

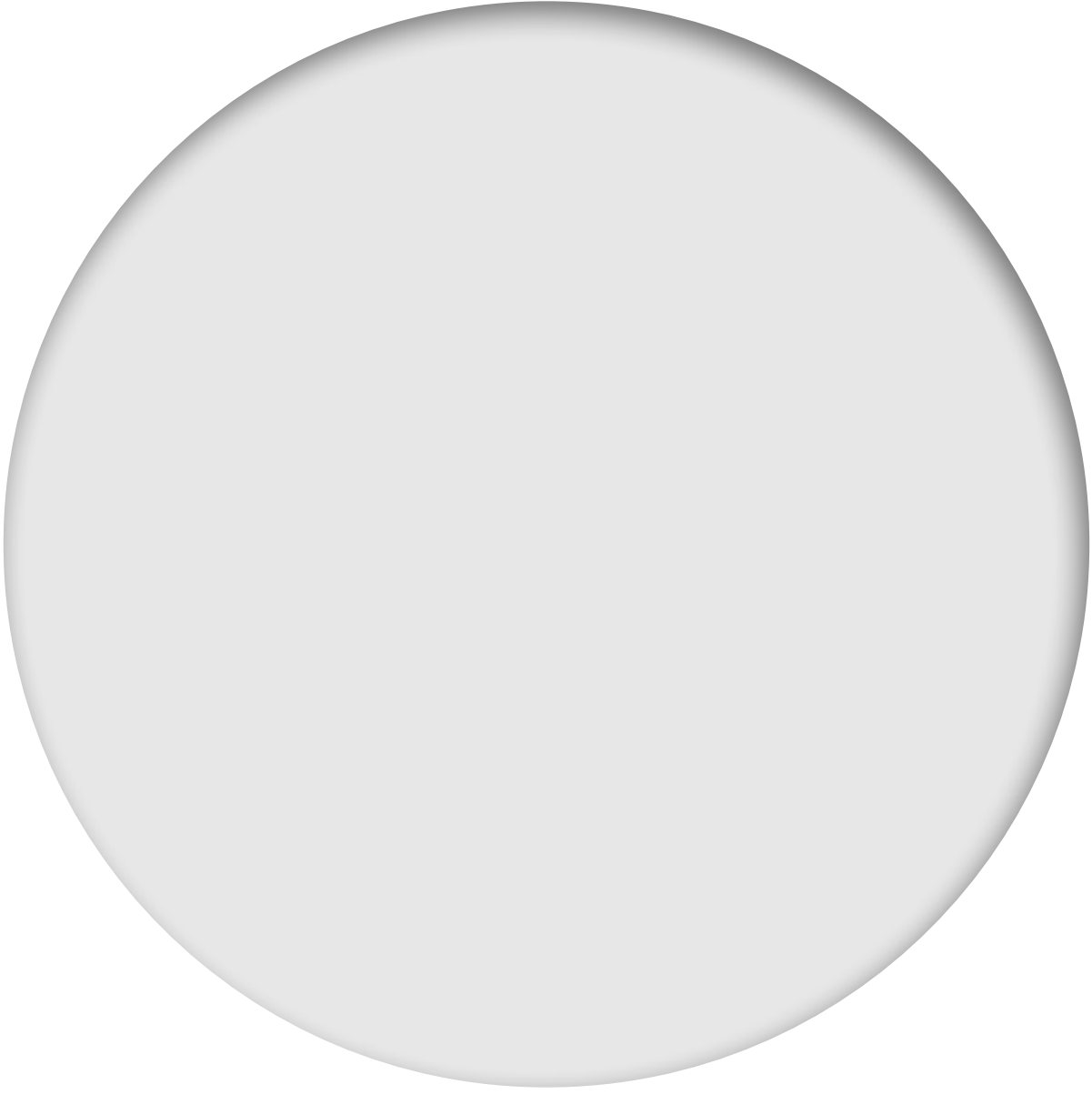


RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*



**From the abyss
to the surface,
from the coast
to the high seas**





Research goes hand in hand with experimentation: The IFREMER's wave tank, located in Brittany, simulates real-world wind and wave conditions to test measuring devices and offshore structures before they move on to testing at sea. The tank is 50 meters long and reaches an extraordinary depth of 20 meters at its deepest point.



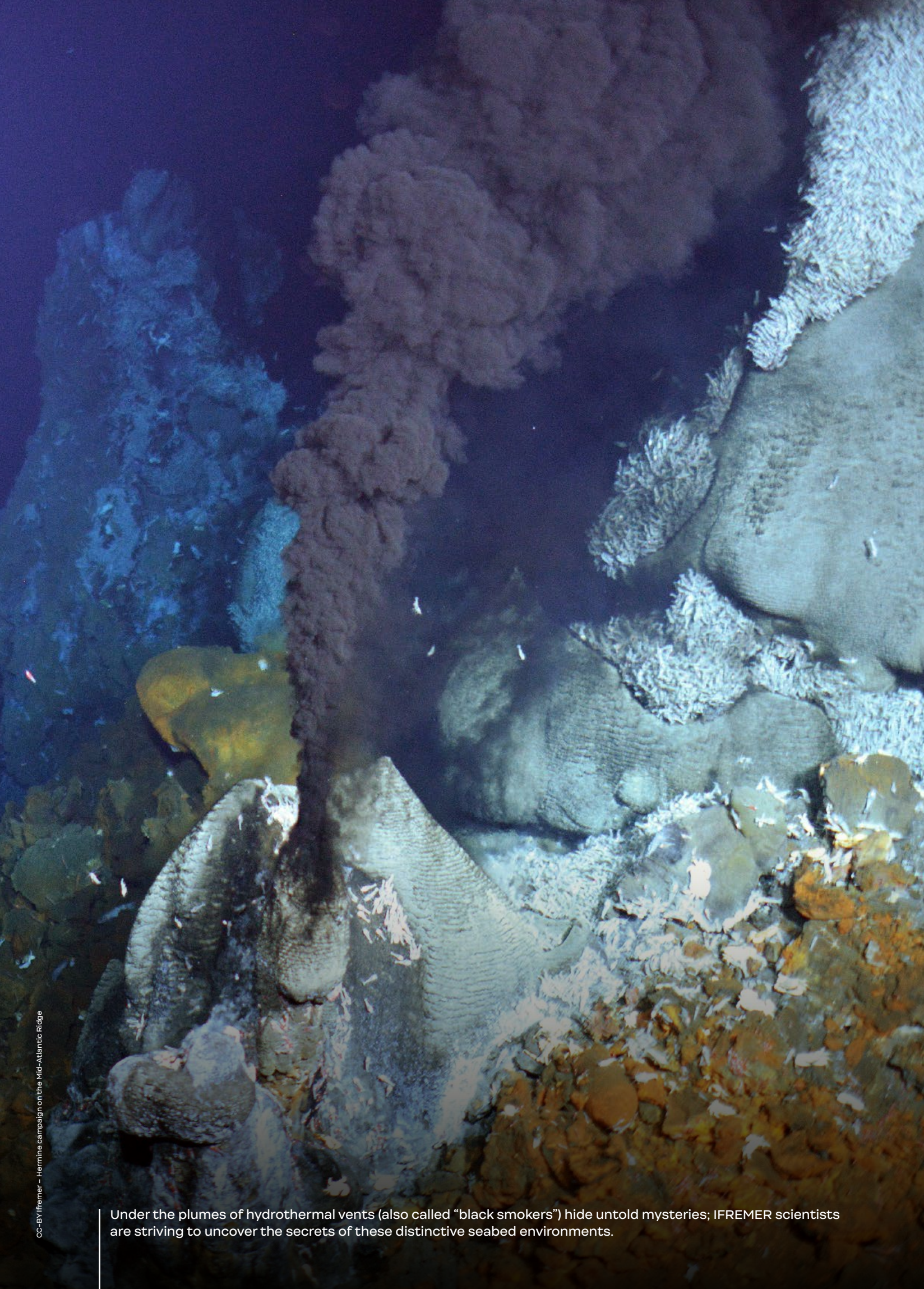
It might look like a bird's colorful plumage, but this is actually a Mediterranean fanworm! The *Sabella spallanzanii* boasts a flamboyant array of filaments. This one was photographed on an artificial reef, part of an IFREMER-led ecosystem restoration project in the Port of Toulon (France).



Ulyx is the latest autonomous submersible to join the French Oceanographic Fleet, operated by IFREMER and its operations subsidiary Genavir. This technological marvel needs no physical connection to a surface vessel, and will be a great ally in deep-sea exploration. The vehicle can reach depths of up to 6,000 meters and operate up to 48 hours in a row.



Autonomous profilers drift and descend into the abyss to take the pulse of the ocean. These devices evaluate ocean health and measure the effects of climate change. Being tested here is a PROVOR CTS5 biogeochemical float co-developed by engineers at IFREMER. Its sensors provide a wealth of information about water temperature and salinity.



Under the plumes of hydrothermal vents (also called “black smokers”) hide untold mysteries; IFREMER scientists are striving to uncover the secrets of these distinctive seabed environments.



IFREMER scientists and Genavir crew on the bridge of R/V Pourquoi Pas?, returning from a cruise. The *Pourquoi Pas?* is the flagship of the French Oceanographic Fleet, operated by IFREMER and its subsidiary Genavir. Every year, nearly 1,800 researchers, engineers, technicians, students, doctoral candidates, and post-doctoral academics from across the French scientific community set sail to continue expanding the limits of what we know about the ocean.

We are the ocean

The ocean connects us, unites us, and makes life on Earth possible. Just as our bodies are about 70% water, the ocean covers about 70% of the planet. Over a geological timescale, it has produced more than half of the oxygen we breathe today, and more than 3 billion human beings depend on it.

In the face of climate change, the ocean protects us by absorbing one-quarter of all greenhouse gases and most of the excess heat generated by human activities. It provides decarbonization solutions in the form of marine renewable energies like wind, wave, and ocean current power. But that very same climate disruption stresses the ocean itself through acidification and warming, while rising sea levels threaten coastal populations and infrastructures.

The vast majority of global commerce is based on maritime transport, and almost all intercontinental communication passes through undersea cables.

Every living thing on our planet relies on the ocean. And in one way or another, we are the ocean.

Whether we're trying to satisfy our curiosity, clarify public policies, understand how the ocean works and what role it plays in a green future, or create solutions through innovation, IFREMER produces and shares information in the hopes of keeping the ocean vibrant and resilient.

Key facts and figures

The ocean covers **70.8 percent of the surface of our planet** (Source: OCP)

Approximately **23% of the CO₂** generated by human activity is absorbed by the ocean (Source: UN)

More than **90% of excess heat** created by climate change is captured by the ocean (Source: UN)

Sea level rise is speeding up: The rate has more than doubled, from 1.4 millimeters per year for the majority of the 20th century to **3.6 millimeters per year** between 2006 and 2015 (Source: NOAA)

There are **245,300 known marine species** (not including microorganisms like viruses and bacteria). 2,000 new species are described each year, and the total number of species remains unknown (Source: WoRMS)

17% of animal proteins consumed worldwide come from aquatic sources (50% in many Asian and African countries) (Source: FAO)

Current average ocean pH is 8.1, **30% more acidic** than in the preindustrial era (Source: UN)

58.5 million people worldwide are employed in the fishing industry (Source: FAO)

Aquatic food consumption is predicted to rise **15% by 2030** (Source: FAO)

5 to 12 million metric tons of plastic enter the ocean each year (Source: UN)

IFREMER dives deep into ocean sciences

From the abyss to the surface, from the coast to the high seas, IFREMER is the only French research institute entirely dedicated to knowledge of the ocean and ocean-related activities. The Institute was created in 1984 when the Scientific and Technical Institute for Maritime Fisheries merged with the National Center for Ocean Exploitation. IFREMER inherited an exceptional scientific legacy, combining historical expertise in fishing science from the 19th century through the present day with modern proficiency in deep-sea ocean exploration technologies. The Institute builds upon that heritage today as it dives deep into every aspect of ocean science.

The women and men of IFREMER are trailblazers, carrying on the tradition of French oceanography and advancing research frontiers with help from the French Oceanographic Fleet - operated by IFREMER and its subsidiary Genavir, and its cutting-edge, constantly evolving exploration vehicles. Every research cruise is an opportunity to gain new understanding of how the ocean works, study its biodiversity, discover new species, and assess the impact of human activities on the planet's largest ecosystem.

IFREMER is a Public Institution of Industrial and Commercial Nature, supervised by the government ministries responsible for research, the ocean, and the environment. It uses its scientific expertise to clarify maritime public policy and devise ocean-based solutions to help create a greener future. The Institute demands excellence in all its work. An ambitious corporate social responsibility policy guides its course. The Horizon 2030 strategic plan outlines the Institute's high-level approach to gathering the scientific data needed to understand ocean system dynamics and mechanics through the year 2100.

The 2024-2028 Statement of Objectives documents the commitment IFREMER has made to the French government to align its research, innovation, and expertise with the green transformation and provide support for a sustainable blue economy. As growing recognition of the ocean's importance competes against a deluge of fake news, IFREMER's Stakeholders Committee keeps the Institute's work firmly anchored in the public mind by providing a place for members of the scientific community and civil society actors of all stripes to come together.

IFREMER's ultimate goal is to give voice to passion-driven, action-oriented science that is based in rational understandings and committed to knowledge-sharing as a tool for raising awareness.

Explore, understand, preserve, act

In the world of oceanography, IFREMER stands out as much for its global reach, conducting operations in all three major oceans, as it does for the unique assortment of skills and disciplines that it draws on to learn every intricacy of how the ocean works.

IFREMER pursues new insights by conducting scientific and technical research on the ocean, an environment that remains poorly understood. Seventy-five percent of the deep sea has yet to be mapped with any precision, and a significant portion of species have never even been observed and described, much less officially identified.

In addition to its research, IFREMER pays special attention to how this work intersects with wider society: It produces expert opinions to clarify and support maritime public policy, proposes innovations in collaboration with economic actors to develop solutions, and participates in European and international initiatives to create a strong, united scientific front in defense of the ocean.

IFREMER's many partnerships bear fruit in the form of shared scientific and technical skills and expertise in the field of marine biodiversity, environments, and resources, as well as on the topic of the ocean's evolution, workings, and usages. Through this abundance of collective knowledge, IFREMER hopes to inspire public authorities, businesses, and individuals alike.

Our purpose

Conduct research, innovate, and provide expertise to protect and restore the ocean, sustainably manage marine resources and ecosystems, and share marine data.

Our research areas by purpose:

Protect and restore the ocean

- Ecosystems and marine biodiversity
- Ocean and climate
- Extreme events
- Pollution and contamination

Sustainably manage marine resources

- Fishing and aquaculture
- Health safety
- Mineral resources
- Energy and materials
- Marine biotechnologies

Acquire and share marine data and information

- Sensors and measurement systems
- Observation
- Digital ocean and modeling

Instruments for well-orchestrated marine sciences

To further our collective understanding of the world's largest ecosystem, IFREMER designs, develops, and deploys state-of-the-art technologies for testing, experimentation, and observation.

These research infrastructures are available to any member of the scientific or business community and they are crucial to our ability to monitor the ocean in real time, measure how it changes, explore hypotheses in the laboratory, and trial innovative technologies in testing tanks.

The French Oceanographic Fleet sets sail around the globe

17 vessels and 6 submersibles

The French Oceanographic Fleet, operated by IFREMER and its operations subsidiary Genavir, sails the world's waters to better understand and protect every part of the ocean, from the abyss to the surface and the coast to the high seas. This research infrastructure addresses today's major issues in marine science and technology. With seventeen research vessels and six submersibles, it serves the French and European scientific communities and contributes to excellence in both basic and applied research.

The Fleet participates in monitoring missions and public service projects for the government, and its crews are highly sought after for partnerships in the business world. It is one of the three largest scientific fleets in Europe. Every year, 1,800 scientists board the Fleet's vessels for research cruises that generate an average of 350 scientific publications per year.

Research tested in the lab and at sea

4 test tanks and 1 offshore test site

IFREMER has **4 testing tanks**, each with its own focus: fishing gear in Lorient; submersibles in La Seyne-sur-Mer; wind and wave effects, hexapod tests, and MRE in Plouzané; wind and wave effects, water turbines, and naval tests in Boulogne-sur-Mer. The Institute also has **an offshore test site** (Saint-Anne-du-Portzic) where it trials prototypes and equipment in real-world conditions during the final phase of development.

Hyperbaric chambers are available in Plouzané and La Seyne-sur-Mer to assess the mechanical and thermal effects of being deep underwater. And finally, **resources for studying polymer and composite material durability** (Plouzané) support research on mechanical resistance and underwater material degradation processes.

Mollusks, fish, and crustaceans in the spotlight of experimental research

4 platforms & 3 experimental sites

IFREMER's seven experimental installations are distributed across mainland France (Bouin, Argenton, La Tremblade, Palavas, Plouzané) and overseas territories (French Polynesia and New Caledonia). Each one studies species of interest in sustainable aquaculture and investigates how the physiology of these species affects their ability to handle climate change.

Creatures on the researchers' radar include mollusks (oysters and bivalves), penaeid shrimp, and tropical fish and invertebrates like sea bass, sticklebacks, and sea cucumbers. Activities and research topics cover everything from production of oyster spat to treatment of aquaculture effluent, mollusk diseases, genetics, sustainable conservation and exploitation of marine species, and the impact of human activity on ecosystems.

Keeping a close eye on the ocean

3 observation infrastructures directed by IFREMER

IFREMER coordinates France's contribution to the worldwide **Argo** program, whose 4,000 floats collect real-time data on the global ocean. This contribution, the second largest in the world, constitutes 30% of European participation and 7% of worldwide participation for the next decade.

The Institute also coordinates France's involvement in **EMSO ERIC**, the European Multidisciplinary Seafloor and water column Observatory: IFREMER teams manage the seafloor observatories installed off the coast of the Azores and in the Ligurian Sea near Nice. They are also in the process of creating two new observatories, one near Mayotte and the other in the Coral Sea off the coast of New Caledonia.

On top of all that, IFREMER co-directs **ILICO**, a national research infrastructure that observes the coastal ocean and forms part of the massive European research infrastructure **JERICO**.

A hot spot for French and European marine data:

3 outstanding digital infrastructures

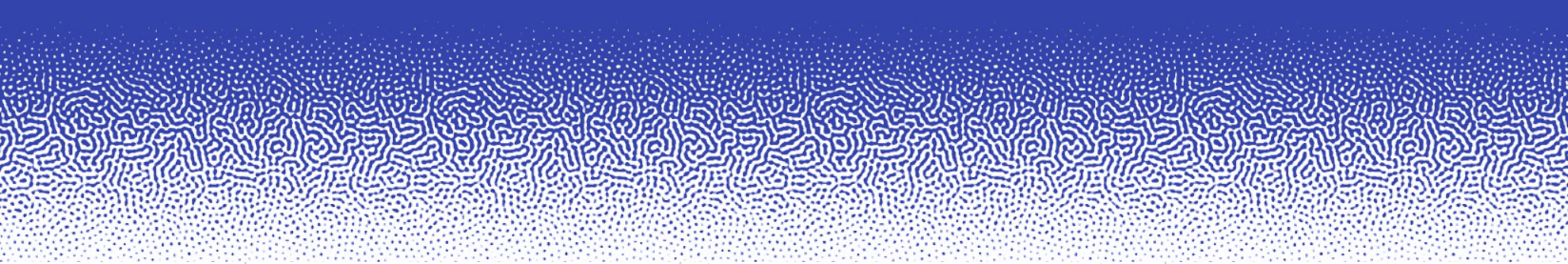
Digital data has become the key to unlocking the secrets of how the ocean works. IFREMER oversees **ODATIS**, the gateway to all French data on the marine environment (satellite images, physical and chemical measurements, biological data, dataset processing and analysis, etc.), as part of the larger DataTerra Research Infrastructure.

The Institute also runs **data.ifremer.fr**, a portal that collects data on the marine environment (geology, marine species) as well as human activities. Plus Ifremer is host to the Datarmor supercomputer, whose processing power and storage are rare in the world of oceanography. With **Datarmor**, researchers can analyze data, create models, achieve new insights into how the ocean has changed over time, and run simulations of those same changes.

Sharing infrastructure for collaborative scientific advancement

All of IFREMER's infrastructures are available for use by the French and European scientific communities, as well as by businesses operating in the field of oceanography, with the goal of creating positive, ocean-oriented synergies.

For research contracted by businesses, the Institute pools resources with partner networks from the Carnot MERS institute; elsewhere, resources are also shared with partners from the THEoREM research infrastructure and the OPEN-C Foundation, Europe's largest network of offshore testing sites in the marine renewable energies sector.





Herring larvae dancing a graceful ballet: This species is vital to the marine food web, but suffers from the effects of climate change. IFREMER scientists are studying whether it can adapt to warmer, more acidic waters during the early stages of its life.



This strange machine resting at the bottom of the sea is a Penfeld penetrometer. It takes soundings of the seafloor terrain up to 30 meters deep, and can operate at water depths of up to 6,000 meters. The device amasses a great deal of useful data for marine geologists.



Mussels work as sentinels to detect chemical pollution in ocean waters. The RINBIO biological indicator network, operated in partnership with the Rhône-Mediterranean-Corsica Water Agency on the SUCHI Med cruise series, has one hundred stations on the French Mediterranean coastline. Bags of mussels are immersed every three years along the Mediterranean seafloor, then assessed for contaminant accumulation.



A room full of treasures: IFREMER's CREAM (Marine Sample and Archive Resource Center) seafloor samples repository is open to the scientific community. This impressive library hosts a growing collection of geological samples that dates back to the 1970s. CREAM is managed by the GéoOcéan mixed research unit and contains 18,000 sediment core sections and 23,000 rocks sampled from across the world's oceans. It's the key to deciphering ocean history.



IFREMER is plotting a course toward renewable energy. Pictured here is a 1/4-scale prototype of the DIKWE energy-producing seawall undergoing trials at the Sainte-Anne-du-Portzic offshore testing site. Designed by the Legendre Group in partnership with GEPS Techno and IFREMER, this invention aims to protect coastlines while using wave power to generate clean energy.

IFREMER's operations span the globe



Highlights

In 2023

1/4 of French research on marine science and technology

1,572 employees,
47 % are women
employees

797 scientists, including
111 accredited to supervise
research (HDR diploma
holders)

**775 engineers, technicians
and administrative staff**
providing direct support
for science

137 doctoral students
in our laboratories
887 employees trained
en 2023

24 locations
around the globe

**24 scientific and
technological research
units** including 11 mixed
research units

€260 million in operating
costs and €30 million
in investment

Co-chair of the Ocean-
Climate PRP, the Grands
fonds marins PEPR,
and the BRIDGES PEPR

98 expert opinions
provided per year on
average (2019–2023)

45 patent families filed

Involved in **15 of the 35
start-ups** in the French
Blue Tech index

**3 European Research
Council projects**

61 H2020 projects
(2014–2020)
and 35 Horizon Europe
projects (2021–)

Top 5 worldwide for the
French Oceanographic
Fleet, operated by
IFREMER and its subsidiary
Genavir

France 2030 Standard-
bearer for 7 of the 12
missions under Objective
10, “Understanding the
deep sea”

Developer of cutting-edge
technology Argo2030,
MARMOR,
DeepSea’nnovation

2,957 publications with
at least one IFREMER
author indexed in the Web
of Science bibliographical
database and consolidated
in Archimer between 2019
and 2023

More than **1 petaflops**
of computing power for
IFREMER supercomputer
Datarmor (plus **70
petabytes** of storage),
giving a performance
equal to 5,000 next-gen
smartphones

More than 8,000 articles
citing IFREMER in the
national press and **more
than 300 hours** of
classroom presence
spreading scientific
knowledge

#AllOnBoard