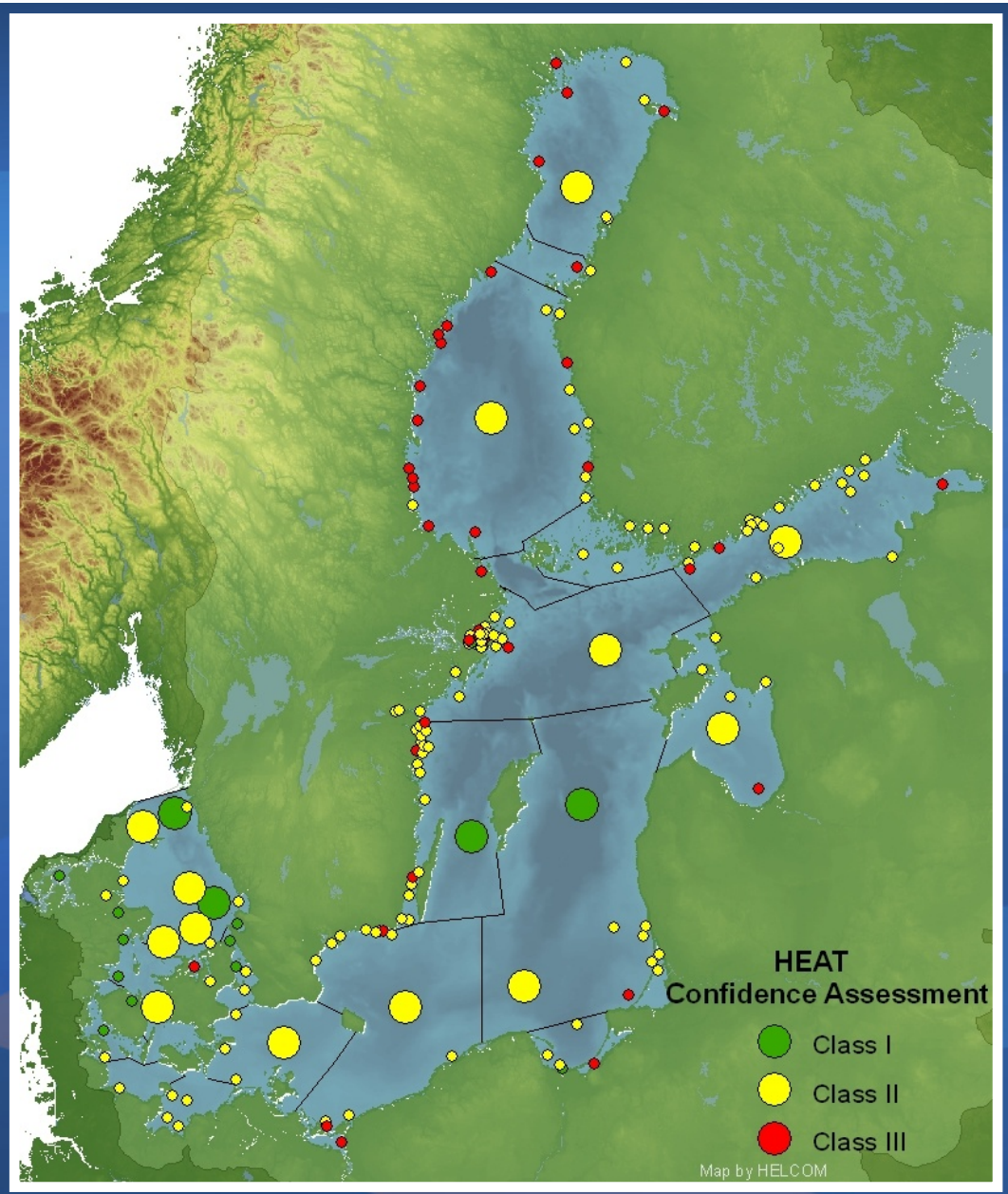


Source: Andersen et al. (in prep.)

HEAT – interim confidence assessment (2/3)

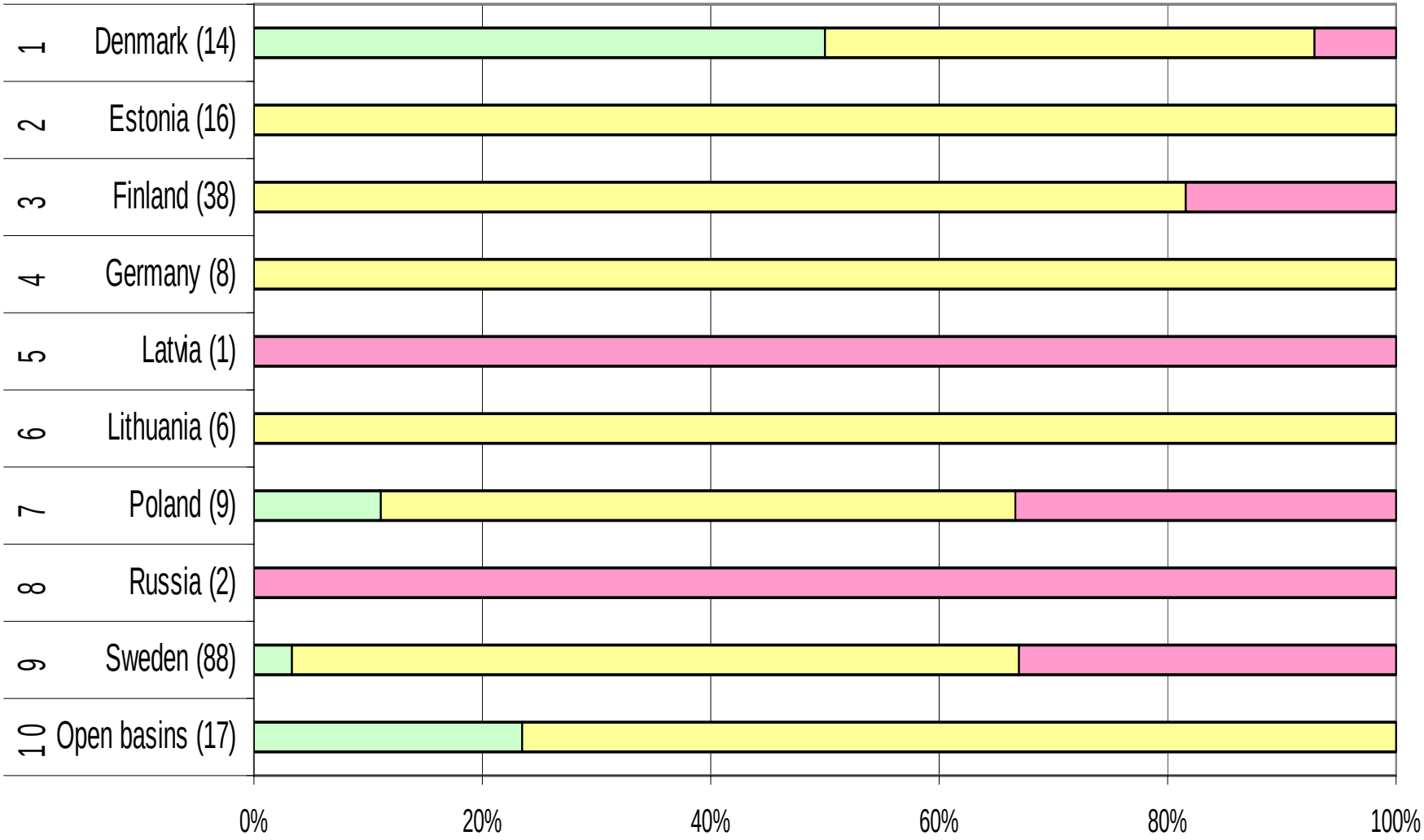
189 areas:

- **Class I (green):**
  - **4 open basins**
  - **11 coastal waters**
- **Class II (yellow):**
  - **13 open basins**
  - **117 coastal waters**
- **Class III (red):**
  - **0 open basins**
  - **43 coastal waters**



Source: Andersen et al. (in prep.)

HEAT – interim confidence assessment (3/3)



Source: HELCOM (2009)

YES WE CAN

… we can rely on our Baltic Sea-wide classification of eutrophication status

What is it good for?

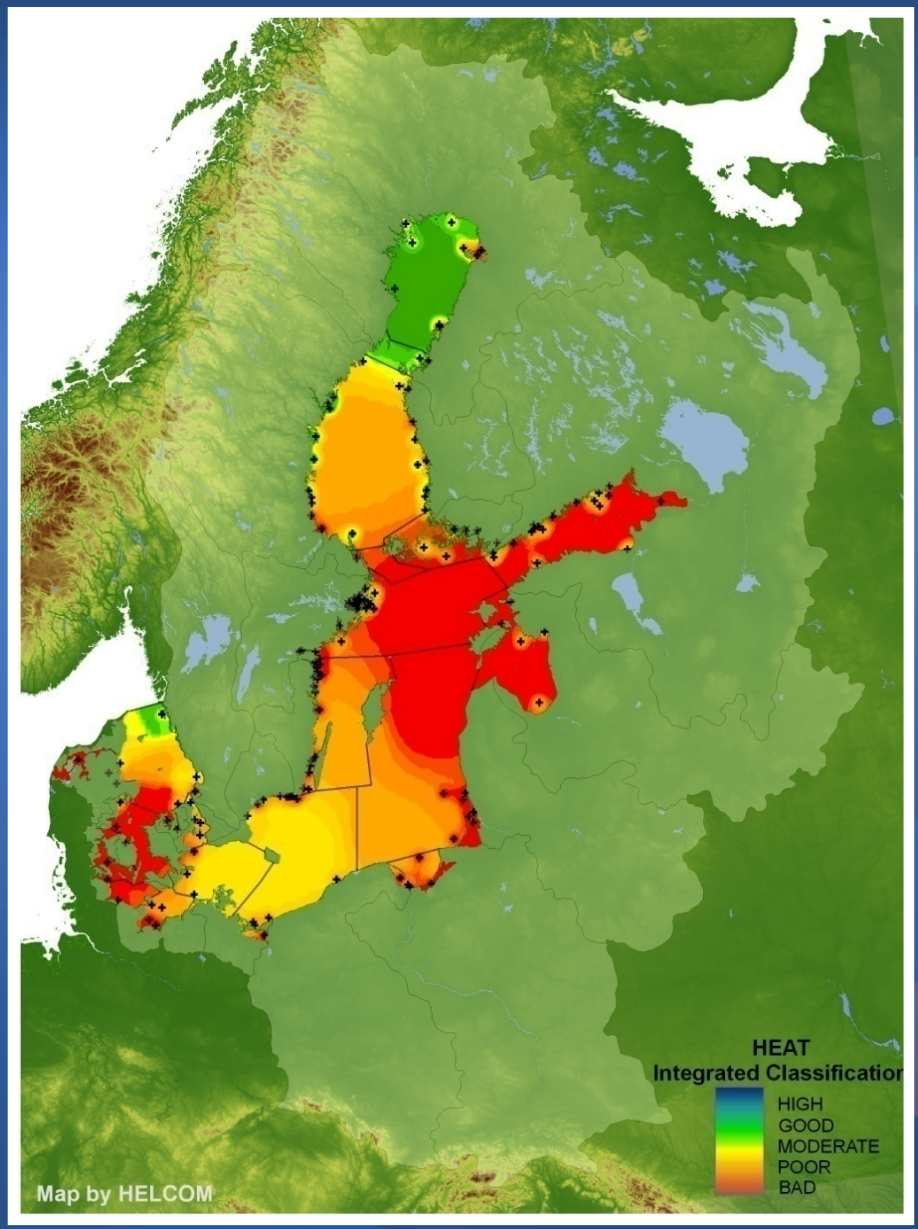
Key messages

- **Most parts of the Baltic Sea are affected by eutrophication (2001-2006)**
- **The Baltic Sea Nutrient Management Strategy (BSAP) is based on Adaptive Management and includes both nitrogen and phosphorus:**

  Do we have a problem? ► Plan ► Act ► Check ► Evaluate

- **Assessment(s) should always make use of an assessment tool (e.g. HEAT) and be accompanied by an assessment of 'confidence'**
- **HELCOM can use the results for:**
  - **The up-coming Holistic Assessment of the environmental status of the Baltic Sea**
  - **The planned revision of the eutrophication segment of the HELCOM Baltic Sea Action Plan**
  - **Development and publication of new indicator fact sheets (e.g. aquatic vegetation, benthic animals, HEAT, etc.)**
- **Other parties:**
  - **EU: Compliance checking of UWWTD, ND, WFD…**

Links to the European UWWTD and ND…



UWWTD:

- An "eutrophication" directive
- Identification of "Sensitive Waters" (2 approaches)
- European Court of Justice Case C-280/02 (2004)
- Any links/common grounds between HELCOM results and the above ECJ case?

ND:

- An "eutrophication from nitrates" directive
- Identification of "Vulnerable Zones" (2 approaches)
- European Court of Justice Case C-322/00 (2003)
- Any links/common ground between HELCOM results and the above ECJ case?

Sources: HELCOM (2009), ECJ (2003) and ECJ (2004)

That's is about it...

... thank you for your attention

Any tricky questions?