

## James Rennie Bequest - Field Studies Report

Expedition/Project Name	Effects of climate change and local hunting on biodiversity in Pacaya Samiria, Peru
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Expedition/Project Date	10.07.- 05.08.2016
Location	Loreto, Peru
Expedition/Group Members	Kristiina Marquardt
Introduction and Aims of project	
<p>The Pacaya Samiria Reserve in the Peruvian Amazon hosts an immense diversity of wildlife that has adapted to the seasonal flood and drought periods and the consequential changes occurring in the habitat. However, as a result of changing climate the variation in water levels is becoming increasingly pronounced which poses a threat to both terrestrial and aquatic taxa.</p> <p>The objective of the expedition was to conduct population surveys on a range of taxa of the reserve in order to answer two key questions: 1) How does climate change affect the abundance and behaviour of species in the reserve 2) Are the employed hunting quotes producing stable population sizes over a longer time period.</p> <p>This research project was initiated more than ten years ago, allowing the monitoring of short-term fluctuations as well as detection of long term trends in population dynamics, and hence prognoses of which species may in future be most at risk.</p>	
Methods (techniques used and their usefulness)	
<p>In order to address both questions, the population surveys were conducted on two types of species: Indicator species and resource use species. A few survey methods are listed below.</p> <p><b>Indicator species:</b></p> <p><u>Dolphin survey:</u> Pink and grey river dolphins are indicators of the aquatic system. They were surveyed on auxiliary boats using fixed width density (<math>D = N / \text{Length} \times \text{Width of river}</math>). The boats were driven 5 km up river and subsequently let drift the same distance down river. Assuming that dolphins are visible in the entire river, the species, number, age group and behaviour were noted down.</p> <p><u>Wading birds:</u> Different wading birds indicate the fish production in the river. The method applied was a line transect i.e. a shoreline count of abundance (<math>Ab = N / \text{Length of river}</math>) using auxiliary boats.</p> <p><u>Macaw survey:</u> The various macaw species function as indicators of the forest system, especially of forest fruit production. Being time sensitive species, the surveys were conducted in the morning or afternoon, using point counts of abundance (<math>Ab = N / 15 \text{ minutes}</math>) in 6 different locations. The species was easiest identified by sound. Number, minute of observation and distance of the first sighting were noted.</p> <p><b>Resource use species:</b></p> <p><u>Caiman survey:</u> Between 8:30 p.m. and 11 p.m. a line transect of 5km was driven up river using auxiliary boats (<math>Ab = N / L</math>). If an individual could not be caught, 'eyes only' was noted down, together with an estimate of the species and size. Captured caimans were measured, weighed and their species and sex determined.</p> <p><u>Bush meat species:</u> Ungulates, large rodents and primates were surveyed using terrestrial transects and camera traps. Transect counts were based on the assumption that the probability of spotting individuals decreases with distance. The density was estimated using the perpendicular distance of</p>	

the first individual sighted. Camera traps were set up to determine the number of individuals per 1000 camera days ( $Ab = N / c \times d$ ).

Fish survey:

Fish were captured using nets and rod fishing. Based on CPUE the abundance was determined as catch (N and mass) / 1 hour of netting and rod fishing. A gill net of 30m x 3m dimensions was used, with a 3 inch mesh. Weight and standard length were noted in order to estimate the population demography.

Habitat survey:

Plots of 20m x 20m were set up in the forest and the following measurements were conducted: DBH of tree species, canopy and understory density, height of the 5 largest trees and leaf litter on ground. The purpose was to determine tree reproduction and forest growth in order to endeavour to qualify the habitat for a 'Payment for Ecosystem Services' programme.

Results (presenting outcome of work)

Within the four weeks of my expedition the boat was located in two different sites, PV1 close to the entry of the reserve, and PV 2 a good 8 hour distance further into the reserve. Both the effects of climate change and local hunting were producing clearly detectable contrasts between these sites, with considerably lower water levels in PV2 at the beginning of July, but simultaneously significantly less exploited wildlife.

As a result, the abundance of river dolphins roughly tripled when moving from PV2 to PV1, but resource use species such as caimans and bush meat species like capybaras and primates drastically reduced in number. A difference in habitat could also be made out, since most of the forest in PV2 was primary forest, whereas in PV1 it was secondary. Wading birds, especially Neotropical cormorants exhibited an abundance of up to 16.000 individuals in both PV2 and PV1, showing a clear population increase since 2010.

Discussion/conclusion (main points arising from the study in relation to objectives and any difficulties encountered)

Although all of the collected data is not yet available to me, a few aspects became apparent during the 4-week observations: The reserve hosting an immense diversity of species is extremely vulnerable to changes in the ecosystem, and it can be stated with confidence that climate change induced water level records and minima affect some populations drastically. Higher bush meat species abundance in PV2 can be explained by lower water levels and hence increased food production, as well as less hunting activities. The abundance of wading birds in both sites indicate high fish production in both sites. Fish populations seem to have recovered after the drought season in 2010.

The strategy applied in the project is community-based conservation, and its success is visible for instance in the lower exploitation of PV2 as well as the understanding of the importance of natural capital showed by local Cocama people collaborating with us. This has for instance made the gradual recovery of various nearly extinct turtle populations possible, which reached a record high this summer since the population collapse.

Where excessive hunting is not responsible for a decrease in populations of resource use species, this is likely to be caused by the species' difficulties adapting to the increased seasonal habitat changes. In these cases it is vital to find alternative resources for the local Cocama people to resort to, in order to prevent the collapse of the local ecosystem.

Personal Statement (outlining the skills and experience you expect to gain from the project)

The expedition was an immense enrichment to my previous experience and skills in conservation research and the practice of science. It was incredibly motivating to realize I could apply a lot of knowledge I had already accumulated in University, and I can confirm to have gained a good many skills regarding the correct execution of different methodologies and data handling, and a lot of species and habitat specific knowledge. Being given a lot of responsibility helped me engage in the surveys and think critically about why different methods were chosen. I am satisfied to have

contributed to the collection of important data and have learned about new fascinating career options. In addition, the collaboration and communication with the Peruvian biologists and guides -in Spanish- added a highly enjoyable multicultural aspect to my experience.

**Summary (a brief summary of the expedition using non-technical language where possible)**

The expedition was part of a long term conservation project in the Pacaya Samiria Reserve in Peru the aims of which were to collect data on different species to estimate how they are affected by climate change and hunting, and which species may be most at risk in future years. This information is vital to assure those species will continue to exist in the reserve, and to secure the livelihood of local people dependent on them.

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