

Session V (J. Tronczynski Ifremer)

Wendy Bonne, Tatjana Hema, Inès Boujmil, Maria Snoussi, Amos Hamza-Chaffai,  
Angel Borja

**How to manage MSFD and enhance the science-policy interface ?**

# How to manage MSFD and enhance the science-policy interface ?

## Marine Strategy Framework Directive - MSFD

is rather **complete/complex** socio-ecological EU **directive - legislation**

GES Descriptors	
BIODIVERSITY	Benthic Habitats
	Pelagic Habitats
	Marine Mammals
	Birds
	Fish & Cephalopods
	Reptiles (Turtles)
D1	
PRESSURES	D2 Non-indigenous species
	D3 Commercial fish and shellfish
	D4 Food webs
	D5 Eutrophication
	D6 Sea-floor integrity
	D7 Hydrographical changes
	D8 Contaminants
	D9 Contaminants in seafood
	D10 Marine litter
	D11 Energy, including underwater noise

**Good Environmental Status is defined for descriptors: criteria /indicators, thresholds etc.**

Science support for GES- focusing on human “component” for the assessment of the ecosystem state

**MSFD is the science policy interface**

MSFD has generated broad scientific response

But do science responds to MSFD needs ?  
How science innovations can be used by MSFD?

# How to manage MSFD and enhance the science-policy interface ?

## MSFD in France (national level)



# How to manage MSFD and enhance the science-policy interface ?

## Session program

### EU perspective

The challenging Marine Strategy Framework Directive as catalyst for marine research

Wendy Bonne et al. ECDG RTD

Marine Strategy beyond borders I, Mediterranean Seabasin wide RSC perspective

Tatjana Hema UNEP/MAP

Marine Strategy beyond borders II, Mediterranean Searegional perspective

Inès Boujmil, Hela Jaziri, Cherif Sammari INSTM, Tunisia

Maria Snoussi, Mohammed V University, Morocco

### Science perspective

Biomonitors and biomarkers in marine pollution monitoring: Possibilities and Limits

Amos Hamza-Chaffai Tunisian Academy of Science, Tunisia

How to manage the MSFD machine: what are the keys

Angel Borja, AZTI, Spain

# The challenging Marine Strategy Framework Directive as catalyst for marine research

Wendy Bonne,  
Alice Belin,  
Ivan Conesa Alcolea,  
EC DG RTD C4,  
Jacques Delsalle,  
EC DG ENV C2





Brussels, 25.6.2020  
COM(2020) 259 final

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND  
THE COUNCIL**

**on the implementation of the Marine Strategy Framework Directive (Directive  
2008/56/EC)**

{SWD(2020) 60 final} - {SWD(2020) 61 final} - {SWD(2020) 62 final}

## Evaluation report

- Evaluation of progress with the implementation of Member States' legal obligations from 2012 to 2018:
  - 2012 and 2018 reports on the status of their marine waters (Art 8) + definition of GES for 11 'descriptors' (Art 9) + targets to achieve GES (Art 10)
  - Establishment of monitoring programmes by 2014
  - Programmes of measures by 2016 and progress in implementing them by 2018



Brussels, 25.6.2020  
COM(2020) 259 final

## Successes

- Joint efforts of 23 coastal and 5 landlocked Member States – in coordination with non-EU countries – to protect the EU’s marine environment through the Common Implementation Strategy.
- Adopting a holistic and ecosystem-based approach to the management of human activities at sea.
- Boosting data collection and research and innovation in the marine environment.
  - Assessment of marine litter
  - Underwater noise monitoring surveys & a number of registers for impulsive underwater sound
  - Novel approaches for analysing seabed integrity and entire food webs
- Promoting public engagement and increasing ocean literacy.
- Reinforcing regional and sub-regional cooperation.
- Supporting the achievement of the EU’s international commitments (SDG14, CBD, etc.)

## Shortcomings

- Lack of adequacy, consistency and coherence in the determination of Good Environmental Status.
- 23 different GES determinations across the EU, no common or comparable goals, depriving economic operators of a level-playing field across the EU and its marine regions.
- Only a little over half of all measures reported assessed to be appropriate to tackle existing pressures. Limited assessment of the effectiveness of measures adopted to achieve targets and GES.
- Insufficient, inefficient, piecemeal and unnecessarily costly approach to the protection of the marine environment leading to:
  - Marine animals still under threat;
  - Seabed under pressure;
  - Dramatic overfishing in the Mediterranean & Black Sea;
  - Widespread oxygen-depleted areas in the Baltic and Black Seas;
  - Considerable amounts of micro-litter in seawater;
  - Increased pressure from underwater noise.



# Shortcomings also reflected in EEA report 2019 and report of European Court of Auditors 2020



EEA Report | No 17/2019  
**Marine messages II**  
Navigating the course towards clean, healthy and productive seas  
through implementation of an ecosystem-based approach

ISSN 1877-0249

<https://www.eea.europa.eu/publications/marine-messages-2/>



European Environment Agency



EN 2020

26

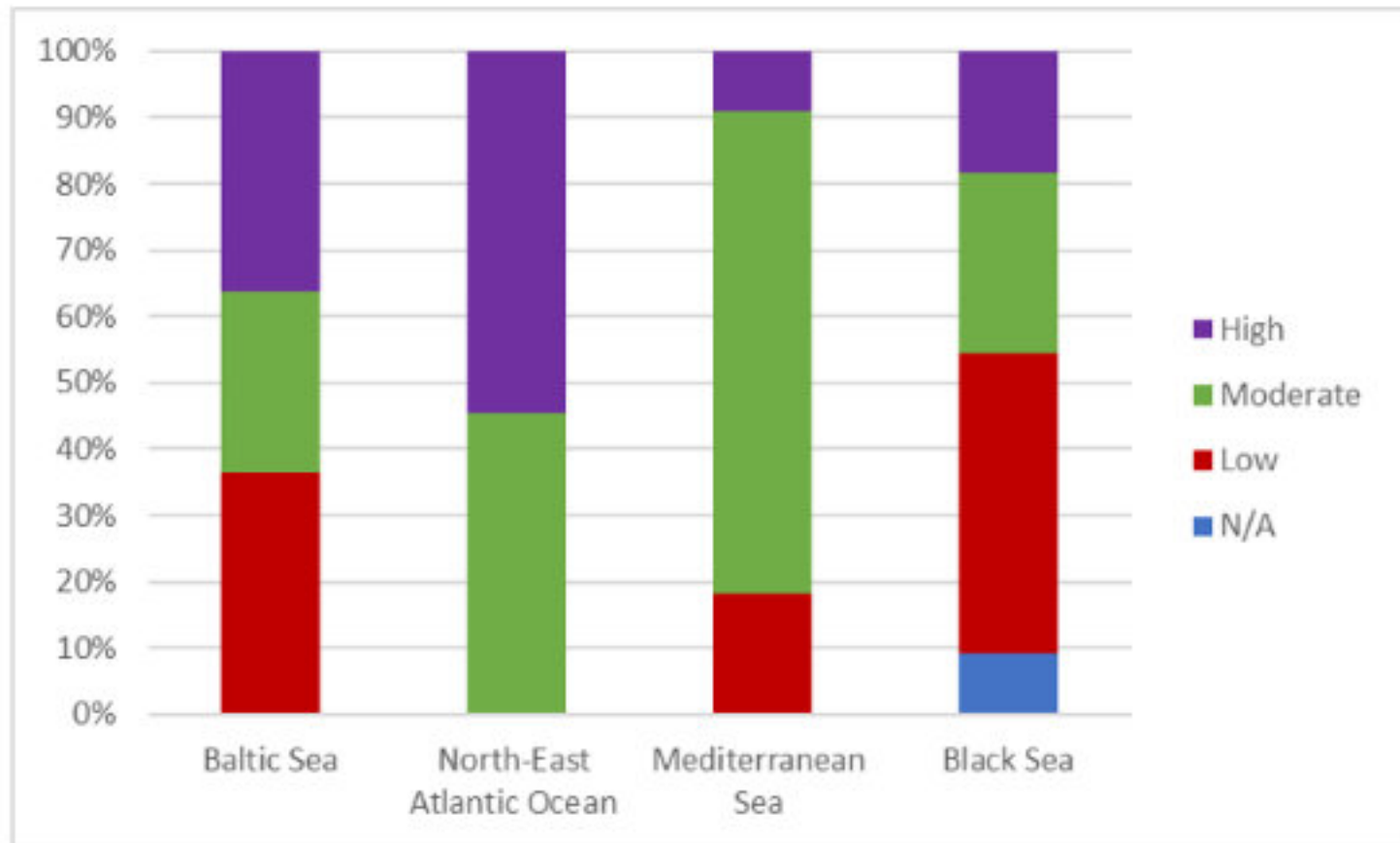
Special Report | **Marine environment:  
EU protection is wide but not deep**



EUROPEAN  
COURT  
OF AUDITORS

<https://www.eea.europa.eu/publications/marine-messages-2/>

## Shortcomings, but good examples/champions are rising



*Figure 3: Summary of the level of coherence achieved within each marine region (expressed as a percentage of the total possible score) for the 2012 reporting of Articles 8.*

## Shortcomings, but good examples/European champions arising

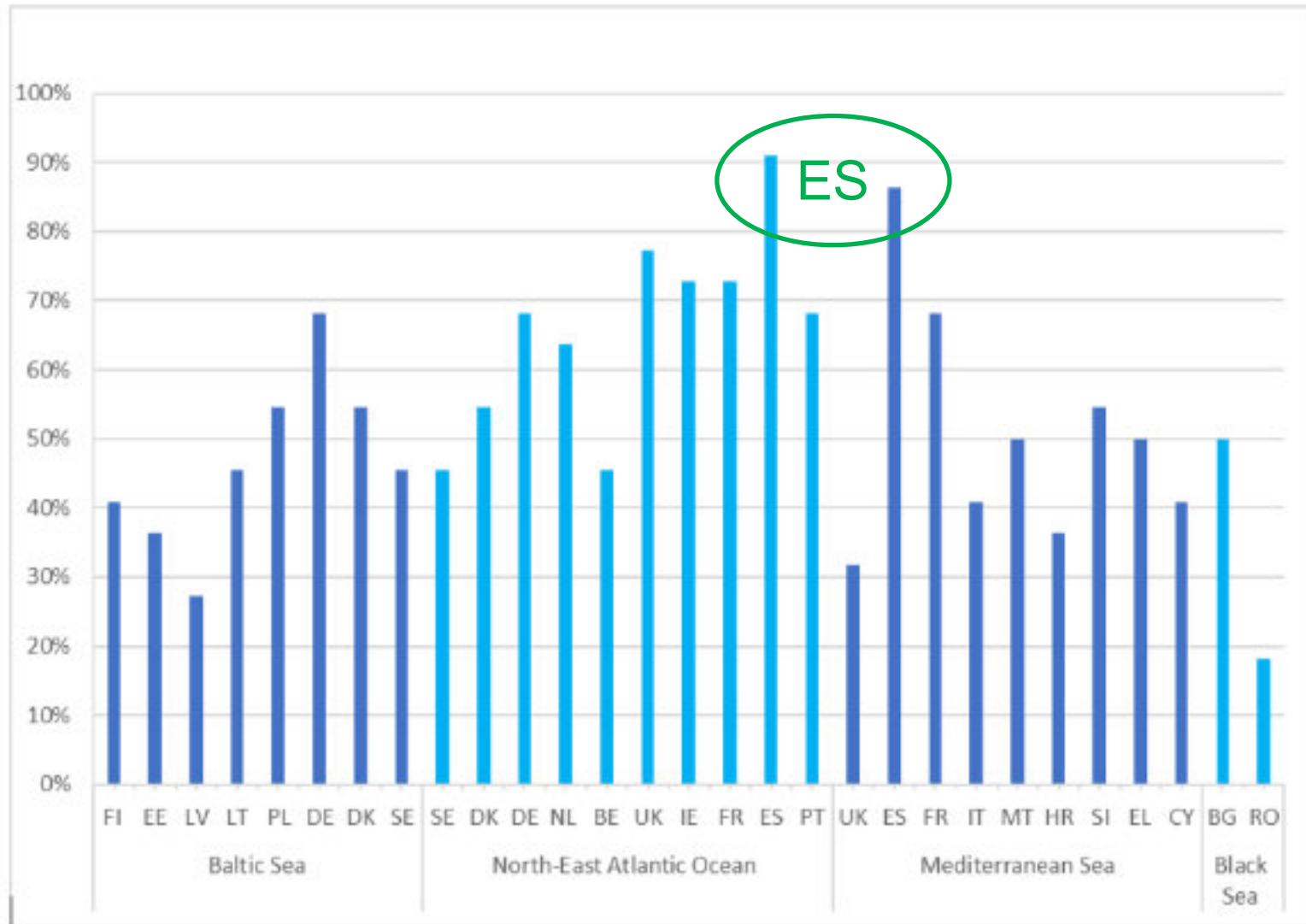


Figure 2: Summary of the overall adequacy scores per Member State for articles 8 (expressed as a percentage of the total possible score) of the 2012 reports. Member States are grouped per marine region, hence SE, DK, DE, FR and ES appear twice.

## Scientific contributions: Strengths – Weaknesses – Opportunities – Threats

<p style="text-align: center;"><b>Strengths</b></p> <ul style="list-style-type: none"><li>• Member-States-INDEPENDENT expertise</li><li>• Creation of novel and more adequate, consistent or coherent approaches (like for noise and marine litter)</li></ul>	<p style="text-align: center;"><b>Weaknesses</b></p> <ul style="list-style-type: none"><li>• Fragmentation due to disconnected national or regional scientific funding</li><li>• Lack of insight in scope of MSFD Descriptors &amp; governance process</li><li>• Lack of replication/application potential of novel assessment methodologies</li></ul>
<p style="text-align: center;"><b>Opportunities</b></p> <ul style="list-style-type: none"><li>• Compose best complementary scientific team (WHO) for long-term cooperation</li><li>• Build <b>scientific consensus</b> (WHAT can you jointly defend)</li><li>• Illustrate cost effectiveness &amp; application potential on a transboundary level (WHAT)</li><li>• Increase experience with joint data compilation and analysis (WHAT)</li></ul>	<p style="text-align: center;"><b>Threats</b></p> <ul style="list-style-type: none"><li>• Lack of long-term support (WHEN)</li><li>• Lack of cooperation governance between scientists and policy officers (WHO)</li><li>• Data availability (WHAT)</li><li>• Date incompatibility between scientific and other authorities/organisations (environmental, industry etc.)</li></ul>

## Recommendations for pathway to success

- Consider deadlines for legal implications of your scientific work
- A review of the MSFD is foreseen by 2023 under Art 23. of the Directive
- Next 10 years are CRUCIAL for which a LONG-TERM scientific programme implementation plan would be necessary
- Scientific “appropriate consortium” to work on it for 10 years including targeted exchange periods with policy community through an experienced long-term science-policy exploitation & exchange coordinator (≠ communication and dissemination) WITHIN consortium
- Design upfront a data compilation and management (contingency) plan
- To achieve significant scientific contribution for the MSFD, consider very carefully the WHAT, the WHEN, WHO can do it and then the HOW
- Victoria Tornero (JRC) gave a presentation on the MSFD & Descriptors 8 (Contaminants), 9 (Contaminants in seafood) & 10 (Marine Litter) in a previous workshop of this joint action that you can also add to the compilation material



Figure 1 - Phases in the research cycle and self-positioning of stakeholders' contribution (as tested with the Quadruple Helix focus groups during the DANDELION Brussels workshop, October 2016).

## Recommendations PROCESS

- Define the WHO to create with
- Building scientific community - network of experts
  - Huge importance to build **scientific consensus**
    - December 2018: first exchange on scope
      - Some scientists - governmental scientific institutes - EC DG ENV - RTD - JRC for problem setting
    - Expert workshop in June 2019
    - Adoption by JPI Oceans Management Board meeting 2019
    - **December 2020 – building scientific community**
  - How many scientists need to be on board to achieve a regionally coherent success? From how many countries?
  - Which scientists can help in defining replication and application potential of scientific outputs in an entire Regional Sea ?
  - Which scientists from which countries are closely connected to the MSFD Common Implementation Strategy ?
  - **Who will take care of a continued network cooperation ?**

Start non-fragmented

## Recommendations PROCESS

Start  
connected

- **Define the WHO to target:**
  - Network analysis of target policy officers in your country
  - Feedback loops with environmental authorities (6-year policy cycle of the MSFD)
    - Who are the WG GES, Strategic Coordination Group members that you also need to convince of your added value ?
    - Who are the representatives in Regional Sea Conventions that you need to convince of your added value, also beyond the MSFD? (link with presentation of Tatjana Hema, UNEP/MAP)
  - How can the scientific authority representatives of your country help you to connect with environmental authorities and Regional Sea Conventions to design a commonly appreciated scientific programme ?
  - **Who takes care of this systematic dialogue in the Joint Action ?**



# Common Implementation Strategy Marine Strategy Framework Directive is your MSFD governance target group

## Marine Directors

### Marine Strategy Coordination Group

Regulatory  
Committee

Working Group  
Good Environmental  
Status

Working Group  
Data, Information &  
Knowledge  
Exchange

Working Group  
Programmes of  
Measures/Economic  
& Social Analysis

Regional Sea  
Conventions

Technical Group  
Litter

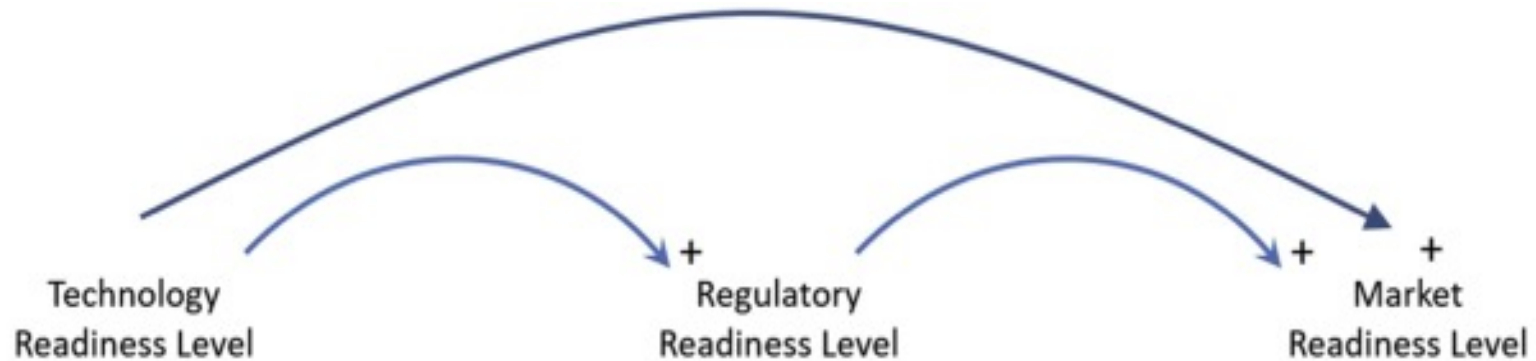
Technical Group  
Data

Technical Group  
Noise

Technical Group  
Seabed

# Recommendations PROCESS

- Consider regulatory readiness level at the same time of your scientific scoping, development and implementation process



**Technology Readiness Level (1-9)**  
**‘Can we build it?’**

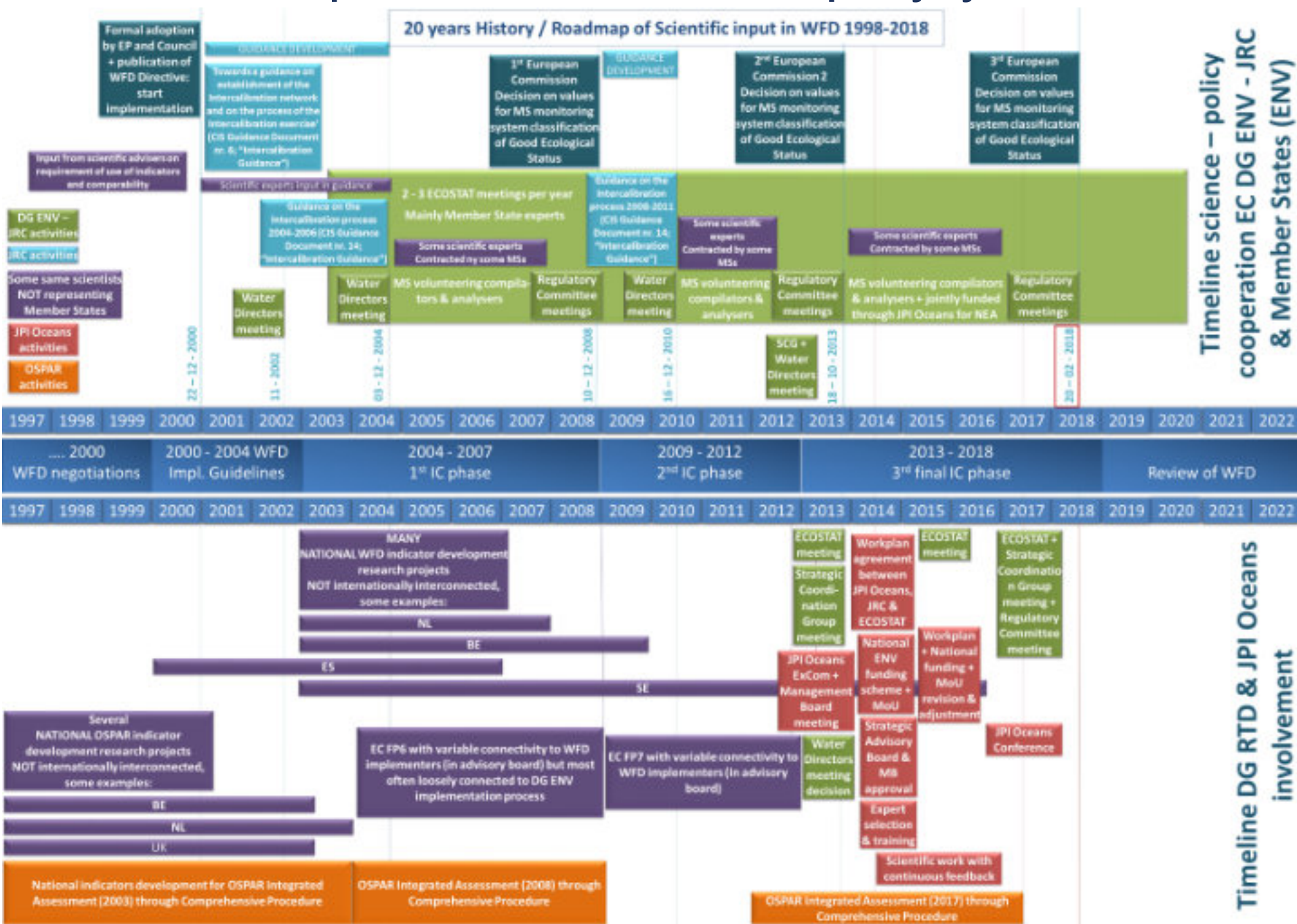


**Regulatory Readiness Level (1-5)**  
**‘Can we accept it?’**



**Market Readiness (1-5) Level**  
**‘Will they adopt it?’**

# Example interaction scientific and policy cycle



# Recommendations PROCESS

- **Define the WHEN:**
  - What are the legislative deadlines ?

*Start timely*



Contribute to improvement for 2024 ?  
Contribute to improvement for 2030 ?  
Deadline for environmental authority  
What is the deadline for scientific contribution?

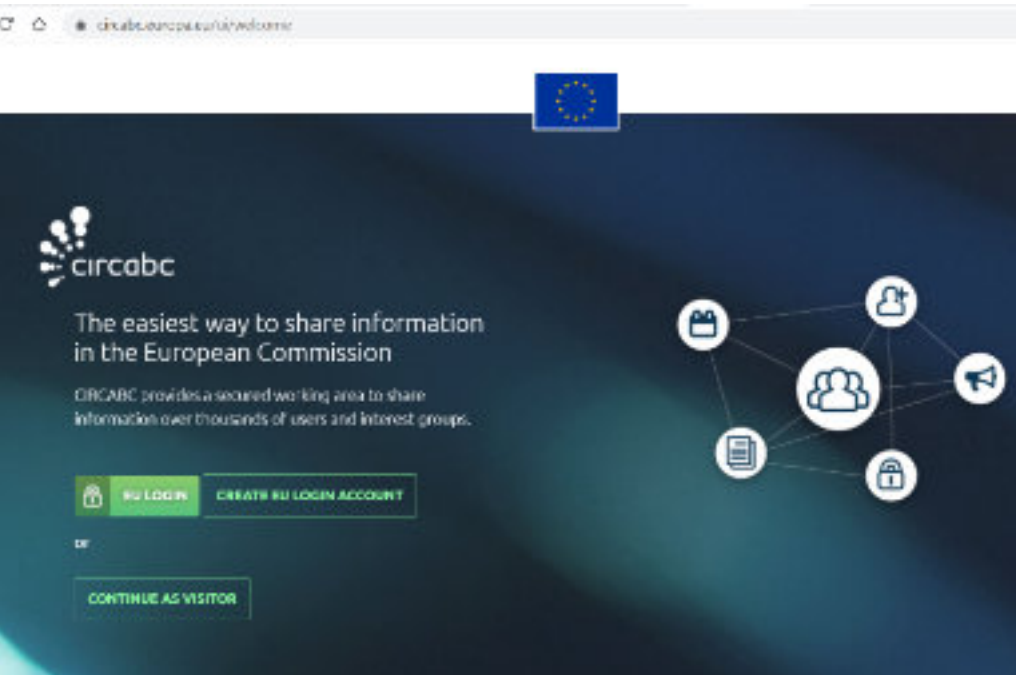
Contribute to improvement for 2026 ?

# Recommendations PROCESS

Start timely

## ○ Define the WHEN:

- What are the legislative deadlines ?
- Which MSFD regulatory committee decisions still need to be taken when ?
- What is included as preparation for these decisions in the work plan of the MSFD Working Group GES 2020-2022 ? Do you want to see smth. included for 2022-2024 ?
- Which Strategic Coordination Group meetings take place to discuss the work plan ?
- When are the working group meetings taking place to contribute to ?



The screenshot shows the CIRCABC website interface. At the top, there is a browser address bar with the URL "circabc.europa.eu/uk/welcome". Below the browser bar is the European Union flag. The main header area features the CIRCABC logo and the text "The easiest way to share information in the European Commission". Below this, a description states: "CIRCABC provides a secured working area to share information over thousands of users and interest groups." There are two buttons: "NO LOGIN" and "CREATE MY LOGIN ACCOUNT". At the bottom, there is a "CONTINUE AS VISITOR" button. A network diagram with icons for a calendar, a person, a document, and a lock is visible on the right side of the page.



The screenshot shows a meeting agenda for the Marine Strategy Framework Directive (MSFD) Common Implementation Strategy. At the top, there is the European Union flag. Below the flag, the text reads: "Marine Strategy Framework Directive (MSFD)", "Common Implementation Strategy", "Marine Directors", and "Meeting of 2 November 2020, Germany (virtual)". Below this is a table with the following information:

Agenda items	15
Document:	MD2020-2-2
Title:	MSFD Common Implementation Strategy - Work programme 2020-2022
Prepared by:	DG Environment
Date prepared:	26 November 2020
Background:	This version of the work programme was submitted to MSCG for its vote by written procedure soon after the 27th MSCG meeting held on 30 November 2020. MSCG voted unanimously in favour of its adoption, the written procedure having ended on 26 November at 17h Brussels time.

Below the table, there is a section titled "Marine Directors are invited to:" with a bullet point: "○ Endorse the work programme."

# Recommendations CONTENT

- **Define WHAT** – define your scope

Increase adequacy, consistency and coherence for GES determination

Start targeted

- Advanced use of computational methods to map and model environmental changes and impacts, including better interoperability and coupling between modelling and observational data
- Which Descriptor can you target best with the concepts reflected upon in this conference ?
- How does the BLUEMED SRIA cover these kinds of scientific development needs?

JRC Scientific and Technical Reports



MARINE STRATEGY FRAMEWORK

DIRECTIVE

Task Group 4 Report

Food webs

APRIL 2010

S. Rogers, M. Casini, P. Cury, M. Heath, X. Irigoien, H. Kuosa, M. Scheidat,  
H. Skov, K. Stergiou, V. Trenkel, J. Wikner & O. Yunev

Joint Report

Prepared under the Administrative Arrangement between JRC and DG ENV (no 31210 – 2009/2010), the Memorandum of Understanding between the European Commission and ICES managed by DG MARE, and JRC's own institutional funding

Editor: H. Piha

EUR 24948 EN - 2010

- **Define WHAT** – define your scope
  - Increase adequacy, consistency and coherence for GES determination
  - Additional info on the state of art can be found at:

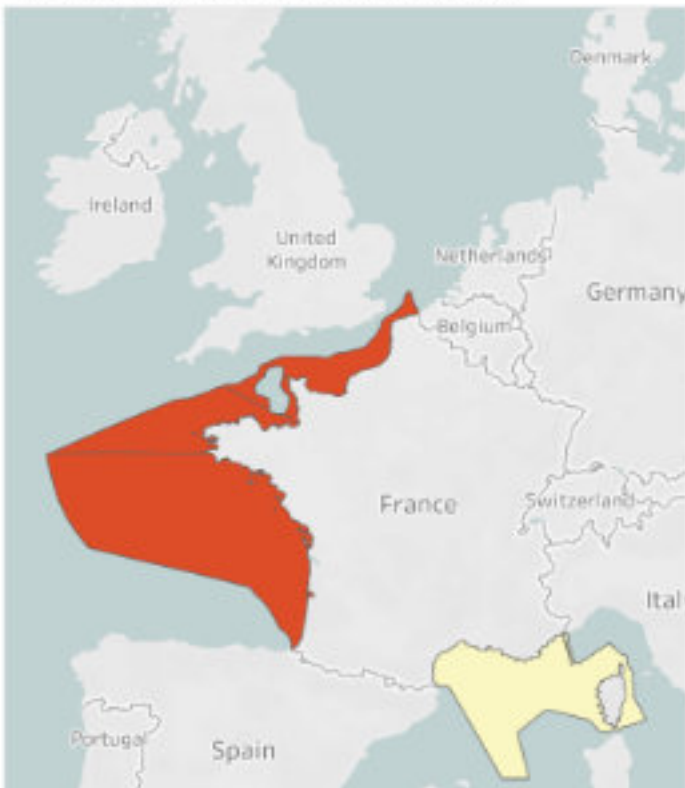
The screenshot shows a web browser window with the URL [water.europa.eu/marine/data-maps-and-tools/msfd-reporting-information-products/ges-assessment-dashboards/country-thematic-dashboards](https://water.europa.eu/marine/data-maps-and-tools/msfd-reporting-information-products/ges-assessment-dashboards/country-thematic-dashboards). The page header features the WISE MARINE logo (MARINE INFORMATION SYSTEM FOR EUROPE) and a navigation menu with links for About, Policy and Reporting, State of Europe's Seas, Data, maps and tools, and Countries and Regional Seas. A breadcrumb trail below the menu reads: Home / Data, maps and tools / MSFD Reporting Information & Products / GES assessments: visualisation tools / Country-Thematic Dashboards. The main heading is 'Country-Thematic Dashboards'. Below the heading, a paragraph states: 'In the present dashboards, the results on the GES assessments under Article 8 are presented by MSFD Descriptor and country. Please double-click on a country and navigate across the different tabs.' A 'Read more' button with a downward arrow is located at the bottom left of the visible content.

# Define WHAT – define your scope

## Environmental status of species (2018 reporting of MSFD Article 8)

Last update: 10/1/2020

Good Environmental Status (GES) assessments for All



Species status

Marine Reporting Unit	Species	Status
AB+FR-MS-GDG	Balaenoptera acurostrata (137087)	Good
	Balaenoptera physalus (137091)	Good
	Dentex dentex (273962)	Not good
	Dicentrarchus labrax (126975)	Not good
	Epinephelus marginatus (127036)	Not good
	Sciaenops ocellatus (127010)	Not good
	Globicephala melas (137097)	Good
	Grampus griseus (137098)	Good
	Argentina (126885)	Unknown
	Callionymus maculatus (126793)	Unknown
	Chelidonichthys cuculus (127259)	Good
	Conger conger (126285)	Good
	Dipturus labrax (105869)	Unknown
	Echichthys vipera (150630)	Unknown
	Eutrigla gurnardus (150637)	Good
	Gadus morhua (126436)	Unknown

Filter by:

Country: France

Marine Reporting Unit: (All)

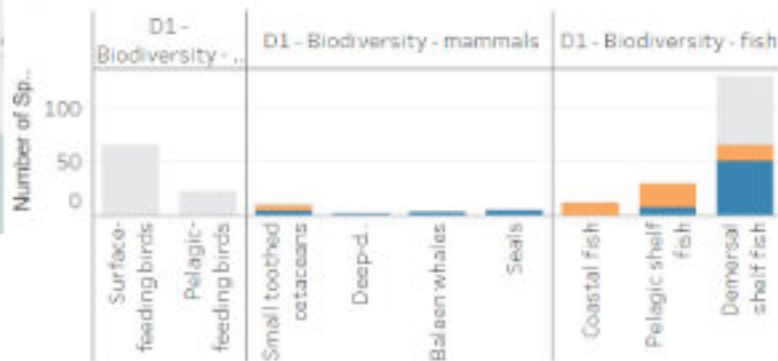
Functional group: (All)

Species group: (All)

Show:

- GES assessment
- GES expected to be a...
- GES achieved
- Not relevant
- Not assessed
- Unknown

Species assessments



species status

- Unknown
- Not good
- Good



# Recommendations CONTENT

Start targeted

- **Define WHAT** - define your scope

Additional info on scientific developments for the Mediterranean can be found in:

Year of the call	Name of the project	Full title	Regions	Descriptors
2018	<a href="#">INDICIT II</a>	Implementation of the indicator "Impacts of marine litter on sea turtles and biota" in RSC and MSFD areas	Mediterranean and NE Atlantic	D10
2018	<a href="#">QUIETMED II</a>	Joint programme for GES assessment on D11-noise in the Mediterranean Marine Region	Mediterranean Sea	D11
2018	MISTIC SEAS III	Developing a coordinated approach for assessing D4 via its linkages with D1 and other relevant descriptors in the Macaronesian sub-region	Macaronesia	D1, D3, D4
2016	<a href="#">INDICIT</a>	Implementation of the indicator "Impacts of marine litter on sea turtles and biota" in RSC and MSFD areas	Mediterranean and NE Atlantic	D10
2016	<a href="#">MEDCIS</a>	Support Mediterranean Member States towards coherent and Coordinated Implementation of the second phase of the MSFD	West Mediterranean and Adriatic	D6, D10, D11
2016	<a href="#">JMP EUNOSAT</a>	Joint Monitoring Programme of the EUtrophication of the NOrth-Sea with SATellite data	Greater North Sea	D5
2016	<a href="#">MISTIC SEAS II</a>	Applying a subregional coherent and coordinated approach to the monitoring and assessment of marine biodiversity in Macaronesia for the second cycle of the MSFD	Macaronesian subregion	D1
2016	<a href="#">IDEM</a>	Implementation of the MSFD to the Deep Mediterranean Sea	Mediterranean Sea	All
2016	<a href="#">QUIETMED</a>	Joint programme on Noise (D11) for the implementation of the Second Cycle of the MSFD in the Mediterranean Sea	Mediterranean Sea	D11
2014	<a href="#">Mistic Sea</a>	Macaronesia Islands Standard Indicators and Criteria: Reaching Common Grounds on Monitoring Marine Biodiversity in Macaronesia	Macaronesia	
2014	<a href="#">ActionMed</a>	Action Plans for Integrated Regional Monitoring Programmes, Coordinated Programmes of Measures and Addressing Data and Knowledge Gaps in Mediterranean Sea cetaceans (D1) and noise monitoring (D11) for achieving GES	Mediterranean Sea	D1, D11
2012	<a href="#">IRIS-SES</a>	Integrated Regional monitoring Implementation Strategy in the South European Seas	Mediterranean and Black Sea	

# Recommendations CONTENT

Start targeted

- **Define WHAT** - define your scope

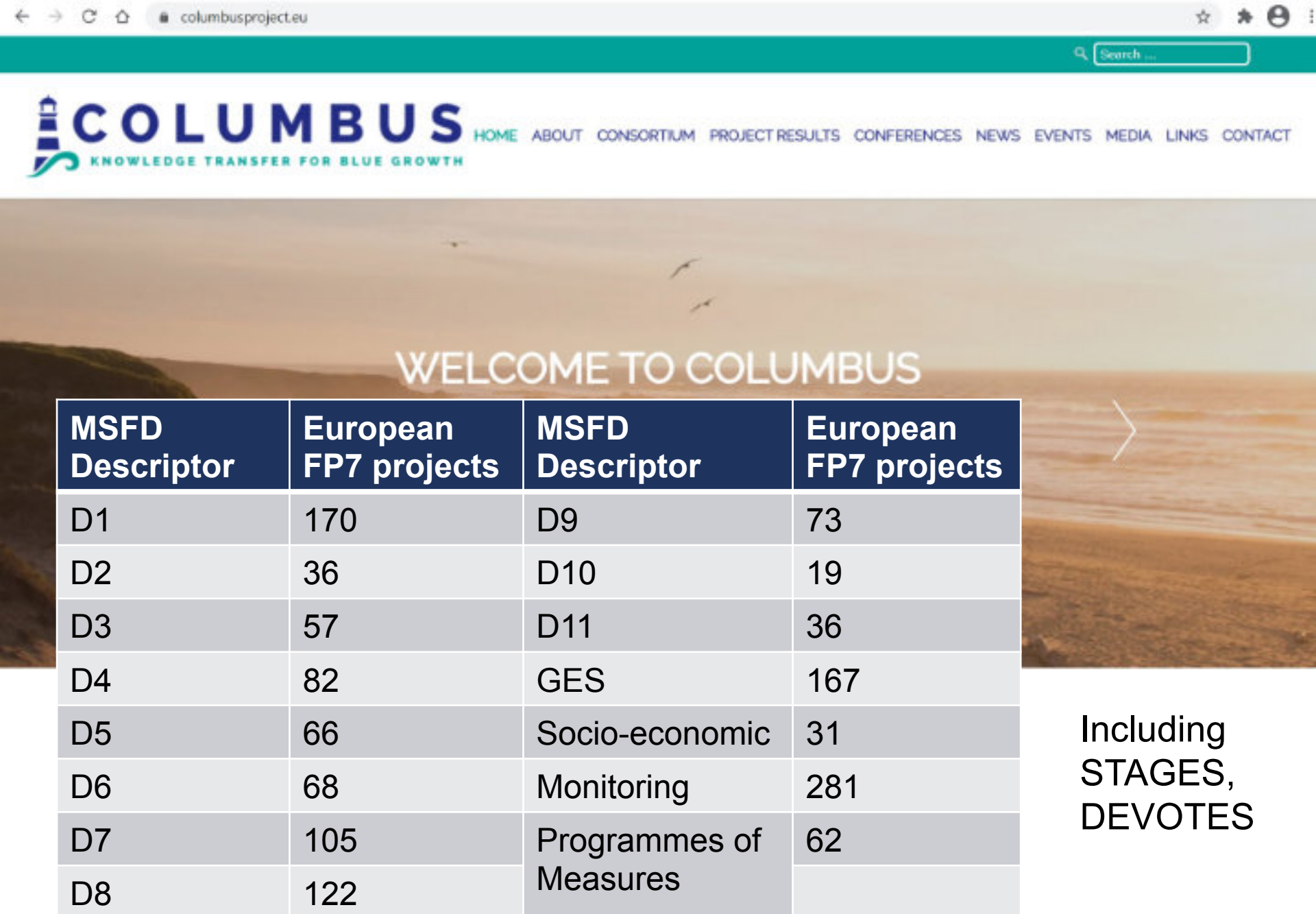
Additional info on scientific developments for other regions can be found in:

Year of the call	Name of the project	Full title	Regions	Descriptors
2018	<a href="#">Helcom Action</a>	Actions to evaluate and identify effective measures to reach GES in the Baltic Sea marine region	Baltic Sea	
2018	<a href="#">RAGES</a>	Risk-based Approaches to Good Environmental Status	Ireland, France, Spain and Portugal	D2, D11
2018	<a href="#">CeNoBS</a>	Support MSFD implementation in the Black Sea through establishing a regional monitoring system of cetaceans (D1) and noise monitoring (D11) for achieving GES	Black Sea	D1, D11
2016	<a href="#">SPICE</a>	Implementation and development of key components for the assessment of Status, Pressures and Impacts, and Social and Economic evaluation in the Baltic Sea marine region	Baltic Sea including the Kattegat	
2016	<a href="#">JMP EUNOSAT</a>	Joint Monitoring Programme of the EUtrophication of the North-Sea with SATellite data	Greater North Sea	D5
2014	<a href="#">Ecaphra</a>	Applying an Ecosystem Approach to (sub)Regional Habitat Assessment	OSPAR	D1, D4, D6
2014	<a href="#">Baltic Boost</a>	Baltic Sea project to boost regional coherence of marine strategies through improved data flow, assessments and knowledge base for development of measures	Baltic Sea	
2012	<a href="#">BALSAM</a>	Baltic Sea Pilot Project: Testing new concepts for integrated environmental monitoring of the Baltic Sea	Baltic Sea	
2012	<a href="#">JMP NS/CS</a>	Towards a Joint monitoring programme for the North Sea and the Celtic Sea	North Sea and Celtic Sea	

Projects from LIFE call (2012) and EMFF calls (2014, 2016, 2018)

taken from the European Commission Staff Working Document (2020) 60: Key stages and progress up to 2019, accompanying the report from the Commission to the European Parliament and the Council on the implementation of the Marine Strategy Framework Directive (Directive 2008/56/EC)

# Scientific contributions on different descriptors

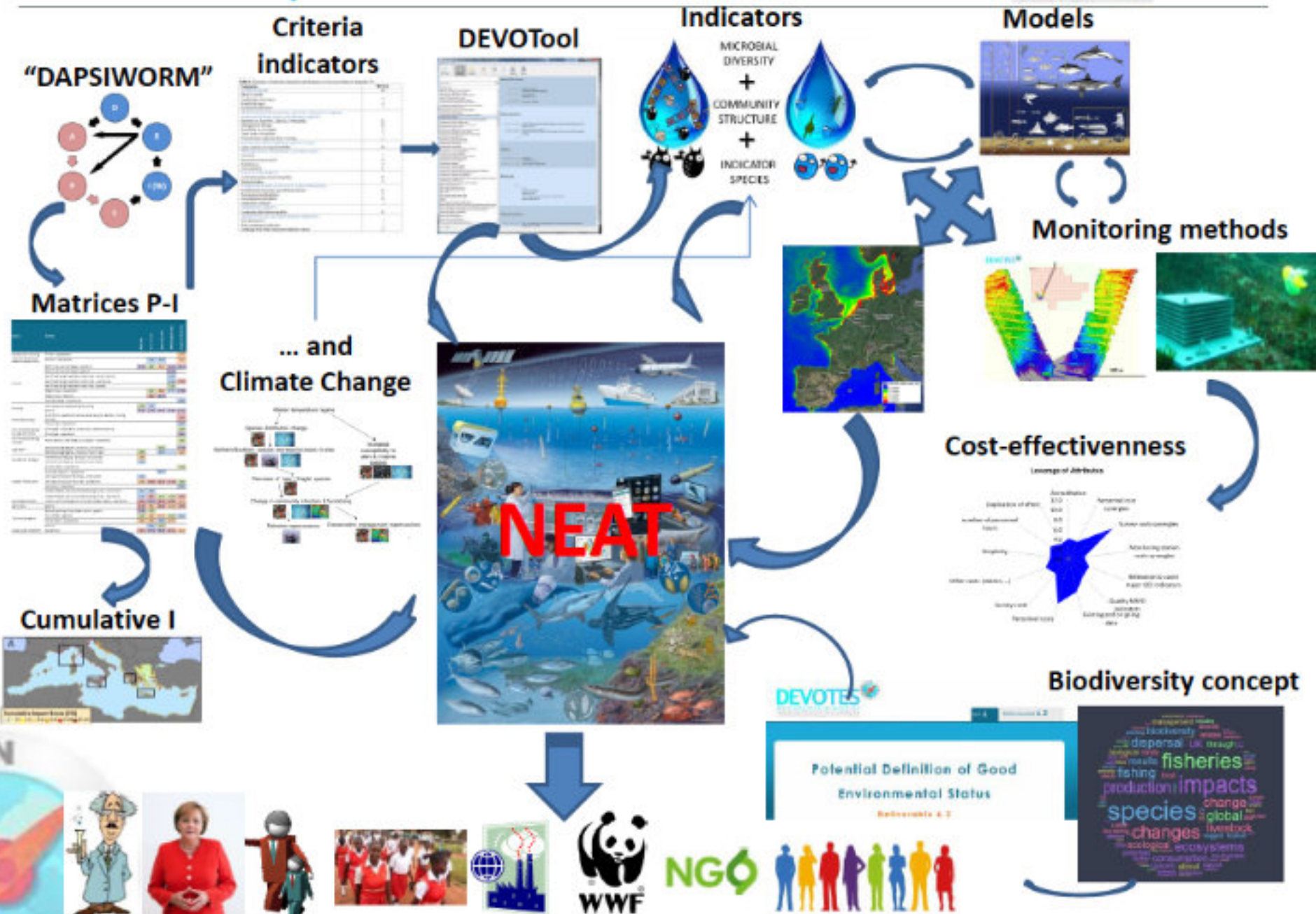


WELCOME TO COLUMBUS

MSFD Descriptor	European FP7 projects	MSFD Descriptor	European FP7 projects
D1	170	D9	73
D2	36	D10	19
D3	57	D11	36
D4	82	GES	167
D5	66	Socio-economic	31
D6	68	Monitoring	281
D7	105	Programmes of Measures	62
D8	122		

Including  
STAGES,  
DEVOTES

# DEVOTES Synthesis





Mediterranean Action Plan Coordinating Unit  
Barcelona Convention Secretariat



# IMAP Implementation and GES

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Musing on the concept of Good Environmental Status: the complexity of the status & the status of complexity

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Tatjana Hema  
Deputy Coordinator  
UNEP/Mediterranean Action Plan Coordinating Unit  
Barcelona Convention Secretariat

# MAP –Barcelona Convention: Overview

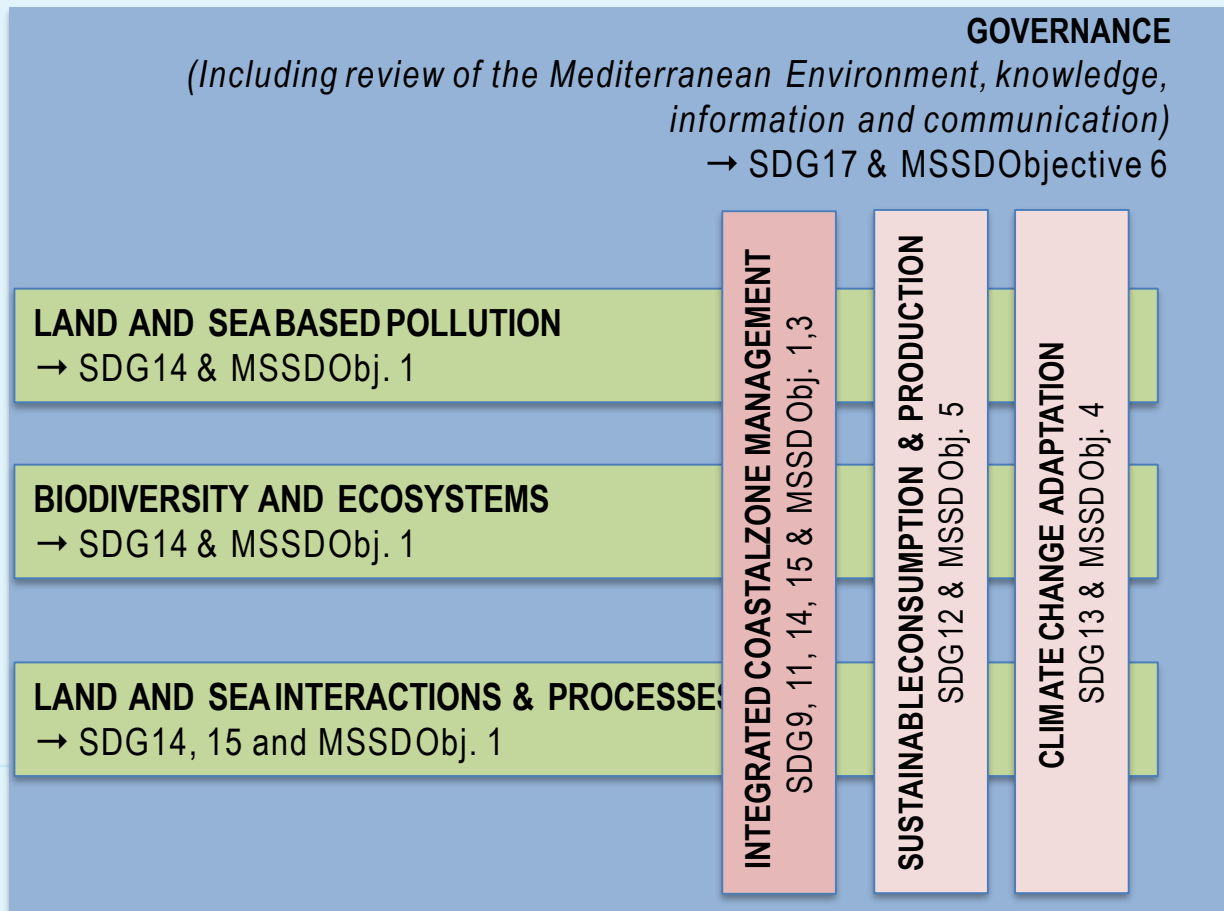
- Barcelona resolution on MAP adopted in 1975; The Convention adopted in 1976. Both amended in 1995
- 22 Contracting Parties including the EU
- The Convention is complemented by 7 Protocols: Dumping, Prevention and Emergency, LBS, Hazardous Wastes, SPA/BD, Offshore, ICZM
- MSSD, other Strategies, Integrated Policies and Action Plans to combat and prevent pollution and protect/conservate marine and coastal biodiversity
- Ecosystem approach as the overarching principle → achieve / maintain Environmental Status of the Mediterranean Sea and Coasts
- MAP vision: **“A healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations”**



# MTS 2016–2021 contribution to SDGs

A healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse contributing to sustainable development for the benefit of present and future generations

GOOD ENVIRONMENTAL STATUS OF THE MEDITERRANEAN  
CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

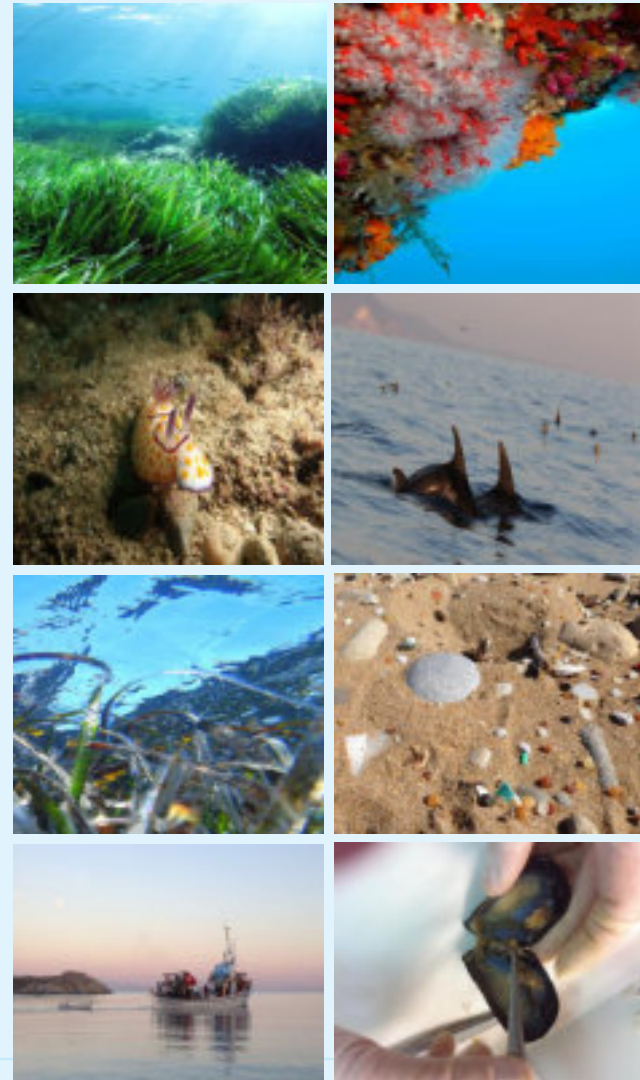


## Contribution to SDGs



# Good Environmental Status of the Mediterranean

- 11 Ecological Objectives covering all the main aspects of the marine and coastal environment (COP 17, Decision IG. 20/4)



- |   |                                       |
|---|---------------------------------------|
| 1. Biodiversity   | 7. Hydrography                        |
| 2. Non-indigenous species                               | 8. Coastal ecosystems and landscapes  |
| 3. Harvest of commercially exploited fish and shellfish | 9. Pollution (contaminants)           |
| 4. Marine food webs                                     | 10. Marine litter                     |
| 5. Eutrophication                                       | 11. Energy including underwater noise |
| 6. Sea-floor integrity                                  |                                       |

- 28 Operational Objectives (COP 17, Decision IG. 20/4)
- 61 Indicators (COP 17, Decision IG. 20/4)
- 40 GES definitions (COP 18, Decision IG.21/3)
- 66 Targets (COP 18, Decision IG.21/3)
- Integrated Monitoring and Assessment Programme (IMAP): 23 Common Indicators and 4 Candidate Indicators (COP 19, Decision IG.22/7)





# Assessment: a key component of the MAP system to support policy making and implementation



**2023  
MED  
QSR**

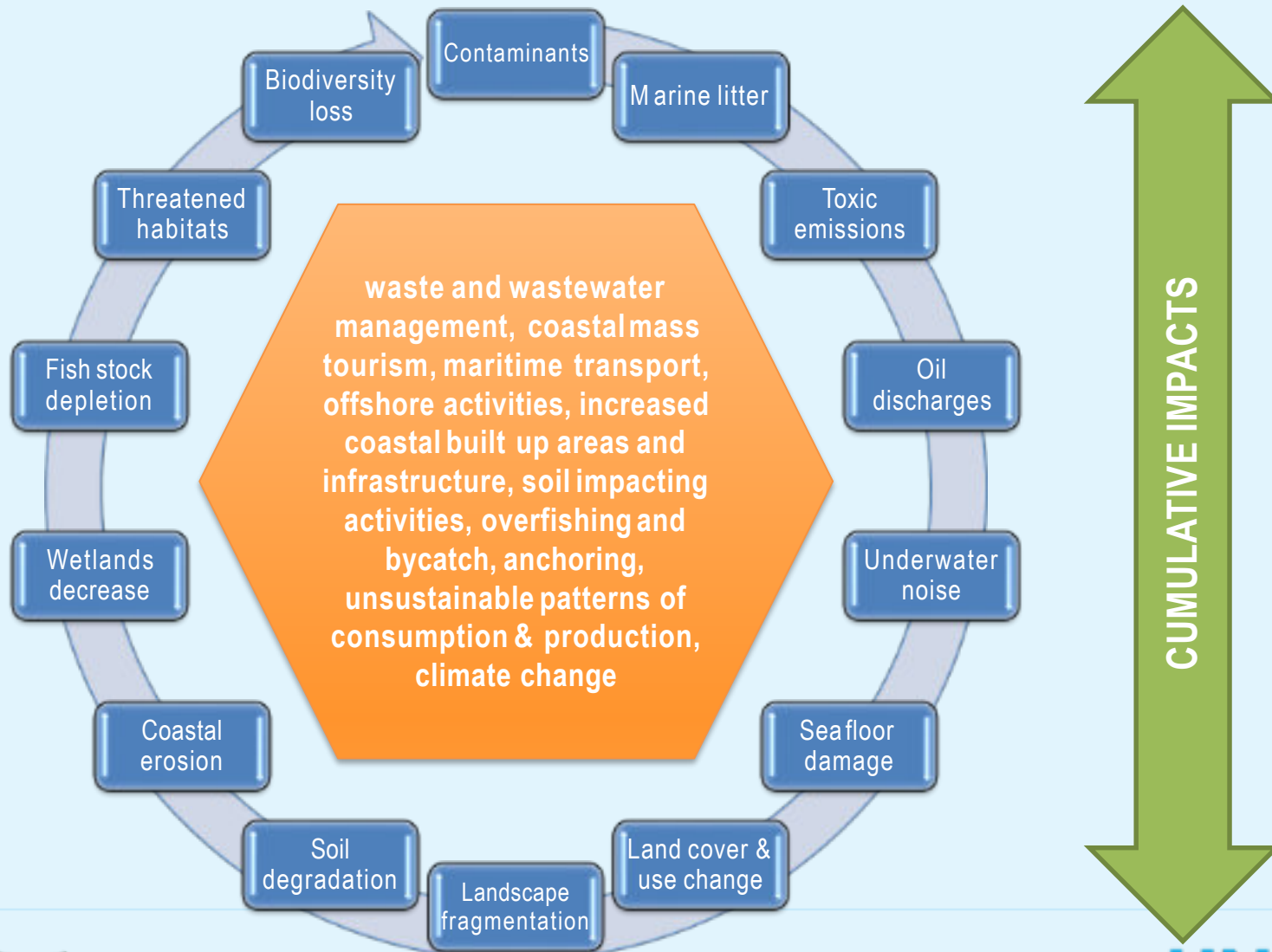


# Mediterranean 2017 Quality Status Report

- 11 Ecological Objectives covering all the main aspects of the marine and coastal environment (COP 17, Decision IG. 20/4)
- First ever Quality Status Report for the Mediterranean
- 23 IMAP Common Indicators
- Data sources:
  - Contracting parties' data sets as part of the MED POL database
  - Other relevant data provided by MAP Components and MAP implementing projects
  - GFCM and other regional sources of data, including projects
- Specific findings, conclusions and key messages per indicator
- Identified key knowledge gaps and limitations



# Key pressures and impacts (2017 QSR & 2019 SoED)



# Towards integrated GES assessment

- Need to ensure better interaction of pressures, impacts and state;
- Two-step recommended process:
  - i. Assessment of predominant pressures and their impacts, including mapping when appropriate;
  - ii. Assessment of the environmental status of marine ecosystems.
- DPSIR-based methodologies with the aim to:
  - i. assess the state of the marine environment;
  - ii. build policy responses addressing the drivers at the cause the degradation of the marine ecosystem and its ecosystem services
- Methodologies reviewed by the IMAP Best Practices Meeting (Rome, Italy, 10–12 July 2018), CORMON pollution meeting (Podgorica, Montenegro, 2–3 April 2019) and MED POL Focal Points (Istanbul, Turkey, 29–31 May 2019)
  - GRIDtable
  - RISK based approach
  - Scoreboard semi-quantitative method.



## MED 2023 QSR Objective

Assess the status of the Mediterranean Sea and Coast and the progress towards its GES, as basis for informed decision-making and enhanced action

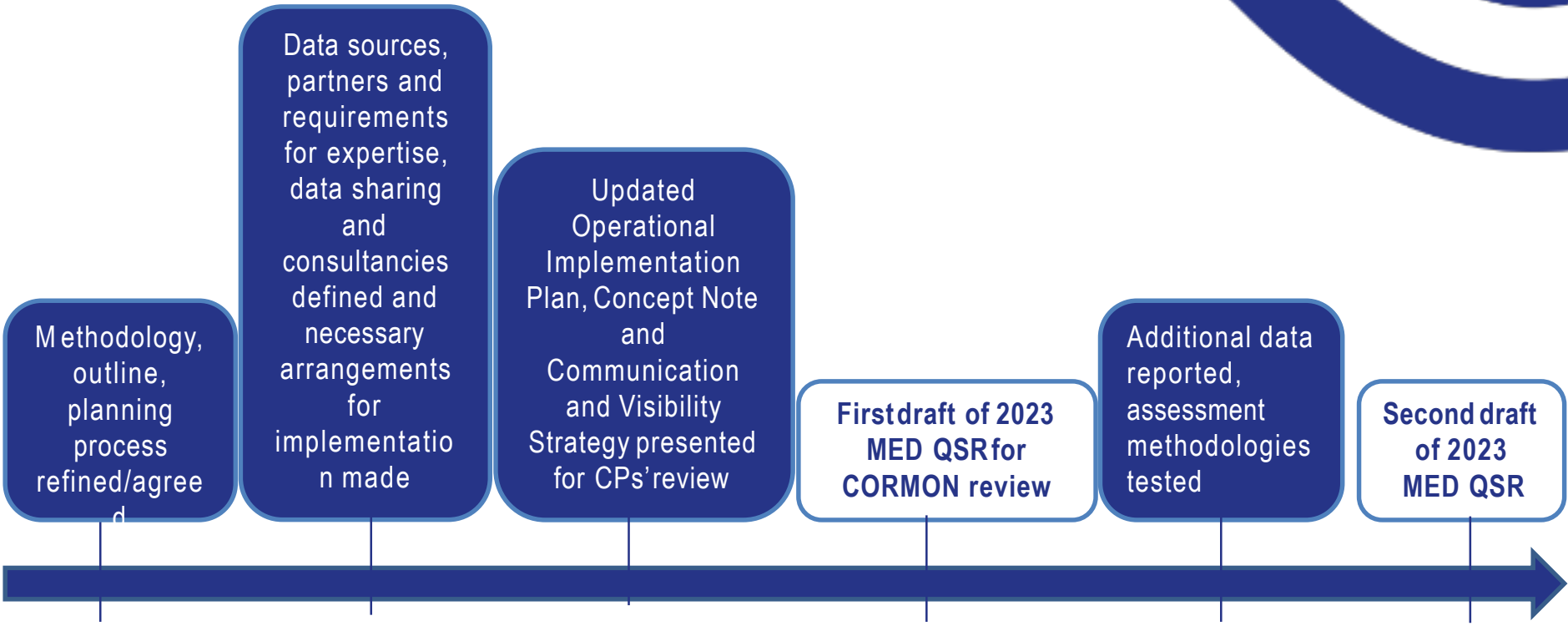
### Vision

“An integrated DPSIR-based GES assessment, developed on consolidated and quality-assured monitoring data sets, reported and processed through an effective IMAP Info System that is interoperable with national and other regional monitoring and reporting networks”

# Methodological Approaches for Assessment

- Regional scale
- DPSIR
- UNEP/MAP IA methodologies
- UNEP Guidelines for IA (2019)
- Consultation with CPs, experts, SCs

# Timeline (1/2)



Apr 2021



Aug 2021



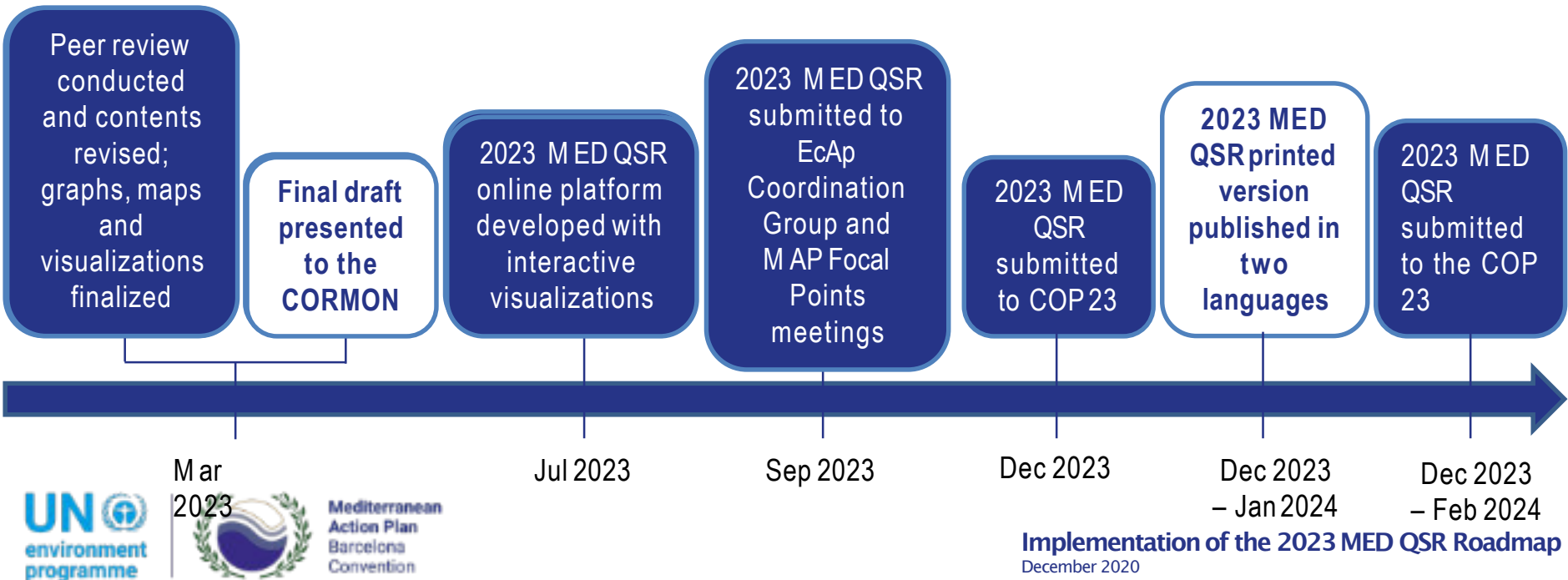
Sep 2021

Apr 2022

Sep 2022

Dec 2022

# Timeline 2/2





# Proposed Elements for Content

## Introduction

## The Mediterranean Sea

- Environmental characteristics
- Socio-economic characteristics
- Regional Cooperation

## Med Quality Status Assessment

- Pollution and Litter: EO5, EO9, EO10
- Biodiversity and NIS: EO1, EO2, EO3, EO4
- Coast and Hydrography: EO7, EO8
- Towards an IA of GES in the Mediterranean

## UNEP/MAP Actions and Measures

## Conclusions and ways forward

# Thank you

Tatjana Hema, Deputy Coordinator, UNEP/MAP



**Mediterranean  
Action Plan**  
Barcelona  
Convention

JPI Oceans Workshop 2–4 December 2020

Musing on the concept of  
Good Environmental Status

Marine Strategy beyond borders | Case of Tunisia

Presented by

Inès Boujmil  
Helajaziri

Under the supervision of the BlueMed GSO  
Pr. Cherif Sammari

- 
- An underwater photograph showing a dark, blue environment with various marine organisms and some debris scattered across the seabed. The lighting is dim, creating a somber and concerning atmosphere.
- The **growing awareness** of the intense pressures causing environmental degradation of the Mediterranean's natural wealth signal the need for a **sustainable approach**.
  - **Scientific knowledge, Maritime strategies** and **citizen science** applied to our shared Mediterranean Sea are the basis for understanding and protecting it.
  - **Science, Society** and **policy** need to be accurately **linked** in Tunisia in order to protect the marine resources and maintain the Good Environmental Status.

Video Source  
François Galgani, Ifremer



# Descriptor 1

## Biodiversity



## Towards the elaboration of a red list of endangered species in Tunisia

- A study will be soon conducted, in collaboration with the **International Union for Conservation of Nature (IUCN)**, to help Tunisia develop a **red list of endangered species**, confirmed by the **Minister of the Environment**.
- In Tunisia, the ecosystem has more than **7500 species**, including **3700 marine species**.
- In terms of conservation, the remarkable ecosystems in Tunisia (**Posidonia meadows, coralligenous, marine mammals, turtles, etc.**) are the subject of particular attention, at the national level such as the **creation of marine protected areas** and the **strengthening of fisheries regulations**.



## 1. MARINE TURTLE MONITORING PROGRAM (INSTM | RAC-SPA)

- The main study site of the loggerhead turtle is the **Kuriat archipelago** (Gulf of Monastir, Eastern Tunisia);
- This site is known to be the only site of **reproduction and of nesting of *Carettacaretta***.

• It is worth mentioning that the species ***Carettacaretta*** are subject to:

- **Incidental fishing** (trawl, gillnet and trammel nets) or voluntary enough
- **Poaching actions** in some localities (Kerkennah, Sfax, the Gulf of Gabes)

• The program relies heavily on the existing program for monitoring the reproduction of ***Carettacaretta*** in the **Kuriat Islands**, undertaken since the 1990s by **INSTM** and **RAC/SPA**.

• The current program proposes to **spread out the radius of action of this program** and **enrich it with the observations at other sites** suspected of marine turtle use.



## 2. Study and Care Centre of Turtles in Tunisia

The Study and Care Centre of Marine Turtles in Monastir plays an important role as an infrastructure for:

- Rescue and rehabilitation
- Autopsies

## 3. National Stranding Network

Established since 2004, should urgently respond to all reports of dead or alive stranding of marine turtles and cetaceans in order to rescue and to have the maximum amount of biological and ecological data and information on the causes of mortality.

## 4. Shortcomings & Perspectives

- Efforts remain to be made in the areas of **banking and data communication**.
- Increasing **fishers and general public awareness** and the **implementation of surveys** would make it possible to **identify other existing or potential egg-laying sites**.





- At the level of the **Convention on Biological Diversity**, the Contracting Parties to the **Barcelona Convention**, including **Tunisia**, have adopted the ecosystem approach (**EcAp**).
- This **integrated management strategy** is aimed at **conservation** and the **sustainable** use of land, water and living resources to achieve **Good Environmental Status (GES)**.



The main challenges in Tunisia facing this particular program are as follows

- Heterogeneity of protocols;
- The rarity and lack of organization of dedicated and non-dedicated prospecting;
- Lack of realistic perennial protocols that can be implemented at the national level.



# Descriptor 2

## Non-indigenous species



## Invasive Specie | Blue Crab

- Tunisia has 2 marine plant species and 15 invasive animal species, including molluscs and 3 crustaceans, namely the speckled shrimp (*Metapenaeus monoceros*), crab (*Libinia dubia*) and 2 blue crab species (*Portunus seignis*; *Callinectes sapidus*).
- Blue Crab invasion & the successful experience in Tunisia
- Commercialisation to reduce the harmful impact of its increasing population on marine biodiversity.
- A National strategy has been developed in Tunisia to reverse the disastrous impact of this invasive specie.





## NON-INDIGENOUS SPECIES MONITORING PROGRAMME (Caulerparacemosa & Symplegmabrankenhielmi)

- Priority is given to the census of species and their **abundance**, **location** and **spatial extension** mainly in areas at risk and secondarily in sensitive areas.

### • Biological parameters

- ✓ Baseline status and monitoring of the number of non native species;
- ✓ Location of signals; Signal frequencies per site;
- ✓ Specific abundances.

### • Perspectives

- Focus on the characterization of sources and vectors of their **introduction**.
- Focus on the impact on **biodiversity**, on economy related to **fishing** and on **animal and human health**.





# Descriptor 3

## Commercial species



# Commercial Species Monitoring Program

- This program provides information on the criteria and indicators of the **state of the fishstocks**.
- These indicators also allow to **assess the good ecological status (GES)** through its **production** (biomass).

## Challenges and objectives

- Maintain or achieve the good condition of exploited stocks
- Improve the state of poorly conditioned stocks
- Promote the rebuilding of stocks



# Mediterranean Brown Grouper Monitoring (*Epinephelus marginatus*)

- This species is particularly targeted by **recreational fishing** in Tunisia.
- This program is based on **existing systems** implemented as part of the **National policy on fisheries and conservation of fishery resources** (biological resting in the Gulf of Gabes, specific fishing surveys).
- It would be wise to include a sub-program dedicated to the **estimation of fishing effort, mortality and biomass** through **recreational fishing**;
- Five (5) areas have been selected by Tunisia to be monitored within the framework of **IMAP**:
  - **2 protected areas**: **Zembra and Zembretta National Park** & the **Kuriata archipelago**
  - **3 areas under anthropic pressure**:
    - ✓ **Kerkennah archipelago**,
    - ✓ **Gulf of Tunis**,
    - ✓ **Area located in the North-West of the Gulf of Gabes** (El Hicha, Akarit-Skhira)







# Descriptor 5

## Human induced eutrophication

## •National Project at INSTM | Harmful Algae Blooms along the Tunisia coasts (Littoral HABs)

- Harmful Algae Blooms (HABs) are a **natural phenomenon** caused by the mass proliferation of **toxic or non-toxic phytoplankton** (cyanobacteria, diatoms, dinoflagellates) in aquatic environments.
- These blooms can be harmful to the **environment, human health and aquatic life** due to the **production of harmful toxins** and **oxygen depletion** following the **accumulation of biomass**.



### •Objectives :

- Evaluate the **impact of acidification of the environment and of contaminants** on the morphology and proliferation of harmful microorganisms.
- Test the **appropriate methodologies to characterize HABs and associated bacteria in bathing areas**.
- Identify **an early warning, rapid and reliable strategy** for the **identification of toxic phytoplanktonic effluorescences and bacteria** in high-traffic and bathing environments.

# Blooms monitoring by CMEMS

- In addition to in situ surveys to detect and monitor algal blooms, we also combine satellite data from Copernicus platform for data validation.

The screenshot shows the Copernicus Marine Service web interface. At the top, there are logos for the European Union and Copernicus, along with navigation links for Home, User Corner, and Contact Us. Below this is a dark blue navigation bar with buttons for 'Access your ocean information', 'OCEAN PRODUCTS', 'OCEAN MONITORING INDICATORS', and 'OCEAN STATE REPORT'. A shopping cart icon and a 'Hello, Sign in' button are also present.

The main content area features a search bar with the text 'chl'. Below the search bar are filter options: 'REGIONAL DOMAIN', 'PARAMETERS', and 'TEMPORAL COVERAGE'. The 'TEMPORAL COVERAGE' filter is expanded, showing a date range from '1992-01-01' to '2020-12-13' and a checkbox for 'If checked, the search results will only show products containing the whole selected time range'. There is also a 'PRODUCT WITH DEPTH LEVEL' checkbox.

The search results section displays 'Found 7 ocean products matching your criteria.' and an 'Export results' button. The first result is 'MEDSEA\_ANALYSIS\_FORECAST\_BIO\_006\_014' with the title 'MEDITERRANEAN SEA BIOGEOCHEMISTRY ANALYSIS AND FORECAST'. The product details include: 'MODEL' with various icons, 'CHL PHYC O2 NO3 PO4 SPCO2 PH FGCO2 PP' parameters, a resolution of '0.042 degree x 0.042 degree (125 depth levels)', a time range from '2018-07-07 to Present', and 'daily-mean, monthly-mean' data types. A 'MED' map shows 'Chlorophyll Concentration [mg/m³]' for '01/01/2017 12:00 UTC' with a color scale from 0 to 1.0. Below the map are options for 'MORE INFO', 'ADD TO CART', 'WMS', and 'Sub-setting'.

# An IOC Newsletter on toxic algae and algal blooms in Tunisia

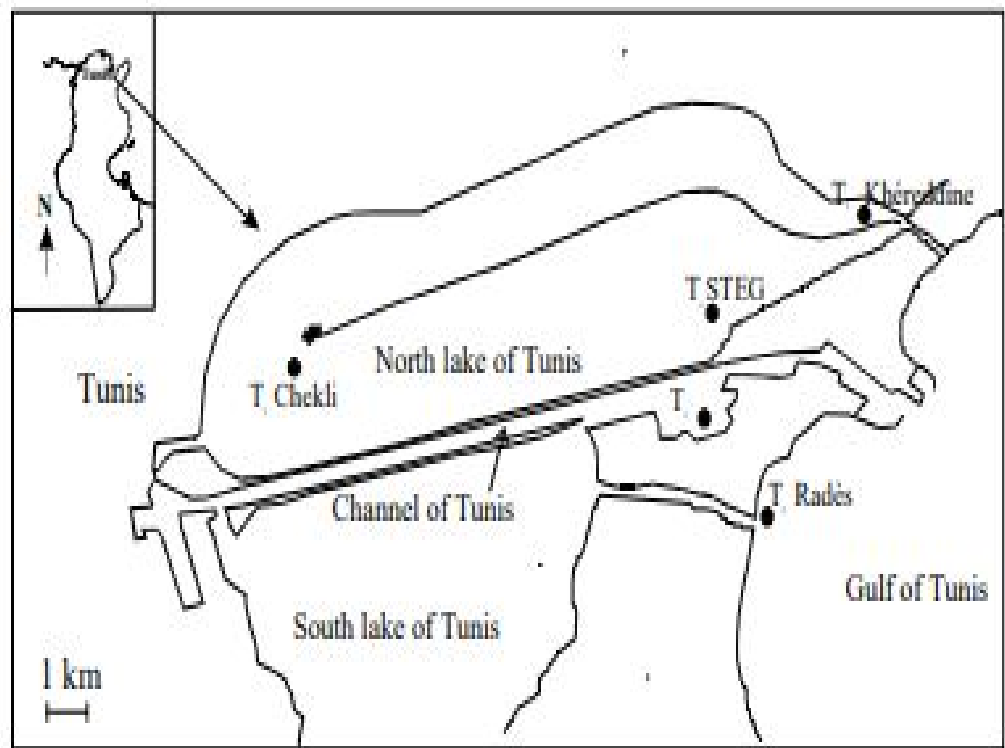


Fig. 1. Sampling stations in shellfish production area of North lake and Channel of Tunis.

• Tunisia

## Detection of toxic *Alexandrium catenella* (Whedon & Kofoid) Balech in clam production zone of North Lake and Channel, Tunisia

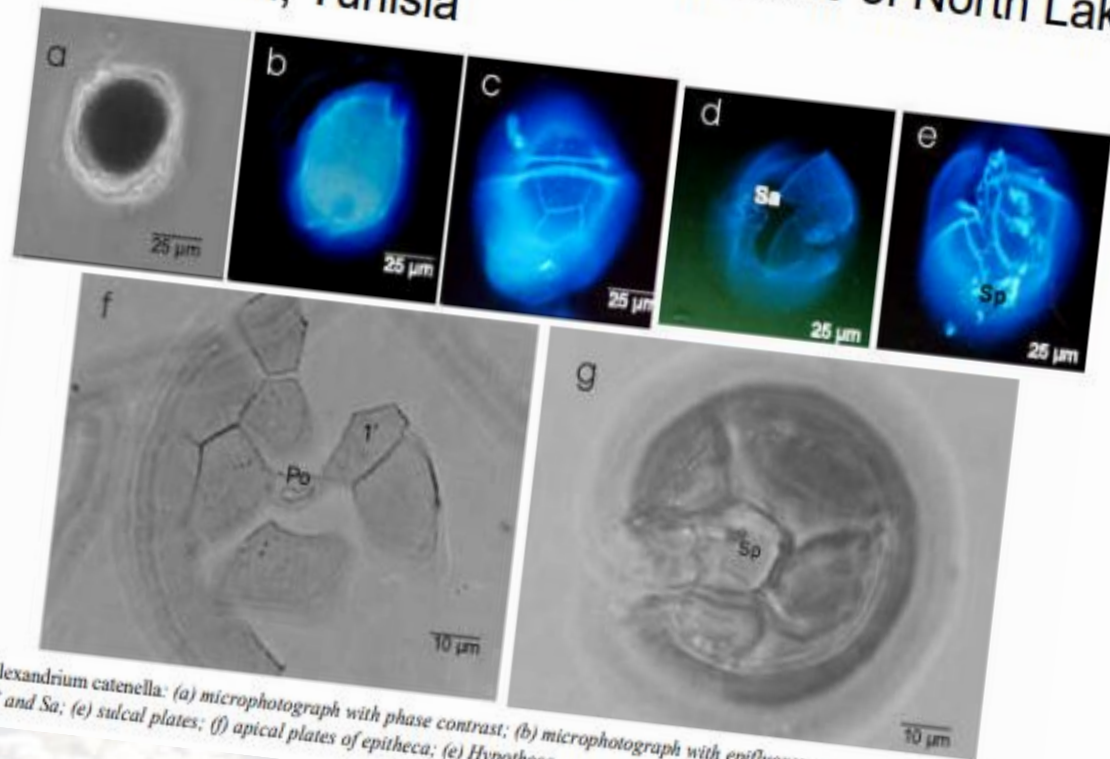


Fig. 2. *Alexandrium catenella*: (a) microphotograph with phase contrast; (b) microphotograph with epifluorescence, ventral view; (c) dorsal view; (d) Po, I' and Sa; (e) sulcal plates; (f) apical plates of epitheca; (g) Hypotheca.



# Descriptor 7

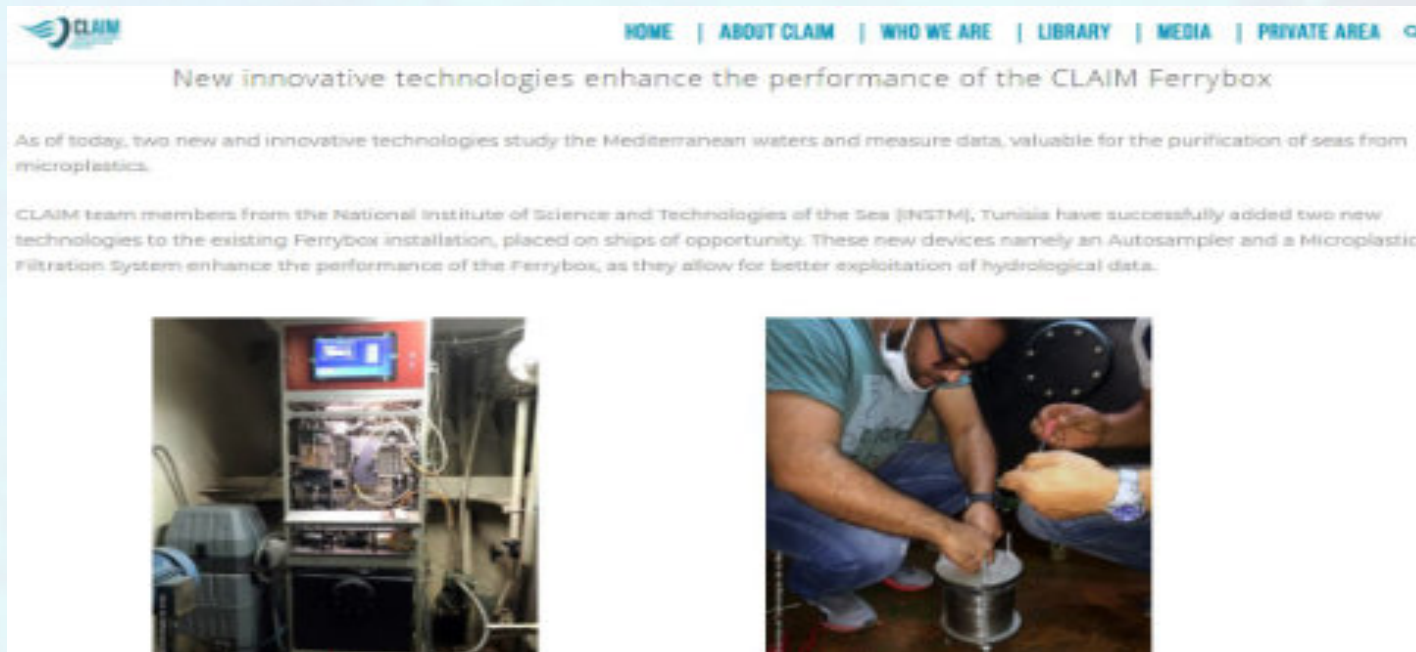
## Hydrographical conditions

## INSTM| NATIONAL OCEANOGRAPHIC DATA CENTER

- The INSTM's National Oceanographic Data Center is composed of **hydrological (HydroBase)**, **biodiversity (Biodiver)** and **Tunisian algae (Tunalgobase)** databases.
- Nevertheless, "**HydroBase**" is the only operational database belonging to **the Marine Environment Lab (LMM)** and it is used in the **SeaDataNet** project.
- INSTM acquired a **FERRYBOX** system installed in **February 2016** on board the **C/f Carthage** of the Tunisian Company of Navigation (CTN). It is a high frequency measuring equipment.
- The **parameters** concerned by our system are **temperature, salinity, turbidity, oxygen** and **Chl-a**.



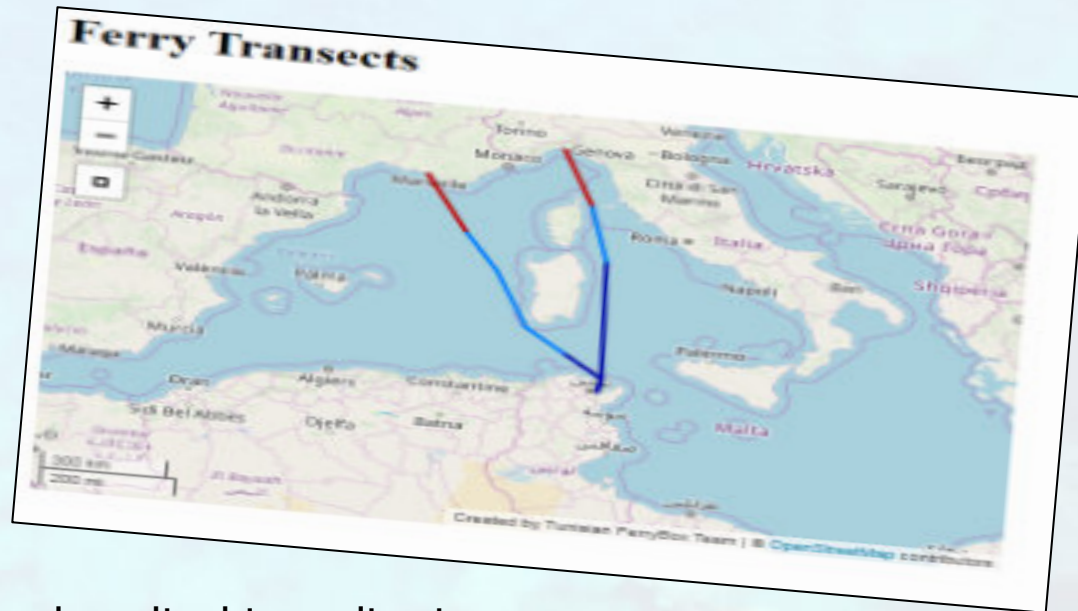
- **New innovative technologies** enhance the performance of the CLAIM Ferrybox
- CLAIM team members from the INSTMT Tunisia have successfully added two new technologies to the Ferrybox installation.
- **Two new and innovative technologies** study the Mediterranean waters and measured data, valuable for the **purification of seas from microplastics**;
- An **Auto-sampler** and a **filtration system for micro-plastics** in order to:
- **Maximize the number of samples**, to determine the nature of the polymers and to explain their dispersion by coupling them with hydro-biological data.



## THE FERRYBOXDATAMANAGEMENTWEB APPLICATION

•The **FerryBoxweb application** is currently in test phase, after the final validation we will proceed to grant public access

Allow a real time evaluation and monitoring of the evolution in surface waters!



•The main functionalities developed in this application are :

- ✓ **Data description**: a description of the data acquisition and processing, as well as the analyses required to generate the graphs and results of the visualization part.
- ✓ **Data visualization**: this part contains 4 types of multi-filters, developed to offer the user different types of scientifically exploitable graphs.
- ✓ **Downloading data**: the downloading process is a two-step process: Filling in a predefined form, Validation or rejection of this request by the solution administrator.



## FERRYBOX DASHBOARD

Data Overview

Data Access

Login

# Tunisian FerryBox project presentation

Project timeline, goals, scheme, database and devices description, and more



### Visualize FerryBox Marine data

↑ 687 recieved files.

updated 1 day ago



### Test data seasonality

Data repartition per month

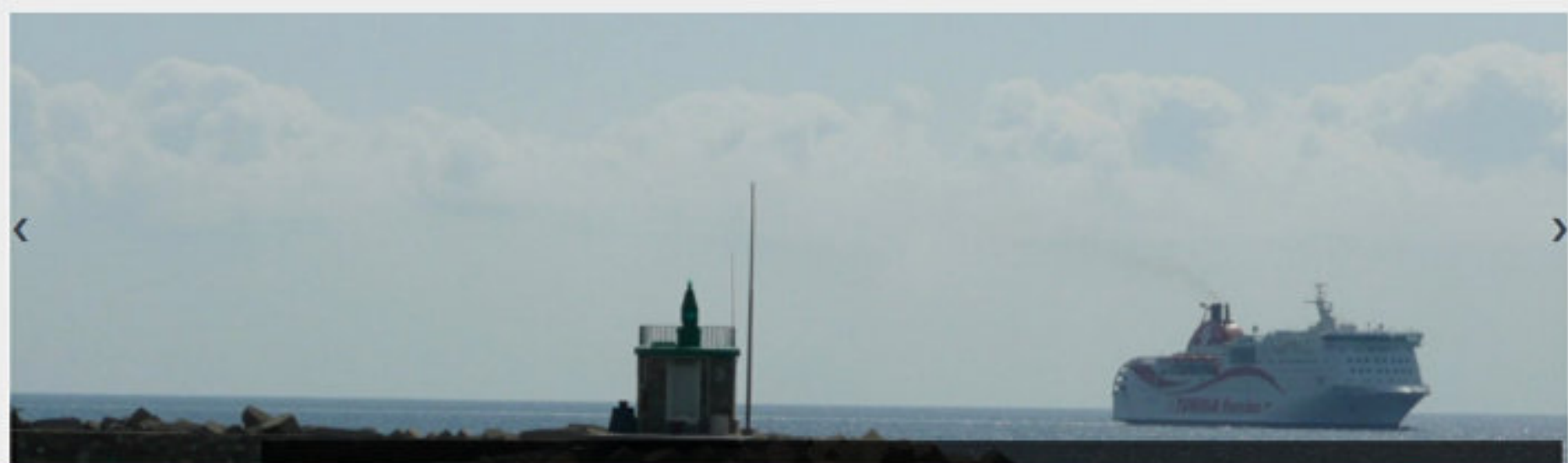
All data included

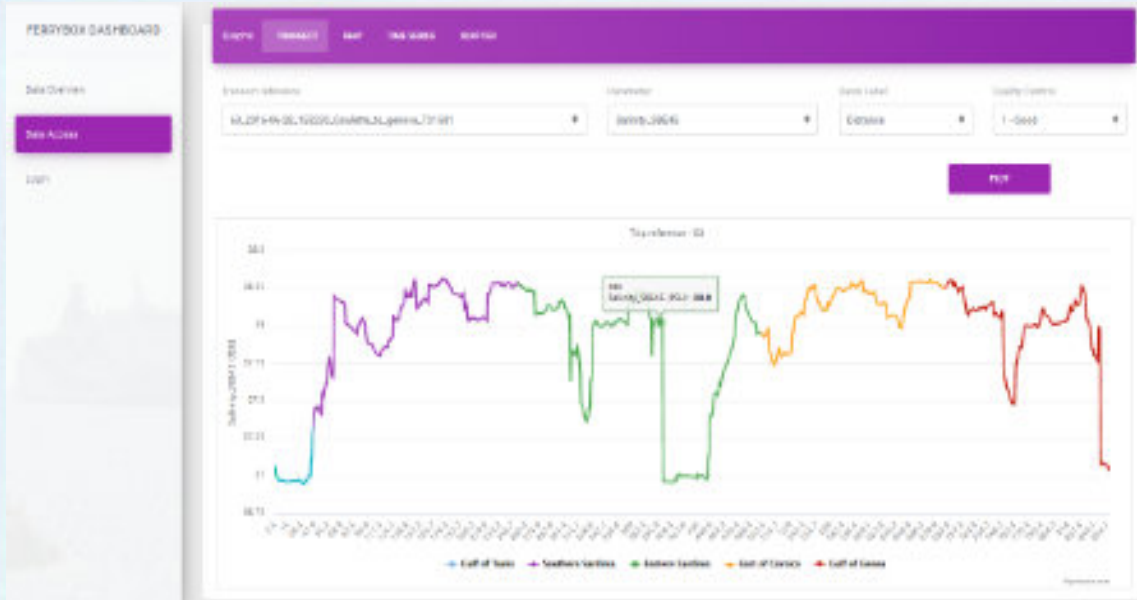


### Asses data quality

% of truncated vs correct files

Only correct files are accessible





Transectplot



TimeSeries



- The **map** shows the details of the routes, a legend with a specific **colour gradient** for each type of parameter.
- A **popup** feature allows you to retrieve the **position** of the point and the value of the **parameter** per click.



# Descriptor 8

## Contaminants



The **National programme for monitoring the quality of the marine environment** within the framework of the **MEDPOL** programme includes:

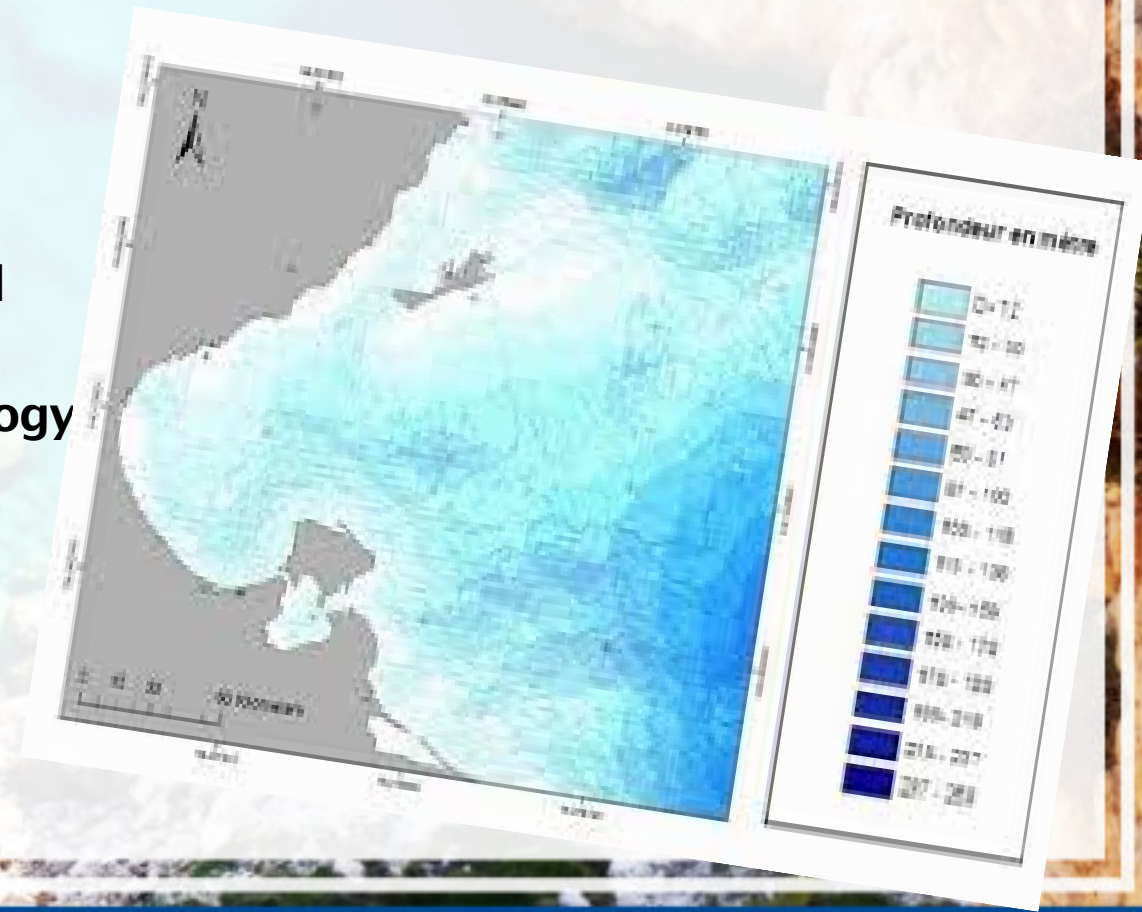
- ✓ monitoring of **land-based pollution sources, estuarine pollution hotspots, coastal treatment plants;**
- ✓ **bathing water compliance** monitoring;
- ✓ **coastal zone analysis;**
  
- The first element that constitutes the **national monitoring program** is the **identification and inventory of legislative provisions** relating to:
  - ✓ Existing monitoring programs in Tunisia of the state of the sea and coasts
  - ✓ Interms of biodiversity, coastline, hydrography, pollution, and marine waste;
  
- > In order to determine what additional provisions are necessary to enable the development and implementation of the **Tunisian national IMAP monitoring program.**

## •National Project at INSTM | Effect of the potential release of pollutants in the Gulf of Gabes (ER-2-PG)

- In the Gulf of Gabes, releases from the **phosphate industry** are very significant (**7 million tonnes per year**) of industrial releases containing solid forms mainly composed of **phosphogypsum**.
- These **solid discharges** have occupied a large part of the **marine surface**, settling on the **sediments**.

### •Objectives:

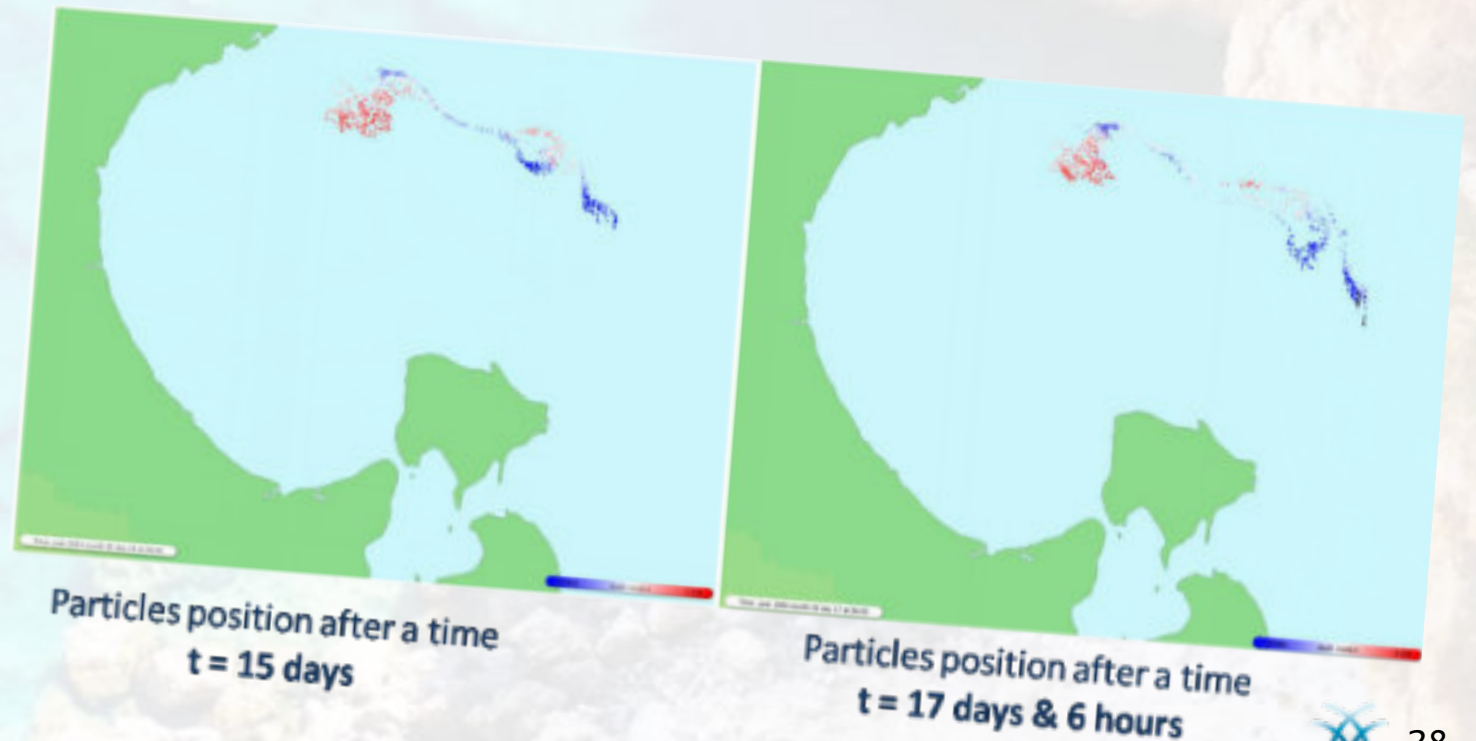
- Investigate expected risk from the **contaminants** accumulated in the **sediment**;
- Provide **decision makers** with a **risk assessment methodology** affecting the **socio-economic sector**.



## • Numerical Modelling Platform – Microplastics

- The two **Lagrangian particle tracking codes** **Track mass** and **Ichthyop** presented are perfectly adapted to study the **dispersion of virtual plastic particles**.
- Their coupling with the **hydrodynamic model ROMS** that we have adapted to the **Gulf of Gabon** is in its last phase.

We have presented some preliminary results of the **coupling of Ichthyop with ROMS**. These results are encouraging!





# Descriptor 9

## Contaminants in fish and seafood

## National Network for Monitoring the Conditions of Production and Marketing of Bivalve Molluscs

- **Coastal waters** are the **receptacle** for urban and agricultural land-based **inputs** may contain substances potentially **pathogenic** to humans.
- In Tunisia, this **National network** allows the **monitoring** and **inspection** of production areas of live **bivalve molluscs** as well as the conditions for **collection**, **purification** and **marketing**.
- This network was set up in **1995** by the **General Directorate of Veterinary Services (DGSV)**.

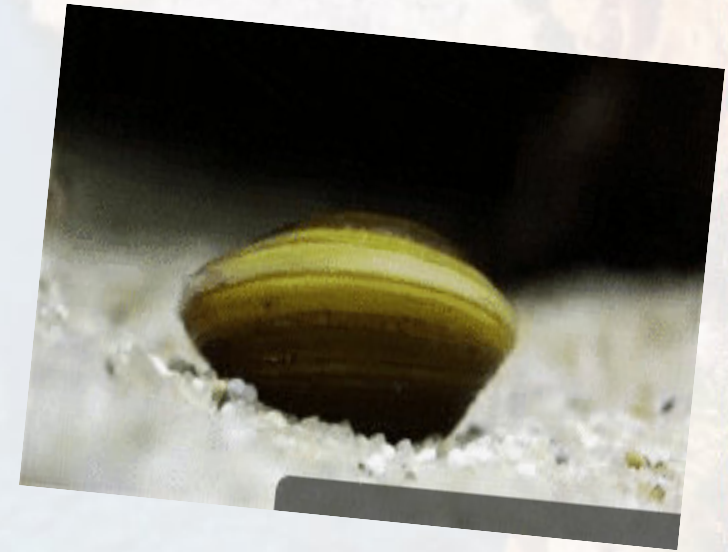




## MiCA National Research Action

- **MiCA** "Microplastics in Clams Action" is a National Research Action initiated & launched by **INSTM**, following the **Blue Med Plastic-free** pilot momentum.
- The main objective of **MiCA** is the **characterization** and **quantification** of microplastic debris in: **water, sediment** and **biota** in intertidal zones, where plastic waste accumulation is important (Sfax).

**The Common Clam** *Ruditapes decussatus* is the biological material for this study, as it is a **filtering** organism & a **Bioindicator**, that gives information about the quality of the environment.



# Societal Challenges

- In addition to that, this study included **female Clam's collectors**, who contributed to **Citizen Science** by collecting Clams for **scientific analysis**.
- Furthermore, the **BlueMedYoung Communication ambassador in Tunisia** realized a survey with these women in order to know more about their social and life conditions, related to **societal challenges action**.
- their **experience in the field** about **marine parameters**, **identification of species** and information about **degradation of habitats** are very important for **research purposes**.



•Several Research papers have been elaborated to examine contaminants

ScienceDirect journals & books

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Food Control  
Volume 32, Issue 2, June 2011, Pages 203–207

### Occurrence of patulin in apple-based-foods largely consumed in Tunisia

Christine Zaidi, Selma Kahl, Maha Hail, Hassan Bacha, R. M.

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Food and Chemical Toxicology, Volume 94, 2014, p...  
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DNA damage in organs of mice treated with...  
Food and Chemical Toxicology, Volume 90, Issue 1...  
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A new method for assessment of heavy metal...  
Analytical Biochemistry, Volume 461, 2015, pp. 33–39  
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Original Article | Published: 01 August 2006

### Oxidative DNA damage levels and catalase activity in the clam *Ruditapes decussatus* as pollution biomarkers of the Tunisian marine environment

Jamel Jebel, Mohamed Sami, Elhachem Ghannouchi, Mohamed El-Agnaf, Mohamed El-Agnaf, Mohamed El-Agnaf

Environmental Monitoring and Assessment 124, 195–200(2007) | Cite this article  
278 Accesses | 45 Citations | 1 Abstract | Metrics

#### Abstract

Levels of the oxidative DNA damage 7, 8-dihydro-8-oxo-2'-deoxyguanosine (8-oxodG) and catalase (CAT) activity were measured in the digestive gland and gills of clams *Ruditapes decussatus*, related to the presence of pollutants along Tunisian marine environment. Increased levels of CAT were observed in tissues of clams from all the sites studied, to control values, and elevated 8-oxodG levels...

### La contamination métallique du rouget de vase (*Mullus barbatus*) et de la sardinelle (*Sardinella aurita*) du golfe de Tunis

by  
Rym ENSOURI (1, 2), Sami MELI (1, 3) & Lassad CHOUBA (1)

Published: 07 December 2013

### Mercury contamination in human hair and some marine species from Sfax coasts of Tunisia: levels and risk assessment

Souad Meghanni-Chaab, A. Hanaï & Hanaï Chahî

Environmental Monitoring and Assessment 184, 477–487(2013) | Cite this article  
32 Citations | 9 Abstracts | Metrics

ScienceDirect journals & books

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Marine Pollution Bulletin  
Volume 111, Part 4, June 2016, Pages 11–12

### Spatial distribution and contamination assessment of heavy metals in marine sediments of the southern coast of Sfax, Gabes Gulf, Tunisia

Imen K. F. A., Ferideh H. F., Aya Z. H. F., Houda B. F., Souad E. H. F., Dina G. F.

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Distribution pattern of persistent organic po...  
Marine Pollution Bulletin, Volume 111, Part 4, 201...  
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Published: 10 June 2010

### Heavy metal concentrations in the surface marine sediments of Sfax Coast, Tunisia

Dorra Gargouri, Chadi Azzi, Mohamed Moncef Serhaji, Younes Jedoui & Mabrouk Montazer

Environmental Monitoring and Assessment 175, 519–530(2011) | Cite this article  
432 Accesses | 73 Citations | Metrics

Issue 3, 2011

### Distribution and partitioning of aliphatic hydrocarbons and polycyclic aromatic hydrocarbons between water, suspended particulate matter, and sediment in harbours of the West coastal of the Gulf of Tunis (Tunisia)

Hadia Hamez, and Leocadio Claudio

Author affiliations

#### Abstract

Harbours of La Goulette, Rades and Sidi Bou Said are considered as the principal largest and most important port in the Gulf of Tunis characterized by a direct influence of different

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#### Article information

<https://doi.org/10.1007/s10661-010-0000-0>

Submitted	29 Oct 2010
Accepted	12 Jan 2011
First published	15 Feb 2011
Citation	J. Environ. Monit., 2011, 13, 685–700



# Descriptor 10

## Marinelitter



- **Plastic litter is an imminent threat for public health to wildlife habitat.**

- **Government Decree No. 2020-32 of January 16, 2020**, establishing the types of plastic bags whose production, import, distribution and possession are prohibited in markets.

- Since **1993**, Tunisia has set up a **national program of solid waste management** to implement an integrated waste management strategy.

- **ANGeD**, created in 2005, currently manages a public system called "**Eco-lef**", which consists of taking back and recovering used packaging,



## Filière de gestion des déchets en plastique: Ecolef

National - Tunisie





## INDICIT II (Implementation Of Indicators Of Marine Litter On Sea Turtles And Biota In Regional Sea Conventions And Marine Strategy Framework Directive Areas)

- **INSTM Tunisia** is a partner in **INDICIT II** project, committed to:
  - Support the **implementation** of EU's **MSFD Indicators Of "Marine Litter on sea turtles and biota"**.
  - Maintain or achieve the **Good Environmental Status (GES)** of the marine environment by **2020** with respect to **marine litter**.
  - Other **international environmental policies** aiming at protecting the marine environment:
    - the **Barcelona convention**,
    - the **OSPAR convention**,
    - the **HELCOM**, etc.



## ANGeD|Missions andResponsibilities

- ANGedis endowedwith**civil personalityand financial autonomy**,underthe supervisionofthe**Ministry of Local Affairs and the Environment**.



The development and strengthening ofan adequateinfrastructure



The launch of collection, recycling and recovery channels



Assistance to municipalities and industrials



The development of an enabling environment for private sector participation and job creation

## National Environmental Protection Agency | ANPE

- **Environmental monitoring** is one of the main missions of the **National Environmental Protection Agency (ANPE)** and the driving force behind all its operational activities.
- ANPE's missions include:
  - **Tackling all sources of pollution & nuisance and mitigating all forms of environmental degradation;**
  - **Ensuring discharges monitoring and the treatment facilities for such discharges.**

## ANPE | EnviroCred

**ANPE** and **(ANME)**, in partnership with the **(AFD)**, have launched since 2009, a **Subsidized Line of Credit**, aimed at facilitating the **funding** in:

- ✓ **depollution monitoring (ENVIROCRED)**
- ✓ **energy management (ALME).**





## The BlueMed Implementation Plan in Tunisia

- Tunisia is currently working to prevent these impacts by developing a strategy based on the establishment of plans for mitigating and/or adapting to the effects of climate change.
- With a special interest to co-champions, Tunisia is currently leading **Priority 1: Understanding Pollution Impacts, Mitigation and Remediation in the Med**
- National ongoing Projects
  - **MiCA**: Microplastics in Clams Action
  - **PrevCOTES**: Establish a marine forecasting system along the Tunisian coasts to predict marine dynamics and the distribution and transport of tracers as an indicator of pollutants.
  - **ER-2-PG**: Effect of the potential release of pollutants in the Gulf of Gabès.
  - **Project DYNAMISME**: Modelling of sediment dynamics and assessment of pollutant dispersion in the Gulf of Tunis.
- Other projects and Start-ups will be developed in Tunisia to tackle **Marine Litter** through a **collaborative approach!**



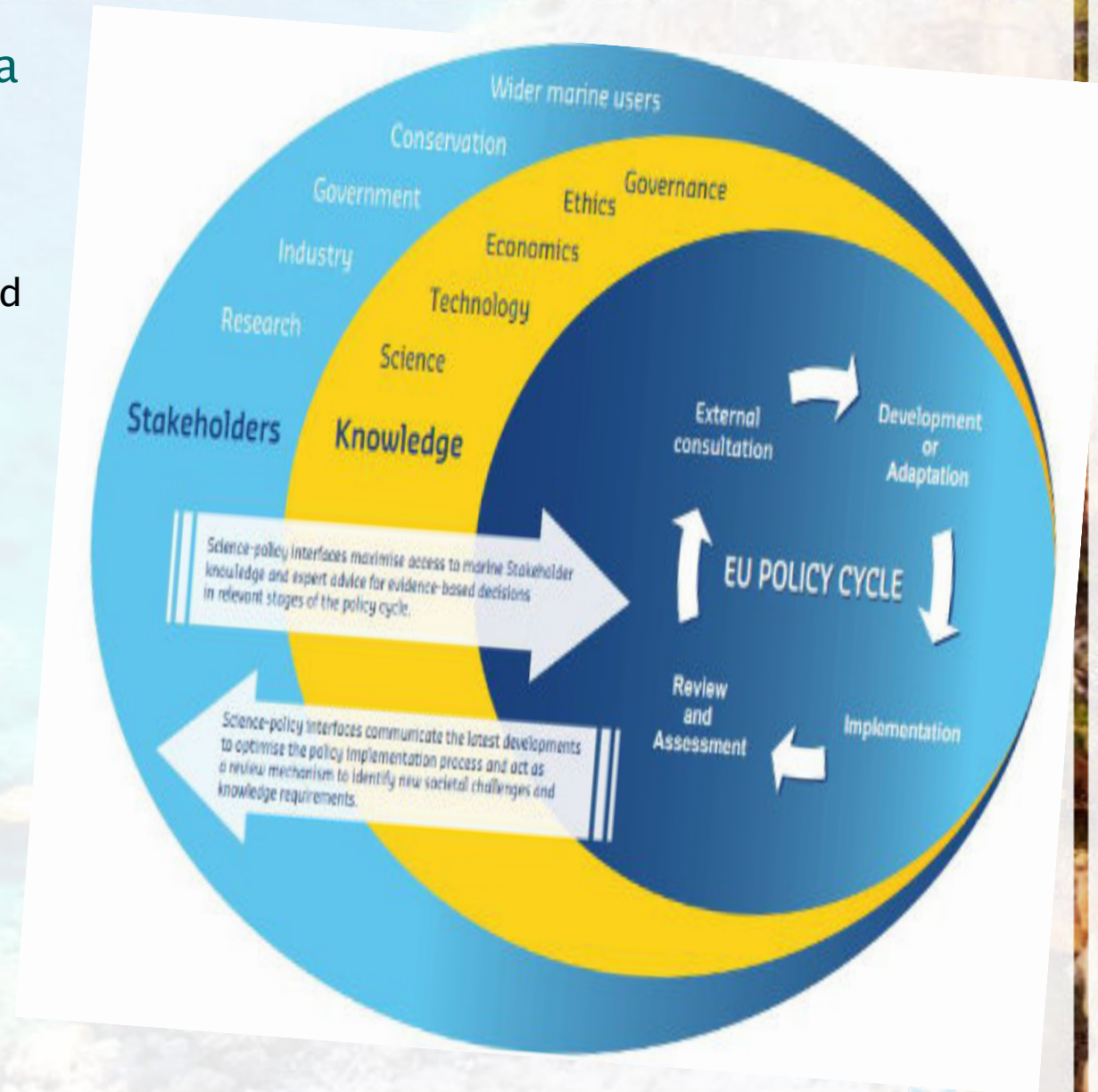
## Towards an Effective Science-policy interface in Tunisia

- Components of an effective **Science-Policy interface** showing the important **role of Stakeholders and Knowledge** and the **need for multi-way dialogue** to promote evidence-based decision making.

(Source: European Marine Board, 2013, Navigating the Future IV. Chapter 13, Marine science-policy interfaces, p.168)

This shows that **science is a crucial component of the knowledge base underpinning evidence-based decision-making.**

- Such interfaces and exchanges should be both:
  - **bottom-up**: engaging stakeholders across multiple sectors.
  - **top-down**: with leadership from policy makers to communicate recommendations on policy requirements !





# Aghmer of hope h Tunisia



## •National HUB in Tunisia|BlueMed

- Due to the pandemic,the set-upofthe **TunisianHUB** was **delayed**,we will workon plastic litter issues by developinganetwork **community**.
- The**Tunisian HUB**will gather**Policy makers,tourismsector**representatives,**Publiccitizens,civil society, Fishermen**and the**scientific community**.
- In a perspective context,this “**national HUB**” might evolve into an “**observatory**” for long-termfollow-up.

Projects
INDICIT I, II (partners)
CLAIM (partners)
COMMON (partners)
ODYSSEA (Partner)
Co-Evolve4BG (partners)
Marine debris, plastics and microplastics on Tunisian coasts
Policy brief on the ban of microplastics in Tunisia.
Plastic Atlas
TERRI'COOP
DEVLOK
PlasiStop
GERACIDD
DESIGN YOUR WASTE
Sea Tu Med
DRINA 0.1
Municipality without plastic (Kram)
Support for the management of the marine and coastal protecte
RAMSUD
COLLECT'ECO
Stop Plastic Pollution
street library

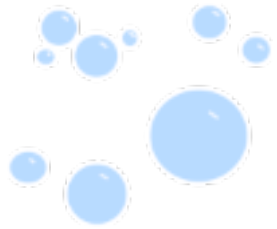
stakeholders
The Minister of Agriculture
Institution of Agricultural Research and Higher Education (IRESA)
Directorate General for Fisheries and Aquaculture (DGPA)
National Institute of Science and Technology of the Sea (INSTM)
National Agency for the Promotion of Scientific Research (ANPR)
Agency for Coastal Protection and Development (APAL)
National Agency for the Protection of the Environment (ANPE)
National Agency for Waste Management (ANGeD)
Regional Activity Center for Specially Protected Area (RAC/SPA)
TUNISIAN UNION OF INDUSTRY, TRADE AND CRAFTS (UTICA )
Ministry of the Tourism
Interprofessional Federation of Tunisian Tourism (Fi2T)

Initiatives
WWF Tunisia
Fell Association Hamem Sousse
Association for the Safeguarding of the Heritage of the Cap Bon N
Environment and Sustainable Development Association - Zarat
Kram Development and Environment Association
Association for the Protection of Wetlands in Southern Tunisia
Young Science Kerkennah
Jlij Association for the Marine Environment
Association of continuity of Generations
Kelibia Environment Association
Cultural and Environmental Association of Kelibia
Association of Coastal Protection Maâmoura
Environmental Protection Association Hammam Ghezaz
Association of Environmental Education of Hammamet
Tunisia Recycling
Tunisian Association for Studies and Research on Cetaceans HOU
Our Big Blue Tunisia

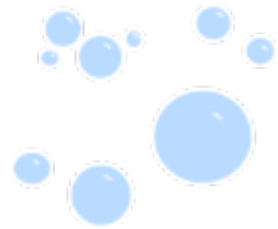
## Perspectives in Tunisia



- A feedback from **dialogues between the science and policy** is vital to **identify gaps** in current **knowledge** and drive the **production of relevant new knowledge**.
- The **interaction** between **politicians** and **scientists** already exists, however, **complementarity** must be **boosted**.
- A **Tunisian Plastic-free HUB** is processing. However, **National HUBs** covering the **11 MSFD descriptors** should be developed to maintain the **GES**.
- A real need is identified for **regional coherence and coordination** between scientists, Politicians and stakeholders; these **regional clusters** will build a **National network** afterwards.
- The development of **Citizen Science** in each country is important as citizens are the main **actors of change**.



Thank you!



The slide features a background of blue wavy lines and a faint world map. At the top left are the logos for JPI OCEANS, blueMed, and a stylized 'G' logo. The title is centered in white text. At the bottom left is the logo of the Académie Tunisienne Beït al-Hikma, and at the bottom right is the logo of the University of Sfax.

JPI OCEANS blueMed

"Biomonitoring and biomarkers in marine pollution monitoring:  
Possibilities and Limits"

Pr Hamza-Chaffai Amel  
Sfax University -TUNISIA  
The Tunisian Academy of Sciences

Académie Tunisienne  
Beït al-Hikma

جامعة صفاقس  
Université de Sfax

1

The slide has a background of a school of fish swimming in deep blue water. The title is at the top in white. At the bottom left is the JPI OCEANS logo, and at the bottom center is the text 'HAMZA-CHAFFAIA, DECEMBER 2020'.

Sharing the Mediterranean Uniqueness

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2

Sharing Mediterranean History, know how, Poetry, Music,  
And sometime some Conflicts and Wars.,  
Common Past. .Common Present and Common Future



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3

High Biodiversity



0.8% of the oceans

BUT

7.3% of the specific

Biodiversity

:

4% Vertebrates

6% Invertebrates

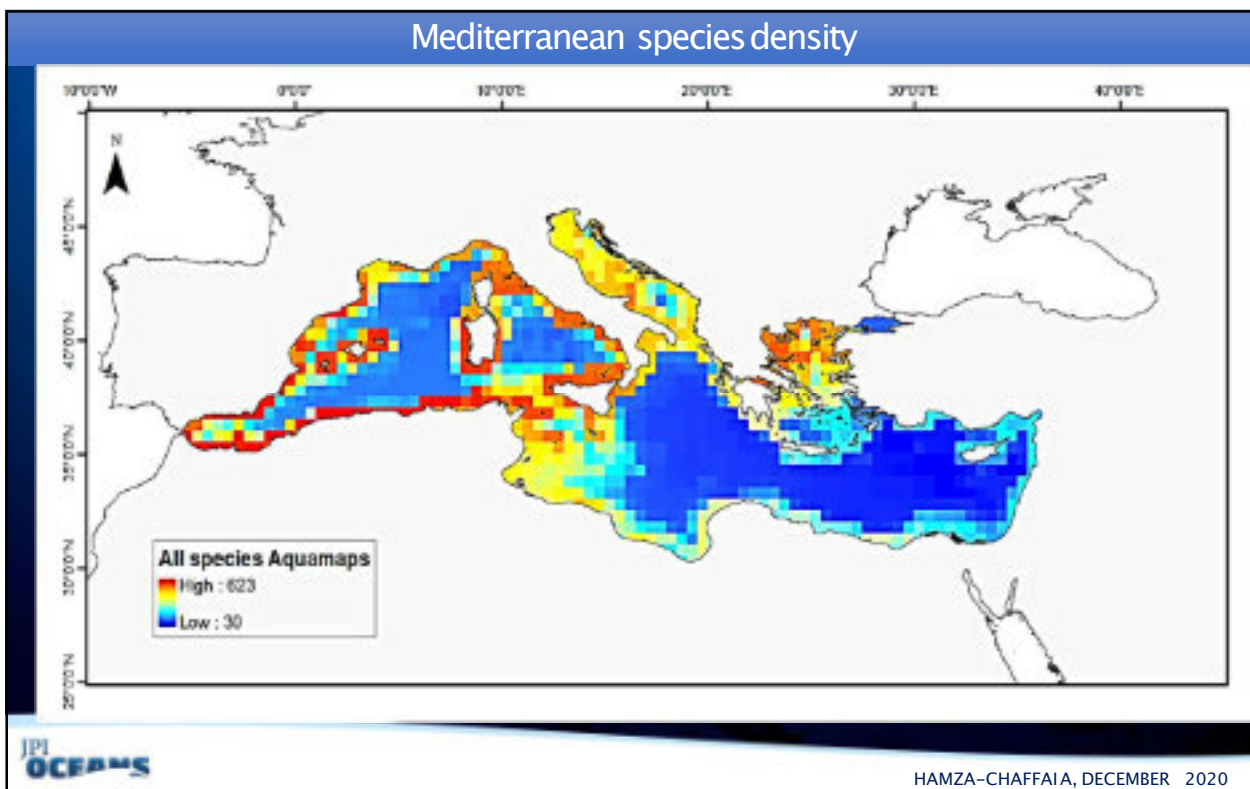
11% Algae

HAMZA-CHAFFAIA, DECEMBER 2020

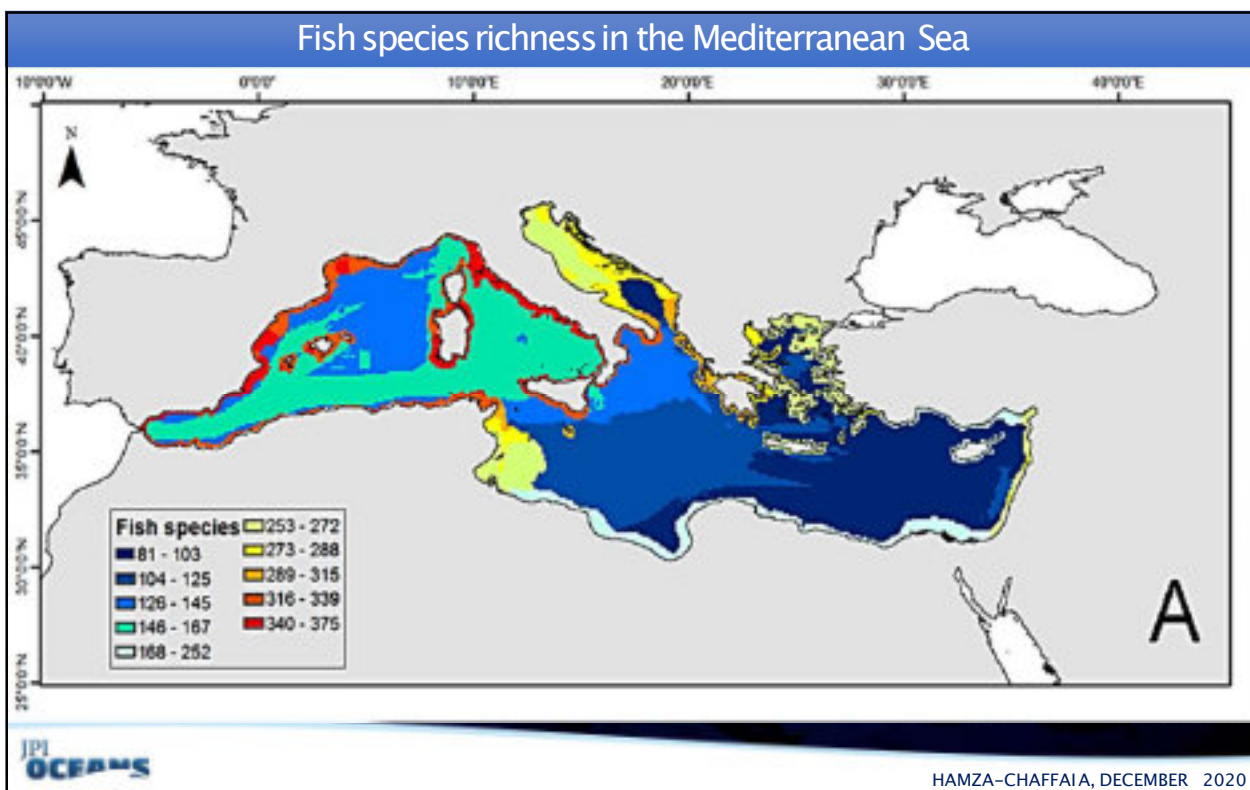


4





5



6



7

## Anthropic Pressure

75 to 80% of marine pollution is from land agricultural, atmospheric inputs, wastewater.

- 12% Maritime transport pollution
- 50 million tons of waste / year
- Over 200 000 tons of Plastic

nice matin

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8

### Anthropogenic Pressure

Uncontrolled urban effluents is also a big problem and an ecological disaster



Thousands of Emergent Pollutants  
-not eliminated with treatment!!  
-Transformed in a more toxic form

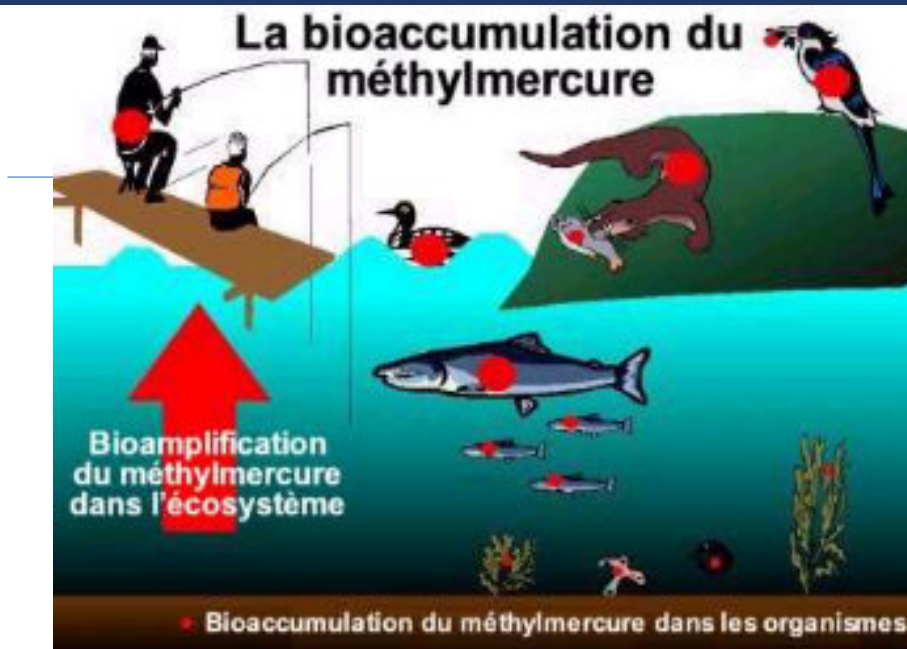


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9

### Bio Accumulation and Bio magnification

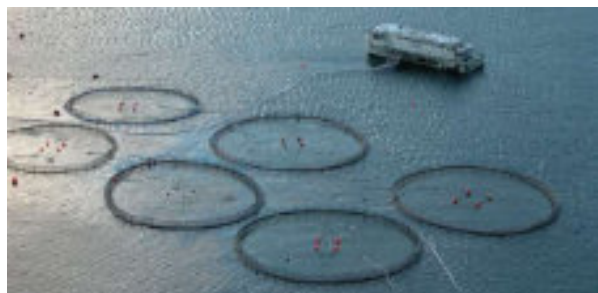


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10

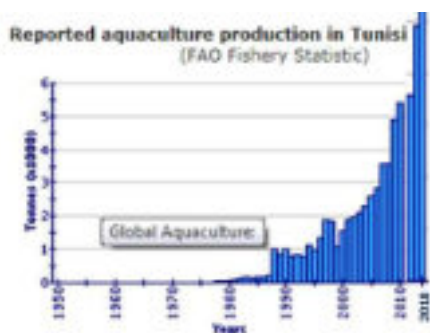
Anthropic Pressure-----OpenOceanAquaculture



Open Ocean Aquaculture



Sparus aurata



Dicentrarchus labrax

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### Environmental Impacts of Open-Ocean Aquaculture


- Fish Meal & Fish Oil:** Using fishmeal leads to heavy farmed fish puts additional pressure on these populations and can impact other wildlife that depends on them for food.
- Drugs & Chemicals:** Vaccines, antibiotics, and other chemicals flow out of pens and mix with wild fish as well as the broader marine ecosystem.
- Diseases & Parasites:** Diseases and parasites can spread to wild fish.
- Fish Waste:** Fish waste is sent to the ocean and settles in the seabed. Uneaten food can also build up on the seabed, affecting the abundance and diversity of these animals.
- Escaped Fish:** Escaped fish compete for food and habitat, transmit diseases, and prey on and breed with local fish, reducing the health of wild populations.
- Predators:** Birds, sea lions, sharks, fish, and other marine wildlife can become entangled in fish pens. The use of deterrents like underwater loudspeakers can alter the natural behavior of predators.

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Invasive species

Portunus segnis  
fish and cephalopods



Metapenaeus monoceros ----- Penaeus keraturus



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# Some Observed effects



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Some Observed Effects-----Simultaneous and accidental hermaphroditism

40 μm

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15

Some Observed Effects-----Sex Ratio

### Sex ratios (Cockle)

Location	Male (%)	Female (%)
R Ungla	68,3	31,7
Bayatka	63,43	36,57

N=663

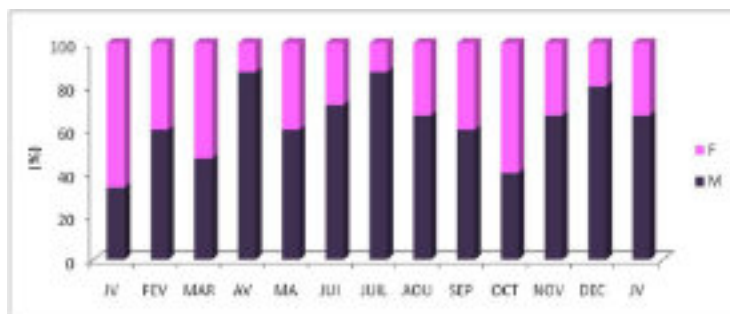
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Some Observed Effects

Cerastoderma glaucum  
65% males 35% females



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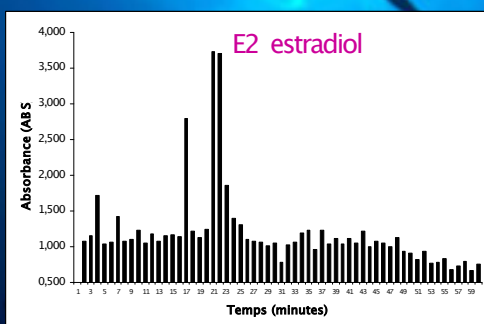


17

Some Observed Effects -----EDs

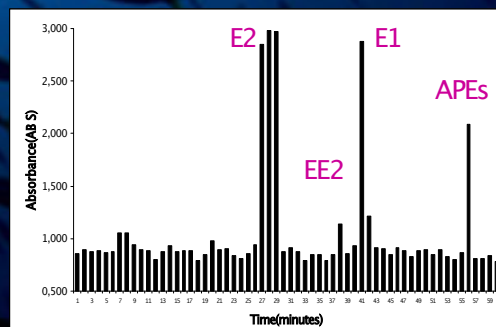
Identification of active compounds

HPLC profile Mussel Extracts



APEs: Alkyl phenols Ethoxilates  
E1: Estrone  
EE2: Ethéynil estradiol  
E2 Estradiol

HPLC profile of Fish extracts



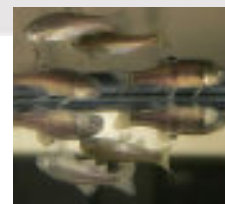
HAMZA-CHAFFAIA, DECEMBER 2020

18

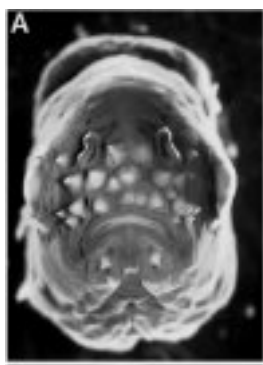
# Work on reducing pollution in effluents in order to decrease anthropogenic pressure on the ocean

Particular attention to xenohormones  
And ED (WG1)

• Early maturity, intersexuality, Vtg induction, morphology change



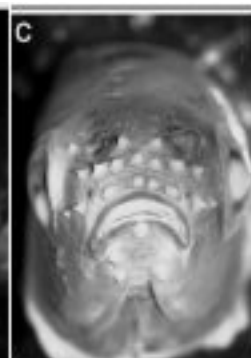
Gambusia affinis



Normal male



Normal female



Exposed female

19

Some Observed Effects-----Imposex



Imposex

40 Mollusk species are concerned (neogasteropods)

TBT Biomonitoring program (Portugal)



20



# Pollution Monitoring



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## Pollution Monitoring---WHY?

Preserving the marine environment quality is a priority

↕

- To provide an **optimal and Sustainable use** of marine resources
- To preserve marine organisms and the Ecosystem (**Ecological aspect**)
- To protect **human health**

↕

HOW can we distinguish between a polluted and a "clean site"??

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## Pollution Monitoring---COMPATMENT?

### What are the possibilities for bio monitoring marine pollution ?

- **Sea water**

- fluctuations
- Low concentrations => analytical difficulties

- **Sediments**

- Longterm integrator for contamination
- Concentrations are higher than those of sea water
- Heterogeneity (granule size, organic matter)
- Pollutants are not available owing to their **nc** form

- **Living Organisms"BIOMONITORS"**

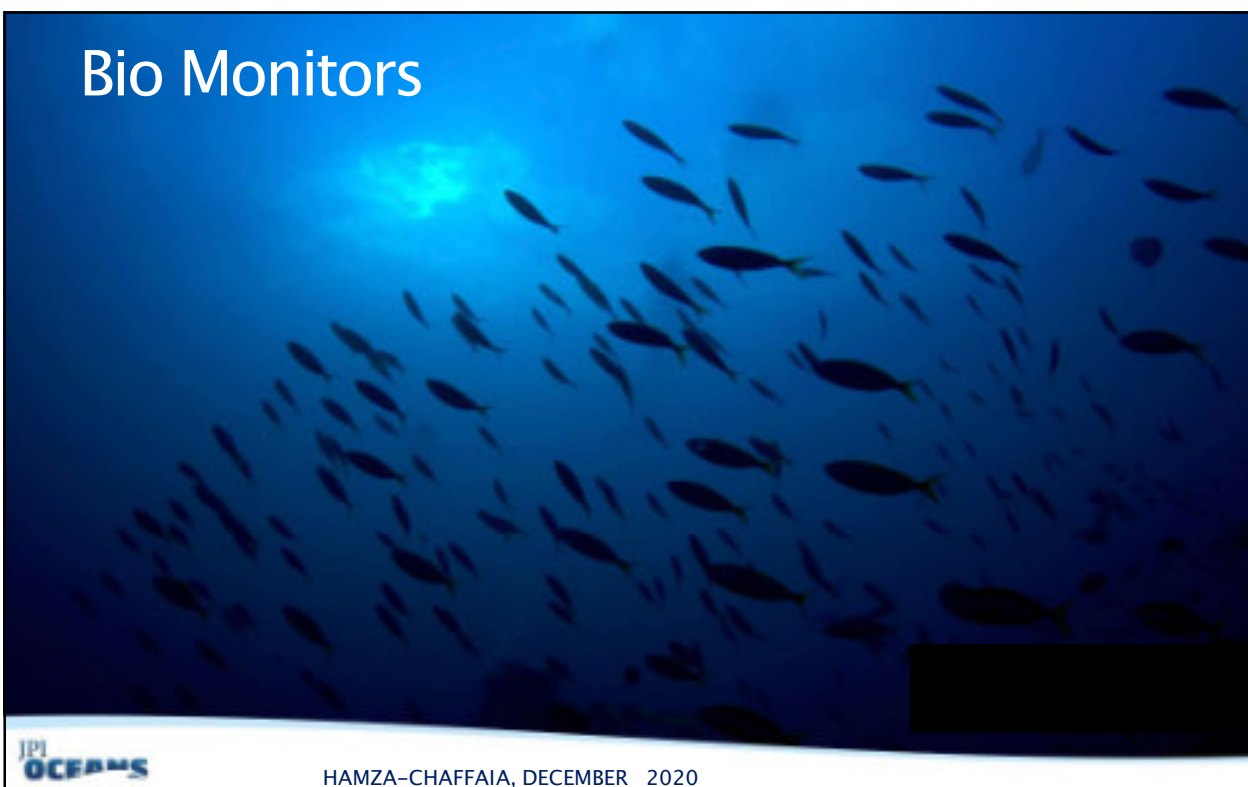
- Reflect the bio available fraction of contaminant
- Ecological and human health interest

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## Bio Monitors

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## How to choose a Bio monitor?

Some important criteria

- The capacity of accumulating pollutant,
- Their sedentary habit which could reflect the pollution state of one site
- Availability in the studied sites,
- A reasonable size allowing dissection and analysis,
- possibility to undertake laboratory experiments.

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Good Candidates for monitoring = Bivalves  
BIOMONITORS OR BIOINDICATOR ORGANISMS

International monitoring programs

□ RNO (France)

□ Mussel watch (USA)



Use Mussels and Oysters




In Tunisia

These species are available only in the northern coast



Use of other bivalve species

26


Biomonitoring ——— Mollusk Bivalves



Cerastoderma glaucum



Ruditapes decussatus



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Different Approaches

- 1-insitu Studies
- 2-invivo and in vitro Studies
- 3-in situ Transplantation experiments
- 4-in vivo Transplantations
- 5-Organ Explants culture (Ex in vivo)



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Approaches

- Single species
- Multi-species

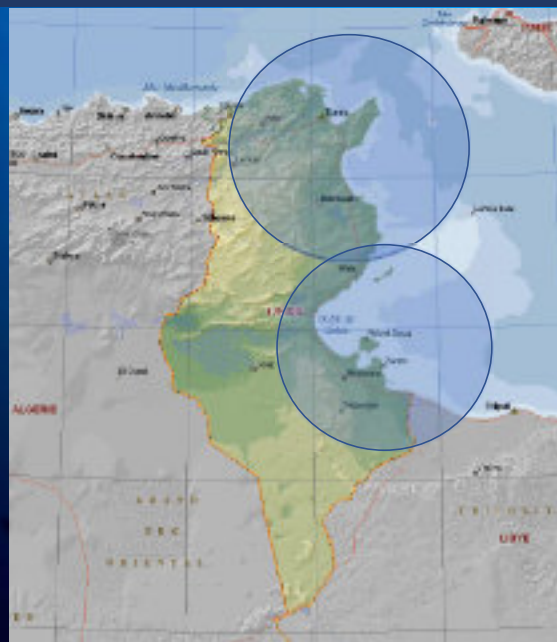


- Microcosm
- Mesocosm



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Monitoring Program-----Tunisia



- 1300 Km of Coast
- National monitoring program
- (INSTM, Inst Pasteur, In rech Vétérinaire)
- Exists since 1995
- Frequency : monthly, twice amoth, and weekly in case of alert
- 60 sites (30 in the north and 30 in the south)
- 5 categories of
  - REPHY toxic phytoplankton
  - REMI microbiology
  - RECNO metals, Hydrocarbons, pesticides
  - REBI biotoxins (in case of alert)
  - REPIDEMIO parasites

30



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## Biomarkers — Definition

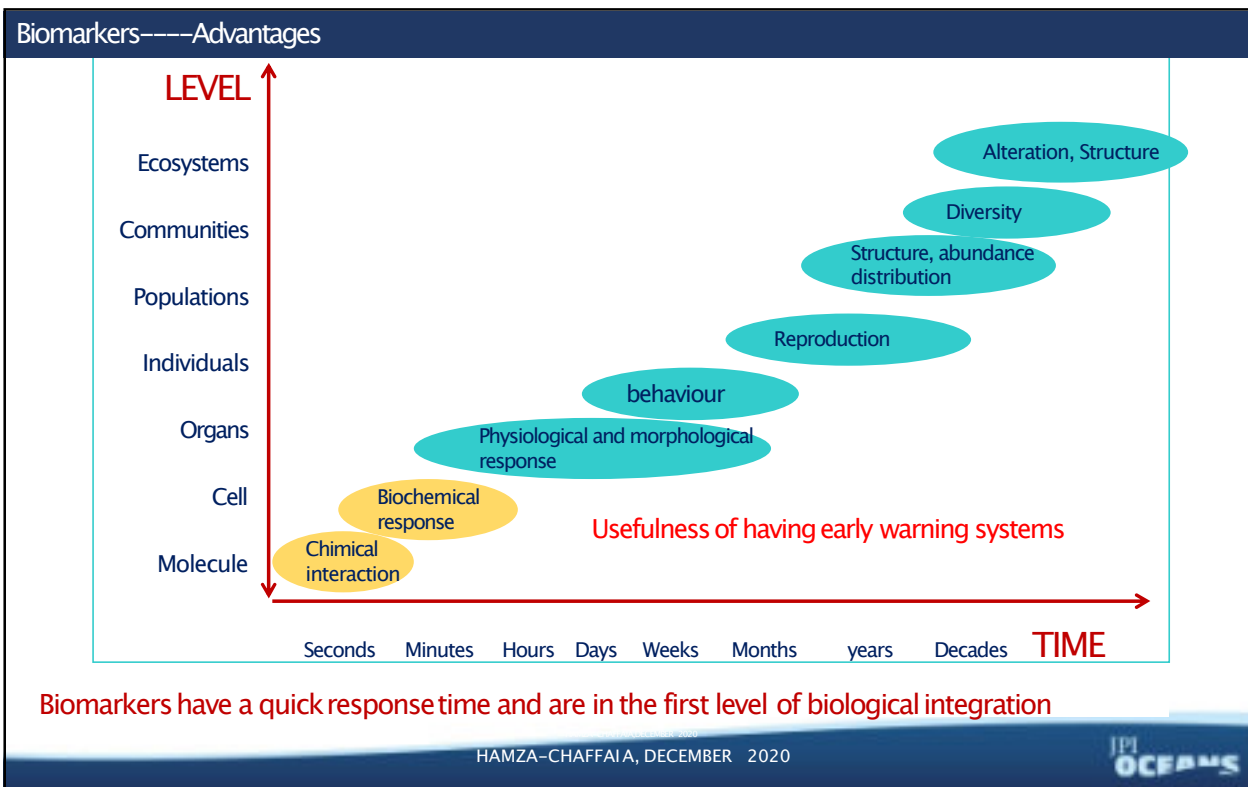
A **biomarker** is a xenobiotically induced variation in cellular or biochemical component or processes, structures, or functions that is measurable in a biological system,

They constitute “**early warning systems**” able to detect the effect of pollution even at low concentrations.

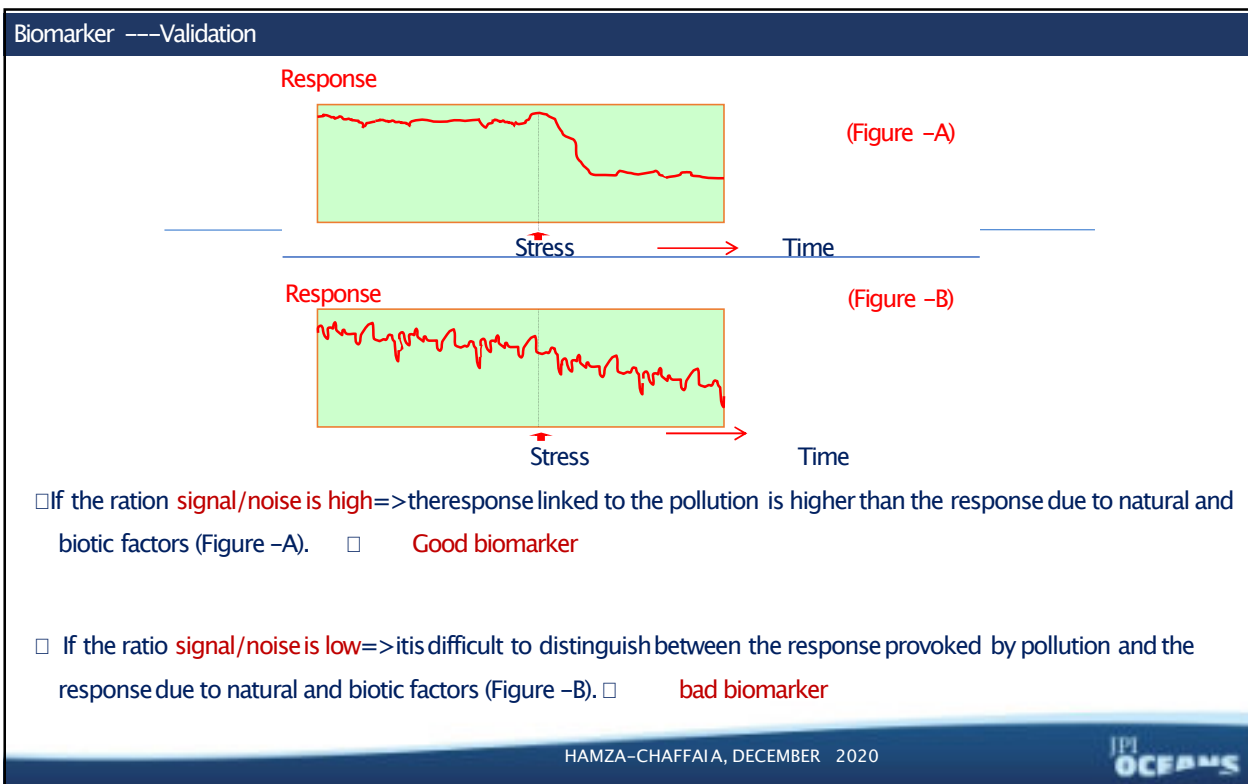
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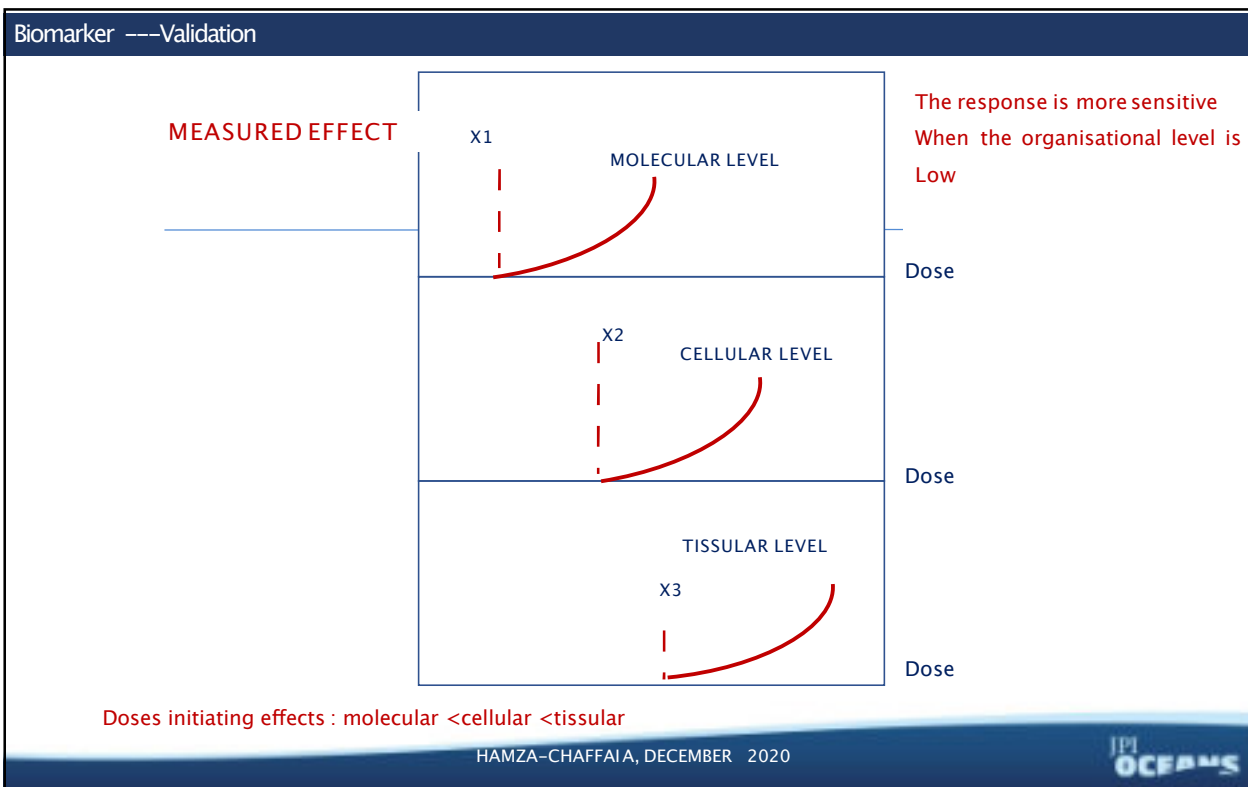
32



33



34



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Validate the available Biomonitorers

Validate Biomarkers for the chosen Biomonitorers

Multi-Marker approach

Consider the signal/noise ration

Consider variations linked to sex, physiology and reproductive cycle

Marine Biology

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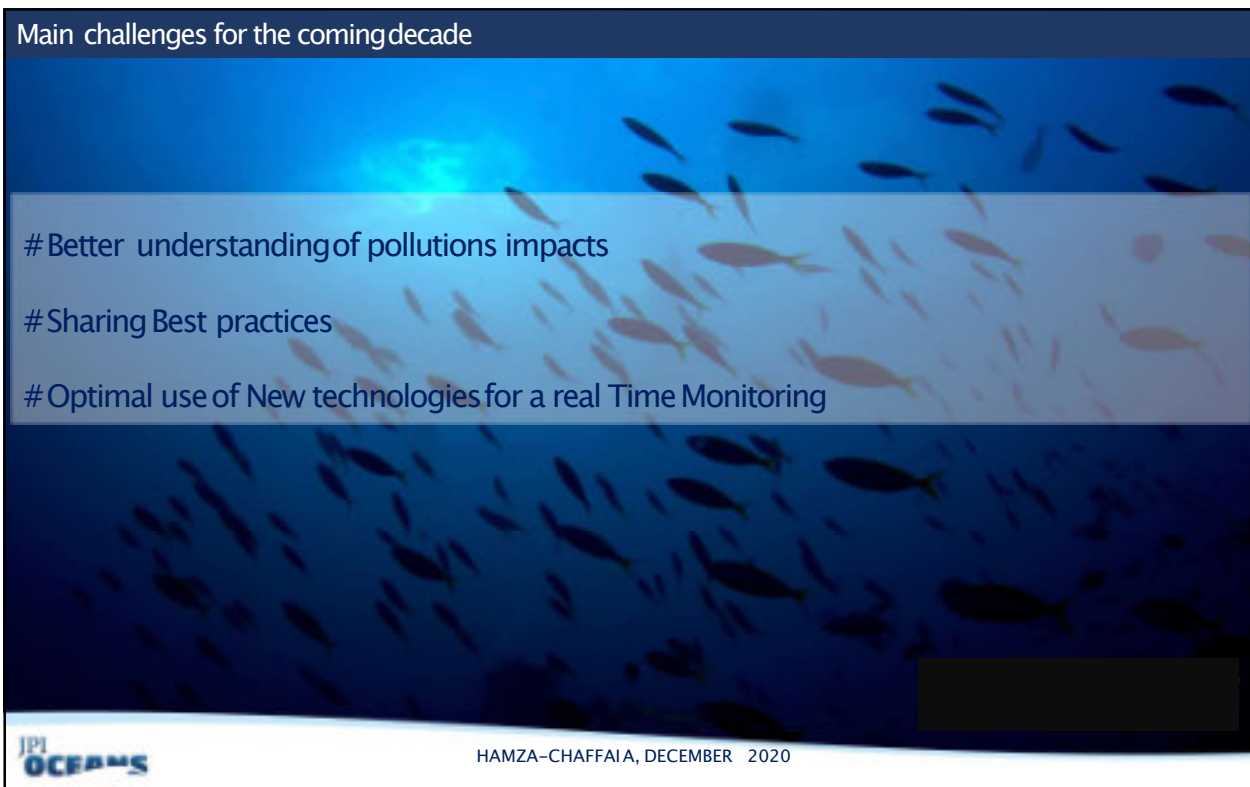


Main challenges for the coming decade

- # Better understanding of pollutions impacts
- # Sharing Best practices
- # Optimal use of New technologies for a real Time Monitoring

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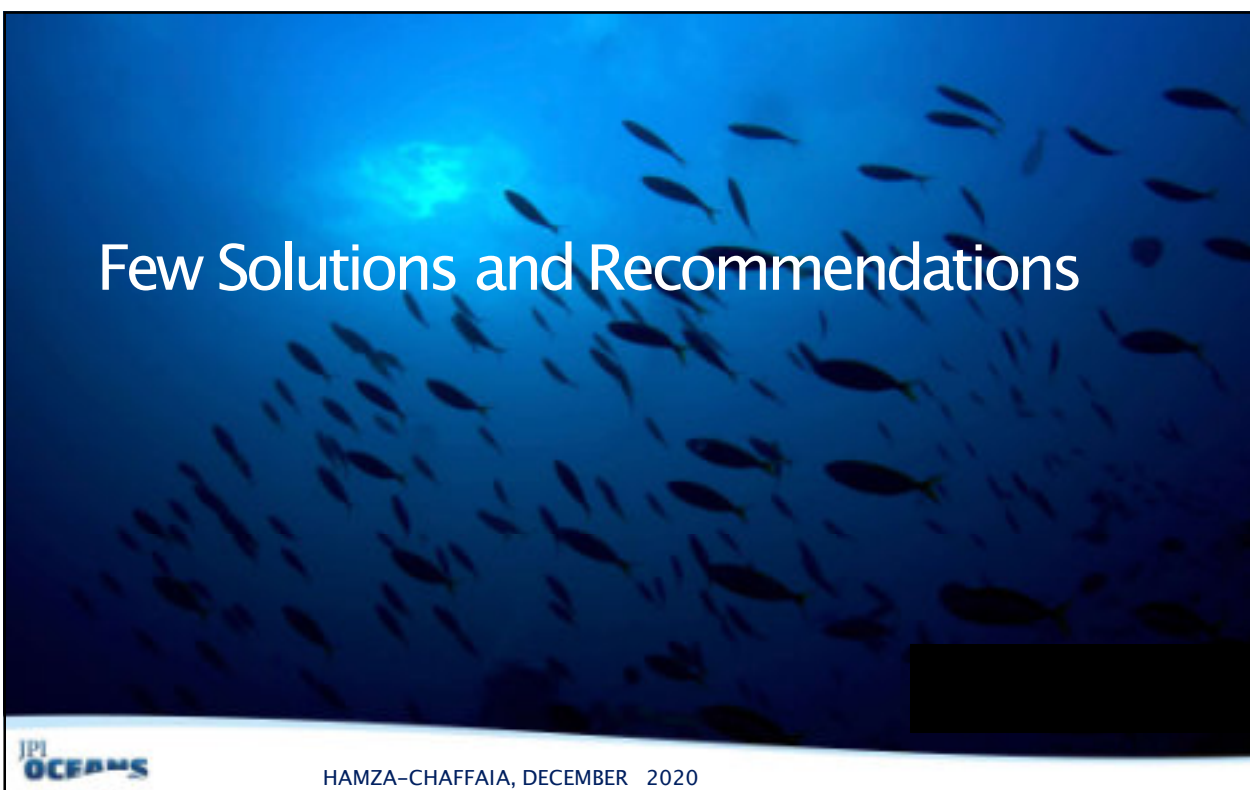


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# Few Solutions and Recommendations


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### # Innovative solutions® for bivalve purification step (to reduce bacterial and pollutant load)



**Cerastoderma glaucum**

- High mortality in juvenile oysters caused by herpes virus : OsHV-1
- 130000 tons in 2009
- 80000 tons in 2015

• Bacterial load, pollutant accumulation

**Ruditapes decussatus**





**Crassostrea gigas**

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### # Optimal use of sea food wastes



**Extreme Fat Blocker  
CHITOSAN x4**










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# For high economic value species, enrich the ocean without disrupting the ecosystem balance




Pecten maximus



Slamo trutta

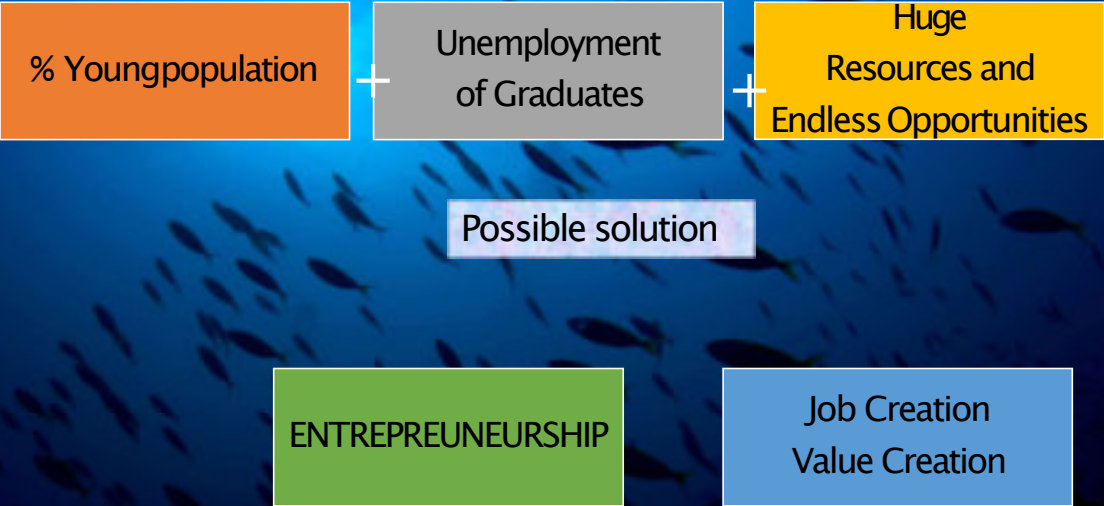


A HAMZA-CHAFFAI - DECEMBER 2020



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# Promote and Develop Entrepreneurship in MED region



```
graph TD; A[% Youngpopulation] --- B[Unemployment of Graduates]; B --- C[Huge Resources and Endless Opportunities]; C --- D[Possible solution]; D --- E[ENTREPRENEURSHIP]; E --- F[Job Creation Value Creation];
```

% Youngpopulation

Unemployment of Graduates

Huge Resources and Endless Opportunities

Possible solution

ENTREPRENEURSHIP

Job Creation Value Creation

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## Transform existing Problems into Opportunities

- # Building on capacities
- # Entrepreneurship Turning Ideas into Business
- # Empowering young graduates in MED countries
- # Catalyzing Job creation



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## # Promote Entrepreneurship

**SECTORS**

- \* Aquaculture
- \* Sea food conservation/Transformation...
- \* Waste/Co product Valorization
- \* Bio remediation
- \* in Knowledge and expertise
- \* Any Ocean Related sector



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Professional Master of Aquaculture  
2018



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# # ENTREPRENEURSHIP TO REACH SDGs



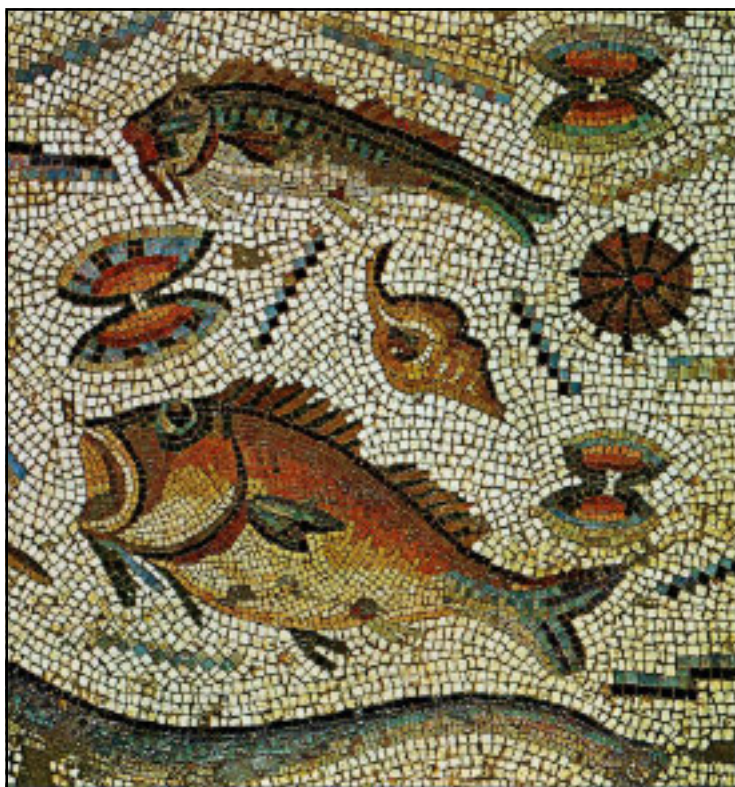
SUSTAINABLE DEVELOPMENT GOALS  
17 GOALS TO TRANSFORM OUR WORLD

1 NO POVERTY	2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION	5 GENDER EQUALITY	6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY	8 DECENT WORK AND ECONOMIC GROWTH	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	10 REDUCED INEQUALITIES	11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION	14 LIFE BELOW WATER	15 LIFE ON LAND	16 PEACE, JUSTICE AND STRONG INSTITUTIONS	17 PARTNERSHIPS FOR THE GOALS	SUSTAINABLE DEVELOPMENT GOALS

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*Thank you*

Pr HAMZA-CHAFFAI Amel

Contact

[amel.chaffai@gmail.com](mailto:amel.chaffai@gmail.com)  
[amel.chaffai@tunet.tn](mailto:amel.chaffai@tunet.tn)

IPI  
OCEANS

# How to manage the MSFD machine: what are the keys?

Angel Borja

# Background

The Marine Strategy Framework Directive a challenge for science & management



Cetaceans

Seabirds



Fishes



Benthos



Microalgae/Angiosperms



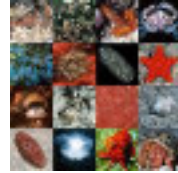
Zooplankton



Phytoplankton



Microbes



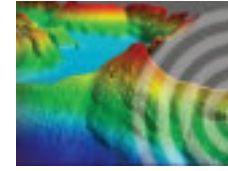
Biodiversity



Alien



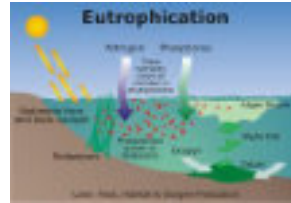
Foodwebs



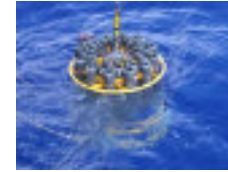
Seafloor integrity



Fishing



Eutrophication



Hydrography



Pollution



Litter



Energy/noise

Assessment under the Ecosystem Based Management approach



There is only one big idea in marine management: *how to maintain and protect ecological structure and functioning while at the same time allowing the system to produce sustainable ecosystem services from which we derive societal benefits*

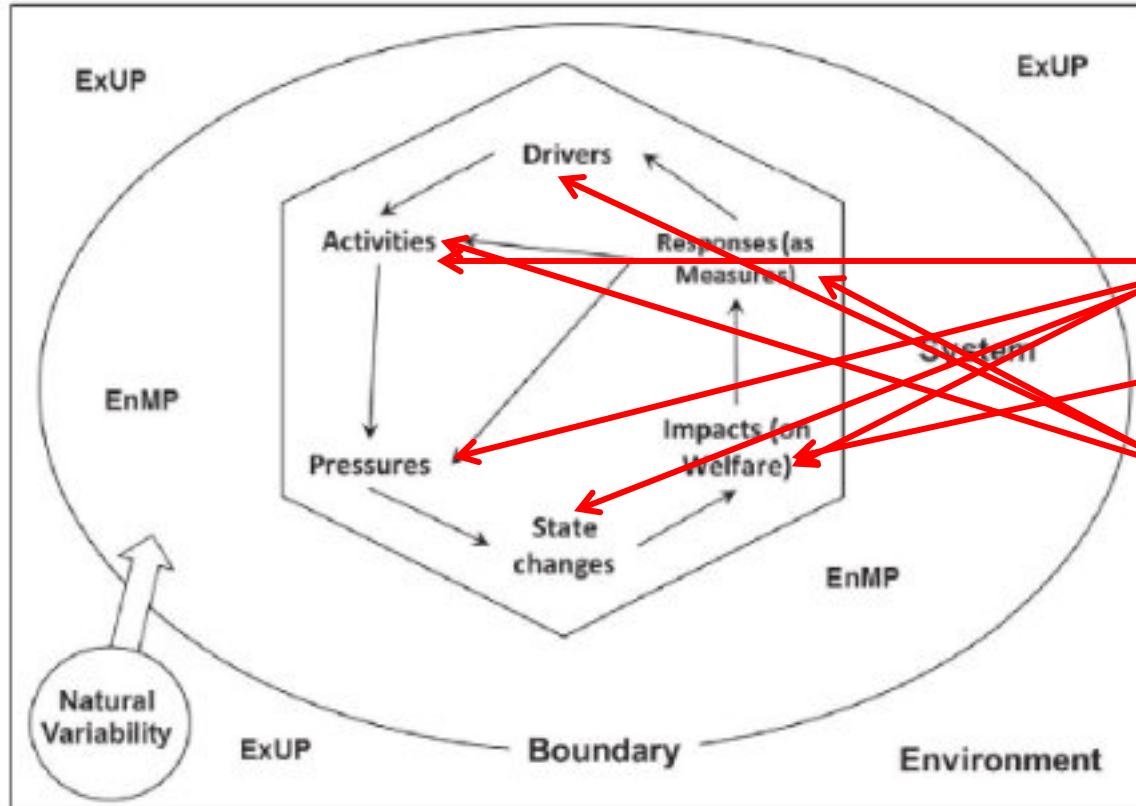
**MSFD**

**MSPD**

# Human activities and pressures producing impacts

(and needing responses)

M. Elliott et al. / Marine Pollution Bulletin 118 (2017) 27–40



Keys of better management

- Organization

- Monitoring

- Assessment

- Management

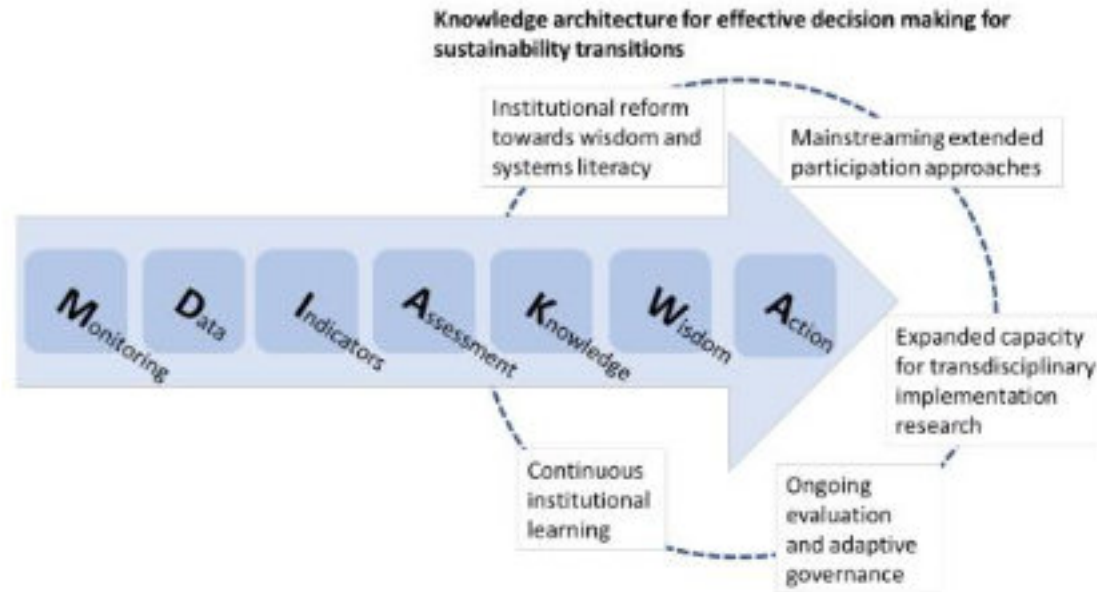
Key: ExUP = Exogenic Unmanaged Pressures; EnMP = Endogenic Managed Pressures (see text for explanation)

# My keys for a better management of the MSFD

## Organization

### 1.- Take always knowledge-based decisions

European Environment Agency



**Fig. 3.** Key considerations in how knowledge systems need to evolve to enable wise governance of sustainability transitions.

\* Oliver et al., in prep. Knowledge architecture for wise governance of sustainability transitions, EEA paper

# My keys for a better management of the MSFD

## Organization

2.- Use existing data as far as possible (open access, Copernicus, etc.)



RESEARCH  
February 2019  
1.2018.00019

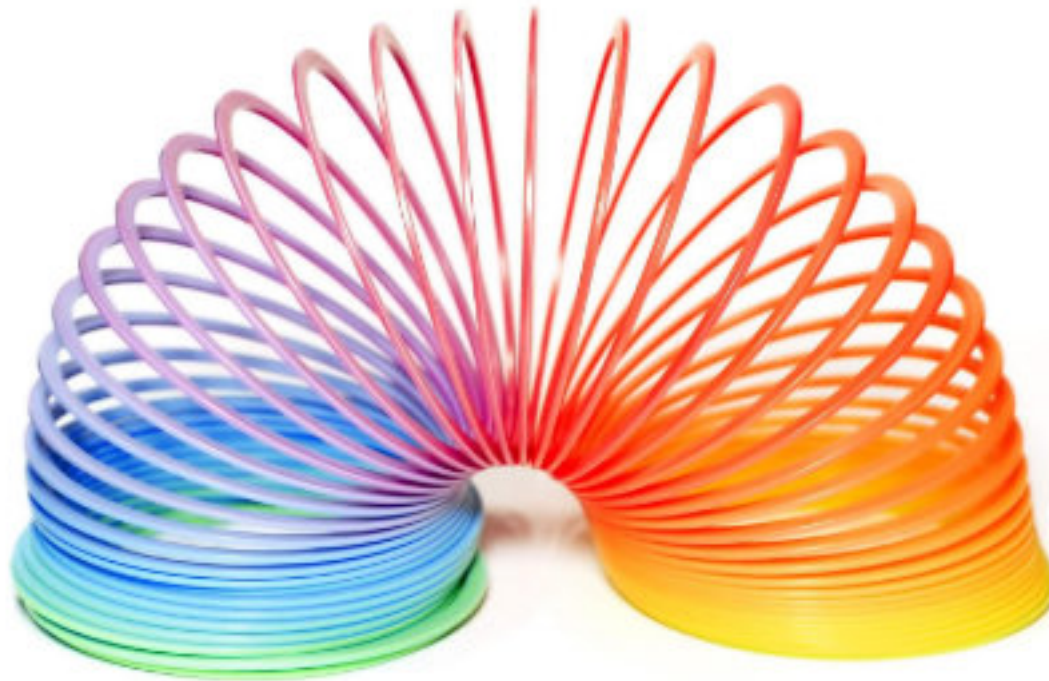


tive  
al  
ses

# My keys for a better management of the MSFD

## Organization

### 3.- Practice flexibility during the whole process



# My keys for a better management of the MSFD

## Organization

### 4.- Promote cooperation within and among states

Ocean & Coastal Management 117 (2015) 4–13

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: [www.elsevier.com/locate/ocecoema](http://www.elsevier.com/locate/ocecoema)



Marine Governance in a European context: Regionalization, integration and cooperation for ecosystem-based management

Katrine Soma<sup>a,\*</sup>, Jan van Tatenhove<sup>b</sup>, Judith van Leeuwen<sup>c</sup>

Marine Policy 131 (2019) 63–79

Contents lists available at ScienceDirect

Marine Policy

journal homepage: [www.elsevier.com/locate/marpol](http://www.elsevier.com/locate/marpol)



Impediments to achieving integrated marine management across borders: The case of the EU Marine Strategy Framework Directive

Marianna Cavallo<sup>a,\*</sup>, Ángel Borja<sup>b</sup>, Michael Elliott<sup>c</sup>, Victor Quintino<sup>d</sup>, Julia Truza<sup>e</sup>

K. Soma et al. / Ocean & Coastal Management 117 (2015) 4–13

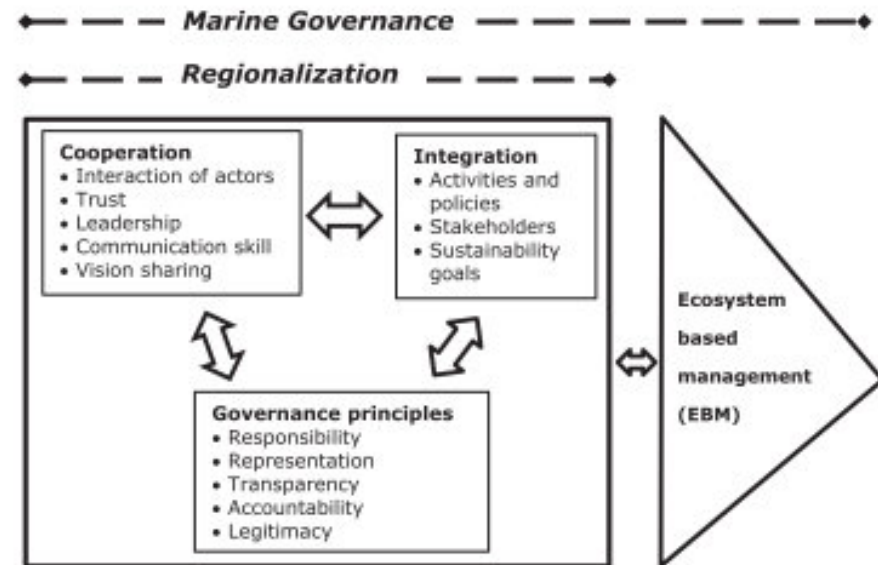


Fig. 1. A theoretical Marine Governance framework.

# My keys for a better management of the MSFD

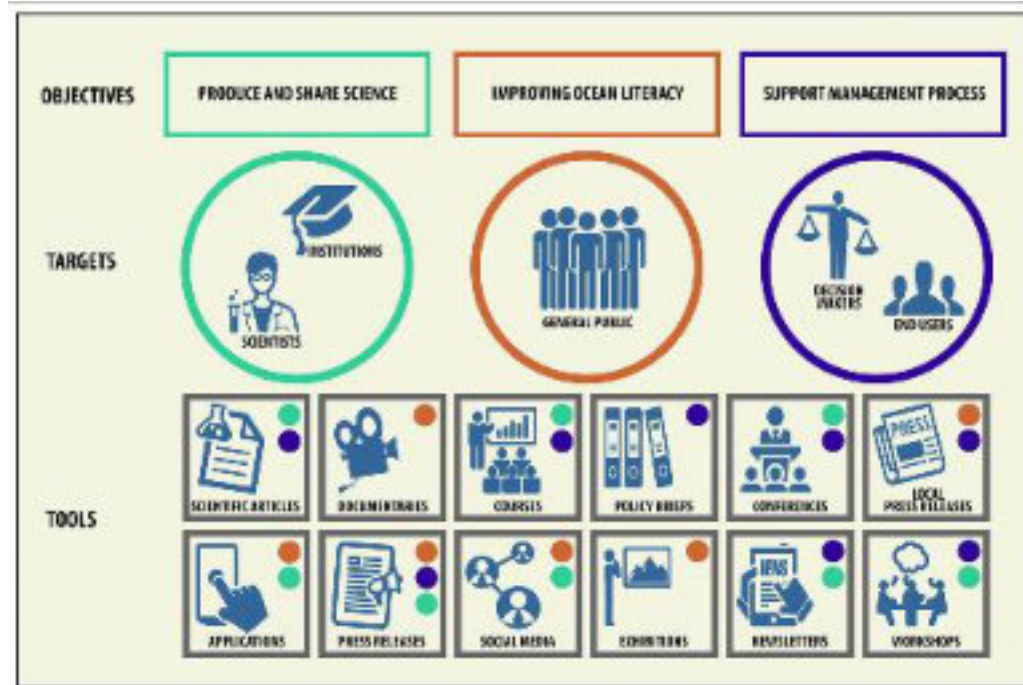
## Organization

5.- Establish strong links between research (EU & national projects) and policy- & decision-makers



## From Science to Policy and Society: Enhancing the Effectiveness of Communication

Martina Mio<sup>1\*</sup>, Alicia Nieto<sup>1,2</sup>, María C. Ojeda<sup>1</sup>, Carolina Alonso<sup>1</sup> and Angel Bernal<sup>1</sup>



# My keys for a better management of the MSFD

## Organization

6.- Avoid endogamy: use multiple experts, origins, multidisciplinary, interdisciplinarity,...

what's the  
opposite of  
exogamous?



autogamous, endogamous,  
autogamic, endogamic,  
self-fertilised,  
self-fertilized



 Thesaurus.plus



# My keys for a better management of the MSFD

## Monitoring

### 7.- Design adequate monitoring networks to cover gap data



## European Marine Biodiversity Monitoring Networks: Strengths, Weaknesses, Opportunities and Threats

Joana Patrício<sup>1\*</sup>, Sally Little<sup>1,2</sup>, Krysla Mazik<sup>3</sup>, Konstantina-Nadia Papadopoulou<sup>4</sup>, Christopher J. Smith<sup>1</sup>, Melissa Tsovala<sup>1</sup>, Helene Hoffmann<sup>1</sup>, Maria G. Uyarra<sup>5</sup>, Oihana Salas<sup>6</sup>, Argiro Zerekas<sup>7</sup>, Gökhan Kaboglu<sup>8</sup>, Olga Kryvenko<sup>9,10</sup>, Tanya Chudikova<sup>11</sup>, Snezana Mordkheva<sup>12</sup>, Martynas Štikas<sup>13</sup>, Angel Burja<sup>14</sup>, Nicolas Hoepfner<sup>15</sup> and Michael Elliott<sup>1</sup>

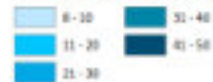


#### REGIONAL OVERVIEW

##### COMPONENTS



##### Total No. of Monitored Components



##### GIS DESCRIPTORS



##### No. of Monitored Descriptors



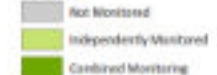
##### HABITATS



##### Total No. of Monitored Habitats



##### PRESURES



##### Total No. of Monitored Pressures



# My keys for a better management of the MSFD

## Monitoring

8.- Use simple but effective methods, avoiding complicate and exp

frontiers  
in Marine Science

ORIGINAL RESEARCH  
published: 12 November 2020  
doi: 10.3389/fmars.2020.592947



### A Synthesis of Marine Monitoring Methods With the Potential to Enhance the Status Assessment of the Baltic Sea

OPEN ACCESS



# My keys for a better management of the MSFD

## Assessment

### 9.- Use quantitative methods and thresholds

Ecological Indicators 12 (2012) 1–7



Contents lists available at ScienceDirect

Ecological Indicators

journal homepage: [www.elsevier.com/locate/ecolind](http://www.elsevier.com/locate/ecolind)



The importance of setting targets and reference conditions in assessing marine ecosystem quality

Ángel Borja<sup>a,\*</sup>, Daniel M. Dauer<sup>b</sup>, Antoine Grémare<sup>c</sup>

Ecological Indicators 22 (2015) 215–224

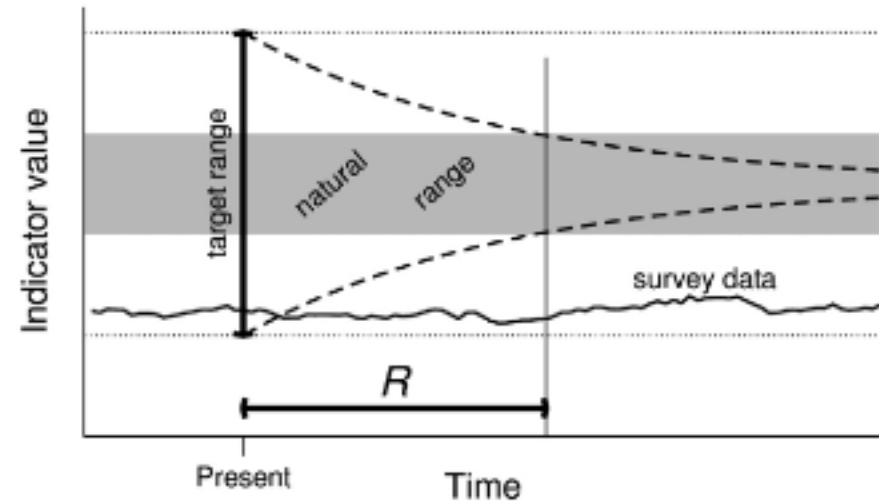
Contents lists available at ScienceDirect

Ecological Indicators

journal homepage: [www.elsevier.com/locate/ecolind](http://www.elsevier.com/locate/ecolind)

Quantitative criteria for choosing targets and indicators for sustainable use of ecosystems

Axel C. Rossberg<sup>a,\*</sup>, Laura Uusitalo<sup>b</sup>, Torsten Berg<sup>c</sup>, Anastasija Zaiko<sup>d</sup>, Anne Chenuil<sup>e</sup>, María C. Uyarra<sup>f</sup>, Ángel Borja<sup>f</sup>, Christopher P. Lytton<sup>g</sup>





# My keys for a better management of the MSFD

## Assessment

11.- Use harmonized and calibrated methods, as far

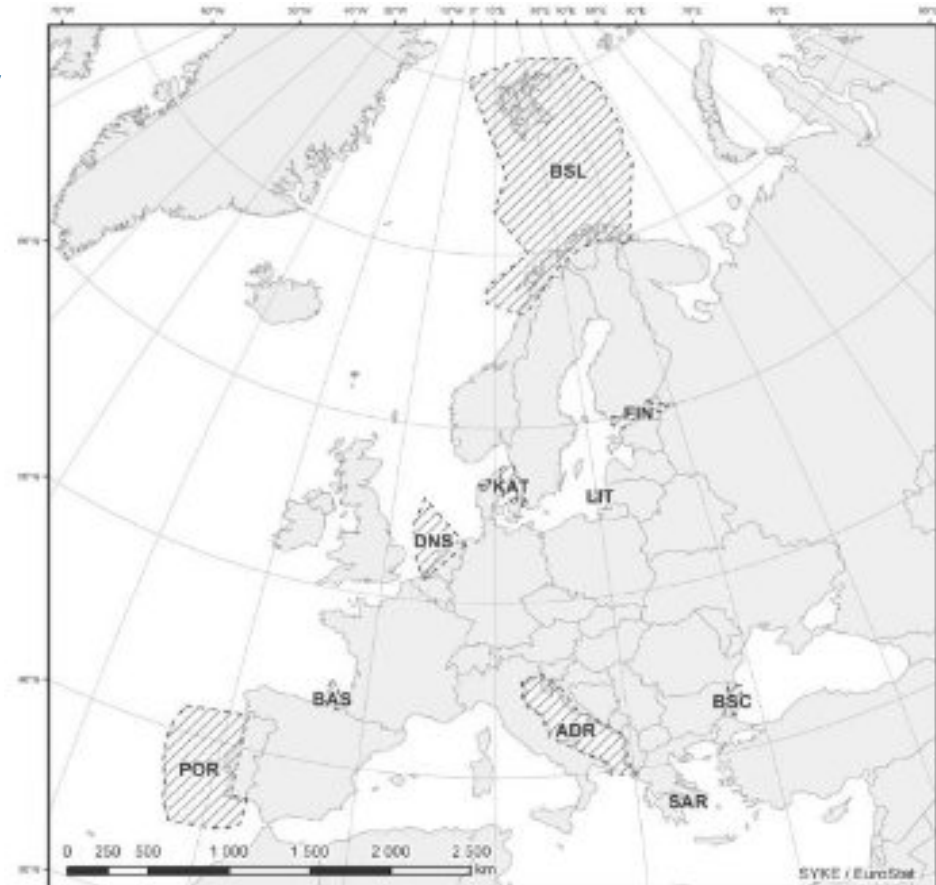


### Indicator-Based Assessment of Marine Biological Diversity—Lessons from 10 Case Studies across the European Seas

Laura Uzitalo<sup>1\*</sup>, Hugues Blanchet<sup>1,2</sup>, Jesper H. Andersen<sup>1</sup>, Olivier Beauchard<sup>2</sup>, Torsten Berg<sup>3</sup>, Silvia Bianchi<sup>4</sup>, Annalucia Cantalano<sup>1</sup>, Jacob Carstensen<sup>5</sup>, Laura Canuget<sup>7</sup>, Sabine Cochrane<sup>1,2</sup>, Roberto Danovaro<sup>1,10</sup>, Anna-Siina Heiskanen<sup>1</sup>, Wilo Karvonen<sup>1</sup>, Snajana Moncheva<sup>11</sup>, Claran Murray<sup>1,1</sup>, João M. Neto<sup>11</sup>, Henrik Nygård<sup>1</sup>, Maria Pentz<sup>12</sup>, Nadia Papadopoulou<sup>14</sup>, Noniki Simboure<sup>15</sup>, Greta Sribalfoed<sup>11</sup>, Maria C. Uyava<sup>17</sup> and Angel Borja<sup>17</sup>

OPEN ACCESS

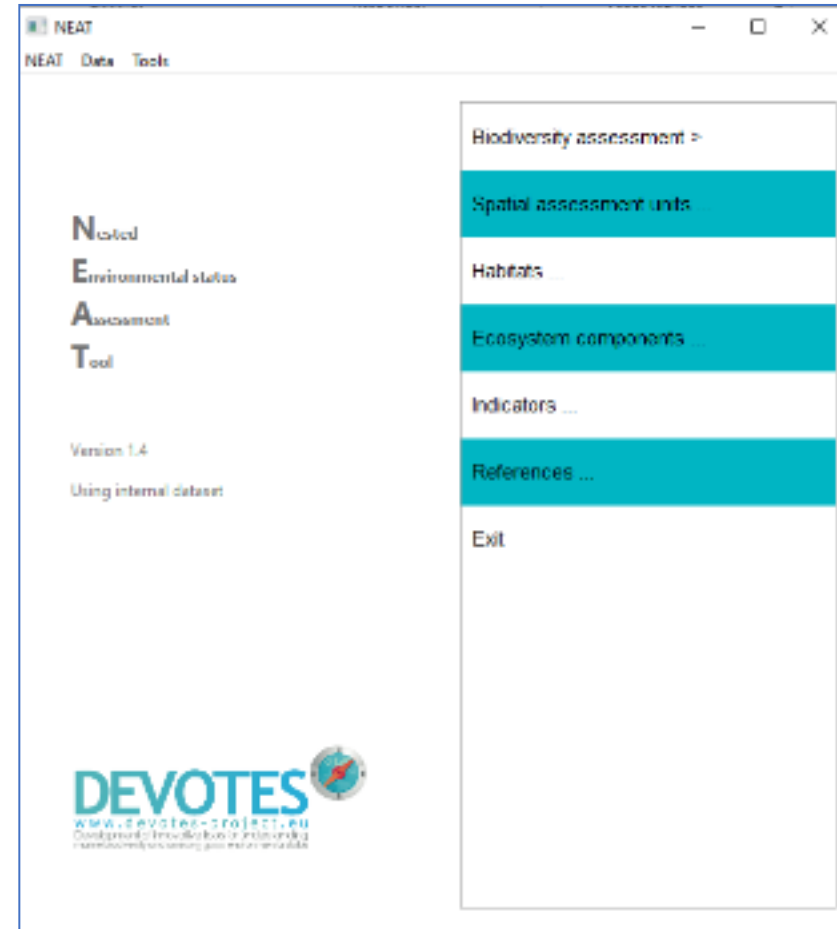
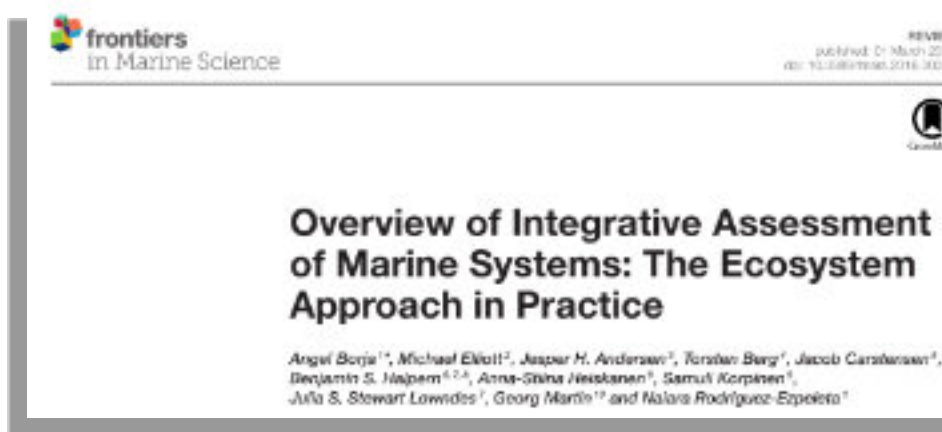
Edited by:  
Michael Eby



# My keys for a better management of the MSFD

## Assessment

### 12.- Use integrative methods (and avoid One Out, All Out)



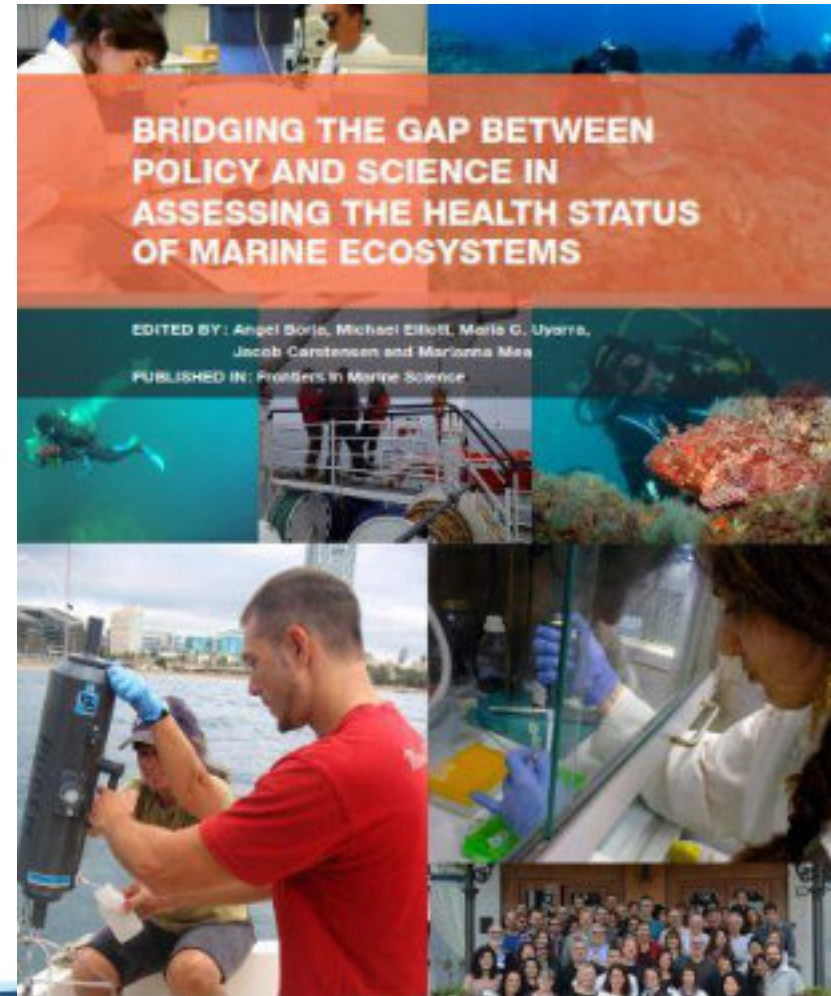
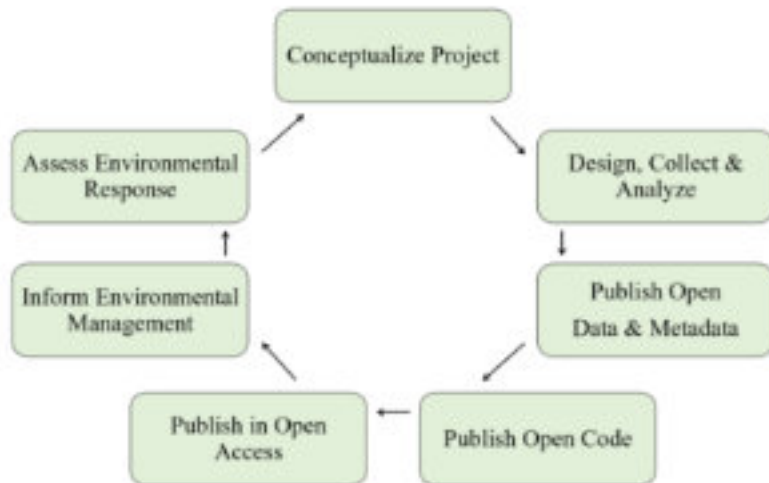
# My keys for a better management of the MSFD

## Assessment

### 13.- Make all data open access

#### The importance of open science for biological assessment of aquatic environments

Marcus W. Beck<sup>1,2</sup>, Casey O'Hara<sup>1</sup>, Julia S. Stewart Lowndes<sup>3</sup>, Raphael D. Mazze<sup>1</sup>, Susanna Theroux<sup>1</sup>, David J. Gillett<sup>1</sup>, Belize Lane<sup>1</sup> and Gregory Gearheart<sup>1</sup>





Contents lists available at ScienceDirect

# Science of the Total Environment

journal homepage: [www.elsevier.com/locate/scitotenv](http://www.elsevier.com/locate/scitotenv)



## Restoring fish ecological quality in estuaries: Implication of interactive and cumulative effects among anthropogenic stressors



Nils Teichert <sup>a,\*</sup>, Angel Borja <sup>b</sup>, Guillem Chust <sup>b</sup>, Ainhize Uriarte <sup>b</sup>, Mario Lepage <sup>a</sup>

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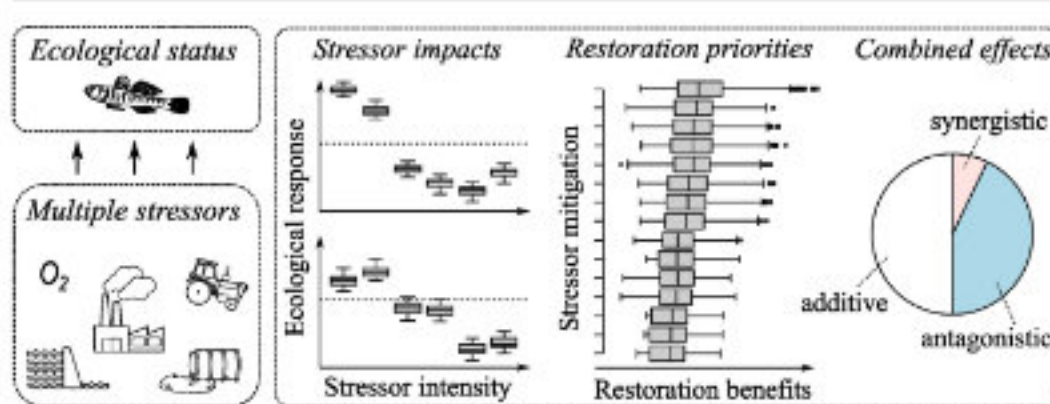
<sup>b</sup> AZTI, Marine Research Division, Herrera Kato, Portuakidea s/n, 20110 Pasaiá, Spain

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### HIGHLIGHTS

- Impact of multiple stressors on fish ecological status was investigated in estuaries.
- Mitigation of water pollution and oxygen depletion yield the largest benefits.
- Non-additive effects represented half of pairwise interactions among stressors.
- Antagonisms are widespread in estuaries for predicting fish ecological status.
- Managers can use these findings in prioritizing restoration measures.

### GRAPHICAL ABSTRACT





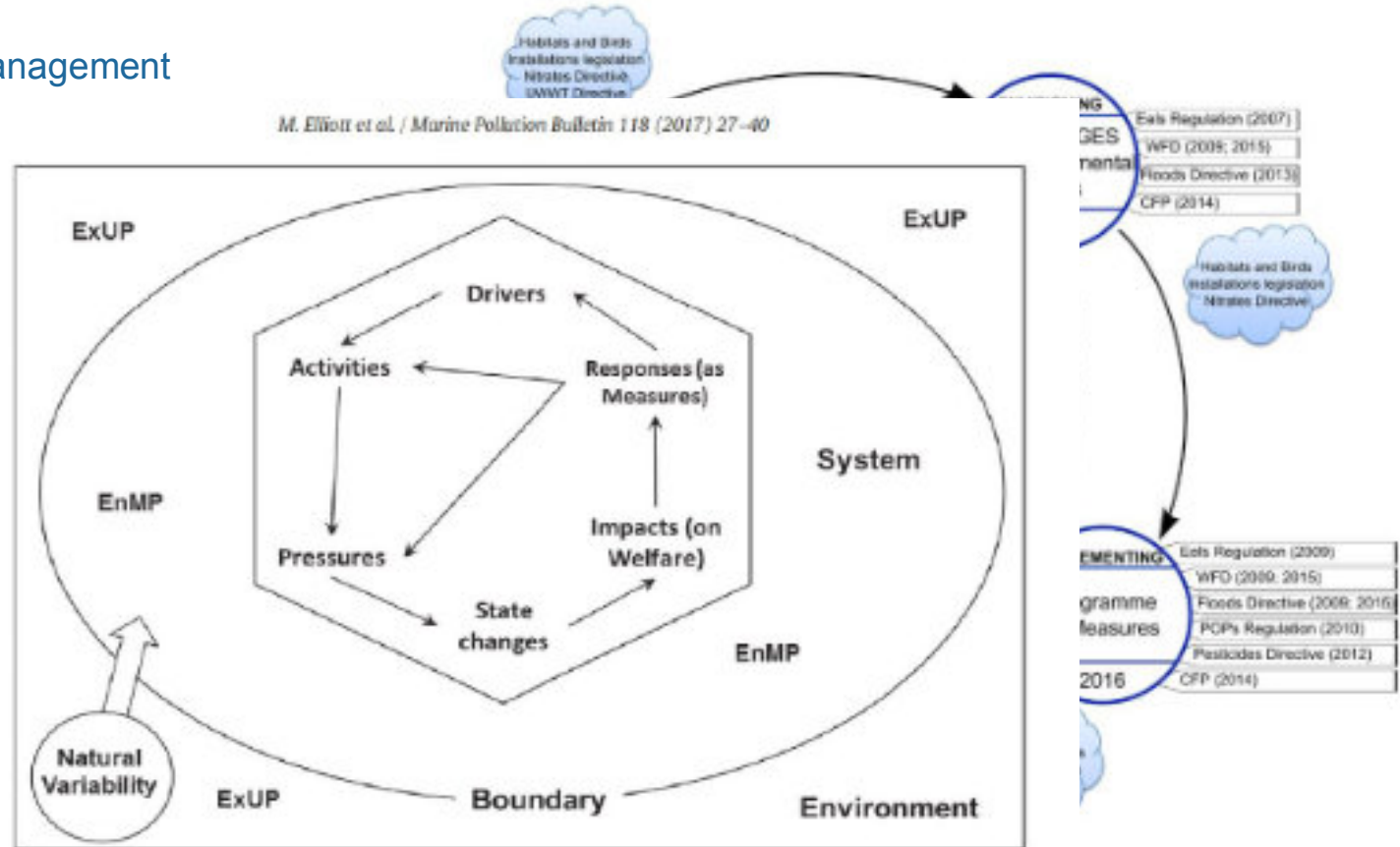
# My keys for a better management of the MSFD

## Management

E. Bigagli / Marine Policy 54 (2015) 44–51

### 15.- Use adaptive management

M. Elliott et al. / Marine Pollution Bulletin 118 (2017) 27–40



Key: ExUP = Exogenic Unmanaged Pressures; EnMP = Endogenic Managed Pressures (see text for explanation)

acts, by phase of policy cycle.



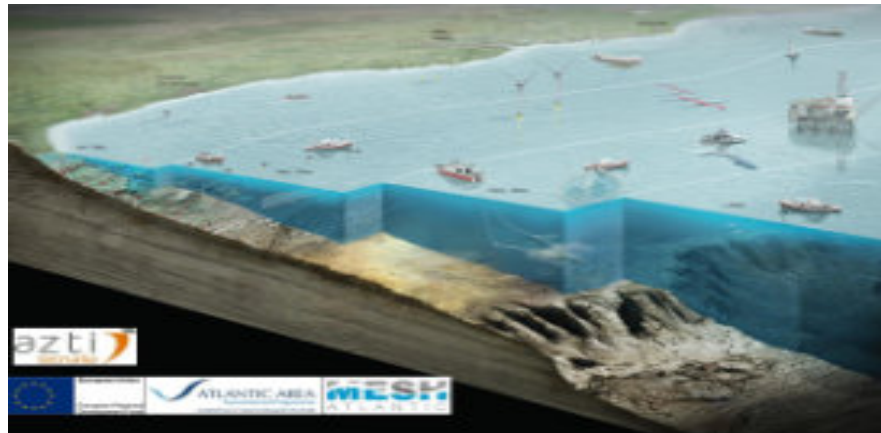
The EU legal framework for the social-ecological systems

Emanuele Bigagli

# My keys for a better management of the MSFD

## Management

### 16.- Use real ecosystem-based management



## Conclusions, with a positive message

We can achieve Good Environmental Status (GES), within the Marine Strategy Framework Directive, and reconcile it with the objectives of the Marine Spatial Planning Directive (Blue Growth)

If:

- Monitoring is adequately designed, coordinated within the same eco-region and using adequate resources
- Any activity at sea is subjected to adequate evaluation of pressures and impacts produced, together with an investigation of its interaction with other activities
- These activities are planned taking into account the assimilative capacity of the system
- Adequate targets are set for indicators of good environmental status
- The programme of measures is designed to address the pressures preventing achieving GES
- Integrative assessments (ecosystem-based approaches) are undertaken regularly, based upon the best knowledge available (e.g. NEAT)
- If marine ecosystems are considered in a holistic way, including humans as part of the system

# JPI OCEANS

THANK YOU

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