MODULE 1 - HARMONIZING METHODOLOGIES AND DATA TO ASSESS AND MITIGATE THE EFFECT OF MULTISTRESSORS

BRIDGE-BS

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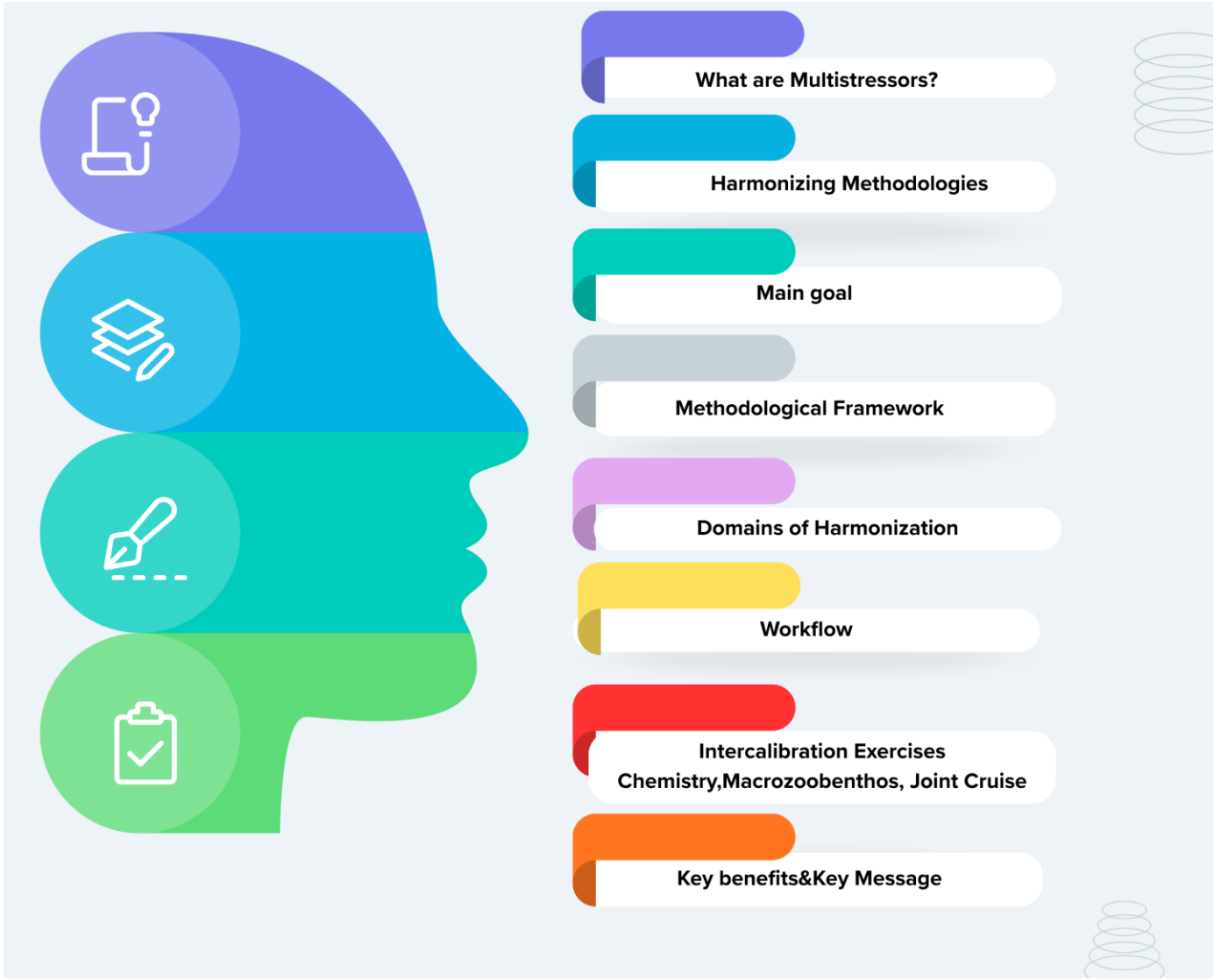
Outline


What are Multistressors?
Harmonizing Methodologies
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Methodological Framework
Domains of Harmonization
Workflow
Intercalibration Exercises
Chemistry,Macrozoobenthos, Joint Cruise
Key benefits&Key Message

What are Multistressors?

Multistressors are **multiple environmental pressures** acting simultaneously on marine ecosystems.
They can **interact**—amplifying or reducing each other's effects.

Examples of Stressors

 *Climate change* – warming, acidification
 *Eutrophication* – nutrient loading, hypoxia
 *Pollution* – plastics, hydrocarbons, heavy metals
 *Overfishing* – trophic imbalance
 *Habitat modification* – dredging, coastal works

Why It Matters

- Enhances **multistressor assessment** and **predictive modeling**
- Supports **evidence-based management** and **Blue Economy** decisions

THE BLACK SEA

multi-stressors

overfishing

eutrophication

climate change

acidification

CO_2

noise pollution

sea snot

chemical pollution

industry

tourism

agriculture

urbanization

maritime transport

sea and land-based activities

deoxygenation

O_2

1990 excessive increase in 2024

human-induced pressures

physical, chemical and biological changes in the marine ecosystem

invasive species

marine litter

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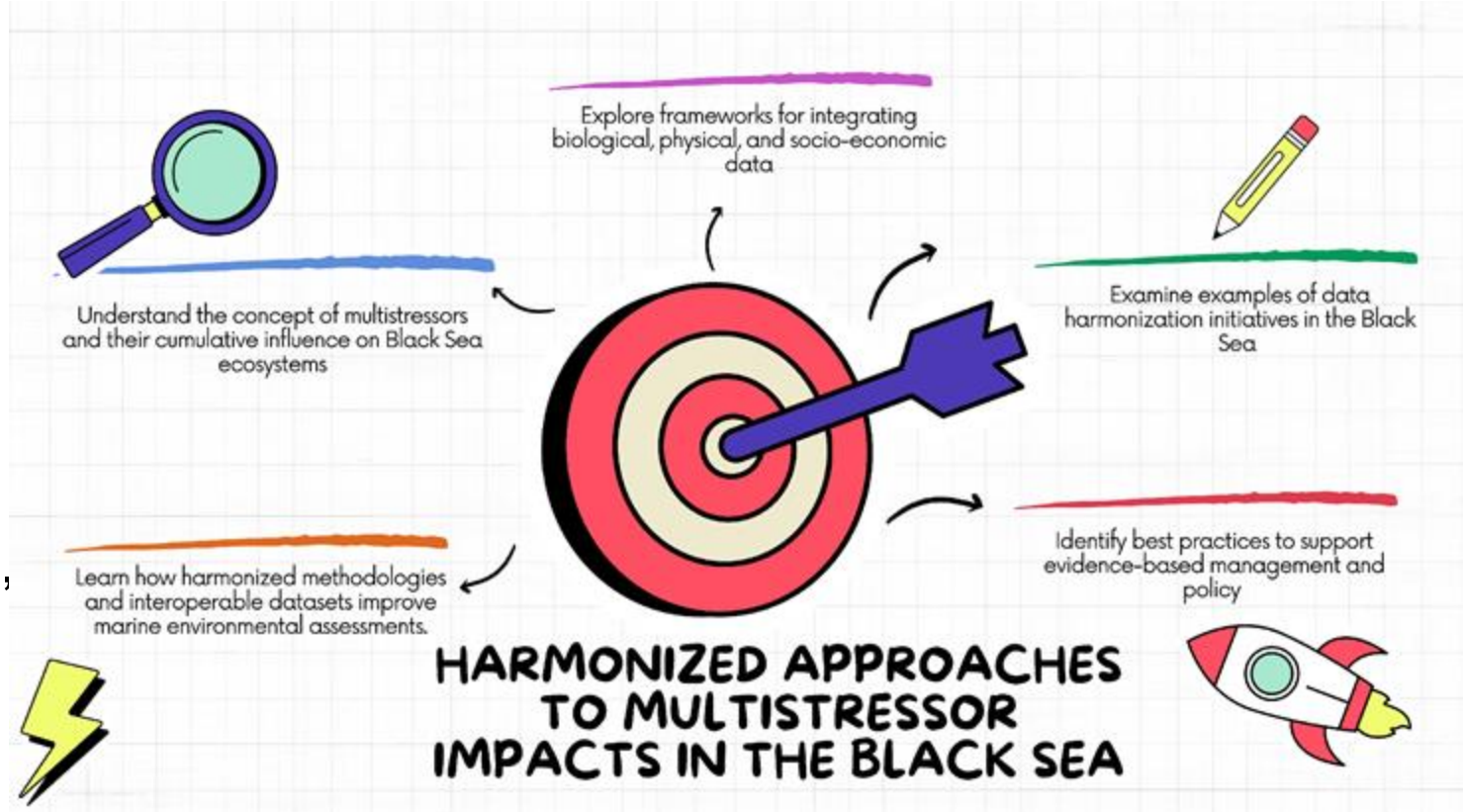
Harmonizing Methodologies and Data to Assess and Mitigate the Effect of Multistressors

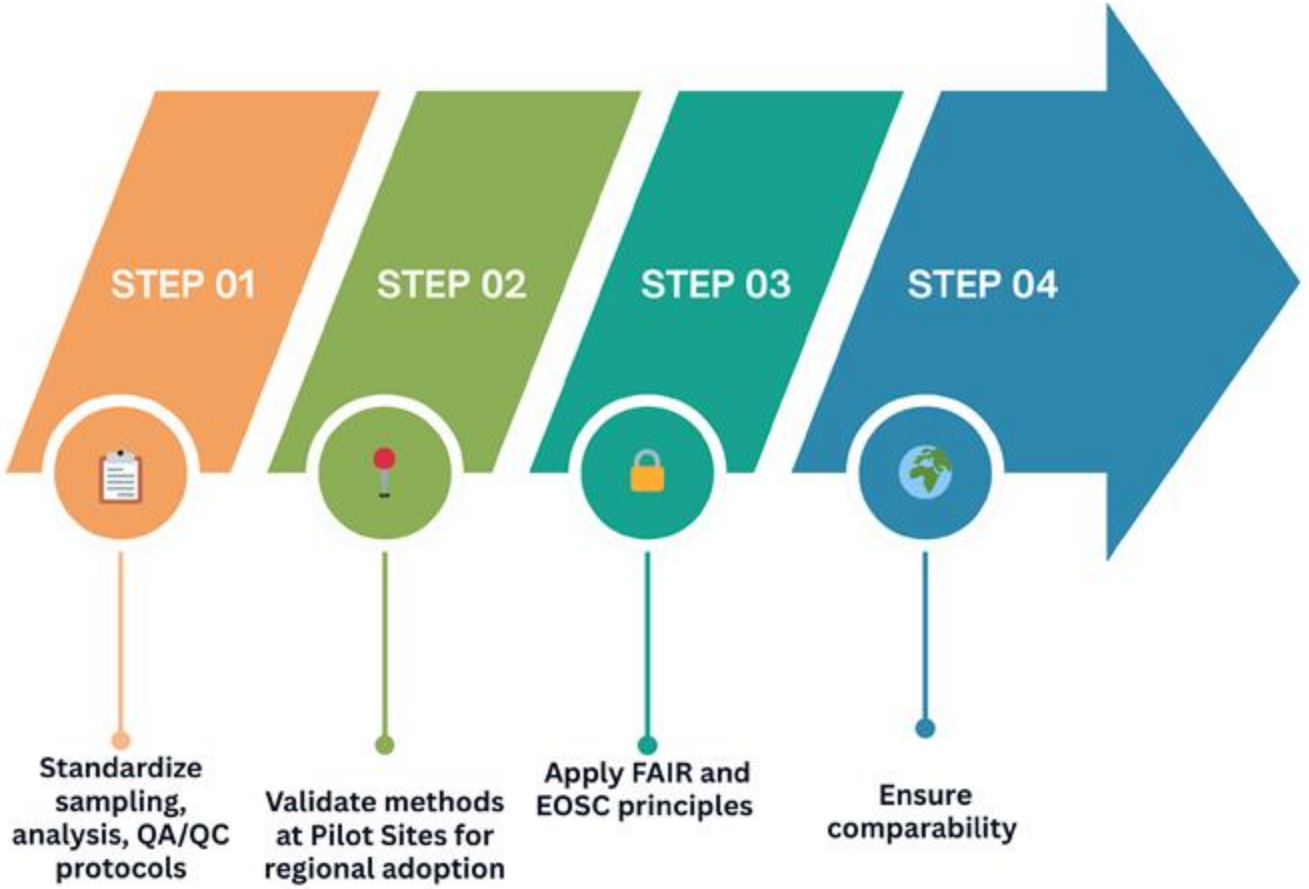
The Black Sea is under pressure from eutrophication, pollution, overfishing, and climate change.

- Effective management requires comparable, high-quality data across all coastal states.
- Harmonisation ensures consistency, reliability, and interoperability of monitoring results.
- Supports ecosystem-based management and adaptive responses to multistressor impacts.



Introduction

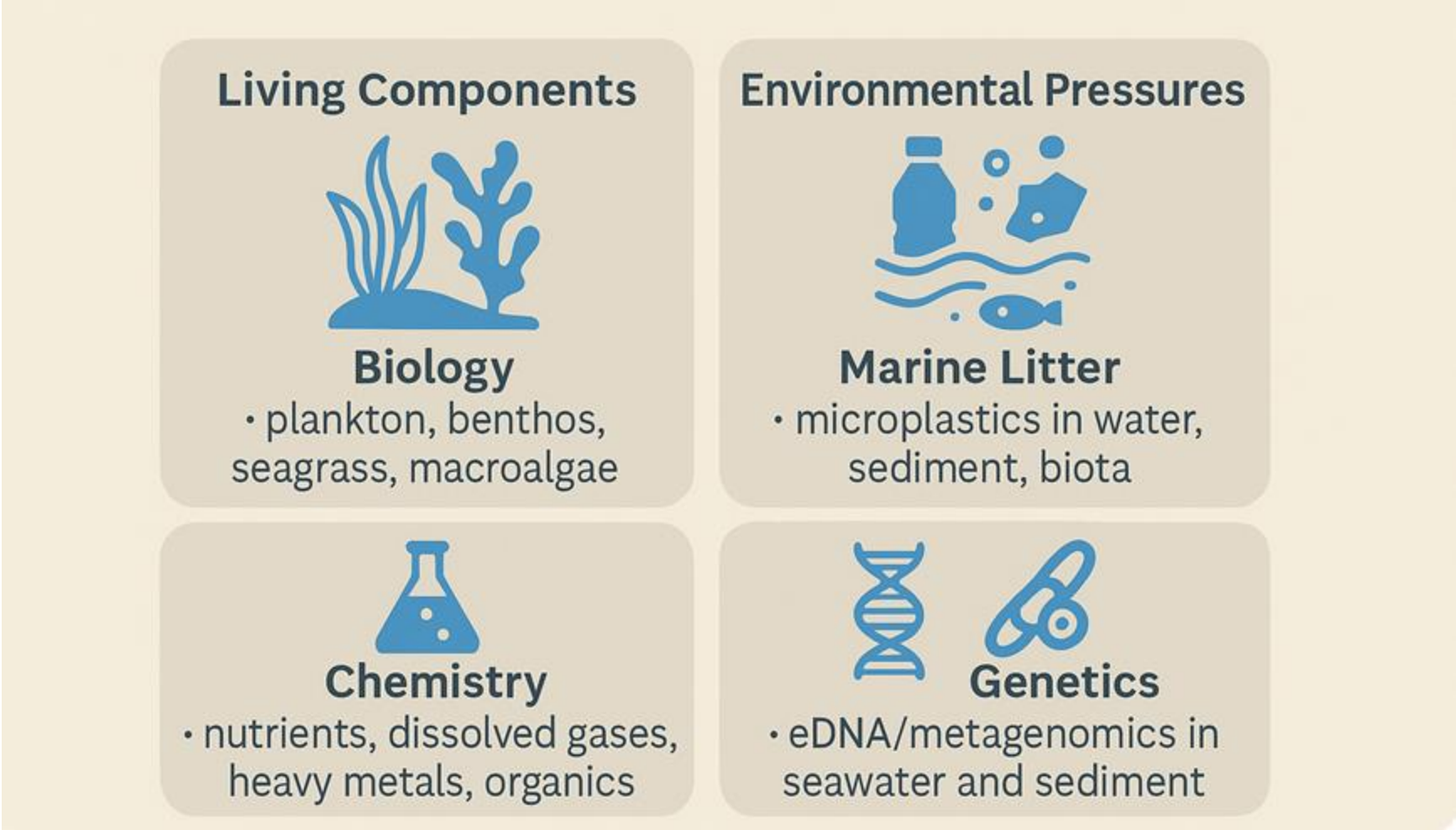
Main goal: Harmonize methodologies and data to assess and mitigate the effects of multistressors.



Methodological Framework

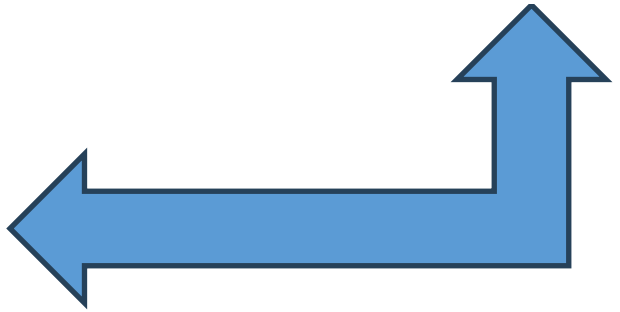
Domains of Harmonization

- Biology
- Chemistry
- Marine Litter
- Genetics



Workflow

- Improved analytical precision.
- Identified calibration/reagent weaknesses.
- Strengthened collaboration and data quality.



Intercalibration Exercises

1. **Chemistry Intercalibration** (QUASIMEME)
Contributors: Romania, Bulgaria, Turkey, Georgia, Ukraine
→ Improved data quality and method harmonisation

2. **Macrozoobenthos** QA Audit (APEM Ltd.)
Partners: Romania, Georgia, Bulgaria
→ Enhanced consistency; minor taxonomic challenges

3. **Cruise Intercomparison** (Bosphorus, July 2024)
Vessels: R/V Bilim-2 & R/V Alemdar II
→ High agreement at depth; minor surface differences

Chemistry Intercalibration Exercise

Parameters Tested

- Nutrients (N, P, Si)
- Chlorophyll & Pheopigments
- Trace Metals & PAHs (sediments)
- DOC & Ocean Acidification

Process

- Reference laboratory: WEPAL–QUASIMEME
- Samples sent April 2023 → results evaluated July 2023

Key Outcomes

- Improved **data quality & consistency**
- Identified **calibration and reagent issues**
- Strengthened **regional collaboration**
- Supported **harmonization & multistressor assessment**

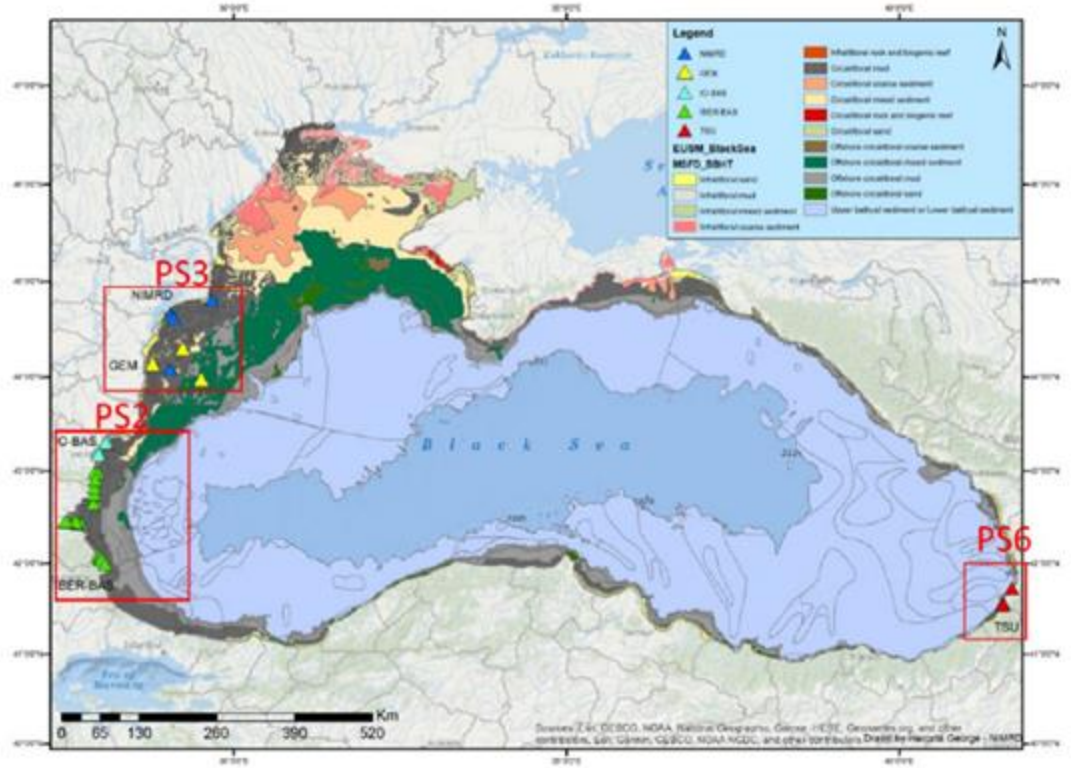
Macrozoobenthos Intercalibration Exercises

To ensure **consistency and reliability in macrozoobenthos** identification and analysis across Black Sea laboratories.

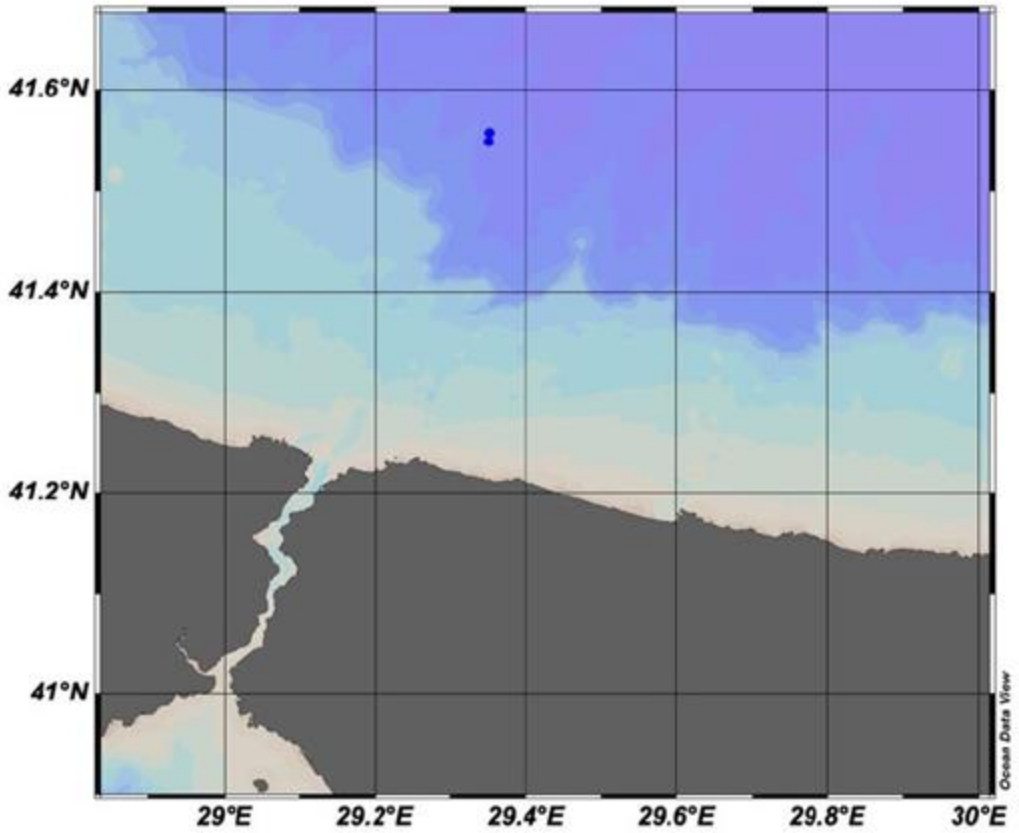
An interlaboratory quality assurance (QA) exercise was conducted in collaboration with **NMBAQCS/APEM Ltd.**, using the **'Own Sample Module' (OSM)** for external audit.

Key Outcomes

Enhanced taxonomic harmonization among partners.
Addressed key identification challenges.
Improved data comparability across Black Sea benthic zones.



Joint Cruise – July 2024 (R/V Bilim-2 & R/V Alemdar II)



Parameters Tested

- Temperature
- Salinity
- Dissolved Oxygen (DO)
- Chlorophyll-a (Chl-a)
- Fluorescence
- Photosynthetically Active Radiation (PAR)

Key Outcomes

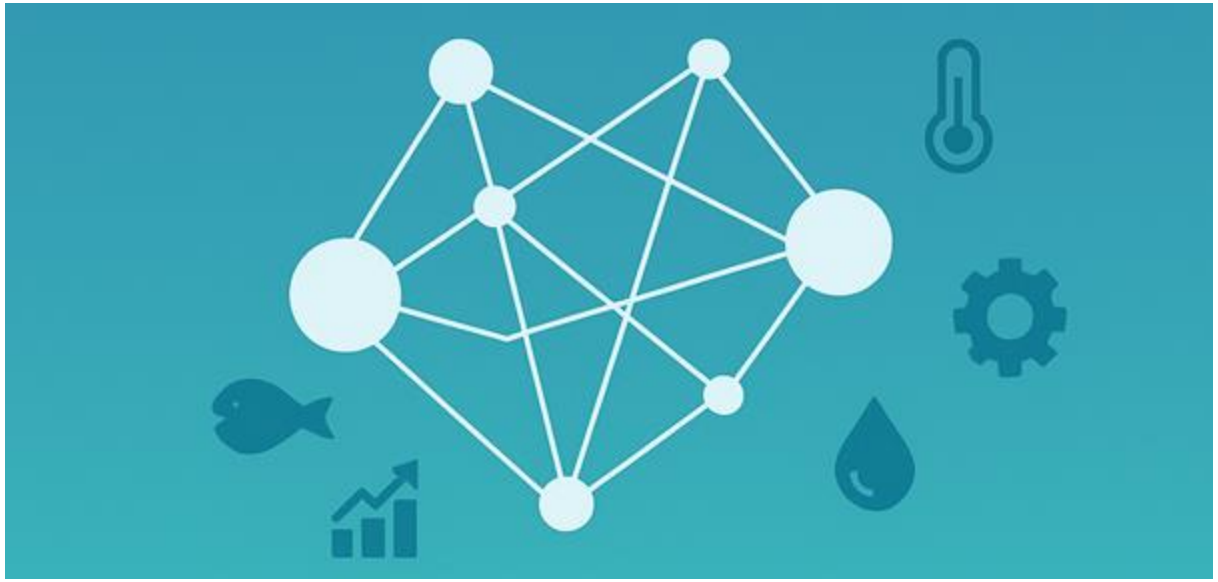
- **Strong agreement** across depth layers, confirming high instrument reliability.
- **Small differences** near the surface likely reflect variations in sampling or calibration

Key benefits

- **Enhanced data reliability and comparability** → improves interlaboratory and long-term monitoring consistency.
- **Strengthened regional cooperation** → supports shared marine governance in the Black Sea.
- **Improved multistressor assessment and predictive modeling** → enhances understanding of cumulative impacts.
- **Supports evidence-based management** and Blue Economy decisions → ensures sustainability and policy alignment.

Key Message: Towards a Sustainable and Resilient Black Sea

- Harmonized monitoring and data management are essential to understand and mitigate the combined effects of multiple stressors on the Black Sea ecosystem, supporting sustainable blue growth and informed policy decisions.



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