POLAR MISSION

• THE EXHIBITION

OCEANO MONACO

MUSÉE OCÉANOGRAPHIQUE

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"To tread the pack ice is to experience
one of our best reasons for living, that is:
to take care of the planet,
to safeguard what our civilisation is
today trying hard to destroy...
We no longer live in the age of the
pioneers and adventurers who ventured
out into unknown lands.
The nature of the journey has changed:
it is not as much about discovering
new lands as about taking care of them."

HSH Prince Albert II of Monaco

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Editorial

This year we will be celebrating the centenary of the death of Prince Albert I, the founder of the Oceanographic Institute of Monaco. When that great explorer and pioneer of modern oceanography took a snapshot of the Lilliehöök Glacier, one of the largest in Spitsbergen, at the turn of the 20th century, could he have imagined that this frozen monster would have retreated several kilometres, a victim of the inexorable dynamics of climate change?

To commemorate this event and the enormous scientific legacy left by His great-great-grandfather, HSH Prince Albert II is this year returning to the Svalbard archipelago. He will not fail to be struck once more by the ecological upheaval hitting these lands of the Far North, lands which he trod in 1982 and again in 2005, and which have certainly made Him even more convinced of the need for a relentless battle to save the poles. A battle which He is leading with the support of the foundation which bears His name, the Princely Government, the Oceanographic Institute and the Monaco Scientific Center.

Arctic and Antarctic have long been the object of great fascination. They will be at the centre of the Oceanographic Institute's new programme, after two years devoted to coral reefs. Far from the eyes but close to the heart, these distant lands stir the imagination. The pack ice and the polar bears in the North, the emperor penguins and the vast icy wilderness in the South are their emblems. Far more than simply breathtaking landscapes, the poles are driving forces vital to the smooth running and balance of the planet, particularly with regard to the climate. And yet they are a little more threatened each year, whether by the disruption of the climate, and its corollaries - loss of biodiversity, rising sea levels, acidification, melting permafrost - or else by pollution, overfishing, the temptation to exploit underground resources or even diplomatic tensions…

> *Far more than simply breathtaking landscapes, the poles are driving forces vital to the smooth running and balance of the planet, particularly with regard to the climate.*

> *Inform, act and convince... giving up is out of the question.*

Robert CALCAGNO
Chief Executive Officer of the Oceanographic Institute,
Prince Albert I of Monaco Foundation

The publication of the book "*At the heart of the polar worlds, Challenged by global warming and exploitation*" by Glénat, the hosting of a high-level scientific symposium, organised by the Prince Albert II of Monaco Foundation in partnership with the Scientific Committee on Antarctic Research (SCAR) and the International Arctic Science Committee (IASC), which will bring together researchers working on the Arctic and the Antarctic, as well as the important "Polar Mission", at the Oceanographic Museum of Monaco, will allow us to raise awareness and mobilise the public on a very large scale. Inform, act, convince… giving up is out of the question. Through His diplomatic action and by interceding with His peers, HSH Prince Albert II made a direct contribution to the creation of the Ross Sea Region Marine Protected Area in 2016. Even if this area is one of the largest in the world, it is not sufficient. The key challenge facing the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) in their annual negotiations is to convince partner countries to create several new Antarctic Marine Protected Areas. However, this does not mean that we are advocating that the Poles should be placed totally under glass. By our action we are also aiming to ensure the existence of a reasonable blue economy.

"*I hope that the emotions aroused by the beauty of these polar regions, combined with an awareness of their vital role on a planetary scale, will lead Humanity to treat them with respect and prudence*", explains HSH Prince Albert II, because one thing we are now sure of is that the future of the poles foreshadows our own.

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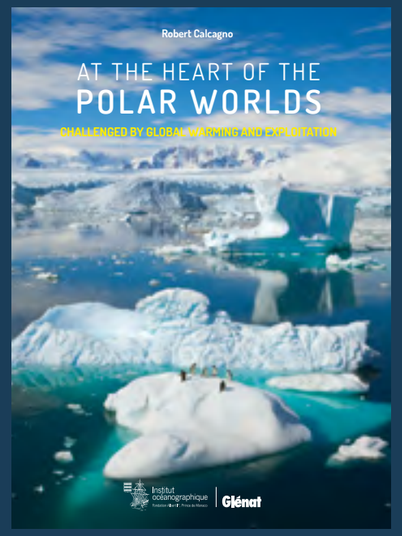
Awareness-raising

Remote and inaccessible, the poles still too often give an impression of unchanged worlds. How mistaken!
The Oceanographic Institute is decoding the major challenges facing these remote lands and opening dialogue through its new programme. Publications, exhibition, activities for younger ones… these are as many tools intended to raise public awareness about these regions, of their breathtaking beauty, their vital role in the earth's climate, but also of the dangers threatening them and the risks we will incur if we do not mobilise for their preservation.



At the heart of the polar worlds

The last regions on our planet to have been discovered and explored by Westerners, the polar regions are still hard to reach. In the north, they are inhabited by indigenous peoples with multiple cultures, such as the famous Inuits, while in the south, protected by the Antarctica Treaty, they are only occupied for scientific purposes. In this extreme environment, wildlife abounds, but man could a ect the fragile balance of these ecosystems, which global warming is already seriously upsetting it. Polar species such as the emblematic polar bear are subjected to the full force of these unprecedented changes which a ect their habitat and food resources. And perhaps the worst is yet to come…

Indeed, experts fear that global warming and the melting of the polar icecap will accelerate dramatically. What is more, since the shrinking of the sea ice is opening up new possibilities for human activities (such as fi shing, transport, o shore exploitation of hydrocarbons and tourism), it seems that it will be impossible to preserve these regions completely. It is therefore an urgent matter to develop a new planetary management system for the poles, and to adopt an approach which, for the fi rst time, will put the preservation of ecosystems before the greed of mankind.

At the heart of the polar worlds, Challenged by global warming and exploitation
By Robert Calcagno • Éditions Glénat • 19.95 €

POLAR MISSION Exhibition

Visit the poles as if you were there! From 4 June 2022, the Oceanographic Museum's new exhibition gives you an immersive experience in 5 stages at the heart of the Arctic and the Antarctic. Visitors can bump into the great explorers who ventured there, the species which have adapted to these extreme environments, the men who have chosen to live in the Far North, the scientists who are moving science forward… Like a reporter they will be given an entrance ticket illustrating a press card which opens all kinds of contents and information as they walk along. On board for a polar mission, they can collect all the information they need to produce their report, which they will be invited to hand over at the end of their tour.

The high point of the visit is the “IMMERSION” room, offering 650 m2 of screen projection, so that you can feel, at the closet quarters possible, the beauty and the fragility of the polar worlds. It is absolutely vital to the balance of planet Earth that the poles remain in good health, which is why Prince Albert I, at the turn of the 20th century, and HSH Prince Albert II, today, have enshrined these territories in Monaco's DNA by the Oceanographic Institute on the one hand and by the the Prince Albert II of Monaco Foundation on the other and it is newly illustrated by this major exhibition.

Booklet-game

A booklet-game, available for sale, accompanies 6-12 year olds and their families throughout the visit.

The objective:

Complete the various missions proposed in each of the exhibition spaces and become a true ambassador of the poles!

A rich activity programme

During weekends and school holidays, the public can enjoy free thematic guided tours (duration: 20 min.). For each visit, an area of the "POLAR MISSION" exhibition is chosen and highlighted through treasure hunts, quizzes and exciting discussions with a guide.

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Declaration
of Mélanie Laurent

Ambassador of the "POLAR MISSION" exhibition

To those who see ecology as punishment, I would answer that we must think in terms of solutions. I was lucky enough to discover this at a very young age, thanks to an upbringing based on common sense: limit waste, eat well... It is better to set an example than feel guilty, to educate than be contrite, to act than procrastinate. It is this vision that I wholeheartedly choose to anchor in my projects.

The Ocean is a challenge. Even though the alarm has sounded, we must not let it paralyse us. Awakening people's consciousness, yes. Offering them solutions, even better! It is this enlightened optimism that I share with the Oceanographic Institute of Monaco, and I am particularly proud and happy to be associated with their exhibition "POLAR MISSION", as ambassador.

When Prince Albert I created this institute more than a hundred years ago, he gave it the mission to “get to know, love and protect the Ocean”, which he never stopped exploring to support science. On several occasions, this great visionary explorer went to the Arctic, already aware of the essential role that the poles play in the balance of our planet. Poles that, like the rest of the world, are threatened by climate change, which is responsible for the melting of glaciers at a dangerous rate, by pollution, overfishing and the extinction of species.

Throughout this new exhibition, each and every one of us is invited to become a privileged observer of the incredible beauty of the polar worlds, but also an informed witness of their great fragility. By becoming true reporters, visitors of the exhibition will not only be able to understand the mechanisms involved in the uttermost parts of the Earth, but they will also be able to bear witness and get involved. We can all contribute at our level. An individual responsibility for a great collective mission: to re-enchant the world.

Mélanie Laurent
Ambassador of the "POLAR MISSION" exhibition
Photo © Marcel Hartman

“Throughout this new exhibition, each and every one of us is invited to become a privileged observer of the incredible beauty of the polar worlds, but also an informed witness of their great fragility...”

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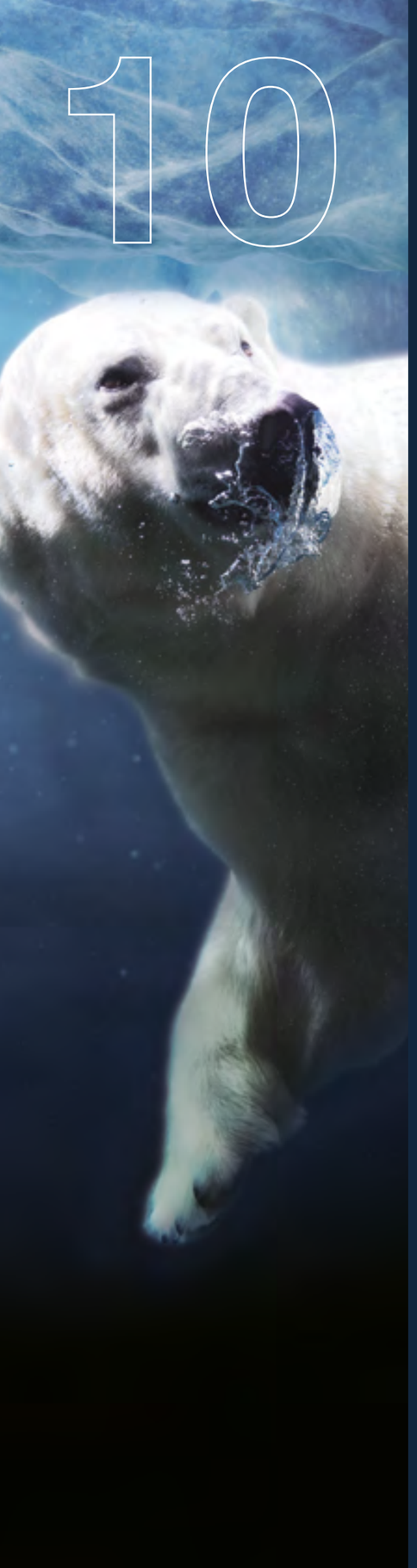

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Polar Mission

The “Polar Mission” exhibition will be at the Oceanographic Museum from 4th June 2022. This new tour route covers 5 thematic areas spread over two levels. Discover the poles and their wildlife, via the men and women who populate and explore them. Objects and documents, digital content and immersive devices are side by side and together complete a 360° experience. The great voyage can begin!

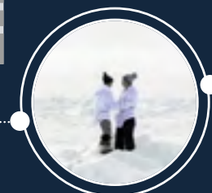
Become an actual reporter and set off on a mission at the heart of the poles!

Each visitor plays the role of a field reporter on a polar mission. Armed with their entrance ticket which takes the form of a “press card”, they trigger content and information throughout their visit. At the end of the tour, visitors are invited to hand over their report on the poles: a special opportunity to express their thoughts and feelings about these remote lands and relate back what they have retained.

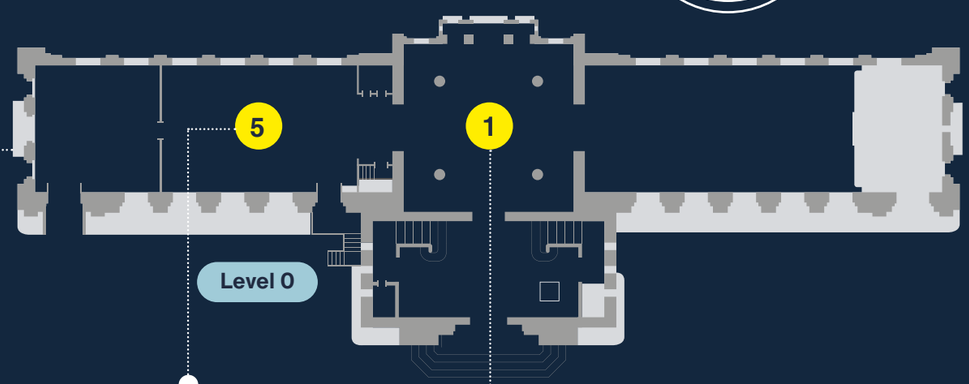
How? By choosing a title, a cover design, and by taking a selfie, like a reporter. This is an opportunity to create a souvenir of their expedition to these extreme territories and share it with their family. If they wish to do so, visitors can also get involved with the Oceanographic Institute and the Prince Albert II of Monaco Foundation, by actively supporting the actions carried out to protect the poles and in particular the creation of new Marine Protected Areas in the polar oceans. As an individual, each visitor can take action on a daily basis, contributing to the preservation of these remote territories. Mélanie Laurent, the ambassador of the exhibition, reminds visitors that “the future of the poles is also ours”, before adding: “If your polar mission is coming to an end, it is in fact here and now that it really begins!”

SPACE N°3
Discover the secrets of the North Pole and the South Pole

SPACE N°4
Embark on a journey in immersion from the North to the South Pole



SPACE N°2
Discover the world of the Inuit



SPACE N°5
Understanding the challenges of scientific research in polar regions

SPACE N°1
Meet the polar explorers from yesterday to today

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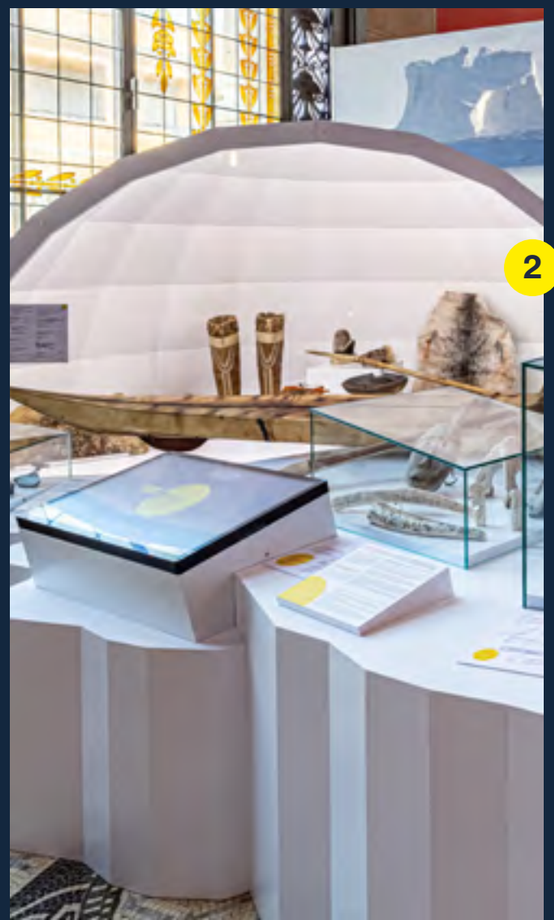
SPACE N°1
Meet the polar explorers from yesterday to today

As soon as you set foot in the Salon d'Honneur, you will find yourself face to face with the great names of exploration. Selected for their contribution to the knowledge of the poles, these explorers of yesterday and today, men and women in life size photographs, speak about their work and their discoveries. Thirty of them are portrayed on a huge map, along with a brief summary of their history. Nine others are represented in real size: contemporaries, such as Jean Malaurie, Jean-Louis Étienne, or Frederik Paulsen and pioneers, like Jean-Baptiste Charcot or Matthew Henson - the first two have reached the North Pole - as well as two women, including Ada Blackjac. Although she was Inuit, Ada, raised by missionaries, knew very little about the land. However, she was the only one to survive the expedition led by four scientists, for which she was hired as a cook.

The spirit of these expeditions has never wavered, between Prince Albert I, who led four expeditions to Spitzbergen, and HSH Prince Albert II, the only head of state to have visited both poles. Not just for the pleasure of the adventure but to show His determination to act in favour of the protection of these territories, which are today under threat. It was on His return from one of these trips that He decided to create His foundation.



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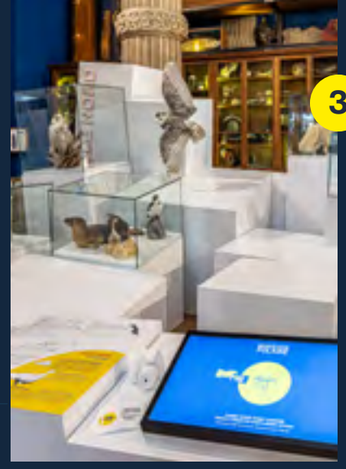
SPACE N°2
Discover the world of the Inuit

Jean Malaurie, an emblematic figure of polar exploration, has made a gift to the Oceanographic Institute of a very large part of his collections, archives and personal effects, illustrating 70 years of a life devoted to the Arctic peoples. Through his eyes and his documents - texts, recordings and videos – visitors are invited to immerse themselves in the Inuit culture (life in society, family life, education...). Numerous objects used in daily life (clothes, dance masks, artworks, religious objects...) are also on display in a scenography which reproduces an icy environment with its traditional igloo. But it also demonstrates to what extent the Inuit way of life and traditions, closely related to nature, are threatened today by climate change, by pollution and are constantly being pushed aside by modernity. Between sled dogs and snowmobiles, nomadism and sedentarisation, and ancestral knowledge of the ice that was passed down from father to son and that is now available on apps, how can we find the right balance? It is imperative to listen to what they have to say.



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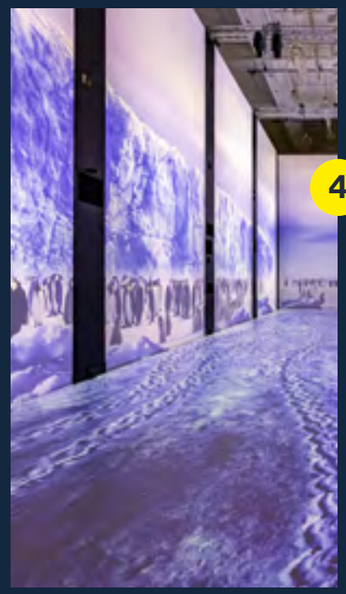
SPACE N°3
Discover the secrets of the North Pole and the South Pole

The challenge of this third space situated in the Oceanomania room is to get a better grasp of the capital role played by the poles in the balance of the planet, understand how they function, but also become aware of the tremendous upheavals taking place there because of climate change. The visitors will become conscious of the differences between these two extremes: if the Arctic teems with life on sunny days, in the Antarctic life remains concentrated on the coasts and in the ocean. Stuffed animals from various scientific collections between the end of the 19th century and that of the 20th illustrate the difference in fauna between these two opposites: the polar bear lives exclusively in the north as the penguin is exclusive to the south. It is important to understand that each species is at the heart of an ecosystem: if one element is damaged or disappears, the whole ecosystem can collapse. Let's take the example of the krill, which on the one hand feeds on phytoplankton and on the other is itself the prey of ocean predators (penguins, cetaceans, fish, etc.). Its disappearance or even an imbalance in its production would have serious consequences for the health of the ocean. A global ocean: altering it would harm the whole planet.



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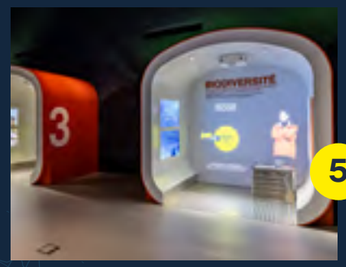
SPACE N°4
Embark on a journey in immersion from the North to the South Pole

In the "IMMERSION" room, the wild, grandiose beauty of these frozen lands comes to life in an unprecedented immersive and interactive device. With a projection surface area of 650 m², the visitor is propelled into the heart of polar landscapes where he will experience 6 emblematic scenes. Firstly, the North Pole in the company of a she-bear and her cubs, or beneath the sea ice to free-dive beside seals, beluga whales or narwhals. Then to the South Pole where visitors come across whales with ever-open mouths, ready to swallow hundreds of kilos of krill before fleeing under their feet; not forgetting the elephant seals resting on their sides, keeping an eye on the killer whales which are ready to emerge from the water; emperor penguins pressed against each other against the blizzard and to protect their young. A wonderland which ends in the dreamlike polar aurora. A voice-over is present in each picture to remind us of the fragility of this ecosystem and the threats to these species. For instance, bears have difficulties in finding food because of the melting ice pack, just like the penguin colonies at the South Pole.

More details on this space on pages 14 to 19.



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SPACE N°5
Understanding the challenges of scientific research in polar regions

Where would knowledge of the poles be if science had not been a stakeholder for many years? Science which will be perceived by visitors in this last space with the presentation of vital data making clear in an instant what is happening in the Arctic and in the Antarctic together with the impacts of these changes worldwide and in our daily life. The first module presents current knowledge about the climate and the consequences of its warming: melting ice, rising sea levels, etc. With very concrete and up-to-date explanations, visitors can understand the issues surrounding the Thwaites Glacier in Antarctica. This monster, 600 km long, 120 km wide and about 3 km high, is currently cracking and could break off. Its melting into the ocean alone could represent a rise of some 60 cm in sea level. A second module focuses more specifically on the impacts of global warming on biodiversity: fauna, flora, forests, etc. How, for example, global warming is encouraging huge fires in the forests of the far north. Finally, the last module recalls what we know about the consequences for humans: whether it is the displacement of populations due to rising sea levels or the melting of permafrost, which is accompanied by the threat of the resurgence of extremely dangerous viruses and bacteria such as anthrax. Three modules with a single purpose: to understand in order to better anticipate.

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“IMMERSION”

Technology Serving Knowledge

MORE INFO

HIGH TECH

This “life simulator” is designed around a mix of matte painting, computer-generated imagery and real time 3D animations. Matte painting is a cinematographic process whereby one or more animated scenes are integrated in postproduction in a decor painted on a plane surface. A real-time computer-generated image is made live according to the actions of the visitors or the situations, unlike images made in post-production. The device used in the “IMMERSION” room juxtaposes these two techniques to enhance realism and speed of interaction.

Contemplating polar auroras, diving beneath icebergs in search of seals, beluga whales and narwhals, espying penguins through the blizzard… Or how can the limits of reality be pushed back to offer a unique experience which mobilises living beings? The “IMMERSION” room, with almost 650m2 of projection space, offers to thousands of visitors the unique and deeply moving sensation of being at the poles. A journey in which they can interact with the content, the environment and the species.

This experience which is part of the “Polar Mission” exhibition and the Oceanographic Museum of Monaco was created thanks to a virtual replica of these extreme regions and the species which inhabit them. This change of scenery was achieved thanks to exceptional technologies and monumental projection equipment. The whole project was scripted by a design team in close collaboration with the Museum. Computer-generated images provide exceptional scenographic productions for places with cultural and scientific mediation activities, without sacrificing the rigour and requirements demanded by a site like the Oceanographic Museum.

One of the goals of this creation is to build on the sense of wonder experienced by the visitors to make them aware of the threats that are hanging over the poles and the risks they represent for the whole planet. We want to create a link between Man and an ecosystem which is generally beyond his reach, to be spectacular while making sense, to dazzle while raising awareness. The device is also based on an educational mode that allows the Oceanographic Museum’s instructors to take the lead of each session and guide the visitors in a more scholarly experience.

A tool at the service of pedagogy

During the school holidays and on the occasion of school visits, the Oceanographic Museum’s educational service offers dedicated activities. A tailor-made visit adapted to young people is made possible thanks to an “educational mode” specially designed for this purpose. The moderator can thus, on request, freeze certain scenes of the system in order to better observe a species or comment on its behaviour. A multimedia library is also accessible to the moderator who at any time can project an educational factsheet, a film or an anatomical chart to enrich the experience.

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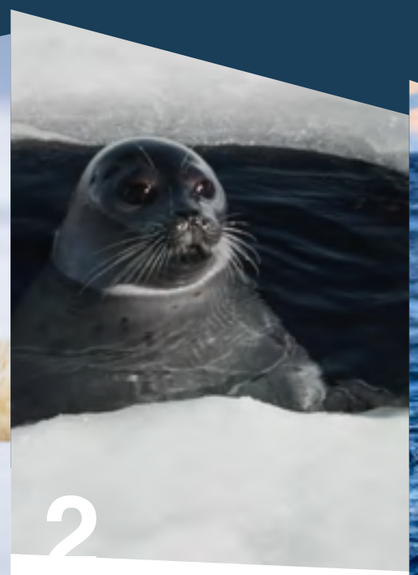
“IMMERSION” a journey in 6 acts

1

MEETING WITH A SHE-BEAR AND HER CUBS ON THE PACK ICE

This majestic emblem of the Far North, the polar bear, is an endangered species, and the number of individuals has a tendency to decline. There are two main reasons for this: global warming, which is causing the disappearance of its habitat, and melting ice which is putting its search for food at risk. Especially as its prey, principally certain species of seals, are endangered for the same reasons. These giants whose life is closely linked to pack ice are gradually moving away from the northern regions and sometimes moving dangerously close to villages in search of food.

To illustrate their vulnerable situation, the polar bears are shown in a compromised decor. The collapse of whole sections of icebergs and the constant cracking of the ice under the feet of the visitors are reminders of how precarious their habitat is.



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UNDER THE PACK ICE, INTERACTING WITH BELUGAS, SEALS AND NARWHALS

To escape from predators, seals usually seek refuge on pieces of pack ice on the open sea. Because of the increasingly rapid melting of these ice floes, these large mammals are forced to adapt their lifestyle and travel greater distances in search of new shelters.

For their part, belugas are endangered by pollution and disturbed by the exploitation of underwater mineral wealth. These large cetaceans, also called white whales, are being forced to dive deeper and for much longer to find food.

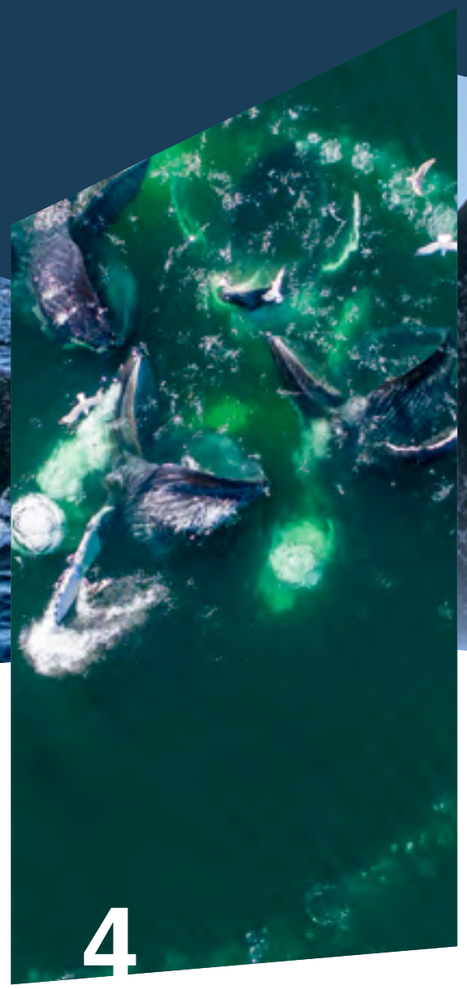
By interacting with these species, visitors are led to feel empathy for these mammals. By becoming aware of their environment, they will realise that a whole ecosystem is being modified and, as a result, more fragile.

3

KILLER WHALES LEAP OUT OF THE WATER WHILE SEA ELEPHANTS LOUNGE ON THE SHORES

The Antarctic region possesses a rich, unique biodiversity where killer whales and sea elephants have evolved far from all human predation for thousands of years. Today, however, humans no longer hide their claims to these distant lands: killer whale overfishing has begun.

Immersed in the sublime decor of the South Pole, between the water ballet of these majestic marine mammals and the strident cries of the sterns and the colonies of sea elephants, visitors grasp the reality of a world totally unknown to them, while at the same time they become aware of the urgent need to protect this world.



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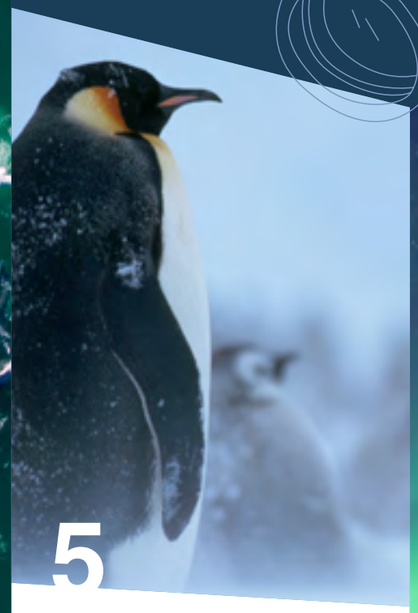
FEEDING TIME FOR THE WHALES

Krill, the base of the food chain, is the diet of many underwater species. Yet, the abundance of these tiny crustaceans is also endangered by overfishing.

Witnessing the gargantuan meal of humpback whales reveals not only how organised they are and their clever hunting methods, but also their dependence on this food.



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A COLONY OF PENGUINS IN A BLIZZARD

The famous emperor penguins of the Antarctic have developed a wonderful globally unique organised lifestyle which allows them to survive in this particularly hostile environment. However, they too are endangered by the lack of food resources, global warming and melting ice.

Adults have to travel further and further out at sea to find food at the risk of returning too late to feed their chicks. Thus weakened, penguin populations tend to decline.

Wrapped in the blizzard at the centre of the penguin colonies, visitors can try to remove the snow in order to see them. By becoming aware of the bitterness of the climate conditions the public will come to appreciate the exceptional nature of their environment.

6

POLAR AURORAS IN THE STARRY ANTARCTIC SKY

This final scene is a serene invitation to be enraptured by the permanent source of inspiration which is nature. A lyrical conclusion where the subtle and the fragile mingle to magnify the magnetic and atmospheric phenomena responsible for this celestial spectacle.

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“IMMERSION” key figures

18

650
m2 of projection
in total

4
scenes :
day and night
on the ice pack
and underwater

Projection
wall with
9
meters high

12
species
to discover

40
video projectors

250
m2 of interactivity

6
different sets

Non-contractual photo - 3D simulation

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Monaco & the Poles,

more than 100 years of commitment

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The poles: what do we know about these fake twins?

North Pole and South Pole are the white, frozen lookouts of the Earth. Separated by some 20,000 km, they share snow, ice and cold… but they have little in common.

Their names alone send out a signal: Arctic originates from the Greek word *arktos*, «bear» referring to the constellations Great Bear and in particular Little Bear, which includes the Polar Star. Antarctic comes from the Greek word *antarktikos*, in other words opposite to the Arctic!

MORE INFO

A KEY ROLE IN THE WORLD CLIMATE

The poles play an essential role in the climate. Major ocean currents flow around the planet, cooling and sinking into the abyss near the poles, then warming and rising to the surface in the tropics.
These gigantic masses of water, cold or warm, move and interact with the atmosphere, and influence the climate.
Global warming, which speeds up the melting of the ice, could have a major impact on this great “conveyor belt” which determines life in many parts of the planet.

NURTURING OCEAN

At the end of winter, when light returns to the Southern Ocean, life takes over. The explosion of phytoplankton provides food for zooplankton, mainly krill, a type of shrimp. There can be 10 000 to 30 000 individuals per m3 of water: a blessing for albatrosses, squids, penguins, whales... Even the satellites can spot this sublime effervescence, which to this day is altered by pollution, global warming and overfishing. Yet it is the basis of the entire food chain in this region.

The Arctic corresponds to an ocean principally covered by pack ice - frozen sea water covering a surface area of between 5 and 15 million km², depending on the season, summer or winter - surrounded by land. Its geography is often compared to that of the Mediterranean.

Conversely, the Antarctic is a continent measuring 14 million km², or 27 times the size of France, covered by a layer of ice with an average thickness of 2,000 m. and surrounded by the Southern Ocean. This ice cap contains almost 80% of the planet’s reserves of freshwater.

North and South Poles also differ by the life they support. The polar bear is the master of the Far North, in the company of seals and walruses, whereas penguins reign in the Far South. However, the two are linked: thanks to the many migratory birds which link them in conditions that weight makes unbelievable, or to the whales which pass each other during their great peregrination towards the equator. Conversely, as to the flora is abundant in the Arctic in spring, and almost non existent in the Antarctic during any season.

Do people live in the Arctic?

- **4 million** inhabitants in about 8 million km².
- **400,000 to 500,000** descendants of the first settlers who arrived 10,000 years ago.
- **120,000** Inuit occupy Northern Canada, Alaska, Greenland and North-eastern Siberia.
- **80,000** Samis live in Sweden, Norway, Finland and a small part of Western Russia.
- **300,000** Yakuts are settled in Siberia.
- About forty other communities exist, but at times only in very small numbers (Nenets, Tchoutktches, Koriaks, Dolagnes, Evenks…).

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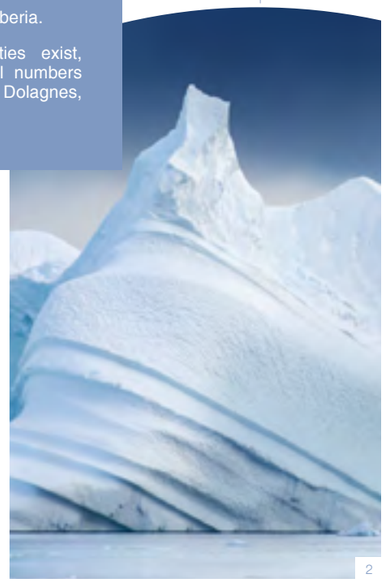

2

Arctic

The life of Arctic inhabitants is disrupted by global warming. The few advantages of being able to grow cucumbers and strawberries in experimental farms in the south of Greenland or the migration of fish such as tuna which are returning to the North Atlantic do not compensate for the threats otherwise incurred. Threats of pollution and disturbances caused by the quest for new mineral resources, the opening of shipping routes, the arrival of more and more tourists every year, melting permafrost (frozen ground), the growing number of fires, the great herds of reindeer which are struggling to adapt…

Antarctic

If nobody lives on this particularly inhospitable land, the land itself has the particular feature of belonging to no-one. It is managed by an international treaty. It is a peace zone, devoted to scientific research. In 1956, France opened the way with the Dumont d’Urville station in Adelie Land. Today 18 countries are present with 44 permanent scientific research stations. Researchers cooperate, away from national rivalries, in the study of climate change, the earth’s magnetic field, ice drift...

3

4

1. Jean Stevens, a native Eskimo woman in Bettles, in the Arctic circle
2. Icebergs in Greenland
3. Seascape at sunset over Wilhelmina Bay in the Antarctic
4. Representation of Earth (according to the transverse Mercator projection), which shows that all the continents are connected by the global Ocean

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Heatstroke over the poles

On both sides of the planet the effects of global warming, today clearly recognised as being due to human activities, are well identified.

The constant decrease of sea ice in the Arctic is particularly visible. It is melting increasingly in summer and reforming less and less in winter. Today it has an average surface area of 13.45 million km², that is 1.24 million less than ten years ago, and it is becoming thinner and thinner. In the Antarctic the increased flow of the glaciers is also leading to regular loss of ice mass. In spring 2021, the breaking off of the A-76 Iceberg measuring more than 4000 km² the size of the French Alpes-Maritimes department), caused quite a stir.

The consequences are multiple and devastating. Firstly, there is the phenomenon of warming amplification: because of its whiteness, sea ice reflects the sun's rays and, as it melts, dark areas appear which absorb these rays. The water then warms up, speeding up the melting of the ice, which in turn liberates more water … the circle is complete.

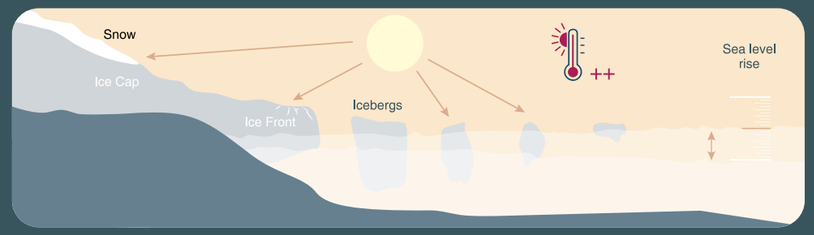
Simultaneously, land thaw, a result of the warming of the atmosphere, leads not only to land subsidence (roads collapse, houses sink, trees fall), but also causes the liberation of methane, a very powerful greenhouse gas, into the atmosphere.

The fauna is also a victim, be it the polar bear, whose Arctic habitat is constantly shrinking, or the king penguin in the Antarctic, which has to make longer and longer journeys in search of food.

MORE INFO

TEMPERATURES ARE RISING AT THE POLES!

At the North Pole the thermometer is going wild! It is actually showing a rise in temperature two or three times higher than that observed on the rest of the Earth (1°C since the preindustrial era). In 2020, temperatures even rose by 4°C in Siberia. The Antarctic has not been spared. Even if there are fewer continuous observations than for the Arctic, the readings show warming of almost 3°C in 50 years at the north-west extremity of the Antarctic peninsula.

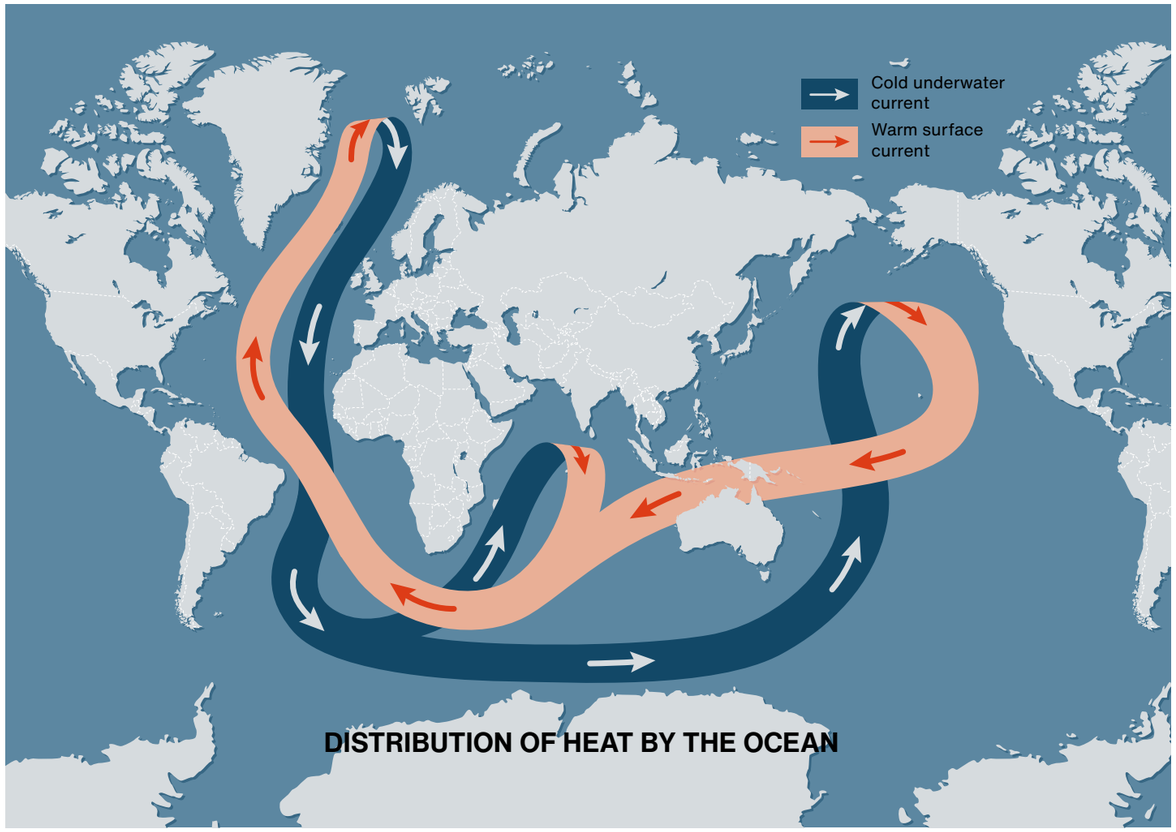


Melting of the ice cap and rise in sea level. The warmer the atmosphere becomes the more the ice melts. Glaciers break up faster, liberating many icebergs. This arrival of fresh water causes a rise in sea level. Water warming due to global warming also leads to thermal expansion, which accentuates the rise in sea level.

Banquise – Une histoire naturelle et humaine,
(Sea Ice, A Natural and Human History F. Genevois and A. Bidart. Editions Quae (2018)
Terre sauvage Spécial Pôles, n° 226, April 2007

The consequences far beyond the poles

Climate warming influences the functioning of the great ocean currents which are themselves closely linked to the climate. Take for example, the Gulf Stream: its modification would have considerable consequences on the temperate climate of one part of Europe. And what about the rise in sea level: fuelled by the melting of the ice caps, it is currently from 3 to 4 mm per year and speeding up as decades go by. It could even rise at an exponential rate, if the measures being taken to stop global warming turn out to be insufficient. The IPCC (Intergovernmental Panel on Climate Change) has calculated that the melting of the snow cover and glaciers of Greenland could lead to a rise of 60 cm at best, and 1.10 m at worst by 2100.



The Biggest Chill. W.S. Broecker. Natural History, 96 : pp.74-82 (1987) ;
www.ocean-climate.org ; www.storymaps.arcgis.com/stories/756bcae18d304a1eac140f19f4d5cb3d ;
Science & Vie n°257, special edition, December 2011, 9.94

> In the northern part of the Southern Ocean, between the great sea currents which flow above or below, them, are bodies of virtually stagnant water at depths of between 1 km and 2.5 km. A shadow zone, relatively isolated but very rich in carbon. The question is: will it continue to accumulate carbon or release it in the coming centuries? A crucial issue in the context of climate change.

Casimir de Lavergne
Oceanographer for the LOCEAN Laboratory of Institut Pierre-Simon Laplace
2018 Oceanographic Institute Thesis Prize

In the Southern Ocean thousands of marine cyclones and anticyclones are in permanent interaction, generating fronts. These fine-scale fronts (about 10 kilometres wide), are of capital importance: they link surface waters to the deep sea and enable communication between the atmosphere and the ocean. Specifically, they induce the transport of heat from the inside the Ocean towards the surface. Thus it would appear that the ocean not only absorbs heat from the atmosphere, but also releases heat from its depths. Could that impair its storage capacity? In any case it appears urgent to represent this fine-scale physics in climate models in order to be certain.

Lia Siegelman
Postdoctoral student at the Scripps Institution of Oceanography, University of California, San Diego, USA
Prix de Thèse 2021 de l'Institut océanographique

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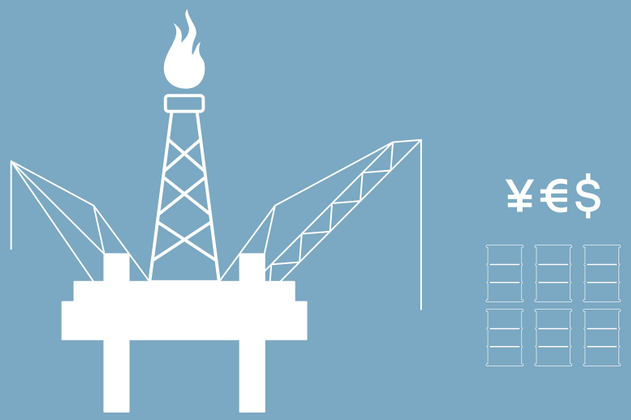
The Poles

are sanctuaries no more

Global warming is unfortunately not the only threat hanging over the poles. Admittedly the inhospitable nature of the Antarctic and the treaties which govern it are restraining the appetites of the various powers on the planet, but it is not entirely shielded from pollution. As for the Arctic region, much more accessible, it is today subject to all kinds of threats. Let's briefly review...

Pollution has reached every corner of the planet

The poles, far from large crowds, were long believed to be spared by pollution. The first analyses carried out in the Arctic revealed a very different reality. As in other parts of the Earth, the winds and ocean currents transport all kinds of toxic substances. In this way organic pollutants (pesticides…), or heavy metals (lead, mercury, cadmium…) have been found in the food chain. And as a result in that of humans. In 1970, tests carried out on the Inuit, great consumers of seal meat, revealed traces of heavy metals. The other scourge of these lands is plastic. A study published in 2018 revealed a very large quantity of plastic waste caught in the pack ice.

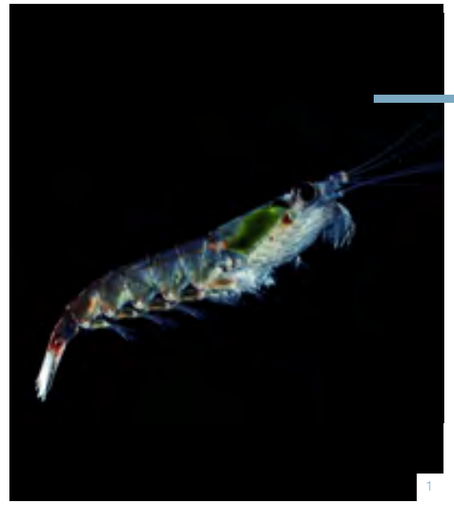


Oil and mining companies are in the starting blocks

Stocks of fossil energy sources (oil and gas) slumber at the bottom of the Arctic Ocean. It is thought that they represent 18% of world resources. On land the subsoil contains large reserves not only of diamonds, but also of gold, silver, lead, zinc...all resources which arouse keen interest and exacerbate debates within populations. In 2020, Greenland granted two concessions to foreign companies for the extraction of uranium and iron, angering the indigenous populations.

Will little fish grow big?

After exhausting the resources of the most remote parts of the Ocean, will industrial fishing companies do the same in the Arctic and Southern Oceans? In the north the protection provided by the sea ice is dwindling as it fades away. At the other end of the Earth, the extreme south, the Southern Ocean is already a fishing area with two flagship resources: the toothfish, of high commercial value, and krill, used to feed fish in fish farming and to produce food supplements. Fishing that is in direct competition with the needs of whales, killer whales and other sperm whales. Neither is it without consequence for birds.


1

1 tonne

the quantity of krill swallowed each day by a baleen whale.


2

Melting sea ice: a boon for shipping, a disaster for the ecosystems

Saving several weeks of transport between Europe and Asia via the Arctic Ocean: the dream of some shipowners is becoming reality thanks to the melting of sea ice in summer. A reason for rejoicing in merchant shipping is however a most considerable threat to the ecosystems. Oil pollution, collisions with large cetaceans, noise pollution: the dangers are many.

The Poles: a New Tourist Attraction

The figures speak for themselves: whereas 5,000 tourists visited the Antarctic in 1990, today they number 80,000. The same enthusiasm in Greenland with an increase of 10% per year between 2014 and 2017 to reach 85,000 visitors today. In the Antarctic invasive species have already been identified: flies, starfish, algae…


3

Above:
1 • Krill (here Antarctic krill), key link in the food chain of cold areas
2 • Freighter in a frozen marine channel, Arctic
3 • Tourists on Cuverville Island, Antarctica

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We can act

Are the polar oceans two Hercules with feet of clay? Everything that makes their strength - action on the climate, a reserve of biodiversity, fishing resources- also foreshadows their fragility. The coming years are therefore crucial: unbridled exploitation of this new windfall will inevitably lead to major catastrophes. However, there are many who are working for sustainable use of the seas and their resources. Here are some examples.

MORE INFO

PROTECTING ARCTIC FISHING

For a long time, pack ice served as a shield: it was host to few fish and prevented any intrusion by fishing boats. Today things are very different. The warming of the waters means there will be more fish: it has been estimated that 800 species are leaving temperate seas in search of colder waters. How can covetousness be curbed? After several years of negotiations, the bordering countries of the Arctic announced a moratorium on commercial fishing in 2017. It prohibits fishing within a radius of 200 km around the geographic pole, in other words in an area the size of the Mediterranean. It gives 16 years of respite, time for science to study the resource and lay the foundation of ustainable fishing.

Sailing without polluting

Heavy fuel oil means considerable risk of pollution: oil slicks, of course, but also pollution linked to emissions of particles of sulphur and soot deposits on the ice which speed up the melting. Cheap and abundant, this fuel emerged in the 1960s. In 2015, 80 % of ships were using it. Since 2011 it has been banned for ships sailing in Antarctic waters. After a long battle waged by the Prince Albert II of Monaco Foundation, it will also be the case in the Arctic. This decision, ratified by the International Maritime Organisation, will become effective in 2024.

Can there be tourism without impact?

In 1991, the International Association of Antarctica Tour Operators saw the light of day, with the aim to defend responsible tourism. On the small part of the continent which is accessible, passenger disembarkation is regulated, clothes must be cleaned, it is forbidden to disturb the animals … But all tour operators are not members. In the Arctic region some tour operators work with the indigenous peoples. For its part the Principality of Monaco prefers to support the Canadian «Students on Ice» project. After an expedition on the ground, young people take part in projects for the protection of these areas.

Several tour operators are working for more sustainable tourism, notably with the help of hybrid boats that therefore cause less pollution. Some cruises combine tourism and research by taking on board scientists. The passengers too are moved by a genuine interest in the environmental issues which are taken into consideration in their travel practices.

Opposite:
1 • Marine Protected Area in Antarctica
www.ccamlr.org

Countries are attempting to Cooperate

In the South, the Antarctica Treaty today ratified by about fifty countries confers on it the status of nature reserve. It cannot be revised before 2048, notably the Madrid Protocol which stems from it and manages the environment. Moreover, several safeguards have been put in place, one of which is the unanimous vote necessary for any modification of the text.

In the north the Arctic Council established in 1996 has made it possible to draw up rules between the bordering States. Six associations of indigenous peoples have permanent participant status and several countries as well as NGOs have roles as observers. But as climate change makes access easier, the appetites of the bordering countries are being whetted. Will the dyke that is the Arctic Council resist?

Marine Protected Areas, "a service to preserve" the Antarctic

Thus far, two marine protected areas have succeeded in emerging within the framework of the Convention on the Conservation of Antarctic Marine Living Resources, (CCAMLR). The first in 2009, on the southern plateau of the Orkney Islands, with a surface area of 96,000 km², is also the first international marine area. The second was drawn seven years later (2016) in the Ross Sea, with the support of HSH Prince Albert II of Monaco to convince His peers that it was necessary. It covers just over two million km² where are situated several scientific study areas.

Since then, the European Union has proposed two other projects, again with the very active support of the Principality of Monaco. One, presented by France and Australia, is situated in the eastern part of the Southern Ocean and is divided into three areas (Mac. Robertson, Drygalski and the Dumont d'Urville-Mertz Sea) covering 950,000 km². The second, in the Weddell Sea, would serve to create a refuge of almost 2 million km² for emblematic species such as penguins, seals or krill. Finally, again to protect penguin feeding areas, Argentina and Chile have put forward a 650,0000 km² project in the Antarctic Peninsula.

If the coming meetings of the CCAMLR approved the setting up of these three new Marine Protected Areas, that would mean the protection of 1 % more of the global Ocean. Objective eleven of the Aichi Convention on Biodiversity (2010) set as a goal the protection of at least 10% of the Ocean worldwide. At the beginning of 2022 this percentage was almost 8 %*.

*Source: https://www.protectedplanet.net

1

- The Marine Protected Area (MPA) on the southern plateau of the Southern Orkney Islands, the first MPA set up by the CCAMLR, in 2009, is also the first international PMA. It stretches over 94,000 km².
- The marine protected area on the Ross Sea region includes several special areas intended for various studies. It has a total surface area of 2,090,700 km²:
  - The total protected area covers 1,555,900 km².
  - The special research area, measuring 110,000 km², is a fishing area serving as a scientific reference.
  - This area of 75,000 km² hosts the ecosystems of the undersea mountains associated with the Pacific-Atlantic ridge.
  - This area of 21,000 km² hosts the undersea ecosystem around Scott Island.
  - The krill research area, measuring 328,800 km², makes it possible to study the variations in the biomass of Antarctic krill.
- The marine protected area proposed by France and Australia for the Eastern Antarctic would be made up of three separate ecoregions: the Mac Robertson area, la Drygalski area and the Dumont d'Urville-Mertz Sea area. It would cover 950,000 km².
- The Weddell Sea marine protected area, with a surface area of 1,800,000 km², would constitute a refuge for emblematic species: penguins, whales, seals, krill...
- The marine protected area of the Antarctic Peninsula would be a buffer zone closed to fishing in penguin feeding areas.

Information to date; we do not know what decisions will be made during the next meetings of the CCAMLR about the MPAs proposed.

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1000 years
are needed for a water molecule to to do a complete tour of the oceans, on the surface and in the depths, following the currents. This is called thermohaline circulation.

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Monaco,

from polar expeditions to international cooperation

MORE INFO

MONACO SUPPORTS THE SPECIAL IPCC REPORT ON THE OCEAN AND THE CRYOSPHERE

In the context of climate change, this report, which details the situation of the polar regions, was requested in 2016 by governments, observer organisations such as the Princely Government of Monaco, the Prince Albert II of Monaco Foundation and their partners. Made public in Monaco in 2019, it notably explains the impact of global warming on polar ice. It underscores the consequences for the biodiversity of these regions and recalls the disastrous repercussions that changes at the poles will have on the rest of the planet.

Prince Albert I, explorer and visionary, opened the way at the end of the 19th century by organising several expeditions in the Arctic and Spitsbergen with the aim to become better acquainted with environments which at that time were little known and well-preserved. Some one hundred years later, climate change has produced a very different situation. After following in the steps of His great-great-grandfather to the North Pole and rounding off the path by visiting the South Pole, HSH Prince Albert II has made his commitment, convinced that only international cooperation can save the poles.

Thus the Principality of Monaco is supporting projects at ground level through the Prince Albert II of Monaco Foundation and research through the Monaco Scientific Center. In parallel, it is promoting dialogue between scientific experts, associations, companies, governments and the public for Ocean conservation via the Oceanographic Institute. The commitment of HSH the Sovereign Prince has already made action in favour of the poles possible on several occasions by pleading the case for banning heavy fuel in the Arctic or for the creation of Marine Protected Areas, to quote only two instances.

1

The polar regions are not areas surrounded by eternal ice, isolated from great planetary changes. They play an unsuspected part in the great upheavals affecting our planet.

Albert I, Prince of Monaco

Convinced that science is the way to progress, Prince Albert I, a great seafarer, carried out 28 oceanographic campaigns between 1885 and 1915. Thanks to his reading, he was particularly fascinated by polar exploration. In 1898 he made a first voyage to the Svalbard Archipelago to the north of Norway. He repeated this voyage three times, visiting Spitsbergen in 1899, 1906 et 1907. The Monacobreen Glacier can still be seen there. His ship the Princesse-Alice II, is considered to have been the finest oceanographic ship of its time. His teams carried out hydrographic surveys, analysed the benthic fauna and the seabed as the equipment on board enabled operations at depths of up to 6,000 m. They also released the first weather balloons to study the atmosphere, an operation which had until then used kites.
Did the Prince imagine that the paintings produced by the artists on board along with the scientists, as well as the many perfectly located photographs, would serve as document database to measure the effects of climate change and notably the spectacular retreat of glaciers?


2

HSH Prince Albert II of Monaco

Fuelled by the accounts of His great-great-grandfather, HSH Prince Albert II travelled to the Far North for the first time with His parents and His sisters: a voyage which He Himself qualified as initiatory. He was then 24 years of age. Since then His interest for these extreme territories has never waned. In the footsteps of Prince Albert I,He travelled all over the Svalbard archipelago in 2005. In 2006, he trod the North Pole after a walk of four days, and, three days later, he made a round trip of 17 days, visiting several Antarctic science stations, thus becoming the first head of state to visit both poles.
However, it was only when he compared His great great-grandfather's photographs on site that the Sovereign Prince became fully aware of the drama being played out in the Arctic. "*I was shocked to see that the Lilliehöök Glacier, one of the largest in Spitsbergen, had retreated by several kilometres, despite being at almost 80° N*", He relates. The scientists' analyses of ice cores showing the impact of the increase in CO2 in the atmosphere only strengthened His decision to act. In 2006, He created his foundation of the same name and gave it three priorities: the management of water resources, the fight against climate change and the protection of biodiversity, notably at the poles. Support for research, the only means of developing action, holds an important place. "*It seems to me essential to highlight these regions. The polar lands are not an adventure ground, the domain of scientists or a new tourist destination. They are the laboratory for the future of our planet*" He explains.


3

Opposite and below:
1• Retreat of the Lilliehöök Glacier in Northwestern Spitsbergen between 1906 and 2005.
2• During his voyage to Spitsbergen in 2005, in the footsteps of his great-great-grandfather, Prince Albert I, HSH Prince Albert II observes the retreat of the Lilliehöök Glacier.
3• The Oceanographic Museum of Monaco

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Science for Action

Since 2010, the Monaco Scientific Center (CSM), a fully-fledged multidisciplinary research institute, has increased the strength of its team with a new department devoted to polar biology. The CSM's polar research aims to evaluate the health status of polar ecosystems by long term electronic and telemetric monitoring, on land and at sea, of the bio indicator species (sea birds including penguins) of these regions hard hit by climate disruption and other anthropogenic pressures (e.g. pollution, fisheries). Beyond the study of the adaptive potentialities of these species in the face of the changes in their environment, the goals of this department's research are to make available results and tools vital to setting up action plans for the preservation of polar ecosystems and their biodiversity (for example through the creation of Marine Protected Areas).

MORE INFO

A RESEARCHER AT THE CSM, CÉLINE LE BOHEC REWARDED BY THE *ACADÉMIE DES SCIENCES*

Among the researcher's recent discoveries, the work published in the international science journal Nature Climate Change shows that more than 70% of royal penguins, a species which is found principally on the sub Antarctic islands of Crozet, Kerguelen and Marion/Prince-Edwards could be facing drastic choices between now and the end of the century: for some, to adapt, for others, to disappear or migrate further south. The current warming of the planet is causing the Antarctic Polar Front, a vast larder for fish which separates Antarctic waters from Sub-Antarctic waters to move further and further away from these islands where royal penguins reproduce. So, in order to feed their chicks, the penguins have to travel greater and greater distances, taking more and more time, which obliges the young to fast for longer and longer periods, to the extent that their survival is at stake.

17,000

penguins are being monitored continuously since the beginning of the 2000s.

Penguins at the heart of the Monaco Scientific Center

What are the capacities for adaptation of penguins (royal, Adelie, emperor, etc.) in the face of changes to their environment due to climate change? Such is the principal challenge facing research being conducted by the Department of Polar Biology at CSM, created in 2010. Work is being pursued on four sites: the sub Antarctic islands of Crozet and Kerguelen, at Pointe-Géologie in Adelie Land and at Akta Bay in Queen Maud Land on the Antarctic continent. Studies are focusing notably on individual responses of animals, but also to determine how their populations develop in different climate scenarios.

To this end, the team is working to develop observation tools which will be minimally intrusive. Many methodological innovations have thus been imagined and used: automatic weighing platforms, permanent or mobile identification systems, video cameras to record the movements of individuals in the colony, on-board sensors… In partnership with the CNRS and the programmes of the French (IPEV-137) and German (AWI-MARE) polar institutes, almost 17,000 penguins have been monitored continuously since the beginning of the 2000s, thanks to chips implanted under the skin, making possible long term studies. New technologies such as radio-frequency identification (RFID), microloggers (GPS/ARGOS, depth gauges, accelerometers or acoustic…), remotely controlled video cameras or vehicles operating in almost-real time from laboratories, are making it possible to collect vital new data in order to refine the modelling of populations and how they react to global changes.

CSM CENTRE SCIENTIFIQUE DE MONACO

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Action and Mobilisation

Since its creation, the Prince Albert II of Monaco Foundation has made the poles a priority, supporting projects on the ground, information and awareness-raising campaigns and promoting scientific research. In this same spirit it is now launching its polar initiative: a programmatic effort over four years, from 2022-2025, in order to make its involvement in the conservation of polar environments even more proactive.

The initiative is targeting the Foundation's traditional areas of interest: science, advocacy, the reinforcement of conservation capacity and action. Four lines of work have been retained for these four means of action. On the science side, a symposium has been organised in February 2022 and another will follow in 2024. As to capacities, the polar initiative will enable the scholarship programme of the Scientific Committee on Arctic Research (SCAR) and the International Arctic Science Committee (IASC) to be supplemented.

The goal is to foster synergy between all these different interventions: in fact, the enormous challenges facing the poles impose a multidisciplinary approach and, moreover, the need to lean on the group of stakeholders as a whole, including indigenous communities and local players.

The Prince Albert II Foundation at the Poles' bedside

FONDATION PRINCE ALBERT II DE MONACO

Among the polar projects supported by the Foundation, let us cite the meticulous work being done by the Scott Polar Research Institute (2020-2022) with the intention of establishing a stranding line for the Antarctic ice cap (the limit after which land ice falls into the Ocean, becoming a floating platform). This phenomenon contributes directly to the rising of the sea level. The retreat of this line towards the continent therefore acts as a sensitive signal of ice loss. The aim of this project is to produce a detailed chronological assessment of changes in the stranding line of the entire Antarctic ice cap.

Another example: support for the *Ice Memory* project being carried out by the Fondation Université Grenoble Alpes. will be renewed until 2025. The aim of the project is to create a heritage of ice cores collected on different glaciers throughout the world before they disappear: priceless raw material for the scientists of the future. The ice cores will be stored at the Concordia Polar Station in the Antarctic.

We can also mention the 2013 Tara Arctic expedition, which enabled to collect information about the composition and dynamic of polar marine systems; the work of Birdlife International to prevent the extinction of penguins in several regions of the southern hemisphere, or the Antarctic-Snow project conducted by the CNRS with the intention of describing the variability of the climate and environment in the Eastern Antarctic over the past 1,000 years, thanks to the measurement of water isotopes.

February 24-25, 2022

“The cold is getting hot!” Symposium

How and at what speed are the changes happening at the poles affecting the planetary climate and life on Earth? Why does this concern each one of us?

These questions are at the heart of the evocatively-titled "The Cold is Getting Hot" symposium. Chaired by HSH Prince Albert II of Monaco, these meetings are organised by the Prince Albert II of Monaco Foundation, in partnership with the Scientific Committee on Antarctic Research (SCAR) and the International Arctic Science Committee (IASC), with the support of the Oceanographic Institute, and in collaboration with the United Nations Decade for Ocean Sciences for Sustainable Development. The symposium has been held on 24 and 25 February at the Oceanographic Museum of Monaco. Issues such as the melting of Arctic sea ice in summer, permafrost thawing, the melting of the ice cap not only in Greenland but also in the Antarctic - which alone could represent a rise of 3.3 metres in the oceans - will be at the heart of these conversations. The basic purpose of this work is to fuel and guide national and international political decisions by revisiting the essential role of the cryosphere in the climate.

thepolarinitiative.org

Monaco Blue Initiative

Launched in 2010 by HSH Prince Albert II of Monaco, this platform for discussion jointly organised by His foundation and the Oceanographic Institute gathers together major decision makers, scientists, representatives of NGOs and from the private sector in order to address current and future global challenges in relation to Ocean management and conservation. The 13th edition (21 March 2022) is centred on three main themes which will be addressed not only in terms of the Ocean generally, but also from the crossed perspectives of the Arctic Ocean and the Mediterranean. These two geographically distinct seas share the common characteristic of being relatively closed and surrounded by lands. If the Mediterranean Sea is subjected to very strong anthropogenic pressures now, in the long term the Arctic Ocean could follow suit.

Find the report of this 13th edition on monacoblueinitiative.org

+38°C

is the record heat registered in Verkhoyansk, in the far north of Siberia on 20th June 2020.

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Agenda highlights

RELEASE OF THE BOOK
"At the Heart of the Polar Worlds - Challenged by global warming and exploitation"
by Robert Calcagno (*Glénat Editions*)

February 23, 2022

"The Cold is Getting Hot!", a SCIENTIFIC SYMPOSIUM devoted to the Poles, organised by the Prince Albert II Foundation, with the support of the Oceanographic Institute.

February 24-25, 2022

13th Edition of the MONACO BLUE INITIATIVE
An international discussion platform addressing current and future global challenges concerning Ocean management. Conversation will be approached from the crossed perspectives of the Arctic Ocean and the Mediterranean.

March 21, 2022

"NORTHBOUND" SEMINAR :
the North Sea and the Arctic Ocean, threats and solutions, organised by the Museum Kunst der Westküste and the Oceanographic Institute.

May 11, 2022

POLAR MISSION

THE INTERACTIVE AND IMMERSIVE EXHIBITION of the Oceanographic Museum. From the discovery of the poles to the wildlife they support, to the men who populate and explore them. The great journey can begin!

June 4, 2022
For a period of two years

TWO EXHIBITIONS proposed by the French Southern and Antarctic Territories (TAAF):
Trip to Southern Territories - Crozet and Kerguelen.
From Dumont d'Urville to DDU: the French in Antarctica.

Early August to October 10, 2022

EXHIBITION BY MICHEL AUBÉRY
A series of stylised and colourful polar animals will come out of the studio of the painter Michel Aubéry to meet the visitors of the Oceanographic Museum.

October 19 to November 21, 2022

Jean Malaurie, famous ethnologist and polar explorer, IS TURNING 100.

December 22, 2022

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Bestiary

THE POLAR BEAR or WHITE BEAR

Ursus maritimus

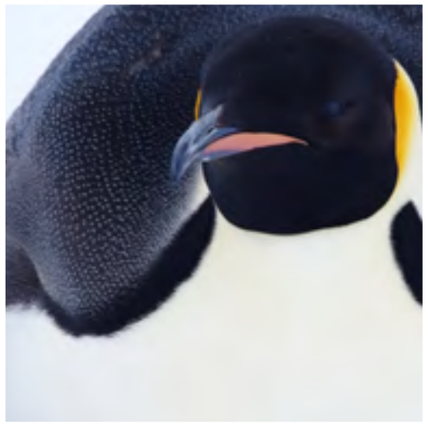
Where does it live? In the Arctic, land and sea environments

Size: up to 3 m tall

Weight: 150 to 200 kg for a female,de 400 to 600 kg for a male

The polar bear is emblematic of the Arctic. It is the largest of all bears excepting the grizzly (a subspecies of the brown bear) The female gives birth to one or two cubs. The polar bear is an excellent swimmer, but can also run at 40 kph on land.

DANGER: At the top of the Arctic food chain, its habitat is continually shrinking, notably because of global warming. Even if it can go without food for a long time, every year it suffers from an increasing loss of ice and scarcity of its favourite dish: seal. The polar bear population is estimated at 25,000 individuals and could have disappeared altogether by 2100.



THE EMPEROR PENGUIN

Aptenodytes forsteri

Where does it live? In Antarctica

Size: the male measures 1.2 m in height. He is slightly larger than the female

Weight: 25 kg to 41 kg

Made famous in 2005 in a film by Luc Jacquet, emperor penguins live in colonies exclusively in the Antarctic, the coldest part of the Earth and have adapted to this extreme environment. They can resist temperatures of up to -65 °C thanks to their dense feathers and fat. They group together in turtle formation as a defence against blizzards, constantly moving so that each one can benefit from the group's heat.

DANGER: While each male incubates his own chick between his feet and the fold of his belly, the females travel hundreds of kilometres in search of food for their offspring. Global warming is forcing them to go further and further, posing a threat to the survival of the chicks.

THE ARCTIC STERN

Sterna paradisaea

Where does it live? In the Arctic and the Antarctic

Size: 40 cm in length, wingspan 75 cm

Weight: about one hundred grams

This beautiful, white-feathered bird, with its black head and red beak, is a little cousin of the gulls. It lives in pairs and remains faithful throughout its existence, that is around 20 years. It migrates from one pole to the other and gathers in colonies, especially in the nesting season.

DANGER: This bird makes the longest migratory journey in the world, flying from the North Pole to the South Pole in about 4 months. It is capable of flying 90,000 km per year. The arctic stern is not really endangered, even though it is hunted in some regions for the quality of its feathers and in the nesting season for its eggs.

THE SOUTHERN ELEPHANT SEAL

Mirounga leonina

Where does it live? In subantarctic zones and sometimes on the Antarctic Peninsula

Size: up to 6 m for the male, 2.5 m for the female

Weight: between 350 and 800 kg for the female, 3 to 6.5 tonnes for the male

Capable of swimming for about thirty minutes without breathing, they are excellent divers. They can dive to a depth of 2,000 m, which has incited researchers to equip them with tags to carry out measures at great depths. They owe their name to a short trunk which grows at the end of the male's muzzle with age.

DANGER: Long hunted for their fat, elephant seals have almost disappeared. Today their population has been restored (600,000 to 700,000 individuals) but each year there are as yet unexplained variations.

THE HUMPBACK WHALE

Megaptera novaeangliae

Where does it live? In all the seas, between the 60th south parallel and the 65th north parallel

Size: up to 18.9 m

Weight: 25 to 30 tonnes (up to 40), the females are the heaviest

Humpback whales are great travellers and can cover up to 25,000 km every year. They are very chatty cetaceans with a complex song. The calf is weaned after about one year, but it remains with its mother up to the age of 5 or 6 years. It is then large enough to escape from predatory killer whales.

DANGER: After their populations were decimated by fishing, numbers have been restored thanks to a moratorium. Today the population is estimated at 35,000 compared with 20,000 at the time. Nevertheless, overfishing of the small fish and krill which constitute their food represents a new threat to these mammals, along with noise pollution and the risk of collision with ships.

THE ARCTIC COD

Boreogadus saida

Where does it live? In the Arctic

Size: males and females are identical, between 25 and 40 cm long

This arctic cod is Arctic's most plentiful fish. It is the principal prey of northern predators: seals, walruses, beluga whales, birds… It lives in waters of between zero and four degrees, or even less, thanks to an antifreeze protein in its blood.

DANGER: The arctic cod is very well-adapted to the Arctic environment. Global warming is therefore a real threat. It is being supplanted by other species such as sandeels and capelins. In the long term this could modify the entire food chain in this region.

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Ice calving

of a glacier in Antarctica.

43 Glossary*

Albedo: All bodies reflect part of the light that they receive. Albedo is the fraction of solar energy which is reflected back into space. It varies according to the composition and colour of the surface: white reflects energy, black absorbs it. For pack ice, albedo is 60 to 90%; for the ocean, from 5 to 10%. In other words, the more pack ice shrinks in summer and is replaced by ocean, the more heat the ocean absorbs, therefore the warmer it becomes.

Break-up: This is the break-up of pack ice due to winds, tides and currents. The opposite is ice jam.

Eskimo: This pejorative name was given to the Inuit by Native Americans and is said to mean “eater of raw meat”. It has now been banned from use. Consequently nowadays the Inuit are known by their true name, which means “human being”.

Glacier: This is a slowly moving mass of ice (made up of fresh water). When it falls into the sea the sea level rises.

Iceberg: Derived from the Scandinavian words *is* (ice) and *berg* (mountain). They are pieces of freshwater ice which have broken off an ice shelf (see below) and which drift on the open sea. The visible part of an iceberg corresponds to about 1/8th of its total volume.

Ice calving: The process whereby a glacier loses fragments of ice in the form of icebergs.

Ice cap: This is a thick layer of ice covering a continental land area. Glaciers are tiny compared to an ice cap. Ice caps have formed over several tens of thousands of years and cover a surface area of less than 50,000 km². Also called Inlandsis (a Scandinavian word meaning inland ice), there are two in the world, one in Antarctica and one in Greenland.

Ice core samples: These are cylinders of compressed ice formed by layers of snow which have been compressed over thousands of years. They are obtained by drilling in the ice. The chemical elements and compounds trapped in the ice at the time the ice was formed are indicators of past climate conditions and pollution.

Ice Shelf: This is a continental glacier which comes to rest on the ocean, not on land. These platforms can be up to several hundreds of kilometres wide. Icebergs are the pieces which break off.

Kelps: This English term covers different species of large brown algae found typically in cold waters. They can grow up to thirty metres high and make up veritable forests which support large numbers of species. Their rapid growth means that they absorb large amounts of CO2 and thus they are allies in the fight against global warming.

Krill: This name is Norwegian in origin. It designates types of small cold-water shrimps of the Euphausiacea family. They are essential food for many species including squid, marine mammals, birds, fish…).

Pack ice or sea ice: Pack ice is a stretch of water, most of the time at sea, which is covered by a layer of ice. Thus, at the end of the polar summer the ocean cools. When the surface of the water reaches -1.8°C, the first crystals form and gradually the entire surface freezes. This process goes deeper and the pack ice slowly thickens. When pack ice melts it does not cause a rise in sea level.

Permafrost: This is soil that is permanently frozen (for at least two years), which makes it impervious. It can be several hundred metres thick. Its melting is a very good indicator of global warming.

Sentinel species: These are species which indicate the condition of an ecosystem and/or its environment.

Toothfish: These are two species of fish found in the southern seas. The Patagonian toothfish is found north of 60° South, the Antarctic toothfish is found south of 60° South. These large predators are of high commercial value and much appreciated for their white, melting flesh. Once subject to overfishing, their numbers are now better regulated , notably in the TAAF: the French Southern and Antarctic Territories.

Umbrella species: In ecology, these are species which often inhabit large areas. When they are healthy, they offer protection to numerous other species.

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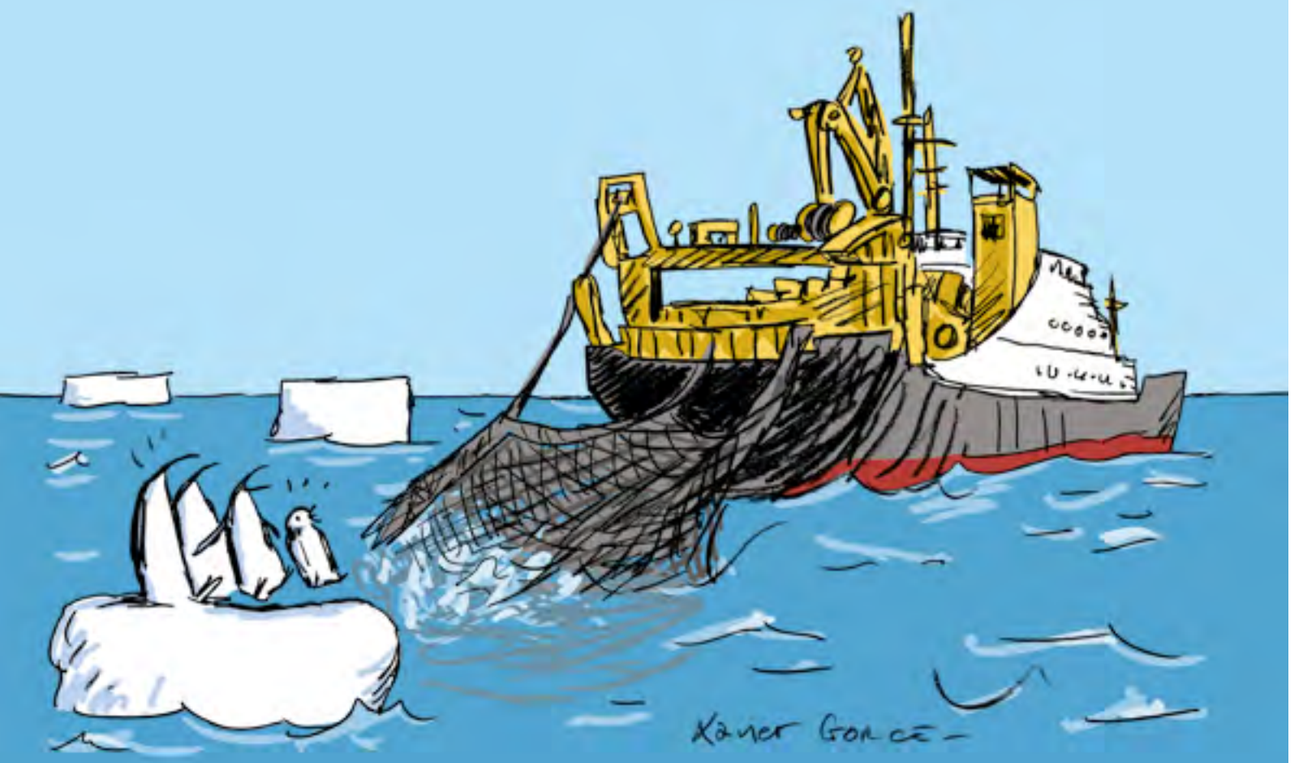

A drawing kindly provided by Xavier Gorce, painter, illustrator and cartoonist, as part of the Antarctica 2020 initiative for the protection of the Southern Ocean in Antarctica.

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Who are we?

The Oceanographic Institute, Prince Albert I of Monaco Foundation was founded by Prince Albert I, a passionate and visionary seafarer.

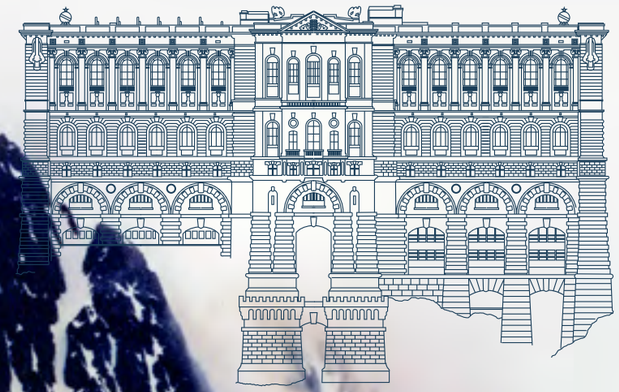
Recognised as serving the public interest by French presidential decree on 16 May 1906, the Foundation has been working for the Ocean for more than a century.

To promote the knowledge, love and protection of the Ocean, it brings together people from the worlds of politics, science, economics and associations and the general public. Managed by a Board of Directors assisted by a Scientific Council, it carries out its mission of environmental outreach via its two facilities, its international influence and the support of its partners.

The Oceanographic Museum

Set against the mythical Rock of Monaco, the Oceanographic Museum is the “flagship” of the Foundation and raises awareness among more than 650,000 visitors per year. Beyond its remarkable architecture, it stands out for its world-renowned aquarium, its exhibition events and the alliance of art and science.

A place of culture and exchange of ideas, where experiences in the protection of the Ocean are shared, the Oceanographic Museum organises and hosts international conferences.



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OCEANOGRAPHIC MUSEUM DATES & TIMES OF OPENING

"Polar Mission" Exhibition from 4 June 2022

Open daily
(except for the Formula 1 Grand Prix weekend and 25 December)

From 10am to 6pm
January / February / March / October / November / December

From 10am to 7pm
April / May / June / September

From 9.30am to 8pm
July / August

OCEANOGRAPHIC MUSEUM RATE

Adult (18 years and over) **18 €**

Student (valid card) **12 €**

Child (4 to 17 years inclusive) **12 €**

Visitors with disabilities 9 €

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