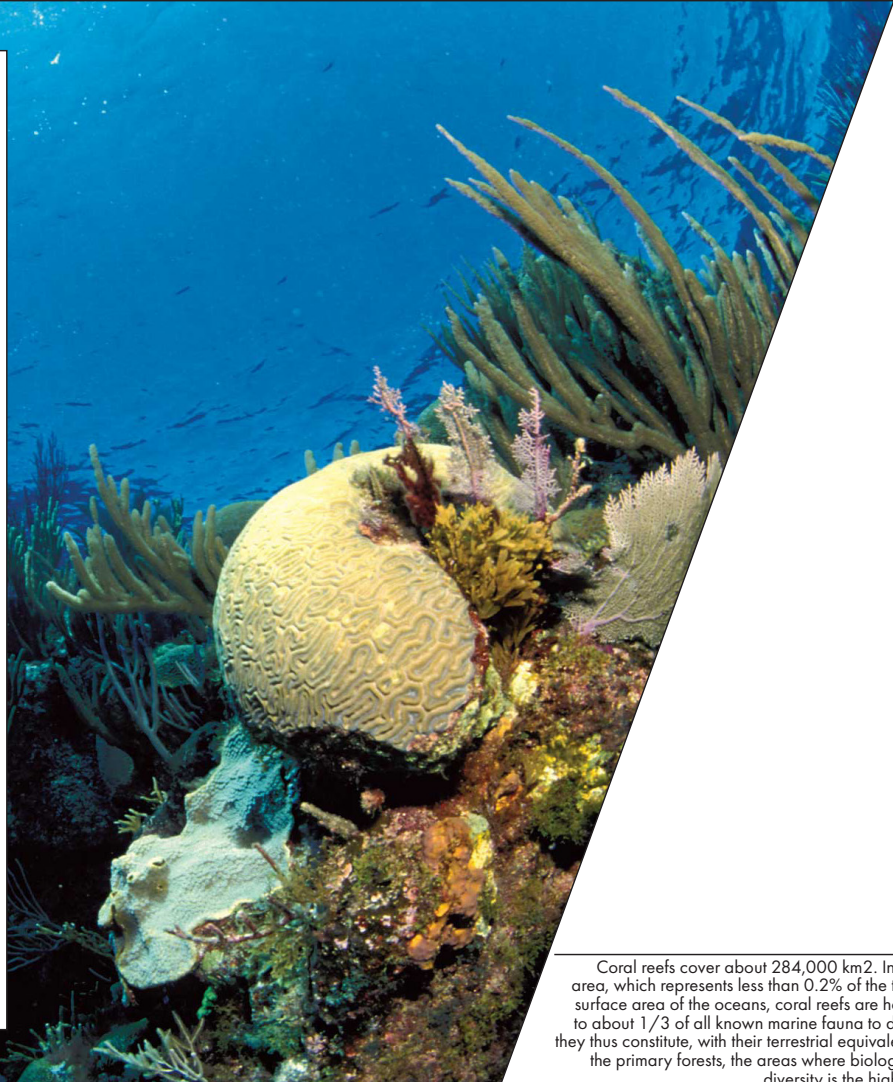
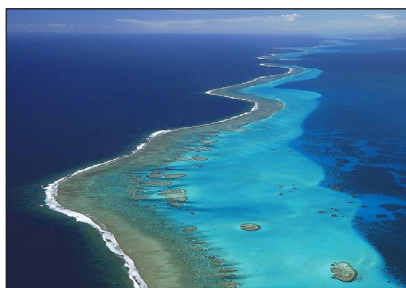


MARINE BIOLOGY DEPARTMENT

The oldest of the departments at Centre Scientifique de Monaco, the Marine Biology Department carries out research on the biological mechanisms underlying the functioning of tropical and temperate coral reefs, and coralline ecosystems. The complementary research of two teams, Physiology/Biochemistry and Ecophysiology/Ecology, has made the Centre Scientifique de Monaco a world-renowned laboratory for its expertise in biomineralization and symbiosis at different scales, from the gene to the ecosystem. The Marine Biology Department also includes an Environmental Economics theme which investigates the sensitivity of human populations to climate change, and more particularly to ocean acidification.



Coral reefs cover about 284,000 km². In this area, which represents less than 0.2% of the total surface area of the oceans, coral reefs are home to about 1/3 of all known marine fauna to date: they thus constitute, with their terrestrial equivalents, the primary forests, the areas where biological diversity is the highest.



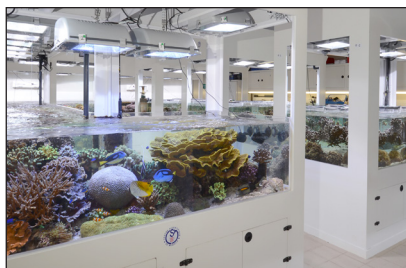
The Great Barrier Reef of New Caledonia.



Gorgon and coral landscape.

FROM THE CORAL REEF...

Coral reefs are biodiverse ecosystems that protect coasts from erosion and provide resources (e.g. food) and services (e.g. jobs) to more than 850 million people worldwide. A team of specialised technicians and researchers conduct field work to study corals from a wide range of habitats in their natural environment - from the tropics to the Arctic, and from the shallows to the deep.



Aquarium room, more than 100 species of corals are cultivated.



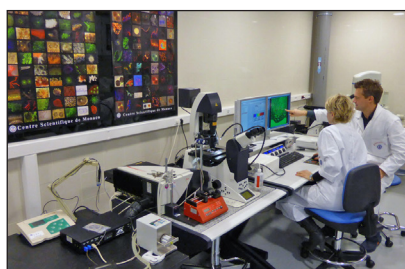
Experimental aquariums.

...TO THE LABORATORY...

The Centre Scientifique de Monaco has cultivated corals in its aquariums under controlled conditions for more than 30 years, making it one of the world's richest and oldest collections of living corals kept for science. Corals are propagated by asexual reproduction.



Analysis of coral health status with PAM (Pulse Amplitude Modulation).



Confocal Microscopy Room.

...FOR ANALYSES AND EXPERIMENTS

The Centre Scientifique de Monaco is widely recognized for its expertise in the study of symbiotic relationships between animals and their associated microorganisms and the biomineralization/ calcification process used to develop the coral skeleton. Teams composed of researchers, post-doctoral fellows, PhD students and technicians use a wide-range of techniques in ecology, physiology, cell biology and molecular biology. The impact of climate change on the future of coral is one of its priority research areas.



MARINE BIOLOGY DEPARTMENT



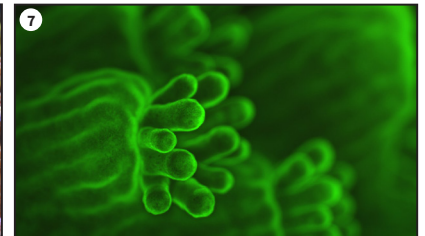
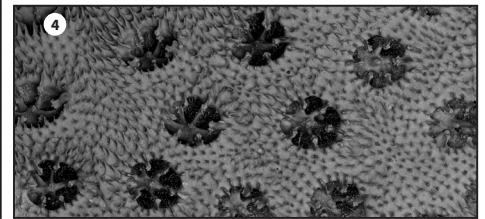
3 TEAMS

- Coral Physiology and Biochemistry
- Coral Ecophysiology and Ecology
- Environmental Economics

The CSM conducts comparative studies of reef-building corals, deep corals, precious corals and gorgonians. Below are photos of the deep coral *Lophelia pertusa* ¹, the tropical corals *Stylophora pistillata* ^{2, 3, 4}, *Platygyra labyrinthiformis* ⁵, *Acropora* ^{6, 7}, Mediterranean red coral *Corallium rubrum* ^{8, 9}, and the gorgonian *Eunicella cavolini* ¹⁰.

Coral Physiology and Biochemistry

This was the first team created in the late 1980s. Since 2003, the team has been directed by Dr Sylvie Tambutté and it continues its initial research on the mechanisms underlying the formation of coral skeletons, a process called Biomineralization. Its research extends over a range of scales from the organism down to the gene. This team has expertise in fields ranging from molecular biology, biochemistry, bioinformatics, microscopy, in vivo cellular imaging and physiology.



Coral Ecophysiology and Ecology

Created in 1992 to complement the work of the Physiology/Biochemistry team by widening the research to the level of the coral ecosystem, this team has been led since the 2000s by Dr Christine Ferrier-Pagès. The research aims to study the response of tropical, Mediterranean and deep-sea corals to climate change and other environmental disturbances. Corals are complex organisms that live in close association, or even symbiosis, with various micro-organisms (dinoflagellate algae, bacteria, viruses...). The research investigates how the environment impacts each partner of the association. There is also an interest in deciphering the role of these various partners in coral nutrition and using the skeleton of corals as a climate archive.



Environmental Economics

This research team was created in 2010 following the wish of His Serene Highness Prince Albert II to bring together economists and scientists in order to inform policy makers about the economic consequences of the effects of climate change and to provide advice on solutions. This research has since been led by Dr. Nathalie Hilmi, who works on three main themes: 1) socioeconomic impacts of climate change and ocean acidification, 2) assessment of ecosystem services of coral reefs, and 3) macro-economic policies and sustainable development.