

tara POLAR STATION



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taraocéan
explore and share



THE TARA OCEAN FOUNDATION RETURNS TO THE ARCTIC

18 years after the schooner *Tara*'s first expedition to the North Pole, the Tara Ocean Foundation team has imagined and designed a new scientific programme - on a whole new scale - to accelerate research on climate and biodiversity in the Arctic.

The construction of *Tara Polar Station*, a new drifting base for scientific research, started in September 2023 and was completed in April 2025 by the Constructions Mécaniques de Normandie in Cherbourg, France.

Climatologists, biologists, physicists, ecologists, glaciologists, oceanographers, doctors, journalists, artists and sailors will embark on an extraordinary new adventure to study the Arctic and its evolution over the next two decades. In this hostile and very challenging environment, these new explorers will push the limits of Arctic research, especially in the darkness of polar winter.

The launch of *Tara Polar Station* is fully in line with the objectives of the Tara Ocean Foundation: exploring the Ocean and sharing scientific discoveries to understand and protect Life on Earth. With this research platform especially designed for the Arctic environment, the Foundation has a state-of-the-art scientific platform to monitor the Arctic at reasonable operating costs. The station is planned to be a hub for collaborations bringing together the international scientific community. This new scientific exploration will contribute to the deployment in the Arctic of France's 2030 Polar Strategy.

Fully engaged in this project, the international community will be able to better understand this unknown environment - key to reading the future of our planet and humanity, as well as biodiversity evolution in an extreme environment. A true climate sentinel, the Arctic is threatened in the very short term as predicted by the Intergovernmental Panel on Climate Change (IPCC). Yet, a lot can still be learned to better anticipate the consequences of the climate crisis and pollution. The Arctic environment is extremely rich and largely unexplored by long-term studies. Potential fields of research are very broad and include: research on migration of boreal marine organisms towards the Arctic and their adaptation; interactions between clouds, sea ice and ocean driving climate; impact of global change on the functioning of ecosystems in the Arctic; research in biotechnology and biomedicine; the adaptation of life in frozen habitats across seasons.

This coming knowledge not only brings hope of better understanding and thus protecting what can still be preserved in the Arctic, but it will also apply elsewhere. Thanks to the collaboration of international research centers, the new scientific data will inform policy makers on ocean protection and governance, in the Arctic and beyond.

From the first expedition, *Tara Polaris I*, up to 2045, we will all benefit from the strategic data collected in the Arctic and shared with all of humanity. We are embarking on an ambitious journey, fully aware of our generation's profound responsibility to shape a sustainable future.

Étienne Bourgois, President, Tara Ocean Foundation

Romain Troublé, Executive Director, Tara Ocean Foundation







TARA OCEAN FOUNDATION, ALREADY PIONEER IN 2006-2008

In 2007, the schooner *Tara* was the first sailboat for more than a century to venture into the extreme conditions of the North Pole, in the wake of the historic drift of the *Fram*. During 507 days of drifting, the schooner was trapped in the ice and totally isolated. 20 scientists and sailors from 10 nationalities, accompanied by 2 dogs, studied the climate, the Ocean and the Arctic sea ice. They raised awareness among all audiences, especially younger generations, and documented the great fragility of this environment already marked by the climate crisis. This team had to adapt to extreme weather conditions, with the lowest temperature recorded at -41°C , and a polar night of 140 days. *Tara*'s first large-scale expedition in the Arctic resulted in the publication of about 20 articles in international scientific media thanks to a consortium of 55 laboratories brought together as part of the European DAMOCLES programme.





THE ARCTIC IS AT THE FOREFRONT OF THE CLIMATE CRISIS

The Arctic Ocean covers 14 million km², an area equivalent to 5 times the Mediterranean Sea. This territory of ice is bordered by 8 countries : Russia, Norway, Sweden, Finland, Denmark (Greenland), Iceland, Canada, and the United States (Alaska). The climate limit of the Arctic is defined by an isothermal line of - 10°C in July - below which trees do not grow. Its geographical limit is the Arctic Circle.

Most of the Arctic Ocean's surface freezes every winter. With climate change, the extent, thickness and volume of sea ice decreased significantly and large parts of the Arctic are now ice-free during the summer. Every summer, this layer of ice partly melts covering only 1/3 of this Ocean in September.

The Intergovernmental Panel on Climate Change (IPCC) reports there will be practically no more sea ice in summer by 2045, due to the effect of on-going climate dynamics.

The Arctic is at the forefront of the climate crisis. The central basin of the Arctic Ocean is the world's fastest-warming region, 3 times the global average. Effects on the environment are already very perceptible : reduction of sea ice, alteration of ice quality, absorption of more solar energy, melting permafrost and increased humidity in the air.

These rapid changes are having significant impacts on ecosystems and the organisms at the base of the region's food chain, such as plankton, as well as on iconic marine mammals including polar bears, Arctic foxes, belugas, narwhals, and seals.

The objective of *Tara Polaris* research programme is to document and understand the dynamics of these transformations, to collect scientific data and to identify the wealth of local biodiversity. The adversity of this extreme and dynamic environment has never before allowed long-term and extensive studies of central Arctic marine biodiversity and biogeochemistry. Year-round and for more than two decades, the teams on board *Tara Polar Station* will pursue their scientific mission at the very heart of the polar pack ice.





3 QUESTIONS FOR THE SCIENTIFIC DIRECTORS OF TARA POLARIS RESEARCH PROGRAMME

Marcel Babin, polar oceanographer, CNRS/Université Laval (France/Canada)
Expedition Scientific Director for *Tara Polaris I*

Lee Karp Boss, biological oceanographer, University of Maine (USA)
Vice-Director for *Tara Polaris I*

Chris Bowler, phytoplankton biologist ENS/CNRS (France)
Vice-Director for *Tara Polaris I*

Why is it so important to know more about the Arctic ?

The Central Arctic Ocean is a remote and extreme environment which we know little about, and most satellite observations do not go beyond 80° North. It is not known how living organisms at the heart of this environment face the extreme seasonality of light, temperature, sea ice and ocean dynamics and how they survive during the long polar night, which lasts for almost half the year. Over the past decades, this unique ecosystem has been increasingly threatened by global warming and the pollution produced by humans. The rapidity of changes and the fact that what is happening in the Arctic impacts the whole planet means that the Arctic is our sentinel. But we absolutely need observations to link the points in order to complete the full annual cycle and track year-to-year variability. *Tara Polar Station* will bear witness to the history of the Arctic for the next few decades. **Marcel Babin**

What are the objectives of this first expedition *Tara Polaris I* ?

This expedition will be crucial to better understand the impact of climate change on the Arctic and the change it could have on the rest of the planet. Several major objectives :

- Improve knowledge of biodiversity on Earth by exploring regions that are not accessible today
- Reveal the unique adaptations that have evolved to allow life in this extreme environment
- Analyze the consequences of sea ice melting and pollution on these unique and fragile ecosystems
- Discover new molecules, species and biological processes with potential new applications

Over the long term, these explorations will refine the predictions of climate models in Europe by 2050, and the consequences of climate change on the functioning of our planet. The results will help improve governance policies for the Arctic and the global Ocean. **Chris Bowler**

How will you conduct your scientific research ?

With *Tara Polar Station*, we are going to establish a long-term observatory and laboratory to study ecosystems of the Central Arctic Ocean. This drifting base will be deployed in the ice for at least two decades starting in 2026, with 10 consecutive expeditions, until 2045. We will start with *Tara Polaris I* and continue with II, III, IV (during the International Polar year). The scientific vessel will accommodate up to 18 people on board in summer and 12 in winter. It will contain 5 laboratories: a wet lab for manipulating samples (including ice cores); dry labs with instrumentation; labs dedicated to on-site experimentation on little-known organisms and their ecosystems. To understand the biology of this unique ecosystem in its Arctic context, a full set of instruments will be deployed to study the physico-chemical interactions between the atmosphere, the surface layer of sea ice and the underlying Ocean. A series of microscopes, cytometers and other instruments for advanced cellular biology will allow experimentation with living organisms and observation of intracellular phenomena. Tools for DNA sequencing, tested on the schooner *Tara*, will also be deployed on site. **Lee Karp Boss**





3 QUESTIONS TO KATHY LAW

Polar atmospheric scientist, CNRS / Sorbonne, (France)
Coordinator for the atmosphere discipline
Observations Spatiales (LATMOS, France)

What are the signs of global atmospheric warming in the Arctic?

There is a rapid increase in physical factors in the Arctic atmosphere. The average rise in annual temperature at the Arctic surface (land and Ocean) between 1971 and 2019 was 3 times higher than that of the global average over the same period. This phenomenon is known as Arctic amplification, due to the fact that areas of the open Ocean exposed by melting sea ice absorb more solar radiation. There is also an increase in extreme events, such as heavy rain or snowfall, temperature peaks and forest fires.

Are there any new atmospheric sources of pollution in the Arctic and, if so, what are their alleged origins?

The Arctic is influenced by pollution (particles and gas) transported from mid-latitudes since the industrial revolution. But more recently, we found sources of air pollution in, or near, the Arctic region that are also important, such as emissions of pollutants from gas and oil extraction in Russia and Alaska. Moreover, with the decrease in sea ice cover in summer, we expect an increase in sea traffic, another source of pollution. The number of cruise ships was already increasing before the Covid-19 pandemic.

What is the most decisive knowledge in your field that you hope to consolidate with *Tara Polar Station* and its long-term observations?

We need to understand the role of the atmosphere in climate change at the Arctic level, and how it evolves. In particular, we need to improve our understanding of the radiation balance, including short- and long-wave radiation fluxes. The role of clouds and aerosols (which are important for cloud formation and the radiation balance) is one of the major uncertainties in global climate models. In this context, *Tara Polar Station's* multi-annual measurements of clouds, aerosols and radiation fluxes throughout the year will provide indispensable data, especially beyond the 80th parallel north where there are no satellite observations.



3 QUESTIONS TO GERHARD KRINNER

CNRS research director, climatologist at the Institut des Géosciences de l'Environnement (IGE, France) and co-author of the IPCC's 6th Assessment Report

The Intergovernmental Panel on Climate Change (IPCC), in its 6th Assessment Report entitled “Climate Change 2021: the Physical Science Basis”, noted that the observed warming is particularly high in the Arctic. Can you tell us more about this phenomenon ?

Over the last 50 years, the Arctic has warmed three times faster than the global average. This phenomenon of warming amplification in the Arctic has been predicted for 50 years, and the reasons are actually quite well known. We are also almost certain that, over the course of the 21st century, warming in the Arctic will be higher than on an overall average. The consequences on sea ice and Arctic ecosystems will therefore be very profound.

How is the Arctic a sentinel of climate change ?

It is precisely because (predicted and observed) climate change is particularly strong in the Arctic. A unique environment is actually disappearing before our eyes ! In addition, climate change in the Arctic has global consequences : The melting of the Greenland ice cap will be irreversible and will cause, in the long run, a sharp rise in sea levels, and the thawing of large areas of permafrost in Siberia and Canada is likely to generate additional emissions of greenhouse gas, thus further amplifying warming.

What is the most decisive knowledge in your field that you hope to consolidate with *Tara Polar Station* and its long-term observations ?

Observations carried out from a drifting station are extremely valuable for studying still poorly understood processes occurring in the atmosphere, sea ice and the Ocean. For example, the ever-longer ice-free season will lead to changes in marine ecosystems that will affect the chemical composition of the atmosphere. But little is known about these processes. Year-round daily observations are crucial to fill these knowledge gaps.





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

5 YEARS

to design *Tara Polar Station*

Tara Polar Station was designed by one of the architects of the *Tara* schooner, Olivier Petit and the ship designer Mauric, together with the Tara Ocean Foundation with the support of Capgemini Engineering.

18 MONTHS

to build *Tara Polar Station*

The construction was handled by the Constructions Mécaniques de Normandie, in Cherbourg, France.

Tara Polar Station has a very special oval shape, to ensure optimum escape from the ice pressure.

Technical specs

- ♦ Length: 26 meters
- ♦ Width: 16 meters
- ♦ Draught: 3.20 meters
- ♦ Maximum height: 11 meters
- ♦ Weight: 388 tons maximum
- ♦ Hull thickness: 20 mm (aluminium)
- ♦ Moonpool diameter: 1.6 meter
- ♦ Fuel capacity: 130 m3 of HVO
- ♦ Autonomy: 500 days
- ♦ Flag: French

Key construction figures

- ♦ 150,000 hours of work
- ♦ 200 people involved
- ♦ 5,000 pieces of hull at the vessel bottom
- ♦ 47 km of welds
- ♦ 20 km of cables





Tara Polar Station can accommodate up to

12 CREW MEMBERS

in winter

4 sailors (captain, chief mate, chief engineer, cook), an onboard reporter, a doctor, 6 scientists among which 3 engineers

Even if the drifting scientific base will spend

90%

of the time locked in ice, the vessel, powered by an engine, is totally autonomous in terms of navigation and will be steered by a captain and his crew.

18 CREW MEMBERS

in summer among which artists, a polar guide and additional scientists

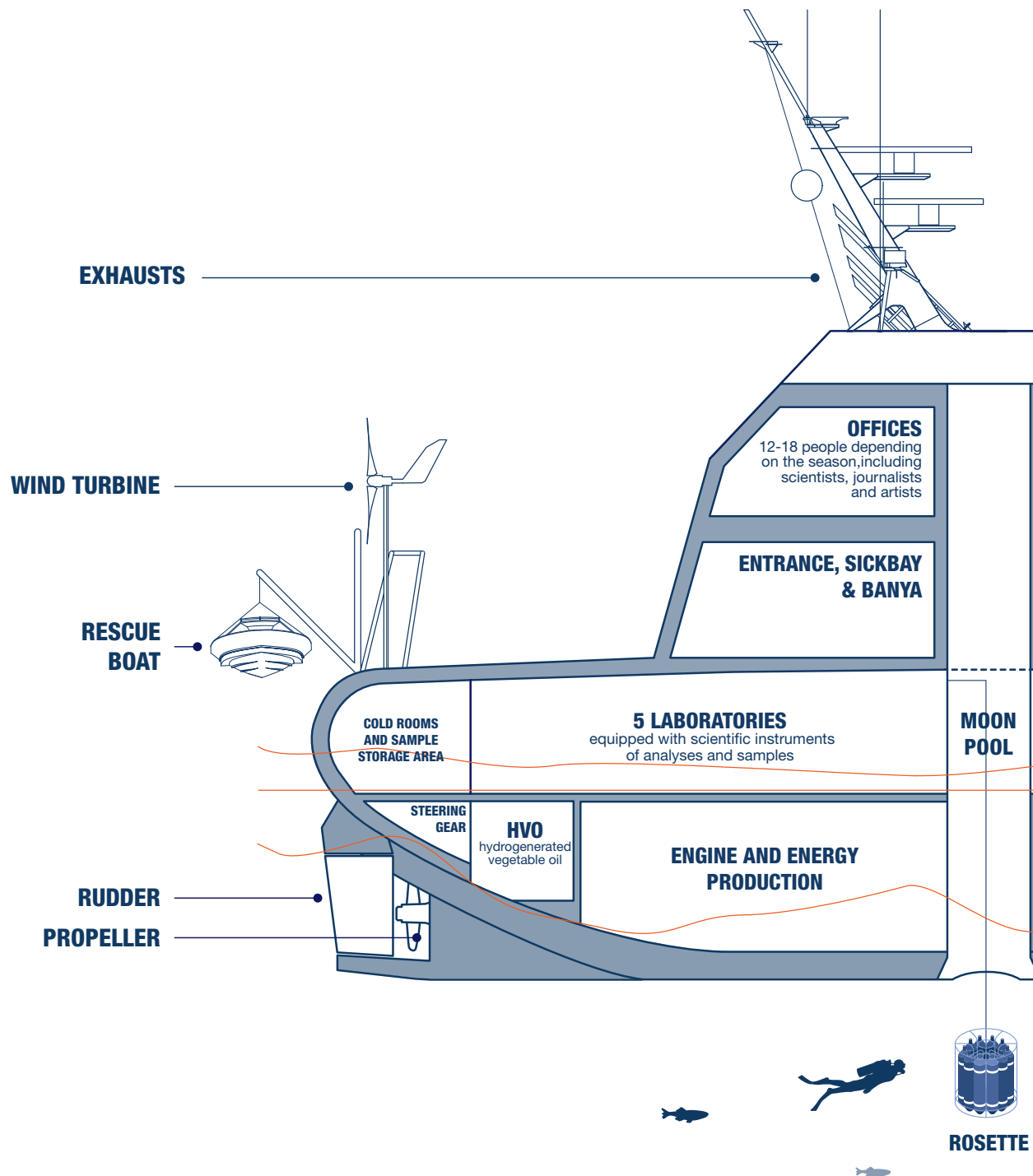
The medical doctor will have a fully equipped sick bay and will be in direct connection with hospitals in France to provide appropriate care in case of frostbite.

Video connection with the Maritime Medical Center in Toulouse (France) is also planned.

Tara Polar Station will constantly disseminate up-to-date information and share the adventure via efficient satellite communication and an onboard reporter.

The station has **shared living spaces such as a mess room, a sauna** - essential in polar regions - and an open space on the top floor.





Tara Polar Station is a drifting laboratory equipped with 2 drones including a marine Remotely Operated Vehicle (ROV), a rosette sampler and a full range of atmospheric and underwater sensors. They will continuously observe the surrounding environment.

A desalination unit will produce

300 LITERS PER HOUR

of drinking water a few hours a day to meet the crew's needs estimated at 1,000 liters per day.

5 ANALYTICAL COMPARTMENTS

ATMOSPHERE

Not to adversely affect the environment, *Tara Polar Station* is fitted with a **water treatment system**, a **degreaser** and what it takes to respect the Polar Code.

Tara Polar Station is powered by «carbon-free» energies through the deployment of **wind turbines**, **solar panels** that **double battery life** and **3rd generation bio-based fuels**.

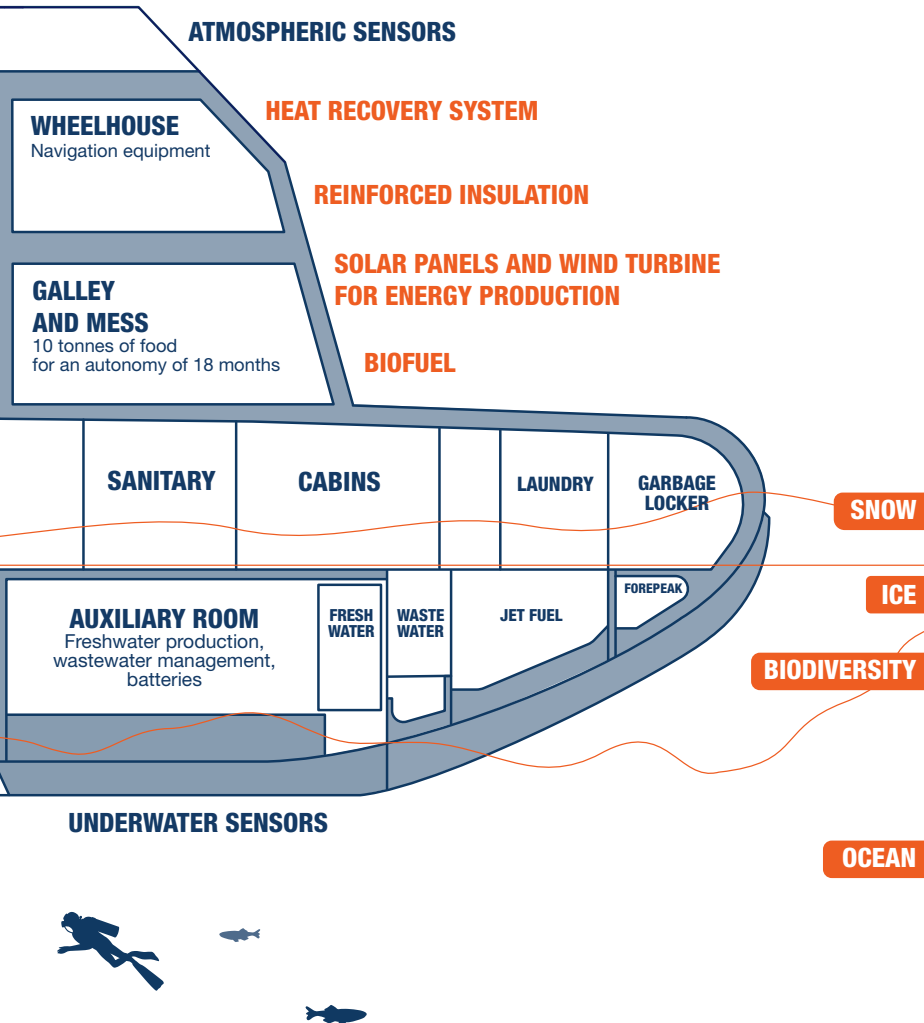
Habitat insulation is even more critical in the Arctic than it is at our latitudes.

Thus, the emphasis has been placed on energy efficiency and removing all thermal bridges between the structure and the inner envelope.

Tara Polar Station is designed to withstand temperatures as low as

-52 °C

A central heating system and its radiator will be powered by **heat exchangers** designed to recover energy from the power generators and complemented by a **12kW biofuel boiler**.



10 TONS OF FOOD

will be stored aboard the vessel to provide for the team's needs for 18 months. The crew will be in charge of a few off-ground cultures (tomatoes, salads and herbs) to improve daily meals on board.

tara POLARIS

The *Tara Polaris* research programme is coordinated by consortia.
Each expedition, starting with *Tara Polaris I*, will have a dedicated consortium.

TARA POLARIS I CONSORTIUM

EXECUTIVE COMMITTEE

Marcel Babin, polar oceanographer, CNRS/Université Laval (France/Canada)
Chris Bowler, phytoplankton biologist, ENS/CNRS (France)
Lee Karp-Boss, biological oceanographer, University of Maine (USA)
Romain Troublé, general manager, Fondation Tara Océan (France)
Clémentine Moulin, head of operations, Fondation Tara Océan (France)
Thomas Linkowski, oceanic engineer, Fondation Tara Océan (France)

COORDINATORS

SEA-ICE, OCEAN, ATMOSPHERE, MOLECULAR APPROACHES & POLLUTION

Benjamin Rabe, physical oceanography, Alfred Wegener Institute (Germany)
Eric Pelletier, genomics specialist, Genoscope (France)
Igor Polyakov, polar physical oceanographer, University of Alaska Fairbanks, USA
Jean François Ghiglione, marine microbiologist CNRS / Sorbonne (France)
Jody Deming, sea ice microbiologist, University of Washington (USA)
Julia Schmale, atmospheric scientist (micro-physics), EPFL (Switzerland)
Kathy Law, polar atmospheric scientist (pollution), LATMOS-CNRS (France)
Marcel Nicolaus, sea ice physicist, Alfred Wegener Institute (Germany)
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Mathieu Ardyna, polar oceanographer, Université Laval / CNRS (Canada/France)
Maxime Geoffroy, polar ichthyologist, Memorial University of Newfoundland (Canada)
Michel Flores, atmospheric scientist (micro- biome), Weizmann Institute of Science (Israel)
Pierre Galand, microbial ecology, CNRS / Sorbonne (France)
Silvia G. Acinas, marine microbiologist, ICM-CSIC (Spain)
Søren Rysgaard, sea ice biogeochemist, Aarhus University (Denmark)

Already 30 research centers from 12 countries are involved in *Tara Polaris I* expedition.

PARTNERS THAT SUPPORT US

French polar strategy



Seeding partners



Scientific partners





TARA POLAR STATION CALENDAR

JULY-AUGUST 2025	◆ Test campaign in the <i>Fram</i> Strait
SEPTEMBER-OCTOBER 2025	◆ Stand by in Iceland *Arctic Circle Assembly
NOVEMBER-DECEMBER 2025	◆ Test campaign for wintering conditions in Longyearbyen
JANUARY 2026	◆ Training * Arctic Frontiers Conference
SUMMER 2026	◆ Departure of the 1 st expedition <i>Tara Polaris I</i>
2028 - 2029	◆ <i>Tara Polaris II</i>
	◆ ◆ ◆



The Tara Ocean Foundation is the first public interest foundation in France dedicated to the Ocean.

For over 20 years, it has been striving for a revolution to preserve Life, convinced that the Ocean is essential to the equilibrium of our planet. Exploring the Ocean and sharing scientific discoveries to raise collective awareness is at the heart of the foundation's mission.

The foundation leads scientific expeditions, in partnership with the French CNRS and leading international research laboratories, to study marine biodiversity and understand the impacts of climate change and pollution. It raises public awareness, from the younger generation to political decision-makers. Thanks to its UN Special Observer Status, the foundation plays an active role in international Ocean governance.

Exploring, sharing and protecting this living Ocean is more vital than ever.

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

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