

**SPOTLIGHT ON...**

# The Galápagos Islands

There are only two places on the planet where giant tortoises roam wild



## Back from the brink

After decades battling environmental crises that threaten to rob the Galápagos Islands of their unique biodiversity, the restoration of giant tortoises is a success story worth celebrating. But more conservation challenges still await the iconic archipelago

by Chris Fitch

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**THE GALÁPAGOS ISLANDS**



- **Geographical Location:** Pacific Ocean
- **Latitude/Longitude:** 0°37'09"S, 90°21'29"W
- **Population:** 25,124 (2010)
- **Ethnicity breakdown:** 81% Mestizo, 7.5% Native Indian, 7.3% Caucasian, 4.2% African-Ecuadorian(2010)
- **Land area:** 3,093 sq miles (8,010 sq km)
- **Ocean area:** 23,000 sq miles (59,500 sq km)
- **Number of islands:** 127 (including 19 large, four inhabited)
- **Language:** Spanish
- **Currency:** US dollar

**A** cloud of dust blooms as I hit the brakes, my bike skidding to a stop. Suddenly, the world is quiet. Holding my breath, I watch as Tamara tiptoes silently down the dirt path ahead. As I flick my camera alive, she silently gestures towards the nearest of some dome-shaped rocks scattered along the path. The dappled morning light makes it difficult to distinguish head from toe, shadow from shell, but as she turns back to me, eyebrows raised, the significance of this moment begins to sink in. ‘Tortoises,’ she whispers eagerly, unable to keep the excitement out of her voice.

It’s almost impossible to think about the Galápagos Islands without a giant land tortoise slowly lumbering into your mind’s eye. The islands are even named after the iconic animals; a *galápagos* being an old style of Spanish saddle which early sailors found comparable to the distinctive shell shapes of the tortoises. Here you’ll find one of only two populations of giant tortoises in the world (the others are more than 10,000 miles away, on the Seychelles’ Aldabra Atoll). While the Galápagos tortoises are divided into two main types – saddlebacks, whose arched shells allow them to reach up high to eat, and domed, whose more restricted shells were designed for foraging on the ground for food – there have been

**► WILDLIFE**

■ Aside from the Galápagos’ most famous residents – the giant tortoises – the islands are also home to the world’s only marine iguanas. They can be primarily seen lazing around in the sun sneezing excess salt everywhere, or occasionally diving into the water – they are excellent swimmers – in search of a meal, nibbling marine algae off submerged rocks. The islands are also home to land iguanas, including a bright pink species classified for the first time in 2009, after being located in a remote part of Wolf Volcano. Sharing the rocky coastlines with the marine iguanas are Galápagos penguins, the only penguin that lives at or near the equator. The roughly 2,000-strong bird population is mainly located in the colder, nutrient-rich waters of Fernandina and Isabela, and this small population size and restricted range means they are graded as ‘endangered’ by the IUCN. Further out to sea, the islands are also a hub of utmost importance for over 2,900 marine species, including sea lions and turtles. To the far north, the remote uninhabited Wolf and Darwin islands witness vast gatherings of hammerheads and even whale sharks, whose presence helped establish the Galápagos Marine Reserve in 1986, now – at 133,000 square km – one of the largest such reserves in the world.



Galápagos is the only place on earth where marine iguanas are found in the wild

15 different recorded subspecies, all restricted to their own particular environmental niches by open water and restrictive terrain.

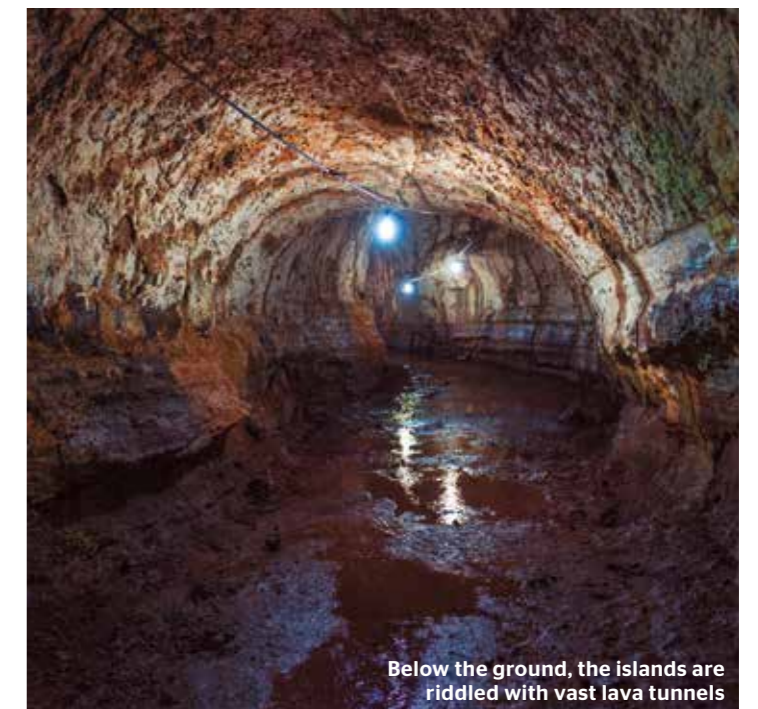
**DARWIN’S LEGACY**

It hardly needs stating that the Galápagos are of utmost international importance in terms of biodiversity, with some of the highest levels of endemism anywhere on the planet. Of the 1,073 World Heritage Sites currently listed by UNESCO, the very first to be classified, back in 1978, was the Galápagos Islands. ‘A unique “living museum and showcase of evolution”,’ is UNESCO’s loving description of the islands, labelling them ‘a “melting pot” of marine species.’ Hence, 97 per cent of the total land surface of the islands, more than 7,600 sq km, was designated as the Galápagos National Park in 1959 (leaving just 237 sq km for the roughly 30,000 residents).

But the islands weren’t always seen for this scientific importance. Initially, they were well-known primarily for their rugged and abrasive image. Even the man who famously changed the hostile reputation of the Galápagos, simultaneously going on to revolutionise not just biological science, but much of the modern world, wasn’t entirely enamoured with their aesthetics.



Santa Cruz is the most populated of the islands, and a tourism focal point



Below the ground, the islands are riddled with vast lava tunnels

‘Nothing could be less inviting than the first appearance,’ wrote Charles Darwin in *The Voyage of the Beagle*, recalling the Galápagos leg of his famous journey around the world.

After a couple of hours flying over the Pacific Ocean, I have to concur with the great naturalist. Dark, rust-coloured rocky outcrops began emerging over the

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horizon, their mildly undulating terrain, punctuated by remnants of past volcanic activity, are visibly home to only a few dry shrubs and cacti (being in the Pacific 'dry belt', the islands have year-round high temperatures, with very low rainfall). Stepping off the plane at tiny Baltra airport, the surrounding landscape appears barren, with no shade to escape the brutal equatorial sun. As first impressions go, it presents a vision of a tough, unforgiving corner of the world.

Despite the plethora of images of the bearded and distinguished face of an elderly Darwin which are plastered on the tea towels and fridge magnets for sale at the airport gift shop, he was, in fact, a fresh-faced 26-year-old when he visited the Galápagos, spending five weeks exploring the islands in September and October 1835. And while Darwin certainly gave over plenty of his time during the visit to documenting the unique wildlife, including seriously testing the resolve of marine iguanas ('I threw one several times as far as I could, into a deep pool left by the retiring tide; but it invariably returned in a direct line to the spot where I stood'), it was the tortoises which appeared to most grab his attention. 'I frequently got on their backs, and then giving a few raps of their shells, they would rise up and walk away,' he wrote, 'but I found it very difficult to keep my balance'.

Prior to the arrival of humans, it is estimated that the Galápagos was home to roughly 250,000 giant tortoises. From the 1500s onwards, passing whalers, pirates and buccaners began stopping by during their sea voyages, having discovered that the animals had the unfortunate survival 'tactic' of being able to stay alive while upside down, without food or water, for up to a year. Grabbing a few tortoises on the way past would therefore provide a constant source of fresh meat throughout a long journey. Even the young Darwin himself indulged in this unique Galápagos gastronomy during his stay, noting that 'the breast-plate roasted... with the flesh on it, is very good; and the young tortoises make excellent soup'. Between 100,000 and 200,000 tortoises were wiped out by hungry whalers and early settlers.

In recent decades, there has been one tortoise who

**▶ TIMELINE**

- **1535** Discovered by Spanish
- **1832** Annexed by Ecuador
- **1835** Visited by a young Charles Darwin
- **1859** Darwin publishes his theory of evolution by natural selection, based on observation in Galápagos
- **1941** Used as a base by the US military for the duration of WWII
- **1959** Official creation of the Galápagos National Park
- **1978** Designated the world's first UNESCO World Heritage Site
- **1986** Creation of the Galápagos marine reserve
- **2012** Death of Lonesome George



On many Galápagos islands, tortoise populations have recovered dramatically

rose above the rest to become almost as much of a Galápagos Islands celebrity as Charles Darwin himself. This individual was the last remaining Isla Pinta tortoise, a subspecies thought to have long since gone extinct. In a mind-bending exercise in contemplating true loneliness, it is believed that he was spotted in 1906, when researchers from the California Academy of Sciences arrived on Isla Pinta to remove three fellow tortoises, but since he was in too difficult a location for them to reach, they left him behind.

This exile only came to an end in 1971, when a Hungarian biologist named Dr Joseph Vagvolgyi arrived to study snails, and later casually mentioned to friends that he had seen a tortoise on Isla Pinta. Experts rushed to the island and found the animal in question. He may well have wandered the island alone for 65 years, hence his name – Lonesome George. Studied intensely over the following four decades, with never-ending attempts to get him to mate with females from other islands, George eventually passed away in 2012, at over 100-years-old, and without any surviving descendants, making him the last ever Pinta tortoise.

**SPY IN THE CAMP**

It was with all this in mind that I find myself excitedly gawping at the sight of three... no, four... no, five wild Sierra Negra giant tortoises nonchalantly dozing in the morning sun during a bike ride on Isabela, the largest of the islands. Each measures two-to-three foot from head to tail, with scaly, ungainly feet poking out from

underneath their thick shells. As Tamara Campaña, resident Galápagos National Park guide, explains in a hushed whisper, the obviously bumpy shells of these animals clearly indicate them to still be in the fresh flush of youth, probably only around 20- or 30-years-old, perhaps not even yet at sexual maturity (without the

**▶ DEMOGRAPHICS**

■ In 1941, the Galápagos' human population consisted of just 810 people. The number of residents sky-rocketed during the 20th century, reaching 18,640 by 2001, and 25,124 by 2010. Population pressure meant that the islands were added to UNESCO's 'in danger' list in 2007, promoting then-Ecuadorian President Rafael Correa to make reforms to the country's 'Special Law for the Galápagos', essentially creating a separate citizenship for Galápagos residents. Its purpose was to act as a control on the number of mainlanders moving to what has become the richest province of the country (thanks to tourism) and threatening the sustainability of the biodiversity which made it such a profitable international tourist destination. Only authorised Galápagos residents are now allowed to work on the islands. Recognising these efforts, UNESCO subsequently reversed their decision in 2010.

predatory interference of humans, tortoises are capable of living to 150-years-old and more). The distinctive rings on their shells will gradually fade away over time, leaving elder tortoises with far smoother shells.

The ancestors of these individuals were the lucky ones. Historically, Sierra Negra tortoises were the most populous of all subspecies, in theory a significant survival buffer when humans began feasting upon them and their shelled cousins across the archipelago. 'When people were colonising Isabela, the closest place to get giant tortoises was the highlands,' explains Tamara. Specifically, this meant the Sierra Negra volcano itself (at 10km across, the second largest caldera in the world). From once being as populous as 70,000, numbers collapsed to between 100 and 200 by the 1950s. It took the end of piracy and the establishment of the National Park to finally stabilise the population and begin their painfully slow recovery.

Even this wasn't the saving grace for Isabela's tortoises. A mortal threat persisted in the unlikely form

**▶ PHYSICAL GEOGRAPHY**

■ The islands famously occur at the meeting point for three major tectonic plates, the Nazca, Cocos and Pacific. Tectonic activity is ongoing among the youngest, most western islands, such as Fernandina and Isabela, which are less than a million-years-old. Further east, where continental drift has carried them away from the volcanic hotspots which cause the islands to emerge from the sea in the first place, the oldest islands, such as Española and San Cristóbal, are between three and five million-years-old, and are still only just beginning the long process of erosion.

Each of the major islands consists primarily of one main cone-shaped volcano, with the exception of Isabela which is formed of six that have since merged together. Many of the islands have enormous underground tunnels formed by the cooling outer crusts of lava, with fast-flowing liquid inside. These were often used as habitats by native species for years, with the skeletons of extinct animals such as giant rats found inside.



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of feral goats. These animals, introduced to the islands in the 1800s, had come to number more than 100,000. Devouring native vegetation, they were wiping the landscape clear of the essential plant-life upon which tortoises were reliant for both food and shade.

So dire was the situation, the Galápagos National Park took the drastic step of launching 'Project Isabela' in 1997, hiring helicopters to fly across the island, shooting dead any goats they found. They even recruited so-called 'Judas goats', who would be fitted with radio collars and set free to try and find others. Once a new group was located, they would all be shot, except the tagged goat, who was again set free to try and find another group, and so on. By the time the project was wrapped up in 2006, the only goats remaining on the island were a few hundred tagged Judas goats.

The Sierra Negra tortoise population has now recovered to around 1,000 individuals, still critically endangered but, as Tamara remarks, nothing like as bad. Returning to our bikes, we cautiously wheel around these peculiar creatures, being careful not to invade their personal space.

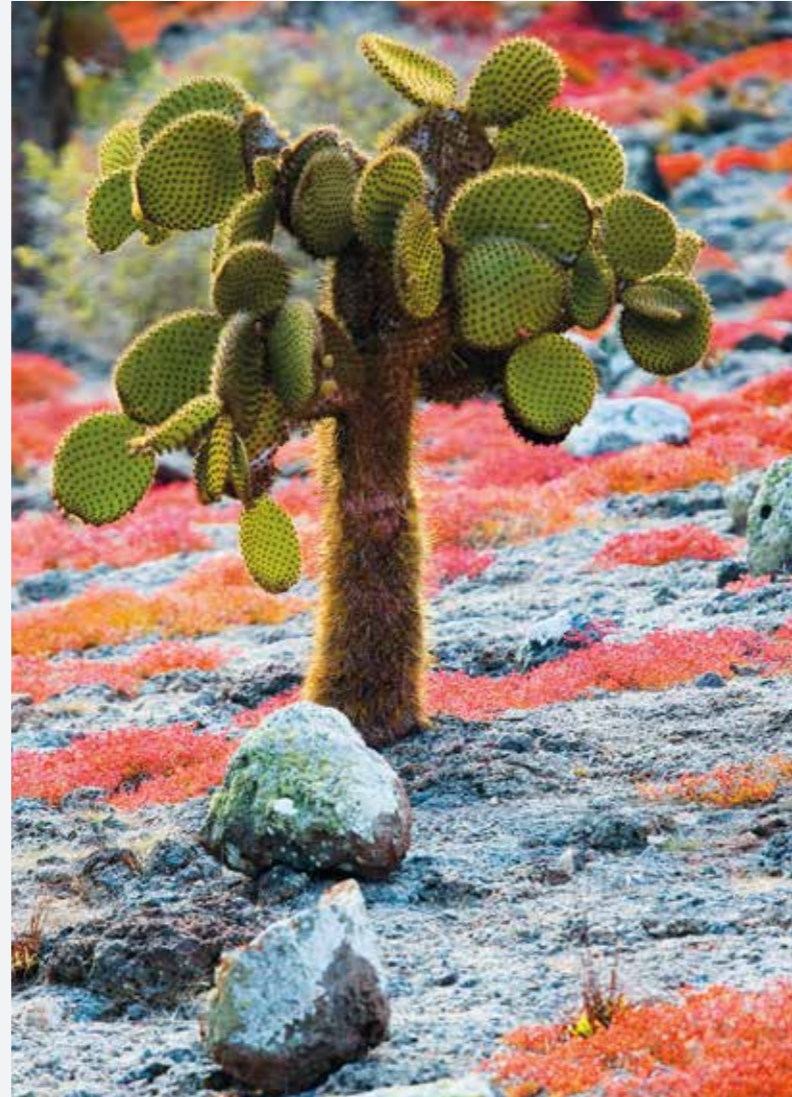
### GO, DIEGO, GO

Isabela is also home to the Arnold Tupiza Chamaidan Giant Tortoise Breeding Centre, a place which can claim some credit for rescuing, among others, the Sierra Negra tortoise. Opened in 1995, it is now home to a number of breeding adults, whose 250 or so annual hatchlings are helping repopulate the islands by being returned to their respective territories once they reach eight-years-old. A colour-coded map by the pens informs us which part of the island each population originally belongs to, and therefore where their offspring should be returned.

Around the corner, an excited crowd is leaning over to peer into a pen filled with baby tortoises enthusiastically working their way through a stalks-and-leaves lunch. These youngsters – each of which would fit comfortably on the head of a tennis racquet – are still highly vulnerable to another threatening invader, the rat. Likely transported here by accident by those same sailors who so developed a taste for tortoise meat, these rodents remain the largest threat across the islands. 'Once they are over three-years-old, all the babies live outside,' explains Tamara. 'Before that time, they are living in special enclosures because the rats can come in and eat the babies.'

It was the rescuing of tortoise eggs in 1965 from tiny Pinzón island, where rats were about to wipe the subspecies out entirely, that first instigated large-scale Galápagos giant tortoise restorations as we see them today. For example, half a century ago the Española island giant tortoise was another subspecies flirting with extinction, thanks, again, to the efforts of whalers and goats. By 1960 there were just 14 tortoises left on Española, 12 females and two males. Enter a saviour, nicknamed 'Super Diego' brought over from San Diego Zoo in 1975. Diego has become probably the islands' most famous tortoise after Lonesome George, and could be credited with almost single-handedly rescuing his subspecies, having since fathered more than 800 offspring. More than 2,000 giant tortoises have now been repatriated to Española, and the population is

### ► FLORA



■ The islands are home to between 552 and 614 known native plant species, more than 30 per cent of which are endemic. The flora of the Galápagos is predominately desert vegetation, given how only the humid highlands generally receive enough rainfall to sustain lush green plant life. The more common dry areas of the islands are frequently populated by shrubs and cacti, plants which are well-adapted to drought-like conditions, only flowering during rare periods of high rainfall. By the coasts, mangroves play a very important role in the local ecosystem, providing breeding sites for birds such as pelicans and frigate birds, as well as a shady refuge for marine wildlife.

Across the Galápagos, there are hundreds of threats posed by invasive plant species. There are at least 866 recognised introduced species now settled in the wild, the majority brought deliberately by humans. One of the most urgent threats is quinine, a tall, rapidly-growing evergreen tree introduced in the 1940s which has spread across Santa Cruz, significantly altering the ecological composition of the vegetation and making survival more difficult for native species. Similarly, the spiny Asian blackberry shrub, introduced in the 1970s, has been observed invading wetter parts of the archipelago and forming impenetrable thick forests, negatively affecting the seed germination of native species.

Despite the efforts of conservationists, Lonesome George died without any live offspring



reportedly self-sustaining. 'I would say the Española species is the most successful breeding programme in the Galápagos,' enthuses Tamara. 'We are not sure about the genetic problems they could have because brothers and sisters will probably mate. But we need to wait at least 50 years to see that.'

### BACK FROM THE DEAD

Across clear, jade-coloured waters and golden bays, I find myself en route for the central island of Santa Cruz, a short flight over from Isabela. Tortoise breeding facilities can now be found across the archipelago's four inhabited islands, and, being where most of the Galápagos' human population lives, Santa Cruz is the centre of most of this conservation work.

Driving across Santa Cruz, a mist hangs over the central highlands, where thousands of tortoises now live wild across the island's highland farms, sharing the grassy enclosures with domestic cattle. In Puerto Ayora – the most populous town on the archipelago – sits the beachside resort of Finch Bay, and, a short walk along the coast, the Charles Darwin Research Station. Here, as well as the stuffed body of poor Lonesome George, young tortoises from across the whole archipelago can be observed, researchers watching them grow through every stage of their young lives. A prominent whiteboard outlines the 5,000-plus tortoises that have been repatriated to each island from this centre since 1970, including 1,825 to Española and 1,007 to Pinzón.

It also shows many tortoises being relocated to nearby Santa Fe. This small, uninhabited island, a shadowy entity visible on the horizon from Finch Bay, is another with a turbulent history. 'In the beginning, they thought there were no tortoises at all there,' explains Monica Reck as we race across the waves on a Finch Bay day excursion yacht towards the distant isle. Reck, a Santa-Cruz-based Galápagos National

Park guide, explains how the relatively recent discovery of bone and skull fractures on the island was the first evidence that, as with the other islands, there was once a healthy Santa Fe tortoise population, likely becoming completely extinct in the mid 1800s. Nevertheless, the drive to return tortoises to Santa Fe has been a strong one, and between 2015 and 2017, 400 juvenile Española tortoises – believed to be the nearest surviving match to the Santa Fe tortoise – were released on the island, as an ecological replacement for their lost Santa Fe cousins. For the first time in 200 years, Santa Fe had become home to wild giant tortoises.

Floreana is another island with a remarkable story attached, one which also starts with the decimation of its tortoises by humans, and the subsequent declaration of their extinction. However, in the north of Isabela, almost bang on the equator, lies Wolf Volcano, the largest in the entire Galápagos. While this part of the island has its own native tortoise population, it also happens to have been the dumping ground for tortoises over the centuries when sailors decided they'd had enough tortoise meat. The animals were pushed overboard and required to swim back to the island.

When they made it, they would have interbred with other tortoises from all over the islands. Hence, while the Floreana tortoise was indeed wiped out on Floreana, its genes may well have lived on around Wolf Volcano. Sure enough, late last year it was announced that individuals had been located that were genetically close enough to the original Floreana tortoise that it could essentially be declared un-extinct. Repopulating the island in the same manner as Española, but from an even more dire situation, could yet be the Galápagos' most unbelievable conservation comeback story.

In many ways, the internationally famous story of Lonesome George, and the failure to get him to produce live offspring, warps the reality of

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conservation in the Galápagos. Giant tortoises were once in serious trouble, but there is no doubt that their restoration over the past half century has been a genuine conservation success. Across the Galápagos, there are now an impressive 50,000 giant tortoises, with the restoration of many populations meticulously planned and executed. It might even be time to end some of the large-scale breeding programmes, with facilities focusing only on a few vulnerable subspecies. 'We have recovered most of the populations in the Galápagos,' explains Tamara. 'We need to keep a balance. If you release thousands of giant tortoises in an ecosystem, they will eat everything, and then the vegetation will have problems.'

Scalesia Lodge, a modern resort built within the forested slopes of Isabela, has just adopted 12 juvenile giant tortoises into a special on-site enclosure. 'It's a big responsibility, because you have to take care of them,' insists Felipe de la Torre, general manager of Scalesia Lodge. 'You have to build the area where you're going to have them according to their regulations. It's quite expensive to feed them, because of the costs of getting transportation up to where they get the *otoy* [the staple food of tortoises, also known as arrow leaf elephant's ear]. If tortoise numbers continue to grow as they are, breeding centres might well need facilities such as Scalesia Lodge to take responsibility for the care of more and more individuals.'

Despite all this success, it is important to remember that it's taken half a century of intense funding and arduous science just to get to a point where most giant tortoises are safe from the immediate threat of extinction. 'On some islands, the repatriation program may indeed end within ten years or so,' acknowledges Linda Cayot, science advisor at the Galápagos Conservancy. 'However, other populations will require this work for up to 30 to 50 years.'

She highlights the recent updating of the IUCN Red List, which still categorises the various surviving giant tortoises subspecies as ranging between, at best, 'vulnerable', and at worst 'critically endangered'. 'One of the major reasons for this is the difference between historical and current day populations,' she explains. 'So we still have a long way to go.'

#### ONGOING RISKS

Biodiversity in the Galápagos is still extremely precarious. There are no shortages of crises affecting the unique ecosystems of the islands, from the warming sea waters and lack of habitat which is driving the decline of the Galápagos penguin, to the lack of food which is starving the blue-footed booby, to the seemingly unstoppable spread of the giant African land snail, considered by experts to be one of the most destructive snail species in the world.

Perhaps most at risk though are one of Darwin's other iconic animals, the finches whose beaks helped him devise his ground-breaking study of evolution ('one might really fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends', he noted during his visit). On the face of it the birds appear fine, whizzing around and picking up scraps, seemingly as plentiful as pigeons. However, these and other land birds have

become increasingly afflicted by the presence of *Philornis downsi*, an invasive parasitic fly which makes itself at home in their nests. Upon hatching, the larvae feed on the blood of the chicks, causing fatality rates close to 100 per cent. Population numbers of land birds continue to decline, and some species, such as the mangrove finch, are already on the brink of extinction.

There is one case study which dares bring hope to the hearts and minds of conservationists battling such problems: the Australian ladybug. These insects were intentionally introduced in 1999 to control the spread of the cottony cushion scale, an invasive insect which threatened over 90 plant species. Twenty years of research suggests that it has been successful. 'They had to do so many [post-introduction] studies to ensure



this wouldn't hurt anything else, because we were introducing an animal on purpose,' recalls Monica. 'It is controlled, and the ladybugs are not bothering anything else.' Now, the ladybugs prey exclusively on the scale, keeping a lid on their population.

As yet there has been no obvious predator that could solve the looming finch crisis, or to the multitude of other environmental issues which undoubtedly keep Galápagos conservationists awake at night. But there remains hope that the interest, strict regulations, funding and, perhaps most importantly – optimism – generated by the slow restoration of the iconic Galápagos giant tortoise might yet pave the way to ensure the islands remain a unique biodiversity hotspot for generations to come. ●

#### ▶ LINKS

- [Latin Routes - latinroutes.co.uk](http://latinroutes.co.uk)
- [Metropolitan Touring - metropolitan-touring.com](http://metropolitan-touring.com)
- [Finch Bay Galápagos Hotel - finchbayhotel.com](http://finchbayhotel.com)