Operation Wallacea

Research Objectives and Procedures

for

Peru

2010

Index

1. Introduction

The Pacaya-Samiria National Reserve is the largest protected area in Peru spanning over 20,000 km2 of tropical rainforest and is a truly exceptional wilderness area. Situated deep in the rainforests of the western Amazon basin, at the point where the Amazon River begins its long journey to the Atlantic Ocean, the Pacaya-Samiria reserve teems with aquatic and terrestrial wildlife. The two major rivers that bound the reserve are the Ucayali and Marañon, and they join to form the Amazon proper right at the point where the reserve begins. The huge floodplains of these majestic rivers have produced the low-lying flooded forests (varzea) of the reserve, much of which is accessible on foot during the dry season surveys. The core areas of the reserve with no exploitation permitted are at the most upstream end. At the downstream end there are communities of Cocama Indians who are involved in reserve management and managing resources in non-core zone areas sustainably. Whilst their dress has changed, the Cocama Indians still live as they did centuries ago. They fish and hunt for meat, collect forest fruits and have small slash and burn gardens. They travel in small dug out canoes and live in thatched roofed houses made from trees and palm fronds of the nearby forest.

There are two main objectives of the 2010 research programme. Firstly to collect data on the sustainability of the use of resources by the Cocama Indians within the Reserve to provide data for community participation in tropical conservation. Secondly though, since the data are being gathered using standardised methods and effort, the data sets over the long term will provide information on the impacts of climate change in the Amazon. Flooded forests are more sensitive to climate change than non-flooded forests, so the Samiria is a perfect site to look at the impacts of both climate change and exploitation on wildlife and overall biodiversity. Dolphins are being used as indicators of the aquatic hyroscape, macaws as indicators of the terrestrial landscape, fish as indicators of the impact of fisheries management, primates and other terrestrial wildlife as indicators of wildlife management of bushmeat, caimans as indictors of the recovery of species after excessive overhunting, and turtles as indictors of intensive restocking management. The 2010 Opwall surveys will complete the annual high and low water season monitoring programmes. Expeditions 1 - 2 are in the high water season when the forests are flooded, whilst those expeditions from late June are in the middle of the low water season. In the dry season surveys three sites will be used on the Samiria river – the mouth, Tacshcocha and Huisto (Figure 1).

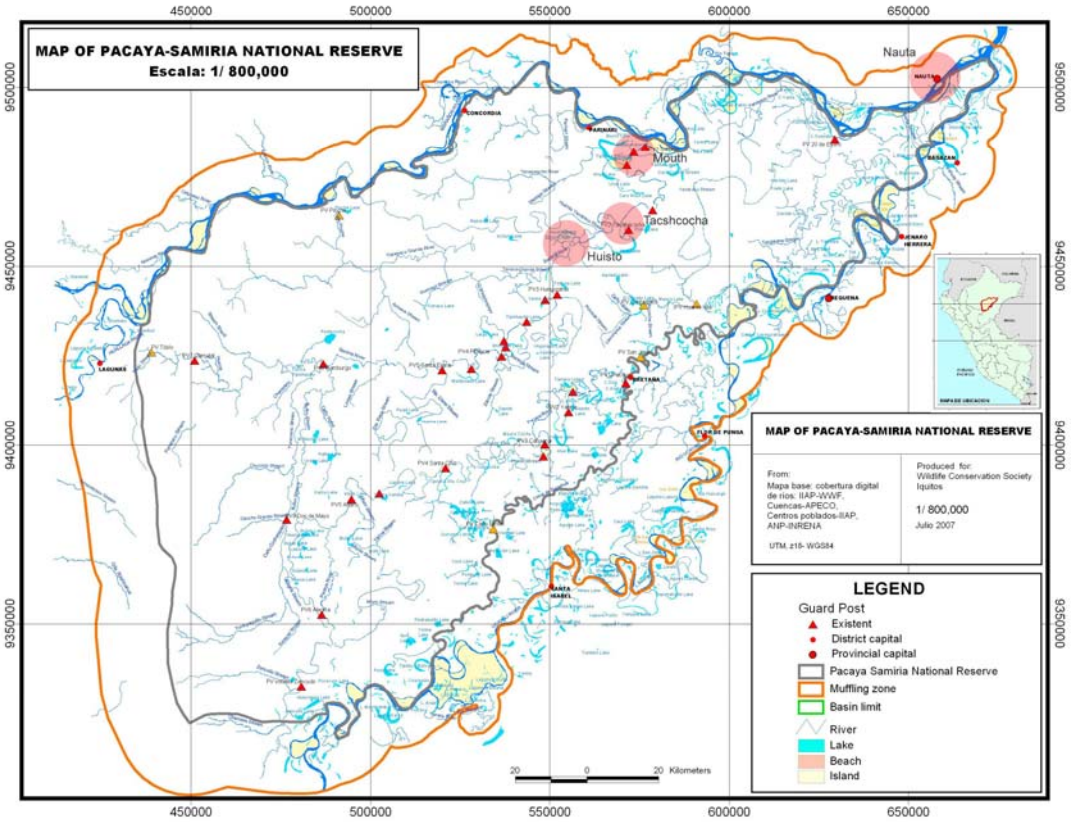

Figure 1 Location of the 2010 survey sites

2. Large Mammal Surveys

Line censuses along transect trails are being used to conduct terrestrial mammal and game bird censuses. Census trails between 2-5 km in length are surveyed repeatedly at each of the three sites. Information registered on a census includes: day, site, species, number of individuals, and perpendicular distance from the individual to the transect line, habitat, time, distance travelled and weather conditions.

The method assumes that all the animals that are on the centre of the line transect (0 m perpendicular distance) will be observed. The technique is based on the notion that observers do not see all the animals that are off the center of the line, and that the probability of sighting an animal depends on the distance of the animal from the line. Animals closer to the line have a higher probability of being seen than animals further from the line. The perpendicular distance of all solitary animals sighted, or the first animal sighted in a social species are recorded (Buckland *et al.* 1993). The DISTANCE estimation calculates the animals that you did not see, and includes these animals in the density estimate.

The method relies on measuring the perpendicular distance of animals before they move as a consequence of seeing the observer. That means observers must try and see the animal before they sight the observer. It also means observers must measure the perpendicular distance of the first sighting. If animals move because of the observer then the estimate will be biased. With the DISTANCE programme trails do not have to be straight, but the perpendicular distances must be measured at the correct angle of the center line. The perpendicular distance is measured directly from the point of first sighting (Buckland *et al.* 1993).

The method assumes that animals are independently dispersed throughout the habitat. Since individual animals within a social group are not independent, but move dependent upon one another, animal groups in social species must be considered as the sampling unit. Thus, DISTANCE will calculate the density of animal groups (Buckland *et al.* 1993).

The equipment used for line transects includes: a map of the area, a compass, data sheets, pens and binoculars. Trails are not placed with any pre-determined knowledge of the distribution of the animals. Censuses are done using small groups of three or four observers walking slowly and quietly (500-1,000 m/hr) between 7am and 3pm.

Census information will be analyzed using DISTANCE software (Thomas *et al*. 2002). This programme is regularly used in calculating individual or group densities (Buckland *et al*. 1993) and can estimate densities if the distribution of sightings within a transect line forms a clear probability function. When the number of sightings is deemed insufficient to determine a probability function, the method known as 'fixed width' will be used to estimate the densities.

3. Caiman Surveys

To assess the population and ecology of caiman species in the ecosystem it is necessary to gain an understanding of their population size. Aquatic transects will be used traveling upstream or downstream on the main river and in nearby channels or lakes at night. A GPS will be used to determine the distance surveyed each night. All caimans seen will be identified to the species level, size estimated and location noted. These data, along with data collected from captured caimans, will be used to analyze the caiman population size. Caiman surveys and captures are conducted from a small boat fitted with a 15-horsepower engine. Caimans are located by their eye reflections using a 12-volt spotlight and approached to a distance where the engine is silenced and the boat paddled closer.

Noosing will be used to capture caimans. The noose is made of a long pole about 2 m in length with a loop of rope that can be pulled tight over the caiman's neck. The caimans will then be secured with rope tied around the jaw behind the nostrils and around the neck. Total body length will be measured from the tip of the snout to the tip of the tail, while head length will be measured from the tip of the snout to the posterior edge of the orbital (the vent). The sex will be determined and the weight recorded in kilograms.

The population abundance of each species will calculated using the formula N/L, where N= the number of individuals and L= the distance travelled in kilometres. The results will indicate the number of individuals per kilometre.

4. Macaw Surveys

Point counts are used to monitor macaws. Eight or nine sample points with GPS locations have been identified at each site with each sampling point separated by 500m. Fifteen minutes will be spent at each point with censuses carried out twice a day; in the morning (5:30-9:00h) and afternoon (16:00-18:30). Within the 15-min counts, all macaw species either perched or flying will be noted and the distances of the birds from the observer will be estimated where possible. Abundance data for each sample point over the various replicates will be calculated.

5. Turtle Surveys

The censuses of the river turtles, in particular *Podocnemis unifilis*, will be carried out in the Samiria River basin. The method consists of travelling with the current of the river on a boat and registering the number of individuals sited, either sunbathing or swimming. The 'fixed width' method is used to estimate turtle abundance, where the fixed width was the width of the river.

The censuses are carried out using a boat and following an imaginary line across the middle of the river between the hours of 11:00 and 13:00, collecting data on: the perpendicular distance, the number of individuals, the location of the boat, the activity of the species and any other information deemed relevant. To facilitate the observations, binoculars will be used when individuals are sunbathing more than 50 m away from the boat. The classification of the microhabitat will be recorded.

Volunteers will also be involved in helping with turtle nest removal and relocating the eggs to secure incubators as part of the Headstart programme run by the Reserve management. Turtle eggs are being collected from the nests and placed in an artificial beach constructed next to the park guard posts. After 60 days the turtles hatch and are released back into the main river.

The turtle nests are located by gently probing the ground with a small stick. Once the nests are found, they are carefully excavated and eggs extracted, one by one, and placed very gently on a tray with a layer of sand. Care needs to be taken to maintain the original position of the egg and not to turn them around during handling in order to make sure that the growth rate of the embryo remains intact. Eggs considered viable are those that develop a whitish spot 24 hours after they have been laid. Cracked shells render eggs unviable. Eggs that are not considered viable due to cracks in their shells, fungus, abnormal size, or appearing flaccid, will be discarded. Every nest in the tray will be labelled with the number of eggs collected and the number of eggs that were not viable.

6. Dolphins and Manatee Surveys

Five kilometre transects at each site will be travelled daily from 9:00 to 14:00 h along the centre of the river using a boat. Information to be collected includes: species, group size, group composition, behaviour (travelling, fishing, playing), time, and any additional observations.

Data will be analysed using fixed width: $$D = \frac{N}{2AL}$$

Where:

D= Density
N= Number of individuals
A= River width
L= Distance travelled
2= Number of margins sampled

A motorized boat will be used to carry out the census. Any dolphins seen coming to the surface for air, swimming with their heads above water, sunbathing or swimming just below the surface of the water (i.e. no deeper than 5 cm) will be recorded with care being taken not to double count any dolphin sightings. For each transect the weather conditions and the start and finish times will be recorded.

7. Fish Surveys

Green gill nets of 3.5'' stretch mesh will be used in lakes and channels with weak currents and white gill nets with the same mesh in the river at each of the three survey sites. The nets are 30 metres in length, 2.5 - 3.5 metres in depth. Nets will be set for standard times of approximately 2hrs although, when logistical constraints affect these, precise setting and recovery times will be noted. Fish are then recovered and the nets left in place for a further two hours. A setting time of two hours is optimal in producing the maximum yield, coincident with minimal attack from piranha and caiman. Local indigenous forest guides are employed to conduct the fishing but always under the supervision and guidance of experienced field biologists. Fishing points will be located on shores or banks where there is aquatic vegetation or shrubs, although meanders are the preferred areas.

All individuals caught in the gill nets will be identified by reference to available literature (Chang and Ortega 1995; Ferreira & Dos Santos 1998; Goulding et al. 2003) measured (standard length) and weighed.

The rationale for gill net use is to simulate, as closely as possible, the potential pressures of local and commercial fishers, rather than to provide a comprehensive survey of fish diversity.

8. Frog Abundance and Diversity Surveys

Six transects of 500m will be surveyed in different habitat types at each site . Transects will be conducted night and day during the period when amphibians are most active (Rodríguez and Duellman 1994). Day transects will be carried out between approximately 7:00am-2pm and night transects between approximately 7:15pm-1am.

Two - three people will conduct surveys during the day and night including a guide to direct the group through the forest and assist in amphibian detection. To maximise anuran detection the length of time spent on each 500m transect will be between 1h 30min-4h. Visual encounter surveys (VES) during the day will be carried out using a probe to disturb leaf litter and vegetation (Donnelly *et al* 2004). During the VES all possible microhabitats will be searched, including leaf litter, tree trunks, decayed logs, fallen palm leaves and bromeliads. Due to the cryptic nature of anurans the disturbance of this vegetation using a probe is the most systematic method of detection (Donnelly *et al* 2004). This will be achieved by methodically probing through the area directly in front of the observers, including up to approximately 3m on either side of the trail. On occasion, some amphibians will be observed beyond 3m, however as the study aims to assess diversity, these specimens will not be included. To identify anurans during night transects instead of probing through leaf litter, torches will be used to catch the reflection of light from the eyes of anurans.

Before each survey the following information will be recorded: date, name of observer, place, area searched, weather conditions, start time and finish, and habitat description. When individuals were encountered information will be recorded about species type and the time of capture.

Upon detection and capture of an individual each specimen will be handled carefully by the guide wearing latex gloves and morphological characteristics, such as webbing between fingers, iris and pupil colour, presence of tympanium, determined as well as photographing the specimen. In addition the snout to vent length (SVL) will be measured using callipers and the sex determined (if possible). The distance along the transect and perpendicular distance from the transect for each specimen will be recorded.

When identification of an individual is not possible in the field, photographs and recorded observations will be used to compare to the identification guide produced by Rodriguez *et al*. (1994).

9. Understorey Bird Diversity and Abundance

Assessing bird diversity from transect or point counts recording all the species seen or heard needs a very high level of skill since more than 500 bird species have been recorded from the Pacaya-Samiria Reserve. Variation in recording between observers can be very large in these types of surveys. Since the objective is to compare bird communities and abundance over time using standardised surveys it has been agreed that standardised mist net sampling will be used. The use of mist nets allows for quantitatively reliable data to be produced for tropical understorey birds, allows for the identification of birds that are shy or seldom vocal, minimises observer bias (Thiollay 1994) and produces results that are easily repeatable (Mason 1996). Mist netting alone does not successfully represent the whole rainforest community (e.g. inclusion of canopy and mid canopy species) but can allow for community structures between habitat types to be compared and over a time series can track changes in abundance and species composition.

Narrow (< 1 m wide) trails will be cleared in suitable patches of forest for ten mist nets 2.5 meter high to be placed at each site 20 meters away from each other. Suitable sites for the nets will be chosen in areas where there is thick undergrowth vegetation. By doing so, birds will not be able to detect the net as easily as they would be able to do in light open areas, and the choice of micro-habitat would be repeatable in each habitat. Each site sampled will consist of a single forest type (eg. varzea, terra firme).

The nets will be set up as close to dawn as realistically possible, between 6:30am and 7:00am, and checked every 30 minutes for birds throughout the day. When birds are found in the net, the time of capture will be noted. The birds will be taken out of the net, placed in a cotton bag for holding whilst other birds are being processed. Each bird will be identified and ringed using colour coded plastic rings. The birds will be weighed (to the nearest gm) and standard morphological measurements taken of the following (recorded to the closest mm):

- The wing- from the carpal joint to the tip of the longest wing feather.
- The bill- from the tip of beak to the skull.
- The tarsus- from the tarsus joint (beginning of the *tibia*) to the third scale of the claw (the knuckle joint).
- The tail- from the body to straightened flattened longest tail feather.
- The full body length- bird was laid on its back, measured from tip of bill to the longest tail feather.

The birds will be released close to the net site but far enough away to avoid them being immediately re-trapped.

The abundance and community composition will be compared between habitats using the following measures of richness:

Margalef's diversity index is expressed as: $D_{mg} = (S-1)\ln N$

Menhinick's index is expressed as: $D_{mn} = S/\sqrt{N}$

In both equations S is the number of species and N is the total number of individuals.

All the species will be further categorised into foraging guilds, based on the food they consume, their choice of substrate and their foraging method. Based on researching relevant literature resources all the species where classified into one of nine foraging guilds. The guilds consist of 5 insectivorous

guilds, bark-gleaner, foliage-gleaner, ground-gleaner, flycatcher and ant-follower; a nectivor guild; a fruigivore guild and an omnivore guild. The data will be analysed by comparing both the number of species and the number of individuals per species in each foraging guild, across the studied habitats. The difference will be statistically tested using two-way analysis of variance (ANOVA) to show whether the difference in numbers of species and individuals per species is due to foraging guild or habitat type.

10. Camera Trapping

These "traps" combine cameras with heat/motion sensors in order to "capture" photographs of cats and other rare species. The sampling design is based on jaguar studies recently conducted in Latin America. Camera trap-based sampling methods have emerged as a reliable technique for inventorying and monitoring medium- and large-bodied mammals. A total of twenty paired MC2 GV StealthCam passive infrared camera trap stations will be set covering an area of *c.* 50 km^2 and distributed across four habitat types: *varzea* forest (five stations), Aguajal, Aguajal-*terra firme* forest edge and *terra firme* forest.

For the camera trap data, detection histories (**H**) will be constructed for each species over one-week sampling occasions (n = 15). For each species and for each occasion, '1' will indicate the detection (photograph) of a species, while '0' will indicate the non-detection of a species. Species detection histories will then be used to produce probabilities. For example, a detection history for species *i* (**H***i*) of 100011 would represent species detections on the first, fifth and sixth occasions over a single season.

11. Giant River Otter Surveys

Censuses will be conducted at the same time as the dolphin surveys to compare relative abundance between censuses rather than absolute counts which would require identification of all individuals. Censuses will be conducted by boat, scanning with binoculars and listening for otter calls. Group sizes and locations will be surveyed using a handheld Global Position System (GPS). Double counting will be avoided by keeping a constant boat speed and where possible by identifying groups by the unique throat markings of individuals.

12. Wading Bird Surveys

One of the main conservation reasons for protecting the Pacaya-Samiria Reserve is the large wading bird communities that use the Samiria river. These populations will be surveyed using 3km long boat based transects. The boat engines will be turned off and the boat allowed to drift down river in the middle of the channel. All waders, ducks, kingfishers, terns and birds of prey encountered will be identified and counted.