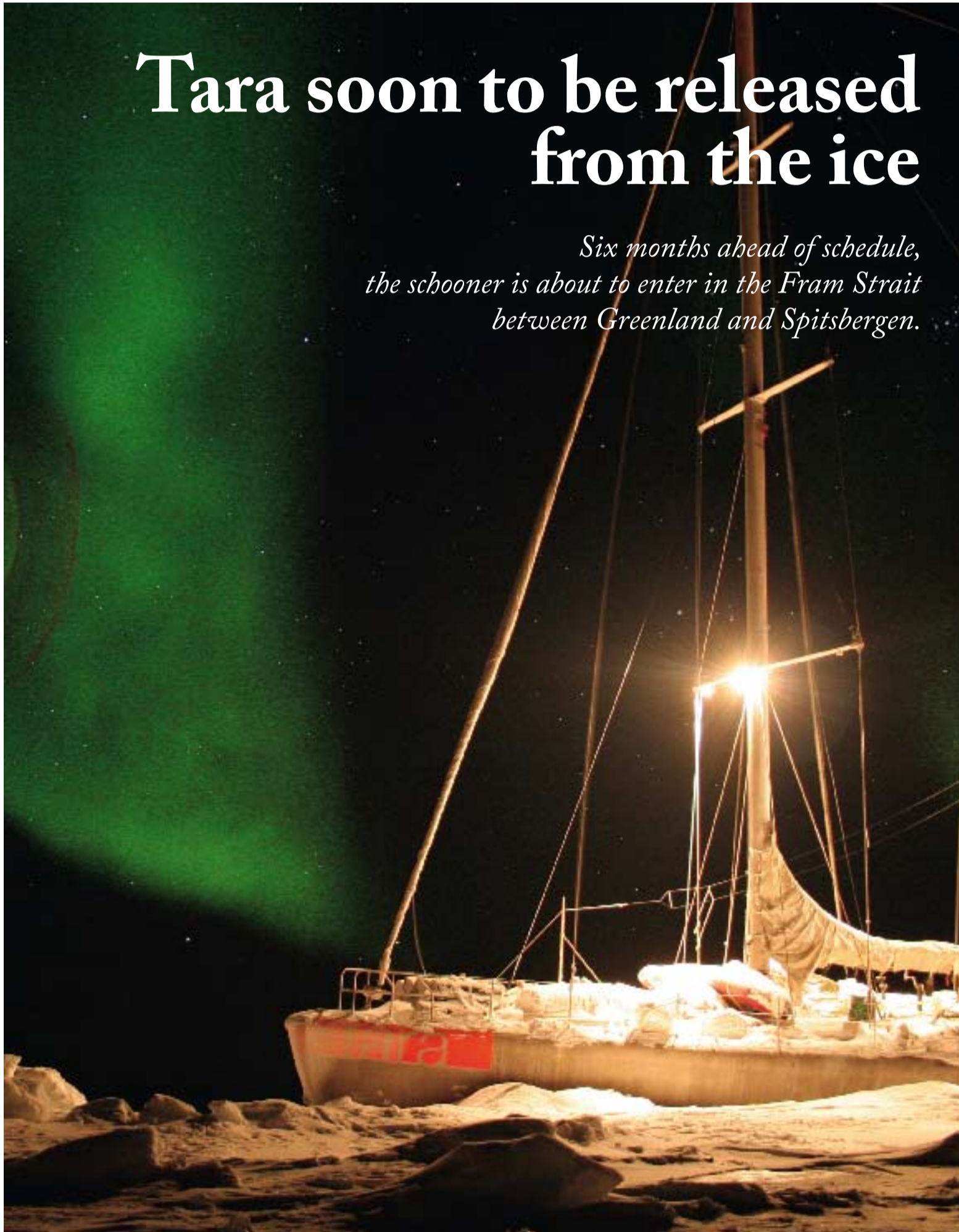


## Tara soon to be released from the ice

*Six months ahead of schedule, the schooner is about to enter in the Fram Strait between Greenland and Spitsbergen.*



Aurora Borealis on Tara caused by the collision of particles sent out by the sun when they meet the upper atmosphere. © Denys Bourget

BY DINO DIMEO

**The fact that Tara's transpolar drift is accelerating is a sign that the Arctic Ocean is warming.**

Tara's journey was to last for two years. It should end way before that, six months ahead of the initial calendar. Indeed, Tara is about to finish her polar voyage that started on September 3<sup>rd</sup> 2006 when she was set in the pack ice North of Siberia. The boat, still embedded in the pack ice and now submitted to the polar night is continuing her route towards the south, ready to exit from the ice between Spitsbergen (Norway) and Greenland (Denmark) by the end of the year 2007. The provisional calendar had foreseen an exit for summer 2008.

The former Antarctica built by Jean-Louis Etienne, that became Seamaster with sir Peter Blake, was rechristened Tara when she was bought by Etienne Bourgois in 2003. The latter, who is the general manager of agnès b, the fashion company, and Bernard Buigues, co-director of the programme, have equipped her to drift for two years on the Arctic ice so as to study climate warming in this part of the globe.

**The schooner accomplishes the journey for which she was conceived.**

This expedition had never been undertaken since the one the Norwegian Fridtjof Nansen accomplished on his sailboat, the Fram, in 1893.

By latching the 190 tons of this polar schooner to the pack ice, the Tara Arctic expedition aims to accomplish a scientific survey linked to the European programme Damocles that gathers 48 laboratories from 12 different countries. The crazy bet of the crew of letting themselves be imprisoned by the ice is already a success. Even though Tara is going to be let out from the pack ice earlier than planned, she will stand out in the history of navigation by being the sailboat that has reached the nearest point to the North Pole. On the 28<sup>th</sup> of May 2007, a mere 170 km separated the ship from the pole.

The starting point of this gigantic expedition was to measure the melting ice in the Arctic Ocean. Climatologists have long since sounded the alarm: future climate simulations predict the total disappearance of the sea-ice in Arctic during summer. It remains to be seen when this will take place. The fact that the Tara drift is accelerating and that the boat has been thrown, after only fifteen months, close to the natural exit point of the ice is one sign of proof of this warming.

The scientists, who have taken turns on Tara, were soon aware of this anomaly. "The ice is more dynamic than predicted. Is it a sign of climate warming? Grant Redvers, the New-Zealander chief of expedition raised the question as of summer 2007. As for Jean-Claude Gascard, research director at the CNRS and coordinator of the European programme Damocles, he noticed a trend toward "a complete disappearance of the sea ice in summer and more new ice formed in winter".

Today, close to an anticipated release, the scientific programme continues to deliver its precious observations. Whether in the atmosphere up to 2.000 meters high or under the Arctic Ocean at more than 4.000 meters deep: air and water temperatures, pressure, salinity, winds; in all 16 weather buoys and 20 ocean buoys screen the pack ice so as to monitor its evolution in real time. If Tara is going to end her journey soon, the scientists on the other hand will need more time to analyse all the data that will have been gathered during the voyage. ■

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**The pack ice melting is speeding up.**

It will disappear completely in summer within ten to fifteen years.

**An extreme complex logistics.**

No one knows precisely how the exit from the ice is going to happen.

**The company director and the scientist.**

Nothing destined Etienne Bourgois and Jean-Claude Gascard to work together.

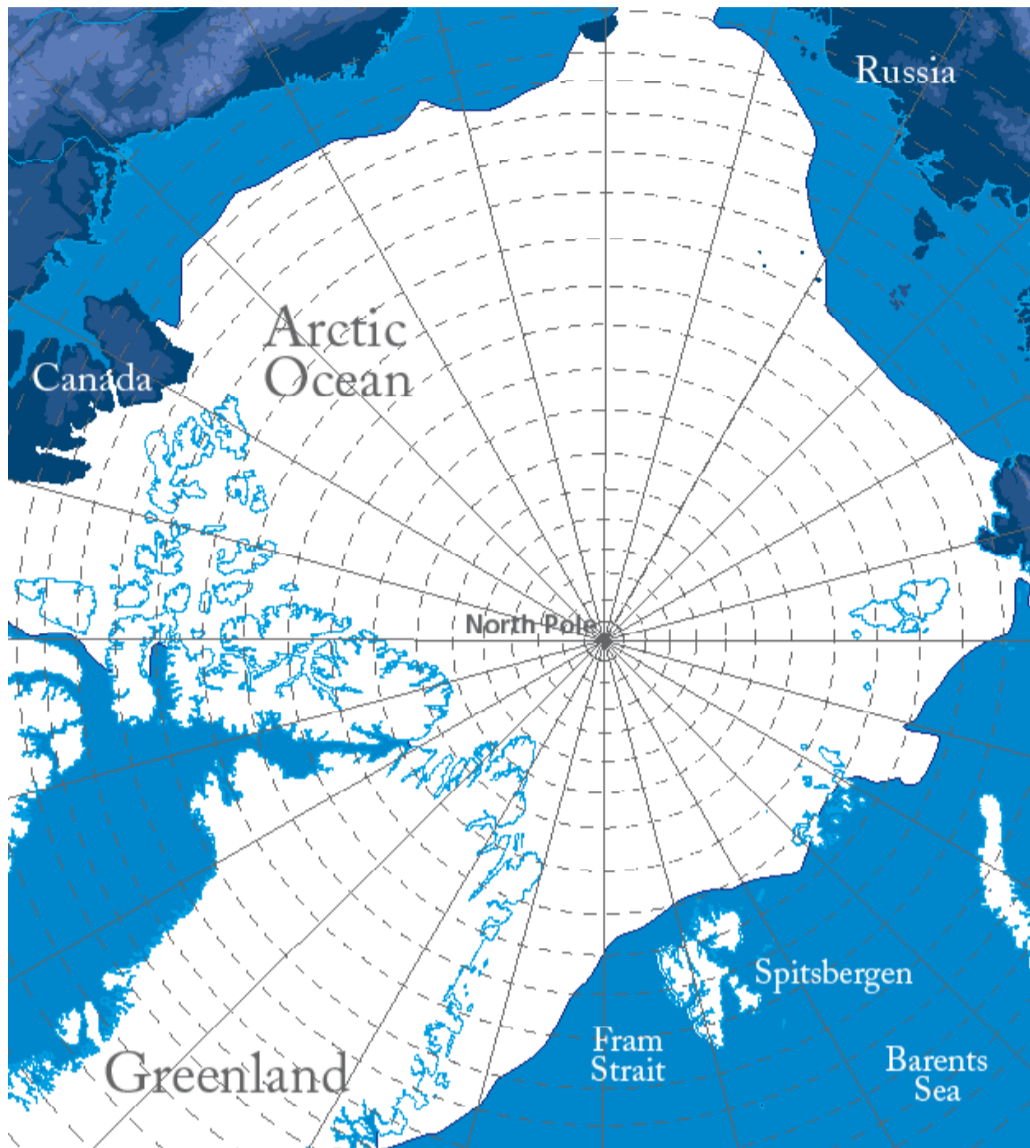
**A sailboat in the wake of the Fram.**

The story of Tara began in the dreams of the Pen Duick VI crew members.

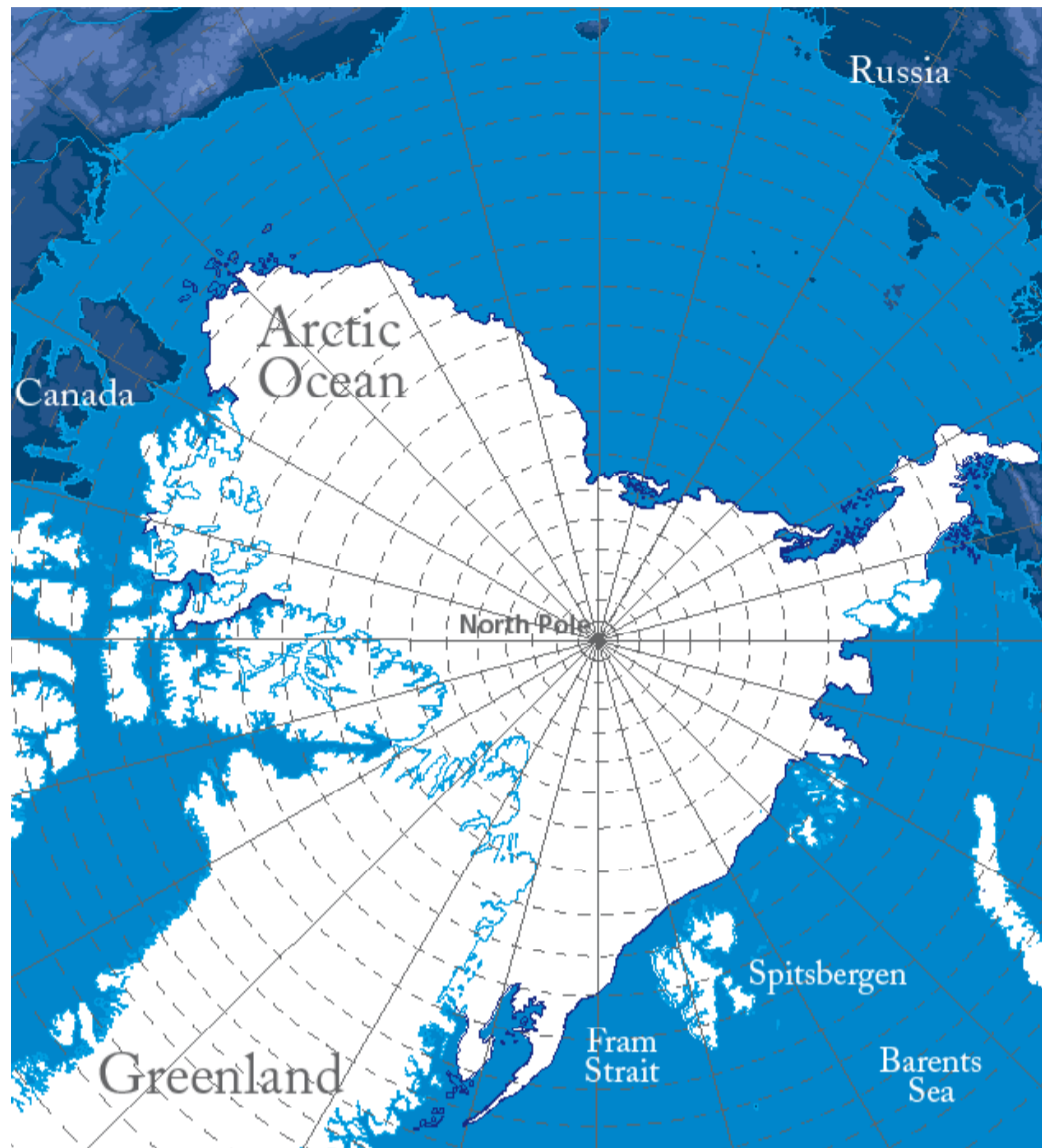


# The great melting of the pack ice accelerates

*Thanks to the collected data on Tara, scientists of the European programme Damocles expect a faster and complete sea ice disappearance in summer.*



The pack ice at the end of the Arctic summer in 1979. © be-pôles



The pack ice at the end of the Arctic summer in 2007. © be-pôles

BY CÉCILE MAILLARD\*

The Tara-Damocles mission that links the members of the Tara expedition to the scientists of the European Commission Program Damocles, has enabled to accomplish an important work of data gathering in the Arctic Ocean. At the end of August, the spectacular retreat of the sea ice in the Arctic took the scientists by surprise. No model had predicted such a retreat, nobody had imagined that the 2005 surface record of minimum pack ice would be beaten in such proportions. At this rate, the total disappearance of the sea ice in summer could happen much earlier than planned. The other surprise could, according to the scientists, be linked to the first one: the pack ice drift, that carries Tara in her journey across the Arctic is twice to three times faster than what the models had predicted. Tara will exit from the ice during winter, six months ahead of schedule. According to an article published by the Damocles consortium in *The Parliament Magazine* in October 2007, this acceleration of the drift on the Atlantic side and the warming on the Pacific side could explain the brutal reduction of pack ice in summer 2007. One must find out why the pack ice is drifting so fast, why its melting is accelerating in summer and to adjust all the prediction models. The collected data by the Tara-Damocles teams since more than 450 days provide precious material to the scientists. Analysed, compared, interpreted, this data will enable to deepen the knowledge of complex climate phenomenon. And to improve predictions regarding the transformation in store for the Arctic Ocean in the coming years. The first elements already open new research avenues.

"After the news we received this summer..." Like all the scientists of the planet, Jean-Claude Gascard, coordinator of the European programme Damocles, is still under shock from the news that came from the sky at the end of August. The pictures delivered by satellites showed a spectacular retreat of the Arctic pack ice. The record of the end of summer 2005 is greatly beaten: at this date, the ice only covered 5,3 millions km<sup>2</sup> versus 7 millions in average during the summers of the preceding decades. At the end of August 2007, this area dropped to 4 million km<sup>2</sup>. If we had needed to start the drift this year in 2007, Tara would have been positioned 400 km more to the North than in September 2006.

To lose 500.000 km<sup>2</sup> each year, is to witness the disappearance each year of an ice surface equivalent to that of France. At this pace, the pack ice will disappear completely within the

reviewed." According to his Swedish colleague Ralf Doescher of the Swedish Meteorological and Hydrological Institute, co-coordinator of the Damocles programme, the disappearance of the pack ice in the Arctic Ocean in summer could occur by 2030. "It is very difficult to determine exactly when the pack ice will disappear in summer, explains Ralf Doescher. On the other hand, it is clear that this trend toward the reduction of sea ice is going to continue."

The other second surprise this summer is the speed at which the Arctic pack ice is drifting. The sea ice moves this year twice as fast than what the Damocles scientists had predicted and three times faster than what the models had predicted. Tara will exit from the Arctic Ocean before the end of 2007 when her release was planned in July 2008. The Damocles teams had anticipated this pack ice drift acceleration but had not

drift could partially explain the sudden retreat of the pack ice this summer. Caught in an express movement, the ice floes rush faster and in higher quantities, in the Fram Strait, between Greenland and Spitsbergen. They also accumulate on the sides of Greenland and Canada, where Da-

could explain the acceleration of the drift. This year was exceptional but we shall need to understand why". Jean-Claude Gascard is convinced that he is witnessing a deep change. He is expecting the total disappearance of the sea ice in summer within the next ten to fifteen years maximum with major consequences for the planet.

One thing is certain for the scientists: the International Polar Year was planned at the right time. "At least, we are where we need to be, at the right moment" comments the Damocles coordinator. The prediction models need to be guided by data. Yet we lack cruelly of data in the Polar Regions".

The Tara-Damocles mission should enable to improve the understanding of the Arctic Ocean when the latter is undergoing deep changes. The overall equipment device that is implemented will enable to retrieve a whole set of data on variables as important as the atmosphere temperature, the ice and the ocean, the ocean sali-

## Two surprises during the expedition: the extent of the pack ice melting and the speed of the boat's drift

damocles teams have observed them this summer.

The scientists are currently working on several hypotheses to explain this acceleration. First research theme: the winds who could have increased their power, or their impact on the pack ice or yet again the dominant winds that may have changed their course. Another research theme, the ice in itself that may have become looser.

The scientists are now wondering on the exceptional characteristic of last summer. Does the great 2007 melting herald others or is it the consequence of exceptional meteorological conditions, this year? "The atmosphere experienced a sudden and unusual warming in Alaska and the Pacific, explains the Damocles coordinator. The ice was stricken by the heat in this area and the wind fields changed, which

nity, the atmosphere humidity, the winds and the currents. All this information is crucial to elaborate the new models.

For the first time and thanks to Tara, data has been recorded at the same time in the same places, in the ocean, the ice and the atmosphere, three environments that are completely inter-related. The collected data, saved in the computers hard disks, have been communicated to the 48 European laboratories that participate in the Damocles programme. An additional few months will be necessary to make them speak. For if Tara is getting closer to her destination, the programme Damocles on the other hand must continue until 2009, before succeeding in elaborating a perennial monitoring system of the pack ice. ■

\*Journalist, contributes regularly to *Géo Magazine*

## The Tara-Damocles mission has enabled to achieve an important data gathering all along the drift

next 10 to 15 years. "Up till now, the models predicted the disappearance of the ice in summer between 2050 and 2080, explains Jean-Claude Gascard. None of them had predicted so fast a retreat. These models will have to be

imagined that it would be with such magnitude. Tara will have drifted one year and a half less than the Fram 111 years ago!

And what if the two summer events were linked inquire the scientists? The speed of the

# The planet's climate is disrupted

*The disappearance of summer pack ice would be a major climate change for the Arctic, the Northern hemisphere and also for the overall planet.*



This summer, the melting pools were many around Tara. © Geir Aske

BY CÉCILE MAILLARD

**Just a year ago, the disappearance of the Arctic pack ice was predicted for the second half of the 21<sup>st</sup> century. Today, this significant event for the future of climate is expected much earlier, between 10 and 15 years. The scientists are starting to determine its consequences for the Arctic first, the Northern hemisphere second and finally for the rest of the planet.**

Concerning the Arctic zone, one can already say through observations of changes that the Arctic, in the north, resembles more and more the Antarctic in the south. Hence, the pack ice disappearance in summer is an usual phenomenon in Antarctic. The fact that it tends to melt in the warm season in Arctic brings closer the behaviour of the two planet extremities. Moreover, up North, in the Arctic Ocean, the young ice, the year ice, is progressively covering a greater area than the old ice, that is present in summer as well as winter. This phenomenon already exists in the south in the Antarctic.

In the Arctic Ocean, with the disappearance of the pack ice in summer, the sun rays will not be reflected to go back into space but on the opposite will be absorbed by the ocean. A few dozen meters of sea water will be warmed up, but this will be sufficient to warm up the atmosphere and thus make neighbouring Greenland perspire... Yet if the pack ice melting has no impact on the sea level, the Greenland glaciers melting on the other hand will have a considerable impact. In the case—that nobody foresees seriously—of a total ice-sheet melting that covers Greenland, that can sometimes reach several kilometres thick, the sea level would increase by 7 meters for the overall planet. Up to now, scientists were counting on an increase by 0,6 meters within the end of the century. With what they have observed this summer, they are now expecting more than one meter “As for the pack ice, the ice-sheet of Greenland is becoming more and more unstable and is melting”, points out Peter Schlosser, coordinator of Search, the American research programme on the Arctic.

This enormous quantity of fresh water dashing to the ocean will modify progressively the salinity rate of sea water. Yet the more water is salty, the more it is heavy and the more it dives in the great deeps,

where strong currents carry it away and make it circulate at the bottom of the ocean.

Today, the Gulf Stream carries warm tropical waters up to the European coasts. They follow the Northern route up to the level of Greenland. There, cooled off, they suddenly dive in the great deep where currents bring them back to the south. A circulation of warm and cold waters, well known by heat engineers! If water is not able to cool off and is less salty, it will remain at the surface, and the Gulf Stream will lose its role of regulator, in particular in the Northern hemisphere. This phenomenon could limit the effects of climate warming in Europe.

The disappearance of the pack ice during summer months will necessarily have on the other hand repercussions on the atmospheric pressure and thus on the rainfall regimen and on the winds. The warming will also induce a strong evaporation, thus an important production of clouds. But according to their characteristics, the latter will not have the same effect. The high clouds contain ice and thus reflect the sun-rays towards the atmosphere by alleviating the warming. “It is as if the downstairs ice was replaced by the upstairs ice” points out Jean-Claude Gascard. On the other hand, if the clouds remain low, they amplify the

**If the pack ice melting has no impact on the sea level, the melting of Greenland's glaciers will have on the other hand a considerable impact.**

greenhouse effect, keeping the heat at ocean level. The scientific uncertainty remaining on this point will have a strong impact on the speed of the pack ice disappearance.

And the speed and sudden climate change can have irreversible effects. Jean-Claude Gascard, oceanographer and coordinator of the scientific programme Damocles, reminds that “the ocean has great inertia, much more than the atmosphere. It reacts very slowly. But these changes—of temperature, salinity, currents—are important, going backwards and attempting to modify the ocean would be extremely difficult”. ■

## An exceptional summer in 2007

BY CÉCILE MAILLARD

**Mild, rainy, cloudy... and long! Summer 2007 was exceptional in the Arctic. Will it remain an exception or does it forecast a lasting change?**

Present on Tara from the end of June till the end of September, Jean Festy, a young engineer of 25 years old, remembers having waded in pools of water this summer. “Finished the hikes by ski, that we took in May and June! To accomplish recordings, we had to put boots on, then waders, then fishing waders that came up to our chest. And we had to be very careful, in some pools, the holes were 4.000 meters deep!” explains the Damocles representative on the boat.

But Jean is not used to spending his summers on the pack ice and to compare the weather with other summers is difficult! Each summer, the snow that covers the ice melts, forms great blue pools on the surface of the pack ice. It was normal for the Tara crew to wade... But observations made by Damocles showed an amplification of the melt pools that now cover more than 50% of the pack ice area in summer.

This melting could be explained by an exceptionally mild summer. Masses of warm and humid air coming from northern Europe were observed above the Arctic Ocean. Temperature records accomplished by the tethered balloon around Tara revealed the presence between 400 and 800 meters high of air masses with temperatures above 10°C. On the other hand, temperatures on the soil, regulated by the ice have not changed much during the summer, situated between minus 2 and 0°C... A few highs at +5°C did however change the crew's natural freezer into a mere fridge, which triggered an emergency rescue operation of food supplies...

As the weather was humid and cloudy, rainfall arrived early during summer and was more important than planned. The collected data under the pack ice attest also to the warming of the ocean: the temperature of the Atlantic water masses— one of the water layers running under the pack ice— has increased by 0,5°C.

Mild, rainy and cloudy, summer was long in the Arctic. Unusually long. In September, Jean Festy and the other summer crew members had to welcome the winter crew. But the water pools made all landing or take off impossible for a few days. A year earlier, when the Tara crew had remained alone on the pack ice, all was congealed around the boat when it was positioned much more to the south!

At mid-october, the forming of the pack ice had not started in the Arctic. Winter came only at the end of October which is one month later than usual. ■



The crew required waders.

© Audun Thøfossen



# A logisticians' headache

*The exact date of the ice exit remains the great unknown*



Romain Troublé is in charge of the polar expedition's logistics. © François Bernard

BY DINO DIMEO\*

Tara's accelerated drift has obliged the whole technical support team to trigger action stations at the last minute. Romain Troublé who has worked on logistics for this polar expedition since its beginning, has been preparing this ice exit for a long time. This time, however, he is in the unknown. Nobody knows exactly at what date the schooner will be released from the pack ice. "Calculations have been made, explains Romain Troublé, but they do not match. Today, we are facing

two predictions: Christmas and the end of January". The logistician claims that today he only needs a maximum of four days to send a helicopter to Tara. It is the requested time to deposit a flight plan and obtain a good weather window, he says. The helicopter will bring two persons with me. Then it will return empty." A flight was to be organised on the 20th of November but a storm in the south has pushed Tara back 40 km to the north. Everything has been postponed to one month later.

The boat's nose is at present resting on a big pressure ridge and the back is very low. "It's the ice reef that has created Tara's tilt last year, continues Romain Troublé, I hope that Tara will slide towards the back to be on the water again. Yet I do not know how long this will take". Under the water, a keel of ice has formed since long. It measured up to nine meters. Once every fortnight, a dive is organised to see how it is evolving. "Today, it is in fact two ice sheets of about 2,5 meters that are overlapping" points out Romain. There is thus about six meters between the bottom of the ice and the boat. It will end up by melting", he adds Unless...But it will not melt! The boat will slide..."Romain is convinced...

Too many unknown factors are clouding the issue. How are we going to put on the rudders? What tilt will have the boat when it goes back in the water? A simulation has

## Two routes remain possible for Tara: the Spitsbergen way or the Greenland way.

been accomplished with the boat's architect. "Should Tara enter in the water now, the water level would be situated above the rudder's holes. This is a great risk. The trap doors are siliconed and the one with a leak has been repaired a few days ago", adds Romain. "We have also brought a great pressure flow pump onboard during the last shift in September".

For the moment, all the available weight, of which the Primagaz bottles has been placed on the boat's front to balance it. The built-in fuel tanks have been filled up by the kerosene that was on the pack ice as well as the thirty drums sealed and placed on the deck, ready to be used by a helicopter. The tractor has on the other hand been released. "One could not navigate with a 3,5 ton mass on the deck" continues Romain Troublé "It is a real museum piece that we shall try to retrieve during the operation" The crew has also stored the snowmobile and a ton of parachute cloth

neatly folded on a two meter cube pallet.

But for the moment, to put back the rudders of 800 kg each, one will have to juggle. "We shall try to put the rudder on the starboard side as it is out of the water (as the boat is tilting on the portside), explains the project manager.

In winter, ropes are stiff like cable and the winches are jammed. We will need to use a hoist with chains that are not subject to frost by using the boom as a strut". Romain, a fine sailor, assures that one rudder blade will be sufficient to lead Tara to a first port of call. Under the boat, the keel of ice also worries the staff "if the propellers are caught in the ice, to launch the engines will tear off every thing, adds Romain Troublé. The risk is to harm the shafts and to open a water lead in Tara". Grant Redvers, the expedition leader is training the crew with drills. "We are in a state of total uncertainty and subject to extreme conditions. This does not exist so much elsewhere on earth" adds Romain.

For nobody knows how the passage back to the water will really take place. "I imagine that Tara will find herself on an isolated piece of ice, says Romain Troublé. When the pack ice will be submitted to the swell, it will dismantle itself. If the wind comes from North-West, the ice will loosen up. If it comes from the South East, it will be the opposite. At these latitudes, even the strong winds can turn 180° in two hours". Unfortunately, despite the help of the route planner Marcel Van Triest, there is very little data and models of swell for this region of the globe that would allow to forecast accurate predictions.

Two routes are possible for Tara... on the Spitsbergen side which would be easier and on Greenland's side where the ship may remain locked in the middle of the ice for an additional two months. "Tara needs 60% of open water to make her way out. Without this, she cannot move" assures Romain Troublé who is eager to see the ice exit take place as well as possible. It remains to be seen when it will take place. ■

\* Journalist at Libération.

## A drift driven by the winds

BY CÉCILE MAILLARD

The route followed by Tara is determined by the elements. But which ones exactly and in which proportions? According to Christian de Marliave, scientific coordinator of the expedition, the winds are responsible of the path followed by the schooner. "The winds are those that push the ice and thus Tara, explains the consultant to numerous polar missions".

Jean-Claude Gascard, for Damocles, considers that the Arctic oscillation does not explain fully Tara's drift speed that is three times faster than what the models predicted. The laboratories participating in Damocles are currently working to determine if the state of the ice- a greater mobility and a lesser thickness- is not playing a part in this acceleration.

The schooner was positioned in September 2006 North of Siberia, above the Lomonosov ridge. This under-water mountain chain crosses the Arctic Ocean like a back bone with a length of 1.800 km and a width of 60 to 200 km. The summits can reach more than 3300 meter above the ocean bottom. Tara got as close as 170 km near the geographic North Pole on 28th of May 2007, becoming the non propelled boat having drifted the most to the north. ■



"Tara has taken a more northern route and has drifted a year and a half less than the Fram". © be-pôles

## agnès b supports the expedition

The Tara Arctic expedition and the Tara Expéditions project have been supported by Agnès Troublé and Etienne Bourgois, managing director of agnès b for the past three years. The trademark that this fashion figure has sown on "Tara" shows her desire to participate to an extraordinary adventure, led by her son, Etienne Bourgois. For the managing director of agnès b and expedition director "Tara Expéditions is a programme that represents for me a real personal investment. This programme embodies the commitment of agnès b and ourselves for the environment". ■

## Return to Lorient

Sharing a common goal which is to contribute to the environment's protection in a sustainable fashion, Cap l'Orient (Community of Lorient and its neighboring communes) and Tara Expéditions have signed a convention making Lorient the home port of Tara during the next three years. Since 2006 and the boat's preparation to the Arctic drift in Lorient, Cap l'Orient headed by Norbert Métaireie, its president, supports the Tara organisation. The schooner should come to the Lorient coast at the beginning of 2008 and benefit from the infrastructures offered on the harbour as well as of the know-how of the regional companies to accomplish important repair works, necessary after the Arctic ice assaults. Events open to the public will be organised to celebrate Tara's return to Lorient. ■



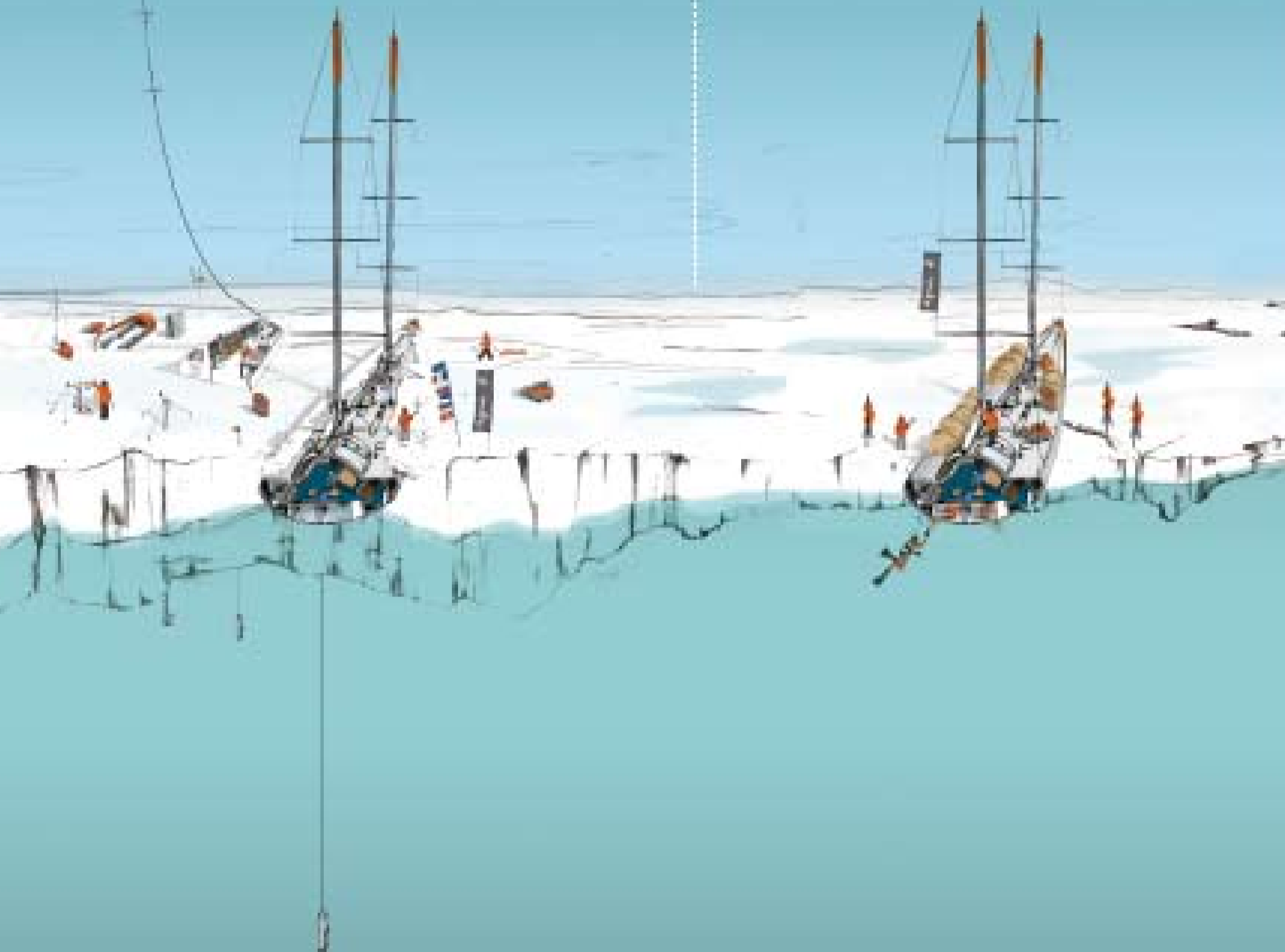
+2.000 m

### Phase 1

Tara in a drifting position  
(September 2006-November 2007)

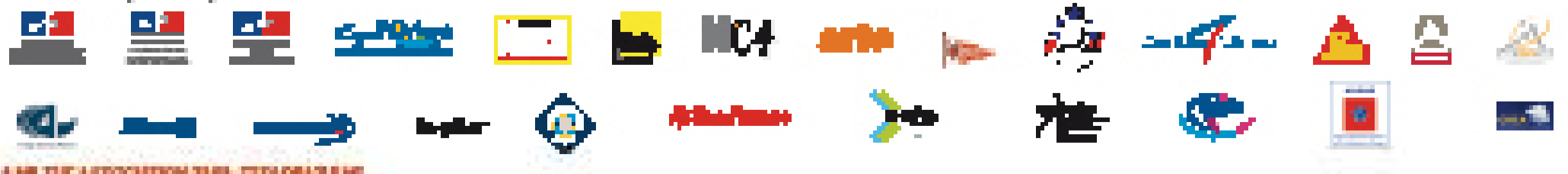
### Phase 2

Tara approaching the Fram Strait  
(November 2007)



-4.000 m

Tara arctic expedition partners



AND THE ASSOCIATION TARA EXPLORETHEM

## THE EXPEDITION IN FIGURES :

Number of covered kilometres: 4.000 km  
Number of covered kilometres in a straight line: 1.100 km  
Greatest distance covered in 24 hours: 36 km  
Maximum drift speed: 1 knot  
Average age of Tara's onboard crew during the expedition: 27 years old  
Number of rainy days: 12  
Coldest temperature: -41°C  
Warmest temperature: +9°C  
Number of days above 0°C: 10 days between the 9<sup>th</sup> of June and the 18<sup>th</sup> of September  
Number of calories necessary per person per day: 4.500 calories  
Number of showers per week per person: 3  
Number of water litres needed per 24 hours: 200 litres  
Daily electric consumption per day: 8 kWh  
Number of polar bears seen: 12  
Number of CTDs since the beginning of the drift: 17  
Number of school classes that follow the expedition in France: 100  
Number of hours of radio necessary for the 70 artists, movies: 300

## Phase 3 Tara exits from the ice (December 2007)



The Fram Strait is a rather narrow passage between Greenland and Spitsbergen. It is in fact the main passage between the Arctic Ocean and the Atlantic Ocean. It is 3.000 metres deep. The Arctic sea ice drifts toward the south and the forced separation of the Strait creates strong pressures on the pack ice flow. These flows, under the influence of the pressure, break, overlap, move apart, then meet again by forming pressure ridges of several metres high. This glacial chaos (red zone) risks mishandling the schooner when it is released from the ice to the Strait.



The geographic location of the Strait Fram makes it particularly vulnerable to Atlantic depressions. Indeed, the depressions that cross the Atlantic hit more generally the French and Irish coasts but sometimes they can take a more Northern course toward Iceland. Once in Iceland, they start toward the perimeter anticyclone of Greenland to settle South of Spitsbergen. The most powerful ones can remain there for more than a week, triggering strong Eastern and Northern winds in the Fram Strait. Tara has experienced winds of 50 to 55 knots a few weeks before entering in the Strait. One can imagine the state that Tara will experience during her release from the ice if the swell and the waves created by this strong low pressure inflow come to shake the broken pack ice area.







# The company managing director and the scientist

*Nothing destined Etienne Bourgois and Jean-Claude Gascard to work together. If it were not for a boat, Tara and a project, the Arctic drift.*

BY MICHÈLE AULAGNON-PONSONNET\*

The company managing director Etienne Bourgois and the research director at the CNRS, Jean-Claude Gascard met in 2005. A year later, the expedition began.

They come from two different worlds and find themselves now in the same boat. The boat owner of Tara, Etienne Bourgois, 47 years old, is managing director of agnès b, in the fashion galaxy. In Paris, his offices in the 10th arrondissement are vast, modern and comfortable and he welcomes visitors in his office where a gigantic model of the schooner is on display. An even bigger photograph of the boat in the waves hangs on the opposite wall. The message is clear: sailing is his passion and Tara plays a very important part in his life. At the head of a company of 1.800 people, in Paris or in Asia, on the eve of the inauguration of a new boutique or of a budget meeting, the company leader always manages to juggle with his schedule and to find a bit of time for Tara.

The European programme Damocles coordinator, Jean-Claude Gascard, 64 years old, officiates on the planet science. CNRS Director of research at the University Pierre-et-Marie Curie, at Jussieu, he works in a tiny office perched in a tower beaten by the winds.

The sole chair is broken, what does it matter? Standing on a shelf between two incomprehensible reports for the man in the street, a photo album through which he leafs carefully. His life as oceanographer is summarized there: his first campaigns on the Arctic ice, the cabin of a Twin Otter, the plane that is like the jeep of the pack ice, a split in the ice with on the one side his tent, and on the other side his scientific equipment, a photograph that always amuses him. Nothing destined the company entrepreneur and the scientist to meet.

Nothing if it were not for a boat, Tara, and a project, the Arctic drift. When Etienne Bourgois buys the schooner in 2003 from sir Peter Blake's widow, he knows that the boat has not yet accomplished the great journey for which she was conceived: the transpolar drift on the steps of the Norwegian explorer Fridtjof Nansen (see last page). Prior to launching it, he wants to buy some more time, to use Tara for already ambitious explorations- Greenland, Southern Georgia, Antarctic ... but with less of a commitment than the Nansen expedition. "I was not familiar with the world of expeditions but I soon understood that one has to be surrounded with professionals" ex-



J.-C. Gascard (on the left) and E. Bourgois (on the right) on the pack ice in April 2007. © Francis Latreille

plains the company director who quickly set up a team of specialists.

Jean-Claude Gascard, on the other hand, is already familiar with the boat. Eleven years ago, in 1996, he elaborated a scientific programme to escort his drift on the Arctic Ocean. Everything was cancelled for lack of means. For

few weeks per year. With a schooner caught in the ice, Jean-Claude Gascard had at his disposal a scientific platform that could be inhabited for long months.

In 2005, the two men are introduced to each other by Christian de Marliave, specialist of polar explorations. Bourgois wishes to

They arrived to the same conclusion:

**"Tara could have taken place without Damocles; Damocles without Tara. But together, it makes so much more sense!"**

the oceanographer, it was out of the question to let another chance go by. Scientists are keen to get information from the poles. But the constraints of access, light and temperature are such that scientific campaigns are limited to a

do the Arctic drift and the idea of adding a scientific dimension to it appeals to him. For the company director, it remains to be seen when to do it. On the scientific side, Gascard dreams of having a platform like Tara and has

a project waiting on his shelf. Yet, the scientist needs to find the funding. The triggering element will be the International Polar Year. For the fourth time since the beginning of polar expeditions, the world science community has decided to join forces and to fund an exceptional research programme for several years until 2009. Jean-Claude Gascard becomes coordinator of one of its leading programmes. It is called the Damocles programme, because with climate warming, a sword is floating above the planet. The scientific budgets are allocated to him. He now needs to convince the owner of the boat.

"It was to soon for me, recalls Etienne Bourgois. But since I had promised to myself to give a scientific dimension to the drift when Tara would set off..." Jean-Claude Gascard adds "We quickly were under the same understanding: Tara could have taken place without Damocles; Damocles without Tara. But together, it makes so much more sense!" The two men work and reach a partnership agreement, all the more remarkable as it links a public research organisation to a private project, public funding and the means of a private person as well as the agnès b trademark. A partnership that still remains unique. Together, they will solve budget, organisation, logistics, person, authorisations issues...

Trials bring them closer such as the difficulties with the Russian bureaucracy when the boat was being set in the ice in September 2006. Etienne Bourgois had to go to Russia without further ado while Jean-Claude Gascard was gritting his teeth on an icebreaker. "We nearly cancelled everything, what a waste it would have been!" says the company manager. "It was done for by one day" adds the scientist.

The two men are on familiar terms with each other, are both very discreet and concerned for their teams. But never oh never does one intervene in the field of the other one. Science remains the competence of Jean-Claude Gascard and Tara, the boat of Etienne Bourgois. It is up to the company manager and to the scientist to lead the schooner to the end of her journey. "It will be a great moment when Tara exits from the ice, explains Jean-Claude Gascard. It is as delicate as for a spatial ship entering in the atmosphere" Etienne Bourgois adds: "What will be interesting, are the conclusions that the scientists will be able to draw over all the data collected up there". ■

\* Editorial manager of the environment section at *Géo Magazine*.

## The men and the boat's safety



Polar bears become the main threat as the boat approaches the coast.

© Audun Thollsen

BY DINO DIMEO

**All risks have been imagined and the insurance policies studied carefully.**

To fit out a boat like Tara is not easy. To make a schooner leave with 190 tons and ten people on board in order to abandon it on the pack ice can give some cold sweats. Etienne Bourgois, manager of the expedition and Philippe Clais, administrator of Tara, put in writing a code of good practice. Each crew member had to sign a letter of appointment that describes the incurred risks. All these risks were thought out and the insurance risk coverage was carefully reviewed with a fine tooth comb. Philippe Clais obtained a two year commitment from an insurance company. He worked with Christian de Marliave, polar expedition specialist to establish the list of restrictions so as to limit risks. "We took a repatriation insurance for everyone onboard of an amount of 300.000 euros, explains

Etienne Bourgois. Anyway, to send an emergency helicopter costs already 200.000 euros." The least eventuality of intervention via Russia, an access always tricky to negotiate, was put in the balance. Tara finally covered herself with three insurance policies, body, transported equipment and pollution.

Onboard, the rules of the maritime code were applied with in particular a medical cabinet and a doctor, an oxygen reserve for eleven days... Up till then, only two light injuries can be accounted for. It is especially during outings on the pack ice that the risks are the highest. "Nobody is allowed to move away from the boat alone, stresses Etienne Bourgois. Especially because of bears" The dogs are also there to give warning. Since Tara has been heading south, the crew goes out by pairs to the bathroom. "My greatest nightmare, aside from the bears, is that the pack ice opens and engulfs somebody" confesses Etienne Bourgois. ■





Hervé Bourmaud, Tara's captain (top photo) © François Bernard. Grant Redvers, expedition leader (bottom photo) © Jean Festy.

## Hervé Bourmaud and Grant Redvers, the polar pair

BY VINCENT HILAIRE, ONBOARD TARA

**Of all the crew members that followed one another onboard Tara, only two will have remained on board from the beginning until the end of the Arctic drift. Grant Redvers, the expedition leader and Hervé Bourmaud, the captain left in July 2006 from Lorient and are still on the boat, in the footsteps of Nansen, the Norwegian explorer who was the first to accomplish this feat.**

To visit the cabin of two polar navigators is always instructive. Especially when they have spent more than a year onboard like Grant Redvers, the expedition leader and Hervé Bourmaud, the captain, both on the boat since the beginning of the transpolar drift.

"In Hervé's cabin, one feels like in Ali Baba's cavern without the amber or the incense. There are bracelets and African objects and two guitars on the top bunk. Posted on a multiple photo frame is the photograph of the pope that christened the schooner in Russia. There is a photo of Tiksi's parents, one of the two onboard dogs. There is a pretty watercolour of the camp on the pack ice. The captain has also hung on the wall the drawings of his son Naël, four years old who is waiting for him on the island of Yeu in France. "His island" is much in evidence. Several postcards and a map describe it. Some reference points for this young man of thirty-five with the look of a Viking who was born in Strasburg.

In Grant Redvers' cabin, the expedition leader, everything seems more orderly. As he invites you in his world, his "cave", Grant sets up a stool and offers some coffee. Lying down, seemingly relaxed, he is a bit stricter and prudent. His island is also on show. New Zealand, her green mountains, snowed volcanoes. Postcards of a pigeon, a cricket. A four leaf clover. The "Kiwi", 33 years old, single, denies it a bit but knows that he is superstitious. Photographs of his mother, his father

and his two sisters are on display. On the shelves, accounts of adventures are organised in an orderly fashion.

Before joining Tara, the two men had a totally different career path. Grant followed scientific studies and received a masters in environmental science to be a hydrologist. At the same age, Hervé was already a skipper. School was far gone for him. To earn his living, he chose the sea and fishing. Not a corsaire, rather a pirate. Good catches were celebrated with huge parties. But he was always brought back to travelling. "I am a passionate person, explains Hervé. When I enter in a

For these two sailors,  
the September 2006 debacle  
remains a memorable event.

new story, I live it to the full. And when it is finished, I set my course on something else".

Grant's experience as a hydrologist led him to Scott Base in Antarctica where he accomplished a study on the used waters of the station. Back in New Zealand, he understood that this was but the beginning of an adventure. During six months of non paid holiday, he joined a sailing expedition in the Antarctic. In the roaring fifties, Grant discovered a new passion, after kayaking and mountaineering, sailing. And the South Pole crossing cap Horn remained an unforgettable feat, with tense moments like when the boat capsized. "It was a real adventure, really, remembers Grant. We were heading for the unknown. It was dangerous. We were not great sailors. I am interested in challenges". New adventures came up, Grant left his work to follow this path.

Today, if Hervé is onboard, it is in great part, thanks to Grant. During their first meeting in Lorient, the "Kiwi" recommended

his application. The two men talked to each other during a barbecue when Tara was in the shipyard getting ready for the drift. "Hervé seemed to me right away like a good guy, says the New Zealander. He was used to working in harsh places, had a great experience of the sea, of fishing and a great physical capacity. A year and a half after, I still feel the same way. Today, we are like an old couple. Even if we do not always agree on things, we have great respect for each other." This is mutual. For Hervé "We know each other well. Grant is our organiser, the diplomat. Someone with an open heart who knows how to listen and who understands. A great guy, a super polar guy, a good sailor".

For the two pioneers of the drift, the two persons who are still onboard, the most memorable event was the September 2006 ice debacle after a few days in the ice. In a few minutes, the pack ice shattered and disseminated all the scientific equipment. Three days without sleep was necessary to gather everything. "The extreme of the extreme. Something very harsh. But we were facing the elements and this is what I seek". Says Grant. For Hervé: "It was a harsh and hard improvisation, I do not like to say it, but I enjoyed myself. I had to give my best". For these two men, these moments are the main reason for their presence here. Real adventures.

Once the drift adventure will be over, how do these two adventurers view their future? Hervé does not have any precise projects for the aftermath, but the wish to finish the Tara adventure successfully. Tara "the whale". A whale that he loves and with which he would still like to pursue the journey. For Grant things are different. "I am excited by the future. I need time to digest this adventure, that is for sure. But I have many dreams. Return to the south? Tara is now going to do incredible things. Tara and me? I want to continue the expeditions and I feel that everything is possible, we shall see. Why not? ■

## Damocles and Tara at school

BY MICHÈLE AULAGNON-PONSONNET

For teachers, the Tara expedition can be a wonderful tool to raise the awareness of school children to climate change, to the importance of poles in climatology and to science. In agreement with Jean-Claude Gascard of the Damocles programme, learning activities have been elaborated to enable teachers to base their teachings on the expedition. A poster competition, suggestions for scientific activities, different operations and audiovisual supports are offered.

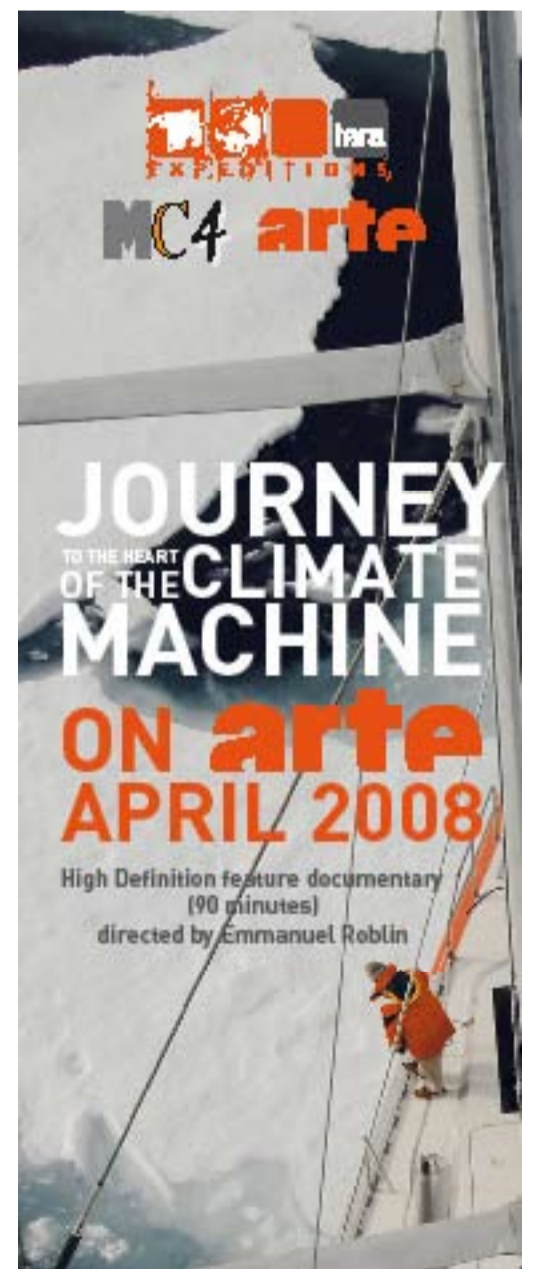
Today, 102 schools  
follow the expedition thanks  
to different education tools.

Beginning November 2007, 102 French schools were following the Tara project, indicate the organisers, without counting those who visit the pedagogical website conceived by the CRDP of Paris (Regional Center for Pedagogical Documentation). The leaders of the expedition specify that the page devoted to Tara and Damocles is the most widely read of the website.

With Marion Lauters, onboard Tara and in relation with the ADEME, a new pedagogical dimension is to be explored on the website. It concerns the eco-responsible approach engaged during the expedition. Marion has assessed carefully the energy flux; waste, water access... and the crew's behaviour. This has been gathered in an environmental diagnosis with pedagogical thematic extensions.

"The objective of this multi-sided device is that most classes and curious individuals enrich themselves from this incredible human and scientific adventure" says Brigitte Sabard, coordinator of the pedagogical support system for Tara. ■

Paris CRDP web site: <http://crdp.ac-paris.fr/tara/index.php>





# The “pack ice” women

Three women have embarked: an environmental student, a physician and an artist.



Marion Lauters © Audun Tholfsen



Minh-Ly Pham-Minh © Francis Latreille



Ellie Ga © Francis Latreille

BY VINCENT HILAIRE, ONBOARD TARA

## Tara's new crew includes three women completely engaged in the polar adventure

The presence of women onboard ships has for ever been a source of debate. This is even more so in the polar expedition's field. Today, sign of the times and mentality changes, three women are onboard Tara. Three women engaged in a polar adventure. To put an end to the machismo that still haunts the spirit of certain boats? Not at all.

Marion Lauters summarizes their common point of view. “On land, there are men and women, it is natural. Why not here? To live a polar adventure is completely possible as a woman”

But for Marion, Ellie or Minh-Ly, their presence on Tara is not a coincidence. Each one in her own way has provoked it by her career path and her motivation.

Marion, the youngest one, a dynamic Parisian of 24 years old, crazy about the sea and travel, succeeded in convincing the expedition's management that she could contribute in her own way to the expedition. Aside from the onboard food management, she is involved in a biology programme and an awareness programme on the environment. Moreover she has just completed her Master in Environment and ecology.

Stepping back, Minh-Ly Pham-Minh, 40

years old, the most experienced of the three, did not imagine she would become a polar physician, “an exclusive club” according to her. Minh-Ly has accomplished seven missions for Doctors Without Borders before leaving for the Antarctic and then coming to Tara. In the refugee camps, Minh-Ly was in charge of the health of 80.000 persons.

Ellie Ga, New York brunette of 31 years old, expresses her art by mixing photos, words and sound. She has been obsessed by the Arctic for two years. She has read many books on the subject when she was an artist in residence at the Explorers Club in New York. After researching

on these adventures, she wanted to shorten the distance with the subject and come work on the spot. Ellie likes “to step out of the frame” and understand better by being here “how the explorers have had to adapt to survive and when they managed how they succeeded to testify it”.

Their presence is positive for Grant Redvers, the expedition leader and Hervé Bourmaud, the captain. “Among ourselves, we do not behave as well. With women, we are more polite. There is less aggressivity. Things are more balanced” says Grant. Hervé goes even further “It is a false taboo subject. A woman or a man aboard does not change much, the discussions are more watered-down and the atmosphere is less brutish that is true but the tasks are accomplished just the same whether by men or by women” Grant adds “Outside professional specialties, everyone does one's task within one's physical capabilities” “The women who are here have been chosen for their profile, not because of their gender”.

What is certain is that few women still partake in polar expeditions. This comes as a surprise for one notices everyday on Tara that the two genders live this adventure with peace of mind. ■

## Science on a daily basis

BY MATTHIEU WEBER

Matthieu Weber was the Damocles engineer who embarked during the first winter. He details the experiments carried out since the summer

During permanent daylight, onboard scientific activities have greatly increased. Most of the scientific experiments initiated during the first winter were completed, boosted by the arrival in April of scientists who stayed on the pack ice for fifteen days. The study of three environments- water, ice and atmosphere-

re-initially planned by the Damocles project were accomplished. From May to September, a tethered balloon under which was attached a string of wind probes destined to measure several parameters of the air mass was launched. The balloon rose up to 1500 meters of altitude. The frost that weighed down the balloon, sometimes created problems to the scientist in charge of this experiment. The snow analysis was completed by the sample boring of sea ice. The crew also set up a network of stakes in the snow to measure the snow falls and the movement of the pack ice that was quite tumultuous.

The EM31: this barbaric term designates an instrument capable of “seeing” the pack ice thickness. One just needs to tow the ra-

dar set on its sledge, along a path well defined to appreciate the pack ice thickness evolution through the weeks. A network of seismometers was also deployed around Tara. Like the earth crust floating on its ocean of magma, the pack ice sheets evolving on the ocean are subject to “ice quakes”. Named Copenhagen, Tartu, Paris and Tromso, the four stations had some surprises in store for those who collected their data and replaced their batteries. From time to time, a curious bear played with the instrument. Sometimes, the numerous melt pools disrupted the proper operation of an engine. The marine biology made its entrance with the arrival of Marion Lauters in April who was in charge of surveying the nutrients (mineral salts) and the

marine micro-organisms with the help of water samplings and plankton fishing nets with microscopic netting. The observation of wild life also became everyone's job, a task made easier in summer with permanent daylight. Bears, seals, borealis fulmar, gulls, snow buntings and the rare ivory gull came to visit the boat. Mild temperatures and long days were propitious to the smooth operation of these activities. The break of a clutch did however disrupt manipulations concerning the CTD (Conductivity-Temperature-Density). It was not possible to send probes down 3700 meters deep. In September, the missing part was brought to the boat so that the data gathering could resume. ■

## The 2007 autumn crew



© Romain Troublé

### 1. Grant Redvers

33 years old, New Zealander – Expedition leader. Onboard since the beginning of the expedition. **Training:** Masters of Environmental Science, Skipper diploma, Divemaster. **Experience:** Three seasons as a scientific technician at Scott Base, a New-Zealand scientific base located in the Antarctic. Grant has a great experience in diving and mountaineering. He is part of Tara Expeditions since 2005.

### 2. Hervé Bourmaud

35 years old - French - Captain of Tara. Onboard since the beginning of the expedition. **Training:** Skipper Certificate, General Machine Operation Certificate, Aptitude Certificate for life-saving appliances. **Experience:** 10 years of offshore fishing, Captain on a net-fisher, Teacher at the professional maritime high school of St Malo. He is in charge of the Ocean winch and is the master of dogs.

### 3. Minh-Ly Pham-Minh

39 years old- French – Physician. Onboard since April 2007. **Training:** specialty in emergency and sinister medicine at the University of Paris V. Qualification as General practitioner. Medicine PHd, University of Paris XI. Diploma of tropical medicine. **Experience:** Doctor and station leader of the Franco-Italian Antarctica base Concordia for more than a year. Chief doctor of the Amsterdam island, in the Antarctic for more than a year.

### 4. Hervé Le Goff

52 years old- French- Member of the scientific Damocles programme. Onboard since September 2007. Research engineer at the CNRS at LOCEAN (Oceanographic and Climate Laboratory: experiments and digital approach). **Training:** ENSTA engineer (maritime engineering) Paris 1977. Doctor in thermodynamic. **Experience:** participated in Tara's setting in the

ice and to the April shift. He has ensured up till now the inland technical monitoring of Damocles onboard experiments. Participated previously to seven missions onboard Vagabond in the Spitsbergen for the Damocles programme.

### 5. Alexander Petrov

50 years old -Russian-scientist in the Damocles scientific programme. Onboard since September 2007. **Training:** Masters degree from the Leningrad Hydrometeorological Institute faculty of oceanology. **Experience:** Engineer at the Leningrad Department of State Oceanographical Institute and research scientist at the Baltic Sea Laboratory of thermohydrodynamic regime, and since 2003 at AARI. In 2006-2007 he took part in the Russian –Antarctic expedition on the Progress station and participated in NABOS projects between 2004 and 2006.

### 6. Marion Lauters

24 years old- French- Masters student- Marion is in charge of a biology programme with the Centre d'Océanologie in Marseille and of food supplies and cooking on board. Onboard Tara since April 2007. **Training:** Master II Environment and Ecology, bachelors in organisms' biology. **Experience:** She participated in the Clipperton expedition of Jean-Louis Etienne as an eco- volunteer and to several expeditions onboard Tara.

### 7. Audun Tholfsen

34 years old, Norwegian. Crew member. Onboard since April 2007. **Training:** Bachelor degree in chemistry and business. Carpenter. **Experience:** For 12 years he has been a water rafting, snowmobiles and polar dogs guide. He has just spent three seasons as a guide in the Spitsbergen. His knowledge of the cold

and the management of people in the wild is an asset for Tara's safety.

### 8. Samuel Audrain

28 years old- French- Chief mechanic. Onboard since April 2007. **Training:** captain 200 UMS (sailing). Mechanic - Sailing instructor. **Experience:** He was part of Jean-Louis Etienne's team during the Clipperton expedition as logistician to organise the diving activities. Sailor and diver on Tara, he has participated in the expeditions in Southern Georgia in 2005/2006 and on the boat's preparation to the drift.

### 9. Vincent Hilaire

40 years old - French – Journalist. Onboard since September 2007. **Training:** masters of economic science and graduate degree in journalism. Onboard role: Vincent will film and take pictures of the expedition starting in September and until the boat and the crew returns to land. He also writes the logs. **Experience:** transatlantic and coastal navigation in the past twenty years. Deputy Editor in chief at the tv network France 3 Centre.

### 10. Ellie Ga

31 years old-American-artist. Onboard since September 2007. **Training:** Masters of Fine Arts in photography from Hunter College in New York City (2005). In 2005, Ellie Ga was the first artist in residence at the Explorers Club in New York where she worked on the project “The catalogue of the Lost”, researching early expeditions in the Arctic. On board Tara, Ellie Ga will pursue her Arctic project by exploring the best way to illustrate the extreme conditions of the expedition: silence, darkness and the cold.



# Tara, a schooner following in the Fram's footsteps

*Lighter, more solid, better isolated, the schooner that is built with modern materials answers to the same constraints as the Fram one century ago.*

BY OLIVIER PETIT

**Olivier Petit is one of the architects who designed Tara in 1986. He tells the story of how he dreamt of and conceived the ideal expedition boat.**

That evening in September 2006, Etienne Bourgois, the new owner of Tara, the boat that I designed more than twenty years ago, gives me great news "Finally, she arose! She is set on the ice!" In his voice, I can sense emotion, a hint of excitement and a lot of relief. The boat is on the ice, she did not find herself crushed like a nut between two ice cubes. This is a second birth for Tara and a moment that Luc Bouvet and myself, the two designers and architects as well as Michel Franco, the project manager, were waiting for since her launch in 1989.

Antarctica, Seamaster, Tara... Those are three names for a same boat, given by her successive owners Jean-Louis Etienne, Sir Peter Blake and finally Etienne Bourgois who will take her to the end of her story after so many journeys on all the oceans up till this polar drift for which she was designed.

The story of Tara began a long time ago. One can start it during the night watches that I did in 1978 with Jean-Louis Etienne on Pen Duick VI. For hours, we would discuss about the ideal expedition boat, we would imagine her in all her details and fine tune her. In the following years, our dreams became more and more precise and in 1986, when Jean-Louis Etienne returned from his expedition on foot towards the North Pole, the project was launched and was entrusted to myself and Luc Bouvet. This is the second boat that we designed on our own behalf, after a racing boat for Titouan Lamazou.

The boat we wished to invent had a great ambition: to accomplish the transpolar drift. For this we had a model: the Fram of Nansen, the boat that enabled the Norwegian explorer to accomplish his expedition between 1893 and

1896. Our specifications were nearly the same: to be caught in the ice and to spend winter with a crew of 14. The boat had to be sufficiently self reliable to provide food, light and heat for at least two years, while the current pushed her and spat her out if all went well on the Eastern coast of Greenland. This was more than a hundred years after the design of the Fram by Nansen and its architect, Colin Archer.

We studied the Nansen's Fram project. Writings of the time existed, models were available. We selected two key ideas: the boat had to slide between the hands and if she was assaulted by the ice, she would have to behave like a cherry stone and arise. It was the reverse of the ice-

**"The boat we want to invent does not exist and her ambition is great: to accomplish the transpolar drift. To achieve this, we have Nansen's Fram as a model.**

breaker that rises and crashes on the ice and is too heavy for a schooner. The boat we were going to design would obey to another principle: to be light. A boat that would follow the art of sidestepping like in boxing.

To draw the lower part of the hull, the constraints were great: an expedition boat always has a heavy load. We had to make the inventory of all the things to bring in the baggage in the holds and anticipate the weight and position of each embarked element so the boat does not list toward the nose or the bottom when the boat will be loaded. We also had to make sure that the boat would remain stable at the start of the expedition like at the end when it would be lighter. Also, we had to be sure that the extra weight due to ice and snow in the rigs during a snow storm would not make her capsize. Finally, we had to ensure that the structure was

homogenous and that it resisted to the efforts due to the wind, to the sea pressure and to the ice in Tara's particular case.

"The boat had to slide between ones fingers like an eel" according to the words of Nansen. In his mind, the hull had to be round in every direction. She had to have no asperities on which the ice could cling and block the boat when the moving ice sheets would start to crash into each other and risk crushing the boat. For the hull to be ejected upward like a cherry stone that is pressed between one's thumb and index, we drew sections of hulls with a wide curving shape. The concept remained the same, yet one century later, technology had much evolved and

the answers were different.

The Fram and Tara share more or less the same length, the same width and an identical programme. One could expect them to have the same movement. Yet the Fram weighed 800 tons whereas Tara only 190 tons on the scales when leaving for the Arctic drift. The explanation could be found in the difference between the traditional building material in wood and the current materials: the jointing. In the wooden building, the different elements of the hull were assembled between themselves with nails, broaches, bearings, metal belts and despite the very sophisticated geometric jointing, each element remained alive, worked and became deformed, always threatening to dissociate itself from the whole. The beginning of the metal construction took on the same concept with a patchwork of metal sheets joined together with rivets. The

great revolution in ship building occurred at the end of the 19th century with welding that enabled to "glue" metal sheets together laying edge to edge, in a more homogenous fashion than riveting. For the hull, we could choose between aluminium and steel. In the end, we selected aluminium for its light weight, its good performance to the cold and its capacity to bend when steel would tear itself apart.

Thermal isolation was crucial on an expedition boat. One needed to combine excellent isolation with good ventilation to avoid condensation created by cooking, breathing and sweating. The walls, the floors and ceilings of the Fram cabins were all lined with a complex insulating material made of reindeer hair, felt and linoleum. At the time, it was a technological innovation! Tara on the other hand has a second indoor skin around the equipments, made of foam rubber between two thin layers of plywood. This second skin is suspended in the hull like a thermos bottle to avoid a thermal bridge made by the contact between the cold aluminium hull and the interior of the living quarters. The plexiglasses in double glazing were assembled with a high resistance mastic called Sikaflex.

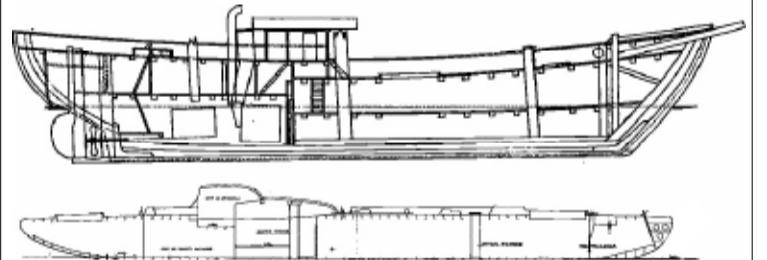
When Antarctica was launched, everybody thought she was bizarre. She did not belong to the canons of beauty of the yachts of those times! She was not even painted when at the time, when one would invest in a boat, one had to show her off. The other night, I was rereading Gauguin's writings and I felt that Tara looks like a Maori woman described by the artists "What distinguishes a Maori woman from other women and often makes her look like a man are the proportions of the body. A hunter Diane with large shoulders and narrow hips (...) Their complexion is golden yellow, it might be true that it is ugly for a few people but for all the others, especially when it is naked it is really that ugly?". ■



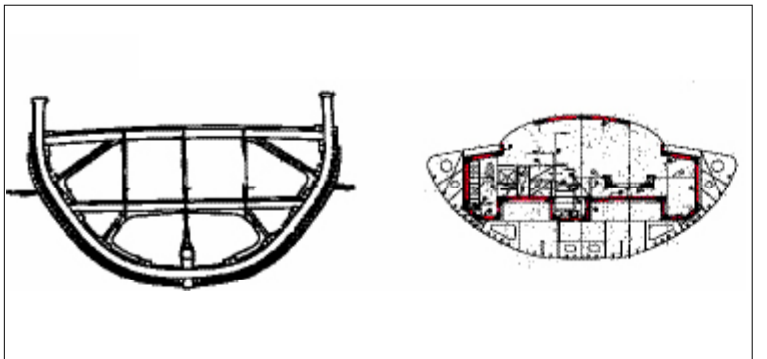
The "three suns" are the result of a parhelion phenomenon, the sun's refraction in the ice crystals that are in suspension.

© Romain Troublé

## Compared structures of the Fram and Tara



Even if the Fram (top) and the Tara (bottom) measure the same length, the traditional construction in wood of the time remains much more impressive than the modern technologies in aluminium. © Tara Expéditions



Tara's light structure welded with aluminium (right) replaces the impressive oak pieces of the Fram (left). One distinguishes also in red, the isolation of Tara's living quarters based on the principle of a thermos.

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