

# Marine forest coastal restoration: an underwater gardening socio-ecological plan (OCEAN CITIZEN)

DAMIÀ GOMILA

CONVOCATORIA: HORIZON-MISS-2021-OCEAN-02  
Project 1010939



## Call: Protect and restore marine and fresh water ecosystems and biodiversity (HORIZON-MISS-2021-OCEAN-02)

Type of action: HORIZON Innovation Actions

Granting authority: European Climate, Infrastructure and Environment Executive Agency

1. (UNILE) UNIVERSITA DEL SALENTO (IT) – Sergio Rossi (coordinator). 2. (IOLR) ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED (IL). 3. (CONISMA) CONSORZIO NAZIONALE INTERUNIVERSITARIO PER LE SCIENZE DEL MARE ASSOCIAZIONE (IT). 4. **(CSIC) AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (ES)**. 5. (UGI) UNDERWATER GARDENS INTERNATIONAL S.L. (ES). 6. (ULPGC) UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA (ES). 6.1. (FCPCT-ULPGC) FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA (ES). 7. (UB) UNIVERSITAT DE BARCELONA (ES). 8. (UBICA SRL) UBICA SRL (IT). 9. (NUI GALWAY) NATIONAL UNIVERSITY OF IRELAND GALWAY (IE). 10. (PLOCAN) CONSORCIO PARA EL DISEÑO, CONSTRUCCIÓN, EQUIPAMIENTO Y EXPLOTACIÓN DE LA PLATAFORMA OCEÁNICA DE CANARIAS (ES). 11. (SUBMON) SUBMON (ES). 12. (DTU) DANMARKS TEKNISKE UNIVERSITET (DK). 13. (V-Corals) V-CORALS LTD (IL). 14. (IOW) LEIBNIZ-INSTITUT FÜR OSTSEEFORSCHUNG WARNEMÜNDE (DE). 15. (CAU) CHRISTIAN-ALBRECHTS-UNIVERSITÄT ZU KIEL (DE). 16. (AWI) ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG (DE). 17. (Crowe Spain) CROWE ACCELERATE MANAGEMENT S.L. (ES). 18. (IMR) HAVFORSKNINGSINSTITUTTET (NO). 19. (OCEANA) FUNDACION OCEANA (ES). 20. (D-Shape Italy) DINI ENGINEERING S.R.L. (IT). 21. (SU) SORBONNE UNIVERSITÉ (FR). 21.1. (CNRS) CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR). 22. (UNIEXE) THE UNIVERSITY OF EXETER (UK).

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Enrique Isla  
Marta Ribes



Nuria Marbà  
Iris Hendriks



Rafael Comas



Damià Gomila  
Manuel Matías

Tomàs Sintès  
Pablo Moreno  
Miguel Álvarez

Total CSIC amount: 1.224.567,50 €

**IFISC budget: 178,423,69 €**

# Marine forest coastal restoration: an underwater gardening socio-ecological plan

**Marine forests** are complex engineer ecosystems with 3D structure. Biodiversity and biomass promoters. Relevant in our fight against climate change.



**Increasingly at risk** from climate change, agri- and aquaculture, industry and urban expansion: degradation of biodiversity, blue carbon stocks, ocean connectivity (natural corridors) and productivity.

UN declared 2021-2030 as the “Decade of Ocean Science for Sustainable Development” as well as the “Decade of Ecosystem Restoration”. The calls have a strong element of **urgency** as about **half of marine ecosystems** have been identified as **strongly affected** by multiple anthropogenic drivers and the need to restore degraded ecosystems is key to fighting the climate crisis, enhancing food security and sovereignty, providing clean water and protecting biodiversity on the planet.

OCEAN CITIZEN's **overarching objective** is to develop an innovative and sustainable protocol for coastal restoration and conservation of marine coastal biodiversity, tailor-made to, but also replicable in different ecozones. This protocol will focus on the expansion and consolidation of existing marine protected areas (MPAs), the creation of ecological corridors for bio-systems interactions, restoration of biodiversity and blue carbon enhancement with innovative structures and processes and defining a self-sufficient economic business model for long-term continuity.

**A) Define blueprints of a replicable protocol for underwater coastal restoration.**

**B) Consolidate and evaluate an ecosystem-based business model for marine preservation**

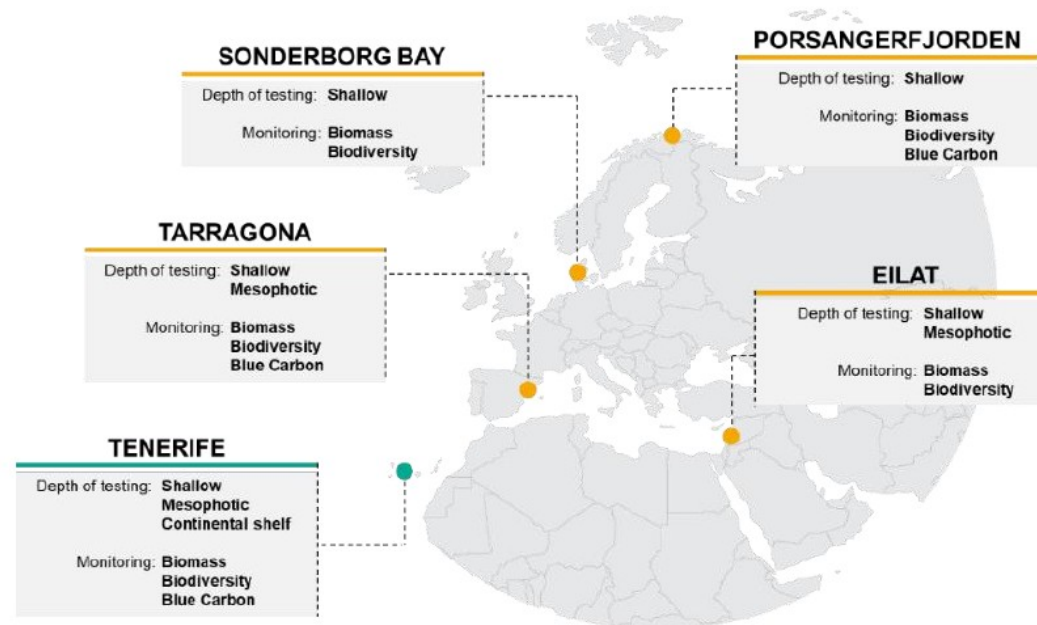
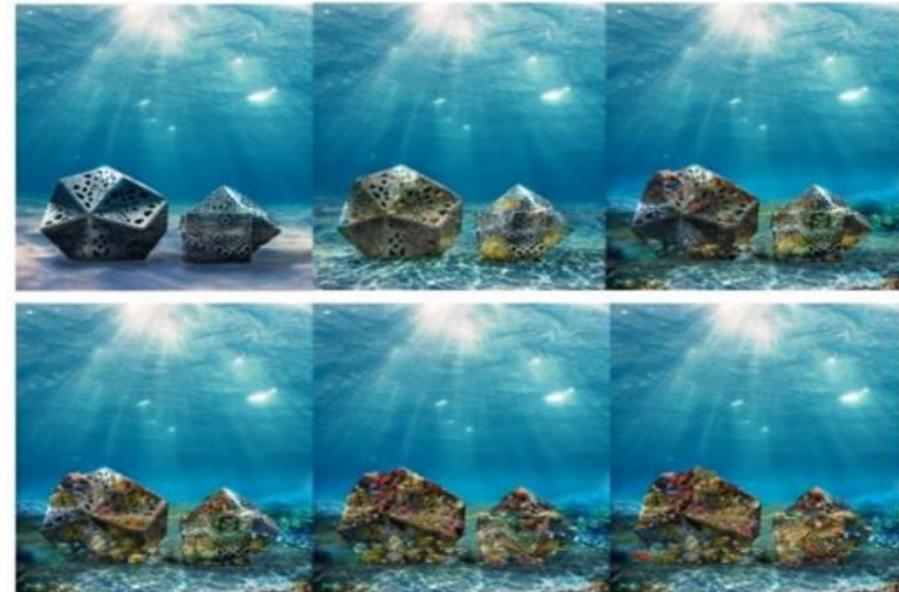


Figure 2: Map of the 5 marine areas of OCEAN CITIZEN

- 1) **Ecosystem engineered-based restoration methods**, including species selection, community structure emulation and growth enhancement (optimization of Blue Carbon sequestration).
- 2) the **Symbiotic Enhanced Reefs (SER®)** which are artificial constructions, designed using A.I., are composed of a mix of calcium carbonate, biopolymers and cement, and will allow to optimise the interaction of the new hard bottom structures with sea currents, increase organic particle retentions, and improve light distribution and organic matter availability while simultaneously enabling humans to intervene through active gardening plans;
- 3) the **Floating Reefs (FR)**
- 4) **Integrated Multi-trophic Aquaculture (IMTA).**



*Figure 1: SER® structure and the biodiversity development.*



## **Work Package 3: Construction and Implementation**

WP3 will put in place the overall restoration roadmap for marine forests (MFs) aimed to make up the restoration plan of the benthic communities. The best available solutions aimed at matching economic development and environmental protection will be implemented in the pilot sites.

### **T3.4 Restoration action implementation in shallow waters**

CSIC will use numerical models of seagrass meadows and invertebrate MFs to design spatial distribution of planting units and planting size at each location.

**In 2023 we will be hiring a pre or post-doctoral researcher whose main task will be designing the spatial distribution of planting units using our numerical models.**

