

ConCiencia

Magazine



GSC: 15 Years of Science
Transforming the Territory

Voices, Projects, and Discoveries
from the Heart of Galápagos

June
2026
Sixth Edition





@ ConCiencia Magazine
Sixth Edition

Languages: Spanish and English

Print Run: 500 copies

San Cristóbal - Galápagos - Ecuador - 2026

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ConCiencia Magazine:

Sixth Edition

Letter from the Editor
By Amanda Thompson

The sixth edition of *ConCiencia* celebrates a major milestone: the 15th anniversary of the Galapagos Science Center (GSC). A partnership between the Universidad San Francisco de Quito (USFQ) and the University of North Carolina at Chapel Hill, the GSC has grown into a leading hub for interdisciplinary research, experiential education, and applied conservation.

This anniversary issue describes the GSC's history and the evolution of our mission. What began as an effort to generate high-quality scientific research has matured into a model of innovative interdisciplinary research that recognizes the deep interconnections among human, animal, and environmental well-being and is grounded in education and community engagement. Over the past 15 years, the Center has led more than 170 research projects, trained hundreds of students, and fostered interdisciplinary and inter-institutional collaborations that link local realities with global challenges.

The articles in this edition demonstrate how science is being translated into action. From the development of the Galápagos sea lion management plan to advances in genomic tools through the GSC Biobank, our research is increasingly informing policy, conservation approaches, and sustainable development. These efforts illustrate a central principle of the GSC: that knowledge is most powerful when it is shared, applied, and co-created with the communities it serves.

A central theme throughout this issue is One Health, the integration of animal, environmental, and human health. Studies on child nutrition and sustainable fisheries, youth well-being and prevention, and long-term ecological monitoring at Wreck Bay highlight the critical need to address social and environmental issues together. These projects engage the local community and reflect our commitment to identifying solutions that are simultaneously scientifically rigorous and socially relevant.

Marine research continues to play a vital role in the GSC's work. Articles in this edition explore the ecology of key species, such as groupers and whales, as well as larger conservation efforts, including the Hermandad Marine Reserve, which protects critical migratory pathways for marine life. Together, these studies highlight the importance of connectivity across ecosystems and the need for coordinated conservation across geographic boundaries.

Innovation in research and education is another defining feature of this issue. From the first colorimetric mapping of Galápagos soils to the use of bioacoustics and environmental DNA, scientists are developing new tools to more effectively understand and protect the archipelago. At the

same time, programs such as the Kenan Fellowship, student field experiences, and the Connecting with Nature Program highlight the GSC's role in training future leaders and strengthening public engagement with science.

As *ConCiencia* celebrates 15 years of impact, it also looks toward the future. The work presented in this edition reflects our commitment to interdisciplinary collaboration, community partnership, and scientific innovation. Drawing on this foundation, the GSC will continue to stand as a model for linking science, conservation, and community, demonstrating how research can build a sustainable and resilient Galapagos and world.



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Galapagos Science Center: Interdisciplinary Science for the Future of Galápagos

The Galapagos Science Center (GSC), jointly managed by Universidad San Francisco de Quito and the University of North Carolina at Chapel Hill, is the only university-based scientific research facility in the Galápagos Islands. For the past 15 years, the GSC has established itself as a hub for interdisciplinary research, experiential education, and community engagement, committed to advancing science, conservation, and a comprehensive understanding of island ecosystems and the challenges that threaten their sustainability.

Located in Puerto Baquerizo Moreno, the GSC features a 1,850-square-meter facility housing five state-of-the-art laboratories specializing in animal health, genomics, marine sciences, human and ecosystem health, and data science and visualization.

Our Objectives



Experiential Education

The GSC promotes hands-on learning experiences for local and international students by providing opportunities to participate in research projects carried out in collaboration with the Galápagos National Park Directorate and other public and academic institutions.



Community Outreach

The center contributes to sustainable development and strengthens environmental awareness within the local community, fostering a deeper understanding of the relationship between people and their environment.



Global Partnerships

The GSC fosters an international scientific network grounded in diversity of thought, methodologies, and approaches, supported by a collaborative data infrastructure. Through integrative science, it connects institutions and researchers dedicated to the innovative and sustainable study of island ecosystems.



Research

Interdisciplinary research focused on conservation and the sustainable development of the Galápagos is one of the core pillars of the GSC. Since 2011, the center has led more than 170 research projects in collaboration with national and international scientists, addressing environmental, social, and health challenges that impact both the Galápagos and island ecosystems around the world.

These research initiatives are developed across five main areas:



Throughout this edition of ConCiencia, we will highlight some of these research initiatives and showcase their impact in Galápagos and beyond.

1.

Galapagos Science Center: 15 Years Connecting Science, Conservation, and Territory

Author: Karina Vivanco

Fifteen years after its founding, the Galapagos Science Center (GSC) celebrates not only its trajectory, but also the crystallization of a vision that has evolved alongside the challenges facing the archipelago. What began as an effort to generate world-class science has become a model that integrates research, community engagement, and decision-making under the One Health approach, where human, environmental, and social health are understood as interconnected systems.





Over the past 15 years, the GSC has led more than 173 interdisciplinary scientific research projects, bringing together 107 principal investigators and more than 1,639 national and international researchers conducting studies in Galápagos. In addition, more than 852 undergraduate, master's, and doctoral students have actively participated in scientific projects, strengthening the development of new generations committed to conservation and sustainability.

This journey has been marked by key milestones.

On February 12, 2010, the Universidad San Francisco de

Quito and the University of North Carolina at Chapel Hill signed the agreement to establish and operate the Galapagos Science Center, launching a strategic partnership aimed at advancing world-class scientific research in the Galápagos Islands. One year later, on May 16, 2011, the GSC building was officially inaugurated on San Cristóbal Island, laying the foundation for a scientific platform with global reach and strong local commitment.

In 2014, with the Galápagos National Park Directorate, the GSC launched a scientific cruise program that initiated long-term monitoring in the Galápagos Marine Reserve. This initiative made it possible to assess



the health of marine ecosystems and better understand phenomena such as El Niño and climate change, providing essential evidence for conservation and informed decision-making.



Between 2015 and 2018, research efforts expanded toward integrating environmental and human health. Through water quality monitoring and Healthy Families studies, the GSC demonstrated how factors such as water quality, nutrition, and social conditions directly influence community well-being. In 2016, this work was strengthened through a partnership with Oskar Jandl Hospital, promoting applied research, professional training, and specialized medical brigades. These efforts strengthened public health and supported key interventions such as the COVID-19 vaccination campaign, which reached 90% of the population in 2021.



In 2019 and 2020, the GSC deepened its connection with the community. The Connecting with Nature program promoted citizen participation and a culture of conservation, while the Barcode Galápagos project, developed during the pandemic, expanded citizen science initiatives by involving local residents in the generation of biodiversity knowledge.

Finally, between 2022 and 2025, the GSC reached a stage of institutional maturity. Its participation in the creation of the Hermandad Marine Reserve, expansion of the Biobank, opening of the Animal Health Laboratory, implementation of the Long-Term Ecological Research

Project at Wreck Bay (LTER Bahía Naufragio), and development of the Sea Lion Management Plan demonstrate how the One Health approach can be translated into concrete actions, infrastructure, and public policy.

Throughout the years, the GSC has also strengthened the dissemination and democratization of scientific knowledge. Between 2015 and 2025, the center generated over 410

scientific publications and benefited more than 10,536 community members through scientific, educational, and participatory activities.

More than an anniversary, these 15 years represent a turning point. From Galápagos, the GSC demonstrates that science can do more than explain the world — it can actively contribute to transforming it.



2.

Nutrition and Sustainable Fishing in San Cristóbal, Galápagos: A Bridge Between Marine Ecosystem Conservation and Child Health

Authors: Ximena Garzón
y Sylvia Jonitz

Child malnutrition in all its forms—including obesity and nutritional deficiencies—is one of the world’s most pressing public health challenges. In the Galápagos Islands, this issue is exacerbated by heavy dependence on imported foods, most of which are ultra-processed and of low nutritional value.

In this context, artisanal fishing from the Galápagos Marine Reserve and local food production play a fundamental role in ensuring food security and improving the nutritional





status of the population. However, the province has the highest rates of obesity in Ecuador, and there is limited data specific to San Cristóbal to guide interventions tailored to the local population.

The primary objective of this study is to characterize the nutritional status, dietary habits, physical activity levels, and metabolic risk factors among children aged 5 to 12 attending a public school in San Cristóbal. In addition, the study seeks to identify the knowledge, attitudes, and practices of families regarding nutrition, hygiene, and health.

Data from the study will provide evidence to support the design of a contextualized educational intervention based on the Pan American Health Organization's Health-Promoting Schools strategy and socioecological public health models.

This study is being conducted within the framework of the project "Child Nutrition System Based on Sustainable Fishing: A Scalable Application in San Cristóbal, Galápagos," an initiative that proposes integrating three key dimensions: improving child nutrition, strengthening artisanal fisheries, and promoting local food production.





Its central premise is to leverage locally available resources—especially fish—to improve child nutrition while strengthening local economies and promoting the conservation of marine ecosystems.

The project is led by a multidisciplinary team from

Universidad San Francisco de Quito (USFQ) and supported through partnerships with community stakeholders. With funding from the Galápagos Life Fund, the initiative exemplifies collaboration between academia and local communities.

The project involves three phases.



The first phase consists of an observational study aimed at understanding the characteristics of the child population through integrating quantitative and qualitative methods. The second phase involves the design and implementation of an educational and nutritional intervention based on the World Health Organization's Health-Promoting Schools strategies. This intervention will encourage individuals to consume local foods—particularly fish, due to its high protein content—and reduce the intake of ultra-processed products. The third phase will evaluate the intervention's impact through a second cross-sectional study replicating the first phase's methodology.

Although empirical results are not yet available, existing evidence suggests a high prevalence of obesity associated with ultra-processed foods, low dietary diversity, and insufficient levels of physical activity.

The study is expected to generate key evidence for the development of a comprehensive intervention that promotes the consumption of local products, especially fish, thereby improving the quality of children's diets. In the medium and long term, this intervention is expected to reduce the risk of chronic noncommunicable diseases, strengthen local food systems, and promote a sustainable public health model in the Galápagos.



3.

Risk and protective factors among young people (18–24 years): violence, STI, and HIV prevention in Galapagos

Authors: Natalia Villegas, Rainier Masa, Cynthia Fraga-Rizo, Mimi Chapman, Gabriela Cholota, Katty Coquinche Avilés, Lucero Rocha, Brian García, Lizbeth Arvizu y Amy Kaiser

The One Health approach recognizes that human health, ecosystems, and social well-being are inextricably linked. This perspective is particularly relevant in the Galápagos Archipelago, as the region's unique environment intersects with its evolving social dynamics. While often associated with ecological concerns, One Health also provides a useful framework for addressing complex public health challenges affecting local communities.

The Galápagos represents a unique place where geographic isolation,





limited resources, and tightly connected communities shape health outcomes. These contextual factors influence not only conservation efforts but also the social conditions that affect well-being. A needs assessment conducted by the UNC School of Social Work in 2019 identified youth pregnancy and violence as critical issues affecting youth in the islands, underscoring the importance of context-specific research and interventions. While youth in the islands may share some experiences with their mainland peers, geographic, environmental, and economic conditions create distinct realities that shape their risks, identities, and future expectations.

Building on this foundation, our study explored how young adults living in

San Cristóbal Island perceive risk and protective factors related to youth pregnancy, intimate partner violence (IPV), and Human Immunodeficiency Virus (HIV). We used in-depth interviews and a Positive Youth Development approach to engage 20 young adults (ages 18-24) and their communities as partners to better understand and foster positive outcomes by responding to their needs. This study was conducted alongside related work exploring youth perceptions of life in the Galápagos and knowledge of their context to inform solutions consistent with local realities and culture.

Our study found that participants described persistent barriers to discussing youth pregnancy, IPV and HIV, often influenced

by misconceptions, stigma, and social taboos. The attitudes and behaviors of parents, peers, and the broader community were seen as shaping risk, while cultural norms played a central role in influencing both vulnerability and protection. Youth described embarrassment, lack of confidence, and fear when discussing these topics. Participants emphasized that youth pregnancy, IPV, and HIV risk are interconnected, functioning as a syndemic in which each condition reinforces the others and shares common underlying roots. Importantly, youth highlighted the need to include youth voices in prevention efforts, expressing a desire to receive education about sexuality without feeling judged. As one participant noted, “adolescents

should be empowered to be curious for the sake of prevention.” These findings align with prior research highlighting the roles of inconsistent education, cultural barriers, and limited communication in shaping youth health risks, while reinforcing Galapagueñan youth’s interest in gaining knowledge for prevention.

Addressing these issues requires collaborative, community-engaged approaches that involve youth, families, educators, and health systems. Strengthening communication, promoting culturally responsive education, and creating safe spaces for dialogue are key steps toward improving sexual and reproductive health. From a One Health perspective, these



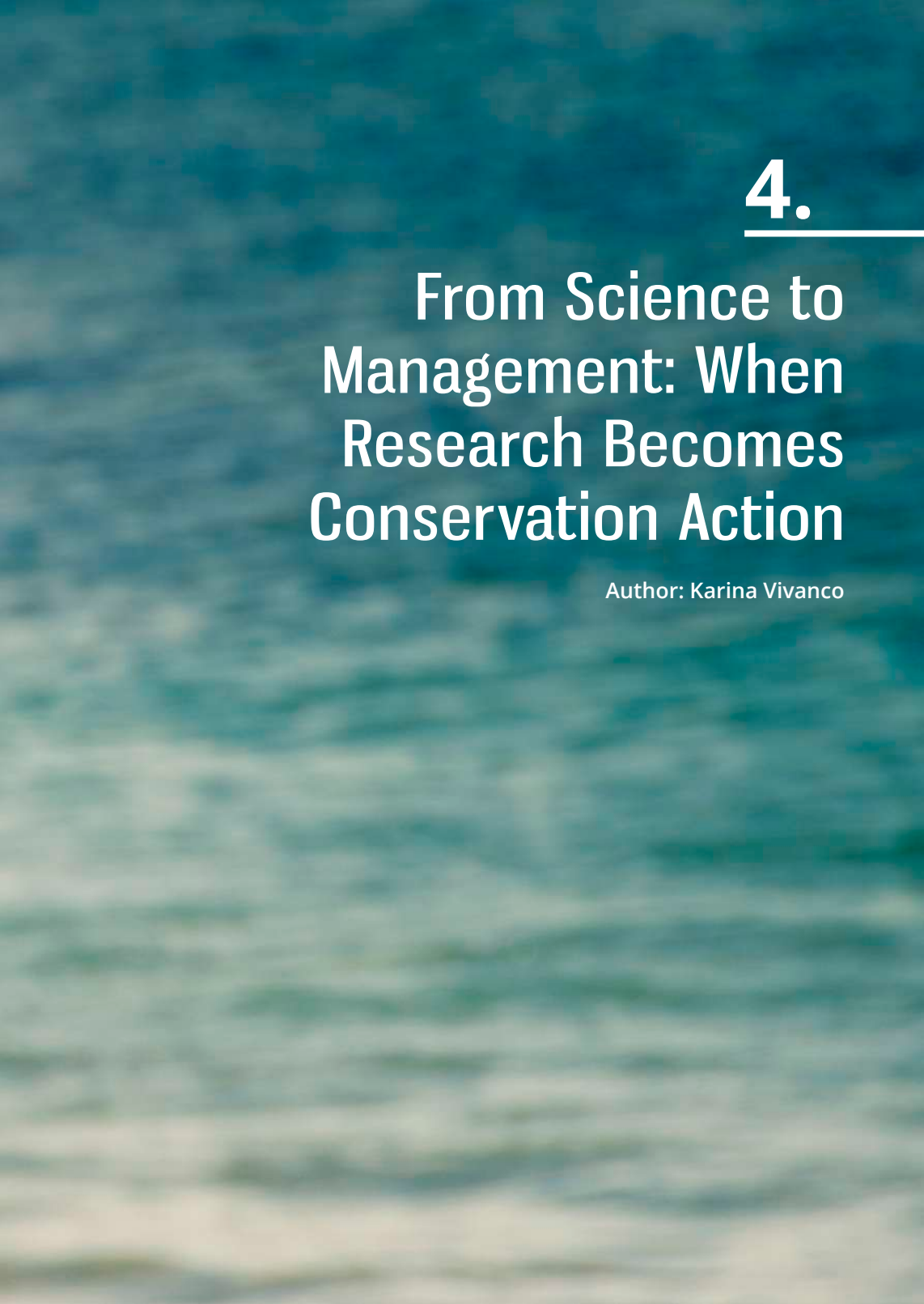


findings reinforce that human health is inseparable from the social environments in which people live. In the Galápagos, advancing sustainable futures depends not only on protecting ecosystems but also on supporting youth well-being.

Collaborators: This project was a collaborative effort from UNC School of Nursing and UNC School of Social Work, with support from the Galapagos Center. Researchers from UNC - Chapel Hill, students, and local partners participated in the study.





The background of the entire page is a blurred photograph of ocean waves. The water is a deep teal color, and the white foam of the waves is visible at the bottom, creating a sense of movement and depth.

4.

From Science to Management: When Research Becomes Conservation Action

Author: Karina Vivanco



For decades, science has generated essential knowledge about the Galápagos' species and ecosystems. Yet, one fundamental question remains: how can this knowledge move beyond scientific publications and become concrete management actions?

The case of the Galápagos sea lion (*Zalophus wollebaeki*), an endemic species classified as “Endangered” by the International Union for Conservation of Nature (IUCN) since 2008, offers a clear perspective.

Historically, conservation efforts in Galápagos have been marked by tensions stemming from the perception that environmental protection takes priority over

human needs, often excluding local communities. In response to this challenge, the Management Plan for the Conservation and Sustainable Use of the Galápagos Sea Lion on San Cristóbal Island 2025–2030, launched on October 27, 2025, proposes a new approach: integrating conservation with the island's social realities and economic dynamics.

The plan, led by Dr. Diego Páez-Rosas (professor at USFQ Galápagos and researcher at the Galapagos Science Center), combined over 20 years of scientific research with a technical and participatory process that included ecological data analyses and contributions gathered through workshops with local authorities,

economic sectors, researchers, and community stakeholders.

The Management Plan's value lies not only in the scientific evidence supporting it, but also in its application as a tool that recognizes a fundamental reality: in the Galápagos, conservation and the economy are deeply interconnected.

Tourism, the archipelago's main economic driver, depends on its iconic landscapes and wildlife. In San Cristóbal, the sea lion is one of the island's greatest attractions; thousands of visitors observe and interact with them each year. Their conservation is therefore not only an ecological priority, but also a strategy

for sustaining the local economy.

The plan is built on this premise: recognizing the sea lion as a natural resource with ecological, social, and economic value. Translating science into management required understanding relationships between humans and nature, identifying conflicts, and proposing viable solutions. Over the course of three years, the process focused on improving coexistence without disrupting everyday life.

Challenges are significant. San Cristóbal is home to the largest sea lion colony in the archipelago, located within a densely populated urban area. Public spaces such as the



waterfront, Carola Beach, La Lobería, and Mann Beach are shared by both people and sea lions, intensifying interactions. These pressures are compounded by threats such as climate change, pollution, and the presence of introduced species that can transmit diseases.

In response, the plan proposes measures such as regulating the use of public spaces, managing carrying capacity, improving wastewater management, and preventing health risks. More than imposing restrictions, the plan seeks to establish guidelines for coexistence.

Community participation was key to the plan's development. Fishers, tourism operators, guides, and local business owners took part in workshops where challenges and solutions were openly discussed. One guiding question shaped the dialogue: why do tourists visit San Cristóbal? The answer— to see sea lions — helped align conservation goals with local interests.

Beyond this specific case, the experience reflects a broader shift in the way conservation is understood. The Galápagos is not only a unique ecosystem, it is also an inhabited





territory. Recognizing it as a socio-ecosystem means integrating human communities into conservation strategies. The COVID-19 pandemic further exposed the islands' strong dependence on tourism, reinforcing the need to protect the species that sustain it.

This management plan demonstrates that science can move beyond theory and become meaningful action. Furthermore, when conservation includes people, it stops being a source of conflict and becomes a shared opportunity.

The development of this plan was made possible through the collaborative work of the Galápagos National Park Directorate and the

USFQ Pinniped Research Program, with support from Fundación Galápagos Rescuing and the Galapagos Science Center, reflecting a strong institutional commitment to strengthening the integrated management of the archipelago's biodiversity.

Access the management plan through the following link:



5.

The DNA of Galápagos: The GSC Biobank and Its Impact on Conservation

Author: Romina Cox

The Galapagos Science Center (GSC) Biobank has become a key tool for conservation and scientific research in the region. Not only does it serve as a storage facility, it also functions as a “biological library” that safeguards samples such as tissues, blood, animal DNA, and water under strict standards that ensure their availability for use in both current and future studies.

The value of this Biobank is demonstrated through its use alongside the GSC Genomics Laboratory. While the Biobank preserves material, the laboratory transforms that material into genetic data that help researchers understand how species respond to factors such as climate change and invasive species.



“The Biobank provides the raw material, and the laboratory transforms it into digital information,” explains Ingrid Silva, coordinator of the GSC Genomics Laboratory and Biobank, emphasizing the importance of this relationship in generating scientific knowledge directly from the islands.

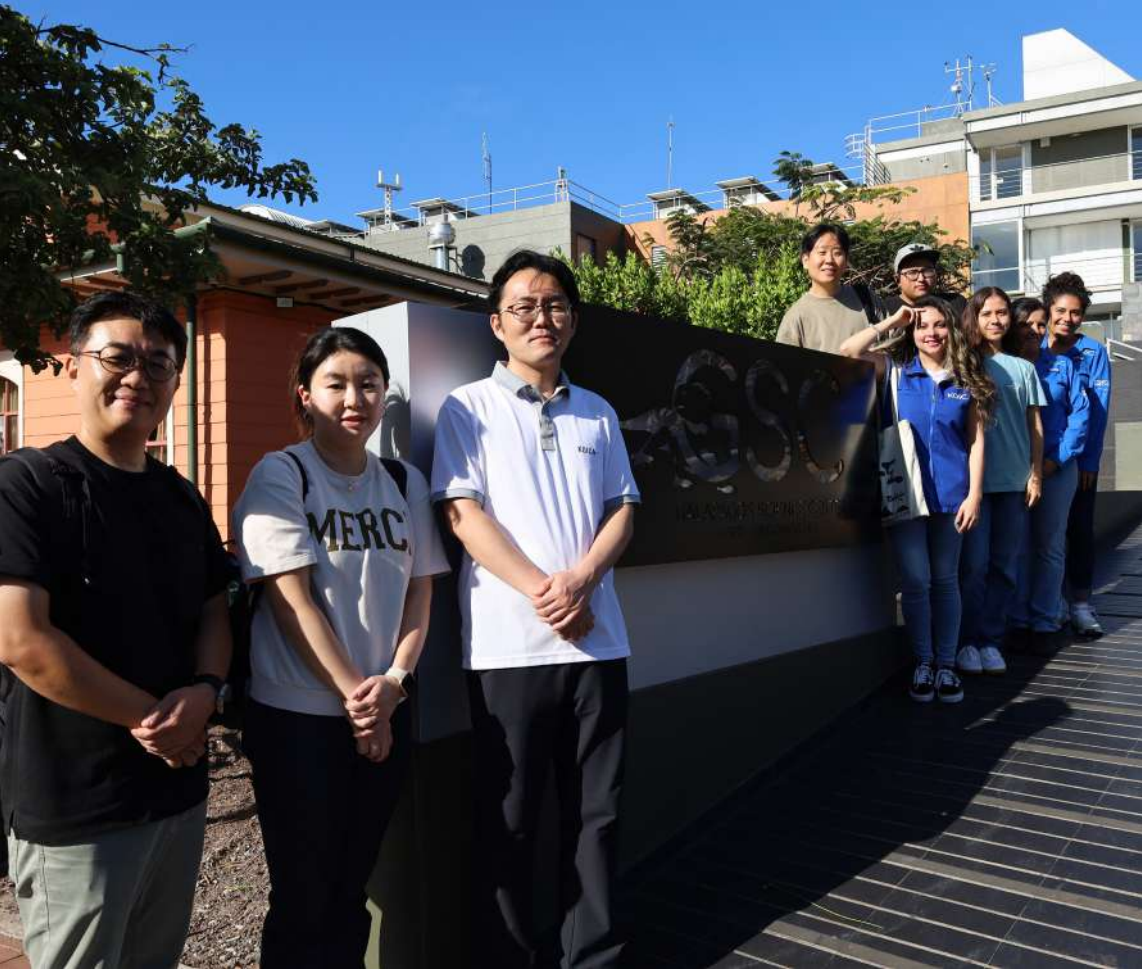
Since 2022, the GSC has been a part of Ecuador’s National Biocenters Network, implemented by the National Genetic Resources Data Bank, an initiative led by the National Institute of Biodiversity (INABIO), the Korea International Cooperation Agency (KOICA), and the National Institute of Biological Resources of Korea (NIBR). This collaboration has significantly strengthened the center’s technical capabilities through providing scientific equipment, specialized training, and the development of standardized protocols. In turn, institutions such as the GSC are able to process thousands of biological samples and generate key genetic information for research and conservation decision-making.

The incorporation of state-of-the-art equipment in 2025 has also made it possible to conduct processes such as DNA sequencing directly in the Galápagos, reducing dependence on external laboratories and decreasing analysis times. This milestone represents a major step toward scientific autonomy in the archipelago.

Currently, the GSC is in the second phase of expanding the Biobank, furthering its scientific and technical capacities. At present, the Biobank houses more than 1,460 biological samples from different species, including sharks and endemic plants such as guayabillo. These collections hold not only high scientific value, but also practical importance: they provide evidence in illegal fishing cases, help researchers study the spread of invasive species, and support ecosystem health assessments through the analysis of environmental DNA.

Tools such as environmental DNA (eDNA) analysis and sequencing technologies like Oxford Nanopore have expanded monitoring capabilities in the Galápagos. These methods make it possible to detect species without capturing them and to obtain information in real time, enabling faster responses to biodiversity threats. In this process, bioinformatics plays a crucial role.





“

“Bioinformatics tools are essential for identifying bacterial or viral strains during epidemic outbreaks. All this information is highly relevant for informing decision-making by institutions responsible for taking action in these situations, such as the Galápagos National Park Directorate and the Agency for the Regulation and Control of Biosecurity for Galápagos (ABG), with whom we work closely,” explains Diego Ortíz, bioinformatician at the GSC.

Looking ahead, the GSC aims to cement the Biobank and Genomics Laboratory as a regional research center for anticipating risks, strengthening conservation efforts, and generating new scientific opportunities for the country. In an environment like the Galápagos, having precise and timely information is essential for informed decision-making and the protection of its ecosystems.

First color map (Munsell scale) of the Galápagos Islands soils: distribution and chromatic diversity

Authors: Antonio León-Reyes, Noelia Barriga-Medina, Laura Aguado-García, Cristina Cifuentes-Castillo, Corné M.J. Pieterse, Hans van Pelt, Diego Ortiz-Yépez, Jaime Chaves-Cevallos, Diana Pazmiño, Melany Ruiz-Urigüen y Natalia Carpintero-Salvador.

The Galápagos archipelago (Ecuador) is known for unique flora and fauna across its vast expanse. Biodiversity studies have led to discoveries about evolution and adaptation among various species (Barriga-Medina et al., 2025). Although there are several studies about marine and terrestrial flora and fauna, there is not much information regarding the physical, chemical and biological parameters of the Galápagos soils.

Moreover, due to their diverse geological formation, there is a wide underresearched variety of soils. Several factors have shaped the archipelago's soils (Lasso and Espinosa, 2022), including geology

and geomorphology—the formation of the islands by submarine basaltic lava and volcanoes. A modulating factor is the climatic conditions induced by the islands' location on the equator and ocean currents, which in turn create a temperature gradient. Another factor is vegetation, which is distributed across five bioclimatic zones where soils vary from highly saline, rocky, and moisture-deficient to arid and humid, among others (Black, 1973). All these factors generate diverse coloration that can be observed between islands and within the habitat of each individual island.

At the Laboratory of Agricultural and Food Biotechnology at the

SOILS OF THE GALÁPAGOS ISLANDS



Universidad San Francisco de Quito (USFQ) in Ecuador, soil samples from the Galápagos Islands were collected and stored in a soil bank as part of several projects that analyzed their microbiomes. The projects included in this study are the Barcode Project, the Invasive *Rubus niveus* Plant Project and the Galápagos Soil Microbiome Project. The projects were conducted over a 10-year period (2015-2025), during which researchers collected samples of different soil types, which were labeled, dried, and stored, and are currently kept at the USFQ main campus (Cumbayá). The soils come from different habitats, ranging from island margins to high altitude volcanic areas. The objective of establishing the soil bank is to

preserve the samples for the study of microbiological diversity and the physicochemical composition of the soils.

In an initial phase, a colorimetric classification of all soil samples from the Galápagos Islands in the soil bank was conducted using the Munsell Soil Color Charts, which are based on three components (Munsell Soil Color Chart, 2009): hue (dominant spectral color), value (luminosity), and chroma (intensity). These results are compiled on a map that summarizes the diversity observed in soil colorimetry (Fig. 1). Additionally, the map shows the geographic location of each of the 78 identified colors of the soil samples within the islands.

The results of the microbiological composition and physicochemical analyses of parameters such as pH, conductivity, total organic carbon, metals, nitrogen, and others are currently being analyzed and will be published in future studies.

The Munsell classification of soil colors allows for the interpretation of organic matter content and the presence of metals and minerals, as well as soil moisture and drainage (Munsell Color, 2009). This can then be correlated with the microbiological and physicochemical analyses of each sample, thereby enhancing understanding the Galápagos Islands' soils with each project.

People involved and background:

The research team is led by Prof. Antonio León-Reyes PhD and Noelia Barriga-Medina PhDc, from the Universidad San Francisco

de Quito (Ecuador), along with collaborators Prof. Corné Pieterse and Mr. Hans van Pelt from Utrecht University (Netherlands), Diego Ortiz-Yépez, Jaime Chaves-Cevallos, and Diana Pazmiño from the Galapagos Science Center (GSC). Cristina Cifuentes-Castillo serves as the soil bank coordinator. Laura Aguado-García, who performed the Munsell colorimetric classification, compiles the results on the map and analyzes samples. Additionally, key collaborators include the park rangers and staff of the Parque Nacional Galápagos (PNG), providing knowledge of the habitat and collection sites, the Galapagos Science Center (GSC), providing expedition logistics, and Melanie Ruiz-Urigüen and Natalia Carpintero-Salvador from the Core Lab at the Universidad San Francisco de Quito (Ecuador), providing the analysis of physicochemical parameters.





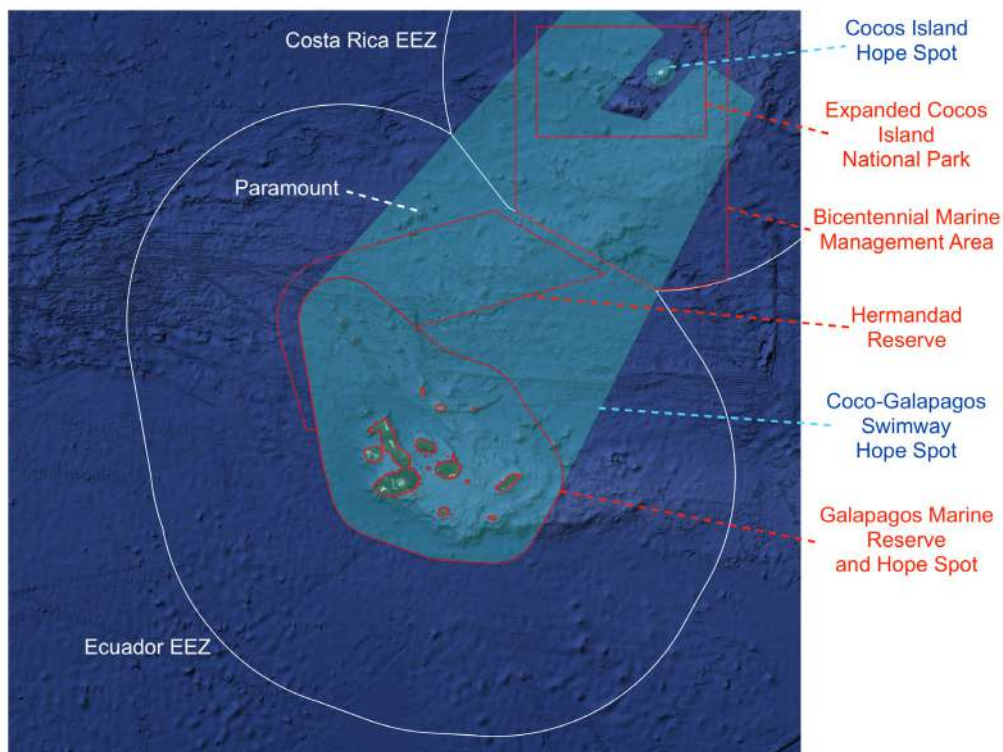
An underwater photograph of a shark swimming near the hull of a boat. The water is dark blue and slightly rippled. The shark is seen from below, swimming towards the right. The boat's hull is visible as a light-colored structure above the shark.

7.

Protecting Connectivity: the new Hermandad Reserve

Author: Alex Hearn

FRAGILE
HOPE



A quarter of a century after the creation of the Galápagos Marine Reserve (GMR), there was a growing sense among scientists and the Galápagos community, that, while the reserve may have performed well in protecting endemic and coastal biodiversity, wide-ranging and migratory species may not have fared so well. This was brought to light in 2017, when a foreign reefer vessel was detained inside the reserve, with over 7000 shark carcasses onboard, including endangered whale sharks, hammerheads and oceanic whitetips.

Although the sharks had been caught outside the reserve, our studies of their behavior and migratory routes

strongly suggested that they were from the same populations as from within the reserve. In the case of the whale shark, these animals undertake annual migrations through the Galápagos, from where they track the paths of tropical instability waves (plankton-rich eddies that propagate westwards for hundreds of miles), before returning, once again through Galápagos, to the shelf break of mainland South America. Hammerheads, on the other hand, largely reside in the reserve, yet at times of the year, females in particular undergo long-distance movements to locations such as the nearby Cocos Island (Costa Rica) and the distant, shallow lagoons of Panama, presumably to pup.

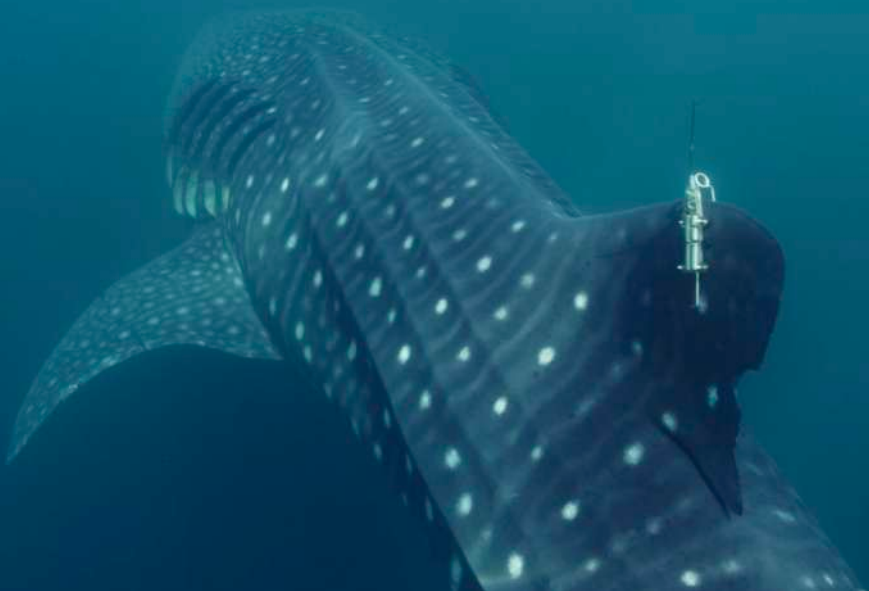
Additionally, many other species of sharks, rays, turtles, cetaceans and seabirds, not only move to critical habitats outside the Galápagos, but do so along predictable pathways. This makes them vulnerable to human activities and can undermine efforts to protect them in the Galápagos.

However, the fact that their pathways are predictable provides an opportunity for researchers to implement spatial protection measures. A local grassroots coalition called Más Galápagos, made up of concerned individuals and organizations, began calling for increased protection in the waters surrounding the Galápagos, and, with the support of the Pew-Bertarelli Ocean Legacy, we brought together a multi-institutional team of scientists to synthesize all existing data and build scenarios to explore what this

increased protection might look like. This process culminated in early 2022, when Ecuador created the new Hermandad Reserve: 60,000 km² of protected waters linking northern Galápagos with Ecuador's maritime boundary with Costa Rica.

Hermandad recognizes that the concept of protecting biodiversity hotspots such as the Galápagos and Cocos, and allowing business as usual outside these hotspots, is insufficient to reverse population decline among endangered migratory species. Rather, it is also necessary to protect the pathways (or "swimways") that connect these hotspots. Hermandad does precisely this.

With the Ecuadorian Navy (INOCAR) and Fisheries Institute (IPIAP), and under the leadership of the Galápagos National Park Directorate (GNPD), our team at USFQ is



currently building the baseline for Hermandad. This involves an expedition from 2024 and two more expeditions in 2026 to collect data on physical oceanographic conditions and biological communities in the reserve. Describing open ocean communities is not an easy task. To do this, we rely on a combination of complementary techniques: we deploy baited stereo-videos that drift in the ocean, recording any creature that approaches the bait. We take water samples and filter out and identify the environmental DNA – tiny fragments of the organisms that occupied the water over the previous few days. We have observers looking out for seabirds, cetaceans and other animals that can be seen from the surface.

Although we have not yet completed the baseline, we are already learning about Hermandad. Our results showed that at least 90 species of sharks, bony fish, cetaceans, seabirds and turtles use the reserve. We also found that the reserve can be divided biogeographically into a cool western area, and a warmer northeastern area. And finally, we discovered a new, unprotected hotspot of biodiversity just outside Hermandad – a shallow seamount called Paramount. Hammerhead sharks resided there for months, while thresher sharks made repeated visits over time.

Our next steps are to complete the baseline, incorporating the effects of season, and to measure





FRAGILE
HOPE

the effectiveness of the reserve in protecting migratory species. We will continue to explore Paramount and evaluate how to best protect its biological community. And we will

continue to call for similar protection measures across the rest of the “swimway” that fall in jurisdictions outside Ecuador.



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Reproductive biology and spatial ecology of sailfin grouper (*Mycteroperca olfax*) in the Galápagos Marine Reserve

Author: Ashley Altobelli

The sailfin grouper or “bacalao” (*Mycteroperca olfax*) is a culturally and economically important fish targeted in the Galápagos artisanal fishery, however information gaps for this species have created barriers to its sustainable management. To address these gaps, this study was launched in August 2024 by Ashley Altobelli, a local fishery biologist and doctoral student at the University of the Sunshine Coast, supported by an interdisciplinary team of collaborators from Woods Hole Oceanographic Institution, Galapagos Science Center, Cetacea Galápagos Program, Universidad San Francisco de Quito, the Charles Darwin Foundation, and the Galápagos National Park Directorate. This study aims to reveal

the spatial and temporal patterns of bacalao spawning and includes three primary methods. The first method, rooted in bioacoustics, involves recording sounds underwater with a device called a hydrophone (or “passive acoustic monitoring”). Marine bioacoustics is the study of sound in the ocean, and yes—many fishes make sounds! One main goal of ours is to facilitate the use of bioacoustics in Galápagos fisheries research. If we understand the source and context of fish sound production, such as during spawning, we can use passive acoustic monitoring as a cost-effective, non-invasive, and long-term tool to study these important processes.

Our objectives with the bioacoustics study are to identify and characterize the sounds of Galápagos fishes, particularly the sounds that bacalao emit during courtship and spawning, and examine the patterns in those sounds' occurrences over time.

Our second method is a more traditional way of studying fish reproduction and involves tissue sampling of both live and fishery-caught bacalao. We collaborate with Galápagos artisanal fishers to obtain samples from their bacalao landings and conduct field trips in which we capture, sample, externally tag, and release live bacalao. These

samples allow us to determine sexual maturity and spawning trends based on development of the reproductive organs and levels of hormones in the blood. As an added bonus, when tagged fish are recaptured by artisanal fishers, the recapture information can be reported in exchange for a reward, allowing us to calculate the distance moved between fish tagging and recapture locations.

This brings us to our third and final method: tracking the movements of individual fish using acoustic telemetry. During our field operations, some fish are implanted





with an acoustic transmitter which allows us to track their movements for up to ten years. With this technology, we can determine long-term movement and residency patterns of bacalao in coastal reef habitats, as well as infer the dynamics of potential spawning migrations or spawning aggregations.

We have made great progress in this project to date. In 2025, our team successfully documented the sound production of bacalao during courtship behaviors, which is a first for this species. We are now using these newly identified

sounds to evaluate spawning trends in our multi-year passive acoustic monitoring dataset. We have also sampled a total of 201 fish throughout the archipelago, obtained nine tag recaptures, and are presently tracking the movements of 29 fish. This combination of behavioral, biological, and spatial data will provide a more thorough understanding of bacalao reproduction. Both data collection and analysis are on-going, and we intend to continue this study for multiple years to determine interannual patterns and establish a long-term research program in

fisheries biology. Our next steps also include expanding this work to other Galápagos fishes of commercial interest.

This work has been funded by the American Museum of Natural History's Lerner-Gray Fund for Marine Research, the Charles Darwin

Foundation's Blue Pioneer Fellowship, the Galápagos Conservation Trust, and the Australian Government Research Training Program Scholarship, and has received in-kind support from the Ocean Tracking Network and the Galápagos National Park Directorate.





Following Whales: Revealing the Secrets of the Ocean in the Galápagos

Author: Daniela Alarcón

At sunrise in the Galápagos Archipelago, the ocean appears still, as if nothing were happening beneath the surface. Then, a blow breaks the silence: a whale surfaces, exhales, and disappears again into the depths. It is a brief, almost fleeting moment, yet enough to remind us that the ocean is alive.

But this moment rarely happens in isolation. It often begins with someone scanning the horizon—from a boat, the shore, or open water—spotting a fin, a leap, or a cloud of vapor. In that instant, a story begins. And thanks to those who share it, that story becomes knowledge.

Under the **One Health approach**, these encounters are not isolated events. The presence of a whale reflects food availability, ocean

currents, and invisible processes that sustain fisheries, tourism, and human life in the islands. Whales and dolphins do not just inhabit this ecosystem, they reveal it.

Yet, an important question remains: how do cetaceans actually use this vast and dynamic ocean?

To answer this, the Cetacea Galápagos Program follows whales in their own environment. The team, comprised of Daniela Alarcón and Juan Pablo Muñoz Pérez, from the



GSC, along with international experts Alessandro Bocconcelli, Paolo Segre, Héloïse Frouin-Mouy, and Francesco Caruso, combines local expertise with cutting-edge technology. This is a part of a bigger acoustics effort that includes well known scientists such as Dr. Laela Sight, Dr. Xavier Mouy and Julien Bonnel.

The focus is on two key species: the blue whale, the world's largest species, and the Bryde's whale, a more elusive and less studied species in the region. Although both inhabit Galápagos waters year-round, their movements and habitat use can differ significantly.



To understand this, researchers use CATS tags, small non-invasive devices that temporarily attach to whales, recording vocalizations, dives, movements, and behavior. These tags allow scientists to reconstruct how whales interact with their environment in fine detail.

The project is in its early stages, exploring key areas and optimal conditions for tagging. With additional support from citizen scientists, multiple species and behaviors have already been recorded, suggesting that certain areas serve as important feeding, breeding, and transit zones. Some whales concentrate in specific regions, likely tracking productive waters, while others range more widely in response to environmental variability. One idea is clear: whales do not move randomly; they follow the ocean's energy.

Understanding these patterns is essential. From a One Health perspective, the same processes that guide whales sustain life in the Galápagos.

This work would not be possible without the community. Every photo, video, and report directly contributes to science and conservation.

If you see whales or dolphins, share your sighting on Instagram [**@CetaceaGalapagos**](#). Together, we are learning to read the ocean, and every contribution matters.



A Royal First Year: North Carolina University students experience research and life in the Galápagos.

This is a shortened version of the story written by
Audrey Smith for Carolina Stories

Eight Carolina undergraduate students spent July 2025 in the Galápagos Islands — participating in cross-disciplinary research at the Galapagos Science Center and experiencing life on San Cristóbal Island alongside residents. These students, along with six students from the Universidad San Francisco de Quito (USFQ), were the first cohort to participate in the new field experience program funded by a gift from Royal Caribbean Group.

Students participated in ongoing work with real-world applications in the Galápagos. Community surveys and drone mapping helped assess the effects of climate change on the region. Water testing screened for the presence of *E. coli* and other contaminants that can pose a significant threat to public health. Tracking sea turtles provided data necessary to determine if the area's current marine reserve is adequate to protect sea turtles.

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“We need to keep these types of science centers running and continue funding this type of research,” said Janelle Choi, a program participant majoring in environmental science. “This research, when carried out alongside communities and guided by residents’ needs, can create lasting, positive impacts on people’s daily lives and livelihoods.”

Carolina students stayed with local residents who served as their host families, learned from USFQ faculty and studied alongside USFQ students. Mary Morgan stayed with a host family who had recently started a new business on the island.





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“When I arrived, my Spanish wasn’t as strong as many of the other students’ who were already bilingual, so I had a steep learning curve,” said Morgan, who is majoring in health policy and management in the UNC Gillings School of Global Public Health. “My host family was incredibly patient and supportive which helped me improve quickly. I’m thankful that I had opportunities to help them behind the scenes too, by being a customer in their new store.”



Many students found themselves affected beyond the classroom, lab or field.

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“Being able to participate in so many types of research that are typically not open to undergraduates certainly helped me gain new technical skills,” said Yarezi Guerrero, an environmental science and public policy double major. “I also grew as a person — in my people skills, in my ability to communicate cross-culturally, in my confidence and in my understanding of what I want my impact to be on the world.”

Maya True Wasik, a global studies and journalism double major, was both a program participant and photographer and videographer documenting the program for the UNC Center for Galápagos Studies, where she previously interned.



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“It was the opportunity of a lifetime,” said Wasik. “My objective being there was to communicate the research being conducted by the Galapagos Science Center in the lab to a wider community to make it more understandable and relatable, and this experience really reinforced my passion for photography and filmmaking.”



The 2024 gift from Royal Caribbean Group provided funding for three years of student field experiences. The second year of Galápagos field experiences will take place in summer 2026.

Galápagos Kenan Fellowship: Advancing Doctoral Research in Galápagos

Author: Kelly Weaver y Maya True Wasik

Three UNC doctoral students will spend the next year conducting original research at the Galápagos Science Center, the only university-based research facility in the Galápagos Islands, co-founded by UNC-Chapel Hill's Center for Galápagos Studies and Universidad San Francisco de Quito.

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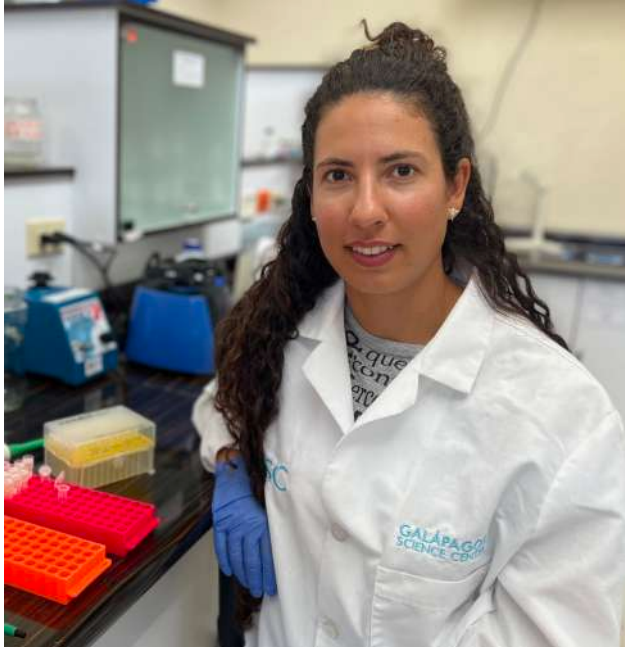
“This fellowship program, now in its second year, continues to offer UNC graduate students extraordinary opportunities to conduct innovative science in one of the world’s most iconic ecosystems,” said Amanda Thompson, director of the UNC Center for Galápagos Studies and co-director of the Galápagos Science Center.

Addressing critical knowledge gaps to support conservation of threatened species

Salomé Jaramillo Gil, a Fulbright scholar and doctoral student in biology, has studied sharks and rays for eight years across Colombia, Mexico, the Galápagos, and Florida. Her research focuses on the behavior and ecology of hammerhead sharks and eagle rays, examining how environmental conditions shape their movements. She also investigates eagle ray diets using DNA-based techniques.

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“Sharks and rays are among the most threatened vertebrates on earth,” she said. “By identifying feeding preferences and dietary shifts, I hope to shed light on the foraging ecology of these species and address critical knowledge gaps, providing essential information to support the conservation of these vulnerable species.”



Salomé Jaramillo Gil



Emily Speciale

Phytoplankton in a Warming Ocean

While Salomé focuses on some of the larger species in the Galápagos, Emily Speciale's attention is on some of the smallest – the phytoplankton that serve as the basis of the Galápagos' marine food web.

A student in Earth, Marine, and Environmental Sciences, Emily recently completed a three-week research cruise in the Galápagos Marine Reserve, collecting seawater research near San Cristóbal and Isabela Islands. Much of her research focuses on using molecular approaches to determine the taxonomy of the phytoplankton community, along with how these microorganisms respond to their environmental conditions.

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“The unique biodiversity of the Galápagos Archipelago ultimately relies on the patterns of these primary producers,” explains Speciale. “As ocean warming intensifies, changes in ocean current patterns will inevitably alter nutrient delivery to phytoplankton communities, which could have large impacts on the overall ecosystem.”

Detecting endangered species in the Hermandad Marine Reserve

Diego Urquía, a doctoral student in biology and graduate of Universidad San Francisco de Quito, studies how warming ocean temperatures impact marine life in the Galápagos using molecular tools. His research spans ecology, demography, and evolution, with past work examining genetic diversity in invasive and native plants like grasses and guava, as well as how endemic fruit flies adapt to the islands' conditions. He has also investigated species such as the Galápagos sea lion, focusing on diet and trophic ecology.

His current work centers on the Hermandad Marine Reserve, a key migratory corridor connecting the Galápagos and Cocos Island, Costa Rica.



Diego Urquía

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“I am applying metabarcoding (a DNA sequencing method) tools to detect endangered pelagic species within the Hermandad Marine Reserve and to understand how their species composition shifts in response to ocean warming,” Urquía said. “In addition, I am using metabarcoding to investigate how ocean warming events, particularly El Niño, impact the diversity and community composition of zooplankton in the Galápagos.”

UNC Center for Galápagos Studies

The Galápagos Kenan Fellowship was established in 2024 with support from the William R. Kenan, Jr. Charitable Trust. The fellowship provides research and training opportunities at UNC and in the Galápagos, travel funding to the Galápagos for field-based research and to conferences to support research dissemination, and a stipend and tuition to support their graduate training.

Thanks to the ongoing support from the William R. Kenan, Jr. Charitable Trust, students are not only advancing research in the Galápagos but also bringing valuable insights back to North Carolina.





LTER Wreck Bay Project: Research and Experiential Education under a One Health Approach in Galápagos

Author: Gabriela Bautista

The Galápagos Archipelago serves as a pulse point for global health, where human well-being and ecosystem integrity are inseparable. At the Galapagos Science Center (GSC), we approach this complexity through the One Health framework, a perspective that recognizes human, animal, and environmental health as part of a single interconnected system. In 2025, we launched the LTER Wreck Bay (Long-Term Ecological Research) project as a

conservation and monitoring initiative for San Cristóbal. The project seeks to establish the scientific baselines necessary to support evidence-based conservation and connect San Cristóbal to international long-term ecological research networks. At a time when climate change is accelerating environmental transformation worldwide, the need for integrated and sustained monitoring has become increasingly urgent.



This model addresses a critical gap in ecological research. As highlighted in the concept of the “invisible present” (Magnuson, 1990; updated by Lindenmayer, 2024), many environmental changes occur gradually over decades, making them difficult to detect through short-term studies alone. Processes such as biodiversity shifts, climate variability, and changes in ecosystem function often become visible only through continuous monitoring over long periods of time. Building this long-term record is essential

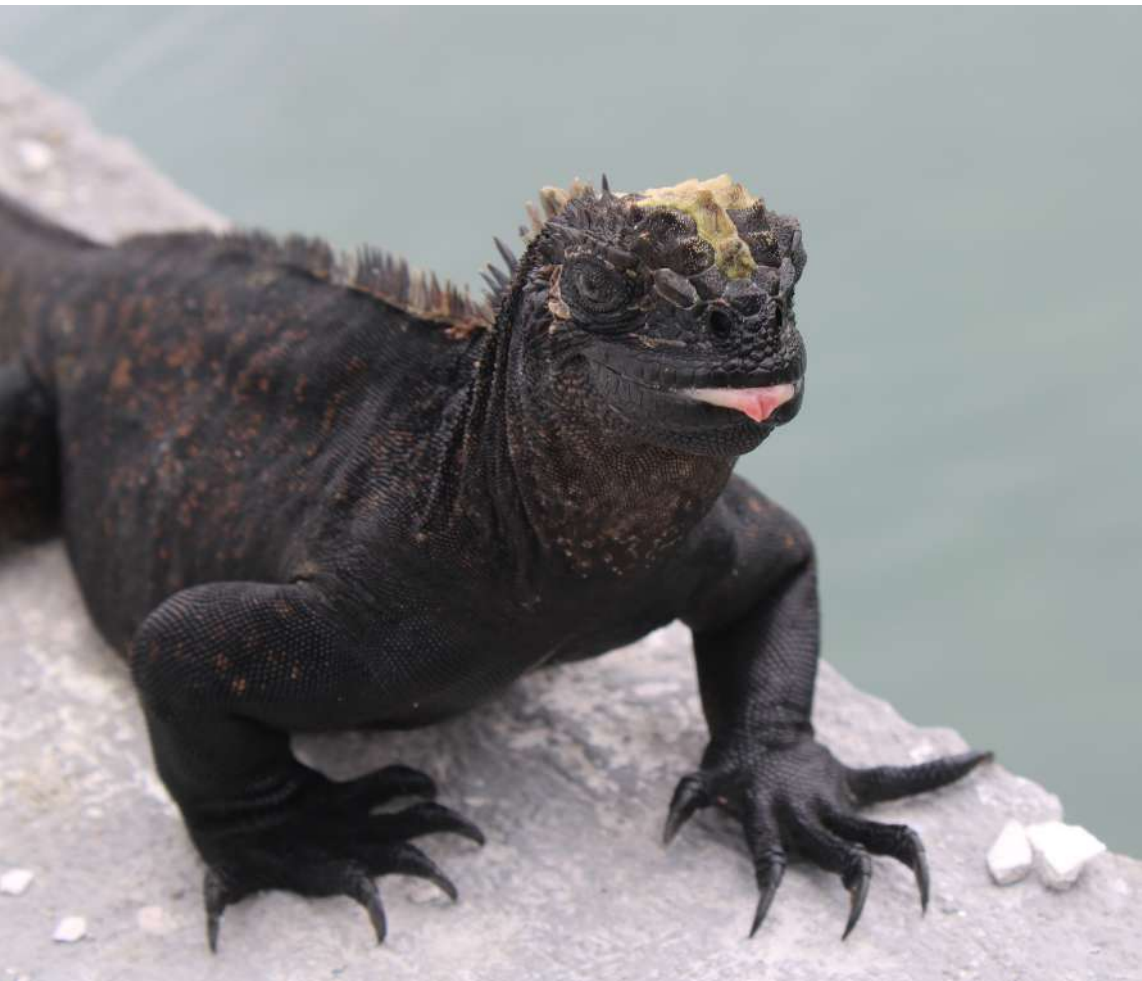
for understanding resilience and guiding future conservation strategies in island systems such as the Galápagos.

Our approach is intentionally multidisciplinary. The project integrates research on plants, water systems, human impacts, and both marine and terrestrial biodiversity. Through a One Health lens, these components are studied as interconnected parts of the same socio-ecological system. Understanding how changes in water

quality, soil health, or biodiversity affect local communities allows science to become a practical tool for conservation and decision-making. The initiative is supported by a diverse team of 20 scientists and specialists organized into six thematic clusters. Their expertise spans marine ecology, terrestrial systems, environmental quality, biodiversity monitoring, and conservation science, with many years of collective experience working in the Galápagos Archipelago. This collaborative structure allows the project to address complex

environmental challenges from multiple perspectives.

A central pillar of the LTER Wreck Bay project is the Experiential Education Program. Beyond generating scientific data, the initiative seeks to create meaningful opportunities for learning and participation. Students from Ecuador and around the world actively engage in monitoring activities, laboratory analysis, and field research while developing practical scientific skills. Whether monitoring reforestation efforts or analyzing environmental pathogens,





participants contribute directly to research with practical relevance for conservation and community well-being. This integration of research, education, and community engagement helps cultivate a new generation of scientists and environmental leaders who understand the interconnected nature of ecosystem and human health. It also strengthens the relationship between scientific knowledge and local stewardship, ensuring that research remains accessible, collaborative, and socially relevant.

The LTER Wreck Bay project represents an important step toward building a long-term participatory research platform in San Cristóbal. More broadly, it reflects a shift

toward integrated, collaborative, and application-oriented science in the Galápagos. By linking ecosystem health, community well-being, and education, the initiative puts the principles of One Health into practice and contributes to a more resilient and sustainable future for the archipelago.

**Conoce cómo ser parte del
componente de Educación
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Connecting with Nature Program CWNP– Co-Creation Spaces for Well-Being

Authors: Leidy Apolo C. And Fernanda Hidalgo



Despite the logistical and structural challenges inherent to life in an island territory, the San Cristóbal community has found in the CWNP an opportunity to deepen its connection with the natural environment and promote a more conscious, informed, and responsible relationship with local ecosystems.



The active participation of children, adolescents, and adults in educational, social, and conservation activities has helped promote environmental awareness and encourage actions aimed at building a more sustainable future for the archipelago.



Beyond simply sharing information, the program creates meaningful experiences that connect generations and inspire the ongoing pursuit of holistic well-being for those who inhabit the islands. Based on providing spaces for dialogue, reflection, and recreation, the program integrates relevant topics such as climate change, health, and pollution, transforming knowledge into a tool for more responsible decision-making

In this way, the One Health approach is reflected in the participation of more than 10,000 people over seven years of work, fostering a deeper understanding of local challenges and a collective commitment to human, animal, and environmental well-being.

Through guided reading sessions, community events, science clubs, and youth programs, the community has explored the importance of protecting the balance between different ecosystems and the people who inhabit them. As a result, understanding these dynamics becomes more than educational content—it becomes an essential part of the islands' collective identity.





Friends of Science Club

The Club is a space where young people from different areas of San Cristóbal come together to learn in safe, inclusive, and science-connected educational environments. Here, we combine field trips with laboratory experiences, fostering curiosity, critical thinking, and teamwork.

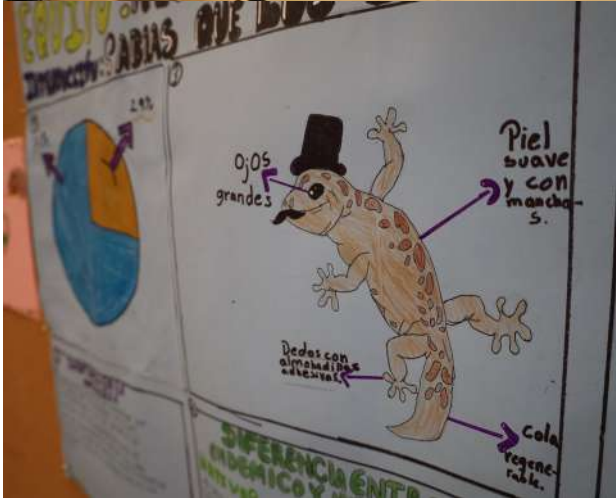
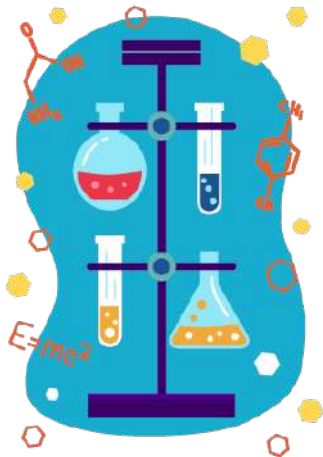


With every step we take, we discover that inspiration is everywhere. It is young people who inspire us to challenge existing paradigms and transform the way we see the world.

Through shared learning, we generate knowledge, engage in science, and work together to build the change we want to see in the world.

This year, we will host our fifth cohort, and we want you to be part of this effort. Your support matters because when we come together as a community, we transform lives.

Learn how you can support the club.





The University
of North Carolina
at Chapel Hill

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