

# 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 km<sup>2</sup>, 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**.

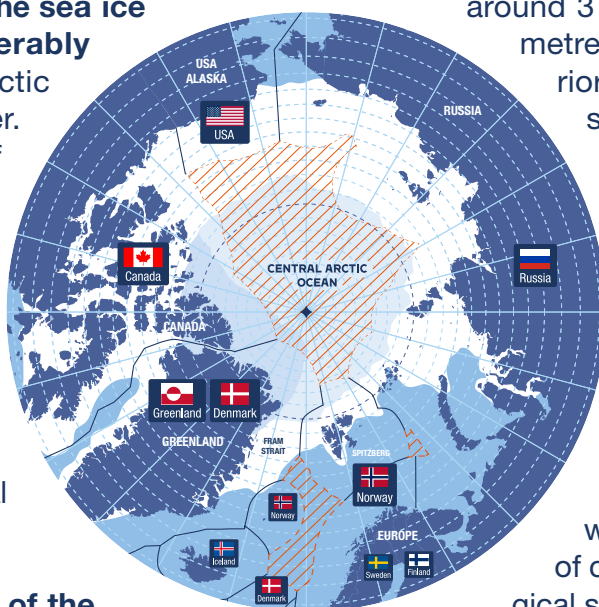
Another phenomenon, **Arctic atlantification**, has emerged over the last 15 years. The increased inflow of Atlantic waters, which are warmer and saltier, is disrupting the natural stratification of the

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<sup>1</sup> 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).



# 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 | SCIENTIFIC BASE CAMP

ALTITUDE  
(in metres)

STUDIED SENTINELS

- 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)

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

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.

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.

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.

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.

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.

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).

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.

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*.

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.

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*.

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 bathy-sonde 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.

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 m<sup>3</sup> of HVO  
provided by NESTE
- ♦ Range: 500 days
- ♦ Flag: French
- ♦ Home port: Lorient

## 12 PEOPLE IN WINTER

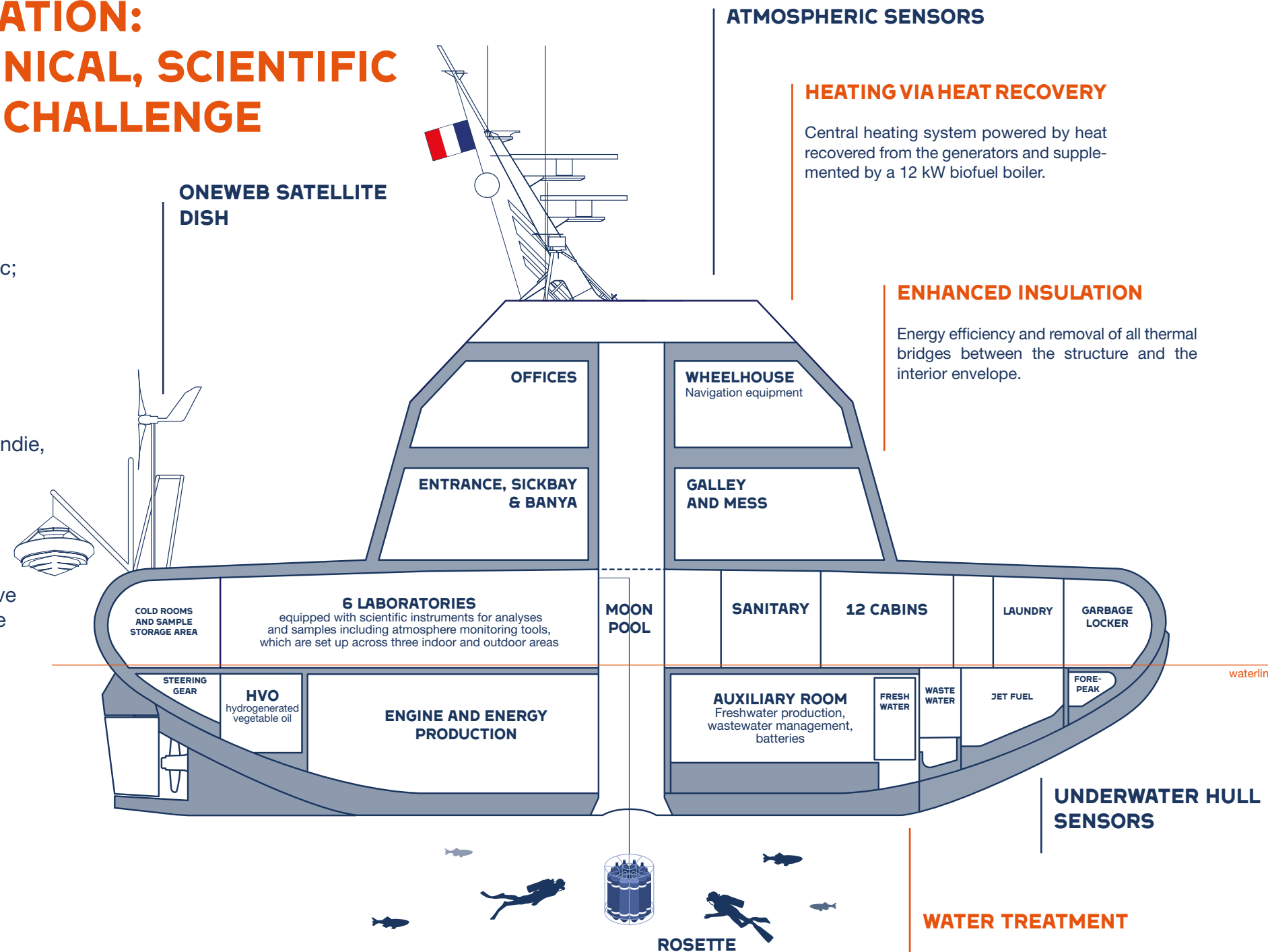
4 crew members (captain, first mate, chief engineer,  
cook), an onboard reporter, a doctor, 6 scientists  
and engineers.

## 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 Tou-  
louse 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.



**+ 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

## 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.

# 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

**Martin Vancoppenolle**, Sea ice Physicist  
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**Christopher J. Mundy**, Sea ice Biologist  
🇨🇦 University of Manitoba  
**Silvia G. Acinas**, Marine Microbiologist,  
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**Jody Deming**, Sea ice Microbiologist  
🇺🇸 University of Washington  
**Søren Rysgaard**, Sea ice Biogeochemist  
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### ♦ Ocean

**Maxime Geoffroy**, Polar Ichthyologist (fish specialist)  
🇨🇦 Memorial University of Newfoundland  
**Pierre Galand**, Marine Microbiologist  
🇫🇷 CNRS/Sorbonne  
**Benjamin Rabe**, Physical Oceanographer  
🇩🇪 Alfred Wegener Institute  
**James O'Brien**, Microbial Ecologist  
🇨🇭 ETH Zurich

### ♦ 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  
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**Marcel Nicolaus**, Sea ice Physicist  
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### ♦ Omics

**Eric Pelletier**, Genomics Specialist  
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**Flora Vincent**, Marine Microbiologist  
🇩🇪 EMBL  
**Shini Sunagawa**, Marine Microbiologist  
🇨🇭 ETH Zurich

## TARA POLARIS I

- Route to the ice-grip point
- Expected drift track
- Expected drift end zone
- Stopovers
- North pole

## LEGENDS

- Ocean depth
  - Winter ice
  - Summer ice
  - Summer ice predicted in 2050 (IPCC)
- 0 1500 km



# TARA POLARIS I CALENDAR

SUMMER 2026 SEPT 2026 APRIL 2027 JULY 2027 SEPT 2027 END 2027

Tara Polaris I  
Departure

Wintering  
Drift start

Spring leg

Summer leg

Autumn leg  
Drift end

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 helped 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



## Financial partners



## Scientific partners



## Institutional partners



## Official suppliers



Fondation  
**taraocéan**  
explore and share



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

[www.fondationtaraocean.org](http://www.fondationtaraocean.org)

