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Towards sampling of the circalittoral benthos for monitoring impacts on marine communities: limitations and next steps.

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Direct sampling in marine research refers to sample collection in which the scientist observes the sampling process at any moment (Eleftheriou, 2013). This category includes, among others: scientific scuba diving, the use of ROV (Remotely Operated Vehicle) or tripped submarines such as the bathyscaphe. Autonomous diving or any other type of diving technique has several limitations in the collection of samples in deep areas, since physically and physiologically the human being is not adapted to withstand the environmental characteristics in these areas. Therefore, scientific work at depths below 30 m is not a highly recommended option. Consequently, the monitoring of the marine communities of the circalittoral bottom requires advanced robotic techniques focused on sampling specific species, avoiding the risk for the scientist. One of the biological communities of greatest interest for monitoring the impacts of human activities such as aquaculture or fishing is the biocenosis of Coralligenous habitats, where the gorgonian facies stands out due to the high presence of filtering organisms. The main Mediterranean gorgonian species are located in mesophotic or subcoastal benthic zones (30 to 150 meters deep) (Coma et al., 1994), being the study of these populations of interest for the monitoring of the seabed as contemplated in the framework of the OCECOSVAL project of the ThinkinAzul program in the Valencian Community (Spain). To study the evolution of these organisms we use a Bluerov2-VP-300M equipped with 4 LED lights (Lumen Subsea Light), a 150 m umbilical cable, two LASER pointers and a manipulator arm with clamp. However, the possibilities offered by commercial models do not solve some key problems such as the collection of several independent samples in one dive, which would be of great interest for population genetics studies to understand the differential population dynamics of species such as *Paramuricea clavata* (Risso, 1827) classified as vulnerable (IUCN, 2021). Thus, these studies will contribute to the improvement of the conservation status of vulnerable circalittoral species of the deep infralittoral where it is very relevant to track large areas of the bottom to locate specimens of *Pinna nobilis* (Linnaeus, 1758) in critical status of extinction (García-March et al., 2020; IUCN, 2021). In the context of this workshop meeting, we propose the adaptation of this device with new functional tools that even make possible the translocation of specimens to more favorable areas for the development of the population, thus avoiding its disappearance (Chiappone et al., 2003). In conclusion, increasing and enhancing the usefulness of ROVs for sampling and scientific work at depths not recommended for divers, would facilitate the study and knowledge of many species that a priori are inaccessible to humans.

Fig 1. Remotely Operated Vehicle Bluerov2-VP-300M [Source: Qstar ROV & subsea solutions, 2023].

Fig 2. Gorgonian specimen of *Paramuricea clavata* [Source: IMEDMAR-UCV, 2022].

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