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## Novel investigative techniques on calcareous red algae build-ups: photogrammetry and CT-scan on Coralligenous from Marzamemi (Sicily)

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Crustose coralline algae (CCA) form Coralligenous build-ups, which are ranked among the most important ecosystems in the Mediterranean shelf. Their skeletal framework hosts a variety of epi- and infaunal communities, which compete for space, contributing to the reef growth, or weaken the structure throughout bio-erosive activities. Investigating the relationship between the algal framework and these hosted communities is of extreme importance for ecological and palaeoecological purposes and monitoring goals.

In this frame, the Italian project “CRESCIBLUREEF - Grown in the blue: new technologies for the knowledge and conservation of the Mediterranean reefs”, is aimed at investigating coralligenous reefs present in the area off the Marzamemi village (South-East Sicily).

Two build-ups have been collected: the first one at 37 m depth, from an area rich in coralligenous cover, and the second one at 36 m depth, from a submarine channel with sparsely distributed build-ups. We present here two new investigative techniques, so far seldom applied for the characterization of the Coralligenous. The first approach involved the quantification of the surficial cover, with the use of an image analysis software, both before and after the removal of their ephemeral canopy of unmineralized organisms. These models were then analysed using Object-Based Image Analysis (OBIA) algorithms that allowed the quantification of the surficial cover. Moreover, the analysis allowed the identification and categorisation of the organisms and materials on the external part of the build-ups, confirming the primary role of CCA as the major component of the samples. Afterwards, a Computed-Tomography (CT) scan was used - for the first time with Coralligenous - to reconstruct the inner structure of the build-ups and, together with radiocarbon dating, to infer the build-ups age and growth rate. CT analysis divided the framework into four main categories based on their density (Low, Medium, High and Ultra High). The structure's cavities, either primary or developed through taphonomic processes, have been measured as porosity. The overall highly-resolved analysis points to a complex and nonlinear growth of the build-ups. The understanding of the structural density, porosity, growth rate, and surficial cover of the build-ups is shedding some light on the Coralligenous inception and growth.

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