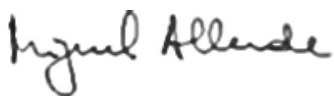



**COVER**

<b>Name of the Center: Millenium Instituto Center for Genome Regulation</b>	
Type (Institute or Nucleus)	Institute
Acronym	MI CGR
Reported period	<u>1 January 2023</u> to December 31, 2023
Starting date of the Center	1 July 2022
Web Page	www.institutocrg.cl
Host Institution(s)	Universidad de Chile Pontificia Universidad Católica de Chile Universidad Andrés Bello Pontificia Universidad Católica de Valparaíso
Address	Valenzuela Puelma 10207, La Reina
Stage	New/ <b><u>Continuity</u></b> /Renewal
Year of Execution	2023
End date of the Center	1 July 2032
Total amount	USD \$ 10,500,000 for 10 years
Total amount for the reported period	USD \$ 364,912.00

<b>Contact Information</b>	
Scientific Contact	<i>Miguel Allende, Director</i>
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<b>Declaración de Singapur</b>
<i>Por este medio declaro que la información entregada en esta memoria anual es fidedigna, y que adhiero a la Declaración de Singapur, contenida en la Resolución Exenta N° 157 del 24 de enero de 2013 de Conicyt, como guía global para una conducta responsable en la investigación.</i>

<i>Institute / Nucleus Director Name</i>	<i>Institute / Nucleus Alternate Director Name</i>
<i>Miguel Allende Connelly</i>	<i>Juliana de Abreu Vinanna</i>
<i>Director's Signature</i>	<i>Alternate Director's Signature</i>
	

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## 1. Summary

### 1.1 Executive Summary

The main objective of the MI CGR is to generate scientific knowledge in the fields of genomics, functional genomics, interaction gene networks, and omic sciences applied to sustainable food production. This is the MI CGR's second year of operation, having begun in late June of 2022. Our scientific team is made up of nine Associate Researchers, 10 Adjunct Researchers, 20 postdoctoral researchers, over 60 students, as well as technicians and administrative personnel and other collaborators, belonging to four host universities, three adjunct universities, along with other research institutes and academic institutions both in Chile and abroad. Below we summarize the scientific activity the MI CGR has carried out in our three main research lines:

#### **RL1: Functional genomics of adaptation and convergent evolution**

With this research line we aim to understand the molecular and evolutionary basis that govern animal-plant-microbiome-abiotic interactions in extreme environments by analyzing existing whole-genome sequence data to identify genes involved in tolerance to extreme conditions. We will use comparative genomics to assess convergent evolution in extreme environments. We will carry out exhaustive sampling to collect bacterial populations to address the role of specific bacterial groups in promoting plant growth in nutrient poor, arid environments. We will also study microbial local adaptation in Atacama to infer evolutionary history, and unveil genetic novelty and new phenotypes, which appear through adaptation over gradients.

#### **RL2: Interaction networks that govern genome structure in communities of organisms**

Sophisticated data analysis, mathematical modeling and systems biology have allowed us to make descriptions of unique ecological niches. By adding functional and causal elements, we aim to understand how networks of organisms are influenced by environmental change. We will take advantage of our unique data collections in environmental gradients combining metagenomics and abiotic factors in a heterogeneous manner to find quantitative relationships between the distributions of organisms, their metabolic and gene regulatory functions.

#### **RL3: Genomics for conservation, ecosystem health and sustainable food production**

Conservation action plans are often considered at the species-level. Through genomics, we can provide a more accurate estimation of biodiversity and detect SNPs involved in local adaptation to specific environmental conditions, which can be incorporated into species distribution models under scenarios of climate change. Genomic tools can also help to understand the mechanisms that control commercially important characteristics of fruit crops by integrating omics and phenotyping data. In aquaculture, we aim to understand the physiological and molecular aspects of *Piscirickettsia salmonis*, a disease with high impact in the salmonid aquaculture in Chile, which may drive pathogenicity. Similarly in agriculture, we aim to improve the stability of molecules such exopolysaccharides, toxins, osmoregulators, and antivirals from cyanobacteria which have potential biotechnological applications in the food, pharmaceutical, bioenergy and other industries, and search for the associated genes.

**Productivity:** During the reported period (1 January to 31 December 2023), we published 77 research articles in peer-reviewed journals, 54 (70%) were in Q1 journals and 17 (22%) were in Q2. Our Associate Researchers published 41 research articles, while other researchers (Adjuncts and Postdocs) published 36 articles. Among the 41 articles published by our Associate Researchers, 25% (19 publications) that were collaborative works with other IM CGR Researchers. When we look at our publications, though, we are most proud of the increase in participation of our students as co-authors in our publications, from 10% in 2022 to 26% in 2023.

**Education, Training and Capacity Building.** During the reporting period, the MI CGR During our 2023 the MI CGR researchers mentored 111 students - 58 doctoral, 15 master's, and 38 undergraduate students, as well as as well as 41 postdoctoral researchers. Eleven students successfully completed their study programs and have gone on to continue work in academic research either as PhD students, postdocs or technicians within the MI CGR. Our students also participated in international internships, and the Center hosted several international student interns.

**Networking and outreach.** From January to December 2023, the MI CGR strengthened its collaborative networks, both in Chile and abroad. We are a part of nice formal collaborative networks and five additional collaboration networks with which we seek to collaborate in joint research projects, data analysis, publications, as well as outreach and science communication. We also organized several scientific conferences and seminars, most notably the 11<sup>th</sup> International Penguin Congress held in Valparaiso, which saw over 250 researchers share knowledge on the biology, ecology, genetics and conservation of penguins and the habitat of the Southern Ocean. The MI CGR participated in many outreach activities including the Genomics Biodiversity Workshop in San Pedro de Atacama which included the participation of researchers from the University of Cologne, as well as school students from local schools in San Pedro and Toconao communities. We also actively participated in Science Week, a national initiative to promote science and engage with local communities, with activities carried out by over 30 MI CGR volunteers nationwide. Our researchers strengthened collaborative links with the private sector and industry. Our RL3 lends itself particularly well for collaborations with the agriculture and aquiculture sectors.

**Administration and Financial Status.** During 2023, the MI CGR operated as a fully independent organization, while still relying on its host institutions for support. We held four meetings of the Board of Directors, as required by our charter, and voted on measures to facilitate operations. In addition, we hired a much-needed Communications Director, and the many outreach activities, as well as our renewed presence and following on social media is evidence of the effectiveness of this role. The MI CGR received its financial contribution from the MSI in July 2023 (\$840,000,000 CLP, approx. \$1,050,000 USD). We also received funding support through FONDECYT projects carried out by our Associate Researchers and their postdocs, as well as from additional national and international sources.

## **1.2 Resumen Ejecutivo**

El objetivo principal del IM CRG es generar conocimiento científico en los campos de la genómica, la genómica funcional, las redes de interacción génica y las ciencias ómicas aplicadas a la producción sostenible de alimentos. Este es el segundo año de funcionamiento del IM CRG, habiendo comenzado a finales de junio de 2022. Nuestro equipo científico está compuesto por nueve Investigadores Asociados, 10 Investigadores Adjuntos, 41 investigadores postdoctorales, más de 100 estudiantes, además de técnicos, personal administrativo y otros colaboradores, pertenecientes a cuatro universidades albergantes, tres universidades adjuntas, junto a otros institutos de investigación e instituciones académicas tanto en Chile como en el extranjero. A continuación, resumimos la actividad científica que el MI CGR ha desarrollado en nuestras tres principales líneas de investigación:

### **RL1: Genómica funcional de la adaptación y evolución convergente**

Con esta línea de investigación pretendemos entender las bases moleculares y evolutivas que gobiernan las interacciones animal-planta-microbioma-abiótica en ambientes extremos mediante el análisis de los datos existentes de secuencias de genoma completo para identificar genes implicados en la tolerancia a condiciones extremas. Utilizaremos la genómica comparativa para evaluar la evolución convergente en ambientes extremos. Llevaremos a cabo un muestreo exhaustivo para recoger poblaciones bacterianas con el fin de abordar el papel de grupos bacterianos específicos en la promoción del crecimiento de las plantas en entornos áridos y pobres en nutrientes. También estudiaremos la adaptación local microbiana en Atacama para inferir la historia evolutiva y desvelar novedades genéticas y nuevos fenotipos, que aparecen a través de la adaptación sobre gradientes.

### **RL2: Redes de interacción que rigen la estructura del genoma en comunidades de organismos**

El análisis sofisticado de datos, el modelamiento matemático y la biología de sistemas nos han permitido hacer descripciones de nichos ecológicos únicos. Añadiendo elementos funcionales y causales, pretendemos entender cómo las redes de organismos se ven influidas por el cambio medioambiental. Aprovecharemos nuestras colecciones de datos únicas en gradientes ambientales combinando metagenómica y factores abióticos de forma heterogénea para encontrar relaciones cuantitativas entre las distribuciones de organismos, sus funciones metabólicas y de regulación génica.

### **RL3: Genómica para la conservación, la salud de los ecosistemas y la producción sostenible de alimentos**

Los planes de acción para la conservación suelen plantearse a nivel de especie. A través de la genómica, podemos proporcionar una estimación más precisa de la biodiversidad y detectar SNP implicados en la adaptación local a condiciones ambientales específicas, que pueden incorporarse a modelos de distribución de especies en escenarios de cambio climático. Las herramientas genómicas también pueden ayudar a comprender los mecanismos que controlan características comercialmente importantes de los cultivos frutales mediante la integración de datos ómicos y de fenotipado. En la acuicultura, nuestro objetivo es comprender los aspectos fisiológicos y moleculares de *Piscirickettsia salmonis*, una enfermedad de gran impacto en la acuicultura de salmónidos en Chile, que pueden impulsar la patogenicidad. Del mismo modo, en agricultura, pretendemos mejorar la estabilidad de moléculas como exopolisacáridos, toxinas, osmorreguladores y antivirales de cianobacterias que tienen aplicaciones biotecnológicas potenciales en las industrias alimentaria, farmacéutica, bioenergética y otras, y buscar los genes asociados.

**Productividad:** Durante el periodo del que se informa (del 1 de enero al 31 de diciembre de 2023), publicamos 77 artículos de investigación en revistas científicas, 54 (70%) en revistas Q1 y 17 (22%) en Q2. Nuestros investigadores asociados publicaron 41 artículos, mientras que otros investigadores (adjuntos y posdoctorales) publicaron 36 artículos. Entre los 41 artículos publicados por nuestros Investigadores Asociados, el 25% (19 publicaciones) fueron trabajos en colaboración con otros Investigadores del IM CGR. Sin embargo, cuando nos fijamos en nuestras publicaciones, estamos más

orgullosos del aumento de la participación de nuestros estudiantes como coautores en nuestras publicaciones, del 10% en 2022 al 26% en 2023.

**Educación, formación y capacitación.** Durante el periodo cubierto por el informe, los investigadores del IM CRG asesoraron a 111 estudiantes: 58 de doctorado, 15 de magister y 38 de licenciatura, así como 41 investigadores postdoctorales. Once estudiantes completaron con éxito sus programas de estudio y han pasado a continuar trabajando en la investigación académica, ya sea como estudiantes de doctorado, postdoctorales o técnicos dentro del MI CGR. Nuestros estudiantes también participaron en prácticas internacionales, y el Centro acogió a varios estudiantes internacionales en prácticas.

**Creación de redes y divulgación.** Desde enero a diciembre de 2023, el MI CGR fortaleció sus redes de colaboración, tanto en Chile como en el extranjero. Formamos parte de agradables redes de colaboración formales y de cinco redes de colaboración adicionales con las que buscamos colaborar en proyectos conjuntos de investigación, análisis de datos, publicaciones, así como divulgación y comunicación científica. También organizamos varios congresos y seminarios científicos, entre los que destaca el XI Congreso Internacional de Pingüinos celebrado en Valparaíso, en el que más de 250 investigadores compartieron conocimientos sobre la biología, ecología, genética y conservación de los pingüinos y el hábitat del océano austral. El IM CRG participó en numerosas actividades de divulgación, entre ellas el Taller de Biodiversidad Genómica en San Pedro de Atacama, que contó con la participación de investigadores de la Universidad de Colonia, así como alumnos de colegios locales de las comunidades de San Pedro y Toconao. También participamos activamente en la Semana de la Ciencia, una iniciativa nacional para promover la ciencia y crear vínculos con las comunidades locales, con actividades llevadas a cabo por más de 30 voluntarios de IM CRG en todo el país. Nuestros investigadores reforzaron los vínculos de colaboración con el sector privado y la industria. Nuestra RL3 se presta especialmente bien a colaboraciones con los sectores de la agricultura y la acuicultura.

**Administración y situación financiera.** Durante 2023, el IM CRG funcionó como una organización totalmente independiente, aunque siguió contando con el apoyo de sus instituciones albergantes. Celebramos cuatro reuniones del Directorio, como exigen nuestros estatutos, y votamos medidas para facilitar las operaciones. Además, contratamos a un Director de Comunicaciones, y las numerosas actividades de divulgación, así como nuestra renovada presencia y seguimiento en las redes sociales, son prueba de la eficacia de esta función. El IM CRG recibió la contribución financiera de la ICM en julio de 2023 (840.000.000 CLP, aproximadamente 1.050.000 USD). También recibimos apoyo financiero a través de proyectos FONDECYT realizados por nuestros Investigadores Asociados y sus postdoctorantes, así como de fuentes adicionales nacionales e internacionales.

### **1.3 Brief History of the Center**

The IM CGR began its journey back in 2011, as a FONDAP Center of Excellence. During its first 10 years our researchers the Center for Genome Regulation was comprised of a multidisciplinary team that all but established genomic science in Chile. Our scientists developed research that comprises molecular and cellular biology, physiology, systems biology, mathematical modeling, bioinformatics, evolution and genetics, disciplines that concur to deliver a comprehensive view of genome sciences and the study of biological networks. The large volumes of data and genomic sequences generated in its first 10 years now serve as the basis for new projects for the IM CGR.

As a newly established Millenium Institute in July 2022, the CGR aims to apply this wealth of knowledge to understand how species can adapt to environmental changes and to develop biotechnological solutions. Since our establishment, we have published over 110 research articles, hosted more than 60 postdoctoral and Young Researchers, mentored some 120 students, and helped 15 students graduate from their respective science programs. We have also hosted seminars, workshops, congresses, and conferences, as well as carried out many outreach activities involving local communities, high school students, and non-academic stakeholders. Finally, we strive to strengthen collaborations with industry and the public sector as well as internationally renowned research institutes and centers. These accomplishments have all been possible through a careful management of the public funding we receive annually, while looking for additional funding opportunities both in Chile and abroad.

### **1.4. Outstanding Achievements** (Máximo media página)

There are a number of outstanding achievements that we would like to highlight, mainly:

- a) **The Genomic Biodiversity in Extreme Environments Workshop.** During this 6-day workshop researchers and graduate students of the IM CGR travelled with colleagues from the University of Cologne and local students to San Pedro de Atacama to study the genetic diversity of life at the biological extremes of the Atacama Desert. In this unique experience, local school students participated in lectures, field visits, sample collection, DNA extraction and analyses along with researchers and graduate students. Students were able to ask questions and get hands on experience in genetic/genomic research - a rare opportunity due to the comparative high costs of genetic research and the use of specialized equipment. The course was considered a great success by all involved.
- b) We are also very proud of the **111 students were mentored during 2023**. Our students, undergraduate, Master's and PhD's, are carrying out research projects in all three of our research lines. Our students help further the genetic research carried out by the IM CGR and play a key role in developing future lines of research and collaborations. In that sense, we are also happy for the **11 students that finished their theses during 2023**.
- c) During 2023 **our researchers published 77 research articles** in peer-reviewed journals. As a research center we understand the importance of publishing our results and disseminating our findings to other researchers beyond our immediate circle of academic colleagues. Thus, we are even more pleased to report that the vast majority of articles were published in Open Access journals or in Open Access formats within traditional/hybrid journals.
- d) Our researchers organized a wide variety scientific events, including the **International Penguin Congress** held in Viña del Mar with over 200 attendees, the **Symposium “A look at genomic patterns of speciation, hybridization and adaptation in southern hemisphere vertebrates”** during the joint annual meetings of the Genetics Society of Chile and the Chilean Society of

Evolution, a very successful five-day **Bioinformatics Workshop** for students, and **seven Interactomics Seminars**, one of which was presented by an international speaker.

## **2. Introduction**

**2.1 Description of the Institute/Nucleus:** The main objective of the IM-CGR is to reveal the mechanisms used by organisms to adapt in response to environmental factors and biological interactions. These adaptations are reflected in genome structure and can be revealed by examining metabolic and regulatory pathways, by comparative genomics, by functional analysis, by searches for co-occurrence patterns, or more ambitiously, by exploring quantitative relationships between biological signals and abiotic patterns. In addition, these discoveries can have a significant impact in highlighting issues of local and planetary importance, including climate change and biodiversity loss. We will focus on exploring the richness present in the massive data sets we have already obtained to identify the mechanisms that explain the emergence of adaptive traits, from the organism level to the community and ecosystem level. Thus, our research is intrinsically interdisciplinary, with experts from disciplines that range from ecology to molecular biology, with important contributions to systems biology and mathematics.

**2.2 Research Lines:** The MI CGR established three research lines which it has maintained unchanged since its beginnings. These research lines are highly interdisciplinary and bring together researchers from different areas of expertise. These areas include experts from disciplines such as genomics, microbiology, evolution, zoology, plant science, agronomy, as well as aquaculture and sustainable food production.

### **1. Functional genomics of adaptation and convergent evolution**

- a. To understand the molecular and evolutionary basis that govern plant-abiotic interactions in arid environments, our main goal is to analyze existing whole-genome sequence data to identify genes and genome features involved in tolerance to extreme conditions, exploring the molecular mechanisms involved in adaptation and development.
- b. Use comparative genomics to further look into convergent evolution in extreme environments and associate an organism's phenotype and local environmental variables with the genotype and genomic regulation using transcriptomics.
- c. We have sequenced 114 metagenome-assembled genomes (MAGs) and a collection of 112 isolated bacteria from the Atacama Desert. We need more exhaustive sampling to collect additional bacterial populations to address the role of specific bacterial groups in promoting plant growth in nutrient poor, arid environments.
- d. We will also study microbial local adaptation in Atacama to infer evolutionary history, and unveil genetic novelty and new phenotypes, which appear through adaptation over gradients.

### **2. Interaction networks that govern genome structure in communities of organisms**

- a. Sophisticated data analysis, mathematical modeling and systems biology have allowed us to make descriptions of unique ecological niches. By adding functional and causal elements, we aim to understand how networks of organisms are influenced by environmental change. We will take advantage of our unique data collections in environmental gradients combining metagenomics and abiotic factors in a heterogeneous manner to find quantitative relationships between the distributions of organisms, their metabolic and gene regulatory functions.
- b. Using genomic co-occurrence and phage-bacteria infection networks, we will define taxonomic, functional and environmental interactions in Atacama biotopes and in Antarctic marine



ecosystems. We will determine microbial/viral beta-diversity/biogeographic patterns consistent with distance-decay relationships, and genetic and taxonomic niche-partitioning.

### 3. Genomics for conservation, ecosystem health and sustainable food production

- a. Conservation action plans and assessments are often considered at the species-level. Through genomics, we can provide a more accurate estimation of biodiversity and detect SNPs involved in local adaptation to specific environmental conditions, which can be incorporated into models for species distribution range under scenarios of climate change.
- b. Genetic and genomic tools can elucidate the mechanisms that control commercially important characteristics of fruit crops by integrating omics and phenotyping data. We will further integrate the phenotype and the information gathered at different omic levels under controlled conditions for crops and plants grown in extreme environments to understand the metabolic pathways involved and their regulatory networks.
- c. The main disease affecting salmon in Chile is piscirickettsiosis, whose etiological agent is the intracellular bacterium *Piscirickettsia salmonis*. We study both the molecular mechanisms underlying the fish response to infection and the mechanisms employed by the bacterium to parasitize its host cell. We aim to increase the basic knowledge behind the physiological and molecular aspects of the *P. salmonis* life cycle that are responsible for its pathogenicity. Since *P. salmonis*, *L. pneumophila* and *C. burnetii* use similar pathogenic mechanisms, studies on *P. salmonis* will not only contribute to expand the knowledge of the biology of this bacterium but also with bacteria of clinical relevance.
- d. We aim to improve the stability of molecules such as pigments, exopolysaccharides, toxins, osmoregulators, antibiotics, antivirals from cyanobacteria which have potential biotechnological applications in the food, pharmaceutical, bioenergy and other industries, to search for genes associated with novel biologically active compounds and to modulate exopolysaccharides syntheses to produce bioethanol by fermentation in extremophile cyanobacteria.
- e. We aim to reveal an association between bacterial communities and antibiotic resistance from seawater of coastal areas of Chile with high density of salmon farms. We apply metagenomics (culture-independent) and phenotypic (culture-dependent) methods to evaluate the bacterial community's risk for antibiotic resistance, and to study whether human – influenced environment can potentiate bacteria to adapt to environmental stresses, such as antibiotics.

a) **Organization of research teams:** Although our researchers participate in and belong to a wide variety of research initiatives, including other Millennium Institutes and Research Centers (*see Section 5*), and despite encouraging collaborative work within and among research groups, we can nonetheless identify three research groups, represented by our research lines. The “**functional genomics of adaptation and convergent evolution**” research group is led by our Director, Miguell L Allende Connelly. This research group includes two additional Associate Researchers, our Deputy Director, Juliana de Abreu Vianna and Rodrigo Gutiérrez Ilabaca, as well as three Adjunct Researchers and several postdocs. Our “**interaction networks that govern genome structure in communities of organisms**” research team is led by Alejandro Maass Sepúlveda and includes 2 additional Associate Researchers, Beatriz Díez Moreno and Mauricio González Canales, as well as three Adjunct Researchers and their postdocs. Alejandro Maass also works in the Center for Mathematical Modelling (CMM), Beatriz Díez collaborates with the Anillo Antártico Project: Long-range transport of xenobiotics and microorganisms, and Mauricio González works at the Institute of Food Nutrition and Technology of the University of Chile. Finally, the “**genomics for conservation, ecosystem health and sustainable food production**”

team is led by Ariel Orellana López, who is the current Director of the Center for Plant Biotechnology at Universidad Nacional Andrés Bello (UNAB), and includes 2 additional Associate Researchers, Romina Pedreschi Plasencia and Verónica Cambiazo Ayala, as well as four Adjunct Researchers and several postdocs.

### **3. Scientific and technological research**

#### **3.1 Current status of research lines**

Since our establishment in 2022, our research lines have remained the same and we have not felt the need to amend or change the three main strategic lines of research that constitute the framework of our Institute. All three of our research lines employ innovative and cutting-edge technology to deliver worldclass results, on par with other scientific centers of excellence. These research lines are detailed below.

##### **1. Functional genomics of adaptation and convergent evolution**

This line of research mainly focuses on discovering the molecular and evolutionary basis of plant-abiotic interactions in arid and other extreme environments. With this research line the IM CGR also seeks to identify genes and genome features involved in the tolerance to extreme conditions by analyzing existing whole-genome sequence data, as well as understand convergent evolution in extreme environments. In addition, we aim to study microbial adaptation in Atacama to infer evolutionary history, unveil genetic novelty and new phenotypes.

Studies developed under this research line include “**DNA sequencing in the classroom: complete genome sequence of two earwig (Dermaptera; Insecta) species**”, In what constitutes a first for Chile, in this study several MI CGR researchers worked closely with school-age students to select the species, collect the specimens, carry out the morphological descriptions, as well as carry out the genetic sequencing, and process the data. In section “*c) Outstanding publications*” (below) we go into more detail about this study. Another investigation developed in this research line includes “**Characterization of the signalling pathways involved in the repression of root nitrate uptake by nitrate in *Arabidopsis thaliana***”. The results showed that the nitrate transporters NRT2.4 and NRT2.5 are subjected to repression by NRT1.1-mediated NO<sub>3</sub><sup>-</sup> sensing, and not to feedback repression by reduced N metabolites. Additional results led the authors to propose a regulatory model for high-affinity NO<sub>3</sub><sup>-</sup> uptake in *Arabidopsis*, highlighting several NO<sub>3</sub><sup>-</sup> transduction cascades downstream of the phosphorylated form of the NRT1.1 transceptor.

##### **2. Interaction networks that govern genome structure in communities of organisms**

This line of research aims to understand how networks of organisms are influenced by environmental change. By adding functional and causal elements to sophisticated data analysis, mathematical models, and systems biology, we can describe unique ecological niches. Data on environmental gradients, combined with metagenomics and abiotic factors in a heterogeneous manner, can uncover quantitative relationships between the distributions of organisms, their metabolic and gene regulatory functions in extreme environments such as the Atacama biotopes and Antarctic marine ecosystems. With this research line we also aim to determine microbial/viral beta-diversity, and biogeographic patterns consistent with distance-decay relationships, community turnover, and genetic and taxonomic niche-partitioning.

Studies developed under this research line include the publication “**Kanamycin treatment in the pre-symptomatic stage of a *Drosophila* PD model prevents the onset of non-motor**

**alterations**” is a great example. The results showed that the gut microbiota is different in the presymptomatic stage of a *Drosophila* model for PD, the Pink1B9 mutant fly. Indeed, there is basal dysbiosis in mutant animals evidenced by substantial difference in the composition of midgut microbiota in 8-9 days old Pink1B9 mutant flies. The data support the idea that that manipulations of gut microbiota in young animals could have beneficial effects on PD progression and age-dependent motor impairments.

Although our three Research Lines are well defined, there is some inevitable overlap between themes and our researchers have found commonalities in their research areas. The publication **“Testing the stress gradient hypothesis in soil bacterial communities associated with vegetation belts in the Andean Atacama Desert”** brought together researchers from both our RL2 and RL3 and included the collaboration of Associate, Adjunct Researchers, and a postdoc from both research lines. This sort of collaboration is exactly what we encourage at the IM CGR, and we are aware of further collaborations that will result in more publications across our Research Lines.

### 3. Genomics for conservation, ecosystem health and sustainable food production

Because of the nature of sustainable food production research, this research line is perhaps the most productive of the MI CGR and continues to grow. Studies in this line of research include: **“A multiomics integrative analysis of color de-synchronization with softening of ‘Hass’ avocado fruit: A first insight into a complex physiological disorder”**. Researchers integrated omics (transcriptomics, proteomics and metabolomics) datasets and network analysis and discovered eight transcription factors associated with differentially regulated genes between regular air (RA) and controlled atmosphere (CA) and twelve transcription factors related to avocado fruit color de-synchronization control in ready-to-eat stage. Higher contents of flavonoids, abscisic acid and brassinosteroids were associated with synchronized fruit, whereas de-synchronized fruit revealed increases of jasmonic acid, salicylic acid and auxin levels. These results represent an important discovery in this complex disorder in a crop of high economic value for Chile.

Work in this line of research also yielded the study **“Drosophila DAXud1 Has a Repressive Transcription Activity on Hsp70 and Other Heat Shock Genes”**. this work analyzes the role of Drosophila DAXud1 using Targeted-DamID-seq (TaDa-seq), which allows whole genome screening to determine in which regions it is most frequently found. The analysis confirmed the presence of DAXud1 in groups of pro-apoptotic and Wnt pathway genes. The enrichment of DAXud1 also identified a DNA-binding motif (AYATACATAYATA) that is frequently found in the promoters of these genes. Surprisingly, the analyses demonstrated that DAXud1 exerts a repressive role on these genes, which are necessary for cell survival. What is most notable from this study is that similar to the example explained above, it represents a collaboration between researchers from different research lines, in this case RL1 and RL3. These collaborations across themes are possible because of the complementary nature of our Research Lines and the shared aims of the researchers at the IM CGR.

### 3.2 Productivity

The MI CGR researchers have published 77 research articles in peer-reviewed journals, of which 54 (70%) were in Q1 journals and 17 (22%) were in Q2. This result shows an increase in our Q1 journal publications and an associated decrease in our Q2 journal publications from 2022 (63% and 27%, respectively for 2022). Our Associate Researchers published 41 research articles, while other researchers (Adjuncts and Postdocs) published 36 articles. Among the 41 articles published

by our Associate Researchers, 25% (19 publications) that were collaborative works either with other IM CGR Researchers (Associate, Adjunct Researchers, or postdoctoral researchers). This result also shows a noticeable increase in collaborative works from the previous year (17%) but we are still falling short of our collaborative works goal. Thus, most of the publications had only one MI CGR researcher (58; 75%). Nonetheless, the marked increase in collaborative publications from the previous year can be ascribed to the fact that we are now more consolidated as an Institute, our researchers have developed productive research links, as well as a sense of belonging, finding commonalities between their different areas of research, all of which has allowed for an increase in collaborative works. We are confident that collaborative works between all our researchers will continue to grow as we create and strengthen collaborations within the MI CGR.

When we look at our publications, though, we are most proud of the increase in participation of our students as co-authors in our publications, from 10% to 26%. We are very pleased with this result, as it highlights our efforts to include students in our research work and showcases the commitment to mentoring and training of the next generation of researchers. Our students will continue to make vital contributions to genomics research, and we will be proud to mentor them along the way.

### *Summary table*

<u>Category of Publication</u>	<u>MSI Center Members</u>	<u>Number of Publications co-authored by students</u>	<u>Total Number of Publications</u>
ISI/WOS Publications or Similar to ISI/WOS Standard	Principal Researchers	<u>10</u>	<u>39</u>
	Other Researchers	<u>6</u>	<u>34</u>
SCOPUS Publications or Similar to SCOPUS Standard	Principal Researchers	<u>2</u>	<u>2</u>
	Other Researchers	<u>0</u>	<u>2</u>
SCIELO Publications or Similar to SCIELO Standard	Principal Researchers	<u>0</u>	<u>0</u>
	Other Researchers	<u>0</u>	<u>0</u>
Scientific Books and chapters	Principal Researchers	<u>0</u>	<u>0</u>
	Other Researchers	<u>0</u>	<u>0</u>
Other Scientific Publications	Principal Researchers	<u>0</u>	<u>0</u>
	Other Researchers	<u>0</u>	<u>0</u>
<b><u>Total of Publications</u></b>		<b><u>18</u></b>	<b><u>77</u></b>

The articles published by our researchers are associated directly with our research lines, and similar to our previous report, most publications (48%) originated from our RL3, followed by RL2 (27%) and RL1 (25%). The total number of publications per research line are presented below:

RL1: Functional genomics of adaptation and convergent evolution: 19

RL2: Interaction networks that govern genome structure in communities of organisms: 21

RL3: Genomics for conservation, ecosystem health and sustainable food production 37

In contrast to our previous report, however, the publication output for our RL1 and RL2 are closer together. While it is difficult to determine the exact cause and effect relation for the observed

result, we can mention that the increase in collaborative works between our researchers likely contributed to a comparable research and publication output of these Research Lines.

At MI CGR we firmly believe that scientific information needs to be made accessible and available to a wide audience. To that end we strive to publish in journals that are either Open Access or opt to publish articles that are Open Access within traditionally non-open access journals. To that effect, we published 65 (84%) of our articles in either fully Open Access journals, or as open access articles within traditional or hybrid journals. When compared with our 2022 Annual Report, where 78% of our articles were published in fully Open Access journals, we are satisfied with our increase in the access to scientific information generated by the IM CGR. This result reflects our commitment to the dissemination of scientific knowledge.

### 3.3 Outstanding publications

Our researchers have many outstanding publications in the timeframe between 1 January and 31 December 2023. In particular, the article **“DNA sequencing in the classroom: complete genome sequence of two earwig (Dermaptera; Insecta) species”** deserves special mention. What makes this publication stand out is that it represents the first time in Chile that school students participated in the entire process from data collection to genetic analyses, and publication. We were very impressed with the enthusiasm with which students wanted to be involved in each of the stages, from selecting the species, the collecting the specimens and carrying out the morphological description, the sequencing technique, and processing the data. Sequencing the earwig genome, in addition to providing genomic information, allowed us to learn about biological aspects associated with their reproduction and their ecological role and impact on agroecosystems. Upon publication, all the students were included as co-authors – another first for Chile. This publication represents a collaborative effort not just with students, but among seven of our researchers, including the IM CGR Director, Miguel Allende, three Associate Researchers, one Adjunct, and two postdocs. The collaborative effort that made this publication possible reflects the type of research we promote within the center, and the culture of cooperation we like to encourage.

**“A multiomics integrative analysis of color de-synchronization with softening of ‘Hass’ avocado fruit: A first insight into a complex physiological disorder”** published in Food Chemistry, also deserves special attention. In this study, three researchers affiliated with the IM CGR – one Associate Researcher, one Adjunct Researcher and one postdoc (R. Pedreschi, C. Meneses, and G. Nuñez-Lillo, respectively) collaborated and devised a comprehensive methodology to integrate data sourced from diverse omics platforms. Furthermore, they offered pioneering insights into a multifaceted physiological disorder affecting Hass avocados, a condition linked to significant food wastage. Because fruit color and firmness guide consumer purchase, when color is de-synchronized with firmness, it contributes to fruit losses during marketing. Due to its global significance, for this study distinguished researchers from Spain, Belgium, and Peru also contributed to this research accomplishment, enhancing the applicability of the results and international recognition.

Finally, during 2023 the group led by Alejandro Maass continued to investigate aspects of the metabolism of microbial communities with a focus on understanding the question: how the community determines which fluxes to use given an environmental condition in the article **“Unveiling abundance-dependent metabolic phenotypes of microbial communities”**. Starting from the assumption that in nature essential biological functions not directly related to cell growth, force communities to show suboptimal growth rates, it is crucial to look for how these states are

fixed. These suboptimal states allow a certain degree of plasticity in their metabolism, thus allowing rapid shifts between alternative flux distributions as an initial response to environmental changes. In this publication Dr. Maass and colleagues introduce the abundance-growth space as a representation of the metabolic phenotypes of a community. This space is defined by the composition of a community, represented by the relative abundances of its members, and its growth rate. Analysis of this space allows us to pinpoint how critical reactions respond to changes in the environment, showing where changes in community plasticity occur. Interestingly, it highlights the relevance of the relative abundance of its members in the loss or gain of plasticity.

### 3.4 Congress Presentations

From 1 January to 31 December 2023, our researchers presented their work at 129 scientific events including annual meetings, congresses, conferences, seminars, and workshops, both at the national and international level. Out of the 129 events, 56 (43%) were oral presentations, and 67 (52%) were posters. These results differ somewhat with our previous Annual Report where our researchers presented at 68 conferences, but where the majority were oral presentations (72%). The increase in poster presentations may be due to the higher student participation in conferences in 2023 compared to 2022 (22% in 2023, compared to 10% in 2022). Students typically prefer a poster format due to a lack of experience with oral presentations, or a language barrier.

For their presentations our researchers and students traveled to Germany, Saudi Arabia, Argentina, Canada, Colombia, Denmark, Spain, United States, France, the Netherlands, Italy, Mexico, and Poland, as well as to many different regions within Chile. This year our researchers and students participated heavily in national scientific events with 83 (63%) presentations in conferences, seminars and workshops across Chile. The reasons for this high national participation are varied, and include costs of travelling abroad, as well as many international conferences being held locally in Chile. The audience at these conferences included other academics interested in the MI CGR's research lines, as well as graduate and undergraduate students, members of industry, the private and public sector. Our researchers also gave 13 invited talks – 12 (92%) at international events and one (1%) at national conference. Compared to 2022, our researchers were invited speakers at the same number of events as in 2023, but most of the talks in 2022 (62%) were at national conferences. This result highlights the importance of the work our researchers carry out on the international stage.

Among the presentations we would like to highlight is the “Integrated approach for a better harvest and postharvest management and technologies”. Our Associate Researcher Romina Pedreschi gave this talk as an Invited Speaker at **the Inaugural Conference at the Global Conference on Sustainable Agricultural Mechanization. Food and Agriculture Organization of the United Nations – FAO in Rome, Italy**. Dr. Pedreschi participated as an expert in postharvest physiology and technology of fruits and vegetables, and her talk focused on sustainable agricultural mechanization from farm to fork, which exemplifies the significant engagement of a specialist in addressing crucial global challenges necessitating evidence-based policymaking. Similarly, our Associate Researcher Beatriz Díez gave the Keynote Speech at the opening of the Latin American Congress of the International Society for Microbial Ecology, in Buenos Aires, Argentina. Her talk titled **“Chile Bay Observatory: 10 years of Antarctic marine microbiome studies ”** highlighted the importance of carrying out long-term research and monitoring programs in regions like Antarctica. The selective pressures in the region, such as extreme low temperatures, high UV radiation, and physical isolation allow it to be a “natural” laboratory for the study of the unique adaptations of microbes (bacteria, viruses, and fungi).

*Summary Table*

Type of presentation	Type of presentation	National Events [Number]	International Events [Number]
Principal Researchers	Conferences, oral communications, poster communications, others (specify)	5	37
	Invited presentations (not included in the above row)	1	10
Other researchers (Adjunct, Senior, Young, Postdoctoral Researchers)	Conferences, oral communications, poster communications, others (specify)	2	45
	Invited presentations (not included in the above row)	0	2
Students	Conferences, oral communications, poster communications, others (specify)	4	23
	Invited presentations (not included in the above row)	0	0

**3.5 Other achievements**

- **Patents:** Nothing to report during the period between 1 January to 31 December 2023.
- **Intellectual property:** Nothing to report during the period between 1 January to 31 December 2023.
- **Organization of Scientific Events**

The full list of the scientific events the IM CGR organized can be found in *Annex 4* below. We can highlight the **11<sup>th</sup> International Penguin Congress** as largest scientific event our researchers help to organize during 2023. Held from 4 to 9 September, the congress marked the first reunion of the world's penguin experts after the COVID pandemic. Our Deputy Director, Juliana Vianna, was a key member of the organizing committee, and together with her team of postdocs and students helped to welcome **over 250 attendees and presenters from 16 countries**. The congress highlighted the importance of penguin research, because despite conservation efforts, concerns remain about how these birds will fare in a world with a warming climate. While most populations are likely to survive, their chances could be improved if humans protect and connect habitats in a few places where penguins can thrive. The congress also hosted a series of social activities aimed towards developing and strengthening researcher collaborations.

In 2023 the IM CGR continued to strengthen its “Interactomics” Seminars. This year we hosted seven seminars, which contrasts with 2022 when we could only host two. This year we also had an international presenter, **Jacek Wierzchos of the National Museum of Natural**

**History and the Spanish National Research Council (CSIC) of Madrid, Spain.** Our seminars are held mostly in hybrid format (in person and digital format) allowing for a wide audience to attend and engage with presenters. Interactomics seminars allow researchers to disseminate the results of their research and strengthen collaborative bonds with other researchers and institutes.

One final scientific event we would like to highlight is the Symposium “**A look at genomic patterns of speciation, hybridization and adaptation in southern hemisphere vertebrates**” during the joint annual meetings of the e Genetics Society of Chile and the Chilean Society of Evolution. Held in Talca, this joint annual meeting convenes researchers from many regions in Chile as well as international speakers. What stands out the most about this Symposium, however, is that it was organized by then PhD candidate Daly Noll. The Symposium included talks on fish, mammalian, and avian genetics, and was followed by a roundtable discussion with the speakers. The Symposium was considered a great success and an important contribution in the area of vertebrate genomics.

#### ▪ **Scientific Editorial Boards**

Five of our Associate Researchers and one Adjunct Researchers are part of the editorial boards of nine scientific journals, all of which are ISI/WOS or Similar a ISI/WOS standard, and are Q1. A few are detailed below, and you can find the full list of Researchers and the editorial boards they are a part of can be found in the summary table.

- a. Romina Pedreschi has been on the editorial board *Postharvest Biology and Technology* since 2016. This journal is devoted to the publication of original papers, review articles and frontiers articles on biological and technological postharvest research of horticultural crops including fruit, vegetables, grapes, flowers, tea and nuts, but excluding grains.
- b. Alejandro Maass has been on the Scientific Editorial Board of *Discrete and Continuous Dynamical Systems* since 2019. This journal publishes peer-reviewed original papers on the theory, methods and applications of analysis, differential equations, and dynamical systems, and is committed to recording important new methods and results in its field.
- c. Rodrigo Gutiérrez is on the editorial board of three scientific journals: *The Plant Cell* (since 2018), *Molecular Plant* (since 2017), and *Journal of Experimental Botany* (since 2010). The *Plant Cell* and *Molecular Plant* publish novel research of special significance in plant biology, especially in the areas of cellular biology, molecular biology, physiology, biochemistry, genetics, and plant-microbe interaction. In contrast the *Journal of Experimental Botany* publishes advances in plant biology, focusing on fundamental processes underpinning the improvement of plants for the sustainable production of food, fuel and renewable materials.
- d. Our Adjunct Researcher, Claudio Latorre, is on the editorial board of *Quaternary Science Reviews* since 2022, and of the *Climate of the Past* journal since 2021. The scope of *Quaternary Science Reviews* includes geology, geomorphology, archaeology, soil science, palaeobotany, palaeontology, palaeoclimatology, and it also considers the results of ancient DNA analyses. In contrast, *Climate of the Past* focuses on all temporal scales of climate change and variability, from geological time through to multidecadal studies of the last century.



***Editorial Boards***

N°	Publication	Publication Category	Member(s) of the Editorial Board	Start (year)	End (year)
1	Discrete and Continous Dynamical Systems	ISI/WOS	Alejandro Maass Sepúlveda.	2019	
2	Quaternary Science Reviews	ISI/WOS	Claudio Latorre Hidalgo.	2022	2028
3	Climate of the Past	ISI/WOS	Claudio Latorre Hidalgo.	2021	2024
4	Frontiers in Plant Sciences	ISI/WOS	Ariel Orellana López.	2012	
5	The Plant Cell	ISI/WOS	Rodrigo Gutiérrez Ilabaca.	2018	
6	Molecular Plant	ISI/WOS	Rodrigo Gutiérrez Ilabaca.	2017	
7	Journal of Experimental Botany	ISI/WOS	Rodrigo Gutiérrez Ilabaca.	2010	
8	Postharvest Biology & Technology	ISI/WOS	Romina Pedreschi Plasencia.	2016	
9	Biological Research	ISI/WOS	Verónica Cambiazo Ayala	2014	2024

- **Awards**

In June of 2023, Associate Researcher Ariel Orellana, was named Visiting Fellow of Magdalene College, Cambridge University. This distinction was bestowed upon Dr. Orellana in recognition of his outstanding research and teaching achievements. A Visiting Fellowship is intended to offer an established scholar an opportunity to pursue their own study and research as a member of the College. Dr. Orellana's main field of research is the biosynthesis of plant cell wall polysaccharides, and the genomics and proteomics of fruits and plants living under extreme conditions. This award further strengthens collaborative links between the MI CGR and prestigious institutions such as Cambridge University.

Alejandro Maass, Associated Researcher of the MI CGR, was named Fellow Ambassador at France's National Agency for Scientific Research (CNRS). Fellow Ambassadors are renowned figures and eminent scientists from around the globe. Similar to "Visiting Professors", the Fellow Ambassadors program aims attract world-class scientists and energize French research. Ambassador Fellows are invited upon proposal of CNRS Institutes and commit to spending at least one month per year over a period of three years in one or more French laboratories. The goal is that this long-term association makes these high-caliber researchers more accessible and willing to work and interact with French researchers on cutting edge science and develop new approaches to research.

MI CGR Adjunct Researcher Claudio Latorre was incorporated as a Corresponding member of the Chilean Academy of Sciences. The current President of the Academy highlighted the importance of Dr. Latorre's appointment, noting that "his experience and knowledge in the area of paleoecology are an invaluable contribution to the development of science in Chile and the world, both for his research and for the students he has helped to train". With his appointment, Dr. Latorre became the third member of the IM CGR to be incorporated into the prestigious Academy, joining our Director, Miguel Allende, and Alejandro Maass.

## **4. Education and Capacity Building**

### **4.1 Education, Training and Capacity Building**

Perhaps our most enduring legacy as a research institute is the mentoring of young researchers. Students are an integral part of the work we do at the IM CGR, and they participate in all aspects of research from generating hypotheses, through experimental design, data collection and analysis, and writing and publishing manuscripts. During our 2023 the MI CGR researchers mentored 111 students - 58 doctoral, 15 master's, and 38 undergraduate students (*for detailed information see Annex 5*). Similar to last year's results, we mostly host PhD and undergraduate students, while Master's students make up the smallest percentage of the Institute's students. The reason for this likely has many causes behind it, but one explanation is the comparative short length of master's programs when you consider the time required to carry out a robust genetic research program. It is perhaps the longer duration of a doctoral program that accounts for the notably higher number of PhD students. A four year program allows students to carve out a research project from hypothesis to data analysis, with enough time to experiment with different techniques, experimental design, and data analysis.

Students receive financial support through Millenium Institute funds, and this year 20 (18%) of students were fully or partially supported by Millenium Institute funds. We are fortunate that in addition, our students can rely on the researcher's external sources of funding, and the remaining 93 students are supported through external funding including FONDECYT, Anillo Projects, as well as other national and international funding schemes. And while most of our students (99; 89%) are Chilean, we have 12 students from seven different countries: Argentina, Colombia, Cuba, Mexico, Norway, Peru, and Venezuela.

We would like to highlight that our researchers are committed to helping students on the path to a career as a research scientist. Their support includes not only sharing knowledge, but also hands-on teaching regarding scientific methods and the use of sophisticated equipment. In addition, our researchers also offer career counseling, discussing with students their potential career prospects, and putting them in touch with other researchers both in Chile and overseas. Several of our researchers also maintain collaborative relationships with industry, mainly agriculture and aquiculture, and generously share those links with their students. It is our hope that all of our students will become independent researchers in the future, whether that path leads them to academia or industry.

In addition to our students, the IM CGR also hosted 41 Postdoctoral and Young Researchers. Young Researchers are those who are at the beginning of their scientific career (< 7 years after graduation), carrying out research that contributes and complements the scientific questions of the Institute. They must have a track record in research and contribute with their scientific productivity, measured through publications and presentations in scientific events, as well as contribute to fulfilling the Institute's objectives. In contrast to our previous annual report where we had more female Postdocs than male, in 2023 the trend has reversed and we have slightly more male than female Postdoctoral and Young Researchers; 24 (58.5%) Male, and 17 (41%) Female. We are still proud of the comparatively high number of female Postdoctoral and Young Researchers in the IM CGR, and we will continue promote a culture where women feel welcomed and included. Our researchers are aware of the gender bias towards males in STEM programs, and we strive to encourage women and girls to consider a career in genomic research.

## 4.2 Achievements and results

Most of our doctoral students are enrolled in the Biological Sciences PhD program, with a specialization in Molecular Biology but due to the transversal nature of genetics and genomic research, our doctoral students are also enrolled in Biotechnology, Applied Mathematics, Molecular and Neurosciences, and Nutrition and Agricultural programs. Meanwhile, our master's students are enrolled in programs that range from Nutrition and Agri-Food Sciences to Environmental Sciences and Natural Resources, as well as Biotechnology. Finally, our undergraduate students are enrolled in a wide variety of programs - from Biological to Marine Biology, Forestry Engineering, Biotechnology, and Veterinary Medicine.

Our students were also co-authors in 20 published research articles. Though that percentage (26%) is comparatively low, it shows a considerable increase from 2022 where students participated in only 4 (10%) publications. A caveat to this result, however, is the way reporting is collected in the ANID electronic system. Due to the sometimes lengthy process of scientific output (from hypothesis to published article), the electronic forms used to collect scientific productivity leave room for debate as to whether a co-author should be registered as a student at the time experiments, analyses, and the first drafts of the article were developed, or whether they should be considered a postdoctoral or young researchers, or a fellow colleague and collaborator as they were at the time of publication. We have for the most part, considered our students as fellow colleagues and co-authors if they had graduated at the time of publication.

Finally, we had 11 students who completed their theses and graduated from their respective programs: three undergraduate, two master's and six PhD's. Their theses ranged in topics from penguin phylogenomics, and gene expression in response to UVB light irradiation in fish, to the role of non-coding RNA in the homeostasis of *Enterococcus faecalis* and the genomic changes related with the adaptation to thermal environments of hot spring cyanobacteria. We also had students participate in internships. For example, Eduardo Pizarro spent three weeks at the National Museum of Natural History in Barcelona, Spain studying vertebrate evolution and adaptation. And we also had students from other countries visit our researcher's laboratories. Such was the case of Amanda Murao, a Brazilian Master's student who spent several months in Dr. Vianna's lab completing part the bioinformatics analyses for her thesis. Finally, we are proud of our student's other achievements, such as Francisca Brown, who is completing her studying her Master's degree under Dr. Alvaro Glavic's tutelage. Francisca won the Rene Cortázar Award for Best Poster at the Joint Meeting of the Genetics Society of Chile and the Chilean Society of Evolution.

## 4.3 Destination of students

Among those students who completed their degree, we would like to highlight Dr. Camilo Valdivieso, Dr. Daly Noll, and Nicolas Toro, MsC. Firstly, Camilo's doctoral research was a fascinating look at the effects of ultraviolet light on the gene expression in zebra fish. Camilo's research took him to some of the highest peaks of the Atacama Desert in search of specimens for his experiments. He found that in wild zebrafish there was no damage, unlike the mutant sebra fish line devoid of melanophores, *Nacre*, which shows inflammation and reactive oxygen species. The response in the endemic *Orestias ascotanensis*, showed an adaptive response, with phenotypic flexibility and possibly transcriptomic plasticity. The results highlight melanophores as the protective pigments for UVB light. Moreover, Dr. Valdivieso proposed molecular markers of response to this stressor and was able to test a non-model organism for the response to UVB light.

Camilo is now a Young Reseracher within Dr. Allende’s laboratory where he continues to advance research in this area, contributing to the Institute’s RL1.

For her part, Dr. Daly Noll looked at the ecological and genomic divergence of gentoo penguins driven by their adaptation in contrasting Southern Ocean environments. Under the mentorship of our Deputy Director, Dr. Juliana Vianna, Dr. Noll sequenced the genomes of 64 individuals of gentoo penguins distributed in 10 colonies around the Southern Ocean. The results showed high levels of divergence between the mitogenomes of four lineages, detecting specific substitutions for each of the four lineages. Although purifying selection was found to be the main force that acts on mitochondrial genes, positive selection signals were detected in codons of mitochondrial Complex I (NADH) genes. Dr. Noll’s work contributes to understanding the taxonomy of gentoo penguins, facilitating conservation efforts, thus adding to the evolutionary, molecular genomic, biogeographic knowledge of the Southern Ocean and the potential future consequences of climate change for biodiversity. Upon finishing her PhD, Dr. Noll successfully applied for a FONDECYT Postdoctoral Research Fellowship, and in early 2024 began her work in Dr. Allende’s research group where she will carry out studies relevant to the IM CGR’s objectives for the next three years.

Finally, Nicolas Toro graduated from his Master’s program in December 2023. Applied Mathematics was his field of study under the tutelage of our Associate Researcher Dr. Alejandro Maass. For his thesis “Studying the relationship of biotic and abiotic processes in the ocean biome from the point of view of genomic regulation using mathematical modeling and Machine Learning techniques” Nicolás applied advanced machine learning techniques to understand the genomic regulatory processes of marine microbial ecology. Upon finishing his degree, Nicolas enrolled in the doctoral program in Applied Mathematics, and is now PhD candidate with Dr. Maass. His research will continue to contribute to the IM CGR aims, particularly to RL2.

## **5. Networking and other collaborative work**

### **5.1 Formal collaborative networks:**

We are part of nine formal collaborative networks that allow room for mutual contributions, shared goals, and complimentary lines of research. These formal collaborative networks have clear tasks and aims outlined in agreements between the IM CGR researchers and the leading institute(s) of the collaborative network. We highlight four of them here (*for the complete list see Annex 6.1*):

- **1000 Genomes Project Chile**

The IM CGR Director, Miguel Allende, is the founder of 1000 Genomes for Chile, a research initiative created with the aim to sequence 1000 Chileans and 1000 Chilean plant and animal species. However, with the advancements in genomic science and the ease with which it is possible to sequence 1000 organisms today, the program lost traction with researchers. In late 2023 IM CGR researchers got together to re-launch the 1000 Genomes Project (*see section 6. Other Achievements*), by redefining project objectives to better reflect national priorities and knowledge gaps in genetics. The current objective of the 1000 Genomes program is to sequence the genome of 1000 native, endemic, endangered species or of endangered and of unique Chilean ecosystems to create a large genetic library in Chile, and to allow this repository serve as the basis for further research. The project is a collaborative effort between the IM CGR and other Centers of Excellence that carry out frontier research in biomedicine, genomics, and processing of large volumes of genomic data. Through this collaborative effort they aim to face a major scientific challenge that is relevant for Chile’s development.

Complementing our experience in various disciplines, the project has initiated an ambitious plan to discover the genome sequence of Chilean organisms, including animals, plants, microbes. While the IM CGR is the leading Institute of this collaborative network, the aim is for all Centers to contribute their expertise in compliance with FAIR (Findable, Accessible, Interoperable, and Reusable) standards, and for information to be public, within the reasonable constraints of industry partners. Formally relaunched in January of 2024, the 1000 Genomes Initiative is the first of its kinds in Chile, and we are confident it will make a lasting contribution to genomic science in Chile.

- **Earth Biogenome Project**

Launched in 2018, the Earth BioGenome Project (EBP) aims to sequence, catalog and characterize the genomes of all of Earth's eukaryotic biodiversity over a period of ten years. The project is divided into three large phases of approximately 3 years each. In Phase I one of the most important goals is to create annotated chromosome-scale reference assemblies for at least one representative species of each of the ~9,000 eukaryotic taxonomic families. Our Director, Miguel Allende, is a member of the EBP and through him both the IM-CGR and the 1000 Genomes Project Chile are included as members/partners of the initiative.

- **Mission Microbiomes**

The Foundation TARA Océan is developing an innovative open science initiative which will enable better planning for the impact of climate change. The schooner *Tara* is a floating laboratory that has already covered more than 570 000 km since 2003, stopping in more than 60 countries. Tara Océan has launched seven "Expeditions", one of which is **Mission Microbiomes** in four key stages: Chile, the Amazon, Antarctica, and Africa. It aims to understand the invisible life of the ocean to answer three key questions:

- How does climate change disrupt ocean currents and the distribution of the marine microbiome?
- What impact does pollution and particularly microplastics have on the marine microbiome?
- How does the land fertilise the ocean?

- **SymbioDiversity - Associated team France-Chile**

An initiative led by the French National Institute for Research in Digital Science and Technology (INRIA), the associated SymBioDiversity team works with massive data on microbial biodiversity. The project coordinators are Anne Siegel of the DYLISS project team at the Inria Center of the Université de Rennes, and the MI CGR Associate Researcher Alejandro Maass. The SymBioDiversity - Symbolic and Data Mining and Exploration of Functional Biodiversity began in 2020 for a duration of four years. Through a combination of data mining, reasoning and mathematical modeling, this team aims to develop approaches for the analysis of microbial diversity in extreme environments, as well as to characterize the functional landscape of these ecosystems.

## 5.2 Other collaborative Networks

The MI CGR has developed partnerships and collaborations with other research organizations and institutions, a few are listed below. Our Deputy Director, Juliana Vianna and our Associate Researcher Rodrigo Gutiérrez work in close collaboration with the Millennium Institute Biodiversity of Antarctic and Subantarctic Ecosystems (IM-BASE) and the Millennium Institute

for Integrative Biology (IM-iBio), respectively. A full list of other collaboration networks can be found in *Annex 6.2*.

- **The Center for Mathematical Modeling (CMM)** based at the University of Chile is a national leading scientific center for research and applications of mathematics. It aims to create new mathematics and use it to solve problems coming from other sciences, the industry, and public policies. Created in 2000 with the support of FONDAP, the CMM has contributed to the innovation and solution of public and industrial problems in areas where mathematical modeling has shown to be essential. Our Associate Researcher Alejandro Maass is an active member of the CMM, through which Dr. Maass has carried out not only pioneering research and complex data analyses, but also outreach activities such as workshops and seminars.
- **Millennium Institute of Integrative Biology (IBIO)** is a Millenium Institute established in 2017 which seeks to identify molecular mechanisms of organismal responses to environmental change and assess the effect of environmental signals on interspecies dynamics, among other objectives. Our Associate Researcher Rodrigo Gutierrez is the Deputy Director of the IBIO and because our two institutes have complementary research lines, collaborations between our researchers, and students have occurred naturally. We share information, resources, results, and co-fund young researchers in areas such as genomics and ecology. We also co-host scientific seminars, such was the case of Dr. Andreas Wagner, from the University of Zurich, who delivered a much talked-about seminar on antibiotic resistance.
- **Society for Molecular Biology and Evolution (SMBE)** is an international organization that facilitates the association and communication among molecular evolutionary biologists and to further the goals of molecular evolution. During the 2023 SMBE Annual Meeting our Deputy Director, Juliana Vianna, was appointed to the SMBE Council. As well as provide guidance for the completion of SMBE's goals, and help coordinate the Society's Annual Meeting, workshops on important, focused topics, and reviews applications for awards and honors bestowed by SMBE. Finally, Juliana will also participate in the oversight of the Society's two peer-reviewed journals: Molecular Biology and Evolution and Genome Biology. As a member of the SMBE Council of Dr. Vianna actively contributes to further the IM CGRs goals, in particular to RL1.

## **6. Outreach and connections with other sectors**

### **6.1 Outreach**

In 2023, the IM CGR researchers appeared in no less than 17 articles and interviews, both nationally and internationally, and organised nine outreach activities specifically designed and geared towards the general public and/or a non-academic audience. Here we would like to comment on a few of these outreach activities:

The **Workshop on Genomic Biodiversity in Extreme Environments**, held in San Pedro de Atacama from September 30 to October 6, 2023, was of great importance. Organized by the IM CGR, this workshop brought together national and international researchers and students with the purpose of studying the unique biodiversity of the Atacama region. Several of our Associate Researchers – Miguel Allende, Juliana Vianna, Beatriz Díez, Claudio Latorre, and Mauricio González – actively participated in the course development and implementation. The workshop was divided into three main parts: theoretical lectures, field trips, and laboratory analysis. The

theoretical lectures provided a solid foundation in genomic concepts, while the field trips allowed participants to collect samples in natural environments, enriching their understanding of local biodiversity. A highlight was the presence and participation of researchers and students from the University of Cologne in Germany, which fostered international collaboration and knowledge sharing. The workshop also had a positive impact on the local community, with science outreach activities conducted in local schools, and students from San Pedro and Toconao schools actively participating in sample collection and data analysis. This event reflects the CRG's commitment to innovative research and knowledge dissemination.

While the Genomic Biodiversity Course was by far our most ambitious outreach activity, IM CGR also **Science Week** activities. Since 2018, Chile has commemorated the National Day of Science, Technology, Knowledge and Innovation on the first Sunday of October. To further promote scientific learning, the **Science Festival or Science Week**, was held from October 1 to 8, 2023 throughout the country. Science Week is promoted by the Ministry of Science and ANID to encourage scientific learning, and includes talks, demonstrations, even theatre and dance presentations, all in the name of science. With more than 150 activities throughout Chile which seek to encourage curiosity, enthusiasm, and appropriation of knowledge in large audiences and audiences. With the aim to strengthen our commitment to Science Communication and the training of young researchers we participated with activities in three regions (Araucana, Antofagasta and Metropolitan regions) **with speakers and science outreach stands and the collaboration of more than 30 volunteers nationwide**. The science outreach teams talked with families, adolescents, and children about the scientific work IM CGR developed in Antofagasta, Universidad del Frontera, and schools in Santiago. We also joined the "**Antarctic Science Week**", sharing our researchers experiences of Antarctic science, including research on invertebrates, mollusks and birds, and accompanied by beautiful and charismatic images of penguins, whales and native plants. Attendees were able to ask questions and resolve concerns about life in extreme environments.

We would also like to highlight a few of the interviews and articles about our researchers published in local media. In particular, the naming of our **Associate Researcher Rodrigo Gutiérrez** as one of the world's leading scientists. In an interview for the highly rated national news media 24 Horas Dr. Gutierrez mentioned some of his career highlights to be considered among world's best biologists and biochemists. Dr. Gutierrez and his team use systems biology approaches to understand the mechanisms that regulate the response of plants to environmental nutritional signals, and pioneered the combined use of classical experimental biology, functional genomics and bioinformatics approaches to unravel the molecular mechanisms of plant form and function. The recognition of Dr. Gutierrez's accomplishment and innovative research techniques at the international scale reflects the calibre of researcher of the IM CGR. Similarly, in an interview with the national newspaper El Mercurio, Chile's highest ranking national newspaper **Associate Researcher Dr. Ariel Orellana** gave insights on the use of biotechnology as an innovative tool to revolutionize waste valorization. From transforming walnut shells into a food preservative, combining biotechnology with an ancient Japanese technique to generate a fertilizer, applied research can transform challenges into opportunities. The wide audience of El Mercurio generated interest among the general public for the innovative biotechnology research carried out by the IM CGR, and highlighted the practical applications of the research we do, particularly of our RL3. For a full list of media participation see *Annex 7*.

## 6.2 Connections with other sectors

In *Annex 8* there is a list of specific connections the IM CGR has with other sectors. For example, our Associate Researcher Mauricio González holds long-standing collaborative links with the agricultural industry. In addition to his individual connections within academia and industry, he also provides professional support in the form of biotechnological solutions for the agriculture industry, through Diganofast, a solutions-based company based in Chile. There is no monetary cost to the IM CGR associated with this collaboration, and Dr. Gonzalez's role is that of scientific and technical advisor, which requires his oversight on processes and techniques used for the service of the biotechnology and agricultural industries.

Similarly, Dr. Ariel Orellana is the Vicepresident of the UC Davis Chile Life Sciences Innovation Center, an appointment he will hold until 2026. This center aims to develop and transfer knowledge and innovative technologies that promote the sustainability and productivity of the agriculture industry and develop marketable bioproducts that contribute to the development of a more sustainable agriculture, among others. Dr. Orellana's role is to Supervise the development of the Life Sciences Innovation Center in Chile, providing scientific guidance as well as on occasion acting as a liaison between the Innovation Center and Chilean universities and agricultural companies. The role requires quarterly meetings to assess and review the Center's annual plan and to make adjustments and suggestions as deemed necessary.

Our Associate Researcher Veronica Cambiazo also holds many links with the aquiculture, mainly salmon farming, and agricultural industry in Chile. Dr. Cambiazo specializes in the Detection of Genetically Modified Organisms (GMO), a role well suited to her extensive knowledge of genomic science. The process consists of a qualitative analysis to detect the sequences most commonly used in the generation of genetically modified organisms. In industry, it is important to detect the presence of GMO because it is critical that consumers be able to exercise their choice of whether to consume, or not, food containing GMOs. Furthermore, Dr. Cambiazo also carries out sampling of fish farms and microbiological isolation of fish pathogens. These types of sampling of the microbial community in fish farms provide insights into the hygienic conditions of the farm's aquatic environment. Since water quality and fish diseases are closely linked, this work helps to identify the pathogens present, leading to quick actions to mitigate the spread of harmful microorganisms and their diseases.

These high value services to industry are just some of the examples of the many practical applications of genomic science. At the IM CGR we are committed to disseminate knowledge at all levels of society, and our engagement with industry is merely one of the many ways we endeavor to share the technical innovations in our field of study.

## 6.3 Other achievements

Discussions held during the San Pedro de Atacama Genomic Biodiversity Field Course (see *section 6.a.* above) led to the decision to formally relaunch the **1000 Genomes Project**. This initiative aims to sequence Chilean native, endemic, and endangered flora and fauna, as well as the microorganisms in unique Chilean ecosystems. While the official relaunch of the 1000 Genomes Project occurred in early 2024, the decision to relaunch the project, the meetings, conversations, gathering support, and other activities related to the project all occurred in the last half of 2023. This type of initiative showcases the importance of bringing together our researchers from the different regions in Chile and giving them the opportunity to brainstorm, explore opportunities, and plan future collaborations in a semi-structured environment where ideas can be



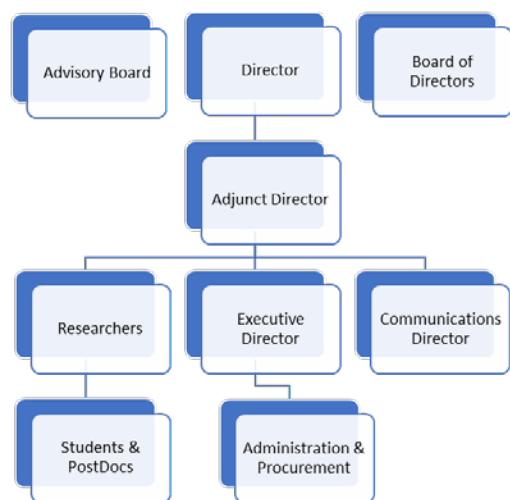
assessed and constructively criticized in a short period of time. We are excited to see 1000 Genomes contribute to the long-term goals of the IM CGR for years to come.

## **7. Administration, Governance and Financial Status**

### **7.1 Organization and administration**

During 2023 the MI CGR was able to operate as a consolidated, independent organization. We held the four official Board of Directors meetings as mandated by our charter. During these meetings we proposed several ideas to streamline specific aspects of our internal governance, in particular the creation of thematic committees which will handle Funding, Ethics, and Personnel/Legal aspects within the Institute. We also applied non-for-profit donor recipient status under Chilean Law No. 21440. Our application was approved in early 2024.

Our administrative and technical assistant staff grew from 39 to 58 staff members compared to 2022. We hired a much-needed Communications Director, who has helped us transmit our results and engage with both academic and non-academic audience through a diverse series of events, publications, interviews, among other activities. We would also like to highlight that we have a marginally higher number of women than men employed as administrative personnel or technicians in our labs (30 women versus 28 men). This result makes us particularly proud as we are committed to foster a culture where women are encouraged to consider careers in STEM.



Category	Female	Male	TOTAL
Assistant & Technicians	28	26	54
Administrative Staff	2	2	4
<b>TOTAL</b>	30	28	58

### **7.2 Financial Status**

The MI CGR financial year begins on 1 July, when it receives the financial contribution from the Millenium Science Initiative (MSI). This fact makes financial reporting on based on calendar year (From January to December) somewhat complicated. On 1 January 2023, we had \$571,267,344

CLP (approx. \$642,675 USD) from our previous fiscal year, which was spent in its totality by 30 June 2023 as required by MSI. We received our year 2 financial contribution from the MSI in late July 2023 (\$840,000,000 CLP, approx. \$1,050,000 USD) of which we spent \$268,732,656 CLP (approx. \$302,324USD) by 31 December 2023. In summary, **the total amount of funds from MSI** for the reported period between 1 January and 31 December 2023 for the MI CGR is **(\$840,000,000 CLP, approx. \$1,050,000 USD)**. In addition, the MI CGR received additional funds through FONDECYT for 23 research projects, as well as funding from two ANID Exploration Funds and Tara Project Funding from the French government, among others. The total yearly amounts per project were adjusted for the reported period, yielding **a total of \$422,883,280 CLP (approx. 475,946USD) for 2023**, making up 35% of the total expenditure by the IM CGR (See Annex 9).

The outflow structure for the reported period shows that most of the MI CGR budget was spent on researchers', students', and research assistants' salaries, partial support for publications, and contributions for attending scientific events (included in Operational Costs), among other activities.

	Description	Yearly	Monthly	Qty.	Total
Researchers	Director	\$19.200.000	\$1.600.000	1	\$ 19.200.000
	Deputy Director	\$15.600.000	\$1.300.000	1	\$ 15.600.000
	Principal Researchers	\$12.000.000	\$1.000.000	7	\$ 84.000.000
	Adjunct Researchers	\$ 4.200.000	\$ 350.000	10	\$ 42.000.000
	Postdocs	\$20.400.000	\$1.700.000	2	\$ 40.800.000
	PhD Scholarships	\$ 5.400.000	\$ 600.000	2	\$ 10.800.000
Administrative Personnel	Executive Director	\$24.000.000	\$2.000.000	1	\$ 24.000.000
	Administrator	\$18.000.000	\$1.200.000	1	\$ 18.000.000
	Finance & Procurement	\$ 7.200.000	\$ 600.000	1	\$ 7.200.000
	Communications Director	\$22.800.000	\$1.900.000	1	\$ 22.800.000
	<b>Total Personnel</b>				<b>\$284.400.000</b>
Other Costs	Equipment (from year 2 onwards)				\$ 14.000.000
	Infrastructure (from year 2 onwards)				\$ -
	General Operational Costs				\$ 40.000.000
	Administrative Costs (e.g. events, legal fees)				\$ 40.000.000
	Individual Operational Costs				\$419.600.000
	Overhead				\$ 42.000.000
	<b>TOTAL</b>				<b>\$840.000.000</b>

## **8. Annexes**

**Annex 1.- Institute / Nucleus Researchers****1. Summary Table of the Center's Researchers****1.1 Researcher Summary Table**

Category of researcher	Quantity	Average age	Nationality		Distribution Gender		
			National	International	Male	Female	Not stated
Director	1	60	1	0	1	0	-
Alternate Director	1	43	0	1	0	1	-
Principal Researcher	9	54.3	6	3	5	4	-
Senior Researcher	4	59.75	0	4	2	2	-
Young Researcher	6	33.3	6	4	4	2	-
Postdoctoral	35	37.6	38.5	2	20	15	-

**1.2 Principal Researchers**

Name	Research Line	Nationality	Gender	Date of birth dd/mm/yy	Profession	Academic Degree	Affiliation	Current Position	Relation with Center
Miguel L Allende	Functional genomics of adaptation and convergent evolution	Chilean	M	08/10/1962	Molecular Biologist	D	U de Chile	Professor	2
Juliana Vianna	Functional genomics of adaptation and convergent evolution	Brazilian	F	09/04/1979	Biologist	D	PUC	Professor	2
Rodrigo A Gutiérrez	Functional genomics of adaptation and convergent evolution	Chilean	M	30/12/1971	Biochemist	D	PUC	Professor	2
Beatriz E Díez	Interaction networks that govern genome structure in	Spanish	F	22/02/1972	Biologist	D	PUC	Professor	2

Name	Research Line	Nationality	Gender	Date of birth dd/mm/yy	Profession	Academic Degree	Affiliation	Current Position	Relation with Center
	communities of organisms								
Mauricio González	Interaction networks that govern genome structure in communities of organisms	Chilean	M	04/12/1962	Molecular Biologist	D	U de Chile	Professor	2
Alejandro Maass	Interaction networks that govern genome structure in communities of organisms	Chilean	M	11/11/1965	Mathematician	D	U de Chile	Professor	2
Verónica Cambiazo	Genomics for conservation, ecosystem health and sustainable food production	Chilean	F	06/01/1961	Molecular Biologist	D	U de Chile	Assoc. Professor	2
Ariel Orellana	Genomics for conservation, ecosystem health and sustainable food production	Chilean	M	01/12/1961	Molecular Biologist	D	UNAB	Professor	2
Romina Pedreschi	Genomics for conservation, ecosystem health and sustainable food production	Italian	F	17/08/1978	Agronomist	D	PUCV	Assoc. Professor	2

### 1.3 Senior Researchers

Name	Research Line	Nationality	Gender	Date of birth dd/mm/yy	Profession	Academic Degree	Affiliation	Current Position	Relation with Center
Rasmus Nielsen Jensen	Functional genomics of adaptation and convergent evolution	North American	M	27/01/1970	Biologist	D	University of California	Professor	2
Gloria Coruzzi	Interaction networks that govern genome structure in communities of organisms	North American	F	28/06/1954	Biologist	D	NYU	Professor	2
Marie France Sagot	Interaction networks that govern genome structure in communities of organisms	French	F	21/04/1956	Computer Science	D	INRIA, Université Lyon	Professor	2
Colomban de Vargas	Functional genomics of adaptation and convergent evolution	French	M	25/08/1971	Biologist	D	CNRS- Sorbonne Université	Professor	2

<b><u>NOMENCLATURE:</u></b> <b>[Gender]</b> [M] Male [F] Female [ND] Does not Declare	<b>[Academic Degree]</b> [U] Undergraduate [M] Master [D] Doctoral	<b>[Relation with Center]</b> [1] Full time [2] Part time
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**Annex 2.- Research Lines**

Nº	Research Line	Research Line Objectives	Description of Research Line	Researcher	Research Discipline	Starting Date [dd/mm/yy]	Ending Date [dd/mm/yy]	Status
RL1	Functional genomics of adaptation and convergent evolution	Use a genomic approach to determine the independent evolution of similar traits in different lineages	Convergent evolution generally involves the same genes, and with this line of research we seek to understand the genetic basis of the evolution of similar traits in different lineages to determine which mutations, either in a gene or in the genetic sequence, are responsible for modifying a particular trait.	Martín Motecino Leonard. Miguel Allende Connelly. Rodrigo Gutiérrez Ilabaca. Eleodoro Riveras Hernandez. Álvaro Glavic Maurer. Alexandra Galetovic Carabantes. Juliana De Abreu Vianna. Colomban de Vargas. Grace Isabel Armijo. Tomás Moyano Yugovic. Pamela Morales. Carola Cañón. Fabiola León. Grace Armijo. Francisca Díaz. David González. Felipe Gajardo. Rasmus Nielsen Jensen.	Molecular biology. Microbiology. Mathematical Sciences. Cell biology. Genetics and evolution. Botany. Zoology. Ecology and environmental sciences.	01/07/2022		
RL2	Interaction networks that govern genome structure in communities of organisms	Study how gene regulatory networks interact in the genome of microbiological communities	A gene regulatory network interacts to control a specific cellular function. Gene regulatory networks are important in development, differentiation and response to environmental signals.	Mauricio Latorre Mora. Claudio Latorre Hidalgo. Jacqueline Acuña Sobarzo. Beatriz Diez Moreno. Pablo Vergara Barros. Natalia Eugenia Jiménez Tapia. Fernanda Fredericksen. Victor Aliaga. Joaquín Rilling. Alejandro Maass Sepúlveda. Gloria Coruzzi. Marie France Sagot. Mauricio González Canales.	Cell biology. Molecular biology. Population biology. Ecology and environmental sciences. Genetics and evolution. Microbiology Analysis. Mathematical sciences. Biogeography. Paleontology.	01/07/2022		

Nº	Research Line	Research Line Objectives	Description of Research Line	Researcher	Research Discipline	Starting Date [dd/mm/yy]	Ending Date [dd/mm/yy]	Status
					Fisheries and fish farming. Immunology. Parasitology.			
RL3	Genomics for conservation, ecosystem health and sustainable food production	Analyze genomes and their interaction networks to generate hypotheses related to the impact of climate change on endangered species, and propose solutions for biodiversity conservation, sustainable agriculture and aquaculture	Conservation genetics is the application of genetics to understand and reduce the risk of extinction of populations and species. From our analysis of genomes, genes and networks, we can generate, and test hypotheses related to the impacts of climate change and environmental degradation, and propose biotechnological solutions for biodiversity conservation and sustainable production in agriculture and aquaculture.	Aurora Gaxiola Alcantar. Claudio Meneses Araya. Romina Pedreschi Plasencia. Ariel Orellana López. Liane Bassini Ney. Gerardo Núñez Lillo. Ignacia Hernández Figueroa. Alexis Ignacio Gaete Silva. Angélica Reyes Jara. Verónica Cambiazo Ayala. Alejandra Goity Falconi. Erika Araus Caramori. Karin Rothkegel Agurto. Alejandra Goity.	Molecular biology. Ecology and environmental sciences. Agronomy and forestry and livestock specialties. Food processing and technology. Other biology specialties. Genetic engineering Veterinary sciences. Agricultural economics and production systems. Fisheries and fish farming Biogeography. Basic nutrition. Biochemistry.	01/07/2022		

### **Annex 3.- Publications (Total or partially financed by MSI)**

#### **3.1.- ISI/WOS Publications or Similar to ISI/WOS Standard:**

##### **3.1.1 Principal Researchers**

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
1	Mitigación de la formación de acrilamida en papas fritas tipo chips mediante la adición de antioxidantes fenólicos de Inca muña ( <i>Clinopodium bolivianum</i> )	Q3	M Zegarra, A Aguilar-Galvez, R Chirinos, D García-Ríos, M Calsin, R Pedreschi, D Campos	Romina Pedreschi Plasencia.	Quimica Nova	10.21577/0100-4042.20170937	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	23-01-2023
2	Metabolite Profiling Reveals the Effect of Cold Storage on Primary Metabolism in Nectarine Varieties with Contrasting Mealinness	Q1	P Olmedo, B Zepeda, J Delgado-Rioseco, C Leiva, AA Moreno, K Sagredo, F Blanco-Herrera, R Pedreschi, R Infante, C Meneses, R Campos-Vargas	Romina Pedreschi Plasencia.  Claudio Meneses Araya.	Plants	10.3390/plants12040766	Genomics for conservation, ecosystem health and sustainable food production.	1	1	0	01-02-2023
3	GoSAMTs are required for pectin methyl-esterification and mucilage release in seed coat epidermal cells.	Q1	JP Parra-Rojas, P Sepúlveda-Orellana, D Sanhueza, H Salinas-Grenet, H Temple, P Dupree, S Saez-Aguayo, A Orellana.	Ariel Orellana López.	Frontiers in Plant Science	10.3389/fpls.2023.1099573	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	08-02-2023
4	Engineering the catalytic activity of an Antarctic PET-degrading enzyme by loop exchange	Q1	Paula Blázquez-Sánchez, Jhon A. Vargas, Adriano A. Furtado, Aransa Griñen, Diego A. Leonardo, Susana A. Sculaccio, Humberto D'Muniz Pereira, Christian Sonnendecker, Wolfgang Zimmermann, Beatriz Díez, Richard C. Garratt, César A. Ramírez-Sarmiento	Beatriz Díez Moreno.	Protein Science	10.1002/pro.4757	Interaction networks that govern genome structure in communities of organisms.	1	0	0	13-08-2023



N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
5	Characterization of the Polar Profile of Bacon and Fuerte Avocado Fruits by Hydrophilic Interaction Liquid Chromatography–Mass Spectrometry: Distribution of Non-structural Carbohydrates, Quinic Acid, and Chlorogenic Acid between Seed, Mesocarp, and Exocarp at Different Ripening Stages.	Q1	MG Beiro-Valenzuela, I Serrano-García, RP Monasterio, MV Moreno-Tovar, E Hurtado-Fernández, JJ González-Fernández, JI Hormaza, R Pedreschi, L Olmo-García, A Carrasco-Pancorbo	Romina Pedreschi Plasencia.	Journal of Agricultural and Food Chemistry	10.1021/acs.jafc.2c08855	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	29-03-2023
6	A First Insight into the Microbial and Viral Communities of Comau Fjord—A Unique Human-Impacted Ecosystem in Patagonia (42° S).	Q2	S Guajardo-Leiva, KN Mendez, C Meneses, B Díez, E Castro-Nallar.	Beatriz Díez Moreno.  Claudio Meneses Araya.	Microorganisms	10.3390/microorganisms11040904	Interaction networks that govern genome structure in communities of organisms.	1	1	0	30-03-2023
7	Cell surface receptor kinase FERONIA linked to nutrient sensor TORC signaling controls root hair growth at low temperature linked to low nitrate in Arabidopsis thaliana.	Q1	JM Pacheco, L Song, L Kuběňová, M Ovečka, V Berdion Gabarain, JM Peralta, T Urzúa Lehuedé, MA Ibeas, MM Ricardi, S Zhu, Y Shen, M Schepetilnikov, LA Ryabova, JM Alvarez, RA Gutierrez, G Grossmann, J Šamaj, F Yu, JM Estevez.	Rodrigo Gutiérrez Ilabaca.	New Phytologist	10.1111/nph.18723	Functional genomics of adaptation and convergent evolution.	1	0	0	15-04-2023
8	Evaluation of a Red Grape Marc Extract as a Natural Nitrification Inhibitor and its Effect on Soil Bacterial Community	Q1	MA Ormeño, JE Maldonado, M González, H Silva, JI Covarrubias.	Mauricio González Canales.	Journal of Soil Science and Plant Nutrition	10.1007/s42729-023-01228-0	Interaction networks that govern genome structure in communities of organisms.	1	0	0	04-04-2023
9	Cell wall disassembly, metabolome and transcriptome analysis in sweet cherry fruit with induced surface pitting.	Q1	E Ponce, G Núñez-Lillo, C Bravo, J Vidal, P Tapia-Reyes, C Meneses, R Pedreschi, C Fuentealba.	Romina Pedreschi Plasencia. Claudio Meneses Araya. Gerardo Núñez Lillo.	Postharvest Biology and Technology	10.1016/j.postharvbio.2023.112262	Genomics for conservation, ecosystem health and sustainable food production.	1	2	0	15-04-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
10	Characterization of the signalling pathways involved in the repression of root nitrate uptake by nitrate in <i>Arabidopsis thaliana</i> .	Q1	V Chaput, J Li, D Séré, P Tillard, C Fizames, T Moyano, K Zuo, A Martín, RA Gutiérrez, A Gojon, L Lejay.	Rodrigo Gutiérrez Ilabaca.	Journal of Experimental Botany	10.1093/jxb/erad149	Functional genomics of adaptation and convergent evolution.	1	0	1	25-04-2023
11	A multiomics integrative analysis of color de-synchronization with softening of 'Hass' avocado fruit: A first insight into a complex physiological disorder	Q1	G Núñez-Lillo, E Ponce, C Arancibia-Guerra, S Carpentier, A Carrasco-Pancorbo, L Olmo-García, R Chirinos, D Campos, R Campos-Vargas, C Meneses, R Pedreschi	Romina Pedreschi Plasencia. Claudio Meneses Araya. Gerardo Núñez Lillo.	Food Chemistry	10.1016/j.foodchem.2022.135215	Genomics for conservation, ecosystem health and sustainable food production.	1	2	1	15-05-2023
12	Do Rootstocks Influence Global Fruit Quality, Postharvest Performance and Metabolite Profiles of <i>Persea americana</i> cv. Hass?	Q1	P Olmedo, B Zepeda, J Delgado-Rioseco, C Leiva, AA Moreno, K Sagredo, F Blanco-Herrera, R Pedreschi, R Infante, C Meneses, R Campos-Vargas	Romina Pedreschi Plasencia.	Horticulturae	10.3390/horticulturae9020184	Genomics for conservation, ecosystem health and sustainable food production.	1	0	1	01-02-2023
13	Hydrological connections in a glaciated Andean catchment under permafrost conditions (33° S)	Q1	SR Pereira, B Díez, J Cifuentes-Anticevic, S Leray, F Fernandoy, C Marquardt, F Lambert.	Beatriz Díez Moreno.	Journal of Hydrology: Regional Studies	10.1016/j.ejrh.2022.101311	Interaction networks that govern genome structure in communities of organisms.	1	0	0	15-02-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
14	DNA sequencing in the classroom: complete genome sequence of two earwig (Dermaptera; Insecta) species	Q1	Sanae Kobayashi F, Maldonado JE, Gaete A, Araya I, Aguado-Norese C, Cumplido N, Díaz S, Espinoza A, Fernández E, Gajardo F, González-Ordenes F, Hauyon K, Maldonado P, Maldonado R, Pochet I, Riveros A, Sandoval R, Sepúlveda-González A, Stuardo C, Tapia-Reyes P, Thornton C, Undurraga S, Varas M, Valdivieso C, School Earwig Genome Consortium, Gutiérrez RA, Orellana A, Montecino M, Maass A, González M, Allende ML, Hodar C, Irles P.	Miguel Allende Connelly. Mauricio González Canales. Alejandro Maass Sepúlveda. Rodrigo Gutiérrez Ilabaca. Alexis Ignacio Gaete Silva. Martín Motecino Leonard. Felipe Gajardo.	Biological Research	10.1186/s40659-023-00414-9	Functional genomics of adaptation and convergent evolution.	4	3	2	17-02-2023
15	In vitro and in vivo biotransformation of glucosinolates from mashua ( <i>Tropaeolum tuberosum</i> ) by lactic acid bacteria	Q1	A Aguilar-Galvez, D García-Ríos, D Ramírez-Guzmán, J Lindo, R Chirinos, R Pedreschi, D Campos.	Romina Pedreschi Plasencia.	Food Chemistry	10.1016/j.foodchem.2022.134631	Genomics for conservation, ecosystem health and sustainable food production.	1	0	1	15-03-2023
16	Hydric Behavior: Insights into Primary Metabolites in Leaves and Roots of Cabernet Sauvignon and Grenache Grapevine Varieties under Drought Stress	Q1	M Tamayo, L Sepúlveda, EP Guequen, P Saavedra, R Pedreschi, A Cáceres-Mella, JE Alvaro, IF Cuneo.	Romina Pedreschi Plasencia.	Horticulturae	10.3390/horticulturae9050566	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	10-05-2023
17	Integrated metabolite analysis and health-relevant in vitro functionality of white, red, and orange maize ( <i>Zea mays</i> L.) from the Peruvian Andean race Cabanita at different maturity stages.	Q1	L Gálvez Ranilla, G Zolla, A Afaray-Carazas, M Vera-Vega, H Huanuqueño, H Begazo-Gutiérrez, R Chirinos, R Pedreschi, K Shetty.	Romina Pedreschi Plasencia.	Frontiers in Nutrition	10.3389/fnut.2023.1132228	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	28-02-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
18	Bioactive compounds characterisation of Peruvian Dysphania ambrosioides (L.) Mosyakin & Clemants leaves by GC/MS and UPLC–ESI–Q/TOF–MSn techniques.	Q1	A Figueroa-Merma, R Chirinos, D García-Rios, R Pedreschi, A Aguilar-Galvez, D Campos.	Romina Pedreschi Plasencia.	International Journal of Food Science & Technology	10.1111/ijfs.16270	Genomics for conservation, ecosystem health and sustainable food production.	1	0	1	15-03-2023
19	Seasonal and Spatially Distributed Viral Metagenomes from Comau Fjord (42° S), Patagonia.	Q3	E Castro-Nallar, V Berríos-Farías, B Díez, S Guajardo-Leiva.	Beatriz Díez Moreno.	Microbiology Resource Announcements	10.1128/mra.00082-23	Interaction networks that govern genome structure in communities of organisms.	1	0	0	22-03-2023
20	Proteomic and metabolomic integration reveals the effects of pre-flowering cytokinin applications on central carbon metabolism in table grape berries	Q1	Olmedo P, Núñez-Lillo G, Vidal J, Leiva C, Rojas B, Sagredo K, Arriagada C, Defilippi BG, Pérez-Donoso, AG, Meneses C, Carpentier S, Pedreschi R, Campos-Vargas R.	Romina Pedreschi Plasencia. Claudio Meneses Araya. Gerardo Núñez Lillo. Patricio Olmedo Miraflores.	Food Chemistry	10.1016/j.foodchem.2023.135498	Genomics for conservation, ecosystem health and sustainable food production.	1	3	0	15-06-2023
21	Kanamycin treatment in the pre-symptomatic stage of a Drosophila PD model prevents the onset of non-motor alterations	Q1	D Molina-Mateo, BP Valderrama, RV Zárate, S Hidalgo, J Tamayo-Leiva, A Soto-González, S Guerra-Ayala, V Arriagada-Vera, C Oliva, B Díez, JM Campusano	Beatriz Díez Moreno.	Neuropharmacology	10.1016/j.neuropharm.2023.109573	Interaction networks that govern genome structure in communities of organisms.	1	0	0	15-09-2023
22	Testing the stress gradient hypothesis in soil bacterial communities associated with vegetation belts in the Andean Atacama Desert.	Q2	D Mandakovic, C Aguado-Norese, B García-Jiménez, C Hodar, JE Maldonado, A Gaete, M Latorre, MD Wilkinson, RA Gutiérrez, LA. Cavieres, J Medina, V Cambiazo, M González	Mauricio González Canales. Verónica Cambiazo Ayala. Mauricio Latorre Mora. Alexis Ignacio Gaete Silva.	Environmental Microbiome	10.1186/s40793-023-00486-w	Interaction networks that govern genome structure in communities of organisms.	3	2	1	28-03-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
23	Metabolomics Reveals Specific Metabolic Changes in Sweet Cherries ( <i>Prunus avium</i> L.) Subjected to Postharvest Treatment with Melatonin after Mechanical Stress	Q1	I Hernández, E Ponce, J Vidal, R Chirinos, D Campos, R Pedreschi, C Fuentealba	Romina Pedreschi Plasencia.	Horticulturae	10.3390/horticulturae9080940	Genomics for conservation, ecosystem health and sustainable food production.	1	1	0	18-08-2023
24	Evaluation of the antihypertensive and antidiabetic potential of peptides from the globulin fraction of quinoa ( <i>Chenopodium quinoa</i> ) by an in silico and in vitro approach	Q1	R Chirinos, N Escobar-Mendoza, A Figueroa-Merma, T Valente de Oliveira, F Guzmán, R Pedreschi, D Campos	Romina Pedreschi Plasencia.	International Journal of Food Science & Technology	10.1111/ijfs.16544	Genomics for conservation, ecosystem health and sustainable food production.	1	1	0	06-06-2023
25	In vitro and in silico studies of antioxidant peptides from tarwi ( <i>Lupinus mutabilis</i> ) as inhibitors of angiotensin-converting enzyme and dipeptidyl peptidase IV enzyme	Q2	R Chirinos, T Valente de Oliveira, F Guzmán, A Aguilar-Galvez, A Figueroa-Merma, R Pedreschi, D Campos	Romina Pedreschi Plasencia.	International Journal of Food Science & Technology	10.1111/ijfs.16618	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	23-07-2023
26	Assessing the RP-LC-MS-Based Metabolic Profile of Hass Avocados Marketed in Europe from Different Geographical Origins (Peru, Chile, and Spain) over the Whole Season	Q1	Irene Serrano-García, Joel Domínguez-García, Elena Hurtado-Fernández, José Jorge González-Fernández, José Ignacio Hormaza, María Gemma Beiro-Valenzuela, Romina Monasterio, Romina Pedreschi, Lucía Olmo-García, Alegría Carrasco-Pancorbo	Romina Pedreschi Plasencia.	Plants	10.3390/plants12163004	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	20-08-2023
27	Active coatings based on oxidized chitin nanocrystals and silk fibroins for the control of anthracnose in 'Hass' avocados	Q1	C Ferreira, A Larach, X Besoain D Duarte Serrano, C Hadad, R Pedreschi, A Nguyen, C Fuentealba	Romina Pedreschi Plasencia.	International Journal of Biological Macromolecules	10.1016/j.ijbiomac.2023.126673	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	31-08-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
28	PIF4 enhances the expression of SAUR genes to promote growth in response to nitrate	Q1	Matías Ezequiel Pereyra, Cecilia Costigliolo Rojas, Anne F Jarrell, Austin S Hovland, Stephen A Snipes, Punita Nagpal, David Alabadí, Miguel A Blázquez, Rodrigo A Gutiérrez, Jason W Reed, William M Gray, Jorge José Casal	Rodrigo Gutiérrez Ilabaca.	Proceedings of the National Academy of Sciences	10.1073/pnas.2304513120.	Genomics for conservation, ecosystem health and sustainable food production.	1	0	0	19-09-2023
29	Topsoil and subsoil bacterial community assemblies across different drainage conditions in a mountain environment	Q1	Aguado-Norese, C., Cárdenas, V., Gaete, A., Mandakovic, D., Vasquez-Dean, J., Hodar, C., Pfeiffer, M. & Gonzalez, M.	Mauricio González Canales. Alexis Ignacio Gaete Silva.	Biological Research	10.1186/s40659-023-00445-2	Interaction networks that govern genome structure in communities of organisms.	1	1	1	24-06-2023
30	Drosophila DAXud1 Has a Repressive Transcription Activity on Hsp70 and Other Heat Shock Genes	Q1	Jorge Zuñiga-Hernandez, Claudio Meneses, Macarena Bastias, Miguel L. Allende, Alvaro Glavic	Miguel Allende Connelly. Claudio Meneses Araya. Álvaro Glavic Maurer.	International Journal of Molecular Sciences	10.3390/ijms24087485	Functional genomics of adaptation and convergent evolution.	1	0	0	19-04-2023
31	Species delimitation and intraspecific diversification in recently diverged South American foxes	Q2	Eduardo J. Pizarro, Bernardita Julio-Kalajžić, Nicole Sallaberry-Pincheira, Valentina Muñoz, Daniel González-Acuña, Javier Cabello, Gerardo Acosta-Jamett, Cristian Bonacic, Agustín Iriarte, Alejandro Rodríguez, Alejandro Travaini, Aitor Cevitanes, José Luis Brito, Javier Millán, Juan Carlos Marín & Juliana A. Vianna	Juliana De Abreu Vianna.	Mammal Research	10.1007/s13364-023-00717-y	Interaction networks that govern genome structure in communities of organisms.	1	1	1	13-10-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
32	Antimicrobial resistance, pathogenic potential, and genomic features of carbapenem-resistant <i>Klebsiella pneumoniae</i> isolated in Chile: high-risk ST25 clones and novel mobile elements.	Q1	Veloso M, Arros P, Acosta J, Berríos-Pastén C, Rojas R, Varas M, Allende ML, Chávez F, Araya P, Hormazabal JC, Lagos R, Marcoleta, A.	Miguel Allende Connelly.	Spectrum Microbiology	10.1128/spectrum.00399-23	Functional genomics of adaptation and convergent evolution.	0	1	0	14-09-2023
33	Diversity, taxonomic novelty, and encoded functions of Salar de Ascotán microbiota as revealed by metagenome-assembled genomes.	Q2	Veloso M, Waldisparg A, Arros P, Berríos-Pastén C, Acosta J, Colque-Ferrer H, Varas MA, Allende ML, Orellana LH, Marcoleta AE	Miguel Allende Connelly.	Microorganisms	10.3390/microorganisms1112819	Functional genomics of adaptation and convergent evolution.	0	1	0	20-11-2023
34	NAC072 Interacts with HB12, HAT9, and MYBR1 in a Temporal Regulatory Network Controlling Peach Fruit Development	Q1	Núñez-Lillo, G., Zabala, J., Lillo-Carmona, José Miguel Álvarez, Romina Pedreschi, Claudio Meneses	Gerardo Núñez Lillo. Romina Pedreschi Plasencia. Claudio Meneses Araya.	Plant Growth Regulation	10.1007/s00344-023-11153-2	Genomics for conservation, ecosystem health and sustainable food production.	0	1	0	13-11-2023
35	Effects of hydrogeochemistry on the microbial ecology of terrestrial hot springs	Q1	Carla Barbosa, Javier Tamayo-Leiva, Jaime Alcorta, Oscar Salgado, Linda Daniele, Diego Morata, Beatriz Díez	Beatriz Díez Moreno. Jaime Alcorta Loyola.	mSphere	10.1128/spectrum.00249-23	Interaction networks that govern genome structure in communities of organisms.	0	1	0	27-09-2023
36	Postharvest storage differentially modulates the enzymatic and nonenzymatic antioxidant system of the exocarp and mesocarp of Hass avocado: implications for disorders	Q1	R Chirinos, J Delgado, A Aguilar-Galvez, A Figueroa-Merma, A Pacheco-Ávalos, D Campos, R Pedreschi	Romina Pedreschi Plasencia.	Plants	10.3390/plants12234008	Genomics for conservation, ecosystem health and sustainable food production.	1	2	0	22-11-2023
37	Proteomic and Low-Polar Metabolite Profiling Reveal Unique Dynamics in Fatty Acid Metabolism during Flower and Berry Development of Table Grapes	Q1	"P Olmedo, J Vidal, J.; E Ponce, B Defilippi, A Pérez-Donoso, C Meneses, S Carpentier, R Pedreschi, R Campos-Vargas"	Romina Pedreschi Plasencia. Patricio Olmedo Miraflores. Claudio Meneses Araya.	International Journal of Molecular Sciences	10.3390/ijms242015360	Genomics for conservation, ecosystem health and sustainable food production.				19-10-2023

N°	Title	Quartile	Authors	PI Associated with the Publication	Source	DOI	Research Line	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
38	Reduced neutralization against Delta, Gamma, Mu, and Omicron BA. 1 variants of SARS-CoV-2 from previous non-Omicron infection	Q1	P Pidal, J Fernández, C Airola, MAraujo, A M Menjiba, H San Martín, N Bruneau, M Balanda, C Elgueta, R Fasce, M T Valenzuela, A Orellana, E Ramírez	Ariel Orellana López.	Medical Microbiology and Immunology	10.1007/s00430-022-00753-6	Interaction networks that govern genome structure in communities of organisms.	0	1	2	07-02-2023
39	Unveiling abundance-dependent metabolic phenotypes of microbial communities		Natalia E. Jiménez, Vicente Acuña, María Paz Cortés, Damien Eveillard, Alejandro Eduardo Maass	Alejandro Maass Sepúlveda.	m-Systems	10.1128/msystems.00492-23	Interaction networks that govern genome structure in communities of organisms.	0	1	0	26-10-2023

### 3.2.- SCOPUS Publications or Similar to SCOPUS Standard

#### 3.2.1 Principal Researchers

N°	Title	Authors	Source (Name of the Journal)	DOI	Quartile	Lines of Research	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
1	Targeted Primary and Secondary Metabolite Analysis of Colored Potato “Michuñe Negra” Grown in Soilless Culture and during Prolonged Cold Storage: Implications in Acrylamide Formation during Frying.	D García-Ríos, JE Alvaro, ME Zuñiga, D Campos, A Aguilar-Galvez, MS Mariotti-Celis, F Pedreschi, R Pedreschi.	Agronomy	10.3390/agronomy13051209	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	1	25-04-2023
2	Distribution and Activity of Sulfur-Metabolizing Bacteria along the Temperature Gradient in Phototrophic Mats of the Chilean Hot Spring Porcelana	Konrad, R., ergara-Barros, P., Alcorta, J., Alcamán-Arias, M.E., Levicán, G., Ridley, C., Díez, B	Microorganisms	10.3390/microorganisms11071803	Q2	Interaction networks that govern genome structure in communities of organisms.	1	1	1	14-07-2023



### 3.3.- SCIELO Publications or Similar to SCIELO Standard

#### 3.3.1 Principal Researchers

N°	Title	Authors	Source (Name of the Journal)	DOI	Quartile	Lines of Research	N° principal researchers of the center	Number of researchers of the center other category	N° students	Date of publication
1	N/A									
2										
3										

### 3.4.- Scientific Books and Chapters

#### 3.4.1 Principals Researchers

N°	Title	Principal Researcher	Source (Name of the Journal)	ISBN	Lines of Research	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
1	N/A								
2									
3									

### 3.5.- Other Publications

#### 3.5.1 Principals Researchers

N°	Title	Publication Category	Other Category	Authors	Source (Name of the Journal)	DOI	Quartile	Lines of Research	N° principal researchers of the center	Number of researchers of the center another category	N° students	Date of publication
1	N/A											
2												
3												

**3.6.- “ISI/WOS Publications or Similar to ISI/WOS Standard”, “SCOPUS Publications or Similar to SCOPUS Standard” “SCIELO Publications or Similar to SCIELO Standard”, “Books and chapters in books” y “Other Publications [Other Researchers]”:**

**3.6.1 Other researchers**

No.	Publication Category	Other Category	Title	Authors	Source	DOI	Quartile	Lines of Research	No. of Researchers	No. of Students	Date of Publication
1	ISI/WOS o Similar a ISI/WOS standard		Variability in terrestrial litter decomposition can be explained by nutrient allocation strategies among soil decomposer communities	JM Murua, A Gaxiola	Functional Ecology	10.1111/1365-2435.14321	Q1	Functional genomics of adaptation and convergent evolution.	1	0	21-03-2023
2	ISI/WOS o Similar a ISI/WOS standard		Chilean long-term Socio-Ecological Research Network: progresses and challenges towards improving stewardship of unique ecosystems	Cristián Frêne, Juan J Armesto, Roberto F Nespolo, Aurora Gaxiola, Sergio A Navarrete, Alejandra Troncoso, Ariel Muñoz, Luis J Corcuera	Revista Chilena de Historia Natural	10.1186/s40693-023-00114-4	Q2	Functional genomics of adaptation and convergent evolution.	1	0	21-03-2023
3	ISI/WOS o Similar a ISI/WOS standard		Cellulose Synthase in Atacama Cyanobacteria and Bioethanol Production from Their Exopolysaccharides	Alexandra Galetović, Gabriel Peña, Nicole Fernández, Milton Urrutia, Nataly Flores, Benito Gómez-Silva, Jocelyne Di Ruggiero, Carolina Shene, Mariela Bustamante	Microorganisms	10.3390/microorganisms11112668	Q2	Functional genomics of adaptation and convergent evolution.	1	0	30-10-2023
4	Scopus		A Metagenomics Insight in the Cyanosphere of Edible Andean Macrocolonies (Llayta)	Vilo CC, Galetovic A, Dong Q, Gómez-Silva B	Austin J Proteomics Bioinform & Genomics	10.3390/microorganisms10081517	Q2	Functional genomics of adaptation and convergent evolution.	1	0	01-09-2023
5	ISI/WOS o Similar a ISI/WOS standard		Low-nutrient diet in Drosophila larvae stage causes enhancement in dopamine modulation in adult brain due epigenetic imprinting	J M Zúñiga-Hernández, Gonzalo H Olivares, Patricio Olguín, Alvaro Glavic	Open Biology	10.1098/rsob.230049	Q1	Functional genomics of adaptation and convergent evolution.	1	0	10-05-2023
6	ISI/WOS o Similar a ISI/WOS standard		Hydroclimate variations over the last 17,000 years as estimated by leaf waxes in rodent middens from the south-central Atacama Desert, Chile	Matías Frugone-Álvarez, Sergio Contreras, Oliver Meseguer-Ruiz, Eduardo Tejos, Antonio Delgado-Huertas, Blas Valero-Garcés, Francisca P. Díaz, Matías Briceño, Manuel Bustos-Morales, Claudio Latorre	Quaternary Science Reviews	10.1016/j.quascirev.2023.108084	Q1	Interaction networks that govern genome structure in communities of organisms.	1	2	01-07-2023

No.	Publication Category	Other Category	Title	Authors	Source	DOI	Quartile	Lines of Research	No. of Researchers	No. of Students	Date of Publication
7	ISI/WOS o Similar a ISI/WOS standard		Feed Regime Slightly Modifies the Bacterial but Not the Fungal Communities in the Intestinal Mucosal Microbiota of Cobia Fish ( <i>Rachycentron canadum</i> )	Samira Reinoso , María Soledad Gutiérrez, Angélica Reyes-Jara, Magaly Toro, Katherine García, Guillermo Reyes, Wilfrido Argüello-Guevara, Milton Bohórquez-Cruz, Stanislaus Sonnenholzner, Paola Navarrete	Microorganisms	10.3390/microorganisms11092315	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	14-09-2023
8	ISI/WOS o Similar a ISI/WOS standard		Reducción, reutilización y reciclaje: Una revisión crítica del conocimiento científico sobre las pérdidas y desperdicios de alimentos en Chile	C Fredes, JL Moya, M Jara, A Reyes	Revista Chilena de Nutrición	10.4067/s0717-75182023000300332	Q4	Genomics for conservation, ecosystem health and sustainable food production.	1	0	01-06-2023
9	ISI/WOS o Similar a ISI/WOS standard		Experimental evidence of the anti-bacterial activity pathway of copper ion treatment on <i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i>	Carlos Tejeda, Marcela Villegas, Pamela Steuer, Fernando Ulloa, Esperanza C Iranzo, Angelica Reyes-Jara, Miguel Salgado	Brazilian Journal of Microbiology	10.1007/s42770-022-00897-w	Q3	Genomics for conservation, ecosystem health and sustainable food production.	1	0	01-03-2023
10	ISI/WOS o Similar a ISI/WOS standard		The Quebrada Negra wetland study: An approach to understand plant diversity, hydrology, and hydrogeology of high-Andean wetlands	Francisco Suárez, Andrés Sarabia, Pedro Sanzana, Claudio Latorre, José F. Muñoz	WIREs Water	10.1002/wat2.1690	Q1	Interaction networks that govern genome structure in communities of organisms.	1	0	16-08-2023
11	ISI/WOS o Similar a ISI/WOS standard		First record of cf. <i>Aenocyon dirus</i> (Leidy, 1858)(Carnivora, Canidae), from the Upper Pleistocene of the Atacama Desert, northern Chile	Francisco J. Caro, Rafael Labarca, Francisco J. Prevosti, Natalia Villavicencio, Gabriela M. Jarpa, Katherine A. Herrera, Jacqueline Correa-Lau, Claudio Latorre & Calogero M. Santoro	Journal of Vertebrate Paleontology	10.1080/02724634.2023.2190785	Q2	Interaction networks that govern genome structure in communities of organisms.	1	1	16-05-2023
12	ISI/WOS o Similar a ISI/WOS standard		Spatial analysis of paleoclimate variations based on proxy records in the south-central Andes (18°-35° S) from 32 to 4 ka	Héctor Orellana, Claudio Latorre, Juan-Luis García, Fabrice Lambert	Quaternary Science Reviews	10.1016/j.quascirev.2023.108174	Q1	Interaction networks that govern genome structure in communities of organisms.	1	1	01-08-2023

No.	Publication Category	Other Category	Title	Authors	Source	DOI	Quartile	Lines of Research	No. of Researchers	No. of Students	Date of Publication
13	ISI/WOS o Similar a ISI/WOS standard		Monitoring bacterial composition and assemblage in the Gulf of Corcovado, southern Chile: Bacteria associated with harmful algae	So Fujiyoshi, Kyoko Yarimizu a, Gonzalo Fuenzalida, Marco Campos, Joaquin-Ignacio Rilling, Jacqueline J. Acuña, Pedro Calabrano Miranda, Emma-Karin Cascales, Ishara Perera, Oscar Espinoza-González, Leonardo Guzmán, Milko A. Jorquera, Fumito Maruyama	Curent Research in Microbial Sciences	10.06/j.cr.micr.2023.0094	Q2	Genomics for conservation, ecosystem health and sustainable food production.	2	0	06-06-2023
14	ISI/WOS o Similar a ISI/WOS standard		Structure and Functional Properties of Bacterial Communities in Surface Sediments of the Recently Declared Nutrient-Saturated Lake Villarrica in Southern Chile	M A Campos , Q Zhang , Jacqueline J Acuña , Joaquin I Rilling , T Ruiz, E Carrazana, C Reyno , A Hollenback, K Gray, D P Jaisi, A Ogram, J Bai, L Zhang, R Xiao, M Elias, M J Sadowsky, J Hu, MA Jorquera	Microbial Eecology	10.007/s00248-023-0273-2	Q1	Genomics for conservation, ecosystem health and sustainable food production.	2	0	08-02-2023
15	ISI/WOS o Similar a ISI/WOS standard		Occurrence, bioaccumulation and ecological risks of antibiotics in the water-plant-sediment systems in different functional areas of the largest shallow lake in North China: Impacts of river input and historical agricultural activities	Ling Zhang, Junhong Bai, Keg ang Zhang, Yaqi Wang, Rong Xiao, Marco Campos, Jacqueli nne Acuña, Milko A. Jorquera	Science Of The Total Environment	10.06/j.sci.totenv.2022.59260	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	20-01-2023
16	Scopus		Bacterial Community Composition and Presence of Plasmids in the Endosphere- and Rhizosphere-Associated Microbiota of Sea Fig ( <i>Carpobrotus aequilaterus</i> )	Angela M. Sanchez-Salazar, Jacqueline Acuña, Michael Sadowsky, Milko Jorquera	Diversity	10.3390/d15111156	Q2	Genomics for conservation, ecosystem health and sustainable food production.	1	0	10-10-2023
17	ISI/WOS o Similar a ISI/WOS standard		Endophytic bacterial communities in ungerminated and germinated seeds of commercial vegetables	Jacqueline J Acuña, Jingming Hu, Nitza G Inostroza, Tamara Valenzuela, Pablo Perez, Slava Epstein, Angela Sessitsch, Qian Zhang, Milko A Jorquera	Scientific Reports	10.1038/s41598-023-47099-4	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	14-11-2023
18	ISI/WOS o Similar a ISI/WOS standard		Holocene sedimentary history of the Silala River (Antofagasta Region, Chile)	Claudio Latorre, Matias Frugone-Alvarez	WIREs Water	10.1002/wat2.1699	Q1	Interaction networks that govern genome structure in communities of organisms.	1	0	09-11-2023
19	ISI/WOS o Similar a ISI/WOS standard		Towards understanding human–environment feedback loops: the Atacama Desert case	Eugenia M Gayo, Mauricio Lima, Andone Gurruchaga, Sergio A Estay, Calogero M Santoro, Claudio Latorre, Virginia McRostie	Philosophical Transactions of the Royal Society B	10.1098/rs.tb.2022.0253	Q1	Interaction networks that govern genome structure in	1	0	13-11-2023

No.	Publication Category	Other Category	Title	Authors	Source	DOI	Quartile	Lines of Research	No. of Researchers	No. of Students	Date of Publication
								communities of organisms.			
20	ISI/WOS o Similar a ISI/WOS standard		Positive feedbacks in deep-time transitions of human populations	Mauricio Lima, Eugenia M Gayo, Sergio A Estay, Andone Gurruchaga, Erick Robinson, Jacob Freeman, Claudio Latorre, Darcy Bird	Philosophical Transactions of the Royal Society B	10.1098/rs.tb.2022.0256	Q1	Interaction networks that govern genome structure in communities of organisms.	1	1	13-11-2023
21	ISI/WOS o Similar a ISI/WOS standard		Editorial: Applications of biological networks in biomedicine	Vinicius Maracaja-Coutinho, Alex Di Genova, Anne Siegel, Mauricio Latorre	Frontiers in Molecular Biosciences	10.3389/fmolb.2022.1005183	Q1	Interaction networks that govern genome structure in communities of organisms.	1	0	01-10-2023
22	ISI/WOS o Similar a ISI/WOS standard		Identification of grapevine clones via high-throughput amplicon sequencing: a proof-of-concept study	Claudio Urra, Dayan Sanhueza, Catalina Pavez, Patricio Tapia, Gerardo Núñez-Lillo, Andrea Minio, Matthieu Miossec, Francisca Blanco-Herrera, Felipe Gainza, Alvaro Castro, Dario Cantu, Claudio Meneses	G3 Genes Genomes Genetics	10.1093/g3journal/jk ad145	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	03-07-2023
23	ISI/WOS o Similar a ISI/WOS standard		Mature iPSC-derived astrocytes of an ALS/FTD patient carrying the TDP A90V mutation display a mild reactive state and release polyP toxic to motoneurons	Fabiola Rojas, Rodrigo Aguilar, Sandra Almeida, Elsa Fritz, Daniela Corvalán, Estibaliz Ampuero, Sebastián Abarzúa, Polett Garcés, Armando Amaro, Iván Díaz, Cristian Arredondo, Nicole Cortes, Mario Sanchez, Constanza Mercado, Lorena Varela-Nallar, Fen-Biao Gao, Martin Montecino, Brigitte van Zundert	Frontiers in Cell and Developmental Biology	10.3389/fcell.2023.1226604	Q2	Functional genomics of adaptation and convergent evolution.	1	1	28-07-2023
24	ISI/WOS o Similar a ISI/WOS standard		The lysine methyltransferases SET and MYND domain containing (Smyd) and Enhancer of Zeste (Ezh) co-regulate osteoblast proliferation and mineralization	Parisa Dashti, Jeroen van de Peppel, Roman Thaler, Christopher R Paradise, Gary S Stein, Martin A Montecino, Johannes P T M van Leeuwen, Bram J van der Eerden, Amel Dudakovic, Andre J van Wijnen	Gene	10.1016/j.gene.2022.146928	Q2	Functional genomics of adaptation and convergent evolution.	1	0	05-01-2023

No.	Publication Category	Other Category	Title	Authors	Source	DOI	Quartile	Lines of Research	No. of Researchers	No. of Students	Date of Publication
25	ISI/WOS o Similar a ISI/WOS standard		Selective concurrence of the long non-coding RNA MALAT and the Polycomb Repressive Complex to promoter regions of active genes in MCF breast cancer cells	Felipe Arratia, Christopher Fierro, Alejandro Blanco, Sebastian Fuentes, Daniela Nahuelquen, Martin Montecino, Adriana Rojas, Rodrigo Aguilar	Current Issues In Molecular Biology	10.3390/cimb45060301	Q2	Functional genomics of adaptation and convergent evolution.	1	0	30-05-2023
26	ISI/WOS o Similar a ISI/WOS standard		Long Noncoding RNA TALAM Is a Transcriptional Target of the RUNX Transcription Factor in Lung Adenocarcinoma	G Bermúdez, C Bernal, A Otalora, P Sanchez, G Nardocci, A Cañas, L Lopez-Kleine, M Montecino, A Rojas	Current Issues In Molecular Biology	10.3390/cimb45090447	Q2	Genomics for conservation, ecosystem health and sustainable food production.	1	0	24-08-2023
27	ISI/WOS o Similar a ISI/WOS standard		Inverse Modulation of Aurora Kinase A and Topoisomerase IIα in Normal and Tumor Breast Cells upon Knockdown of Mitochondrial ASncmtRNA	Maximiliano F Bendek, Christopher Fitzpatrick, Emanuel Jeldes, Anne Boland, Jean-François Deleuze, Nicole Farfán, Jaime Villegas, Gino Nardocci, Martín Montecino, Luis O Burzio, Verónica A Burzio	Non-coding RNA	10.3390/nrna9050059	Q1	Functional genomics of adaptation and convergent evolution.	1	0	02-10-2023
28	ISI/WOS o Similar a ISI/WOS standard		Protein arginine methyltransferases PRMT, PRMT/CARM and PRMT have distinct functions in control of osteoblast differentiation	Parisa Dashti, Eric A Lewallen, Jonathan A R Gordon, Martin A Montecino, Johannes P T M van Leeuwen, Gary S Stein, Bram C J van der Eerden, James R Davie, Andre J van Wijnen	Bone Reports	10.1016/j.bonr.2023.101704	Q2	Functional genomics of adaptation and convergent evolution.	1	0	05-07-2023
29	ISI/WOS o Similar a ISI/WOS standard		An overview of plasmid transfer in the plant microbiome	Angela M. Sánchez-Salazar, Tanvi Taparia, Asmus K. Olesen, Jacqueline J. Acuña, Søren J. Sørensen, Milko A. Jorquera	Plasmid	10.06/j.plasmid.2023.02695	Q3	Genomics for conservation, ecosystem health and sustainable food production.	1	0	01-07-2023
30	ISI/WOS o Similar a ISI/WOS standard		Diversity, Community Structure, and Potential Functions of Root-Associated Bacterial Communities of Different Wheat (Triticum aestivum) Cultivars under Field Conditions	Jacqueline J. Acuña, Joaquín I. Rilling, Nitza G. Inostroza, Javiera Manquian, Qian Zhang, Vadakattu V. S. R. Gupta, Milko A. Jorquera	Agronomy	10.3390/agronomy305392	Q1	Genomics for conservation, ecosystem health and sustainable food production.	2	0	08-05-2023

No.	Publication Category	Other Category	Title	Authors	Source	DOI	Quartile	Lines of Research	No. of Researchers	No. of Students	Date of Publication
31	ISI/WOS o Similar a ISI/WOS standard		The holobiome of marine harmful algal blooms (HABs): A novel ecosystem-based approach for implementing predictive capabilities and managing decisions	G Gajardo, J Morón-López, K Vergara, S Ueki, L Guzmán, O Espinoza-González, A Sandoval, G Fuenzalida, AA. Murillo, C Riquelme, H Camerón, S Nagai, F Maruyama, S Fujiyoshi, K Yarimizu, I Perer, M Kawai, A Ávila, G Larama, MA Gonzalez, Joaquín I. Rilling, M Campos, T Ruiz-Gil, B Durán-Vinet, Jacqueline J. Acuña, MA Jorquera	Environmental Science and Policy	10.06/j.en vsci.2023. 02.02	Q1	Genomics for conservation, ecosystem health and sustainable food production.	2	0	04-03-2023
32	ISI/WOS o Similar a ISI/WOS standard		Metagenomics reveals biogeochemical processes carried out by sediment microbial communities in a shallow eutrophic freshwater lake	B Kuang, R Xiao, Y H Yaping W Ling Zhang, Z Wei, J Bai, K Zhang, JJ Acuña, MA Jorquera, W Pan	Frontiers in Microbiology	10.3389/f micb.2022 .2669	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	14-01-2023
33	ISI/WOS o Similar a ISI/WOS standard		Ecological risk assessment of glyphosate and its possible effect on bacterial community in surface sediments of a typical shallow Lake, northern China	R Xiao, B Kuang, Y Hu, Y Wang, J Bai, L Zhang, C Wang, Z Wei, K Zhang, MA Jorquera, M Campos, JJ Acuña, W Pan	Ecotoxicology and Environmental Safety	10.1016/j. ecoenv.20 22.114445	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	01-01-2023
34	ISI/WOS o Similar a ISI/WOS standard		Airborne bacterial communities associated with particulate matter in Temuco (Chile), one of the most air-polluted cities in South America	T Ruiz-Gil, Ji Rilling, M Campos, E Carrazana, S Fujiyoshi, F Maruyama, D Tanaka, A Sakatoku, J Noda, JJ Acuña, MA Jorquera	Aerobiologia	10.1007/s1 0453-023- 09803-9	Q3	Interaction networks that govern genome structure in communities of organisms.	2	0	18-12-2023
35	ISI/WOS o Similar a ISI/WOS standard		Prevalence of Salmonella in Eggs from Conventional and Cage-Free Egg Production Systems and the Role of Consumers in Reducing Household Contamination	Doina Solís, N Cordero, M Quezada-Reyes, C Escobar-Astete, M Toro, P Navarrete, A Reyes-Jara	Foods	10.3390/fo ods122343 00	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	1	28-11-2023
36	ISI/WOS o Similar a ISI/WOS standard		Ontogenetically distinct neutrophils differ in function and transcriptional profile in zebrafish	JP García-López, A Grimaldi, Z Chen, Claudio Meneses, K Bravo-Tello, E Bresciani, A Banderas, SM Burgess, PP Hernández, CG Feijoo	Nature Communications	10.1038/s4 1467-023- 40662-7	Q1	Genomics for conservation, ecosystem health and sustainable food production.	1	0	15-08-2023

**3.5.- Collaborative publications**

Category of Publication	1 researcher		2 researchers		3 researchers		4 or more researchers	
	Nº	%	Nº	%	Nº	%	Nº	%
<i>ISI/WOS Publications or Similar to ISI/WOS Standard</i>	55	71,43	10	12,99	5	6,49	3	3,90
<i>SCOPUS Publications or Similar to SCOPUS Standard</i>	3	3,09	1	1,30	0	0,00	0	0,00
<i>SCIELO Publications or Similar to SCIELO Standard</i>	0	0,00	0	0,00	0	0,00	0	0,00
<i>Books and chapters</i>	0	0,00	0	0,00	0	0,00	0	0,00
<i>Other Publications</i>	0	0,00	0	0,00	0	0,00	0	0,00
<b><u>Total of publications</u></b>	<b>58</b>	<b>75,2</b>	<b>11</b>	<b>14,29</b>	<b>5</b>	<b>6,49</b>	<b>3</b>	<b>3,90</b>



**Annex 4.- Organization of Scientific Events**

Scope	Title	Type of Event	City	Country	Responsible Researcher	URL
International	11th International Penguin Congress	Congress	Viña del Mar	Chile	Juliana De Abreu Vianna	<a href="https://www.penguin-conference.com/">https://www.penguin-conference.com/</a>
International	Simposio 13: Una mirada a los patrones genómicos de la especiación, hibridación y adaptación de vertebrados del hemisferio sur	Symposia	Talca	Chile	Daly Noll Vergara	
International	Of Mice and Men: Alien Invasion of Marion Island	Conference	Santiago	Chile	Juliana De Abreu Vianna	
International	A highly rugged yet easily navigable adaptive landscape of antibiotic resistance	Conference	Santiago	Chile	Rodrigo Gutiérrez Ilabaca	
International	Seminario Interactomics: Hábitats microbianos endolíticos como únicos refugios para la vida en el poliextremo ambiente del Desierto de Atacama	Seminar	Valencia	Spain	Alexandra Galetovic Carabantes	
International	Towards a modern analysis of omics data of the ocean	Workshop	Valparaíso	Chile	Alejandro Maass Sepúlveda	<a href="https://eventos.cmm.uchile.cl/omicsceodos/">https://eventos.cmm.uchile.cl/omicsceodos/</a>
National	Bioinformatics Workshop	Workshop	Santiago	Chile	Juliana De Abreu Vianna	
National	Seminario Interactomics: Regulación epigenética de la transcripción: contribución de la arquitectura tridimensional del genoma	Seminar	Santiago	Chile	Jacqueline Acuña Sobarzo	
National	Seminario Interactomics: Mecanismos moleculares de la inmunidad vegetal y su integración en el desarrollo de bioestimulantes de origen vegetal	Seminar	Rancagua	Chile	Alexandra Galetovic Carabantes	
National	Seminario Interactomics: Estudio de los factores abióticos y bióticos que afectan la estructura y ensamble de comunidades de bacterias en el transecto Talabre-Lejía	Seminar	Santiago	Chile	Jacqueline Acuña Sobarzo	
National	Seminario Interactomics: Nodo laboratorio natural Desierto de Atacama (Landata) resultados de la primera etapa	Seminar	Atacama	Chile	Alexandra Galetovic Carabantes	
National	Seminario Interactomics: Agrigenómica: Cosechando genes y genomas	Seminar	Santiago	Chile	Jacqueline Acuña Sobarzo	
National	Seminario Interactomics: Mejoramiento genético y genómica en la acuicultura	Seminar	Santiago	Chile	Jacqueline Acuña Sobarzo	
National	Introducción al Trabajo con la mosca Drosophila Melanogaster	Workshop	Santiago	Chile	Álvaro Glavic Maurer	

## **Annex 5.- Education and capacity building**

### **5.1 Capacity Building inside MSI Centers**

MSI RESEARCHER	NUMBER									TOTAL NUMBER PER MSI RESEARCHER
	Undergraduate students			Graduate students						
				Masters			Doctoral			
	F	M	ND	F	M	ND	F	M	ND	TOTAL
Rodrigo Gutiérrez Ilabaca	1	2	0	0	0	0	7	4	0	14
Mauricio González Canales	0	0	0	1	1	0	1	1	0	4
Miguel Allende Connelly	0	0	0			0	2	2	0	4
Juliana De Abreu Vianna	7	4	0	1	2	0	4	1	0	19
Claudio Meneses Araya	0	1	0	1	0	0	2	1	0	5
Verónica Cambiazo Ayala	0	3	0	0	0	0	2	0	0	5
Mauricio Latorre Mora	0	1	0	1	1	0	1	3	0	7
Álvaro Glavic Maurer	1	3	0	0	1	0	2	0	0	7
Liane Bassini Ney	0	0	0	0	0	0	0	1	0	1
Alejandro Maass Sepúlveda	0	0	0	0	2	0	0	2	0	4
Angélica Reyes Jara	0	0	0	0	0	0	1	0	0	1
Alexandra Galetovic Carabantes	2	1	0	0	0	0	0	0	0	3
Claudio Latorre Hidalgo	1	1	0	0	0	0	1	1	0	4
Jacquelinne Acuña Sobarzo	3	0	0	0	0	0	1	1	0	5
Aurora Gaxiola Alcantar	0	1	0	1	0	0	2	1	0	5
Martín Motecino Leonard	0	2	0	0	0	0	1	2	0	5
Romina Pedreschi Plasencia	0	0	0	1	0	0	0	1	0	2
Ariel Orellana López	0	0	0	0	0	0	0	2	0	2
Total	16	22	0	6	8	0	29	29	0	110

**Annex 5.2. - Short-term Traineeships of MSI students and researchers****Internships**

Student name	Institution	Country	Advisor	Project Description	Starting Date [dd/mm/yy]	Ending Date [dd/mm/yy]
Eduardo Pizarro González	Museo de Historia Natural	Spain	Juliana Vianna	The objective of the internship was to share information on genomic research techniques for phylogeny reconstruction	07-07-2023	21-07-2023
Pamela Beatriz Aravena Espinoza	Center of Integrative Microbiology and Evolution, University of Oslo	Norway	Verónica Cambiazo	Collaboration and data analysis for the student's doctoral thesis	01-07-2023	08-07-2023

**External Internships**

Intern Type	Intern Name	Academic Degree	Home Institution	Destination Institution	Country	Project Description	Starting Date [dd/mm/yy]	Ending Date [dd/mm/yy]
Researcher	Mariana Nery	Doctorate	Universidad Estatal de Campinas	Pontificia Universidad Católica de Chile	Brasil	During her visit, Dr. Nery collaborated with Juliana Vianna, Alternate Director, in marine mammal genomics research, gave seminars on marine mammal genomics, and conducted research in the field.	05-03-2023	11-03-2023
Student	Amanda Mourao	Master	Universidad Estatal de Campinas	Pontificia Universidad Católica de Chile	Brasil	Amanda participated in laboratory activities in genomic techniques, as well as training in data analysis and bioinformatics.	17-04-2023	29-11-2023
Researcher	Anne Siegel	Doctorate	CNRS	Universidad de Chile	France	Research on bioinformatics methods	10-01-2024	19-01-2024
Researcher	Clemence Frioux	Doctorate	INRIA	Universidad de Chile	France	Research on bioinformatics methods	10-01-2024	19-01-2024
Researcher	Damien Eveillard	Doctorate	Universite de Nantes	Universidad de Chile	France	Research on bioinformatics methods	10-01-2024	19-01-2024
Student	Antoine Régimbeau	Undergraduate	Universite de Nantes	Universidad de Chile	France	Research on bioinformatics methods	10-01-2024	19-01-2024
Researcher	Daniele Iudicone	Doctorate	U. Nápoles	Universidad de Chile	Italy	Research in ocean sample analysis TARA_Chile	15-05-2023	22-05-2023
Researcher	Yann Le Cunff	Doctorate	U. de Rennes	Universidad de Chile	France	Research on bioinformatics methods	10-01-2023	19-01-2023

Intern Type	Intern Name	Academic Degree	Home Institution	Destination Institution	Country	Project Description	Starting Date [dd/mm/yy]	Ending Date [dd/mm/yy]
Student	Chabname Ghassemi	Master	U. Bordeaux	Universidad de Chile	Francia	Research on bioinformatics methods	10-01-2023	19-01-2023
Researcher	Andres Nejamkin	Doctorate	Laboratory of Molecular and Integrative Physiology.	Pontificia Universidad Católica de Chile	Argentina	The purpose of this visit was associated with the possibility of conducting experiments to study the role of Nitric Oxide (NO) in the response to NO <sub>3</sub> - in Marchantia polymorpha.	01-05-2023	31-05-2024

## **Annex 6.- Networking and other collaborative work**

### **6.1 Formal Collaboration networks**

Network Name	Network Scope	Researchers				Institutions
		From the Center		External		
		Researchers	Postdocs/ Students	Researchers	Postdocs/ Students	
Go-See	International	4	2	30	10	CNRS, University of Arizona, Imperial College London
INRIA-Équipe Associé	International	4	2	3	2	CNRS-Rennes; INRIA-Bordeaux
1000 Genomas Chile Project	National	4	1	0	0	Centro de Gerociencia, Salud y Metabolismo; el Centro Avanzado de Enfermedades Crónicas; el Instituto Milenio de Biología Integrativa y el Centro de Modelamiento Matemático
Consorcio de secuenciación del genoma del SARS-CoV-2	National	3	0	60	0	Ministerio de Ciencias, Universidad de Chile, Pontificia Universidad Católica, Universidad Mayor, Universidad Andrés Bello, Universidad de Valparaíso, Centro de Modelamiento Matemático, Instituto Milenio IBio, Proyecto 1000 Genomas, Universidad Austral de Chile-sede Puerto Montt; Faculty of Renewable Natural Resources, Arturo Prat University, Iquique and Universidad de Antofagasta

Network Name	Network Scope	Researchers				Institutions
		From the Center		External		
		Researchers	Postdocs/Students	Researchers	Postdocs/Students	
Earth Biogenome Project	International	2	0	50	0	Universidad de Chile; Dalhousie University; Revive & Restore; University of Sydney; Spacetime Ventures; Australian Museum; Universidad Nacional Autonoma de Mexico; University of Oslo; Center for Translational Biodiversity Genomics
Mission Microbiome	International	2	0	21	0	CEODOS Chile, Universidad de Concepción y los Centros de Investigación de Excelencia COPAS Sur-Austral e INCAR, Centro de Modelamiento Matemático
BioSymbioDiversity - Associated team France-Chile.	International	2	2	5	1	Universidad de Chile, INRIA-Francia, PUC-Chile
Proyecto Europeo Bluetools	Intertacional	1	1	14	1	Universidad Autonoma de Madrid, Universidad De Alicante, Centro Astrobiología Madrid
Tara Ocean	International	4	2	10	3	Fundacion Tara Oceans

**NOMENCLATURE:****[Network Scope]**

[N] National [I] International [LA] Latin American

**Annex 6.2.- Other Collaboration Networks**

Activity Name	Objective	Description	Co-Participants Institutions	Number of Research from the Center	Number of Postdocs/Students from the Center	Number of External Research	Number of External Postdocs/Students	Product	Name of the Center Principals Researchers Participating in the activity
IMCGR - SMBE	To provide strategic direction to achieve SMBE goals.	Our Deputy Director, Juliana Vianna, was named Conunselor of the Borad of the Society for Molecular Biology and Evolution (SMBE)	SMBE	1	15	8	35	1, conferences	Juliana De Abreu Vianna
IMCRG - CMM	Collaborate on data analysis using biological information, genomics and mathematical modeling.	The CMM and NLHPC have resources for analyzing large amounts of data that MI CGR researchers have used individually. Now, the goal is to work together to carry out collaborative work.	Center for Mathematical Modelling	4	8	15	12	2, publications	Alejandro Maass Sepúlveda. Beatriz Diez Moreno. Miguel Allende Connelly. Juliana De Abreu Vianna.
IMCGR - MI BASE	Share information and experiences to complement the research lines of both centers.	This collaboration stems from the participation of our Deputy Director in the IM BASE and IM CRG. The activities we carry out (e.g. research, dissemination) complement each other as we answer scientific questions from different research areas.	MI BASE	2	12	6	15	3, publications, seminars and workshops, community engagement activities	Juliana De Abreu Vianna.
IM CGR - IBIO	Share information and experiences to	This collaboration stems from the participation of our Associate Researcher	IBIO	1	6	6	8	3, dissemination of results, publications	Rodrigo Gutiérrez Ilabaca.

Activity Name	Objective	Description	Co-Participants Institutions	Number of Research from the Center	Number of Postdocs/Students from the Center	Number of External Research	Number of External Postdocs/Students	Product	Name of the Center Principals Researchers Participating in the activity
	complement the research lines of both centers.	Rodrigo Gutierrez in both Millenium Instittues. The activities we carry out (e.g. research, dissemination) complement each other as we answer scientific questions from different but complimentary research areas.							
IM CGR Natural History Museum Barcelona	To share information, mentor students, and support data analyses.	This collaboration allows studnets from both institutions th eopportunity to carry out internships. Such was the case of Eduardo Pizarro during July 2023.	Natural History Museum Barcelona	1	3	4	5	2, theses, publicaitons	Juliana De Abreu Vianna.

## **Annex 7. - Outreach**

### **7.1. - Outreach activities throughout the period**

Event Title	Type of Event	Scope	Target Audience	Date	Region	N° of Student from the Center	N° of Attendees	Duration in days	Participating Researchers	Responsible for the activity
Expo Ciencias UFRO 2023	Other	National	Público general.	01-10-2023	de la Araucanía	6	500	1	Jacqueline Acuña Sobarzo.	UFRO
Curso de Biodiversidad Genética en Ambientes Extremos	Other	International	Estudiantes de enseñanza media, pregrado, postgrado	25-09-2023	Antofagasta	10	70	5	Miguel Allende Connelly. Juliana De Abreu Vianna. Alexandra Geltovic Carabantes. Mauricio Gonzalez Canalez. Beatriz Díez Moreno. Alexis Gaete Silva. Camilo Valdivieso Jaime Alcorta Loyola. Francisca Díaz Aguirre.	Miguel Allende Connelly
Filling the science gaps for a sustainable and predictable ocean: a science to policy dialogue	Workshop	National	Sector público.	15-05-2023	Metropolitana de Santiago	2	30	1	Alejandro Maass Sepúlveda.	Alejandro Maass Sepúlveda
Debo preocuparme de la Antártica si vivo en Arica?	Foro	Nacional	Público general.	23-01-2023	Metropolitana de Santiago	10	35	1	Juliana De Abreu Vianna.	Ciencia Abierta - Ministerio de Ciencias
XVII Feria de Investigación FIUFRO 2023	Otro	Nacional	Estudiantes de enseñanza media.	15-11-2023	de la Araucanía	6	1000	1	Jacqueline Acuña Sobarzo.	UFRO



Event Title	Type of Event	Scope	Target Audience	Date	Region	N° of Student from the Center	N° of Attendees	Duration in days	Participating Researchers	Responsible for the activity
Biología del Desarrollo: Uso del modelo de Drosophila melanogaster	Workshop	Nacional	Estudiantes de enseñanza media.	26-10-2023	Metropolitana de Santiago	3	8	2	Alvaro Glavic Maurer.	Alvaro Glavic
Uso de Drosophila melanogaster como modelo de estudio	Seminario	Nacional	Estudiantes de enseñanza media.	15-06-2023	Metropolitana de Santiago	3	30	1	Álvaro Glavic Maurer.	Alvaro Glavic
Semana de la Ciencia	Otro	Nacional	Estudiantes de enseñanza media.	16-10-2023	Metropolitana de Santiago	6	200	5	Alexis Ignacio Gaete Silva.	Milena Murillo Directora de comunicaciones IM-CRG

## **7.2.- Articles and Interviews**

Type of media and scope	Local/Regional		National		International		TOTAL
	N° Interviews	N° Articles	N° Interviews	N° Articles	N° Interviews	N° Articles	
Written							
Written	0	0	2	2	1	1	6
Internet	1	0	3	4	0	1	9
Audiovisual	0	0	2	0	0	0	2
<b>Total</b>	<b>1</b>	<b>0</b>	<b>7</b>	<b>6</b>	<b>1</b>	<b>2</b>	<b>17</b>

**Annex 8. - Connections with other sectors**

Activity	Type of Connection [Number]	Type of Activity [Number]	Institution Country	Agent Type [Number]	Economic Sector
Establishment of a standardized protocol for microbiome analysis and its application in the food industry.	2	2	Chile	2	Agriculture
Using biotechnology for the development of new products or compounds from agro-industrial wastes	2	2	Chile	1	Fruticulture
Member of the Board of Directors of Biofrutales S.A.	1	2	Chile	1	Fruticulture
Vicepresident of the Board of Directors of UC Davis Chile Life Sciences Innovation Center in Chile	1	2	USA	1	Agriculture
Biotechnological solutions for the agriculture industry,	1	2	Chile	2	Biotechnology
Detecting Genetically Modified Organisms (GMO)	1	4	Chile	1	Food processing
Sampling of fish farms and microbiological isolation of fish pathogens	2	2	Chile	1	Aquiculture

**NOMENCLATURE:**

**[Type of Connection]** [1] Services Contract [2] Cooperation Agreement

**[Type of Activity]** [1] Development of Studies [2] Project Implementation [3] Training [4] Prospective Activity [5] Scientific Training [6] Installation of Scientists [7] Others (specify at the table foot other types of activity)

**[Agent Type]** [1] Industry and Services [2] Organizations and Public Services [3] Educational Sector

**Annex 9.- Total Funding**

<b>Funds</b>	<b>2023 Sources of Funding</b>	
	<b>Amount [\$]</b>	<b>Percentage of resources used by the Center [%]</b>
MSI	\$ 840.000.000	66,51%
Proyecto Fondos de Exploración - ANID	\$ 117.250.000	9,28%
Proyecto TARA y Fondo Francés para el medio Ambiente	\$ 90.000.000	7,13%
FONDECYT	\$ 199.765.030	15,82%
Other International Funds	\$ 13.868.250	1,10%
Other Public Funds	\$ 2.000.000	0,16%
<b>TOTAL</b>	<b>\$ 1.262.883.280</b>	<b>100%</b>

<b>Type of Expense</b>	<b>Total Amount [\$]</b>
<b>Scientific Staff Personal Científica</b>	\$160.800.000
<b>Technical Staff Personal Técnico</b>	\$51.600.000
<b>Administrative Staff Personal Administrativo</b>	\$49.200.000
<b>Communications Staff Personal de Comunicaciones</b>	\$22.800.000
<b>Investments Inversiones</b>	N/A
<b>Infrastructure Infraestructura</b>	N/A
<b>Consulting Consultorías</b>	N/A

**Annex 10.- Other Outstanding Activities**

Name of the activity relevant in your discipline	Type of activity relevant in your discipline carried out	Description of the relevant activity in your discipline	Importance in your discipline of the activity	Possibility to maintain or replicate this activity
N/A				

**Annex 11.- Negative or positive aspects that you would like to address in order to understand the context in which the center developed its work during the reported period.**

Relevant Positive and Negative Aspects (Extensión máxima de 2 Páginas)
N/A

**11.1 MI CGR SWOT Analysis 2023**

	Helps achieve our objectives	Hinders our ability to achieve objectives
Internal	<ul style="list-style-type: none"> <li>Experienced, respected researchers in their fields</li> <li>Genomics is a transversal discipline</li> <li>High scientific productivity</li> <li>Links within academia and industry</li> <li>Collaborations among researchers</li> <li>Mentor students, postdocs, and young researchers</li> <li>Actively participate in dissemination of results and science communication</li> <li>Community engagement</li> <li>Enthusiastic students</li> </ul>	<ul style="list-style-type: none"> <li>Because genomics is so transversal, the CGR appears to lack a cohesive thread</li> <li>Some projects within the CGR appeal to only a few researchers</li> <li>Lack of engagement from some researchers</li> <li>Scientific productivity is difficult to summarize in a practical and timely manner</li> </ul>
External	<ul style="list-style-type: none"> <li>There is general support for science and research in Chile, scientists are well regarded</li> <li>Good relations with MSI and ANID in general</li> <li>Collaborative links with industry and other academic institutions</li> <li>Genomics is considered interesting by the general public</li> <li>Many scientific outreach activities hosted by ANID, Explora, and others</li> <li>Possibility of fundraising for specific projects</li> </ul>	<ul style="list-style-type: none"> <li>Annual MSI funding is unchanged since 2022</li> <li>Funding sources (e.g. FONDECYT) have become difficult to obtain</li> <li>Internal bureaucracies in each of the host Universities delay processes</li> <li>Legislation surrounding Millenium Institutes as Foundations/Corporations requires the hiring of <b>knowledgeable</b> legal consultants</li> </ul>

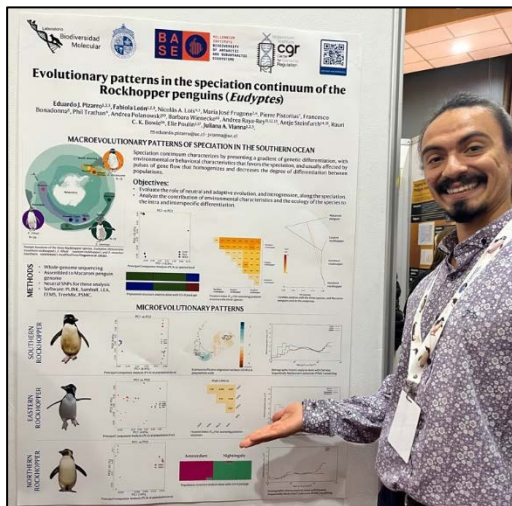
The objective of the SWOT analysis is to find practical solutions to a specific problem complex situation. We carried out our SWOT in august 2023 and we identified many more strengths than weaknesses, which we feel speaks well of our team. One of the issues our researchers felt we should focus on, and which was most likely to be influenced and resolved by our intervention, was finding ways to increase MSI Annual Funding. Together with several other Millenium Institutes we drafted a letter to ANID and the MSI initiative to request a review of annual funding for research centers. The letter was sent in early 2024, and we look forward to engaging with ANID to find a practical resolution to this issue.

## **Annex 12.- Relevant materials, products and activities carried out by the center**

### **12.1 Genomic Diversity Course, San Pedro de Atacama September 2023**



### **12.2 11<sup>th</sup> International Penguin Congress, Viña del Mar, September 2023**

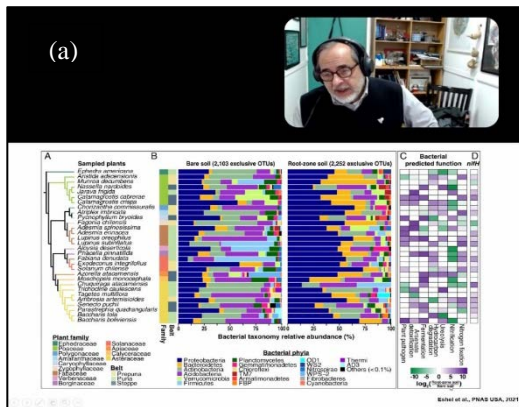




### 12.3 Science Week Activities, October 2023



### 12.4 Two of our hybrid-format Interactomics seminars, (a) Dr. Mauricio Gonzalez, (b) Dr. Lorena Pizarro, and a sample of our promotional posters (c, d)



(c)

**Ciclo de seminarios Interactomics 2023**

"ESTUDIO DE LOS FACTORES ABIÓTICOS Y BIÓTICOS QUE AFECTAN LA ESTRUCTURA Y ENSAMBLE DE COMUNIDADES DE BACTERIAS EN EL TRANSECTO TALABRE-LEJÍA."

**MAURICIO GONZÁLEZ C.**  
UNIVERSIDAD DE CHILE

**Lunes 10 de julio**  
17:30 hrs, vía zoom

(d)

**CICLO DE SEMINARIOS INTERACTOMICS 2023**

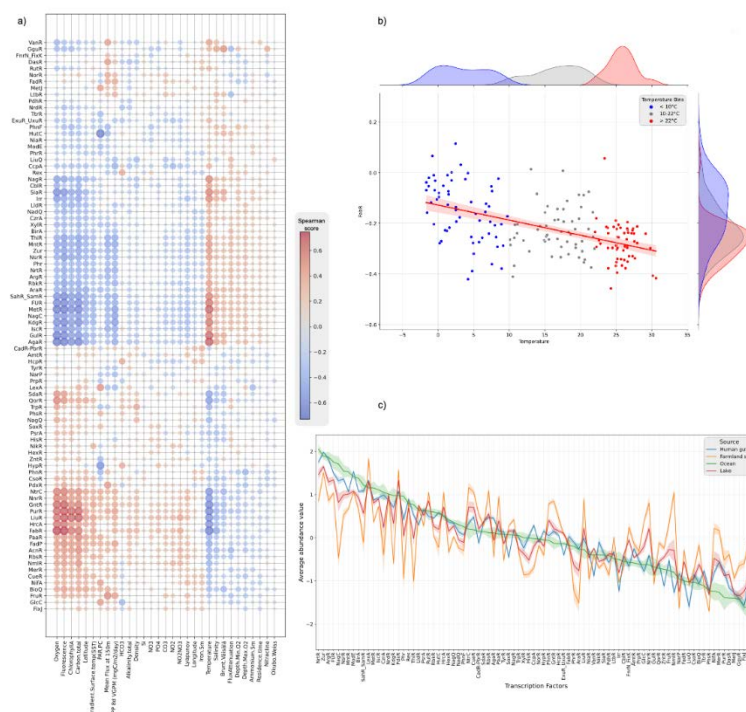
"MECANISMOS MOLECULARES DE LA INMUNIDAD VEGETAL Y SU INTEGRACIÓN EN EL DESARROLLO DE BIOESTIMULANTES DE ORIGEN BACTERIAL."

**Lunes 04 de septiembre**  
17-30Hrs. Vía Zoom

**Lorena Pizarro.**  
Universidad de O'Higgins

## 12.5 Research carried out with one of our Collaborative Network partners

During 2023 the group led by Alejandro Maass continued to work on the study of gene regulation of bacterial communities in the ocean, based on the data produced by the **TARA Ocean Foundation** since 2009, and incorporating the data of bacterial metaG and metaT obtained in the CEODOS expedition organized in 2021 in Chile together with the same Foundation. The main results are being written up in an article to be submitted during the first semester of 2024. The main results show how the abundance of motifs associated with sets of transcription factors that appear in the intergenic zones of bacterial metaG are predictors of relevant environmental conditions of the ocean related to climate variations: Temperature, Carbon Flux, NPP, N02+N03, among many (see Fig.1). This study will provide a tool to generate a fingerprint of the transcriptional regulation of bacterial samples.



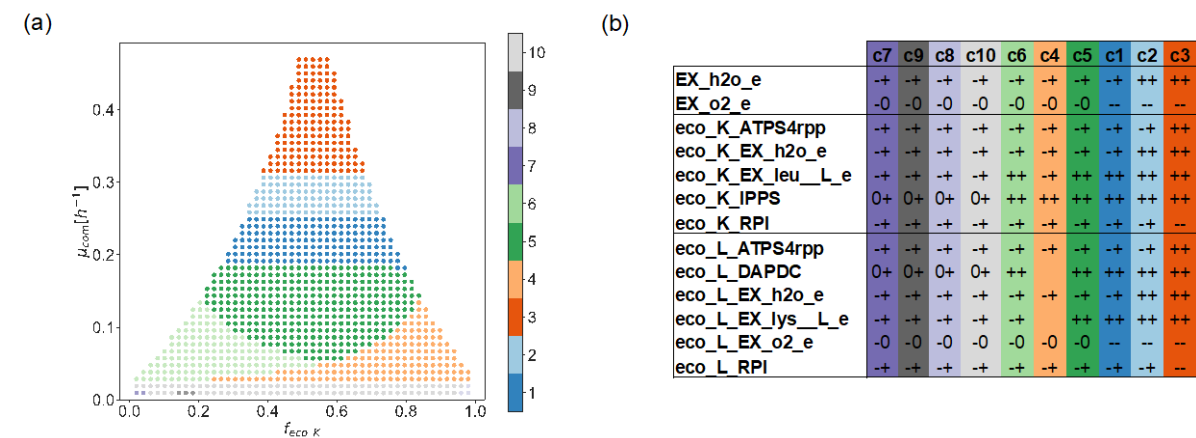
**Fig. 1.** Patterns evidencing the interplay between environmental variables and the clr-normalized abundance of transcription factor binding motifs in global ocean's surface samples.

## 12.6 Summary of one of our Outstanding Publications

The article "**Unveiling abundance-dependent metabolic phenotypes of microbial communities**" was published where, starting from the assumption that in nature essential biological functions, not directly related to cell growth, force communities to show suboptimal growth rates, it is crucial to look for how these states are fixed. These suboptimal states allow a certain degree of plasticity in their metabolism, thus allowing rapid shifts between alternative flux distributions as an initial response to environmental changes. In this paper we introduce the abundance-growth space as a representation of the metabolic phenotypes of a community. This space is defined by the composition of a community, represented by the relative abundances of its members, and its growth rate. Analysis of this space allows us to pinpoint how critical reactions respond to changes in the environment, showing where



changes in community plasticity occur. Interestingly, it highlights the relevance of the relative abundance of its members in the loss or gain of plasticity. (see Fig 2.)



**Fig. 2.** Analysis of the abundance-growth space for a synthetic community of *E. coli* supplemented with leucine and lysine. (a)

12.7 A few of our researchers’ appearances in national media

POTENCIANDO LA ECONOMÍA CIRCULAR:

### ¿Cómo la biotecnología puede valorizar y reutilizar los residuos de la industria agrícola?

Transformar el pelón de la nuez en un preservante de alimentos, combinar biotecnología con una técnica milenaria japonesa para generar un fertilizante altamente efectivo, son parte de los ejemplos de cómo la investigación aplicada puede transformar los desafíos actuales en oportunidades sostenibles. Este es el trabajo que realiza el Centro de Biotecnología de Sistemas y el Centro de Biotecnología Vegetal de la Universidad Andrés Bello.

**Dr. Ariel Orellana,** director del Centro de Biotecnología Vegetal UNAB.

24 HORAS Tendencias

Espectáculos Tecnología y Ciencia Redes Sociales

### Rodrigo Gutiérrez: científico chileno destacado entre mejores biólogos y bioquímicos del mundo

El director alterno del Instituto Milenio de Biología Integrativa (iBio) fue incluido en el ranking research.com, que analizó las contribuciones de más de 67 mil profesionales de esta área.

24horas.cl

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### Develando el misterio de la desincronización de color con ablandamiento en palta Hass.

Investigación de la Dra. Romina Pedreschi ha iniciado el camino para descubrir por qué esta variedad presenta esta dificultad en madurez de consumo, que sumado a problemas fisiológicos y patológicos de postcosecha, puede provocar entre 10% hasta 30% de pérdidas de la fruta en destino a nivel de retail. Destaca que la fruta de temporada temprana y media, con menos materia seca, es la que tiene mayores problemas de desarrollo de color, aunque tecnologías como la atmósfera controlada contribuye a reducir esta desincronización.

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