

ECO-REEF BIO-FILM GROWING & MONITORING

INSTALLATION

Installation of the modules on a sandy-gravel seabed (1 m depth), carried out manually on a weighted base and fully reversible, without permanent alterations to the substrate.



1st Week

The surface roughness is still visible, with no signs of erosion. Early sedimentation processes can be observed, indicating the initial phase of ecological colonization.



3rd Week

The modules are entirely covered by a uniform biofilm. The accumulation of sediments and filamentous algae in shaded niches confirms their bioreceptivity.



7th Week

The first green filamentous microalgae were observed, validating the material's passive trapping function for suspended matter.



9th Week

A massive presence of biofilm and the progressive loss of the original geometric lines indicate a high level of bioreceptivity.



Watch the Living Lab at Palizzi Marina video



Spoke 4: Technologies for resilient and accessible cultural and natural heritage | Goal 4.7: Protection and enhancement of natural and cultural heritage and the identity of inland territories

P.P. 4.7.1_Open platform "phygital space" (physical and digital) of the type "user profiling" for the advanced and dynamic codesign of interventions on the built and ex novo

Action 9

[Lead: Prof. Consuelo Nava with ABITAlab]

Enabling Technologies and Additive Manufacturing (3D printing) for the prototyping of systems and components in testing cases at settlement and building scale

Deliverable 7.2.5

Development of models for the selection and preparation of prototypes of systems and components for the testing cases at aggregate and building scale, and elaboration of the related information system: from prototypes to demonstrators (TRL 6)

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www.phygitalplatform.it



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Eco-Reef NBS experimental physical prototype



ABITA lab
REGGIO CALABRIA
Centro Interuniversitario
Architettura Bioecologica ed
Innovazione Tecnologica per l'Ambiente



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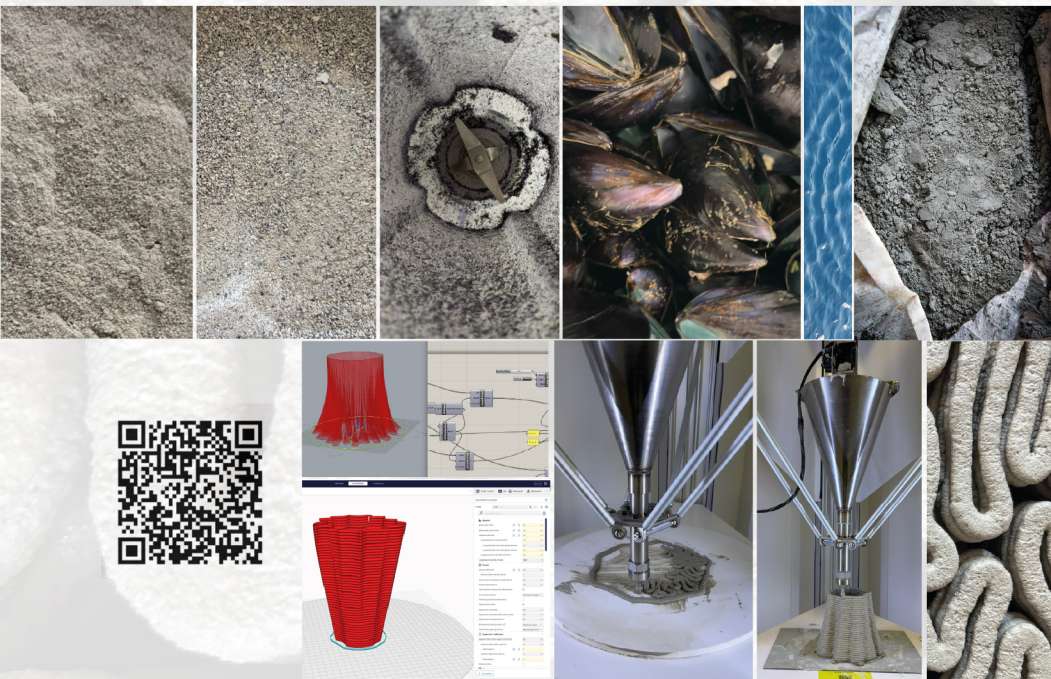
Italiadomani
MANO RESPONSABILE
DI SPERANZA E RESILIANZA



tech4you
Pilot Project 4.7.1

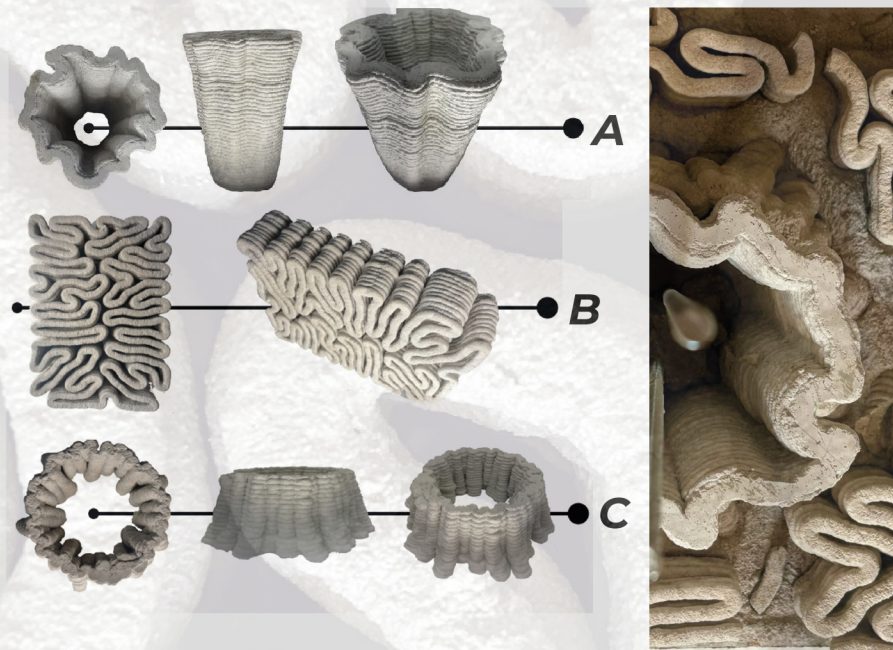
ECO-REEF ADVANCED MATERIAL & PHYGITAL MANUFACTURING

The **Eco-Reef** experimentation represents an innovative application of advanced materials and phygital manufacturing. Through 3D LDM printing, a cement-based biocement was developed, enriched with 15% powdered shells of *Mytilus galloprovincialis*, which are rich in calcium carbonate. This composition introduces micro-roughnesses that are ideal for the colonization of marine microorganisms and makes it possible to produce modules with calibrated porosity.



ECO-REEF ECOLOGICAL ASPECTS & FUNCTION

The ecological performance of the Eco-Reef is structured around three functional components: component A generates turbulence and anchoring points for sponges, ascidians, and other filter-feeding organisms, contributing to improved water quality and enhancing biological productivity; component B provides protected cavities that serve as safe refuges for juvenile stages of fish and small crustaceans, thereby supporting the recruitment of marine populations; component C integrates the characteristics of the first two components with a synergistic effect that increases structural complexity and multiplies opportunities for colonization.



ECO-REEF NBS EXPERIMENTAL MODULE

The **Eco-Reef prototype** was installed at Palizzi Marina (37.91772709610265, 15.992805999299165), near the concrete blocks of the detached breakwater groyne. The Eco-Reefs were produced through LDM prototyping, with calibrated porosity and biogenic surfaces. Their placement at the Palizzi Marina site makes it possible to verify in the field the results obtained from the digital experiments conducted using ABITAlab's advanced digital tools, which allow the simulation of wind flow and turbulence patterns induced by different geometries. The immersion of the prototype thus enables a comparison between digital predictions and the actual behavior of the system, while monitoring over time its mechanical resistance, dissipative effectiveness, and degree of bioreceptivity.

