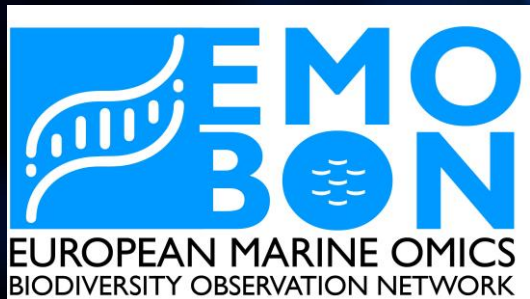




EMBRC
EUROPEAN
MARINE
BIOLOGICAL
RESOURCE
CENTRE

Towards an extended biological and oceanographic observatory for marine ecosystem monitoring

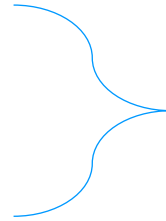
June 2022



Biodiversity Observatory – why?



- Ecosystem Health
- Ongoing Biodiversity Crisis



reverse the damage
restore and protect?

Biodiversa strategy
Green Deal
Biodiversity Strategy
UN Decade of Ocean Science
for Sustainable Development



Biological data lag physical & chemical observation data

- Science ↔ Data
- Remote access through datasets
- New EMBRC direction → observation

other fields supported

Biodiversity research Bioprospecting
Environmental change Biotechnology
Climate change Invasive species
Microbiome



European Marine Omics Biodiversity Observation Network

first coordinated long-term marine genomic biodiversity observatory in Europe

▶ Build the European community

- Frequent baseline genomic biodiversity data
- High data and metadata standards
- Follow all national and international regulations

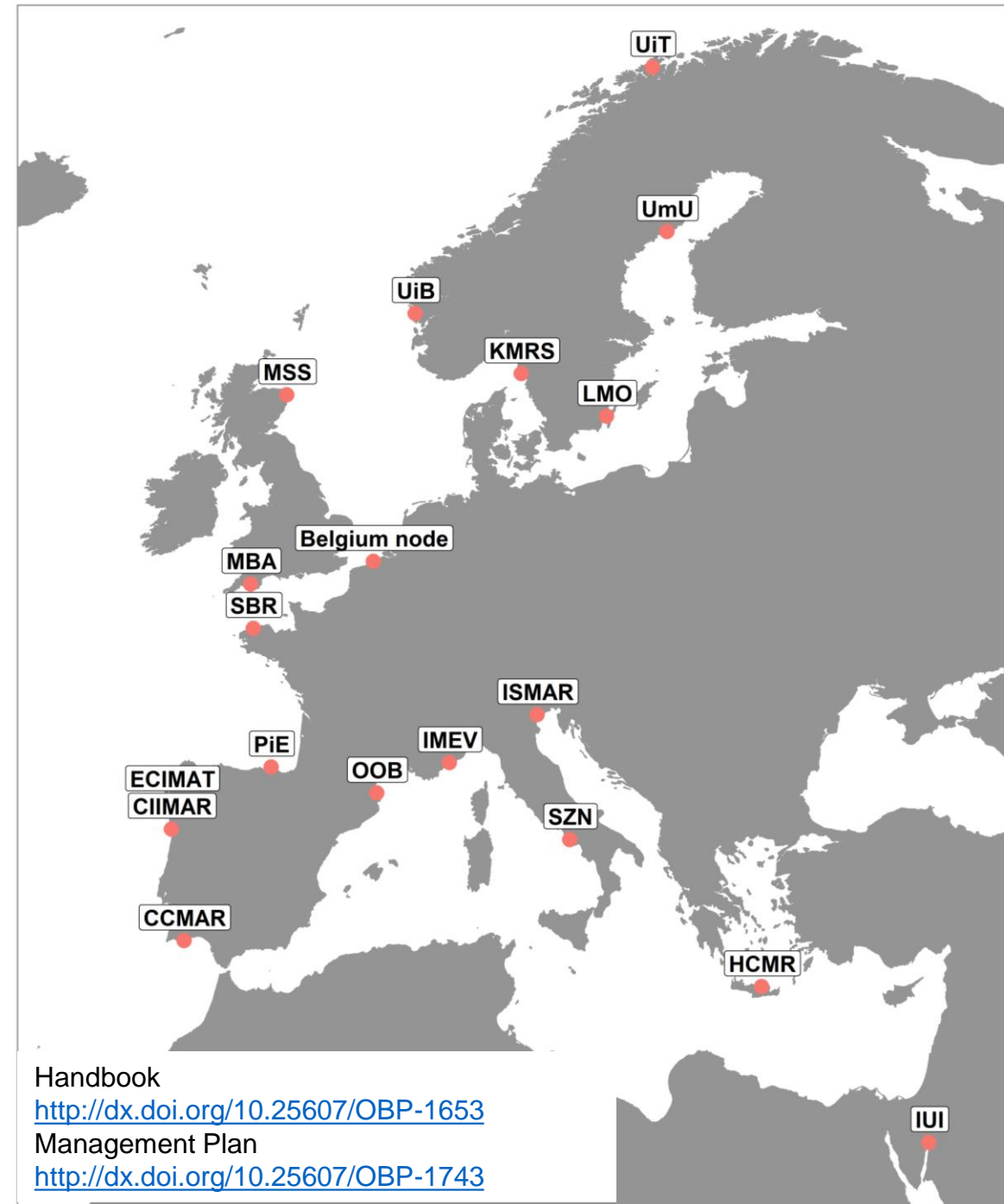
▶ Contribute to the global community

- International networks (Group on Earth Observation BON, Genomics Standards Consortium, Global Omics Observatory Network)
- Data available to the global community
- Set an example to copy and follow → become the catalyst

EMO BON Overview

the first centrally-coordinated long-term marine genomic biodiversity observatory in Europe

- 19 coastal observatory stations
- Shared protocols
- Regular sampling campaigns
- 3 habitats
 - water column
 - soft sediments
 - hard substrates
- Rich metadata (who, where, when)
- Complementary measurements (EOVs)
 - Temperature, salinity, chlorophyll-a, sediment pH, sediment Eh



EMO BON - in detail

Water Column



- ▶ Bimonthly sampling
- ▶ Microbial community
- ▶ 3-200 & 0.2-3 μm size fractions
- ▶ Metagenomics

Soft Substrates



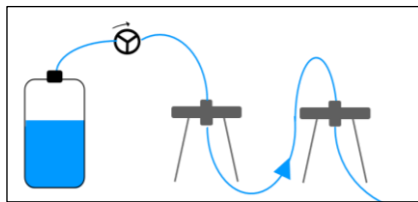
- ▶ **Microbial community**
 - Bimonthly sampling
 - Metagenomics
- ▶ **Meio- & macro-benthos**
 - 2-3 samplings a year
 - COI & 18S metabarcoding

Hard Substrates



- ▶ Passive sampling using Autonomous Reef Monitoring Structures (ARMS) units
- ▶ Long term (12-month deployment)
- ▶ Sessile and motile organisms
- ▶ *COI & 18S* metabarcoding

Sample processing



Biobanking

Centralized DNA extraction & sequencing

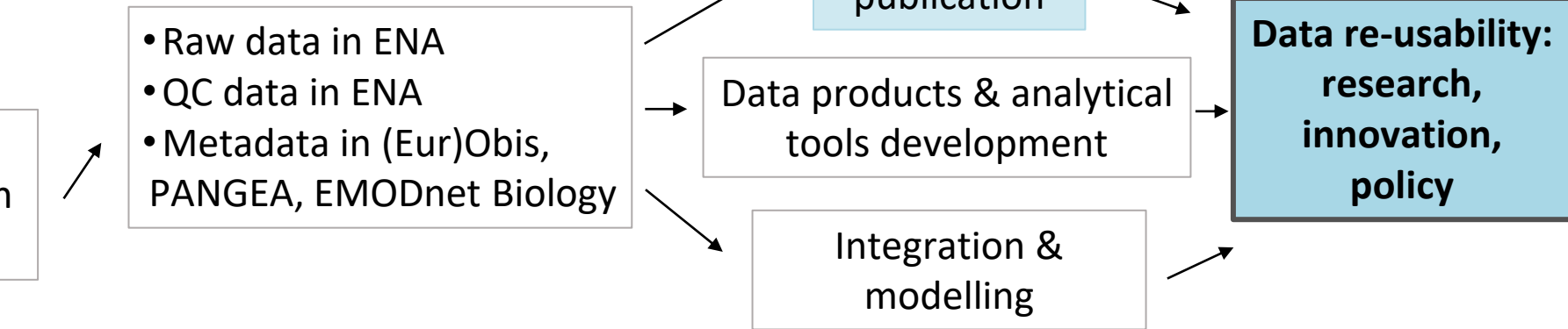
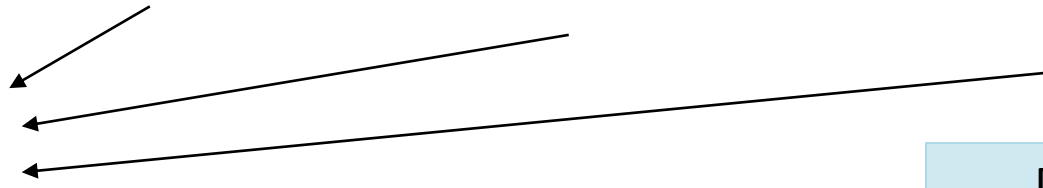
- Raw data in ENA
- QC data in ENA
- Metadata in (Eur)Obis, PANGEA, EMODnet Biology

Data publication

Data products & analytical tools development

Integration & modelling

**Data re-usability:
research,
innovation,
policy**



EMO BON ongoing & future work



Development of an effective and semi-automated system for the management of EMO BON data & (meta)data

- ▶ timely release of (meta)data
- ▶ adherence to FAIR principles

Development of a workflow for marine metagenomic observatory data analysis (EOSC-Life)

- ▶ taxonomic & functional profile per sample
- ▶ analyzed data in Mgnify (EMBL-EBI)

Participation in EU projects

- ▶ data usage & applications

Building a traceability system for samples & data

- ▶ track all samples & their data at any time

Ocean Decade Project proposal under Program OBON (Ocean Biomolecular Observing Network)

- ▶ EMO BON to be endorsed as an Ocean Decade Action

An ocean EXTENDED observatory



Development of an effective and semi-automated system for in situ IMAGING

- ▶ UVP6
- ▶ improved systems

BIOBANKING

- ▶ Reusability of the sample for different purposes or when availability of better techniques
- ▶ Time-series availability

Ocean MODELLING

- ▶ Contextualization
- ▶ Ecological integration
- ▶ Evolutionary integration
- ▶ Scenarios for ecological shifts

REMOTE SENSING

- ▶ Contextualization
- ▶ Validation
- ▶ Further development for coastal waters applications

Integration with EU initiatives

- ▶ Digital Twin Ocean; ESA Biodiversity precursors; LTER sites

EMO BON with Remote Sensing and Modelling



Contribution to an effective and semi-automated system for the management of coastal waters:

- ▶ Invasive species detection and forecast
- ▶ HABs detection and forecast
- ▶ Ecological shifts forecast
- ▶ Microbiome health index of the ocean
- ▶ Microbiome functional patterns in the ocean

Starting EU projects for interaction:

- ▶ BiOcean5D
- ▶ Marco-Bolo

Some modeling tools to exploit:

- ▶ ROMS
- ▶ Lagrangean diagnostics & history of water masses
- ▶ Dispersal patterns
- ▶ SDM & HSM

Some RS tools to exploit:

- ▶ Phytoplankton functional types
- ▶ Optical water classes
- ▶ Other ocean color derived products

EMO BON Integration opportunities discussion



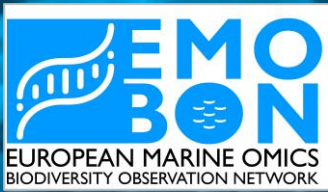
Assimilated data

Cross validation systems

Long term monitoring

Alert systems

Ecological shifts forecast



Thank you!

EMO BON Operational Committee

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