GALAPAGOS NEWS

Spring-Summer 2015

GIANT TORTOISE RESTORATION INITIATIVE *TAKES OFF*

The Sting that could Save Darwin's Finches

PROJECT UPDATES:
Penguin Condos
Mangrove Finches
Snail-sniffing Dogs
Albatross Airstrips

Tracking Galapagos

GC PHOTO CONTEST 2016

GALAPAGOS CONSERVANCY

Saving one of the world's great treasures

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Johannah Barry, President of Galapagos Conservancy, visits the brand new tortoise hatchlings at the Fausto Llerena Tortoise Center on Santa Cruz.
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FROM THE

PRESIDENT

Johannah Barry

CONTENTS

Cover Image
A Giant Tortoise makes his way through the vegetation on Wolf Volcano during an expedition in December 2014. *Photo Credit: James Gibbs*

We admit to favoring tortoise stories in this issue of *Galapagos News*, thanks to GC's Science Advisor Dr. Linda Cayot, who heads our Giant Tortoise Restoration Initiative. Linda brings us a number of updates, including the latest on genetics work leading to a captive breeding and repatriation program for Pinta and Floreana tortoises. This effort, years in the making and years in its implementation, will see Floreana tortoises once again roaming Floreana after 150 years of extinction in the wild. Hybrid Pinta Island tortoises will also be returned to Pinta — inspired by the memory of Lonesome George.

And speaking of the iconic Lonesome George, he is now off display at the American Museum of Natural History in New York and is awaiting the preparation of his new home in Galapagos. The Government of Ecuador is engaged in a significant redesign of their visitor and interpretation centers on all of the islands, and as part of this effort, they are planning a secure, climate-controlled exhibit space for Lonesome George. This exhibit will be the centerpiece of an important interpretive project that will feature more than fifty years of successful tortoise conservation by the Galapagos National Park Directorate and its scientific colleagues. But the story of Lonesome George remains both a cautionary tale of species extinction and an inspirational story for conservation.

The tiny Galapagos penguins, a vulnerable species in Galapagos, are doing well, thanks in part to the important work of Dr. Dee Boersma of the University of Washington. Her ingenious penguin "condos" are being used by the birds in the islands. And on the large end of the size scale, the Galapagos waved albatross is experiencing great success thanks to another man-made initiative — the clearing of invasive woody plants to make albatross "airstrips." Dr. James Gibbs of SUNY-Syracuse takes us to Española to view some test flights for these large, yet equally vulnerable, birds.

We are always grateful to our donors whose unwavering support has allowed us to take on the many conservation challenges posed in Galapagos. Our friend Judie Muggia has focused her energy and support on one of the most critical challenges in the islands — creating future leaders to take on the critical work of protecting and preserving these islands. Her generous support over the years has propelled our work in education to the highest levels of the Government and has resulted in a new, island-wide educational curriculum developed specifically to embrace the nature and character of the islands. This work will ensure that Galapagos remains in good and capable hands for generations to come.

GALAPAGOS CONSERVANCY
Saving one of the world's great treasures

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GALAPAGOS CONSERVANCY STANDARD MEMBERSHIP

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Important strides are being made today to protect the unique biodiversity and landscapes of Galapagos, but the future of the archipelago will depend on the generosity and commitment of forward-looking individuals. Success in protecting Galapagos means preserving in perpetuity an example of how nature existed before humans.

The Galapagos Legacy Society is comprised of special friends of Galapagos who have demonstrated their commitment to the long-term conservation of the islands by making a planned gift through Galapagos Conservancy.

Please contact Meridith Bolado at **(703) 383-0077** or email **legacy@galapagos.org** with any questions.

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GALAPAGOS NEWS

REGREENING SANTA CRUZ

The Galapagos National Park (GNP) took more than 50 staff into the field in February for a day of intensive reforestation. The work took place near Los Gemelos in the highlands of Santa Cruz and involved planting some 1,600 specimens of endemic and native species over an area of approximately two acres.

© GNP

CDF UPDATE

The Charles Darwin Foundation (CDF) reports excellent, continued success in several of their key conservation initiatives as evidenced in recent Facebook posts. With support from many international donors, including Galapagos Conservancy, CDF's science programs remain a robust element in the overall management of the Galapagos islands. Government institutions, such as the Galapagos National Park and the Galapagos Biosecurity Agency, have expressed their support for CDF's work and their deep appreciation for the many decades of CDF's leadership in science for conservation. CDF's current mandate to operate in Galapagos comes to an end in 2016 and discussions between CDF and the Ecuadorian government over the future of the Charles Darwin Research Station are scheduled over the next several months.

© Todd Smith, AdventureSmith Explorations

2014 TOURISM STATISTICS RELEASED

The Galapagos National Park and the Ecuadorian Ministry of Environment completed an analysis of data provided by visitors who entered the protected areas of the archipelago in 2014. According to the analysis, a total of 215,691 tourists entered Galapagos in 2014, up 6% from 2013. Of these visitors, 30% (65,694) were Ecuadorian and 70% (149,997) were from foreign countries. Americans made up 26%, followed by Britain (6%), Germany, Canada, and Australia (4% each), and Argentina (3%). The remaining 23% were divided among 153 other nationalities. 35% of travelers visited the Islands on cruises lasting approximately 7 days, while 65% stayed in the various inhabited towns for a period of 5 days. The data reflected in the report was provided by tourists via the Transit Control Card, which all tourists complete upon entering the the Galapagos National Park.

MIGRATING SPECIES

In November, delegates from over 170 countries attended a conference in Quito to discuss proposals made to increase the protection of certain migrating animals. The governments of Ecuador and Costa Rica were successful in their proposal to list two species of hammerhead shark under Appendix II of the United Nations Convention for Migratory Species (CMS). This measure affords these iconic marine predators greater protection when outside of protected national waters. An additional 19 species of sharks and rays were proposed for listing, all of which were accepted under the Convention.

© Simon Pierce

© Liza Diaz Láloma, CDF

GOOGLE GALAPAGOS

In collaboration with the GNP, CDF, and the University of Cuenca, Google is building on a pilot project conducted in 2013 that brought Galapagos to a new, online audience. The Trekker, a backpack with a 15-lens camera system that captures 360-degree images as the wearer walks, is being used to resample some of the sites that have already been mapped so as to visualize changes over time and also to collect images at several new locations. Once processed at Google Headquarters, these new images are expected to appear on Google Maps by the middle of this year.

FREIGHTER STRANDED

Another cargo vessel ran aground off San Cristóbal, just months after a similar incident in the same spot last year. Following the grounding of the *Floreana* in Wreck Bay at the end of January, Ecuador declared a state of emergency, mobilizing resources to help unload and refloat the vessel. The freighter was carrying nearly 50,000 liters of fuel and 1,400 tons of cargo, much of it food and gas cylinders. After 66 days, the vessel was floated, towed past the boundaries of the Galapagos Marine Reserve, and sunk in early April 2015. Last year, the *Galapaface I* was stranded in the same bay for more than a month before being similarly towed and sunk.

© AMNH/D. Finnin

LONESOME GEORGE TO GO HOME

Lonesome George, the last giant tortoise from the island of Pinta, is scheduled to return to Ecuador sometime in late 2015. When he died unexpectedly in 2012 at the Charles Darwin Research Station on Santa Cruz, the GNP sent his body to the United States to be preserved. In September last year, Lonesome George was revealed to the public in a special exhibition at the American Museum of Natural History in New York. The GNP is planning a special climate-controlled building to house Lonesome George as part of an important interpretive project that will feature more than fifty years of successful tortoise conservation. The new center will be named after Fausto Llerena, the warden who looked after George during his 40 years in captivity.

FLOREANA MOCKINGBIRD SURVEY

The latest survey of the critically endangered Floreana mockingbird reveals an increase in the population. In January, GNP announced that there are currently around 300 mockingbirds, almost double the number recorded in 2012. The species disappeared from the main island of Floreana in the 19th century, but survives on two nearby islets. While the latest survey appears to be good news, poor weather conditions could lead to a dramatic crash in the population. In 2006, these islets were home to fewer than 50 individuals.

THE STING THAT COULD SAVE DARWIN'S FINCHES

by **Henry Nicholls**

In a patch of tropical dry forest on the outskirts of Guayaquil, George Heimpel peers into the nest of a yellow-rumped cacique. He is not looking for a bird, but searching for a wasp, one that could save Darwin's finches from extinction.

In the harsh, highly variable conditions that are typical of Galapagos, survival is never easy. But over the last few decades, the world-famous finches have had to contend with a new and menacing threat, a parasitic fly that goes by the scientific name *Philornis downsi*. First discovered back in the 1990s in the nest of a woodpecker finch on Santa Cruz, this invasive insect is now well established on most of the Galapagos Islands, affecting at least 18 species of land birds, including 10 of Darwin's finches. It lays its eggs in their nests, the larvae hatching out to gorge themselves on the chicks. The consequences are usually lethal for the feathered host, which may account for the rapid decline in several bird species in recent years.

In 2012, the Galapagos National Park (GNP) and the Charles Darwin Foundation (CDF) held a workshop in Galapagos to come up with an action plan to combat the threat posed by *Philornis*. This has seen researchers pursuing several different lines of attack, including setting traps for the fly, fumigating nests, and biological control. This last approach is where Heimpel comes in, an entomologist at the University of Minnesota who studies parasitoid wasps. These are insects with a modified sting, which they use to inject eggs into the body cavity of another species. This results in the host being devoured from within. "If a specialist parasitoid of *Philornis downsi* were to arrive in Galapagos, either on its own or as part of a biological control program, it could dramatically reduce the burden these flies are placing on the finches," he says.

There are already several species of parasitoid wasp established in Galapagos. "So far, we have found seven species that are capable of parasitizing *Philornis*," says Charlotte Causton, a senior research scientist at the CDF, "but all appear to have wide host ranges, attacking other flies and probably other insect groups." Moreover, the rate at

Left: Arno Cimadom, a researcher at the University of Vienna in Austria, inspects a finch nest on Santa Cruz. © Christian Wappl.

Above: *Brachymeria podagrica*, one of the seven parasitoid wasps that will occasionally parasitize *Philornis downsi* larvae. © Piedad Lincango.

Finch in peril. Over the last 15 years, the warbler finch population on Santa Cruz has declined by more than 50%. © John Colas.

George Heimpel and colleagues inspect nests on mainland Ecuador for a parasitoid wasp that might help control *Philornis* in Galapagos. © George Heimpel.

which these parasitoid wasps attack *Philornis* is far too low to be of any use as a biological control, she says. "We continue to collect *Philornis* pupae from different parts of the Archipelago to try to understand the natural enemy complex associated with this fly."

Heimpel, meanwhile, has taken the search for a more effective parasitoid to mainland Ecuador. Although it seems reasonable to assume that *Philornis* probably reached Galapagos from Guayaquil, hitching a lift on board one of the many ships and planes that travel to and from the Archipelago, the fly had never been seen in Ecuador until Heimpel began to look. But last year, working in two pockets of forest on the outskirts of Guayaquil, he and his colleagues came across the fly in the nests of several bird species.

Crucially, there was also evidence of parasitoid wasps. "We've seen many holes in *Philornis* pupae showing that wasps emerged rather than a fly." This year, Heimpel is back in Guayaquil, collecting *Philornis* pupae from birds' nests and rearing them in captivity to identify the wasps that emerge. Back in Minnesota, in a special quarantine lab, these wasps will be studied in detail in the hope of identifying a species with suitable egglaying habits.

A candidate for biological control would need to tick several boxes, says Heimpel. For a start, *Philornis* pupae exude a frothy glue that causes them to clump together along with twigs, feathers, and dust into a big sticky ball. This poses a problem for a would-be parasitoid and may help account for the low frequency at which wasps parasitize *Philornis* in Galapagos. "A wasp could get to the pupae on the outside, but the ones on the inside are going to be very difficult to attack," says Heimpel. "It would either need to sting the larvae before the pupae form or it would need to have a really long ovipositor."

If, after careful study, Heimpel's team were able to identify a wasp that was sufficiently specific to act on *Philornis* without affecting native Galapagos flies, it would then be up to the Galapagos National Park to decide whether to introduce it to the Islands. Although biological control has been effective in Galapagos in the past (see box at right), such a decision will never be taken lightly. But the threat that *Philornis* poses to land birds in Galapagos could hardly be more urgent.

"This is just one of several promising approaches we are pursuing," says Causton. "We now have a group of experts from eight countries and 14 institutions working together to find techniques to control the fly," she says. "We are hopeful that between us we will come up with a solution in the not too distant future."

"The threat that *Philornis* poses to land birds in Galapagos could hardly be more urgent."

THE SCALE INSECT AND **THE LADYBUG**

Cottony cushion scale insect was first spotted in Galapagos nearly 30 years ago, and by 2000 it had spread to most of the major islands in the Archipelago. It's a problem because it sinks its mouthparts into the woody stems of plants, tapping into the sap of a range of species from the white mangrove to *Scalesia*. So in 2002, the Galapagos National Park agreed to the introduction of another insect, a non-native ladybug, to control it. More than a decade later, the ladybug has become established and appears to be containing the scale insect's impact on native plants without itself causing any obvious damage to other species.

The Giant Tortoise Restoration Initiative TAKES OFF

by **Linda J. Cayot,** *Science Advisor at Galapagos Conservancy*

In July 2012, as the international workshop *Giant Tortoise Restoration through Integrated Research and Management* concluded, we knew we'd been part of something very special.

Twenty-seven park rangers, tortoise researchers, natural resource managers, botanists, and others had sat in a room for a week, sorting through all we collectively knew about Galapagos tortoises, arguing about what needed to be done, and developing a detailed plan for tortoise research and management for the next twenty years. With most of the tortoise populations back on the road to recovery, it was time to focus on restoring the overall tortoise population to its historical numbers. Prior to the arrival of humans in Galapagos, more than 200,000 tortoises roamed the islands. Exploitation, beginning in the 1700s and continuing for more than two centuries, reduced that number to some 20,000 animals, or just 10% of what it should be.

The workshop was hard work. But disagreements among scientific factions (ecologists, geneticists, botanists, etc.) eventually transitioned into inspired brainstorming for novel solutions to put all tortoise populations on the path to full recovery, with a vision of a future Galapagos with more than 200,000 tortoises once again spread across the Archipelago. This was a labor of love and dedication for these magnificent animals; although none of us in the room would live to see the end result, our children and grandchildren will.

This exciting conservation adventure was supported by a strong scientific foundation and the accumulated field experience of many, particularly the park rangers who have monitored each tortoise population for decades. To ensure the workshop results translated into action, over the next year we developed the Giant Tortoise Restoration Initiative (GTRI), a long-term project led by Galapagos Conservancy in concert with the Galapagos National Park Directorate (GNPD), and in collaboration with many international scientists. The GTRI expands existing programs for: breeding, rearing, and repatriation; habitat restoration; control and/or eradication of invasive species that impact giant tortoises; returning tortoises to islands where they are extinct, eliminating tortoise poaching, and other issues in the world of Galapagos giant tortoise conservation.

In wildlife conservation as in many areas, the only way to ensure success for a major project is to have an on-the-ground champion. So, in April 2014, with the GTRI developed, Galapagos Conservancy hired Washington (Wacho) Tapia, MSc, to be that champion. With years of tortoise work under his belt, Wacho hit the ground running. A second tortoise champion, Dr. James Gibbs of the State University of New York College of Environmental Science and Forestry, became ever more involved. Check out their stories on the next page.

The Tortoise Centers: *The heart of tortoise recovery*

Given the importance of the three breeding and rearing GNPD Tortoise Centers to the long-term restoration of Galapagos tortoises (e.g., the Española and Pinzón tortoises were saved from extinction by these centers), it is essential

Left: Tortoises gather on Wolf Volcano to take advantage of the puddles and pools created by the abundant rainwater of the wet season.

that they function as effectively as possible. In November 2014, I, along with Dr. Joe Flanagan, Chief Veterinarian at the Houston Zoo and a long-term collaborator with Galapagos Conservancy, traveled to Galapagos to join Wacho and a number of park rangers for the first ever evaluation of the three Galapagos Tortoise Centers. Among the park rangers joining us was Fausto Llerena, one of the most knowledgeable people about Galapagos tortoises. Having worked for the GNPD for 43 years, Fausto participated in numerous field trips to tortoise country and supervised the Santa Cruz Tortoise Center (which now bears his name) for decades. We were lucky to have him along to share his knowledge and wisdom. With three days at each center, we examined the health status of most of the tortoises, reviewed the corrals, feeding procedures, care of eggs, incubation, and data management. We produced a series of recommendations, including increasing sunlight and size of some corrals, improving food dispersal so that tortoises don't have to compete with each other, and developing a multi-center data system to ensure data quality and subsequent analysis. Some recommendations have already been implemented.

Española Island: *Thinning the thickets*

In 2010 James Gibbs and colleagues initiated a long-term research project on Española Island focused on interactions among giant tortoises, cactus, woody vegetation, and albatross. After completing an analysis of the 40 plus years of tortoise data collected by many park rangers and scientists, James and colleagues published an open-access article on the history and status of Española tortoises (*Visit www.plosone.org, search article 0110742*). The current tortoise population has nearly 1,000 individuals — a result of the four decades of repatriation of nearly 2,000 tortoises. There is now significant natural reproduction of those repatriates! An important finding was that, due to the impact of the past presence of goats and the decades-long absence of a large tortoise population, the island has undergone a transformation to dense thickets of woody vegetation. This altered habitat could be limiting dispersal of tortoises and is not conducive to nesting albatross that frequent the interior of the island. In light of this finding, further tortoise repatriations to Española are temporarily suspended, while the issue of whether the woody vegetation is a problem or not is assessed.

WACHO TAPIA

pictured here on Pinzón Island

JAMES GIBBS

pictured here on Isabela Island

MEET THE TORTOISE CHAMPIONS

Both lovers of reptiles, **Wacho Tapia** and **James Gibbs** have dedicated much of their lives to Galapagos tortoises.

Wacho Tapia began working with giant tortoises as a volunteer at the Charles Darwin Research Station when he was 17, just out of high school. After university, he completed his thesis research on the *aplastados*, strange flattened tortoises living on the southern slopes of Cerro Azul, a volcano of Isabela Island. During Wacho's time at CDRS, I was his supervisor; we developed a strong working relationship and friendship. After completing his thesis, Wacho worked for the Galapagos National Park Directorate (GNPD) for 15 years in various positions. There, his passion for tortoises grew. When the opportunity came to direct the GTRI, Wacho jumped at the chance. We are lucky to have him at the helm.

I first met **James Gibbs** when he traveled to Galapagos in the early 1980s, also at 17 years old, to assist his brother studying finches on Daphne Island. James went on to complete his PhD at Yale University where he connected with Drs. Jeff Powell and Gisella Caccone just as they were initiating the now twenty-plus-year research project on Galapagos tortoise genetics. That brought him back to Galapagos where he became involved with the CDRS and the tortoise program. As the CDRS moved away from tortoise work, James, a professor at the State University of New York College of Environmental Science and Forestry, became an adjunct scientist with Galapagos Conservancy. In 2012-13, he participated in the "Wise Sage" visiting scholar program with the Ecuadorian government, working with the GNPD to enhance science capacity for advancing conservation.

Wacho, James, and I work together as the GTRI leadership team; we began with the planning of the 2012 Tortoise Workshop. Wacho is the director of the Initiative in Galapagos, the main liaison with the GNPD, and the leader of all field trips. James provides scientific guidance, helping with research design, training park rangers, and providing scientific leadership on field trips. I act as general coordinator, work on fundraising, and ensure that we keep the long-term vision in mind.

The GTRI would be impossible without the collaboration of the GNPD. All planning and field trips are done jointly, with the GNPD often providing the boat, logistics, and many personnel — extremely capable and genial park rangers, whose passion for tortoises and Galapagos equals our own. The future of Galapagos depends on them, and we greatly appreciate their knowledge and enthusiasm. The GTRI also relies heavily on the support of our members, who provide the resources, affirmation, and inspiration to move this difficult but exciting campaign forward.

To gain insight into potential benefits of habitat management, the GNPD recently cleared five small areas in the middle of the island. In May 2015, a return trip took place to measure how quickly the woody plants recover and if the albatross and tortoises are taking advantage of the newly cleared areas. The fate of the declining cactus population, an important resource for tortoises, is another major issue. Prior to their eradication, goats destroyed most of the cactus. Reproduction of the few remaining individuals is near zero; woody plants shade out the little cactus and the expanding tortoise population may exert too much pressure on them. In 2013, the field team encircled 12 adult cactus with tortoise-proof fencing; follow-up monitoring should help us determine what happens to cactus with and without tortoises.

Santa Fe Island: *Returning tortoises after 150 years*

The giant tortoises of Santa Fe disappeared sometime in the middle of the 19th century. A small, low island in the center of the archipelago, it likely experienced the first tortoise extinction in Galapagos, a result of exploitation by whalers and those who came before them. The island has remained without a tortoise population ever since. Goats, introduced around 1900, caused major ecosystem degradation. After they were eradicated in the early 1970s, the vegetation recovered rapidly. For complete island restoration however, Santa Fe needs tortoises. While no Santa Fe survivors have ever been identified, genetic analyses indicate that the Española tortoise species is the one most closely related to the extinct Santa Fe species; tortoise habitat on Española is also similar to that on Santa Fe. With the current suspension of repatriations to Española Island, the young tortoises produced at the Tortoise Center on Santa Cruz will be used to repopulate Santa Fe and initiate a more comprehensive island restoration.

Last year's field trips to Santa Fe focused on searching for the ideal release site for the young Española tortoises, establishing 20 quadrats (10 fenced and 10 open marked areas) for long-term monitoring of changes in vegetation and the impact of giant tortoises, and 1 additional quadrat to study individual cactus and their regeneration.

Although the first release was planned for early 2015, the weather didn't cooperate. We needed rain and the subsequent green vegetation to ensure adequate food at the start. Given that the rains have finally come, we expect tortoises to be on Santa Fe in early June. Stay tuned…

Pinzón Island: *No more rats!*

In December 2014, Wacho and James once again teamed up with several park rangers as well as tortoise geneticists (led by Dr. Mike Russello from the University of British Columbia) on a field trip to Pinzón Island. In December 2012, the GNPD and partners undertook a campaign to eliminate all introduced black rats, which first arrived on Pinzón in the late 1800s. For more than a century, the rats ate every giant tortoise egg and/or hatchling produced in the wild. Saving the aging tortoise population via the very successful rearing and repatriation program was only a stop-gap method (in spite of running now for 50 years!) until the rats could be eliminated.

In addition to a population census, the December trip was the first concerted effort to find hatchling tortoises after the rat eradication. With the rats gone, hatchlings should be able to successfully emerge from natural nests. The field teams measured all tortoises encountered, took blood samples, and searched for hatchlings. Mike Russello, a member of the extended tortoise genetics research group overseen by Dr. Gisella Caccone at Yale University, is the expert on Pinzón tortoise genetics. His previous work had indicated that the current repatriates are not representative of the full genetic diversity of the native tortoise population. The results of DNA analysis of tortoise blood samples from all zones will inform future management efforts and ensure greater genetic diversity in repatriated tortoises. The tortoise population is estimated at 570. The field team was most excited to find 10 hatchling tortoises; many more probably remained hidden under rocks

and vegetation. These young animals, not seen in more than a hundred years, will provide a new foundation for a growing population that should eventually reach historical numbers. We expect to see many more little tortoises in the future thanks to the departure of the rats.

Pinta and Floreana Islands:

Hybrid hunting to resurrect tortoise species from extinction

Through genetic analysis of blood samples collected in 2008, the genetics team discovered a small "trove" of tortoises with strong genetic affinity to tortoises on Pinta and Floreana (now extinct on their islands) sequestered on Wolf Volcano, all likely descendants of tortoises left there by mariners some two centuries ago. The dream to recover these tortoises and start a breeding program to repopulate Pinta and Floreana is soon to become reality. In December 2014, James and Wacho led a short trip to Wolf Volcano in preparation for the 2015 expedition to collect tortoises. Along with relocating many of the tortoises marked previously, the team collected blood samples from 28 unmarked saddlebacks; the samples have been shipped to Yale University for genetic analysis. Based on this short expedition, the team can now develop the operational plan for the 2015 expedition, likely to transpire in November or December. ■

What's to come in 2015 and beyond?

Tortoise releases, counting, tracking, collection, breeding, and rearing

This year we expect even greater advances in the GTRI. Coming activities include:

• Returning giant tortoises to **Santa Fe Island** — the release of approximately 200 juvenile Española tortoises, with follow-up monitoring trips each quarter. Annual releases of more Española juveniles by the GNPD are expected over the next 10 years.

• Major expedition to census the tortoises of **San Cristóbal Island** — to count tortoises, collect blood samples, and gain a greater understanding of that population, one of the lesser known tortoise populations in the Archipelago.

• Annual monitoring trip to **Española Island** to continue the long-term project on interactions among tortoises, cactus, woody vegetation, and waved albatross.

• Expedition to **Wolf Volcano on Isabela Island** to collect hybrid adult tortoises with partial Pinta and Floreana tortoise ancestry; breeding programs for both tortoise species to be initiated.

• Census of the small, less well known population of tortoises on **Santa Cruz Island**, the Cerro Fatal tortoise, to determine population size, distribution, and threats.

• Development of an **operational manual and database** for the Tortoise Centers based on last year's review; additional capacity building for all Tortoise Center staff.

• Second annual review of the three **Tortoise Centers**.

Top, left: The cactus forest on Santa Fe, where young tortoises will be released this year.

Top, right: 1) A scientist collects data on the tortoises of Wolf Volcano.
2) Young tortoises at the Santa Cruz Tortoise Center await repatriation to their island of origin when they are 5 years old.

Left: One of 10 "naturally hatched" baby tortoises found on Pinzón in 2014.

Right: A majestic Pinzón adult tortoise shows off his saddleback carapace.

All photos, © GTRI team

GALAPAGOS CONSERVANCY

Saving one of the world's great treasures

PROJECT UPDATES

PENGUIN CONDOS IN USE

Two Galapagos penguins huddle in a "penguin condo" in February 2015. © Dee Boersma

To increase the population of Galapagos penguins, the rarest and most endangered penguin species in the world, Dr. Dee Boersma of the University of Washington and her research team built 120 high-quality, shady nest sites ("penguin condos") since 2010 on three major islands where penguins currently breed — Isabela, Fernandina, and Bartolomé. The nests were dug into or constructed out of natural lava rocks and are monitored two to three times per year to determine if artificial nest sites do, in fact, increase reproduction and reproductive success of penguins when food is available. The long-term goals of this project are to reverse the decline of the Galapagos penguin population, and to strengthen the population so that it can better withstand intense climate fluctuations caused by El Niño events.

As of February 2015, 13 of the constructed nests contained eggs or chicks at some point during scientific monitoring. All were located on the Mariela Islands in Isabela Island's Elizabeth Bay — an area with cold, nutrient-rich waters where most of Galapagos' penguins live.

Since the first artificial nests were built in 2010, 24% of the total active nests (nests containing eggs or chicks) have been constructed nests. In the Mariela Islands, constructed nests account for nearly half of penguin breeding activity. These results indicate that constructed nests do appear to help the penguins reproduce successfully, and that the construction of additional quality nest sites in the Marielas will allow this positive trend to continue.

Boersma's team made other observations in February 2015, indicating the signs of a healthy and stable penguin population. Juveniles appeared to represent from 3 to 10% of the population, and most of them likely fledged in December or January as they were still fully feathered. The team also witnessed attempted copulations at Punta Vicente Roca, along the coast of Isabela around Tagus Cove, and in Elizabeth Bay. If nutrient-rich upwellings continue in Elizabeth Bay this year, the penguins will likely continue to attend nests and breed.

Dr. Boersma and her team have recommended that the Galapagos National Park create a marine-protected area in Elizabeth Bay, as the Mariela Islands located in the Bay represent the highest density breeding area for Galapagos penguins. Providing special protection for this area will also benefit many other species of seabirds, marine mammals, and fish. Dr. Boersma also recommends creating a second Penguin Conservation Zone around Bartolomé Island. ■

MANGROVE FINCH PROJECT

These two lucky mangrove finch hatchlings now have a good chance of surviving in the wild. © Liza Díaz Lálova, CDF

SEASON 2

Thanks to your support, the Mangrove Finch Project has entered its second year of this ground-breaking program with a strong team dedicated to bringing a critically endangered population back from the brink.

As is normal for those studying Darwin's finches in Galapagos, a new year began with great anticipation as the project team waited for the unpredictable rains that herald the onset of the breeding season. When the wait was over and the rains arrived, the team was back in the field hoping to repeat the successes of 2014, which saw 15 hand-reared fledglings released back into the wild mangroves of western Isabela.

However, this season the field team faced some unexpected challenges. Mangrove Finch Project lead

Darwin the dog sniffs a Giant African Land Snail © Rebecca Ross, DFC

SNAIL-SNIFFING DOGS

In Galapagos, native species are threatened by introduced, invasive species such as goats, rats, pigs, and cats, among many others. While much has been accomplished in the management of existing invasive species, the Islands are constantly at risk of new unwanted species arriving each day. The Giant African Land Snail (GALS) — the largest species of snail found on land, growing to nearly 8 inches in length — is one such new invasive that has taken up residence in Galapagos. Known to consume at least 500 different types of plants, scientists consider the GALS to be one of the most destructive snail species in the world. It now poses a serious threat to the native snails and plants of Galapagos.

Invasive Giant African Land Snails were first detected on Santa Cruz Island in 2010, and less than 50 acres are currently infested. But the snails are expanding their range every wet season. Experience has shown that once an invasive species becomes established, it is almost impossible to remove. At this point in time, it is still possible to eradicate the GALS from Galapagos if additional management techniques are integrated into current activities.

Previously, staff from the Galapagos Agency for the Regulation and Control of Biosecurity and Quarantine (ABG) had to search for and collect GALS on rainy nights using headlamps — an extremely challenging solution to the permanent eradication of the snails. Dogs, on the other hand, have an incredible sense of smell and can be trained to detect scents imperceptible to the human nose, making them ideal for the detection of the GALS. This project utilizes two scent detection dogs to find GALS in order to help clear currently affected areas and search for previously undetected populations in the Islands.

During the first phase of the project, which took place in the fall of 2014, two detection dogs were trained by Dogs for Conservation (DFC) in the United States to specifically detect GALS. Darwin, a golden Labrador retriever, was rescued after he was unable to successfully complete a service dog training program, and Neville, a black Labrador retriever, was saved from a shelter. Darwin and Neville were selected based on their detection abilities and temperament for working with multiple handlers. In December of 2014, the dogs were brought to Galapagos where six ABG staff were trained as handlers for this and future detection projects. Many had never worked with dogs before and had to learn the basics of canine behavior, learning theory, scent theory, training methods, and handling skills. New kennels were built by ABG personnel with materials funded through this project.

Both dogs required a period of acclimation to Galapagos and to their new roles. The dogs could only be trained on dead snails in the US due to biosecurity risks for this highly invasive species, so additional training was needed upon their arrival in Galapagos to transition them to live snails and snail eggs. Darwin and Neville have now been fully trained to detect the invasive snails, and the dogs will be regularly assisting with GALS eradication and monitoring on Santa Cruz.

DFC continues to provide guidance and support to the GALS K9 team, with whom they are in weekly communication. This project also serves as a pilot to establish a permanent canine detection program in the Galapagos. Expertly trained dogs and experienced handlers will be a highly cost effective detection tool for ongoing biosecurity programs aimed at eliminating targeted invasive species that threaten the unique and fragile ecosystems of Galapagos. ■

© Rebecca Ross, DFC

Francesca Cunninghame explains, "It was exceptionally dry at Playa Tortuga Negra, and the mangrove finches were slower breeding. Consequently, we only identified 12 nesting pairs. We also experienced two days of high wind gusts, which made climbing trees up to 60 feet into the canopy overwhelming and dangerous."

The Mangrove Finch Project is based on so-called "head-starting," collecting eggs from wild nests early in the season when the probability of chick survival is very low. These eggs were then incubated and the chicks hand-reared in captivity at the Charles Darwin Research Station on Santa Cruz. Once independent, they began their journey back to Isabela by boat to then spend four to six weeks in pre-release aviaries within the mangrove forest where they will adapt to their natural surroundings before being released. The fledglings will then be radio-tracked for one month to record their initial movements and survival. In 2014, the monitoring did not detect any mortality following release.

As of the writing of this publication, the 2015 project team managed to successfully hand-rear 8 chicks, and they are currently in the pre-release aviaries on Isabela. ■

The Mangrove Finch Project is a bi-institutional project carried out by CDF and GNPD in collaboration with San Diego Zoo Global and Durrell Wildlife Conservation Trust. The project is supported by Galapagos Conservancy, the Galapagos Conservation Trust, The Mohamed bin Zayed Species Conservation Fund, the Durrell Wildlife Conservation Trust, The Leona M. and Harry B. Helmsley Charitable Trust, and The British Embassy in Ecuador.

AIRSTRIPS FOR ALBATROSS

PROJECT UPDATE

"Seeing tortoises and albatross together is a marvelous sight!"

by Dr. **James Gibbs,** *Adjunct Scientist for Galapagos Conservancy*

Making experimental "airstrips" for waved albatross is not easy! The albatross colony located in the interior of Española Island that is suspected to have suffered from woody plants grown in so thickly after the departure of the goats (good riddance!) cannot be reached by a simple hike from the coast. On an expedition in 2013, we had to stage the effort by establishing a camp in the central part of the island under an enormous — and apparently the only — "caco" tree on the entire island. "Caco" is a leguminous tree species with delectable foliage that did fare well under the goats. We hauled out tents, food, and water to the base of the "caco" and the luxurious shade it provided under its large heart-shaped leaves. We then used that site as the base camp to make daily forays over the next 8 days to the south side of the island. Looking south from the top of Española Island is a little overwhelming — there is nothing out that way but blue ocean all the way to Antarctica.

The south side of Española is covered in dense, at times nearly impenetrable, woody vegetation — mainly *muyuyo,* a small tree with bright yellow flowers. In May 2013, we randomly chose 10 sites on the south flank and made counts of the albatross nesting within a 50m radius of those points, which we marked with a large pile of lava rocks. May is when albatross are sitting on eggs, so it's a good time to figure out who has settled where. They sometimes protest our appearance but mostly ignore us as we push through the thick vegetation looking for albatross on eggs, counting untended eggs, and counting all adults present. We then flipped a coin and designated half of the sites for clearing and half to remain as controls for a return trip in Nov 2013 when the hard work began.

In November, the eggs had hatched, and, present in the thickets and the few available openings, there were large fuzzy juveniles trying to learn to fly. With machetes and brush saws, we began hacking away the vegetation and hauling it away to the edges of the "airstrips" designated for clearing. We cleared the inner 20m radius circles of five of the plots, leaving the other five "as is." It took 2-3 hours per plot with 12 men hacking, whacking, and hauling, as well as sweating, joking, and drinking what water we could parse out from what was available. Everything was strictly rationed, as it had to be hauled up from the coast 1.5 days away.

The albatross on these plots didn't seem to mind the commotion. We did this for 4 days in the head-splitting heat, each day ending by walking back up to the center of the island, usually with no water left. At the end of finishing our last plot with everyone resting and dehydrated, a juvenile albatross wandered into our newly made "airstrip" *(see photo, below right)* and started flapping its wings wildly — "Our first customer!" someone called out, and everyone had a big laugh.

In 2014, we reappeared around the same dates in May and re-counted all of the incubating adults on the plots in exactly the same manner. An interesting pattern is developing … each plot supports about 24 incubating albatross, but the cleared plots gained on average of 5 incubating albatross, while the number on plots left with woody vegetation didn't change. That's a pretty big increase, but it will not be until May of 2015 when we know if this was an anomaly or a more permanent, positive response to clearing. We'll also see if the plots have grown in quickly or have maintained themselves in an open state.

Notably, we are starting to see more and more tortoises on the south side of Española, including in our clearings. They are presumably dispersed from the repatriation areas on the north side as the tortoise population grows. Seeing tortoises and albatross together is a marvelous sight — and perhaps represents a restoration of an old relationship that once occurred all over the island. Time will tell. Stay tuned for the outcome of the 2015 albatross nest counts! ■

Top: An albatross comes in for a clumsy landing at a crowded "airstrip." © Christine Weisenstein. Above, left: One of the naturally maintained albatross airstrips on Española. Above, right: The "first customer," a juvenile with its brown fuzzy feathers, wanders onto a newly-cleared airstrip. © James Gibbs

TRACKING GALAPAGOS

Whale Shark © Jonathan Green. Sea Lion © Oli Burbage-Hall. Sea Turtle © Alex Hearn, CDF. Petrel © Daniel Allen.

Over the years, zoologists have been quick to embrace new technologies, using the very latest gadgets and gizmos to access the secret lives of animals. Their discoveries are always interesting and often have important implications for conservation. In addition to giant tortoises, researchers in Galapagos have used electronic add-ons to study everything from waved albatross to whale sharks.

WAVED ALBATROSS

During the waved albatross breeding season, from late-April to December, this Galapagos favorite can be seen on nesting sites on Española. But when the birds launch themselves off the island on a foraging trip, GPS-enabled tracking devices reveal that they commonly head for the Peruvian coast, often travelling thousands of kilometers at a time.

GREEN SEA TURTLE

Satellite transmitters have been used to monitor where female turtles go when they've finished nesting on the shores of Galapagos. It would appear that some head for Central and South America, ending up anywhere between Nicaragua and Colombia; some hang around in Galapagos, visiting other islands; and others swim south and west into the open Pacific.

SWALLOW-TAILED GULL

Using data loggers and water sensors, researchers were able to reveal hidden patterns of behavior in the nocturnal swallow-tailed gull. These birds, it seems, are influenced by the lunar cycle, concentrating their foraging efforts to coincide with the new moon when the abundance of prey species at the surface is greatest.

HAMMERHEAD AND GALAPAGOS SHARK

For almost ten years, a network of scientists has been using satellite and acoustic tags to track scalloped hammerheads and Galapagos sharks in the Eastern Pacific. Clear evidence of the migration routes of these top predators is crucial for informing conservation policy and practice.

DARK-RUMPED PETREL

The foraging behavior of the critically endangered Galapagos petrel is largely unknown, but ongoing research — using satellite transponders — is starting to reveal some of this missing information.

BLUE-FOOTED BOOBY

Researchers have used data loggers to study the underwater movements of blue-footed boobies in extraordinary detail. Typically, boobies spend about 3% of a foraging trip under water. In an average dive, a bird will descend about 4 meters below the surface, but one particularly adventurous individual was submerged for an impressive 39 seconds and reached a depth of 22 meters.

FUR SEAL AND SEA LION

GPS-tracking devices and time-depth recorders have been used to compare the foraging patterns of Galapagos sea lions and Galapagos fur seals. The data reveal a complex pattern of movements that shows these similar species rarely came into conflict over food.

WHALE SHARK

The Galapagos Whale Shark Project is one of the most ambitious tagging projects ever attempted for this species. One of the goals of this initiative is to account for the aggregations of female whale sharks in the vicinity of Darwin Island in the northwest of the Archipelago. As more data come in, it is looking increasingly likely that the Galapagos Marine Reserve may play an important role in a much larger-scale migration undertaken by pregnant females of the species.

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In 2004, Galapagos Conservancy partnered with Celebrity Cruises to launch the **Celebrity Xpedition's Galapagos Fund** — a program that encourages guests aboard the Celebrity vessel *Xpedition* to support community-based initiatives through which residents of the Galapagos Islands promote conservation and sustainability in their communities.

Since its inception, the Fund has provided nearly one million dollars to finance a wide-range of projects. Some have helped reduce the introduction of invasive species, and to increase rural incomes through small- and medium-scale sustainable agriculture and marketing projects. Through improved classroom learning and extra-curricular environmental education projects Galapagos youths have connected to their home and understand their role in protecting the Islands. Local institutions, such as municipalities, cooperatives, and local not-for-profit's have benefited through technical support and professional consultancies for project such as recycling and refuse management and improved fishery methods. The Fund has also contributed to improved community health services and greater involvement of the local population in reducing pollution and litter by supporting efforts to eliminate the use of plastic bags.

Thanks to a grant from Royal Caribbean Cruises Ltd's Ocean Fund, Galapagos Conservancy has launched a $50,000 matching gift challenge to encourage guests who travel aboard Celebrity Cruises' *Xpedition* to make gifts to the Celebrity Xpedition's Galapagos Fund. "By generously agreeing to match up to $50,000 of gifts on a 1:1 basis, the Ocean Fund will help to encourage more and larger gifts from travelers, significantly increasing the resources available to support conservation projects that will make a real difference in the Islands," said Galapagos Conservancy's president, Johannah Barry.

A new round of grants from the Xpedition's Galapagos Fund will be awarded later this year. We look forward to telling you more stories of how visitors can leave a permanent legacy for the Galapagos people — the caretakers of their home and our favorite place.

THANK YOU

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MEMBER SPOTLIGHT

Judie Muggia

For more than 50 years, Judie Muggia has been an active member of the Winchester, MA community, serving on the town's Board of Selectmen and supporting numerous causes and organizations. Judie has also been active in the Galapagos Islands and Ecuador — a second home to Judie, as her husband grew up in Quito before traveling to the States to study and practice medicine.

In 1998, Judie founded Galapagos Direct, a tour business specializing in personalized travel to Galapagos and mainland Ecuador. She has always been a strong believer that it is important for the Galapagos tourism industry to support conservation and to play a role in protecting the Islands. "I believe that it is incumbent upon those of us who derive both pleasure and income from introducing people to the Galapagos Islands to *give back*. We must both educate our clients about the fragility and importance of the islands and share our time and financial resources with local programs that ensure the long-term protection of this world treasure."

Over the years, Judie supported a number of different education and community conservation initiatives in Galapagos, including training in different fields for promising local youths and formative after-school programs. But she was always looking for a way to have a more strategic and profound impact.

In 2013, Judie contacted Galapagos Conservancy and shared her belief that education is the key for long-term conservation in the Islands. She learned about **GC's Education for Sustainable Development (ESD) Program**, which was in the early stages of development, and agreed to fund two scholarships through Galapagos Conservancy to sponsor students at the Tomás de Berlanga School, which is being developed as a demonstration school for the Islands.

In 2014, Judie helped move the ESD Program forward by funding a participatory planning process in which a team of education experts from Ecuador, the US, and Mexico worked closely with the Ecuadorian Ministry of Education and the Galapagos education community to develop a roadmap for deep educational reform in the Islands. Recently, she agreed to fund the Program Director/Educational Leadership Coach who will put these ideas into action, later this year.

"For me, someone who has been looking for years for an effective way to invest in local education, the ESD Program is a dream come true! The key to its success will be the commitment of Galapagos Conservancy's leadership to establish a partnership for lasting education reform that involves the Galapagos-based Scalesia Foundation, the Ecuadorian Ministry of Education, a talented team of international education experts, local teachers and school directors, and local families in the islands."

Judie is retiring from the tourism industry this summer, but she remains committed to ensuring that Galapagos youth are educated to understand and assume a pivotal role in shaping a sustainable society in the Islands. GC's work in this area would be impossible without her vision and commitment. ■

Sunset at Isabela Island © GC Member, Sarah Knutie

The long-term goal of Galapagos Conservancy's Giant Tortoise Restoration Initiative, carried out in collaboration with the Galapagos National Park Directorate, is to rebuild Galapagos tortoise populations to their historical numbers. This includes returning tortoises to islands where humans caused their extinction. An analog species, or substitute, (Española tortoises — genetically closest to the original Santa Fe tortoises) will soon be released on Santa Fe to initiate the return of giant tortoises to an island where they went extinct in the mid-1800s.

BLOG [EXCERPT]
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This morning under the intense equatorial sun, we are searching for tortoises, specific tortoises, in the Fausto Llerena Tortoise Center on Santa Cruz. Scouring the grounds, we look for 5-to-10-year-old tortoises with celeste blue numbers on their shells. Freddy Villalva — Park ranger and head tortoise keeper — has given us a list of over 200 Española tortoises to find. The colored number indicates the island, and the color for Española is celeste blue. Freddy's list includes all Española tortoises large enough to be released on Santa Fe.

This feels like an Easter egg hunt combined with a massive accounting exercise. Each tortoise has secreted itself somewhere on these rocky grounds amongst some 1,000 tortoises from different islands, each island with its own color of paint. Finding the right Española tortoises amongst the horde is a challenge. Normally this would be more difficult given tortoises' propensity to hide themselves in the deep shade under thorn bushes, but fortunately this hunt was organized around a scheduled feeding day. Hungry tortoises come out from their hard-to-reach refuges looking for something to eat, making them easier to intercept.

As for an accounting exercise, we need to find and collect the correct tortoises, and only the correct tortoises. And 200+ tortoises is a lot of tortoises! For several years, Galapagos National Park staff have been rearing these tortoises specifically for Santa Fe Island. Each tortoise is the fruit of much labor, water, food, and care. Through population modeling, we have projected the future population on Santa Fe based on numbers released initially and through the years. It's all been in the abstract, but suddenly here they are! It's happening now. The first step is to find each and every tortoise on the list. . .

Top: A group of young tortoises that scientists and park rangers sorted through to find the Española tortoises bound for Santa Fe.

Above, both photos:: Freddy Villalva marks and weighs the tortoises as he dictates data to his colleague.

All photos © James Gibbs

By guest author Dr. James Gibbs of the State University of New York's College of Environmental Science and Forestry (SUNY-ESF) and Galapagos Conservancy Adjunct Scientist

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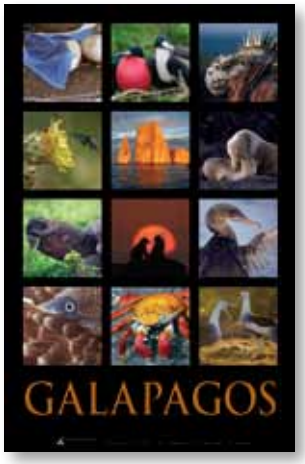

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