BEeS

The LifeWatch ERIC Biodiversity & Ecosystem eScience Conference

Seville
22-24/05/23

Threats and challenges to biodiversity and ecosystem conservation from an eScience perspective

LifeWatch ERIC

GOBIERNO DE ESPAÑA · MINISTERIO DE CIENCIA E INNOVACIÓN

UNIÓN EUROPEA
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ANERIS

Towards a network of Operational Marine Biology: the ANERIS project

Jaume Piera (ICM-CSIC)

ANERIS *operAtional seNsing lifE technologies for maRIne ecosystemS*

CALL:

HORIZON-INFRA-2022-TECH-01 "*Next generation of scientific instrumentation, tools and methods*".

MAIN EXPECTED OUTCOME:

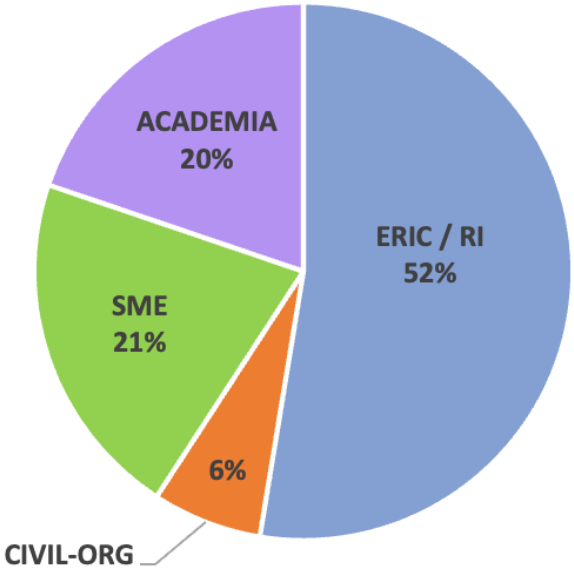
- **Innovative scientific instrumentation, tools and methods**, which **advance the state-of-art of European lead research infrastructures (RIs)**.
- **To lead RIs to support new areas of research and/or a wider community of users**, including industrial users.
- Enhance the potential of RIs to **contribute addressing EU policy objectives and socio-economic challenges**.

ANERIS *operAtional seNsing lifE technologies for maRIne ecosystemS*

https://www.aneris.eu/

26 partners

10 M€



LifeWatch ERIC

EMBRC EUROPEAN MARINE BIOLOGICAL RESOURCE CENTRE

emso ERIC EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM

EGI FOUNDATION

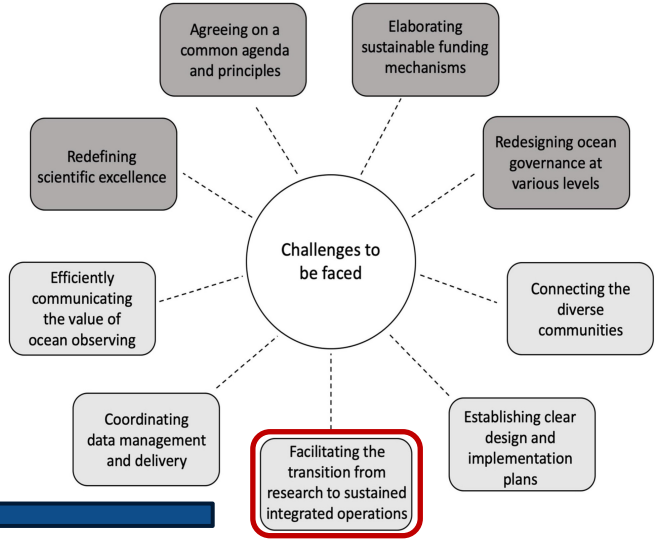
EURO BIOIMAGING

MAIN CHALLENGE: There are several **information gaps** (temporal, spatial and taxonomical) for **Marine Sensing Life-Technologies**

*Révelard et al. (2022) "Ocean Integration: The Needs and Challenges of **Effective Coordination Within the Ocean Observing System**"*

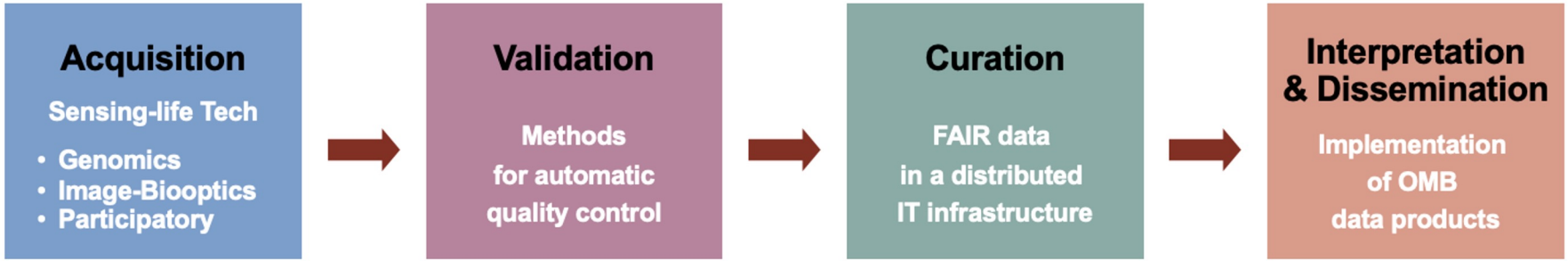
*Facilitating the transition from research to **sustained integrated operations***

Challenges of Effective Coordination Within the Ocean Observing System



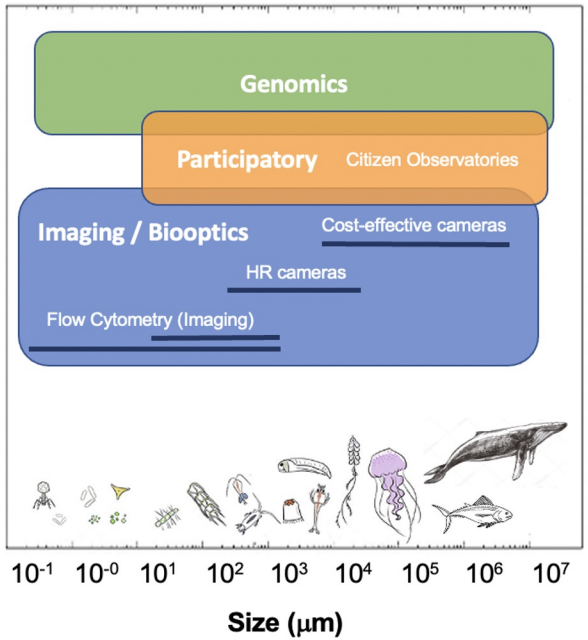
MAIN CHALLENGE: There are several **information gaps** (temporal, spatial and taxonomical) for **Marine Sensing Life-Technologies**

MAIN GOAL: we plan to implement in ANERIS the concept of **Operational Marine Biology (OMB)**: *Towards **systematic and long-term routine measurements of the ocean and coastal life**, and their rapid interpretation and dissemination*

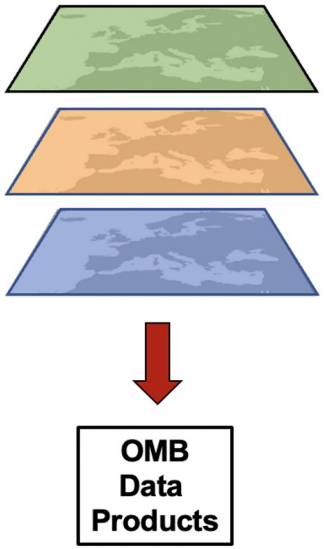


ANERIS: OMB Data products

ANERIS Sensing technologies

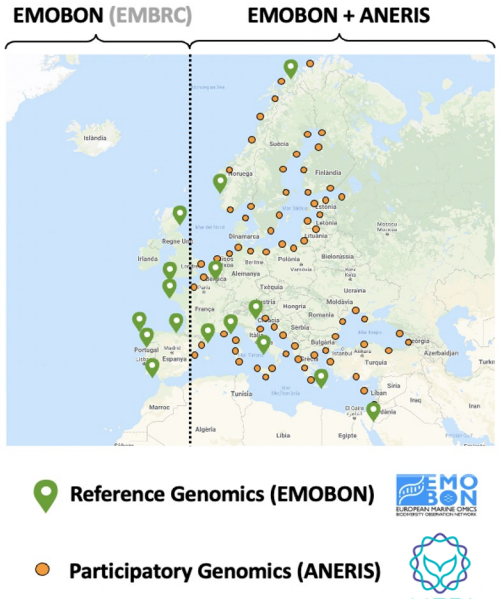


OMB data production



Example of application

Improving spatial resolution



ANERIS Technologies

1. **NANOMICS** NAnopore sequeNcing for Operational Marine genomICS
2. **MARGENODAT** workflows for the MARine GENOmics DAta managemenT
3. **SLIM-2.0** A Virtual Environment for genomic data analysis (*ANERIS extended version*)
4. **EMUAS** Expandable Multi-imaging Underwater Acquisition System
5. **AIES-ZOO** Automatic Information Extraction System for ZOOplankton images
6. **AIES-PHY** Automatic Information Extraction System for PHYtoplankton images
7. **ATIRES** Automatic underwaTer Image REstoration System
8. **AIES-MAC** Automatic Information Extraction System for MACroorganisms
9. **AMAMER** Advanced Multiplatform App for Marine lifE Reporting
10. **AWIMAR** Adaptive Web Interfaces for MARine life reporting, sharing and consulting
11. **AMOVALIH** Advanced Marine Observations VALidation-Identification system based on Hybrid intelligence

Integration of different technologies in the data pipelines

ATIRES.Denoising & Colour correction

AIES-BEN. Regions of interest (ROI) Indetification

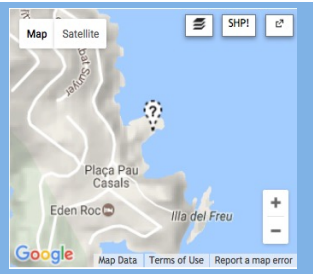
Citizen Observatory

Images are uploaded as separate (but related) observations to be validated with **AMOVALIH**

AMOVALIH (I) Collaborative identification and validation systems

New observation

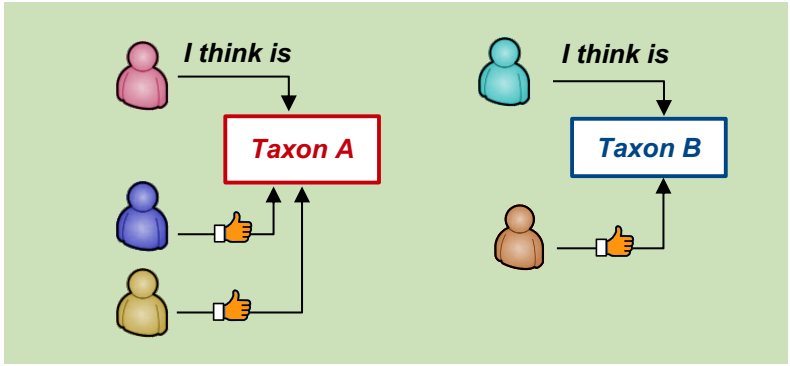
?

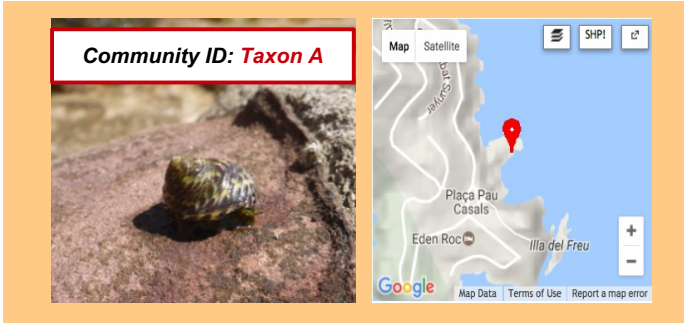


Users may require the community support to help in identifying unknown observations

ID Please !

Collaborative identification





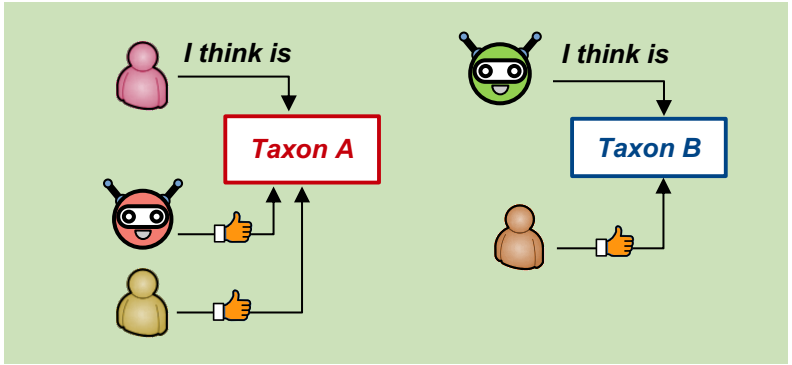
Community ID

Updated dynamically with new inputs from the community

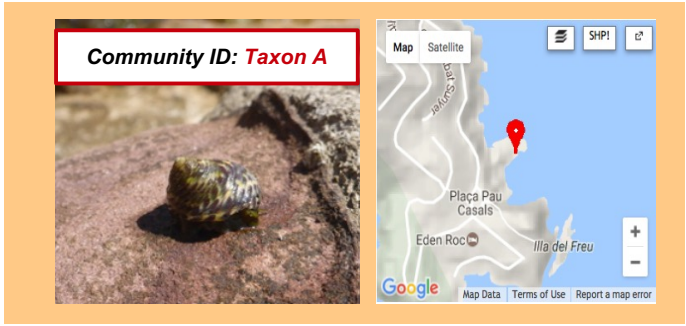
AMOVALIH (II) Hybrid intelligence

Users may require the community support to help in identifying unknown observations

Collaborative identification with hybrid intelligence



ID Please !



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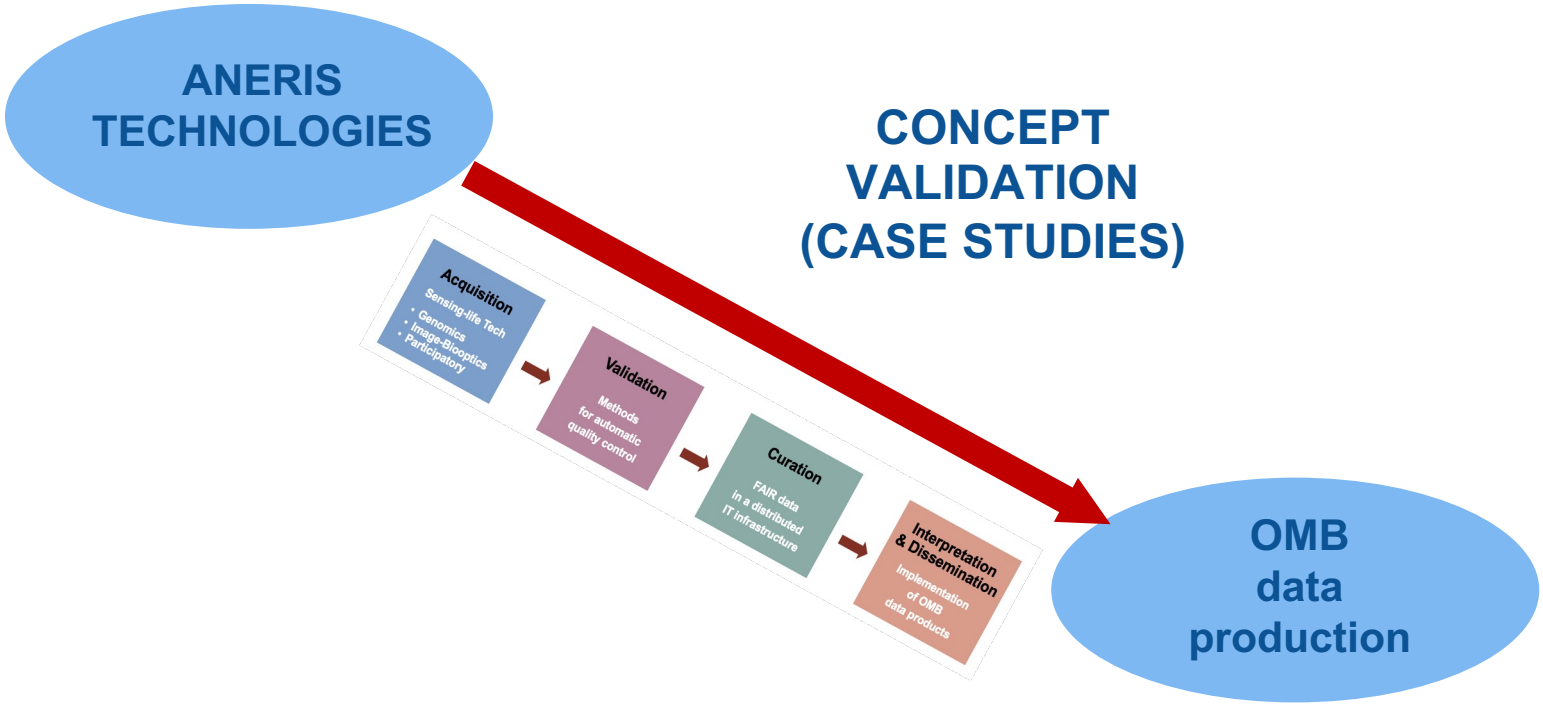
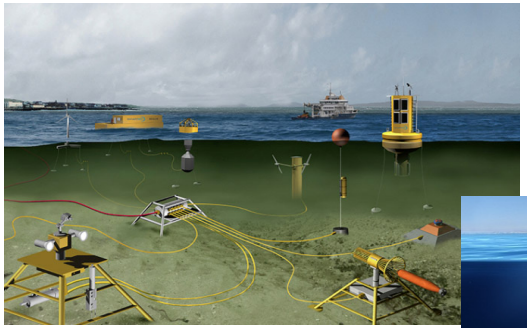

ANERIS TECHNOLOGIES
CONCEPT VALIDATION (CASE STUDIES)
Acquisition
Sensing-life Tech
• Genomics
• Image-Biooptics
• Participatory
Validation
Methods for automatic quality control
Curation
FAIR data in a distributed IT infrastructure
Interpretation & Dissemination
Implementation of OMB data products
OMB data production

CS1. High-temporal resolution marine life monitoring in RI observatories

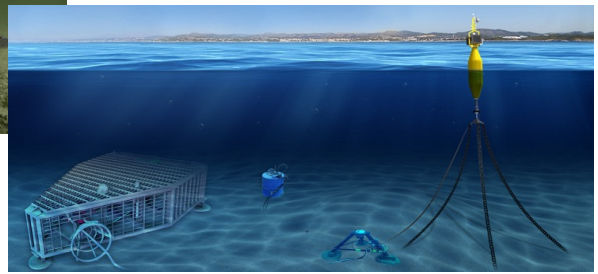
Target OMB products: *Continuous **high-resolution time series** of (1) **cytometric indexes** describing the plankton community, (2) **imaging-based indexes** (size, shape….) describing those communities, (3) **taxonomic composition**, resulting from automated classifiers controlled by humans; some of these series are in format that will be ready to publish in international, open, databases*

SMARTBAY

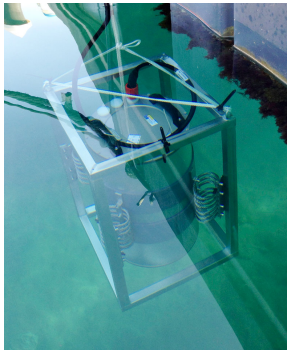


emso ERIC

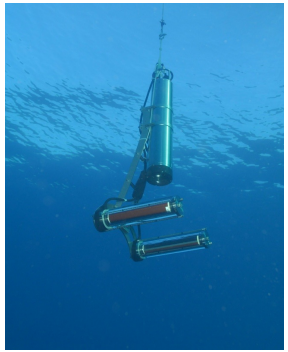
OBSEA



CYTOSUB



UPV6

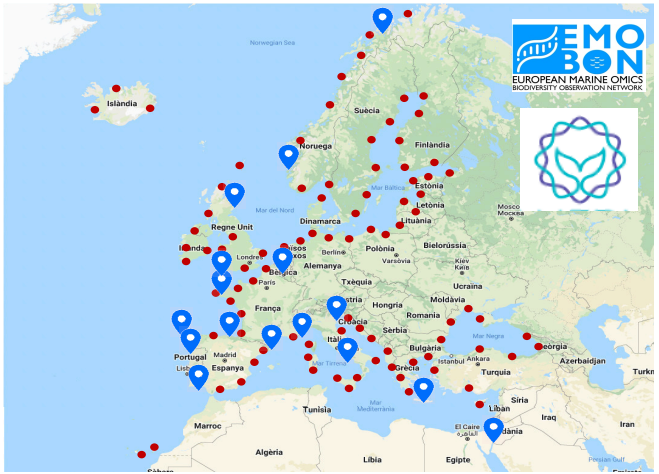


CS2. Improved spatial and temporal resolution of marine life monitoring based on genomics

Target OMB products: *This case study will deliver a set of* ***indicator maps for species diversity****, intraspecific genetic variation and non-indigenous species occurrence based on the* ***extended marine omics monitoring network***

EMO BON
EUROPEAN MARINE OMICS
BIODIVERSITY OBSERVATION NETWORK

EMO BON



EMO BON + ANERIS

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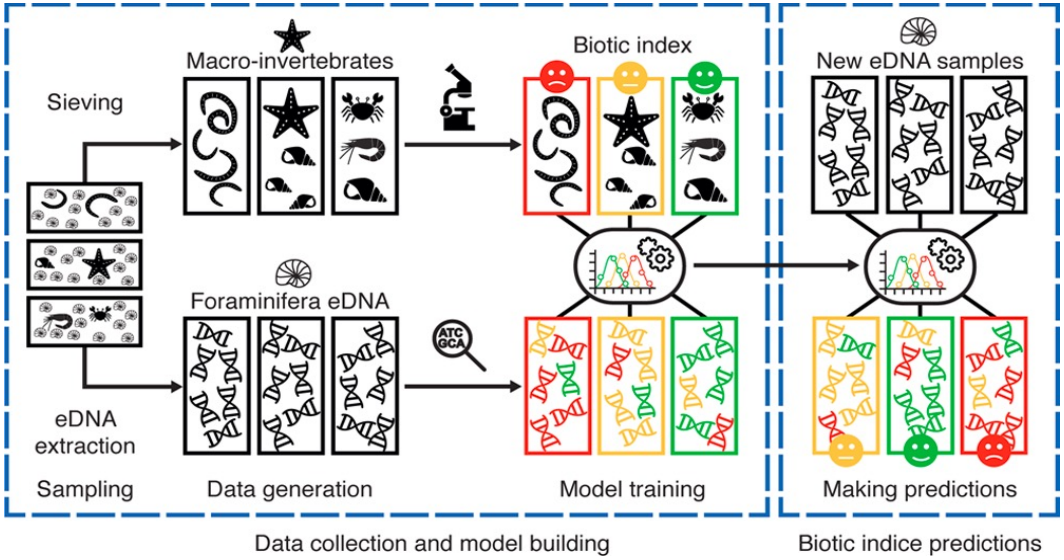
CS3. Large scale marine participatory actions (bioblitzes, BioMARathons)

Target OMB products: ***Seasonal maps of species occurrences*** *with special focus on threatened and alien/invasive species*

CS4. Merging imaging and genomic information in different monitoring scenarios

Target OMB products: *The expected* ***OMB products here will be the most experimental ones****, trying to produce information of marine /coastal fauna and flora across the European coastline/ identification of biodiversity hotspots and climate refugia spots that should be prioritised in conservation actions*



Cordier, Tristan, et al. (2017): "Predicting the ecological quality status of marine environments from eDNA metabarcoding data using supervised machine learning." *Environmental science & technology*

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Thank you! | www.lifewatch.eu/bees-2023