DTO-BioFlow
Integration of biodiversity monitoring data into the Digital Twin Ocean

Institute of Oceanology – Bulgarian Academy of Sciences, Varna, Bulgaria

DTO-BioFlow Data Grant Holders Workshop, Paris, France, 3-5 June 2025

Harmonizing Bulgarian Black Sea Zooplankton Data in EMODnet: A Step Toward Open Science

ZOOPLANKTON MONITORING IN THE BULGARIAN BLACK SEA COAST (2012–2021)

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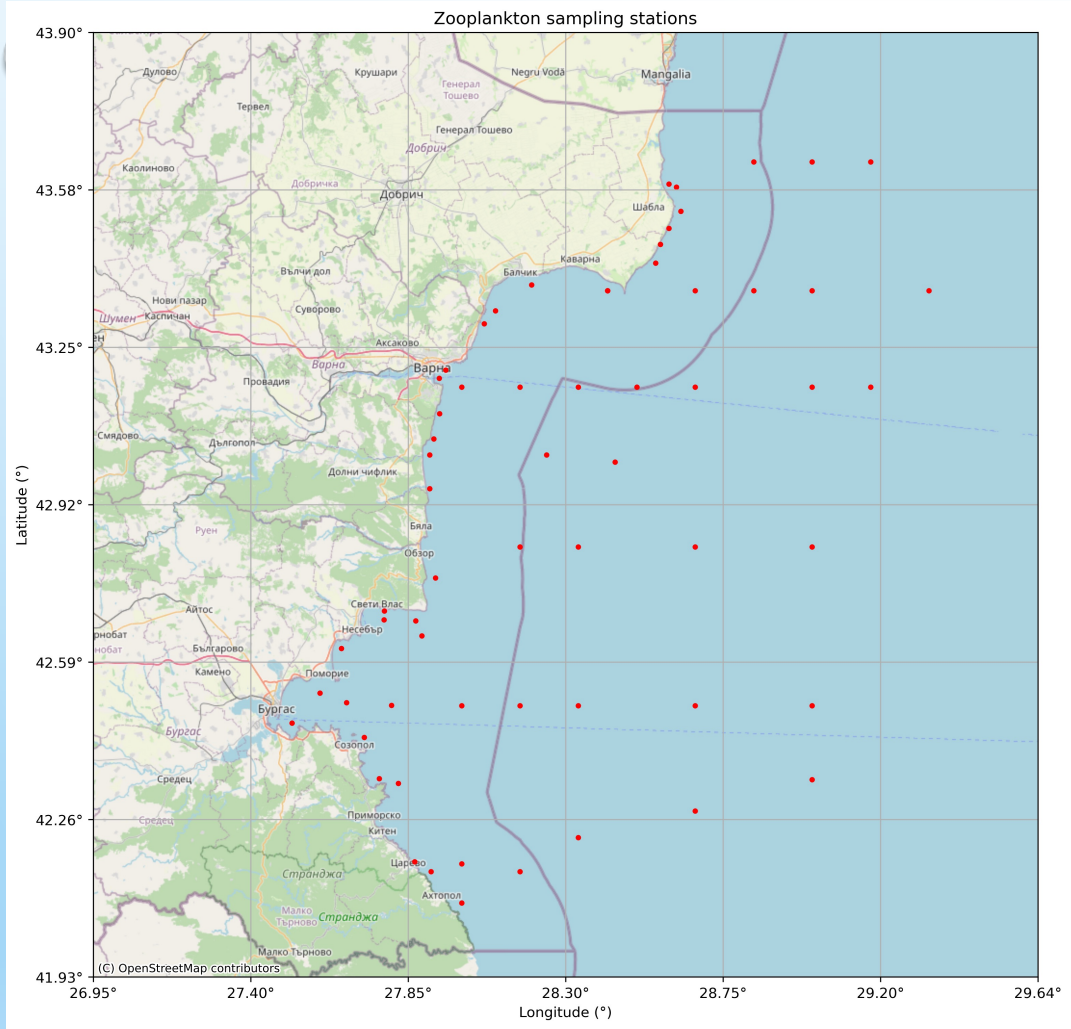
GOAL

- to unlock 10-years (2012-2021) of zooplankton data, adopting FAIR principles and sharing them as open data;
- to establish sustained zooplankton data pipelines, ensuring long-term integration into the Digital Twin Ocean (DTO) and global ocean observing frameworks;

Main objectives

- Switch and unify available zooplankton data to specific EMODNET format
- Develop skills to correctly format biological data to required formats and gain knowledge on the quality control steps
- Provide public access to search and download data, metadata and data products of zooplankton species occurring in Black Sea coastal and marine waters, taking into account the FAIR principles
- Create specific biological data products to illustrate the temporal and geographic variability of occurrences and abundances of zooplankton species, with a priority to develop those required for support policy, management and planning
- Filling important identified gaps in the biodiversity data coverage

STUDY AREA



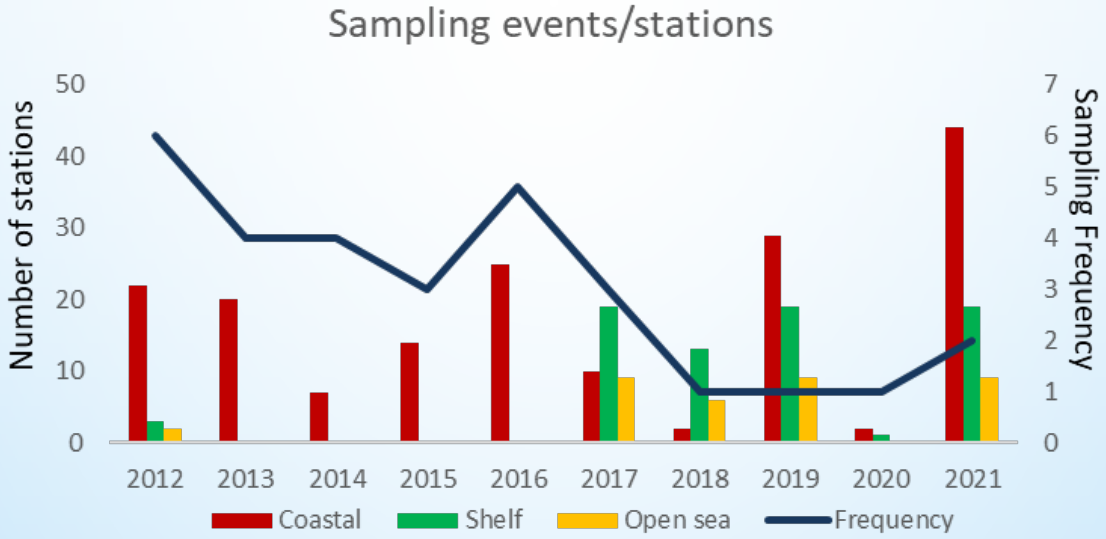
MAP OF THE ZOOPLANKTON SAMPLING

Assessment Areas

- ❑ Coastal
- ❑ Shelf
- ❑ Open sea

MRU	MRU CODE	MRU AREA [km^2]
(BLK-BG-AA) Coastal	BLK-BG-AA- SiviriburunKaliakra	157
	BLK-BG-AA-KaliakraGalata	821
	BLK-BG-AA- GalataEmine	698
	BLK-BG-AA- EmineMaslenNos	857
	BLK-BG-AA- MaslenNosRezovo	153
(BLK-BG-AA) Shelf	BLK-BG-AA- Shelf	9933
(BLK-BG-AA) Beyond Shelf	BLK-BG-AA- Open Sea	22982

DATA OVERVIEW

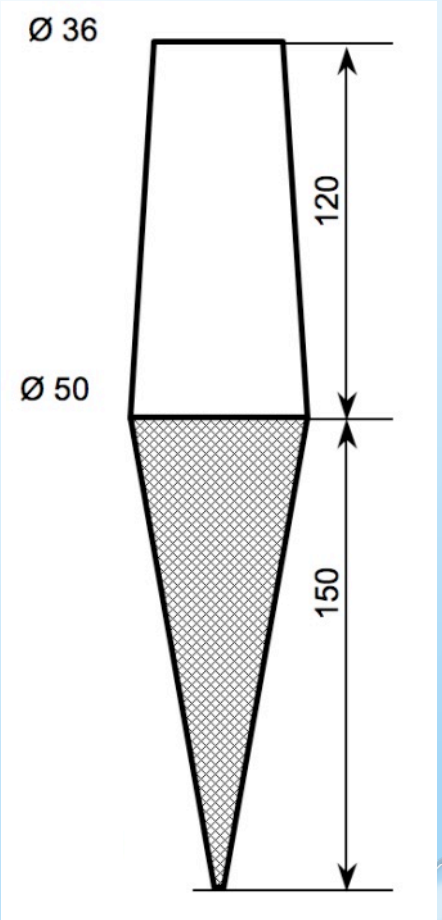


- TIME SPAN: 2012–2021
- SAMPLING FREQUENCY – IRREGULAR
- DATA SOURCE – NATIONAL MONITORING (AGREEMENTS WITH MINISTRY OF ENVIRONMENT AND WATERS)
- NUMBER OF SAMPLING EVENTS / STATIONS – OVERALL 30 EVENTS AND 74 STATIONS

SAMPLING METHODOLOGY

- JUDAY PLANKTON CLOSING NET (36 CM DIAMETER,150 UM MESH SIZE)
- VERTICAL HAULS – DISCRETE LAYERS (UPPER MIXED LAYER, THERMOCLINE, FROM THE BOTTOM OR FROM THE OXIC/ANOXIC BOUNDARY TO THE LOWER BOUNDARY OF THE THERMOCLINE), NET IS EQUIPPED WITH A RELEASER
- SPEED NOT EXCEEDING 1 M/S (UNESCO,1968)
- SAMPLES ARE PRESERVED IN 4% SEAWATER FORMALIN SOLUTION BUFFERED WITH SODIUM BORATE (BORAX)

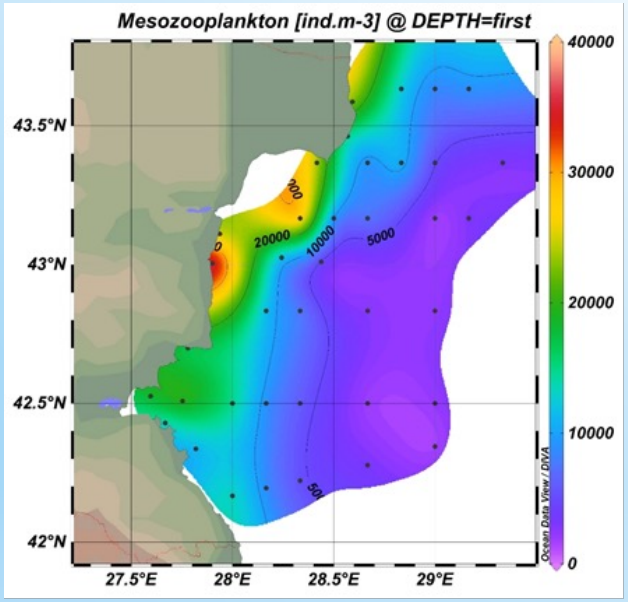
The Black Sea Monitoring Guidelines for mesozooplankton (Alexandrov et al., 2020) provide a comprehensive methodology for field and laboratory procedure, Dimov 1959.



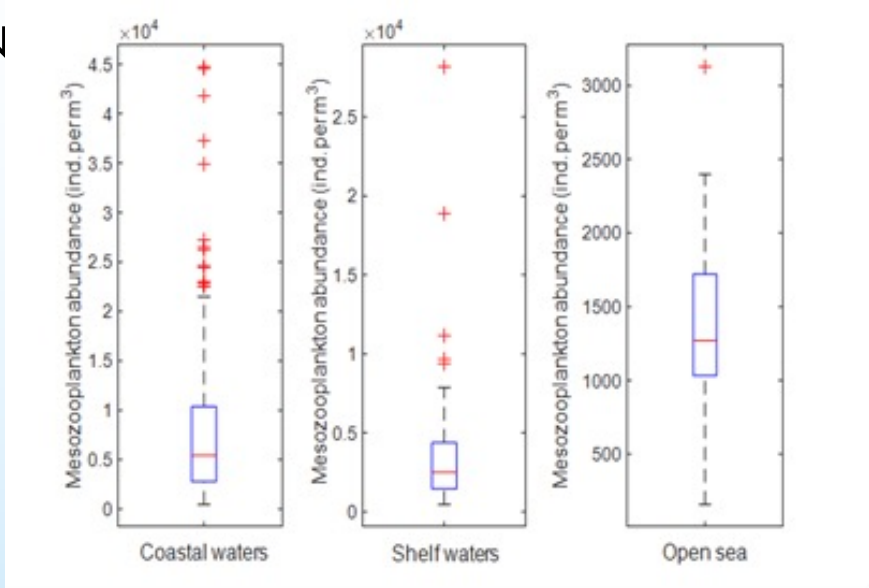
Juday plankton net

DATA HIGHLIGHTS

- NUMBER OF TAXA OBSERVED
- DOMINANT SPECIES/TAXA DISTRIBUTION
- SEASONAL/INTERANNUAL TRENDS
- ECOLOGICAL FINDINGS



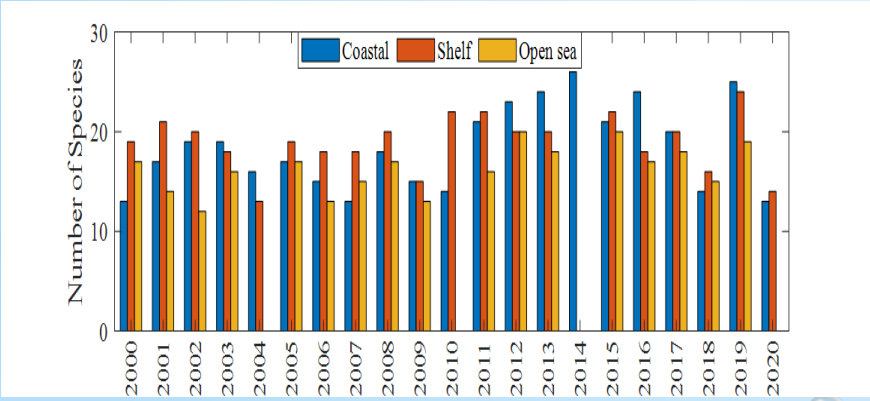
Mesozooplankton abundance spatial distribution



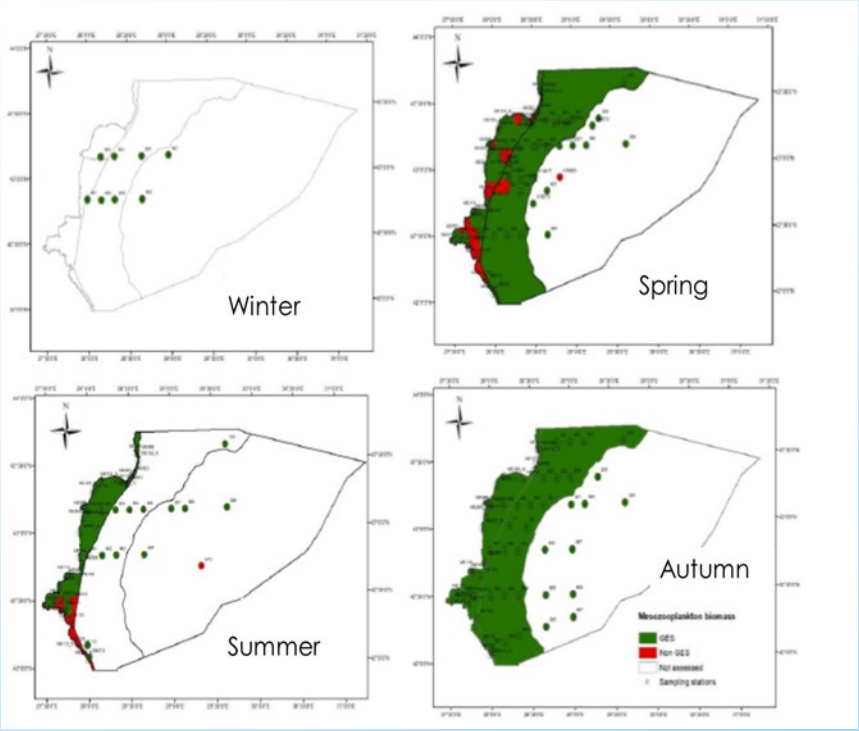
Box-plot of mesozooplankton abundance by sites grouping to coastal, shelf waters and open sea

USE CASES

- SUPPORT FOR MSFD
- BIODIVERSITY ASSESSMENTS
- ECOSYSTEM-BASED MANAGEMENT
- CLIMATE CHANGE STUDIES



Number of mesozooplankton species



GES in regard to zooplankton indicator (mesozooplankton biomass- $mg.m^{-3}$)

CHALLENGES & LESSONS LEARNED

- SAMPLING LIMITATIONS
- DATA QUALITY ISSUES
- METADATA HARMONIZATION CHALLENGES

QUESTIONS

- IS IT POSSIBLE TO ADD ADDITIONAL CODES TO THE DICTIONARIES REGARDING SAMPLING TOOLS?

THANK YOU FOR THE ATTENTION!