Marine Biodiversity and Ecosystems' Services

An updated research agenda as a follow up of the 2010 targets….

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in charge of Marine Biodiversity
IFREMER

2010 International Year of Biodiversity

"Océans" & the Census of Marine Life
Symposium on ocean exploration, governance and 10 years of discovery, Washington DC October 19th, 2010

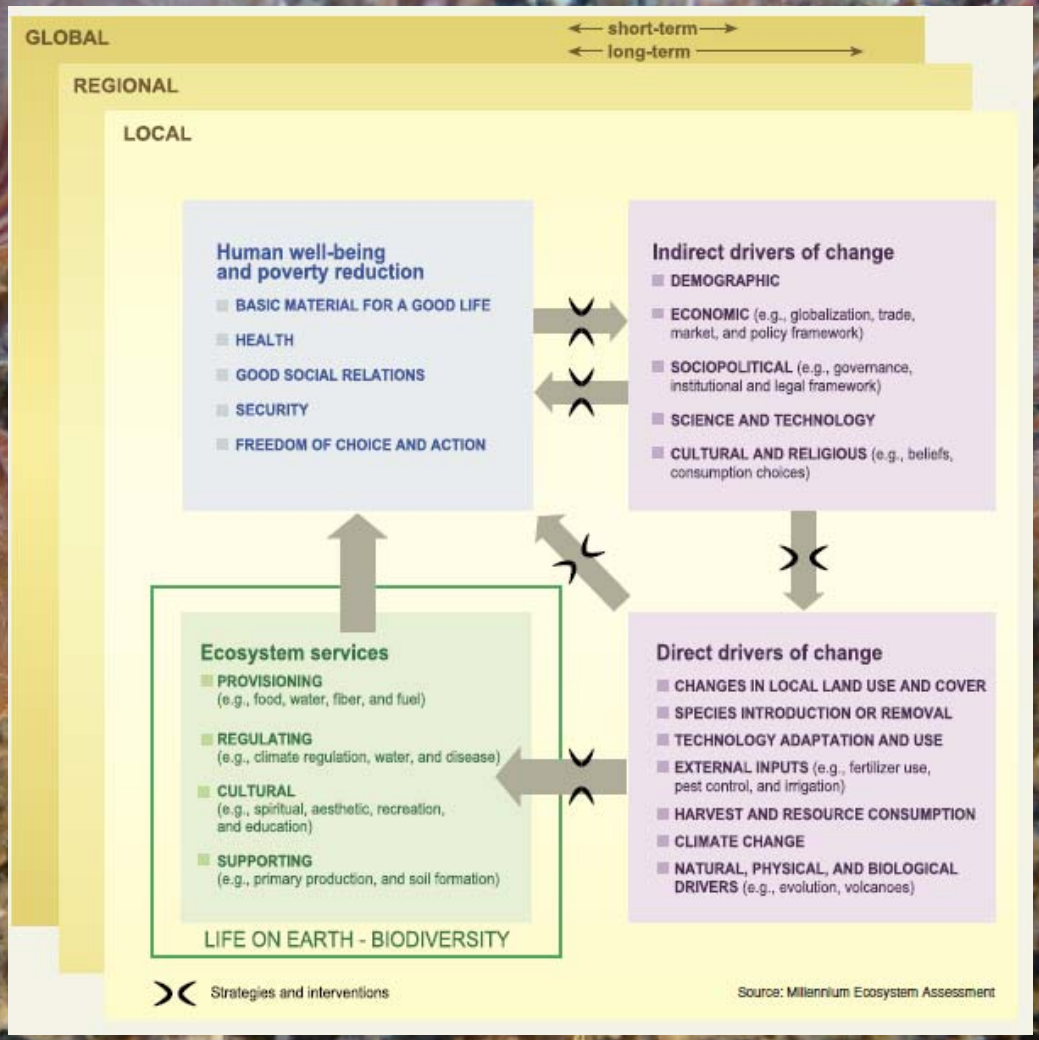
Ifremer

Main Objective in term of governance: Halting the loss of biodiversity by 2010 (CBD)

The Millenium Ecosystem Assessment …(MEA 2005)

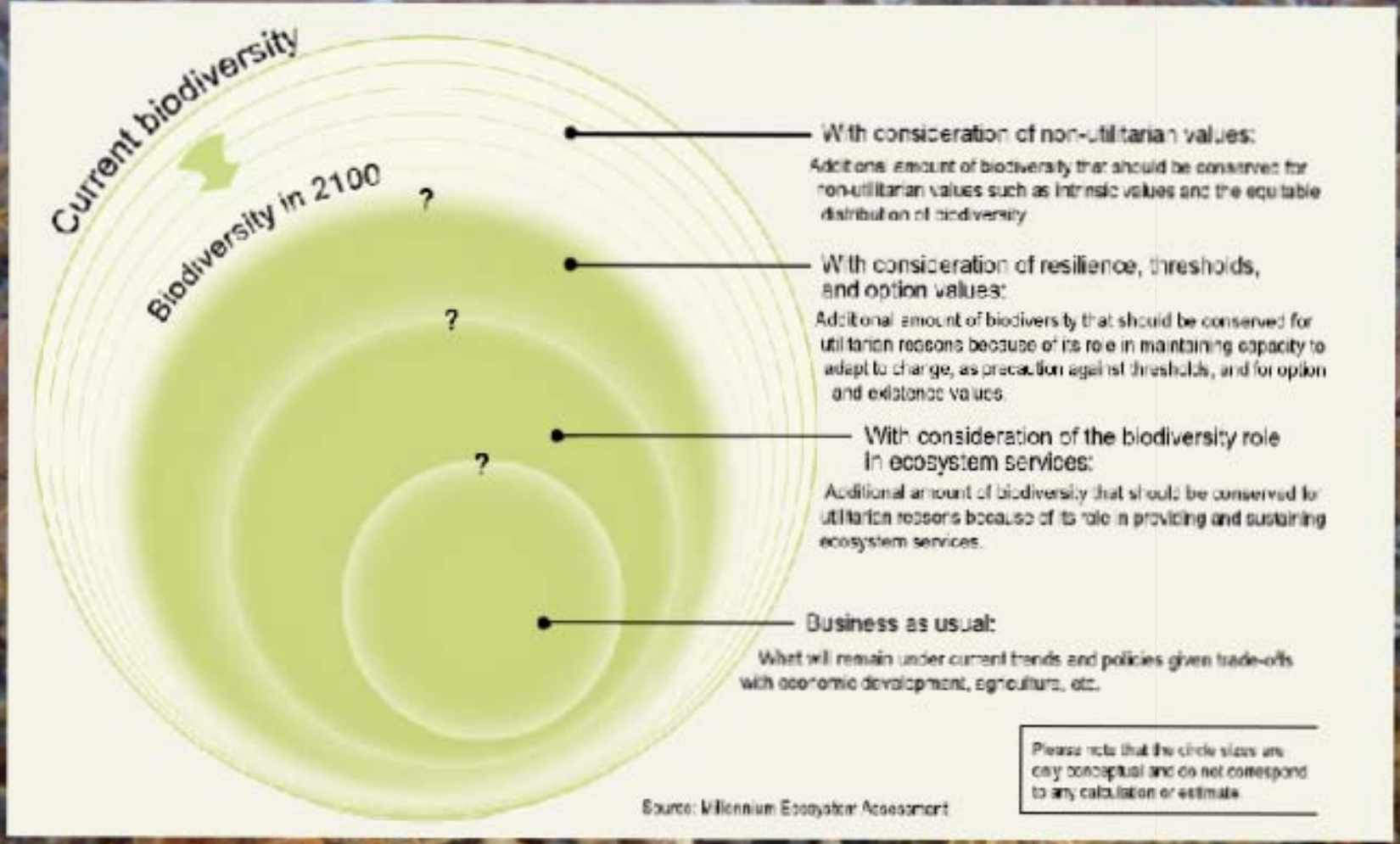
Biodiversity is the keystone for sustainability of ecosystems services (present and future…)

- 60% of ecosystem services already impacted
- marine fisheries, one of the main provisionning services presently affected



A conceptual framework for biodiversity governance, …although prompting for trade-offs among ecosystem services !

Millenium Ecosystem Assessment (2005)
Trends under different value frameworks ? (MEA, 2005)



A matter of choice for the decision makers…..but based upon the best scientific advice possible ! … including the capacity of scenario development & assessment (DPSIR approach)

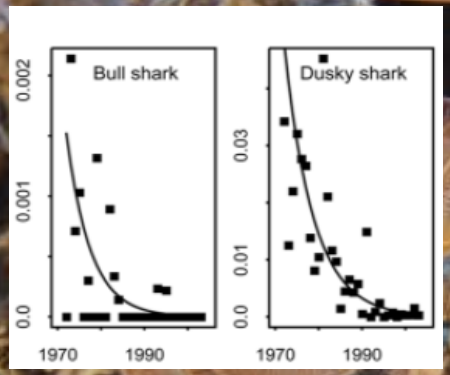

Scientific community ready to provide such integrated advice for biodiversity management ??

Marine Biodiversity Status & peculiarities constraining our knowledge…and therefore management capacity…

- In spite of a highly significant effort (e.g., Census of Marine Life), marine biodiversity remains largely unknown
- Virosphere is totally unknown (1ml seawater # 1M microorganisms)
- Many genus showing a worldwide distribution (e.g., pelagic apex predator fish)
- Lack of 'ownership' for living resources, including in high seas areas
- Lack of knowledge on species interactions at the ecosystem level (functionnal groups)
- Technical constraints to develop monitoring & observation networks
- Mainly 3D (*vs* 2D in terrestrial domain)
- Process dynamics highly differentiated

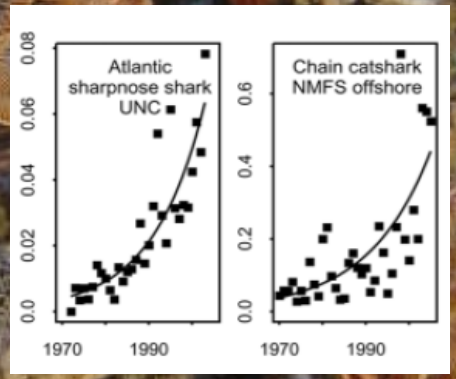
Cascading effects of top predators overfishing… *(Myers et al., 2007)*

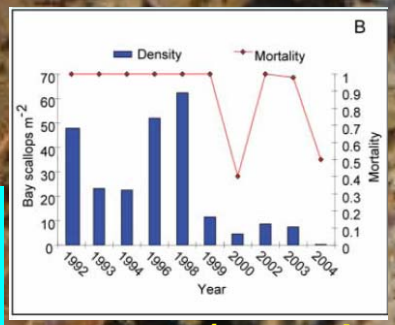
demonstrating the need for a trans-sectorial approach in management and integrated knowledge



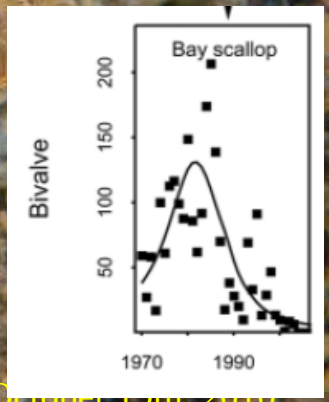
Sharks

Rays-Skates…





Bay scallop…
….fishery collapse



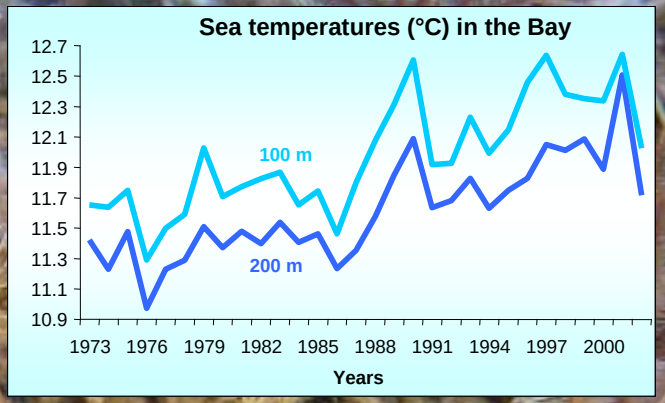
Critical importance of interactions & 'TOP-DOWN' drivers !

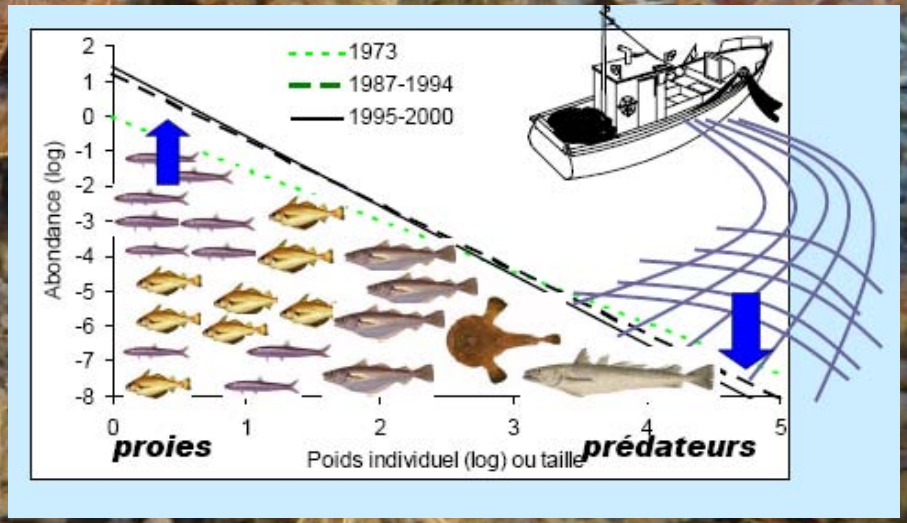
Interactions among 'Climate Change – Biodiversity – Fisheries Management' in the Bay of Biscaye, FR

- Fisheries management:

  - Global change: 1.5°C seawater increase over the last 25 years,
  - New species distribution & recruitment patterns (subtropical sp.)
  - Overfishing on temperate & boreal sp.
  - Increasing share of smaller Sub tropical sp.

Ecosystem Approach & modelling required !





Living resources trends in the Bay of Biscaye (Blanchard, 2005)


How the research address the new challenges ?

The Key Issues….

- (1) Cataloguing biodiversity, (variety, quantity & distribution of genes, populations, communities & ecosystems) & its distribution

- (2) Understanding ecological & evolutionary processes that account for biodiversity (interactions with human & environmental drivers)

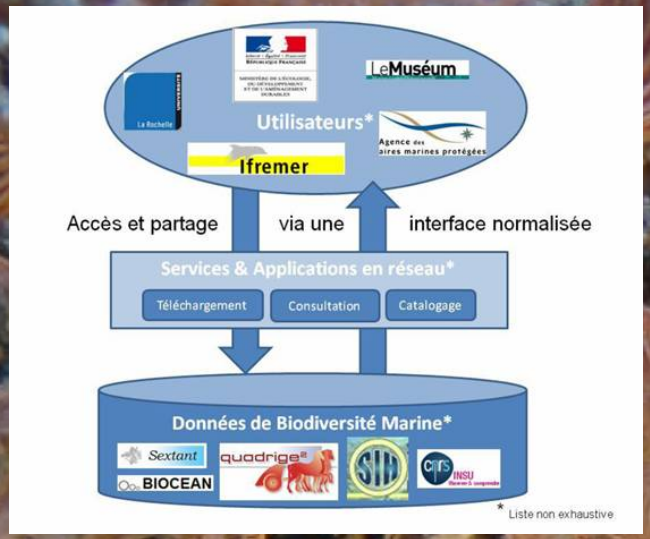
- (3) Assessing how patterns of biodiversity influence function of populations, communities and ecosystems & provision of ecosystem services

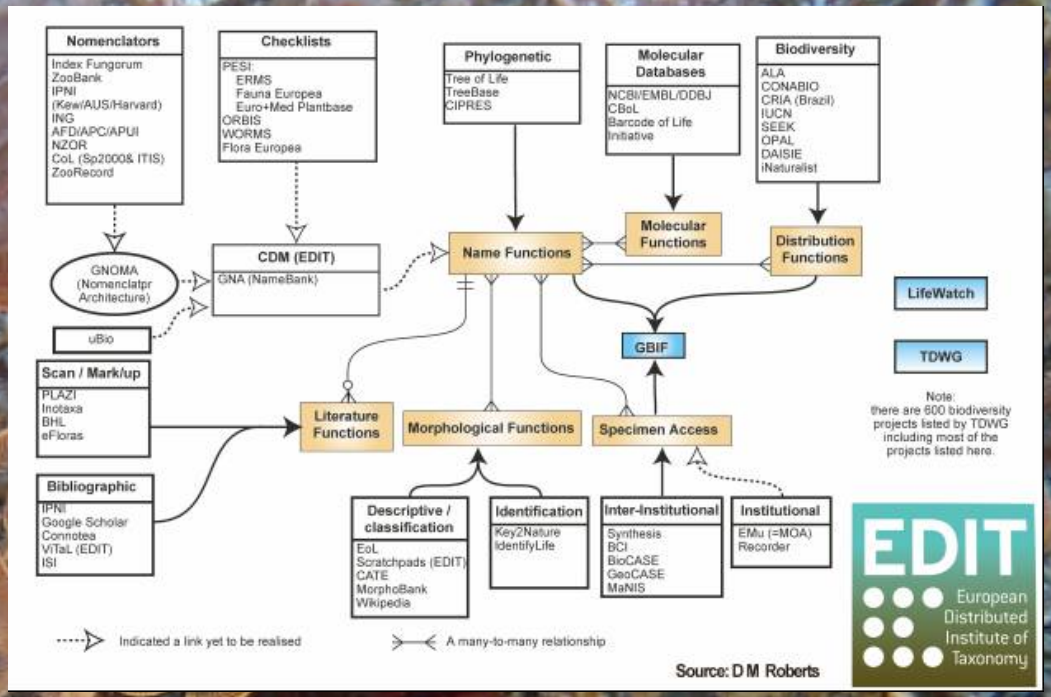
- (4) Understanding and modelling how the biodiversity, functions & ecosystems services respond to human & environmental drivers

- (5) Supporting development of management systems to meet objectives for biodiversity conservation via the design of decision support approaches and tools

(Thébaud & Le Guyader, 2005)

Marine Biodiversity cataloguing ….





International Projects

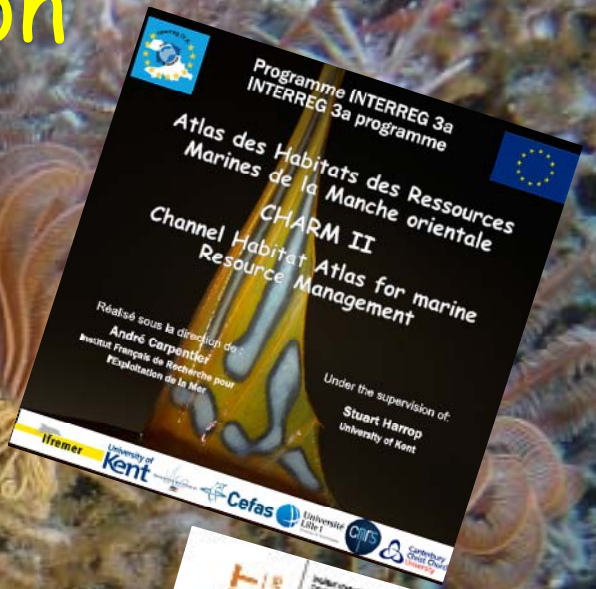
On going development of the French SINP information system interoperating various databases (Huguet 2010)

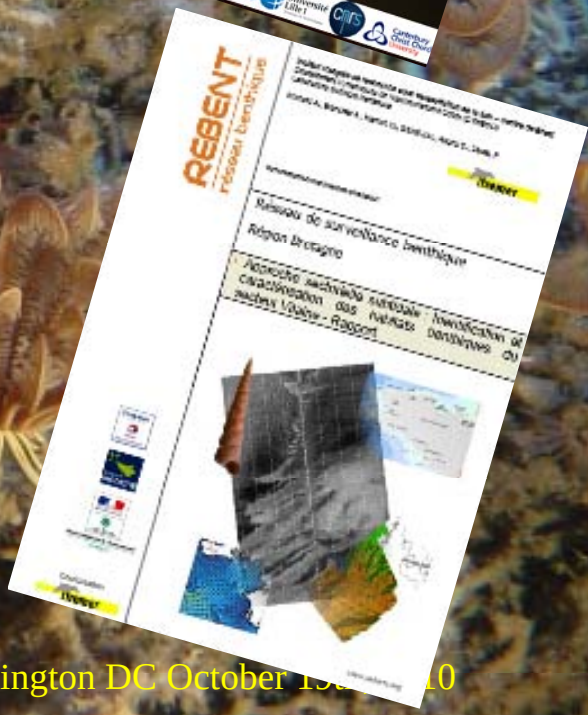
- Data mining (>600 sources…)

(Thébaud & Le Guyader, 2005)

Exploration & Marine Biodiversity characterization

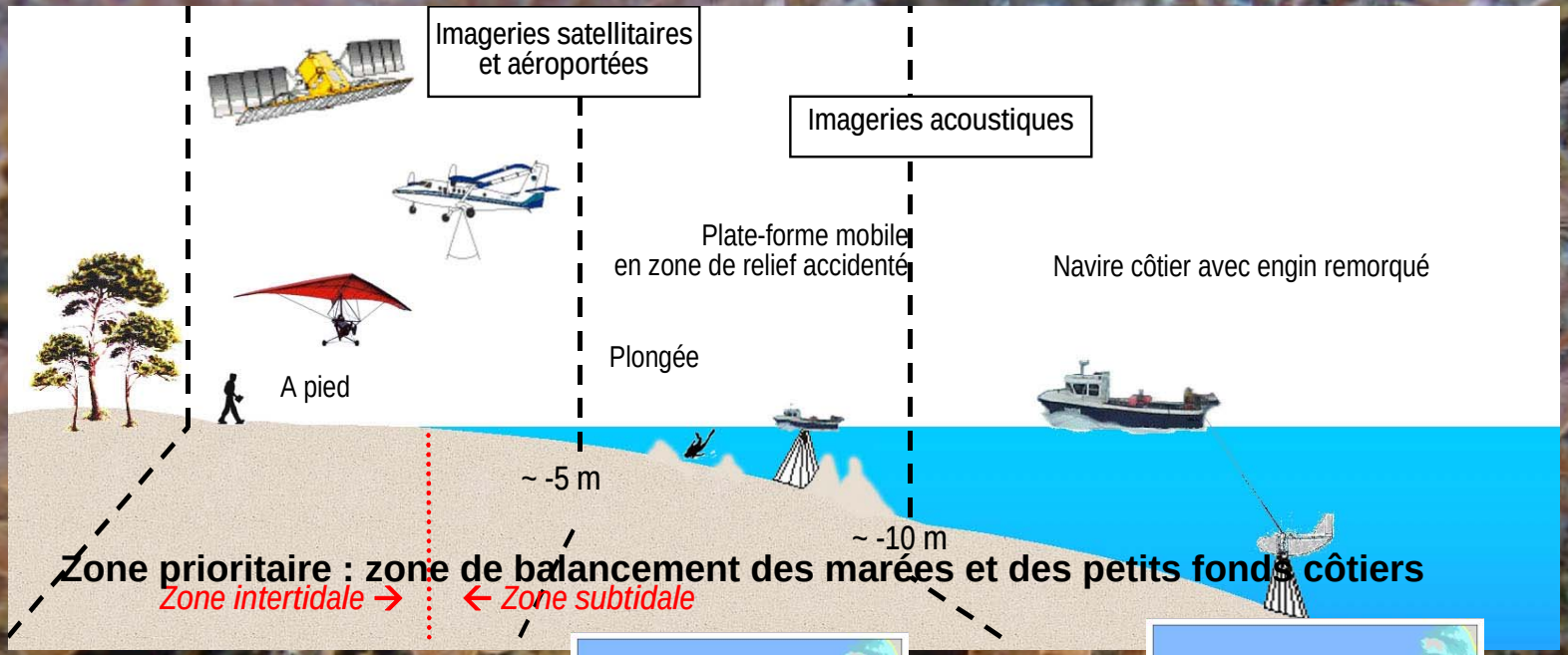
- Atlas & Habitat Mapping (CHARM II & III)
- REBENT national monitoring network – habitat mapping & biocenosis aiming to a full coastl coverage (norms, database & interactive maps…) - communication
- Coordination with the MESH – 'Mapping European Seabed Habitats' project to harmonize at the EU level, habitat mapping…



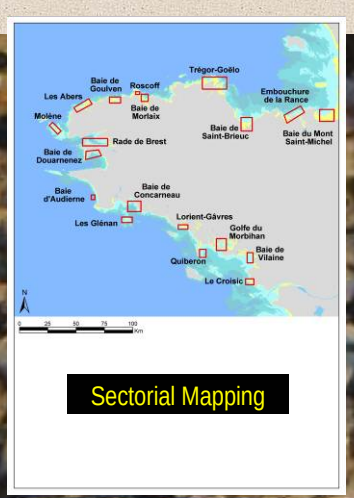


MESH MAPPING EUROPEAN SEABED HABITATS
This project has received European Regional Development Funding through the INTERREG III B Community Initiative
NWE ENO INTERREG IIIB NORTH WEST EUROPE

National Benthic Monitoring Network REBENT: Technological instruments deployed



Regional Mapping



Sectorial Mapping

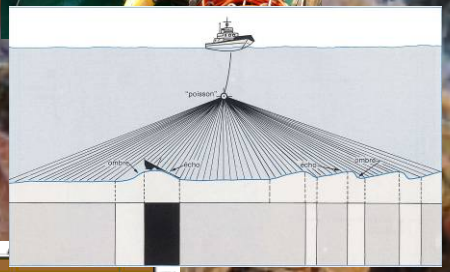
Stations

(Le Mao 2007)

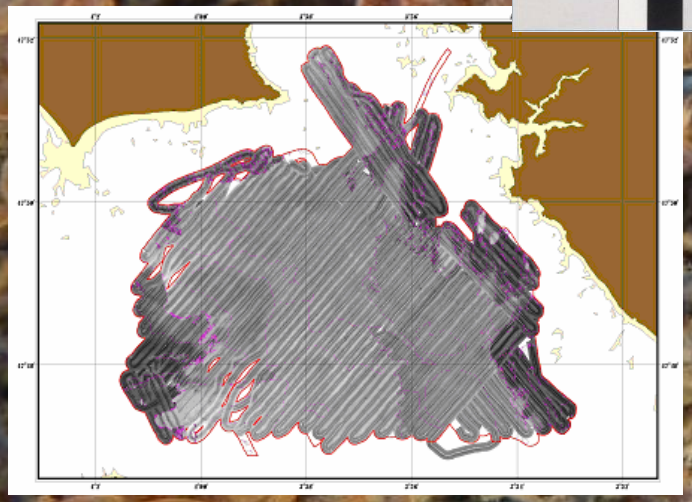
3 integrated spatio-temporal approaches

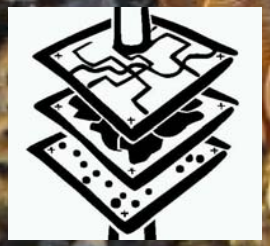
Data Treatment in Subtidal areas

Acoustic Prospection



Lateral Soundtracking

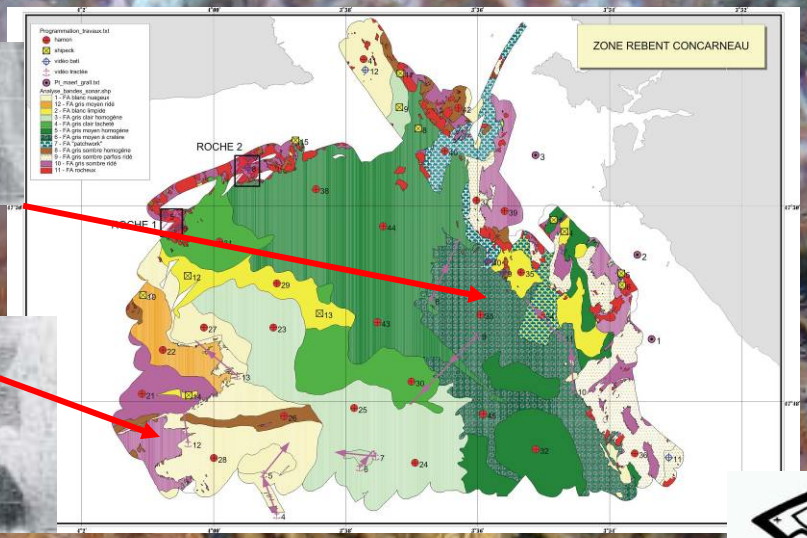




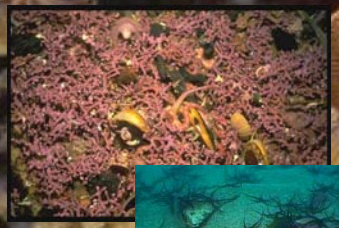
In-Situ + Video samplings

Scientific boat specifically designed for mapping habitats in very shallow waters (acoustic imagery+high resolution bathymetry+sismic & sediment analysis by sounding - *data integrated into ROXANN software)*

DATA Treatment



Morpho- sediment mapping

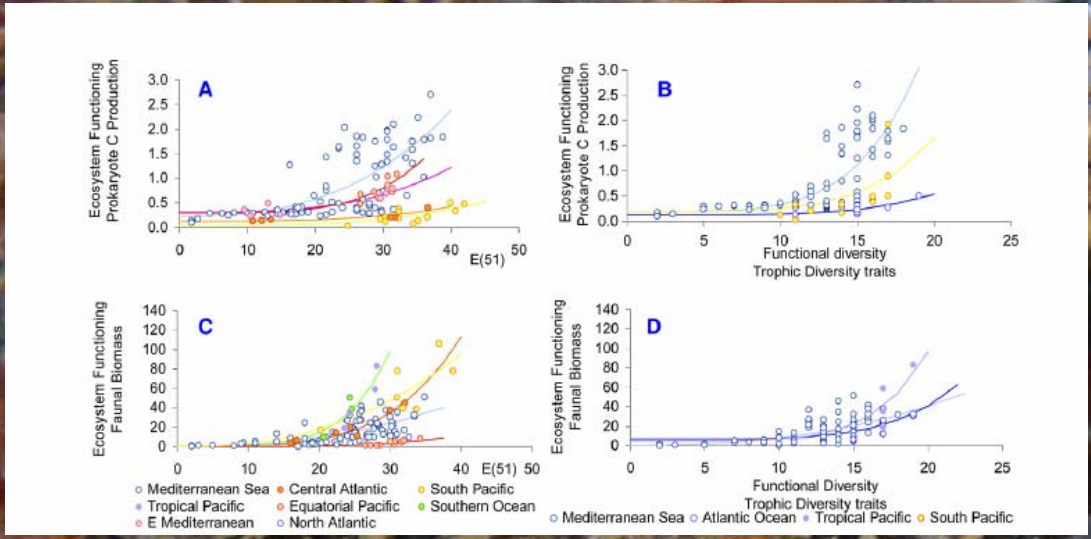


Analysis & Data Integration

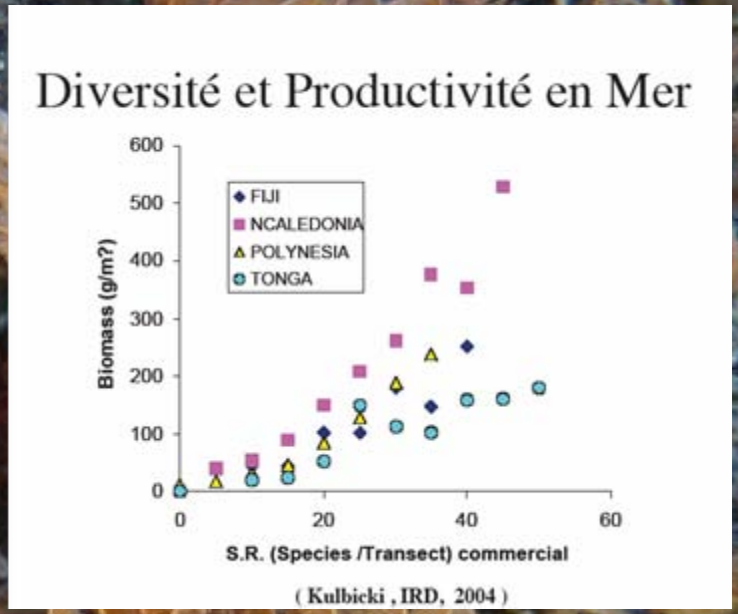
+ Vidéeo
+ Analysis & treatment of faunistic data

Benthic Habitat Mapping

Biodiversity, Resilience & Ecosystem Productivity

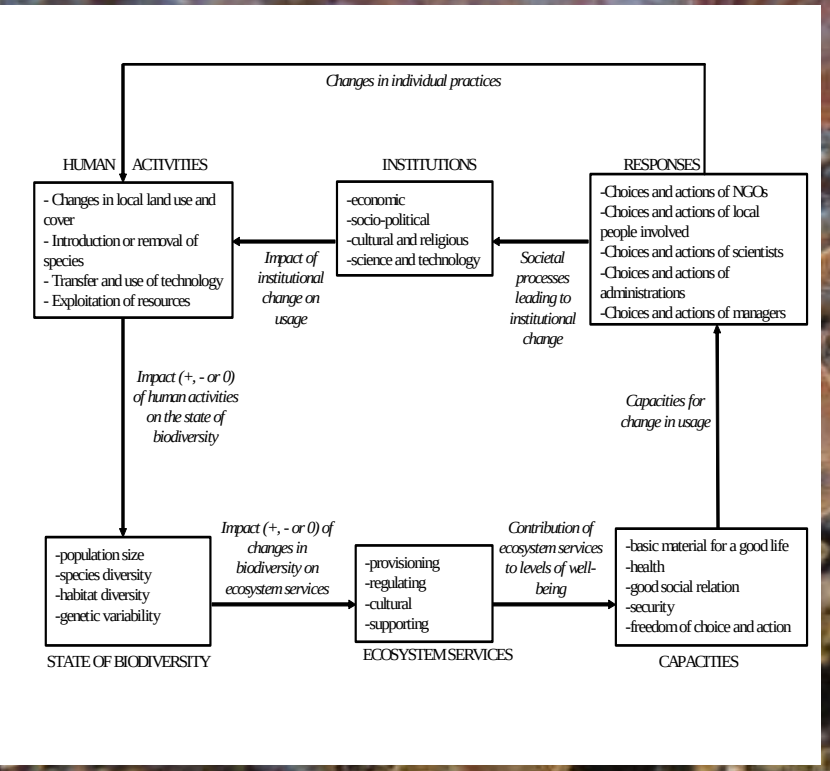


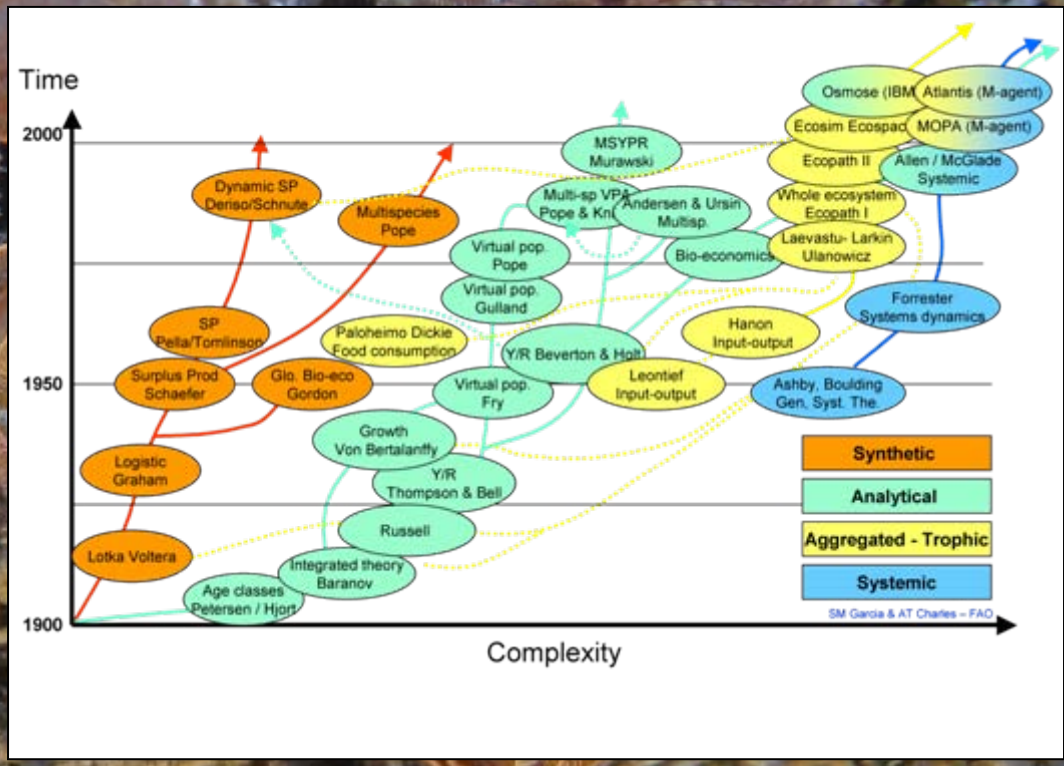
Relationship between biodiversity & ecosystem functionning (after Danovaro et al., 2008)



Need an understanding of the process underlying the ecosystem productivity

Understanding and modelling how the biodiversity, functions & ecosystems services respond to human & environmental drivers





Model crossing MEA and PSR frameworks
(Levrel and Bouamrane, 2008)

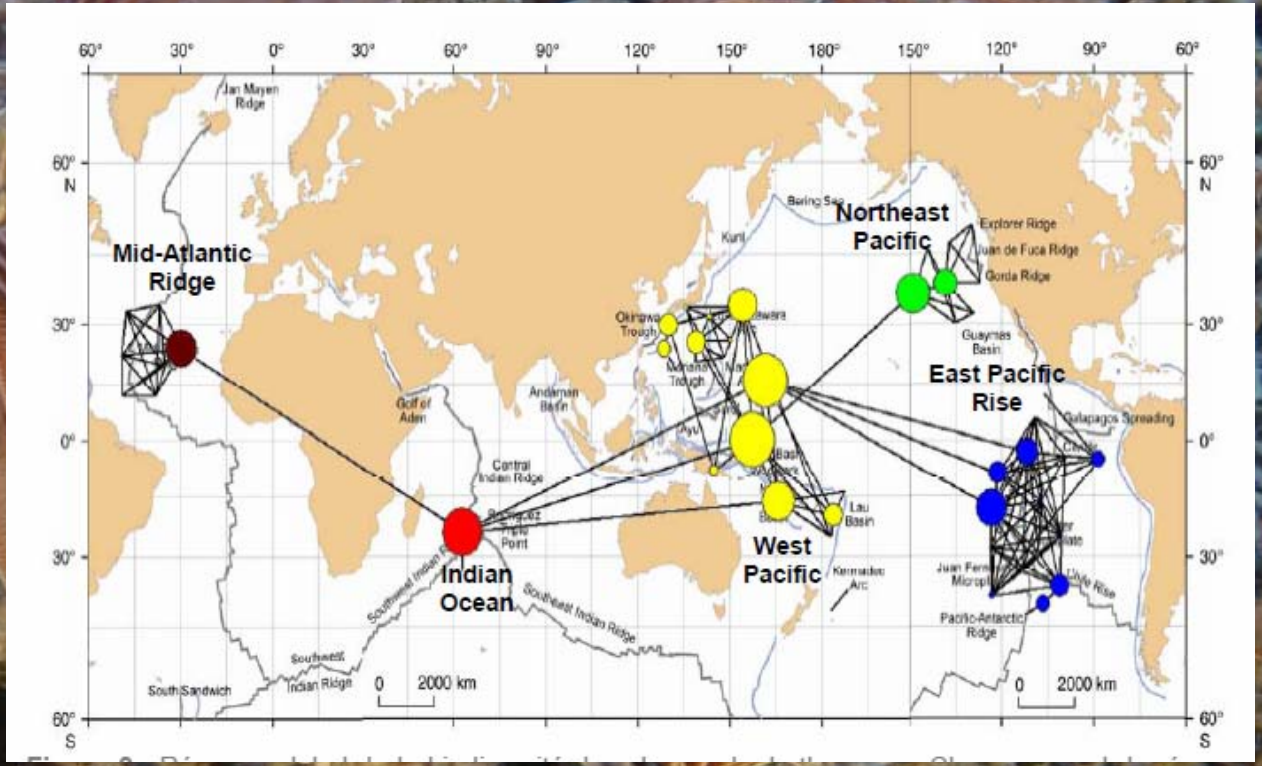
Evolution of fisheries modelling (1900-2005)
(Garcia & Charles 2007)

(Thébaud & Le Guyader, 2005)


Governance & Research

MPAs Network as a Management tool for marine biodiversity sustainability ….research questions …

- One of the main tool for marine biodiversity conservation (CBD, EEA, French MPA Agency…)
- Indicators for effective assessment
- Connectivity issue (beyond the total acreage under management) !
- GDR 'MARCO' – Marine connectivity (research network)



Global biodiversity networks for hydrothermal vents using a neuronal approach (Moalic et al., in press)

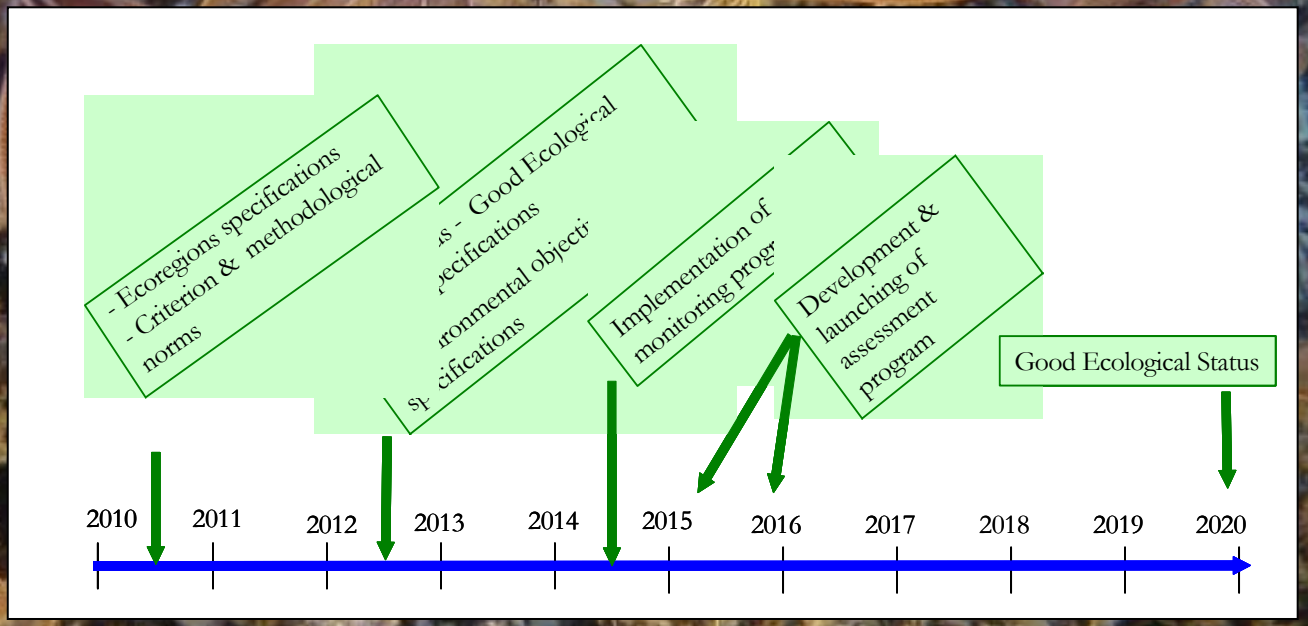
Biodiversity Governance – the European Agenda….

- Presently, at the top of the European agenda:
  - Revised Post-2010 Strategy (4 options)
    - *Halt the loss of biodiversity & ecosystem services in the EU by 2020 & restore them insofar as possible*
    - Translation into the FP8th Research Program & LIFE + (0.2% to 8% in 2011)
  - Revised strategy on Invasive Species
  - Marine issues:
    - New European Parliament Intergroup
    - Revised FCP – Fisheries Common Policy (ecosystem approach)
    - Directive Implementation: Marine Strategy – Water Framework (WFP)- Marine Strategy Framework Directive 2008/56/EC (MFSD) -

Biodiversity Governance & the MFSD

- Covering the EEZ using a regional approach (ecoregion)
- 'Tight' Agenda
- 'Good ecological Status' to be reached by 2020 !
  - leading to numerous research questions (specifications, sampling strategies, indicators…)

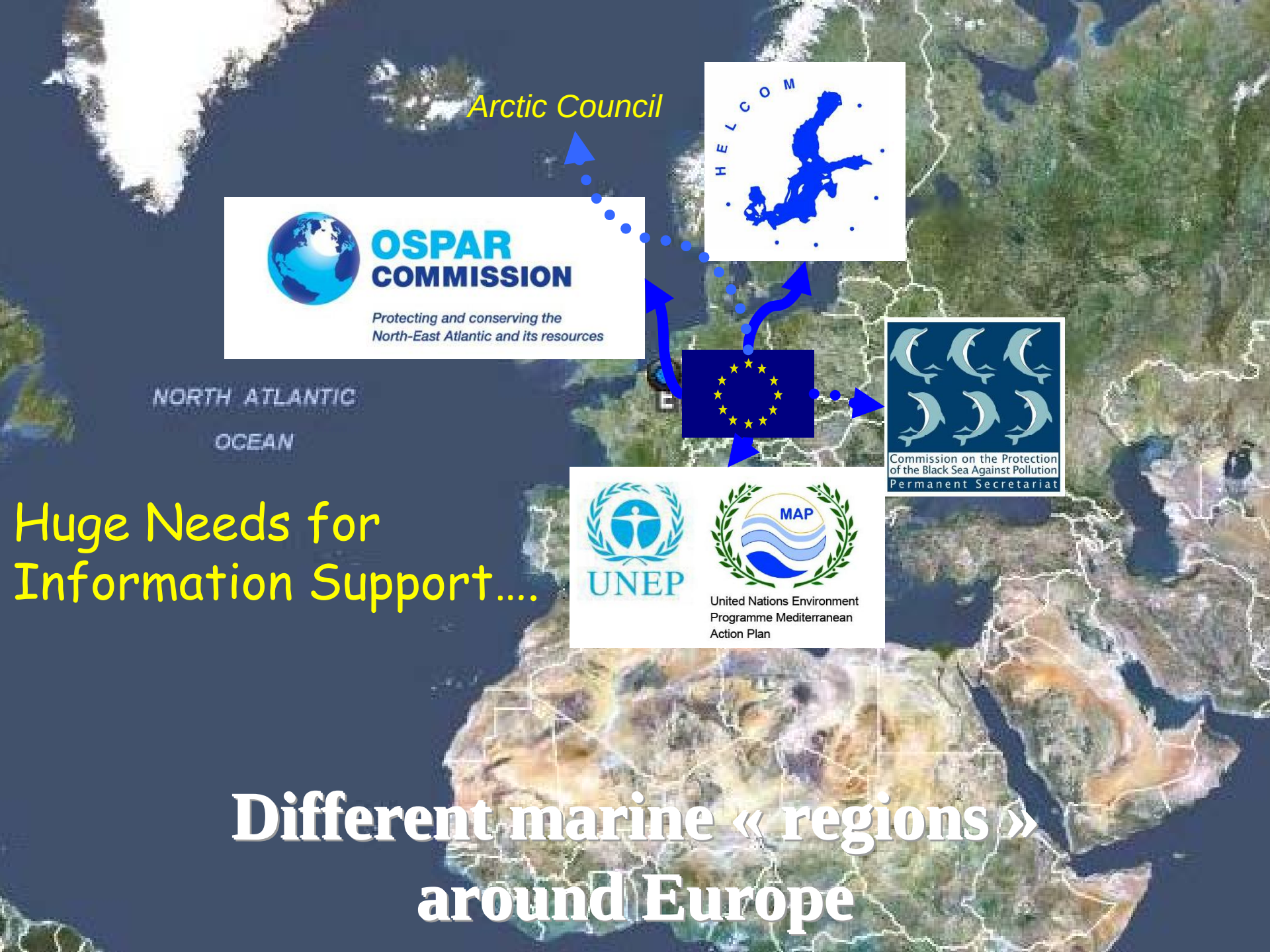
D 1 Biodiversity
D 2 Non-indig.
D 3 Fisheries
D 4 Food webs
D 5 Eutrophication
D 6 Seafloor integrity
D 7 Hydrogr.
D 8 Contaminants
D 9 Cont. in seafood
D 10 Litter
D 11 Energy introduction (noise)



Annex I
Qualitative descriptors

Descriptor 1: Biodiversity

Level	criterion	meta-indicators		
Species	**1.1 Species distribution**	Distribution area (1.1.1)	Distribution pattern within the area (1.1.2)	Colonized area by species [for sessile & benthic sp.] (1.1.3)
	1.2 Population Size	Abondance and/or population biomass (1.2.1)		
	1.3 Population status	Population dynamics [e.g., size or age structure, sex ratio, fecundity rate, survival/mortality rates] (1.3.1)	Genetic structure of population (1.3.2)	
Habitat	**1.4 Habitat distribution**	Distribution area (1.4.1)	Distribution pattern (1.4.2)	
	1.5 Habitat extension	Habitat zoning (1.5.1)	Habitat volume (1.5.2)	
	1.6 Habitat Status	Satus of typical species & habitat (1.6.1)	Relative Abondance and/or Biomass (1.6.2)	Physical, hydrological & chemical conditions (1.6.3)
Ecosystem	**1.7 Ecosystem structure**	Status of typical species and communities (1.6.1)	Relative abondance and/or biomass (1.6.2)	Physical, hydrological & chemical conditions (1.6.3)

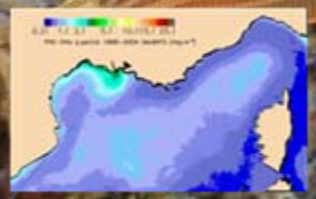

Arctic Council
HELCOM
OSPAR
COMMISSION
Protecting and conserving the
North-East Atlantic and its resources
NORTH ATLANTIC
OCEAN
Commission on the Protection
of the Black Sea Against Pollution
Permanent Secretariat
UNEP
MAP
United Nations Environment
Programme Mediterranean
Action Plan
Huge Needs for
Information Support….
Different marine « regions »
around Europe

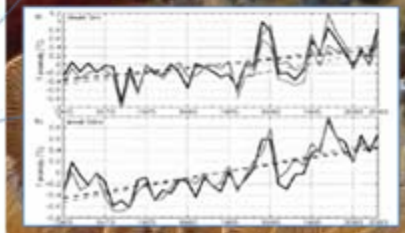
Biodiversity Governance – the French Agenda….

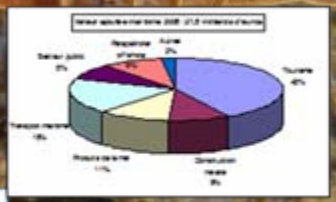
- Worldwide responsability considering > 10 M km^2 EEZ
- Directive Implementation: Natura 2000 Sea ('Bird' & 'habitat' Directives) - Marine Strategy – Water Framework (WFP)- Marine Strategy Framework Directive (MFSD)
- Revised French National Strategy (2010-2011) in accordance to CBD & European action plan…towards a regional integrated approach (rather than sectorial action plans..) – revised national research strategy
- 'Grenelle de la Mer' French Marine Policy – Operationnal committees to implement 139 recommendations, products from a cooperative process involving all stakeholders [State, Elected representatives, NGOs, Unions, Employers, Qualified people] (e.g., 20% MPAs including a share of No Take Zone)

Indicators

- ONB 'National Biodiversity Observatory' to reduce the gap between scientifc advice & decision makings
- 'Tableau de Bord' TBMF (metropolitan + overseas)







Barème (voir explications) : non qualifié à cette échelle - non déterminé
excellent - bon - moyen - médiocre - mauvais

Indice de confiance : * = faible (méconnaissance, manque de données) ; ** = moyen ; *** = correct (compte tenu de la définition actuelle de l'indicateur).

Optimization of Scientific Expertise

- FRB (Fondation for Biodiversity Research)
  - CESAB (# US NCEAS National center for ecological analysis & synthesis)
  - ECOSCOPE project (to facilitate data and expertise sharing)
  - Research Prospective
  - Research CALLs on biodiversity & ecosystems services
  - EU ERANET Biodiversa II
- ALLENVI (Coordination among Scientific research institutes in environmental sciences)
- …. To also support the IPBES

Conclusions

- Biodiversity relatively unknowm, already impacted, even before knowing its contribution to ecosystem services sustainability
- Critical Needs in
  - Data to further develop modelling & scenarios and to assess efficiency of management options
  - Enforcing the ecosystem approach
  - Improving scientific coordination for building an integrated expertise at national & international level & to support the decision making process (IPBES development)
- Governance slowly shifting from a sectorial to a more integrated management system
- Improved sharing of expertise among stakeholders (research, decision makers, managers, public… cf. Grenelle Mer) to facilitate decision process & acceptability

Species should not be studied in an isolated way but as part of the environment where they live….Alexander Von Humboldt, 1793 !

Thank you for your attention !

& to the French Embassy for this invitation ….