

Conservation Management Plan

Mexico

ProjectsAbroad



Partners:



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1. OVERVIEW

1.1 Description of Mexico:

Mexico has very diverse habitats with almost two-thirds of the country's terrain consisting of mountains and highlands of three significant different ranges. Deserts dominate the north and tropical rain forests are found in the south. It has a 10,143 km of coastline, of which 7,338 km face the Pacific Ocean and the Gulf of California, and the remaining 2,805 km front the Gulf of Mexico and the Caribbean Sea. Mexico also shares borders with the USA to the north and Belize and Guatemala to the south. Mexico is the 13th largest country in the world and the 5th largest in the Americas.

Mexico is a privileged country for its biodiversity and is in fourth place among the countries with mega-biodiversity along with Brazil, Colombia and Indonesia. It occupies the first place in all lists of biological diversity that have been developed in the world. The mega concept only applies to a very small number of countries: those containing an extraordinary percentage of the planet's biodiversity - between 60 and 70% of biodiversity on the planet. Mexico is one of the most important of these. The majority of these mega-diverse countries are totally or partially found in the tropics. Due to the geographical features of Mexico the country can be split into two biogeographic regions, Nearctic and Neotropical. These two regions intertwine in Southern Mexico making it an incredibly important area for biodiversity.

Mexico is situated on top of three large tectonic plates, making it one of the most seismological regions on earth. Mexico has many active volcanoes with Volcán de Colima, situated near Guadalajara, erupting in 1994, and several others that have been dormant for decades. Popocatepetl and Ixtaccíhuatl ("smoking warrior" and "white lady," respectively in Náhuatl) occasionally send out puffs of smoke clearly visible in Mexico City. There are also earthquakes throughout the country, of which some are more destructive than others.

The Tropic of Cancer runs through the country and divides it into tropical and temperate zones. Land to the north has cooler winter months and to the south there are much more even temperatures all year round that only differentiate with variations in altitude. There are pronounced wet and dry seasons in Mexico, the general wet season is from June to mid-October, and the hurricane season, on both coasts, runs from June to November.

Conservation in Mexico is not a modern concept. In pre-Hispanic times the ancient Mayan people declared large areas of strictly protected zones within their exploited areas. In the fifteenth century large areas in the Valley of Mexico were reforested and then in the sixteenth century zoological parks and botanical gardens were created by the emperor Moctezuma II.

In modern times the Mexican government is still declaring protected areas, during the 1930's 82 areas were declared as National Parks and Forest Reserves, and at this time a specific government sector was created to help with its protection. Although this level of protection decreased over the next two decades in the '80's-'90's another 35 areas were protected including many marine and island areas. In Mexico there are various types of protected areas: federal, state, municipal, community, and private. However only 5% of the land mass of Mexico is actually under any type of protection.

Mexico's coat of arms is centred on the flag, featuring an eagle eating a serpent, perched on a prickly pear cactus above a lake. This image comes from an Aztec legend.

The Projects Abroad conservation project is situated in the state Colima on the central Pacific coast which is famous for its lime production. Three quarters of the state consists of mountains and hills but the coastal area has mangrove forests, deciduous rainforests, scrubland and lagoons.

1.2 Map of Mexico and Colima to show the camp location:



1.3 Tecoman, Colima:

The temperature of Tecoman city always fluctuates a few degrees above the average temperature of other adjacent areas not so densely built up. This effect is known as “hot spot”, where the temperature of cities increases as the vast energy consumption eventually becomes heat which then reverberates off asphalt and rooftops, which act as solar collectors.

In Tecoman there exists semidry climates, warm BS1 (h ') to the north and centre of town, on the south, warm humid A (w0). The average annual temperature is 26.3 °C, with an average annual rainfall of 810.6 mm. This occurs being mainly in the summer.

The 60.35% of the total climate corresponds to A (w0), while the remaining 39.65% corresponds to the climate BS1 (h ').

1.4 Chupadero Beach:

It is located in the municipality of Tecoman, in Colima, Mexico. It is a long stretch of black sand that extends over a wide gently sloping beach with a sharp fall-off into the ocean. It has relatively calm surf but with strong currents offshore. This site is accessed by dirt road 1km from a tarmacked surface. The drive from Tecoman to Camp Chupadero takes 25 minutes.

Nearby is the estuary of the same name, "Laguna Chupadero", and it has calm waters with a green-bluish tinge caused by the many weeds that feed the abundant bird population. Among the most important features we can mention are the following: it is surrounded by a forest of four species of mangrove, which provides refuge for several species of mammals and birds, and is particularly important as a year round food and water supply for migrating bird species.

2. Chupadero Flora and Fauna

2.1 Flora:

Our natural local flora is limited due to the surrounding farmland. However the lagoon has its mangrove forest consisting of four different species of mangrove: *Rhizophora mangle* (red mangrove), *Laguncularia racemosa* (white mangrove), *Avicennia germinans* (black mangrove, mother of salt) and *Conocarpus erectus* (buttonwood mangrove). Chupadero has all four species that can be found in Mexico. The black mangrove is a rare and endangered species and is offered more protection as a result. Each black mangrove tree is marked within the Chupadero forest to emphasise this.

There are some naturally occurring palm trees lining the coastline, however these are mostly used by humans for harvesting the coconuts. The shrubs lining the dunes are also left to their natural state and keep the structural integrity of the dunes stable.

2.2 Fauna:

Our most abundant species on the beaches of Chupadero are the Olive Ridley sea turtle (*Lepidochelys olivacea*). However we also have nesting Leatherbacks (*Dermochelys coriacea*) and Black (*Chelonia mydas agazzisi*) sea turtles.

Black Turtle



We regularly find the following three mammals on the beach as they predate on the sea turtle eggs:



- White nosed coati (*Nasua narica*) – photo left
- Common Opossum (*Didelphis marsupialis*)
- Northern raccoon (*Procyon lotor*)

The mangroves support many more species of mammals, including the Neotropical river otter (*Lontra longicaudis*), collared peccary (*Pecari tajacu*) and white-tailed Deer (*Odocoileus virginianus*). However we lack more accurate data for this specific environment and hope to fully explore the wildlife of the mangroves using our remote camera sensor project, thus compiling an accurate and complete species list.

The bird life found on the lagoon is more extensively documented and its function as an important stop-over for migrating birds means that there are many species to be found. These include: herons, egrets, coots, gulls, pelicans, ducks, divers, sandpipers, doves,

orioles, kingbirds, jacanas, grackles, blackbirds, cormorants, anhinga, spoonbills, hawks, kites and ospreys.

There is also the American crocodile (*Crocodylus acutus*) found in the lagoon, and, where we work at the captive breeding program for crocodiles, the Mexican crocodile (*Crocodylus moreletti*).

3. Threats to the Area

3.1 Sea Turtle Poaching:

The main threat that directly affects our camp area and makes our presence in Chupadero so important is the threat poachers pose to the survival of marine turtles. Without our assistance in retrieving all the nests laid on Chupadero beach future generations of sea turtles would be taken before they are able to hatch and reach the sea. Our presence helps rescue these nests and also limits the amount of illegal activities on the beach. The other threat that these poachers pose is killing the adult turtles as well. This is so they can take the eggs quicker by cutting the eggs out of the laying females. So not only are we helping to protect future generations but also our present population of sea turtles.

The Olive Ridley turtle is currently in a very fragile but stable position on the pacific coast of Mexico. Therefore conservation efforts will help to decrease the fragility of the species but any negative effects on the species will help to quickly destabilise the equilibrium in this area and potentially change their “Vulnerable” status to “Endangered” on the IUCN red list criteria.

3.2 Mangrove Deforestation:

The forest surrounding our local lagoon is a mangrove forest, which in turn is surrounded by farmland. As most of the farmland that borders the mangroves is remote there is little or no supervision of the protection of the mangroves and as such there is undocumented deforestation to create more land for profitable farming.

Mexico has already lost 65% of existing mangrove ecosystems since the 1970s according to estimates by the National Institute of Ecology (INE). Most alarming is that every day 4.43 hectares is lost, an area similar to six football fields, representing every year losses of 2.5% of remaining mangroves. The INE indicates that if annual loss rates remain constant, by 2025 there will be a decrease of 40-50 % of the mangrove area present in 2000.

3.3 Mangrove and Ocean Pollution:

The second and very real threat to our local ecosystem is the run-off of industrial pesticides and fertilizers from nearby farms. There is a huge irrigation system that runs through all the farmlands and runs directly into the lagoon and a river just north of camp that goes into the ocean.

3.4 Hunting:

Although there is not a perpetual hunting problem within the mangrove system, this is because the area is so inaccessible. If an edible animal presents itself as easy prey they will be taken. This happens mostly with iguanas, deer, peccary and many of the smaller animals that are easier to take.

4. Turtle Project

4.1 Summary:

Sea turtles have survived many natural disasters which caused the extinction of other species at different stages in their evolution. They have successfully adapted to their environment and are important members of marine ecosystems worldwide. But this tenacious survival instinct and ability to withstand natural changes and disasters is failing to withstand the pressures exerted by humans. Any artificial pressures exerted on wild populations are usually quick and unexpected and do not give the species a chance to adapt and survive

Turtles belong to the clade Sauropsida and within this group we find the order Testudines (Quelonia), in which sea turtles are grouped into two families Cheloniidae and Dermocheloniidae.

Of the seven species within these two families, only three nest on the coast of Colima: Olive Ridley (*Lepidochelys olivacea*) the Black turtle (*Chelonia mydas agassizi*), which is sub-species of the Green turtle, and the Leatherback (*Dermochelys coriacea*). The Olive Ridley turtle is typical of the Pacific and Indian oceans, being the most common on our western coast.

To date Projects Abroad has released nearly **1.5 million** turtles back into the oceans!

4.2 Aims:

- Save as many nests per season and move them to a protected area.
- Keep in optimal conditions the hatcheries of sea turtles located on the nesting beach with this development strengthening the existing conservation program at the Centre for the Conservation of Sea Turtles "El Chupadero".
- Reduce the impact of illegal extraction of both eggs and adult turtles
- Record the temperature and humidity of the nests to help make more informed decisions in the future

4.3 Methodology:

Patrol the beaches at night on the quad bikes with an experienced member of staff. On patrol, turtle nests are located by following the turtle tracks moving up the beach. A track with disturbed sand at the highest point of the trail has a nest. If there is a hole dug and left open then the track is called a false crawl and abandoned by the female and ignored by the patrol. When a clutch of eggs has been laid we recover, noting the time, date, location, number of eggs, and if the adult turtle is present, take notes on the physical condition of the turtle and measurements of the carapace. The eggs will then be brought back to camp and reburied at the same depth as the turtle laid them, the sand that surrounded the eggs is also buried with the eggs as this has fluid secreted by the mother that provides additional protection against bacteria found in the sand.



After the eggs have been buried, the figures from the data sheet are entered onto a database, allowing us to collate information on how many eggs we have collected.

A minimum of 45 days after collecting the nest, turtle hatchlings will start to climb their way out of the nests. At which point they are collected and placed in a container to release on the beach when they are in their most active state. Hatchlings are released after emerging and once the rest phase is over, the release should occur preferably at night, when temperatures are low and when there is no presence of birds or other predators.



In nature hatchlings emerge in the early hours of darkness so by dawn they have come quite a distance away from the nest before being seen by many predators. As a result the nests are checked at regular intervals throughout the night.

The run down the beach for the hatchlings is needed for “imprinting”, therefore babies are released on the beach and not less than 6 meters from the water line and are left alone to get to the sea. This ensures that they have the time to collect the necessary parameters to return to their natal beach.

When all the hatchlings have hatched, the nest is cleaned and the number of dead turtles and infertile eggs are counted. This is subtracted from the number of eggs buried, giving us the number of turtles that were successfully released. These figures are then entered onto the database, giving us our success rate.

To take temperature and humidity data using thermocouples, the equipment goes in the nest from the day it is found and reburied in the hatchery, and the temperature is taken every 6 hours, three times a day.

Sea turtles determine the sex of their embryos by the temperature of the nest where, studies have shown, exists a thermal point of balance called the “pivotal temperature”. Developing embryos reaching their fifth week of incubation (depending on species) are influenced by this temperature. Most embryos that develop in an environment warmer than the pivotal temperature will become females and those cooler, males. Another critical factor is the humidity of the sand as this facilitates the development of the embryos. However, if the humidity levels are not correct then fungi can grow and infect the eggs. This is why the measuring of the temperature and humidity of the nest is so important and can help us determine any adjustments to the hatchery that may be needed to help in the correct development of the eggs.



A female leatherback turtle on her way back to the ocean

5. Lagoon Bird Survey Project

5.1 Summary:

The Chupadero lagoon has been categorised as a Ramsar site and Projects Abroad was officially recognised for their efforts in achieving this status. The Ramsar convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Chupadero Lagoon was awarded this status on 2nd February 2008 with matriculation number 1764.

The lagoon has an important mangrove ecosystem that contains many species of birds, some that are in danger of extinction and others that are both striking and rare. For this reason we are performing a census that will indicate what species are present and how many individuals we have in the different lagoon habitats. We aim to investigate any differences in diversity between habitats which can also be compared to research from other areas.

5.2 General Aim:

- Create a census that gives information about the species and abundance of birds in the different habitats throughout the Chupadero lagoon.
- Create a species list for the birds found at the inland lagoon named Colorada.

5.3 Specific Aims:

- Create regularly visited fixed observation points in the lagoon.
- Know the abundance and the diversity of species of birds that can found in the different habitats within the lagoon.
- Analyse local migrations of species between the different habitats and the seasonality of the movement.



5.4 Methodology:

The study area is the lagoon Chupadero and a boat is used to study the birds. We identify species, numbers, location and behaviour which are all recorded on data sheets and inputted into our own database. Each individual survey lasts for 20 minutes and they are performed at fixed still points, where there is 360° visibility, and in a sweeping survey where there is limited visibility due to close channels and spreading tree branches. There are six different points for the still surveys and three for the sweeping channel surveys. These different areas were chosen for consistent bird activity, easy access in a boat and for a good 360° view for the still spots. The best channels were selected which allowed the best views without too much tree growth for the sweeping surveys. The different survey points are spread as evenly around the lagoon as possible to generate a complete data set.

We hope to process this data and start to understand the population dynamics of the lagoon by studying when migratory birds arrive, how long they stay and whether this affects local bird populations. For example are resident birds displaced by the arrival of migrants? Do they seek refuge in different areas of the lagoon? Do the stormy seasons affect bird distributions?

All these questions, and more, can be addressed with comprehensive data sets taken at fixed locations year round. Ways to study this data can use recognised statistical tests such as relative abundance which can be analysed over the course of the year.

$A \times B \div 100$ = abundance of species in the observation day.

Where- A= number of birds seen in the same species, B= total birds.

Other tests can also be applied as our data sets increase and we begin to understand how the bird populations behave on the lagoon.



6. La Colorada Crocodile Centre

6.1 Summary:

In the state of Colima there are two species of crocodile- the American (*Crocodylus acutus*) and the Mexican (*Crocodylus moreletii*). The American crocodile historically resided in the area but the accidental introduction of the more aggressive Mexican species from government breeding centres has caused the numbers of the American crocodiles to deplete in affected areas. The crocodile breeding centre at Laguna Colorado was one of these breeding centres and is now working to confine the Mexican species to the lagoon whilst working to reintroduce the American species back into areas where the numbers have dropped. The lagoon is now isolated by fencing from the surrounding areas and we hope to continue our involvement in the running of the centre and help with the new breeding project for the American species and their future reintroduction.

6.2 Aims:

- Determine the number of crocodiles that exist in the Laguna Colorada and evaluate if the populations are stable.
- Help in the maintenance and day-to-day running of the centre.
- Create within the current infrastructure a museum about the species of reptiles found in the area for education of both school groups and other visitors.
- Aid in any proposed re-locations of problem animals.
- Take biometric data of captive bred crocodiles to assess growth rates and suitability for release
- Create a species list of birds for the lagoon to demonstrate its importance as a site of high biodiversity

6.3 Methodology:

To determine the number of crocodiles in the lagoon night surveys are carried out when the moon is at its minimum exposure. A paddle boat (for minimum disturbance) is taken out onto the lagoon; using a powerful torch the entire surface of the lagoon is scanned and all crocodile eyes spotted are recorded. The size of each crocodile is estimated by calculating the distance from eyes to snout and multiplying by a factor of seven. This way the crocodiles can be divided into size categories. Over time we can use this data to monitor changes in the populations in the lagoon and assess whether captive individuals can be released into the area.

One of our commitments to the crocodile centre is to help in maintenance and cleaning. This involves cleaning the pools of the captive animals and maintaining the elevated walkway that circumvents the lagoon. This walkway is essential for monitoring the animals and provides us with access to different habitats around the lagoon and the associated fauna.

The crocodile centre is often approached by local residents that are having difficulty with “rogue” crocodiles near their homes or on their farms. We help in the safe capture and relocation of these animals into an area that has been evaluated and deemed suitable for the introduction of an adult crocodile. At no time are volunteers in danger during the capturing process and will only become involved when the animal is safely under control.

Baby crocodiles born in captivity must be carefully monitored for growth rates, weight and general health. This biometric data is very important and the young hatchlings are kept at a 28 °C and fed twice a week to maximise their growth rates to allow a quick release back into the wild. Volunteers help in this process and are involved in the whole process from birth to release.





We are currently undertaking an extensive bird survey at the crocodile lagoon as we aim to compile an accurate species list over the space of an entire year with all the differing seasons. The lagoon is vital to the local fauna as during the dry season the water levels are maintained and this attracts many unusual species that come down from the nearby highlands. Data collected on the birds of the area is essential in understanding these local migrations and further emphasises the

importance of the lagoon as a biodiversity hotspot. The survey is performed by walking the circumference of the lagoon using the specially designed walkway and identifying each individual bird using both binoculars and photography coupled with extensive field guides.

The aim for the beginning of this year is to create a museum on all the reptiles and birds in the area to increase the education and environmental awareness of the tourists and school groups that visit the area. There is currently a large unused room that only has a few crocodile skulls and a replica of a crocodile nest at the centre, so the Projects Abroad volunteers will help to create poster boards giving information to visitors. This information will describe the life-cycle of crocodiles, their evolution; the different species found in Mexico, and describe other reptile species found in the area (e.g. turtles, iguanas, snakes). A short video loop will be created to help with different learning methods. A section of the room will be taken up with the display of the different bird species found at the lagoon, and at what time of year to find them.

7. Secondary Project:

American Crocodile (*Crocodylus acutus*) Breeding Program

7.1 Summary:

As mentioned above the American crocodile (*Crocodylus acutus*) has been outcompeted by the Mexican species (*Crocodylus moreletii*) in many areas within the state of Colima and we are keen to help set up a release program to re-establish their numbers in areas where they have become rare. The lagoons Almela and Cuyutlan in the Colima region of Mexico have been identified by the Colima Environmental Office as areas with declining populations of American crocodiles and as such would be our first choices for repopulation. Monitoring of these lagoons has demonstrated that there are no invasive Mexican crocodiles currently living there and so the American species should be able to recover quickly when breeding numbers increase.

7.2 Aims:

- Incubate and hatch American crocodile eggs from two or three different clutches for the first year of breeding.
- Keep the young individuals in a contained habitat for a year to become large enough for release.
- Safely release the juvenile crocodiles into the wild.
- Keep monitoring the sites after release to ensure the health of the population.

7.3 Methodology:

The breeding season for American crocodiles is at the beginning of the dry season, which is approximately March. The clutch sizes are from 30-60 eggs. At the beginning of March the breeding pair of American crocodiles at the Colorado crocodile centre may produce a clutch of eggs. Last year they did not produce any eggs so a backup to this eventuality is to search the shores of Laguna Chupadero in the El Caiman area for a nest. This is an area free of Mexican crocodiles but with a stable population of breeding American adults. Only one nest will be taken for the breeding project but any nests that are found on the shores of Colorado lagoon will be taken for protection. After hatching, skin samples of the individuals and the clutch found on Colorado will be taken and sent to the University of Manzanillo to compare and see if the Colorado clutch is viable for release as there have been some cases of cross-breeding between the two crocodile species.



The eggs will be hatched using the facilities currently available at the Colorado Crocodile program. They will also be kept here for the entire time before their release into the wild. They will be kept for a year to grow into juveniles that are better able to defend themselves from any predators. Then when the individuals are deemed large enough they will be released into the chosen lagoons and monitored as they adapt to their new habitats.

Long term studies will investigate how the population evolves and whether there is an increase in wild-breeding adults.

8. Beach Clean-ups

8.1 Summary:

Coastlines all over the world become polluted with rubbish every time the high tides recede. Whilst we cannot prevent rubbish being dumped at sea we can educate locals not to throw rubbish away on the beaches. Bits of plastic, broken bottles and other garbage are hazardous to animals and people alike without even considering the aesthetic issues of seeing beautiful beaches covered in debris. To date volunteers and staff have collected and recycled over 2 tons of rubbish from the beaches under our supervision here in Mexico.

8.2 Aims:

- Walk the turtle beaches regularly collecting rubbish to be brought back to camp for recycling and safe disposal
- Environmental awareness campaigns using posters, bins and school presentations to try and educate people on the damage discarded rubbish can cause
- Weigh and record the amount of rubbish collected

8.3 Methodology:

Using protective gloves volunteers and staff will patrol the beaches and collect any rubbish found. The beach is split into sections and each one will be monitored in order so that the entire stretch is cleaned before we start over again.

Volunteers will separate rubbish for recycling back at camp and plastics, glass and paper will be managed appropriately and taken off to recycling plants.

Volunteers will help design posters and signs to be placed at strategic points along the beach where locals picnic and visit. These will be accompanied by large bins for rubbish disposal which we will empty at least once a week.

Proposed Projects:

9. Remote Camera Sensors.

9.1 Summary:

The Chupadero lagoon is home to a wide variety of mammals including the elusive Neotropical otter (*Lontra longicaudis*) which we have been fortunate to see a couple of times. Other mammals include deer, coatis, peccaries and many other small species.

9.2 Aims:

- Photograph mammal species present in the lake the Chupadero mangrove forest to complement the existing list of mammals.
- Monitor the species found in the photographic sample set, in order to obtain the necessary data to calculate the relative abundance of different species.
- Assess if there are different mammals using areas within the different species of mangrove.
- Establish a basis for defining the status of populations from the data obtained in the study,
- Use the photos to help with education of the local population that visit the lagoon about the importance of protecting mangroves and their wildlife.

9.3 Methodology:

The sampling is directly through photographs from sensor cameras. A quadrat method will be used for the cameras. For this type of study this method maximises our chances of capturing wildlife on film. A description of the flora and habitat of each camera site must be thoroughly recorded before setting up each quadrat. GPS data must also be collected for each site so that results can be referenced on larger scale maps of the area. Areas with a majority of one of the four types of mangroves will be used to try to assess if different animals prefer habitats dominated by specific tree species.

The cameras have 6 rechargeable D or C batteries each, which are changed every week before being placed back in the field. The external memory capacity ranges between 256 MB and 1 GB, and the camera will be set to three photos for every trigger to ensure that nothing will be missed.

10. Green Iguana Re-introduction Project

10.1 Summary:

Historically the Chupadero lagoon has provided sanctuary for large populations of green iguanas (*Iguana iguana*). The mangrove forests are excellent habitats for these magnificent reptiles but deforestation and increased human impact from fishermen and tourism may be having an impact on the numbers. The project would perform an initial census to evaluate the state of the green iguana populations to then decide if further action is needed.



As a non-extractive breeding program will potentially be used, individuals found in the mangrove forest Chupadero, will be used in this program as this is where we plan to release our specimens. This means there will be no mixing of gene pools to change genetic variation just an increase of the natural survival rate of the green iguana found in Chupadero's mangrove forest.

The program will provide protection for the young of the species until they are large enough to make them less vulnerable to predators. The iguanas of the mangrove forest are no longer as numerous as they once were according to local knowledge, however as there is no official scientific study of green iguanas in the area it is important to assess the area first to check the status of the current population. If it is found that there is a healthy, breeding population then there will be no need for the breeding program to be set up.

10.2 Aims:

- Ascertain if there is a need for a breeding program to re-establish populations of green iguanas in the Chupadero mangrove forest.

If such a program is necessary:

- Provide protection for young iguanas from predators whilst they grow into adult specimens.
- Release juvenile individuals into areas of the mangrove forest Chupadero that we have designated as suitable
- Keep a breeding male with several females to slowly increase the numbers of individuals available for release.
- Keep performing the habitat surveys after the release of our individuals to monitor the growing population.

10.3 Methodology:

Firstly a habitat and single species survey will be performed throughout as much of the forest as possible. As the forest is approximately 40km², line transects will be used to cover the largest area possible. Notes will be taken on where any iguana is spotted, their size and approximate age, and any visible injuries or other notes of interest.

If a breeding project is deemed necessary then young individuals will be found and safely caught from the Chupadero Mangrove forest and given protection in specially designed enclosures on Camp

Chupadero, 1km from the edge of the mangrove forest. The enclosure will be made using smooth concrete walls, there will be vegetation to create a natural environment, with artificial feeders. The surroundings will be low vegetation to help keep the enclosure as undisturbed as possible for the iguanas. The floor will be made up from soil substrate taken from the Chupadero mangrove forest.

When the first group of individuals are grown and their sex determined, the first release will occur. The only individuals kept will be a single male and several females for breeding purposes. When these breeding individuals produce eggs they will be removed to a specially designed hatchery for closer observation and measurements. After three successful clutches the breeding adults will be released and new ones captured in order to maintain genetic variation in the wild populations.

The iguana egg hatchery will be in a building with many windows to allow for good light and ventilation that can be easily adjusted with the needs of the nests temperature and humidity. The floor will be of concrete to allow for disinfecting the entire area between batches of eggs.

Nest boxes will be individual buckets of approximately 19 cm high, 13 cm and base roof 20 cm. The substrate used to nest the eggs will be a careful mix of fine sand (20%), alluvium (60%) and vermiculite (20%). The conditions for the incubation will be maintained with the temperature of the nests within a range of 26 to 31°C with a relative humidity of 13-15%. These conditions will be closely regulated using the temperature and humidity reader three times a day, first thing in the morning, at noon and then after sunset carefully recording the results each time.

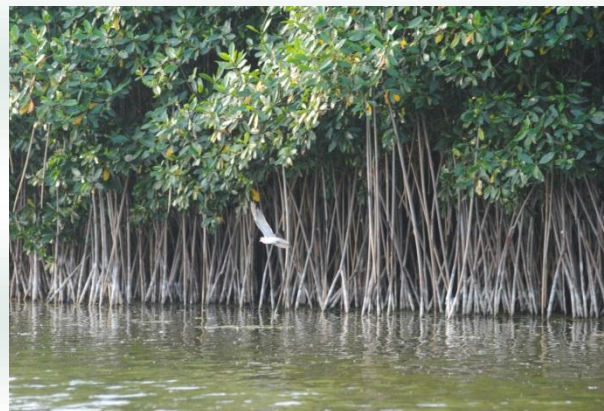
Once hatched, the young will be kept in an area with their fellow hatchlings with heat regulations for a period of a month. Then, when old enough, they will be moved to a different enclosure with the adults, under similar conditions, until they are ready for release.

This method of breeding iguanas has been taken from the proven method used at UMA Lucernas University in Veracruz.

11. Mangrove Reforestation Project

11.1 Summary:

The limiting borders of the Chupadero lagoon support four different species of mangrove trees and these areas are in constant contact with local residents. Areas cleared for agriculture cannot be recovered as the land is now being used for farming and whether legal or not we cannot retake the land without backing from the authorities. However the coastal border of the lagoon suffers from illegal extraction whereby locals cut down the trees for firewood. Our long term presence in the area means that we can designate certain sites for reforestation and the locals will respect our work and stay out of the area.



Mangrove forests are hugely important ecosystems worldwide as they form natural barriers against fierce ocean storms, crashing waves and threats of erosion. Their unique root systems provide safe nursery areas for thousands of species of fish and crustacean and many pelagic fish species specifically migrate to mangrove forests to lay their eggs. Mangrove conservation has become a global effort and we feel that we can help here in Mexico as well.

11.2 Aims:

- Designate reforestation sites based on accessibility and level of degradation
- Collect germinate seeds from wild mangroves and planting in a nursery. Saplings will be transplanted back when they reach a pre-determined height
- We must cultivate plants from all four species and, if possible, concentrate on the rare black mangrove (*Avicennia germinans*) as numbers have decreased drastically.

11.3 Methodology:

We will collect germinated seeds from areas of higher mangrove densities where illegal extraction has yet to have an impact. These seeds will be brought back to a nursery site and planted in seedling bags along with soil taken from the lagoon shore. The shade netting of the nursery will resemble the conditions of the wild habitats and plants will be watered and nurtured until around 50cm tall. Saplings will then be replanted into the reforestation sites with care taken to put the plant into the ground with the soil from the seedling bags.

Further research will be done on the best way to cultivate the saplings and on deciding which species should be planted where. As some of the mangrove species grow in clusters and others individually; some prefer saltier water, others fresh; we must create a map for each reforestation site dictating the location of each species within the area.