

RESTORESEAS

Marine Forests of animals, plants and algae: nature-based tools to protect and restore biodiversity

DURATION

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TOTAL GRANT

€ 1,998,129

MORE INFORMATION

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CONTEXT

The losses of marine forests are catastrophic tipping points accelerating the degradation of ecosystem services that are essential for humanity and all species. These services include nursery, shelter and feeding grounds for many species including providers of human food security, coastal protection, and counteracting climate change by carbon sequestration, for which seagrasses are one of the most efficient ecosystems on Earth. Yet, with these habitats being out of sight and challenging to reach, below the ocean surface, marine forest restoration is both rare and difficult to monitor. RESTORESEAS studies the biological and biophysical processes at stake of the key species involved in these hypotheses in the Atlantic Ocean, and their interactions to help determine the effectiveness of restoration and conservation action. The project aims to further the scientific understanding of the role played by specific, genetic and functional diversity in marine forest ecosystems of the Atlantic Ocean, with a focus on seaweed, seagrass and corals. Building upon novel hypotheses, experimentation on propagation, indicators and global models will permit the assessment of the conditions for large scale conservation and restoration approaches.

MAIN ACTIVITIES

RESTORESEAS activities will test and investigate hypotheses developed to restore marine forests through the following set of activities :

1. Surveys and habitat suitability/biodiversity models for the Atlantic Ocean, with unprecedented marine data richness to map hotspots of rich pristine marine forest habitats to propose conservation priorities under future scenarios of climate change and other pressures, to map habitats requiring restoration.
2. Conducting surveys/ Mapping and coupling habitat suitability/biodiversity models for the Atlantic Ocean with unprecedented data to identify hotspots of rich pristine marine forest habitats in order to propose conservation priorities under future scenarios of climate change and other pressures, and prioritise habitats requiring restoration.
3. Comparatively testing different approaches (clonal versus sexual propagation) for restoration of different types

of marine habitats in different types of marine ecosystems, including effects of species and population genetic biodiversity, focusing on roles of symbiont microbiomes and of adaptive genetic traits.

4. Developing efficient strategies (eDNA of seawater and sediments) for long-term monitoring of the benefits of restoration and conservation, aiming for standardized approaches across regions and habitats, that will continue beyond the project and that can infer past baselines (sediment eDNA).

OUTCOMES AND EXPECTED IMPACTS

RESTORESEAS will test the role of different species, their associated microbiomes, as well as functional diversity, in order to reveal the state of marine forests, their unique biodiversity and their patterns across sites and across time in order to embrace the intricacies and dynamics of microbial communities present in natural populations of habitat forming seaweeds, seagrasses and corals. Rather than focusing on the restoration of keystone species, these approaches will help determine critical sizes for ecosystem stability and allow the quantification of long-term outcomes of conservation and restoration approaches.

The use of novel indicator tools of ecosystem function and diversity (genetic tools), historical trends (sediment cores and future models), carbon sequestration, comparing temporal trajectories and baselines will provide the knowledge necessary to implement effective conservation and restoration policies of keystone habitats. This would also help improving management practices for conservation and restoration, that will be planned to account for climate change, extreme events, and diseases.

Working both empirically at a local scale and with large scale models and global data, RESTORESEAS will also provide information on conditions for effective conservation and restoration at different scales, that can be adapted.

PROJECT CONTRIBUTION TO POLICIES AND/OR SOCIETY

The societal/policy value starts with direct integration of civil, professional, political, and technical organisations with relevance for the target areas and goals, including direct involvement of citizens and fishermen. RESTORESEAS will for example involve fishermen in the course of the project to help monitor incidental catches of corals and identify the regions where there is a degradation of the benthic habitat. RESTORESEAS is also planning on working with university students to ensure knowledge transfer.

The broad scale modelling and mapping of key marine forest sites of the Atlantic, and the nature-based solutions for restoring marine degraded areas will inform concrete policy plans with local, regional and global impact towards the achievement of the global Aichi targets, the Paris Agreement, UN Sustainable Development Goals and will match the targets of the

EU Biodiversity Strategy for 2030 and the UN Decade on Ecosystem Restoration.

EXPERIMENT, CASE STUDIES

- Mapping vulnerable/degraded marine forests of the Atlantic Ocean
- Role of habitat restoration and conservation on biodiversity
- Biodiversity in the seawater surrounding marine forests
- Biodiversity over geological time on sediments surrounding marine forests
- Roles of the microbiome in restoration of shallow marine forests and deep marine animal forests
- Diversity and role of pathogens in restoration of marine macrophytes and coral ecosystems
- Restoration of cold-water coral habitat
- Marine restoration for a future climate - phenotyping for adaptive restoration of marine forests
- Tipping points in restoration success - contrasting restoration approaches across multiple models

FUNDERS

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- State Research Agency (AEI), Spain
- The Swedish Environmental Protection Agency (SEPA), Sweden

