tara POLARIS I

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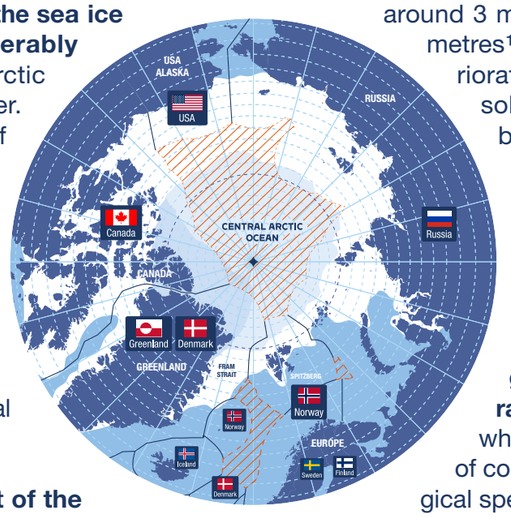
THE ARCTIC: A SENTINEL OF GLOBAL CHANGES

The Arctic Ocean,the only polar ocean on the planet, covers 14 million km², an area equivalent to five times that of the Mediterranean Sea. Bordered by eight countries: Russia, Norway, Sweden, Finland, Greenland (Denmark), Iceland, Canada and Alaska (United States), it lies almost entirely beyond the Arctic Circle (66° 33' North latitude). This icy region can experience up to six months of polar night and six months of daylight, with constant daylight in summer (no sunrise or sunset).

Most of the Arctic Ocean's surface freezes over every winter. **With climate change, the extent, thickness and volume of the sea ice have decreased considerably** and a large part of the Arctic is now ice-free in summer. Every summer, this layer of ice melts so that by September it covers only a third of this Ocean.



The Intergovernmental Panel on Climate Change (IPCC) **predicts that summer sea ice will disappear by 2045**, as a result of global warming.

The Arctic is at the heart of the climate crisis. The central Arctic Ocean is warming three to four times faster than the rest of the planet. This is known as **Arctic amplification**.

Another phenomenon, **Arctic atlantification**, has emerged over the last 15 years. The increased inflow of Atlantic waters, which are warmer and saltier, is disrupting the natural stratification of the Central Arctic Ocean. Until now, Atlantic waters remained at intermediate depths,whilst the cold, fresh Arctic waters were found higher up in the water column.

These mechanisms of Arctic amplification and atlantification have significant consequences on ecosystems and organisms at the base of the region's food chain, such as plankton, fish and iconic marine mammals, notably polar bears, arctic foxes, belugas, narwhals and seals.

The environmental effects are already very noticeable: a reduction in sea ice thickness (from around 3 metres in the 1980s to 1.5 metres[1] on average today), deterioration in ice quality, greater solar energy absorption (albedo decrease due to sea ice melt), permafrost thaw and an increase in atmospheric humidity.

The Arctic will be increasingly influenced by the atmospheric and oceanographic processes characteristic of mid-latitudes, which will increase the influx of contaminants and new biological species. The Arctic's ongoing transition to a new state demands systematic, year-round, and long-term monitoring. It is essential to understand this unique ecosystem in order to inform climate models and policies in this region, which faces multiple pressures (environmental, geopolitical and economic).

1· https://doi.org/10.1088/1748-9326/aae3ec

THE CENTRAL ARCTIC OCEAN: A LIVING ECOSYSTEM UNDERGOING CHANGES

Sea ice can be regarded as one of Earth's major biomes. Regardless of its age (ranging from a few hours to several years) and its condition (from slush to hard, frozen ice), it always supports life. The porous nature of sea ice, together with the physical and chemical properties of its interstitial fluids, determines its habitability for a wide variety of living organisms. **Acting as a concentrator of micro-organisms, sea ice provides confined micro-spaces where all the elements necessary for life, originating from the atmosphere and the ocean, come together.** Today, it is a key component of polar marine ecosystems, providing a refuge for viruses, archaea, bacteria, protists, small invertebrates and fish larvae, despite its extreme and contrasting conditions (temperature, salinity, pH, alkalinity, gases).

As sea ice thins and disappears, some Arctic species may be able to adapt their physiology and phenology, or move northwards in search of more favourable conditions, but others may be forced out as the Arctic warms. Current trends suggest that species which depend on sea ice for breeding, resting or feeding will see their range shrink as sea ice retreats earlier and the open-water season lengthens. **Marine species and Arctic ecosystems are under pressure from cumulative changes in their physical, chemical and biological environment.**

TARA POLARIS: ASSESSING THE CENTRAL ARCTIC OCEAN HEALTH

“In the long term, the *Tara Polaris (2026–2046)* expeditions will help inform weather model forecasts in Europe by 2050 and shed light on the consequences of global changes (climate and pollution) on the functioning of our planet. The findings, which will be openly accessible, will support better governance of the Central Arctic Ocean, guiding regulations on industrial activities until we have a clear picture of the health of our planet’s only polar ocean. Through regular reports on the Central Arctic Ocean’s state, we are fostering international and regional cooperation, particularly with indigenous peoples. *Tara Polaris (2026–2046)* is a comprehensive programme. From research to knowledge-sharing through artists, educational resources and live updates from the station, our aim is to raise awareness across the whole society.”

Romain Troublé, Chief Executive Officer of the Tara Ocean Foundation
Director of the *Tara Polaris (2026–2046)* programme

10 EXPEDITIONS TO THE HEART OF THE ARCTIC

“It is unknown how organisms living in the heart of the Central Arctic Ocean cope with the extreme seasonality of light, temperature, sea ice and ocean dynamics, or how they survive during the long polar night. Over recent decades, this unique ecosystem has come under increasing threat. Its condition tells us how humanity is transforming the Earth. We urgently need observations to better understand the nature of the changes happening in the Arctic, particularly to capture the full annual cycle and track interannual variability. The *Tara Polaris (2026–2046)* programme will bear witness to the history of the Arctic.”

Marcel Babin, Polar Oceanographer, CNRS/Laval University/Sorbonne (France/Canada)
Co-Scientific Director of the Tara Polaris programme, Scientific Director of the *Tara Polaris I (2026-2027)* expedition

“The drifting research station, *Tara Polar Station*, will be deployed in the Central Arctic Ocean for 10 consecutive expeditions (*Tara Polaris I, II, III*, etc.) until 2046. A true scientific hub, this laboratory-observatory will host researchers from all over the world (biologists, physicists, ecologists, glaciologists, atmospheric scientists, oceanographers, etc.). The first twelve crew members are committing to a winter-over of around nine months. The selection and training process has been modelled on that used at remote research stations. Our aim: a close-knit group ready to face the challenges of an extraordinary expedition.”

Clémentine Moulin, Director of Operations at the Tara Ocean Foundation
Coordinator of the *Tara Polaris I (2026-2027)* expedition

TARA POLARIS I

Tara Polaris I (2026–2027), the first expedition of the *Tara Polaris (2026–2046)* programme, is essential for providing an initial assessment of the impacts of global change on the Arctic and the wider Earth system, while advancing knowledge on the Central Arctic Ocean ecosystems.

KEY OUTCOMES:

- Push the boundaries of knowledge on biodiversity by exploring regions that are difficult to access
- Discover the unique adaptations that have evolved to enable life in this extreme environment
- Analyze the consequences of sea ice melt and pollution on these fragile ecosystems
- Identify new molecules, species and processes with potential new applications
- Monitor Arctic fish stocks and the impact of the arrival of more temperate species
- Provide new data to refine climate models and improve forecasts of future weather conditions at lower latitudes, including Europe

TARA POLARIS I SCIENTIFIC BASE CAMP

ALTITUDE
(in metres)

STUDIED SENTINELS

The *Tara Polaris I expedition (2026–2027)* aims to characterise and gain a better understanding of the various compartments (ocean—sea ice & snow—atmosphere) specific to the Central Arctic Ocean, as well as their interconnectivity. Seasonality is a fundamental aspect of both this system and the Arctic marine ecosystem, yet it has not been fully captured by previous year-round expeditions.

1000 m

ATMOSPHERE
- Meteorology
- Clouds
- Aerosols
- Trace gases
- Contaminants (mercury, plastics and other chemicals)

SEA ICE AND SNOW
- Snow cover
- Ice cover
- Ice dynamics
- Habitat and biodiversity
- Contaminants (mercury and other chemicals)

1 m

0 m

- 30 m

- 100 m

- 150 m

OCEAN
- Ocean hydrography
- Ocean dynamics
- Water mixing (Atlantification)
- Light variations
- Nutrient availability
- Biodiversity
- Microbial processes
- Carbon export
- Contaminants (mercury, plastics and other chemicals)

- 2000 m

DEPTH
(In metres)

WEATHER MAST

Fitted with sensors to measure air pressure, temperature and relative humidity at 2 m and 4 m, horizontal wind speed and direction, solar and terrestrial radiation, and snow accumulation and flux.

RADIOMETER

Measures the amount of solar radiation reaching the sea ice and the amount reflected by it. The ratio of these two quantities defines the albedo.

SNOW SAMPLING + ICE GRID MAPPING

Sampling of snow and sea ice to carry out measurements of their physical properties (thickness, density, temperature profiles), optical properties (light penetration beneath the ice), biogeochemical properties (mercury and other chemical substances) as well as the diversity of the organisms inhabiting them.

AZFP + ADCP + TURBULENCE + UVP

AZFP — Acoustic profiler for zooplankton and fish

A sonar system that emits ultrasound at different frequencies and analyses the backscattered waves to quantify the presence and abundance of zooplankton and fish in the water column. This instrument is deployed to depths of up to 100 m.

ADCP — Acoustic Doppler Current Profiler

Comprising transducers to transmit and receive acoustic signals, this tool enables the vertical profile of the current (velocity, direction, etc.) to be determined by characterising the movement and velocity of particles suspended within it. This instrument also enables the measurement of turbulence, i.e. small-scale movements of the water.

UVP—Underwater photographic profiler

An instrument that takes high-resolution photographs of zooplankton in the water column.

SEDIMENT TRAPS

A device for collecting particles that fall through the water column, enabling these particles to be quantified and characterised. The sediment traps collect 24 samples in 250–500 ml bottles, arranged on a rotating disc located beneath the structure.

THERMOSALINOGRAPH

Mounted beneath the hull, it continuously measures the temperature and salinity of the water at a depth of 3 m.

PLANKTON NET

Funnel-shaped nets that filter the water and guide suspended organisms towards the base of the net. The mesh sizes used can range from 500 µm to 20 µm to sample plankton of different sizes. It can reach depths of up to 2,000 m.

HYDROPHONE

A passive acoustic, underwater sensor that listens for sounds in the ocean without emitting any signal.

SATELLITES

All communications between *Tara Polar Station* and the outside world are carried out via satellites (Iridium, Argos, GPS) in polar orbit. Furthermore, all the data collected on the study of snow and ice (density, thickness, crystallography, humidity, etc.) enable the calibration of satellites that study the cryosphere (Cryo-Sat-2 or the future CRISTAL).

RADAR + LIDAR

Radar

Works in the same way as a LIDAR, but emits waves of lower frequencies (radiowaves), which makes it possible to determine the position of objects at long distances.

Lidar

Enables the remote determination of the properties of an object or a surface by emitting waves via a laser (close to the visible spectrum) and analysing them when they return. Its range is 10 km.

CAMERA 180°

A camera system for taking 180° photographs of the area around the polar station at regular intervals, in order to monitor the state of the sky and ice conditions around *Tara Polar Station*.

TETHERED BALLOON

This is a helium balloon that carries a suite of instruments. It is used in particular to measure air temperature, humidity, atmospheric pressure, wind speed and direction at six levels between the surface and an altitude of 1,000 metres. The instruments installed also collect atmospheric particles for biogeochemical analysis.

DRONE

Fitted with camera, the drone enables images of the ice to be collected in order to assess its condition and monitor its changes. The drone can also be used to take air quality measurements.

SNOWMOBILE

An electric snowmobile designed for logistics on the sea ice and to link the various sampling points scattered across the ice around *Tara Polar Station*.

TENT

Shelter for extreme environments enabling measurement instruments to be set up directly on the ice.

SURFACE ADCP

A current profiler system comprising a transducer for measuring the speeds and directions of marine currents, and two transducers for quantifying and identifying the biomass in the water column beneath *Tara Polar Station*.

CTD - ROSETTE

A system comprising a bathysonde and Niskin bottles which close at a predetermined depth to collect samples at the desired depths. In addition to collecting water samples, sensors measure the physico-chemical parameters of the water. This is the instrument used by *Tara Polar Station* that is designed to descend to the greatest depth. It can reach depths of up to 2,000 metres.

ROV

A remotely operated underwater vehicle, connected to the ship via an umbilical cable, and which is fitted with cameras to film the underside of the sea ice. It is also fitted with sensors that measure the physical and chemical properties of the water and enable the thickness of the sea ice to be estimated. Its area of operation is limited to a radius of 250 m around *Tara Polar Station*.

AUV

An autonomous, compact underwater drone capable of reaching depths of up to 300 m. It uses sensors to measure and characterise environmental parameters such as temperature, salinity, chlorophyll concentration and the amount of solar energy penetrating the water. Its operational range is limited to a radius of 1 km around *Tara Polar Station*.

PHYSICAL MOORING

A set of temperature and salinity sensors positioned at fixed depths along a 100-metre-long mooring line.

TARA POLAR STATION: A HUMAN, TECHNICAL, SCIENTIFIC AND FINANCIAL CHALLENGE

5 YEARS OF DESIGN

Architects: Olivier Petit; Bureau Mauric; supported by Capgemini Engineering and Albert II, Prince of Monaco

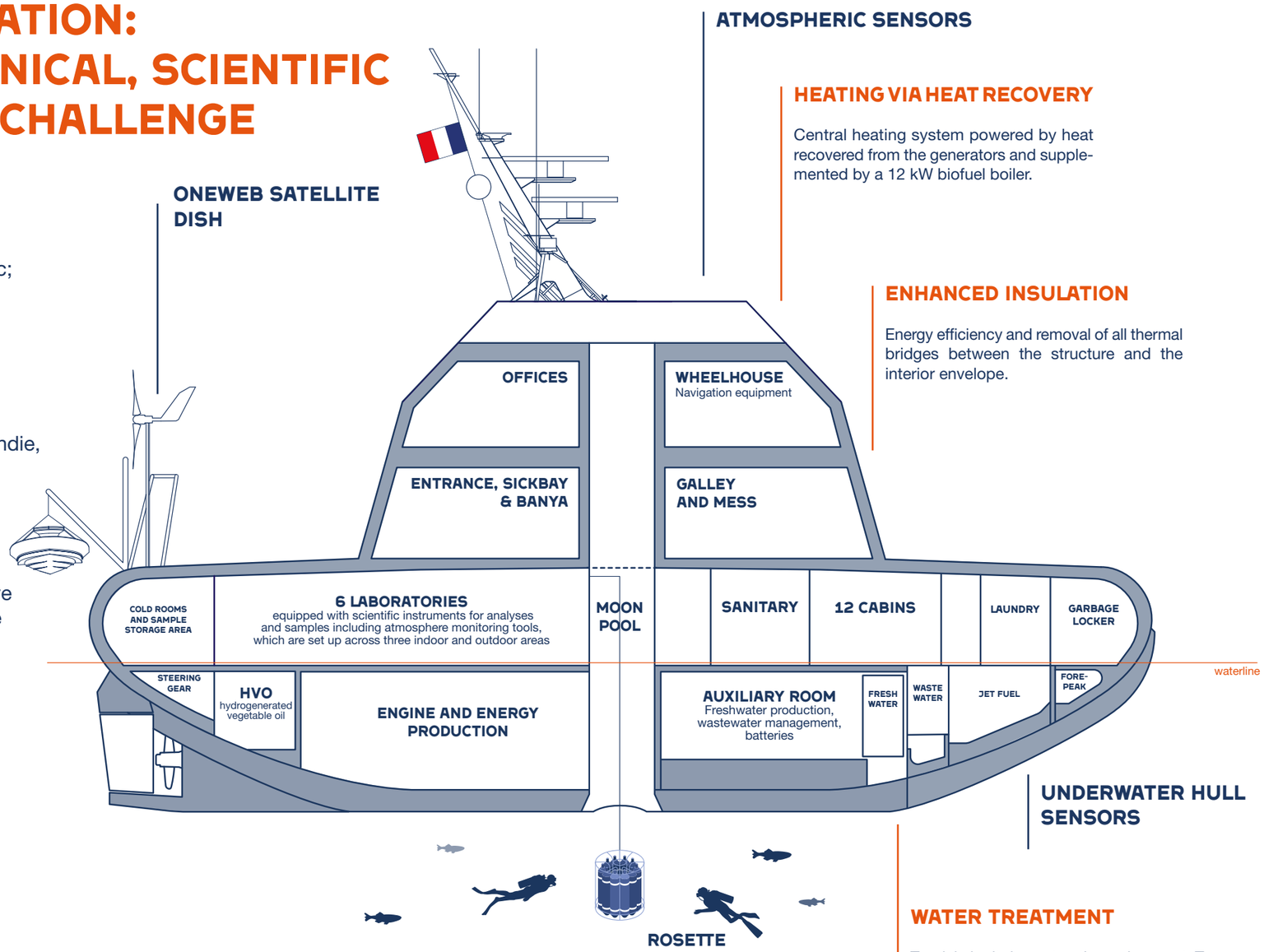
18 MONTHS OF CONSTRUCTION

Constructions Mécaniques de Normandie, Cherbourg, France.

TECHNICAL SPECIFICATIONS

Tara Polar Station has a very distinctive oval shape, designed to withstand the pressure of the ice :

- Length: 26 metres
- Width: 16 metres
- Draught: 3.20 metres
- Maximum height: 11 metres
- Weight: 405 tons maximum
- Hull thickness: 20 mm (aluminium)
- Moon Pool diameter: 1.6 metres
- Fuel capacity: 130 m³ of HVO provided by NESTE
- Range: 500 days
- Flag: French
- **Home port: Lorient**



WATER TREATMENT

To minimise its impact on the environment, *Tara Polar Station* is equipped with a water treatment system, an oily water separator and everything necessary to comply with the Polar Code.

12 PEOPLE IN WINTER

4 crew members (captain, first mate, chief engineer, cook), an onboard reporter, a doctor, 6 scientists and engineers.

18 PEOPLE IN SPRING AND SUMMER

An artist, a polar guide, 3 additional scientists and a guest or a journalist join the drifting base.

MEDICAL MONITORING

The crew will be in direct video contact with the Maritime Medical Consultation Centre in Toulouse for appropriate care in the event of injuries or frostbite. Various studies on human health will be conducted in collaboration with the French National Centre for Space Studies (CNES), the European Space Agency (ESA) and Weill Cornell Medicine in the United States.

PERMANENT CONNECTION

Tara Polar Station will be able to broadcast information around the clock and recount the adventure thanks to an onboard reporter and a high-speed connection provided by Eutelsat. This high-performance connection will enable data exchange, coordination of the expedition and preserving essential connections with loved ones.

+50%
of the space dedicated to science

220
scientific protocols to be carried out during *Tara Polaris I (2026-2027)*

90%
of the time locked in the ice; autonomous navigation at sea

UP TO -52°C
Can withstand extreme temperatures

300 LITRES / H
of drinking water produced by a desalination system to meet the crew's needs, estimated at 1,000 litres of water per day

12 TONNES OF FOOD
to provide for the crew's needs for 18 months

6 MILLIONS EUROS
Average cost of an expedition

TARA POLARIS I CONSORTIUM

The scientific work carried out as part of the *Tara Polaris (2026–2046)* programme is coordinated by consortia specific to each expedition, starting with *Tara Polaris I (2026–2027)*.

EXECUTIVE COMMITTEE

Director of the Tara Polaris Programme
Romain Troublé, Chief Executive Officer
Tara Ocean Foundation

Co-Scientific Director of the Tara Polaris programme and Scientific Director of Tara Polaris I
Marcel Babin, Polar Oceanographer
CNRS/Laval University/Sorbonne

Co-Scientific Directors of the Tara Polaris programme
Chris Bowler, Phytoplankton Biologist
ENS/CNRS
Lee Karp-Boss, Marine Biologist
University of Maine

Tara Ocean Foundation Coordination Team
Etienne Bourgois, Founding President
Clémentine Moulin, Director of Operations
Thomas Linkowski, Oceanographic Engineer
Nathalie Joli, Scientific Coordinator
Samuel Audrain, Fleet Manager

Involvement of 30 research institutes, 34 laboratories, 12 countries

The French National Centre for Scientific Research (CNRS) (15 laboratories), Laval University, the University of Maine, the Alfred Wegener Institute (AWI), the Swiss Polar Institute (SPI), Memorial University of Newfoundland (MUN), the University of Manitoba, the French Atomic Energy and Alternative Energies Commission (CEA)-Genoscope, Sorbonne University, the Arctic University of Norway (UiT), the Paul-Émile-Victor French Polar Institute (IPEV), the Institute of Marine Sciences (ICM-CSIC), the Free University of Brussels (ULB), Aarhus University, the Finnish Meteorological Institute (FMI), the European Molecular Biology Laboratory (EMBL), the Weizmann Institute of Sciences, the University of Victoria (UVic), Friedrich Schiller University of Jena (FSU), Ohio State University (OSU), the University of Alaska Fairbanks (UAF), University of Washington (UW), the Federal School of Technology in Lausanne (EPFL), the Swiss Federal Institute of Technology Zurich (ETH Zurich), the École Normale Supérieure (ENS), Kyoto University, the University of Perpignan Via Domitia (UPVD), the University of Bergen (UiB), Paris-Saclay University, Grenoble-Alpes University (UGA).

COORDINATORS

✦ Atmosphere
Julia Schmale, Atmospheric Scientist
EPFL
Michel Flores, Air Microbiome Specialist
Weizmann Institute of Science
Kathy Law, Atmospheric Scientist
LATMOS-CNRS/Sorbonne

✦ Sea ice
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University of Washington
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✦ Ocean
Maxime Geoffroy, Polar Ichthyologist (fish specialist)
Memorial University of Newfoundland
Pierre Galand, Marine Microbiologist
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Benjamin Rabe, Physical Oceanographer
Alfred Wegener Institute
James O'Brien, Microbial Ecologist
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✦ Contaminants
Hélène Angot, Atmospheric and Pollution Scientist
CNRS
Jean François Ghiglione, Specialist in Marine Microbial Ecotoxicology
CNRS/Sorbonne

✦ Long-term observation
Mathieu Ardyna, Polar Oceanographer
CNRS/Laval University/Sorbonne
Marcel Nicolaus, Sea ice Physicist
Alfred Wegener institute

✦ Omics
Eric Pelletier, Genomics Specialist
Genoscope
Silvia G. Acinas, Marine Microbiologist
ICM-CSIC
Flora Vincent, Marine Microbiologist
EMBL
Shini Sunagawa, Marine Microbiologist
ETH Zurich

TARA POLARIS I CALENDAR

SUMMER 2026 — ***Tara Polaris I*** **Departure**

SEPT 2026 — **Drift start**

APRIL 2027 — **Wintering**

JULY 2027 — **Spring leg**

SEPT 2027 — **Summer leg**

END 2027 — **Drift end**

Autumn leg

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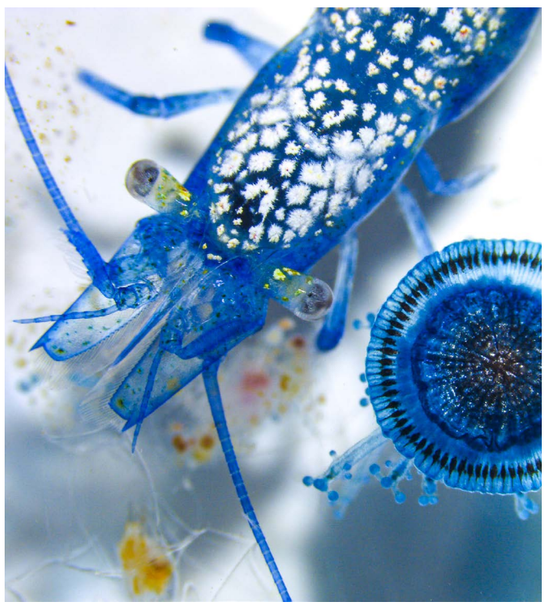
Headquartered in France, the Tara Ocean Foundation is a pioneering nonprofit organization dedicated to ocean conservation. Based on the deep conviction that the Ocean is essential to life on Earth, for over 20 years the Tara Ocean Foundation has helmed a transformational movement to protect ocean life. Exploring the Ocean and sharing scientific discoveries to inspire collective awareness is at the heart of our mission.

The Foundation conducts scientific expeditions, in partnership with leading international research laboratories, to study marine biodiversity and understand the impacts of climate change and pollution. We raise awareness among citizens - from younger generations to political decision-makers. With United Nations Special Observer status, the Tara Ocean Foundation is a key stakeholder for international governance, such as the Global Plastics Treaty and the High Seas Treaty.



"*Tara Arctic (2006–2008)* was the schooner's first major expedition and followed in the footsteps of the great polar explorations, particularly that of the *Fram* led by Nansen. The drift presented risks. As the ice melted, the charts were inaccurate. The crew found themselves trapped in the ice and completely isolated. These voluntary prisoners did not know how long the drift would last. They had to adapt to extreme weather conditions. With *Tara Polar Station*, and now a fleet of two vessels, we are reaching a new milestone in oceanographic science support and in knowledge sharing, especially through the work of artists. It is essential that the science conducted on board is communicated to as many people as possible, from politicians to children in classrooms."

Étienne Bourgois, Founding President
of the Tara Ocean Foundation

MAIN PARTNERS

French polar strategy

GOUVERNEMENT
Liberté
Égalité
Fraternité

FRANCE 2030

Financé par
l'Union européenne
NextGenerationEU

Financial partners

AXA · CMN · BNP PARIBAS · Capgemini · agnès b.

BIC · Fondation VEOLIA · Fondation Albedo Cryosphère · BIOTHERM · Prince Albert II of Monaco Foundation · Explorations de Monaco

Fondation Didier et Martine Primat · bird · France Collectivités · L'ORÉAL · NESTE · EUTELSAT

1% for the Planet · Green Got · INTERPARFUMS · Neuflize OBC · URIAGE

Scientific partners

cnrs · cea · The University of Maine · TAKUVIK · AWI

Institut Polaire Français · Swiss Polar Institute · Amundsen Science · anr · cnes · erc · NSERC CRSNG · MEOPAR

Institutional partners

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Together, let's defend life.
Let's protect the Ocean.

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