

Problems in biodiversity-based ecological status assessment

lessons learned from WFD

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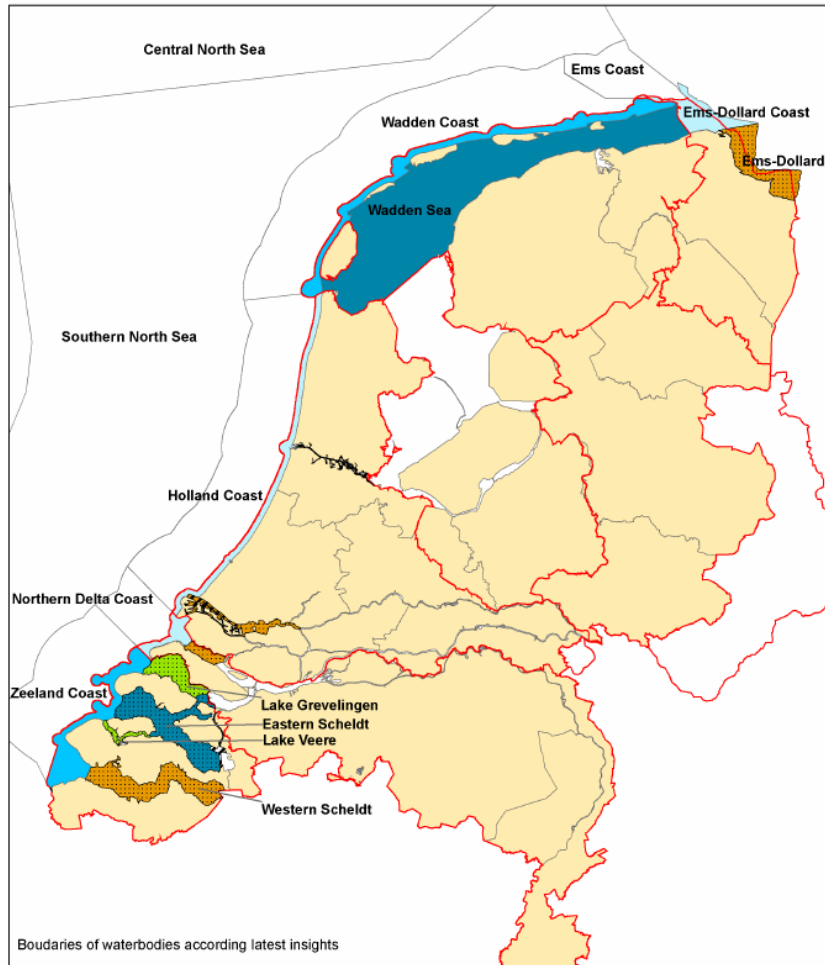
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Key statements:

- ‘Ecological quality’ is *multiscale*. There is not a single reference for ‘good quality’
- In Europe’s strongly impacted waters, observable reference states are rare or absent and the monitoring methodology should acknowledge this
- *Differentiated* protection is more useful for improving sustainability than absolute protection in just a few small areas
- European policy should identify *scale mismatches* between problem and solution, and offer European-scale solutions instead of local punishment where appropriate

WFD – macrobenthos status in Dutch estuarine and coastal waters



WFD Coastal & Transitional waters for this study

Estuaries:

Westerschelde

Ems

Coastal lagoon:

Waddenzee

Semi-enclosed sea-arm:

Oosterschelde

Marine lake:

Grevelingen

Brackish lake:

Veere

Indented coastline:

Southern coast

Wadden coast

Sandy coastline:

Holland coast

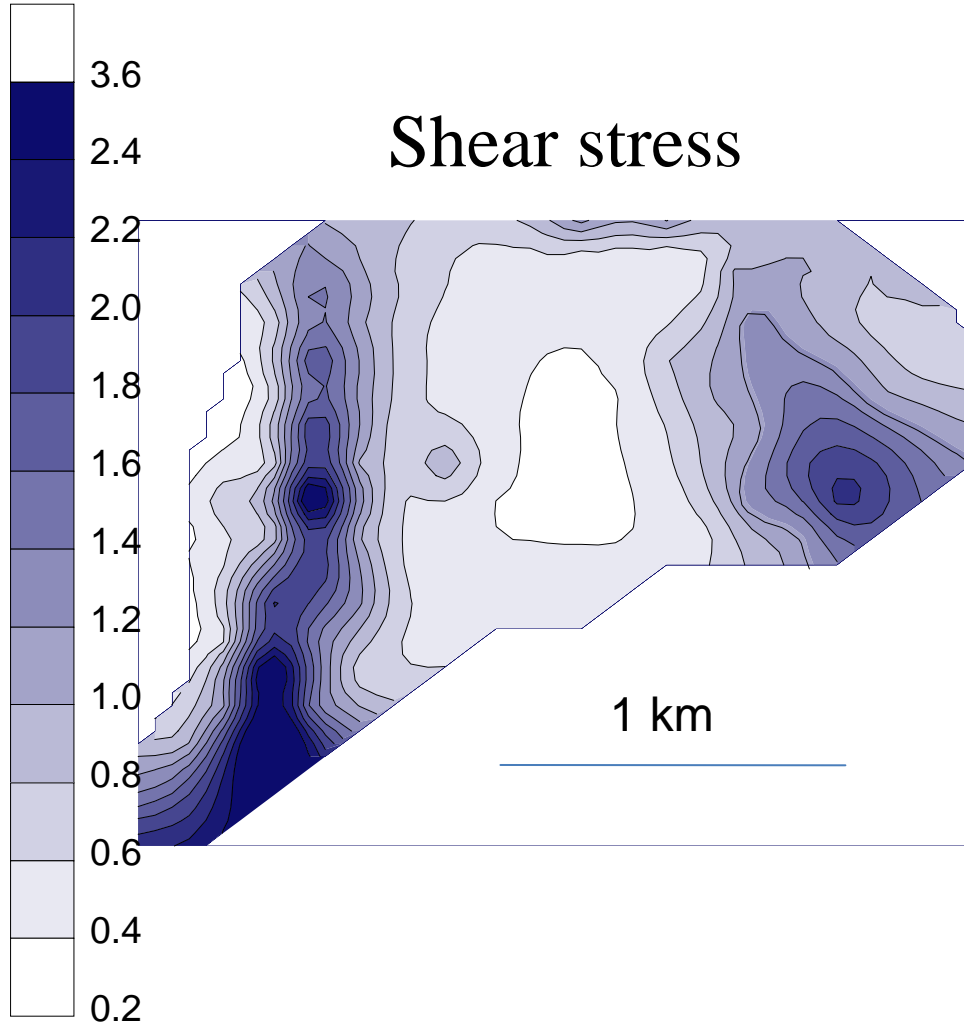
Multiscale indicator

- What do you want to conserve in an estuary?
 - Ecosystem *function* of macrobenthos
 - Diversity of habitat types
 - Species diversity within habitat types
 - (Genetic diversity)
- Several *scales* are important: estuary, habitats, within-habitats
- -> Danger of using a single 'quality estimator'

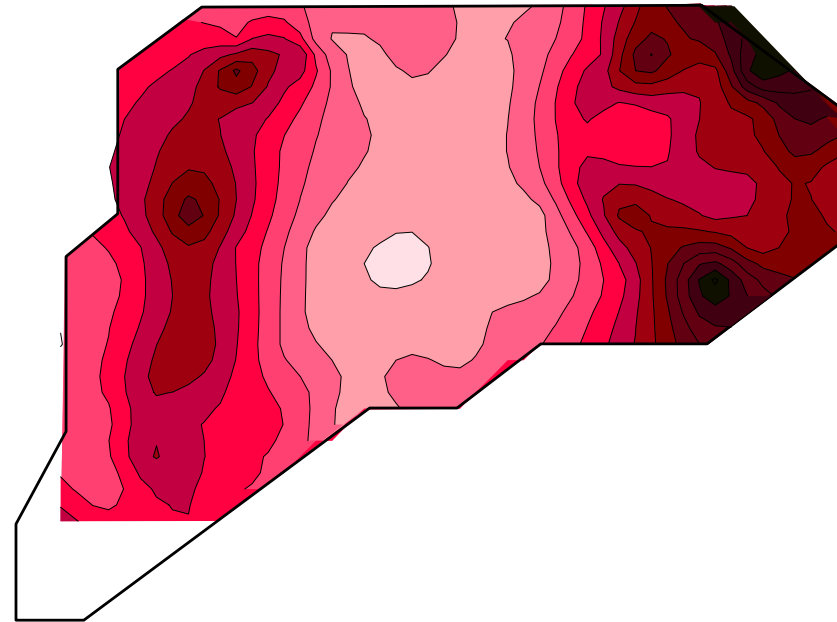
Example: Molenplaat tidal flat (Westerschelde)

Pa

Shear stress



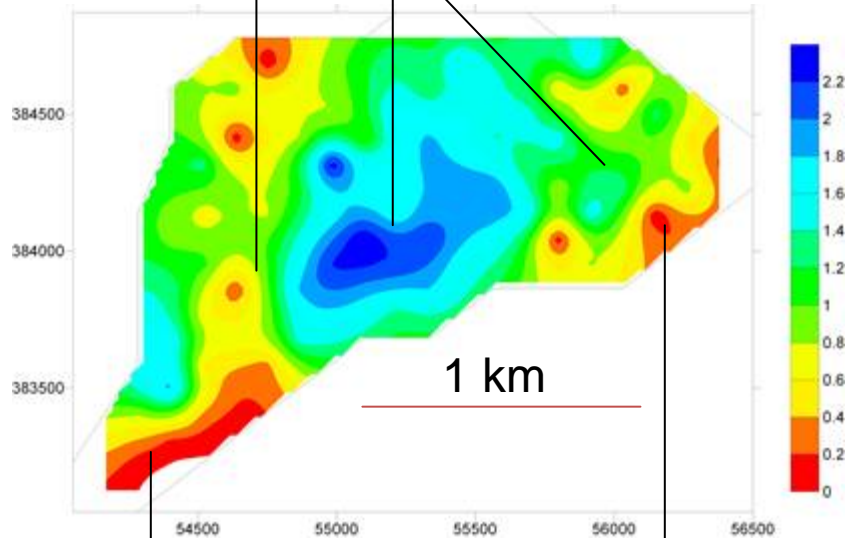
Scores first axis CA



Example: Molenplaat

sand ridges
mobile sediment
some Arenicola,...

high biomass
silty sand
sediment
cockle, Macoma,
Nereis,...

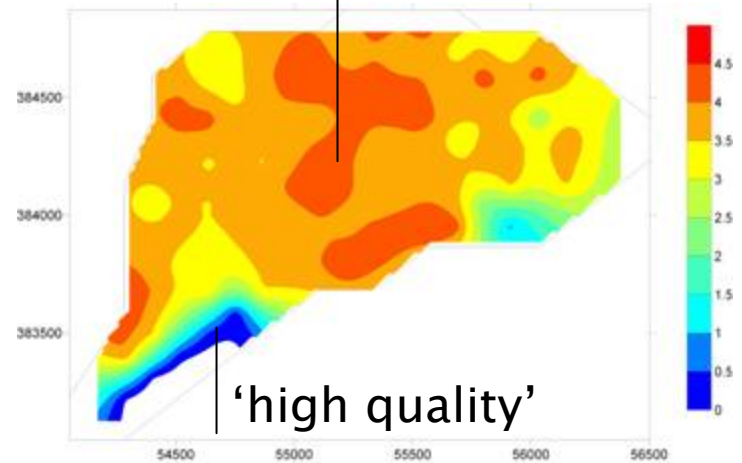


sand megaripples
very low biomass
Haustoriids, some
lost animals

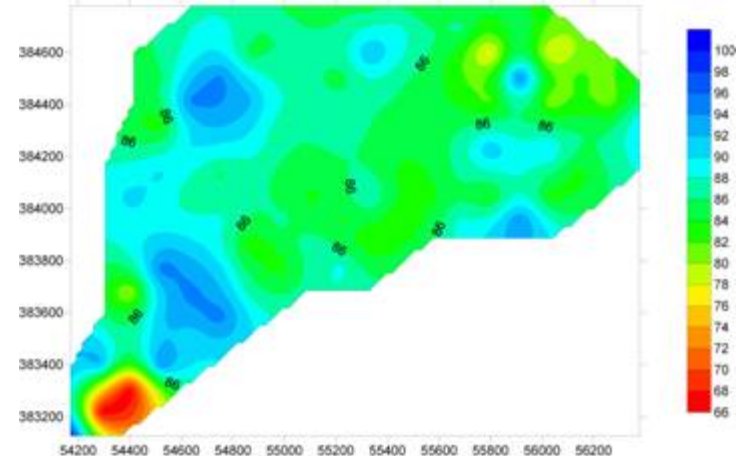
(log) biomass

AMBI

'meanly polluted'



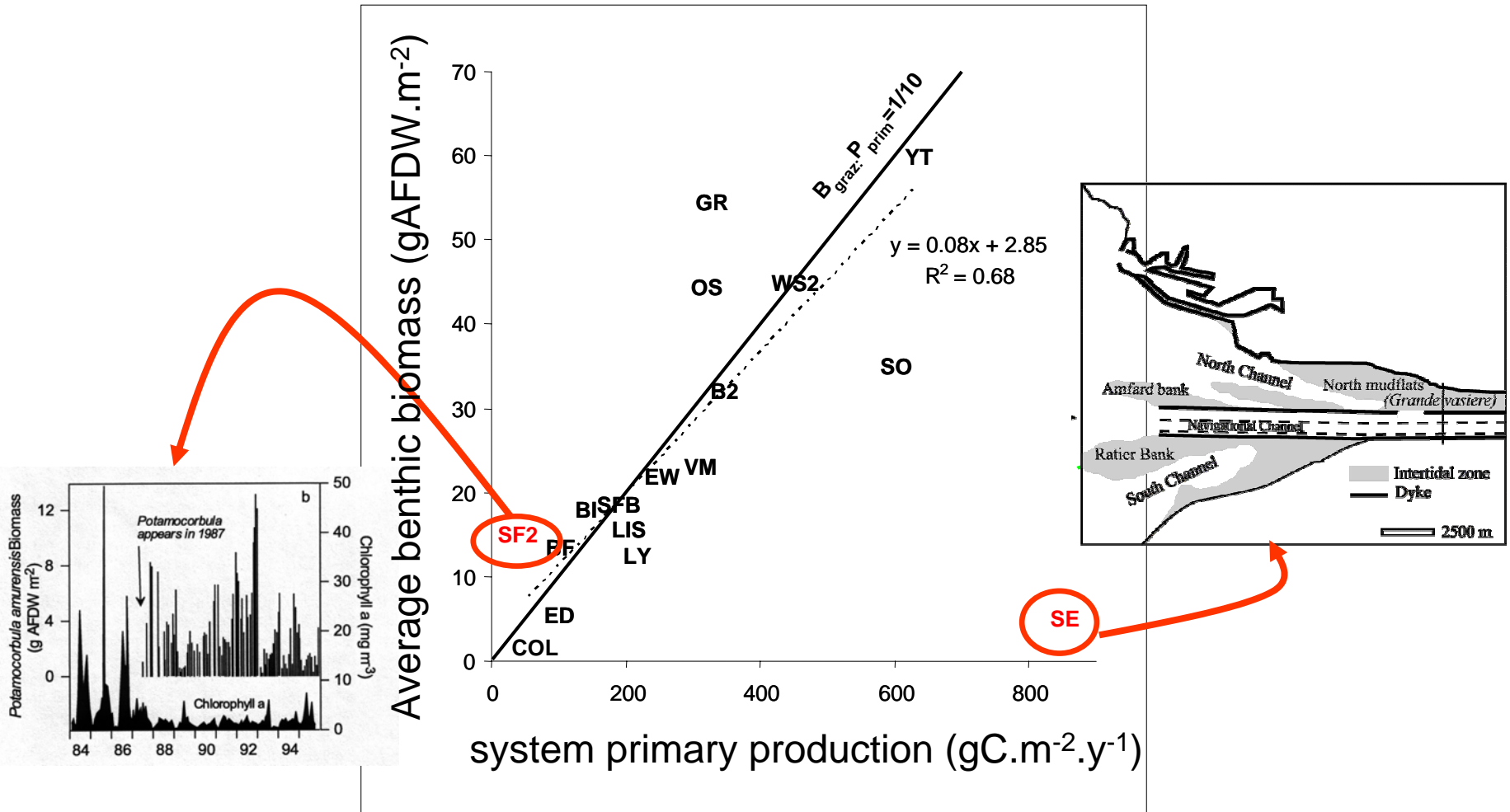
TAXONOMIC DISTINCTNESS



Multiscale criteria

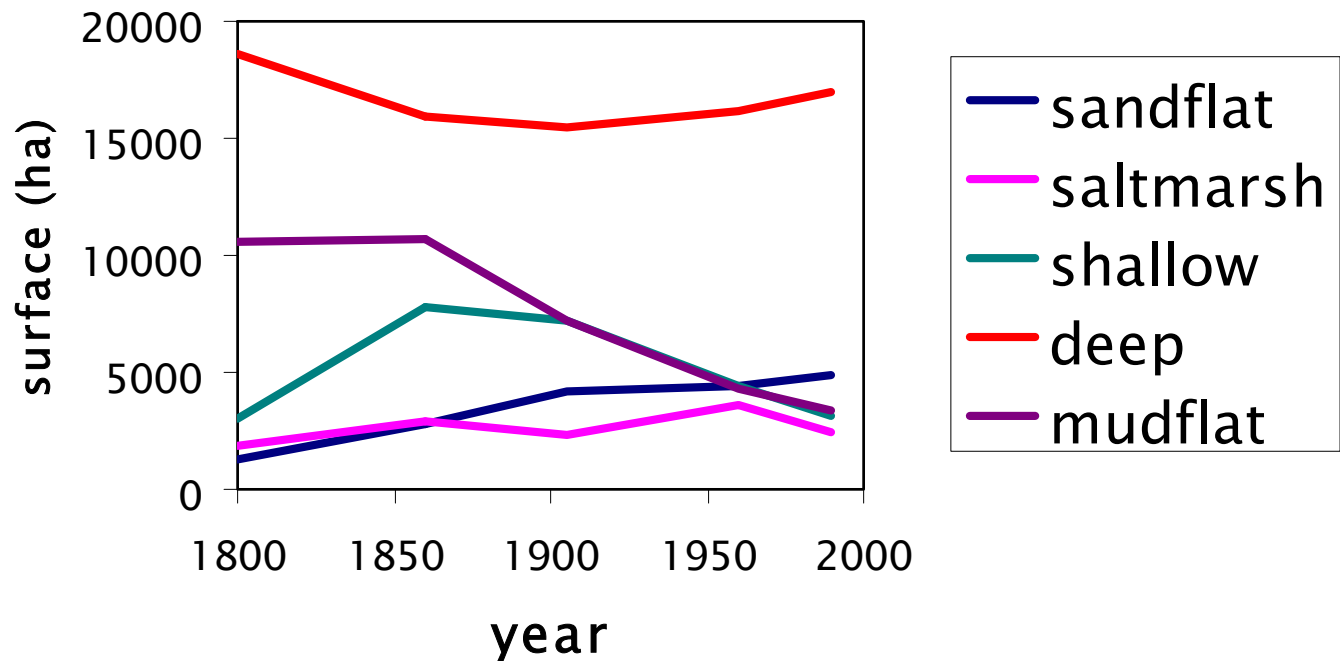
- Overall ecological *function* must be guaranteed (productivity, food for higher trophic levels)
- Natural *range of physical conditions* must be maintained
- Within habitat types, *expected biological community* must be fully developed

Whole water body: integrity of system functions

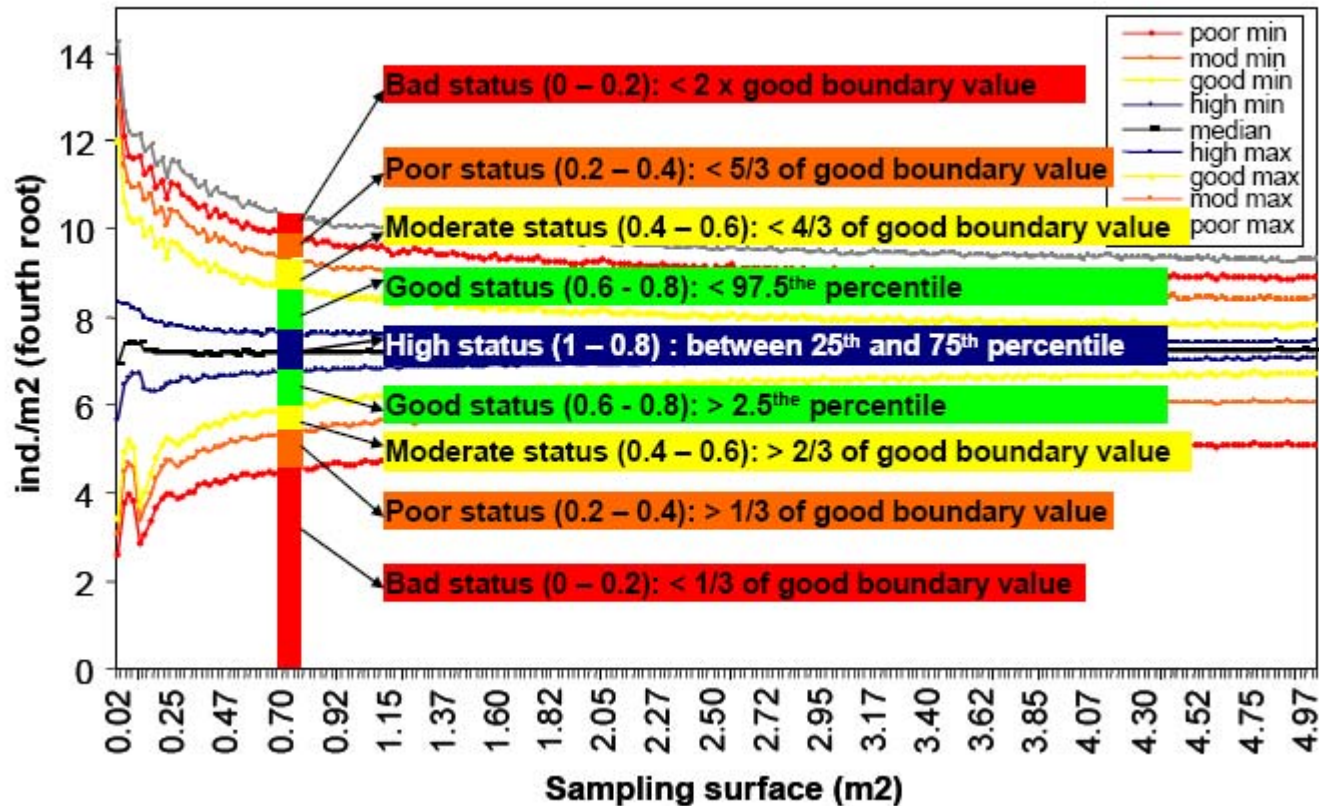


Level 2: Habitat level: system completeness

- < 1950: land reclamation / narrowing of estuary
- > 1950: dredging and broadening of channels



Level 3: within-habitat

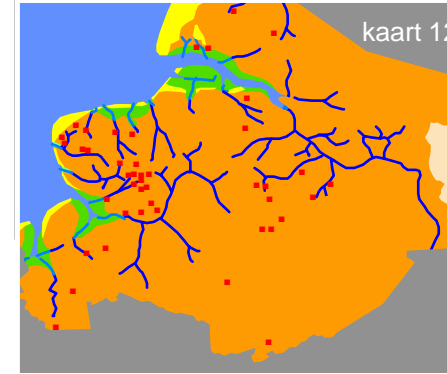
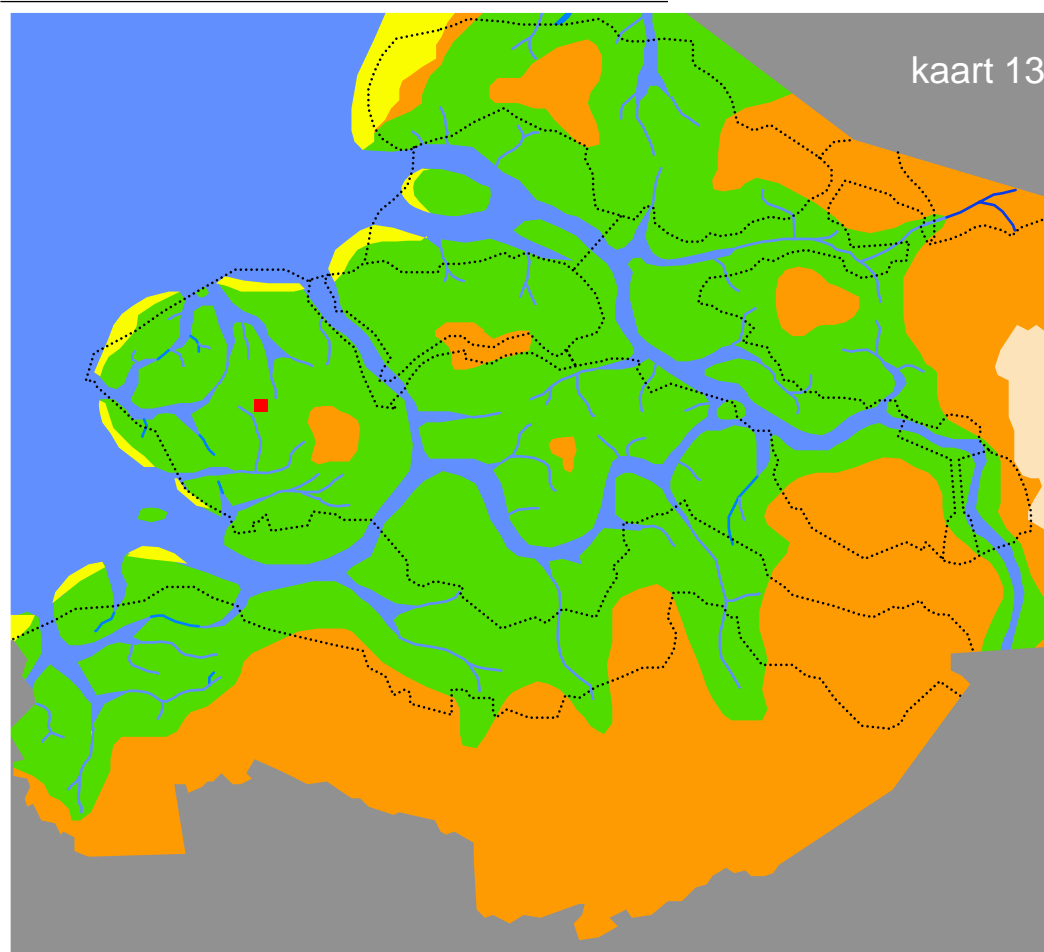


Randomisation tests describing difference with reference data set for density, Biomass, number of species, similarity

Problem 1. What is the reference?

Late Roman Times
Year 350

Interval
150 jaar



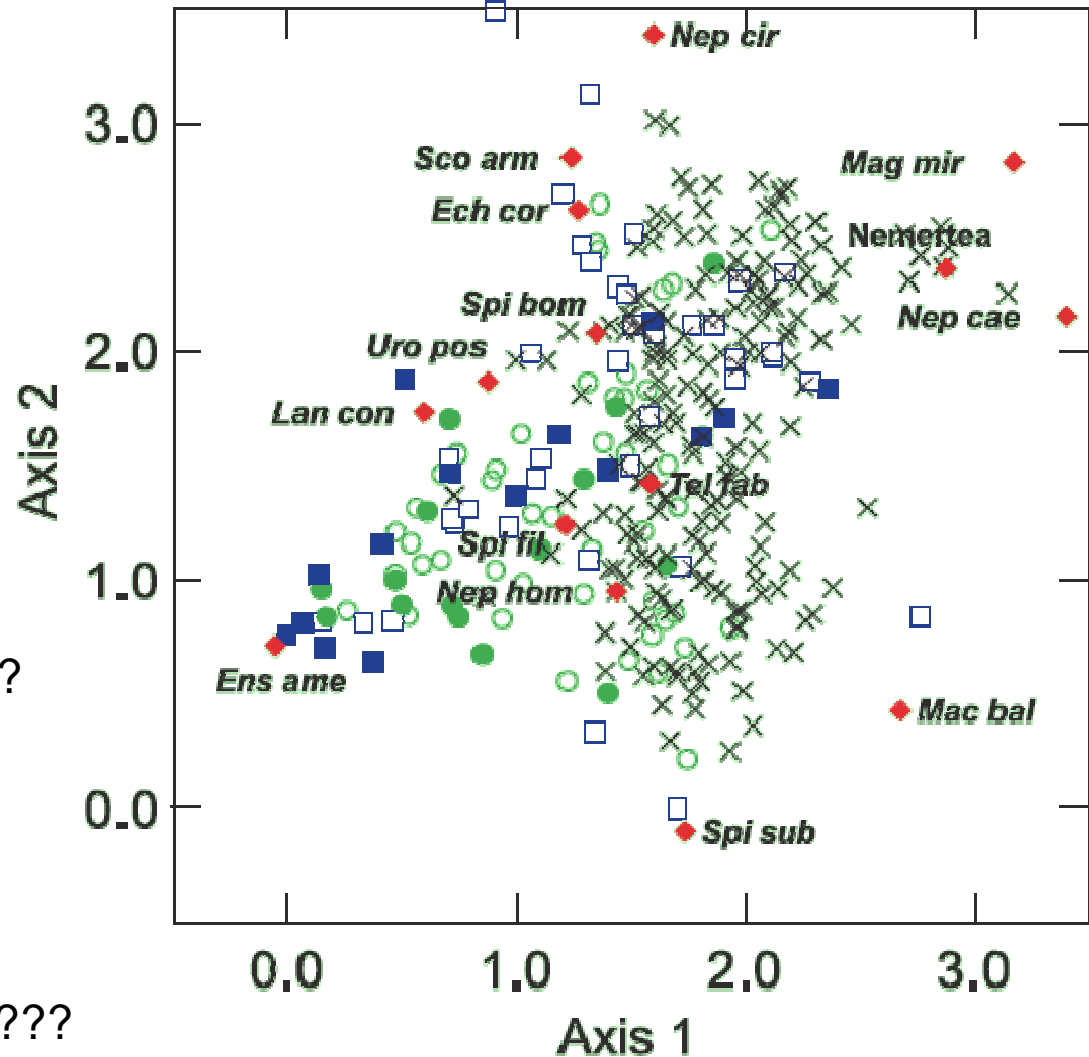
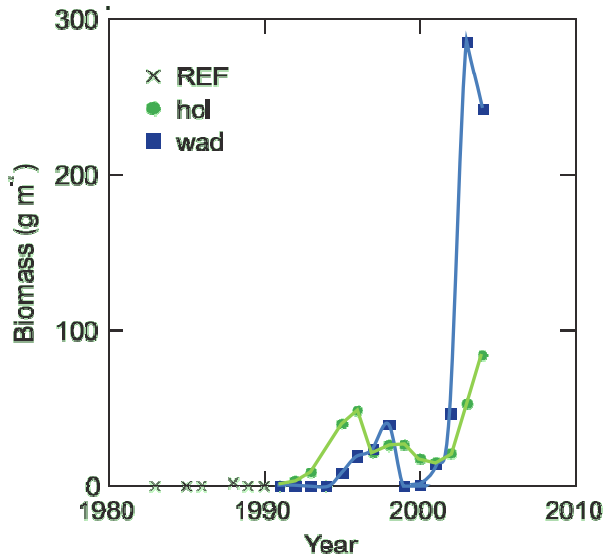
- North Sea, tidal gullies
- Rivers
- Dunes
- Mudflats, saltmarshes
- Coastal High Marsh
- Archeologic rests

Problem 1. What is the reference?

- No historical reference: man made this environment
- No spatial reference: untouched estuaries do not exist in our region
- Solution? Drop 'absolute' or 'pristine' reference
- Strategy: Monitor changes – investigate ecological causes of detected changes – adapt management (or not)

- But: link human activities – stress – ecological changes: how to investigate if everything is stressed? -> unstressed and partially stressed conditions needed.

Problem 2. What is manageable?

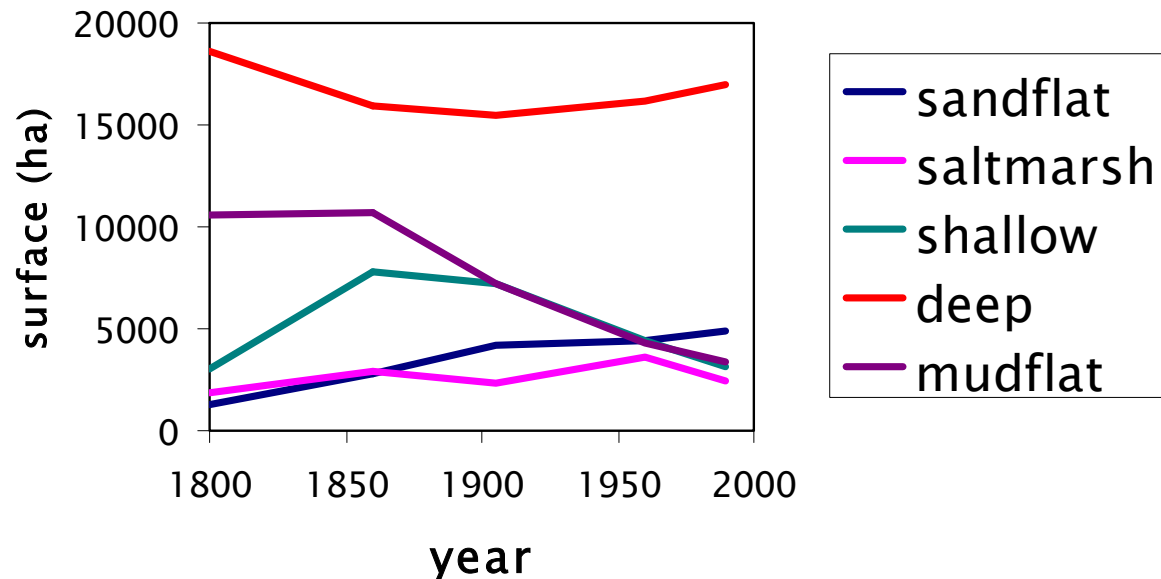


- Only due to *Ensis* invasion?
- So, what about it's food?
- Indicator of new niches?
- Correspondance to other changes in North Sea?
- Amenable to management???

Problem 3. Appropriate scale of management?

- Signs of coastal squeeze due to dredging and harbour access
- Common problem to most European estuaries
- Not manageable at local scale, given marine traffic policy

- Solution at European scale ?



Lessons for marine strategy

- Our seas are physically as diverse as our estuaries: habitat mapping and appropriate multiscale measures needed !
- We do *not* want the same communities everywhere

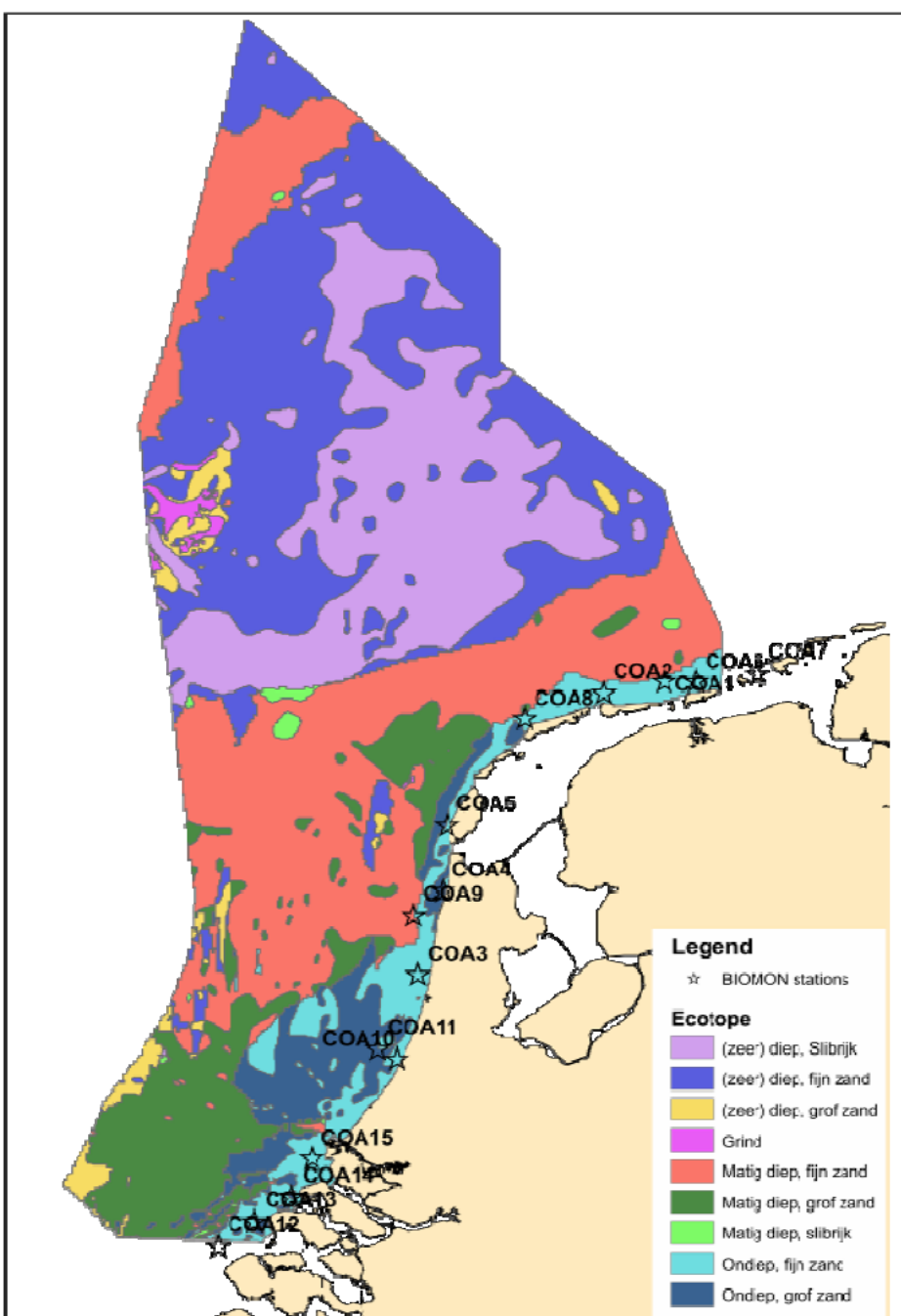
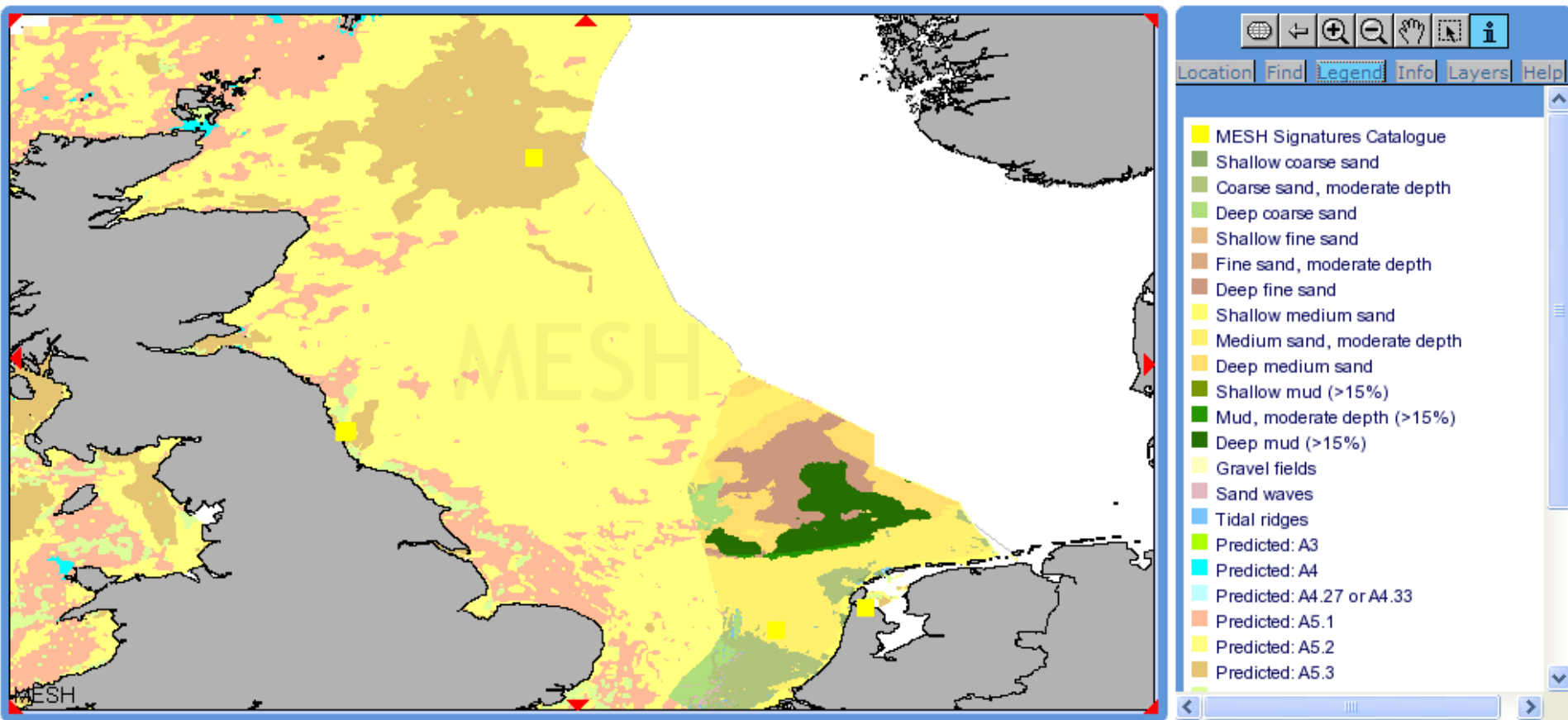


Figure 20. The habitat map for the Dutch continental shelf. Most of the coastal zone is either shallow with fine sand or shallow with coarse sand

MESH seabed habitats



THE framework to attach biodiversity information to!

Lessons for marine strategy

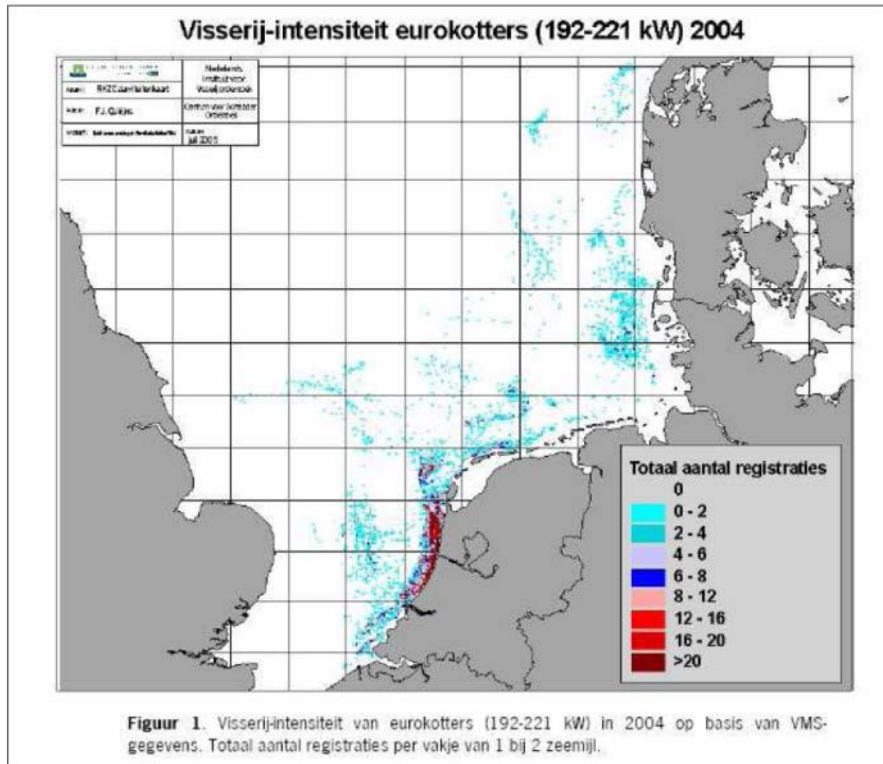
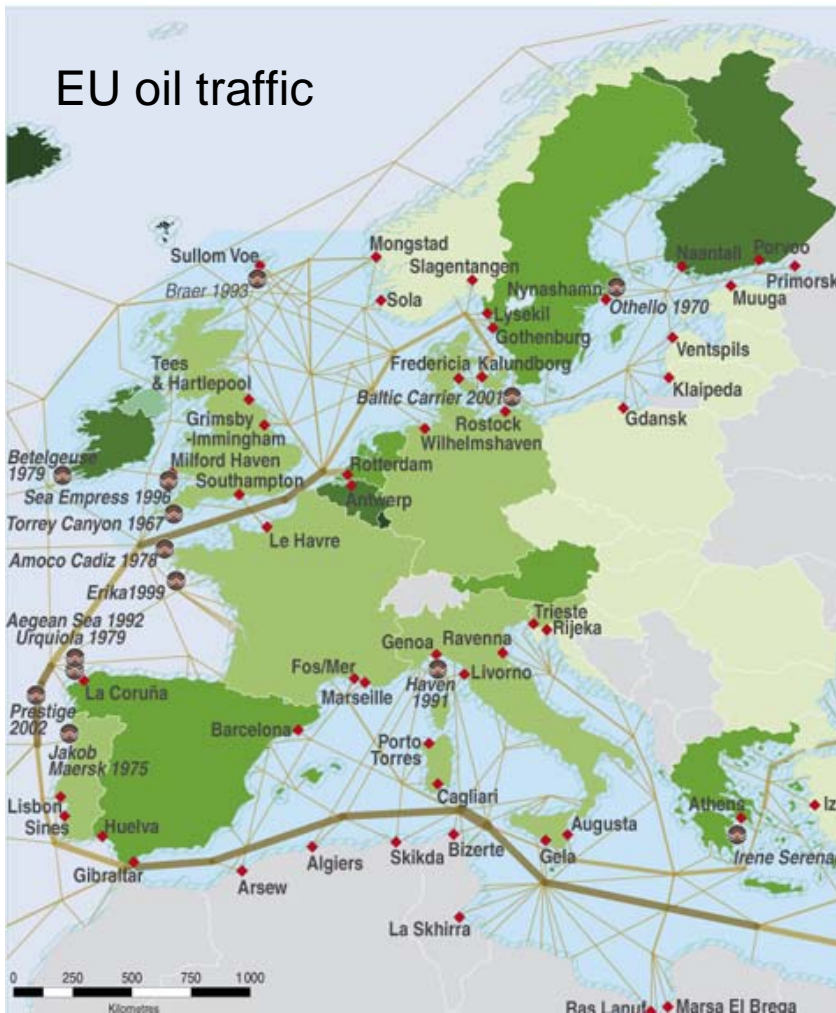


Figure 14. Fishery intensity in the North Sea (Steenbergen et al., 2005b)

- Our seas are as thoroughly and completely stressed as our estuaries
- MPA's need to serve role in *developing* references
- *Differentiated* protection for cause-effect studies
- Protection of seas at large more important than local total-ban

Lessons for marine strategy



- Management scale must match both the scale of biodiversity problems and the scale of socio-economic drivers
- Due attention needed for division of responsibilities between different actors

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