Autonomous and cabled underwater sensor networks applied to remote monitoring of biological indicators


**JERICO-Next Introduction**

Since coastal areas are one of the most productive and dynamic environments of the world’s ocean with significant impact on ecosystem, JERICO-Next believes that the interconnection between physics, biogeochemistry and biology in the coastal sea should be analyzed in order to understand its complexity. This process requires new technological developments that guarantees the continuous monitoring of a larger set of parameters. So the project’s vision is to improve and innovate the cooperation in coastal observatories around Europe. This work was partially supported by the project JERICO-Next from the European Commission’s Horizon 2020 research and innovation programme under grant agreement No 654410.

**Geophysical cycles in the form of daily and seasonal changes in the light intensity and length of the photoperiodial in addition to diurnal and tidal cycles, plus the marked hydrodynamical patterns of tides, impose a strict synchronisation of species behavior through natural selection.** Hydrodynamical behavior under the form of invasive populations of the seafloor and across the above water column, directly affects our perception of continental margins biodiversity and ecosystem functioning. Monitoring biodiversity and the environmental drivers controlling these rhythms at different spatiotemporal scales is a holy task in a context of estimating the effects of the increasing anthropogenic impact. To comply with the monitoring of biological indicators set by the EU Marine Strategy Framework Directive (MSFD; 2008/56/EC, descriptors: D1 biodiversity; D2 alien species; D3 commercial fish and shellfish species; Glacioaerifer richness and ISI) marine bitter) and the technical guidance for monitoring (MEE 2014, Report B7 26289 EN, identifying high-definition cameras as key tools for biodiversity monitoring), the development new methodologies for capturing the composition of communities in relation to species’ rhythmic activity and environmental control the coupling of new fixed and mobile multiparametric platforms, is of pivotal relevance. In order to increase spatial coverages and allow for strategic and adaptive changes in monitoring, autonomous underwater vehicles (AUVs) and benthic robots (crawlers) will be used to extend the range and duration of studies within the deeper parts of the ocean, and to enhance the situational awareness of the remote sensing platforms. This multi-parametric monitoring is a challenge to be overcome, in order to have standardized protocols for the acquisition and automation of data processing regarding species composition (i.e., ichthyology, relative abundance (i.e. eversion) and food web structure. Obtained data are of relevance since additional extended as reference for impact monitoring in industrial sectors.

**COSTYNA** (Coastal Observation System for Northern and Arctic Seas) is an operational coastal monitoring forecasting and information system for the North Sea composed by fixed platforms, Ferryboxes, gliders and AUV-cable systems. Two nodes are available. Underwater node Helgoland is a cabled observatory at 11 meters depth located at the North Sea, with 10 plugable access points. Underwater Node Spitzbergen is an experimental platform located in a polar fjord system.

**The Galway Bay Cabled Permanent Observatory (CPO) comprised a suite platform cabled to shore, hosting a variety of scientific instruments for ocean observation and equipment testing and validation. The seabed cabled observatory EMSEO-Molène was deployed off-shore 2 km north of Molène, in the marine protected area “Iroise Marine Park.” It is an EMSEO testing site at depth 11 meters, dedicated to sensors and equipment in-situ and long-term qualification.**

**LeVe, cabled observatory with a suite of physical, biological and chemical sensors that involves many scientific fields and is expected to stimulate innovation and research.**

**OBSEA, the Underwater Cabled test Observatory located at 4 km from the coast of Catalonia and 20 meters depth that offers real-time data from a fishing protected area.**

**Effects of citrus and quantity of species.**

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