

GALAPAGOS NEWS

SPRING/SUMMER 2013

Tales of a
Tortoise Tracker

Rat Eradication

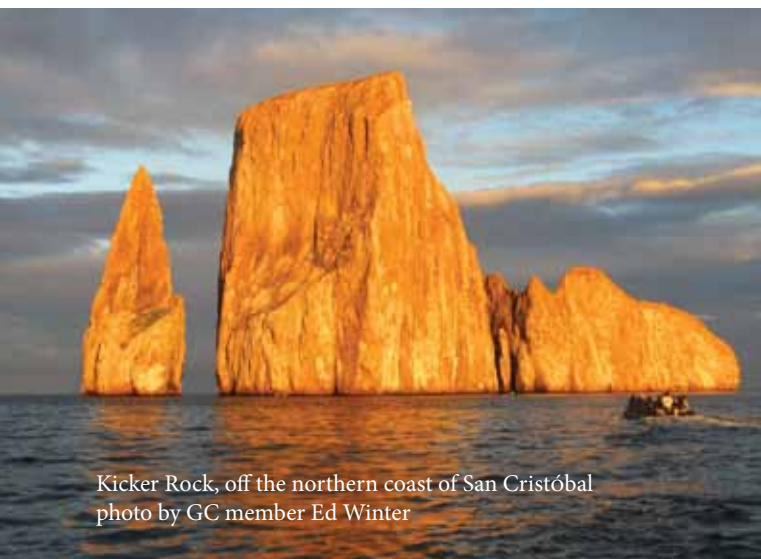
And the race to catch Galapagos Hawks



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Kicker Rock, off the northern coast of San Cristóbal
photo by GC member Ed Winter

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Cover Image
A saddleback Galapagos tortoise retracted in its shell at the base of Sierra Negra Volcano on Isabela

Island. Photo by Pete Oxford/Minden Pictures/FLPA.

FROM THE PRESIDENT Johannah Barry

Galapagos has been given many accolades, and well deserved ones. It was the first site to be inscribed on the World Heritage roster, it retains 95% of its original biodiversity, and it is the best preserved tropical archipelago in the world. It has been called the living laboratory of evolution. But it is more than that. It is an extraordinary library, where volumes of material and information have yet to be discovered. In Galapagos, we can see evolution in real time; we can see species evolve and change in response to a variety of conditions. New species of plants and animals are being discovered, and some of those thought extinct have been rediscovered. And while we now exist in an age of lightning fast information, overwhelmed with instantaneous commentary, images, and extraordinary discovery, we still can be amazed in Galapagos.

This issue of *Galapagos News* speaks to new discoveries and new conservation techniques employed to combat long-standing problems with invasive plants and animals. The scientific work prompted by genetic information from tortoise species thought to be lost will bring two species back from extinction. And news that the rare pink land iguana is reproducing (p. 5) is a delightful puzzle for conservation managers in the islands. The work of our colleagues at Island Conservation on Rábida (p. 6) was born out of the successful ecosystem restoration efforts of Project Isabela, more than a decade ago, and now holds great promise for restoration work on other islands in the archipelago.

While conservation work has benefitted from advances in technology, genetics, microbiology, and other important tools, the basis of scientific inquiry — observation and curiosity — continues to be important to our understanding of the natural world. Julia Ponder's work with hawks (p. 8) and Fredy Cabrera's work with tortoises (p. 9) depend on that intellectual spark. Why do animals behave in the ways that they do, and how can understanding them help us be better stewards of the animals and their environments?

Galapagos continues to provide opportunities to pose these questions and seek answers. Sometimes those answers are found through the lens of a microscope, sometimes through the lens of a telescope. And sometimes just by standing in quiet observation. We are grateful to you for your support of all these efforts, and your commitment to ensuring that the Galapagos Islands continue to provoke intriguing questions about how the world works.



GC PHOTO CONTEST for 2014 GC Calendar

Email no more than 5 photos, one per email, to photo@galapagos.org. Include your name, subject of photo, and location (if known) in the email subject line, and your full contact information in the body of the email.

Visit www.galapagos.org for rules, permissions, and to view last year's winners.

ENTER by 7.31.13

Photos by GC Members: Bill Bevington, Joe Italiano, Jeff Ashwell

The legacy of one man's visit to Galapagos changed the world ...

What will be *your* legacy?

Remembering Galapagos and the work of Galapagos Conservancy in your will is one of the most valuable ways to show your support.

Leaving a legacy enables GC to commit to protecting the wildlife and habitats of Galapagos well into the future.

Contact legacy@galapagos.org
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GALAPAGOS NEWS



© Yale University

“If we can find these individuals, we can restore them to their island of origin.”

Dr. Adalgisa Caccone, Yale University

THE CDF GETS AN ECO-FRIENDLY MAKEOVER

The Charles Darwin Foundation (CDF) is taking the first steps towards turning its research station in Puerto Ayora into a more eco-friendly, sustainable, and pleasurable place to work. With the advice of architects at The Prince’s Foundation for Building Community, CDF’s administrative building is being transformed, opening up its cupola and sealed windows. This has increased both natural light and ventilation, while reducing temperature, humidity, and the cost of running uninspiring fluorescent lighting and inefficient air-conditioning units. In addition, the building has been repainted white to reflect much of the sun’s heat and retrofitted with a new, more energy-efficient system of LED lighting. It is hoped that these and future changes will have an impact beyond CDF, inspiring cost-effective design principles that could benefit others throughout the Galapagos Islands.

LONESOME GEORGE has relatives

Lonesome George passed away in 2012, but he’s still making news. Just months after his unexpected death in June of last year, geneticists revealed that there may be dozens of tortoises with Pinta ancestry living on Wolf Volcano on Isabela Island.

In December 2008, the Galapagos National Park Service (GNPS) and geneticists from Yale University mounted a huge expedition to Wolf to take blood samples from as many of the volcano’s tortoises as possible. They came away with more than 1,600 samples.

After careful analysis, the geneticists have identified 17 individuals with Pinta-like genes (see photo at left). Four of these tortoises appear to be first-generation hybrids, with at least one of their parents being of full Pinta stock. The rest are second-generation hybrids, according to a paper published in the scientific journal *Biological Conservation* in January 2013.

Given that the sampling may only have captured about one-fifth of the tortoises on Wolf, the geneticists estimate that there could be some 60 to 70 *Chelonoidis abingdoni* hybrids yet to be discovered. What is more exciting is that five of the 17 tortoises are juveniles less than 20-years-old, which means it is possible that there is still a purebred Pinta tortoise(s) out there and breeding. “Our goal is to go back in 2014 to look for surviving individuals of this species and to collect hybrids,” says Adalgisa Caccone, senior author on the study.

CRUCIAL COLLECTIONS

On behalf of the people of Ecuador, the Charles Darwin Foundation (CDF) is responsible for the most comprehensive collection of Galapagos organisms anywhere in the world. For more than 50 years, Galapagos National Park staff, CDF researchers, visiting scientists, and naturalist guides have contributed to this collection that now contains more than 80,000 native specimens and an almost complete set of introduced, non-native species (see darwinfoundation.org/datazone/checklists). In spite of this impressive collection, housed at the CDF research station in Puerto Ayora on Santa Cruz, it’s estimated that at least 50% of all Galapagos species are yet to be described. As the Galapagos Islands are subjected to ever increasing pressures, the growing collections are of immense importance for species identification and for conservation management carried out by local partners like the Galapagos National Park Service and the new Agency for Biosecurity in Galapagos (ABG). In addition, the CDF collections are also an important educational tool, providing the opportunity to teach and learn about what it is that makes Galapagos unique.

IGUANA SMUGGLER SENTENCED

A German national caught trying to smuggle land iguanas out of Galapagos will serve four years in prison, the maximum possible sentence for this kind of wildlife crime. Dirk Bender, a 32-year-old lifeguard, was arrested at Baltra airport in July last year as he attempted to leave the Islands with four land iguanas (*Conolophus subcristatus*) in his luggage. Land iguanas are categorized as “vulnerable” on the International Union for the Conservation of Nature’s Red List of Threatened Species and are protected according to the Convention on International Trade in Endangered Species.

At his trial in Puerto Ayora in January, Bender was found guilty of attempting to extract an endangered species from the Archipelago. “The court’s decision is a milestone in the defense of the rights of nature and the conservation of the fragile Galapagos ecosystem,” said Edwin Naula, director of the Galapagos National Park Service. Bender was deported from Galapagos in February under police guard to serve out his four-year prison sentence in Guayaquil, Ecuador.

This is not Bender’s first wildlife crime. In 2011, Fijian authorities fined him \$15,000 for attempting to smuggle another threatened species — a gravid female Fiji Crested iguana — onto a flight from Fiji to Hong Kong.

NEW BIOCONTROL AGENCY

Ecador has created a new agency that will strengthen biosecurity in Galapagos. The Agency for Biosecurity in Galapagos (ABG) will replace *Agrocalidad* in the province. It will serve as the organization responsible for controlling, regulating, preventing, and reducing the risk of introducing exotic organisms in both urban and rural areas of the Galapagos Archipelago.

PINK IGUANAS BREEDING

GNPS staff have found a juvenile pink land iguana—clear evidence that some individuals of this enigmatic species are still managing to reproduce.

Following the discovery of this species near the summit of Wolf Volcano on Isabela Island in 1986 and classified as its own species in 2009, there has been serious concern about the viability of this population. Owing to its small size of just a few hundred individuals and its incredibly small range of less than 25 km², the Galapagos pink land iguana is now recognized as critically endangered on the IUCN Red List.

“It’s good news to have found a juvenile,” says Gabriele Gentile of the University of Rome “Tor Vergata” in Italy. He accompanied GNPS staff during the routine survey of Wolf Volcano in September 2012. But the individual was probably three or four years old and not a hatchling, he cautions. “We still lack evidence of ongoing reproduction.”

Land Iguana
© Claude Lester



Pink Iguana
© GNP



BAITING RATS

The island of Rábida off the south coast of Santiago is now free of invasive rats, the GNPS announced at the end of last year after the distribution of poisoned bait across the island in 2011. The GNPS has now carried out a similar campaign over the much larger island of Pinzón, with plans to scale up the operation even further to take on Floreana’s rats in 2014. (See page 6 for more details.)

PRESIDENT CORREA RE-ELECTED

Rafael Correa is to serve a third successive term as President of Ecuador. In national elections held in February, Mr. Correa polled almost 60% of the vote, ahead of his closest rival, the banker Guillermo Lasso with just over 20%. Shortly after coming into office in January 2007, President Correa declared Galapagos “at risk” and “a national priority.” He is thought to back proposed amendments to The Special Law for Galapagos currently before the National Congress, which will address several shortcomings in the existing legislation. According to the Ecuadorian constitution, which prevents an individual from serving more than three successive terms as president, Mr. Correa now has a maximum of four years left in office.



The Galapagos National Park Service has now declared Rábida Island rat-free. © Stephen Montgomery, Wikimedia Commons.
Rat photo: © Mikhail Soldatenkov



RID OF RATS

by **Bradford Keitt**, Director of Conservation at Island Conservation

On December 20, 1905, a team of naturalists from the California Academy of Sciences stepped ashore on Rábida, a small island that lies off the south coast of Santiago in the center of the Galapagos Islands. Among them was 23-year-old geologist and mollusk enthusiast Washington H. Ochsner. From 150 meters above sea level, he began to find snails, but only “vast numbers of dead shells that flaked the ground with white.” Beyond 250 m, however, he uncovered live specimens “glued to the lower surface of loose lava blocks.” Ochsner had discovered Rábida’s endemic land snail *Bulimulus ravidensis*. But in the years and decades to come, nobody ever saw it again. Everyone assumed it had gone extinct.

Fast-forward more than a century to November 2012, more than a year after a huge effort to eradicate invasive rats from the island. Christine Parent, a biologist at the University of California at Berkeley, is scaling Rábida’s dusty slopes. Like Ochsner before her, Parent is looking for snails. She comes across empty shells. Then, further up, she finds live specimens clinging to the undersides of rocks and at the base of some native ferns. All too often biologists find themselves reporting on the extinction of species. Any day an “extinct” species is

rediscovered is unquestionably a good one.

The vast majority of recent extinctions have occurred on islands and the single most important cause is invasive species. In Galapagos, at least seven vertebrate species have gone extinct since the arrival of humans and 40% of the 95 vertebrates that remain are endangered. The rats and cats that our ancestors introduced to the archipelago are now present on almost half of all islands, where they threaten tortoises, iguanas, lizards, and both land and seabirds alike.

Fortunately, there is a solution. There have now been more than 1,000 successful projects to remove invasive vertebrates like rats from islands around the world. The subsequent recovery of the unique species that live on them is rapid and impressive. Although such initiatives are now commonplace, each one requires considerable planning and a careful consideration of the risks involved. In Galapagos, the Galapagos National Park and the non-governmental organization, Island Conservation, went to considerable lengths to protect native species that might be affected by the widespread dispersal of rodenticide. Lizards or land iguanas, for instance, might feed on the bait directly. The Galapagos hawk could ingest poison by feeding on the rats themselves.

So before the treatment of Rábida in January 2011, it was necessary to bring the hawks into captivity. The helicopters could then start flying, with sophisticated GPS technology to guarantee the delivery of rodenticide in sufficient density to

all parts of the island. Such well-planned actions resulted in the desired outcome. Following thorough searches of Rábida, the Galapagos National Park has now declared the island free of rats. Its native species — like the Rábida land snail rediscovered by Parent on the most recent survey in November — are starting to recover. On the same trip, rangers also came across a live gecko that may turn out to be the endemic Rábida gecko, known only from fossil material and long-presumed extinct. It is because of the rat removal and other important conservation actions taken by the Galapagos National Park and its partners that we are seeing these first indications of what we anticipate will be a complete recovery of the ecosystem on Rábida and other Galapagos islands.

Following this success, the Galapagos National Park and Island Conservation, with support from several other institutions and donors, took similar action on Pinzón last year. Pinzón sits between Santa Cruz and Isabela and, at nearly 18 km², is more than three times the size of Rábida. Once again, it was necessary to bring the island’s hawks into captivity. Because of the presence of rats, the Pinzón tortoise has not successfully bred in the wild in 150 years. With rats gone it is expected that tortoise hatchlings will now survive long enough to grow into adults and reclaim their position as the largest vertebrate on the island.

Pinzón is just the latest target in the Galapagos National Park’s ambition to render the archipelago free of invasive rodents by 2020. Next year in 2014, Floreana Island will be the target. At 172 km², this will be the largest island ever attempted for rat eradication and, when successful, will create an oasis for many critically endangered species, including the Floreana mockingbird and Galapagos petrel. This will cement the Galapagos National Park Service’s position as a world leader in island restoration. ■

GC’s POSITION ON ERADICATION OF INVASIVES

The Convention on Biological Diversity cites invasive alien species as a significant threat to biodiversity worldwide, second only to that of habitat destruction. There are two main approaches to the problem of invasive species: controlling and eradicating established species, and preventing the arrival of yet more aliens. The present rat eradication program in Galapagos led by the Galapagos National Park Service and Island Conservation is clearly aiming for control and eradication with an equal and ongoing focus on preventing the introduction of alien species through the newly established Agency for the Regulation and Control of Biosecurity and Quarantine for Galapagos (ABG). Given the destructive impact of introduced rats on the native fauna and flora of Galapagos, we at GC are fully supportive of all efforts to remove them from the unique habitats of the Archipelago.



Top: The Rábida gecko, a species formerly known only from fossil material. © Island Conservation.

Inset: The Rábida snail, rediscovered in 2012. © Christine Parent.

Below: Conservationists haul off a bucket of bait in preparation for the dispersal of rodenticide by helicopter. © Island Conservation.

The effort to eradicate invasive rodents from Galapagos has been a huge collaboration between the Galapagos National Park Service, Island Conservation, the Charles Darwin Foundation, the Raptor Center at the University of Minnesota, Bell Laboratories, the Durrell Wildlife Conservation Trust, Friends of Galapagos Organizations, Galapagos Conservancy, and several other philanthropic partners.





Clockwise from top left: © Peter Teal
© Erik Oberg
© Joe Moore

CAPTIVE HAWKS

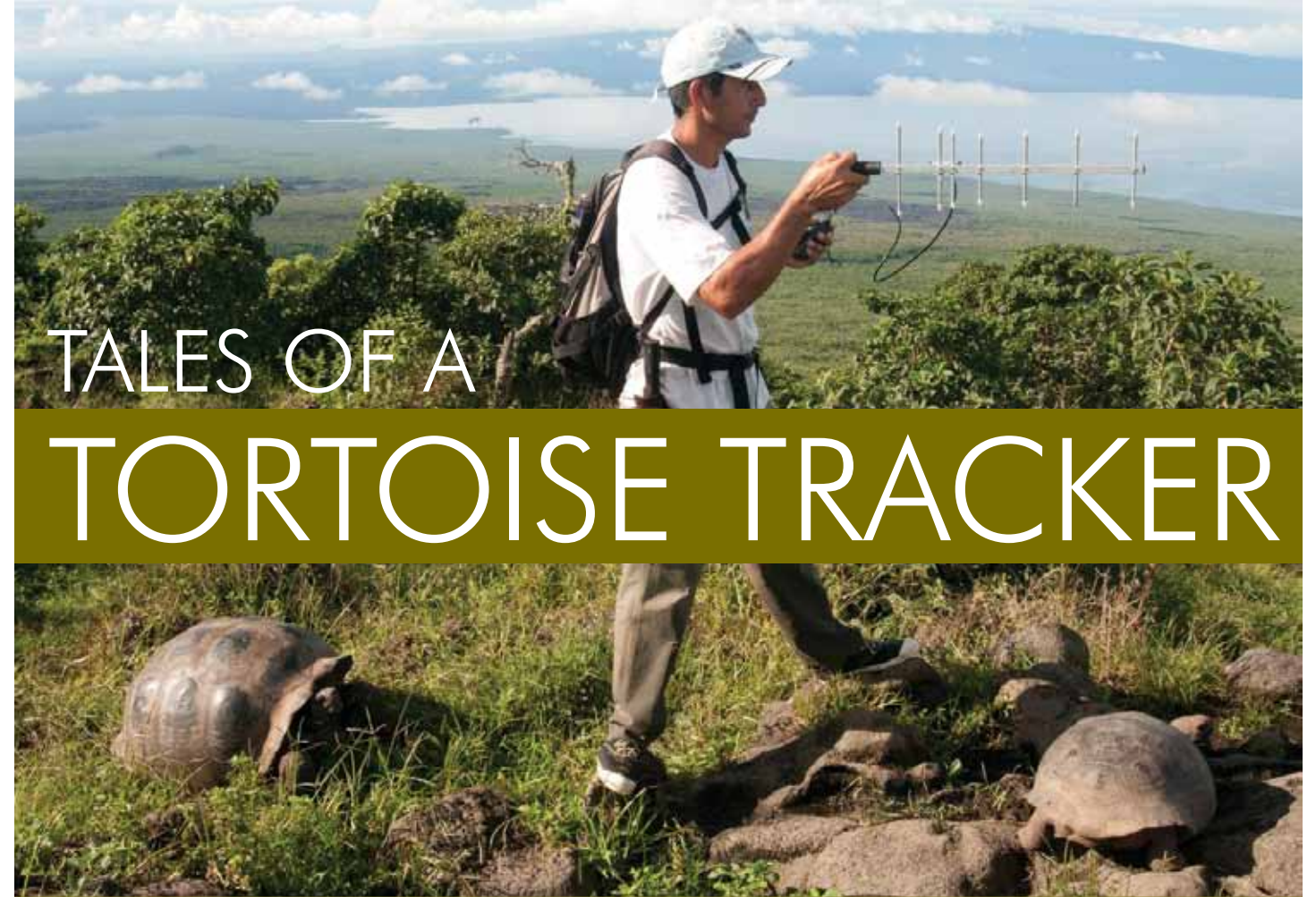
by **Julia Ponder** (pictured above), *Wildlife Veterinarian at the Raptor Center at University of Minnesota*

“Where are they all coming from? And what am I going to do with them?” It was the fourth day of trapping in our effort to bring Pinzón’s resident hawks into protective captivity. Hotel Gavilanes (Hotel Hawk), as our temporary enclosures were fondly called, had been built to house 40 birds. It should have been big enough but we hadn’t expected more birds to arrive from elsewhere. It was time to adjust the plan.

In my capacity as director of The Raptor Center at the University of Minnesota in the US, I had been asked to assist with the plan to rid Pinzón of its invasive rodents. Any hawks left on the island during the eradication ran the risk of dining out on poisoned rat, with potentially fatal consequences. In order to protect this charismatic raptor, we (and our partners on the project) set up a captive station for the birds. But

as we brought the local resident population into captivity, more hawks began to arrive from elsewhere. In the end, we had to add to the facilities, making room for 60 birds. It took a combination of excellent observation, experienced handling, routine medical exams, and around 100 g of meat per bird per day to keep them all healthy. After six weeks, we released the hawks back onto Pinzón, an island we are hoping is now rat-free. Adult breeders were released first and allowed to return to their territories. Although the hawks will face a reduced prey base with the rodents gone, it is well documented that they eat many other things. At least one female hawk seems to have a particular penchant for crab.

The project does not end with the release of the hawks. There are still lessons to be learned. We took a blood sample from each bird for genetic analysis, which will hopefully tell us where the new arrivals came from. Long-term monitoring is planned to document how the hawks fare now that rats are on the way out. ■



TALES OF A TORTOISE TRACKER

by **Fredy Cabrera** (pictured above) of the *Galapagos Tortoise Movement Ecology Program*, gianttortoise.org

“I AM ABOUT TO DIE.” I was standing on trembling earth, just a few feet from a billowing, thunderous fumarole. I braced myself for the inevitable.

But to my eternal relief, the booming faded and the tremors subsided. With the panic over, I picked up my rucksack and radiotracking equipment and headed off in search of my quarry: eleven GPS-tagged giant tortoises roaming somewhere in the vastness of Alcedo, the central volcano on the western island of Isabela.

I first encountered giant tortoises growing up in Bellavista, the small community in the highlands of Santa Cruz en route from Baltra to Puerto Ayora. We had tortoises around our family farm and would also come across them while out hunting for goats and pigs, two staples of our diet back then. I did not think too much about them until 1999 — they were just a regular feature of the landscape. I was working with the Galapagos National Park in their effort to eradicate goats from the archipelago — running over lava fields, climbing near vertical escarpments, and spending nights out in the cold on the trail of these and other invasive animals. When my specially-trained hunting dog started sniffing the ground and licking his paws, I watched as he uncovered a nest full of hatching tortoises. The babies seemed to be trapped, digging down rather than up. So keeping my dog well away, I helped

them to the surface. It was thrilling to watch them scurry away into the undergrowth.

In spite of this moving experience, I never imagined I would ever work directly with tortoises. But ten years later in 2009, I met Stephen Blake, an ecologist at the Max Planck Institute of Ornithology in Germany. He had recently set up a tortoise research project and was on the lookout for a technician with knowledge of Galapagos and experience in the field. Thanks to funding from the Swiss Friends of Galapagos, I am still with the project more than three years later. I can’t imagine doing anything else.

The work on the project is extremely varied. The most time-consuming task is locating wild tortoises. We have now tagged almost 50 different individuals from four different species on three different islands with a small electronic device. This contains a GPS unit that records the tortoise’s position every hour. It also emits a unique radio signal, helping us to locate the animal and the valuable data it’s been generating. You might think it’s easy to find a tortoise, especially one broadcasting its location. Our data — and the all-too-common experience of walking for ten hours in a day only to return to camp without success — suggest otherwise. Tortoises, we have discovered, can move quickly over impressive distances. Like all the local residents, I knew that the distribution of the tortoises changed with the seasons, but I had no idea of the details of their migration up and down the volcano, doggedly marching along the same trails year after year, following the growing season of their favored plants.



They move into the lowlands during the rainy season to feed on the lush new growth, then migrate back into the highlands in the dry season to stock up on grass.

In parallel with tracking the movements of wild tortoises, we have been trying to find out the extent to which tortoises help to disperse the seeds of many Galapagos plants. Are they, as is often said, really the “Gardeners of Galapagos”? Our research suggests that they are just that.

A couple of years ago, I spent three months working with the captive tortoises at the Charles Darwin Research Station in Puerto Ayora to study this question in detail. By feeding them colored beads and then sorting through their dung — someone’s got to do it — we worked out that it typically takes around 12 days for food to pass from one end to the other. Given what we now know about tortoise movements, most individuals will have carried seeds hundreds of meters from the parent plant in this time, sometimes much further. By “using” tortoises to move many seeds over large areas, parent plants increase the chances that at least some will germinate and survive. It was during this work that a large male tortoise almost took off the tip of my index finger, his sharp beak chomping down on what he probably thought was a banana.

Even with the erupting volcanoes, the long days under the hot sun or in driving rain, the risk to life, limb, and digit, I love what I do. Every day, we are learning so much that is new about the hidden lives and ecology of these wonderful creatures.

I feel privileged to be part of this research, to be growing as a scientist, and to be making a difference to the conservation of the islands that my family and I call home. ■



MY FAVORITE TORTOISE

Many of the tortoises we are following are named after people involved in the project. In 2010, Stephen and I tagged a large male near Cerro Fatal on the eastern slopes of Santa Cruz. We called him Fredy, so I will always have a soft-spot for him. On the same day, we also tagged a female who we called Sandra, after my wife. Both Fredy and Sandra are very active tortoises: they migrate between a lagoon near our old farm and Cerro Fatal, and spend lots of time close to each other. You can download all the data for Fredy and Sandra and the other tortoises from the animal movement website movebank.org



- **Previous page:** Standing at the summit of Alcedo Volcano on Isabela, Fredy hopes to receive a radio signal from one of the program’s tagged tortoises. © Stephen Blake.
- **This page:**
- **Top:** Sometimes Fredy has to move tortoises off the road so that he can get to work. © Stephen Blake.
- **Middle:** A tortoise is scrubbed down in preparation to receive the small electronic device that will collect data on its movements. © Sebastian Keynes.
- **Below:** Fredy and Miriam Silva attach a GPS tag to “Fredy” the tortoise. © Stephen Blake.



Before the arrival of pirates, whalers, and scientists, the Galapagos giant tortoises had evolved from a single species into at least 14 different species, with an estimated population of 200,000 tortoises spread across the larger islands of the archipelago. These gentle giants, isolated and safe in Galapagos, were extremely vulnerable to the arrival of humans. Collected for food by sailors in the 19th century, the tortoises underwent massive exploitation resulting in the decimation of most populations.

Today tortoises are probably at 10-20% of historical numbers. With new technologies and greater knowledge of the tortoises and their environment, Galapagos Conservancy (GC) and its many partners have the chance now to restore these populations and their islands closer to historical numbers and conditions.

The international tortoise workshop in July 2012, organized jointly by GC and the Galapagos National Park Service (GNPS), resulted in the Giant Tortoise Restoration Initiative, building on 50+ years of successful tortoise research and management. The ultimate goal is to achieve restoration of as many of the islands that have (or once had) tortoises as possible, eventually achieving an archipelago-wide tortoise population of more than 100,000 animals. We have a long road ahead, but we have the know-how, the technology, and the critical partners to ensure success.

One of the most exciting projects being developed is the Tortoise Recovery Project for Wolf Volcano, Pinta Island, and Floreana Island. The first stage includes a year of preparation prior to the first expedition to Wolf Volcano to recover tortoises that are not native to Wolf (focusing first on those with Pinta and Floreana ancestry). Tortoise breeding programs will then be initiated for both populations, with the first cohorts of juvenile tortoises expected to be released on Floreana and Pinta in 2018 or 2019. This highly ambitious project will only succeed through close collaboration with the genetics team at Yale

University, the GNPS, and a number of international scientists.

GC has also played a key role in developing recommendations for improving the tortoise centers on Santa Cruz, San Cristóbal, and Isabela. We will continue to work closely with the GNPS to ensure that these centers operate efficiently and effectively and continue to focus on the tortoise populations of highest conservation priority.

Our partner Dr. James Gibbs of SUNY-ESF at Syracuse, NY is currently in Galapagos working closely with the GNPS on the development of a project to return giant tortoises to Santa Fe Island. Although extinct for probably more than 150 years, an analog species will be selected to restore that island’s tortoise population and bring its ecosystem into a more pristine state. ■



UPCOMING EXPEDITIONS TO WOLF VOLCANO

The 2008 expedition to Wolf Volcano (pictured above) to collect blood samples from more than 1,600 giant tortoises was a huge undertaking. The current plan to collect “Pinta/Floreana” tortoises from Wolf will be even more ambitious, requiring extensive preparation, multiple collection trips, genetic identification of each tortoise, and the eventual return of giant tortoises to Floreana and Pinta. Building on lessons learned during Project Isabela, we are convinced that GC and its partners will be successful and help in the betterment of Galapagos and its iconic giant tortoises.

CONTROLLING PHILORNIS DOWNSI

One of Galapagos Conservancy's pivotal conservation priorities is controlling *Philornis downsi*. This extremely destructive invasive fly is decimating the populations of many species of Galapagos birds, including the famous finches and mockingbirds. Although not a particularly glamorous subject, the need for urgent action is evident as the impact of this insect presents a real extinction risk for several species.

The adult fly lays its eggs in bird nests. The larvae hatch at the same time as the chicks, burrowing into their bodies and feeding on their blood and tissues. In addition to extremely high rates of direct mortality (often up to 100% in an infested nest), studies have confirmed that surviving birds often display reduced growth rates, anemia, and beak deformation that severely impair normal development and reproductive success.

Currently there are no successful mitigation techniques for the control of *Philornis downsi* for Galapagos birds, primarily due to the substantial gaps in our understanding of the breeding ecology of the fly. In February 2012, GC co-funded a workshop in Galapagos that provided a forum for global experts to share information and discuss the feasibility of different control methods including the use of insecticides, fly traps baited with attractants, insect sterilizing techniques, and biological control (using natural predators).

GC is supporting the follow-up actions that were outlined in a five-year work plan to improve the management strategies directed at this invasive insect. These include feasibility studies for the aforementioned control strategies, laboratory work to learn more about the breeding behavior of the fly, and also monitoring the bird and fly populations in the humid and arid zones of the islands to determine seasonal population changes.

Immediate action is required to ensure the sustainable future of the populations of Darwin's finches, mockingbirds, and flycatchers, some of which face a very real threat of extinction due to the damage caused by this parasite. With mounting threats including habitat destruction and predation by introduced rats and cats, we cannot afford not to take action if we want to save bird species such as the Mangrove finch, which has a population estimated at just 100–150 individuals. ■



Mangrove Finches are extremely vulnerable to *Philornis*.
© Birgit Fessl

AN INVITATION: TO VISIT THE GIVING LIBRARY

Galapagos Conservancy is honored to have been chosen as one of the first charities to be featured in **The Giving Library** (www.givinglibrary.org), an online archive of video interviews designed to offer philanthropists the opportunity to locate, study, compare, and engage with hundreds of nonprofit organizations across the country.

The Giving Library allows you to connect with the people behind a non-profit organization, putting a face and a name to the mission and goals of that charity. On Galapagos Conservancy's Giving Library "bookshelf," you'll find a series of interviews with GC's President, Johannah Barry. Watch and learn from Johannah as she explains the mission and history of GC, what makes us unique and effective, and describes the challenges we face moving into the future . . . and more!

If you like what you see, please give GC a boost by using the Library's nifty social media sharing buttons to let your friends know about the important work we do in the Galapagos Islands.

giving library™ Watch. Connect. Give.

5 Fast Philornis Facts

- Native to Trinidad and Brazil
- First recorded in Galapagos in the 1960s and now found on 11 islands
- Adult flies are vegetarian and the larvae feed on blood
- Known to affect at least 18 Galapagos bird species, three of which are critically endangered
- Introduction of parasitic wasps may be an effective means of biological control

EDUCATION for SUSTAINABLE DEVELOPMENT

by Richard Knab, GC Director of Strategic Partnerships

The Galapagos Islands are the best preserved tropical archipelago in the world, but long-term protection of the islands will be assured only when local residents become champions for conservation and have the knowledge, skills, and desire needed to pursue lifestyles and livelihoods that are consistent with the fragile Galapagos environment.

The Galapagos education system currently serves 7,500 primary and secondary students (30% of the resident population) in 33 public and private schools on the islands of Santa Cruz (15 schools), San Cristóbal (11), Isabela (6), and Floreana (1). Historically, the system has faced chronic challenges as a result of many factors, including poorly trained teachers, obsolete teaching methods relying on rote memorization, and a curriculum that has failed to develop skills in the schools' graduates that prepare them for the work place or university.

Ecuador's Ministry of Education is taking important steps to change this situation. In the last seven years, it has tripled public investments in education, implemented new teacher training programs and student and teacher evaluation standards, and developed a new national Pre-K through 12 curriculum with a strong emphasis on sustainable development and the Quechuan concept of *sumak kawsay* (achieving a harmonious relationship between human beings and their surroundings). The new national science curriculum uses the Galapagos Islands as the integrating theme for a full year of middle school and a special version of the curriculum has been adapted for Galapagos. In the words of former Minister of Education, Gloria Vidal, the Galapagos curriculum is designed to "develop a deep understanding and appreciation for what makes Galapagos unique, encourage a strong commitment to conservation, and prepare residents to participate actively in discussions related to local public policy."

Galapagos Conservancy, the Galapagos-based Scalesia Foundation, and a network of international education specialists are committed to supporting the Ministry in efforts to strengthen the skills of Galapagos teachers and fully implement the new Galapagos curriculum.

A cornerstone of our education efforts in Galapagos is the Tomás de Berlanga Bilingual School (TdB). Established by the Scalesia Foundation in 1994, the TdB is a private school that seeks to provide students with the knowledge, skills, and desire to contribute to the sustainable development of their community, and to serve as a model school and teacher training ground for other Galapagos educators. A donor-funded scholarship program makes the TdB School available to students with financial need.

In 2013, the Lindblad/National Geographic Fund renewed its significant, multi-year funding of the TdB, and a number of new individuals and businesses, including Galapagos Direct, joined the growing number of GC donors that are helping to improve education opportunities for Galapagos youth. According to Judie Muggia, President of Galapagos Direct, "Today's children of Galapagos will determine its future. Investments in the TdB School and broader reform efforts represent an investment in preserving Galapagos over time."

Erick Guillen, 10 (pictured at right), is among those supported by the TdB Scholarship Program. Erick began his education in a rural Santa Cruz school, and lives with his father, a mechanic, and mother, who works at home. He was able to transfer to TdB in 2012 because of outstanding grades and a 1-year scholarship. He gets excellent grades, loves sports, and is a budding musician. ■



GALAPAGOS CONSERVANCY'S HONOR ROLL

Galapagos Conservancy would like to recognize the following individuals and businesses for their commitment to improving education in the islands:

Lindblad/National Geographic Fund, October Hill Foundation, Schaffner Family Foundation, Galapagos Direct, Celebrity Xpedition Fund, Buffy Redsecker and Alan Chung, Phillips Family Foundation, Bay and Paul Foundation, Latin Excursions, Natural Habitat, Regina Colasacco, Kathleen Diamond, George and Ellen Brandenburg, Pito and Chris Salas, Leslie Lenny

CAMERAS for CONSERVATION

TORTOISE WEBCAMS

Galapagos Conservancy is excited to connect our current and future members to the Galapagos Islands in a dynamic and engaging way — “Tortoise Cams.”

In June 2013, four motion-sensitive webcams will be installed in key tortoise viewing locations at the Fausto Llerena Tortoise Breeding Center in Puerto Ayora on Santa Cruz Island. At least one of the cameras will focus on the young (1- to 5-year-old) tortoises, who are ready to show off for tortoise fans around the world. Another camera is planned to focus on the adult Espanola tortoises, and two others will focus on interesting areas of high tortoise activity, yet to be determined.

Due to the isolation of the Galapagos Islands, wireless data transmission is unreliable and slow, so the cameras will be powered and linked to the internet via traditional cables and electricity. Images will be transmitted to the web as changes in the viewing window take place, and will not be streamed due to the high cost of data transmission in the Islands. For instance, if a tortoise(s) is sleeping, the image transmitted will remain static until movement is detected. Because the Tortoise Center already has the necessary technical infrastructure in place, the cameras will be set-up in hidden locations within close proximity to computers.

Stay tuned to GC's website, www.galapagos.org, for more information on this exciting new way to connect with Galapagos.

GC thanks Dr. Jim Gallagher (See *Donor Spotlight* below), for his generous contributions to this project.

DONOR SPOTLIGHT



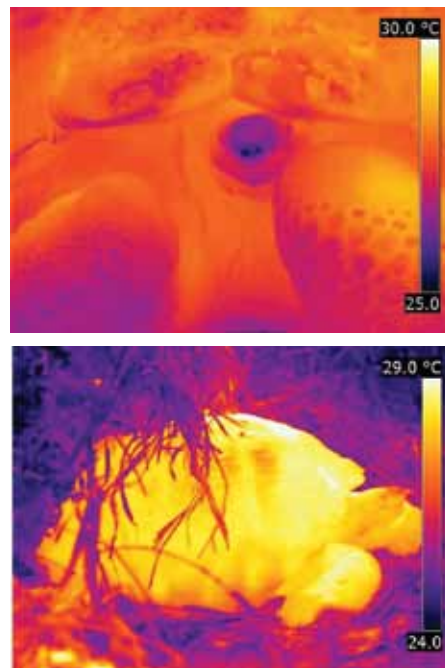
DR. JIM GALLAGHER

THERMAL CAMERAS

Dr. Glenn Tattersall, a professor in the Department of Biological Sciences at Brock University in Ontario was recently in Galapagos working with GC partner scientist, Dr. James Gibbs, on thermal imaging of tortoises in Santa Cruz.

Dr. Tattersall's work focuses on understanding how animals control their metabolism and body temperature during times when a high metabolic rate or high body temperature are impossible or inefficient to sustain.

Understanding this process will shed light on how animals modify and manipulate body temperature and may generate a whole new interpretation of why tortoise shell shape varies and also help with understanding how tortoises manage in the extreme environments of Galapagos. The images themselves are both scientifically and artistically intriguing.



Glenn Tattersall's thermal images of Galapagos tortoises, May 2013

Jim Gallagher, Ph.D. visited the Galapagos Islands more than a dozen years ago. A now-retired New Yorker who founded a consulting firm in the human resources field, Jim has been a loyal member of Galapagos Conservancy ever since, and was eager to lend his financial support to a project involving the installation of web cameras in several key sites in Galapagos. (See “Tortoise Webcams” on this page.)

"I was as enthralled as Charles Darwin by the truly wondersome environment of these islands and a return visit is still on my bucket list," he says. "In the meantime, being a part of the web camera project whets my appetite, as it will bring a taste of the Galapagos to the rest of the world. I'm delighted to have been a part of getting this imaginative project up and running."



The invasive hill raspberry in Galapagos.
© CDF/Rachel Atkinson

INVASIVE SPECIES: TO ACT OR NOT TO ACT?

by Ian Dunn, Chief Executive of the Galapagos Conservation Trust

Increasingly, one reads about the economic impact of invasive species. They cost the US economy billions and the global economy around \$1.5 trillion every year. Beyond this economic argument for taking action against invasive species, there are some rather more profound questions: are invasive species just an inevitable part of today's life on earth and their impact is to be accepted? Or, where they are a direct consequence of the activities of humans, do we have a moral obligation to take action?

Invasive species are those introduced species that spread freely and at the expense of local species (as opposed to introduced flora and fauna that do not, of their own accord, run wild). In the US, for example, water hyacinth (*Eichornia crassipes*) is responsible for clogging waterways and changing aquatic ecosystems to the detriment of indigenous plant and animal life. In Galapagos, the hill raspberry (*Rubus niveus*), the parasitic fly *Philornis downsi*, and rats (both *Rattus norvegicus* and *Rattus rattus*) are among the most rampant of invasive species.

Of course, plants and animals have natural means of dispersal that are fundamental to their success as species. But while oceans, mountain ranges, and deserts would have acted as natural barriers to such movement in the past, the life-style of humans means this is no longer the case. As individuals, we travel in concentrated numbers,

moving around with our “catchy” clothes, pockets, packages and bags. As a species, we have built an intricate globalized society based on the transportation of goods. The US, for instance, is estimated to export \$133 billion in food and drink each year and imports \$110 billion. Every movement is an opportunity for life to move with it.

So what if it does? Does it matter? If we consider humans as a natural part of the biosphere, then the answer has to be no. This view is implicit in the notion of the so-called anthropocene, an informal geological epoch in which the activities of one species — *Homo sapiens* — are expected to determine the immediate future of life on the planet. At the same time, however, isn't the anthropocene precisely the reason why we should concern ourselves with invasive species (and other impacts we are having on natural systems)? We have the power to do something about them.

Nowhere is this more obvious than in the Galapagos Islands. This is partly because these Islands have only recently been exposed to human influences and it is still possible to consider the control or eradication of many invasive species. Due to the iconic nature of the Archipelago, we have developed a deep understanding of its ecological makeup, so we are also well informed to determine the impact we are having.

Finally, one can argue that we simply should not be impinging on the rights of other species to co-exist, whether that be in Galapagos or elsewhere. Where it is within our understanding and powers to repair the damage caused by invasive species like raspberries, *Philornis downsi*, and rats, it is therefore incumbent upon us to do so. ■



GALAPAGOS CONSERVANCY

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