

GALÁPAGOS

POST

ISLAND LESSONS: GLOBAL FUTURES



- HOW EL NIÑO IS RESHAPING ISLAND ECOSYSTEMS
- THE ENIGMA OF FERNANDA: A LONE SURVIVOR IN GALÁPAGOS
- GALÁPAGOS TEACHERS INSTITUTE CHAMPIONS SUSTAINABLE EDUCATION WITH POTENTIAL FOR GLOBAL RIPPLE EFFECTS



Celebrating Conservation

from the **PRESIDENT**

Dear Friends of Galápagos,

As the newly appointed President of Galápagos Conservancy, I wish to start by saying thank you! Your financial support and help spreading awareness about our work are both essential to helping us fulfill our critical mission to ensure Galápagos remains a well-protected home for its one-of-a-kind flora and fauna.

The first several months of my tenure have been a rewarding experience, revealing the tangible impact of our collective efforts. Through your consistent support, our team has been focused on key areas such as protecting endangered species, mitigating the spread of invasive species, restoring fragile ecosystems, and directly involving local communities at every step along the way.

This edition of the Galápagos Post highlights our focus on some of the most pressing issues this unique ecosystem faces. We provide updates on climate change research and an in-depth look at the unfolding El Niño phenomenon and its effects on the islands.

And, we share the outcomes of a study we recently completed that demonstrates the strong and positive effects that reintroducing giant tortoises has had on the ecosystems they inhabit.

To offer you a more personal view of the conservation work on the ground, this issue also features a local scientist whose research on sea lions is contributing valuable information to guide efforts to conserve the iconic pinnipeds.

You have my deepest gratitude for your commitment to Galápagos Conservancy. Together with our incredible conservation and support staff, we can make a lasting impact and ensure that the unique landscapes and creatures of Galápagos will be conserved for generations to come.

Thank you for your continued support.

For Galápagos,



Dr. James Gibbs
President
Galápagos Conservancy

MEET OUR NEW VICE PRESIDENT OF OUTREACH AND PHILANTHROPY

Dear Friends of Galápagos,

I began my relationship with the Galápagos Archipelago in 2011 when I visited the archipelago as a part of an ecotourism trip. The visit sparked fascination, curiosity, and a deep desire to protect one of the world’s great ecological wonders for future generations. Now, more than a decade later, and despite continuing efforts to protect and conserve the unique ecological setting, the threats to the flora and fauna of Galápagos are more serious than ever. The ongoing need prompted me to make a radical change in the trajectory of my career. I have spent the last 20+ years fundraising for higher education at various research universities around the country, but the onslaught of news about the ongoing environmental concerns made my decision to apply my skills towards conservation an easy one.

Once I made the decision to change the course of my career from fundraising in higher education to fundraising for conservation I began looking at organizations that were pragmatic, effective, and mission driven. Even within Galápagos, there are a number of organizations working in various capacities to research, preserve, and protect.

None seemed to measure up against the grounded scientific approach, the hands-on conservation, the community building and education, and the long and trusted partnerships with the residents and professional conservationists in the community.

I am excited and humbled to begin the next phase of my career as the VP of Outreach and Philanthropy with Galápagos Conservancy. I hope that you will continue the essential support that you provide to this wonderful organization. The work we do simply could not be completed without the generosity of individuals like you who can proudly make a claim to be an essential part of Galápagos Conservancy.

For Galápagos, for the world,

Josh McCoy

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SCIENCE IN ACTION!

Who knew whiskers could talk?

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CONSERVATION



EXPEDITIONS 2023: SAFEGUARDING WILDLIFE IN GALÁPAGOS

In the first half of 2023, Galápagos Conservancy, through its operational arm Conservando Galápagos and in partnership with the Galapagos National Park Directorate, spearheaded ten expeditions across Isabela, Española, Santa Fe, and Fernandina islands. Each expedition had its own objective, but all shared the mission of helping safeguard Galápagos wildlife. From January through May, the first comprehensive census was conducted of the giant tortoises living on Isabela’s Sierra Negra and Cerro Azul volcanoes. In March, 86 juvenile tortoises were reintroduced on Española, enhancing genetic diversity of the rapidly recovering tortoise population there and helping restore the island’s ecosystems. Concurrently, an expedition to Santa Fe tracked the success of introducing over 700 tortoises to the island and determined the population is on the verge of starting to reproduce. An arduous expedition to Fernandina in February attempted to locate a mate for Fernanda, a member of the critically endangered *Chelonoidis phantasticus* species — with none found, the focus on Fernanda intensifies as the only surviving member of her species. The year’s activities culminated with expeditions to Española in June and August to perform island-wide surveys of the nesting population of the waved albatross, an endemic species whose global nesting area is this single island. Dr. Jorge Carrión, our Director of Conservation who guided all the expeditions, said, “Together, these arduous field expeditions greatly advance our understanding of the conservation status of the archipelago’s iconic species and provide critical guidance for implementing management measures for them.”



HOW THE LEGACY OF LONESOME GEORGE CAN HELP GALÁPAGOS GIANT TORTOISES

A soon-to-be-released animated short film, "Lonesome George," features the Galápagos giant tortoise of

Pinta Island, emphasizing the need to protect all tortoises from the sad fate of its star. Filmmakers Dorian Cambi and Andrés Montesinos tell the story of the last known specimen of the *Chelonoidis abingdonii* species, the famous Lonesome George, who was discovered in 1971 on Pinta Island and passed away in captivity in 2012. After his death, George's remains became an exhibit in the Galápagos National Park Directorate's giant tortoise breeding center, now serving as a poignant reminder of biodiversity loss. Using 3D animation, the film tells the story of Lonesome George in a vivid and engaging manner that helps support Galápagos Conservancy’s mission to restore the giant tortoises of Galápagos to their natural habitats by educating viewers on the reality faced by many species struggling to survive. Please watch the film when it becomes available: <https://www.lonesomegeorge-themovie.com/>

INSIGHTS FROM THE MEDIUM TREE FINCH AND YELLOW WARBLER IN THE FACE OF NEST PREDATION

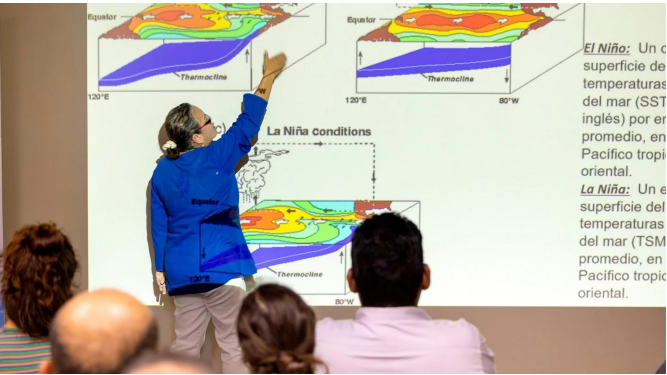
Galápagos, renowned for its unique biodiversity, faces challenges from invasive species. The critically endangered medium tree finch, unique to Floreana Island, is among the most affected. A 2022 study by the University of Vienna, funded by Galápagos Conservancy, revealed a clearer understanding of invasive predators faced by Floreana’s birds. Three invasive species are responsible for 90% of the reproductive failure among Floreana's birds: introduced black rats, feral cats, and smooth-billed anis. These widespread threats call for urgent and effective control measures, which are now underway by the Galápagos National Park Directorate and its partners Island Conservation and Jocotoco Foundation. The findings will guide future conservation efforts, emphasizing the pivotal role of scientific research in conserving the islands' ecosystems.



WACHO ARTICLE

Daniel Montalvo, a Galápagos-born entrepreneur influenced by his naturalist father, has been a fervent advocate for environmental education for over a decade. Fueled by his childhood connection with the archipelago's giant tortoises and his passion for communication, Daniel, with Galápagos Conservancy's backing, embarked on a project to raise awareness about the challenges facing these tortoises. Daniel intends to produce engaging audiovisual content about giant tortoises for social media to deliver compelling conservation messages. The importance of a balanced relationship between communities and nature, emphasizes the socio-economic and cultural merits of conserving these creatures. Galápagos Conservancy’s support amplifies Daniel’s vision, fostering both local and global awareness. Their united efforts shows a commitment to safeguarding the Galápagos’ unique legacy and crafting a sustainable future for the islands.

RENOWNED SCIENTIST’S PRESENTATION SPOTLIGHTS EL NIÑO



Galápagos Conservancy hosted an essential discussion highlighting the El Niño phenomenon's past and likely future effects on the Galápagos Archipelago. The event engaged local stakeholders and residents keen to comprehend this climate anomaly and its implications for the islands. Dr. Mercy Borbor, a renowned environmental scientist and Galápagos Conservancy board member, led the conversation, drawing from her extensive career as a marine scientist at ESPOL, a university in coastal Ecuador, and as an advisor for the Inter-American Institute for Global Change Research. She explored historical El Niño data, evaluated current predictions for 2023-24, and explained tools and mitigation measures vital for conserving Galápagos ecosystems and biodiversity as the current El Niño event unfolds. Many community members attended the presentation, indicating a strong interest in better understanding and preparing for this climatic event. With experts like Dr. Borbor, Galápagos Conservancy aims to empower the local community with knowledge, driving collective efforts to protect the archipelago's unparalleled biodiversity against evolving environmental challenges.

CELEBRITY CRUISES GALÁPAGOS FUND HELPS RENOVATE THE GALÁPAGOS NATIONAL PARK DIRECTORATE’S PLANT NURSERY



Celebrity Cruises and Galápagos Conservancy have partnered together since 2006, raising over \$1.5 million for the Celebrity Cruises Galápagos Fund. Galápagos Conservancy, as the fund administrator, recently channeled resources to upgrade the Galápagos National Park Directorate's plant nursery on Santa Cruz Island. This nursery, crucial for ecosystem restoration, produces 20,000-25,000 seedlings annually and aids projects like our *Scalesia* regrowth forest in the Los Gemelos area. Since 2014, this joint initiative among Celebrity Cruises, Galápagos Conservancy, and the Galápagos National Park Directorate has greatly expanded the forest restoration project, benefiting many local wildlife species by improving their habitat. Guests from the Celebrity cruise ship Flora play an important role in this restoration effort by planting many of the trees. Fausto Arcos, General Manager of Celebrity Cruises in Ecuador, highlighted the company’s commitment to conservation and the local community: “There is immense value in providing a unique opportunity for guests and collaborators to participate in these significant efforts that foster direct contact with nature in this pristine corner of the world.”

WISE GRANTS



ARTE + VIDA (ART + LIFE) = CREATIVE CONSERVATION IN GALÁPAGOS

Galápagos Conservancy celebrates Vanesa del Valle Enrique, a local pioneer of the ARTE + VIDA initiative since November 2022. Supported by a Galápagos Conservancy Women in Sustainable Entrepreneurship (WISE) grant, Vanesa artistically

repurposes waste materials like tin cans, glass jars, and fabric into captivating artworks — enhancing the environment and championing conservation in the archipelago. Her unique approach not only combats waste and pollution but also bolsters environmental consciousness among the community. Vanesa's passion for conservation underscores the transformative power of creative entrepreneurship in safeguarding Galápagos.

ENCOURAGING YOUTH TO CARE FOR GALÁPAGOS THROUGH DANCE AND ART



In Puerto Ayora, Santa Cruz Island, Jennifer Palma, a dancer and wildlife advocate, transformed her dual passions into a conservation mission with the help of a Galápagos Conservancy grant. The outcome was "Galápagos Modern Dance," which melds dance and conservation education. Currently, 70 children attend Jennifer's classes, simultaneously learning about modern dance and the unique species of Galápagos through creative choreography that embodies the grace of an albatross, the calmness of a tortoise, and the agility of a sea lion. Dance transcends mere movement, instilling in the students a love of the creatures around them and emphasizing the importance of conserving their homeland. Community performances amplify this message broadly. The program also offers environmental art classes to younger children. Galápagos Conservancy is proud to champion initiatives that bond communities with promoting the protection of the treasures of Galápagos.



THE ART OF RECYCLING IN THE HANDS OF CHILDREN

Art can serve as a powerful medium for teaching children about environmental conservation. Patricia Solano, with the support of Galápagos Conservancy, recently embarked on a project on Santa Cruz Island to promote both creativity and environmental awareness among children. Over several months, 12 kids from Los Túneles, a neighborhood of the port city Puerto Ayora, honed their artistic skills by learning drawing and painting techniques. They used recycled wood as canvases, emphasizing the importance of reusing materials. In an interview, Solano expressed that such activities allow children to artistically interpret the diversity of wildlife and plants in Galápagos, helping them to recognize how necessary it is to protect nature. Projects like this not only spark creativity but also champion sustainability in the community, echoing the collective responsibility to safeguard Galápagos.



HOW ONE WOMAN IS LEADING GALÁPAGOS' SUSTAINABLE STYLE REVOLUTION

In the Galápagos Islands, Diana García merges aesthetics with environmental responsibility with the goal of reshaping fashion to become more environmentally sustainable. With support from a Galápagos Conservancy Women in Sustainable Entrepreneurship (WISE) grant, combined with her 20 years of experience working with textiles, Diana's sustainable fashion initiative thrives on

the 3Rs — reduce, reuse, and recycle. By transforming discarded materials, her workshop crafts diverse items, from bags to headbands, minimizing pollution as well as her carbon footprint. This innovative approach not only exemplifies resource efficiency but has also resonated with eco-conscious consumers. The project's outstanding success has amplified production and generated part-time employment, bolstering the Galápagos community's economic growth and resilience.

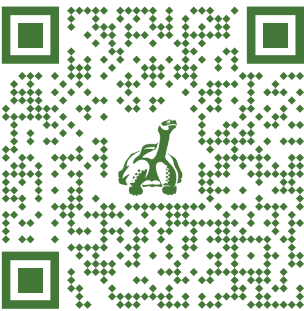
LIKE FATHER, LIKE SON: THE LEGACY OF A NATURALIST GUIDE INSPIRES INNOVATIVE GIANT TORTOISE PROJECT

Daniel Montalvo, a Galápagos-born entrepreneur influenced by his naturalist father, has been a fervent advocate for environmental education for over a decade. Fueled by his childhood connection with the archipelago's giant tortoises and his passion for communication, Daniel, with Galápagos Conservancy's backing, embarked on a project to raise awareness about the challenges facing the tortoises of Galápagos. Leveraging his multimedia skills, Daniel produces engaging audiovisual content about giant tortoises for social media to deliver compelling conservation messages. Daniel stresses the importance of a synergistic relationship between local communities and nature, emphasizing the socioeconomic and cultural merits of conserving these creatures.



EMBARK ON AN ADVENTURE WITH THE YOUNG TORTOISE PROTECTORS!

On Santa Cruz Island, the Young Tortoise Protectors program, supported by the Galápagos National Park Directorate and Galápagos Conservancy, has engaged 30 local teenagers as citizen scientists to safeguard giant tortoises. These youngsters conduct surveillance to understand tortoise behavior and challenges when approaching urban areas, such as ingestion of plastic waste, predation, competition for food, and collisions with speeding vehicles. Since early 2023, under the guidance of environmental educators and park rangers, the Young Tortoise Protectors have made eight monitoring trips to help tortoises. Lorena Pincay, who leads this initiative, said she believes the data collected will be an important contribution that leads to improved conservation strategies. This exciting, kid-focused program highlights the importance of education, scientific research, and community involvement in conserving the archipelago, urging collective action against ongoing challenges.



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GALÁPAGOS IN FLUX:

HOW EL NIÑO IS RESHAPING ISLAND ECOSYSTEMS

El Niño, a recurring climate pattern that brings warmer water to the Galápagos Archipelago, has begun. Trade winds, which normally blow across the Pacific from east to west, have started to weaken, diminishing the strength of the Humboldt Current, which normally brings cold, nutrient-rich water first north from Antarctica and then west to Galápagos.

As the temperature and nutrient levels of waters around Galápagos change, all of Galápagos is affected. Marine life, which thrives in cool, nutrient-rich waters, suffers during the warm spell brought by El Niño. Sea lions, boobies, penguins, and cormorants all struggle to find food, often skip breeding, and widely extend their range in search of things to eat.

Warmer seas also evaporate far more water into the atmosphere, which greatly increases the amount of rainfall on the normally dry, hot archipelago. This influx of rain brings profound changes to life on land in Galápagos. The rain triggers far greater productivity on land, relieving the normal drought conditions of Galápagos. Plant growth skyrockets, insects proliferate, and many wildlife species double or even triple their reproduction and survival.

El Niño is a natural event, occurring every 2-7 years, and has intensified in the late 20th century, possibly due to human-driven greenhouse gas increases, although direct causation is yet unconfirmed. There is not much we can do but watch it unfold, but we do know that Galápagos will face many difficulties. Notably, heavy, prolonged rainfall and warm, unproductive seas, along with sea-level surges like the 45-centimeter rise in 1997-98, pose significant challenges for Galápagos.

We are supporting many efforts throughout the archipelago to help both its wildlife and people adapt to this El Niño, including helping municipalities deal with impending threats to infrastructure, anticipating the need for increased invasive species control on land, and preparing for coral reef recovery. The only way we are able to continue to do this important work is through your steadfast support.

Thank you!



JENIFER SUÁREZ: A BEACON AMID GLOBAL CORAL CHALLENGES

The escalating global crisis of coral bleaching and erosion, accentuated by climate change, pollution, and overfishing, has put marine ecosystems at grave risk. Coral reefs, frequently labeled as the “rainforests of the sea,” are a major focus as they are vital to marine biodiversity. The loss of these reefs affects not just the beauty of our oceans but also the many marine species they sustain. The diversity of species in coral reefs is second only to tropical forests.

Amid this worldwide concern, the Galápagos Archipelago has emerged as a symbol of both marine fragility and resilience. Around 100 women here work for the Galápagos National Park Directorate. Among this dedicated group is marine biologist Jenifer Suárez, whose commitment to conserving the archipelago’s coral reefs is profound and noteworthy.

From an early age, Jenifer was drawn to the sea. Her academic journey, fueled by a scholarship, led her to a biology degree and subsequent marine research at the Charles Darwin Foundation. In 2014, her focus shifted to the Galápagos National Park Directorate, where she spearheads a coral reef restoration project in the Galápagos Marine Reserve. Her work in the field and under the ocean is supported by Galápagos Conservancy.



"NO ONE CAN PROTECT WHAT THEY DON'T KNOW."

- Jenifer Suárez

Jenifer’s response to the global challenge of coral degradation is hands-on. On her frequent dives, she gathers data on coral health that contributes not only to local conservation efforts but also to global understanding of coral status. With support from Galápagos Conservancy, she initiated several underwater nurseries in Academy Bay on Santa Cruz Island. These nurseries, pivotal in aiding coral growth by providing small corals for outplanting on weakened coral reefs and into new areas, are making significant strides in reviving corals in several areas of the Galápagos Marine Reserve.

Emphasizing awareness and education, Jenifer actively interacts with the local community, engaging many youth from the local community in coral propagation and planting efforts. Through her educational outreach, she hopes to instill a sense of duty among residents and spark parallel global conservation movements.

Jenifer’s dedication, alongside community collaboration, is helping secure the future of Galápagos coral reefs and provides an inspirational template for addressing similar challenges faced by corals elsewhere.

THE EFFECTS OF EL NIÑO ON GALÁPAGOS PLANTS, ANIMALS AND PEOPLE



The Galápagos Archipelago, recognized for its distinct biodiversity, is vulnerable to global climate anomalies, notably El Niño. The El Niño-Southern Oscillation (ENSO) disrupts the archipelago's ecosystems with warmer ocean temperatures and increased rainfall, affecting marine species adversely while benefiting certain terrestrial species, challenging the cacti-dominated landscape, and amplifying risks from invasive plants. "Virtually all aspects of life on these islands will feel the effects of El Niño," said Galápagos Conservancy General Director Washington Tapia.

TERRESTRIAL EFFECTS: LIFE IN BALANCE FOR TERRESTRIAL SPECIES, EL NIÑO CAN BE BOTH A BOON AND A BANE:

Galápagos Giant Tortoises: These iconic creatures displayed mixed responses to past El Niño events. While the 1982-83 phase saw them adapt by moving to lower elevations, the 1997-98 event flooded many nests and caused breeding disruptions, yet increased food availability, boosting growth and survival rates.

Landbirds: These terrestrial birds, many of which are unique to Galápagos, tend to significantly increase reproduction due to increased plant growth and associated insect production. However, increased breeding during El Niño can be countered by the rise of diseases like avian pox, especially in wetter conditions.

Reptiles, Rodents, and Invertebrates: While limited data exists, certain reptiles and rodents depend on predictable rainfall patterns. Invertebrates, too, are likely to face challenges, particularly from invasive species thriving in wetter conditions. Generally, though, most species thrive during El Niño due to reprieve from drought provided by increased rainfall.

Plant Life: Flora generally proliferates during El Niño thanks to sudden availability of abundant water in the typically droughty environment, but some species suffer.



MARINE FAUNA: BATTLING THE WARMTH EL NIÑO'S WARMTH GENERALLY SPELLS DISASTER FOR MANY MARINE SPECIES:

Green Sea Turtles and Marine Iguanas: With primary food sources dwindling due to warming sea conditions, these animals experience considerable mortality during El Niño, exemplified by the 90% decline in marine iguanas seen in 1997-98.

Sea Lions: These mammals, particularly pups and alpha males, face drastic reductions in their populations during intense El Niño phases due to the lack of fish to eat in the warmed seas.

Marine Birds: Penguins, flightless cormorants, boobies, and frigatebirds often skip breeding, experience increased mortality from lack of food, and disperse widely to find food.



HUMAN COMMUNITY: A DIFFICULT TIME THE SOCIOECONOMIC EFFECTS OF EL NIÑO CAN TEST HUMAN RESILIENCE:

El Niño presents significant challenges to the economic foundations of the Galápagos Islands, particularly in tourism and fishing.

Tourism, accounting for about 90 percent of the local economy, could be affected by declines in key species due to climate change, affecting visitor numbers and experience.

Fishing remains vital to local society and faces threats from shifts in marine species abundance due to rising temperatures and modifications in upwelling patterns — the process where cold, nutrient-rich waters from the deep ocean rise to the surface. These modifications in upwelling patterns can disrupt the food web and affect fish populations. Ensuring the sustainability of the fishing industry amid climate change is paramount for the protection of emblematic species and the adoption of sustainable practices.

Human well-being is also affected: Invasive species, including mosquitos that vector disease, proliferate and can also affect agricultural production. Infrastructure, including roads, can also be damaged due to flooding.



LOOKING AHEAD:

Anticipation and planning are essential to ensure the resilience of unique biodiversity and local communities. According to Tapia, taking decisive actions now is "an invitation to protect our past and build a sustainable and enriching future in these iconic islands."

Ultimately, the challenges posed by El Niño and associated climate change in Galápagos are a global and local call to action. Collaboration, adaptation, behavioral change, and conservation are vital to securing the survival and prosperity of the unique gem that is Galápagos.

THE ENIGMA OF FERNANDA

A LONE SURVIVOR IN GALÁPAGOS

The discovery of Fernanda, a lone female Galápagos giant tortoise and last known member of the *Fernandina* species (*Chelonoidis phantasticus*) — previously thought extinct for over a century — signaled a conservation breakthrough in rediscovering a lost species. However, it now increasingly highlights the grim reality of species extinction. Extensive expeditions to Fernandina Island by teams from Galápagos Conservancy and the Galápagos National Park Directorate to find another member of her species have, despite enormous efforts, so far been fruitless. We are increasingly moving toward the conclusion that Fernanda is an ending of her species.

A Remarkable Discovery

In 2019, scientists from Galápagos Conservancy, the Galápagos National Park Directorate, and other organizations discovered Fernanda on Fernandina Island. Initial excitement was tempered with caution, as genetic tests were needed to confirm her species.

Blood samples were sent to Yale University, where geneticists led by Dr. Gisella Caccone performed an analysis. The results confirmed that Fernanda was indeed a *Fernandina* giant tortoise, with DNA that best matched that of the only other tortoise ever found on Fernandina Island — one killed by scientist collectors in 1906 and kept in a museum since. This confirmation triggered an immediate and large-scale response to find a male mate for Fernanda to revive the nearly extinct species.

The Quest for Survival

Energized by the scientific confirmation, the Galápagos National Park Directorate and Galápagos Conservancy organized ambitious expeditions to search for additional tortoises on Fernandina. Despite the island's challenging landscape — dominated by an active volcano — scientists, rangers, and volunteers combed through the area. Aerial support was even mobilized to explore inaccessible terrains. However, no other tortoises have been located.

Conservation Dilemma

While Fernanda's discovery provided hope, the inability to find another of her species illuminates the tragic circumstances facing many endangered animals. Currently housed in the Galápagos National Park Directorate's Giant Tortoise Breeding Center in Santa Cruz, Fernanda serves as both a symbol of hope and a solitary reminder of the urgency needed in conservation efforts.

As the Galápagos National Park Directorate Director Danny Rueda Córdova put it, "*We desperately want to avoid the fate of Lonesome George,*" referring to the last *Pinta* giant tortoise who died in 2012 without leaving any offspring. Time is ticking to find a companion for Fernanda to prevent another heartrending loss.

The enigmatic case of Fernanda, the assumed lone surviving *Fernandina* giant tortoise, encapsulates the complex challenges and moral imperatives of modern conservation. Her survival against all odds provides a glimmer of hope, but the failure to find any other members of her species underscores the urgency and complexity of the work that still lies ahead. Fernanda's existence remains a poignant reminder of both nature's resilience and fragility, while fueling continued efforts to save not only her species but the broader ecosystem to which she belongs.

TORTOISE DNA — IMPLICATIONS FOR CONSERVATION

Critical research into the taxonomy of Galápagos giant tortoises, funded by Galápagos Conservancy, is currently being conducted by geneticists at Princeton, Newcastle, Oxford, and Yale universities, as well as several other institutions. This international team is tackling a 300-year-old dilemma: Are the giant tortoises whose populations are scattered across the volcanoes and islands of Galápagos all of a single species or many different species?

This question has been debated for centuries. Given tortoises arrived in the archipelago and spread across its islands and volcanoes over only the last few million years (a “wink of an eye” in evolutionary time), they represent a relatively young evolutionary radiation. In other words, they may not have had enough time to mature into separate species. On the other hand, several populations have been separated by ocean for over a million years and based on their differences in size, shape, and behavior, seem to have become quite different creatures that may well be unable to breed together even if they could reach one another.

Galápagos Conservancy is funding this research because answering the question is key to understanding how we best go about conserving the giant tortoises of Galápagos. The issue is, how do decision-makers decide where to invest their efforts in conserving tortoises if they don't know what is being protected? If, for example, all tortoises are members of a single species, then having a few robust populations somewhere in the archipelago is sufficient to “save the species,” a view taken by many biologists today and increasingly embraced by the International Union for the Conservation of Nature. But, if every tortoise population on every island and volcano represents a unique species, then all should be protected equally, a view long taken by the Galápagos National Park Directorate and many conservationists.

The international team recently published preliminary outcomes of their investigation, the title of which foreshadows their key finding: “Whole-genome sequencing confirms multiple species of Galápagos giant tortoises.” The team managed to sequence the entire genome of 38 tortoises from all 13 populations present today (and even a few that are functionally extinct, using DNA harvested from museum specimens). They found strong evidence that Galápagos giant tortoises belong to as few as five

and as many as 13 species, depending on how rigorously they parsed the data.

However, the real picture is more nuanced than simply “single or many” species. Because the tortoises are relatively recent arrivals to Galápagos, each island and volcano represents a different stage in the process of speciation, with some taxa further along in that evolutionary process than others. Consider, for example, an Española tortoise (small, flat, saddle-backed, and sedentary) and an Alcedo Volcano tortoise (large, round, and migratory), separated from each other for at least a million years and clearly different species. Others, though, are clearly still in the process of splitting, such as all the tortoises scattered across the volcanoes large and small on southern Isabela Island — tortoises virtually indistinguishable from one another in size, shape, and behavior.

The key takeaway is that the giant tortoises of Galápagos cannot be considered a single species, and regarding them as such is dangerous for conservation. This finding provides further foundation and justification for the Government of Ecuador to continue its efforts to protect and restore giant tortoises “island-by-island” and “volcano-by-volcano.” Such an approach aims to save the full swath of diversity and evolutionary history represented in the giant tortoise dynasty of Galápagos, which together represent the highest concentration of turtle diversity on Earth.



FOSTERING CONSERVATION: EMPOWERING THE GALÁPAGOS ISLANDS THROUGH COMMUNITY ENGAGEMENT

The Galápagos Islands hold a priceless treasure trove of biodiversity whose beauty captivates the world's imagination. Designated a UNESCO World Heritage Site, these unique islands are home to an astonishing array of endemic species that have fascinated scientists, explorers, and nature enthusiasts for centuries.

Galápagos is also home to over 30,000 people, who live, learn, and work in this natural paradise. These island communities play a pivotal role in shaping the fate of these lands. Dependent on both terrestrial and marine resources, most inhabitants of Galápagos depend directly or indirectly on conservation of the islands natural resources for their very subsistence.

IN THIS UNITED EFFORT TO SAFEGUARD AND CONSERVE, ENVIRONMENTAL EDUCATION EMERGES AS THE GUIDING THREAD THAT BINDS THE COMMUNITY TO CONSERVATION.

Galápagos Conservancy, deeply committed to this cause, spearheads a sustainability education program reshaping the perspectives and actions of present and future generations. With over 450 educators empowered in sustainability pedagogy, more than 7,000 students are able to learn about their role in safeguarding these islands. Environmental education transcends the classroom, permeating every household, side street, and pathway, weaving conservation into the very fabric of everyday life.

Galápagos Conservancy's influence extends beyond the classroom through its conservation grants. It backs local projects and initiatives aimed at pioneering the protection of this unique ecosystem. With 135 ongoing projects across the islands, this communal collaboration stands as a bridge between the community and its natural heritage, emphasizing the commitment and diversity of efforts integral to safeguarding Galápagos.

Today, we extend a call to action. The Galápagos Archipelago needs your support and involvement in this collective endeavor for a sustainable future. Each contribution you make strengthens the bonds that unite the community with conservation, and each sustainable practice you spearhead in your community allows the future of this planet to be brighter. By joining Galápagos Conservancy with your support and actions, you're investing in a legacy of biodiversity and beauty deserving of protection. Your involvement in this journey toward a future where the Galápagos Archipelago shines in full splendor is pivotal.

Thanks to the community's unwavering commitment and the invaluable support of donors like you, we can ensure that Galápagos continues to inspire and astonish generations to come.

TRACKING THE IMPACT OF CLIMATE CHANGE ON GALÁPAGOS SEA LIONS AND FUR SEALS

Thanks to unrestricted donor support, Galápagos Conservancy is supporting a new initiative to investigate how climate change will impact pinnipeds — endemic sea lions and fur seals — in the archipelago. The new study will monitor the feeding habits of these animals over time to see how they are being affected by changes in ocean temperature and prey availability.

Over the past four decades, Galápagos sea lions and Galápagos fur seals have faced significant population declines as a result of the changing climate, pollution, invasive species, and other human-driven impacts. As a result, today these pinnipeds are listed under the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

Leading the research is Dr. Diego Páez-Rosas, a distinguished Galápagos marine scientist at the Universidad San Francisco de Quito (USFQ), who is supported by other USFQ researchers, the Galápagos National Park Directorate, and Galápagos Conservancy. Páez-Rosas has spent the last two decades working on research projects related to the marine megafauna of the archipelago and calls Galápagos pinnipeds “sea health sentinels.” By studying their behavior and population trends, we can understand what is happening in the trophic levels below them (i.e., in populations of fish, plankton, and other organisms further down the food chain) and gain insights into the overall health of the marine ecosystem.

Many experts currently indicate that one of the effects of climate change is a tendency toward more frequent and intense El Niño events that increase ocean temperature. That temperature increase in the Galápagos Marine Reserve leads to decreases in productivity and makes the pinnipeds’ food sources scarce, endangering their populations.

Dr. Paéz-Rosas affirms that by “investigating these issues, we are tracing the foraging strategies of Galápagos marine predators and trying to link population dynamics, home range, trophic flexibility, and health with their feeding success and energy budgets.” Dr. Paéz-Rosas’ work is starting to reveal that Galápagos pinnipeds, in fact, consume a wide variety of fish, including some sharks and other species previously unknown to be in their diet. They have a very broad diet, which bodes well for them adapting to future changes in marine life communities brought on by climate change.

Dr. Jorge Carrión, Galápagos Conservancy’s Director of Conservation, said that this research will produce baseline data for the conservation of Galápagos pinnipeds and enable researchers to look into the potential long-term effects of climate change on these species.

“WE HOPE TO SHARE KNOWLEDGE THAT WILL HELP GALÁPAGOS MARINE RESERVE MANAGERS COMPREHEND THESE SPECIES’ FUNCTION AS ECOSYSTEM SENTINELS.”

- Dr. Jorge Carrión



Sea lion basking in the sun. © Donna Langdon



Sea lions exploring the Galápagos Marine Reserve © Joshua Vela



Fur seal stretching on the rocky coast of Genovesa Island © Joshua Vela

Galápagos Conservancy congratulates Dr. Diego Páez-Rosas for his contribution to the conservation of Galápagos ecosystems. His research into the relationship between climate change and Galápagos pinnipeds will undoubtedly aid in the conservation of these species.



SCIENCE IN ACTION: STABLE ISOTOPE ANALYSIS SHEDS LIGHT ON GALÁPAGOS SEA LIONS

What can we uncover from a single whisker?

Scientists in Galápagos are harnessing an innovative technique to glean information about the foraging behavior of sea lions in the archipelago, leading to a greater understanding of the species' ecology and its sensitivity to environmental change.

The technique is known as stable isotope analysis, and it involves measuring the relative abundance of different isotopes of carbon and nitrogen in an animal's tissue. The method is based on the idea that unique signatures of these isotopes, which every species has, are also revealed in those that eat them. Along the theme of “you are what you eat,” a smidgeon of tissue from any animal can be processed in a mass spectrometer to tell you generally what it has eaten. Moreover, akin to tree-ring analysis, if you sample tiny bits of tissue from body parts formed at different times throughout an individual’s life, such as a whisker, you can not only tell what it generally ate but also what it specifically ate at different ages.

In the case of the Galápagos sea lion (*Zalophus worlbeaeki*), scientists collect whisker samples from sea lion pups and then analyze the isotope ratios therein. Because these stiff, thick whiskers grow over long periods and persist for years on the muzzle of a sea lion, sectioning and sampling the whisker can give you a sense of what it ate during different ages or different times of year.

In this manner, by plucking sea lion whiskers, researchers have used the analysis to study the foraging behavior of female sea lions during the pre- and postpartum stages. Their findings suggest that the females studied foraged in different areas and ate different prey during these two periods. In other words, sea lion mothers were eating different foods before and after giving birth to their pups.

They are also learning that sea lions eat a large variety of marine life, not just a few select fish species as previously thought, which means they can likely adapt to changing marine conditions better than others.

And they have learned that a single large colony of sea lions is, in fact, made up of subgroups that consistently forage in different parts of the archipelago and eat rather different foods.

All of this information is being integrated with other data to paint a more complete picture of the behavior and resilience of the species.

These analyses, all derived from a whisker, are providing scientists and conservationists with valuable insights into the foraging ecology of the Galápagos sea lion — information that the Galápagos National Park Directorate is using to develop a management plan to protect this emblematic species.



ONE SPECIES OF FLYCATCHER IN GALÁPAGOS APPEARS EXTINCT. DOES THE SAME FATE AWAIT ANOTHER?

Seven years ago, scientists comparing the genes of so-called “Vermilion Flycatchers” of Galápagos realized they were looking at two new species. These birds were not of the Vermilion Flycatcher (*Pyrocephalus obscurus*) species ubiquitous across much of the Americas — they were a different species altogether.

Unfortunately, experts soon realized that one of the two newly-recognized species hadn’t been seen on its home island of San Cristóbal in decades. The San Cristóbal Flycatcher (*Pyrocephalus dubius*) has since been declared extinct — though a search continues following anecdotal reports of recent sightings on the island.

The other species, the Galápagos Vermilion Flycatcher (*Pyrocephalus nanus*), is still found on Santa Cruz, Fernandina, Rábida, and Isabela Islands — but its numbers have been dwindling because of persistent threats. Black rats devour the birds’ eggs while the larvae of the parasitic avian vampire fly (*Philornis downsi*) feed on the blood of birds that do manage to hatch, causing the death of chicks in the nest. Meanwhile, introduced blackberry plants have choked out the native species this brilliantly-colored bird depends on for its survival.



Juvenile tortoise to be released after the invasive species eradication process in Floreana © Galápagos Conservancy



Tortoise in its natural state in Wolf Volcano from where the tortoises with Floreana lineage were extracted © Joshua Vela



Juvenile tortoise to be released after the invasive species eradication process in Floreana © Galápagos Conservancy

Galápagos Conservancy, alongside our partners at the Galápagos National Park Directorate and other strategic allies, has worked to address these threats, with promising results.

With funding from Galápagos Conservancy, scientists offer “self-fumigating” nesting materials treated with insecticides to kill the parasite in the birds’ nests. Traps were also deployed throughout the archipelago to capture adult flies before they could reproduce. Separately, conservationists are working to control blackberry thickets and restore native habitat.

These efforts are paying off. This year, 12 chicks were born on Santa Cruz Island — a notable achievement because only 15 known breeding pairs of Galápagos flycatchers remain on this island. It was a welcome milestone for this precious bird.

In conjunction with the Galápagos National Park Directorate, we are now supporting expansion of these efforts onto the other islands where this unique species is found. Our hope is to ensure a brighter future for these striking flycatchers and the unique ecosystems that underpin their existence.

GALÁPAGOS TEACHERS INSTITUTE CHAMPIONS SUSTAINABLE EDUCATION WITH POTENTIAL FOR GLOBAL RIPPLE EFFECTS

On June 5, over 470 educators attended the 13th Teachers Training Institute in Galápagos, representing a partnership among the Ministry of Education, Galápagos Conservancy, and the Scalesia Foundation. This year's focus, "Civil Society Initiatives for Sustainable Production Activities," concentrated on sustainable economies and cultivating environmental consciousness. While the immediate impact of this event is evident in Galápagos, the model has the potential to inspire educational initiatives worldwide.

During her welcome speech, Marcela Pazmiño, the Director of Education in Galápagos, expressed gratitude for the collaborative support and emphasized the institute's innovative approach to virtual learning and special education needs. Jenny Macias, Pedagogical Advisor at Galápagos Conservancy, recognizes, "the institute plays a critical role in advancing sustainable education, a theme with undeniable global importance given today's environmental challenges."

Central to this educational paradigm is the Education for Sustainability Program. While deeply rooted in the Galápagos context, its methodology — blending ecological sustainability into curriculum development — has universal relevance. Through sessions and events like the Teachers Institute, educators become equipped to emphasize sustainability in the classroom. This educational model can serve as a template for schools around the world, fostering a new generation of environmentally conscious citizens.



These training sessions extend beyond knowledge transfer; they inspire curiosity and a direct connection to the environment. As global issues like climate change and biodiversity loss escalate, equipping teachers as sustainability guides becomes paramount. These educators, enriched by local expertise and pedagogical techniques, can pioneer impactful, environment-focused learning environments.

The institute's vision to train every teacher in sustainability topics, and the anticipated ripple effect among students, families, and communities is a testament to the potential of education as a tool for global change. If this Galápagos model is mirrored in schools worldwide, the cumulative impact could significantly advance global environmental conservation and sustainability awareness.

The Galápagos Teachers Institute is more than a local initiative; it stands as a beacon for global educational transformation, underscoring the power of focused, localized action to inspire and effect change on a worldwide scale.



BEYOND LONESOME: THE PURSUIT OF GEORGE'S LINEAGE ON WOLF VOLCANO

About two months ago, a team of scientists traveled to Wolf Volcano. This team had a lot to accomplish on this trip, but one of their main focuses was to find a specific type of saddleback tortoise that had been recorded as living on Wolf Volcano in the past. Their hope was to find several of these saddlebacks so they could take some of them back to the breeding center in Santa Cruz.

This saddleback tortoise was confirmed to be on Wolf Volcano over ten years ago and has a very special link to one of the most famous tortoises of all time – Lonesome George. Lonesome George was the last pure Pinta tortoise that passed away in 2012. He was and still is a conservation icon recognized both in Galápagos and around the world as a reminder to care for all the precious species on earth before they are lost forever.

With Lonesome George's death, it was confirmed that we could not bring back the exact species that used to roam all over Pinta island. However, with the knowledge that there are hybrid relatives of Lonesome George on Wolf Volcano, there is still hope!

During the expedition, the team was able to locate one of these special tortoises that is a hybrid relative of Lonesome George and deployed a satellite device to track its location in real time. Both Galápagos Conservancy and the Galápagos National Park Directorate are excited with this success as it is the first of

many steps toward the future restoration of Pinta island.



"A TRUE LOVER OF THE GALAPAGOS ISLANDS, I AM SINCERELY HONORED TO BE PART OF THE GALÁPAGOS CONSERVANCY AS A MONTHLY CONTRIBUTOR. I AM ALSO THRILLED TO HAVE BEEN GIVEN THE OPPORTUNITY TO BE INVOLVED IN THE 'ADOPT A GIANT TORTOISE' PROGRAM.

BEING A STAUNCH ADVOCATE AND A PASSIONATE PROPONENT OF ANY EFFORT MADE TO SAVE AND PRESERVE THE UNIQUE FAUNA AND FLORA OF THE ENCHANTED ISLANDS, I GIVE KUDOS TO THE GALAPAGOS CONSERVANCY AND ITS STAFF FOR THEIR DEDICATION AND EFFORTS TO THAT EFFECT."



—RENAUD W. GRANEL
MONTHLY DONOR

ECOLOGICAL RESTORATION ON FLOREANA ISLAND: NOT AT A TORTOISE'S PACE!

Most often, ecological restoration in Galápagos feels like a slow and methodical process.

Invasive species might be painstakingly removed square meter by square meter. Or the breeding of critically endangered giant tortoises might take place through efforts spanning decades.

That's the norm, anyway.

But, on rare occasions, as will be the case starting in January of 2024, ecological restoration moves at a far more noticeable pace.

At the start of the coming year, the Galápagos National Park Directorate, with support from the Government of Ecuador and in collaboration with Galápagos Conservancy, will begin the process of restoring 13 species to Floreana Island!

You read that right: Thirteen different species will be released back into the wild on an island where they once thrived.

The list includes: Floreana giant tortoises (absent for nearly 150 years), vegetarian finches, sharp-beaked ground finches, large ground finches, gray warblers, large tree finches, vermilion flycatchers, Galápagos mockingbirds, lava gulls, barn owls, Galápagos hawks, Galápagos flycatchers, and snakes.

Part of the thinking here is that no species exists in isolation, and the richer the ecosystem is, the better the chances for all of these species to thrive.

Now, this won't exactly happen at breakneck speed. Not every species will be released at precisely the same time, and there are, indeed, invasive plants and animals that need to be dealt with before this mass-rewilding occurs.

Still, when it does happen, buckle up! It will be fast, and it will

represent an unprecedented island restoration experiment in the Galápagos Archipelago — one that may serve as a model for ecological recovery in various places around the globe.



Our members are the driving force behind our efforts to preserve, protect, and restore the Galápagos Islands. As we work with our partners to tackle some of the biggest challenges Galápagos has ever faced, **we need your support now more than ever.**

AMPLIFY YOUR IMPACT AS A GALÁPAGOS GUARDIAN

Your generous online recurring monthly gift is the most efficient and reliable source of funding that we can count on for expeditions, scientific research, saving endangered species, and so many other direct conservation actions! Online gifts have the lowest overhead cost, so they are the most cost-effective way for Galápagos Conservancy to receive your support.

Plus, Galápagos Guardian recurring monthly donors receive this exclusive iron-on Fantastic Fernanda patch!



Scan the QR code or visit galapagos.org/winter2023 to become a Galápagos Guardian monthly donor today.



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