

FINAL REPORT 2007

The Woolly Monkey Project: Status and Conservation of Primates in Amacayacu National Park, Colombian Amazon: A community based research project

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Photo1: Dissemination event *Meeting of Minds*: Mamerto Gregorio, leader from San Martin de Amacayacu and Prof. Sir Ghillean Prance during a medicinal plant trail. The Living Rainforest, UK (Source: Entropika)

Photo2: Male woolly monkey in Amacayacu National Park (Source: Noga Shanee)

Photo 3: Local meeting with Mocagua community (Source: TWMP)

PRESENTED TO:

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1. INTRODUCTION

Since February 2005, The Woolly Monkey Project (TWMP) has been collecting systematic census data in the overlapping areas within Amacayacu National Park (ANP) and two Tikuna indigenous communities, Mocagua and San Martin de Amacayacu. This community-based project started as a personal initiative of the Principal Investigator (PI) and Dr Sara Bennett¹, with the aim of addressing the conservation issues affecting the area, placing particular focus on woolly monkeys, one of the hunting target species. After developing a Pilot Project in 2003, the idea had the full support of six indigenous communities and ANP. This research is divided into two: (i) census field work/wildlife harvest assessment, and (ii) a conservation awareness campaign. This report contains information on census field work and an attached appendix includes preliminary information of the conservation campaign (see Appendix 1).

Although the initial idea of this project was to focus on primate conservation, we are currently collecting data on other large mammal hunting targets, such as tapirs and capybara, which are in need of immediate conservation action, but information on their distribution is non-existent in ANP. This report aims to provide a summary of our research, photographic records and a short film saved on CD to give to the readers an insight to the study sites, their wildlife and the Tikuna people. We apologise for the poor quality of the short film, recording quality is hindered by field conditions and basic standard of equipment available.

We would like to thank you for your support of this ongoing project, which has been providing an alternative income and supplementary education for local people, as well as research opportunities for eight Colombian volunteers and six overseas volunteers (see Appendix 2). Currently, TWMP is part of a regional conservation initiative, *The Calderon Project*, which will extend our conservation efforts to neighbouring areas in order to enhance the effectiveness of ANP as a protected area alongside local communities (see Appendix 3).

¹ Dr Sara Bennett: Conservationist carrying out research in the Colombian Amazon for more than 20 years, working alongside indigenous communities and the Colombian Park System (UAESPNN).

2. BACKGROUND INFORMATION

2.1. Hunting in tropical rainforests and species vulnerability

Human beings have inhabited tropical forests for thousands of years, and the length of human habitation in the Americas, let alone the Amazon floodplain, is still a matter for scholarly dispute (Smith, 1999). Recent evidence suggests that the diverse environments in the Americas were penetrated by hunter-gatherers at least 30,000 years ago (Dillehay and Collins 1988) and central Amazonia 10,000 years ago by Paleo-Indian people (Roosevelt et al 1996). Many groups of hunter-gatherers built base camps close to floodplains of certain rivers, especially the Amazon. Some groups may have settled on higher parts of the floodplain, because they were specialists in foraging in such environments (Smith, 1999). For millennia, indigenous people have depended on hunting and fishing to fulfil their protein requirements (Robinson and Bennett, 2004). Some hunting target species have been able to withstand human hunting, but other hunting sensitive species were unable to survive the human harvest and, owing to their life history traits and ecological constraints, have become locally or globally extinct (Olson and James 1982; Michalski and Peres. 2005).

For instance, in the mid-nineteenth century wild populations of the black-bellied tree duck (*Dendrocygna autumnalis*) were robust on parts of the Amazon floodplain. Nowadays hunting pressure has reduced this species to small groups, drastically affecting the diet of local people, particularly on the Marajo Island (Smith, 1999). Peres (2000) estimated that 3.8 million primates are consumed annually in the Brazilian Amazon (range in estimates, 2.2 to 5.4 million), which represents a total biomass harvest of 16,092 tonnes and a mean annual market value of \$34.4 million (Chapman and Peres, 2001; Peres, 2001).

Comparative studies carried out in the Brazilian (Peres, 2001) and the Colombian Amazon (Palacios and Peres, 2005) suggested that vertebrate biomass was strongly correlated with hunting pressure. Large primates' densities were consistently low in hunted areas, with the ateline primates (e.g. woolly monkeys, howler monkeys, spider monkeys and miquiqui monkeys) being the hunting targets.

Bearing in mind the three characteristics that influence species vulnerability in population decline: i) rate of population increase; ii) longevity and iii) generation time (Pimm, 1991), atelines are so highly sensitive to hunting that even subsistence levels of hunting can result in local extinction (Peres, 1991; Stevenson *et al.* 2005). Their vulnerability is mainly caused by their low reproductive rates and long inter-birth intervals (Peres, 1990). Selective hunting may also affect the sex ratio of primates influencing their population growth (Peres, 1991; Sinclair et al 2006). The ecological role of atelines is invaluable, as recent evidence suggests in some Neotropical forests, large primates, particularly woolly monkeys, can play important roles as seed dispersers for canopy plant species (Andresen, 1999; Dew, 2002; Russo *et al.*, 2005; Stevenson, 2000; 2002). Their extinction may strongly affect community wide patterns of seed dispersal and thus plant diversity (Dew 2002, Stevenson *et al.*, 2005; Stevenson and Aldana unp. data).

Unfortunately key vulnerable species like *Lagothrix* (woolly monkeys), whose ecological role is vital for seed dispersal, are not always included in the most suitable category of threat in the IUCN Red List classification. Currently this species is classified as Lower Risk (LR/lc) (Rylands, *et al.*, 2000), and despite the efforts of this research to collect information for its re-evaluation², to date we do not have all the data required for such purpose. According to the updated version of Guidelines for Using the IUCN Red List Categories and Criteria V 6.2 (2006) geographic range is a priority and *Lagothrix* is widely distributed among the Amazon basin. Nevertheless, as IUCN (2001) states, “*It is important to emphasize here that a taxon may require conservation action even if it is not listed as threatened*”. At local level conservation awareness has been raised and hunting bans are adhered to by one of the Tikuna communities involved in this research (Mocagua), however regional government support is required in order to extend hunting bans/restrictions to other areas exposed to high levels of hunting.

2.2. Overlapping areas³ and their implications for conservation

Several authors hold opposing views regarding the presence and impact of local people in protected areas. The arguments range from those who state that indigenous people can live within protected areas without depleting natural resources (e.g. Colchester, 2004; Keller and Turek, 1998), to those who point out that the harmonious coexistence between indigenous people and wildlife in Neotropics relies deeply on low human densities and technological limitations, especially shotguns (Alvard, 1994; Galetti, 2001; Terborg, 2000; Hamblen, 2004). As Robinson (2006) states, “*Conservationists have not developed the knowledge or quantified how species loss undermines human livelihoods, security and economic development*”. Attempts to determine the sustainability of hunting so as to design management policies are still in their infancy (Peres, 2000) and researchers should collect enough reliable data (at least five years) before determining hunting quotas and hunting zones (Bodmer and Robinson, 2004).

Palacios and Peres (2005) indicated that in the Colombian Amazon, long-term surveys on large mammals should be implemented on selected sites, specifically overlapping areas within indigenous land and protected areas, to obtain base-line information with the aim of defining and implementing conservation actions. Overlapping areas had been a matter of concern as commercial exploitation of resources has been depleting wildlife and drastically affecting the dispersion of important key plant species (Peres and Palacios, 2007).

² Re-evaluation: of taxa against the criteria should be carried out at appropriate intervals. This is especially important for taxa listed under Near Threatened, Data Deficient and for threatened taxa whose status is known or suspected to be deteriorating (IUCN, 2001)

³ Overlapping areas: In the Colombian environmental legislation, overlapping areas correspond to the land that overlies between Indigenous reservations (Resguardos Indigenas) and protected areas designated by the Colombian Park System (PNN Amacayacu, 2006)

2.3. Tikuna Indigenous People

The Tikuna indigenous group is widely distributed along the Amazon River in Peru, Colombia and Brazil, with an approximated population of 30,000 inhabitants it is one of the largest indigenous groups in the area (Lopez, 2000). In Tikuna mythology, they originated in the Eware ravine near the Colombian-Brazilian border, and the territory where the community of San Martin de Amacayacu is located, is known as the sacred land where the chosen people live (com. pers. A. Vasquez; Lopez, 2000). In 1932 as a result of a civil war (Peru-Colombia) and ultimately, agreements between Colombia, Peru and Brazil, Colombia gained the Trapecio amazonico (Colombian trapezium), a small portion of land lying on the Amazon River (Bunyard *et al*, 1993) (see maps 1 & 2). This division fragmented the Tikuna group into the three countries and subsequently into three cultures, although all with the Tikuna dialect as the common language, the second language being Spanish (Colombia and Peru) and Portuguese (Brazil). In the Colombian Amazon the Tikuna population of 7,102 inhabitants represents 1.33% of the Colombian population (DANE 2005b). Their economy relies mainly on horticulture, fishing, gathering and trade. Hunting was a traditional activity and a significant component of their diet; nowadays hunting represents an important economic activity as the trade of meat brings finances to buy commodities such as school supplies, clothes, batteries and petrol.

2.3.1. Mocagua community: This community lies next to the visitor centre of ANP, its Indigenous Reservation IR⁴ has 4,025 hectares, and its population is approximately 370 inhabitants (see map 3). It provides the main labour for the running of the park, in the form of guides, cooks, carpenters and general workers, which helps the community to minimise the extraction of natural resources for cash acquisition. The Mocaguans have been Christians since late 1960s and the school is managed by Catholics. There is no secondary education in the community, thus students have to go to boarding schools in the next community (Macedonia) or Puerto Narinio and Leticia (closest cities), with a dramatic impact on their traditional way of life. Tikuna language is spoken only by 10% of the community (pers. com. C. Panduro). During the early 1970s the wildlife in the area was radically affected by the skin traffic (Jaguar and Nutria), and owing to its proximity to the Amazon River, traders and complicit local people had easy access to their land. As a consequence, the wildlife in Mocagua's IR decreased and hunting became scarce for local people. Conservation initiatives are welcome as they can see clearly the evident decrease of wild populations of large mammals. Currently Mocagua is the only community in the area applying a hunting ban for woolly monkeys and a hunting restriction for tapirs⁵.

⁴ **Indigenous Reservation:** (Resguardo indigena) Legal and socio-political institution made up of an indigenous community, with a title of collective ownership, possesses its territory and is ruled by the indigenous code of laws and its cultural guidelines and traditions (Republic of Colombia 1990).

⁵ Tapir's hunt restriction: only one tapir can be hunted by family each year. There are discrepancies regarding who compose a family unit, as there are 3 families who are the hunters in the community.

2.3.2. San Martin de Amacayacu: San Martin is located on the Amacayacu river, one of the most important tributaries of the Amazon River in the area (see map 3). Its IR is 4,300 hectares and forms part of Puerto Narinio's IR, which has an area of 139,871 hectares (ANP and Franco, 2006). The community has some 495 inhabitants, all of whom speak the Tikuna dialect. It is one of the most traditional communities in the area and hunting practices are still strong. In the early 1980s illicit crops were common in the area, and two runways for illegal trade were established in San Martin's IR.

In the late 1980s the Colombian army bombarded the area, destroying the runways and the laboratories for coca processing, eradicating the illicit crops from the area. Unfortunately, this illegal trade brought income to the community upon which they became dependent. Currently, illegal cedar exploitation and meat trade are the main economic incomes and its exploitation is mainly developed by people from Puerto Narinio (the closest town, part of the general IR), fortunately the community is monitoring the area and the involvement of local people in illegal activities is decreasing. Despite this, economic resources are still needed to implement an ongoing and sustainable monitoring programme. Commercial hunting in the San Martin IR is higher than in other Tikuna communities as their land is rich in large mammals. The meat is sold mainly to Puerto Narinio, especially for the Catholic boarding school. San Martin wants to be independent from the large IR, Puerto Narinio and are currently mapping their IR limits with ANP in collaboration with TWMP.

2.3.3. REM (Regimen Especial de Manejo/ Special Management Plan): In order to determine conservation policies in overlapping areas, alongside indigenous communities, the Colombian Environmental Ministry (UEASPNN) designed the REM, which aims to: i) Identify the traditional use of the territory; ii) Reinforce local traditional knowledge; iii) Implement local management policies; iv) Monitor the use of natural resources; and v) support sustainable use of resources by indigenous people. From 2006 to July 2007, the REM made the first approach to the Tikuna communities, but to this date the communities have not been clear about implementing the management plan within their IR. Nevertheless, the government is aware of the difficulties. As in the past the communities had disagreements with the creation of the protected areas, as the whole area is part of their traditional territory. The information submitted by TWMP has been the baseline to determine hunting bans and restrictions, but there is not a signed agreement between the communities and ANP. The effectiveness of the first approach of the REM is not yet clear and more work has to be done with the communities, in order to implement and monitor the proposed management plan.

3. AIMS

This project aims to address two large hypotheses:

- 3.1. Human activities have been directly and indirectly responsible for the perceived reduction in all large vertebrates' populations over the past generation.

- 3.2. It is possible to recover and maintain robust populations of fauna in the study site by changing human system dynamics.

Prediction: Traditional knowledge and ecological data will support the implementation of hunting bans and/or restrictions, resulting in a population increase. The success of the hunting bans/restrictions will be monitored by indigenous people as a local initiative.

4. OBJECTIVES

- 4.1. To assess the status of primate populations and large vertebrates in the Southern part of Amacayacu National park, an area intensively exploited by indigenous communities, and provide a baseline for future monitoring
- 4.2. To continue the training of indigenous wildlife monitors in quantitative methods
- 4.3. To reinforce the applicability of the community Natural Resources Management plan within the two communities

5. Methods

- 5.1. **Study sites:** It is important to clarify that in the initial funding applications it was intended to work alongside three Tikuna communities. This was re-evaluated with ANP, and this research includes only two Tikuna communities (Mocagua and San Martin). Due to the lack of information gathered by ANP in the Purite basin, and its ecological importance in the area, Omé⁶ Biological Station was added as a new study site (see below).

- 5.1.1. Overlapping areas: This area encompasses ANP and the Tikuna indigenous communities of Mocagua and San Martin). ANP is located in the south of Colombia at 3°53' S and 70°15' W in the municipality of Leticia, Amazonas department; its area is 293,500 hectares. The average temperature is 26°C. Relative humidity is above 90%. Annual rainfall is 2,894 mm and the average altitude is 96 m.a.s.l. This is an area irrigated by white water rivers, resulting in nutrient rich soils in comparison to other Amazonian areas (IGAC 1999). From 2001-2002 ANP and six Tikuna indigenous communities, some of whom overlap the Park's territory, established hunting, logging and fishing bans and restrictions, but monitoring this initiative has been difficult to establish and only Mocagua applies hunting restrictions. Since 2005, systematic data on large mammal populations have been collected by TWMP in Mocagua and San Martin (Maldonado, 2007a;b).

A component of the data collection was community-based research to determine the impact of hunting on the large sensitive fauna. This preliminary approach was intended to evaluate the need for and the subsequent applicability of hunting

⁶ Omé: means woolly monkey in Tikuna language.

restrictions. In 2007 The Colombian Park System carried out a preliminary approach with the indigenous communities to establish a co-management plan (**REM**: Special Management Plan); the implementation phase of the plan is dependent on availability of financial resources and is therefore uncertain. Up to date the only wildlife monitoring carried out in the overlapping areas has been this research.

- 5.1.2. Omé Biological Station: Located to the east of ANP 3° 32.188' S and 69° 53.531' W on the Purité River, at approximately 100 km upriver from the river mouth and the nearest human settlements it is relatively isolated. Defler (in press.) points out that the only wildlife hunting took place during the time of commercial spotted cat hunting over 30 years ago and more recently, when mammals were used to bait cats. Occasional meat hunting took place ten years ago when a Brazilian commercial meat hunter plied the river looking for deer and tapir, but much of that was undoubtedly closer to the River Putumayo downriver from the Colombian portion of the river. Defler (pers. com.) states that the communities of primates (that have been subject to extensive census in this area) are essentially intact and that the biomass of large primates (*Lagothrix* and *Alouatta*) is unaffected by human activities. However, because the soil in the Omé area is oligotrophic, which is poorer than Amacayacu soils, there are lower natural densities of terrestrial mammals (Defler pers.com. and Maldonado obs. pers).

Omé represents a rare opportunity to carry out research in a pristine forest and Colombian students have begun to take advantage of its isolation. The protection of Omé and the upper Purité River is vital for the conservation of rare species such as *Pteronura brasiliensis* and *Melanosuchus niger*. Also, although *Lagothrix lagothricha* is not rare where there are no hunters, this region protects robust populations of this large primate. The valuable cedar tree was harvested in this area some years ago but there is no evidence of any recent harvesting of any type of tree. Three small buildings have been developed that are available for use of researchers and habitation in the zone. A marked and measured trail system of 40 km exists as part of the research station an invaluable tool for various research projects.

- 5.2. **Primate' census**: The line transect census technique (Peres, 1999; Buckland et al. 2001) has been used to determine the abundance of primate populations. Working with local co-investigators familiar with the area, fourteen 3-5km transects have been cut from random points at four sites exposed to different levels of hunting pressure. At the point of detection, time, species identity, group size, sighting location, height and perpendicular distance for the first animal sighted are recorded. A GPS waypoint is recorded for sighted groups when possible. Census is carried out from 5:30 am, at a walking speed of < 1,250mt/h. For ten days of each month, two teams of two people record data at the same time. In order to compare and systematically review the data recording sheets; the four sites are rotated each month and 21 co-investigators have been divided into small teams. Each team comprises: i) An expert hunter (usually illiterate) with a young relative in charge of

completing the data sheets; to help provide training to young co-investigators who learn how to track signals and animals from expert hunters. **ii)** At least two members with knowledge of the area dating back a minimum of ten years. **iii)** The four positions available every month (two in each community), are rotated within the teams to provide an economic income to different families every month.

- 5.3. **Wildlife harvest assessment:** Two local project coordinators have been trained to complete a “record of hunted animals sheet”, which includes: hunted species, sex/age, weight, body measurement (cm), hunter name, place of hunting event, duration of hunting trip, who consumed or bought the meat, price per kilo, and observations (pregnant female and number of fetuses found). In order to triangulate the information, the PI selects 5 random hunters and talks informally with them about the hunting event to confirm the veracity of the data recorded by the local coordinator.
- 5.4. **Participatory methods:** in order to quantify local people’s perceptions of wildlife utilisation, a combination of qualitative and quantitative methods has been employed. *Qualitative:* Participant observational methods (Brockington and Sullivan 2003), which require the immersion of the researcher in the place and society. These methods include: **i)** conversational and discourse analysis: informal conversations with co-investigators during the field work in order to record historic information on hunting practices by each co-investigator, his family and community. **ii)** Focus groups: meetings with co-investigators are held before every fieldtrip in order to discuss particular issues related to previous trips, data collection and equal distribution of responsibilities within each team. In addition the research team attends monthly meetings organised by the communities to discuss general issues related to resources use moderated by local research coordinator and PI. The meetings are video-recorded.

6. RESULTS

6.1. Primate' Census

Table 1: Primate Densities at Three Study Sites Exposed at Different Levels of Hunting (Colombian Amazon)

AUTHOR	STUDY SITE	DENSITY (Ind/km ²)						
		<i>Alouatta seniculus</i>	<i>Cebus albifrons</i>	<i>Callicebus torquatus</i>	<i>Lagothrix lagothricha</i>	<i>Pithecia monachus</i>	<i>Saimiri sciureus</i>	<i>Saguinus sp.</i>
Barrera, 2006/ Van Leijsen and Vleut (2005)	PNN Amacayacu/ Hunting area	0	0	2.87	0	5.51	30.17	30.13
Defler, (in press)	Purite unhunted area	1.15	7.92	0.28	7.86	7.62	11.64	8.5
Maldonado- preliminar	PNN Amacayacu/ Hunting area	0.98	0.75	2.6	1.78	4.32	3	12.22
Palacios and Peres, 2005	Quebradon el Ayo (Pure)/ unhunted area	1.05	2.5	6.8	6.9	11	11.3	16.9
Sanchez, 2006	PNN Amacayacu/ Hunting area	0.94	1.05	2.92	0	2.48	6.65	10.6

Census Period: March 2005- June 2007; n = 401 Visual Detections

A comparison between 3 study sites, Amacayacu, Purite (Ome) and Quebradon el Ayo, has shown that densities in Mocagua and San Martin are significantly lower than Purite (Ome) and Quebradon el Ayo, which are un-hunted areas. Nevertheless it is important to note that Quebradon el Ayo and Purite (Ome) have notoriously poor soils with very low fertility (Defler 2004; IGAC, 1999; Palacios and Peres, 2005).

In contrast, the southern part of Amacayacu presents high fertility soils as the study sites are close to the Amazon River, a white water river. This could be compared with other Amazonian regions such as the Yavari river basin, as they present similar climatic and edaphic conditions (IGAC, 1999).

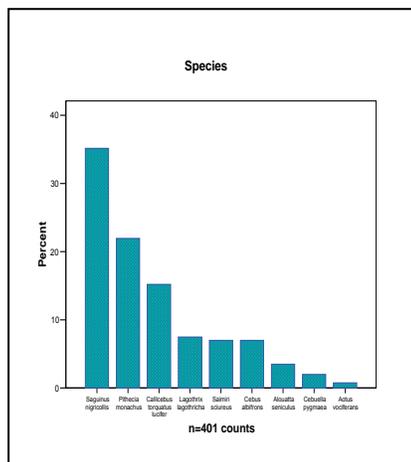


Figure 1. Total percentages of primate encounters at Mocagua, San Martin and Ome, March 2005- June 2007

The figure 1 represents the total number of primate encounters at Mocagua, San Martin and Ome. Between March 2005 and June 2007, a total of 401 visual detections were recorded and 733 km walked. *Lagothrix* was observed more than expected in Ome, with a total of 15 encounters (adj. res. 3.2, $p < 0.005$). *Saguinus nigricollis* presented the highest number of encounters in the three communities, representing 35%, followed by *Pithecia monachus* (22%). *Cebuella pygmaea* has been sighted only in San Martin community.

Coinciding with Palacios and Peres (2005), during the census in Ome *Allouatta seniculus* was not observed, and only three auditory detections were recorded. While leaving down stream the Purite river from Ome, eight groups of howler monkeys were observed in a period of 10 hours.

These observations are consistent with Palacios and Rodriguez (2001) who stated that howlers are considered habitat specialists, making extensive use of flooded Igapó forest at certain seasons of the year.

6.2. Harvest of Wildlife in Mocagua and San Martin (Preliminary results)

Figure 2 represents the percentages of wildlife harvested in Mocagua and San Martin, this includes data collected in 1999 (Arias unpub. data) and data collected from 2005-2006 by this research. In order to summarise the information, all the hunted birds and reptiles were grouped by class (Aves and Reptilia respectively), while large mammals were grouped by Order. Rodentia encompasses 33% of the total harvested fauna, *Agouti paca* (27%) and *Dasyprocta fuliginosa* (11%) being the preferred preys. Large birds (Galliformes) make up the following hunting target (17%). From the order Artiodactyla, the white-lipped peccary (*Tajassu pecari*) represents 11% of the total harvested fauna ($\chi^2=47$; $df=7$, $p < 0.001$).

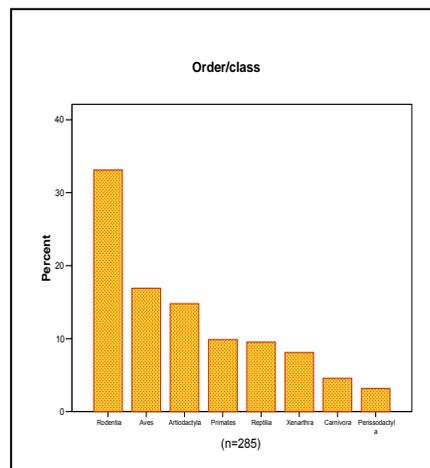


Figure 2. Wildlife harvested in Mocagua and San Martin (1999, 2005, 2006) (n=285)

It is important to note that the veracity of wildlife harvest data is still an issue. For instance, data recorded by local co-investigators in San Martin, reveals low numbers of tapir and large primates hunted, while in Mocagua the figures are more accurate. From a total of 28 primates registered, 89% occurred in Mocagua and only 11% in San Martin. Howler monkeys (*Allouatta seniculus*) were the preferred prey (26%) followed by titi monkeys (*Callicebus torquatus*) and night monkeys (*Aotus vociferans*) which were hunted equally (25%). Cases of woolly monkey hunting were verified by volunteers and personnel from Amacayacu NP, but were not included in the harvest sheets.

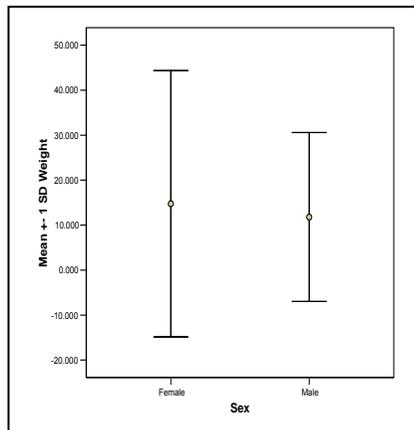


Figure 3. SD and Mean Weight of harvested wildlife by class (n=285)

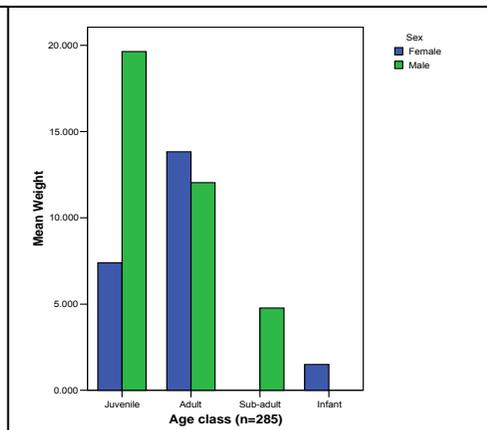


Figure 4. Mean weight (grams) of large-vertebrates by age/sex classes

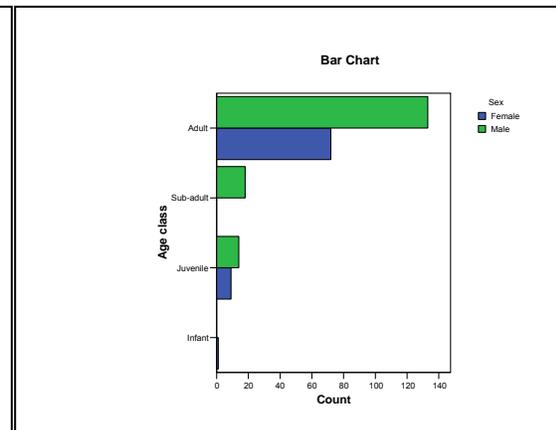


Figure 5. Frequency of large-vertebrates hunted by age/sex (n=285)

Additional information collected by local co-investigators included sex, weight and size of hunted animals. Figure 3 illustrates the mean weight and SD of total harvested animals. There is not a significant difference in weight between genders.

Although there is not enough evidence to deduce that hunting is selective, the preliminary results suggest that 68% of harvested fauna are males, and 83% are adults. Hunters manifested that hunting is opportunistic and they would prefer the biggest animals, which are usually males. To determine the sustainability of hunting requires accurate information on the number of animals extracted and their sex/age class; the results suggest that particular attention on San Martin's data is required. It is important that local people realise that collecting data on wildlife harvest is vital for them in order to quantify changes in protein source availability in the long term (amongst other reasons). Long-term and continuous research is needed in order to gather reliable samples, and most importantly, full involvement of local people. Accurate information is essential before suggesting any conservation strategy (eg. hunting quotas/restrictions/bans, selection of hunting areas, etc). Sensitive species have been over-hunted. For example in May 2007, seven tapirs were hunted in San Martin (pers. com. A. Barona). As the community does not follow any hunting restriction, control is nonexistent (Figs 4 and 5).

Clear evidence of local extinction is found in the case of the capybara (*Hydrochaeris hydrochaeris*). In a community meeting in September 2005 a community leader and coordinator of TWMP (Lorenzo Gregorio) said: *Caypbara run away because they were chased by shotguns. Now we can see what can happen to other animals like the huangana (Tayassu pecari)*. This argument was based on traditional knowledge and direct observation. Our preliminary results confirmed that capybara is not hunted anymore, representing only 1.3% of the harvested fauna; census information also indicates that less than 1% of our current data set is represented by *Hydrochaeris*. This overexploitation was mainly driven by commercial hunting. If local control is not implemented wild populations of white-lipped peccary could decrease, becoming very rare and thus vulnerable to local extinction.

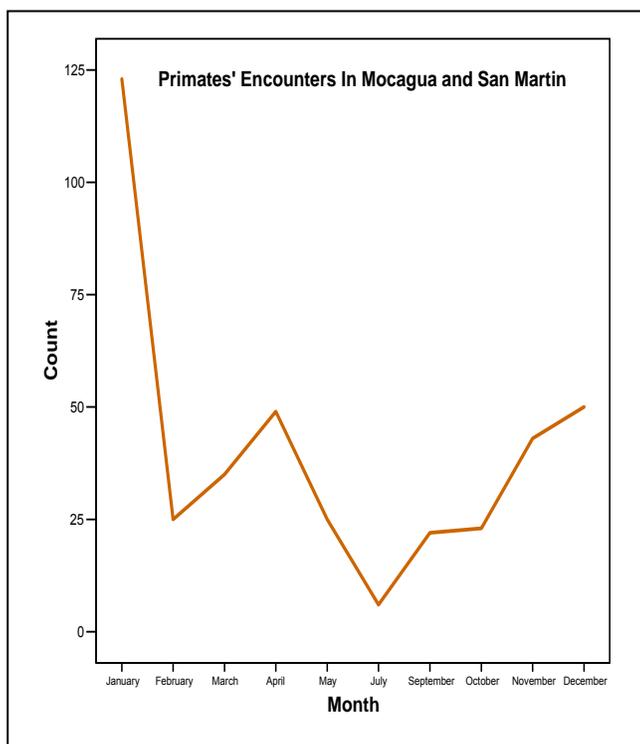


Fig 6. Monthly primate' visual detections during 2005-2007 (n= 401)

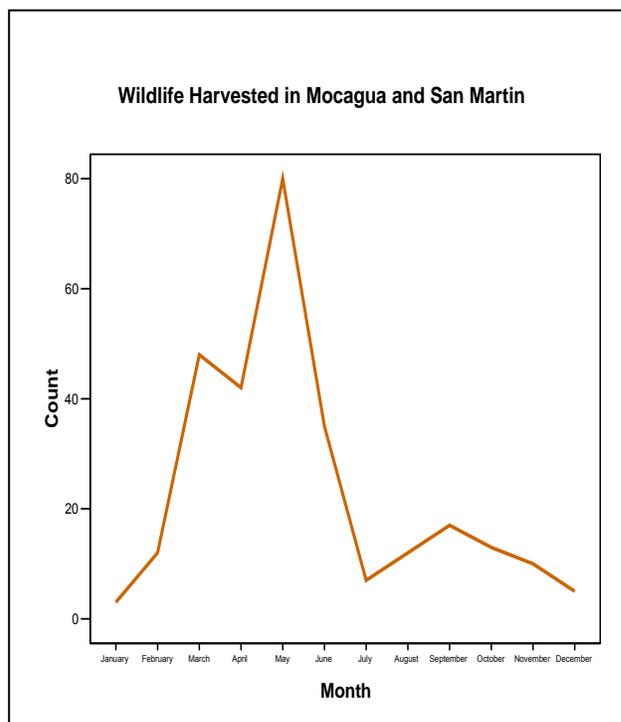


Fig 7. Monthly wildlife harvest in Mocagua and San Martin (n= 285)

Encounters with primates seem to be higher during the rainy season (November to May) and it coincides with the peak of hunting. From March to May wildlife has the highest food availability, thus animals gain weight. For local hunters, this is the time of *fat animals* and hunting increases drastically. It is interesting to note that in July encounters and harvest of wildlife both decrease significantly. One explanation could be the difficult access to *terra firme* forest as the river level decreases but the forests are still flooded, limiting the access not only by foot but also by boat. Additionally, when the level of the river drops, fish are easier to catch, and local people spend the majority of their time fishing for consumption and commercialisation, decreasing the pressure on wildlife harvest (Figs 6 and 7).

6.3. Dissemination (please see Appendix 4)

6.3.1. **Conservation Awareness Activities:** Preliminary data collection of local people's perception of wildlife utilisation was carried out (February to September 2005) (see Appendix 1). During this period it was intended to open communication channels with the aim of introducing the study, research team and data collection techniques. This initial approach was fundamental to gain the confidence and support of local people. Bearing in mind local perceptions of the decline of some wildlife species we defined the flagship species of the research. The once favoured hunting targets, woolly monkeys, have now become increasingly difficult to find in the forest. This has raised concern among local people and thus provided a compelling starting point from which to focus environmental education in the area. It has been suggested that wildlife management strategies are more effective when they concentrate on local species of cultural and ecological interest to communities (Cormier 2003; Silvius, 2004). Owing to their value as important forest seed dispersers and the special kinship bonds that Amerindian people traditionally form with monkeys (Cormier 2003) this species has proved to be a promising flagship for conservation in the area.

Initially, through targeting children it was hoped that an interest and understanding in wildlife would be retained into adulthood as an investment in long-term conservation efforts. The education received by children plays a significant part in influencing future resource consumption and the process of knowledge gain passed on from children to parents (and other adults) highlights the importance of rooting positive attitudes towards nature among young people (Hugh-Jones, 1992).

From October to December 2006, a total of 19 days were employed to carry out a second approach to children at the schools of Mocagua and San Martin. With the collaboration of the director of the schools, the education officer of the Monkey Sanctuary Trust, (Cornwall, UK), one volunteer and the PI, biology lessons, painting, forest walks, poetry and story writing, filming, (also watching of wildlife films) and performance art were employed to record additional qualitative data on local children's perceptions of wildlife.

6.3.2. **Local and regional level:** Monthly meetings are held in each community (see 5.1.4). In Amacayacu National park's visitor centre (Aviatur concession), the PI gave oral presentations about primate conservation and community-based research to visitors, the tourism concession's staff and Colombian journalists. Following are the outputs of the last meeting in each community:

Mocagua: On the 16th of February a meeting was held in Mocagua community. 25 community members, a representative of Amacayacu National Park (Diana Deaza), a representative of a local NGO working in the area (Dr Sara Bennett) and the research team attended the meeting. The main topic of the meeting was to evaluate the current management of natural resources, based on the

guidelines for fishing and wood extraction agreed in 2004. The general feeling was that fishing has been overexploited and that hunters from other communities do not follow the hunting bans/restrictions implemented by Mocagua although they are hunting within Mocagua's IR.

Additionally, local people commented on the lack of participation by the community in meetings related to projects that are currently carried out in their IR. A woman community leader mentioned that young people do not participate in community activities if they are not paid for it. Finally, she commented on the loss of Tikuna culture and how it is affecting local social and environmental dynamics. To conclude the meeting all the participants agreed that young people should be encouraged to go to the forest, learn how to live there and get this information from a local expert. The PI proposed to take such groups for fieldtrips where local hunters will share their knowledge with them and the research team of TWMP will train them in wildlife and plants census techniques. These activities will be carried out from November 2007 when the PI returns to the field.

San Martin: The last meeting took place on the 25th of February, with the participation of 43 community members, Park representatives (Alexander Alfonso and Andres Barona) and the research team. The aim of this meeting was to agree with local people the new project coordinator team, as the general feeling was that TWMP is employing the same people without giving job opportunities to other members. This situation was difficult to solve as the previous local coordinator had not been rotating the co-investigators as we arranged the previous community meetings in September 2005. A new team was chosen by the Curaca⁷ and community members. The local person in charge of research commented on the lack of understanding of local people concerning the research projects working in San Martin, as most of community members do not speak fluent Spanish and the messages are not clear for them, despite their having agreed to participate in the research. The PI explained again (mentioned in September's meeting) the possibility of communicating the results of the research with visual tools as videos recorded by local members using Tikuna language. As a result of this meeting *Participatory video* has been implemented.

After having a discussion with some young leaders of the community about their perception of large mammal depletion within their IR, one of them, Mamerto Gregorio commented: *"it is easy for white people to talk about how critical is the situation of Amazon forest, when they do not depend on the forest, when they have the background, the money and the experience of travelling and learning about what is happening in other areas. But for us forest is all we can see, and for many people the forest is never-ending, we have been living here all our lives and although resources are decreasing we do not have other way to supply our needs"*. The PI briefly commented that it would be helpful for them to form their

⁷ **Curaca:** Local Chief elected by the community. The Curaca and The Cabildo (local committee) are the maximum authorities in the communities and are the legal representatives.

own view of the global conservation context to find out what their local situation is, and how it could be in the near future if they do not change human dynamics.

- 6.3.3. **National:** In August 2005 and 2006, the PI submitted two interim reports to the Colombian Park System (UEASPNN). Research permit was granted till October 2009. This is the first 3 year permit obtained by an individual project in ANP.
- 6.3.4. **International 2006:** At the 21st Congress of the International Primatological Society, in Entebbe, Uganda (2006), during the meeting: *Primates in Peril: The World's 25 Most Endangered Primates 2006-2008*, the PI proposed the yellow-tailed woolly monkey (*Oreonax flavicauda*) (endemic Peruvian species), and it was included in the final list. Following this, a pilot project was carried out by a team of previous volunteers of TWMP with the involvement of a Peruvian student and a local NGO (see Appendix 5).

International 2007

Fundacion Entropika Colombia and UK: In order to approach policy makers and the different stakeholders in the study area, the PI proposed the creation of a foundation with the aim of addressing conservation issues at local, regional, national and international levels. As a result, in February 2007 a group of local conservationists, all of whom have been working in the area for at least 5 years, and local indigenous people established Fundacion Entropika Colombia. In April 2007 Entropika UK was formed as a limited company, and currently it is waiting for its application for charitable status to be approved.

Meeting of Minds UK:

The Living Rainforest (Newbury): The launch of Entropika was carried out on the 22nd of June in the UK, with the Event *Meeting of Minds*. With the involvement of an elder leader of San Martin de Amacayacu (Don Azulay Vasquez) and a young leader (Mamerto Gregorio), Fundacion Entropika carried out an exchange of traditional plant use combining traditional knowledge with a scientific approach; Professor Sir Ghillean Prance, Peter Bunyard and Prof. Jeremy MacClancy, were some of the speakers. The PI presented preliminary results of this research, highlighting the importance of community involvement for the implementation of long-term conservation strategies. As a result of this event, important links were established between British organisations and participants. It was an exceptional opportunity for the Tikuna leaders to disseminate the importance of their culture for the future of the Colombian Amazon, explaining as well current conservation issues facing by their community.

Eden Project: From the 27th of June till the 14th of July, three Eden Project teams (Tropical biome, education, and storytellers), the Tikuna representatives and the Entropika team developed a cultural exchange regarding the use of plants by Tikuna people and Cornish traditional culture. A final talk was given at Oxford University, Department of Anthropology on the 18th of July.

7. RECOMMENDATIONS

ASPECT	IDENTIFIED ISSUES	STAKEHOLDERS INVOLVED (SI)	RECOMMENDED ACTION
Extraction of natural resources	Over-hunting: capybara, tapirs and peccaries Over-fishing	Tikuna communities. ANP. TWMP. Boarding schools	<p>a) Discuss with Curacas the possibility of implementing wildlife monitoring with local people, as well to enhance the hunting bans/restrictions.</p> <p>b) Explore the possibility of captive breeding of Capybara, which has been successful in Brazil and Venezuela (with indigenous communities).</p> <p>c) Find alternative sources of income: carry out a feasibility study of the local economic initiatives identified by the REM⁸, in order to find sustainable alternatives.</p> <p>d) Inform boarding schools about the over-exploitation of large mammals. Suggest and support implementation of aquaculture projects.</p> <p>e) Evaluation of current ecotourism should be evaluated. It has to be clear that local communities have the adequate profit from it, as this income could minimise drastically over-extraction of natural resources.</p> <p>Note: to take action, funding is required. Funding application with all the SI is in preparation (see Appendix 3)</p>
	Illegal logging	Tikuna communities. ANP. Puerto Narinio, Local police, CORPOAMAZONIA ⁹ , logging companies, regional traders	<p>a) Monitoring wood extraction is necessary but control over the logging business has to be implemented by regional authorities; unfortunately the corruption minimises the chances to have a legal agreement between the different actors. As a regional initiative, where local people have direct income from the production and commercialization of final products (e.g. cedar furniture), selective logging can still allowed by regulating numbers and species extracted. A preliminary approach to regional business groups was carried out by the PI in March 2007, and they received the idea positively and two main traders would like to be included in this proposal.</p> <p>b) An economic and ecological feasibility study should be implemented in order to determine the possibilities of developing sustainable logging extraction which benefits local people.</p>
Ecological information	Census: Small sample size	TWMP. Tikuna communities. ANP	<p>a) It is important to implement long-term monitoring of wildlife and its harvest. Full local involvement is necessary to guarantee reliable data. It is only possible if the presence of conservationists and personnel of ANP is permanent. The continuation of TWMP will enhance involvement of local people.</p> <p>b) Combining line transect techniques with camera-trapping methods will increase the chances of keeping record of diurnal and nocturnal wildlife, thus increasing sample size of census fieldwork.</p>

⁸ During the initial phase of the REM, local economic initiatives were presented by the communities. Some of the ideas are: aquaculture, local ecotourism, communitarian work for the improvement of the local handcraft shop, captive breeding of rodents, and extension of their IR.

⁹ **CORPOAMAZONIA:** Regional authority from the Colombian Environment Ministry in charge of the Colombian Amazon basin.

			c) To evaluate the conservation status of herpest sensitive species, IUCN criteria has to be fulfilled. Having technical support from the Colombian Red List Authorities (RLA), local environmental organisations could have access to the appropriate tools, such as RAMAS ^{®10} software. GIS training is vital to complete an accurate GIS database. This information will be indispensable for zoning, sustainable extraction of resources, amongst other conservation strategies.
	Plant survey	TWMP. Tikuna communities. ANP	From January 2007 up to date, TWMP is carrying out a plant survey of key plant species (for wildlife and human use) in order to determine diversity, distribution etc. plant survey should be implemented in neighbouring forests to monitor current deforestation and other environmental threats. This information is necessary for identifying possible opportunities for sustainable logging.
Local dissemination	Lack of local involvement for the design of a management plan	Tikuna communities. ANP. TWMP.	a) It has been clear that even if local people manifest their agreement about the REM, no action is taken in order to implement the management plan. The message has to be redirected, from a local person to the community. Thus dissemination of proposals, results, etc, has to be effective, it means that local people understand why a management plan is important to secure their livelihood in the long term. We propose that local leaders work directly with ANP and TWMP, and they will disseminate the information with the use of visual tools (bearing in mind illiteracy). Participatory Video ¹¹ has been implemented by TWMP since April 2007. More equipment and training for local people is necessary to provide complete tools, thus local people will not depend on outsiders to disseminate their own ideas across the SI. Up to date young leaders are actively involved in this process. b) Traditional knowledge has to be transferred to young people in order to combine traditional and ecological information, to understand current environmental dynamics.
Follow-up	Weak monitoring	Tikuna communities. ANP. TWMP. CORPOAMAZO NIA	The challenges of making effective protection of natural resources by protected areas in developing countries still enormous. International funding is mandatory in order to achieve the design, implementation and monitoring of management plans. Regional initiatives like The Calderon Project (see Appendix 3) are crucial for the conservation of fragile ecosystems like the Amazon rainforest. Even small scale conservation can provide global ecological services especially for climate regulation, use of medicinal plants, etc.

¹⁰ **RAMAS[®]**: This program assigns taxa to Red List Categories according to the rules of the IUCN Red List Criteria and has the advantage of being able to explicitly handle uncertainty in the data (Akçakaya and Ferson, 2001).

¹¹ **Participatory Video**: Participatory video is a method used to involve community members in creating their own films on issues relevant to them. It is important to make the distinction between PV and documentary making as PV is the production of materials by the communities themselves rather than an interpretation of messages by an "outsider". This means that rights to material, control over its ultimate representation and the decision-making process remains firmly in the hands of the participants (Lunch and Lunch 2006).

8. CONCLUSIONS

After two years of data collection it is clear that in order to understand (or at least have preliminary information) the complex seasonal cycles of the Amazon rainforest that affect food availability, wildlife use of space and human's economic dynamics, long-term data has to be collected. Ecological interactions have to be monitored in order to understand how human activities are affecting these interactions, and urgent conservation action has to be implemented. Conducting research along with local communities can be challenging. The main obstacle has been a lack of trust of white people within the community due to the exploitation of the relationship between the two groups in the past by outsiders working in the area. This has, in turn, tainted the Tikuna peoples' view of conservation projects and hindered recent attempts towards cooperation. The communities are dealing with several issues such as cultural identity and land tenure within their own indigenous land, which drastically affect their view and use of natural resources.

The challenges of conservation are huge when socio-political issues are present in the study area, but at the same time to work alongside the Tikuna communities in order to contribute to the solution of those issues is a motivating factor. Quantitative data are critical for San Martin to support their appeal for the extension of their indigenous land. It is important to acknowledge the limitations in acquiring reliable data on wildlife harvest collected by local people. However the implementation of conservation policies/strategies is only achievable when local communities are fully engaged in solving their problems. The fact that local people and Colombian Park System support TWMP in the long-term, granting a research permit till 2009, confirms the need of information and support to solve current issues and the intention of developing a management plan. Environmental law enforcement is crucial to obtain real protection of natural resources. As Terborgh (2002) states, internationalization of conservation could be the only effective way of protecting natural resources. Financial support, technological transfer, training and law enforcement could be achieved only if local, regional, national and international organizations join forces to preserve nature...extinction is forever and time is running out.

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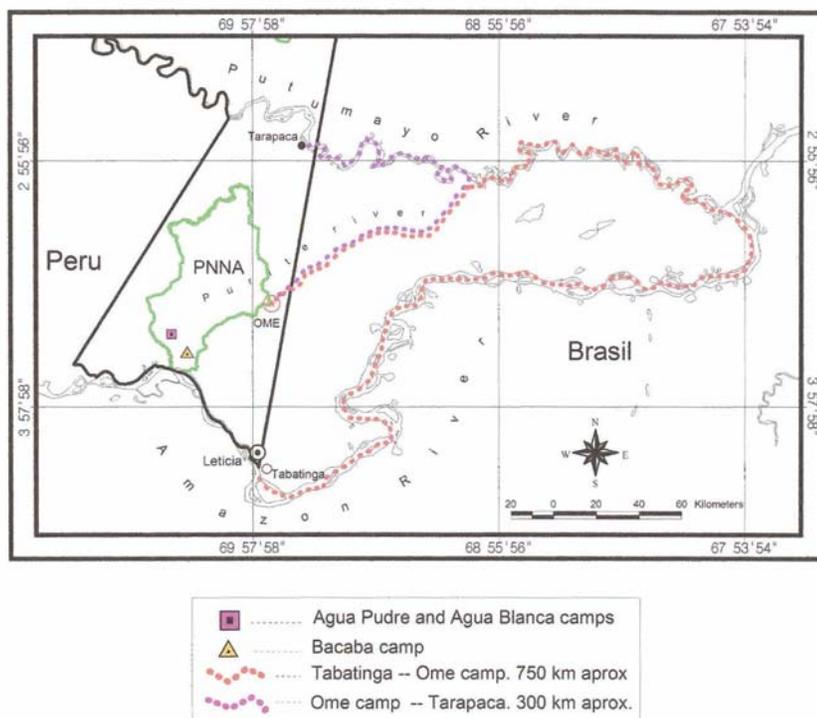
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10. MAPS

PARQUE NACIONAL NATURAL AMACAYACU



Maps 1 and 2: Colombia, Trapecio amazonico (Colombian trapezium) and Amacayacu Nacional Park



Map 3. Study sites: Agua Pudre and Agua blanca (San Martin) (square). Bacaba and Pucacuro (Mocagua) (triangle). Ome Biological Station and access routes, from Tabatinga (Brazil) and from Tarapaca (Colombia).

11. LIST OF APPENDICES

- 11.1. Appendix 1: Conservation Awareness Report (By Hannah Parathian MSc)
- 11.2. Appendix 2: TWMP: Research Team 2005-2007
- 11.3. Appendix 3: Calderon Project Proposal
- 11.4. Appendix 4: TWMP Dissemination of Research 2005-2007
- 11.5. Appendix 5: *Oreonax* Project: Pilot Project Report (By Noga and Sam Shanee MSc)

Appendix 2

TWMP: VOLUNTEER TEAM 2005-2007

Hannah Parathia MSc. Primatologist	UK	Joined TWMP in 2005 and currently is doing a PhD degree at Oxford Brookes University. Her research focus on Local's people perception on wildlife utilization in Mocagua and San Martin, Colombian Amazon.
Clair Tucker MSc Primatologist	UK	Carried out conservation education activities with local people and gave English lessons
Noga Shanee MSc and Sam Shanee Primatologists	Israel UK	Carried out census work. After volunteering in TWMP, they went to Peru to conduct a Pilot Project on the Conservation status of the yellow tailed woolly monkey and are waiting for funding to implement a long-term project in Amazonas, Peru.
Liz Tyson Environmental Law	UK	As the Education Officer of the Monkey Sanctuary Trust (Cornwall, UK) she went to volunteer at TWMP carrying out the education activities. Founder of Entropika UK and currently is living in Leticia, coordinating education activities with the involvement of local schools, Entropika, ANP and TWMP.
Andres Barona Ethno-botanist	Col	He is carrying out the plant census fieldwork. Founder of Entropika Colombia. Interpreter (Spanish/English) during the event <i>Meeting of Minds</i> (UK).
Lina Pelaez Wildlife Veterinarian	Col	She carried out census and education fieldwork
Juan David Sanchez Biologist	Col	While volunteering for TWMP he collected data for his Biology degree
Andrea Barrera MSc. Biologist	Col	She carried out collaborative fieldwork with TWMP while collecting data for her MSc dissertation. Currently is starting a PhD degree in the UK
Jenny Zambrano Biologist	Col	She carried out collaborative fieldwork with TWMP while collecting data for her Biology degree. Currently is starting a PhD in USA
Maria Jose La Rota. Biologist	Col	She carried out collaborative fieldwork with TWMP while collecting data for her Biology degree. Looking for MSc in USA
Johanna Aldana Biologist	Col	Carried out census fieldwork and conservation education activities with local people and gave English lessons
Juliana Ospina Ecologist	Col	Currently is carrying out census fieldwork and education activities with the two Tikuna communities and local schools in Leticia alongside Entropika foundation and TWMP
Angela Maldonado MSc PhD (c) Conservationist	Col	Principal Investigator of TWMP. Director of Entropika Foundation and the Calderon Project. Will obtain PhD degree in 2009. Her dissertation topic is the sustainability of hunting in overlapping areas within two Tikuna communities and ANP.

TWMP: DISSEMINATION OF RESEARCH 2005-2007

DATE	DESCRIPTION	LOCATION
06/Sep/07	Poster Presentation at: 2 nd Congress of the European Federation for Primatology: <i>Assessing the impact of hunting on harvest-sensitive primates within protected areas and indigenous land in the Colombian Amazon</i>	Prague, Czech Republic
27/June-14/July/07	Cultural and conservation exchange of plant and traditional knowledge between San Martin and the UK	Eden Project, Cornwall
22/June/07	Organisation of conference and Oral Presentation	<i>Meeting of Minds</i> , The Living Rainforest, Newbury (UK)
May/07	Oral Presentation.: <i>Conducting community-based research and conservation in the Colombian Amazon: The Woolly Monkey Project</i>	Research Symposium of Social Sciences and Law Oxford Brookes Univ (Oxford)
05/Mar/07	Workshop with ANP members of staff. Sharing information and planning research for 2008	ANP (Leticia)
25/Feb/07	General community meeting and workshop (census methods/GPS)	San Martin (ANP)
16/Feb/07	General community meeting and workshop (census methods/GPS)	Mocagua (ANP)
26/Nov/06	Oral presentation: Evaluacion del Estado de Conservación de la Comunidad de Primates en Zonas de Traslape -Parque Amacayacu, Amazonas. Información preliminar	II Congreso Colombiano de Zoología Santa Marta, Colombia
12/Sep/06	General community meeting and workshop (census methods/GPS)	San Martin (ANP)
04/Sep/06	General community meeting and workshop (census methods/GPS)	Mocagua (ANP)
28/Jun/06	Poster presentation at 21 st Congress of the International Primatological Society: Potential effects of forest fragmentation and ateline (Primates) extinction on plant diversity and composition in the western Orinoco basin, Colombia	Entebbe, Uganda
13/May/2006	Status and conservation of primates and other vertebrates in Amacayacu National Park.	British Federation of Women Graduates: Research Presentation Day (London)
20/Mar/06	presentation of the seminar: <i>FINAL PROJECT: preparing, conducting and completing field research in a tropical forest TWMP</i>	Primate Conservation Seminar Series, OBU (Oxford)
07/Mar/06	Oral presentation: Status and Conservation of Primates and Other Vertebrates in Amacayacu National Park-Colombia – A Community Based Project (Work In Progress)	Oxford Brookes University: Lunch time Seminar for Research Students (Oxford)
06/Dec/05	Oral presentation: Community-based research: A powerful tool for Amazon forest conservation.	British Federation of Women Graduates (London): Christmas

		meeting
DATE	DESCRIPTION	LOCATION
18/Nov/05	Posters presentation: Status and Conservation of Primates and Other Vertebrates in Amacayacu National Park-Colombia – A Community Based Project (Work In Progress) and The woolly monkey Project – Environmental education programme	Royal Geographical Society (London): In the Field event 2005
14/Nov/05	Oral presentation: Human-Primate Inter-specific relationships: An experience from the Amazon.	Schumacher College- Plymouth University (Devon): Guest speaker
02/Nov/05	presentation of two posters: TWMP: Research and Education	OBU, Primate Conservation Fundraising Campaign Launch Event (Oxford)
29/Oct/05	Oral presentation: Participatory research in the Colombian Amazon: <i>The Woolly Monkey Project</i> .	International Honours Program (IHP) from Boston University at Cornwall (UK)
26/Aug/05	Oral presentation: Evaluacion del estado de conservacion de la comunidad de primates y otros vertebrados en el PNN Amacayacu, Amazonas - Investigacion Participativa con comunidades Tikuna.	Universidad Nacional de Colombia, International Congress of Wildlife Management (Bogota)
28/Feb/05	General community meeting and workshop (census methods)	San Martin (ANP)
26/Feb/05	General community meeting and workshop (census methods)	Mocagua (ANP)
20/Feb/05	Official meeting with ANP and Curacas of Tikuna communities	ANP