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# INFOCIRM







## ***InfoCIRM***

Secretariat of the InterMinisterial Commission for the Sea Resources

Brazilian Antarctic Program (PROANTAR)

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Brazilian Navy





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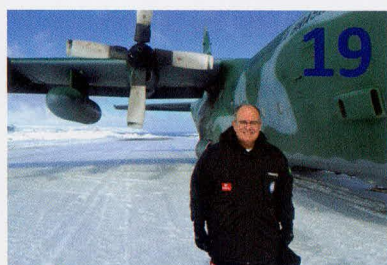


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# SECIRM 35 YEARS



The year was 1974 when the Inter-ministerial Commission for Sea Resources - CIRM was created, a multidisciplinary collegiate devoted to the governance of our ocean, to meet the requirements of the scientific community in order to develop policies and plans for the marine and coastal environment.

After 5 years, it became necessary to create a body to implement the decisions of the CIRM. So, 35 years ago, the Secretariat of the Inter-ministerial Commission for Sea Resources - SECIRM was launched.

Since its inception on December 19, 1979, SECIRM was structured to articulate and implement the plans and actions of CIRM, a preview of the potential resources of the Blue Amazon for Brazil's development.

CIRM observed the political developments of the 1970s and, more than that, has anticipated the events and initiated the Survey of the Brazilian Continental Shelf - LEPLAC; the Sustainable Potential Assessment Program of Living Resources in the Exclusive Economic Zone-REVI-ZEE; the Mineral Potential Assessment Program

of the Brazilian Legal Continental Shelf-REM-PLAC; and the Global Ocean Observing System/Brasil - GOOS/Brasil.

It was a period of heightened strategic vision. Among the many and important matters, it also dedicated special attention to Antarctica. The task of implementing the Brazilian Antarctic Program - PROANTAR Was attributed to SECIRM in 1982. That same year, the first Antarctic Operation was carried out. In 1983, the country was elevated to the consultative membership of the Antarctic Treaty. The challenge was to plan, build, launch and operate a Scientific Research Station.

On February 6, 1984, the Comandante Ferraz Antarctic Station was inaugurated, a political step with significant repercussions. That same year, in recognition of research conducted, Brazil became a member of the Scientific Committee on Antarctic Research - SCAR.

Today, on the southern portion of our planet, PROANTAR is doing the OPERANTAR XXXIII, which is in its final phase, with the full employment of our temporary station, the camping sites, the two red ships and their aircraft that have

supported about 330 researchers and climbers, a number thirty percent higher than in previous years. It should be noted that the Emergency Antarctic Modules - MAE are fully attending to the support of research and, as a temporary installation for the base-group, ensuring a permanent Brazilian presence on the frozen continent.

Expectations for the near future in the region are positive, as we approach the outcome of the contest for the building of the New Brazilian station in Antarctica, which will provide modern and comfortable facilities.

The winning project possesses simplicity in architectural feature and incorporates technical innovations: security in the systems; the inclusion of renewable natural energy sources - solar and wind; cogeneration of energy using the heat from generators as a heat source; reusable water; and efficient management of energy between production and consumption.

In relation to the activities in the northern hemisphere, the Program for Scientific Research in the Arquipélago de São Pedro e São Paulo - PROARQUIPÉLAGO turned 16 years, marking





the presence of the Brazilian state in those abyssal waters and making habitability in Belmonte Island viable. It should be pointed out that SECIRM recently received a plot of about 600m<sup>2</sup>, in Fernando de Noronha, for the installation of a future Research Station and expanding the opportunities for research in the scientific community.

In the far eastern Brazil, the Trindade Island Research Station is fully operational, built in 2010, continuing the PROTRINDADE program's actions and also ensuring the preservation of that peculiar ecosystem. In regards to the South, the Subcommittee for LEPLAC received a technical report in October this year containing the proposed outer limits of the Brazilian continental shelf beyond 200 nautical miles, in that

region, which was submitted to the United Nations, which will legitimize our maritime border with the international community.

Off the Brazilian coast, SECIRM continues to support the actions of other ongoing programs such as REMPLAC, the Program of Human Resources Training in Marine Sciences - PPGMAR, the Program for Marine Biotechnology - BIOMAR and the Program of Prospecting and Exploration of Mineral Resources of the international area of the South and Equatorial Atlantic - PROAREA. These last two ensure a priority for Brazil in the exploration of mineral resources within the seabed of the Atlantic Ocean.

Aware of the importance of strengthening the maritime mentality in the Brazilian population, particularly among young people, SECIRM

through the Maritime Mentality Program - PROMAR released the concept of the Blue Amazon and the Brazilian Antarctic Program, seeking to raise awareness in society about the sustainable use of marine resources in all dimensions, with emphasis on scientific, environmental, economic aspects and sovereignty and geopolitical importance of the Brazilian presence in the Antarctic Continent.

Throughout its existence numerous challenges were surpassed by SECIRM, consolidating not only its commitment to assist the CIRM, but to promote a permanent forum for discussion on the shared use of the oceans and Antarctica.



# A BRAZILIAN FAMILY IN ANTARCTICA

## Building the Future

**R**ather than leaving a material legacy for our daughters, Amyr and I just started building something no one can take from them. Something that inflation or time will not corrode. Something they would lead for their entire lives, thinking about the responsibility we all have for preservation and our commitment to pass on the love of nature to others.

Amyr and I always like to travel, especially to remote places. It was on one of these trips that I had the opportunity to visit Antarctica for the first time. It was 20 years ago. I boarded a Russian ship and traveled for 20 days to the southern tip of the peninsula. There were few boats that could reach the Daisy Bay, just as it still is today. That was my goal and I reached it. The trip was so magical that I looked to return over and over again. Interested in returning to the frozen destination, I managed to go back another 14 different seasons, on board other sailing ships besides ours, and other vessels. On every trip I got to know a little more of the route that was to become my favorite on Earth.

It's interesting to note that since then much has changed. Antarctica has become an accessible continent for tourism, visited by thousands of tourists every year. Tourism there is explored through different means: by plane, ship, and even in large or small sailboats. Some tourists opt for ice camping programs while others prefer canoeing. Diving specialists offer underwater programs; the most prepared make trips to the ultimate degrees of latitude. Some climbers do mountaineering climbing. Groups come from many countries around the world. Of course, each of these activities has their price, often the biggest obstacle.

Although it's more frequented by humans today than it was 20 years ago, Antarctica is even better preserved, and reveals it-

self as a very well protected destination. The first time I went, there were several places I visited that had waste dumped around the shelters and scientific stations. Today the rules are clear to visitors, which guarantee the preservation, at least until 2048, when the Antarctic Treaty currently in force expires, and everything should be evaluated with caution.

Antarctica is an almost utopian destination, and in Brazil it has been associated with Amyr's name since the 1980s, when he made a solitary winter trip aboard the sailboat *Paratii*, crossed the Antarctic Circle and went to Margaret Bay. From there he headed to Spitzbergen crossing the Arctic Circle. Indeed, it was talking about this trip to our daughters that I realized that an invisible link always united us as we sat to have a conversation and listen to Amyr speak about his stories. Even when he talked about things that happened when we were together, I always preferred to let him tell it. It's funny to notice how different people see things while sharing the same experience. Sometimes, when telling a story about a trip we took together, his journey seems much better.

The girls were very young when they began to feel the absence of their father, who was away from home for long periods. They observed from the beach, in the backyard of our house, this go and return of Amyr. And often these absences took around 6 months.

I felt a huge void at an end-of-the-year party at school when they had no one to deliver their little letters, and an idea came to me one day when the girls and I were on the beach waiting for Amyr, who had arrived from another long trip. Once he stepped ashore, we asked him to take us with him next time. He was surprised and became thoughtful.

At my family's house, everybody thought that the idea was crazy, as did many of my friends. But it was already decided. The following summer we traveled together for the first time: the 8 year-old twins Tamara and Laura, Marininha, Amyr and me. On that trip Marininha, the youngest, turned 6 years old when we hit Cape Horn for the first time. We went together to Antarctica, and we couldn't imagine what would happen - that trip turned out to be transformative for all of us.

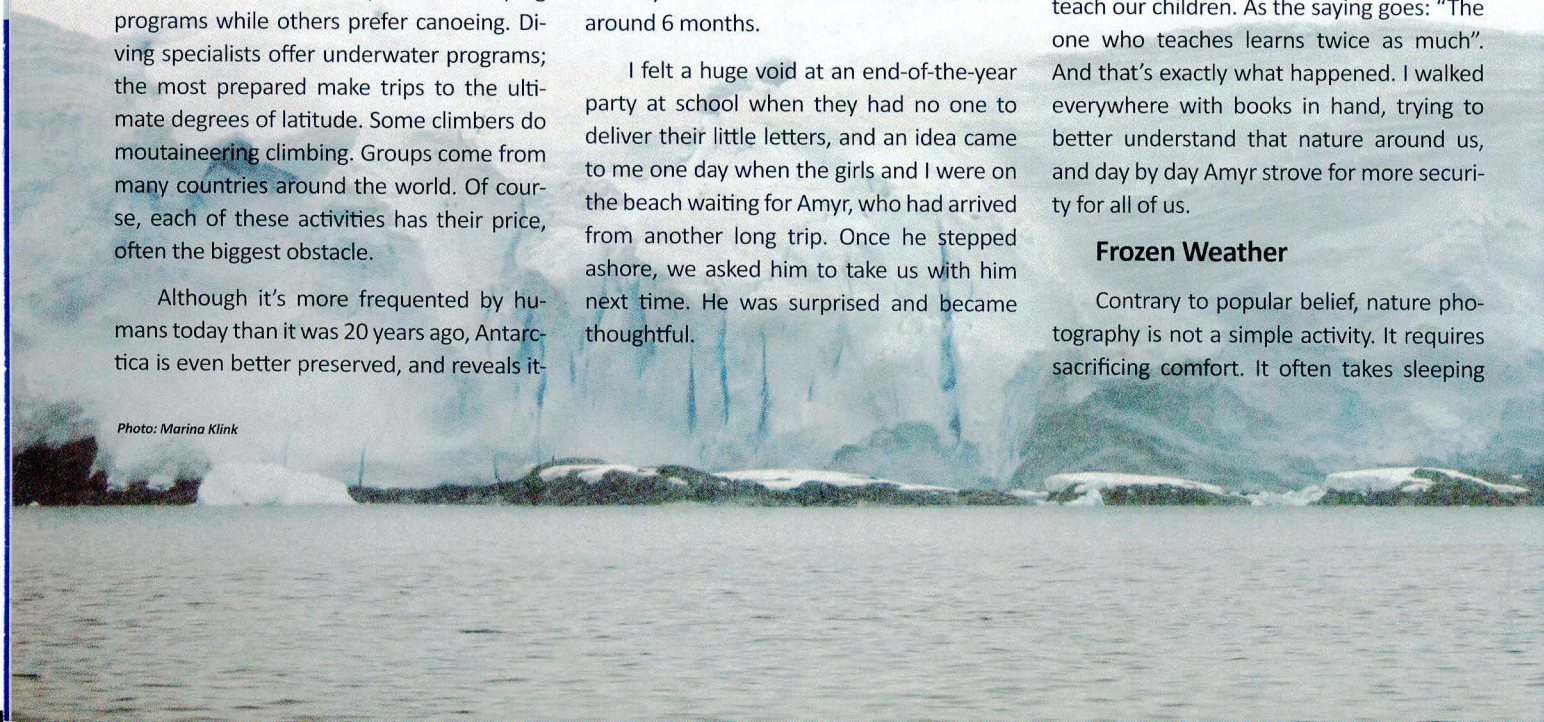
We organized in advance and planned carefully, as this holiday is quite different from trips of many people. Antarctica is a destination where there is no possibility to shop. It is a journey with no stores or hotels: it's exclusively a contemplative destination.

### Living on Board

There is no Wi-Fi or mobile phones aboard a sailboat sailing the Antarctic Peninsula, and this has made us bond more each day. We established our routine inside the boat. For those who know what I'm talking about, boats have limited space. This led us to establish our routine on board and learn to maintain discipline. We learn to live with it. Another important thing was the exercise of creativity. It was basic for us to constantly create interests; otherwise the trip would be a constant fight among us. On a family trip to a remote destination, we ended up having to learn many new things in order to teach our children. As the saying goes: "The one who teaches learns twice as much". And that's exactly what happened. I walked everywhere with books in hand, trying to better understand that nature around us, and day by day Amyr strove for more security for all of us.

### Frozen Weather

Contrary to popular belief, nature photography is not a simple activity. It requires sacrificing comfort. It often takes sleeping







Klink family

in tents without power or taking a shower, sometimes running the risk of freezing your fingers, carrying a lot of weight, walking long distances, or feeling too cold or too hot. The important step is when we can slow down; when we disconnect from the way we live in big cities, and create intimacy with nature. It is when we connect with the real world that opens before us. More than pushing a button and printing images, I have used the photographs as my own voice..

The photograph was the form I found to connect with what I like; it was the way I found to build a kind of very solid invisible bridge between people who may never have left their cities, and may never have stopped to look at the environment itself with the explosion of life that exists in remote places. Shooting icy landscapes and polar animals fascinates me, and I look to transmit their struggle for survival in the cold. This family trip was not only fun for them. We had an agreement that they would have the daily task of making their personal records of the trip. These records, added to the photos I took, eventually allowed for the project that came next.

I went to girls' school and suggested we look at our trip as a field study activity. It happened. In return they presented in the classroom, using the diaries as a source of content and my photographs as illustrations.

The presentations were repeated in other classrooms, in other schools and ended up making it to the corporate world, currently numbering more than 130 lectures presented.

In one of these presentations that they made, an 11-year-old boy was so impressed he made a drawing that he gave us when leaving the auditorium. His drawing showed a whale and it read: "I'm going home to search on the internet things I can do to save the whales." That's when I realized that all they learned through us was moving forward and becoming part of the thoughts of other young people. At that instant I was sure that all our efforts had paid off. It is when we realize that we can make a difference to someone. The experience gained horizons when the content of the lectures became a book by the sisters called "Holidays in Antarctica." The book is now in its 7th edition, and it is

adopted in more than 60 schools in Sao Paulo, including public schools.

### Passion for the Cold

Here at home, when it comes to traveling to Antarctica, Amyr is the absolute record-holder. Besides numbering more than 40 expeditions, he is also our greater supporter. He was the one who spread among us this great passion for the icy regions, and who made it possible for us to take our daughters to the Southern Continent seven times. Traveling aboard Paratii2, they could even sail the Optimist to the south of the Antarctic Circle.

Our daughter Tamara was even there twice more, but these opportunities came with the Brazilian Navy. During the 2014 summer vacation, she stayed home to prepare the material and participate in a cultural contest offered to high school students from all over Brazil that was organized by the Brazilian Navy. She produced a 3-minute video on her own demonstrating the importance of Brazil's presence in Antarctica and ended up being one of four winners. The award was the great attraction: to visit the



Sailboat Paratii 2



Brazilian Comandante Ferraz Station with the Navy and through the eyes of scientists. It was a very special opportunity for her.

But the best trips are those when we travel as a family, and we have that feeling that we travel as a whole. More than being together, the residual of a contemplative journey is what follows, when we see our children transmitting their learning about the importance of preserving nature to other young people. It's rewarding to look at the whole process and see that everything went right because we spent more time to-

gether, trying to make our children see the true value of things, the importance of valuing nature and the immense joy of returning to Antarctica again.

Being able to guide our children is a gift, and the feeling is summarized in the text that I read on a plaque affixed to the airport in Johannesburg: Alone you go fast, but together we'll go further.

Source: Marina Klink is a Nature Photographer, author of the book "Antártica - A Última Fronteira" (Antarctica - The Final Frontier), released in February 2014 in Port Lockroy, on the Antarctic Peninsula.

Photos from Marine Klink's personal files



Amyr and Marina Klink while visiting the Brazilian Station in Antarctica



Amyr Klink with his daughters in pinguineira

Photo: Marina Klink



Marina Klink on top of the pole of sailboat Paratii

Photo: Marina Klink





# Antarctic Rediscovery



Tamara Klink together with Matheus, Valdemir and Elias - the winners of the the Brazilian Navy cultural "Brazil in Antarctica".

In January 2014, when I began producing the video with which I and my biology teacher used for the contest sponsored by SECIRM, I had no idea that this series of choices of words and images would be our passport to an Antarctica entirely unknown to us. That may sound strange to some, considering that two trips to the same place are completely equal. Or maybe for those who find that Antarctica is an entirely white place where animals are few and similar. However, I would not only visit the Comandante Ferraz Antarctic Station, about which I had only heard of, but I would see again an environment alongside researchers, and with an amazing logistical support.

Going from Punta Arenas to King George Island watching the sea from the Hercules cabine, made me even want the journey to last three days, which is the time it usually takes to get there by boat. In March 2014, the short time we spent in Antarctica was divided between the helicopter and the station. The scenes we saw out the window, large icebergs that looked small, the cracks in the snow mountains, the waves, which were thin white scratches at sea, were the most

amazing so far. Within the two longer and shorter hours of my life, I passed quickly and with attention by the station with the feeling that we would never see there again..

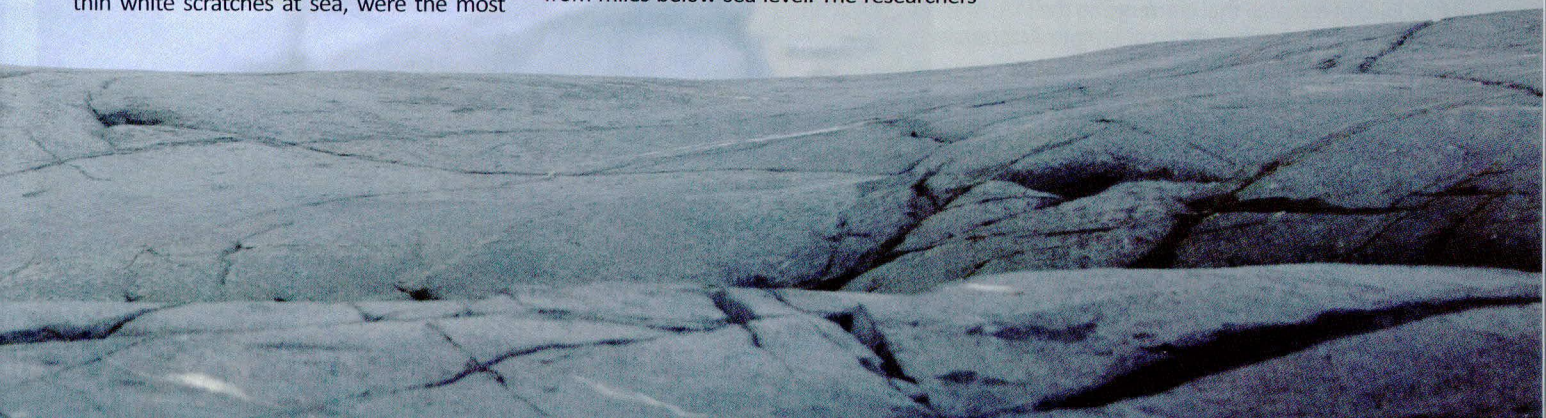
What was my surprise to find, in December of that year, that we would go back to that place? But it was not the same, it never is. With no pull ups, we landed in Frei again in January. Arriving by helicopter in Ferraz, humpbacks and emperors (not penguins, but the crew of the base group) welcomed us. In three days, we watched the collections and preparation of equipment for researchers, visited colonies of penguins and elephant seals, we saw small ice blocks releasing from big ones and met a totally different Antarctic from the one I knew.

After the experience in the station, we went to the ship Almirante Maximiano, and got a few extra days due to a "bad" sea. More than the ship in itself, I liked meeting some of the many people who work in it, most of them with wide smiles on their faces; people who worked nights and days to map the seabed, performing water sampling from various depths and raising soil samples from miles below sea level. The researchers

showed us some of their many scientific treasures, treasures that were not in the algae, lichens or ice chips, but the combination of these with their knowledge and their ability to make them useful as scientific discovery and drug development, less toxic pesticide, among others.

Returning home after this trip was not a happy event at first. But being able to share this experience over and over again, with people who, like me, were not very familiar with the work of Brazil above 60 degrees latitude, it made me happy to multiply it and immensely grateful to all the people who contributed to it.

Source: Tamara Klink - one of the four winners of the cultural contest "Brazil in Antarctica", carried out by the Brazilian Navy.





# BRAZILIAN PRESENCE IN ANTARCTICA



Photo: Edson Vandeira

Since its creation in 2009, the National Institute of Antarctic Science and Technology of Environmental Research - Antarctic INCT- has been contributing to the development of Brazilian Antarctic research through long-term studies on the Antarctic biocomplexity. These studies have focused on acquiring knowledge about processes in atmospheric, terrestrial and marine systems, and their relationship to climate change and human presence on this continent. These studies show the essential role that Antarctica plays in the thermal balance of the planet, and in particular to South America, where the climate is especially controlled by air masses coming from the icy continent.

Currently, the INCT-APA is staffed with 70 PhD researchers distributed over 21 institutions of Education and Research, working in four lines of research that converge on the following objectives:

- Study the Antarctic atmosphere and its impacts on the South American continent;
- Study the impacts of global change on the Antarctic terrestrial environment;
- Study the impacts of natural and human activity on the marine environment;
- Promote environmental management.



ROV Imaging - Photo: Edson Vandeira

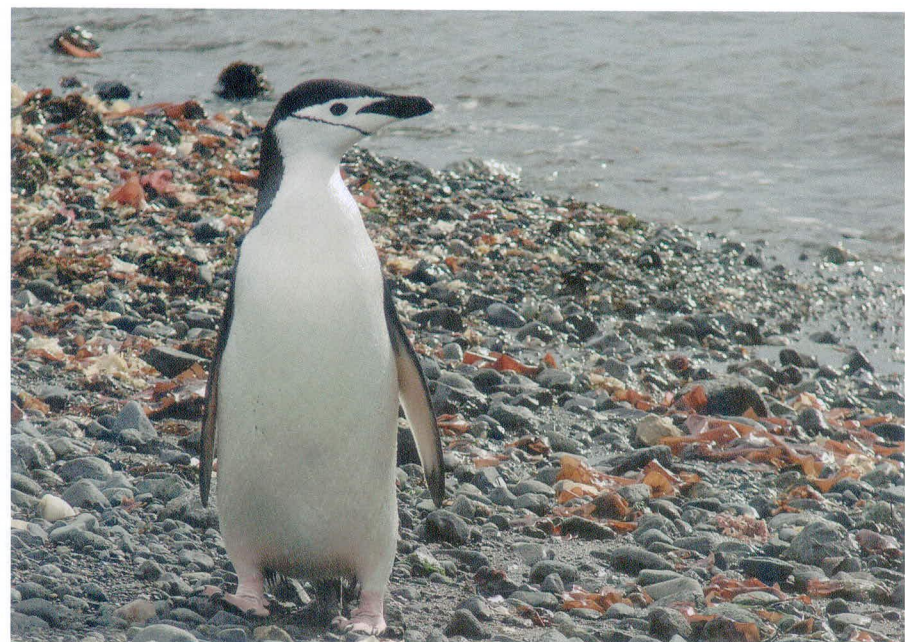


Photo: Rafael B. Moura



# INCT-APA DEVELOPS RESEARCH ON CLIMATE CHANGE

## Main results obtained by the INCT-APA research

- Improvement of climate forecasts in the national territory, improvement of national climate models and meteorological forecasts, as well as its results showing that solar radiation can change the physicochemical properties of the atmosphere and influence the winds and the amount of UV radiation that reaches the earth's surface, as well as cloud cover and rain.

- Studies on the characterization of the effects of the Sun-Earth Relations in the upper atmosphere of the Antarctic region and South America are showing their engagement with the other layers of the atmosphere to have strong effects associated with weather processes. In the same context, characterization studies are being conducted of ionized layer of the atmosphere in the Magnetic Anomaly region located in south/ southeastern Brazil.

- Studies of the ozone layer showed a decrease of this layer over the South Pole and with extreme events in South America. The researchers of the INCT-APA continuously perform studies on the ozone layer in the Antarctic region and its effects on South America. One of the consequences is an increase in UV radiation, which is confirmed by extreme events over Antarctica and South America, including the south of Brazil, where in 2010 it was possible to see a 25% reduction of ozone concentration, affecting human health in ways such as: skin cancer and glaucoma. In addition, it exerted serious effects on agriculture.

- Expansion and integration of knowledge about the diversity and abundance and distribution of marine and terrestrial life of the Antarctic environment (knowledge on living resources) as well as studies on adaptive processes of Antarctic organisms to environmental conditions (potential pharmaceutical effects, health and bioproducts development).

- Development of prospective studies on potential impacts of climate change in Antarctica (global warming, natural disasters, melting ice, preventive and corrective actions that impact nature).

- Production of knowledge and critical mass to support decisions and policy recommendations on Biological Diversity.

- Performing actions aimed at education and the dissemination of science for public awareness from the Brazilian research in Antarctica and the importance of this continent for the planet.

Moreover, among the most important contributions that the INCT-APA performs to advance the Brazilian state-of-the-art Antarctic research is the establishment of a database that aims to be a tool to gather and strengthen the generated data set within the Institute and, above all, to preserve the memory of the Brazilian Antarctic Program, and serve as a basis for future studies of processes and models for Antarctica.

More information about the INCT-APA can be obtained on the website of INCT-APA ([www.biologia.ufrj.br/inct-antartico](http://www.biologia.ufrj.br/inct-antartico)), where the results of INCT-APA surveys are available through the volumes of the Annual Activity Report of the INCT-APA (ISSN 2177-918X).

Source: INCT-APA – Coordinator: Prof. Dr. Yocie Yoneshigue Valentin (IB/UFRJ) / Vice-coordinator: Prof. Dr. Rosalinda Carmela Montone (IO/USP)



# BRAZILIAN RESEARCH IN ANTARCTICA SEEKS TO UNDERSTAND THE ADAPTATION OF PLANTS TO COLD ENVIRONMENT

- Plant communities - Ardley Island. Photo: Graciele Alves – UNIPAMPA

**T**he Antarctic Vegetation Study Group - NEVA - the Federal University of Pampa - UNIPAMPA in São Gabriel - RS, in conjunction with the National Institute of Science and Technology of Southern Environmental Research - INCT-APA UFRJ, has been developing research activities since 2009 focused on evaluating the vegetation and biodiversity of plant communities in thawed areas of the Antarctic Continent.

The proposed investigation of the subject stems mainly from the fact that the Antarctic plants possess a potential for molecular studies, particularly because their cells are under constant effect of stressful environmental factors such as, for example, ionizing radiation, UV rays (UV-A

and UV-B), extreme temperature, a deficit in water and metals, which affect the development of plants that are not adapted to these factors, jeopardizing the integrity of the DNA. With this, NEVA's current interest is to understand how these plants have adapted themselves, leading to the production of different molecular mechanisms, which may even affect the transfer of genetic information as they are exposed to varying levels of environmental stress. These changes include the increase of molecules that can be exploited in a biotechnological point of view like, for example, antifreeze proteins.

Over the years, these studies could analyze: the increase and/or decrease of the plant communities in Antarctica throu-

ghout the archipelago of the South Shetlands; an assessment of the flow of greenhouse gas effect in thawing land areas in the Antarctica; an evaluation of the insecticide action mechanism of the terrestrial algae extract *Prasiola crispa* in neuromuscular models of insects (where a patent is already proposed with the results of this research); monitoring edaphoclimatic factors for correlation with the flow of gas from the greenhouse effect on soil; and an assessment of the conservation status of species of lichenized mosses and fungi in Antarctica thaw areas.

This year researchers at NEVA are mainly focusing their activities on the description of the genome of *Prasiola crispa* Lighthfoot (terrestrial algae), *Deschampsia*





*Nelson Island Camp, CrulsRefuge. Photo: Filipe Victoria - UNIPAMPA*



*Fungi Sample collection for Biotechnological Studies. photo: Rodrigo Alves- UNIPAMPA*

antarctica Desv (an Antarctic native grass related to the rice grown in Brazil) and *Polytrichum juniperinum* Hedw (a kind of moss that has existed since the origin of land plants), enabling the development of a gene database that can be explored in evolutionary and biotechnological studies, seeking to contribute to exploratory analyzes of molecular markers associating genes with differential expression in environmental stress conditions such as the cold.

The core research today includes a team of twelve researchers; all doctors, with ten professors from UNIPAMPA and two from the Universidade de Santa Cruz do Sul - UNISC. Due to the important work carried out, NEVA was given a 400m<sup>2</sup> build-

ing, financed by FINEP and MEC.

As for the scientific production team, the researchers from UNIPAMPA published 36 works in the last three years - all in internationally recognized scientific journals - promoting Brazilian research in Antarctica. This scientific production owes much to the training of teachers and collaborations among lab institutions in other countries, totaling 19 national and foreign institutions as of today.

The contribution of Antarctic research is undoubtedly very significant for Brazil, considering that this is a program that has already been in place for 33 years and is firmly consolidated. In this sense, the contribution by the research team of the Antarctic Vegetation Study Center of the

Federal University of Pampa - UNIPAMPA for Brazilian science has contributed, in a decisive way, in the formation of human resources (dissertations and completion of course work) scientific production (published papers) and generation of research products in biotechnology, which can be showed by the increasing number of professors and doctors with research carried out on plants and fungi in Antarctica.

**Source: Prof. Dr. Antonio Batista Pereira.**





## Parliamentarians and the Secretary of Science, Technology and Innovation of the Brazilian Navy visit the Station in Antarctica



*Parliamentarians and guests in front of the Antarctic Emergency Modules*

Every year, parliamentarians visit the Comandante Ferraz Antarctic Station-EACF, in order to closely see the work developed by the researchers, the Brazilian Navy and the Brazilian Air Force in the Antarctic continent and to verify the investments made in the EACF, derived from their budgetary amendments.

Fifteen parliamentarians, together with the Secretary of Science, Technology and Innovation of the Brazilian Navy, Admiral Fernandes, along with officials of the National Patent and Trademark Office (Executive Office of the President), Telecommunications Regulatory Agency (ANATEL), Office of the Federal Attorneys, The Brazilian Navy, the Brazilian Army and The Brazilian Air Force and Brazilian persons visited the Comandante Ferraz Antarctic Station, on March 17, 2015.

At that time, the delegation visited one of the most inhospitable regions of the world, witnessed the work of the Brazilian Station Team Members, which stays one year on the frozen continent. The delegation was still able to receive further information about the Antarctic Program and the reconstruction of the Brazilian Station, through a speech delivered by the Secretary of CIRM. Thus, in addition to presenting the results achieved during 2014, it was possible to reaffirm the importance that this program holds for our country.

Due to the adverse weather conditions, which happens very often in Antarctica, the delegation was only able to visit the EACF at night. On site, parliamentarians and guests attended a ceremony of floral affixing in honor of the two dead Officers who perished during the EACF fire, in 2012, and visited the Polar Ship Admiral Maximiano and the Oceanographic Support Ship Ary Rongel which at that time, were in their final phase of the XXXIII Antarctic Operation.

The joint Parliamentary Group to Support the Brazilian Antarctic Program was created in 2007 to ensure the continuity of the Brazilian Antarctic Program-PROANTAR, through political actions and by fund raising to develop the program, in its scientific, environmental and logistics/operational strands.

Throughout these 33 years of PROANTAR, more than 3,000 Brazilians had the opportunity to get to know and develop research in the region. This presence has guaranteed Brazil, since 1983, when it became a Consultative Member of the Antarctic Treaty, to participate in the decisions about the future of that important continent.

Entourage members were the following Representatives: Vicentinho Alves (TO), Roberto Rocha (MA), José Medeiros (MT), Pauderney Avelino (AM), Damião Feliciano (PB), Clarissa Garotinho (RJ), Giacobbo (PR), Maurício Quintella Lessa (AL), Júlio Delgado (MG), André Figueiredo (CE), Geovania de Sá (SC), Marcelo Aro (MG), Mariana Carvalho (RO), Bruna Furlan (SP) e Weverton Rocha (MA).







Comandante Ferraz Antarctic Station

Photo: Luciano Candisani

## Letter of acknowledgement addressed to the Commandant of the Brazilian Navy, by the Members of Parliament, for visiting the Comandante Ferraz Antarctic Station

Dear Commandant,

First of all, we would like to congratulate you for the excellent job that you have been developing ahead of the Brazilian Navy.

We acknowledge the value that the Armed Forces in the country, mainly in view of the great challenges that the institution faces in order to ensure order, security and the development of the nation. Among the important activities carried out by the Brazilian Navy, we would like to highlight the valuable Brazilian Antarctic Program (PROANTAR), which we had the opportunity to get to know more profoundly in March of this year, due to your invitation.

The research work and sustainable exploitation of Antarctica have unique scientific value.

The continent has a great influence on the global climate system, in addition to being a peculiar natural environment and little altered by humans. The studies carried out in this region are able to bring new knowledge to the world, contributing to the fields of Oceanography, Biology, Marine Biology, Glaciology, Geology, Meteorology, among others.

The Brazilian Navy is present in the Antarctic continent for over thirty years, allowing not only the development of research and Science, but also logistical support of great magnitude and complex operations. This parliament recognizes the essential nature of work undertaken in the region, whose contributions to the modern world include both scientific as well as strategic advances for Brazil.

The recent visit confirmed that the Navy has exercised an activity of complex logistics, in which civil and military citizens face the distance, isolation and the intense cold to contribute to the advancement and development of the country. The obstacles and difficulties are evident, but the institution stands out for organization, zeal and discipline associated with the dedication and patriotic spirit of its members, which has been instrumental in ensuring the success of the operations in recent decades.

The efforts to rebuild the Antarctic station prove the ability of the Brazilian armed forces to overcome the elements with will power and professionalism. We recognize that the existence and maintenance of the program depend not only on the excellent military operations, but also on the parliamentary action, in order to ensure the necessary support for the efforts that have been done.

Therefore, we put ourselves available to assist in the expansion and qualification of PROANTAR, reinforcing our esteem for the project.

We thank the Brazilian Navy for the rendered services and for the opportunity to get to know in a deeper and more profound way the jobs that are developed in the Antarctic continent. By giving us the opportunity to perform this visit, we were able to visualize our country's construction of the future.

Brasília, March 24 2015.



# Beyond the Antarctic Coast: Brazil and the Antarctic ice shelf



**Figure 2** - The Cryosphere INCT team that crossed over more than 1,400 km from the ice sheet of West Antarctica using modified Hylux Toyota vehicles (three-axis) when they passed through automated module Cryosphere 1. The team took his journey north to the future site of the Cryosphere 2 module (to be set up at approximately 80° S, 94° W in the summer of 2015-2016, green dot in Figure 1).

The largest seasonal phenomenon of our planet occurs in Antarctica, the variation of the frozen sea area, which oscillates every year from 1.8 to 20 million square kilometers, controls the entire climate system in the Southern Hemisphere, particularly the South Atlantic. This ice sheet, which covers 99.7% of the Antarctic continent with its 13.7 million square kilometers of area, has a volume of 25 million cubic km and is very close to Brazil. That's right, it would cover the whole country with a homogeneous layer of ice nearly 3 km thick!

This huge volume, if fully melted, would lead to a rise of 57 meters in the sea level. Thus, any changes to that mass of ice, even if quite small, will have important implications for our coastal regions. In addition, this mantle is the main vortex of energy on the planet and therefore one of the primary drivers of the climate system. But there are other findings that emphasize the role of ice in the environmental system:

1 - Most of the oceans' bottom water is formed under the Antarctic ice shelves (floating parts of the mantle) or under the belt of the sea ice surrounding the continent, and therefore plays an essential role in the oceanic cell of Meridional Overturning;

2 - Variations in coverage of the Antarctic ice (glacial and marine), for example, affect the dynamics of polar air masses, controlling the origin and intensity of cold fronts that there are formed and reach the Brazilian territory; and 3 - Over the past two decades, drastic changes were detected in

the ice: - Ice Platforms disintegrated (over 25,000 square kilometers was lost) and many glaciers have accelerated their flow towards the sea. Recent investigations show that the Antarctic ice melt is already contributing to a rise in average sea level, but still only slightly (about 0.4 mm per year).

Antarctica's interior is the cleanest and unaltered environment on earth and, therefore, an ideal place to monitor the chemical composition of the atmosphere and to detect signs of global pollution. Not only in the present but in the past as well:

- The Antarctic ice sheet is formed by the accumulation of snow crystals over hundreds of thousands of years, and it maintains the atmospheric characteristics at the time of precipitation. An interesting fact is that when scientists withdraw cylinders full of

ice (ice samples in scientific jargon) from the deepest layers of ice, they also analyze the composition of the gas bubbles trapped there. This technique has generated one of the most important contributions of Antarctic science: The determination of the concentration of greenhouse gases in the period prior to the direct measurements in the atmosphere (records date back to 1958 only). The results clearly show an increase of 40% in the concentration of CO<sub>2</sub> (carbon dioxide) and 150% for CH<sub>4</sub> (methane) from the start of the "Industrial Revolution".

Despite all these findings and the proximity of Brazil (incredible as it seems, Brazil is the seventh country closest to 90% of global ice volume), little was known about the influence of Antarctica in the Brazilian environmental system before the creation



**Figure 3** - In addition to research in the Antarctic ice sheet (ie, within the continent), the INCT Cryosphere teams search the Southern Ocean, the frozen ground and the Antarctic atmosphere. In the photo, the INCT oceanographic team, supported by helicopter of the Brazilian Navy, places sensors for monitoring icebergs.



of the Brazilian Antarctic Program - PROANTAR in 1982 (in fact, the country did not have a specialist in Glaciology, the science of snow and ice in all its forms).

Since 1992, with the creation of the first national group dedicated to glaciological science at the Federal University of Rio Grande do Sul (UFRGS), a program was initiated to investigate the masses of Antarctic ice, their variability, the evolution of their atmospheric chemistry in the historical past and especially the influence on the variability of South America's atmospheric conditions. This action culminated in 2008 with the creation of the National Institute of Science and Technology of the Cryosphere, which has since then united 8 associated laboratories dedicated to the study of the variability of different components of the mass of planetary ice, including studies of Antarctic sea ice (which seasonal effect is the greatest natural phenomenon on Earth. The Antarctic sea ice covers 1.9 million square kilometers on average in March, and jumps to almost 20 million square kilometers in September of each year), glaciers and the Antarctic ice sheet, Andean glaciers, permafrost (permanently frozen ground) and their responses to climate change. The program includes the installation of a national laboratory for analysis and interpretation of ice survey and the National Center for monitoring the cryosphere, mainly to assess the impact of the melting of part of the cryosphere to the average sea level.

This INCT allowed for an expansion of the studies carried out by the Brazilian Antarctic Program (PROANTAR) into the Antarctic continent, culminating with the installation of the scientific module "Cryosphere 1" ( $84^{\circ} 00'S$ ,  $79^{\circ} 30'W$ ) in the summer of 2011/2012 for climate monitoring and atmospheric chemistry in a joint action of researchers from the State University of Rio de Janeiro (UERJ), UFRGS and the National Institute for Space Research (INPE). Recently, in the austral summer of 2014/2015, the first national crossing of the Antarctic ice sheet was carried out. A small INCT team crossed more than 1,400 km from the Antarctic ice sheet to collect surface samples of snow and taking the route and the location for the second national module installation within the interior of Antarctica, the "Cryosphere 2" in the summer of 2015/2016.

The INCT of the Cryosphere also leads the Brazilian oceanographic research in the Austral Ocean, performing operations on



**Figure 1** - A better perspective of the Antarctic ice sheet, showing the real proximity to the South American continent. The colored dots identify the geographical location of the Comandante Ferraz Antarctic Station - EACF ( $62^{\circ}05'S$ ,  $58^{\circ}24'W$  - yellow), the Cryosphere 1 scientific module ( $84^{\circ} 00'S$ ,  $79^{\circ} 30'W$  - blue) and where the Cryosphere 2 module scientific will be installed (green dot) in the summer of 2015-2016. The EACF-Cryosphere 1 distance is about 2500 km.

board the Polar Ship Admiral Maximiano of the Brazilian Navy, collecting oceanographic data on the characteristics of water masses in the Bransfield Strait and northwestern sea of Weddell. In general, the activities carried out within INCT also contribute to the acquisition of oceanographic and glaciological data in areas of the world with few observational data, studying the ocean-atmosphere interaction in the South Atlantic Ocean and the Southern Ocean and the impact on the weather forecast and climate in the south-southeast region of Brazil. Laboratory and field oceanographic research is carried out by researchers at the Federal University of Rio Grande - FURG, INPE and University of São Paulo - USP. The group led by researchers at the Federal University of Viçosa (UFV) is studying the permafrost response to climate variations. The INCT team also investigates organisms that have evolved under the extreme temperature conditions and the humidity of the interior of Antarctica (Federal University of Minas Gerais - UFMG). Finally, since 2012, we have been monitoring the environmental, socioeconomic and geopolitical consequences of the rapid reduction of the area covered by sea ice in the Arctic, including the opening of new maritime routes in the far north.

**Source:** Prof. Dr. Jefferson Cardia Simões - Glaciologist - General Coordinator of the National Institute of Science and Technology of Cryosphere - INCT Federal University of Rio Grande do Sul - UFRGS.



# CIRM members perform cooperative visit



A group comprising representatives of the Secretariat of Interministerial Commission for Sea resources-SECIRM, the Ministry of Foreign Affairs, Ministry of Environment, Ministry of Science, Technology and Innovation and the Federal University of Rio Grande do Sul, got together with representatives of the Antarctic Programs of Brazil, Argentina and the German station GARS O'Higgins to hold a cooperative visit to some stations & bases in Antarctica.

The visits took place from 5 to 11 November, 2014 and began at Oceanographic Support Ship Ary Rongel, which took the delegation to the vicinity of the Antarctic stations and bases visited, in the following locations:

- King George Island, Fildes Peninsula, Maxwell bay;

- The Russian "Bellingshausen" Antarctic Station and the Chinese "Great Wall" station;

- "Half moon" island, South Shetland Islands: Argentine Base Camara;

- King George island, Potter Peninsula, Maxwell Bay: South Korean "King Sejong" station;

- King George island, Potter Peninsula, Maxwell Bay:

- Argentine "Carlini" Base;

- Martel Inlet, Admiralty Bay: Brazilian Comandante Ferraz Antarctic Station; and

- King George Island, Admiralty Bay: Polish "Henrik Arctowski" Antarctic Station ".

The event has significant political development and has allowed the preparation for future participation in joint technical visits, with member-countries of the LATIN AMERICAN MEETING OF MANAGERS OF NATIONAL ANTARCTIC PROGRAMS – RAPAL - to foreign stations in the Antarctic continent, according to the Antarctic Treaty System. Besides the exchange of the experience among the various Antarctic programs, the visit strengthened even more the ties related to the cooperative spirit and friendship between the countries involved.



Base Càmara-Argentina



Great Wall-China



Arctowski - Poland





## CIRM has a new Coordinator

**O**n 6 February, Admiral Eduardo Bacellar Leal Ferreira took over the Brazilian Navy Commander. As a maritime authority, he also took office as coordinator of the Interministerial Commission for Sea Resources - CIRM.

In his inaugural speech, Admiral Leal Ferreira said: "The preparation of our forces has been one of the main reasons we are enjoying the longest period of peace in our history, characterized by diplomatic referral of disputes. I see the ocean and the inland waters as a way to approach and cooperate with other nations and as an access to remote corners of our vast country, allowing the State's presence in these regions" - which meets the current ocean governance policy developed by CIRM.

Born on June 2, 1952 in Rio de Janeiro, he joined the Navy in January 1971 at the Naval Academy. He was promoted to Ensign on December 13, 1974 and to Admiral in March 2013. Before assuming the Command of the Navy, he was the Commanding Officer of the Brazilian National War College, an institution under the Ministry of Defense. During the ceremony, he thanked his predecessor, Admiral Moura Neto.

The new Commandant of the Navy worked on board Brazilian ships for more than 16 years - he has accumulated about 1,300 days at sea - having served over 40 years, among other things, as Commanding Officer of the Corvette "Frontin", the Frigate "Bosísio", the 2nd Escort Squadron, the Naval Academy, the 7th Naval District in Brasilia, and the position of Commander-in-Chief of the Fleet.

Abroad, he served as an Astronomical Navigation Instructor at the Naval Academy of Annapolis in the US and as a student at the Naval War Academy in Chile.

The inauguration ceremony took place at the Brazilian Marines Base, in Brasilia. Among those present were Ministers Jaques Wagner (Defense), Carlos Gabas (Welfare), José Elito (Institutional Security Office), Mangabeira Unger (Secretariat of Strategic Affairs) and Patrus Ananias (Land Development). Also present were former Minister of Defense Nelson Jobim, Minister of the Federal Supreme Court (STF) Marco Aurelio Mello and Minister of the Federal Audit Court (TCU) Raimundo Carreiro, in addition to other civil and military authorities.







## Brazil is part of the small group of countries that accepted the challenge of implementing remediation in Antarctic soil

**B**razil has intensified environmental monitoring research in Antarctica since 2002, when the Ministry of Environment (MMA) prompted the Project of Environmental Change in Antarctica through two research networks: one studying global impacts and the other the local impacts in the area of the Comandante Ferraz Antarctic Station - EACF.

After a fire at the Station in early 2012, monitoring of the affected area to check the level and extent of hydrocarbon contamination from the use of diesel fuel for power generation in the station was established. This monitoring is being carried out by researchers from the Oceanographic Institute of the University of São Paulo (IOUSP), by experts from the Environmental Company of the State of São Paulo - CETESB and IBAMA from soil samples, sediment, moss and algae in annual campaigns of soil contamination research.

Based on the results of contamination encountered, a remediation plan has been defined for the area, in order to mitigate or eliminate any pollution of the soil and prepare it for the reconstruction of EACF. From the experience gained by previous studies, a Bioremediation Program of the area contaminated with hydrocarbons began.

With the application of bioremediation technique, it is intended to stimulate the

microorganisms present in the soil affected by the supply of nutrients that are naturally in low concentrations in Antarctic soil (typically nitrogen and phosphorus) so that they consume carbon of the hydrocarbons to obtain energy. After the microbial attack, this carbon ends up being released into the atmosphere as CO<sub>2</sub>, as a product of microbial respiration. Therefore, the soil containing hydrocarbon needs to be removed, homogenized with the presence of fertilizers and stored in an isolated environment so that a process of degradation of pollutants occurs in a technique known as "Biopile".

The Remediation Program of the EACF's soil began in the Antarctic 2013-2014 summer, where the knowledge generated by the research has been applied. The institutions involved in this work is the Brazilian Navy, through the EACF Group Base and Brazilian Marines Engineering Battalion, MMA, through the Biodiversity and Forests Department, the UFSJ (Federal University of Sao Joao del Rei), USP and CETESB.

In addition to the continuity and improvement of the implementation of engineering and design of Biopile and the monitoring of hydrocarbon degradation efficiency, there are also plans for:

- Selecting bacteria from EACF's soil, which are able to degrade diesel oil and can be grown and multiplied in laboratories to be applied in greater numbers of Biopile;

- more efficient selection of fertilizer to the conditions presented by the EACF's soil; and

- developing an emergency action to be applied in the event of new leaks, where procedures will be provided for the proper collection of contaminated soil, which will be put in appropriate places. Fertilizers and degrading bacteria will be used immediately, so that soil can be decontaminated.

This work was observed by representatives from the United Kingdom and the Czech Republic on January 9 while carrying out technical inspections of the Emergency Antarctic Modules and in the area of EACF, as provided in the Environmental Protection Protocol (Madrid Protocol) of the Antarctic Treaty.

With this important program, Brazil, as well as Australia and Argentina, became part of the select group of countries that accepted the challenge of implementing remediation projects in the Antarctic soil. An exchange of experience initiatives between these countries are already underway and is expected to thereby enhance the techniques used and achieve the greater goal—to minimize the environmental impacts of human presence in Antarctica.

**Text collaboration:** Prof. Dr. Juliano Cury - UFSJ, Eng. Fernando R. S. Pereira - CETESB and Environmental Analysts Renato Lagrade e Bianca Chaim Mattos - MMA.



## PHASE 1:

- Due to an expected start up in the EACF's reconstruction works in the first intervention, in January 2014, the soil contaminated with hydrocarbons where there was the former engine room was treated at the location. Thus, the technique chosen for this procedure was the "biocava", which consisted of "packaging" and aerating the mixture of contaminated soil and fertilizer, using high density polyethylene membrane (HDPE) of 2 mm in thickness.

*Photo: installation of Biocava's aeration network*



## PHASE 2:

- In the second phase of remediation that took place earlier this year, the intervention occurred in the area between the treated area in the first phase and the shoreline. Conventional biopile was used where contaminated material was removed and, after being mixed with fertilizer, deposited in an area already impacted previously prepared for this purpose. The mixture will be stored in biopile until the soil is completely free of contamination or hydrocarbon levels are low.



*An English representative observes the process of soil bioremediation during the technical inspection* Photo: Lt. Quineper





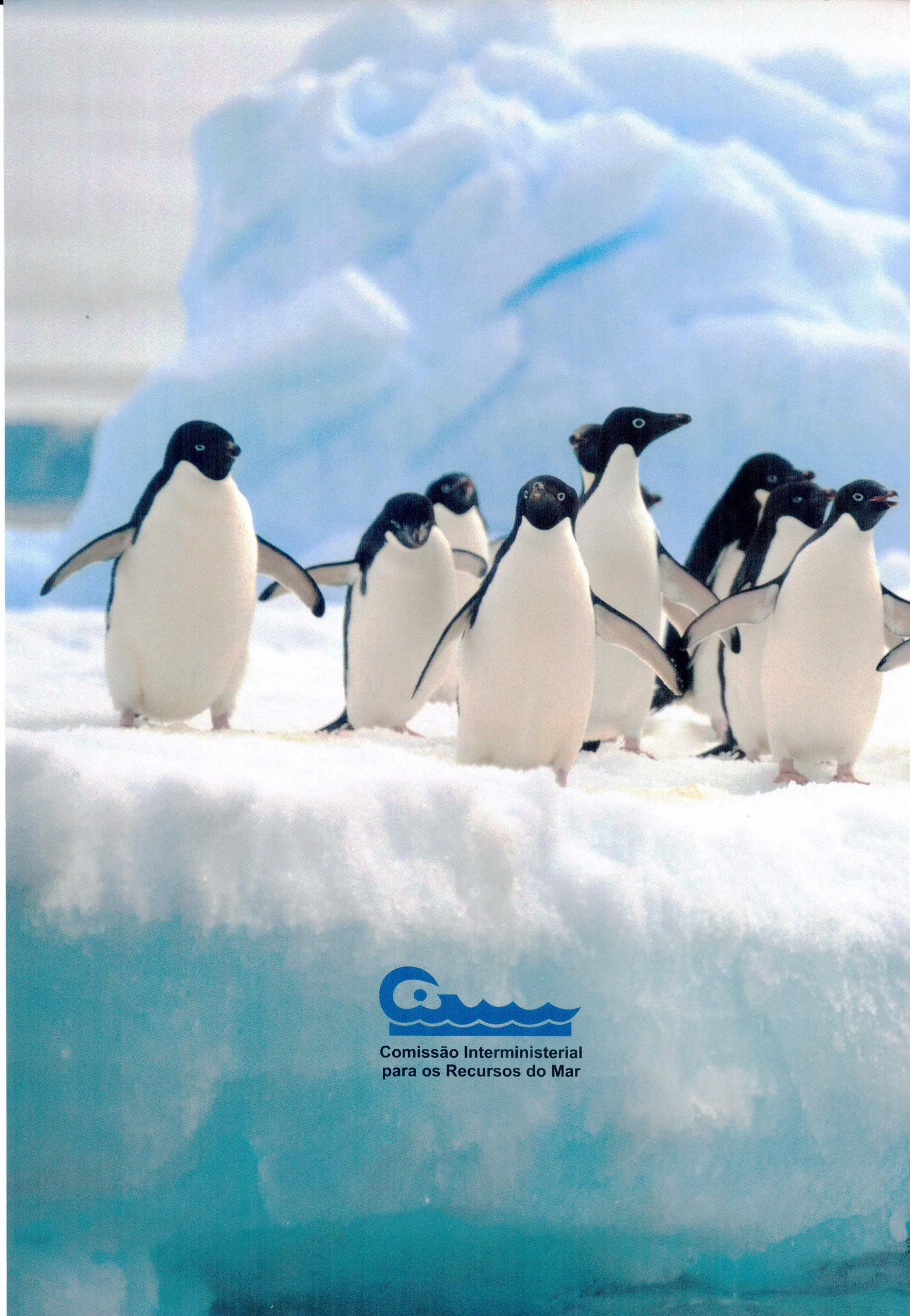
*Oceanographic Support Ship Ary Rongel during the XXXIII Antarctic Operation*

*Photo: Cesar Fraga*









Comissão Interministerial  
para os Recursos do Mar