The Marine Institute: – Delivering marine science, research, technology development and innovation in Ireland

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CIPAC Symposium 17th June 2025

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Marine Institute

Survey photos Tom Szumski MI

Who we are and what we do.

- Our ocean economy.
- Protecting our marine environment: Key drivers.
- Case study: Screening for contaminants of emerging concern.

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Survey photos Tom Szumski MI

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Ireland's scientific agency responsible for supporting the sustainable development of the State's maritime area and resources

Marine Institute HQ - Galway

Newport Catchment Facilities

RV *Celtic Explorer*

RV *Tom Crean*

Deepwater ROV *Holland I*

Lehanagh Pool Marine Research Site:

Marine Institute Act (1991)

"to *undertake*, to *co-ordinate*, to *promote* and to *assist* in marine research and development and to *provide such services* related to research and development that, in the opinion of the Institute, will ***promote economic development*** and ***create employment*** and ***protect the marine environment***"

Our Ocean Economy is extremely valuable

- In 2023 Ireland's ocean economy:
  - Generated over €6.5 billion in turnover (nominal value).
- Direct economic contribution:
  - €2.72 billion p/a, Gross Value Added
  - Employs ~38,900 people (FTE)

2023 relative contributions by industry

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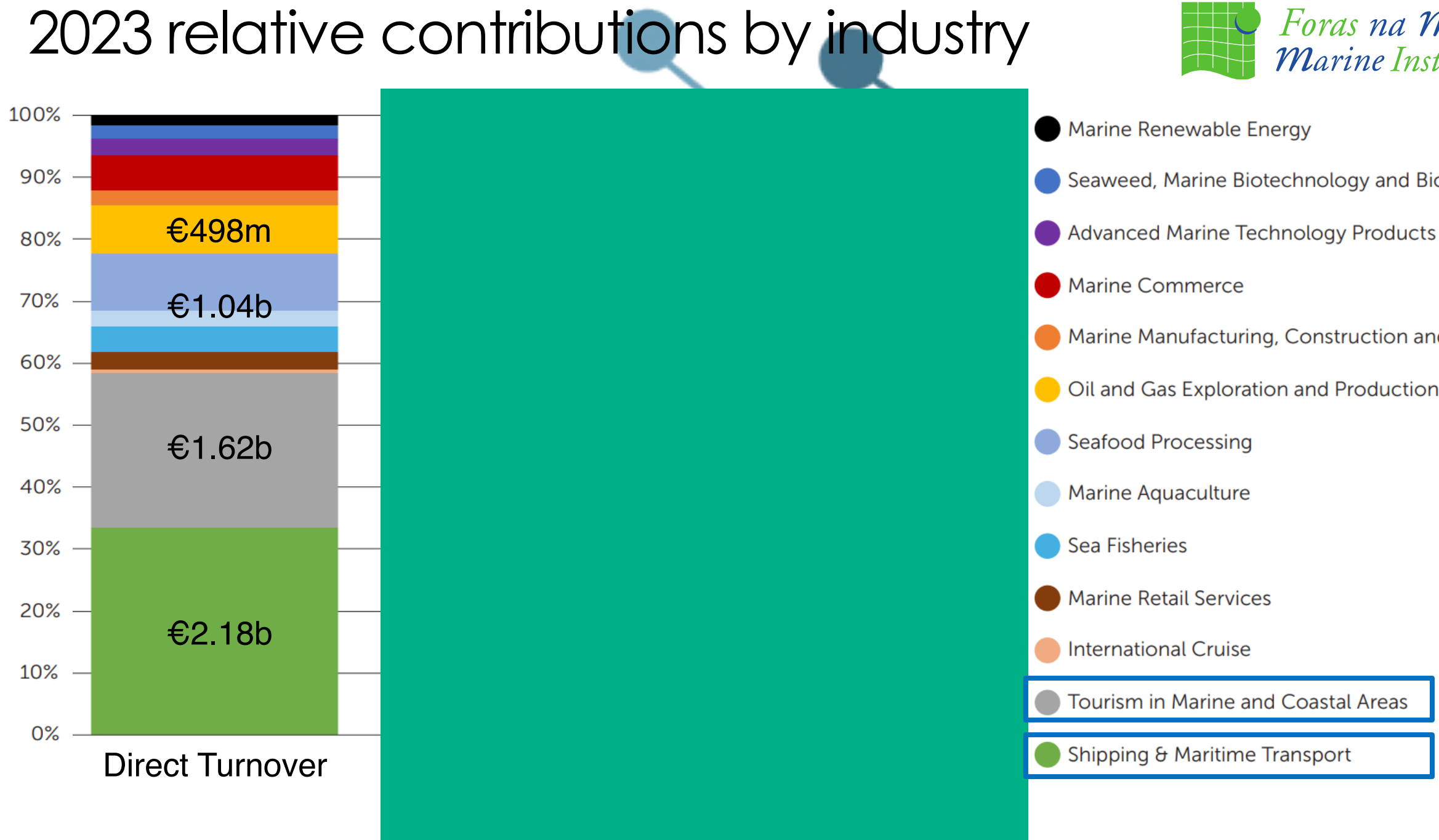

What We Do

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Scientific Advice & Services:

- We provide a wide range of scientific advice and services to Government departments, agencies and stakeholders.
- These services play a vital role in protecting and managing our ecosystems, meeting EU obligations and achieving a sustainable ocean economy.

Forecasting Ocean & Climate Change:

Working with national and international partners to:

- Observe and understand how our ocean is changing;
- Respond to current patterns of change; and,
- Model likely future scenarios.

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Research & Innovation:

- We support, coordinate and promote marine research and innovation at national and international levels.
- We also conduct research, participating in and leading national and international research partnerships.

Ireland's Ocean Economy:

- We partner with other agencies involved in sustainable economic development to support Ireland's ocean and coastal economies.
- We contribute research, ocean knowledge, infrastructure, advisory and regulatory services, and identify maritime development opportunities.

Key Government Departments:

Primary client Department:

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

→ Scientific Advice

Sectoral and Policy support:

Fisheries, Aquaculture, Seafood

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

→ Services, Data & Evidence

Offshore Renewable Energy, Marine Spatial Planning

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

→ Data & Evidence

EU Directives (Marine Strategy Framework, Water Framework)

An Roinn Iompair
Department of Transport

→ Services

Ports and shipping
(Irish Maritime Development Office)

An Roinn Gnóthaí Eachtracha
Department of Foreign Affairs

→ Programmes

Irish Aid (Our Shared Ocean)

Marine Chemistry: Monitoring - Advice - Research

SERVICE DRIVERS *Why & for Who?*

- Service Contracts and requirements: *Government depts & agencies*
- Legislation: Directives and conventions
- National and international data reporting obligations
- MI strategy and national priorities: SFAs 1. Services; 2. Climate/biodiversity; 3. Applied Research

THEMATIC AREAS *What?*

Food Safety
- Residues Farmed Fish
- Contaminants

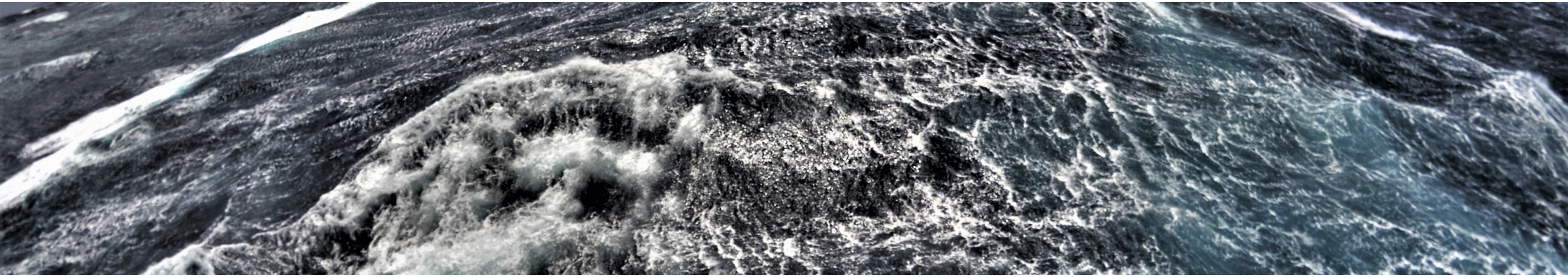
Pollution
- Water Framework Dir
- MSFD/OSPAR

Biogeochemistry
- Coastal
- Oceans

How?

Programmes → Lab services → ISO 17025 Quality System → DATA → Collaboration:

Marine Environmental Monitoring Drivers



WFD

Water Framework Directive 2000

Dir. 2000/60/EC

Good Surface Water Status – & **No deterioration**

Catchment based

MSFD

Marine Strategy Framework Directive 2005

Dir 2008/56/EU

Good Environmental Status – 11 Descriptors

OSPAR

OSPAR Convention 1992

NEAES 2020 - 2023

Spatial Domains

WFD – Estuarine (80) and Coastal (45) water bodies

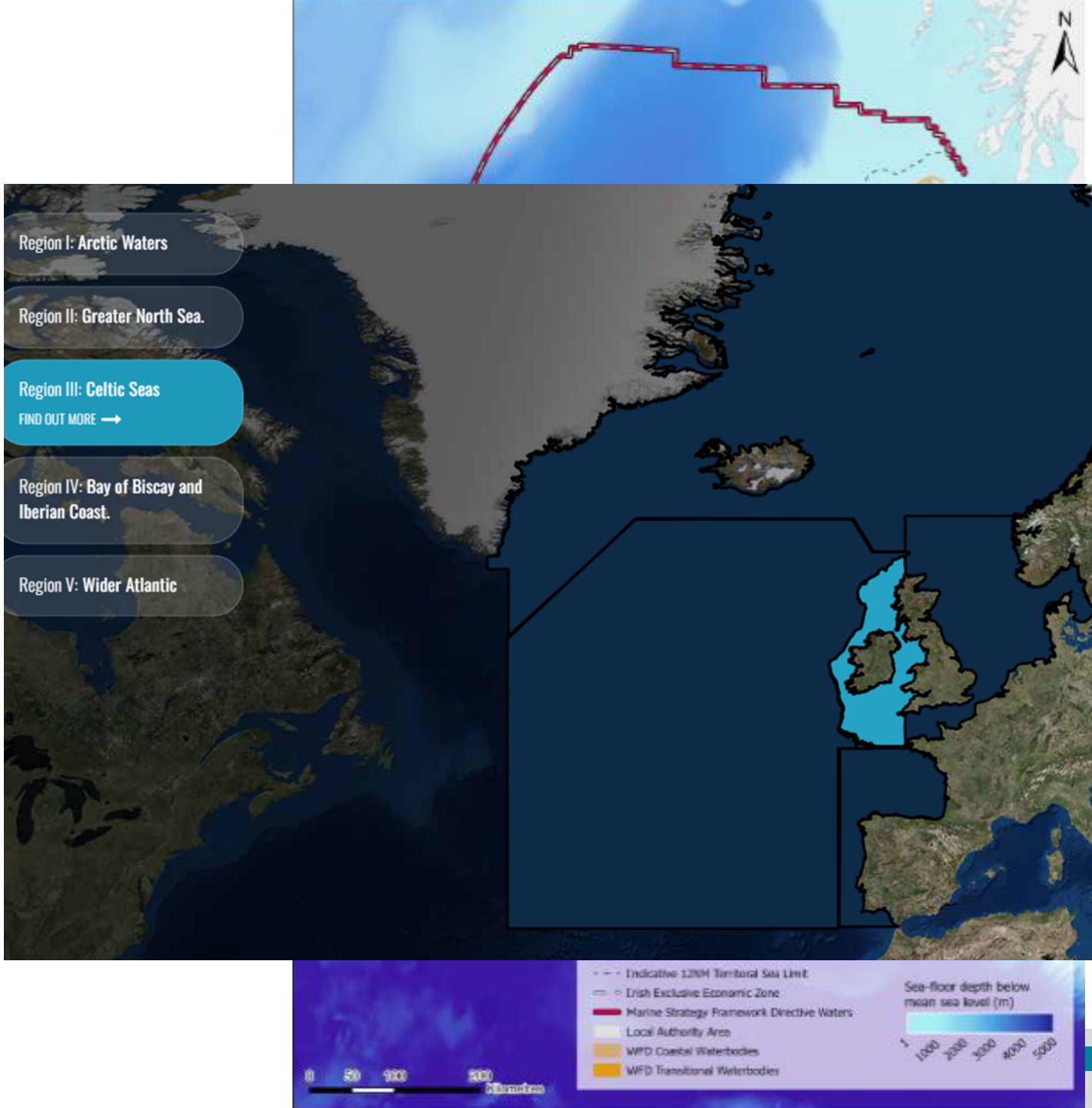
1 nautical mile from baseline.

MSFD – Inner WFD coastal waters; to EEZ

Marine reporting units

OSPAR – North-East Atlantic;

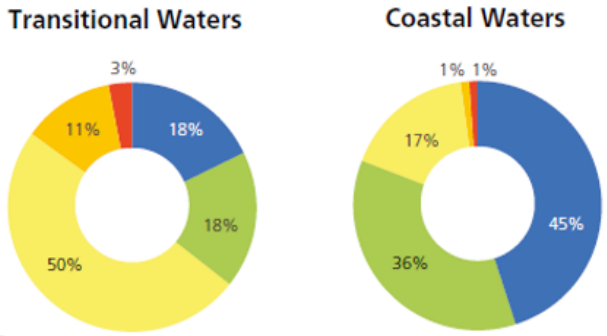
Ireland, UK, Fr – Region III

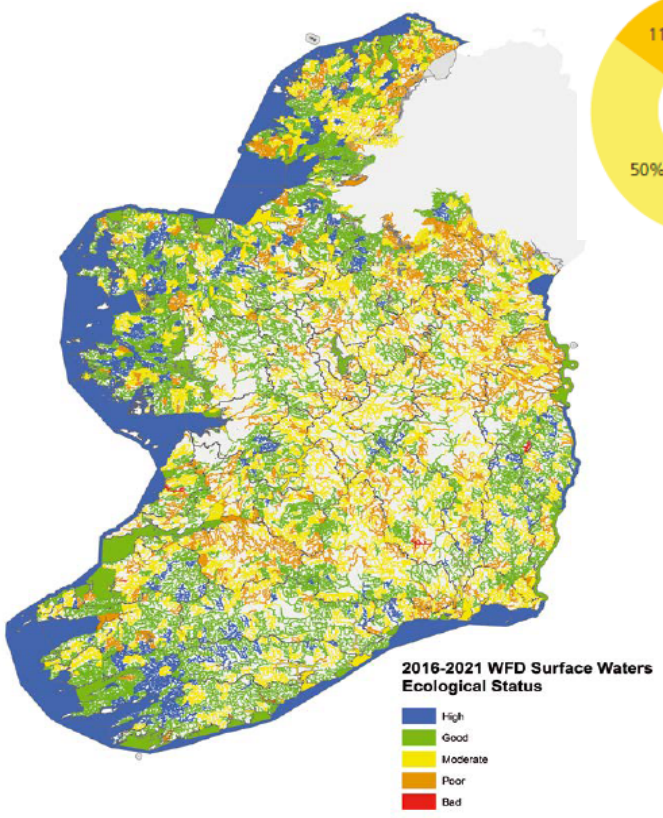


WFD – Classification

Monitoring Requirements

- Surveillance
- Operational
- Investigative





Quality Elements TCWs

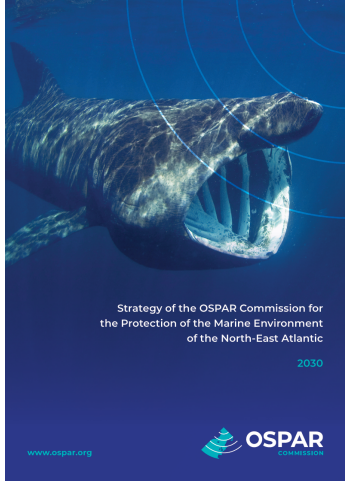
Biological

- Benthic Invertebrates
- Phytoplankton
- Other Aquatic Flora: Macroalgae; Angiosperms
- Fish (TW Only)

Physico-Chemical

- General Physico-Chemical Conditions
- Priority substances & Other pollutants

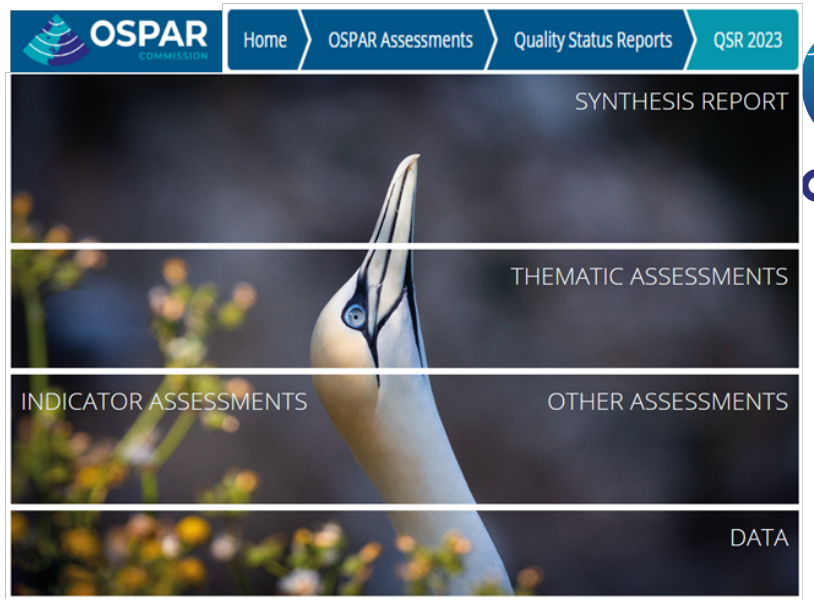
Hydromorphology



OSPAR

Strategy 2030

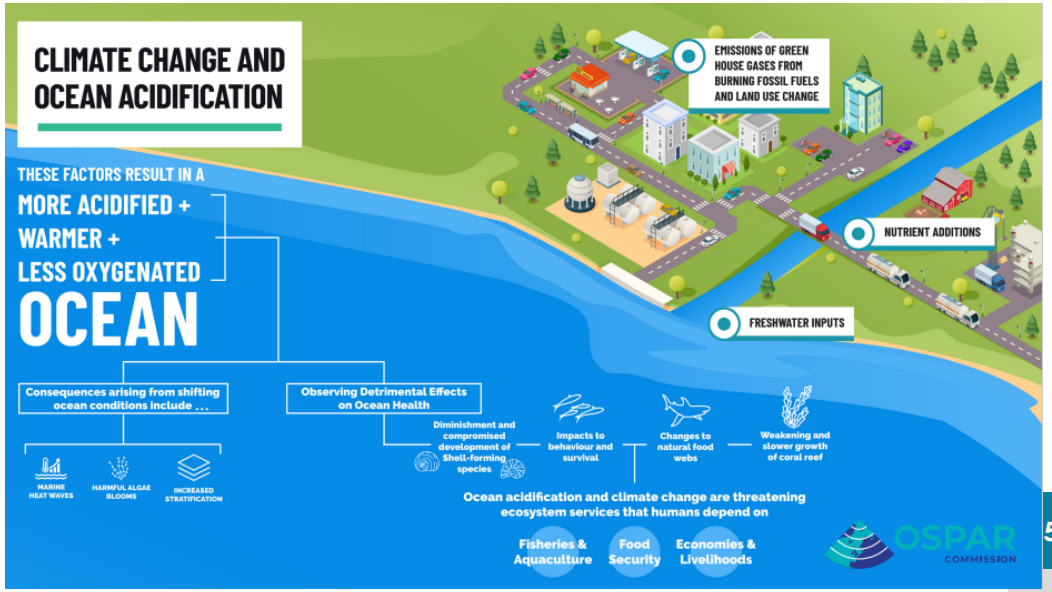
Quality Status Report 2023 - OSPAR-OAP (Prod)



OSPAR QSR2023

12 Strategic objectives to achieve a North East Atlantic that is

- clean,
- biologically diverse,
- productive & sustainably used,
- resilient to Climate Change and Ocean Acidification

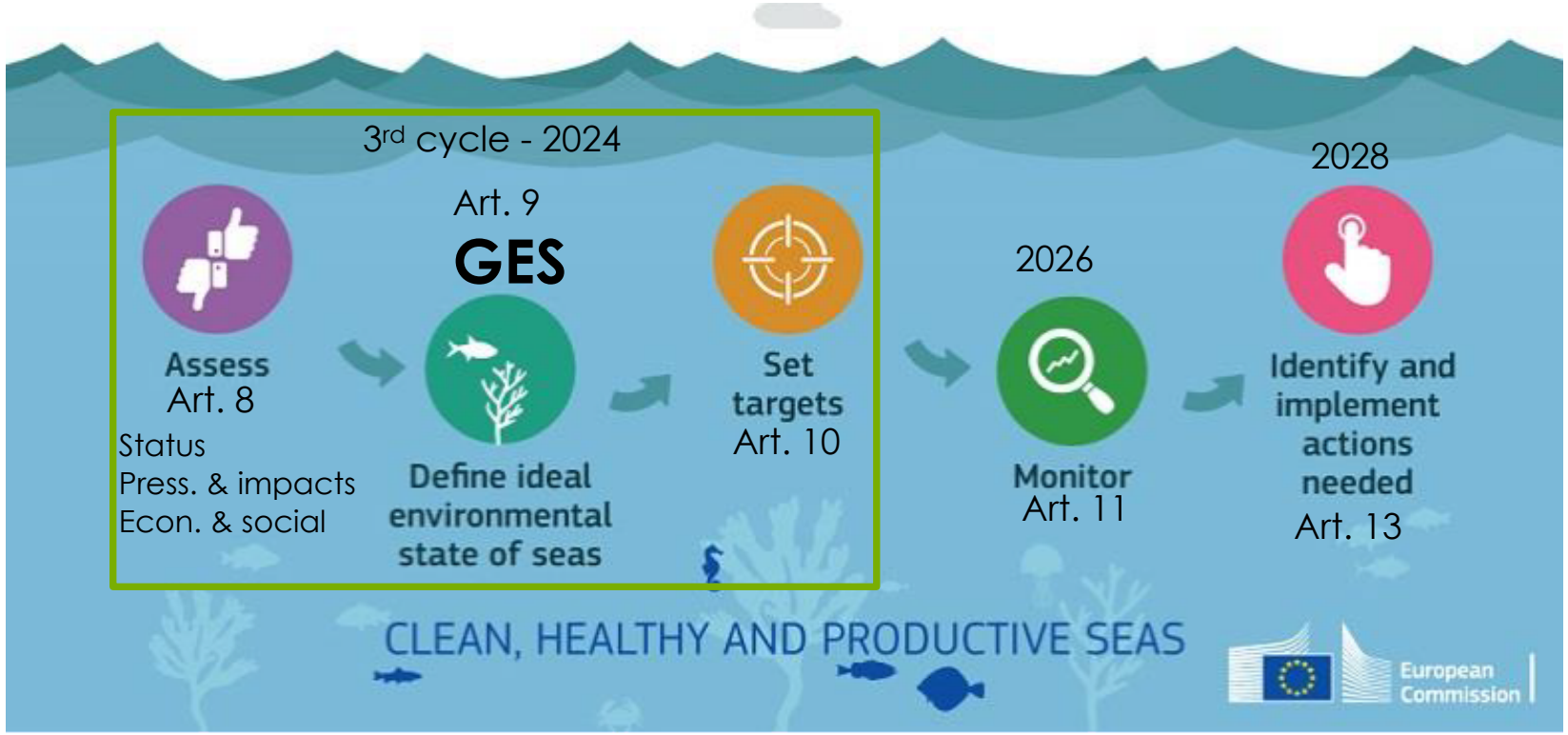


Marine Strategy Framework Directive (MSFD – Dir 2008/56/EU)

Aim: Clean, healthy, biologically diverse and sustainably used marine environment

Good Environmental Status

MSFD



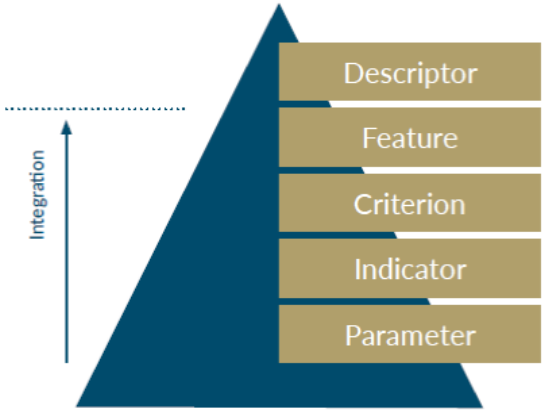
Guiding Principals

- Descriptor led approach
- International Cooperation -RSCs
- Evidence Based
- Ecosystem Based Approach
- Precautionary principle
- Risk Based
- Polluter Pays
- Participatory
- Nature Based

Annex III: elements to consider Dir (EU) 2017/845

1. Marine Ecosystem -Structure, function and processes
2. Anthropogenic pressures, uses and human activities

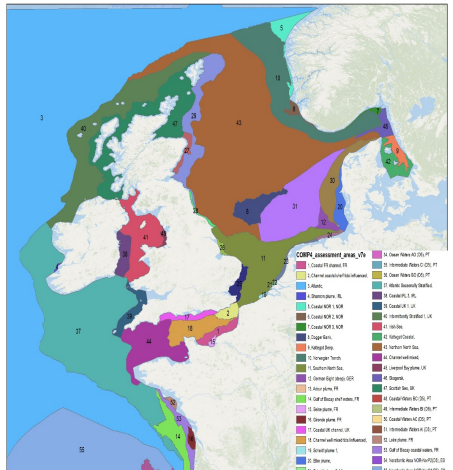
Monitoring and assessing GES- Criteria and Methodology Comm. Dec. 2017/848

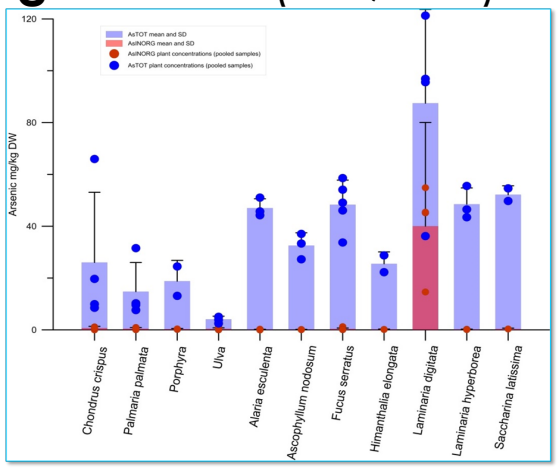


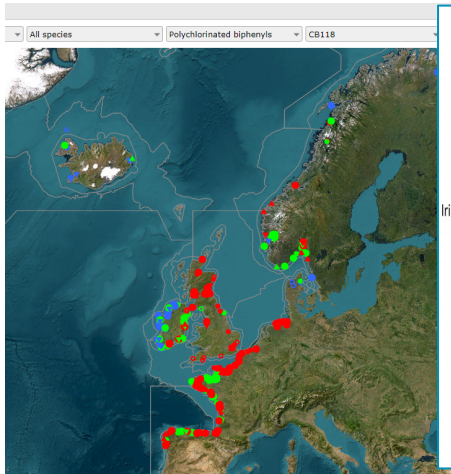
Marine Environment – Clean Seas

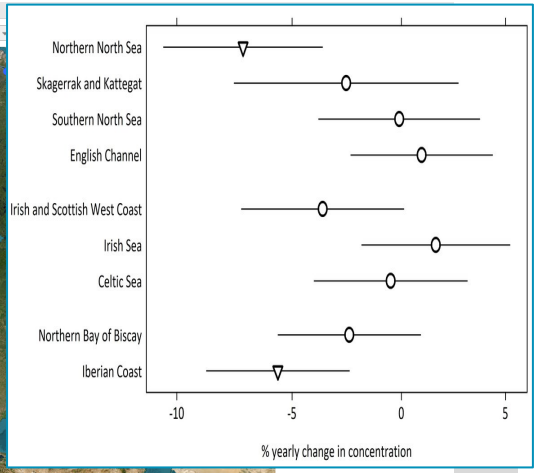
Hazardous substances – *toxic, persistent, bioaccumulate* – Concentrations & impacts on marine life and services
Nutrients – Water Quality, Eutrophication

- Nutrients and Water Quality
- Contaminants in Seafood
- Contaminants in Water, biota & sediment
- Impacts of marine activities
- Cumulative Impacts; open ocean; bioaccumulation
- **Contaminants of emerging concern** (100,000s)







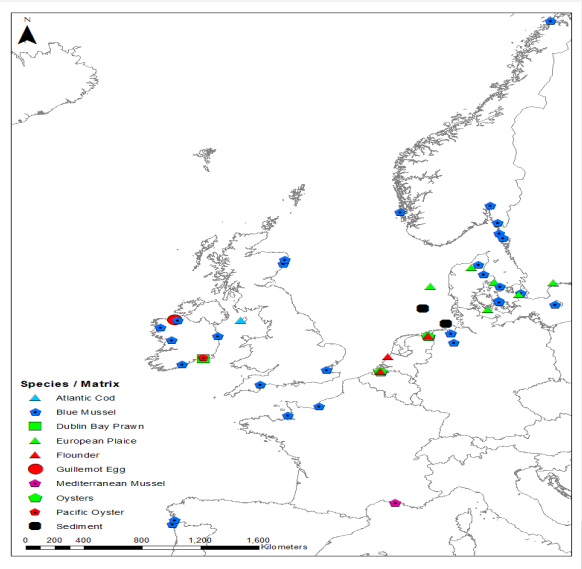


Known unknowns, Unknown unknowns

- Monitoring limitations
  - legacy substances -> message?
  - Risk
  - Matrix -Higher Trophic levels?
- Real-world mixtures
- Cause and effect; subtle.
- Emerging Substances

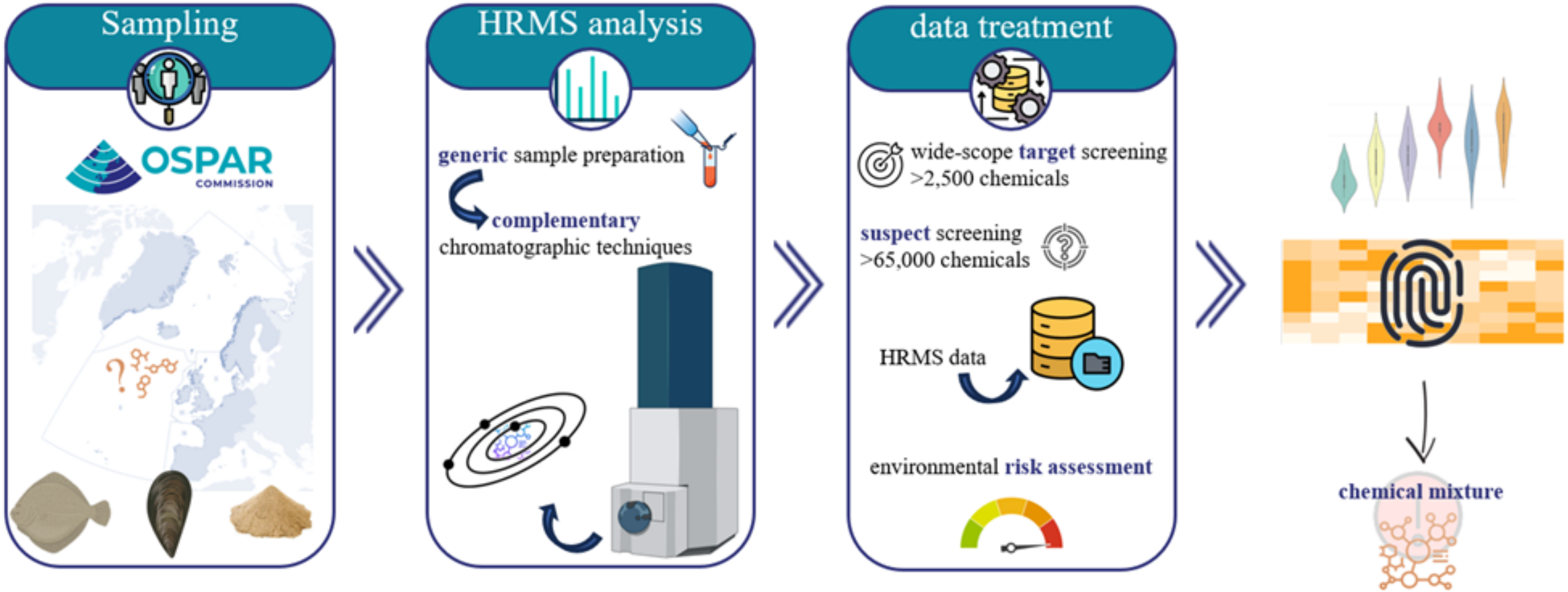
Sampling coverage in CONnECT (#1 and 2)

	CONnECT								CONnECT (2)					
	Blue Mussels	Mediterranean Mussels	Pacific Oyster	European Oysters	Plaice	Flounder	Cod (flesh)	Prawn	Sediment	Roach	Plaice	Common Dab	Blue Mussels	Marine Mammals
United Kingdom	4								2		1		1	
Germany^	4													
Sweden	2													
Norway	4													
Ireland	5		2				1	1	2					2
Denmark	7				6									
Spain	2								2					
France	2	1												
Netherlands				5		3				2				
Belgium												2		
Total	30	1	2	5	6	3	1	1	6	2	1	2	1	2



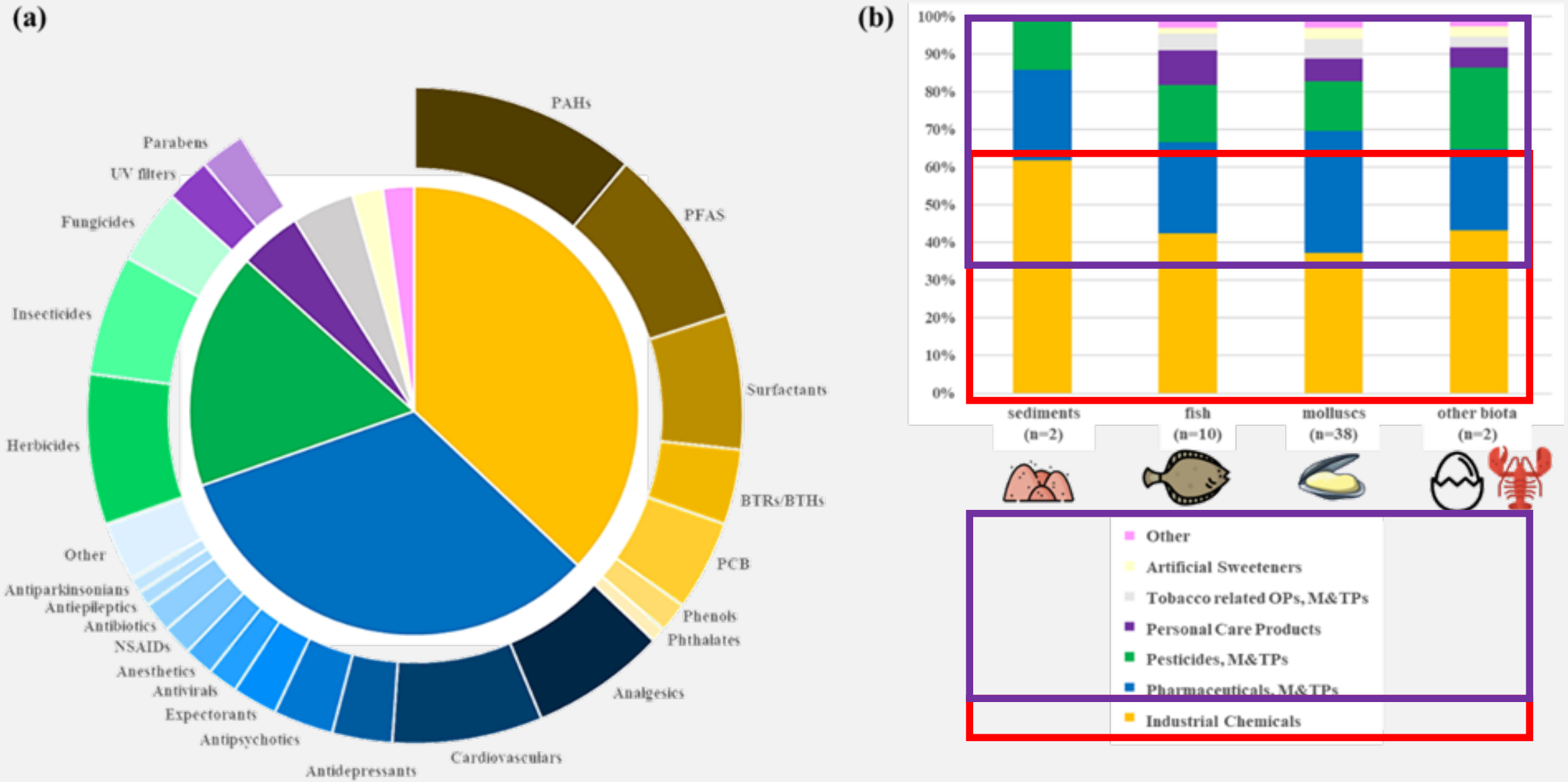
ospar quality-status-reports-connect-study

Wide scope target and untargeted screening for chemicals

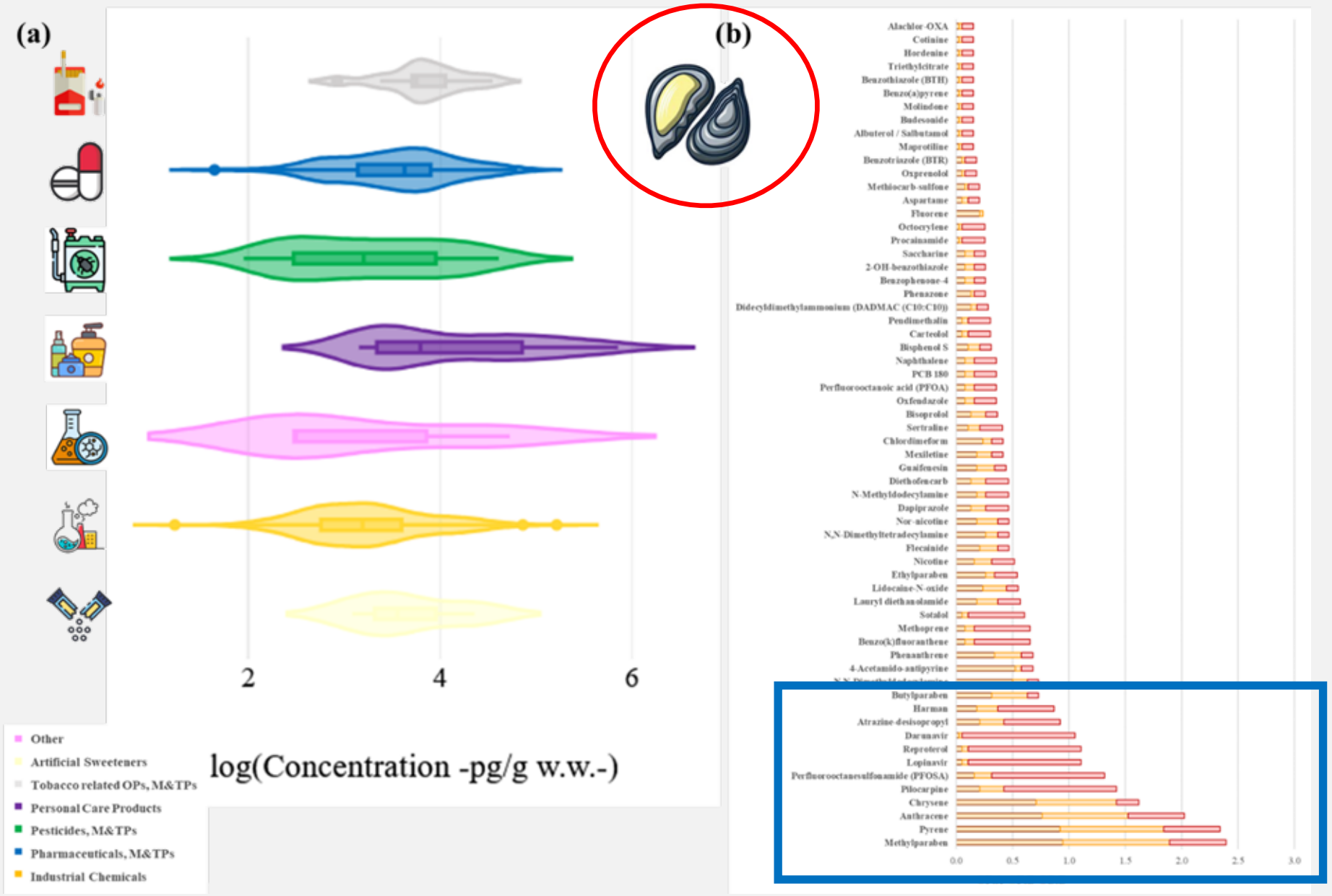


McHugh et al. 2022 : https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/other-assessments/connect-study;
Gkotsis et al 2025: https://doi.org/10.1016/j.jhazmat.2025.138393

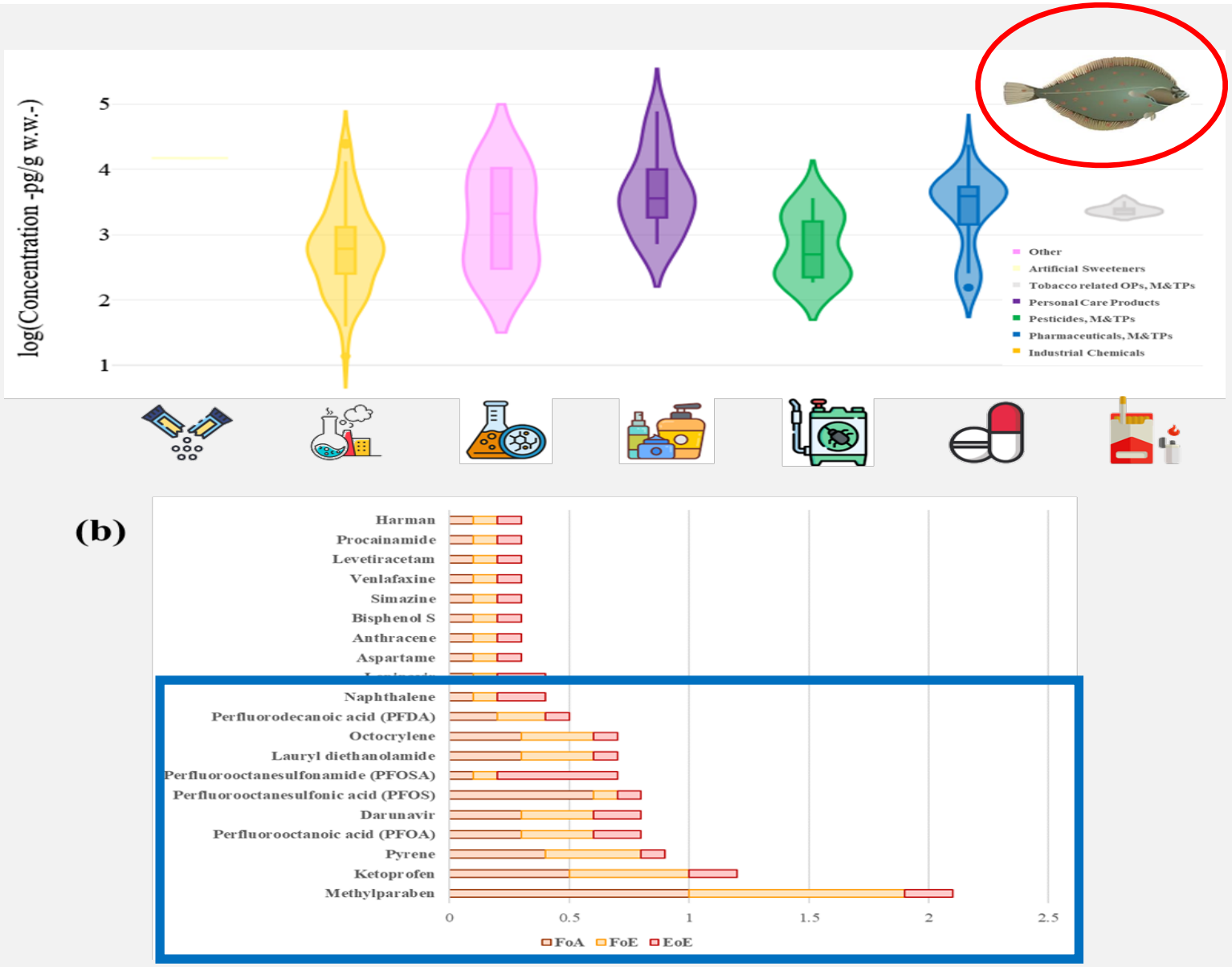
OSPAR COMMISSION
Protecting and conserving the North-East Atlantic and its resources



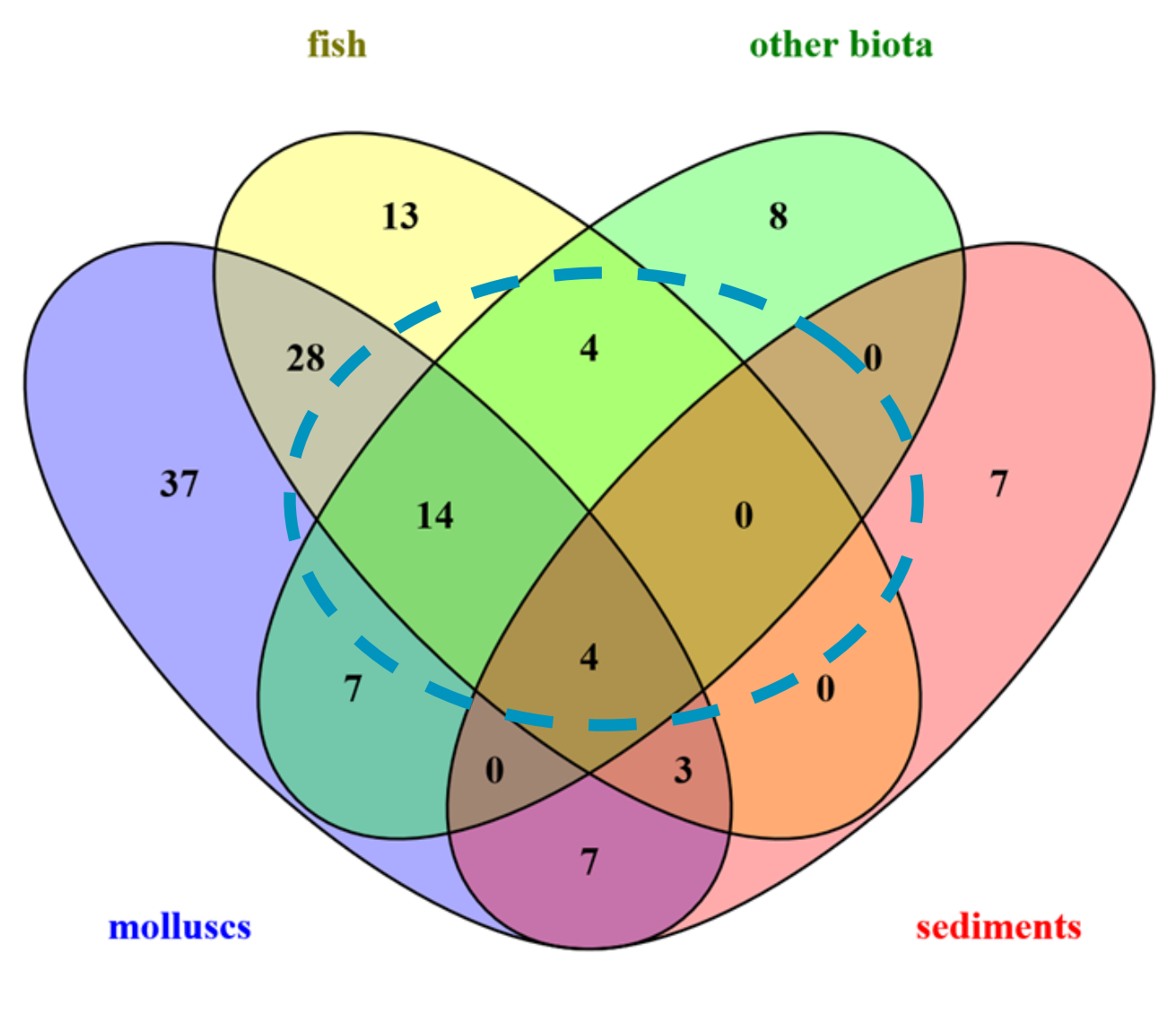
a) Chemical use classes of detected organic pollutants though **wide-scope target screening** based on their main use, application, or regulatory class;
b) distribution of detected OPs in environmental compartments.



(a) Violin plot, median log conc per chemical class in **molluscs** and distribution of concentration values.
(b) contribution of factors to priority score in molluscs > exceeding respective ecotox values.



a) Violin plot median logarithmic concentration per chemical class for OPs detected in fish samples and the distribution of individual concentration values. (b) Bar chart of the contribution of each factor in the priority score for the compounds detected in the fish samples and exceeding



Venn diagram of the 132 detected chemicals through wide-scope target analysis in different analysed marine matrices

Contaminants summary

- Pollutants regulation increasing and thresholds generally decreasing → Marine Risk
- In general *pollutants* are low in Irish waters → Risk based approaches.
- Research very applied → fit monitoring goals *and to support assessments (e.g. screening, imposex, mammals, bird eggs and passive sampling)*.
- *Biology* / bioaccumulation part of assessment .. → challenges.
- Pesticides / related compounds while detected generally low.
- Assessment approaches → Ecosystem indicators and integrated approaches.
- Close *collaboration* with national and international colleagues (e.g. NORMAN), EPA/IFI


THANK YOU
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