TORTOISE FOUND on
FERNANDINA!

and our $50,000 Challenge Fund
to fund another Fernandina Tortoise Expedition

URBANIZATION
in Galapagos

Searching for Shark Nurseries

New Book:
GALAPAGOS Revealed:
Finding the Places Most People Miss

PROJECT UPDATE:
Tortoise Population Census

Highlights from the GC Blog

2019 Photo Contest is OPEN:
Submissions due 7/22/19!
Reading the articles in this edition of Galapagos News, I am struck by the resilience of this extraordinary place. Visited (accidentally) by Tomas de Berlanga, Bishop of Panama in 1535, the islands enjoyed their anonymity until the growth of tourism and the accompanying increase in a resident population starting in the mid-1980s.

This issue of Galapagos News explores the impact of a growing human population and some unintended consequences. Author Kyoko Gotanda examines the changing foraging and dietary habits of the iconic Galapagos finches. Becoming accustomed to eating an array of human food (cookies and French fries being of particular interest), finches are developing beak shapes and sizes to accommodate their new diets. The consequences of dietary changes are being examined by an international team of scientists who will continue to monitor this issue. Another iconic Galapagos creature, the giant tortoise, is also experiencing unfortunate, and in one case — deadly, interactions with residents. With their regular migratory paths in the Santa Cruz highlands now being impacted by human barriers — fences and highways being the most significant — tortoises are finding themselves on roadways and farms where they are scavenging in garbage dumps and, in one rare incident, being bitten by a dog. Understanding these historic migratory paths and working with the resident population to change or mitigate the impacts of infrastructure on these routes will be immensely helpful to not only the Santa Cruz tortoises, but to tortoise populations on all the inhabited islands.

We read in Lauren Goodman’s article that there are still mysteries being solved in Galapagos. Her lively report on blacktip shark nurseries is an exciting discovery and will be a boon to shark populations in the Galapagos Marine Reserve. And we are reminded, in Linda Cayot’s touching farewell, that Galapagos, while changing, still has the power to enchant and transform us.

We are honored to share Wacho Tapia’s thoughts upon discovering the miracle tortoise gracing the cover of this newsletter, while also reporting on the other recent successes of our Giant Tortoise Restoration Initiative team. As always, our thanks to the dedicated scientists who work tirelessly to protect and preserve this archipelago and its extraordinary flora and fauna. And our thanks to you, our readers and supporters, for your enduring faith in our efforts.

Johannah Barry

FROM THE PRESIDENT

Galapagos News is a twice-yearly publication that is produced for Galapagos Conservancy supporters and friends.

The information in this issue was obtained from various sources, all of which have extensive knowledge of Galapagos. The opinions expressed are those of the authors, and not necessarily of Galapagos Conservancy.

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For more information, visit:

www.galapagos.org/challengefund2019

A great friend and long-time supporter of Galapagos Conservancy has committed $50,000 to fund the expedition to search Fernandina Island for more tortoises (see story on pages 12 and 18). He has challenged our members to match his commitment by August 31, 2019. We hope you’ll help us reach this goal!

YES! I want to support the Fernandina Expedition!
Member Name(s): _____________________________
Address: _____________________________________
City, State, Zip: ________________________________
Email: ________________________________________

Cut out, use centerfold envelope, or mail this form to:
Galapagos Conservancy
2019 $50,000 Fernandina Challenge Fund
11150 Fairfax Blvd. Suite 408
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To make your gift online, visit:
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*All gifts will be applied to the Challenge Fund through 8/31/19.

$50,000 CHALLENGE FUND for the FERNANDINA TORTOISE EXPEDITION

GOING GREEN: Help us help the environment by requesting to receive this newsletter by email instead of by mail. It’s simple: email-member@galapagos.org. GC’s EIN # is 13-3281486.

The tortoises thank you.

Member Name(s): _____________________________
Address: _____________________________________
City, State, Zip: ________________________________
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Put “Galapagos News by email” in the subject line, and include your full name and address in the body.

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$50,000 Challenge Fund for the Fernandina Tortoise Expedition

The tortoises thank you.

Yours for the Earth,

Johannah Barry
President

Galapagos News

Cover Image: One of the very first photos taken of the tortoise found on Fernandina Island in February 2019. © GMPD

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$50,000 Challenge Fund for the Fernandina Tortoise Expedition

The tortoises thank you.
**LAND IGUANA REINTRODUCTION**

Until this year, Galapagos land iguanas have not been seen on Santiago Island since 1838. The species had been classified as "locally extinct" on the island due to the destruction caused by invasive species such as feral pigs and goats, which were eradicated in 2001.

In January 2019, the Galapagos National Park Directorate (GNPD) and Island Conservation reintroduced 1,436 Galapagos land iguanas to the island as part of an effort to restore the island's habitat. The iguanas were sourced from the small island of North Seymour, where there were more than 5,000 individuals. This population had become too large for that island, where food was becoming scarce, so the removal of these individuals should also enable the remaining iguanas to thrive.

With support from Galapagos Conservancy, the GNPD and scientists from Massey University will monitor the transplanted population for two years to ensure that the animals thrive in their new home. Through consistent monitoring, the team will look for the success of establishment of iguanas on the island (adaptability), reproduction (identification of nests), and verification of biomass — which includes the identification of the iguanas’ favorite plants to eat, collection of survival data, and other key observations.

Danny Rueda, Director of Ecosystems for the GNPD, explained, "The land iguana is an herbivore that helps ecosystems by dispersing seeds and maintaining open spaces without vegetation." The GNPD will also establish a permanent management program for introduced species, such as ants and rodents, to protect future nesting areas of land iguanas in Santiago.

**LONESOME GEORGE GENOME REVEALS SECRETS of LONG LIFE**

An international team of researchers, including from the Galapagos National Park, have analyzed the genome of Lonesome George, the last Pinta Island giant tortoise, alongside DNA from the Aldabra giant tortoise, which is found in the Seychelles in the Indian Ocean. The study, published in Nature Ecology and Evolution in December of 2018, is important for the tortoise conservation team in Galapagos as it may inform decision-making around restoring populations of different Galapagos giant tortoises, especially on islands where they are now extinct, such as Floreana.

The study revealed insights into the genetic variants behind the long lifespans of giant tortoises, including their ability to repair their DNA, control inflammation, and maintain their robust immune systems, which may include cancer resistance. These factors could help explain how some giant tortoises have been known to live for nearly two centuries.

**CORAL REEF RESEARCH**

Since the 1982-83 El Niño event, coral reefs in Galapagos have been virtually nonexistent with more than 95% lost across the Archipelago. A recent study by Peter Glynn and his colleagues, published in Marine Pollution Bulletin, looked at the past, present, and future state of coral reefs in Galapagos. They found that some sites are undergoing recovery, including those reefs found off the coast of Floreana, Marchena, Darwin, and Wolf Islands, with the central and northern island sites recovering most rapidly. It was noted that the greatest potential threats to the recovery of the coral populations include ongoing ocean warming and acidification, erosion of the reefs by animals and other organisms, disease, human population growth, overfishing, invasive species, pollution, and habitat destruction. Due to the diverse nature of these threats, the study concluded that there will be ongoing local and Archipelago-wide mortality and destruction of the coral reef system in Galapagos.

**NEW HAMMERHEAD SHARK BREEDING AREA FOUND**

A new breeding area for scalloped hammerhead sharks (Sphyrna lewini) was discovered in the coastal area of Santa Cruz Island during a recent monitoring expedition of juvenile sharks and sea turtles organized by the Galapagos National Park Directorate (GNPD). Eduardo Espinoza, the park ranger leading the expedition, commented, “Approximately 20 hammerheads, between neonates and juveniles, were counted in this area. Five of them were fitted with internal and external identification devices for follow-up and further studies, with the goal to help this species to recover through management actions and measures to protect these ecosystems.”

According to the International Union for Conservation of Nature’s Red List of Threatened Species, scalloped hammerhead sharks are Endangered due to their slow growth, low reproductive capacity, and mass overfishing. Their populations have declined by more than 90% worldwide. (See related story on pages 6-7.)

**FIREWORKS BAN IN GALAPAGOS**

Just before New Year’s Eve last year, the local governing council in Galapagos unanimously approved a resolution prohibiting “the importation, sale, distribution, and use of fireworks or pyrotechnics in the Galapagos province.” Fireworks that produce light but no noise were excluded from the ban.

The measure was passed with the intention of protecting the Archipelago’s wildlife; according to the local council, “ecosystems as sensitive as the Galapagos Islands are affected by fireworks, principally its unique fauna.” Animals have been found to experience elevated heart rates, nervous stress and anxiety from fireworks, which may change their behavior and ultimately impact their survival.

The local council also wants to avoid potential pollution of water sources and deterioration in air quality caused by fireworks by implementing the ban. A campaign to limit the use of fireworks on the Galapagos Islands was first launched in 2017.

**RANGERS RELEASE HATCHLINGS FROM NATURAL NESTS**

Galapagos National Park rangers helped to release more than 40 tortoise hatchlings, or “galapaguitos,” from their natural nests between December of last year and the first half of January 2019. Rangers have been monitoring 624 nests in the five natural nesting areas of Santa Cruz Island since December, where they dug and released hatchlings that were trapped in the mud caused by recent rains and unable to leave their nest. Rangers also counted any eggs that did not hatch.

These activities are complemented by the protection of natural tortoise nests against invasive species such as ants, felines, and feral pigs.
SEARCHING FOR SHARK NURSERIES

by Lauren Goodman, Graduate Researcher from UNC Chapel Hill

Picture this. You are out in the field with a birds-eye view of a completely clear lagoon, waters the color of turquoise and white sandy bottoms. Then, all of a sudden, you see it: sharks, and not just any sharks. Baby sharks.

While I’d like to say that this is how my first spotting of a juvenile blacktip shark went, that would be a complete lie. In all reality, I didn’t notice the first baby shark in any of my drone footage until three, I repeat, three days later. It turns out that when you are so concentrated on capturing a specific area within the drone footage, you forget to actually look for sharks. But the moment I noticed the movement of juvenile blacktip sharks in my footage, it was a day of celebration. I vividly remember jumping up onto the chair I was sitting on and yelling so loudly it startled everyone else around me.

The potential nursery areas are particularly important because they likely contribute more sharks to the adult shark population than other habitats. This matters because a large and healthy shark population has multiple benefits, such as increased marine tourism and regulation of smaller fish populations. Thus, to understand shark populations, we need to study their densities. A drone may more accurately capture shark densities in these areas. Additionally, the fact that drones have the capability to conduct small-scale surveys of large animals at a much lower price than traditional methods has also caught on in the conservation management field.

The methodology for our studies is quite simple. At each site we fly a predefined path, filming video with the drone. These flights include areas that we currently believe may be baby shark habitats and areas where we don’t expect to find any sharks.

When the drone flight is complete, a large gillnet (a fishing net with buoys on top that move when something is caught) is thrown into the water and the area of interest is blocked off for an hour. During this time if sharks are caught in the net, they are captured, tagged, and health measurements are taken. The number of sharks caught in the net within one hour is then compared to the number captured on video by the drone. This requires multiple people to watch the drone footage and independently count the number of baby blacktip sharks in each site per month. A ranked system measuring shark abundance across sites using both survey methods will allow us to determine which sites have the highest abundance of baby sharks and how each method compares within and across sites.

While simple, this research is incredibly important to better understand where these baby sharks are and what the best way to measure their abundance is. Additionally, drone surveys may prove more efficient and less invasive than the traditional methods used to understand abundance of baby sharks.

Through this research, I hope to influence the expansion and protection of essential fish habitats and shark nurseries around the Archipelago. While previous survey methods have worked, it is my hope that drone applications will become the quicker, safer, and cheaper method to search for shark nurseries.

Although this pilot survey is largely focused on one island, San Cristóbal, there is potential for expansion if we prove that drone surveys are more efficient than traditional methods.

This technology could, ultimately, be used to increase the protection of nursery areas and ensure the blacktip shark population in Galapagos is conserved. Additionally, it will likely extend to multiple species of sharks, such as the scalloped hammerhead. And who knows? Maybe population surveys of different species can be improved upon through the use of drones.
Darwin’s Finches and Urbanization

By Kiyoko Gotanda, Behavioral Ecologist at the University of Cambridge

In Puerto Ayora you can find Darwin’s finches everywhere — by the water, at the kiosks (open-air food stalls), and at the dock. If you happen to leave some food out at a restaurant, the finches are quick to notice and swoop in for a quick meal. In nonurban areas, and do finches in urban areas prefer human foods? Earthwatch sent teams of volunteers and supported us financially, both of which proved invaluable.

We selected four different sites that varied in the degree of urbanization and the number of tourists. Two were located at El Garrapatero, located 10 km from the nearest town. One area was not frequented by tourists and the second was often frequented by tourists who have picnics. Our third site was Academy Bay which is adjacent to the major town of Puerto Ayora and our last site was Puerto Ayora itself.

We undertook observations of what food each finch was consuming, as well as conducted a cafeteria-style choice experiment where finches were presented with seeds from three local plants, and three human foods (crisps, biscuits, and rice).

Our results showed that finches are eating different things depending on where they live. Finches in Puerto Ayora were observed consuming mostly human foods, while finches at the non-tourist part of El Garrapatero were observed consuming mostly local foods. At Academy Bay, finches did feed on the local seeds, but were also observed consuming human foods as well as drinking water from broken pipes. We also found, when given a choice, finches in the urban site and tourist sites would much rather eat human foods than natural foods.

Our results are interesting because they show that human behavior can have consequences beyond what we observe in urban areas. Human food consumption on the beaches has resulted in finches at a beach, kilometers away from an urban center, developing a taste and preference for human foods. Essentially, humans are changing how Darwin’s finches interact with different resources, which may be changing the evolution of Darwin’s finches. We are continuing our research to further tease apart the direct and indirect consequences of humans and urbanization on Darwin’s finches, so stay tuned!

Urbanization has been increasing globally in recent decades, with more than half the world’s population residing in urban areas. For animals, urbanization can change patterns of selection and adaptation, even on remote islands such as the Galapagos Archipelago. On Galapagos, four islands have permanent human populations. The animals found there are already renowned for their naivety, how close you can approach them and, now, they seem to be in search of some tasty tidbits of food you might leave behind. On the mainland and elsewhere, one might normally think pigeons or gulls to be the main scavengers of human food, but on Galapagos, it appears that Darwin’s finches are taking advantage of the abundance of human food available in town.

So why is this important? Darwin’s finches are an iconic example of adaptive radiation. Today, we have several species of Darwin’s finches that have evolved from a common ancestor that came from mainland South America about two million years ago. Each species of Darwin’s finch has adapted to consume specific food resources that the other species have a much harder time eating. For example, the cactus finch has a long, thin beak that allows it to reach the centers of cactus flowers to drink nectar. In other words, there is a strong link between the diversity of foods naturally found on the Archipelago and the different shapes and sizes of finch beaks.

Recently, we discovered that the size and shape of the medium ground finch’s beak has changed. We think the increase in the size of Puerto Ayora, the largest town on Galapagos, might have something to do with it. With an increase in human population comes an increase in human foods, such as crisps, biscuits, and bread. The selection that once shaped the different beak shapes and sizes may no longer be present when there is such a varied diet available.

We set out to put this idea to the test. We wanted to find out what the finches in town are eating compared to finches in nonurban areas, and do finches in urban areas prefer human foods? We observed consuming mostly local foods. At Academy Bay, finches did feed on the local seeds, but were also observed consuming human foods as well as drinking water from broken pipes. We also found, when given a choice, finches in the urban site and tourist sites would much rather eat human foods than natural foods.

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Author

Kiyoko Gotanda is a Natural Sciences and Engineering Research Council of Canada Banting Postdoctoral Fellow in the Behavioral Ecology Group at the Department of Zoology, University of Cambridge, as well as a Clare Hall Research Fellow in the Sciences. Her research focuses on the intersection of evolution, ecology, and behavior.

This research was carried out by an international team of scientists from the United States (University of Massachusetts, Boston and Amherst), Canada (McGill University), Norway (Nord University), England (University of Cambridge) and Ecuador (Universidad San Francisco de Quito).

Left: The non-tourist site at El Garrapatero, where the only humans who occasionally visit are scientists.

Right: Earthwatch volunteers prepare a trial of the cafeteria experiment. These experiments helped us determine if and where Darwin’s finches preferred human foods.
Increasing urbanization is a well-documented threat to biodiversity globally. Urban areas support fewer species, roads and walls act as barriers to animals, and there is increasing human-wildlife conflict as they come into contact with each other more often.

It might seem surprising that urbanization is having an effect on the wildlife of Galapagos — after all, 97% of the land is designated as Galapagos National Park (GNP) and therefore nobody lives there. With an increasing human population on the Islands, however, it follows that there will be increasing interactions with the unique species found there. The GNP is taking action against detrimental human behaviors. In late 2018, for example, they banned fireworks across the Archipelago as they were causing stress for a wide range of species, including Galapagos sea lions.

Galapagos giant tortoises migrate long distances to ensure their survival, and they are taking steps to prevent the effects of urbanization and other threats, such as ensuring both boat and vehicle speeds are controlled throughout the Archipelago, are taken into consideration.

If you are a true Galapagos fan, and have read dozens of books and articles on the Islands, a quick peek at many of the acknowledgements will come up with the name Roslyn Cameron. She came to the Islands in 1991, taught English for several years, then worked for the Charles Darwin Foundation and has been a mainstay of Galapagos Conservancy for the last decade. Her 20-year knowledge of Galapagos, her key role as a liaison between scientists, tourists, and writers, as well as her connection to the Galapagos Islands communities are indeed widely acknowledged and appreciated.

For the just-published book Galapagos Revealed: Finding the Places That Most People Miss (Galapagos Conservancy, 2019), Roslyn Cameron has teamed up with renowned Distinguished Professor of Biology from the University of Minnesota, Randy Moore. A frequent visitor to the Islands for more than 25 years, Randy has led countless field trips, and conducted his own vast research on evolution. (See his Understanding Galapagos: What You’ll See and What It Means — McGraw-Hill, 2015.)

With the rich background of the two authors, Galapagos Revealed turns out to be a fascinating book. I have been to the Islands 11 times since 1981, yet this book took me to many new places and put into perspective many things only glanced at, like an old statue a bit off the trail I never noticed before. (This chapter alone riveted me for hours.) This chapter alone riveted me for hours.

One of the most innovative sections is the chapter on Charles Darwin, from angles visitors may not have thought of — not only the places where he is known to have visited, but also the various monuments to him scattered here and there, why they were created, and who made them. One of the most innovative sections is the chapter on Charles Darwin, from angles visitors may not have thought of — not only the places where he is known to have visited, but also the various monuments to him scattered here and there, why they were created, and who made them. One of the most innovative sections is the final chapter: “Stories Without Places: The Fascinating ‘Firsts’ of Galapagos” with more than 200 items. Within that truly fascinating chapter are map lists — the first English map of Galapagos, or the first capital of the Galapagos. And there are “groundbreakers” like the first crew members to leave graffiti at Tagus Cove in 1826; and who wouldn’t want to know about the first course for professional taxi-drivers in 2013 (and not a moment too soon.) This chapter alone riveted me for hours.

Randy Moore’s 53 color photos further enrich the written content of the book, beautifully illustrating the kitsch, humor, and sorrow of the life of Galapagos and its people and wildlife. The book itself has a very sturdy coil binding and the paper is of high quality. Ros Cameron and Randy Moore also invite readers to add any more secrets and facts to future editions. Galapagos Revealed is an essential snapshot of a little-known Galapagos.
The Most Unexpected Discovery of My Life

by Wacho Tapia, Director of GC's Giant Tortoise Restoration Initiative

During the 29 years I have dedicated to the conservation of the Galápagos Islands and their giant tortoises, I have had the opportunity to participate in many exciting events, including the identification and subsequent description of a new tortoise species. But the emotional high I experienced as a participant in perhaps the most important finding of the century — a live tortoise on Fernandina Island — is indescribable. I know that my expedition colleagues, Galápagos National Park rangers Jeffreys Málaga, Eduardo Vilema, Roberto Ballesteros, and Simón Villamar, and the Animal Planet team led by Forrest Galante, were just as exhilarated.

Prior to this discovery, only one specimen of the Fernandina tortoise Chelonoidis phantasticus had ever been found — a male tortoise collected during the California Academy of Sciences expedition in 1905–06. In February 2019, we found a female tortoise that was likely alive when the other tortoise was found, some 112 years ago.

Animal Planet obtained the necessary permit from the Galápagos National Park Directorate (GNPD), and their team arrived in February 2019 for a five-day expedition to film a search for tortoises on Fernandina. We began at the site where GNPD ranger Jeffreys Málaga and Charles Darwin Foundation researcher Patricio Jaramillo found tortoise scat in 2015.

I must admit that, like most people, I had been convinced that the Fernandina tortoise was extinct until their discovery in 2015. However, when Jeffreys — a very skilled ranger and key member of the Giant Tortoise Restoration Initiative — assured me that what they found was unquestionably tortoise scat, I became convinced that at least one living tortoise remained on the island. That discovery pushed the GTRI team to plan for an exhaustive search across the island as soon as the funding could be secured. This mega-expedition would be one of the most difficult scientific expeditions in Galápagos, as Fernandina is a large, very young island, with more than 60% of its surface covered by recent a’a lava fields that are nearly impossible to cross because of the sharp, chunky, and angular nature of this kind of lava.

Our trip to Fernandina with Forrest and the Animal Planet team would provide more than just filming for the documentary. It gave me the opportunity to make an exploratory visit to better plan for the mega-expedition in situ. To temper any false expectations, I explained once again that I was not optimistic; even if a tortoise or more still lived on the island, we would most likely not find one, as the trip was short and the search team small. However, it was an opportunity not to be wasted.

Once we arrived on Fernandina, we set up camp near where Jeffreys had found the tortoise scat four years before. During the first two days of extensive searching, we found

traces of a tortoise — probably female — and some dry scat, but no tortoise. On the third day we moved on to several patches of vegetation toward the south, all of which were surrounded by a lava flow.

We started early in the morning. In the first three green patches, we only encountered land iguanas, so we decided to cross the lava flow to reach a patch of vegetation we could see in the distance. Upon arriving there, we immediately found tortoise scat, and then the “bad” where a tortoise had slept — perhaps as recently as the night before. While Forrest and his team filmed this, we heard Jeffreys cry, “Wacho — Tortugas!” Hope and excitement bubbled up in me. We ran to Jeffreys, where we saw a living female tortoise resting in a small space between rocks and vegetation. The emotion was indescribable — this was the first tortoise found on Fernandina in more than 100 years! And she was alive and well.

With permission from the Galápagos National Park Director, we carefully transported the tortoise to the Tortoise Center on Santa Cruz Island, where we began studying her diet (from the faces we collected on the island and those we obtained in her corral) and her behavior. This adult female is very old and quite small (approximately 55 cm long, less than 2 feet). She likes to eat cactus as well as other plant species, and is healthy and very active each morning.

When Animal Planet contacted me in October 2018 to let me know of their interest in the endeavor, but also made it clear that the possibility of finding a tortoise was near zero. Animal Planet obtained the necessary permit from the Galápagos National Park Directorate (GNPD), and their team arrived in February 2019 for a five-day expedition to film a search for tortoises on Fernandina. We began at the site where GNPD ranger Jeffreys Málaga and Charles Darwin Foundation researcher Patricio Jaramillo found tortoise scat in 2015.

I must admit that, like most people, I had been convinced that the Fernandina tortoise was extinct until their discovery in 2015. However, when Jeffreys — a very skilled ranger and key member of the Giant Tortoise Restoration Initiative — assured me that what they found was unquestionably tortoise scat, I became convinced that at least one living tortoise remained on the island. That discovery pushed the GTRI team to plan for an exhaustive search across the island as soon as the funding could be secured. This mega-expedition would be one of the most difficult scientific expeditions in Galápagos, as Fernandina is a large, very young island, with more than 60% of its surface covered by recent a’a lava fields that are nearly impossible to cross because of the sharp, chunky, and angular nature of this kind of lava. Our trip to Fernandina with Forrest and the Animal Planet team would provide more than just filming for the documentary. It gave me the opportunity to make an exploratory visit to better plan for the mega-expedition in situ. To temper any false expectations, I explained once again that I was not optimistic; even if a tortoise or more still lived on the island, we would most likely not find one, as the trip was short and the search team small. However, it was an opportunity not to be wasted.

Once we arrived on Fernandina, we set up camp near where Jeffreys had found the tortoise scat four years before. During the first two days of extensive searching, we found traces of a tortoise — probably female — and some dry scat, but no tortoise. On the third day we moved on to several patches of vegetation toward the south, all of which were surrounded by a lava flow.

We started early in the morning. In the first three green patches, we only encountered land iguanas, so we decided to cross the lava flow to reach a patch of vegetation we could see in the distance. Upon arriving there, we immediately found tortoise scat, and then the “bad” where a tortoise had slept — perhaps as recently as the night before. While Forrest and his team filmed this, we heard Jeffreys cry, “Wacho — Tortugas!” Hope and excitement bubbled up in me. We ran to Jeffreys, where we saw a living female tortoise resting in a small space between rocks and vegetation. The emotion was indescribable — this was the first tortoise found on Fernandina in more than 100 years! And she was alive and well.

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In addition to being triumphs of human endeavor, rediscoveries like these are important because they challenge lazy assumptions about the natural world. They underscore how much we still have to fathom about our planet and the brilliant diversity of species in it. They also open up new protected, underexplored space, is exactly the sort of place in which to rediscover lost species. The most celebrated of these is Lonesome George, a giant tortoise from the island of Pinta, a species assumed extinct for more than 50 years until a snail biologist chanced upon this lone male in 1971. The Santiago rock rat offers a similar story, which until the 1990s was a species known only from specimens collected by the California Academy of Sciences in 1906. More than 90 years later, in 1997, American mammal biologist Robert Dowler was on Santiago and put out some traps to see what was there. The next morning, he was stunned to find 25 rice rats, an endemic species that had somehow managed to survive in spite of the threat from non-native black rats.

Even more surprising is the probable rediscovery of a Fernandina giant tortoise in 2019 (see p.12). During the California Academy expedition in 1906, naturalist Rolfo Beck found a single male high up the side of a volcano and had “skinned the tortoise by moonlight.” This specimen, given the apt name Chelonoidis phantasticus, was the only irrefutable evidence that Fernandina had ever harbored tortoises at all. So it is extraordinary that members of the Giant Tortoise Restoration Initiative (GTRI) should have come across an adult female grazing on the south side of the volcano in February this year, more than 110 years after Rolfo Beck’s initial discovery.

In addition to being triumphs of human endeavor, rediscoveries like these are important because they challenge lazy assumptions about the natural world. They underscore how much we still have to fathom about our planet and the brilliant diversity of species in it. They also open up new opportunities for conservation and restoration. The giant tortoise from Fernandina has been moved to Santa Cruz Island and there is now hope that, with the successful experience of reintroducing tortoises to islands like Española, it may be possible to turn Chelonoidis phantasticus from a ghostly entity into a real, thriving species. Above all, stories of discovery celebrate the resolve of conservationists worldwide and their determination to keep on looking.
In the five years since I began leading the Giant Tortoise Restoration Initiative (GTRI) in Galapagos, I have organized and led many field expeditions — to Pinzón, San Cristóbal, Española, Santa Fe, and Wolf Volcano, one of the most difficult places in the Archipelago. But each time, I had the great advantage of knowing the area and the difficulties we would encounter.

This time, however, I was organizing and directing a census of the Eastern Santa Cruz Giant Tortoise (Chelonoidis donfaustoi), the new species named in 2015. Based on our knowledge to date, the species is considered Critically Endangered. But it was essential that we determine the true status and range of the population to develop effective management measures for its long-term conservation. This expedition, however, was one of my greatest challenges.

I only knew a small portion of that section of Santa Cruz Island, and like the census we carried out on San Cristóbal in 2016, this would be one of the biggest expeditions in the history of Galapagos conservation. In addition to covering known tortoise areas, we had to cover areas we considered potential tortoise habitat — a total of 80 km² of rugged terrain.

Preparing for the census was stressful. We’d been trying to complete it for a couple of years, but for a variety of reasons, it kept being postponed. To ensure we would get it done this year, I started planning, in collaboration with the Galapagos Agricultural Zone to the eastern coast of Santa Cruz. Each team of three was responsible for a defined search section — at which point our energy was depleted.

During the nearly three weeks of intense work, with 10 days focused on the tortoise area within the Galapagos National Park and the remaining days in the agricultural zone, we encountered 403 tortoises, marking each one with a microchip. Nearly 50% (190) of those encountered were juveniles, an excellent sign of a growing population. The final population estimate — based on our mark-recapture data — was 504 individuals. Completing this comprehensive population census only three years after the publication of the species description was made possible by financial support from the People’s Trust for Endangered Species and many donations from Galapagos Conservancy, and the enormous effort of park rangers and scientists.

Preparing for the census was stressful. We’d been trying to complete it for a couple of years, but for a variety of reasons, it kept being postponed. To ensure we would get it done this year, I started planning, in collaboration with the Galapagos National Park Directorate, in early 2018. To delineate the search blocks, I relied not only on the knowledge and expertise of park rangers and other experts, but I also made several field trips to open trails.

We established 12 separate camps from the farms in the Agricultural Zone to the eastern coast of Santa Cruz. Each team of three was responsible for a defined search section — approximately 6.5 km², to ensure that we covered the total search area of 80 km². We’d rise in the dark, eat breakfast, and start out as the sun rose, working until it set some 12 hours later — at which point our energy was depleted.

With careful planning, the preparation of food, equipment, and water, a detailed field protocol, a long list of et ceteras, and the expertise of the more than 50 park rangers, scientists, and porters who participated, we managed to complete the three weeks of intense but gratifying work. After successfully searching each section, we can now say, with complete certainty, that the range of the Eastern Santa Cruz tortoise covers an area not exceeding 40 km². Of course, there will always be a few individual tortoises that sporadically dare to explore outside those limits.

Over the decades, I have watched conditions change, more and more rapidly. Today the human population is closer to 30,000, with more than 250,000 visitors arriving each year. Yet while the human-inhabited islands have undergone on-end development, many uninhabited islands are in better condition than when I first arrived — with many invasive species controlled and some native populations on the upswing (including my favorites — the giant tortoises).

Upon my arrival in Galapagos I visited the corrals at the Tortoise Center, but it was not until I journeyed into the Santa Cruz highlands and encountered my first tortoise in the wild that I was hooked. Watching this giant reptile amble through the forest, seemingly without a care in the world, transported me into an era long past, before humans walked the Earth. Even at hatching, the tiny tortoises appear to have arisen from some ancient time. Giant tortoises, the focus of my PhD research in the early 1980s, have remained at the core of my involvement.

Some of my favorite memories over the years include:

- Following a tortoise down a river in the highlands of Santa Cruz during El Niño 1982-83. That the tortoise noted for a river run — a mode of migration almost NEVER available in Galapagos — to migrate to the lowlands amazed me. We bumped into rocks as his carapace and my flashlight caught on the Clerodendrum branches overhead. When the tortoise entered the river late one afternoon to begin his half-hour river run, I, the intrepid scientist, followed. He was, after all, my focal animal for the day.

- Leading the GCT cruises on the Integrity, in partnership with Richard Polatty (good friend, naturalist guide, and now a GC board member) and INCA Travel (a GC travel partner), from 2009 to 2017. I loved sharing Galapagos with group after group of wonderful people from around the USA and world.

- Spending weeks camped on uninhabited islands following tortoises, land iguanas, and other species — sharing exhausting days of fieldwork, stories, laughter, and sleep, long-lasting friendships with park rangers and Ecuadorian students.

- Emerging from my tent one morning on the crater floor of Alcedo Volcano to watch giant tortoises emerge out of the mist as the sun rose above the crater rim.

In 2012, I facilitated the international tortoise workshop in Galapagos that resulted in the Giant Tortoise Restoration Initiative (GTRI) — a collaborative effort of Galapagos Conservancy with the Galapagos National Park and a suite of international scientists. Our aim is to restore Galapagos tortoise populations to their historic distribution and numbers. Over the last several years, we have returned tortoises to Santa Fe Island, begun a breeding program to restore tortoises to Floreana Island, and continued to work on rebuilding populations on Española, Pinzón, and other islands. As coordinator of the Initiative, I continue to work with Wacho Tapia (photographed above), the Galapagos-based GTRI director, and Dr. James Gibbs, our principal scientist. Since Wacho first worked with me as a volunteer at the Charles Darwin Research Station when he was 17 years old, he has grown into an extremely knowledgeable and accomplished professional. I am happy to turn the GTRI over to his capable hands.

I discovered the Galapagos Islands in my late twenties, and I have never truly say goodbye to my Galapagos friends and colleagues, and I will continue to support our joint efforts to protect and restore this amazing place into the future.

Dr. Linda Cayot served as GC’s Science Advisor from 2005 through 2018 and has played an instrumental role in Galapagos conservation efforts for nearly 40 years. She retired at the end of 2018 and will be missed by everyone at Galapagos Conservancy as well as those she worked with in Galapagos and around the world.
A Tortoise Bone from the California Gold Rush
posted January 23, 2019

"In 2013, the remains of a Galapagos giant tortoise were recovered during the analysis of archaeological materials excavated in downtown San Francisco. The bones were mixed in with refuse deposits dating to the early 1850s, during the California Gold Rush. At the time, I (Cyler) was assigned the task of identifying the animal, bones, as part of my work for the Cultural Resource Management firm, Archeo-Tec, in Oakland, CA. The identification of a Galapagos tortoise from a Gold Rush-era archaeological assemblage was a surprise! Why and how did Galapagos tortoise bone end up in downtown San Francisco, in a refuse deposit from the mid 19th century, well over 3,300 miles from its home?"

Authors: Cyler Conrad is an archaeologist at Los Alamos National Laboratory, and Laura Pages Barceló is an educator at the Bosque Ecosystem Monitoring Program at the University of New Mexico.

Marine Invasive Species: A Galapagos Conservation Challenge
posted February 12, 2019

"One program component entails examining marine debris and determining its potential as a vector for the introduction of non-native species, which will help us to better control the entry of potentially invasive marine species in the Galapagos Marine Reserve. Participation in this project has fostered my own ecological awareness, compelling me to make changes in my lifestyle—primarily by reducing my use of plastic. The amount of plastic floating in the oceans of the world and showing up in Galapagos is truly alarming."

We also carry out directed searches for marine invasive species around the Archipelago. In April 2018, I joined a team of CDF and collaborating scientists on an expedition to the islands of Darwin & Wolf, one of the areas with the largest biomass of sharks in the world and home to the largest population of coral reefs in the GMR. During the expedition, the team registered the presence of several invasive species spotted.

Authors: Wilson Higuera (Research Assistant) and Rosita Calderon (Laboratory Assistant) work for the Marine Invasive Species program at the Charles Darwin Foundation.

The Measure of a Penguin
posted April 16, 2019

"How do we measure a penguin? First, we have to find them, which can be a challenge! Unlike many penguins that breed in dense colonies, Galapagos penguins nest in deep, dark, lava tunnels or crevices that protect their eggs and chicks from the hot equatorial sun. When a penguin is quietly incubating its eggs inside a lava tunnel, it can easily go unnoticed. Even when standing out in the open, their black backs provide camouflage against the dark lava shore, making them hard to see."

During our research trips, we spend hours each day slowly boating along the shores of Isabela, Fernandina, and Bartolomé Islands looking for penguins. We watch for movement and scan the coastline for white splashes of guano that indicate a penguin was standing on shore and may have a nest nearby.

Authors: Caroline Cappello, Godfrey Merlen, and Dee Boersma make up the dedicated research team that has traveled to Galapagos penguin breeding areas twice a year since 2010 to check both natural and constructed nests and study the penguins.

Monitoring Terrestrial Invertebrates in a Scalesia Forest in Galapagos
posted May 7, 2019

"Monitoring the terrestrial invertebrates in the Scalesia forest (like spiders, ants, beetles, moths, butterflies, wasps, etc.) gave me the opportunity to do what I had always dreamed of: applied science in support of conservation! Working with invertebrates, providing scientific advice, generating information that can be used to inform management decisions by the GNPD, and providing a service to the community are all goals that I’m now able to realize. As an entomologist, I have always faced the challenge of explaining what my work consists of and why it is important. Luckily, in Galapagos — where science is the basis for management decisions and conservation priorities — it is much easier, so here I go!"

To monitor invertebrates, I go into the forest with a volunteer and my local Galapagos field assistant, Marcelo Loyola. Our challenge is to place several traps to collect the invertebrate specimens, while trying to minimize our impact on the site and struggling to make our way through the dense blackberry thickets. Once we emerge from the forest, we head back to the laboratory at the CDRS to classify and identify our samples. This final phase is the most complicated part of the process, but it provides valuable information on the invertebrate diversity of this ecosystem."

Authors: Jacqueline Rodriguez has been working at the Charles Darwin Research Station as an entomologist since 2014. Currently, her focus is on ecological restoration projects, like monitoring invertebrates in the unique Scalesia forest in the Santa Cruz highlands to evaluate the effects of chemical control of invasive plant species.
MEMBER SPOTLIGHT

Bill Mims (left) and Jim Millner, surrounded by their ham radio equipment in Galapagos.

From February 28 until March 6, 2019, the HD8M Amateur Radio Team (calling sign stands for “Galapagos Department of Marine Government”) operated ham radio from the side of Cerro Crocker, a volcano high above the city of Bellavista on Santa Cruz Island. The HD8M members consisted of Jim Millner, a retired psychologist, and Bill Mims, a retired airline pilot. The purpose of the operation was to bring attention to the fragile ecosystem of the Galapagos Islands. This was done by making contact, by radio, to other Amateur Radio operators all around the world. As a part of the confirmation process, the team exchanged QSL cards (post cards paid online confirming the contact) from which one dollar or more would be donated to Galapagos Conservancy.

Since the members of the HD8M team were the only operators using Amateur Radio in the Galapagos Islands (which made it a rare entity), their station was in high demand. In just six-days of operation, they were able to talk to more than 8,000 stations around the world, including ham radio operators in 140 countries and all fifty US states. In addition, they were able to donate more than $1,000,000 over the last decade to conservation initiatives aimed at improving sustainability in Galapagos.

Special thanks to Peter Mimmelen, a travel advisor with Cruise Planners®, for coordinating the successful events.

Presentation at the AERA Annual Meeting

On April 6, 2019, members of the Education for Sustainability in Galapagos Islands (ESG) team presented five professional articles related to the ESG Program as part of a Round Table Discussion at the 2019 Annual Meeting of the American Education Research Association (AERA) in Toronto entitled: “Education for Sustainability: A Public-Private Partnership for Transforming Education in the Galapagos.” AERA, the biggest and most respected general educational association organization, hosts this international conference annually with nearly 10,000 people attending. More than 12,000 proposals were submitted for this year’s conference.

The articles presented were: 1) Development and Implementation of the Education for Sustainability in Galapagos Program, 2) Connecting Education Policy with Environmental and Sustainability Education in Galapagos, 3) Evaluation of the Education for Sustainability in Galapagos Program, 4) The Role of Power and Politics in Education for Sustainability in the Galapagos Islands, and 5) Integrating English Education and Education for Sustainability in the Galapagos. We look forward to continued research and dissemination of our experiences related to our education work in Galapagos.

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www.galapagos.org/shop/
It’s now GIVING SUMMER! We’ve extended the deadline for our $50,000 Challenge Fund to August 31, 2019! Details inside.

The annual photo contest is now open! We are welcoming our members to submit up to 3 photos per person, for a chance to win a coveted spot in our 2020 Galpagos calendar. Please visit www.galapagos.org/travel/travel/photo-contest/ for rules, permissions, and to view last year’s winners.