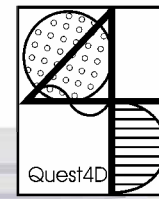


Changes in macrobenthos: past versus present

Jean-Sébastien Houziaux

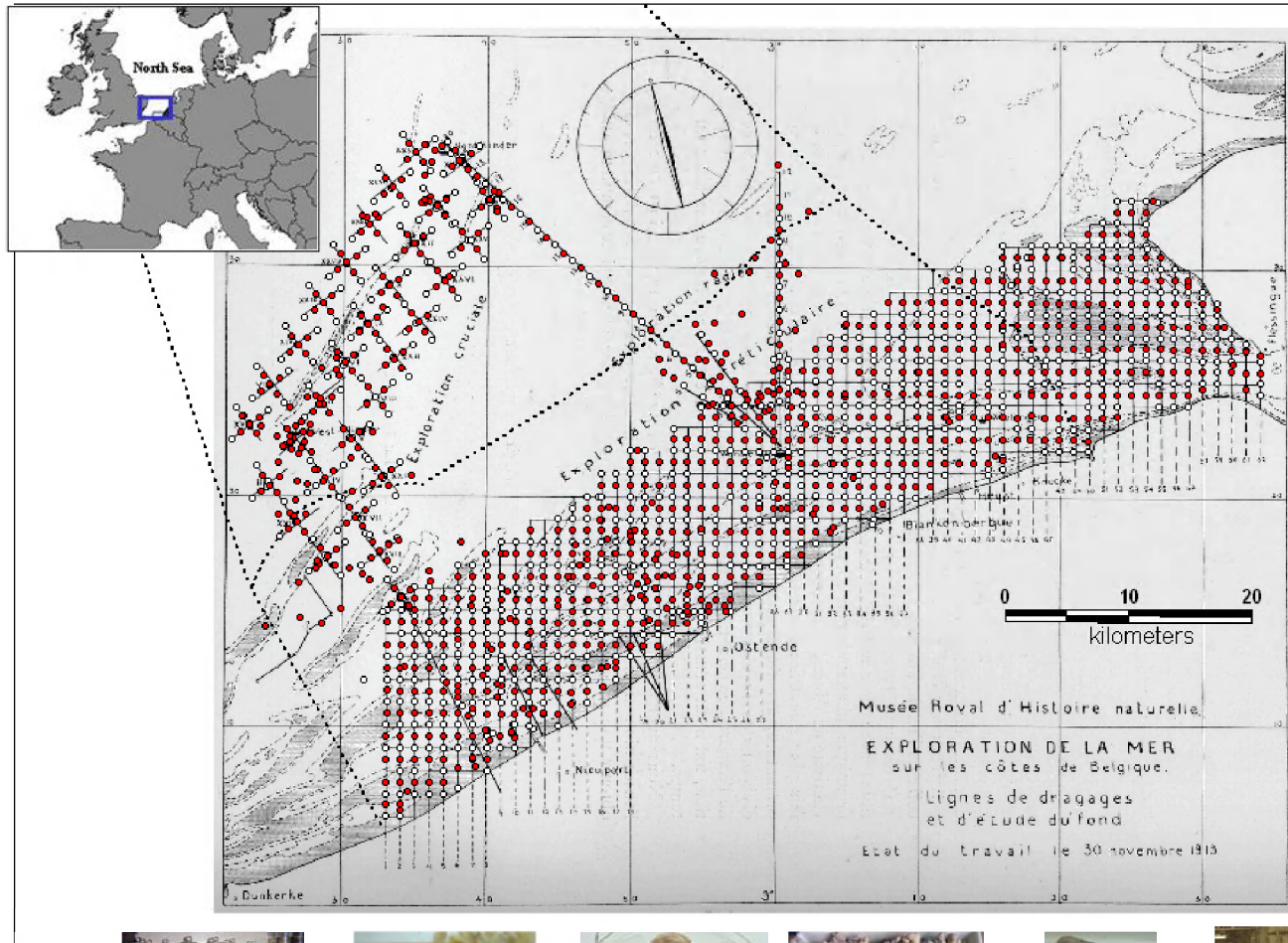
BMM - UGMM



New European legislation: what is a “Good Ecosystem State”? GES

- Since the 1990s, various european Directives aimed at nature protection have been issued. The most recent is the « Marine Strategy » Framework Directive – « MSFD »
 - The MSFD targets reaching a GES in European seas. Targets are defined for 11 different descriptors of the marine ecosystem, including « seafloor integrity ».
 - “Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.”
 - This directive and others involves the definition of objective criteria towards measurement of the GES
 - The measurement of the amplitude of change induced by human pressures is necessary to set meaningful targets => Baseline assessment
- => Benthos composition = sensitive indicator for change in the seafloor condition => Monitoring

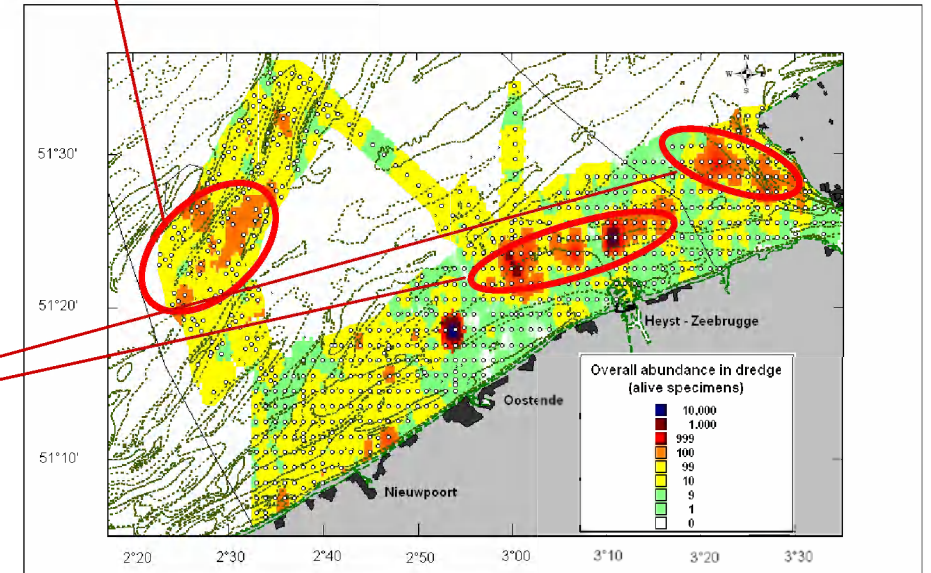
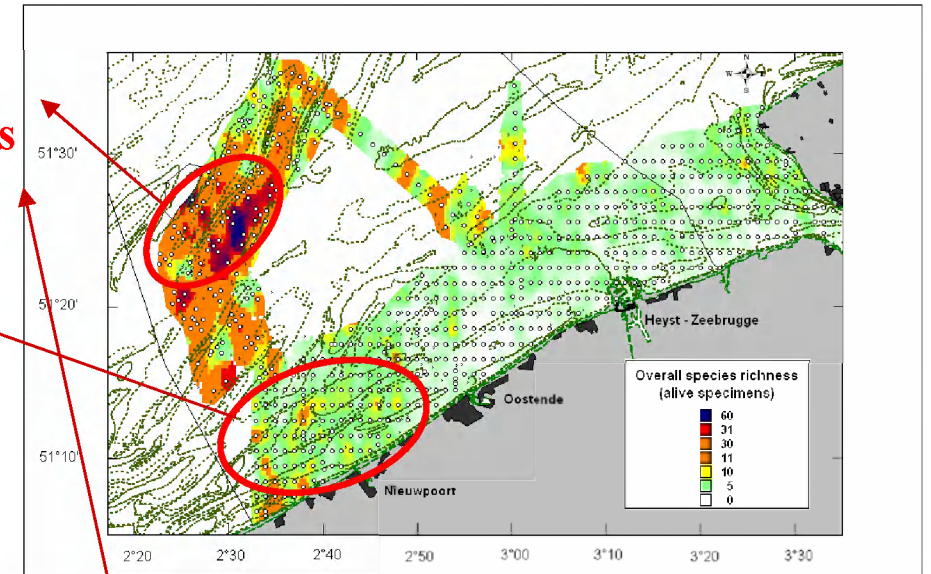
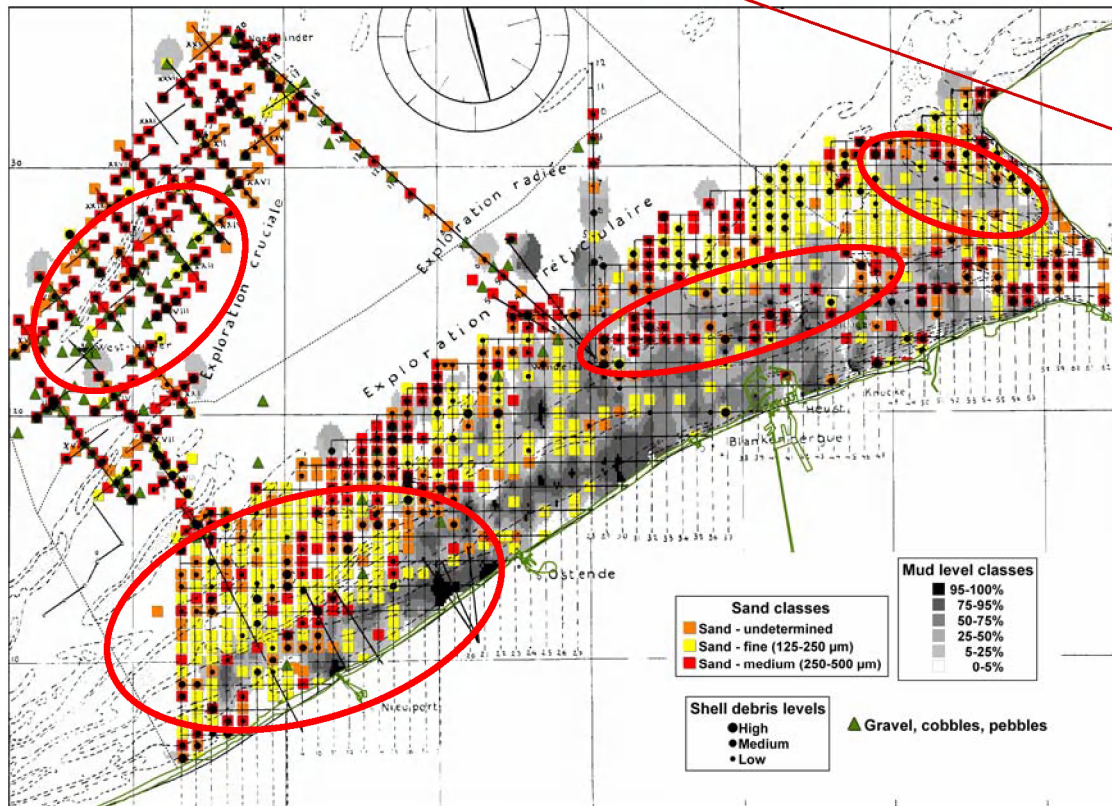
Belgium: a unique historical macrobenthic data set: The surveys and material of G. Gilson, 1899-1908



Seafloor and benthos, 1900: highlights

**Western coast:
moderate diversity
and density (in- and
epifauna)**

**Epibenthic community
of open-sea gravels:
large taxonomic
diversity and densities**



**Highest densities
(infauna), low species
diversity**

Coastal waters: case of dominant bivalves

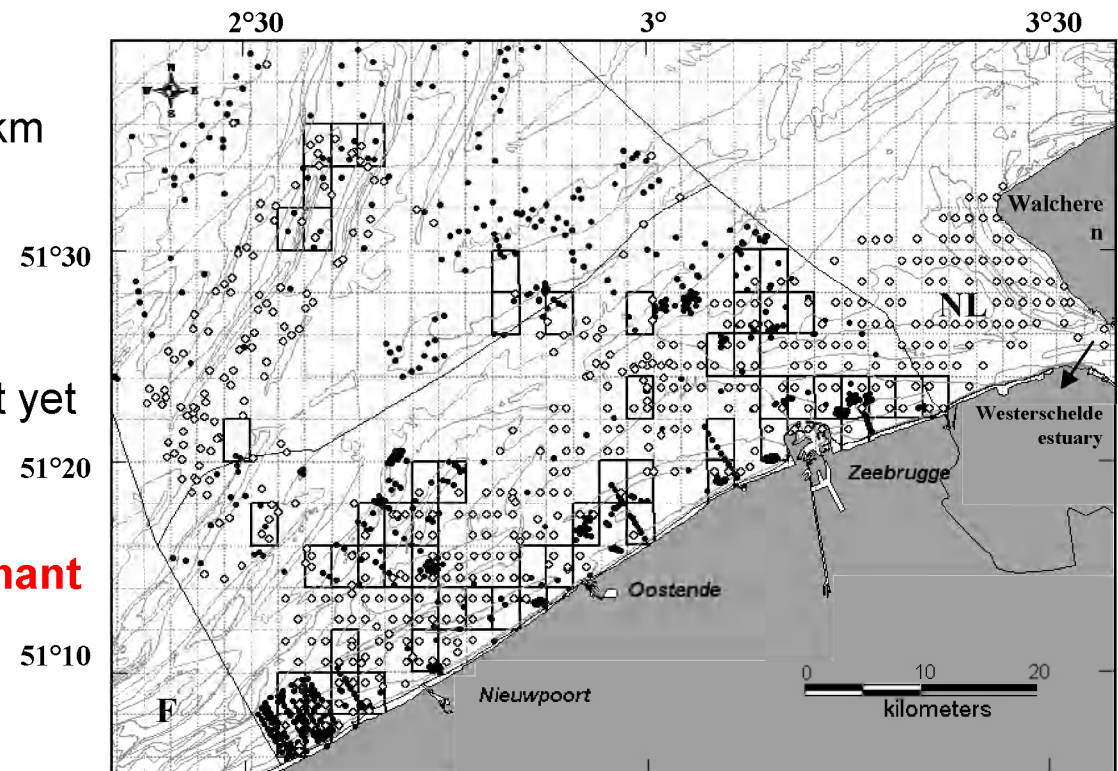
- Long-term analysis challenges for coastal macrobenthos:

Gilson's dredge data ⇔ Recent Van Veen data, 1994-2008 (joint DB of U. Gent + ILVO-Fisheries)

- ⇒ Sampling gear incompatibility:
Point sampling ⇔ towed dredge (1,9 km long)
Different efficiencies
- ⇒ Different spatial distributions
- ⇒ Historic data on soft-bottom macrobenthos: polychaetes not robust yet

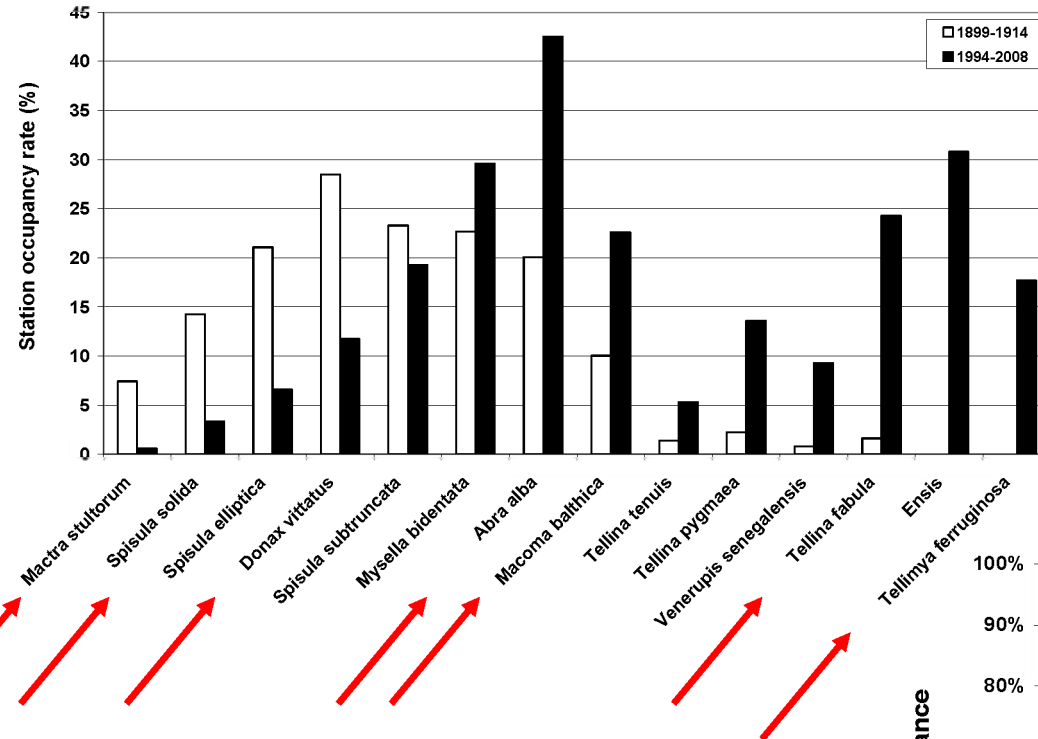
- Solutions:

- Spatial analysis of **numerically dominant bivalves** through data gridding
- Standardize abundances to maximum values => distribution of **relative densities**
- P/A data => **difference maps**



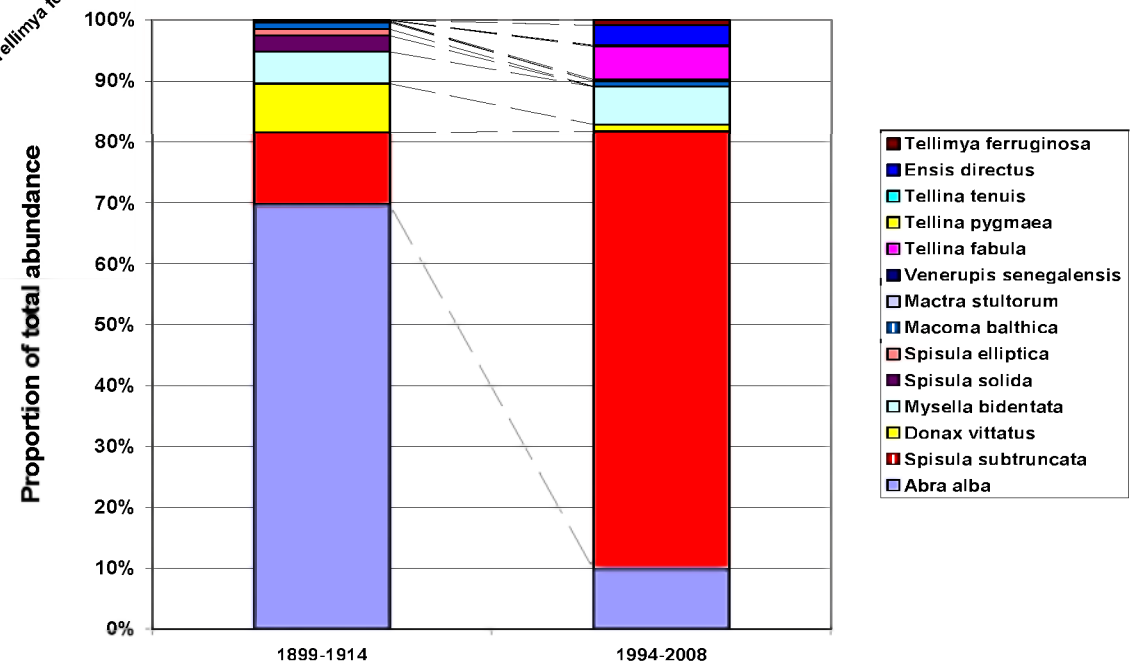
Coastal waters: case of dominant bivalves

General figures



Station occupancy rates

Contribution to total abundance

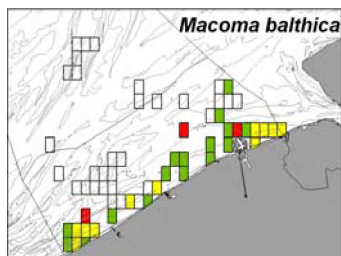
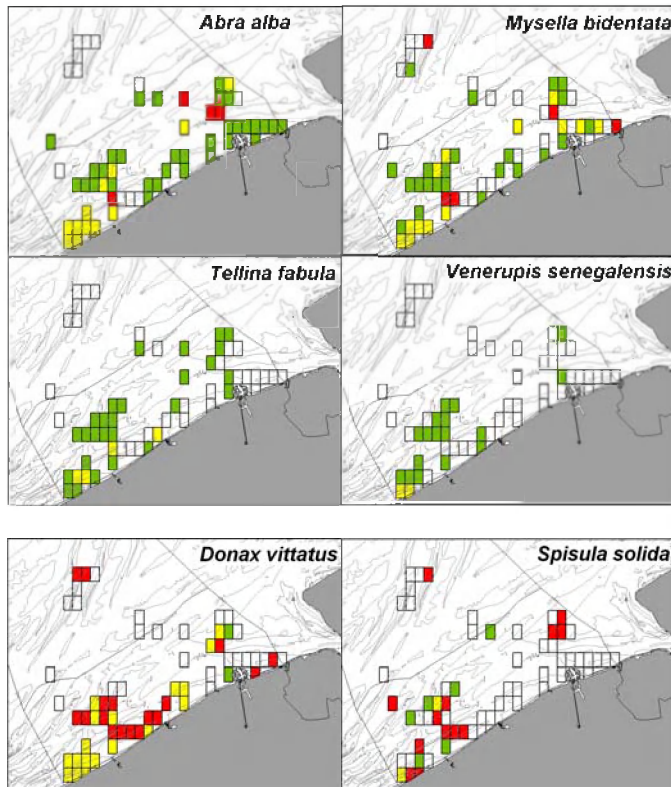


Coastal waters: case of dominant bivalves

Geographic spreading

Grid cell occupancy

- Absent in both
- Absent historically
- Absent recently
- Present in both



Macoma balthica (estuarine):

**Expansion from Schelde
mouth to the entire coastal
waters**

Muddy fine sand

species:

Expansion

**(+ shifts in relative
density distribution)**

**Shallow clean fine sand, filter-
feeding species:**

Regression

⇒ **Probable impact of change in fine
sediment dynamics (increased
turbidity?)**

⇒ **Probable effect of eutrophication /
pollution: increased benthic
biomass/productivity?**

BUT:

- **Hydro-climatic factors (unlikely)**
- **Ensis directus invasion (unlikely)**
- **Other factors (fishery effects)?...**

Change 1900 – 1970 > Change 1970-2000s

⇒ **More ‘sophisticated’ biodiversity
analyses once polychaete data
checked**

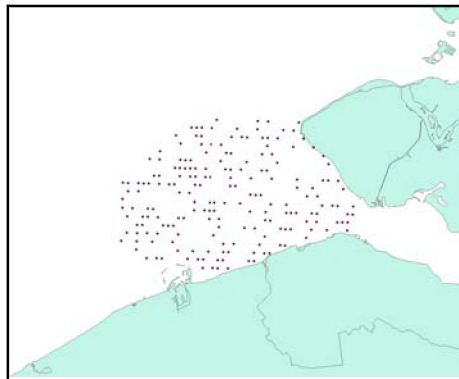
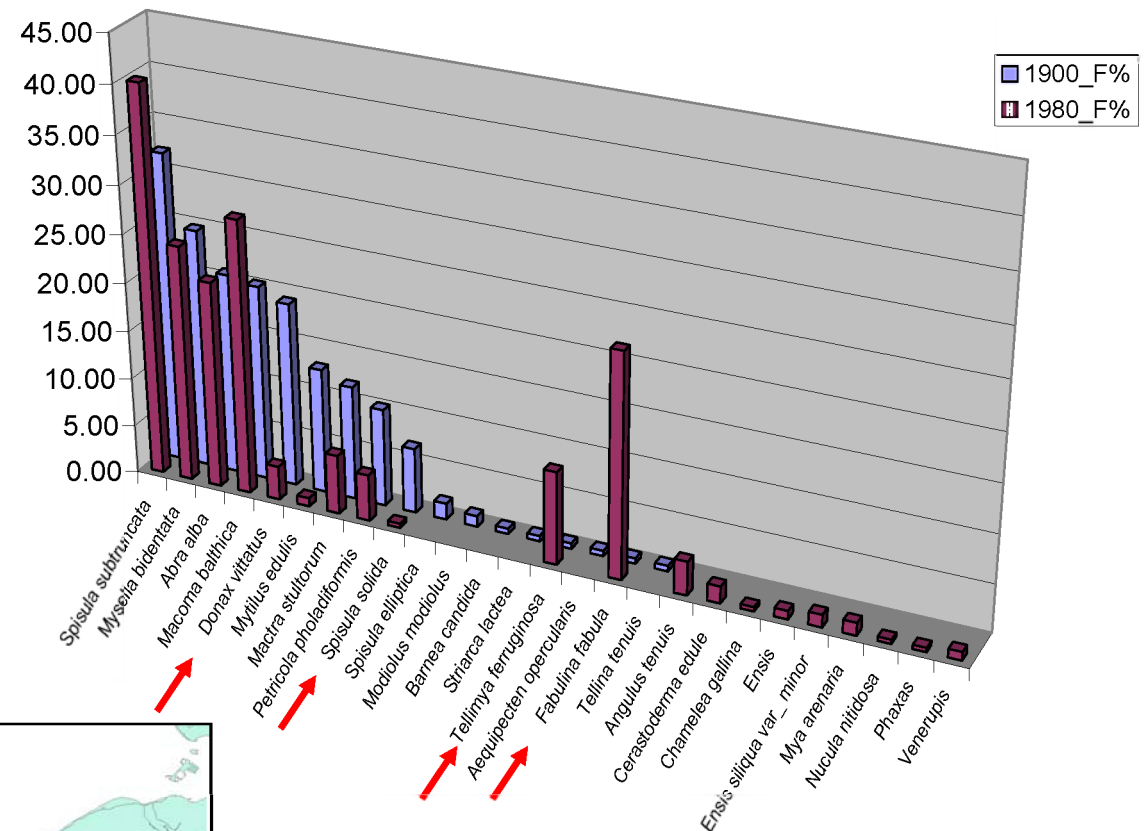
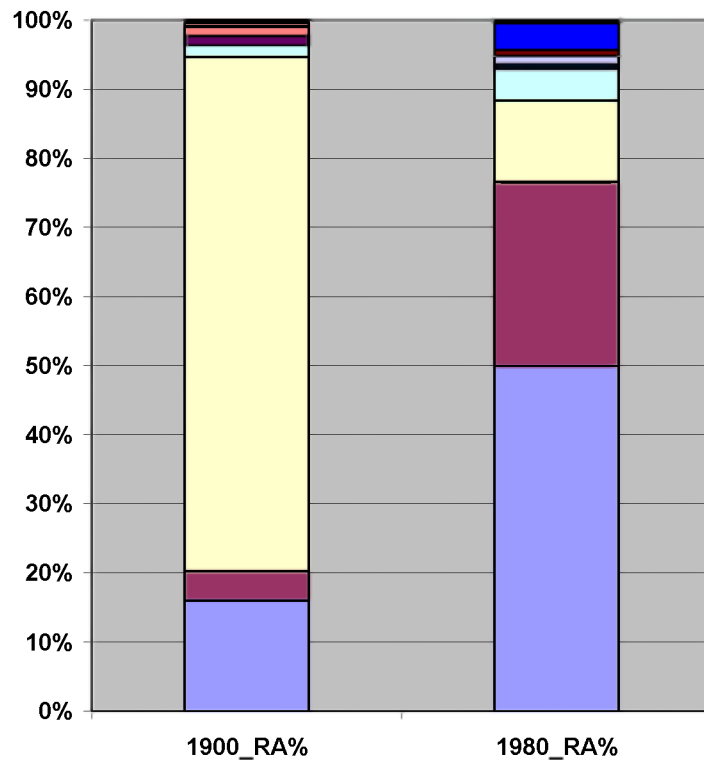
⇒ **Incorporation of recent data from
Dutch waters**

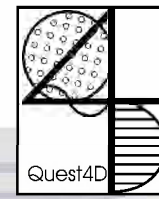


Westerschelde mouth : 1900 versus 1980-82 (J. Craeymeersch, IMARES)

Contribution to total density (14 species)

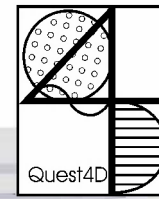
Station occupancy (% stations - spreading)





Present-day observation

- Ecosystem engineering – Rabaut and coll.
 - *Lanice conchilega* (tube building segmented worm)
 - Essential structuring component of the “*Abra alba*” macrobenthic community
 - *Owenia fusiformis* (tube building segmented worm)
 - Sand bank stabilisation. Recently thriving
- And in the 1900s and 1970s? => Gilson data and literature



Coastal 'ecosystem engineers' in the past

L. conchilega

- 1900: occasional - widespread
- 1970: occasional
- 1980s: common, max densities 2000/m²
- 1990s-2000s: essential component of *A. alba* community – very large densities (max 10,000/m² => “reefs”)
- (NB. Typical component of sandy gravel associated fauna too)

O. fusiformis

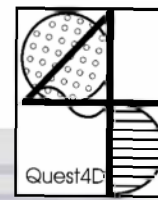
- 1900: occasional, offshore
- 1970: occasional, offshore
- 1980s: occasional, low densities
- Mid-2000s: strong expansion in muddy fine sands with locally very large densities (max 11,000/m² => “reefs”)

=> Recent thriving



Conclusions

- Macrobenthic communities of coastal waters since the 1970s are altered compared to the early 1900s, with different species thriving from the local pool.
- Increased influence of background turbidity (i.e. increased chronic deposition of mud)?
- Relatively more species contribute substantially to bivalve biomass: suggestion of biomass increase?
- Findings are consistent with moderate levels of organic enrichment in highly mixed coastal waters (eutrophication effect)
- “Ecosystem engineer” tube-building worms: fate in the long run, link with ecosystem disturbance?



Thank you for your attention !