Addressing the sustainability of the Adriatic sea using marine robotics

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I. ABSTRACT

As other oceans and seas, the Adriatic Sea is suffering major impacts from over-fishing and pollution. Many factors such as solid waste, direct discharge of wastewater and oil pollution contribute to the degradation of coastal and marine ecosystems. There is an urgent need for better pollution monitoring and protection of the Adriatic Sea [1]. This need is not unique of the Adriatic sea. Indeed, all our oceans need to be conserved and sustainably used according to the United Nations Sustainable Development Goal (SDG) 14 Life Below Water [2]. Using robotics to do so is the natural thing to do given the possibilities introduced by low cost small-to-medium size robots that can be used as swarms in a wide area. In a fragile environment such as the sea, battery or solar-powered robots can be an alternative to gas/diesel polluting ships for environmental monitoring tasks. Moreover, by using underwater robots the status of the whole water column can be easily assessed.

The Laboratory for Underwater Systems and Technologies (LABUST) has has participated in the Submarine Cultures Perform Long-term Robotic Exploration of Unconventional Environmental Niches (subCULTron) [3] EU project, where a swarm of heterogeneous robots monitored a very special ecosystem, the Venice lagoon. More recently, LABUST participated in two projects related to the detection of oil spills at sea using a combination of unmanned vehicles, both marine and aerial, the Underwater Robotics Ready for Oil Spill – URready4OS [4] and Expanded Underwater Robotics Ready for Oil Spill – e-URready4OS [5] projects.

These and other robotics projects address specifically targets 14.1 (significantly reduce marine pollution) and 14.2 (sustainably manage and protect marine and coastal ecosystems). Nowadays, LABUST is addressing the conservation and sustainable use of the Adriatic sea as per Goal 14. In particular, the recently started Multifunctional smart buoys (BUOYS) project [6] is developing an innovative smart sea buoy technology. A solar-powered static buoy to measure environmental variables with connection to a smart city network is being developed (see Figure 1) as well as a dynamic buoy for pollution monitoring and control in a wider area.

In the Interreg Italy-Croatia InnovaMare project [7], a series

Fig. 1. Multifunctional smart buoys concept.

of use cases using underwater robotics and sensors for the sustainability of the Adriatic Sea have been defined. These relate both to the UN SDG Goal 14 and to the EU Marine Strategy Framework Directive (MSFD) [8] descriptors. One of the Autonomous Surface Vessels (ASVs) utilized in these use cases is shown in Figure 2. A description of the use cases and their relation to UN SDG Goal 14 will be provided in the full paper as well as robots technical details and preliminary results from recently conducted experimental tests.

Fig. 2. ASV Korkyra in use in the INNOVAMARE project.

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