

# Conservation Management Plan

## Costa Rica

ProjectsAbroad



Partners:



# Contents

<u>Background Information</u> .....	4
<u>Barra Honda National Park – Flora and Fauna</u> .....	5
<u>Flora</u> .....	5
<u>General Projects</u> .....	8
Scarlet Macaw project .....	8
Butterfly Project .....	9
<u>General Aim</u> .....	9
<u>Methodology</u> .....	9
Bat Project .....	9
<u>General Aim</u> .....	9
<u>Objectives</u> .....	9
<u>Methodology</u> .....	10
Bird Survey .....	10
<u>Aim</u> .....	10
<u>Summary</u> .....	10
Indigenous Tree Project .....	11
<u>Aim</u> .....	11
Fungi inventory .....	11
Bio Digester .....	12
<u>Aim</u> .....	12
<u>Summary</u> .....	12
Remote Sensor Cameras .....	13
<u>Aim</u> .....	13
<u>Methodology</u> .....	13
Environmental Education .....	13
Monitoring environmental variables .....	14
<u>Future Projects</u> .....	15
<u>Ocelot Survey</u> .....	15
<u>Amphibian Project</u> .....	15
<u>Primate Research</u> .....	15
<u>Implementing the plan</u> .....	15
<u>Reporting on Research</u> .....	16



# Background Information

Although Costa Rica represents only a fraction of the world's land (0.25%), it has an enormous amount of biodiversity – estimated at roughly 5% of the planet's total. This level of biodiversity is due to a combination of geographical features that make it very unique. The backbone of the country consists of a number of volcanoes, peaking at 3,800 metres, which has produced a very rich and fertile soil composition. To the west of Costa Rica is the Pacific Ocean, and to its east the Caribbean Sea. With latitude of 10 degrees North, Costa Rica is certainly a tropical country. It is the combination of this unique tropical climate, high rainfall, range of altitude, fertile soil and long coast lines that has allowed the development of many different eco-systems and the vast growth of dense tropical forests.

Costa Rica has dedicated much of its attention to the protection of the environment. With almost 25% of its land already protected, it is leading the way for countries all around the world in protecting its natural resources as no other country can match this achievement. It is also the only country in the world to meet all five criteria established by the UNDP to measure environmental sustainability.

Projects Abroad's conservation project is located in the North East of the country in the peninsula of Nicoya within the Guanacaste region. This area is home to some of the world's most unique dry tropical forests that are intertwined with deep caverns.

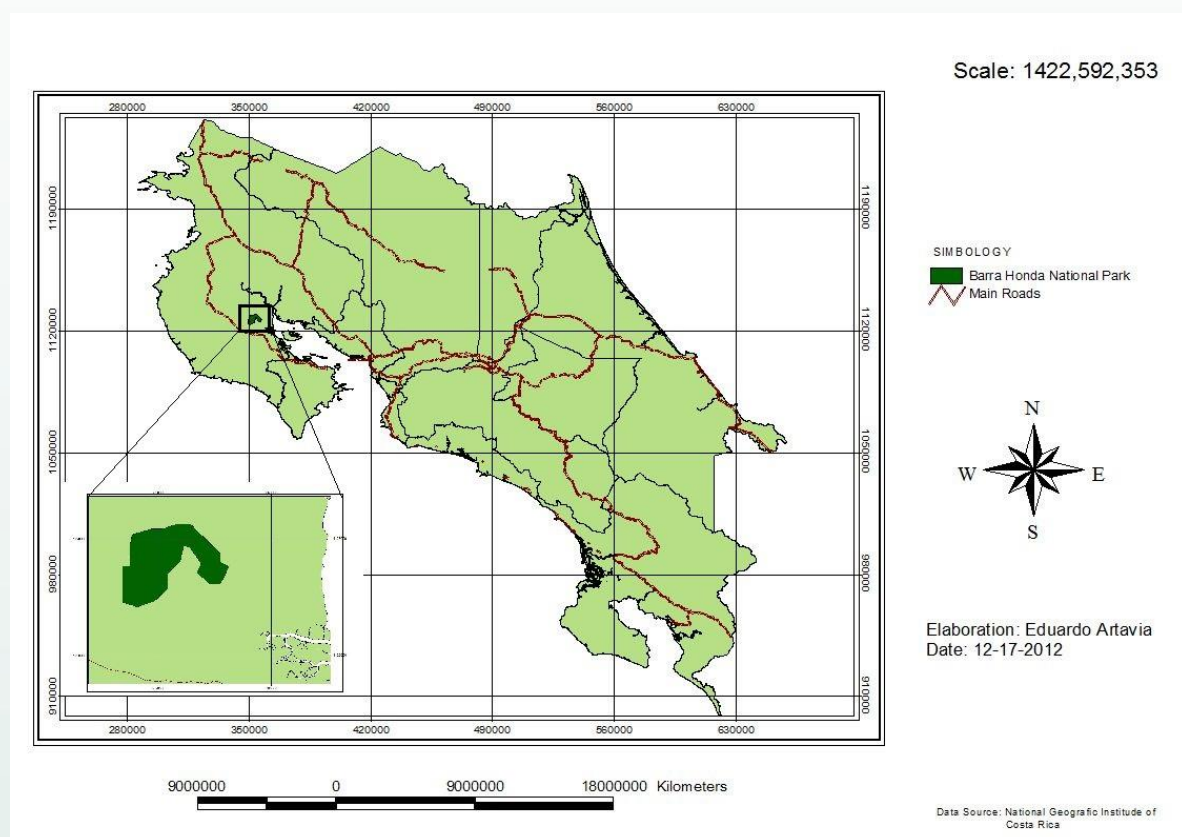


Fig 1: Map of Costa Rica and the location of Barra Honda National Park

## GUANACASTE PROVINCE

The Guanacaste province of Costa Rica is very different to other areas of the country in that it experiences little rain and is hot all year round. The area is characterized by a climate with two distinct seasons: rains from May to November and a dry season from December to April. It is this contrast in seasonality and the heat in the region that results in dry tropical forests.

The Guanacaste area borders Nicaragua on the north and is home to a stretch of beautiful beaches that attract many tourists. With agriculture being a dominant industry in the region there are many cultural activities or 'Fiestas' focusing on rodeo and other cowboy related games during specific times of the year.

## BARRA HONDA NATIONAL PARK – FLORA AND FAUNA

### Flora

Barra Honda can be described as a dry tropical forest, which means they have to withstand long dry periods every year and the trees shed their leaves to cope with it. The forests are predominately made up of broad-leaved deciduous trees. Within Barra Honda there is primary and secondary forest. Secondary forests make up a larger proportion because much of Costa Rica forests have been affected by logging and the misuse of natural resources before environmental protection became high on government agendas (approximately 50 years ago). In fact, Barra Honda is home to a number of tree species that have almost been driven to the point of local extinctions due to logging. It is these species that Projects Abroad is targeting in its indigenous tree project.

Among the primary and secondary forests within the park, Projects Abroad has identified a total of 103 different tree species (some of which grow up to 40 meters in height) and 16 different species of vine and shrub.

### Fauna

Due to the geographical location of the park and its geological makeup, the park is home to a large array of fauna. Much of the geology is limestone rock, and so there is an abundance of caves, which are perfect habitat for bats. There are approximately 70 different species of Chiroptera (bats) in the park making up almost 50% of the park's mammals. The numbers of some species of bats in certain caves can reach the thousands making this a very significant site for studying bat ecology and flying the flag for bat conservation.

Other mammals found in abundance are:

- Mantled howler monkey (*Alouatta palliata*)
- White throated capuchin (*Cebus capucinus*)
- White nosed coati (*Nasua narica*)
- Common Oposums (*Didelphis marsupialis*)
- Armadillo (*Dasypus novemcinctus*)
- Ocelot (*Leopardus pardalis*)
- Coyote (*Canis latrans*)

All of these mammals play a vital role in the park's eco-system, and their numbers need careful monitoring to ensure they continue to exist in healthy numbers.

Other fauna that can be found in abundance in the park are the many different species of reptiles. These range from large iguanas to small geckos and amphibians that make up the diet for many of the parks mammals and birds.

The diversity in bird species remains an unknown, but Projects Abroad is currently collecting data that will build an inventory and allow population dynamics to be studied from year to year. The most notable species are the scarlet macaw and the several species of hummingbirds. As we are currently data deficient on birds within the park, we to discover some positive surprises in late 2013 and 2014.

To date there have been very few studies on the insects in the park. Projects Abroad has already collected data on the Lepidoptera groups (butterfly project) and has recorded 60 different species so far with the preferred habitat of each species noted. This data is essential when assessing habitats and making decisions for the management of the park. We will continue with our studies and in the future consider other entomology studies.

## CONSERVATION THREATS

### **Commercial Development – Tourism and recreational development**

Tourism is often very beneficial towards conservation: if wild areas are sought after by tourists, then these areas are generally managed well; however, when there is a tourism interest in a national park or any area with wildlife, it is important to manage the extra amount of people visiting without being detrimental to the environment.

### **Livestock farming and wood plantations**

Conflict amongst local farmers must be managed to protect predators and other suspected problem animals. Farmers must demonstrate good working practices to avoid environmental degradation caused by pollution or nomadic grazing. Environmental education is important to ensure that local communities respect the environment and understand the importance of the park.

Wood plantations must be managed accordingly so they do not affect the wild flora and fauna found within the parks boundaries.

### **Biological resource use**

Wild animals have been hunted in Barra Honda for many decades and continue to be illegally poached. Evidence has been collected on the poaching of scarlet macaws and deer with other species also threatened. These are concerns that need to be taken seriously and mitigated to ensure they do not cause local extinctions and have a knock on effect on food chains and balance of ecosystems.

### **Extreme weather**

The Guanacaste region of Costa Rica is very prone to wild fire as it is such a dry environment. During the dry months everything on the forest floor is highly combustible and fires are easily started. This threat is managed by the Costa Rican government through teams of staff which educate the local communities and build fire defences in vulnerable areas. These defences come in many forms

whether it is through controlled fires or clearing pathways of vegetation so fires cannot spread. The threat of fire is taken very seriously in Costa Rica; it not only has the potential to destroy wild areas but it poses a threat to human life. Projects Abroad helps the government where it can in these initiatives but will never work in the control of a fire. Volunteers can help in education and the clearing of areas for fire control.

## CONCLUSION

Barra Honda is increasingly being surrounded by the presence of humans. In the past humans have threatened the park with logging and poaching, and more recently the threat comes from misuse of resources and pollution. Along with changes in global weather patterns these threats have the potential to cause serious declines in some species. Without monitoring several parameters within the park, it is very difficult to make sound management decisions for the future. Like all national parks around the world, there is often more work that staff and resources can undertake. Projects Abroad hopes to ensure the future of Barra Honda through the flow of volunteers and our dedicated local team of biologists and conservation coordinators. Together with Barra Honda we hope to monitor wildlife and ensure it has everything it needs to flourish and remain an area of outstanding beauty.

# General Projects

## SCARLET MACAW PROJECT

One strategy for biodiversity conservation worldwide is appointing one of the species found in a particular environment as a flagship species.

A "flagship species" is a species which is known for its beauty, uniqueness, or because they represent something religious or a place name, amongst other variables to focus people's attention. (Perez and Delibes de Castro. 2005)

Successful examples of the use of flagship species include that of the Giant Panda (*Ailuropodo melanoleuca*), Gorilla (*Gorilla gorilla*) and the Koala Bear (*Phascolarctos cinereus*). There is no doubt that each initiative for these species warrants greater conservation efforts for all species in their immediate environments and biomes. The level of interest generated through a flagship species can also have positive effects on education programs, funding and research.



The Projects Abroad conservation team in Costa Rica has identified the magnificent Scarlet Macaw (*Ara macao*) as a flagship species for our conservation efforts at the park. Although the species is categorized on the IUCN red list as 'Least Concern' they are threatened locally and their numbers within the park and surrounding areas are at risk of local extinction.

The main threat is poaching for the illegal wildlife trade, which has reduced their numbers to an estimated two mating pairs. We hope to reverse this trend whilst these mating pairs are still sexually active.

### Methodology

The first step in this project is to locate the trees that the birds use for nesting. It is very important to locate these nests as early as possible to be able to protect against poaching. With many other animals in the park that need hollow trees to make their nests, the amount of space is limited, which can mean the scarlet macaws choose to nest outside the park boundary. This in turn brings a greater threat from poaching.

The year of the Scarlet Macaw is divided into in five categories:

Behaviour	Activity
From January to February: The pairs will locate suitable nesting sites and prepare the nest	Attempt to locate the location of the nest through studying behavior and listening to call
From February to March: the females lay the	Check the nest, climb the tree and count the



eggs and incubate them.	eggs, record relevant data.
April: the eggs will hatch	Protect the nest and analyses the behavior of the adults, climb the tree count the hatch.
From April to July, the adults care the hatch	Protect the nest with observations
July: the young fly with the adults, learn from them to fly and socialize	Analyze the behavior.

## BUTTERFLY PROJECT

### General Aim

- To compile an inventory of all diurnal insects found in the order of Lepidoptera. Conclusions will be made regarding the different weather conditions individual species prefer and preferences for certain types of habitat.

### Methodology

Different sampling areas of the park have been chosen to allow comparisons to be made about the habitat preferences of each species. 52 study areas have been selected throughout a range of microhabitats. These study areas - or transects - are all of equal distance to ensure consistency.

In each transect, 12 fixed traps are deployed at heights of 2.4 and 6 meters at each corner. Collections are made on two days every week, and the time of year and seasonal variables recorded. Each trap contains fruit to attract the insects.

When collecting individuals from traps, all live specimens are set free, and those that cannot be identified are taken back to the lab to be identified later, although this is extremely rare. Once identified they are placed in a refrigerator for 25 hours and then prepared on sheets of polystyrene using entomological pins and kept for display and educational purposes.

## BAT PROJECT

### General Aim

- Identify and monitor the species in the order Chiroptera in order to establish a basis as to the status of bat populations in the Barra Honda National Park.

### Objectives

- Capture and identify individuals in the order Chiroptera in the Barra Honda National Park, Cerro Barra Honda area.
- Compile an inventory of the different sites.
- Calculate the relative abundance of the different species found.

- Compare the activity of bats and environmental variables such as weather patterns.

Barra Honda National Park is home to thousands of bats of many different species that roost in the vast network of caves as well as many species, such as *Artibeus phaeotis*, that build their shelter in the leaves of seasonal plants. In fact, Projects Abroad has found this species dwelling in the Panama tree *Sterculia apetala*, which was a fact new to science, proving that there is a need to study all the bat species in this area to gain greater knowledge in order to help protect them in the future.

To date the Projects Abroad team has recorded 37 different species of bat within the park highlighting their importance to the eco-system and the need to study them over time and identify fluctuations in their numbers.

## **Methodology**

Trapping is the standard way of determining the population of small mammals (Barnett & Dutton 1995). Mist nets are used to trap the bats and are 12 meters long by 2 meters high. Each net is placed along the trail roads in Barra Honda and are around 50-75 meters from each other covering an area of of 250 meters.

Volunteers and staff then set up a recording station 75 meters from the last net and the nets are checked every 45 minutes. Captured individuals are taken to the recording station, identified and the wing span, body length, weight are all recorded. Each individual is then marked using nail polish on one nail and released.

On each night, the phase of the moon and location within the park are noted.

## **BIRD SURVEY**

### **Aim**

- Compile an inventory of all bird species recorded at the park.
- Act as a basis for further study by identifying endangered species within the park.
- Act as a method of testing the health of the entire park eco-system.

### **Summary**

Birds play an important role in the ecosystems as plant pollinators, insect eaters, seed dispersers and they are a vital part of the forest's food chain. They are relatively easy to identify using the correct tools (binoculars, books etc.), they are present in most habitats, and they are good indicator of the health of the ecosystems and environment (INSKIPP & al., 2011 and SAGAR BARAL & al., 2005). Birds, like many other species, are facing pressure and threats from human activity. Some of the threats that birds are facing include habitat loss and fragmentation, human activity, agriculture, pesticides, fertiliser, over-grazing by livestock, deforestation, degradation of forest, over utilization of forest, poaching, pollution, trapping, disturbance, drainage, destruction of feeding and nesting sites, river pollution, burning area, over-fishing, over-exploitation, and climate change. (INSKIPP & al., 2011 and SAGAR BARAL & al., 2005).

### **Methods**

Projects Abroad staff and volunteers are conducting assessments in various locations throughout the park utilising *Birdlife Internationals' Important Bird Areas* data sheets that are made available to the public who are assessing bird habitats. Data for the park will then be submitted to Bird Life International.

A number of line transects of 2 km have been selected throughout the park so that each habitat and area is represented at least twice. Observers record data along these transects on foot, and every 200 meters they stop and record data for 5 minutes. Over time this data will compile an inventory and allow conclusions to be drawn on the preferential habitats of each species.

## INDIGENOUS TREE PROJECT

### Aim

- To identify and map 5 species of indigenous tree species within the park
- Conduct a basic assessment of these trees.
- Collect seeds from each species for a seed bank and to germinate to plant saplings of each.
- Determine seed densities of individual specimens to study the potential regeneration and the potential for the food supply of seed-eating species.

Target tree species:

- Sweet Cedar (*Cedrela salvadorensis*)
- Spanish Cedar (*Cedrela odorata*)
- Cocobolo /Rosewood (*Dalbergia retusa*)
- Mahogany (*Swietenia macrophylla*)
- Ron Ron (*Atronium graveolens*)

Approximately 50 years ago, deforestation was a big problem in Costa Rica, and for this reason many species of trees became vulnerable to local extinctions. As trees take a long time to grow, it is important to reverse the trend and get these species back into the eco-system and contributing to the ecology of all species that depend on them.

It is crucial for Barra Honda to have its forest in good health as it is categorized as a dry tropical forest and is at high risk to forest fire. Maintaining a healthy population of each species and having a healthy stock of each species seed will help mitigate the effects of such an event.

### Methods

Locations of each tree species are recorded through existing knowledge and through strategic exploring. Once the trees are located their GPS locations are noted. The diameter and height of each tree is recorded. Other data recorded includes damage to the tree, lowest living branch, gradient in which it is growing and any special features. Photographs are also taken to make comparisons over time.

## FUNGI INVENTORY

Fungi are one of the most important groups of organisms on the planet. This is easy to overlook, given their largely hidden, unseen actions and growth. They are important in an enormous variety of ways and especially in a dry tropical forest where almost all of the trees lose their leaves once a year creating a huge amount of leaf litter on the forest floor.

As the trees in the forest lose their leaves, it is vital for the health of the eco-system for this energy loss to be recycled and used for the growth of new leaves and the regeneration of all the forest's inhabitants.

It is fungi along with bacteria that are responsible for this recycling of energy and nutrients. Without the presence of both, it would take a much longer time for dead matter to be broken down. Therefore the presence of fungi is paramount to the health of any forest.

## **Aims**

- An inventory compiled to assess the diversity in fungi species found within the park.
- Relative abundance determined to assess the health of the forest's fungi presence.

## **Methodology**

A study site within the park has been selected, as it is an existing path that transects both primary and secondary forest. The path is 800 meters long and is used to scan for the presence of fungi. All volunteers taking part in this survey are trained in locating, identifying and sampling fungi species.

Both sides of the path are inspected for the presence of fungi at a distance of two meters from the edge of the path on both sides.

Data sheets are used to input notes in the field of species, abundance, substrate and a description. Photographs are also taken of the pileus, hymenophore and the stipe.

Each specimen is identified in the field using field guides. Those that cannot be identified are photographed and sent to experts for accurate identification.

To estimate the abundance, the frequency of each species is noted as being high, medium or low at each observation site.

When identifying substrates, different categories are selected such as clay, sand etc..

For species that can be confused with many others, further measurements are noted.

## **BIO DIGESTER**

### **Aim**

- To install and operate a bio digester among the offices and accommodation buildings in the Barra Honda.
- Produce biogas to be used for staff and volunteers' meals.
- Use the bio digester as an educational tool for visitors to the park including volunteers, and for local schools and communities.

### **Summary**

The biogas bio digester is installed underground and connected with a series of underground piping that feeds it with raw sewage. After installation, the bio digester takes up to 4 weeks to create a starter culture of methanogenic (CH<sub>4</sub> producing) bacteria. The system is then fed daily with raw sewage allowing the bacteria already in there to extract energy from the waste and generate methane gas as a by-product.

This project is also in collaboration with the national park as it is fed by a series of nine bathrooms and one kitchen that is shared amongst park staff, Projects Abroad staff and Projects Abroad volunteers.

Barra Honda National Park's effluent does not have an adequate treatment tank. The waste travels to septic tanks and leaks into the soil, which has the potential to contaminate land and the water in the immediate areas surrounding each tank. Projects Abroad would like to eliminate this pollution in line with our conservation work and set the standard for environmental protection and sustainable living in Costa Rica.

## REMOTE SENSOR CAMERAS

### Aim

- Compile an inventory of mammals found in the park through the use of remote sensor cameras.
- Check for presence or absence of specific species in specific areas.
- Establish a basis for the further study of vulnerable and endangered wildlife.

### Methodology

A series of transects are chosen throughout the park in suitable habitat and with suitable pathways. Within each sector, 100m x 100m quadrats are established. The cameras are then deployed in suitable areas within the quadrat.

Each quadrat is studied for a period of 4 weeks before changing the location to another area in the park. During each individual study of each quadrat, weather variables are recorded, and a general habitat assessment noted.

## ENVIRONMENTAL EDUCATION

Education is one of the most important tools and techniques available to a conservationist. Any change to human behaviour in favour of biological conservation is a welcome initiative. Education can also act as a method to ensure compliance with legislation. An example of this is when poachers realise the penalties of their actions, they often think twice. It is often a lack of awareness from humans that cause environmental problems and reversing this trend by teaching people will result in a decline in environmental degradation both globally and locally.

Projects Abroad recognizes the importance of environmental education and identifies this as a way in which international volunteers can make a huge impact.

### Aims

- Encourage a general interest in wildlife.

- Generate greater awareness of conservation issues.
- Bring about specific changes in opinion.
- Disseminate specific information and training in areas such as forest fires, hunting, deforestation, irrational use of resources and pollution.
- To get awarded the Costa Rican Blue Flag Award.

## Methods

Initially, three schools in the surrounding area of Barra Honda have agreed to take part in the education program. Each class will take lessons once a week over a period of five months to address all issues in the Projects Abroad environmental curriculum.

Projects Abroad aims for each school to begin initiatives in:

- Bio – Garden - Use plants to filter wastewater and produce clean water.
- Nursery Garden – Begin growing endangered tree species for replanting.
- Recycling – Set up recycling stations that each material can be collected from.
- Composting – All organic waste disposed of to produce nutrient rich compost.
- Eco toilets – Change the systems to use less water and encourage the reuse of water.
- Waste Separation – At all garbage sites implement separate containers for each waste type.

## MONITORING ENVIRONMENTAL VARIABLES

It is almost impossible to monitor population trends of a species or make sound management decisions in conservation without considering environmental variables. Many of these variables can be monitored at the study site or relatively close by. At Barra Honda, Projects Abroad has a complex weather station that measures many variables such as temperature, rainfall, and wind speed and wind direction. As we study many different types of organisms that react to weather fluctuations differently, it is important to understand this when drawing conclusions on individual projects.

# Future Projects

## OCELOT SURVEY

Barra Honda National Park has very little scientific information on the ecology and population dynamics of ocelots and their prey. As Projects Abroad has recorded ocelots within the park on remote sensor cameras, the team is excited to plan and launch a new project to gain knowledge of these cats within the park.

## AMPHIBIAN PROJECT

During the wet season Barra Honda becomes alive night and day with a strong presence of amphibians. There is very little knowledge of the many species that reside in the park and currently there is no monitoring. As amphibians are directly related to water levels, their numbers can be compared to weather data to gain a holistic view of how weather patterns affect the park and will affect the park in the future.

## PRIMATE RESEARCH

The primates found in the park are white-throated capuchins (*Cebus capucinus*) and mantled howler monkeys (*Alouatta palliata*). Both species have significant populations but with no previous research, population estimates are unknown. As both species feed on flowers, leaves and fruit, their numbers can reflect the health of the forest. With very little knowledge on these species and their interactions with the Barra Honda forest, it is important to learn more about their ecology during different times of year. The structure of each population will also be very important in determining whether each species is in decline or increasing.

## IMPLEMENTING THE PLAN

As Projects Abroad places volunteers, interns and professional into hundreds of projects worldwide, it is vital that these resources are deployed in a way that utilizes their strengths and coincides with the aims and objectives of the project.

To ensure all resources available to the project are being used correctly Projects Abroad employs five staff on site directing the daily activities and ensuring research is being carried in accordance with this plan. Projects Abroad also has a conservation program manager ensuring constant consultation with experts and the project is correctly managed.

### **Staff at the project:**

- Anthony Ruiz, Conservation Manager.
- Eduardo Artavia, Biologist.
- Oscar Cubero,, Assistant biologist.
- Jose Mario Gonzalez, Conservation Coordinator.
- Oscar Rosales, Conservation Coordinator.
- Meicel Guevara, Chef and motivator.

## REPORTING ON RESEARCH

Data collected at the project will be sent to Projects Abroad head office in the U.K. to be reviewed by the Conservation Programme Manager. Internal reports will be written using these data sets and made available to the public through a public domain.

When data sets are sufficient reports will be peer reviewed by leading experts with the aim of publication in scientific journals.