

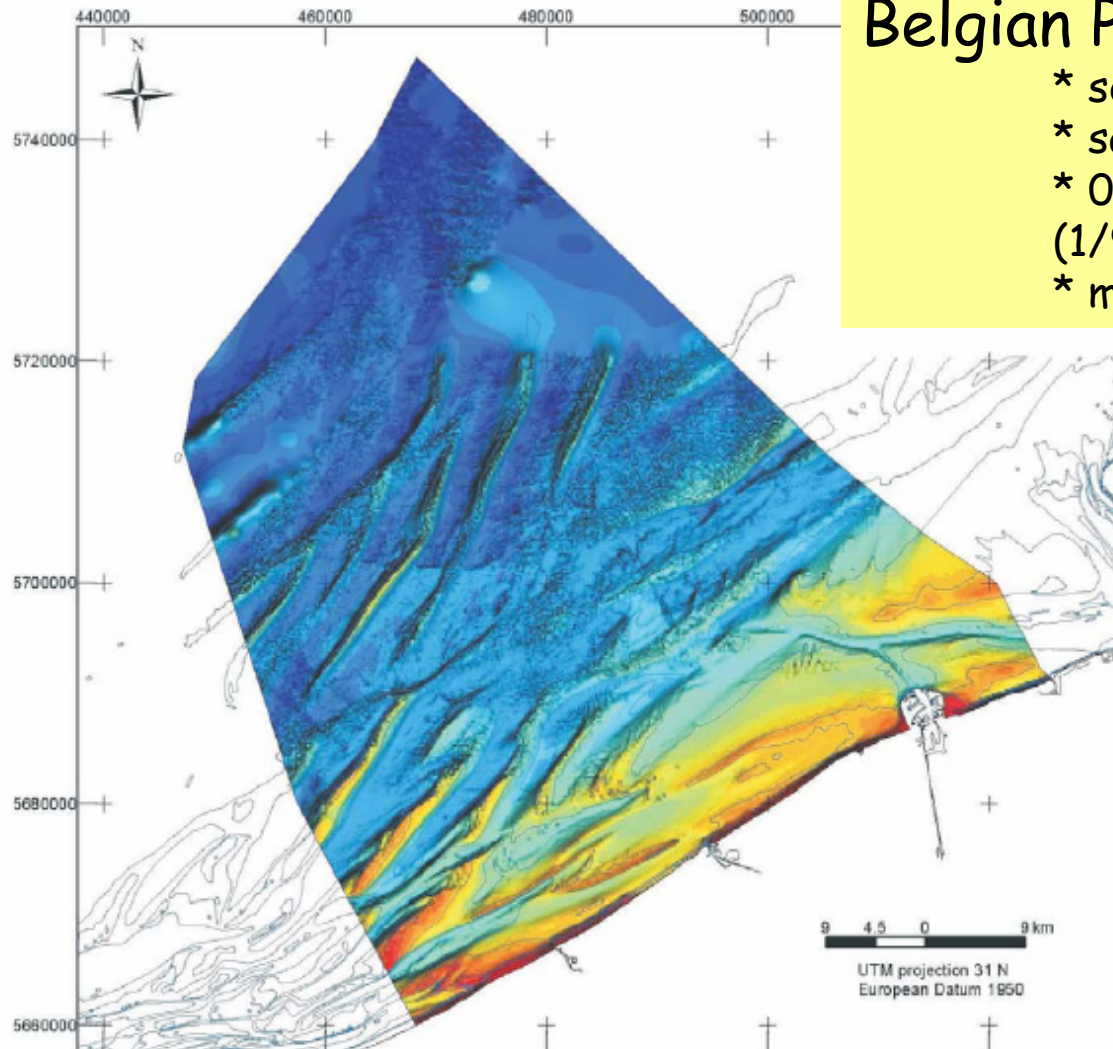
Ecosystem services and the MA methodology applied to marine and coastal ecosystems (in Belgium)



M. Vincx, S. Deros, S. Degraer *et al.*



What does MA means for the 'Belgian' Marine and Coastal Systems ?



Belgian Part of the North Sea

- * soft substrates (mud-sand-gravel)
- * sand banks parallel to the coast
- * 0.5 % total surface of the NS (1/9 of the surface of Belgium)
- * max. depth 46 m



Source : RCMG : Verfaille *et al.*, in press

Potential use of space based on legislation

99 % fishing

99 % fishing

97 % shipping
of which
20 % traffic separation

97 % of fishing,
of which 20 %
traffic

26 % military use

26 % military use

15 % sand and gravel extraction

15 % sand and
gravel extraction

1,2 % dredging and dumping

0,6 % wind parks

18 % cables and pipelines

18 % cables and pipelines

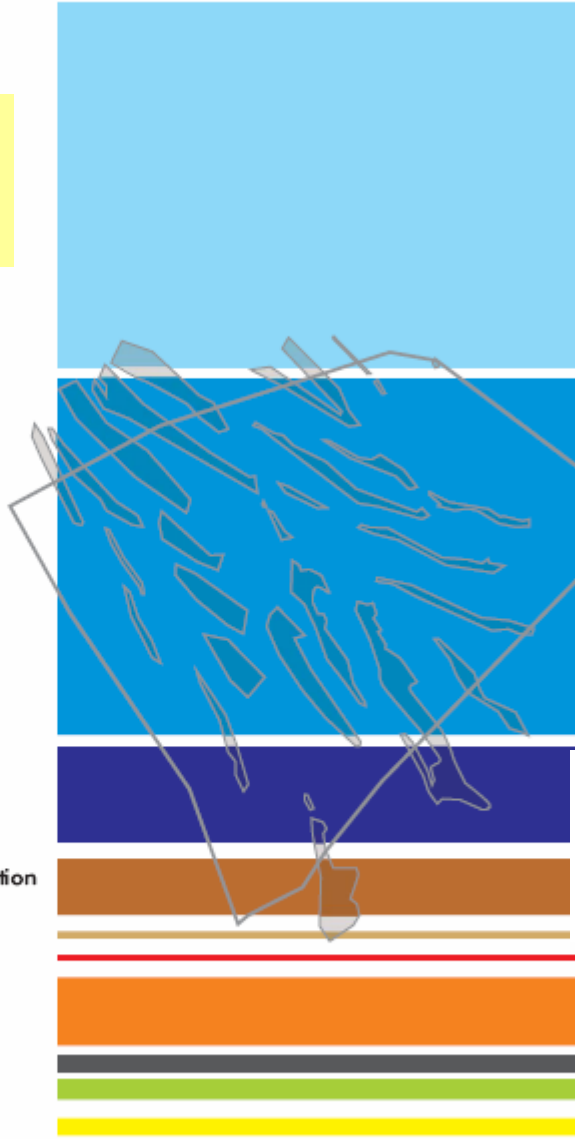
0,1 % coastal defence

4 % nature conservation

4 % nature conservation

1,9 % coastal recreation

1.9 % coastal recreation

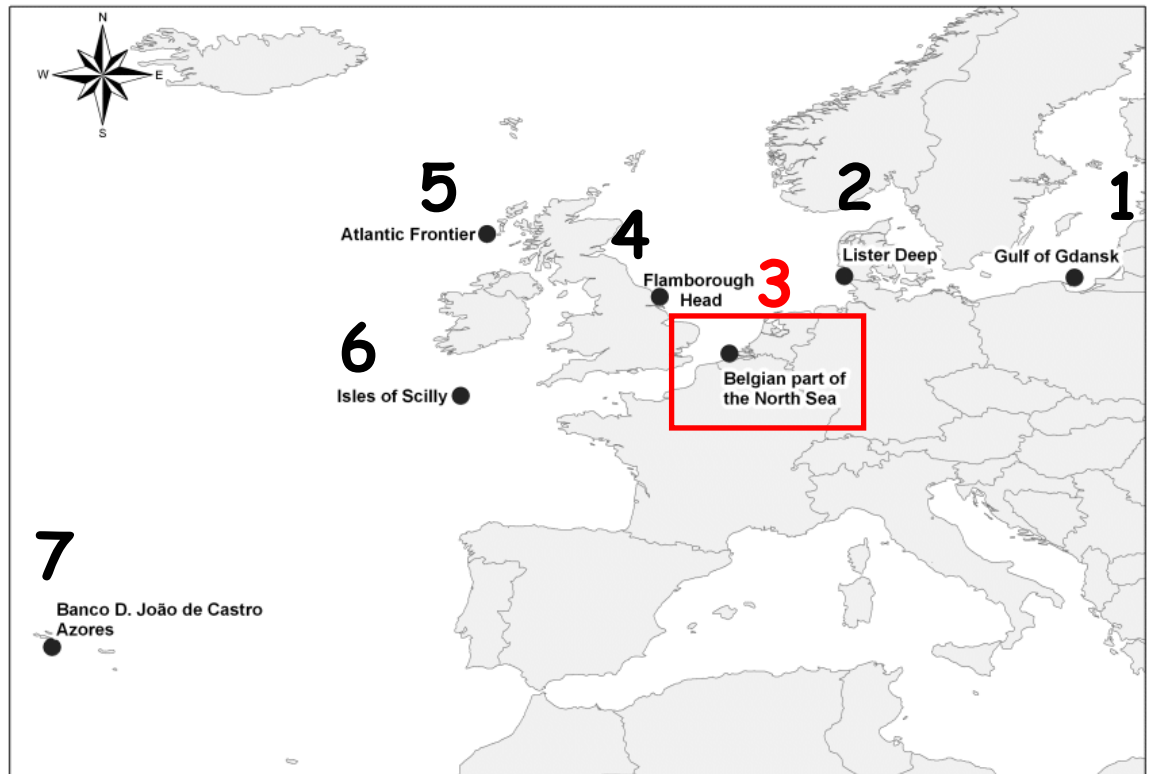


264 %
TOTAL CLAIM FOR SPACE
(potential use of space based on legislation)

Identification, Definition and Quantification of Goods and Services provided by Marine Biodiversity : Implications for the Ecosystem approach

Source : Beaumont *et al.* (MarBEF unpublished results)

Paper of the European NoE :
MarBEF : Theme 3 :
'Socio-Economic Importance of
Marine Biodiversity'



Four categories of Goods and Services provided by Marine Biodiversity :

1. Production services
2. Regulating services
3. Cultural services
4. Supporting services
5. Option use value....

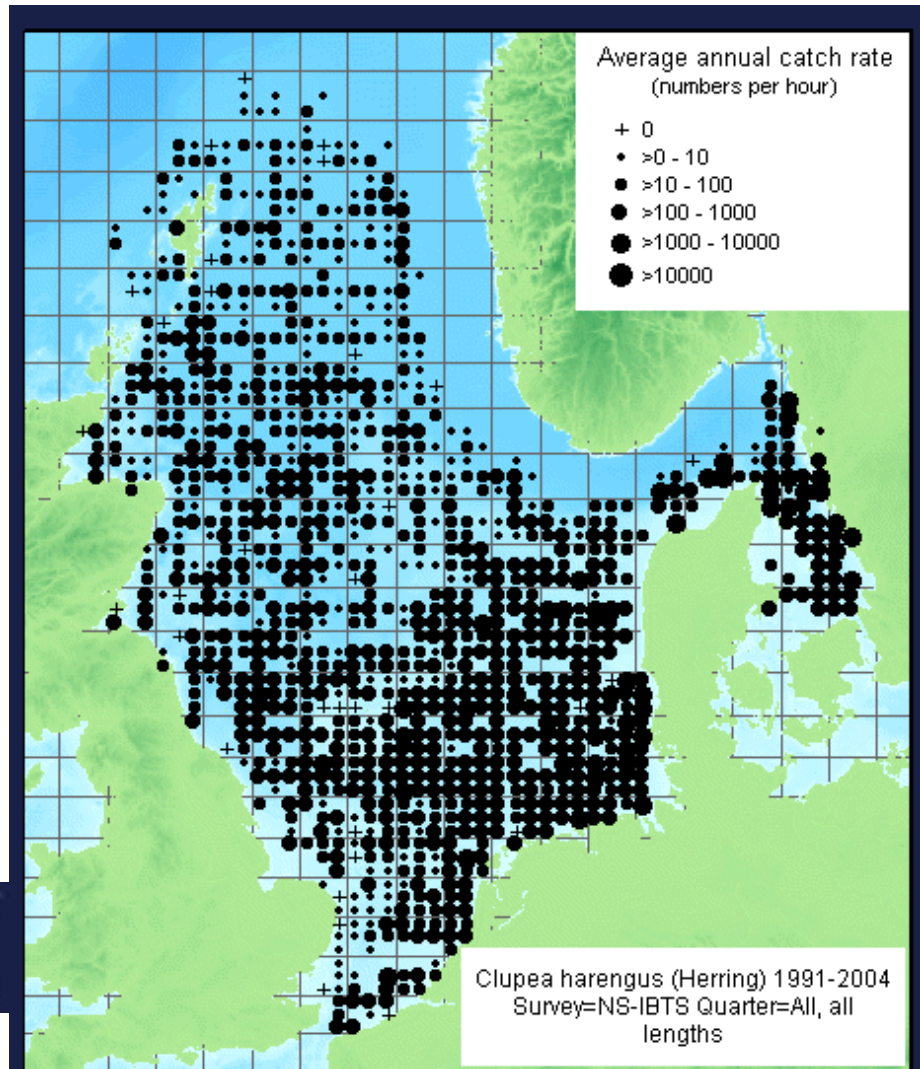
Examples for the BPNS :

Production services : **FOOD PROVISION**

'extraction of marine organisms for human consumption'

Herring

Belg. Part : < 0.01%



	Internat. Catch (t)	Belgian catch (t)	Belgian contr. (%)
Herring	479585	5	<0.01
Mackerel	607850	5	<0.01
Cod	30870	1285	4.2
Haddock	68735	310	0.5
Whiting	16370	270	1.6
Plaice	66500	3770	5.7
Sole	21580	1445	6.7

Source : ICES data & ILVO (Belgian data), Mira-T 2005 Calewaert et al.

Regulating services : Gas and Climate regulation

Low density of phytoplankton (?) and no macroalgae present so low impact on gas and climate regulation

Regulating services : Disturbance prevention

not present : no seagrassbeds, no marshes, but dunes

Regulating services : Bioremediation of waste

Belgian Part of the North Sea is a high energy area with high turbidity and sediment bedload.

The organisms are capable of withstanding waste compounds, including organic matter from rivers, and redistributing them (cf. further e.g. *Lanice* reefs)

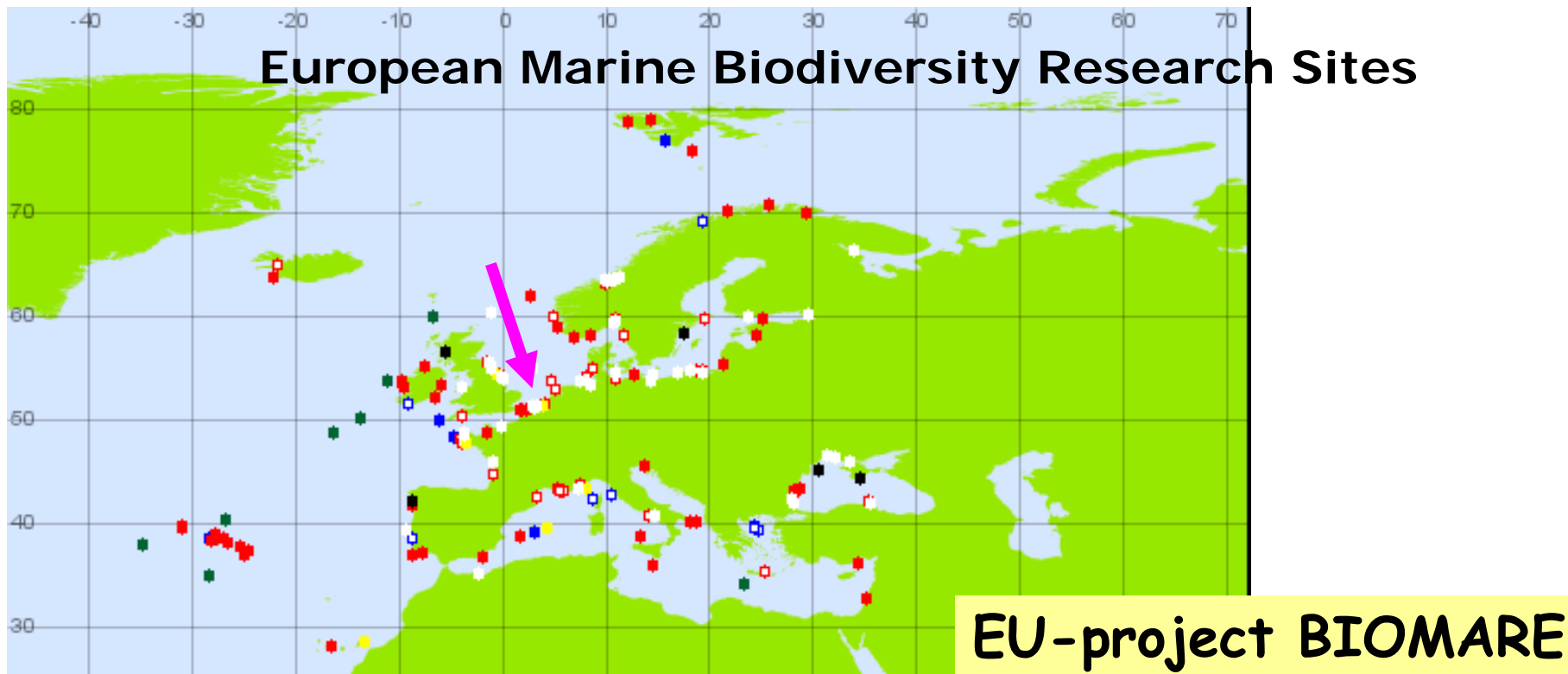
Cultural services : cultural heritage and identity

e.g. traditional shrimp fisheries take place which attracts tourists



Cultural services : Cognitive benefits

- Field trips at sea by schools, universities, ...
- Excursions on the beach and in dunes...
- Good knowledge of ecosystem components : scientific data from the area is frequently used by international scientists : interesting case study area (cf. MARBEF ... BIOMARE reference sites, ...)





01

Multifunctionality and valuation

Valuation of competing functions, to optimise the societal use of coastal and marine resources

→ FCGM@CORILLA-encora@feem.it



03

Marine and coastal spatial planning

Multiple-scale structuring of spatial coastal and marine planning and related decision-support systems for sustainable development

→ Thessaly_University_hkok@teagran.gr



05

Long term coastal geo-morphological change

Promoting the development, demonstration and dissemination of new and emerging models and methodologies for the prediction of long-term geo-morphological changes to coastal and estuarial systems, including the effects of climate change

→ University_of_Plymouth_juliette.jackson@plymouth.ac.uk



07

Restoration and preservation of coastal biodiversity

Testing and improving an ecological valuation protocol for the coastal and marine environment

→ Ghent_University_steven.degraer@UGent.be



09

Assessment of field observation techniques

New and emerging tools and practices for coastal and marine observation, with focus on remote sensing and remotely controlled measuring devices

→ GH55-chris.haese@glas.de



02

ICZM Participation and Implementation

Testing and improving methods to evaluate progress in the implementation of ICZM, including eGovernance

→ EUCO-a.pickawer@uicc.net



04

Pollution, prevention, detection and mitigation

Development and application of emerging methodologies for preventing, detecting and mitigating pollution and for identification of areas at risk

→ CETMCF-philippa.sargent@qip.resnet.gov.uk



06

Effect of Development and Use on Eco-morphology and Coastal Habitats

Impact-assessment tools and environmental techniques for recovery of coastal habitats

→ DHI_Water_and_Environment_kas@dhni.dk



08

Sustainable coastal engineering techniques

Cataloguing innovative coastal engineering techniques to solve practical coastal protection issues

→ TUDeft-1.dammars@tudelft.nl



10

Capacity building, training and education in ICZM

Comparative assessment of ICZM training and education programmes

→ University_of_Cantabria_hispacosta@ulc.es

BeNCoRe, the Belgian national network for coastal research aims at initiating and facilitating knowledge sharing and cooperation between Belgian marine institutes. BeNCoRe is part of the European Network ENCORA.



www.bencore.be

membership

Do you want to be pampered even more and as a true VLIZ member become fully involved in the activities of a dynamic institute? See <http://www.vliz.be> for more details.

publications

VLIZ website: <http://www.vliz.be>

VLIZ Nieuwsbrief

an attractive illustrated newsletter on marine research and policy in Flanders; published three times a year; free to VLIZ members only (in Dutch)

'De Grote Rede'

the one and only free informative magazine on sustainable management of the Flemish coastal area; sent to subscribers three times a year (in Dutch)

VLIZINE

free, monthly electronic newsletter about marine research and policy in Flanders, including job vacancies, conferences and workshops, news flashes etc. (in Dutch)

VLIZ Collected Reprints

an annual compilation of scientific papers by Flemish marine researchers

VLIZ Library Acquisitions list

a free, electronic list of VLIZ library acquisitions, distributed on a weekly basis

VLIZ Special Publications

a series of publications related to special activities (conferences, workshops, etc.)



The Flanders Marine Institute

oostende



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e-mail: info@vliz.be
<http://www.vliz.be>



VLIZ
a forum for
marine research
and policy in
Flanders
(Belgium)



Cultural services : Leisure and recreation

Diving, angling, beach fisheries with bottom set gill nets,

Bird watching, ...



Cultural services : Feel good or warm glow ?

Few people know what biodiversity exists in the soft substrates...

Supporting services : Biologically mediated habitat

+ *bioremediation of waste*

e.g. Lanice conchilega reefs



subtidal

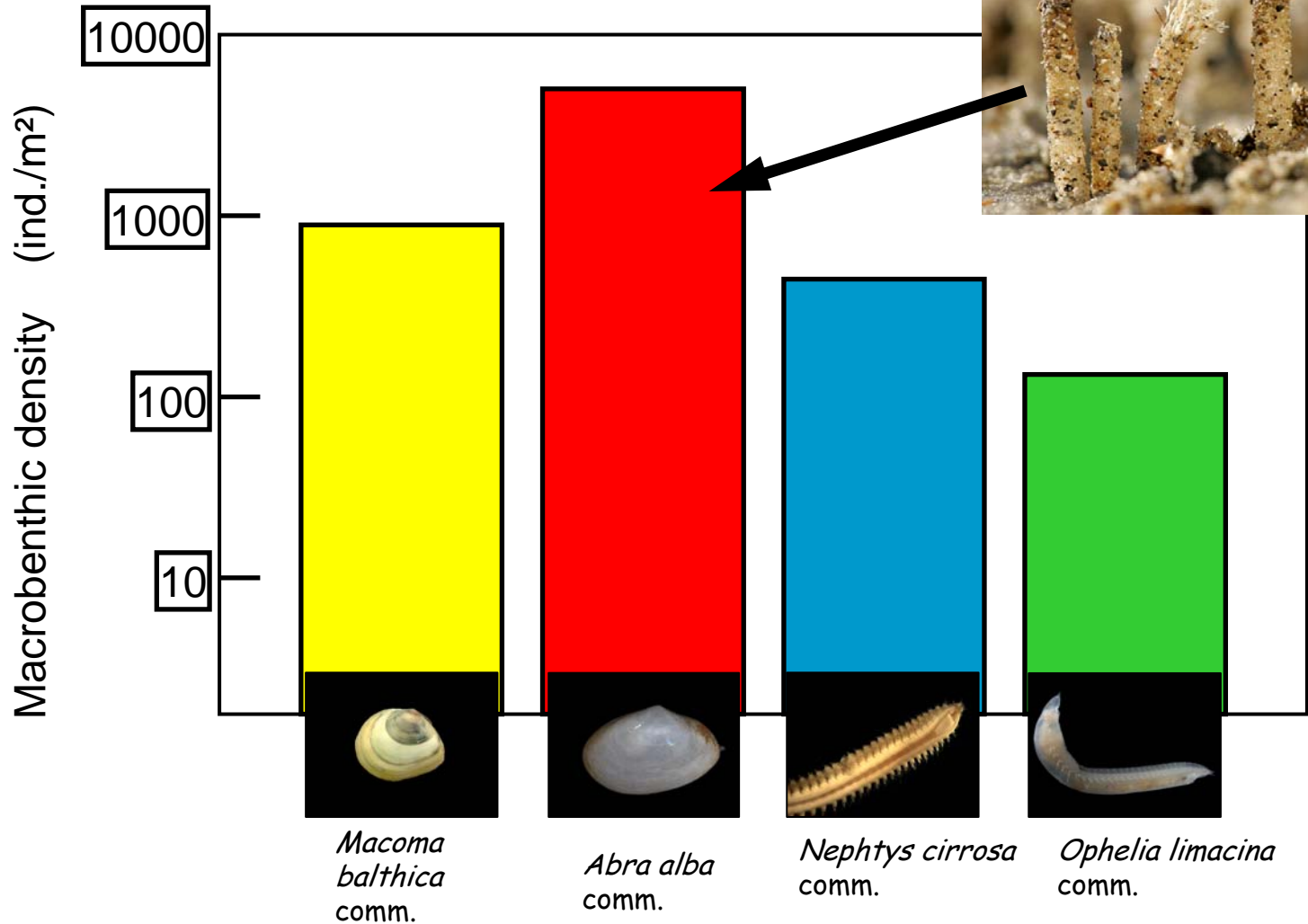


intertidal

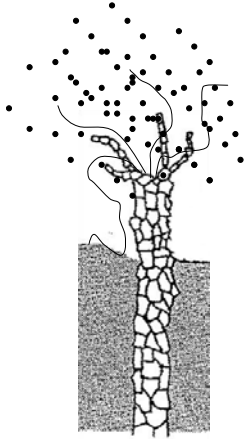
MACROBENTHOS

Community structure

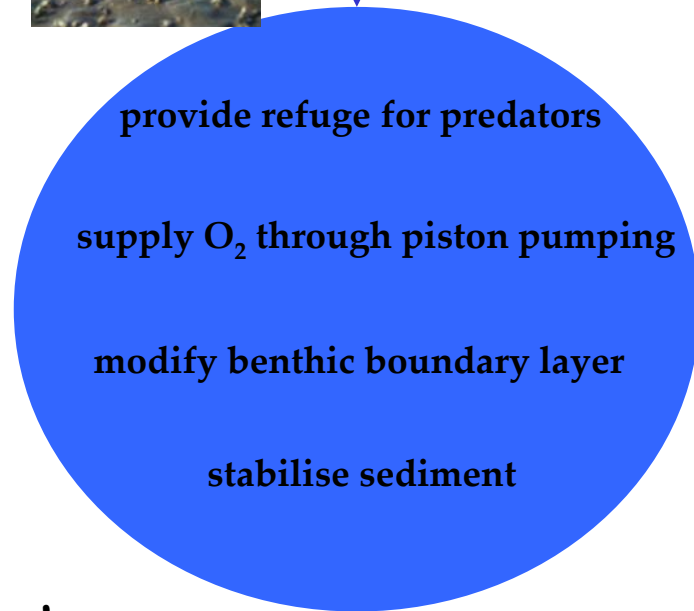
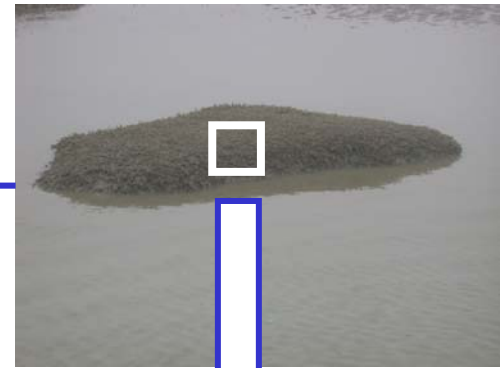
Densities (ind./m²)



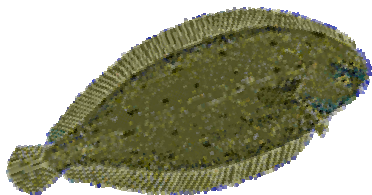
Lanice conchilega as important habitat engineer



Aggregations/



Lanice reefs are important habitat structuring marine bioherms that provide **GOODS** for human use



Increased Biodiversity

Increased Biomass Production

Increased food provision for higher trophic levels

GOODS AND SERVICES : summary 7 European sites

	Gdansk	Lister	BPNS	flamboroug	Atlant.	Scilly	Azores
	site 1	site 2	site 3	site 4	site 5	site 6	site 7
Food provision :	+	+	\$\$	+	+	+	\$\$
Raw materials	\$\$?	?	+	+	+	?
Gas and climate regulation :	+	+	+	+	+	+	?
Disturbance prevention :	+	?	0	0	0	0	0
Bioremediation of waste :	+	+	+	+	+	+	?
Cultural heritage and identity :	+	+	+	+	?	?	?
Cognitive benefits :	+	+	+	+	+	+	+
Leisure and recreation :	+	+	+	+	+	+	0
Feel good and warm glow :	?	+	?	+	+	+	+
Future or speculative values :	+	?	?	?	+	?	+
Resilience and resistance :	?	?	?	?	?	+	+
Biologically mediated habitat :	+	+	+	+	+	+	?
Nutrient cycling :	+	+	+	+	+	+	+

'+' : present;

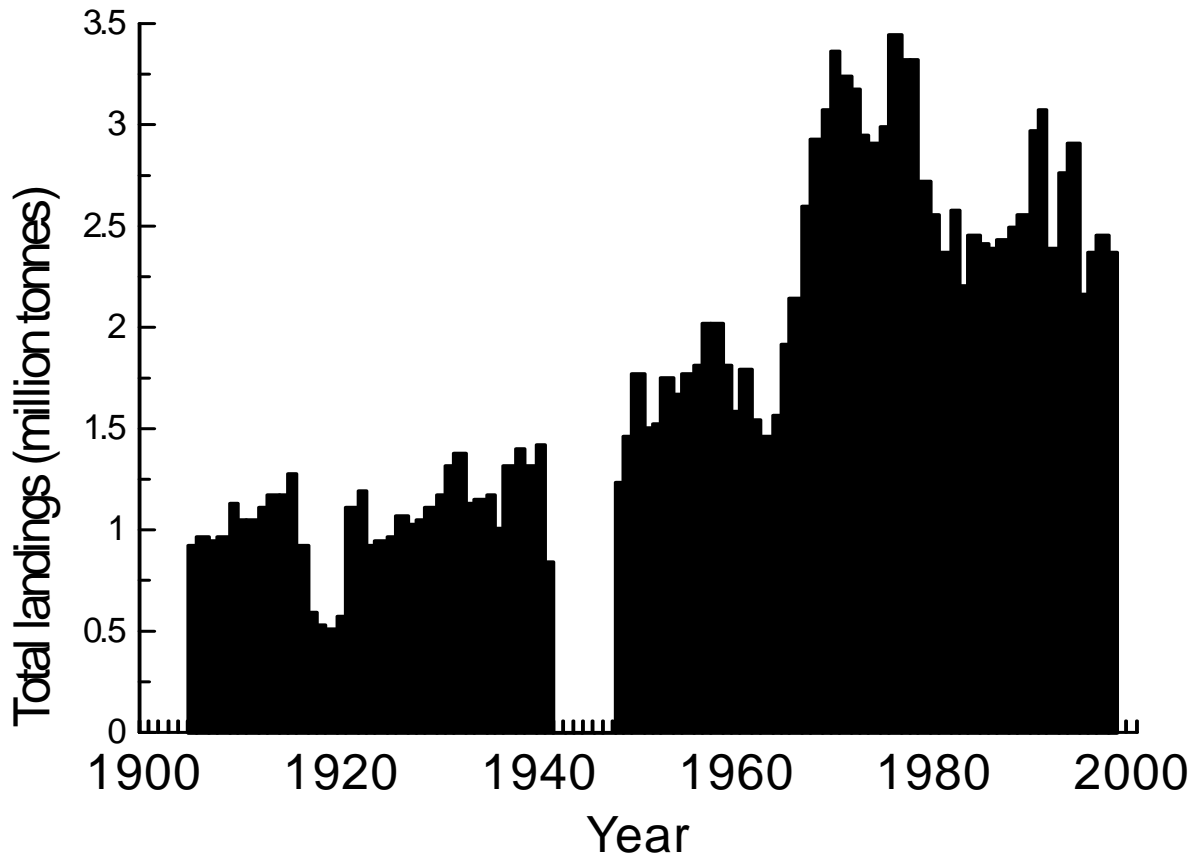
\$\$: monetary value available

'0' : not present; '?' : unknown;

Source : Beaumont *et al.*, unpublished (MarBEF, Theme 3)

Top-down pressure: trends in North Sea landings

FISHERIES

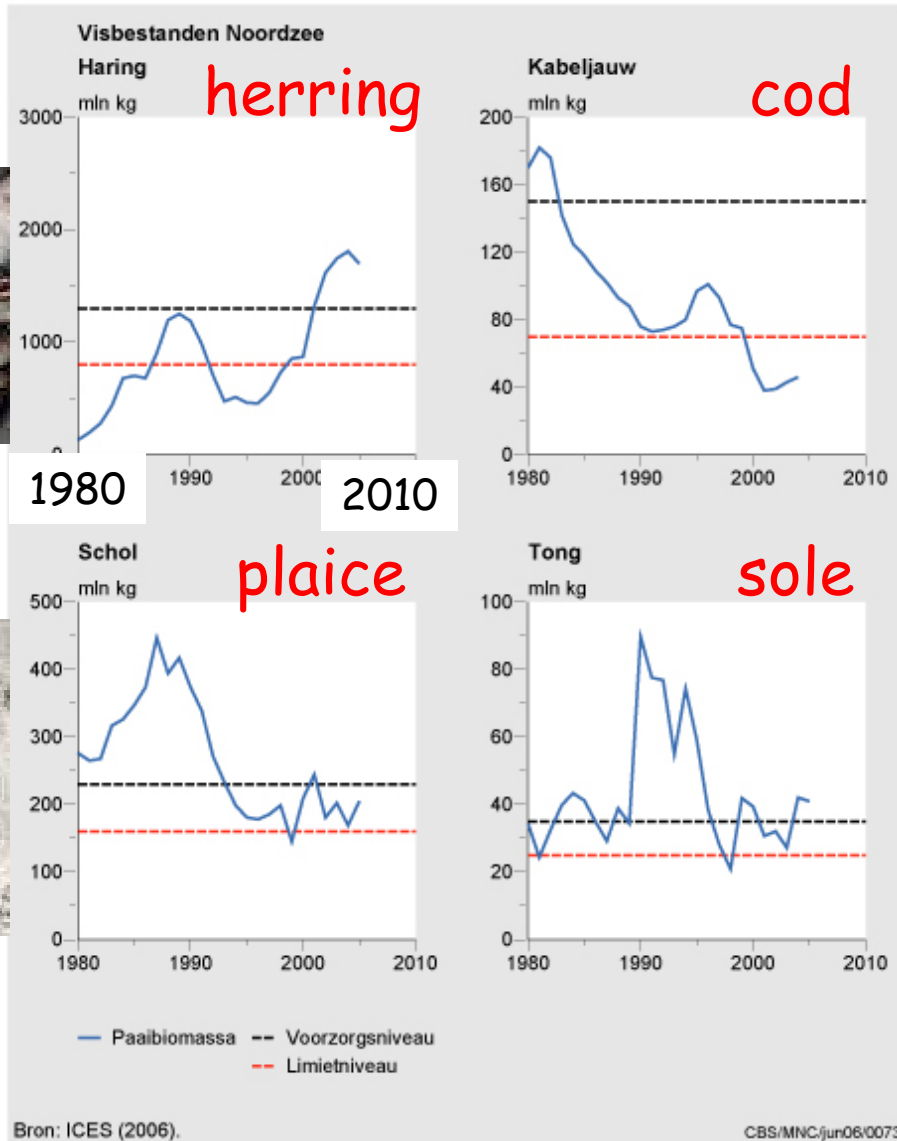


ICES Data

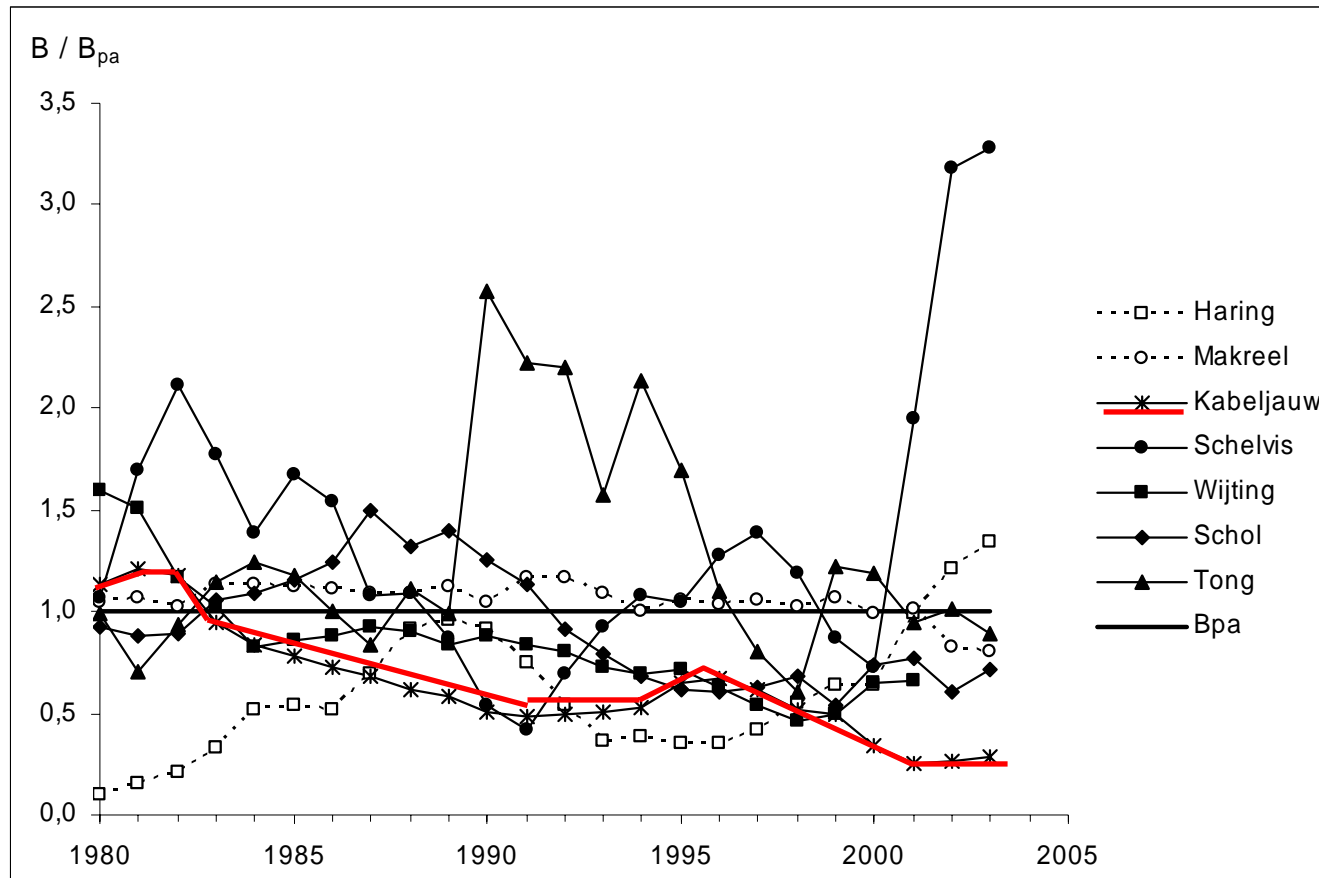
- Landings in 1900
 - 1 m tonnes
- Landings in 1970s
 - 3.5 m tonnes
- Landings now
 - 2.5 m tonnes
- NS fish biomass estimated at 10mt
- Current landings represent annual removal of c. 25% of standing stock biomass.
 - Ignores black-landings
 - Ignores by-catch and discarding!

Evolution of fish stocks in the North Sea (1980 - 2005)

Data source ICES, 2006

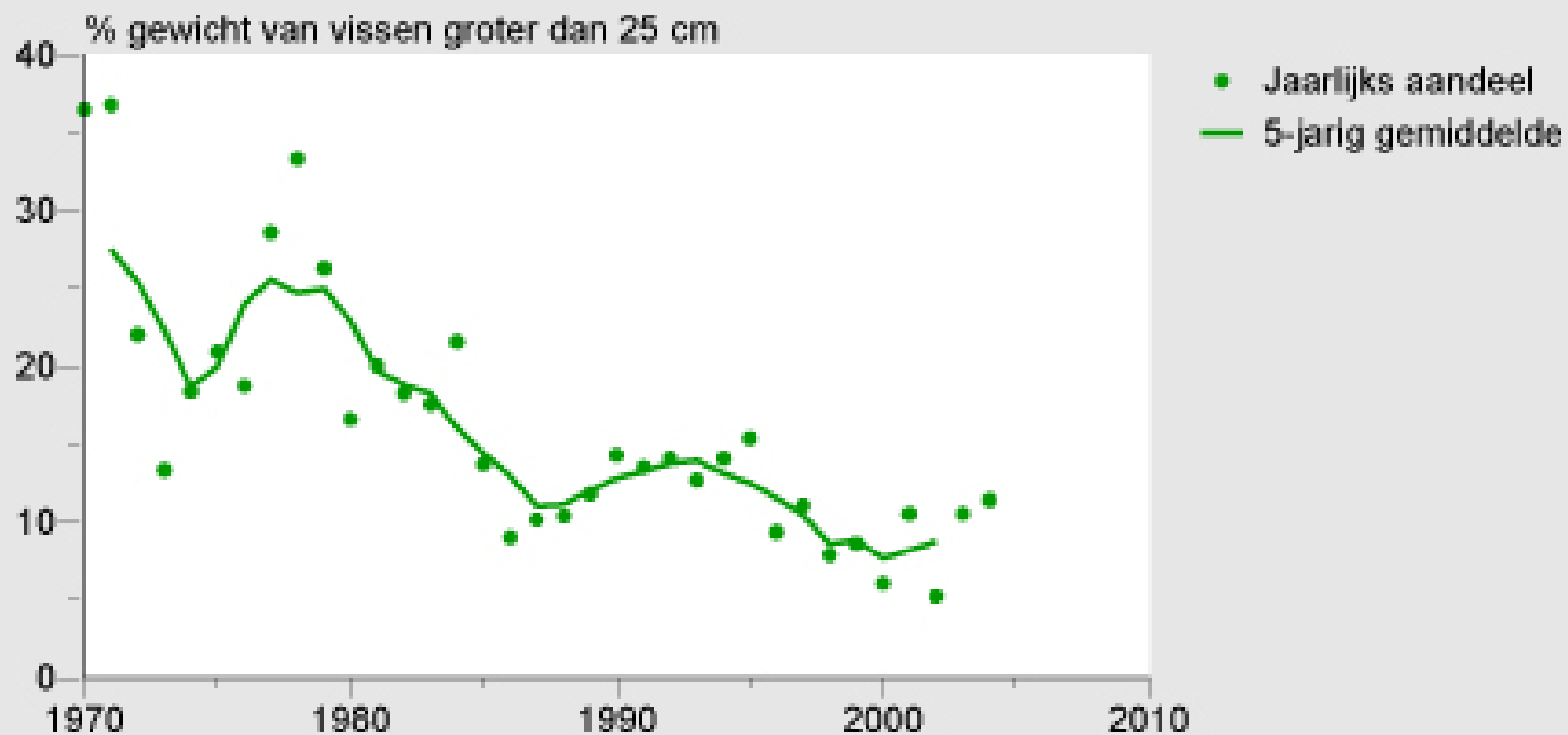


Evolution of the biomass of the spawning stock (B) for 7 indicator species compared to the precautionary level B_{pa} (North Sea and adjacent regions, 1980-2003)



Source : ICES data and ILVO in Milieurapport, MIRA-T, Calewaert *et al.*, 2005

Grote vissen in vangst



Bron: RIVO.

RIVO/MNC/ok05/1247

Gebruik de VISwijzer

Waarom deze VISwijzer?

Meer weten?

Gebruik je invloed

Stop de VISwijzer in je portemonnee. Gebruik hem in een restaurant of wanneer je vis koopt. Kies voor soorten uit de groene kolom en help mee de natuur onder water te beschermen!

Let ook op de herkomst

Etiketten moeten informatie over waar de vis vandaan komt, hoe ze wild gevangen is of gekweekt is. Bij twijfel gerust vragen!

Let op het MSC-logo



Producten met het MSC-logo garanderen dat deze vis op duurzame wijze is

Leven in Zee!

Veel in het wild gevangen vissen, schaal- en schelpdieren worden overbevist. Ook zijn er visserijmethoden waar haaien, dolfinen, schildpadden en zeevogels als bijvangst sterven of waarbij de natuur op de zeebodem

Kijk op www.goedevis.nl voor andere vissoorten, recepten of meer achtergrondinformatie.

www.noordzee.nl
www.wnf.nl

Partners:
www.diergaardeblieren.nl

VISwijzer



PUBLIC AWARENESS !

Steeds meer ondernemers nemen het initiatief om de natuur te sparen en een duurzaam produkt te leveren.

Zie ook:
'De Goede Visgids'

Kies voor een levende zee!

Prima keuze

- Alaska pollak/koolvis (Alaska)
- Forel (Europa)
- Grijs garnaal (Noordzee, Waddenzee)
- Harder (Waddenzee)
- Haring (Noordzee)
- Heek (Zuid Afrika)
- Heilbot (Pacifische*)
- Kabeljauw (IJsland)
- Kabeljauw (Pacifische*)
- Koolvis (Noordzee)
- Meerval (Nederland, België)
- Mossel (Zeeland)
- Mul (Noordzee)
- Oester (Zeeland)
- Poon (Noordzee)
- Rivierkreeft (China)
- Sardien (Noordoost Atl. Oceaan)
- Sprot (Noordzee)
- Tilapia (Nederland, België)
- Zalm (Pacifische*: VS, Canada)



Tweede keuze

- Alaska pollak/koolvis (Rusland)
- Goudbrasem, dorade (Mid.I. Zee)
- Harder (Mid.I. Zee, Noordzee)
- Heek (Europa)
- Krab (Noordzee)
- Langoustine (Noordzee)
- Makreel (Noordoost Atl. Oceaan)
- Pangasius (Azië)
- Pijlinktvis (NO Atl. Oceaan)
- Schar (Noordzee)
- Schelvis (Noordzee, IJsland)
- Tarbot (Europa)
- Tilapia (div. landen)
- Tongchar (Noordzee)
- Tonijn (geelvin, skipjack)
- Victoriabaars (Nijlbaars)
- Wijting (Noordzee)
- Zalm (Pacifische*: Rusland, China)
- Zalm (Schotland, Noorwegen)
- Zeebaars (Mid.I. Zee, Noordzee)
- Zeekat (NO Atl. Oceaan)



Liever niet

- Garnaal (Tropische)
- Griet (Noordzee)
- Heilbot (Atlantische, Groenlandse)
- Kabeljauw (Noordzee, Oostzee)
- Leng (Noordoost Atl. Oceaan)
- Octopus (Atl. Oceaan)
- Paling (Europa)
- Red snapper (div. landen)
- Rog (NO Atl. Oceaan)
- Roodbaars (NO Atl. Oceaan)
- Schol (Noordzee)
- Tarbot (Noordzee)
- Tong (Noordzee)
- Tonijn (blauwvin)
- Zeeduivel (NO Atl. Oceaan)
- Zeewolf (Noordoost Atl. Oceaan)
- Zwaardvis (div. landen)



Verklaring keuzemogelijkheden



Marine Stewardship Council (MSC), onafhankelijk keurmerk voor duurzame visserij
Wild gevangen
Gekweekt

Prima keuze

Niet overbevist, zorgvuldig gekweekt, minimale of beperkte schade aan natuur.

Tweede keuze

Problemen met kweek of visserij. Dit is een mindere keuze dan soorten uit de groene kolom.

Liever niet

Kies liever voor een alternatief uit de groene kolom! Deze soort wordt te zwaar bevestigd. De manier van kweken of vangen is te belastend voor natuur en milieu.

*Op het etiketaanpak van het gebied de Stille Oceaan

Voor MSC-producten en -verkoopinformatie kijk op www.goedevis.nl

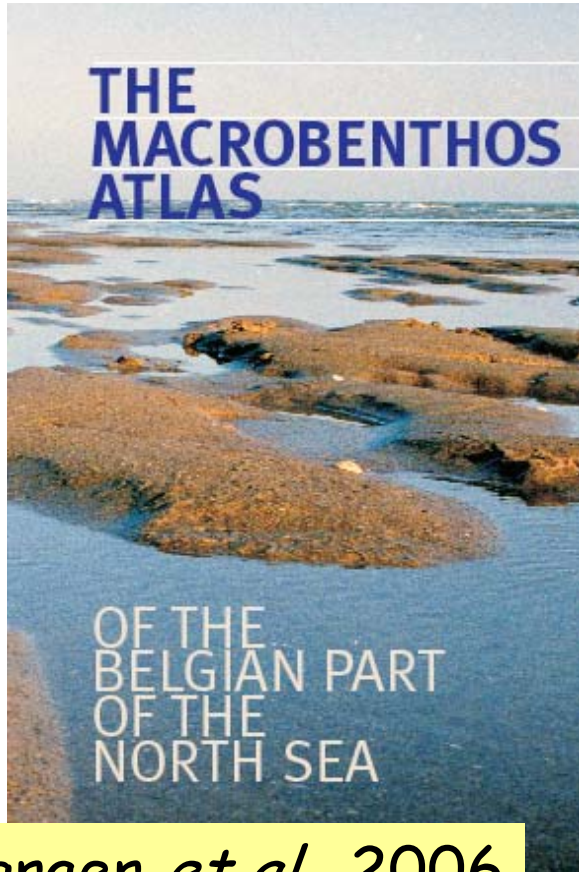
BPNS : 1971 - recent

MACROBENTHOS

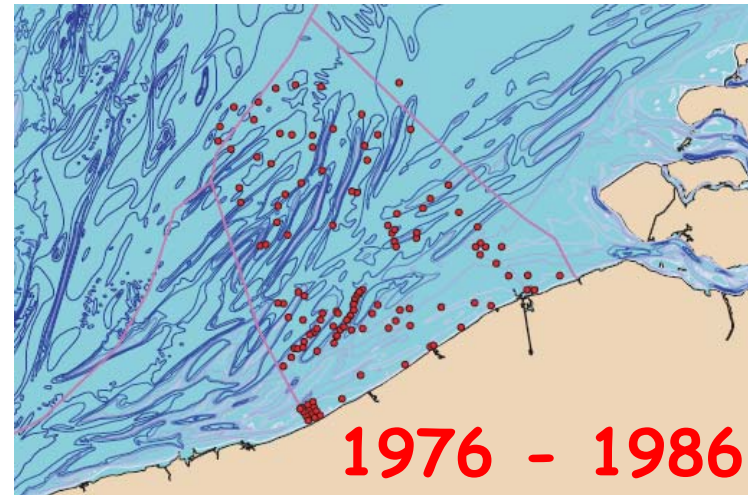


MACROBEL

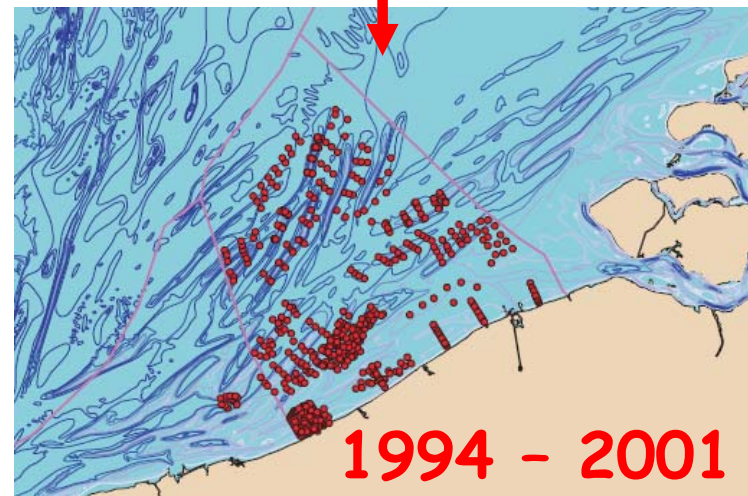
Long term trends in the macrobenthos of the Belgian Continental Shelf



Degraer *et al.*, 2006



1976 - 1986



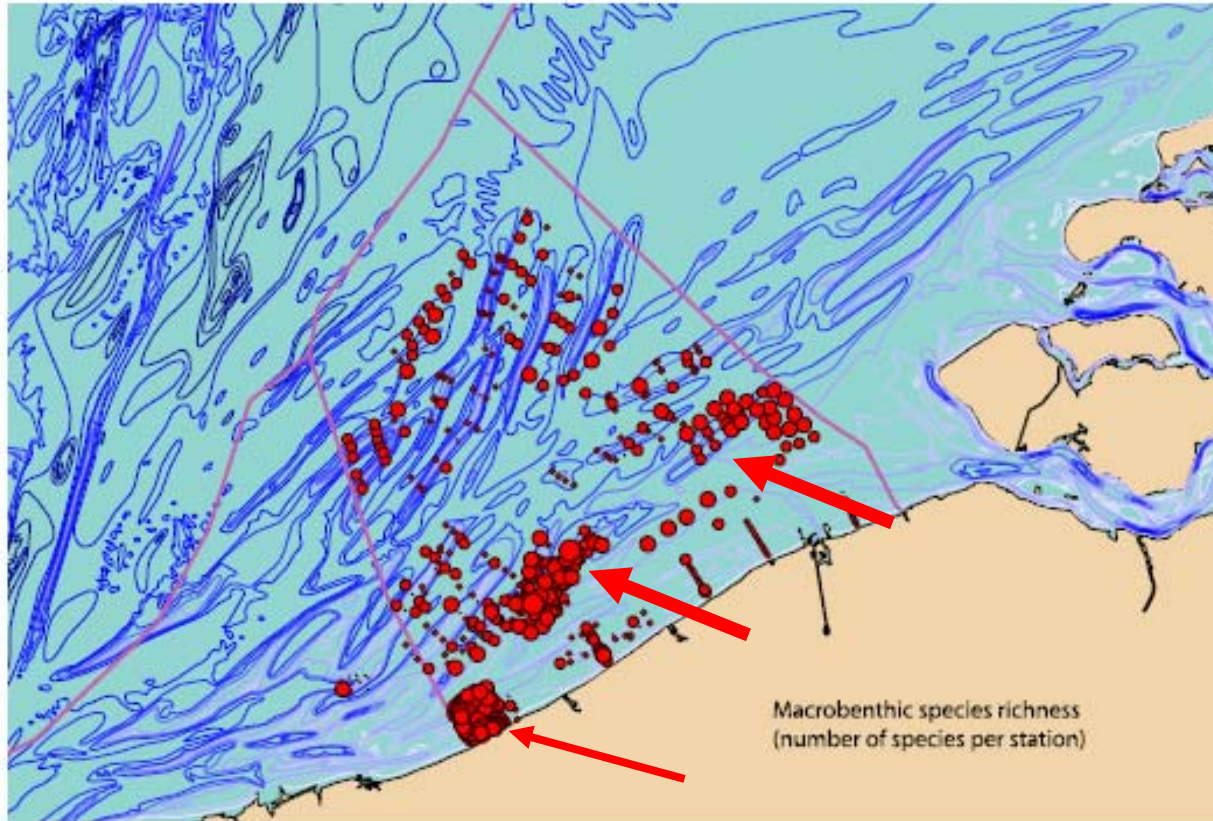
1994 - 2001

Partners

With the support of

Sponsor

Number of macrobenthic species : 265 species



Western coastal zone (+ Vlaamse Banken +Zeelandbanken : maximum values of both density (150.000 ind/m²) and diversity (81 species per station)

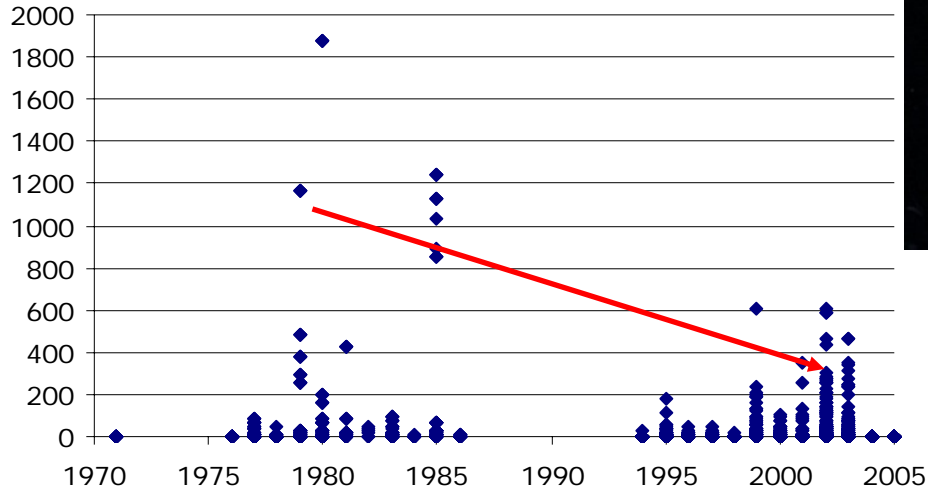
Some differences in trends between 76-86 and 94-01



max. dens. (ind/m ²)	1976 - 1986	1994 - 2001
<i>Abra alba</i>	13888	4834
<i>Ophelia limacina</i>	656	158
<i>Pectinaria koreni</i>	1075	350
<i>Donax vittatus</i>	42	302
<i>Macoma balthica</i>	13	165
<i>Spisula subtruncata</i>	351	1308
<i>Capitella capitata</i>	43	696
<i>Eumida sanguinea</i>	800	3489
<i>Lanice conchilega</i>	2106	9327
<i>Magelona johnstoni</i>	211	8950
<i>Spiophanes bombyx</i>	1500	11793



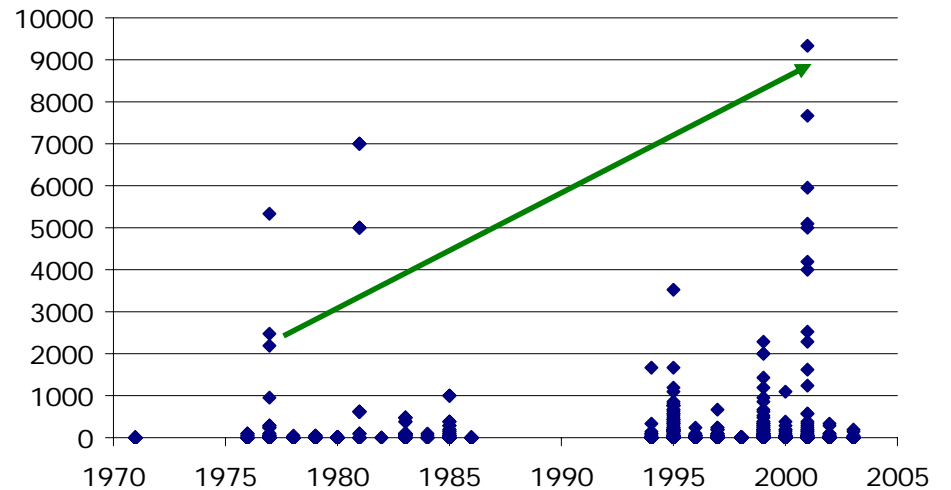
Pectinaria density per sq. m.



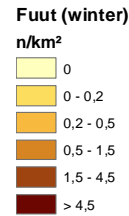
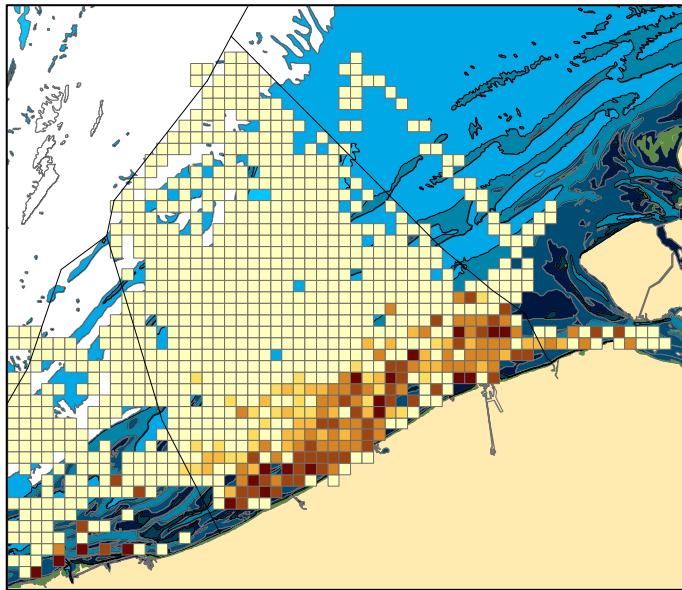
Source : data ICES - BEWG



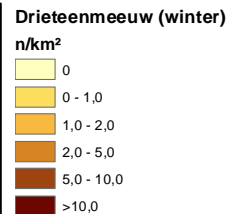
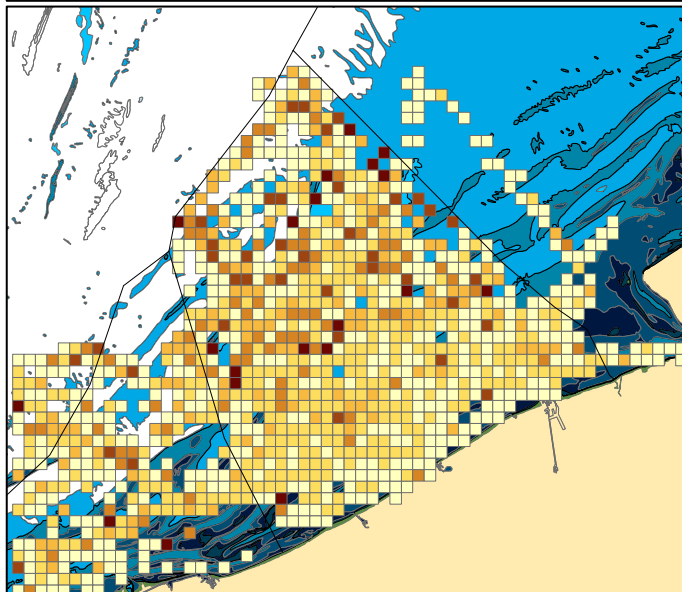
Lanice conchilega density per sq. m.



Birds : 'Coast and Open Sea' : winter densities

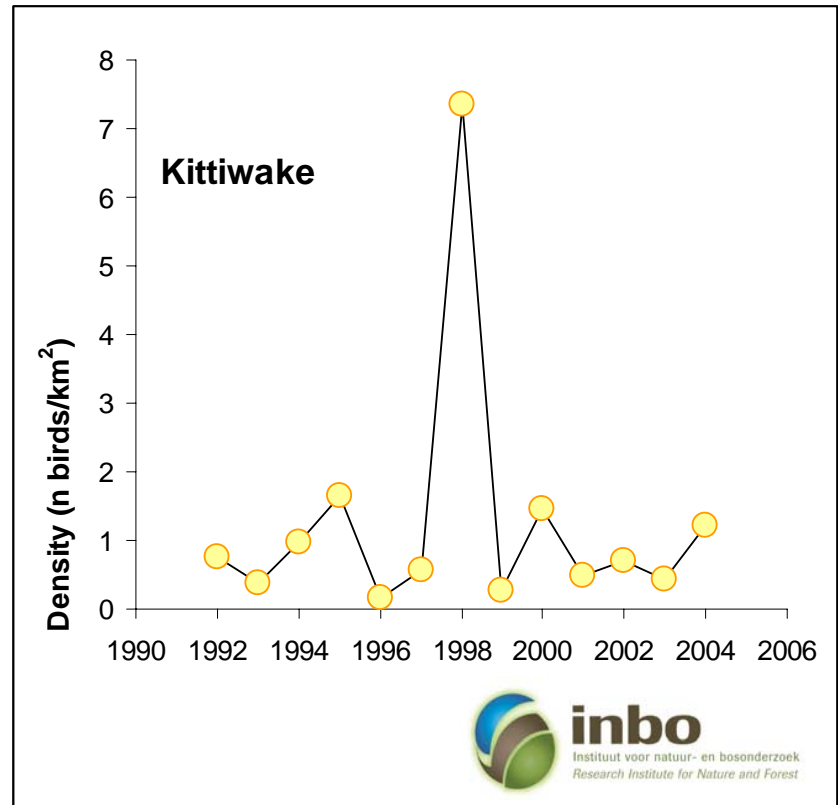
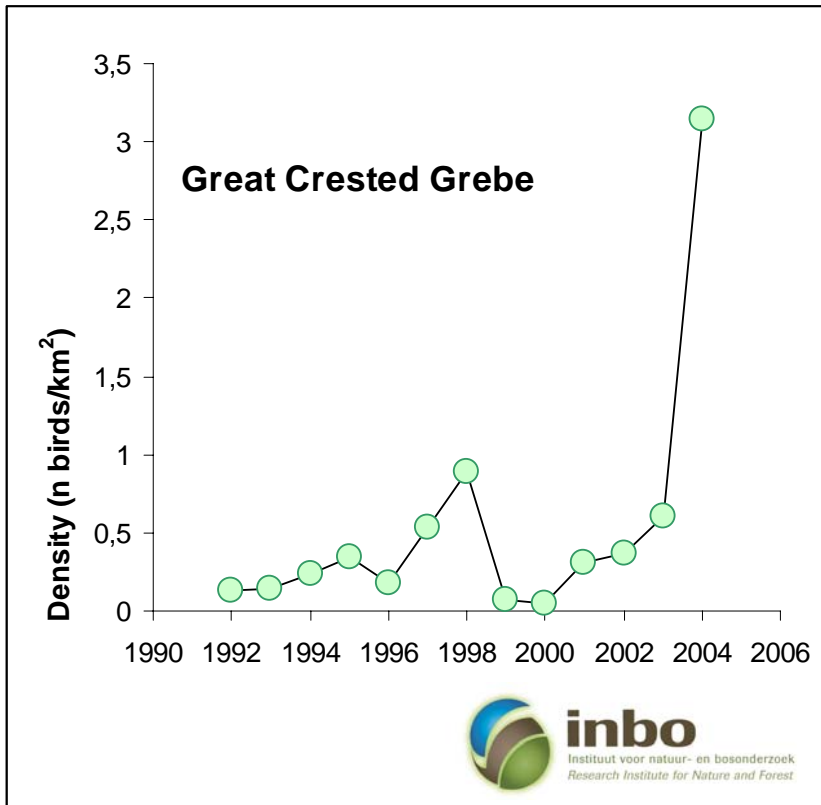


Great crested grebe



Kittiwake





Source : Stienen, 2006

Challenges to developing **indicators** of ecosystem services

- ❖ how can observable attributes of ecosystems and human well-being be linked ?
- ❖ how can indicators be aggregated across spatial scales without smoothing out important heterogeneity ?
- ❖ how can indicators reflect future consequences for human well-being ?
- ❖ what is the **minimal set of indicators** to represent multiple facets of ecosystem services ?

❖ ...

VERY DIFFICULT TO ANSWER NOW !

BIOLOGICAL VALUATION

“The *intrinsic value of marine biodiversity*, *without* reference to anthropogenic use “

Biological valuation	Socio-economic valuation
Intrinsic value (high value = f.i. hotspot area for nature preservation)	Value of goods and services (high value = many goods & services provided to humans)
Relative value Non-monetary score	Absolute/relative value Usually monetary score

MARINE BIOLOGICAL VALUATION: TESTING THE PROTOTYPE VALUATION STRATEGY

FIRST CASE STUDY AREA: BELGIAN PART OF THE NORTH SEA (BPNS)



MAIN ADVANTAGES

- Small and well-studied
- Very good **spatial data coverage** for
Macrobenthos
Seabirds
Epibenthos (demersal fish, ...)
Hyperbenthos (shrimps, ...)

Degraer et al.

TESTING: SEABIRDS BPNS

→ Community level - structure

Is the species richness in the subarea high?

RARITY – AGGREGATION – FITNESS CONSEQUENCES

→ Species/population level - structure

Is the subarea characterized by high counts of many species?

AGGREGATION

Is there a high percentage of a species population located within the subarea?

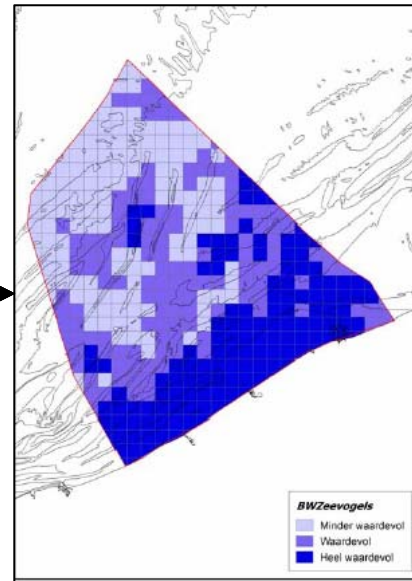
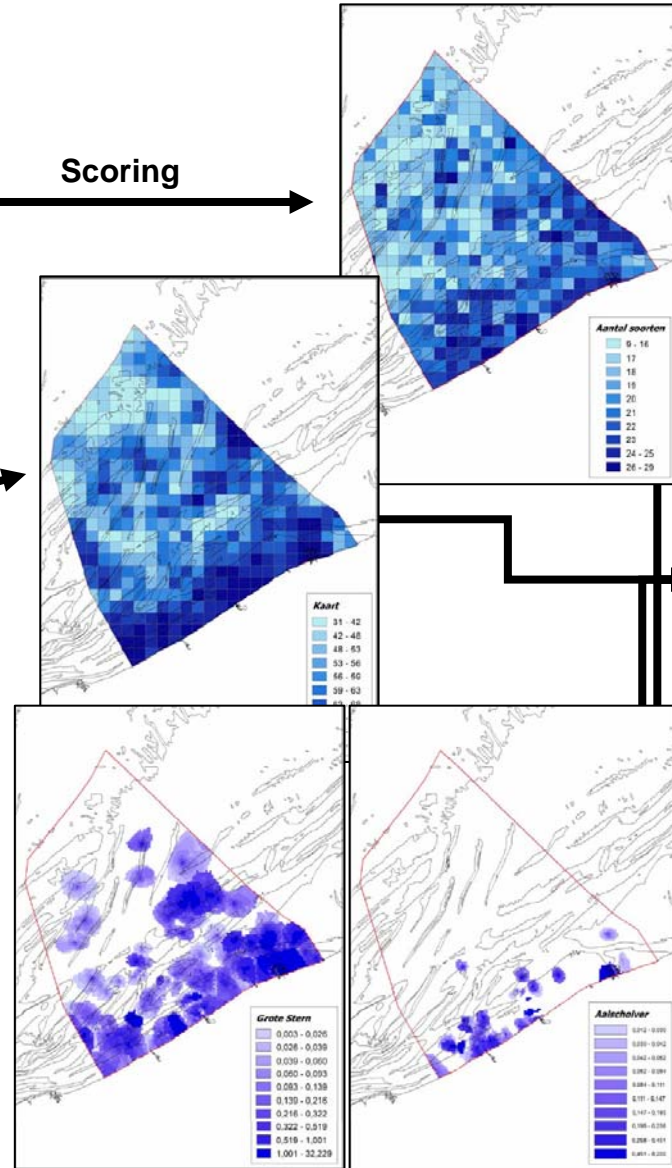
PROPORTIONAL IMPORTANCE

Scoring

Scoring

Scoring

Biological valuation map seabirds

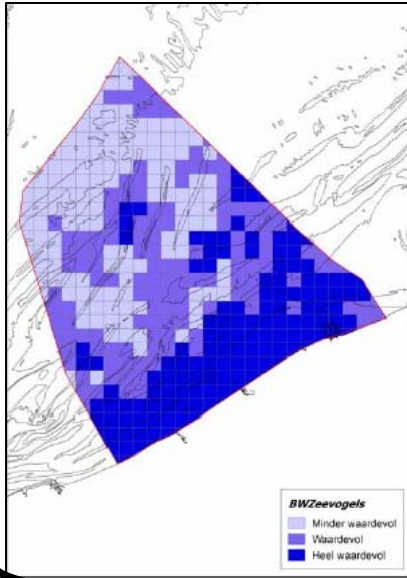


→ Other valuation questions (other biodiversity levels/criteria)

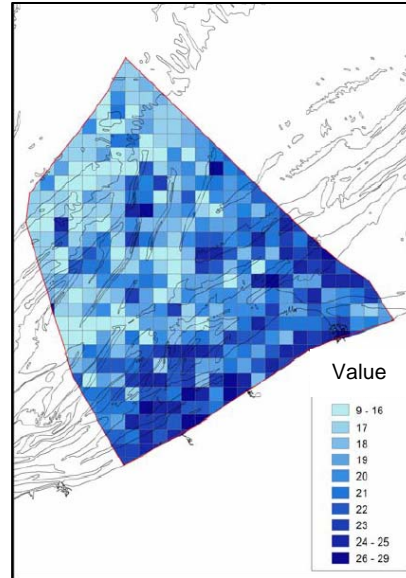


TESTING: BIOLOGICAL VALUATION MAP BPNS

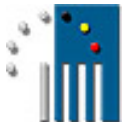
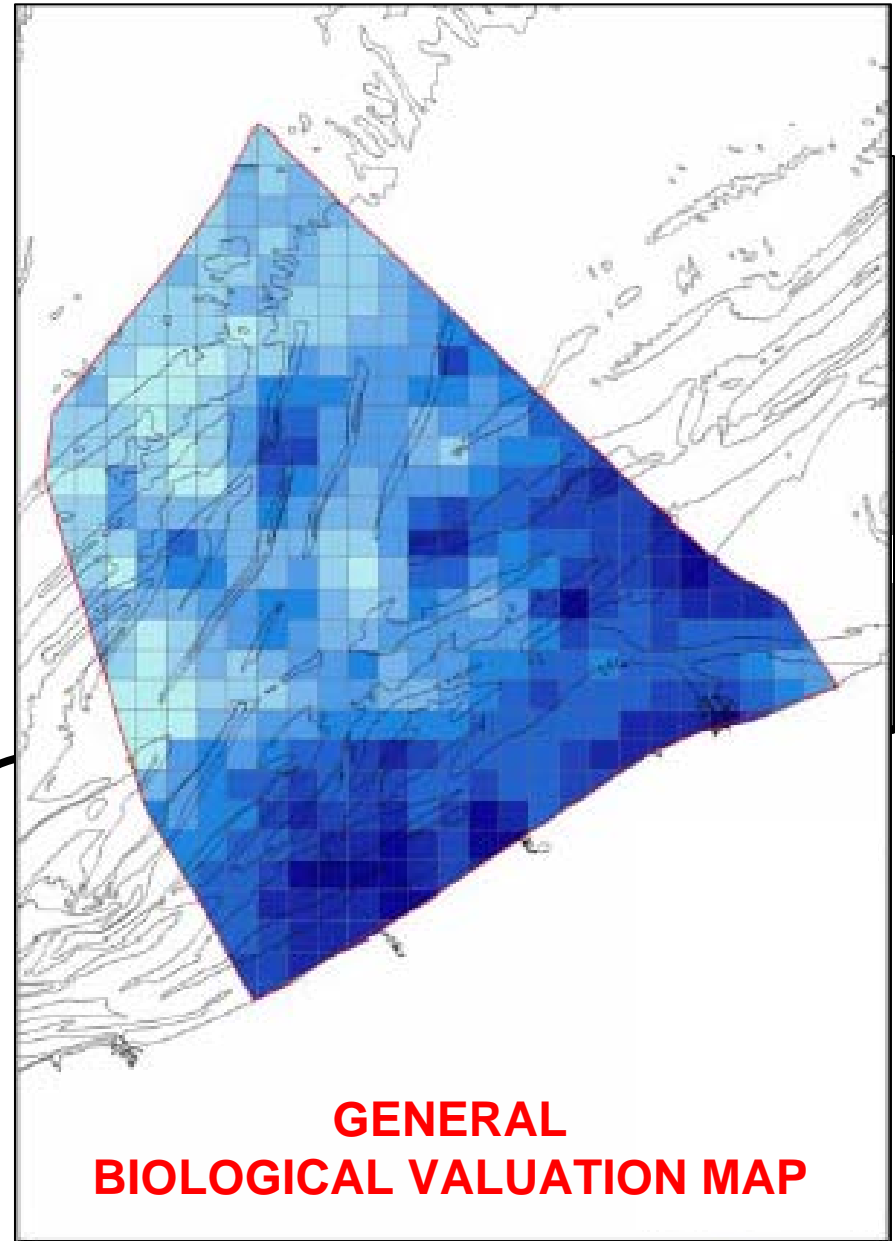
Map
seabirds
(final)



Map
macrobenthos
(hypothetical)



Integration of values for
separate ecosystem
components



MARINE BIOLOGICAL VALUATION: IN CONCLUSION



- (1) A integrated, common strategy for biological valuation would be a powerful tool within marine Decision Support System
- (2) A prototype strategy for marine biological valuation is set up and is now in the process of testing
- (3) Everybody who is an expert, curious or suspicious about biological valuation is invited to contribute to the strategy's improvement

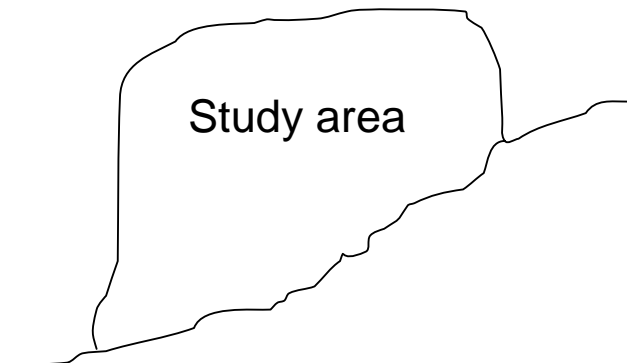
***Towards a
scientifically acceptable and generally applicable
biological valuation strategy for the marine environment***

Derous et al. submitted : *Biological valuation: Towards a scientifically acceptable and generally applicable protocol for the marine environment*

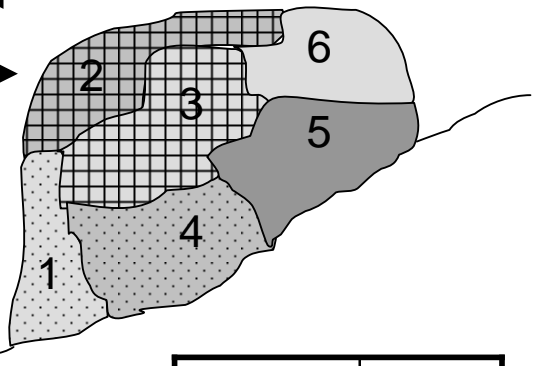
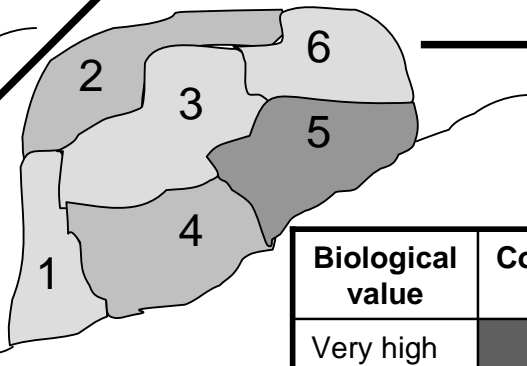
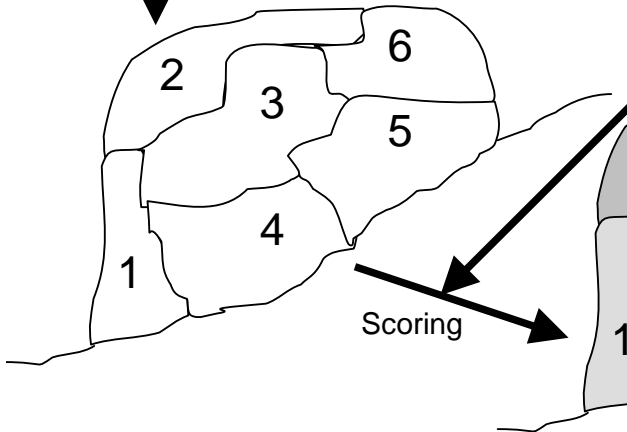
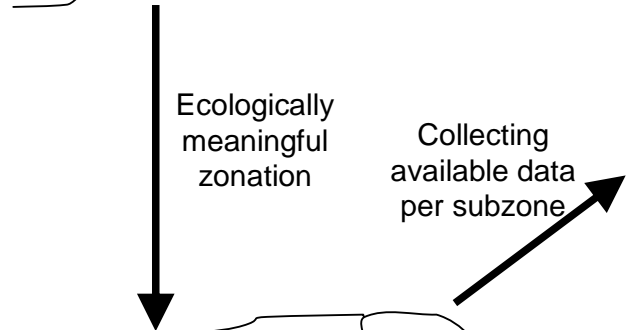


Lecce, 9-11 May 2006





Sub zone	Available data	Ratio AQs answerable/ total # AQs	Quality of data
1	SB counts, MB density and species richness	21/46	Different sampling gears used for MB
2	SB counts	7/46	Infrequently visited subzone
3	MB density and species richness	13/46	Only 1 sampling point for MB
4	SB counts, EB biomass	8/46	
5	SB counts, MB/HB and EB density-species richness	42/46	Very detailed data
6	SB counts, MB/HB and EB density-species richness	42/46	Very detailed data



Biological value	Colour
Very high	Dark gray
High	Medium-dark gray
Medium	Medium-light gray
Low	Light gray
Very low	White

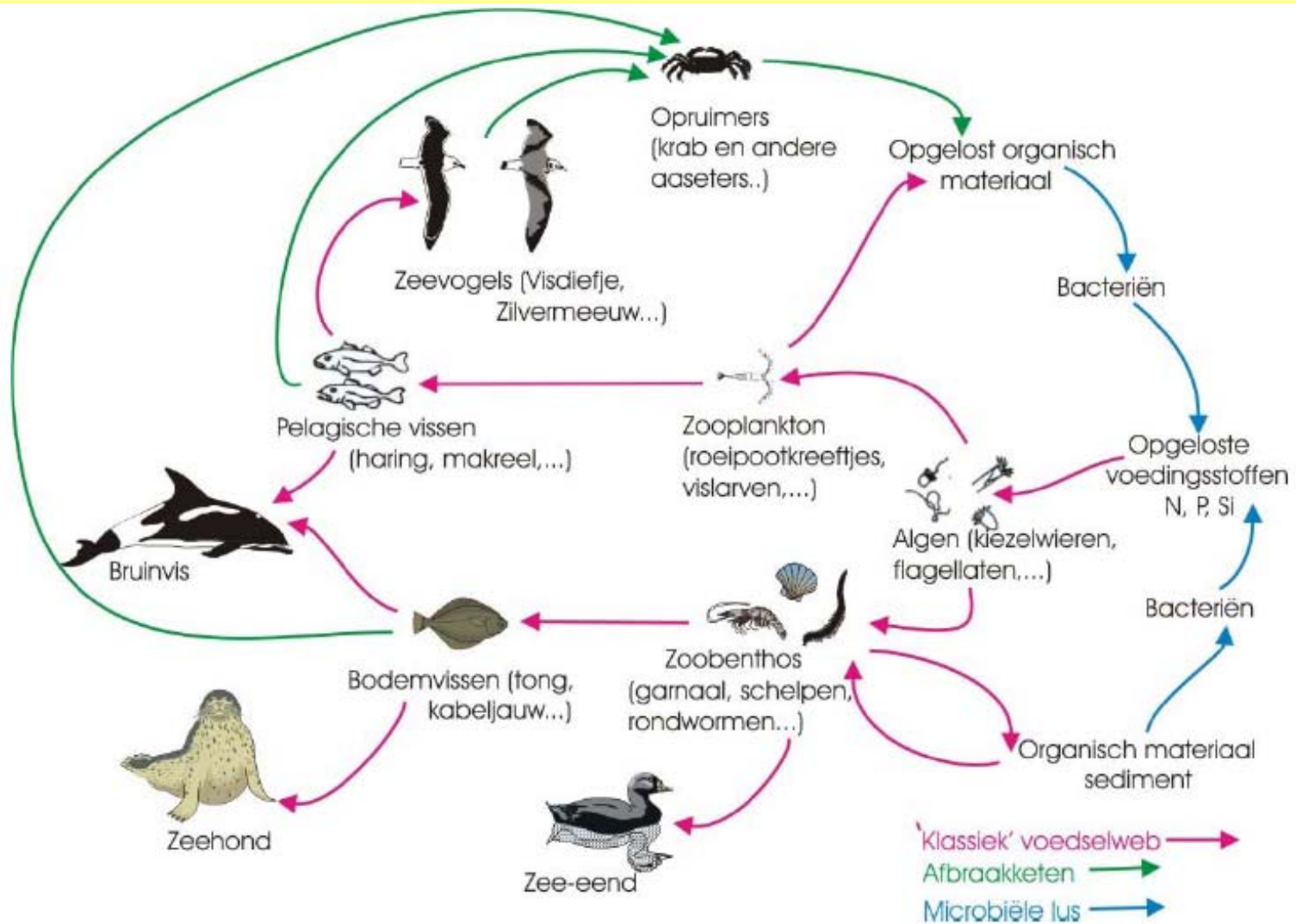
Reliability	Effect
High	None
Medium	Stippled pattern
Low	Grid pattern

BIOLOGICAL VALUATION MAP

Derosus et al. subm.



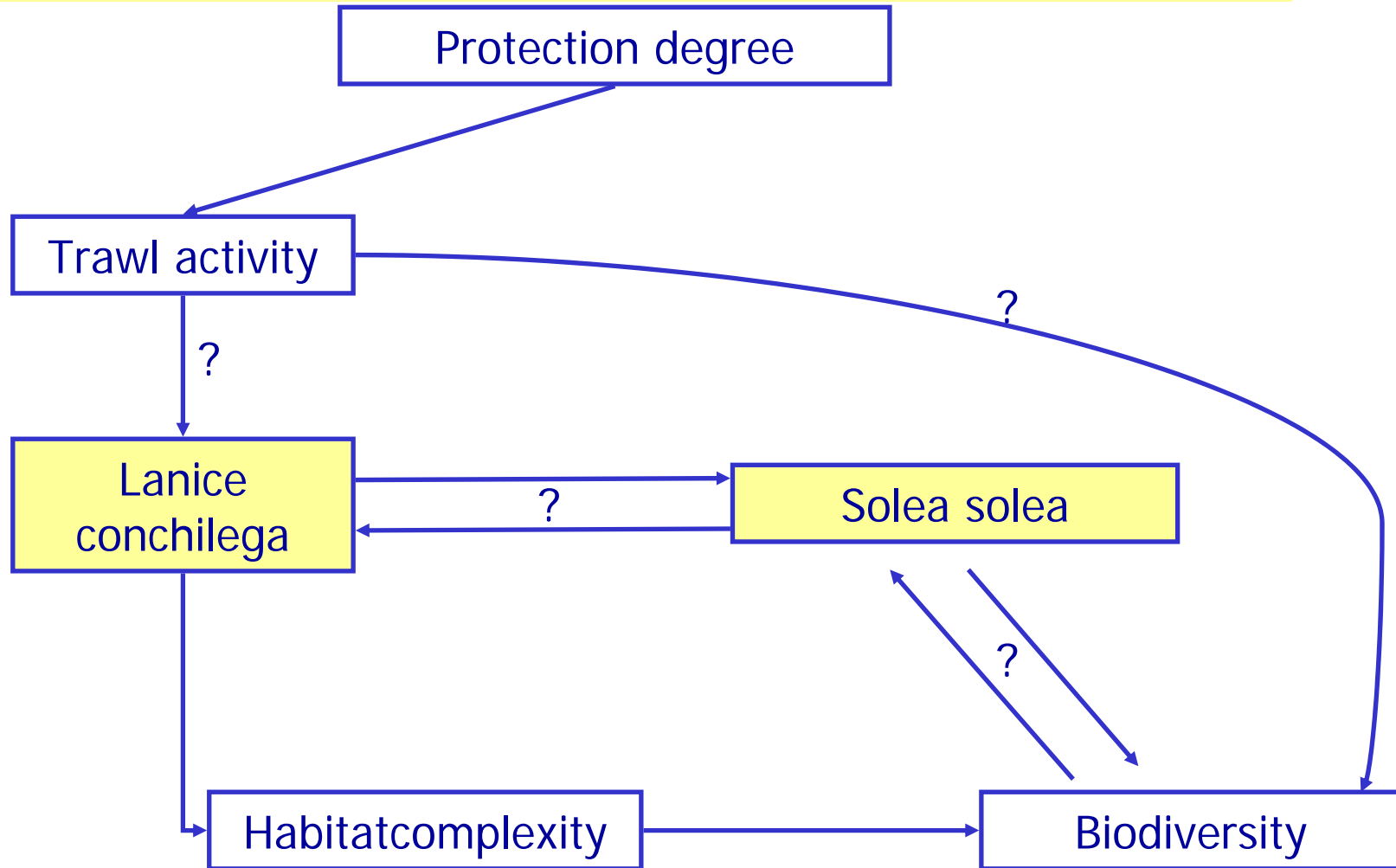
ECOSYSTEM-approach : links between role of bioindicators.....



Source : Claus & Cuvelier (2004) : The marine food web in the BPNS TROPHOS -BELSPO project



*MA question : How does an MPA influence the **ecosystem functioning** and how does this provide goods (in casu fish) for human use?*



CONCLUSIONS : MA for Belgium ?

- ✓ BPNS well-known (although not integrated over the several ecosystem components) : importance of the **ecosystem approach** and valuation of the **functional role of the bio-indicators** (cf. WESTBANKS-BELSPO)
- ✓ '**Biological valuation**' (INTRINSIC biological value) should be combined with 'goods and services' approach
- ✓ Importance of **long term data series** (without gaps) and proper **data archives** (standardised methods!)