



# SEAPROLIF

Diversity and functioning  
of coastal marine biomes under siege:  
implications of SEAwEed PROLIFerations  
across three oceans



## Partners



## SEAPROLIF Coordination

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## Sponsors



Study sites in  
2 hemispheres  
3 oceans  
6 temperate and tropical regions

federating  
6 French partners  
2 Portuguese partners





## Background

Seaweed proliferations are a serious threat for biodiversity in tropical and subtropical coastal ecosystems. For instance, the structure and functioning of coral reef ecosystems can be altered by competition between seaweeds and corals.

These alterations can jeopardise the goods and services that coastal ecosystems provide to the human populations that depend on them. Little is known about the causes of and the mechanisms behind these proliferations or about the number of species actually involved.

To study seaweed proliferations, SEAPROLIF is focusing on the genus *Asparagopsis* (red algae, Rhodophyta), inventoried by DAISIE\* as an invasive species found in European subtropical and temperate waters. Given the lack of knowledge on seaweed proliferations in terms of their taxonomy, their ecosystem effects, their origin, etc., a global and multidisciplinary study is necessary to describe, understand and manage them.

\*Delivering Alien Invasive Species Inventories for Europe

## The objectives of the SEAPROLIF programme

The first objective is:

- ▶ to determine the proliferation status of seaweed populations according to the main environmental and habitat parameters;
- ▶ to establish an inventory of the benthic organisms, especially cnidarians, affected by seaweed proliferations;
- ▶ to monitor the spatio-temporal changes in populations in selected study sites. The results will be recorded in a remotely accessible database and used to map information from across all three oceans.

The second objective is to develop an 'identity card' of the *Asparagopsis* taxa in each study area using three complementary approaches:

- ▶ molecular taxonomy and phylogeography to identify the clades (*Asparagopsis* genus comprises a species complex) occurring in the study areas and determine whether non-indigenous species cause the proliferations;
- ▶ chemotaxonomy with a metabolomics approach to determine the chemical signature of each clade and provide the first clues as to how proliferations occur;
- ▶ next-generation sequencing to assess the composition of microbial communities associated with the seaweed. Ambitious but feasible, this community genomics approach is one of the scientific challenges of the project.

The third objective is to set up *in situ* and laboratory experiments to test the harmfulness of *Asparagopsis* as well as the ecological effects of its proliferation on benthic communities.

In particular, these experiments will evaluate the natural toxicity of *Asparagopsis* on coral health, check changes in the endosymbionts community (*Symbiodinium*), and how herbivores keep it under control. The measured toxicity will be compared among the different above-characterised metabolomic phenotypes and genetic clades to identify any potential links with the seaweed-associated microbial communities.

The results are expected to help better understand seaweed proliferations in the study areas, document their effects on cnidarians and assess their impacts. Special efforts will be made to compile, share and transfer knowledge. In particular, SEAPROLIF will provide advice for policy makers or coastal managers on appropriate marine biodiversity management measures.

## Map of study sites



## ERA-NET NETBIOME

As an ERA-NET NETBIOME project, SEAPROLIF grants the opportunity to conduct an interdisciplinary research programme involving French and Portuguese laboratories specialising in tropical and subtropical marine ecosystems.

SEAPROLIF involves eight partners and thus constitutes a multi-site research consortium covering the distribution range of *Asparagopsis* across three oceans and two hemispheres: the Portuguese islands of Azores, the French islands of Réunion, New Caledonia, French Polynesia and Guadeloupe; Portugal and the Mediterranean.