

Galapagos *news*

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BIODIVERSITY ISSUE



Compared with many other places in the world, Galapagos does not boast a great abundance of species. There are several intertwined reasons for this: until the arrival of humans, relatively few species and only certain types have been able to find their way to these remote shores; the Islands are also just a few million years old, so there has not been much time for this process of colonisation to take place; and then, only certain species have been able to survive and reproduce in this frequently hostile environment. But those species that did reach Galapagos have thrived,

often giving rise to new species in the seclusion provided by each volcano and island. This origin of new species is what makes Galapagos particularly special, with a very high incidence of endemism – species found nowhere else on earth. The images on the cover were taken by GCT staff and volunteers over several years, with a few thrown in from photographic enthusiasts Santiago Bejarano and Alex Hearn. Thanks to all for allowing us to showcase these photographs, which capture the remarkable and frequently peculiar biodiversity of Galapagos.

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Biodiversity 2010

This year is the International Year of Biodiversity. At the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 – more commonly known as the Rio “Earth Summit” – signatures began to dry on what’s now known as the Convention on Biological Diversity (CBD), a global agreement that aimed to promote the conservation of biological diversity. A decade later, in 2002, the CBD announced its commitment “to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth.”



Though it is spectacularly hard to assess biodiversity, most experts concede that we have not met this “2010 Biodiversity Target”. So 2010 is now being used to refocus minds on the importance of biodiversity conservation and to put in place some more concrete and measurable targets for years to come.

Being an isolated group of volcanic islands, Galapagos is a pretty barren place, far less species-rich than a rainforest, for example. But that same isolation has meant that many of the species that do call Galapagos home have set out on their own evolutionary journey and are to be found nowhere else on earth. There are many things that make Galapagos worth preserving and this opportunity to see evolution in action is certainly one of them. This issue of *Galapagos News* aims to celebrate Galapagos’ intriguing biodiversity and address some of the conservation challenges that lie ahead.

The pressure from both the resident and tourist population is particularly pressing. Yet in the last few decades, conservation biologists have come to appreciate that where humans and wild nature coexist – as in Galapagos – the conservation vision most likely to succeed is one that understands and works with the needs and ambitions of the local human population. This is incredibly hard to achieve and there are very few examples where it has been successful. On page 6, Mark Gardener, Director of Terrestrial Sciences at the Charles Darwin Foundation (CDF), has written an introduction to three striking features in this issue, each homing in on a different inhabited island in Galapagos. He stresses the importance that CDF places on humans in its increasingly holistic approach to conservation.

Gardener goes on, on pages 6-8, to look at San Cristobal, an island now altered beyond recognition where opportunities for serious restoration will be extraordinarily hard. On pages 8-10, CDF’s Director of Technical Assistance Felipe Cruz presents the exciting case for the restoration of Floreana, one of CDF’s three flagship initiatives for 2010. And on pages 10-12, James P Gibbs, an ecologist at the State University of New York and a long-time supporter of Galapagos conservation, inspects Isabela, where the benefits of a whole-island approach to conservation are most evident. The humans that live on and visit each of these islands pose different threats towards a different suite of biodiversity and different opportunities for conservation action.

In Global Galapagos on page 13, Jacqueline Grekin and Oliver Hillel from the Secretariat of the CBD take a tour of the world’s island biodiversity hotspots before homing in on Galapagos. The Archipelago’s wealth of experience “can serve as a global reference” for other islands striving to conserve their biodiversity, they conclude.

As always, you can catch up on the latest Galapagos-related news (pp. 4-5), read about several new books (p. 14) and find out what your Friends of Galapagos Organisation has been up to (p. 15). Finally, on page 16, there is an interview with local high-school student and artist Mason Cameron.

A handwritten signature in black ink, which appears to read "Henry Nicholls".

Henry Nicholls
Editor

NEWS

from Galapagos



© CDF

Marine alarm

One in five of the marine species listed as threatened in Galapagos may already be extinct, warn researchers. The International Union for the Conservation of Nature (IUCN) currently recognises 43 marine species at risk of extinction in Galapagos. It may be too late to save the endemic Galapagos Stringweed and several species of algae on this Red List, report scientists in *Global Change Biology*. Several factors are likely to have played a part in the declining abundance of these species. "The unpredictable mix of El Niño, increased human presence and global climate change is a recipe for the breakdown of natural ecological functions with serious impact on the recovery potential of species and habitats," says Stuart Banks of the Charles Darwin Foundation (CDF) and an author of the study.

For his colleague Scott Henderson, Conservation International's Regional Marine Conservation Director in the Eastern

Tropical Pacific, their findings offer a wake-up call. "It is time we recognise that the Ocean has limits just as the rainforests of the Amazon, the rivers of Europe, the ice sheets of the Arctic and the grasslands of the Great Plains," he says. "For seas to thrive we need increased efforts to slow climate change, more, bigger and better managed marine protected areas (MPAs) and better managed fishing activities outside MPAs."

In spite of these alarming trends, there is cause for some optimism, says Graham Edgar, CDF's former Head of Marine Science and Conservation and the lead author of this study. "For a marine biologist, Galapagos is the most remarkable location on the planet. It is the only place worldwide with a coexisting mix of tropical species such as corals and hammerhead sharks and cool-water species such as fur seals, kelps and penguins," he says. "There is still much hope for the future for this global aquatic treasure through innovative efforts in participative

management by the Galapagos National Park Service (GNP) and through learning from the findings of collaborative studies by local and international marine scientists."

Floreana Tortoises

Scientists have identified nine tortoises currently held in captivity that appear to have Floreana ancestry along with ancestry from other island tortoises. The Floreana Tortoise is assumed to have disappeared in around 1850. The nine individuals – six females and three males – are currently housed at the Charles Darwin Research Station on Santa Cruz, report geneticists in the scientific journal *PLoS One*. These nine animals, together with others with possible Floreana ancestry on Isabela, could be used in a breeding programme to generate suitable tortoises to introduce back to Floreana.

Brighter Boobies

Male Blue-footed Boobies that take a year out from breeding turn up the following year with brighter feet, which may make them more attractive to females. A study carried out on a colony of boobies in Mexico over the course of two successive breeding seasons shows that foot colour in boobies fades with age and breeding effort, but a male can recover some of his former glory by taking time out from the annual reproductive grind. "Sabbaticals might allow boobies to recover from reproductive effort and display brighter feet," they suggest in the journal *Biology Letters*.



© Rosalind Cohen, NODC, NOAA

New itineraries

GNP will begin rolling out new itineraries for tourist vessels this year in an effort to maintain the high-quality experience that tourists expect. Monitoring activities and feedback from guides and visitors have suggested that high demand at some visitor sites was compromising the wilderness experience that is part of the Galapagos package. The 70 vessels operating multi-day tours will stick to 15-day itineraries, which will prevent them from visiting the same site twice. This is expected to halve the pressure on popular stop-offs like Bartolome and Espanola.

Finch immunity



Galapagos finches are fighting back against invasive pathogens, according to a new study. Researchers have developed a rapid means of detecting the presence of antibodies against the avian pox virus *Poxvirus avium* and the nest fly *Philornis downsi*, two recently introduced pathogens that could prove lethal to some of Galapagos' most iconic bird species. Reporting in *PLoS One*, the scientists found that Medium Ground Finches that have encountered these pathogens have elevated

levels of disease-specific antibodies. It is not yet known whether this actually improves the finches' chances of surviving an attack by these pathogens.

CDF plans

In a report delivered at a meeting in Quito at the end of January, CDF Executive Director J Gabriel Lopez looked back on 2009 and revealed plans for the organisation's forthcoming year. The focus will now be on three "emblematic" projects, he said: measuring the "human footprint" in Galapagos; the "comprehensive" restoration of Floreana (see pp. 8-10); and studying the consequences of climate change. Galapagos is an "ideal laboratory" for compiling "highly trustworthy" data on the effects of the El Nino phenomenon, noted Lopez. This shows that "it is almost certain El Nino events will be more frequent, more intense" and could have a "devastating impact on the Islands' endemic species."

Checklist launch

CDF's checklist of all known Galapagos species is soon to be launched officially on its website (www.darwinfoundation.org). This will provide the first clear, accessible database of the species known in the Archipelago, says Frank Bungartz, CDF's Theme Leader of Biodiversity Assessment. It will have many uses, providing essential background information needed to measure conservation success, as a tool for identification and as a management tool. "Intricate knowledge on sensitive and rare species distribution is an essential pre-requisite for development planning," says Bungartz.



Coastal clean-up

Fishermen are being offered alternative employment following the closure of the sea cucumber fishery in the Galapagos Marine Reserve. GNP is now paying fishermen to help clean up the waters of the Reserve. This initiative has already resulted in the collection of more than 4,000 kg of waste. Once back on land, the fishermen are recording weight, material type and size of the waste items, which are then either recycled or disposed of more appropriately.

On the move

The Galapagos Fur Seal no longer appears to be endemic to the Archipelago, after a colony has set up home around 1,500 km away off the coast of Peru. The Peruvian Geophysics Institute has reported that the sea surface temperatures just off their coastline have risen from an average of 17 °C to 23 °C in the space of just 10 years. Climate change may help account for this remarkably rapid increase, although this remains speculation. Whatever the cause, the Peruvian waters are now closer in temperature to that in Galapagos, making them better suited to the Fur Seals' lifestyle.



Correction

In the last issue of *Galapagos News* (Volume 29), it was stated incorrectly that the El Nino phenomenon may have a dramatic influence on the Nazca Booby population. According to the latest evidence, Nazca numbers appear to hold fairly steady over the course of an El Nino event.

THE BIG PICTURE

Most conservation efforts in the last 50 years in Galapagos have focused on single iconic species. Using this approach there have been many notable successes such as the recovery of Espanola Tortoises from 15 to over 2,000 individuals and the complete eradication of goats from Santiago Island. However, when focusing on single species there are often perverse effects at the ecosystem level. An example of this would be an explosion of the mouse population after competing rats have been eradicated. Most conservationists in Galapagos are now thinking more holistically and are focusing on whole ecosystem ecology and trying to understand the mechanisms that drive that system. In addition, it is essential to develop an understanding of the economic, policy and social pressures that lead to the current system degradation: without considering the human element most conservation efforts are bound to fail.

Unfortunately there is no magic wand for restoration; changes in biological and non-biological factors that occur as systems degrade may be difficult or impossible to reverse sufficiently so that systems can return to their pristine state. It is increasingly understood that the maintenance or restoration of ecosystem function should be the ultimate goal of conservation management and we suggest that this should also be the focus in Galapagos. Ecosystem function includes the plethora of interactions between biological, physical and social elements.

The examples that follow look at three islands in different states of degradation and the limitations and challenges for their restoration.

Mark Gardener, Director of Terrestrial Sciences, Charles Darwin Foundation

San Cristobal: collapse of the humid highlands



Mark Gardener ...

... is the Director of Terrestrial Sciences at the Charles Darwin Foundation.

Of all the islands in the mostly arid Archipelago of Galapagos, San Cristobal has been the most frequently visited by passing ships for the last 500 years. This is for a single reason; fresh water flows from the humid highlands to the coast. It is for this same reason that Galapagos' first permanent colony, the agricultural village of El Progreso, was established here in 1879. Today, more than 95% of the humid highlands of San Cristobal have been degraded by land clearance or invasive species. The list of invasives is long and includes blackberry, guava and rose apple, goats, donkeys, pigs, cattle, horses, rats, cats and the freshwater fish tilapia. Insect pests such as the Mediterranean fruit fly and the dengue mosquito have also affected human livelihoods and health.

One person who has seen all these changes is Alejandro Jerez, an 84-year-old retired farmer. He has worked as a salt miner on Isabela, helped the Americans build the World War II military base on Baltra, fished using only sailboats and worked a farm in the Soledad district of San Cristobal. Until the 1970s, when regular cargo boats started to come, Alejandro was completely self-sufficient for all food except rice and lentils.



Colonisation

In 1879 the infamous Manuel J Cobos established sugar cane plantations and a mill, which he made profitable by diverting water and utilising slave labour. This all came to an end with his assassination in 1904. Gradually, this agricultural land was abandoned and the mill dismantled in 1930. After the war, Cobos’ daughter-in-law set up a cattle ranch in the high grasslands, though recurring droughts made large-scale cattle production unsustainable. During the 1970s and early 1980s, ongoing colonisation brought a wave of plant invasions, which have contributed to the transformation of grassy highlands to low forest. Today most agricultural land has been abandoned and the 6,000 inhabitants live mainly in Puerto Baquerizo Moreno (right), working in the public sector or the burgeoning tourist trade.



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Electricity

The San Cristobal highlands are a wind-swept place. In 2007, three 50-metre-high wind turbines capable of generating 2.4 megawatts (MW) were installed. In 2008 they produced 10% of the Archipelago’s power requirements. They have resulted in little or no mortality of endemic seabirds that nest in the highlands. There are plans to install a further five turbines on Baltra with 3.2 MW capacity to supply Santa Cruz. If this green energy production is coupled with a campaign to limit energy use, Galapagos may well be on the way to a sustainable future.

Fruit bowl

In 2010, Galapagos has a resident population of around 30,000 and an annual tourist population of 170,000. Unfortunately, feeding all these people is far from sustainable, with more than 90% of foodstuffs imported from continental Ecuador. This is the principle mechanism for the introduction of invasive species to the Archipelago. Considering the degraded state of the highlands and since San Cristobal has a relatively good supply of freshwater, why not *intensify* agriculture to reduce the dependence on food imports? There would be challenges: invasive plants reduce farmland productivity and managing them is expensive; the cost of labour and materials is also higher than on the mainland; and locally produced food will struggle to compete with highly subsidised mainland imports.

Disappearing fast

Several species noted by Darwin in 1835 (including the Galapagos Hawk, San Cristobal Rice Rat, Marine Iguanas and San Cristobal Tortoise) are now either extinct or vulnerable as a result of land clearance and the introduction of invasive species. Others, like the Chatham Mockingbird and Vermillion Flycatcher (right), have lost a lot of habitat. Furthermore, whole ecosystems have disappeared: the once widespread and iconic *Scalesia pedunculata* forest no longer exists.



© Frank Bungartz, CDF

Hope in the arid zone

Compared to the humid highlands, the arid lowlands of San Cristobal have been relatively unaffected by colonisation. However, in the early 1990s the population of over 10,000 goats and donkeys was having a serious impact on the arid vegetation. Two very threatened species which are only found in San Cristobal, the Galapagos Rock Purslane (*Calandrinia galapagosa*, left) and the Cristobal Yellow Daisy (*Lecocarpus darwini*) needed urgent attention. A number of fences were erected between 1993 and 2005 which gave plants intermediate protection. In the last few years, the Galapagos National Park has been undertaking a goat and donkey eradication programme which will remove the long-term threat to these special plants.



© CDF

El Junco

San Cristobal's El Junco lagoon (right) is the only permanent freshwater body in Galapagos and its well-preserved sediments make it invaluable for building up a picture of what the climate was like in Galapagos' past. Using pollen, scientists have shown that during the Ice Age, between 26,000 and 13,000 years ago, Galapagos was a much drier place than it is today. Other researchers have studied the lake's microbiological, molecular and hydrogen isotopic signatures. Yet more work has focused on algae records, demonstrating that the last 50 years were the warmest on record, possibly as a result of anthropogenic global warming.



© CDF

Floreana: into the unknown



Felipe Cruz ...

... is the Director of Technical Assistance for the Charles Darwin Foundation (with additional reporting by Henry Nicholls).

Floreana is one of the oldest islands in Galapagos boasting greater biodiversity than many of the younger islands. Its relationship with humans is particularly unusual. It was the first island to be inhabited by humans, with a small colony established in the 1830s. But this and later efforts to exploit the island's natural resources ended in failure so that there were no humans on Floreana between the 1870s and the 1930s. Today, it only has one small village – Puerto Velasco Ibarra (which is where I grew up) – there is no airport and the island's total human population stands at just 120, with little immigration from the continent making a stable community.

From now until 2014, the Charles Darwin Foundation (CDF) and the Galapagos National Park (GNP) will be raising funds to invest in Project Floreana, a bold plan to inspire a new, holistic approach to island conservation, embracing the local community as the solution to the Islands' problems, not the cause. Here are some of its highlights ...

Floreana Island	
Area	173 km ²
Date of settlement	1807
Current population	120
Endemics	350
Invasives	369



INVASIVE SPECIES

With the removal of Floreana's introduced mammalian invaders, many of the highly threatened endemic plant species are now flourishing. Unfortunately so too are some of the worst weeds in the Archipelago and a team of local residents is employed full time to search for and control these species in order to contain their spread (right).

Mice, rats and cats continue to be a serious problem, particularly for Floreana's birds. In the 1980s, CDF and the GNP began to control rats in key areas around the petrel breeding colonies. This work will be continued and expanded to other areas that are of importance to wildlife and people, with eradication as a long-term goal. We also aim to remove cats from the island within the next five years.

Across the globe the spread of alien species is caused mainly by people, and working with the local community will be the key to minimising the arrival of new invasives. For example, gardening with native plants rather than introduced ornamentals, helping to improve standards of hygiene in chicken farms to reduce the spread of disease to wild birds, and implementing quarantine measures should all help contain this problem.



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REINTRODUCTIONS

Although the influx of humans has been less on Floreana than on other islands, several species have gone extinct. These include the Floreana Tortoise (see page 4) and a relative of the cucumber. Other species have been lost from the island, but luckily remain on surrounding islets. The Floreana Mockingbird, which figured strongly in Charles Darwin's thinking, disappeared from the island not long after his 1835 visit, but two small populations survive on tiny islets. As soon as we have a field team in place, we will start the preliminary work towards reintroducing some of these surviving mockingbirds to the main island. Similarly, a snake – the Galapagos Racer (left) – is today only found on these same islets and could also be returned once the restoration has been achieved.

NO-TAKE ZONE

When I was growing up in Puerto Velasco Ibarra, the waters near the port were highly productive, yielding lots of lobsters, groupers and other fish. Now the area has been heavily overfished and it is rare to see much marine life around the village. In order to understand the process of restoration in the marine realm and help to bring back species to this area, there is a proposal to protect a 4 km stretch of coastline whilst allowing fishing to continue along an adjacent stretch. Not only should this allow the marine populations to recover in the protected no-take zone, but it will produce real data on how a marine community recovers following overexploitation and the benefits of marine protection.



© Gerick Bergsma 2008/Marine Photobank

PEOPLE



The small human population presents a golden opportunity to bring everyone living there on side. Floreana residents are more aware than those on other islands of the challenges of island living due to the difficult conditions and lack of basic resources. Project Floreana will build on this awareness, helping the community to develop a shared vision for the island, focusing on waste management, water, energy and agricultural production to help the community use scarce resources effectively, investing in education about conservation and sustainable living and offering vocational training to local residents.

Work with the community is planned to start soon and with the help of the team of local residents now trained up as wildlife technicians, we believe they will be a valuable help to the experts in each field (left). After all it is only with the local community support and hard work that Floreana can become the first society in Galapagos aiming for sustainability, and thus providing an example to the rest of the Archipelago and the world.

Isabela: back from the brink



James P Gibbs ...

... is Professor of Environmental and Forest Biology at the State University of New York and has worked in Galapagos since 1981.

Isabela, the largest and most diverse island in Galapagos, is composed of five main volcanoes, most of them active. One of them – Alcedo – hosts a rich mix of species, with several endemic plants and insects as well as some 5,000 tortoises, perhaps the largest single tortoise population in Galapagos. The volcano’s ecosystems have recently undergone a cycle of destruction and renewal that serves as an example of the staggering challenges, remarkable successes and ongoing concerns associated with conservation of Isabela’s magnificent biodiversity.

I first visited the island with members of the Galapagos National Park (GNP) almost 20 years ago, when it was possible to move easily around the flanks of the volcano because little vegetation blocked our passage. Cresting the crater rim on our first day we discovered the reason: amongst the dozens of tortoises were hundreds of goats in coats of all colours. I photographed one raised up on its hind legs reaching for some last leaves, its rear hooves planted firmly on a hungry tortoise’s shell. There was little herbaceous growth left for tortoises to eat and little shade from the searing rays of the sun. The volcano’s scant soil, the product of around one million years of gradual erosion, was exposed and about to be whisked away by the first rains. With so many goats, what could possibly be done?

The answer came in the form of Project Isabela, an ambitious joint effort between CDF and GNP to remove all feral goats from the north of the island. Its successful conclusion in 2006 was down to a combination of intricate planning and preparation, generous funding, methodical eradication and careful monitoring, and Project Isabela is now known as the largest ecosystem restoration project accomplished in any protected area anywhere in the world. So how does the island look today in 2010 and what are the challenges that still lie ahead?

Isabela Island	
Area	4,588 km ²
Date of settlement	1897
Current population	1,749
Endemics	931
Invasives	816



© Greg Shriver

RECOVERY

By chance, the removal of goats coincided with an El Niño rainfall event that jump started many of Isabela's plant communities, particularly its herbs and shrubs. Though there have been no records of Alcedo's endemic shrub, *Hyptis gymnocanlos*, for more than 20 years, there is still hope that some of its seeds lie buried and will, in time, germinate. Along with the recovering vegetation, species such as the Galapagos Rail – a fascinating small bird that skulks in the underbrush looking mostly for spiders – has returned (left). In many areas their loud chattering in response to footsteps can be heard frequently where once silence reigned. Ecosystem recovery on Alcedo is especially evident in the invertebrate community.

HUMAN IMPACT

Despite these successes major challenges remain. Many originate in Puerto Villamil, the primary population centre on Isabela. The last decade has witnessed its transition from a sleepy fishing village with sandy streets to a bustling urban centre. Despite a relatively tiny footprint Villamil nevertheless generates continual threats to the biodiversity of all of Isabela. A recent CDF survey of the gardens in Villamil discovered a biological time bomb: about half of landholders are cultivating exotic species, including many black-listed in the Islands. Most of the hundreds of “pet” dogs and cats in the town live largely uncared for outdoors, a potential reservoir for new diseases that could easily spread to the fauna in the adjacent National Park. Consumption of tortoise meat, prohibited since 1933, remains a continuing problem. Between 1995 and 2004, humans killed at least 190 giant tortoises, most of them on Isabela (right). The only long-term solution to this troubling statistic seems to be educating Villamil schoolchildren about the benefits of conservation.



© James P. Gibbs

FROGS

The increased human activity on Isabela probably accounts for the introduction of an entirely new class of vertebrate – frogs – to Galapagos. The species *Scinax quinquefasciata* is common in the coastal lowlands of Ecuador and is now well ensconced in the wetlands around Villamil. This has proven extremely vexing because little is known about the species' biology and, by extension, methods for its control. Applications of high concentrations of caffeine – known to kill frogs by arresting heart function – have been proposed but pose risks to other aquatic organisms. Another approach under consideration is to increase the salinity of the frog-infested lagoons by pumping sea water into them – an expensive project involving large water pumps with an uncertain outcome.

NEW DISCOVERIES

Against this background of conservation achievements and ongoing concerns, Isabela has witnessed some remarkable discoveries in recent years. Most surprising perhaps was the announcement last year of an entirely new species of land iguana – the so-called Pink Iguana – that had been lurking unnoticed on the flanks and summit of Wolf volcano. Even the better known Yellow Land Iguana, assumed to have been stripped from most of the island by dogs and other introduced predators, was recently discovered to have a substantial previously unknown population at Punta Garcia on the east coast. The largely unexplored lakes in the caldera of Cerro Azul, one of the most active volcanoes in the world, have also yielded some surprises. The lakes face recurrent desiccation and eruption events yet host a remarkable diversity of aquatic life, including groups such as nematodes, beetles and dragonflies to name but a few. Finally, new forms of insect diversity continue to be catalogued, particularly on the slopes of the northern volcanoes. In 2008, for example, it was revealed that the moth *Galagete darwini* is actually not one but two different species, one based in the low, arid zones and the other in the high-elevation areas of the island (left). Together these discoveries have added gravity to efforts to conserve and restore the native biodiversity of Isabela – perhaps the most important gem in the biological treasure trove that is Galapagos.

© Patrick Schmitz

BIRD CONCERN

Two bird species remain of great concern on Isabela. Flamingoes use the brackish ponds along the coastal margin and have been in slow decline, probably because rising water levels during recent strong El Nino events have flooded nesting sites (right). This is only expected to get worse with climate change. More urgent perhaps is the situation of the Mangrove Finch, now confined to a breeding population of about 100 individuals in just two mangrove forests on the island. The main threats to this species are introduced Black Rats, Smooth-billed Anis, fire ants and parasitic flies. Should the situation get much more desperate, it might be necessary to bring the last Mangrove Finches into captivity. Work has already begun using the more abundant Woodpecker Finch to develop the husbandry techniques that would be needed.



© James P. Gibbs

© CBD



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This year, 2010, the global spotlight will be on biodiversity. Not only will it be the International Year of Biodiversity, it is also the year of the 2010 Biodiversity Target. As such, it is a unique opportunity for governments and stakeholders to address the biodiversity crisis. At its 10th meeting in Nagoya, Japan, in October this year, the Conference of the Parties to the Convention on Biological Diversity (CBD) is due to adopt a revised and updated Strategic Plan, including new biodiversity targets for the post-2010 period and a strategy for achieving them. Although still in discussion, some elements of that Plan are beginning to take shape. In all likelihood, those elements will include the need to protect the most critical ecosystems, including coral reefs, coastal wetlands and seagrass beds through such means as effectively managed protected areas.

The importance of islands for marine biodiversity is well recognised, with over half of the tropical marine biodiversity and seven of the ten coral-reef hotspots surrounding islands. And yet, island biological diversity has been described as

among the most threatened in the world. Over the past century, island biodiversity has been subject to intense pressure from such factors as invasive species; climate change; overexploitation and unsustainable uses; and pollution from nutrient loading. Such pressures are expected to continue.

Indeed, many island Parties to the CBD have reported that their coastal ecosystems are in decline. The mega-diverse country of Madagascar, for example, recently reported a 30% decrease in live coral and disturbance to the breeding and development of marine turtles due to the increase in temperature, salinity and sea-level resulting from climate change; Indonesia noted that 40% of its coral reefs were damaged as of 2006, citing destructive fishing practices, among other factors; the Philippines, for its part, reported damage to 70% of its coral.

Destruction of mangrove and seagrass communities is also cited by numerous island Parties, including Indonesia, where over 70% of mangrove forests and 10% of seagrass beds are now damaged, and the Philippines, which has reportedly lost 30 to 40% of its seagrass areas in the last 50 years.

This pressure is keenly felt by islanders. Among the most vulnerable of the developing countries, small island developing states depend on the conservation and sustainable use of island biodiversity for their well-being, particularly that of marine and coastal biodiversity. Coral reefs, mangroves and seagrass communities support a wide range of marine animal species, such as crab, shrimp and fish, which are important food sources for islanders; the Philippines, for example, reports that about 62% of its coastal population depends directly on coral reefs for their livelihood. Furthermore, these ecosystems buffer coastlines and coastal communities from cyclones and tsunamis and other extreme climatic events projected to increase with climate change.

These are among the challenges that led the Parties to the CBD, in 2006, to adopt the first-ever programme of work dedicated solely to protecting the uniqueness and fragility of island biodiversity. High on its recommended to-do list for countries and regions was to “protect areas of particular importance to island biodiversity through comprehensive, effectively managed and ecologically representative national and regional protected area networks.”

The response was immediate: five Micronesian governments – the Federated States of Micronesia, the Republic of Palau, the Republic of the Marshall Islands, the US Territory of Guam and the US Commonwealth of the Northern Mariana Islands – made a joint commitment to conserve at least 30% of their near-shore marine resources and 20% of their terrestrial resources by 2020. The Micronesia Challenge, as it became known, has since inspired a host of other commitments, including the Caribbean Challenge, the Coral Triangle Initiative and the Western Indian Ocean Challenge.

Galapagos is miles ahead of other islands when it comes to the creation of marine protected areas. There has been legal protection for the waters surrounding the Galapagos Islands for almost 25 years. In 1998, the extent of the Galapagos Marine Reserve around each island was increased; it now takes in 99.5% of the continental shelf around the Islands and more than 130,000 km² of ocean. And yet, implementation of the Galapagos Marine Reserve’s management plan has long been hindered by local conflicts. Similarly, several island Parties to the CBD have reported that management of their marine reserves is a major challenge. With its wealth of experience, however, Galapagos can serve as a global reference for island nations and nations with islands as they strive to fulfill their pledges and to make new ones.

Reviews

A CHARMING JOURNEY

Is Your Mama An Iguana?

by Johanna Angermeyer,

Pelican Press (2009),

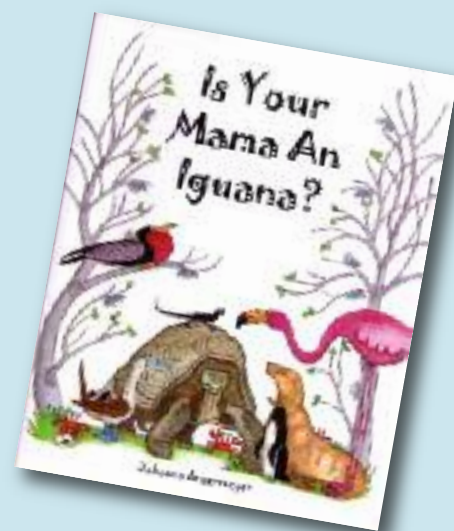
ISBN 9780954485108

porthole@gotadsl.co.uk

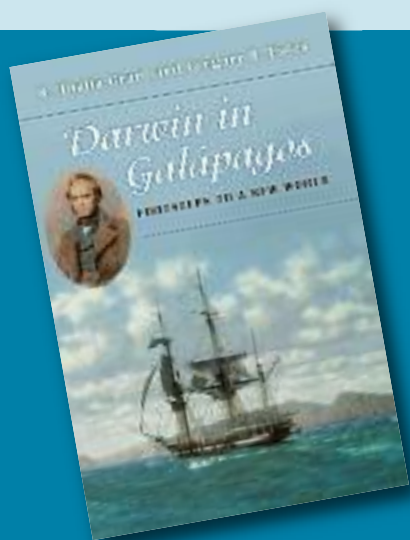
Beautifully illustrated, this charming story explores the journey of Iggy, a newly hatched Marine Iguana searching for his Mama. Along the way he meets a variety of Galapagos inhabitants. In revealing something of themselves, each of them teaches Iggy (and us) a different characteristic of Marine Iguanas, helping him to find his Mama.

Combined with the story, the illustrations make it a joy for any child to play at finding specific animals and counting the three crabs which appear on nearly every page.

The inside covers of the book include a map of the Islands and illustrated facts about Marine Iguanas. A great way to introduce children to animals that are not normally featured in children's books and toys, and of course to the Galapagos Islands themselves. I think the biggest recommendation for this book is the word 'again', which is what my two-year-old says every time we reach the end!



Reviewed by Alison Chopra,
Galapagos Conservation Trust volunteer



Reviewed by John van Wyhe, director of
Darwin Online (darwin-online.org.uk)

EVOLUTIONARY STEPS

Darwin in Galapagos:

Footsteps to a New World

by K Thalia Grant and Gregory B Estes,

Princeton University Press (2009),

£20.95/\$29.95, ISBN 9780691142104

Darwin and Galapagos have had more than their fair share of publications but once in a while a special contribution appears, and such is this new book by K Thalia Grant and Gregory B Estes. A good book should be based on first-hand knowledge of the subject and the authors offer an impressive combination of experience – from an intimate knowledge of Galapagos today (the authors have been retracing Darwin's footsteps in the

islands for years), the science and even the historical documents composed by Darwin.

The first chapter provides Darwin's biographical background before moving on to the voyage of the *Beagle*. The treatment becomes much more detailed when Darwin and the *Beagle* reach Galapagos in late 1835 – a vast amount of information is marshaled to give readers a full picture. The book is well illustrated with a rich mixture of historical and modern images. Any reader seriously interested in Darwin and Galapagos will want to read this book. Unfortunately, though the authors cite much of the large literature on Darwin they do not cite their extensive use of Darwin Online.

ZOOLOGICAL DERRING-DO

Remarkable Creatures: Epic Adventures in the Search for the Origins of Species

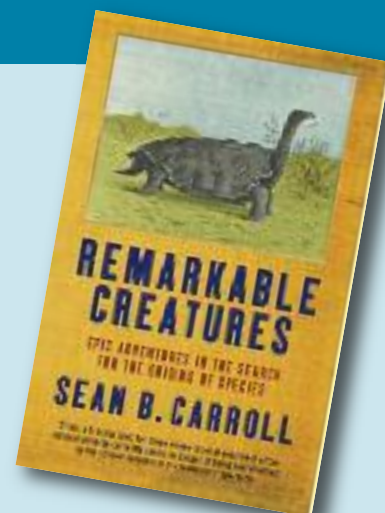
by Sean B Carroll, Quercus (2009), £8.99,

ISBN 9781849160728

Remarkable Creatures offers a compelling, meandering tour through the history of one idea: evolution. As a biologist and writer Sean B Carroll has not set out to write a definitive history. Instead, and perhaps more engagingly, he has cherry picked stories from the past that capture the drama of efforts

over the last 200 years to understand the way of the natural world. Carroll's "remarkable creatures" are both the animal discoveries he showcases and also the driven men and women whose inquisitive nature got the better of them. Darwin, HMS *Beagle* and Galapagos are there, followed by dozens of tales of delightful zoological derring-do.

If you know of a recent Galapagos-related book, film, play or exhibition you would like to see reviewed, please email the editor at gct@gct.org.



Reviewed by Henry Nicholls

A FOGO Near You

Galapagos has a diverse and beautiful native flora, comprising 500 native species of which 180 are endemic. However, over 1,000 plant and animal species have been introduced by humans, either intentionally or accidentally. Many are ornamentals. Scientists at the Charles Darwin Foundation (CDF) work diligently to determine the threats to native flora, suggest what management actions can be taken and monitor their consequences. The Galapagos Conservancy (GC), the Frankfurt Zoological Society, Lindblad Expedition's Galapagos Conservation Fund and the Japan Association for Galapagos (JAGA) have all supported

this work. The Nordic Friends of Galapagos and GC have also supported CDF's very successful native garden project, which includes a beautifully illustrated guide book written specifically for the local community (below right). Local people trained by CDF have found employment and provided positive leadership for conservation while helping the prevention, control and eradication of introduced species. In the Santa Cruz highlands, JAGA is supporting the restoration of native vegetation as well as gaining some hands-on planting experience during their annual members' visit.

CDF's flagship project *Project Floreana* got off to a good start last year thanks to support from the Galapagos Conservation Trust (GCT). A team of wildlife technicians has developed skills in weed control and mapping, rare plant identification, and monitoring and protection; they understand first-hand

their very important role in restoring their home. A project coordinator has been appointed to work with the local community in Floreana and GCT has also helped to fund the Floreana Mockingbird project.

Last year, the Swiss Friends of Galapagos celebrated their 15th anniversary by raising the equivalent of around \$100,000. This has been channeled into three main projects: the protection of giant tortoises on southern Isabela, the reintroduction of the Floreana Mockingbird and the preservation of the Galapagos petrel.



© CDF

Not Another Booby ...



A diver in Galapagos swims alongside a Venus' Girdle (*Cestum veneris*), a ribbon-shaped jellyfish that lives in the surface water of several of the world's oceans. It feeds on small crustaceans and molluscs, using combs on its trailing edge to propel itself through the water and small tentacles to ensnare its floating prey.

Mason Cameron ...

Islander



... is 16 years old, and studying gastronomy as part of his curriculum at the government high school in his home town of Puerto Ayora on Santa Cruz.

What was it like going to school in Galapagos?

There are around 20 schools on Santa Cruz. The one I went to from first grade is a private school and one of the smallest in the Islands. In the primary school, there were around 100 children, but in the secondary school there were only about 30 kids in total. In my last year, there were only six pupils in my class, including me. This is probably a reflection of the fact that most people in Galapagos can't afford to send their children to a fee-paying school. There were plenty of animals and plants around the school and lots of open space. It was a fun school.

What are you doing now?

I am now starting my first year at the oldest high school in Galapagos. It has been here for 40 years and offers gastronomy as one of the general high-school subjects. I love to be creative and I love to cook plus I really enjoy being one of almost 600 kids as I have lots of new friends and a lot more fun things to do outside school. I hope to travel after high school and maybe work in Australia where I was born. I would like to be a boat captain who can cook.

What do you get up to outside school?

I usually help mum or visit my friends. We go camping sometimes up in the highlands and I get to go kayaking, scuba diving or windsurfing quite often. I play chess. I also like to paint,



usually with oils over canvas. At the back of my house is a little tree house studio that my mum and I built years ago. I usually paint Galapagos landscapes but what most people seem to like most are the paintings of my fat cat Harry.

Do you think this is typical of most teenagers in Galapagos?

Probably not. I have always enjoyed physical exercise and open spaces so sitting in class is hard unless it's something I like. Last year, my class and another class in my high school, which would make us about 15 pupils, won a prize for a fun project we did on mangroves around Puerto Ayora. We took samples of the sand or, in my case mud, and looked for interesting little bugs and crustaceans. But most of the kids in my class wanted to go to the cinema or visit Quito at the end of term.

Have you been outside Galapagos?

Yes, I've been to a lot of places on holiday including Nantucket, Samoa, London, Australia, even Antarctica, but some of my favourite holidays were in Galapagos. I always feel safe in Galapagos. It's my safe spot, you could say. There's more to this feeling than this is the place I call home. There's something incredibly special about the mornings in particular, especially when you go camping on the beach. You see great sunrises and sunsets and animals everywhere you look. I have everything I need here: friends, food, places to go and fun things to do and every now and again I get a surprise because I live in such a special place; meeting princes, being at the filming of the movie *Master and Commander*, watching erupting volcanoes, going on board the replica of the *Endeavour*. And friends from all around the world pop in.