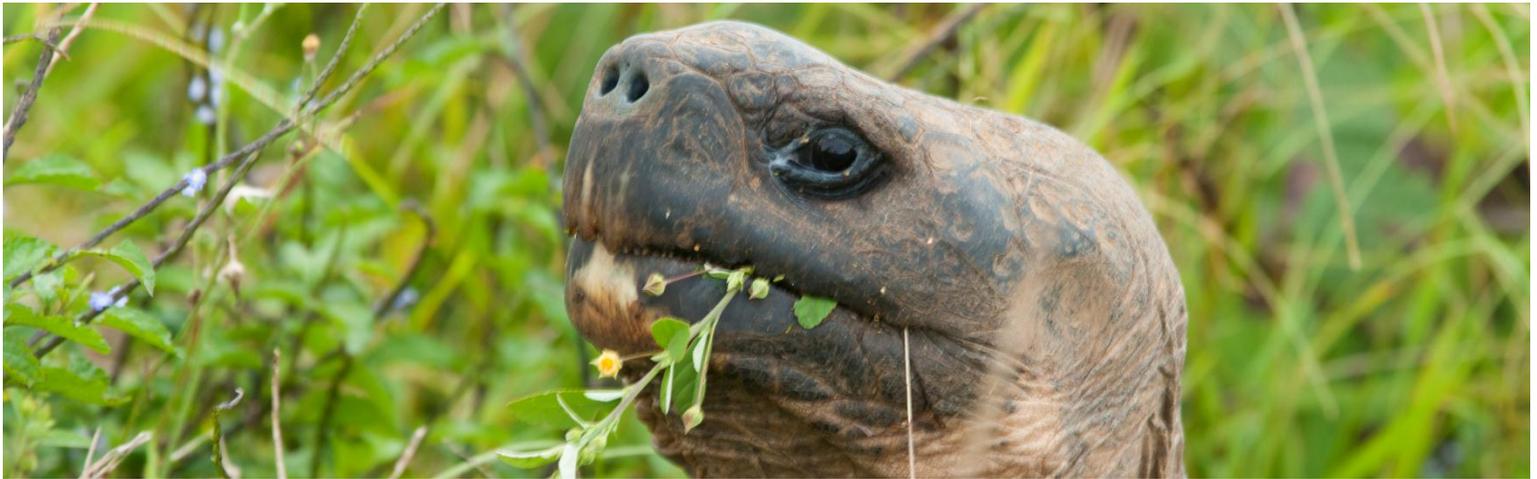


Galapagos Tortoise Movement Ecology Programme

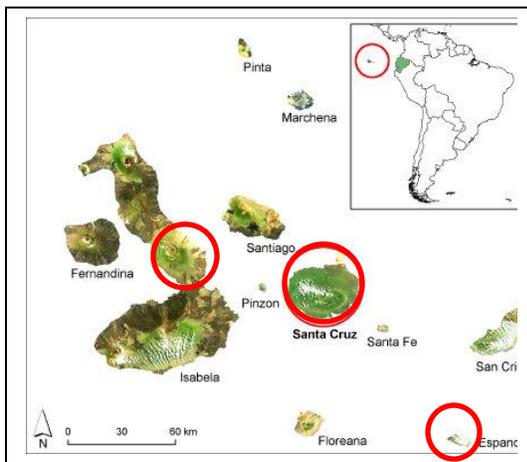


Alcedo giant tortoise (Chelonoidis vandenburgi) feeding on Sida rhombifolia on the crater rim

The **goal of the Galapagos Tortoise Movement Ecology Programme** is to assist the Galapagos National Park to **effectively conserve** giant Galapagos tortoises by conducting cutting edge **applied science** and developing an experiential tortoise-based **outreach** programme. We use Global Positioning Systems (GPS) tracking to understand the movement strategies of Galapagos tortoises on three islands, each of which has a different set of ecological conditions. We focus on why tortoises migrate, seeking to understand why a 250kg reptile would haul itself up and down a volcano! We also try to discover how movement influences the health, reproduction and conservation status of tortoises. We believe that conducting high quality science is important, but that scientific results should not be buried in university libraries. Therefore we attempt to translate our scientific work into meaningful experiences for young people on Galapagos and elsewhere by working with education professionals who are able to bring our work into mainstream formal and informal education systems. All of our tortoise movement data (over 1.5 million GPS locations) are freely available to the public through [Movebank](#), and we provide frequent updates on [Facebook](#).

Where we work

The three islands on which we work (right) provide a sample of the range of environmental conditions experienced by Galapagos tortoises. Alcedo volcano rises to 1100 meters with arid lowlands near the coast and humid highlands at the crater rim. Santa Cruz in the center of the archipelago also has arid lowlands and wet uplands, but also contains the largest human population of any island. In contrast, Espanola, in the extreme southeast, is usually flat, arid, hot and devoid of humans.



Highlights

Giant tortoises

- Largest terrestrial reptiles
- Once widespread worldwide, now only occur on Galapagos and Aldabra Atoll
- Can weigh up to 300kg and live for more than 150 years
- Colonized Galapagos from mainland South America ca. 3 million years ago
- Once tortoises lived on up to 10 islands but are now found on just 6 islands
- Massively overhunted in 1800s for food and oil
- Some species remain critically endangered

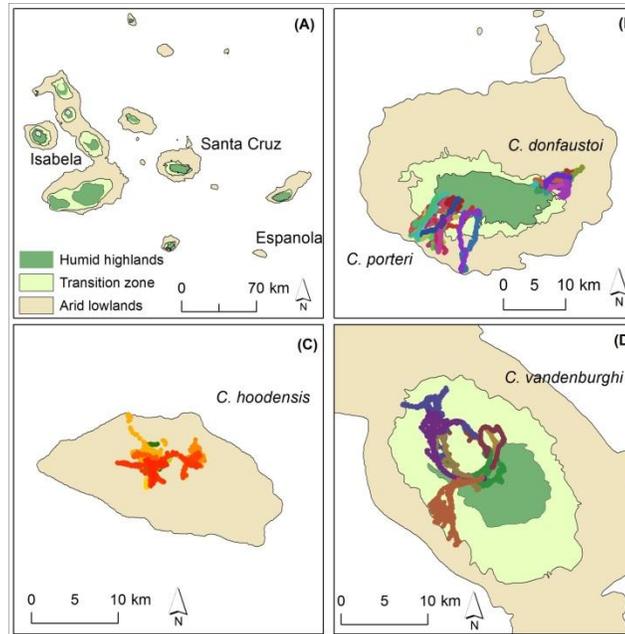
Programme

- Began in 2009
- Over 100 tortoises tagged with GPS or VHF radios, from 4 species on 3 islands
- Over 800 local young people have participated in our outreach programme, including field and classroom activities
- Seven scientific articles, with more coming soon.



Tracking tortoise movements

We attach GPS tags to the shells of giant tortoises using plumbers epoxy. The tags take a GPS fix every hour and have a battery life of 10 years. The tags also have acceleration sensors in them which allow us to track activity patterns and even energy use. The data give us a detailed yet also long term picture of tortoise movements which we can analyze in relation to environmental factors such as rainfall, temperature, vegetation, and topography, and animal factors such as size, sex, and health status. This helps us to not only understand giant tortoise ecology but also to answer fundamental questions about migration more generally.



Tortoises across the archipelago (A) migrate on Santa Cruz (B) and Alcedo (D), but are more sedentary on Espanola (C).

Tortoise reproduction and health

We study the relationships between tortoise movement, health and reproduction. This is important to understand the evolution of migration and the consequences of environmental change such as climate, land use, invasive species, and infrastructure like roads and fences. We collect blood and fecal samples from females, and take ultrasound scans to look for eggs. We monitor the incubation success of eggs and the survival and movements of hatchlings under different environmental conditions.



Ultrasound image of developing follicles



Measuring freshly laid eggs



New hatchling wearing a VHF transmitter

Outreach and education

We translate our scientific results in meaningful ways for local communities, including young people and decision makers. We introduce Galapagos youth to our fieldwork through practical experience with our partner the Ecology Project International. Together with the Galapagos Conservation Trust and Saint Louis Zoo we have developed an education package for use in school science clubs around the world.



Next steps

We will publish our research on how relationships between environment and animal traits like physiology and life history interact to drive movement strategies. We will develop an applied research project on interactions between tortoises and private land owners – critical players in tortoise conservation on some islands. Finally we will bring our “education package” to schools on three islands to inspire interest in nature, science and conservation action.

Highlights

Tortoise movement ecology

- Tortoises migrate on islands where there are large seasonal and geographic differences in rainfall and food availability. These conditions only occur on larger islands which have humid highlands and arid lowlands
- Tortoise migrate over large distances, up to 20km round trip on Santa Cruz and over 40km round trip on Alcedo
- Migrating tortoises usually follow the same routes and use the same locations at either end of the migration
- Usually, only adult tortoises migrate. The energy balance of “should I stay or should I go?” favors migration as tortoise size increases. Big tortoises lose weight if they stay in areas with low food availability.
- Santa Cruz tortoises migrate out of the National Park for long periods during the dry season.
- Tortoise diets include over 60 species of plants including fruit, and some invasive species, such as guava.
- Tortoises swallow lots of seeds from many different species and plant them in rich piles of dung all over the islands as they move, making them the “gardeners of Galapagos”

Partners and donors

- Galapagos National Park
- Charles Darwin Foundation
- Max Planck Institute of Ornithology
- US National Science Foundation
- SUNY-ESF
- E-obs GmbH
- Saint Louis Zoo
- Ecology Project International
- Houston Zoo
- Galapagos Conservation Trust
- Swiss Friends of Galapagos
- National Geographic Society
- Washington University (St. Louis)