

The Galapagos Giant Tortoise

Giant tortoises once inhabited all the continents on Earth, with the exception of Antarctica. As the human population grew and people began to colonise new areas, the large tortoises were hunted, providing an easy, and apparently rather tasty food source to settlers. The giant tortoises were hunted to extinction. Only oceanic islands provided a safe haven, albeit a temporary one.

History of the Galapagos giant tortoise



Galapagos giant tortoise © Sally Wellman

The history of tortoises in Galapagos is a catastrophic tale. In the 1600s, buccaneers who used the Islands as a base for repairing ships and restocking water, began to collect the tortoises to store live on board. They could survive for several months without food or water and they provided invaluable fresh meat and sometimes even water from their bladders!

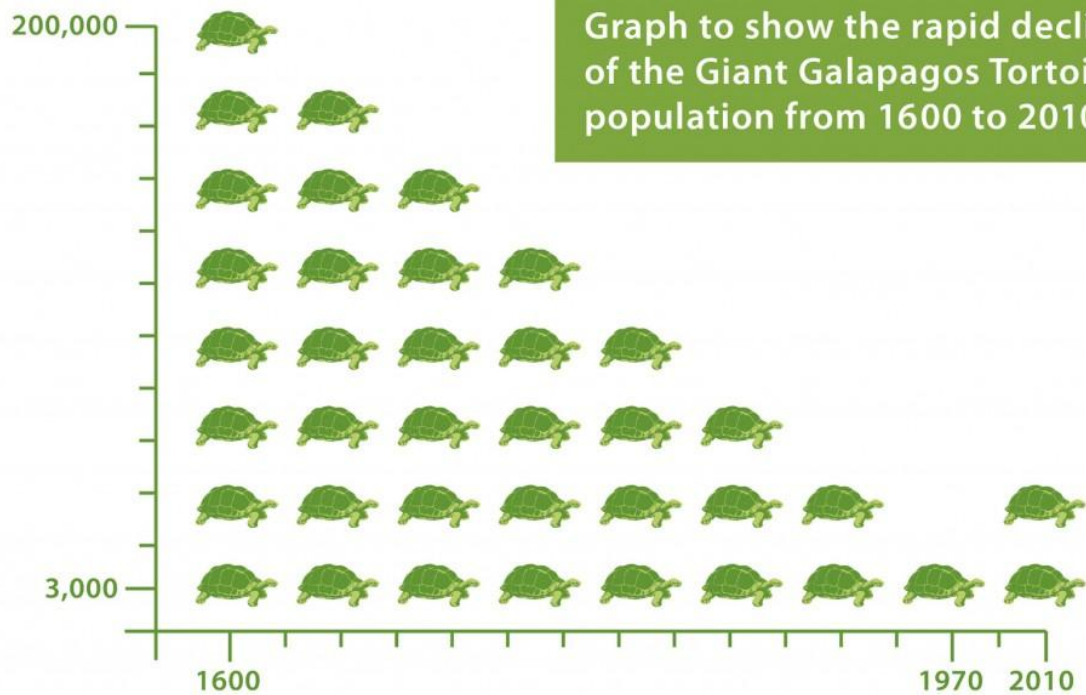
The exploitation continued into the 1800s until early this century, when whaling ships and fur-sealers collected more tortoises for food and their fine 'turtle-oil'. Early settlers on the Islands hunted them for their meat and cleared large areas of their habitat for agriculture.

Settlers also introduced domestic animals, many of which became wild and, coupled with other invasive species, had a disastrous effect on population numbers.

No-one knows the exact figures, but it is believed that well over 100,000 giant tortoises were removed from the Islands during this time. Having once lived on 10 islands, they now inhabit six. Only 10 of the original 15 species have survived.

Tortoises that survived such destructive practices then faced new threats from a growing human population and tourist industry: increased agriculture, development of infrastructure and the introduction of domestic and [invasive species](#) such as goats, rats, pigs and fire ants.

Tortoise Population Decline



There is a lack of precise data regarding population fluctuations.

It is estimated that the population could have been as high as 200,000 in the 1600s, dropping to 3,000 in a 1970 census.

Numbers have been slowly rising since then.

Tortoise conservation

In order to help conserve both the Islands and the animals that live there, the [Galapagos National Park \(GNP\)](#) and [Charles Darwin Foundation \(CDF\)](#) were formed. The conservation of giant tortoises is a main focus, and conservation efforts mean that today's tortoise populations are stable or increasing.

Since tortoises first colonised the Islands they have had to adapt to challenging environmental conditions – the harsh, relentless heat of the equatorial sun, the search for suitable food, periods of drought when food is scarce, active volcanoes spewing out lava and hot ash, attack by [ectoparasites](#), and even possible changes in sea levels to name but a few. Galapagos giant tortoises, however, are resourceful and have mostly been able to adapt to their environment over time.



Galapagos giant tortoise © Christian Ziegler

It is now man-made, or [anthropogenic](#), change that poses the most serious threat to tortoise populations. From the arrival of buccaneers and whalers who used the Islands as a base, to the appearance of the first settlers, tortoise numbers have declined dramatically in response to humans.

The rapid development of infrastructure to meet a growing population and a booming tourist industry puts pressure on natural resources. Introduced species such as goats and pigs not only compete for the same food source, but also prey on tortoise eggs and young hatchlings. There are still cases of tortoises being killed for food.

For these reasons it is imperative that we understand as much about the lives of the giant tortoise as we can, in order to plan conservation strategies to help them. The [Galapagos Tortoise Movement Ecology Project](#) and [Movebank](#) are two such strategies.

Science in the Field

Now we have our key question for scientific investigation – How can we help conserve the population of Galapagos giant tortoises?

What information do we need?

Recognising the need to find information to help conserve this iconic species, and the importance of understanding long distance migration of the tortoises, the [Galapagos Tortoise Movement Ecology Project \(GTMEP\)](#) was set up in 2009 to help the [Galapagos National Park](#) answer some key scientific questions, including:

-  How much space do tortoises need?
-  How, when, where and why do Galapagos tortoises migrate?
-  What factors disrupt these movements?
-  What habitat resources are critical for survival?
-  What are the ecological roles of Galapagos tortoises i.e. why are they important for the environment?
-  How are tortoise populations changing over time, particularly in response to threats and conservation management?

Tracking tortoises

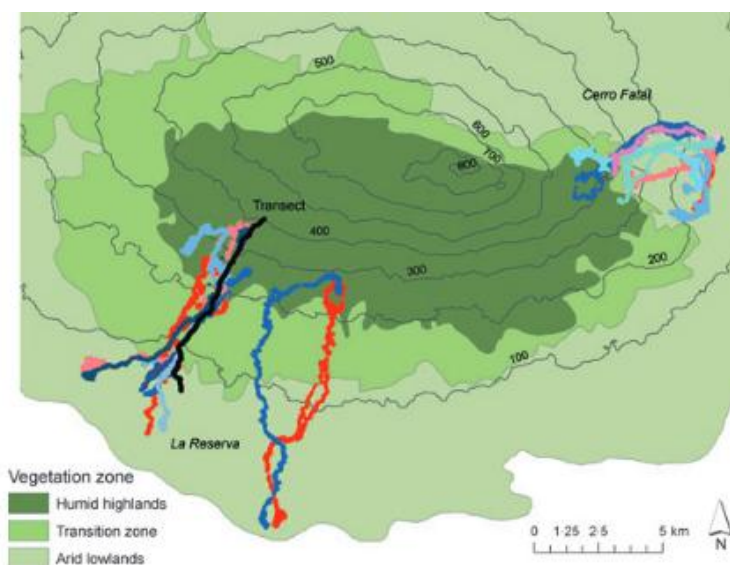
In order to provide answers to these questions, the programme uses a variety of techniques to study the tortoises, including direct observation of tortoise behaviour and a more high-tech approach of tracking tortoise movements using [Global Positioning System \(GPS\) tracking](#).



Researchers attach a GPS tracker to a tortoise shell © Steven Blake

GPS tracking involves gluing a tag onto the tortoise shell (also known as a [carapace](#)). This GPS tag can tell us their location and their movements every hour, every day. It records the [latitude](#), [longitude](#), date and time, as well as other environmental aspects of the tortoise such as how active the tortoises are.

This information is recorded and can be plotted on a map. The movements of these tagged tortoises, and also many more species around the world, are accessible on a website called [Movebank](#). This data can be plotted on Google Earth to create images like this:



Giant tortoise tracking data © Steven Blake

From studying this data from the GPS tags, the researchers are able to track tortoise [migrations](#) and help conserve the tortoises by making sure that they are not disturbed from their natural paths. As of July 2014, 83 tortoises have been tagged on the islands of Santa Cruz, Isabela and Espanola.

In addition to scientific research, the program is also working with schools and educators both in Galapagos and worldwide to educate and inspire the next generation of conservation scientists.



Dr. Steve Blake and a giant tortoise © Christian Ziegler

Tortoise Tracking

Join one of our tortoise trackers in Galapagos who is trying to find out where the tortoises are. In this section we will learn more about tortoise tracking, about migration patterns and how we can track where they go using advanced GPS tagging methods.

How to tag a Galapagos giant tortoise



Moz the tortoise (on the left) and Charlie (on the right with a tag) get on their way © Steve Blake

-  Find the right tortoise for your study.
-  Give the shell a good scrub with soapy water and use [acetone](#) to remove further dirt.
-  Dry well and using sandpaper, scrub the site of the tag to improve adhesion.
-  Fix the tag in place with high grade plumbers' glue – this needs to be done very firmly to ensure that the tag is not scraped off by the dense vegetation that tortoises encounter.

No adverse effects have been recorded for the tortoises that have been tagged. Each tag lasts 2 years, giving a long dataset for each individual. Data is collected via a GPS reading every hour that enables a detailed map of each tortoise's movements to be recorded.



Tortoise expert Fredy Cabrera measures Moz the tortoise for his research records © Steve Blake

You can learn more about the work of the [Galapagos Tortoise Movement Ecology Programme](#) by visiting the [Tortoise Migration on Alcedo Volcano](#) page which is part of the [Google Maps Education](#) resources.

What have we learnt from tracking tortoises?

There is a seasonal pattern to the weather in Galapagos as you can see from the diagram below. There is a warm season from January to May and a dry season from June to December.



Galapagos Graphics: A graph to show the fluctuations in temperature and rainfall in Galapagos © GalapagosIslands.com

The changes in temperature and weather patterns have an impact on the movements of giant tortoises.

In the dry season, slopes of Santa Cruz are covered with a dense fog which enables plants to grow, even if there is less rain. Sometimes if there is a lack of food in the lowlands (because fewer plants have been able to grow) most tortoises (especially male tortoises) migrate up to 10 km to the highlands. In the highlands, temperatures are 2-2.5°C lower than lowland temperatures.

It is usually just full grown tortoises that migrate, the young tortoises stay in the lowlands until they are big enough. The female tortoises stay in the lowlands until they lay their eggs, then they migrate to the highlands.

As soon as the wet season begins, tortoises move back to the lowlands for the rich vegetation that can be found there.