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CHILEAN ANTARCTIC SCIENCE PROGRAM 2016

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- FONDECYT-INACH
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- INTERNATIONAL COLLABORATION
- FONDAP
- PAI-CONICYT

Line I

THE STATE OF THE ANTARCTIC ECOSYSTEM

Associated with the Scientific Committee on Antarctic Research (SCAR) program, "State of the Antarctic Ecosystem (AntEco)."

Biological diversity, or biodiversity, can be defined as the totality of all organisms within a system. Their collective interaction determines how ecosystems work and support the biosphere of our planet. In this respect, the focus of our research is on the past and present patterns of biodiversity for all environments in the Antarctic, sub-Antarctic and Southern Ocean regions, with the principal purpose of furthering knowledge about biodiversity, ranging from genes to ecosystems, along with gaining a better understanding of the biology of individual species. This knowledge can be applied to the preservation and management of Antarctic ecosystems.

The "State of the Antarctic Ecosystem" line of research is closely tied to international initiatives such as the Census of Antarctic Marine Life (CAML) and Chile's National Antarctic Program, which have been able to fill many of the gaps in knowledge about the condition of Antarctic ecosystems. In this way, the intricate biogeographical processes that lead to the similarities and differences among the southern (austral region) biota are being uncovered, though this has been possible only through broad interdisciplinary efforts. As a result, this PROCIEN line is attempting to gain further understanding of the evolutionary patterns behind the existence of unique communities in and around Antarctica, and to document the conditions and evolution as well as their conservation status.

Many Antarctic biological communities are still unknown and it is not surprising that scientific expeditions continue to discover new species. This had led to increasing the breadth of our knowledge of Antarctic biological diversity, while posing some very perplexing questions about their phylogeny, ecological roles, and population size - which may be related to future conservation needs.

There are more than 15 projects now in on this line of research, with studies ranging from microscale to ecosystem level, with the strongest emphasis on evolutionary and biogeographic details. This project involves a collaborative effort to answer key issues related to the 80 high-priority questions identified by SCAR for investigation during the next 20 years.

◉ I.1. Phylogeography, population genetic structure and connectivity of the Subantarctic crab *Halicarcinus planatus*, the first alien marine invertebrate discovered in Antarctica (2016-2020)
Karin Gerard (UMAG)
gerardkarin@yahoo.fr

◉ I.2. Diversification of the spiny plunderfish *Harpagifer* in the Southern Ocean (2015-2018)
Elie Poulin (Univ. de Chile)
epoulin@uchile.cl

◉ I.3. Paleogeographic patterns v/s climate change in South America and the Antarctic Peninsula during the latest Cretaceous: a possible explanation for the origin of the Austral biota? (2015-2018)
Marcelo Leppe (INACH)
mleppe@inach.cl

◉ I.4. Macroalgal Adaptive Radiation: Potential Links to Ecological Niche Diversity in the Ecoregion of Magallanes and Chilean Antarctica (2014-2017)
Andrés Mansilla (UMAG)
andres.mansilla@umag.cl

◉ I.5. Historical and recent biogeographic patterns and processes in Southern Ocean marine mollusks with contrasting developmental modes (2014-2017)
Claudio González (IEB)
omeuno01@hotmail.com

◉ I.6. The metagenomes and metatranscriptomes of microbial communities at the Arctic and Antarctic Ocean surfaces: which metabolic processes and principal actors drive these ecosystems and how will climate change modify them? (2013-2016)
Beatriz Fernández (Univ. de Chile)
biotica@gmail.com

M. Leppe

◉ I.7. Phylogeography and evolutionary history of the species *Neobuccinum eatoni* (Mollusca, Neogastropoda) in the Southern Ocean (2012-2016)
Angie Díaz (UMAG)
angie.ddl@gmail.com

◉ I.8. A missing component of biodiversity: evaluation of biodiversity on parasite fauna in Antarctic fishes (2014-2017)
Isabel Valdivia (UACH)
isabel.valdiviarojas@gmail.com

◉ I.9. Microevolution of penguins in Antarctica: genomic-wide SNP analysis to understand adaptation (2015-2018)
Juliana Vianna (PUC)
jvianna@uc.cl

◉ I.10. Evolutionary history of the Antarctic pearlwort *Colobanthus quitensis* (Caryophyllaceae): Population genetics, phylogeographic patterns, and adaptive differentiation (2014-2017)
Cristian Torres (UBíoBío)
crtorres@ubiobio.cl

◉ I.11. Study of viral and bacterial diversity in seawater and Antarctic fish species: Finding of natural reservoir of salmonid pathogen (2013-2016)
Marcelo Cortez (USACH)
marcelo.cortez@usach.cl

◉ I.12. Does dietary overlap, feeding selectivity and growth change in Antarctic ichthyoplankton at different time scales? A biophysical study in Chile Bay, Greenwich Island, South Shetland Islands during austral summer season (2013-2016)
Mauricio Landaeta (Univ. de Valparaíso)
landaeta.mauricio@gmail.com

◉ I.13. DNA barcoding as tool to described the Antarctic parasite biodiversity in marine invertebrates species (2016-2018)
Leyla Cárdenas (UACH)
leylacardenas1@gmail.com

◉ I.14. Photobiont selectivity and specificity in the genus *Caloplaca* (lichenized Ascomycota): comparisons between southern Chile and Antarctic communities (2014-2017)
Reinaldo Vargas (UMCE)
reinaldovargas@gmail.com

◉ I.15. Diversity and inter-annual variability of eukaryote microbial communities in Antarctic coastal waters (2016-2018)
Juan Ugalde (U. Mayor)
juan@ecogenomica.cl

◉ I.16. Identification of new fungal species from Antarctic marine sponges (2015-2017)
Inmaculada Vaca (Univ. de Chile)
inmavaca@uchile.cl

◉ I.17. Foraging ecology in extreme environments. The role of climate variability and mother-offspring dependence on the foraging strategies of the Antarctic fur seal (*Arctocephalus gazella*) (2015-2017)
Renato Borrás (PUC)
rborras@gmail.com

◉ Funding over USD 850,000.
◉ Funding between USD 210,000 and 850,000.
◉ Funding between USD 105,000 and 210,000.
◉ Funding under USD 105,000.

Line II

ANTARCTIC THRESHOLDS: ECOSYSTEM RESILIENCE AND ADAPTATION

Associated with the "Antarctic Thresholds: Ecosystem Resilience and Adaptation (AnT-ERA)" program, from the Scientific Committee on Antarctic Research (SCAR).

Stress factors in Antarctic ecosystems result from a number of aspects, including seasonal and inter-annual variability, long-term climate change, conditions involving low temperature, high levels of ultraviolet radiation, and scarcity of water. To these natural conditions we also acknowledge the stress factors related to human activities.

The unusual conditions found at various locations in Antarctica have shown differing levels of change. While some areas of the White Continent itself may not show evidence of this, the Antarctic Peninsula region has become one of the areas that has suffered the greatest temperature increases in the past fifty years. In the coming years we should expect to see cascading biological responses, ranging from a molecular level to alterations of entire communities, and involving key organisms in the Antarctic ecosystem.

The AnT-ERA program is intended to describe how Antarctic organisms have adapted to current conditions, and how they might respond in the future. It also hopes to identify which species will likely be winners and which will be losers under these new scenarios, and how this will affect the functioning of the communities and ecosystems.

This represents an opportunity for measuring and quantifying the effects of a warming climate, for impacts ranging from factors affecting individual species to the ecosystem, and helps in the understanding of current patterns and processes as well as for the detection of changes in the future.

This concept employs several projects, using a number of different approaches, to address the research questions, whether these deal with Antarctic plants, algae, invertebrates, mosses, or bacteria as the principal subjects in the studies. Antarctic algae, for example, have revealed their resistance to the effects of changing conditions in the Southern ocean, demonstrating that they have the metabolic prerequisites to adapt to such change. Likewise, Antarctic macroalgae would be resistant to short-term UV stress at current temperatures and under probable increases predicted within the context of climate change.

◉ II.1. Antarctic Plant Ecophysiology: Unraveling the biological consequences of climate change on plant populations of the Maritime Antarctic (2012-2016)
León Bravo (UFRO)
leon.bravo@ufrontera.cl

◉ II.2. Ecophysiology of Antarctic snow algae: adaptation mechanisms to a changing polar environment (2016-2019)
Iván Gómez (UACH)
igomezo@uach.cl

◉ II.3. How would experimental warming affect freezing tolerance of Antarctic vascular plants? (2015-2018)
León Bravo (UFRO)
leon.bravo@ufrontera.cl

◉ II.4. Metabolomic responses of the Antarctic mosses *Sanionia uncinata* and *Polytrichum alpinum* to global warming (2014-2017)
Gustavo Zúñiga (USACH)
gustavo.zuniga@usach.cl

◉ II.5. Response of soil enzymatic and microbial activity to global temperature increase in cold ecosystems of Patagonia and Antarctica (2014-2017)
Ángela Machuca (UdeC)
angmachu@udec.cl

◉ II.6. Coping with warming of Southern Ocean: invertebrates responses to thermal stress conditions (2013-2016)
Marcelo González (INACH)
mgonzalez@inach.cl

◉ II.7. A multi-disciplinary approach to understand the impact of ice loss and deglaciation on Antarctic coastal benthic ecosystems (2015-2018)
Antonio Brante (UCSC)
abrante@ucsc.cl

◉ II.8. Evolutionary history of *Colobanthus quitensis* and its associated microorganisms: implications for understanding present biogeographic patterns, adaptation to environmental change and interactions with glacial cycles (2015-2018)
Marco Molina (Univ. de Talca)
marco.molina@ceaza.cl

P. Ruiz

◉ II.9. Shifts in marine Antarctic microbial community structure and function in response to deglaciation and sea ice meeting accelerated by climate change (2014-2017)
Beatriz Diez (PUC)
bdiez@bio.puc.cl

◉ II.10. Assessing the utility of Antarctic sponges for studying global climate change: individual to community level responses (2015-2018)
César Cárdenas (INACH)
ccardenas@inach.cl

◉ II.11. Photosintetic responses to warming as consequence of the climate change in populations of Antarctic plants from different latitudes in the Maritime Antarctic (2013-2016)
Patricia Sáez (UdeC)
patrisaezd@gmail.com

◉ II.12. Addressing global warming scenarios in freshwater ecosystems using aquatic insects as model organisms in sub-Antarctic and Antarctic regions (2013-2016)
Tamara Contador (UMAG)
tamara.contador@yahoo.com

◉ II.13. Physical controls of biological hot spots along the Antarctic Peninsula continental shelf: future status and current climate trends (2014-2017)
Andrea Piñones (CEAZA)
andrea.pinones@yale.edu

◉ II.14. Effect of endophytic fungi on the ecophysiological performance and biochemical responses of *Deschampsia antarctica* under the current scenario and in one of simulated global climate change (2013-2016)
Rómulo Oses (CEAZA)
romulo.oses@ceaza.cl

◉ II.15. Applying evolutionary principles to infer climate adaptation in marine species: using a genomic approach (2014-2017)
Juan Gaitán (UACH)
juadiegaitan@gmail.com

◉ II.16. *Campylobacter* in Antarctica: diversity, origin and effects on wildlife (2014-2017)
Daniel González (UdeC)
danigonz@udec.cl

◉ II.17. Historic and recent colonizers: genetic and phenotypic variability and phylogenetic relationships of *Colobanthus quitensis* and *Juncus bufonius* in the context of regional changes in Antarctica (2013-2016)
Marely Cuba (UdeC)
mcuba@udec.cl

⊙ II.18. Study of the active layer of frozen soils within the area of Düse Bay, Antarctic Peninsula (2015-2016)
Sebastián Ruiz (UMAG)
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◉ Funding over USD 850,000.
◉ Funding between USD 210,000 and 850,000.
◉ Funding between USD 105,000 and 210,000.
⊙ Funding under USD 105,000.

Line III

ANTARCTIC CLIMATE CHANGE

Associated with the "Antarctic Climate Change in the 21st Century," and "Past Antarctic Ice Sheet Dynamics" programs, from the Scientific Committee on Antarctic Research (SCAR).

In dealing with the threat posed by climate change, it is clear that a large number of our society's challenges and opportunities will flow from two sources: the study of phenomena in Antarctica, and the impacts of global telecommunications.

The growing concern over climate change in recent years reinforces the urgent need to find answers to many key questions affecting Antarctica, so that the coming impacts can be assessed, along with a better understanding of the causes that bring these changes about.

At the same time, as a result of this search for answers relating to Antarctica, a steadily growing multidisciplinary approach has been developed, stimulating the advancement of science and at the same time, aiding in the formation of advanced human capital.

Within this context two SCAR scientific programs work toward these objectives:

1. Antarctic Climate Change in the 21st Century (AntClim21), an effort attempting to provide better regional predictions relating to key elements of the Antarctic atmosphere, the Southern Ocean, and the cryosphere over the next 20 to 200 years. The program also expects to provide improved understanding of the responses of physical systems and the biological factors derived from natural and anthropogenic forcing.

2. Past Antarctic Ice Sheet dynamics (PAIS), a program which is responsible for greater knowledge and understanding of the sensitivity of the ice sheets on East and West Antarctica and the Antarctic Peninsula, against a wide range of changing climatic and oceanic conditions. These include modeling the "greenhouse" climate of the past, which was warmer than the present environment, along with earlier periods of warming and ice retreat during the terminal phases of the most recent ice ages.

Several of the PROCIEN projects in this line of research reflect the efforts to enhance understanding of these processes and mechanisms of change, and to assess the associated trends. One approach attempts to reconstruct past climate conditions using recent high-resolution glacial and geochemical records obtained for the Laclavere ice plateau and surrounding areas near the Union glacier. This type of research involves enormous logistical challenges to provide for working in those extreme and remote environments. These projects involve the use of cutting-edge technologies to assist in solving key questions regarding the past, present and changing future in Antarctic climate parameters.

Special mention is in order for the project entitled "Research Center: High Latitude Marine Ecosystems Dynamic (IDEAL)," which receives 4.5 billion CLP (about US$6.7 million) in financing from CONICYT (900 million CLP each year for five years). This project focuses on two macro regions: southern Tierra del Fuego, and the Antarctic Peninsula, since both exhibit particular sensitivity to possible scenarios involving global warming and anthropogenic impacts. In turn, the project is organized in four research programs whose results will be connected through a modeling and synthesis group for expansion into a larger temporal and spatial context.

The first research program will study the connection between the Antarctic Peninsula and the southern region of Tierra del Fuego by looking into the Antarctic Circumpolar Current (ACC) which represents an insurmountable barrier for plankton and benthic (bottom-dwelling) fish, while generating local adaptation responses in the Antarctic and sub-Antarctic regions.

The second program deals with the modulation of biological interactions triggered in Antarctic and sub-Antarctic systems by environmental stress. The third program will address research into global impacts of climate change on various marine species, communities, and ecosystems. The last research program will cover the social dimension of the several socioeconomic system aspects of neighboring coastal communities (fishing, aquaculture, bio-fuels, climate control, nutrient cycles, recreation, tourism, research and education, esthetic benefits, and spiritual and cultural factors.

P. Ruiz

◉ III.1. Research Center: High Latitude Marine Ecosystems Dynamic (2015-2020)
Humberto González (UACH)
humberto.gonzalez.estay@gmail.com

◉ III.2. Influence of the solar activity on the polar environment (2014-2017)
Alessandro Damiani (USACH)
alessandro.damiani@usach.cl

⦿ III.3. Assessing the role of iron and light on phytoplankton production and air-seav CO2 fluxes in a changing western Antarctic Peninsula (2015-2018)
Ernesto Molina (USACH)
emolina@bio.puc.cl

⦿ III.4. Understanding glacier response to climate change in Chile (2013-2016)
Shelley MacDonell (CEAZA)
shelley.macdonell@gmail.com

⦿ III.5. Recent high-resolution climate reconstruction at the northern Antarctic Peninsula - glacio-geochemical investigations at Plateau Laclavere ice cap (2012-2016)
Francisco Fernandoy (UNAB)
francisco.fernandoy@unab.cl

⦿ III.6. Ozone variability influence on the coupled atmosphere-ocean system (2014-2017)
Pedro Llanillo (USACH)
pedroquechua@hotmail.com

◉ Funding over USD 850,000.
⦿ Funding between USD 210,000 and 850,000.
⦿ Funding between USD 105,000 and 210,000.
⦿ Funding under USD 105,000.

Line IV

PHYSICAL AND EARTH SCIENCES

Associated with the "Antarctic Astronomy and Astrophysics" and "Solid Earth Responses and Influences on Cryosphere Evolution" programs, by the Scientific Committee on Antarctic Research (SCAR).

More than anything else, it is the physical environment that has determined the nature of the existence of life in Antarctica, and has shaped its landscape. Understanding of the physical conditions is a major component in an appreciation of the present, as well as the future of the White Continent.

This research line integrates the branches of Antarctic science to create a holistic study of the continent and its surrounding ocean, as key parts of our planet down through history. This line is tied to the research conducted by two SCAR Standing Scientific groups: GeoSciences, and Physical Sciences. In addition, it is also linked to two of the SCAR Scientific Research Programs: Antarctic Astronomy and Astrophysics (AAA), and Solid Earth Response and influence on Cryospheric Evolution (SERCE) .

At a physical level, the processes occurring at the interfaces between the ice, the oceans, the land and the atmosphere -- all these are essential to provide us with the ability to describe and predict responses to climate change.

There are still uncertainties that call for continuing research to enhance our understanding of the dynamics of the Antarctic ice shelf, as well as the processes and changes involved in sea ice and ocean current circulation. There are still unresolved questions about atmospheric dynamics and chemistry, and the role of upper-atmospheric ozone as it affects the Antarctic climate.

We must also keep in mind that the elements of physical sciences research in Antarctica are based on the unique properties of the White Continent. Some of these special characteristics also support its use as a platform for astronomical observation and studies of the relationships between earth and the sun.

The 2016 PROCIEN projects covering this theme include two that we believe are particularly noteworthy. One is the study and interpretation of recent sedimentary processes to detect varying rates of sedimentation along the coast of the Antarctic Peninsula. The other is a new approach to study the influence of solar activity on the Antarctic environment, which compares satellite data estimates with new models of atmospheric chemistry in an effort to assess climate forcing.

R. Quinán

◉ IV.1. Equilibrium and non-equilibrium processes in space plasmas and the solar-wind-magnetosphere-ionosphere interactions (2016-2020)
Marina Stepanova (USACH)
marina.stepanova@usach.cl

◉ IV.2. Characterization of Low Clouds over the Antarctic Peninsula and the West Antarctic Ice Sheet (WAIS) (2016-2019)
Penny Rowe (USACH)
prowe@harbornet.com

◉ IV.3. Reflectivity of Antarctica (2015-2018)
Raúl Cordero (USACH)
raul.cordero@usach.cl

◉ IV.4. Multichannel espectroradiometer to monitor ozone and solar radiation in Antarctica (2014-2016)
Raúl Cordero (USACH)
raul.cordero@usach.cl

◉ IV.5. Seismic facies variability and sedimentation processes in small bays and fjords of the Danco Coast, Antarctic Peninsula (2012-2016)
Cristián Rodrigo (UNAB)
cristian.rodrigo@unab.cl

◉ IV.6. Effect of warming and increased CO2 concentration on thermal acclimation of leaf respiration of Antarctic plants (2014-2017)
Carolina Sanhueza (UdeC)
csanhuez@gmail.com

◉ IV.7. Clustering of George VI Ice Shelf tributary glacier types (2014-2016)
Guido Staub (UdeC)
gstaub@udec.cl

◉ IV.8. Ground-based Measurements of the Radiance Distribution in the Antarctic Peninsula (2015-2018)
Raúl Cordero (USACH)
raul.cordero@usach.cl

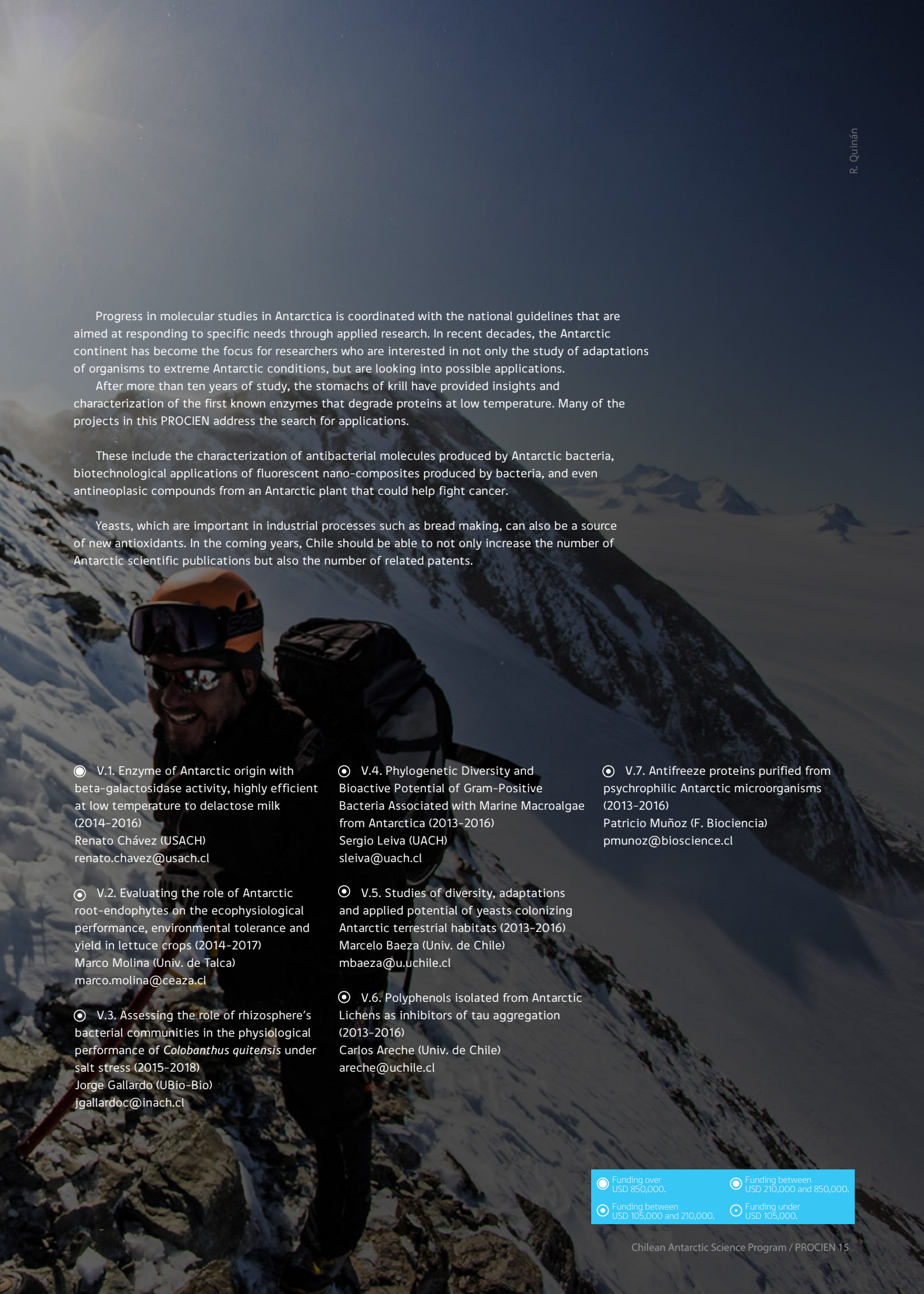
◉ IV.9. Thermal evolution of the Antarctic Peninsula and the South Shetland Islands by thermochronology: implications to climate change (2014-2017)
Francisco Hervé (UNAB)
fherve@ing.uchile.cl

⊙ IV.10. Stratigraphy and palaeoenvironment of the lower strata of Fildes Peninsula Group (2015-2016)
Fernanda Carvajal (UNAB)
fer.carvajal.h@gmail.com

◉ Funding over USD 850,000.
◉ Funding between USD 210,000 and 850,000.
◉ Funding between USD 105,000 and 210,000.
⊙ Funding under USD 105,000.

Line V

ANTARCTIC MICROBIOLOGY AND MOLECULAR BIOLOGY



R. Quinán

Progress in molecular studies in Antarctica is coordinated with the national guidelines that are aimed at responding to specific needs through applied research. In recent decades, the Antarctic continent has become the focus for researchers who are interested in not only the study of adaptations of organisms to extreme Antarctic conditions, but are looking into possible applications.

After more than ten years of study, the stomachs of krill have provided insights and characterization of the first known enzymes that degrade proteins at low temperature. Many of the projects in this PROCIEN address the search for applications.

These include the characterization of antibacterial molecules produced by Antarctic bacteria, biotechnological applications of fluorescent nano-composites produced by bacteria, and even antineoplasic compounds from an Antarctic plant that could help fight cancer.

Yeasts, which are important in industrial processes such as bread making, can also be a source of new antioxidants. In the coming years, Chile should be able to not only increase the number of Antarctic scientific publications but also the number of related patents.

◉ V.1. Enzyme of Antarctic origin with beta-galactosidase activity, highly efficient at low temperature to delactose milk (2014-2016)
Renato Chávez (USACH)
renato.chavez@usach.cl

⦿ V.2. Evaluating the role of Antarctic root-endophytes on the ecophysiological performance, environmental tolerance and yield in lettuce crops (2014-2017)
Marco Molina (Univ. de Talca)
marco.molina@ceaza.cl

⦿ V.3. Assessing the role of rhizosphere's bacterial communities in the physiological performance of *Colobanthus quitensis* under salt stress (2015-2018)
Jorge Gallardo (UBio-Bio)
jgallardoc@inach.cl

⦿ V.4. Phylogenetic Diversity and Bioactive Potential of Gram-Positive Bacteria Associated with Marine Macroalgae from Antarctica (2013-2016)
Sergio Leiva (UACH)
sleiva@uach.cl

⦿ V.5. Studies of diversity, adaptations and applied potential of yeasts colonizing Antarctic terrestrial habitats (2013-2016)
Marcelo Baeza (Univ. de Chile)
mbaeza@u.uchile.cl

⦿ V.6. Polyphenols isolated from Antarctic Lichens as inhibitors of tau aggregation (2013-2016)
Carlos Areche (Univ. de Chile)
areche@uchile.cl

⦿ V.7. Antifreeze proteins purified from psychrophilic Antarctic microorganisms (2013-2016)
Patricio Muñoz (F. Biociencia)
pmunoz@bioscience.cl

◉ Funding over USD 850,000.
⦿ Funding between USD 210,000 and 850,000.
⦿ Funding between USD 105,000 and 210,000.
⦿ Funding under USD 105,000.

◉ V.8. Fildes Peninsula Resistome: Is there any contribution of antimicrobial resistance genes from waste waters? (2012-2015)
Helia Bello (UdeC)
hbello@udec.cl

◉ V.9. Selection and identification of microbial consortiums with high acidogenic and methanogenic activity from Antarctic sediments, for application to psychrophilic wastewater anaerobic digestion under temperate to cold climates (2013-2016)
Léa Cabrol (PUCV)
lea.cabrol@gmail.com

◉ V.10. Actinobacteria diversity in Antarctic ecosystems and assessment of the biotechnological potential of their secondary metabolites (2012-2016)
Leticia Barrientos (UFRO)
lbarrientos@ufro.cl

◉ V.11. Isolation of Antarctic microorganisms able to synthesize highly fluorescent semiconductor nanoparticles (Quantum Dots) for biotechnological applications (2011-2016)
José Pérez (UNAB)
jperezd@gmail.com

⊙ V.12. Bacterial diversity in soils of different animal settlements from Cape Shirreff, Antarctica (2015-2017)
Julieta Orlando (Univ. de Chile)
jorlando@u.uchile.cl

⊙ V.13. A xylanase from an Antarctic filamentous fungus as model for the study of cold-active enzymes (2015-2017)
Renato Chávez (USACH)
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⊙ V.14. Diversity and activity of nitrous oxide-reducing bacteria in Antarctic soils influenced by marine animal settlements (2015-2017)
Lía Ramírez (Univ. de Chile)
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⊙ V.15. Prospection and characterization of biosurfactants produced by Antarctic bacteria (2015-2017)
Claudio Lamilla (UFRO)
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⊙ V.16. Nutraceutical metabolites and photosynthesis activity in Antarctic snow microalgae: Effects of temperature and UV radiation (2015-2017)
Claudio Rivas (UACH)
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⊙ V.17. Characterization, heterologous expression and improving antimicrobial activity of bacteriocins produced by Antarctic *Pseudomonas* (2013-2016)
María Soledad Pavlov (PUCV)
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⊙ V.18. Characterization of psychrophilic bacteria isolated from *Deschampsia antarctica* phyllosphere and their potential protective effect against frost injury to plants (2013-2016)
Fernanda Cid (UFRO)
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⊙ V.19. Role of mercury resistance mechanisms in tellurite cross-resistance in psychrotolerant bacteria isolated from Antarctic Chilean territory (2015-2017)
Fernanda Rodríguez (USACH)
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⊙ V.20. Biochemical Mechanisms of desiccation tolerance in the Antarctic moss *Sanionia uncinata* (2015-2017)
Marisol Pizarro (USACH)
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⊙ V.21. Study of the extracelular reduction of tellurite and copper in bacteria isolated from the Chilean Antarctic territory (2015-2017)
Mauricio Valdivia (USACH)
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⊙ V.22. Identification and characterization of a new mechanism/strategy for tellurite resistance in tellurite-resistant bacteria isolated from Chilean Antarctic Territory (2013-2016)
Claudia Muñoz (USACH)
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⊙ V.23. Depsides and depsidones from Antarctic lichens: Antioxidant activity and their possible effect as tau aggregation inhibitor (2015-2016)
Francisco Salgado (Univ. de Chile)
fsalgado@ug.uchile.cl

⊙ V.24. Purification and Characterization of a new Laccase isolated from the Antarctic thermophile *Geobacillus* sp. ID17 (2015-2016)
Joaquín Atalah (Univ. de Chile)
akhin.dw@gmail.com

⊙ V.25. Antibacterial effect of derivated compounds from Antarctic lichens against *Acinetobacter baumannii* (2015-2016)
Xabier Villanueva (UdeC)
xvillanuevamartinez@gmail.com

⊙ V.26. Evaluation of the cytotoxic activity of extracts isolated from Antarctic and Subantarctic actinobacteria, *Candida* sp., and from human cancer cell lines (2015-2016)
David Astudillo (Univ. de Valparaíso)
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⊙ V.27. Effect of lichen compounds on biofilm formation and quorum sensing type I system of *Vibrio anguillarum* (2015-2016)
Claudia Torres (UdeC) ctorresb@udec.cl

⊙ V.28. *Rhodobacter* sp response to stress induced by UV radiation: Plateau vs. Antarctic (2015-2016)
Lenka Kurte (UCN)
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◉ Funding over USD 850,000.
◉ Funding between USD 210,000 and 850,000.
◉ Funding between USD 105,000 and 210,000.
⊙ Funding under USD 105,000.

R. Quinán

Line VI
ANTARCTIC ENVIRONMENT

The Antarctic continent is characterized by an environment that features broad and complex interrelationships with the rest of the planet. Antarctica influences and is in turn influenced by what happens elsewhere on the earth.

Antarctica as an "island" continent? It is simply not so. Its cold ocean currents interact with much of the maritime environment of the rest of the world. The Humboldt current affects weather conditions throughout Chile. Furthermore, particles from distant volcanoes, trash from all the continents, and pollen and spores of various plant species, all find their way to Antarctica, transported by wind and currents from distant parts of the world, including South America, Africa, Asia, and Australia.

Antarctica's pristine environment, having very little human intervention, makes it susceptible to harm from increasing human activity. The search for more friendly anthropogenic interaction with this region calls for the development of new technologies adapted to the extreme polar conditions as well as a comprehensive political and regulatory framework for environmental monitoring that is kept up to date.

PROCIEN supports several initiatives in this line of research. Some projects are studying the impact of the Antarctic bases and stations on the freshwater bodies of the Fildes Peninsula, in order to obtain accurate data related to the effects of human occupation on the freshwater ecosystems in Antarctica. This research line also includes assessment of the effectiveness of the Antarctic Treaty, which has regulated activities on the White Continent since it came into force in 1961.

◉ VI.1. Protocol to select paint schemes to protect structural steel against atmospheric corrosion in areas of Chile with high environmental corrosivity (2013-2016)
Rosa Vera (PUCV)
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⊙ VI.2. Anthropogenic pressure over the Antarctic microbial world: Stability of soil communities facing hydrocarbon pollution disturbance (2015-2018)
Sebastián Fuentes (PUC)
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⊙ VI.3. Biomagnification and potential effects of Persistent Organic Pollutants (POPs) in the aquatic food web of the Antarctic Peninsula and Patagonia (2012-2016)
Gustavo Chiang (C-MERI)
gustavochiang@gmail.com

⊙ VI.4. Effects of Antarctic environment on vitamin D status and health risk biomarkers of its inhabitants (2016-2018)
Arturo Borzutzky (PUC)
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⊙ VI.5. An assessment of the impacts of Antarctic bases on the aquatic ecosystems of the Fildes Peninsula (2014-2017)
Roberto Urrutia (UdeC)
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⊙ VI.6. Characterization of methane cycling in Antarctic and sub-Antarctic lakes (2015-2018)
Ma. Soledad Astorga (UMAG)
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⊙ VI.7. Environmental levels of xenobiotics in the South Shetlands islands, Antarctica (2015-2018)
Mónica Montory (UDEC)
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⊙ VI.8. Melting Claims: Antarctica as a challenge for theories of territorial and resource rights, and as a conceptual locus for rethinking the normative grounds of sovereignty claims over natural resources (2015-2016)
Alejandra Mancilla (INACH)
amancilla@inach.cl

⊙ VI.9. Assessment of heavy metals and persistent organic pollutants on Antarctic fauna from several locations of the Antarctic Peninsula (2015-2017)
José Celis (UdeC)
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⊙ VI.10. Determining the presence of drug residues in waters of the Southern Ocean (2015-2016)
Maccarena Marcotti (UST)
maccarena.marcotti.m@hotmail.es

⊙ VI.11. Development and optimization of an analytical methodology for determination of PAHs by solid phase microextraction using stir bar sorptive extraction (SBSE) for snow samples collected from the glacier La Paloma, Antarctic Peninsula (2015-2016)
Carmen Sánchez (UTFSM)
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⊙ VI.12. Environmental Antarctic Monitoring Center (2012-2016)
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⊙ Funding between USD 210,000 and 850,000.
⊙ Funding between USD 105,000 and 210,000.
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CHILEAN ANTARCTIC SCIENCE PROGRAM 2016

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