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Underwater Scuba Photogrammetry VS. MBES Acoustic Sounding: how to integrate multiscale data for a better understanding of Coralligenous outcrops

Andrea Giulia Varzi et al. ▸

Coralligenous (C) includes calcareous build-ups of biogenic origin, characterised by the association of calcareous algae and several invertebrates. This habitat is one of the most important at the Mediterranean scale; it is a hot-spot of biodiversity thriving from shallow waters down to the limit of the mesophotic zone. The Italian project "CRESCIBLUREEF - Grown in the blue: new technologies for the knowledge and conservation of the Mediterranean reefs" aims at studying peculiar C outcrops found along a depth gradient offshore Marzamemi village (SE Sicily).

During the first project expedition (June 2021), we performed a Multibeam Echosounder (MBES) survey of the target area by using a R2Sonic 2022 system. A new 17 km2 high-resolution morpho-bathymetric map was realised, which interpretation led to the identification and classification of five major habitats, including different C morphotypes. C habitat in the form of banks was found mainly distributed between 30 and 35 m of water depth (w.d.). This investigation allowed us to observe and quantify the overall C distribution along a depth gradient spanning between 20 and 100 m of w.d., giving us a broad-scale perspective of its extension at the seafloor.

A third marine survey (September 2021) was focused on collecting video and still images by using a Sony α Alpha 7ii reflex coupled with the Easydive Leo3 Wi housing and the Easydive illumination system Smart Sea - Gold Plus 7000 Lumen, through scuba diving. Data collection was performed over selected areas suitable for the application of underwater photogrammetry, taking into account the presence of C build-ups (as confirmed by the interpretation of the MBES dataset) and the operational depth (i.e.: no more than 35 m of w.d.). Data collected by adopting this technique and processed using Structure-from-Motion (SfM) algorithms allowed us to get more information at the community level of such complex habitats, coupling the seafloor scale with the smaller scale obtained by direct observations.

In this work, our intention is to improve the understanding of the geospatial context of Coralligenous distribution and extent from a multiscale perspective. Specifically, we want to show how eco-geomorphological indexes calculated using the high-resolution outputs of the C photogrammetry (3D meshes, DTMs, and orthomosaics) may be used to perform resolute investigations of such habitat on a broader scale, by considering their spatial distribution extrapolated from the MBES data.

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