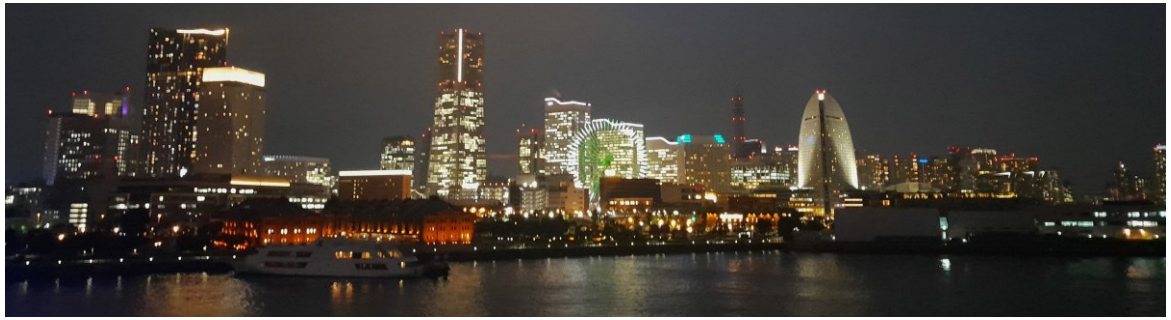
Applying ecosystem and risk-based approaches, toward an integrated assessment *of* benthic habitats communities *at* regional sea scales

Laurent Guérin*, Maider Plaza Morlote, José Manuel González-Irusta, Abigail McQuatters-Gollop, Anna J. Lizińska and the OSPAR OBHEG, COBAM & QSR teams



MSEAS, Yokohama June 2024

UNIVERSITY OF PLYMOUTH

Rijkswaterstaat Ministry of Infrastructure and Water Management

OFB OFFICE FRANÇAIS DE LA BIODIVERSITÉ

INSTITUTO ESPAÑOL DE OCEANOGRAFÍA

Co-funded by the European Maritime and Fisheries Fund

NEA PANACEA

North East Atlantic project on biodiversity and eutrophication assessment integration and creation of effective measures

ECAP RHA an Ecosystem Approach to Regional Habitat Assessments

This project is co-financed by the European Union

OSPAR QSR2023

@DrLaurentGuerin

WE STAND WITH UKRAINE

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MENU du Jour

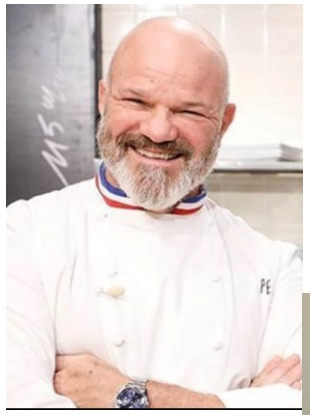
Apéritif ~ European Regional Sea ***scales & policy context***

Entrée ~ ex. **Benthic assessment** vs Water **quality status** (BH2a)

Plat principal ~ **Scientific** benthic indicators and **integration methods**

Fromage et Dessert~ **Expert judgment** and **Science-policy interaction**

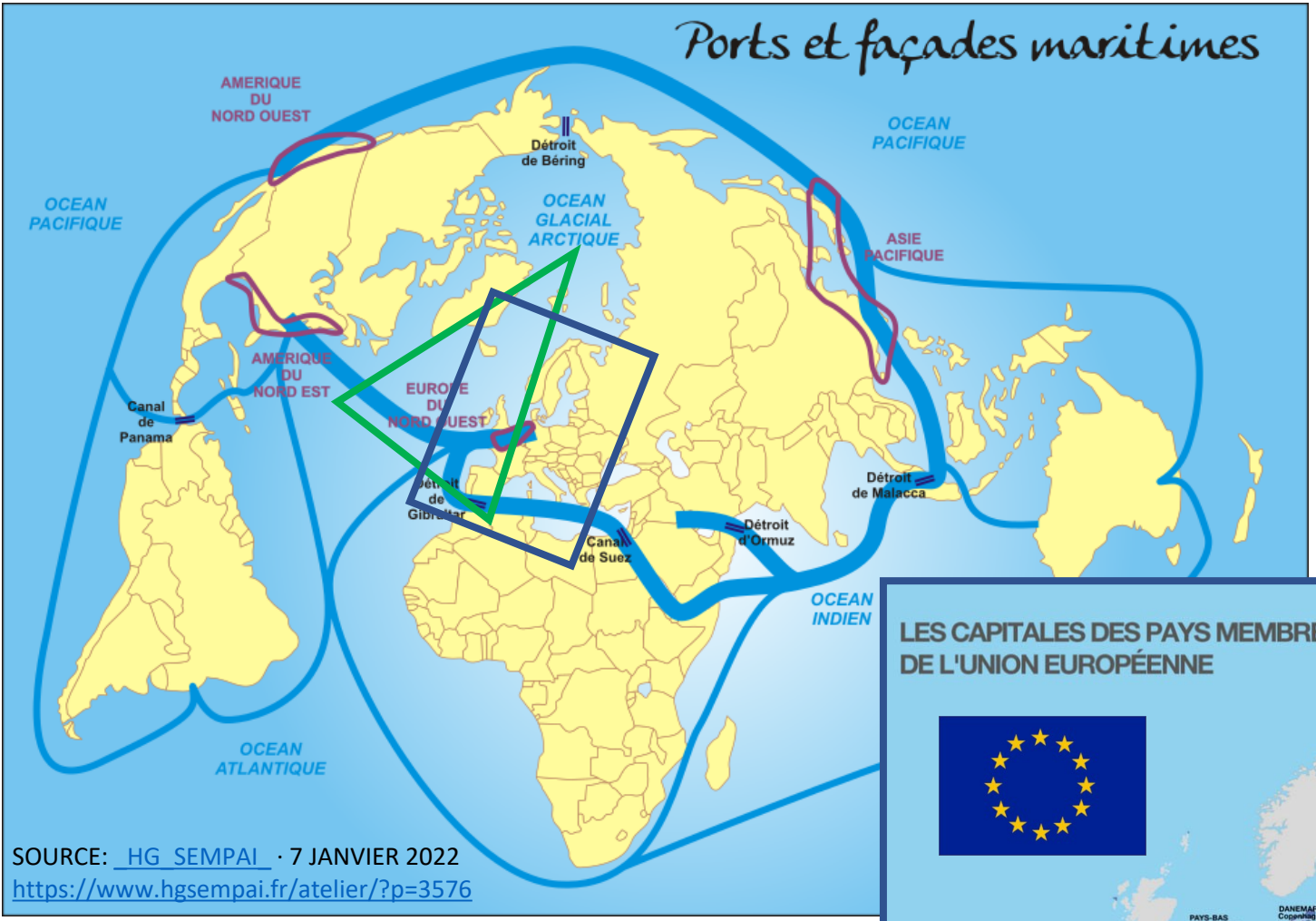
Digestif ~ ***Questions?***



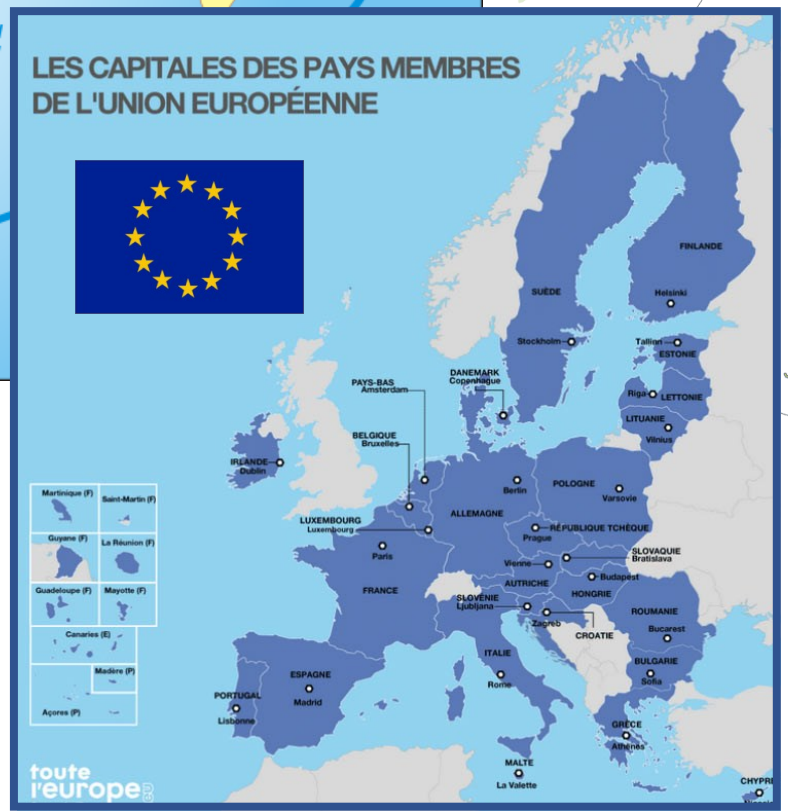
Bienvenue, merci et asseyez vous bien svp

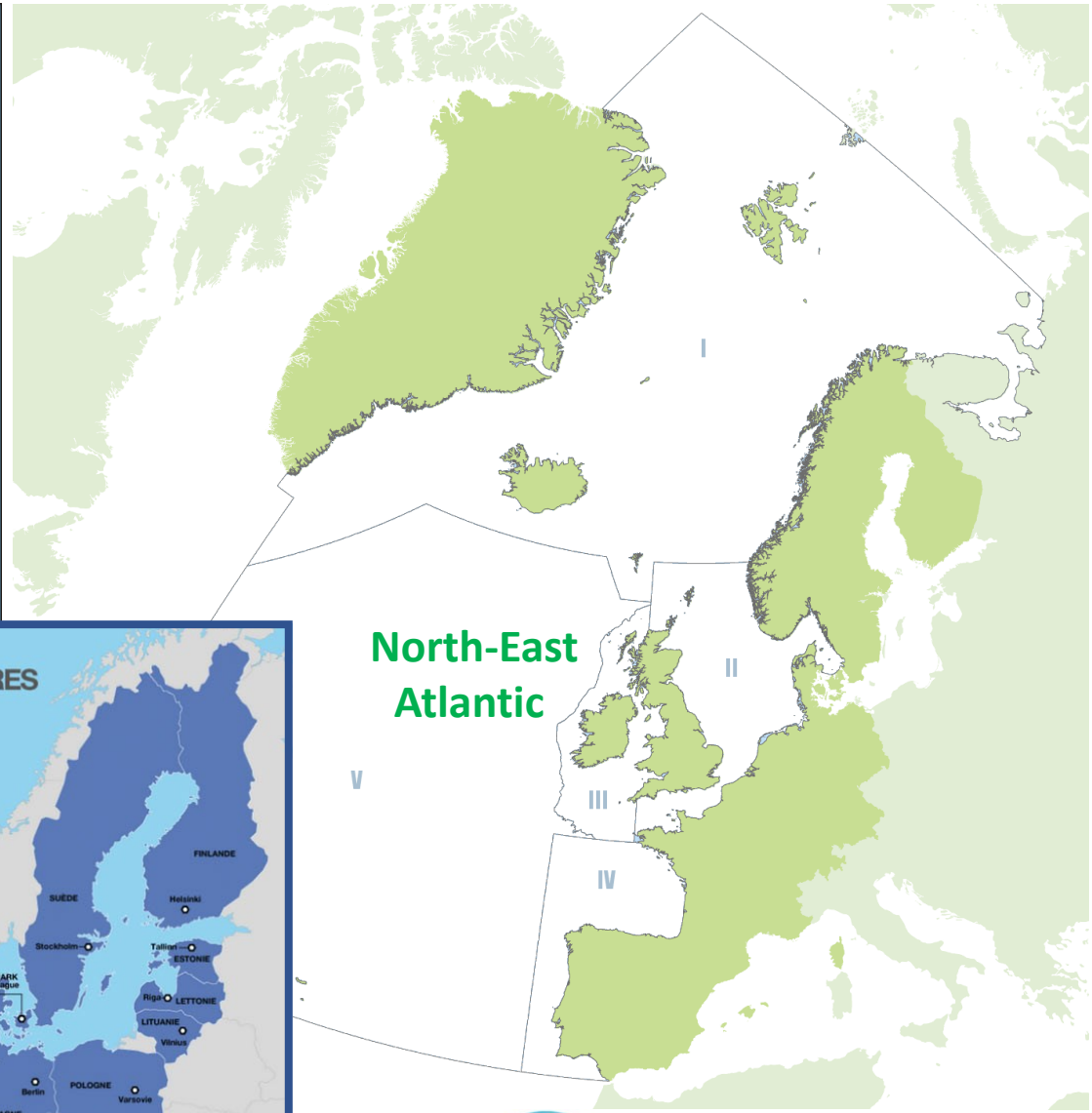
ようこそ、ありがとう。

welcome, thanks and seat well please



SOURCE: _HG_SEMPAI_ · 7 JANVIER 2022
https://www.hgsempai.fr/atelier/?p=3576





European Seas scale
& the
North-East Atlantic

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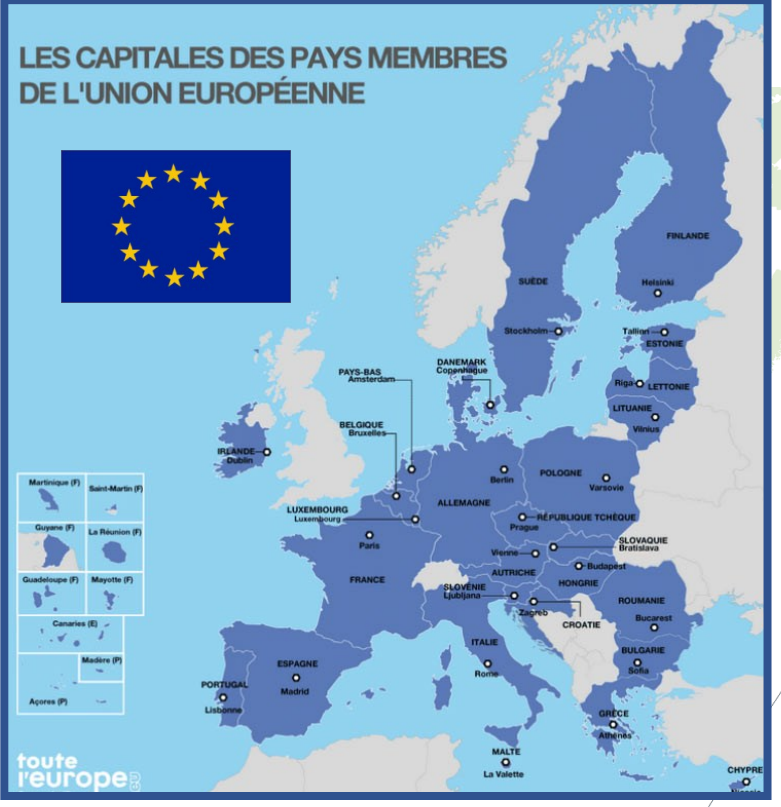
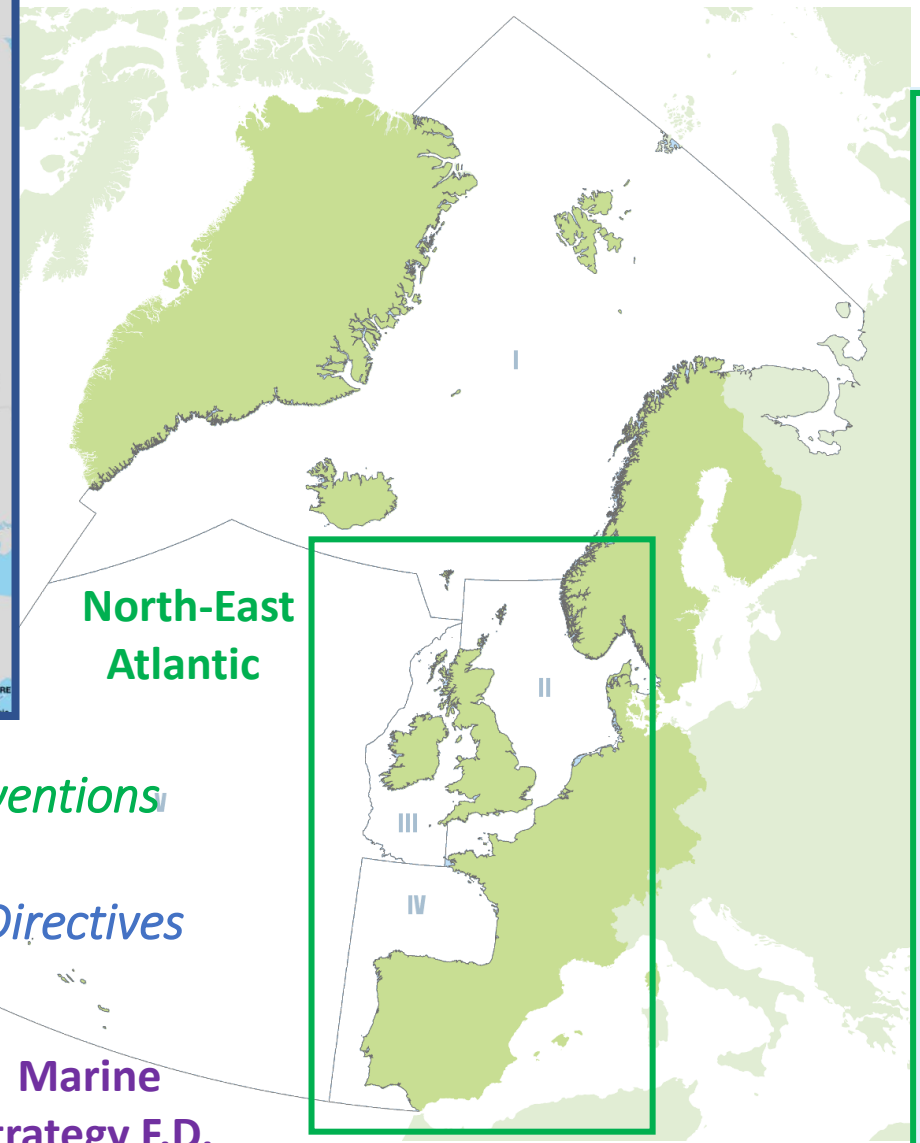
https://www.ospar.org/

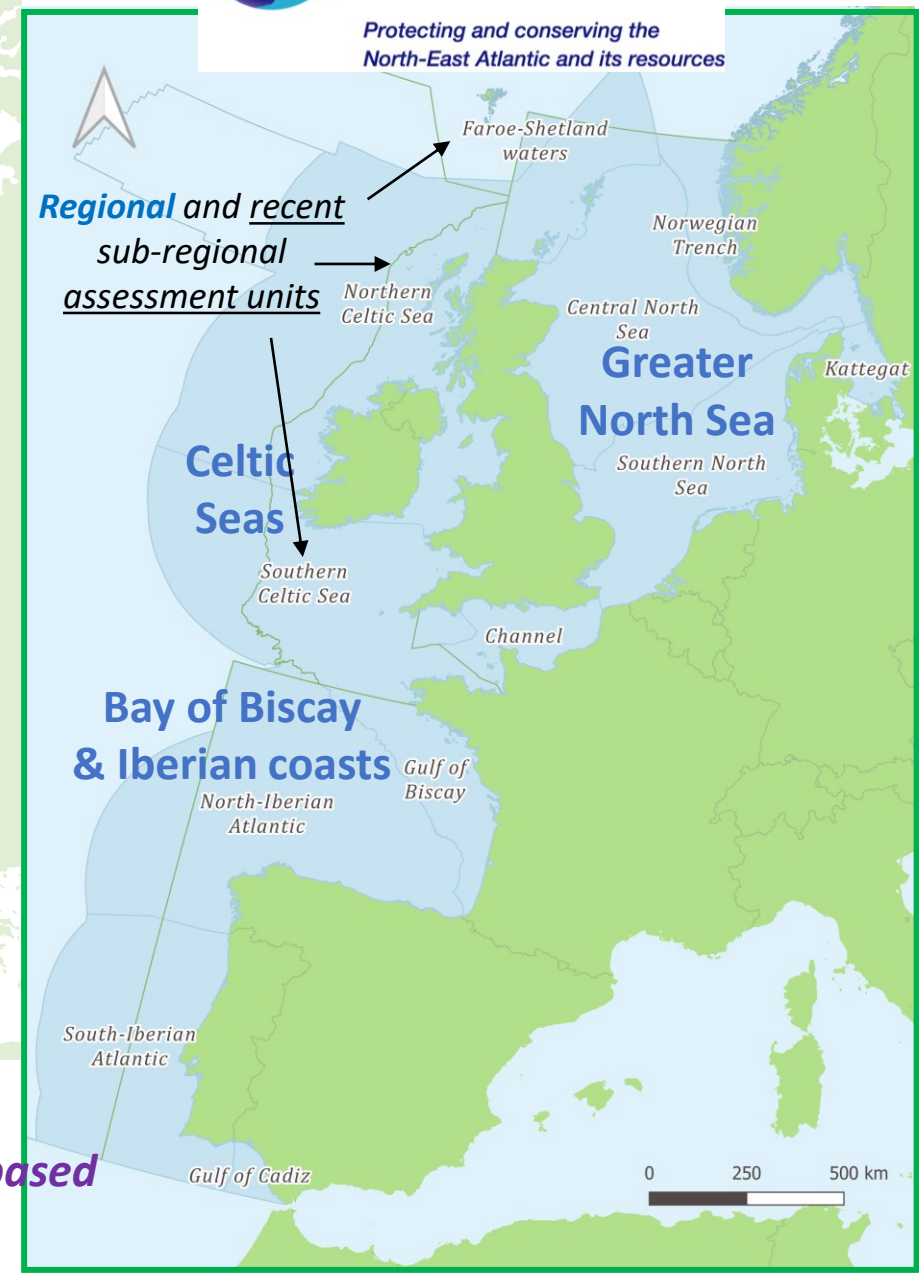




North-East Atlantic

OSPAR COMMISSION

Protecting and conserving the North-East Atlantic and its resources



1970-1990's Regional Sea Conventions

2000's European Environmental Directives

NATURA 2000

Water F.D.

Marine Strategy F.D.

marine spatial planning global

From conservation…

…to ecosystem-based management

Water F.D.

WISE WATER INFORMATION SYSTEM FOR EUROPE

https://water.europa.eu/

2016 + 2022
OSPAR data calls

https://oap.ospar.org/en/

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Ex: Water Framework Directive - **National Coastal water bodies** : biological quality element – **Benthic habitats**

*From OSPAR "**BH2 (condition of benthic habitats**)" C.E.M.P. + "**BH2a**" methodological standards https://www.ospar.org/documents?v=39000*

BH2a = "assessment of coastal habitats in relation to **nutrient and/or organic enrichment**" (mainly from land-based and riverine inputs)

Reporting year	Biological quality element	BE Belgium	DE Germany	DK Denmark	ES Spain	FR France	IE Ireland	NL Netherlands	NO Norway	PT Portugal	SE Sweden	UK United-Kingdom
2010	Benthic invertebrates											
	Macroalgae (reefs)											
	Angiosperms											
	Other aquatic flora											
2016	Benthic invertebrates											
	Macroalgae (reefs)											
	Angiosperms											
	Other aquatic flora											

reported and assessed	reported and not assessed	not reported

Maps: 2010 WFD quality status - benthic vegetation (coastal water bodies) - 2016 WFD quality status

Water F.D.

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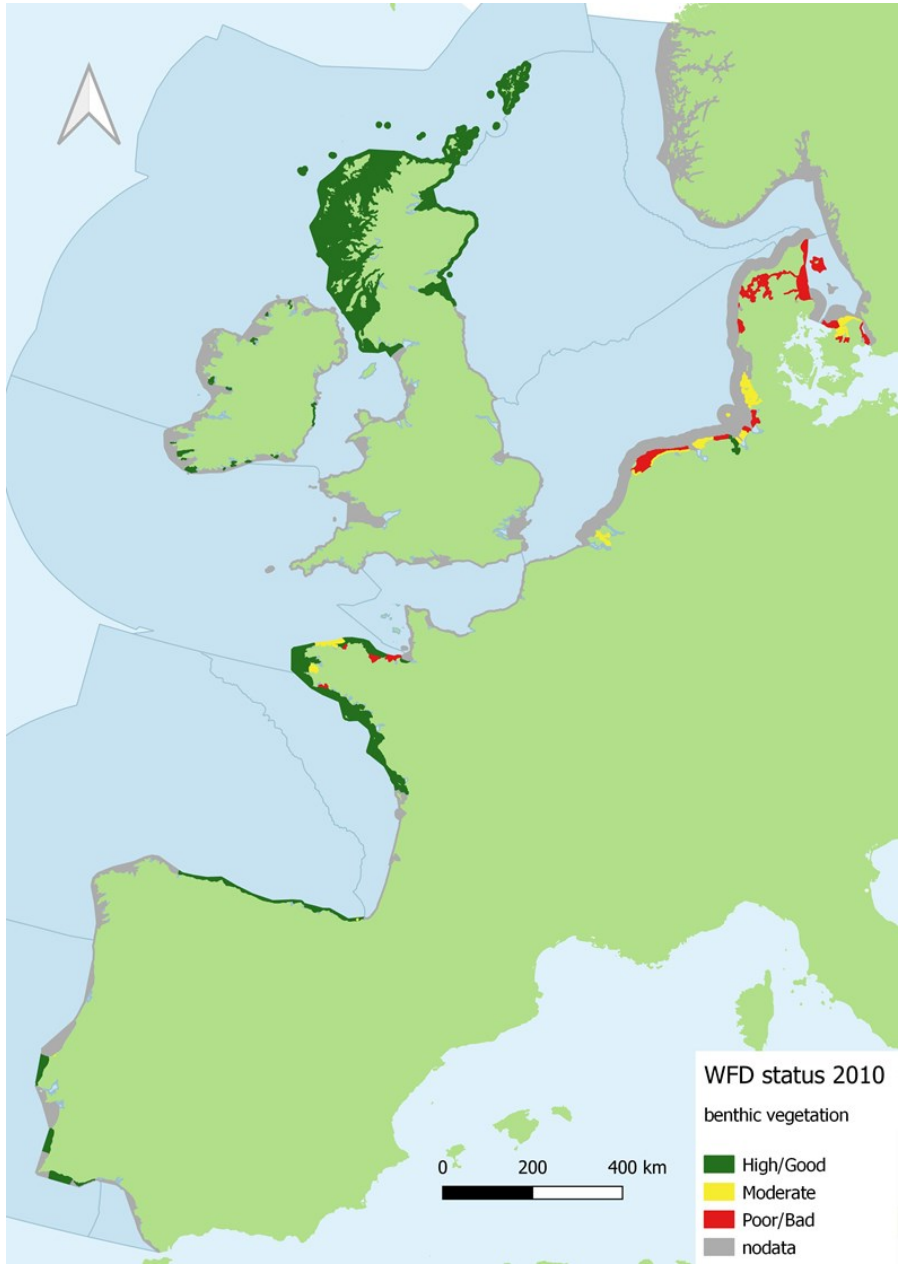
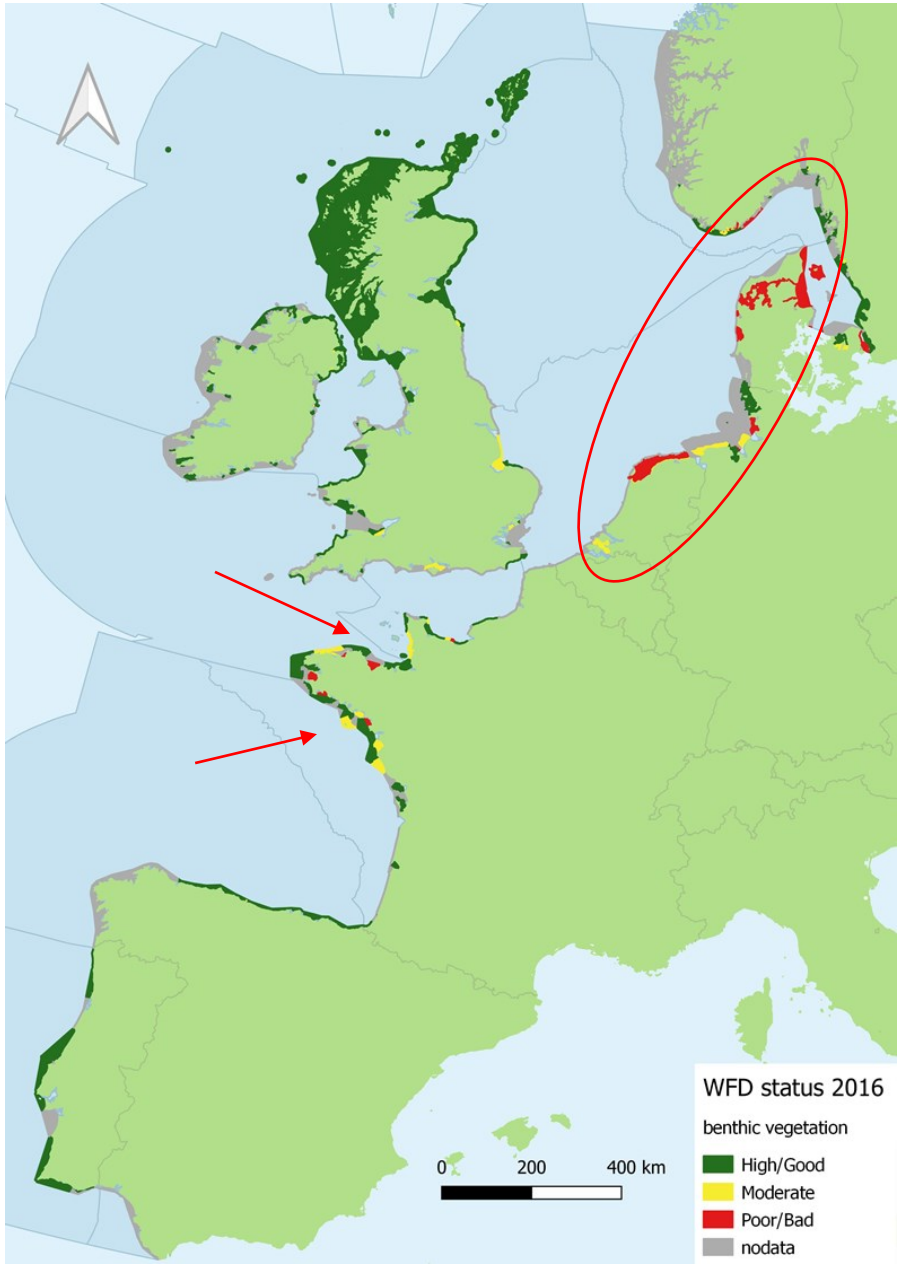
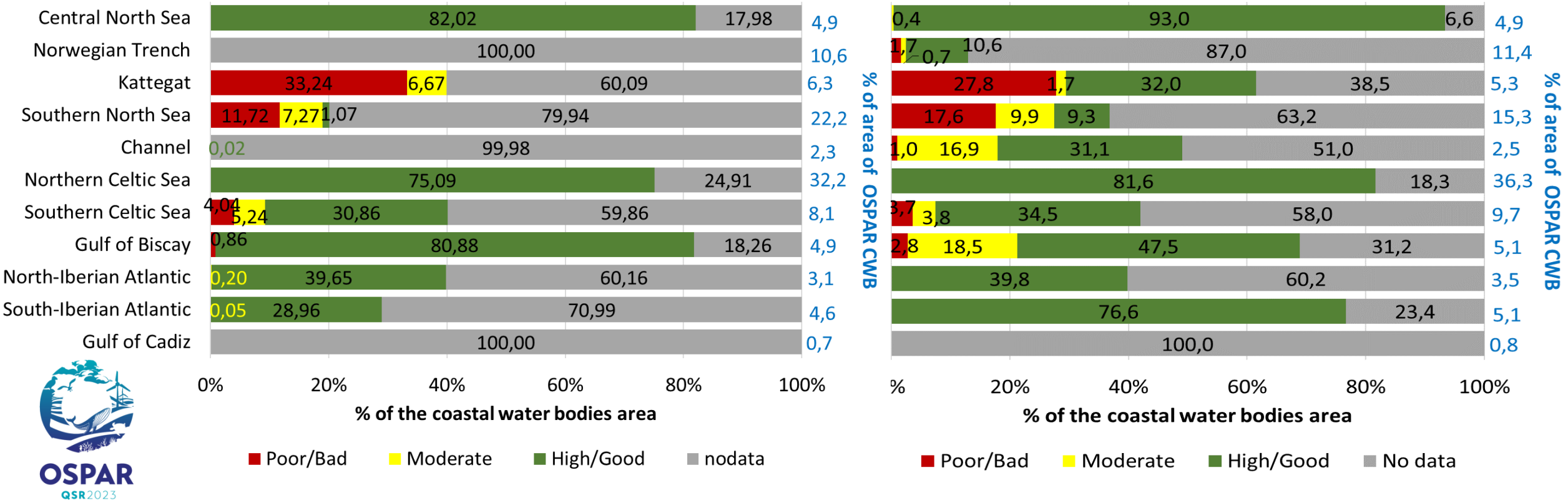




Stats: 2010 WFD quality status - benthic vegetation (coastal water bodies) - 2016 WFD quality status



Coastal water bodies were assessed for only 72% (invertebrates), and 59% (vegetation) of the total area of 3 OSPAR regions. From those, the Water Framework Directive quality status was **good or high for 79% (invertebrates) and for 86% (vegetation)**. However, **local eutrophic impacted areas** were highlighted for 2010 and 2016 reporting cycles.

Changes in proportions were caused by the **differences in total assessed area** of coastal water bodies, an increase in the **number of assessed sites** and **changes in the ecological status** of some coastal water bodies.

But this is only **a piece** of the diagnosis / puzzle !

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Benthic Broad Habitat Type, including their associated biological communities	Broad Pressure Type: Physical disturbance	Extraction/injury of species	Hydrological changes	Eutrophication (nutrients or organic enrichment)	Non-indigenous, pathogens, cultivated and genetically modified species	Contaminants	Litter	Energy, including under water noise
Littoral rock and biogenic reef				A				
Littoral sediment				A				
Infralittoral rock and biogenic reef				A				
Infralittoral sediment	P			A				
Circalittoral rock and biogenic reef				A				
Circalittoral sediment	P			A				
Offshore circalittoral rock and biogenic reef								
Offshore circalittoral sediment	P			P		P		
Upper bathyal rock and biogenic reef								
Upper bathyal sediment								
Lower bathyal rock and biogenic reef								
Lower bathyal sediment								
Abyssal								

Key:

A	Assessed and reported under OSPAR and the European Union Water Framework Directive (WFD)
	Considered under OSPAR and the European Union Marine Strategy Framework Directive (MSFD)
P	Partially assessed in the OSPAR Intermediate Assessment 2017
	Main risks (potentialy widespread across the OSPAR maritime area)
	Relationship identified but not currently assessed

From OSPAR, 2018. BH2 CEMP
https://www.ospar.org/documents?v=39000

But this is only **a piece** of the diagnosis / puzzle !

Habitats of European interest

reporting obligations of Article 17 of the EU Habitats Directive (92/43/EEC)

https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

OSPAR Convention list of Threatening and Declining habitats

https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats

From conservation & single pressure…

Water F.D.

OSPAR QSR2023

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OSPAR Convention list of Threatening and Declining habitats
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From conservation & single pressure…

…towards ecosystem- and (matrices) multipressures risk-based approaches

= converging Regional Sea Conventions & European Environmental Strategies

Water F.D.

Marine Strategy F.D.

Broad Habitat Types, including their associated biological communities	Physical disturbance	Extraction/injury of species	Hydrological changes	Eutrophication (nutrients or organic enrichment)	Non-indigenous, pathogens, cultivated and genetically modified species	Contaminants	Litter	Energy, including under water noise
Littoral rock and biogenic reef				A				
Littoral sediment				A				
Infralittoral rock and biogenic reef				A				
Infralittoral sediment	P			A				
Circalittoral rock and biogenic reef				A				
Circalittoral sediment	P			A				
Offshore circalittoral rock and biogenic reef								
Offshore circalittoral sediment	P			P		P		
Upper bathyal rock and biogenic reef								
Upper bathyal sediment								
Lower bathyal rock and biogenic reef								
Lower bathyal sediment								
Abyssal								

Nested biological and geographical scales

Key:

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	Considered under OSPAR and the European Union Marine Strategy Framework Directive (MSFD)
P	Partially assessed in the OSPAR Intermediate Assessment 2017
	Main risks (potentialy widespread across the OSPAR maritime area)
	Relationship identified but not currently assessed

From OSPAR, 2018. BH2 CEMP
https://www.ospar.org/documents?v=39000

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NEA PANACEA

North East Atlantic project on biodiversity and eutrophication assessment integration and creation of effective measures

Mars 2021 – Mai 2023

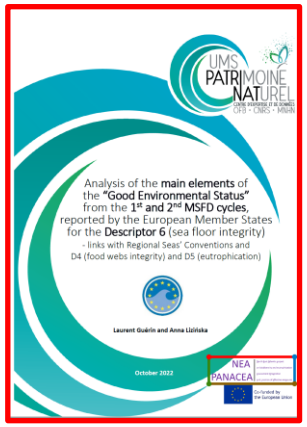
https://www.ospar.org/about/projects/nea-panacea

+ web search« Nea Panacea » or « EcApRHA »

https://www.ospar.org/work-areas/bdc/ecaprha

3-5 mai 2023, La Haye (NL): “final” meeting of our dream team ☺

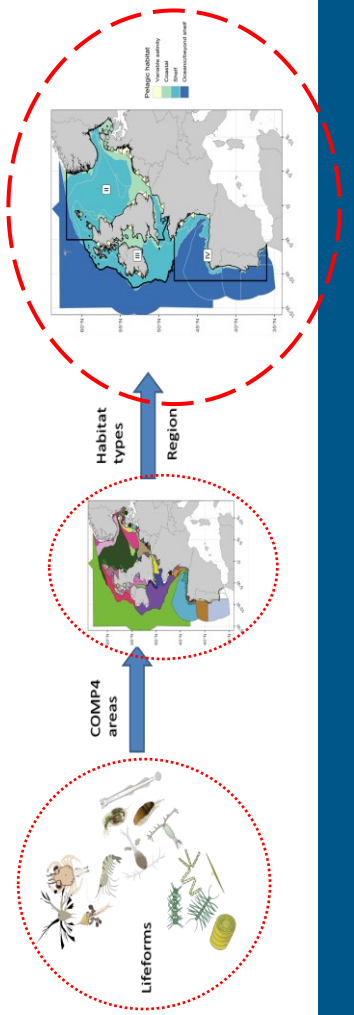
WORKING THEMES	ACTIVITIES 1 Pelagic Habitats	2 Eutrophication & Physical Conditions	3 Benthic Habitats	4 Marine Birds	5 Coordination Integration
A. Indicator development					
1. Data (management and calls)	1		3, 6		
2. (Joint) Monitoring strategy			1		
3. Improve indicator methodology	1, 2, 3, 4	2	2, 3, 4, 6	1	
4. Improve indicator operability	1, 2, 3 4		1, 2, 3, 4, 6		
B. Towards improved and coherent assessments					
1. Threshold Values / Assessment levels	4	1, 4	1, 2, 4, 6	1	
2. Assessment scales	2, 3, 4	3	1, 2, 4, 6		
3. Linking state to pressure	2, 3, 4, 5	1,2, 3	1, 2, 3, 4		2
C. Delivery of article 8					
1. Indicator assessments	2, 3	2	3, 4, 6, 7	1, 4	
2. Integration of state assessments (thematic assessments)	4, 5	2	1, 3, 7	2, 4	2
D. From assessments to measures					
1. Effectiveness of measures (thematic assessments)	3, 4, 5	1	3, 5	3, 4	2
2. Inform new measures: D6 (thematic assessments)			2, 3, 4, 5, 6		



Guérin & Lizińska, 2022.
DOI:10.13140/RG.2.2.16732.46728

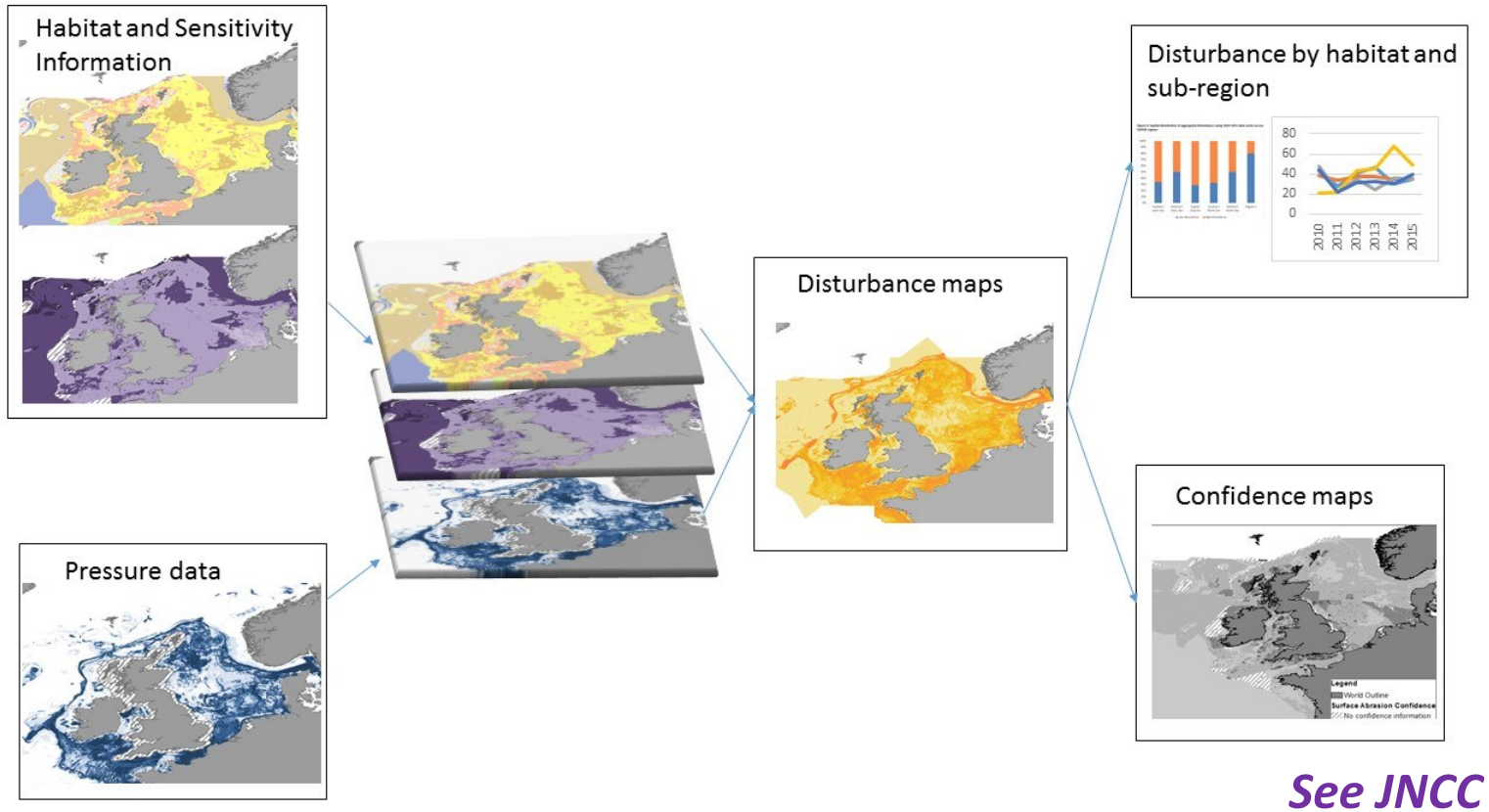
Aqua Ecology · University of Plymouth · Rijkswaterstaat Ministry of Infrastructure and Water Management · BIO CONSULT Schuchardt & Scholle GbR · cnrs · LOG ulco Université · OFB Office français de la biodiversité · Instituto Español de Oceanografía · JNCC

***Wide-scale models based** on (some) species or communities data*



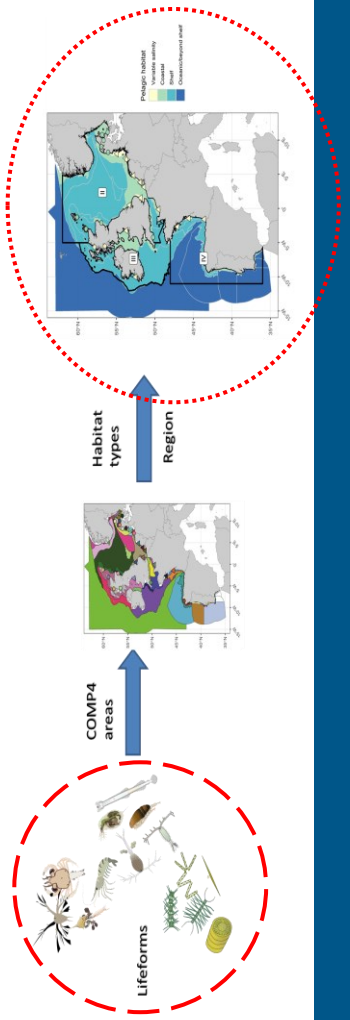
Extent of physical damage to predominant and special habitats (BH3)

- Assessing the disturbance of benthic habitats following anthropogenic activities.
- Applied to fisheries data.



See JNCC et al previous talk

Fine-scale condition-based *on* ***species*** *vs pressure data*

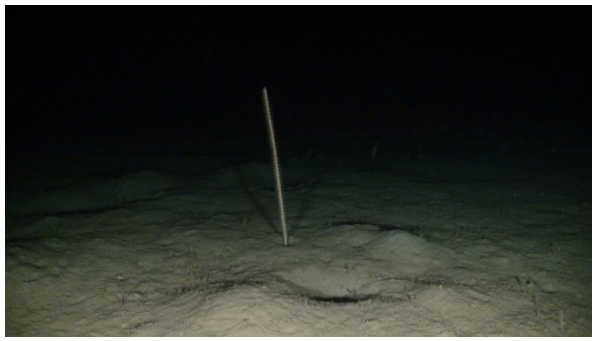


Typical species composition (BH1)

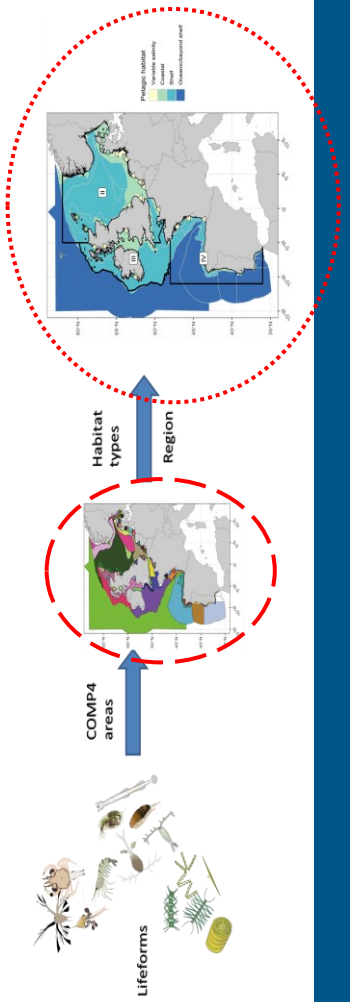
- Species vulnerable to changes in pressure.
- Requires habitat mapping, ground-truthing and pressure maps.
- Tested methods using:
  - Scientific bottom trawl data on soft-sediments.
  - Remotely Operated Vehicle transects on soft sediments and reefs.
  - Box cores on soft-sediments.

See José et al talk in a few minutes (this session)!





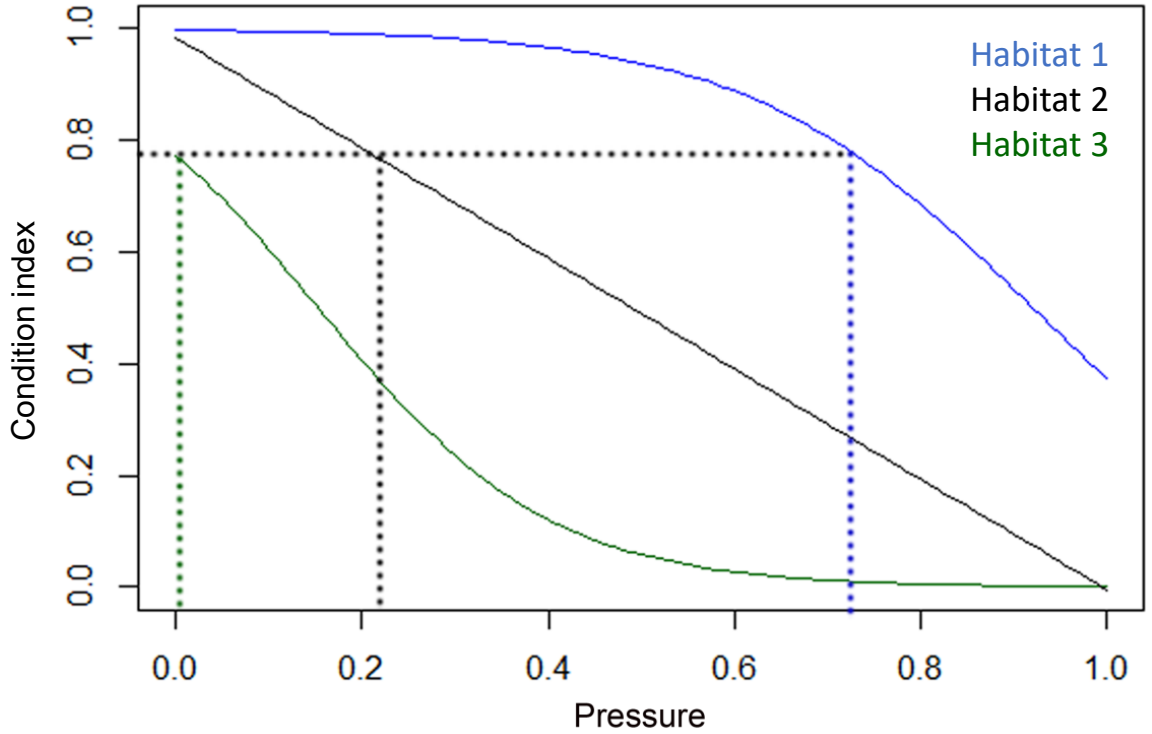
Fine-scale condition-based *on* ***community*** *vs pressure data*



Condition of benthic habitat communities (BH2)

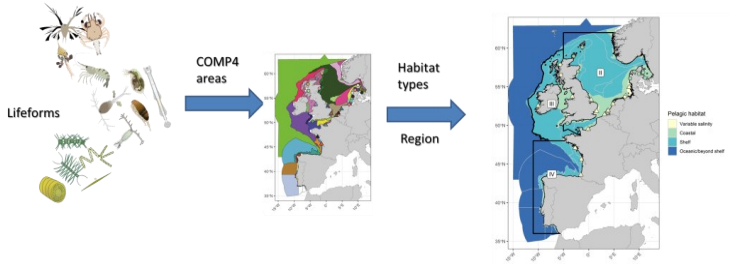
Muséum national d'Histoire naturelle

- Assess the condition of EUNIS level 5 habitats exposed to a gradient of pressure.
- Requires benthic community and pressure data.
- Tested on various pressure types.



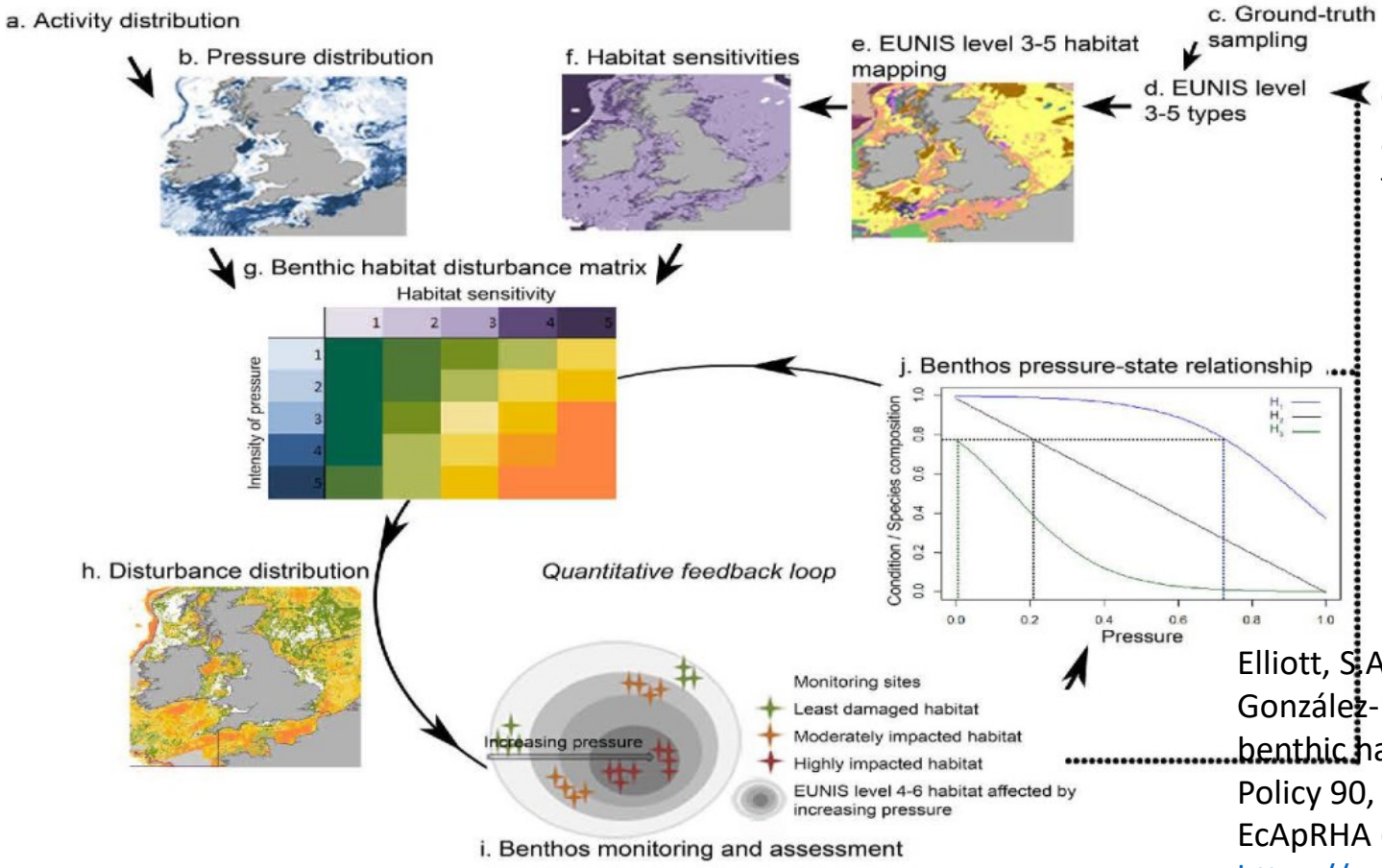
See BH2a in this talk a few seconds ago, and Lorna related and challenging works & talk about thresholds in this session

Integration method development / recipe:
Fine scale community data **to** calibrate wide-scale models



S.A.M. Elliott et al. 2018

Marine Policy 90 (2018) 88–94



Overarching conceptual approach for an integrated assessment of benthic habitat indicators at sub-regional scale, to highlight the feedback of information gathered across Indicator Assessments and provide increased confidence in benthic Indicator Assessment. (Elliott et al., 2018)

See José et al next talk in a few minutes (this session)!

Elliott, S.A.M., Guérin, L., Pesch, R., Schmitt, P., Meakins, B., Vino-Herban, C., González-Irusta, J.M., de la Torriente, A. and Serrano, A., 2018. Integrating benthic habitat indicators: Working towards an ecosystem approach. Marine Policy 90, 88-94. https://doi.org/10.1016/j.marpol.2018.01.003

EcApRHA (benthic, pelagic, food webs) deliverables available at: https://www.ospar.org/work-areas/bdc/ecaprha

INTEGRATION OF BH1 & BH3 METHODS

Disturbance matrix	Sensitivity 1	2	3	4	5
Pressure	1	2	3	4	6
	1	2	4	6	7
	1	3	5	7	9
	1	4	6	8	9
	2	4	7	9	9

matrix simplification

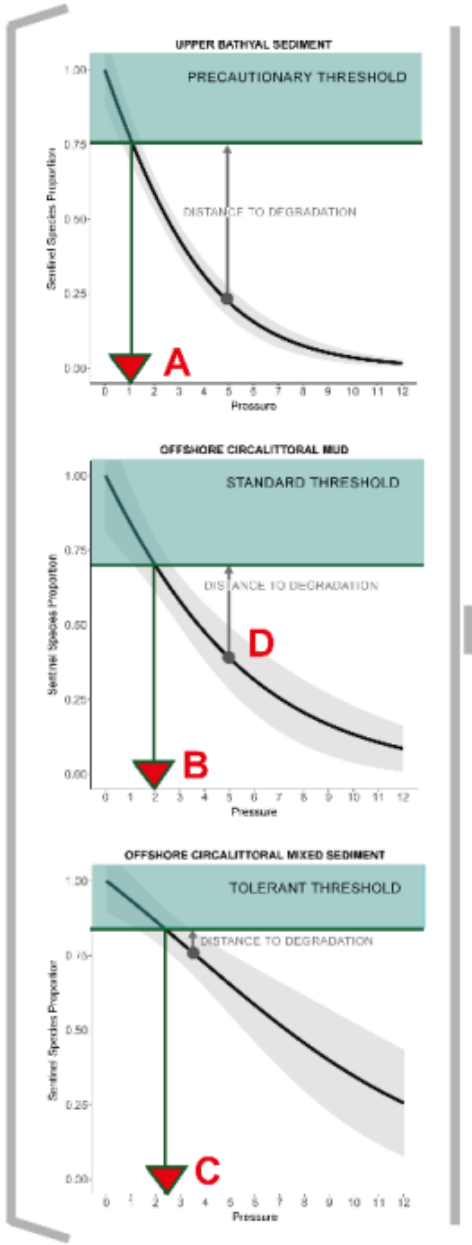
Disturbance matrix	Sensitivity 1	2	3	4	5
Pressure	1	2	3	6	6
	1	2	4	6	7
	1	3	5	7	9
	1	4	6	8	9
	2	4	7	9	9

matrix simplification

Disturbance matrix	Sensitivity 1	2	3	4	5
Pressure	LD	LD	LD	LD	MHD
	LD	LD	LD	MHD	MHD
	LD	LD	MHD	MHD	MHD
	LD	MHD	MHD	MHD	MHD
	MHD	MHD	MHD	MHD	MHD

Definition of pressure categories

Disturbance matrix	Sensitivity 1	2	3	4	5
Pressure 0-≤A	LD	LD	LD	LD	MHD
>A-≤B	LD	LD	LD	MHD	MHD
>B-≤C	LD	LD	MHD	MHD	MHD
>C-≤D	LD	MHD	MHD	MHD	MHD
>D	MHD	MHD	MHD	MHD	MHD



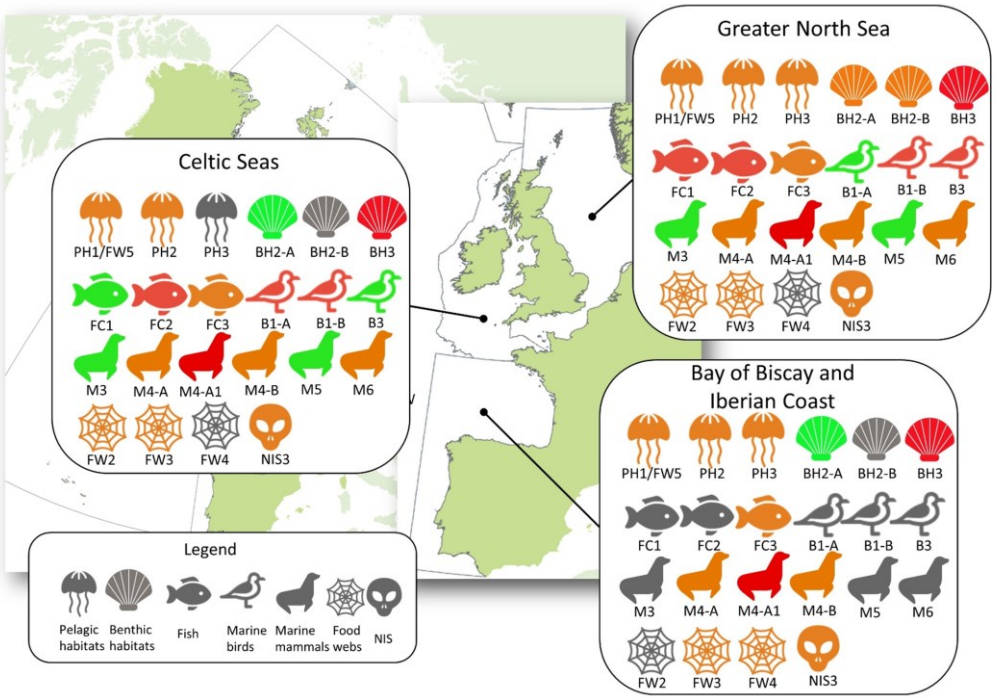
Disturbance matrix	Sensitivity 1	2	3	4	5
0-≤ 1	LD	LD	LD	LD	MHD
>1-≤1.8	LD	LD	LD	MHD	MHD
>1.8-≤2.5	LD	LD	MHD	MHD	MHD
>2.5-≤5	LD	MHD	MHD	MHD	MHD
>5	MHD	MHD	MHD	MHD	MHD

Scheme of the 2 types of indicators' integration method
LD: Low disturbance. MHD. Moderate/high disturbance

Plaza-Morlote et al, 2023
in OSPAR 2023
https://www.ospar.org/work-areas/cross-cutting-issues/cemp
https://www.ospar.org/documents?d=51126

See José et al + Lorna next talks in a few minutes (really, told you: keep your chair!)

From experts' judgement and policy/political support based on several indicators under development…



Poor	Indicator value is below assessment threshold, **or** change in indicator represents a declining state, **or** indicator change is linked to increasing effect of anthropogenic pressures (including climate change), **or** indicator shows no change but state is considered unsatisfactory
Uncertain	No assessment threshold **and/or** unclear if change represents declining or improving state, **or** indicator shows no change but uncertain if state represented is satisfactory
Good	Indicator value is above assessment threshold, **or** indicator represents improving state, **or** indicator shows no change but state is satisfactory
Unassessed	Indicator was not assessed in a region due to lack of data, lack of expert resource, or lack of policy support.

EcApRHA – an Ecosystem Approach to Regional Habitat Assessments
This project is co-financed by the European Union

NEA PANACEA – North East Atlantic project on biodiversity and eutrophication assessment integration and creation of effective measures
Co-funded by the European Maritime and Fisheries Fund

OSPAR QSR2023

Assessing the state of marine biodiversity in the Northeast Atlantic

Northeast Atlantic marine biodiversity is subject to intense human pressure.

Using spatial and time-series data, the status of 52 biodiversity indicators was assessed across the Northeast Atlantic. This process involved 188 scientists, as well as policy-makers from 15 countries.

- This first ever holistic assessment showed widespread degradation of Northeast Atlantic marine habitats and species.
- Gaps in data and knowledge challenge assessment of some indicators.
- Science-policy synergy is critical to delivering holistic ecosystem assessment.

25% of indicators in poor status
58% of indicators in uncertain status
17% of indicators in good status

Reference: McQuatters-Gollop, A., Guérin, L., Arroyo, N.L., Aubert, A., Artigas, L.F., Bedford, J., Corcoran, E., Dierschke, V., Elliott, S.A.M., Geelhoed, S.C.V., Gilles, A., González-Irusta, J.M., Haelters, J., Johansen, M., Le Loc'h, F., Lynam, C.P., Niquil, N., Meakins, B., Mitchell, I., Padegimas, B., Pesch, R., Preciado, I., Rombouts, I., Safi, G., Schmitt, P., Schückel, U., Serrano, A., Stebbing, P., De la Torriente, A., Vina-Herbon, C. Assessing the state of marine biodiversity in the Northeast Atlantic. Ecological Indicators. https://doi.org/10.1016/j.ecolind.2022.109148

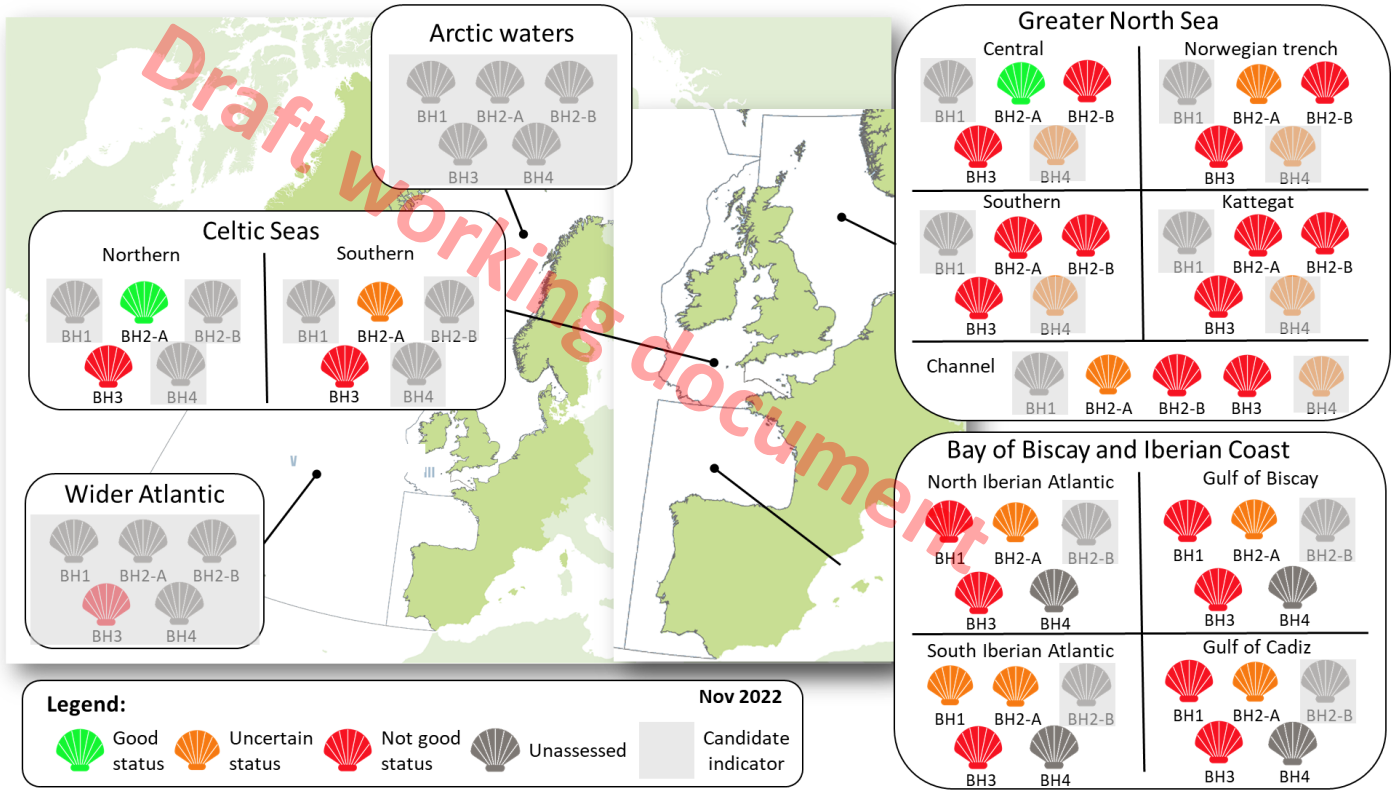
McQuatters-Gollop et al, 2022

=> EU EcApRHA** contribution to **OSPAR Intermediate Assessment 2017

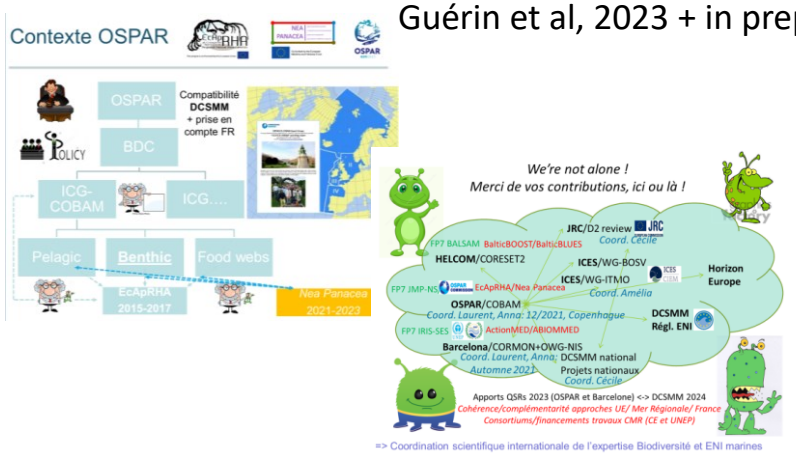
=> EU Nea Panacea** contribution to **OSPAR QSR 2023

See Abigail et al talk in some minutes (this session)!

From experts' judgement and policy/political support based on several indicators under development…



Poor	Indicator value is below assessment threshold, **or** change in indicator represents a declining state, **or** indicator change is linked to increasing effect of anthropogenic pressures (including climate change), **or** indicator shows no change but state is considered unsatisfactory
Uncertain	No assessment threshold **and/or** unclear if change represents declining or improving state, **or** indicator shows no change but uncertain if state represented is satisfactory
Good	Indicator value is above assessment threshold, **or** indicator represents improving state, **or** indicator shows no change but state is satisfactory
Unassessed	Indicator was not assessed in a region due to lack of data, lack of expert resource, or lack of policy support.



Guérin et al, 2023 + in prep

NOT in **OSPAR QSR 2023, but =>**

Lessons learnt from the OSPAR Science-policy process!

+ next steps =>

- Future Benthic integration OSPAR CEMP (*in prep*)
  (with pelagic/food web and other biodiversity leads)
  => OSPAR assessment 2028? Science publications!
- Guérin et al (Nea Panacea report + ITRS 2023 + articles *in prep*)

See details in the papers + ITRS 2023 (ref last slide)
+ MSEAS 2024 Poster tonight (GP-P01 = my face!)

Poster Session 17h-20h:
Laurent Guérin, Abigail McQuatters-Gollop, Anna J. Lizińska
Co-production of knowledge: a case study of some European science-policy expert groups networks involved in marine biodiversity management challenges

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Lessons learnt from 12+10+10 years of experiences in the life and holy Grail scientifical quest of Sea habitats' experts involved in science-policy interactions for marine ecology of European Seas

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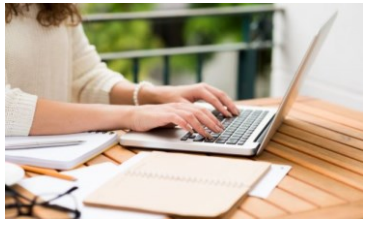

***Coming "soon"**: future publications of these collective works & processes*

- ***Science Journal articles & conferences**: Guérin, Lizińska and Schmitt, in prep; Guérin et al, in prep (North-East Atlantic's benthic and biodiversity QSR2023 assessments & Science-policy processes) + IMCC2024 (Capetown)*
- ***OSPAR 2028 Quality status assessment** (including Benthic habitats updated assessments methods and results) https://oap.ospar.org/en/*

Thank you! ありがとうございます

Scan me for the science article

Scan me for OSPAR QSR 2023

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NEA PANACEA

North East Atlantic project on biodiversity and eutrophication assessment integration and creation of effective measures

EcAp RHA
an Ecosystem Approach to Regional Habitat Assessments

This project is co-financed by the European Union

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