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June 2022, Issue 3

NAUTILOS Newsletter

New approach to underwater technologies for innovative, low-cost ocean observation



NAUTILOS closing first Reporting Period successfully – a word by the Coordinator, Gabriele Pieri (CNR)

In March 2022, NAUTILOS project passed its first 18-month work period and we can proudly say that during this time, the project's strategic objective has been aligned with the accomplished activities. The main goal concerns the filling of marine observation and modelling gaps for chemical, biological and deep ocean physics variables through the development of a new generation of cost-effective sensors and samplers, as well as the integration of the developed technologies within observation platforms and their deployment in large-scale demonstrations in European seas.

All 39 planned deliverables have been submitted at this stage. Each deliverable went through an internal peer-review process to ensure high-quality products. Specific objectives align with what is stated in the project's Description of Action.

different Work Packages and project's final goals.

NAUTILOS included five milestones within the first 18 months, all successfully achieved. This involved Work Packages 2, 5, 8 (2 milestones) and WP10. In WP2, all sensor and sampler developers defined in collaboration the specifications required for the work to be carried out in the subsequent development phases. WP10 achieved its associated milestone by ensuring that a comprehensive outreach, communication and dissemination strategy had been put in place to be adopted by the project's partners. In WP5, to obtain a multi-platform network integration among the different nodes of the NAUTILOS program, the definition of a common underwater communication protocol was established by using optical and acoustic communication channels. Finally, WP8 achieved two milestones: the first one was the design and deployment of the data infrastructure and data flow description, with a backend based on ERDDAP managing and organising the data to be interoperable. The second milestone was the development of the [Graphical User Interface](#) established on the web portal with tools and services for accessing the project's data. In addition, the [Citizen Science tools](#) and services were designed and developed for use in the foreseen CS activities.

Looking forward to the challenges and opportunities the next period holds for NAUTILOS while all partners are getting ready for the first Review Meeting that is to take place in June in Pisa, Italy.

NAUTILOS context – a summary

The EU-funded NAUTILOS project is developing a new generation of sensors and samplers for physical, chemical and biological essential ocean variables in addition to micro- and nano-plastics. NAUTILOS is integrating recently advanced marine technologies into different observing platforms and deploying them through innovative and cost-effective methods in a wide range of key environmental settings and EU policy-related applications.

The fundamental aim of the project is to complement and expand current European observation tools and services, to obtain a collection of data at a much higher spatial resolution and temporal regularity, and length than currently available at the European scale, and to further enable and democratize the monitoring of the marine environment to both traditional and non-traditional data users, while improving the capacity of understanding and predicting the ocean, through better models.

Four key principles underlie the NAUTILOS project: development, integration, validation and demonstration of new cutting-edge technologies with regard to sensors, interoperability and embedding skills. The development is always guided by the objectives of scalability, modularity, cost-effectiveness and open-source availability of software and data products produced.

NAUTILOS will provide full and open data feed towards well-established portals and data integrators.

series of citizen science activities.

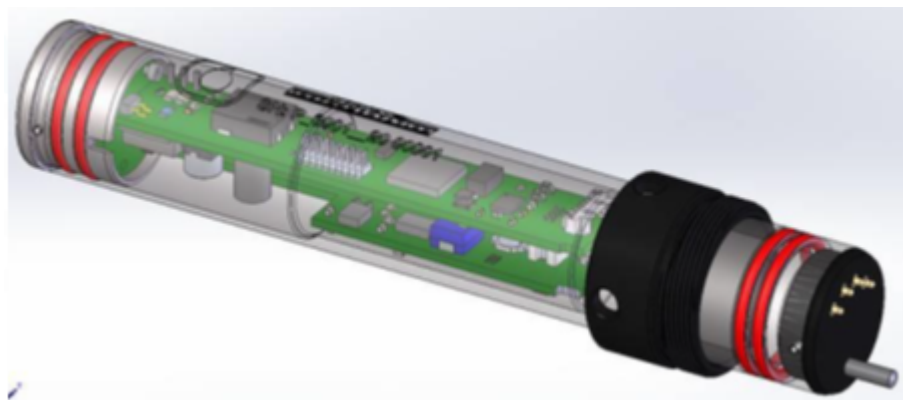
Three Work Packages completed

At month 18 of the project, the first work packages that we have successfully delivered are WP2, WP3 and WP8.

WP2 represented the preparatory stage requirements for the subsequent development of specifications faced by WP3 and WP4 as well as the integration in WP5 and WP7. The activities carried out have examined the needs from a political and societal view, regarding needed enhancements of ocean observation and monitoring programs, and provided the basis for ensuring the technical specifications for sensors, samplers and systems, their consequent integration within the platforms, and an in-depth analysis of the drivers.

The overall objective of identifying the needs and requirements for optimal, cost-effective sensing of physical, chemical and biological parameters in the marine environment was achieved by taking into account such initiatives as the IOC Ocean Best Practices in order to set a baseline for best practices guidelines for new sensors and devices within NAUTILOS as well as a strong link with Ocean Best Practices community. With the collaboration of all partners involved in the development of sensors and samplers within WP3 and WP4, milestone MS2 of the project was achieved.

With regard to WP3, its goal was to advance the development of cost-effective sensing technologies in response to the increasing need for marine biological observations and measurements, including current biological and ecosystem EOVs, corresponding deep-ocean EOVs, and DOOS specific EOVs, MSFD descriptors, and other emerging parameters of interest. This goal was achieved by developing a corresponding range of marine instruments - dissolved oxygen and fluorometric sensors, downward-looking hyperspectral and laser-induced fluorescence imagers, passive acoustic sensors, active multi-frequency bio-acoustic water column profiling sensors, and phytoplankton and other suspended matter samplers.



Activities of WP8 fulfilled their goals as foreseen. The validation of the data in terms of accuracy, reliability and specificity of each developed sensor has been integrated into the data management platform. The interoperability aspects of the project have been carried out based on a high-level

each other, both in terms of types of data and platform data collection channels. Models for the three NAUTILOS case studies to create the Nature Run results have been delivered. The design and development of the Graphical User Interface for data visualisation have been performed.

Furthermore, an APP and other devices suitable for the Citizen Science activities have been designed and developed. Finally, the actions have brought a few algorithms and methods designed and developed for various environmental domains.

Read more about WP8 [here](#) and if curious to take a closer look at the APP, click on the [link](#).

What's happening in the other Work Packages?

The remaining WPs are fulfilling their goals as planned.

WP4 is working on developing carbonate system/ocean acidification sensors for measuring CO₂ and pH parameters, and microplastic sensors for in-situ autonomous measurements. The development of a new generation of sensors for measuring silicate based on electrochemical methods, sensors for the study of oceanic plastic pollution and an in-situ low-level marine radioactivity sensor has commenced. The prototypes of the microplastic sampler and detector have been built and are currently being tested. Combined testing of sampler and detector are planned for June 2022 and system integration of both has started.

The preparation for the integration activities of sensors and samplers within the selected platforms has been initiated within WP5.

WP6, as a recently launched, has performed the preliminary scoping of the necessary planning and commitments required for conducting calibration, validation, and scenario testing.

WP7 has also recently started and has moved forward with deploying integrated oxygen sensors in animal-borne tags from SMRU on southern elephant seal females in the Valdes Peninsula, Argentina.

WP9 activities have also recently started. The objective of the WP is to evaluate the benefits of new technologies developed in NAUTILOS with regard to the capacity to analyze, simulate and predict the ocean processes. This evaluation will be achieved using Observing System Simulation Experiments (OSSE) and remote sensing calibration.

The project exploitation strategy was developed in WP11, and the scoping stage of the Environmental Impact Assessment took place.

Communication, Citizen Science & Synergies

On the 8th of April project video was launched. Check it out below and get inspired about exploring, uncovering and protecting the underwater continent!



WP10 and WP12 have been very active in promoting NAUTILOS work by participating in workshops, co-organizing events and citizen science campaigns as well as by establishing numerous synergies with European and International initiatives.

CITIZENS EMPOWERMENT THROUGH OCEAN KNOWLEDGE CO-PRODUCTION



EMD 2022
OCEAN LITERACY #EU4OCEAN SUMMIT

WORKSHOP
"Citizens Empowerment through
Ocean knowledge co-production"

20TH OF MAY
AT 13H-14H45

Logos: NAUTILOS, EIT, CNR, outdoor PORTOFINO, SURFRIDER FOUNDATION EUROPE, Marine Science, Alma Mater Studiorum University of Bologna

NAUTILOS co-organised with Lega Navale, Outdoor Portofino, Surfrider Foundation and University of Bologna an EU4Ocean workshop during the European Maritime Day.

This workshop focused on knowledge co-production by sharing experiences, major outcomes, and good practices of different citizen science projects. Read more about it [here](#).

Our policy brief "NOURISHING BLUE ECONOMY AND SHARING OCEAN KNOWLEDGE", jointly developed with EuroSea and other key European projects was presented at the European Maritime day. It advanced five recommendations for the betterment of links between Blue Economy and ocean knowledge. Find out the what topics were discussed topics and who the speakers were [here](#).



EuroSea, EMODnet, Blue-Cloud

EMI
EUROPEAN MARITIME
Ravenna
19-20 May 202

19 May 2022 | 15:45-16:45 CEST (Hybrid)
**Ocean observations, marine data & services
for the European Green Deal**
Stakeholder workshop 9

In collaboration with:
NAUTILOS, Eurofleets, iAtlantic, AtlantECO, ODYSSEA

#EMD2022 #OceanObserving #MarineData #EUGreenDeal

This event is co-organised by EU projects EuroSea (grant agreement No 862626), Blue-Cloud (grant agreement No 862409), and the EMODnet marine data service (funded by EMFAF).

have been performed where information and facts about the impact of plastic litter and microplastics on the marine environment were presented. One such event was our partner CIMA's visit to kindergarten students to talk about Ocean observations using an AUV.



[Read more](#) about what important task were the students given during this visit and how they handled it.

CNR-ISMAR PARTNER PARTICIPATED IN THE SCIENTIFIC CRUISE “POPLAST2021”



From March 14th to March 27th 2021, researchers from CNR-ISMAR participated in the scientific cruise “PoPlast2021” on board the Italian research vessel “G. Dallaporta”. The cruise was performed in the Northern Adriatic Sea and focused on the quantification of macro- and micro-plastic pollution in front of the Po river delta. The scientific activities during the cruises were disseminated to primary school students through a series of live streams allowing students to ask questions to the researchers on board the ship.

A series of virtual citizen-science surveys were organised with various high schools using orthophotos of beaches to study marine litter. In addition, seminars were given to high-school students.

Finally, a high-school student-driven project was organised, where students mapped their research questions on marine plastic pollution and organised field studies on local beaches, using methodological approaches, sampling, data analysis and scientific reporting.

Beach cleaning campaigns were organised for university students in Crete and pupils in Germany, wherein the latter AI methods were successfully used to identify marine litter hotspots and detect and quantify plastic waste.

A two week sailing campaign for citizen science volunteers was implemented within WP12 in Cyclades islands aiming to investigate plastic pollution in relation to meteorological data and sea currents.

Another, Marine Litter Collection campaign "On The Field", was organised for high-school students using the Sea cleaner Protocol, following which the students prepared a short film.

IMBBC ORGANISES STUDENT DEMONSTRATION

ACTIVITIES FOR PLASTIC POLLUTION AND BEACH

COUNTRY 2022



IMBBC HCMR is implementing a series of Citizen Science campaigns targeting primary school kids in Crete during spring-summer 2022. Three primary schools, 9 classes and a total of 135 students will be reached during the period of one month (10/5/2020 –8/6/2022). Read more about the initiative on NAUTILOS website.



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