



Fundación  
**Charles Darwin**  
Foundation  
GALAPAGOS



# IMPACT

REPORT 2021





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# THE CHARLES DARWIN FOUNDATION

## EXPLORING, UNDERSTANDING, SHARING

The Mission of the Charles Darwin Foundation (CDF) and its Research Station is to provide knowledge and assistance through scientific research and complementary action to ensure the conservation of the environment and biodiversity in the Galapagos Archipelago.

For more than sixty years, we have conducted cutting-edge research in marine and terrestrial environments, working both in the Galapagos National Park and in the Galapagos Marine Reserve. In this impact report, we share the important milestones and successful stories driven by our efforts to support conservation of the unique species and ecosystems of Galapagos and their services.

Dear friends,

Life in the Galapagos is slowly returning to normal as this special region of the world, and our Research Station, are once again welcoming visitors. It is a pleasure to present our achievements in 2021, which held many challenges due to the pandemic and global uncertainty.

This year, we have slowly been recovering and with great efforts, we are making progress against our goals. CDF has developed a Strategic Plan 2022-2027 which provides direction for our future. We've also made significant improvements to our infrastructure including the Inspiration Complex, marine research labs and Conference Center. The multi-stakeholder Galapagos Hub is a reality and we have a project underway to create a central digital platform to share scientific data and findings about the Galapagos with scientists and the public.

In short: we have not stood idly by and are in good shape to navigate the waters into which the future will take us.

I want to thank our donors, stakeholders and leaders, especially the COMON, Wyss and Gordon and Betty Moore Foundations for their generous support, as well as our Board of Directors and staff, who together have been propelling us forward.

Now, as my term ends, and as George Harrison sang 'All things must pass', it is time for me to go.

Serving the Charles Darwin Foundation has been an unforgettable experience, and it has been a privilege to work with such talented individuals. A special thanks to my colleagues on the Board of Trustees - past and present - as well as to our Executive Director and his team for their dedication to saving the Galapagos. It remains clear to me: "if we cannot save the Galapagos, we cannot save the world."

I wish the very best to the incoming president, as we continue the foundation's important scientific work for the conservation of the wonderful natural landscapes of Galapagos.

HANS VAN POELVOORDE  
CDF BOARD PRESIDENT





Dear all,

On behalf of the Charles Darwin Foundation, it is my pleasure to share with you our Impact Report for 2021. We've made some dramatic advancements in our scientific research program this year across our 18 projects, including some notable 'firsts'.

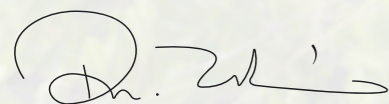
In marine projects, our shark ecology team tracked for the first time a pregnant hammerhead shark's ~4,000 km journey from Galapagos to the coastal breeding grounds of Panama... and back again! Her voyage included a stopover in Cocos Island, Costa Rica, underscoring the importance of establishing an Eastern Tropical Pacific marine corridor for these charismatic migratory species.

On land, our Galapagos Tortoise Ecology Movement Program discovered the presence of four novel viruses in otherwise healthy giant tortoises – a stunning discovery that shows us that the unique evolutionary processes that have occurred in Galapagos are not solely restricted to the charismatic fauna.

Back at sea, we saw striking results from behavioral studies among fauna during the pandemic. In the case of green sea turtles, a big shift in behavior was observed with individuals spending considerably more time in bays and near to shore in the absence of tourism, indicating that even low impact activities such as snorkeling and swimming can affect behavior more than was thought previously.

These highlights represent but a few of the advances in our research program for 2021, and I invite you to discover our teams' many other interesting results and advances, in this new and more impactful format.

As always, thank you for your support of the Charles Darwin Foundation and its Research Station. The work that we do is supported by organizations and individuals from all over the world who care deeply about the conservation of the Galapagos Islands – a unique place that represents a microcosm of the challenges and threats that we face in the conservation world today.



RAKAN ZAHAWI  
EXECUTIVE DIRECTOR  
CHARLES DARWIN FOUNDATION



# CHARLES DARWIN FOUNDATION HISTORY

## Raymond Lévêque: The Swiss student who put our Research Station on the map

Peter Kramer (CDF Executive Director from 1970 to 1973 and current General Assembly member)

The first act, the creation of the Charles Darwin Foundation, involved the signing of papers which played out in Quito and other capitals. Without the second act, creating the Research Station in Puerto Ayora on Galapagos, not much on-the-ground action would have happened. Right after the documents creating the Foundation were signed, UNESCO, at the recommendation of CDF, hired a young Swiss biologist, Raymond Lévêque, to go and build a research station on Galapagos. That was certainly a daunting mission, and in hindsight, it seems a bit crazy to have asked a 28-year-old biology student without relevant experience to undertake such a logistically challenging task.

The enterprise was made even more difficult, because more experienced people had previously recommended that they build the Station in Tortuga Bay, which local people in Puerto Ayora found absolutely absurd. Raymond had no way to communicate with his far-away superiors in a timely manner; and letters would have taken weeks to go back and forth. He was conflicted, but ultimately followed the advice of the locals to construct the first two buildings at the place where the Station is today. Local people and construction workers from the continent got it done. Later, everybody agreed that Raymond had done a great job.

Sadly, he was exhausted and disappointed in himself when he left in early 1962 because he felt he had not accomplished what he was sent out to do. Two buildings were standing, but he felt they were not really completed. He also regretted that he had not done enough fieldwork, had not completed his seabird census, and was slow in publishing the information on seabirds that he had assembled.

Raymond Lévêque was not only our first Director, he was also the youngest ever. Thanks to his courage, flexibility, and perseverance he succeeded in putting the Charles Darwin Research Station on the map under extremely difficult conditions. We should celebrate him as the real founder of the Charles Darwin Research Station.



Raymond Lévêque: The first Charles Darwin Research Station Director



Construction workers at the Charles Darwin Research Station with Edgar Pots (first administrator of CDRS) wearing a large hat.



READ MORE



Raymond Lévêque: The first Charles Darwin Research Station Director



During 2021 the  
**Charles Darwin  
Foundation** led

**18**

marine and terrestrial  
projects. In this  
document we present  
the most salient  
results of the year.



# MARINE ECOSYSTEMS





Monitoring invasive species © Alan Chung

282

SCUBA dives were carried out and 513 transects were censused across a total of 71 different sites. We registered 159 fish species, 80 mobile macroinvertebrates, and 177 sessile organisms



## MARINE BIODIVERSITY AND BIOINVASIONS IN THE GALAPAGOS MARINE RESERVE

Marine ecosystems face an increasing number of threats including climate change, habitat loss, pollution, and invasive species. **Since 2000, CDF has been conducting a long-term evaluation of subtidal communities in the Galapagos Marine Reserve (GMR), focusing on recording the diversity, abundance, and size of the species present in three major groups of macrofauna: fish, macroinvertebrates, and sessile organisms.**

In 2021, our team conducted a subtidal ecological monitoring campaign which encompassed all the islands and islets of the archipelago. 282 SCUBA dives were carried out and 513 transects were placed in a total of 71 different sites. **We registered 159 fish species, 80 mobile macroinvertebrates, and 177 sessile organisms. This has provided the Galapagos National Park Directorate with a complete current description of the marine ecosystem community as well as information on the dynamics and magnitude of fluctuations of this biota on a yearly basis.**

Our marine ecosystems team studies marine invasions that are a growing threat in recent years due to global trade, transport, and tourism. These species compete for space and resources, displacing native species, changing populations and communities. **In 2021, 59 introduced species and 35 cryptogenic species were reported in docks and moorings.** We are using the Subtidal Ecological Monitoring survey data to evaluate the status of bioinvasions in the GMR, testing for spillover of introduced species from anthropogenic habitats (e.g., docks and moorings) to natural habitats across the archipelago.

More broadly, we aim to understand the risk (extent and impact) of non-native marine species already established in the GMR, as a model to evaluate invasion dynamics and management strategies for island ecosystems and Marine Protected Areas (MPAs).



*Botrylloides niger*, an introduced species

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Marine Invasive Species Project



Subtidal Ecological Monitoring Project



A scalloped hammerhead shark © Jordi Chias

+4000 km

traveled by Cassiopeia, a pregnant hammerhead shark, providing the first round-trip satellite track between Galapagos and Panama.



## CASSIOPEIA'S AMAZING JOURNEY BETWEEN GALAPAGOS AND PANAMA

The Shark Population Status and Ecology Project is studying the distribution and health of various species of sharks in the Galapagos Marine Reserve to better understand the connectivity of populations in the Eastern Tropical Pacific, and to determine whether marine protected areas are effectively protecting these highly mobile and endangered creatures.

In 2021, as part of an international collaboration, our researchers used satellite transmitters to follow in near real-time the movements of pregnant hammerhead sharks that aggregate at the beginning of each year around the northernmost Galapagos islands of Darwin and Wolf.

**Cassiopeia, a pregnant scalloped hammerhead shark, provided scientists at CDF with the first round-trip satellite track between Galapagos and Panama, after covering more than 4000 km!**

This round-trip migration illustrated by Cassiopeia has underscored the importance of connectivity between Galapagos and mainland coastal areas, where multiple scalloped hammerhead shark nurseries have been registered. Mapping migratory routes is key to enable recommendations of additional protection scenarios for hammerhead sharks, as well as to validate the effectiveness of marine reserves, like the newly created Reserva Marina Hermandad, for this highly migratory species.



Detailed return satellite track of pregnant scalloped hammerhead shark 'Cassiopeia' between the Galapagos Islands in Ecuador and the coast of Panama. © CDF

**The scalloped hammerhead shark was listed in 2019 as Critically Endangered by the Red List of Threatened Species issued by the International Union for Conservation of Nature, based on an estimated global population decline of >80% over three generation lengths (72.3 years).**

READ MORE



Shark Ecology Project



# 2042

penguins censused in 2021. The population is considered stable and the census was slightly greater than in 2020.



© Andrés Cruz

## POPULATIONS OF PENGUINS AND CORMORANTS ARE HEALTHY

We conduct long-term ecological monitoring of seabirds to assess population dynamics of the Galapagos penguin, the flightless cormorant, and the waved albatross; all are threatened by climate change, introduced species and pathogens, increased human interaction, and non-infectious diseases. The Galapagos penguin and flightless cormorant can be found nowhere else on Earth and have very small populations.

**The primary objective of monitoring seabird health and population status is to improve management plans to protect these unique and fragile species.** In 2021, during the monitoring in Isabela and Fernandina Islands and in Marielas Islets, encouraging results indicated a larger number of penguins compared to the previous year. **From 1,940 individuals reported in 2020, this year an estimated population of 2,042 has been censused.**

For flightless cormorants, in 2020 a total of 2,290 individuals were estimated, while in 2021 the total number was 2,085. Despite some reduction in numbers, the population size is within the expected range.

CDF scientists believe that the La Niña event (cooling of the Eastern Tropical Pacific), when there is more food available for these species, has led to a higher than expected number of individuals being observed.

The percentage of adult individuals for both species was high as well, indicating that there are more reproductive adults, with more positive trends in the populations of penguins and flightless cormorants likely in the future.



Flightless cormorant / *Phalacrocorax harrisi*  
©Sam Rowley

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Population Studies of Marine Birds

READ MORE



Interdisciplinary Fisheries Research



© Esteban Barrera

## TAKING STEPS TOWARDS SUSTAINABILITY OF FISHERIES

Fishing is one of the most important activities in Galapagos. It is a source of employment for more than 500 fishers and their families. In addition, fishing is essential for food security for the local people of the archipelago. We conduct interdisciplinary research to understand the entire fishing system to help develop sustainable fisheries in Galapagos.

In 2021, the team focused on installing seafood traceability technology to encourage good fishing practices and improve the livelihoods of Galapagos fishers. With more and more consumers willing to pay higher prices for sustainable products, a traceability system will permit local fisheries to comply with this demand. In collaboration with Shellcatch Inc. we led the implementation of a pilot traceability system in the Galapagos small scale fishery, recording the journey from the point of sale, back to its point of origin. **The consumer can evaluate this process by a simple scan of a QR code on the package that is for sale! Thus far, traceability equipment has been installed on five artisanal fishing vessels.**

We also analyzed the impact of COVID-19 on fishers, restaurants and small seafood retailers in the Galapagos Islands. **Our research revealed substantial financial losses due to the collapse of tourism, with losses of approximately \$170,000 per week, equivalent to a 73% decrease in sales.** In response, we developed a training bootcamp for more than 40 seafood entrepreneurs in Galapagos, brought technical assistance to 9 seafood ventures, and formed the Galapagos entrepreneurs community.





## INVESTIGATING THE IMPACTS OF HUMAN ACTIVITIES ON GREEN SEA TURTLES

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Reducing the Threats to Sea Turtles

Marine Protected Areas, such as the Galapagos Marine Reserve, play an important role in mitigating the impacts of human activities on marine ecosystems and wildlife. The disturbance of wildlife by tourism-related activities has become a major concern recently, due to the substantial increase in visitation and recreational activities.



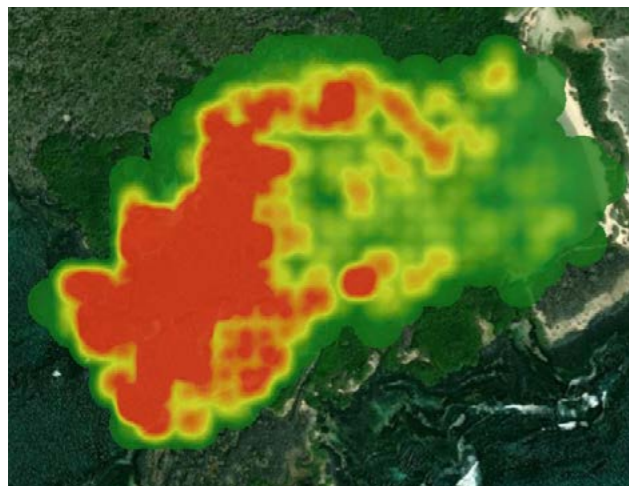
Turtles resting and feeding in Playa Mansa.

We study the effects of tourism on sea turtles in the Galapagos Islands. In 2021, we investigated the behavior of free-ranging green turtles during the inter-nesting period, and their response to vessel noise. **Our monitored turtles spent 25% more time traveling and were more alert when vessel noise was present.** This finding revealed that wild sea turtles can detect and distinguish vessel noise, and shift their behavior accordingly. Turtles exposed to propeller noise during the inter-nesting period, moved from shore waters into offshore areas with higher levels of marine traffic and risk of vessel collision as well as greater risk for shark predation.

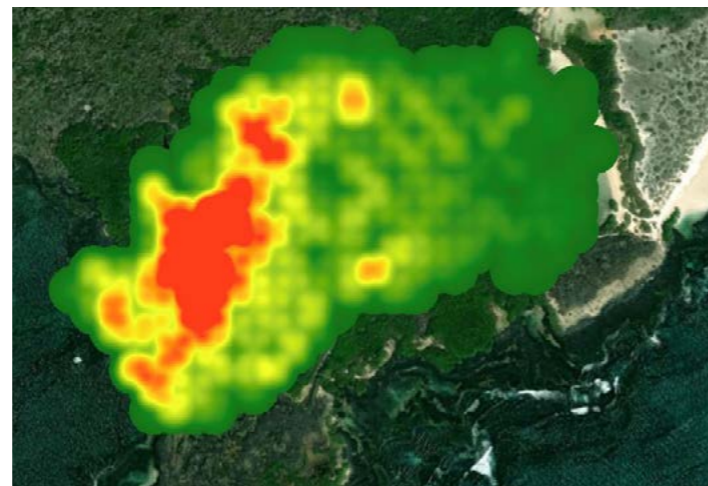


Speed boat transiting in the bay. Kayaking activities taking place in Playa Mansa.

We also investigated whether human presence in Tortuga Bay, an iconic tourist site on the island of Santa Cruz, affects the green turtle's abundance and habitat use of the bay. **We found that the number of turtles present in the bay decreased by 68% when human activities took place (swimming, snorkeling, kayaking, and boat transit).** Furthermore, in hours with fewer human activities, the turtles spread more widely and are also found closer to the beach, compared with hours with human presence in the bay, when turtles aggregated in a smaller area far away from the beach.



Turtle distribution heat map within the bay in the absence of touristic activities, the red area shows the space used by the turtles.



Area of the bay occupied by sea turtles (red area) when touristic activities take place.



TERRESTRIAL ECOSYSTEMS





© Juan Manuel García, CDF.

## NEW KNOWLEDGE ON GALAPAGOS TORTOISES' HEALTH AND WELL-BEING

Galapagos tortoises are one of the most emblematic animals. Unfortunately, two centuries of overhunting led to the extinction of two species and reduced others to critically small population sizes. Galapagos tortoises play multiple roles in the archipelago. **As ecosystem engineers and mega vertebrates, they help to maintain healthy ecosystems within the archipelago and may act as sentinel species, which means they are indicators of environmental disturbances because they are very sensitive to change.** And as a conservation icon, tortoises strongly contribute to the local economy through tourism. Today, tortoises remain endangered due to climate change, invasive species, habitat loss and fragmentation, illegal trade, pollution, and the introduction of novel pathogens.

Over the last 11 years, we have worked to better understand tortoise migration across the islands and the threats they face in a rapidly changing environment. We use a One Health approach to determine how the coexistence between tortoises, domestic animals, and human beings may facilitate the spread of disease and cause new challenges for the conservation of this iconic species.

READ MORE



**Galapagos Tortoise  
Movement Ecology  
Program**



4

new viruses were  
discovered in clinically  
healthy Galapagos  
tortoises.



In 2021, we significantly advanced our understanding of tortoise health and well-being, with three new discoveries within the Galapagos Tortoise Movement Ecology Program.

**We described, for the first time, the presence of four novel viruses in clinically healthy Galapagos tortoises** (two herpesviruses and two adenoviruses) that have probably evolved with these giants over the years. These viruses are new to science, and therefore more research is needed to better understand the role they play in tortoise health and whether they can cause disease under certain circumstances such as stress.

**A novel threat to wildlife and human health was also identified, with the description of antibiotic-resistant bacteria in tortoise fecal samples.** These resistances are most likely the result of environmental pollution produced by inappropriate use of antibiotics in humans and domestic animals that are contaminating water sources, soil, and plants, and are being ingested by tortoises and potentially other animals.

**We described the first blood reference intervals of free-living Santa Cruz giant tortoises.** This is an important tool for veterinarians and other scientists to analyze tortoise health or treat sick animals at breeding centers, as it provides the normal values for different blood parameters such as glucose, calcium, potassium, red and white blood cells.

Our results will inform current and future local conservation actions and management decisions to reinforce the protection of the most iconic species of the archipelago.



Scientists taking blood, feces and urine samples from a Galapagos Giant Tortoise © Juan Manuel García, CDF.



Dr. Ainoa Nieto processing samples in the field. © Juan Manuel García, CDF.

*This program is a multi-institutional collaboration between the Charles Darwin Foundation, Max Planck Institute for Animal Behavior, Galapagos National Park Directorate, Saint Louis Zoo Institute for Conservation Medicine, Houston Zoo, and Galapagos Conservation Trust. Drs. Stephen Blake and Sharon Deem lead the program with the support of a local team based in Galapagos and a large number of international collaborators/partners.*





# 42%

of monitored nests had material from dispensers sprayed with an insect growth inhibitor. As a result, significantly fewer fly larvae of the invasive Avian Vampire Fly were found in these nests.



## PROTECTING GALAPAGOS LANDBIRDS

We are developing methods to control the invasive Avian Vampire Fly, *Philornis downsi*, which is seriously threatening endemic Galapagos landbirds such as the Little Vermilion Flycatcher and the Mangrove Finch. We are researching the treatment of bird nests with larvicides, trapping with lures, and identifying a potential biological control agent.

In 2021, **scientists found that the self-fumigation technique has great potential for reducing the impacts of the fly larvae in nests of endangered bird species.** Self-fumigation is a way for birds to help themselves by incorporating material impregnated with a bird-safe insecticide into their nests. Scientists set out dispensers with three different nest-building materials - cotton, down feathers, and coconut fiber - to see which materials were most attractive to birds. The materials were sprayed with an insect growth inhibitor, which has been found to have no negative effects effects on birds.

Activity at the dispensers was monitored with trap cameras. **On average, 42% of monitored nests had some material from the dispensers incorporated, and these nests also contained significantly fewer fly larvae and had higher fledging success.** Plans are afoot to test additional nesting materials to attract species that were not interested in the materials offered so far - some birds are quite particular about what they use to build nests! These tests will help further evaluate the efficacy of this tool for protecting nestlings from the devastating blood-sucking larvae of the Avian Vampire Fly.

READ MORE



**Control of the Invasive Avian Vampire Fly *Philornis downsi***

## HOPE FOR THE LITTLE VERMILION FLYCATCHER

**In 2021, eight Little Vermilion Flycatchers fledged, joining the critically endangered population on Santa Cruz Island.** Eight may not sound like much, but it's a record for recent years, and it's thanks to an ambitious experimental management program run by CDF, the Galapagos National Park Directorate, and the University of Vienna to reduce the impacts of invasive species on this emblematic bird. The Little Vermilion Flycatcher (*Pyrocephalus nanus*), classified as Vulnerable by the International Union for the Conservation of Nature (IUCN), is very rare on Santa Cruz Island with an estimated 30 breeding pairs remaining. The greatest threat to the Little Vermilion Flycatcher is the Avian Vampire Fly (*Philornis downsi*). However, scientists have also found that the dense stands of invasive blackberry (*Rubus niveus*) in their habitat are affecting breeding success, by preventing parent birds from accessing high-energy prey on the ground to feed themselves and their chicks. This drives parents to abandon eggs and makes chicks less resilient to fly attack.

The success of a three-year experimental management program to recover Little Vermilion Flycatcher populations was evaluated in 2021. **The management program has involved the restoration of Scalesia forest through blackberry removal, rodent control, and injection of a low-impact insecticide into the base of nests to reduce the number of Avian Vampire Fly larvae.** These experimental techniques have proven highly effective, and the population of the Little Vermilion Flycatcher on Santa Cruz Island is now increasing steadily. The management actions are also benefiting a program that aims to restore the Scalesia forest, one of the most threatened habitats in the archipelago. Scientists have observed natural recovery of several endemic and native plant species, including the threatened giant daisy tree (*Scalesia pedunculata*), Galapagos cafetillo (*Psychotria rufipes*), and tree ferns.

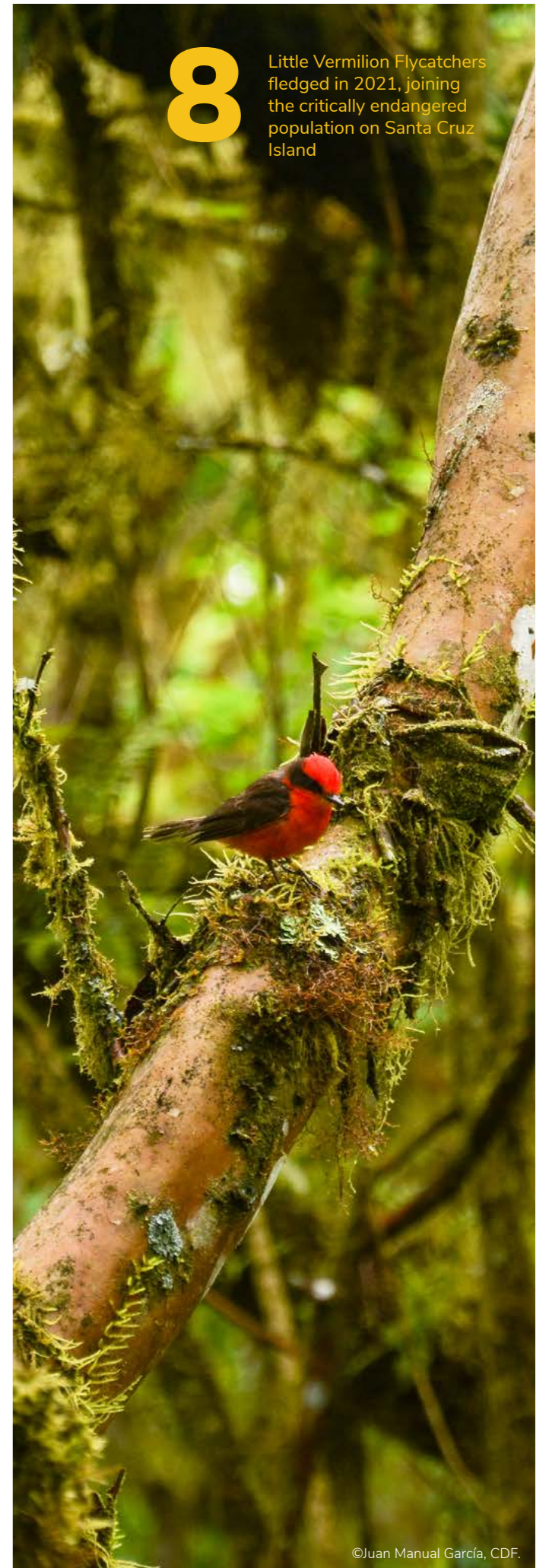
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**Conservation of Threatened Populations of Small Land Birds Project**

# 8

Little Vermilion Flycatchers fledged in 2021, joining the critically endangered population on Santa Cruz Island



©Juan Manuel García, CDF.

©Juan Manuel García, CDF.



**PUERTO EGAS, SANTIAGO ISLAND**





## SAVING THE ENDANGERED *Scalesia* FOREST

*Scalesia pedunculata*, a giant daisy tree species endemic to Galapagos, is currently threatened by invasive plants, mainly by blackberry (*Rubus niveus*). Only 300 ha of forest remnants of this species remain on Santa Cruz, representing 3% of its historical distribution.

To assess the impacts of blackberry and its control on vegetation, invertebrates, and birds, "The Los Gemelos Project" was established between CDF, Galapagos National Park Directorate, and the University of Vienna in 2014. Plots were established in areas invaded by blackberry and in areas where blackberry and other invasive plant species are being controlled. Results in 2021 showed that invasive species control is successful. The vegetation in the control plots have a greater number and higher percent cover of endemic and native species than the vegetation in the invaded plots. **The invaded plots also have 60% blackberry cover, while the plots with control only have 3% blackberry cover.**

However, over the last nine years, 75% of monitored *Scalesia* adult trees fell over and the percentage of *Scalesia pedunculata* cover was reduced to 40%. This is a natural process because as a pioneer species, *Scalesia* only lives about 15-20 years. In the past when a tree fell over, it allowed light to pass through, which facilitated the germination of the *Scalesia* seeds. Today, the shade caused by the blackberry prevents these seeds from germinating.

**Over the past nine years, we have not found any *Scalesia* seedlings in the invaded plots, which confirms that the blackberry inhibits seed germination and thus the natural regeneration of *Scalesia pedunculata*.** In addition, conducting a comparison of the distribution of *Scalesia pedunculata* at Los Gemelos between the years 2011 and 2021, we calculated that we are currently losing approximately 5% of the *Scalesia pedunculata* cover every year due to the blackberry invasion.

This data demonstrates that without continued and larger-scale control of blackberry, we will lose the *Scalesia* forest remnants over the next two decades. The cost of chemical and manual blackberry control is very high (up to US\$20,000 per 1 hectare over 20 years) and chemical control is not environmentally friendly. Therefore, a more economical and sustainable control method is needed, such as biological control.



© Juan Manuel García, CDF.

# 3%

cover *Scalesia pedunculata* is estimated as remaining in Santa Cruz Island.



## MAPPING *Scalesia cordata* AT CERRO GRANDE, ISABELA



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Saving *Scalesia cordata* from extinction

*Scalesia cordata*, a tree species endemic to southern Isabela Island, is disappearing. Today, only a very small fraction of the trees recorded twenty years ago remain, showing the rapid rate at which this species is being lost. In 2019, it was estimated that there were only about 300 trees left on Isabela. But now we know that there is still hope! Less than 1 km from the perimeter of Isabela's agricultural zone is Cerro Grande. At this site, there is a remnant patch of *Scalesia cordata* trees, identified in recent years by park rangers from the Galapagos National Park Directorate (GNPD). This patch holds potential for the conservation of the species, since it has the highest known density of remaining trees today.

To optimize the search and management of *Scalesia cordata* at this site, **in 2021 we conducted drone flights and generated georeferenced aerial images.** With these images, we identified individual *Scalesia cordata* trees, recorded their geographic coordinates and generated maps identifying the location of each these trees. The maps were used by GNPD and CDF personnel to find these trees in the field and control the introduced plant species in the area. This with the intention to increase the germination probability of *Scalesia cordata* seeds and therefore the natural regeneration of this species.

**In the 17 ha surveyed by drone at Cerro Grande, we identified approximately 255 *Scalesia cordata* trees.** Additionally, we found more individuals in the field that were not detected in the drone images, possibly because they were hidden under other vegetation!

The work of mapping and detection of *Scalesia cordata* and the restoration of its population at Cerro Grande has been very successful for several reasons. First, we established a methodology to identify trees from drone images. This allows us to obtain an accurate estimate of the actual number of individuals of this species. Second, knowing the location of these trees from drone images makes it easier to find them in the field to carry out targeted management actions. In 2021, these actions facilitated the germination and establishment of more than 150 seedlings at Cerro Grande, a place where no natural regeneration of *Scalesia cordata* had occurred for years!. Finally, by having access to these trees, it is also possible to collect a large number of seeds for another objective of this project: the germination and growth of *Scalesia cordata* seedlings in the GNPD greenhouse on Isabela.

# 255

*Scalesia cordata* trees have been identified at Cerro Grande on Isabela Island from drone flights.



© Juan Manuel García, CDF.





6,000

seeds of *Lecocarpus leucarpoides* were obtained from mother plants in the laboratory to save this species from extinction.



© Patricia Iaramillo Díaz

59

study sites

2,300

plants

54

species

## GALÁPAGOS VERDE 2050

The Galapagos Verde 2050 (GV2050) project is a science-based ecological restoration initiative for the archipelago. It works with several endangered species, such as the *Galvezia leucantha* subsp. *leucantha* on northern Isabela, which has increased its population fivefold since 2017.

The *Opuntia echios* var. *echios* in South Plaza has increased its population by 250% compared to 2014, while more than 6,000 seeds of Española Islands' *Lecocarpus leucarpoides* have been produced in 2021.

In the sustainable agriculture component, a study was conducted to analyze the role of women in agriculture through workshops and surveys. Furthermore, the benefits of planting the endemic tree *Scalesia pedunculata* in coffee plantations was studied, with preliminary results estimating that this species captured 16 tons of carbon dioxide per hectare.

With the support of the Galapagos National Park Directorate, an 80m<sup>2</sup> greenhouse was built on Floreana island, where germination experiments with 14 endemic and native species started, focusing on three restoration projects. Meanwhile, 4 hectares have been restored in three study sites on Baltra Island using 12 ecosystem keystone species.

Building on the success of the project in 2021, **the GV2050 project has grown into a fully-fledged Program encompassing 7 different research projects** focused on ecological restoration in natural, rural, and urban areas.



Technical assistant Pavel Enríquez-Moncayo is classifying fruits and seeds for germination experiments for the ecological restoration of Baltra island. © Paul Mayorga, CDF.





## SCIENTIFIC PUBLICATIONS

In 2021, CDF scientists alongside collaborating researchers published 64 peer reviewed journal articles. Additionally, four bachelor's and master's theses were completed, and we published three new books.

64

peer reviewed publications



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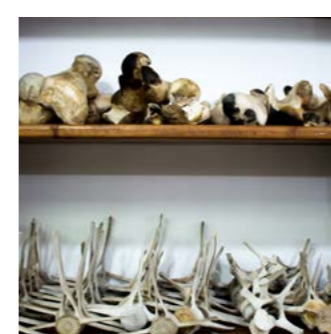
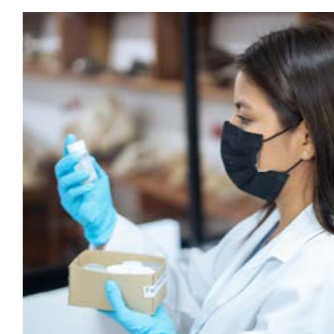


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## CDF NATURAL HISTORY COLLECTIONS

The Natural History Collections of the Charles Darwin Research Station represent an invaluable scientific resource to study the biodiversity of Galapagos. The science conducted at the Charles Darwin Foundation is anchored to these collections that started over 60 years ago and we envision that these data will be used by decision makers to generate the best strategies that benefit and preserve Galapagos biodiversity.

Our four Natural History Collections—herbarium, terrestrial invertebrates, marine organisms, and vertebrates—include endemic, native, and invasive species. Currently, all collections are growing with more than 100,000 specimens registered. Our emphasis is on increasing our holdings of marine organisms and terrestrial vertebrates where we expect to have discoveries of species new to science, thus increasing the inventory of the Galapagos biota.







## CDS, Herbarium Collection


The herbarium comprises more than 46,000 specimens. In 2021, we identified and added more than 1,000 accessions to the database and mounted 940 specimens. As part of the digitalization project of the Herbarium, 1,300 specimens of vascular plants were scanned; at present, 49% of the collection of vascular plants have been digitized. In 2021, we validated data of 6,300 plants, 400 ferns, 580 algae, and 414 seed samples, and corrected the taxonomic identification of around 400 specimens. We revised the algal collection of the CDS Herbarium, resulting in the taxonomic actualization of 577 records, the curation of 700 specimens, and the retrieval and data entry of 470 specimens.



**46,000**  
specimens

## MCCDRS, Marine Collection

The marine collections consist of 9,847 specimens, mostly marine invertebrates. In 2021, we added information to the new database system, dataBoard, and validated that information with scientific publications. We entered 350 observation records into the database. Additionally, 200 invertebrate specimens stored for 10 years were accessioned. As a result of the research conducted by the Marine Invasive Species team, we added 90 new taxa and 1,672 records to the dataBoard. Finally, we validated and accessioned 706 specimens collected during the last two seamount expeditions, and during the expeditions to hydrothermal vents conducted in the last decade.



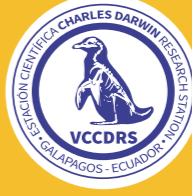
**9,847**  
specimens



Giant land crab, *Cardisoma crassum*  
©Juan Manuel García, CDF.

## VCCDRS, Vertebrate Collection

The VCCDRS collection has 2,036 accessions. We curated more than 700 specimens of the alcohol collection, and edited data in the dataBoard regarding common names, conservation category, and updated any cited literature.

**2,036**  
specimens

## ICCDRS, Terrestrial Invertebrates Collection

The Terrestrial Invertebrates Collection encompasses 40,953 accessions. In 2021, the collection received its first cabinet for type specimens (holotypes and paratypes), which allowed staff to properly curate 561 type specimens in the orders *Coleoptera*, *Blattodea*, *Orthoptera*, *Lepidoptera*, and *Stylopmmatophora*.



Galapagos Sulphur Butterfly, *Phoebis sennae*  
© Andrea Acurio, CDF.



**40,953**  
specimens



Galapagos centipede, *Scolopendra galapagoensis*  
© Andrea Acurio, CDF.





© Rashid Cruz, CDF.

European Union  
#BeachCleanUp



## EDUCATION AND COMMUNITY OUTREACH ECO-PROGRAM

The ECO-Program's mission is to create an environmentally-aware community in the Galapagos. By providing information and sharing our scientific results, the local community will have the tools they need to become more environmentally responsible.

### Student Participation Program

We worked with 77 students from the San Francisco de Asís and Tomás de Berlanga Schools on Santa Cruz Island. The participants took part in 26 sessions that addressed topics such as self-awareness, scientific information, and local issues.

To support the implementation of the Galapagos Contextualized Education Curriculum, more than 870 students visited the Research Station to learn about invasive species.

This was an opportunity for students to learn about science in a fun way, reinforcing their knowledge of the unique environment that surrounds them, and empowering them to take action to protect it.

### Scientific Talks: Science Goes to the Community

We held 29 virtual and in-person talks, with different speakers, on topics such as fisheries, invasive species, and the conservation of endemic species, among others.

**870** students visited the Research Station to learn about invasive species

### Shark Ambassadors Science Club

Our Shark Ambassadors participated in activities focused on strengthening their connection with the ocean, and to generate public awareness about the importance of caring for marine ecosystems.

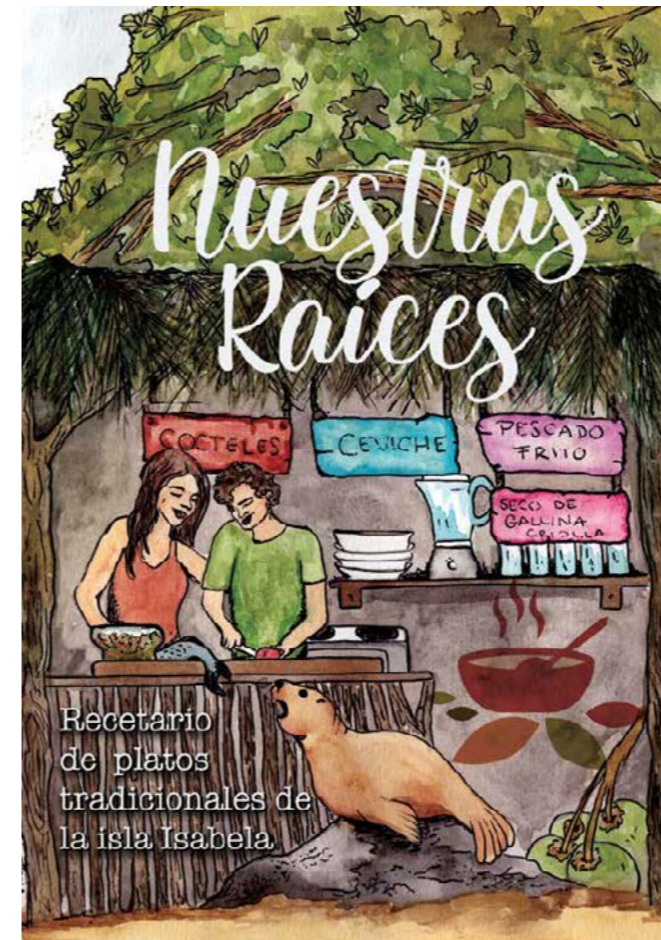
In 2021, approximately 30 activities took place including surfing, kayaking, and freediving. Students learned about various marine issues such as microplastics and heard from several CDF scientists, who presented their work.

This year, the Shark Ambassadors were invited to participate in the #BeachCleanUpDay organized by the European Union. The experience allowed them to teach EU ambassadors and environmental authorities of Ecuador how to collect microplastics at Tortuga Bay in Santa Cruz.

**30** activities took place including surfing, kayaking, and freediving



© Rashid Cruz, CDF.



In March, we finalized the installation of the third and final fog catcher of the "Harvesting Water" Project. This project seeks to increase water collection in the upper part of the island through the installation of fog catcher systems of 80m2, to provide a secure and clean fresh water supply and contribute to the sustainability of agricultural activities on the island.

We officially launched the first recipe book entitled "Our Roots" on Isabela island. In this book, 12 typical dishes of the island were presented (four starters, four main courses and four desserts). The book was written by Isabela high

## ISABELA ACTIVITIES REPORT 2021

In 2021 on Isabela Island we completed the third version of the environmental education project "Sustainable Community" whose purpose is to raise awareness and empower participants to become environmental leaders on the islands. Due to the restrictions of the pandemic, this project went from a face-to-face modality to a virtual one. A total of 38 classes were held over 7 months and 44 students from the first and second baccalaureate of science of the Stella Maris Fiscomisional Educational Center participated. In addition, virtual courses and experiential outings related to our projects of sea turtles, land turtles, bird watching, mangrove ecosystems, sharks and ecological restoration were carried out, with more than 100 students from the community participating. We gave more than 25 scientific talks to park rangers, ABG, MAG, tour guides, students and other inhabitants of the island.

**44** students took part in our Sustainable Community program in Isabela

school students with the support of their mothers and grandmothers. Each recipe describes the relationship between these dishes and the history of their families in Isabela. The purpose of this recipe book was to recognize part of the local culture through its culinary tradition and promote sustainable agriculture of the island.



Download the recipe book here





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## CDF LIBRARY, ARCHIVE & MUSEUM

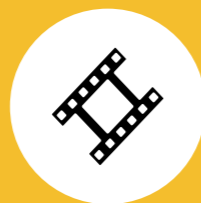
The CDF Library, Archive & Museum includes three different spaces dedicated to the management of text and audiovisual documents, archival materials, and artifacts of historical and institutional value.

Starting in 2021, we assumed a special commitment to the recovery of knowledge and memory, and to their dissemination. Throughout the year, the library curated its online catalog to offer a complete, accessible, and accurate database. **More than 3,400 records from six collections related to science in Galapagos were reviewed**, and a series of 120 descriptors were applied to them. At the same time, the digital collection is being evaluated and some 1,200 new electronic documents have been added to the inventory. Finally, the "Galapagos Bibliography" (published in 2005) is being updated, a process that also allows for the recovery of currently lost material.



# 3,400

records curated from 6 collections related to science in Galapagos



# 17,000

unique slides and 500 photographs and negatives were scanned

In 2021, **17,000 unique slides and 500 photographs and negatives were scanned and we began analyzing the manuscripts collection.**

The museum recovered archaeological artifacts taken from Galapagos in 2005. CDF now curates two collections (about 250 pieces) and continues searching for and adding materials of historical, academic, and social interest.

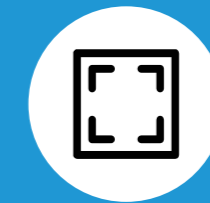
In December 2021, we inaugurated *Galapagueana*, a digital archive where the memory and knowledge of CDF and Galapagos meet to create a dense and rich tapestry. The platform emphasizes the value of the archipelago's cultural heritage and offers the best of the area's collections. *Galapagueana* has its physical counterpart in an exhibition on Galapagos' history and memory, located in the CDRS Exhibition Hall.

VIEW MORE



Visit Galapagueana

Galapagos Diary, Rosamond Georgina Lloyd Taylor, 1938-1939



# 837 m<sup>2</sup>

is the total area of the Inspiration Complex



## THE *Inspiration* COMPLEX

In November 2021, we inaugurated the new Marine Research Center of the Charles Darwin Foundation, and celebrated the culmination of one of our most ambitious infrastructure projects in the last few decades. The design and construction of the Inspiration Complex took nearly five years and is a reality thanks to inter-institutional support, CDF staff, and the great heart and generosity of one of CDF's major donors, the COMON Foundation from the Netherlands. The design and architectural direction of this Marine Research Center was led by Fabian Salame, a Galapagos architect with more than 16 years experience.

This is a milestone in the history of scientific research in the Galapagos Islands, as these new buildings will be a **place of inspiration for researchers and visitors alike, while also facilitating scientific work of international relevance.**

The Inspiration Complex is a state-of-the-art marine science hub **with offices, conference rooms, quarantine facilities, laboratories, and secure housing for equipment**, as well as visitors facilities. In its inaugural year, we held various prominent events, including the international symposium Galapagos-Israel.

The Inspiration Complex also serves as an educational space for the children and youth of Galapagos. In our laboratories, our scientists and educators welcome groups from local schools who want to learn more about the Galapagos marine world through interactive and hands-on learning experiences.

WATCH VIDEO





# AUDITED FINANCIAL REPORT 2021

	2021	2020
<b>INCOME</b>		
Applied restricted income	3,263,295	3,309,399
Unrestricted pledged income	2,321,992	2,082,685
Unrestricted other income	203,005	112,113
Institutional promotions	208,614	110,988
Other income	111,167	98,753
<b>TOTAL</b>	<b>6,108,073</b>	<b>5,713,938</b>
<b>EXPENDITURE</b>		
Science, conservation and education*	3,771,232	3,765,213
Fundraising	430,948	402,468
Other expenditure	1,883,231	1,425,123
Extraordinary	-	55,000
<b>TOTAL</b>	<b>6,085,411</b>	<b>5,647,804</b>
<b>*Science, conservation and education</b>		
Cost of scientific projects	2,623,963	1,768,128
Cost of other projects	639,332	1,541,271
Services to scientists	159,702	156,733
Laboratory and collections	348,235	299,081
<b>TOTAL</b>	<b>3,771,232</b>	<b>3,765,213</b>

## STATEMENT OF FINANCIAL POSITION

ASSETS	2021	2020
Cash/cash equivalents	2,389,078	2,277,942
Other current assets	263,474	489,516
Non-current assets	3,419,299	1,136,140
<b>TOTAL</b>	<b>6,071,851</b>	<b>3,903,598</b>
<b>LIABILITIES AND EQUITY</b>		
Deferred income	1,727,731	887,221
Other current liabilities	1,654,303	1,535,434
Employee benefits	734,855	580,602
Equity	1,954,962	900,341
<b>TOTAL</b>	<b>6,071,851</b>	<b>3,903,598</b>



©Juan Manuel García, CDF.



**120**  
CDF staff



**28**  
visiting scientists



**52**  
volunteers

## OUR TEAM

### CDF Staff

The Charles Darwin Foundation team is composed of 120 individuals, most of whom are based at our operative branch in Galapagos, the Charles Darwin Research Station. Our research is possible thanks to the hard work of accounting, maintenance, operations and logistics, human resources, IT, fundraising, communications and other administrative teams who do all the 'behind the scenes' work, and share the strong passion that fuels our efforts to ensure that the Galapagos Islands remain well-managed and sustainable in the future.

### Collaborating and Visiting Scientists

The science we are developing in Galapagos is a collaborative effort between scientists and institutions from all over the world. For more than six decades, many collaborating, associate, and visiting scientists have relied on the Charles Darwin Research Station and in 2021, we hosted 28 visiting scientists, from 9 countries and 15 universities and research institutes. Their studies focused on climate change, the ecology of terrestrial and marine species, tourism, and invasive species among others.

### Volunteers and Scholarship Grantees

Our volunteers are a vital part of our family. In 2021, we trained 52 volunteers, who donated their time and energy in pursuit of a common goal. Additionally, in 2021 we awarded three local scholarships, bringing the total number of scholarships this year to nine. We are happy to be able to offer local student scholarships every year to help community members pursue their university education.



Visiting scientists from the University of Bielefeld, Germany. Their project is a long-term study of the sea lion (*Zalophus wollebaeki*) population and health status on Isote Camaño. © Juan Manuel García, CDF.



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You can have an impact on the conservation of Galapagos, the world's living laboratory, by making a donation today to the Charles Darwin Foundation for the Galapagos Islands.

You can make a tax-deductible donation by visiting our website: [www.darwinfoundation.org](http://www.darwinfoundation.org)

We also receive donations via check, bank and stock transfers. If you want to donate using one of these methods or if you would like to make a bequest to the Charles Darwin Foundation, please contact our fundraising team at [fundraising@fcdarwin.org.ec](mailto:fundraising@fcdarwin.org.ec) or visit [www.friendsofcdf.org](http://www.friendsofcdf.org)

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You can support our research and conservation efforts by sponsoring one of the five species we work with, Galapagos Giant Tortoise, Little Vermilion Flycatcher, Green Sea Turtle, Scalloped Hammerhead Shark, and Galapagos Penguin.

Your donations directly support these projects.



DONATE NOW



SPONSOR A SPECIES NOW



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We would like to thank the Galapagos National Park Directorate for their collaboration and partnership in carrying out all of our projects.

The 2021 achievements highlighted in this report are possible thanks to the generosity of our donors, and the support of the Ministry of Environment of Ecuador, the Galapagos Biosecurity Agency, the Ministry of Foreign Affairs of Ecuador, the Governing Council of Galapagos, and other institutions.

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