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**Press release**





## EDITORIAL

Étienne Bourgois, President, Tara Ocean Foundation  
Romain Troublé, Executive Director, Tara Ocean Foundation

### **The Tara Ocean Foundation will return to the Arctic by 2025!**

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

The construction of the new Tara Polar station, which will serve as a base for scientific research, shall begin before the end of 2022.

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: our mission is to explore and advance knowledge on the world's oceans and seas through scientific discovery. With this research platform especially designed for the Arctic environment, the Foundation will acquire a state-of-the-art instrument to monitor the environment at reasonable operating costs. The Station will also be a hub for collaborations bringing together the international scientific community under the French flag, within the framework of the new French 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, of humanity and the evolution of a whole domain of biodiversity. A true sentinel of the climate, the Arctic is threatened in the very short term. However, lessons can be learned out there to better anticipate the consequences of the climate crisis.

The Arctic environment is extremely rich and largely untouched by long term studies, thus fields of exploration are very broad. These include: research on migration of marine organisms towards the Arctic and its evolution; chemistry of the atmosphere; impact of climate change on the functioning of ecosystems in the Arctic; research in biotechnology and biomedicine; further research on the adaptation of life in frozen habitats across seasons.

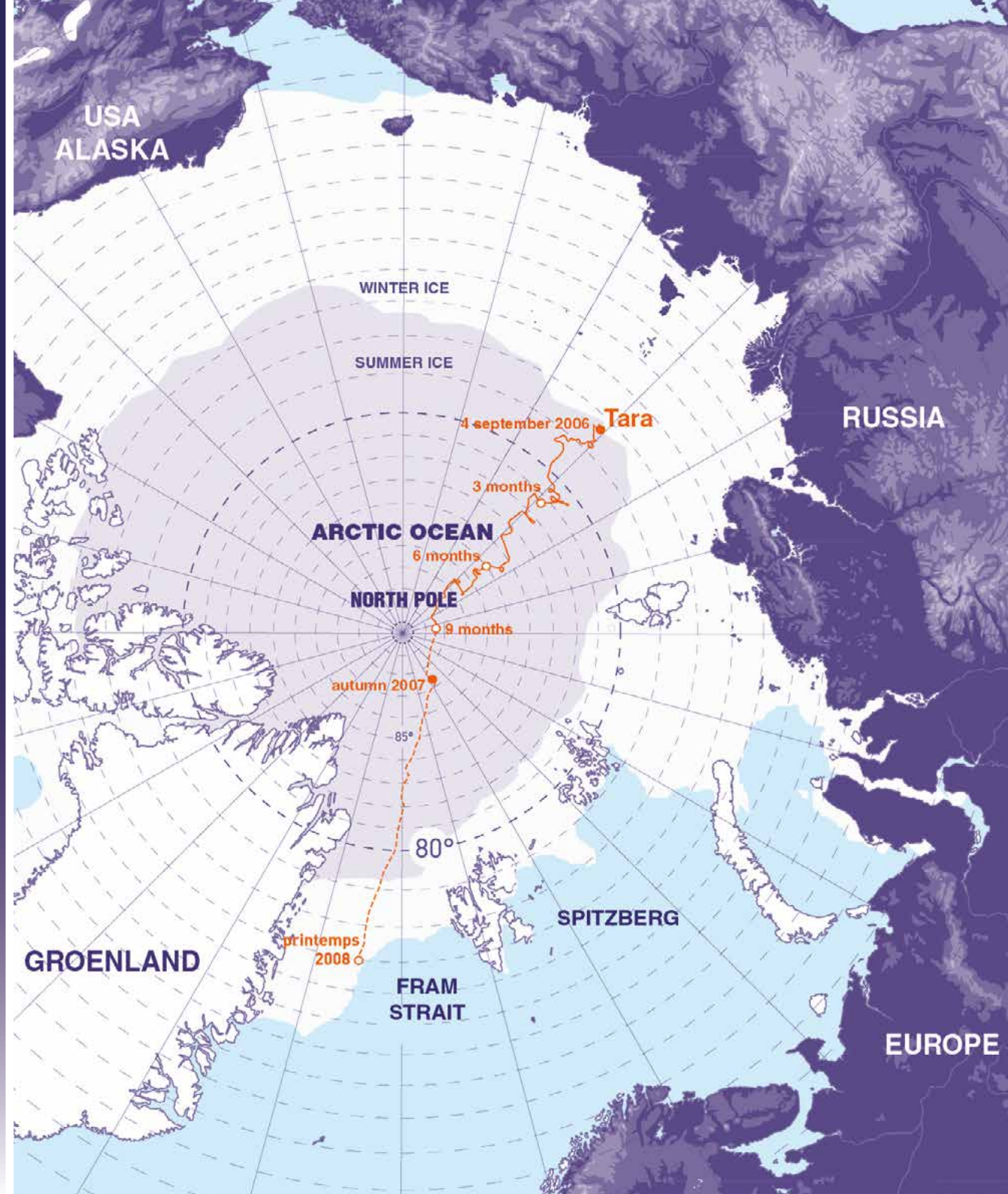
This future knowledge brings hope of better understanding and thus preserving what can still be preserved in the Arctic, but it will also apply elsewhere. All of our research - multidisciplinary and supported by important scientific centers around the world -- and feed international policy-making with key information.

From the very first mission until 2045, we will all benefit from the strategic information collected in the Arctic, then analyzed and shared with all of humanity. We are embarking on an ambitious endeavor and we measure the responsibility of our generation towards a sustainable future.

**"Today is the first day of this mission which promises to be historic."**

## THE TARA OCEAN FOUNDATION, ALREADY A 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 of 10 nationalities, accompanied by 2 dogs, studied the climate, the Ocean and the Arctic sea ice. They raised awareness among all audiences, in particular the youngest, 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  $-41^{\circ}\text{C}$ , and a polar night of 140 days. Tara's first large-scale mission in the Arctic resulted in the publication of some 20 articles in the international scientific press by a consortium of 55 laboratories brought together as part of the European DAMOCLES program.





## THE ARCTIC, AN UNKNOWN OCEAN AND AN INDICATOR OF THE CLIMATE CRISIS

The Arctic ocean covers 16.5 million km<sup>2</sup>, an area equivalent to 5 times that of 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 - 10°C in July - below which trees do not grow. Its geographical limit is the Arctic Circle.

Rather 1.5 m thick currently ocean's surface freezes every winter. With climate change, with climate change, the extent, thickness and volume of sea ice decreased significantly and a large area of the Arctic is now free of ice during the summer. Every summer, this layer of ice partly melts covering only 1/3 of this ocean in September. The IPCC reports there will be practically no more sea ice in summer by 2045, due to the effect of ongoing climate dynamics.

Use of high words but not a clear statement. Also this sentence has a similar message to the last sentence in this paragraph so it feels very repetitive a too dramatic (back to the discussion how we shall deliver messages while minimizing the

'climate anxiety' effect). Air temperatures at the surface of pack ice increase (on average) twice as fast as elsewhere in the world. Effects on the environment are already very perceptible: reduction of sea ice, alteration of quality of the ice, absorption of more solar energy, melting permafrost and increased humidity in the air. The Arctic is indeed the number one sentinel of our planet in the era of the climate crisis.

These rapid developments have major repercussions on ecosystems and living organisms at the base of the region's food chain (plankton), as well as on emblematic marine mammals (polar bears, arctic fox, beluga, narwhal, seals, etc.).

The objective of the Tara Ocean Foundation mission is to document and understand the dynamics of these transformations, to collect scientific data, and identify the wealth of local biodiversity. The adversity of this extreme and dynamic environment has never before allowed long-term research, All year round over 20 years at the heart of the polar ice pack. This will be the mission of Tara Polar Station crews.



## 3 QUESTIONS FOR CHRIS BOWLER

CNRS Research Director at Ecole normale supérieure,  
President of Tara Ocean Foundation's scientific committee

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

The Arctic Ocean (AO) is a remote and extreme environment which we know little about, and satellite observations, and most of 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. The Tara Polar Station will bear witness to the history of the Arctic for the next few decades.

### What are the objectives of this mission?

This mission 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
- Observe Arctic fish stocks and the impact of the arrival of more temperate species
- Discover new molecules/species/processes potentially with 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. Our results can be used to improve governance policies of the Arctic and the world's Ocean.

### How will you conduct your scientific research?

With the Tara Polar Station program, we are going to establish a long-term, drifting observatory/laboratory to study ecosystems of the central Arctic Ocean. This observatory will be deployed in the ice for at least 2 decades starting in 2025, with 10 consecutive missions, until 2045. The vessel will accommodate up to 20 people on board in summer and 12 in winter, and will contain 6 laboratories: a wet lab for manipulating samples (including ice cores); dry labs with instrumentation; and 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.



### 3 QUESTIONS TO KATHY LAW

Atmospheric chemist, Laboratoire Atmosphères, 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 rise in average 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 the 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, the 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 6<sup>th</sup> Assessment Report

#### **The Intergovernmental Panel on Climate Change (IPCC), in its 6<sup>th</sup> 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 much more 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 the 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: FACTS AND FIGURES

The Tara Polar Station was designed by one of the architects of the schooner Tara:  
**Olivier Petit and the Tara Ocean Foundation**

**5 YEARS**

of collaboration to design  
the mission and the Tara Polar Station

**18 MONTHS**

to build the Tara Polar Station

The Tara Polar Station is a

### **DRIFTING LABORATORY**

equipped with 2 drones including a marine drone, a rosette sampler  
and a full range of atmospheric and underwater sensors.  
They will continuously observe the surrounding environment.

The Tara Polar Station will

**CONSTANTLY  
DISSEMINATE UP-TO-  
DATE INFORMATION**

(exchange of scientific data, sharing of location  
and real-time weather conditions)

and relate the adventure via efficient  
satellite communication and specific  
production means.

Even if this drifting station will spend

**90% OF ITS TIME  
LOCKED IN ICE,**

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



The crew will be composed of the captain, scientists,  
**1 CHIEF ENGINEER, 1 ENGINEER, 1 CHEF AND 1 PHYSICIAN.**

**THE 12 CREW MEMBERS**  
will be able to enjoy a fully private space

**IN WINTER**

A structure will accommodate up to  
**20 CREW MEMBERS**  
composed of sailors, scientists,  
journalists and artists

**IN SUMMER**

The station has

**COLLECTIVE LIVING SPACES**

such as a mess room, a sauna-essential in polar regions-showers  
and an open space on the top floor.

The physician will have

## A FULLY EQUIPPED INFIRMARY AND WILL BE IN DIRECT CONNECTION WITH THE HÔPITAUX DU PAYS DU MONT-BLANC IN CHAMONIX (FRANCE)

to provide appropriate care in case of frostbite. He will also have video connection with the Centre de consultation médicale maritime (maritime medical center) in Toulouse (France).

Not to adversely affect the environment, the Tara Polar Station will be fitted with

## A WATER TREATMENT SYSTEM, A DEGREASER, A COMPACTOR AND A BIODIGESTER

to treat, in an ecological way, the various waste generated by the living conditions on board.

About

## 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.

## 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.

The 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.

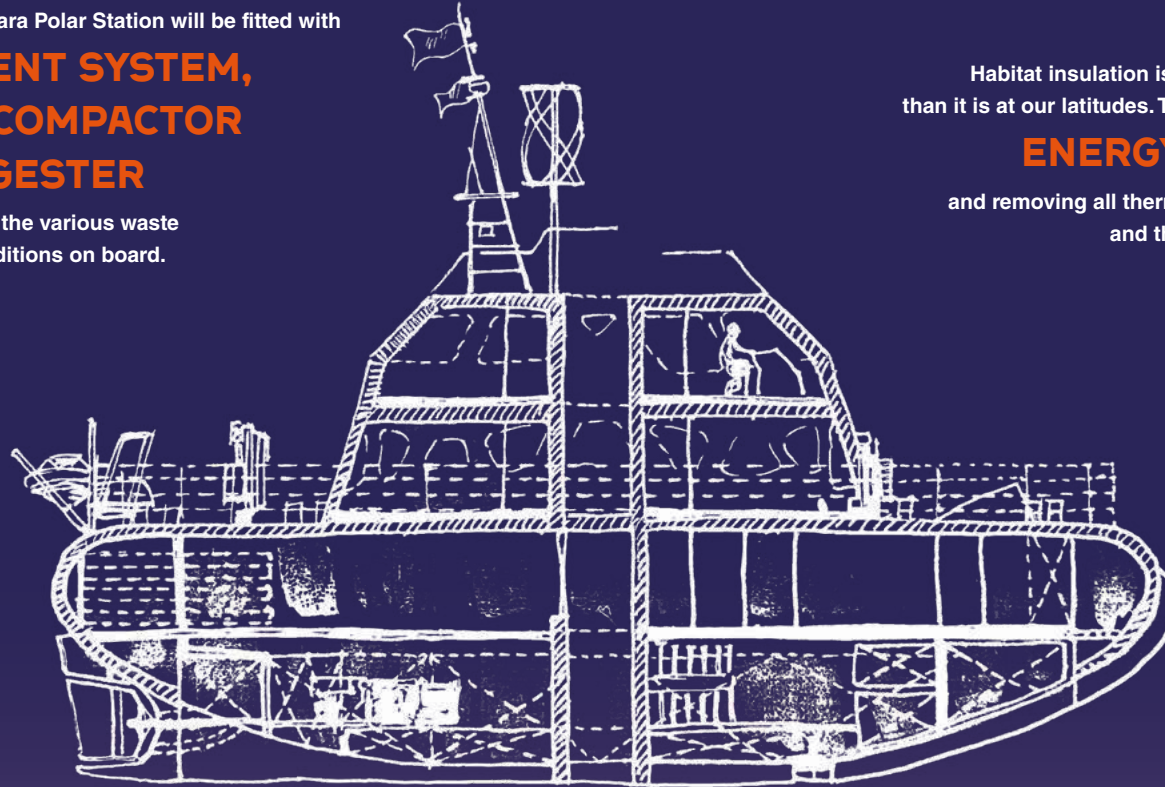
Habitat insulation is even more critical in the Arctic than it is at our latitudes. Thus, the emphasis has been placed on

## ENERGY EFFICIENCY

and removing all thermal bridges between the structure and the inner envelope.

The 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.



## AGENDA FOR THE TARA POLAR STATION

### **JUNE 2022**

Project's launch

### **AUTUMN 2022**

Beginning of construction

### **1<sup>ST</sup> QUARTER 2024**

End of construction

### **SUMMER-WINTER 2024**

Tests, optimization and training

### **SUMMER 2025**

Departure of the 1<sup>st</sup> expedition  
aboard the Tara Polar Station

# SCIENTIFIC CONSORTIUM OF THE PROGRAM

## TARA POLAR STATION

### Coordinators

**Chris Bowler**, biologist, ENS/CNRS (France)  
**Lee Karp-Boss**, oceanographer and biologist, University of Maine (USA)  
**Marcel Babin**, oceanographer, Université Laval/CNRS (Canada/France)

### Ecology

**Jørgen Berge**, marine ecologist, University of Tromsø (Norway)  
**Rolf Gradinger**, sea ice ecologist, University of Tromsø, (Norway)  
**Marit Reigstad**, marine ecologist, University of Tromsø, (Norway)  
**Paul Wassmann**, marine biogeochemist, University of Tromsø, (Norway)  
**Katja Metfies**, molecular ecologist, Alfred Wegener Institute (Germany)  
**Maxime Geoffrey**, Acoustics & Fish Ecology, Memorial University of Newfoundland (Canada)

### Technique

**Joannie Ferland**, biologist, Université Laval/CNRS (Canada/France)  
**Marie-Hélène Forget**, scientific coordinator, Université Laval/CNRS (Canada/France)  
**Thomas Linkowski**, oceanographer, Amundsen Science (Canada)  
**Douglas Couet**, ingénieur en biologie, Institut pluridisciplinaire Hubert Curien (France)

### Genomics

**Patrick Wincker**, genomist, Genoscope National Sequencing Center (France)

### Atmosphere

**Julia Schmale**, atmospheric microphysicist, EPFL (Switzerland)  
**François Ravetta**, atmospheric physicist, CNRS/Univ. Versailles St-Quentin (France)  
**Kathy Law**, atmospheric chemist, CNRS/Univ. Versailles St-Quentin (France)

### Sea ice

**Dirk Notz**, sea ice specialist, Max Planck Institute (Germany)  
**Florent Dominé**, snow specialist, Université Laval/CNRS (Canada/France)  
**Francois Fripiat**, glaciologist and oceanographer, Free University of Brussels (Belgium)  
**Marcel Nicolaus**, Sea ice physicist, Alfred-Wegener Institute (Germany)  
**Martin Vancoppenolle**, oceanographer specialized in sea ice and climate, CNRS/Sorbonne Univ. (France)  
**Søren Rysgaard**, marine microbiologist and ice biogeochemist, Aarhus University (Denmark)

### Ocean (Arctic)

**Marie-Noëlle Houssais**, oceanographer, CNRS/Sorbonne Univ. (France)  
**Benjamin Rabe**, oceanographer, Alfred-Wegener Institute (Germany)  
**Mathieu Ardyna**, oceanographer, Université Laval/CNRS (Canada/France)  
**Kelsey Bisson**, oceanographer, Oregon State University (USA)  
**Nina Schuback**, oceanographer, Swiss Polar Institute (Switzerland)

### Marine biology

**Antje Boetius**, biologist, Alfred Wegener Institute (Germany)  
**Connie Lovejoy**, microbiologist, Université Laval/CNRS (Canada/France)  
**Jody Deming**, microbiologist, University of Washington (USA)  
**Flora Vincent**, microbiome oceanographer, EMBL (Europe)  
**Eva Ortega-Retuerta**, microbiologist, CNRS/Sorbonne Univ. (France)  
**Colin Brownlee**, cell biologist, Southampton University (UK)  
**Eric Marechal**, plant biologist, CEA/CNRS (France)  
**Georg Pohnert**, specialist in metabolomics, Max Planck Institute (Germany)

## French Polar Strategy



### Initial partners



### Scientific partners



### Technical partners





## ABOUT

The Tara Ocean Foundation is the first public interest foundation in France dedicated to the Ocean. For the past 19 years, we have conducted high-level scientific research in collaboration with international laboratories of excellence to explore, understand and anticipate changes associated with climate and environmental risks. Our 2 key missions are exploring and sharing. To make the Ocean a collective responsibility and preserve it, the Tara Ocean Foundation raises awareness and educates young generations to protect this vital ecosystem.

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

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