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The Chilean Antarctic Bulletin (Boletín Antártico Chileno) is the official publication of INACH. Its goals include dissemination of information on Chilean national scientific and related activities. The Bulletin recently received a new design and editorial approach in efforts to reach a larger audience. It is one of the few scientific magazines that is provided at no charge, from government funding, and aimed at the general public. The Bulletin includes a section on collaborative work that is open to all Antarctic researchers. In addition, there is a material covering international activity, interviews, news, along with the long-standing practice of special sections devoted to topics such as the International Polar Year, Antarctic cetaceans and Darwin in Patagonia. The Bulletin has a circulation of 2,000 copies, distributed free of charge to regional and national authorities, international Antarctic institutions, Chilean and foreign libraries, universities, researchers, and so on. The Bulletin is a biannual publication.

Editorial

Several weeks ago we unveiled the National Program for Antarctic Science for 2011. The results are now available. There were 55 proposals for the six 2010 open competition funding opportunities, for which 23 were approved, resulting in 52 projects to be conducted during 2011. This represents the largest number of Antarctic projects in the 47 years of Chilean polar activities. Without a doubt, this was a crowning achievement for the Bicentennial celebration of Chile's independence.

The 47th Antarctic Scientific Expedition (*"Expedición Científica Antártica,"* or ECA) was kicked off last November 23 and will last until the first of March, 2011. There is an anticipated logistics investment of 650 million Chilean pesos and a transfer of 674 million pesos to the researchers, a 41 percent increase in field projects compared to the period 2009-2010, for a record number of 232 people including scientists, logistical support personnel, and students, all working on aspects dealing with the White Continent. There will be a record number of dives, with 9 projects and 16 divers working in waters of barely 1 degree Celsius (33.6 degrees Fahrenheit). In addition, there will be three projects which will establish field camps at six sites, with 18 people performing research in the most extreme polar conditions for 54 days. During this 47th Antarctic Scientific Expedition we will work on 20 separate areas in the South Shetland Islands, the Antarctic Peninsula, and the Weddell Sea.

Our program is open to the world, augmented constantly with connections to other Antarctic programs, providing an enrichment of science through differing points of view and optimizing the use of resources that various countries have in Antarctica. During this season there will be participation by 13 nations, since 51 percent of the National Antarctic Science Program projects include foreign participation.

These are figures that speak well of sustained growth and important principles, including support for high-quality projects, incorporating international peer review and featuring clear lines of research.

This robust program is already producing results. The project directed by Dr. Anja Wendt, of CECS, supported by CONICYT and INACH, has made discoveries on the effects of global warming on glaciers in the Antarctic Peninsula. The Fleming Glacier (latitude 69.5º S, latitude 66º W) has lost its floating ice shelf and has thinned considerably. At the glacier elevation of 1100 meters there is an average thinning of 0.7 meters per year, while the glacier face is losing an average of 4 meters of thickness each year.

We are also obtaining valuable information about cold-adaptation mechanisms for several polar species, including fish and invertebrates, which are described in the article by Dr. Marcelo González, INACH biologist in charge of studies of Antarctic bio-resources.

This issue of the Bulletin includes a brief special on contamination in Antarctica, with three articles covering this topic that troubles everyone who cares for the White Continent. The impact of human activity is inevitable and still tightly contained if we compare it to what is happening in other areas of the planet. For that reason it is important to employ measuring and monitoring means to provide early warning for long-term effects, to allow for appropriate control and mitigation measures.

Finally, we'd like to draw attention to the article by Marcelo Mayorga, which contributes new background material on the historical activities of sealers in the Antarctic and Sub-Antarctic regions. One hundred years after the conquest of the South Pole by Scott and Amundsen, the history of the far southern regions continues to offer the spell of adventure, and the lure of the continuing struggle for knowledge about what is still hidden from our sight, and what remains unexplored.

José Retamales, PhD
Director INACH

Summaries of Articles

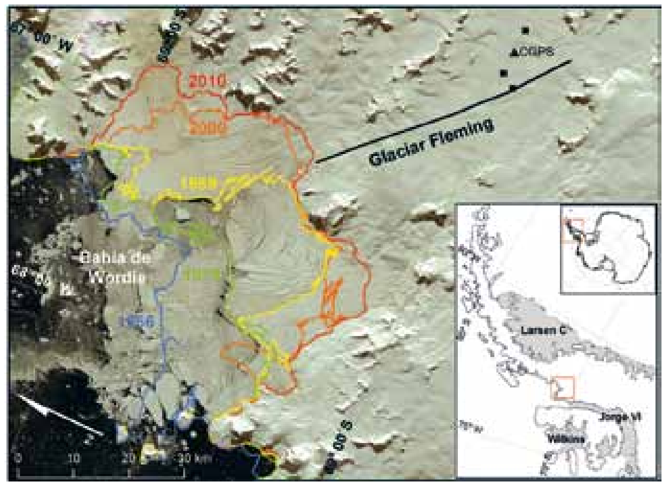
The Sunken Forests of Magallanes and Antarctica

Who would have thought that in the frigid waters of the Straits of Magellan and the South Shetland Islands that there would be… forests? There are two ecological studies (including one sponsored by INACH: "The Structure of Bottom-Dwelling Communities in Antarctic Rocky Reefs") of the algae forests in the two regions, for the purpose of identifying variations in the structure of communities associated with these forests which may be related to changes in their physical environment. In Antarctic, the algae communities show significant differences between locations, probably related to erosion brought about by the ice that descends within the glaciers toward the sea, or by the associated icebergs.

Doctor Emma Newcombe prepares to photograph a quadrant of an algae forest in the Magallanes region.

Behaviour of the Fleming Glacier following the retreat of the Wordie Ice Shelf

The warming of the Antarctic Peninsula is considered to be greater than the worldwide average, resulting in unprecedented changes in glaciers and ice shelves in the region. The Antarctic Ring project entitled "Stability and recent behavior of glaciers on the Antarctic Peninsula: interactions with ice shelves" focused on Fleming Glacier in Wordie Bay in the southwest of the Antarctic Peninsula. The glacier used to flow into a floating ice shelf which has retreated during the last 50 years and has disappeared almost completely. The loss of the retention from the ice shelf resulted in an increase of the ice flow of up to 50 percent when compared to the measurements taken during the 1970s. As for the height of the glacier, there has been an observed thinning, within the study zone from the glacier front up to a height of 1100 meters above sea level showing an average loss of 0.7 meters of thickness each year, and the glacier face reaching an average loss of 4 meters per year. Climate change is seriously affecting Antarctic glaciers and it is probable that the effects of these variations will result in an increase in sea level.



Map of Wordie Bay and the Fleming glacier in the southern part of the Antarctic Peninsula. The background image is a mosaic of Landsat images and shows the ice shelf in 1989. The colored lines show the extent of the floating Wordie ice shelf between 1966 and 2010. The sensor network located on the glacier is shown in black markers. The location of Wordie Bay is shown in the lower right on the map.

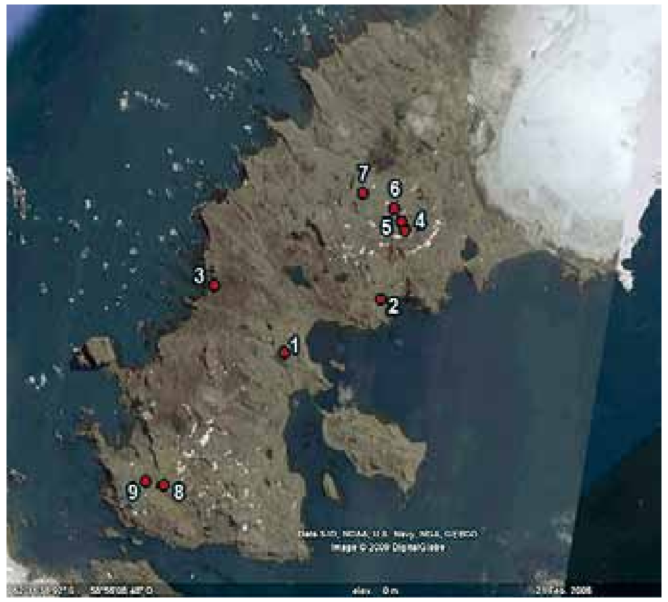
Adapting to the cold (or, the paradox of losing in order to win)

For millions of years Antarctic has been a stable environment, with low temperatures to which living things have adapted. In many cases that adaptation has meant the loss of abilities and characteristics which would have caused them to perish in more temperate locations. Nevertheless, alarms have gone off in the Antarctic Peninsula. Air and water temperatures have increased, though the associated impact on ecosystems is still unknown. Dr. Marcelo González describes some surprising cases of adapting to the cold in plants, bacteria, fish (some transparent!) and how their defense mechanisms could lose effectiveness when faced with global warming.

As a way of adapting to cold temperatures, the Antarctic ice fish (Chaenocephalus aceratus) has very few red blood cells. As a result, its blood is more fluid and these animals require less energy to pump that blood through their bodies.

Biodiversity in Antarctic bacteria: a current challenge

Within the framework of the "Bacterial Microbiota on the Fildes Peninsula: behavior in the face of antibacterial agents and the production of antibacterial compounds" we see a study primarily of the phylogenetic relationships of isolated viable bacteria from several types of habitats on this peninsula. These phylogenic approaches provide evidence that the majority of the haplotypes are specific to each habitat. Nevertheless, they offer an evolutionary history that is independent of their present environment. In addition, the same strain of bacteria is found in different environments as well as in similar but physically distant locations. The data collected in this project served as a springboard for undertaking a new line of research in the project "Biodiversity and metabolic capabilities of the bacteria community in several habitats on the Fildes Peninsula (King George Island) and Cape Shirreff (Livingston Island)" which is also financed by INACH.



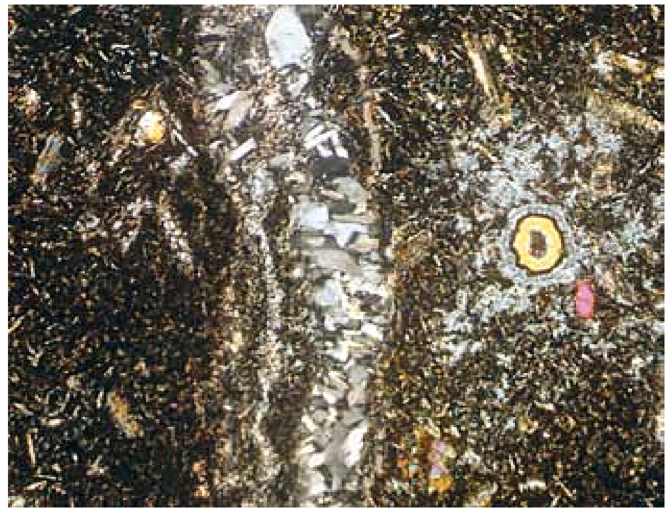
Sampling points on the Fildes Peninsula.

Low grade metamorphism in the volcanic sequence of the South Shetland Islands

During the last 100 million years, the area now known as the Antarctic Peninsula and the South Shetland Islands was the scene of intense volcanic activity. Layer after layer of lava and pyroclastic rock were laid down, following the outpouring of volcanic ash and fragments of lava from innumerable eruptions.

The initial deposits of rock were in turn covered by still younger layers of rock, which in time were subjected to pressures and temperatures far greater than those on the Earth's surface where they were initially formed. In these conditions beneath the surface it is common to find flowing water that becomes heated, bringing about what are known as hydrothermal flows. These fluids ran through the buried rock, filling the fractures and cavities, filling them with a wide assortment of minerals known as secondaries.

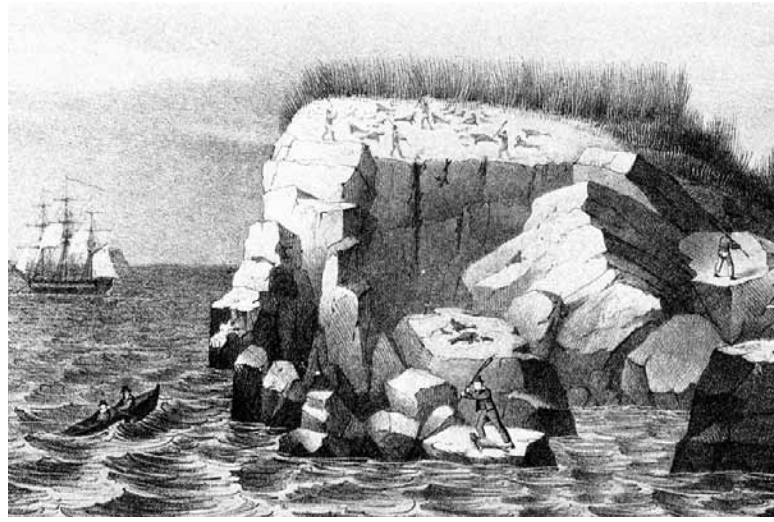
The project entitled "Low grade metamorphism in the volcanic sequence of the South Shetland Islands," funded by INACH, attempts to identify these secondary minerals in several study locations. Studies are already underway for the rocks at Hannah Point on Livingston Island, using specimens collected by the geologist Hernán Michea. The photos show how the secondary minerals produce amigdaloidal (almond-shaped) forms or small veins in what were once the fractures in the volcanic rock. Precise identification of these minerals will reveal the conditions of pressure and temperature in which these structures were formed, along with the characteristics of the fluids that took part in the formation, through a process known as low-grade buried metamorphism.



Zeolites in veins and other secondary minerals in amigdaloidal forms.

Geographic and ethnographic findings concerning sealers in the southern waters of Chile

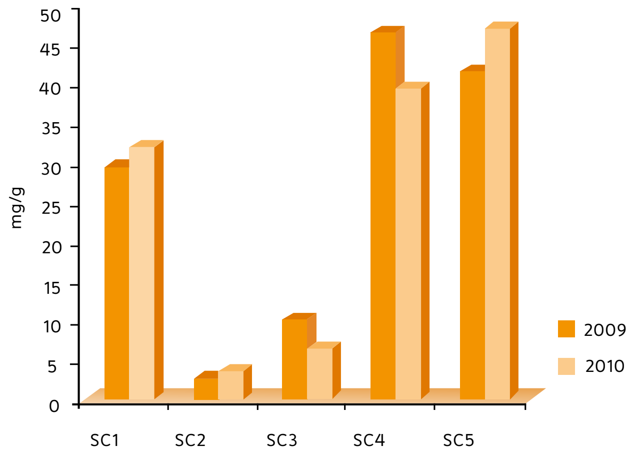
The period from the end of the 18th century through the closing of the 19th century, saw the earliest economic activity, the hunting of seals, for the southern end of South America and particularly the Magallanes and Chilean Antarctic region (which as of 1843 would become part of the Republic of Chile). These expeditions not limited to the hunting of fur seals and later the commercial exploitation of the skins. The hunters also gained a considerable body of geographic, ethnographic, and cultural knowledge ranging from the characteristics of these inhospitable regions to the customs and daily lives of the indigenous peoples of the region.



Seal colony or "rookery" showing a group of sea lion hunters in the Falkland Islands (islas Malvinas). The image is taken from the book "Voyages and Discoveries in The South Seas, 1792-1832" by Edmund Fanning.

Hydrocarbons in Antarctic soils

Operations involved in loading and discharging of fuels are serious sources of hydrocarbon soil contamination. This project measures this contamination at the O'Higgins Station in Antarctica, contamination in limited locations but characterized by difficult natural degradation owing to the extreme conditions of the area. Considering those conditions and the results of soil samples, bioremediation presents an interesting potential. Nevertheless, additional in-depth studies are needed before implementing this technique in such extreme conditions.



Variations in the total hydrocarbon content for the soil samples taken during the years 2009 and 2010. In the figure, "SC" stands for Contaminated Soil ("suelo contaminado").

Antarctic air: Is it pure?

Few places in the world have the strict degree of environmental care found in Antarctica. However, it is difficult to conduct human activity there without impacts. INACH has funded the project entitled "Characterization of fine Antarctic tropospheric aerosols in the extreme north of the Antarctic peninsula, with linkage to their sources" which has measured particulate matter in that sector for comparison with similar data for densely populated cities such as Santiago de Chile. The presence of these aerosols does not constitute a risk to human health but it reveals an increase in recent years, suggesting the need for monitoring of future contamination.

TEOM equipment with the ACCU system, installed on the interior and exterior of the LARC.

Persistent Organic Contaminants: A global threat

Persistent organic contaminants represent a global threat, although available information on spatial and temporal tendencies on such contamination in the southern hemisphere and in Chile has historically been scarce and fragmentary. In 2010 we began to work on a more systematic approach for the Antarctic continent, since remote and cold locations represent selective accumulation zones for these contaminants which are persistent, toxic, and bio-accumulative. The first sampling of water, air, sediment, and organisms was done in January of 2010. The first data are to be available during 2011.

Taking snow samples from the Collins Glacier to determine the seasonal accumulation of persistent organic contaminants in this environmental location.

COLOPHON

COVER

Climate change directly affects living entities, influencing their evolution, changing and reshaping the natural landscape. The representation of the Antarctic continent in an ancient technology such as ceramics, with its long creation process of shaping, drying, firing, enameling at 1,015 degrees C, and shrinking, create a direct comparison to the natural physical process when faced with temperature changes, resulting in transformation, leaving clear testimony to its fragile nature.

Javier Canales Mayorga

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