



Celebrating the World Ocean Day With INGV and EMSO ERIC

Palermo, 6-8 June 2024



PROJECT ACRONYM: ANERIS

PROJECT TITLE: operAtional seNsing liFE technologies for maRlne ecosystemS

PROGRAMME: HORIZON EUROPE

START date: 01/01/2023 **END date:** 31/12/2026



ANERIS

OPERATIONAL SENSING LIFE
TECHNOLOGIES FOR MARINE
ECOSYSTEMS



VISION

Protecting marine and coastal biodiversity through technological, scientific and methodological innovation in the fields of marine life-sensing and monitoring.



MISSION

To build the next generation of marine-sensing instruments and infrastructure for systematic routine measurements and monitoring of oceanic and coastal life, and their rapid interpretation & dissemination to all interested stakeholders.

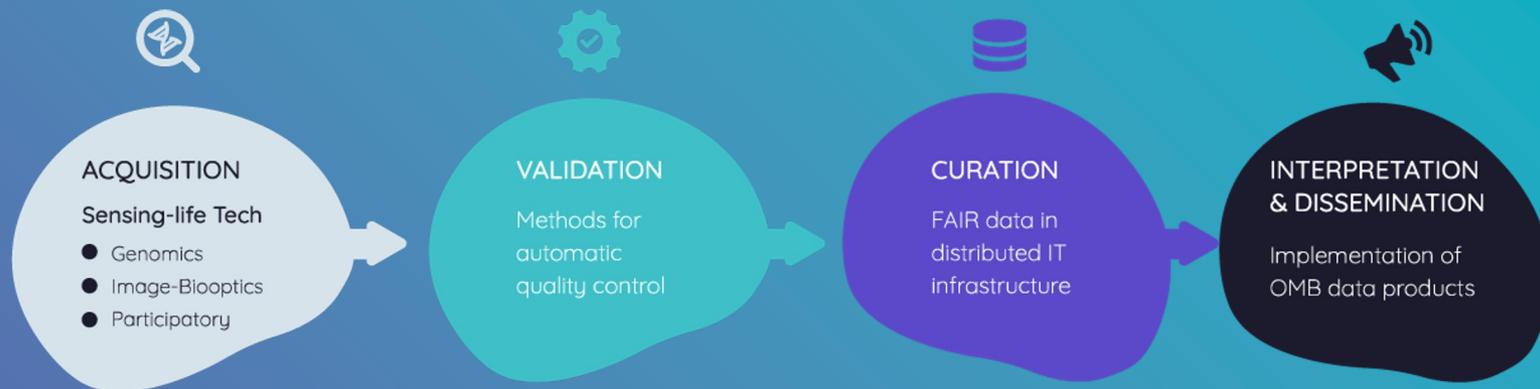


GOAL

Involving academia, industry, governments and civil society, ANERIS proposes the concept of Operational Marine Biology (OMB)) to provide faster, higher quality, reliable, and accessible marine and coastal life data using novel technology.

ANERIS

The ANERIS project, coordinated by CSIC, brings together 25 Partner organisations from 13 countries in Europe and the Mediterranean Basin with the aim of tackling the rapid loss of ocean biodiversity by developing innovative tools and technology for monitoring, research and management of marine life, and introducing the concept of Operational Marine Biology (OMB). OMB is a biodiversity information system which allows long-term routine measurements of ocean and coastal ecosystems and their quick interpretation and dissemination to all relevant stakeholders. The Operational Marine Biology (OMB) information flow will be based on an automatic pipeline of information production, from acquisition to interpretation and dissemination.



To achieve this, ANERIS will work to design the next-generation of scientific instrumentation tools and methods for marine life-sensing technologies: genomics, imaging bio-optics and participatory sciences; which will be implemented in a co-design framework involving and training interested stakeholders from academia, industry, government and the public to develop OMB data products.



UNIVERSITAT POLITÈCNICA
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BARCELONATECH

EMSO ROLE in the project

EMSO ERIC is involved in the ANERIS project together with the other three ERICs (LifeWatch, EMBRC, Euro-BioImaging) as well as large-scale IT infrastructures and frameworks (EGI, EOSC) in the development and validation. This ensures the uptake and implementation of the developed OMB technologies in the broad networks represented by these infrastructures and leverages their expert communities and connections.

The concept of marine life sensing technologies in ANERIS, and the generation of specific OMB data products, will be validated through 4 case studies connected to different Research Infrastructures (Ris).

Two EMSO ERIC nodes, SmartBay (Ireland) and OBSEA (Spain), are actively contributing to the ANERIS case study 1 "High-temporal resolution marine life monitoring in RI observatories" for long-term autonomous monitoring systems, enhancing local marine life sensing capabilities.



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

Deployment of Imaging flow cytometers and in situ imagers in two EMSO nodes (SmartBay and OBSEA) and one LifeWatch/EMBRC node (VLIZ observatory).

Two commercial instruments will be involved to be improved during the project:

- Imaging Flow Cytometer CytoSub, developed by the ANERIS SME partner CytoBuoy (CYBO),
- Underwater Vision Profiler.4 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.

(Lead Partners VLIZ, SU, UPC, MI, CYBO, OsloMet, UH. Involved RIs EMSO, LifeWatch, EMBRC, EGI).

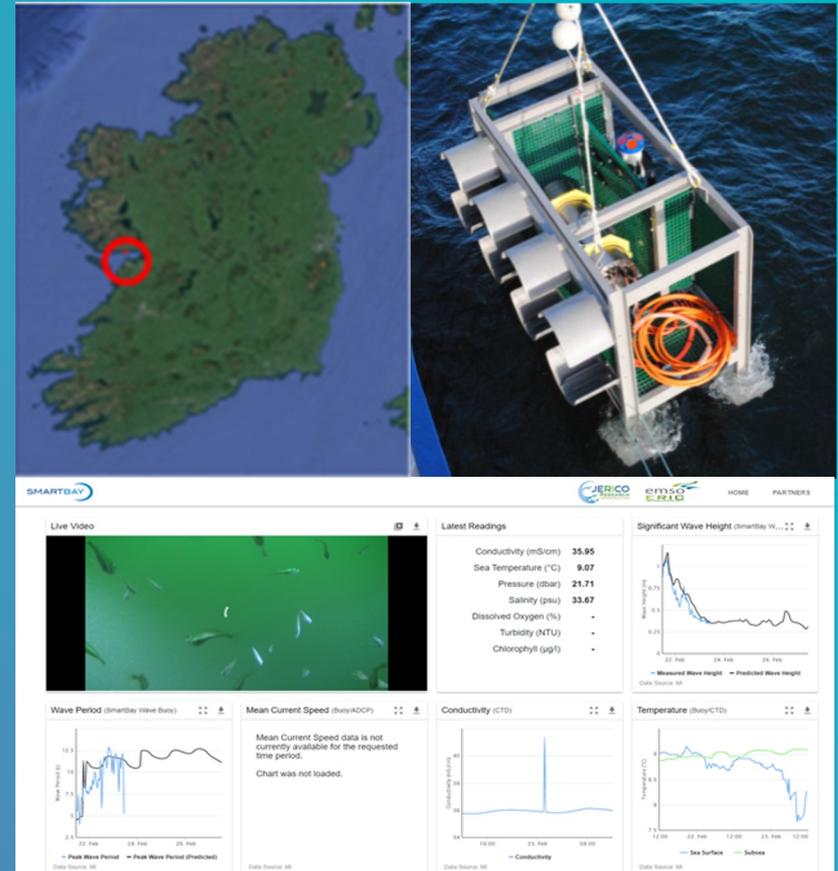
ANERIS and EMSO ERIC Regional Facility SmartBay Cabled Observatory



Operational since 2015, SmartBay underwater cabled observatory
27m depth, 1.5km offshore of Spiddal

The observatory provides real time data and is capable of supporting scientific instruments from researchers for testing new marine technologies. A fibre optic cable connects the subsea sensor hosting platform back to Spiddal to retrieve continuous, real time data:

- sea temperature,
- salinity,
- fluorescence (turbidity and chlorophyll),
- ADCP,
- live camera,
- PCO₂,
- pH,
- hydrophone
- sonar



SmartBay in ANERIS Case Studies

Deployment of Imaging flow cytometers in EMSO nodes (SmartBay and OBSEA)

Commercial instruments for Imaging Flow Cytometer CytoSub, developed by the ANERIS SME partner CytoBuoy (CYBO),

New instruments deployed and working in operational mode in EMSO-SMARTBAY (MI, M18,36,48);

Expected Outcomes:

Improved monitoring of phytoplankton & zooplankton

Early detection of harmful algal blooms

Contribution to biodiversity data and research

ANERIS Progress Update at SmartBay

CYTOSUB

Three days of in person training was provided by CytoBuoy partners at SmartBay during the last week of May.

Training focused on operations and maintenance of Cytosub instrument and integration with the SmartBay Observatory.

Additional training was also provided to SmartBay Scientific users from Marine Institute.



ANERIS Progress Update at SmartBay

UVP6

Test instrument integrated and tested with SmartBay Observatory successfully in early June.

Operational instrument received and integrated with SmartBay Observatory one week later.

Deployment of SmartBay observatory with ANERIS instrumentation planned for 1st week of July 2024.

Next steps; finalising data flow pipelines with partners in WP5. Planned for Summer 2024.



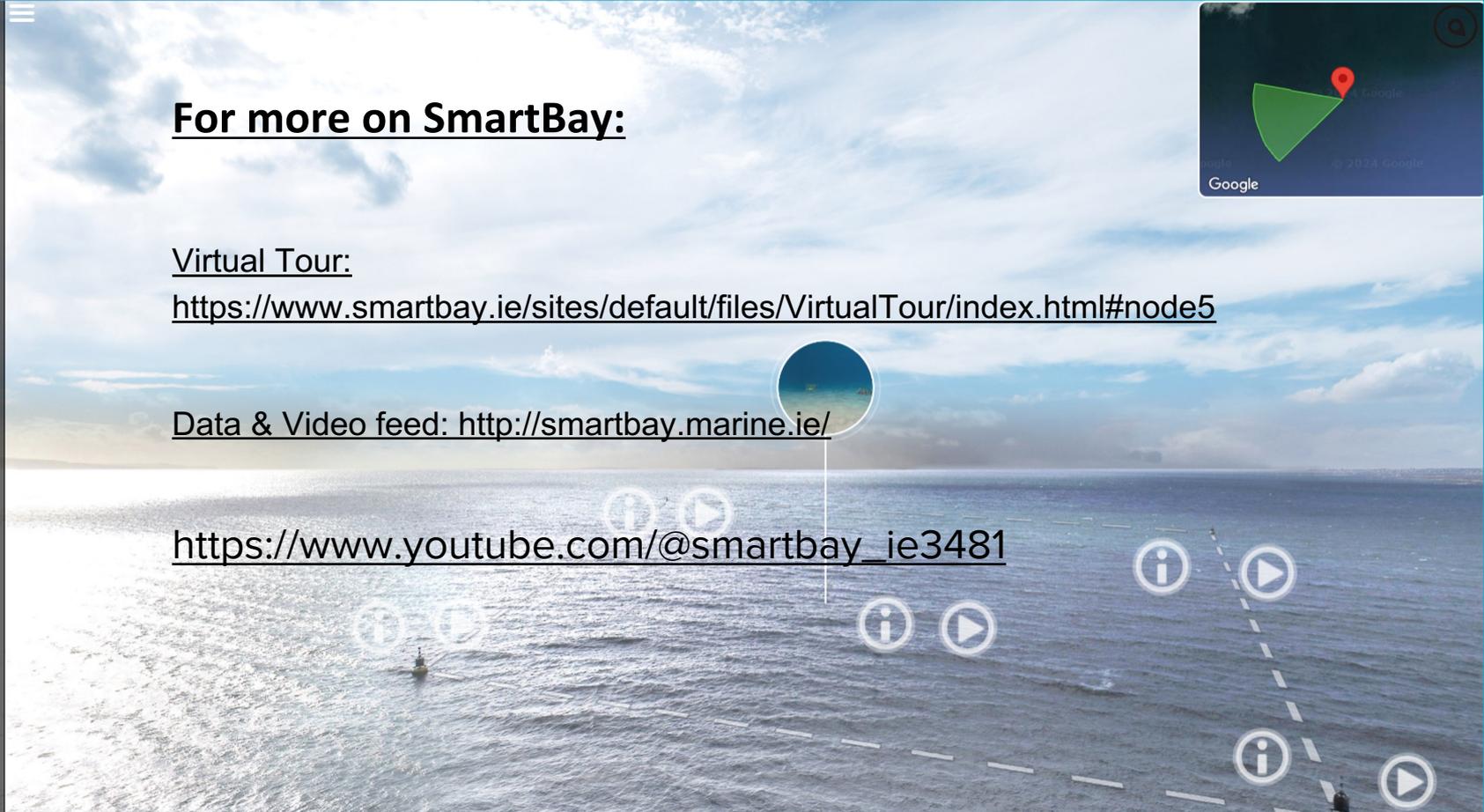
For more on SmartBay:

Virtual Tour:

<https://www.smartbay.ie/sites/default/files/VirtualTour/index.html#node5>

Data & Video feed: <http://smartbay.marine.ie/>

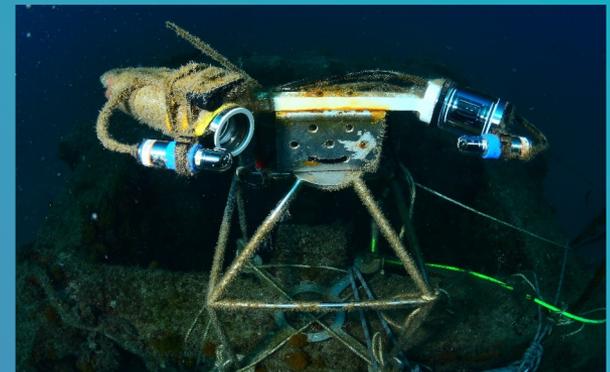
https://www.youtube.com/@smartbay_ie3481



OBSEA in ANERIS project

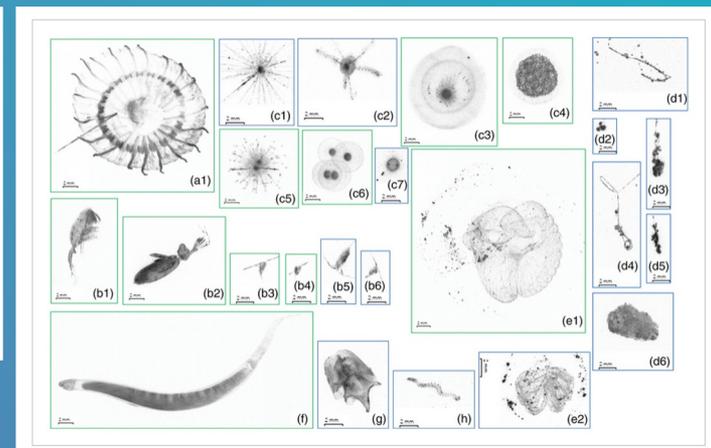
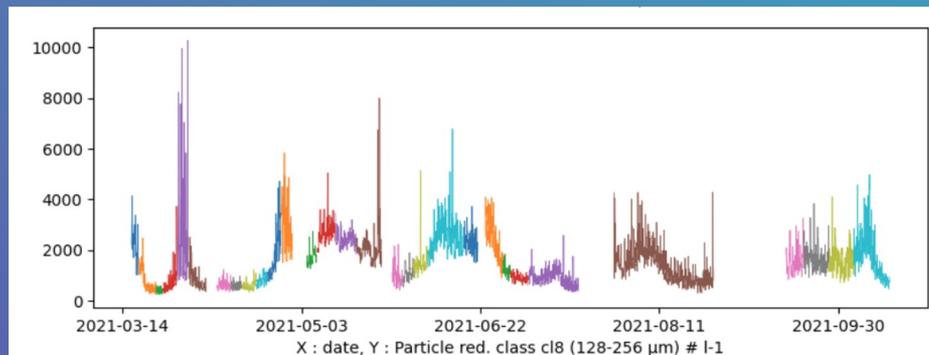
DEPLOYMENT OF UVP-6

On February 2024, during the first year of the ANERIS project, SARTI-UPC researchers together with researcher from the Laboratoire d'Océanographie de Villefranche (LOV) have deployed an Underwater Vision Profiler at the OBSEA observatory. The Underwater Vision Profiler or UVP (CNRS patent) is designed to study large ($>100 \mu\text{m}$) particles and zooplankton simultaneously and to quantify them in a known volume of water. The UVP system makes use of computerized optical technology with custom lighting to acquire digital images of zooplankton IN SITU down to depths of 6000m.



DEPLOYMENT OF UVP-6

The UVP collects in-situ images, counts and sizes all particles larger than $\sim 100\mu\text{m}$, and extracts regions of interest (ROIs) for large particles ($> \sim 1\text{mm}$). The counting, sizing, and image segmentation are done by the instrument itself. This pre-processed data is stored in the application EcoPart ($\sim 25\text{K}$ profiles and $\sim 2\text{K}$ time series samples of marine particles) and the ROIs are sent to EcoTaxa for taxonomic identification. EcoPart structures its information by size and export depth-resolved particle size spectra, and also retrieves the taxonomic identifications from EcoTaxa to export concentrations for the taxonomically identified particles (including plankton).



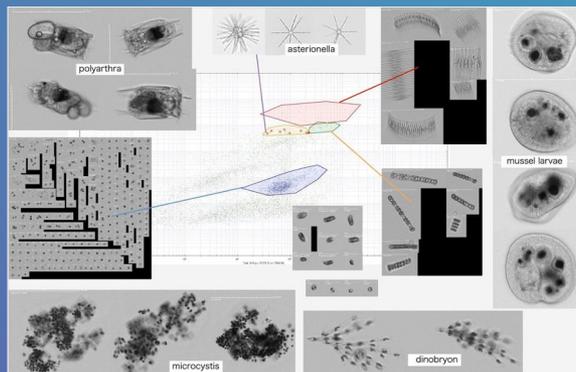
DEPLOYMENT OF CYTOSUB

On April 2024, during the first year of the ANERIS project, SARTI-UPC researchers together with researcher from the Institut de Ciències del Mar (ICM) and engineers from CytoBuoy have deployed the CytoSub at the OBSEA observatory. This instrument offers solutions for analysis and classification of microorganisms and particles in water and complex media. It provides a more holistic view on the dynamics of the microworld by combining speed, information and size range.



DEPLOYMENT OF CYTOSUB

The CytoSub is an imaging flowcytometer. The CytoSub analysis microorganisms and particles in water, like Phytoplankton. It collects in depth information on microbe communities and diversity, viability, germination, physiology. It can detect changes and notice trends. It monitors abundance and growth of phytoplankton or zooplankton, Harmful algae blooms. The instrument can run autonomously for multiple months on a set schedule to measure. The output of the measurements are single particle footprints and images. Unique for the CytoSub is the wide particle range that can be measured. For the Aneris Project one of the outputs are the images that will be used for the datapipeline developed by Vlaams Institute for the Sea (VLIZ) in their AIES-PHY, Automatic Information Extraction System for PHYtoplankton images.



CytoClus analysis with some example photo collections shown representing groups of particles in the data.