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 (“Expeditción 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 69.5° S, latitude 66° 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
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.

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.

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 Herrán Michea. The photos show how the secondary minerals produce amigdaloidal lamind-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.

Biodiversity in Antarctic bacteria: a current challenge

Within the framework of the “Bacterial Microbiota on the Filide 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 phylogenetic 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 Filide Peninsula (King George Island and Cape Shirreff Livingston Island)” which is also financed by INACH.

Geoarchaeological and ethnohistorical 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 Magellanes 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.
Contamination in Antarctica

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.

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.

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

COLOPHON

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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