WHAT IS THE OCEAN MICROBIOME?

Fondation tara océan explore and share

Every liter of water contains between 10 and 100 billion microorganisms, classified in 4 populations: phytoplankton, protists, bacteria, and viruses. This classification does not reflect the immensely rich biodiversity of plankton, nor their numerous ecological interactions: symbiosis, parasitism, predation, and protection.

The Microbiome Mission will help us understand **WHO DOES WHAT, AND HOW,** in an environment in constant mutation due to climate change

SUBJECTS OF STUDY

exterior stress factors

environ-ment

pollutants

rising temperatures

marine currents

excess of nutrients coming from land and rivers

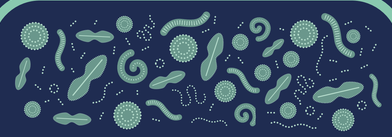
CO_2

CARBON PUMP

MICROBIOME

O_2

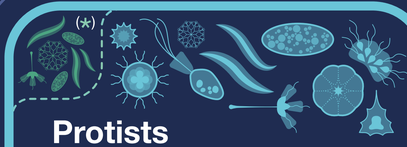
OXYGEN GENERATOR



Phytoplankton(*)

size in micrometers: 0.1 à 10 µm

Phytoplankton consists of all microscopic single-cell algae — the micro-algae. Certain bacteria and protists are phytoplankton. These microorganisms, thanks to chlorophyll pigments, use CO_2 to produce organic matter and generate oxygen. They are equivalent to plants on land.



Protists

size in millimeters: 0.8 to 10 mm

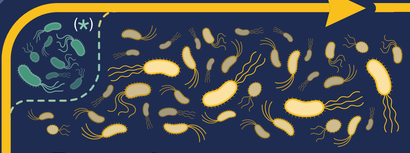
Protists are complex unicellular organisms with a nucleus and sometimes skeletons of glass, stone, or organic matter in extraordinary shapes. Certain are capable of photosynthesis — the phytoplankton. Fueled by solar energy, they produce living matter from carbon dioxide (CO_2), water, and mineral salts. Some of this organic carbon sinks to the bottom of the oceans, sequestering atmospheric CO_2 there for thousands of years.

ASSOCIATION

SYMBIOSIS

PREDATION

PARASITISM



Bacteria

size in micrometers: 0.1 à 2 µm

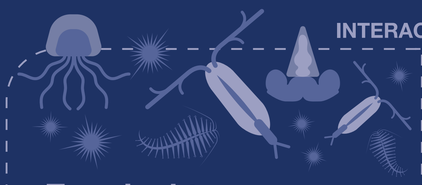
Bacteria are simple unicellular organisms with nuclei. Some participate in the photosynthetic activity of the oceans (cyanobacteria). Others recycle dead plankton into nutritive elements and thus participate in the 'breathing' mechanism of the oceans. Still others live in symbiosis with protists and planktonic animals (zooplankton), providing them vital elements.

Viruses

size in micrometers: 0.01 to 1 µm

Extraordinarily numerous and varied, viruses need a host in order to multiply. Sometimes they provoke the mass death of bacteria, protists or zooplankton, especially those that are multiplying too rapidly in the ecosystem. Most often, they penetrate their hosts without killing them, contributing new genes and participating in the microbiome's equilibrium.

INTERACTION



Zooplankton

size: 0.5 mm to several meters

These are multicellular organisms—the animals in plankton. Often transparent and gelatinous, they show complex behavior, including massive vertical migrations several hundred meters deep. Every night krill, copepods and fish larvae rise to the Ocean's surface to feed without being seen. Zooplankton is in constant interaction with the microbiome.

conductivity

acidity pH

salinity

temperature

nitrogen level

oxygen level

nutrients

JUST AS THE HUMAN MICROBIOME

CONTRIBUTES TO OUR WELL-BEING, THE OCEAN MICROBIOME CONTRIBUTES POSITIVELY TO THE HEALTH OF THE PLANET

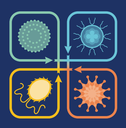
It structures, produces and protects. The microbiome influences the entire oceanic ecosystem, and thus the climate of our planet.

The microbiome is an indicator of the Ocean's state of health. Today the human microbiome is well-studied. In contrast, more than 60% of microbial genes present in the ocean remain to be discovered.

HUMAN MICROBIOME

OCCEAN MICROBIOME

Studying the microbiome means…



understanding a global system

determining what affects its functioning

measuring stress factors

quantifying the impact of rivers

identifying the influence of plastic pollution

assessing the distribution of the microbiome in ocean currents

in a common environment: the Ocean

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