

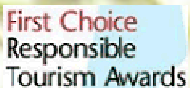


EXPEDITION REPORT

Expedition dates: 19 August - 1 September 2012

Report published: February 2013

Amazonian plethora: biodiversity monitoring of jaguars, pumas, primates and other flagship species of the Peruvian Amazon.



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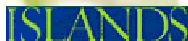
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EXPEDITION REPORT

Amazonian plethora: biodiversity monitoring of jaguars, pumas, primates and other flagship species of the Peruvian Amazon

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Authors

Alfredo Dosantos Santillán
Tahuayo River Amazon Research Center

Matthias Hammer & Adam Stickler (editors)
Biosphere Expeditions

Abstract

An expedition to the Tamshiyacu Tahuayo Community regional Conservation Area was conducted with Biosphere Expeditions in 2012; this was the first Biosphere Expeditions survey to the area.

The aim of the survey was to determine patterns of occupancy, abundance and density of cat, primate and other flagship species at the Tahuayo River. Long-term monitoring of these populations in the Tahuayo River area provides a concise data set to guide the area's wildlife management.

The sampling consisted of transect wildlife censuses and the deployment of eight camera traps on a trail grid system. Data collected included abundance of certain species and habitat preference. Only the margay was recorded during the survey by the camera traps, large cats (jaguar and puma) as well as ocelot were not recorded. Variations in the presence – absence patterns were normal.

Resumen

Una expedición al Área de Conservación Comunal Regional Tamshiyacu – Tahuayo fue conducida con la colaboración de Biosphere Expeditions en el año 2012; esta fue el primer muestreo de Biosphere Expeditions en el área.

El objetivo principal del muestreo es determinar los patrones de abundancia y densidad de felinos, primates y otras especies bandera en el río Tahuayo y monitorear a largo plazo las poblaciones de felinos, primates y otras especies bandera en el área del río Tahuayo y proveer un banco de datos para guiar el manejo de fauna silvestre en el área.

El muestreo consistió de censos por transecto para fauna silvestre y el despliegue de 8 trampas cámara en un sistema de red de transectos. La colección de datos incluyó abundancia de ciertas especies y preferencia de hábitat. Sólo margay fue reportado por una de las trampas cámara, los felinos grandes (jaguar y puma) y el ocelote estuvieron ausentes en los resultados. Las variaciones en los patrones de presencia-ausencia son normales.

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1. Expedition Review

M. Hammer & A. Stickler (editors)
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Expeditions are open to all and there are no special skills (biological or otherwise) required to join. Expedition team members are people from all walks of life and of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This expedition report deals with a survey of iconic wildlife species in one of the best conserved remaining regions of the Amazon basin with vast areas of unbroken canopy. The survey ran from 19 August to 1 September 2012. Since the Amazon was first explored scientifically, naturalists have been astounded by its diversity of plants and animals, with the western Amazon boasting the area's highest biodiversity. The Amazon harbours up to 300 species of trees in a single hectare, as well as hundreds of species of shrubs, vines, herbaceous plants and ferns. The Amazon supports over 2,000 species of birds, almost a quarter of the world's total, and, around 300 species of mammals.

This project was based at the Tamshiyacu Tahuayo Community Regional Conservation Area (TTCRCA). Previous studies suggest that this area has the greatest mammal diversity and particularly the greatest primate diversity in the entire Amazon.

The conservation activities performed by the communities of the upper Tahuayo River have had an important influence into the protection of the area. Logging, hunting and fishing activities were identified as serious threats and in the early 1980s a control system to prohibit the extraction of natural resources was introduced. Ten years later, in 1991, the Regional Government of Loreto declared the Tamshiyacu Tahuayo Community Reserve and the high primate diversity was a factor in its creation. In 2007 the Tamshiyacu Tahuayo Community Reserve changed its category to *Area de Conservacion Regional Comunal Tamshiyacu Tahuayo*.

Previous work on the trail grid at the Tahuayo River Amazon Research Centre (Dosantos, personal observation) suggests that there may be two species of titi monkeys (one so far unknown), two species of saki monkeys (one so far unknown), two species of squirrel monkeys (one so far unknown) and two species of night monkeys (one or both so far unknown). Much work has already been done by the Tahuayo River Amazon Research Centre, but there is still a big gap of information that needs to be filled by scientific work, especially as regards primates and cats.

1.2. Research area



Figure 1.2a Flag and location of Peru and study site. An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at [Google Maps](#).

Peru is located on the Pacific coast of South America and is the third largest country on the continent. Two-thirds of Peruvian territory is located within the Amazon basin. The expedition base camp was within the Loreto Department, which boasts the second largest protected area, the Pacaya Samiria National Reserve (over two million hectares) and also the first Community Regional Conservation Area of the country, the Tamshiyacu Tahuayo Community Regional Conservation Area (TTCRCA) of 421,000 hectares.

Biologists refer to the Tamshiyacu Tahuayo area as the “green paradise” of the Amazon forest. Located south of Iquitos, just off of the main Amazon river, the reserve encompasses areas around the Tamshiyacu and Tahuayo rivers eastward towards the border with Brazil. The reserve is currently adding a million acres of undisturbed forest onto its boundary, which will then include land all the way to the border with Brazil.

In terms of biological diversity, the research area is amongst the richest in the world and the TTCRCA harbours many species that exist nowhere else. The reserve's mammal diversity has been shown to be the greatest of any region in the Amazon, and the number of primate species is the highest of any protected area or reserve in Peru (Puertas and Bodmer 1993). The area also harbours 240 species of fishes ([Gobierno Regional de Loreto](#)) that inhabit rivers and lakes, 550 species of birds ([Gobierno Regional de Loreto](#)), such as the harpy eagle and razor-billed curassow. 87 non-flying mammal species have been recorded ([Gobierno Regional de Loreto](#)), amongst them the Amazon manatee, pink river dolphin, giant river otter, and jaguar. At least 14 species of primates are present (Puertas and Bodmer 1993), including an important population of the red uakari monkey. It is also an area of great plant diversity.

1.3. Dates

The expedition ran over a period of two weeks divided into two one-week slots, each composed of a team of international research assistants, scientists and an expedition leader. Slot dates were 19 - 25 August | 26 August - 1 September 2012 and this period was chosen to coincide with the dry season when there is less likelihood of daily activities being interrupted by rain and when the trail grid is accessible.

1.4. Local conditions & support

Expedition base

The Tahuayo River Amazon Research Center (TRARC) is a basic, but very comfortable lodge right inside the remote Tamshiyacu Tahuayo Community Regional Conservation Area. Cabins all have twin or triple beds and a view to the Tahuayo River. All meals were prepared for the team and vegetarians and special diets were catered for. The TRARC was also equipped with a solar panel system that provides sufficient electricity to cover all the basic electricity needs.

Weather

The area lies within the confines of the Amazon basin with a sub-tropical climate and distinct wet and dry seasons. The wet season is between December and June when rainfalls are heavy and frequent and the humidity is high (around 90% inside the forest). During the dry season, when the expedition took place, the average temperature was 26.8 °C with a maximum of 33.5°C. Rainfall totalled 9.26 mm during the dry season between June and November.

Field communications

Mobile phones did not work in the research area, but the TRARC had satellite internet and telephone for emergency communication with Iquitos. In addition, the expedition leader sent an expedition diary to the Biosphere Expeditions HQ every few days and this was published via [Facebook](#), [Google+](#) and the [Wordpress blog](#).

Transport & vehicles

Team members made their own way to the Iquitos assembly point on time. From there they travelled by boat to the TRARC (about 4 hours). Once at TRARC, studies were conducted on foot or by canoe. All transport, boats and vehicles were provided from the expedition team assembly point for the outward and return journeys.

Medical support & insurance

The expedition leader was a trained first aider, and the expedition carried a comprehensive medical kit. Further medical support was provided through a medical post in Esperanza village (Clinica Ana Stahl), about two hours by boat. The nearest hospital was in Iquitos, about four hours by boat. Safety and emergency procedures were in place, but did not have to be invoked, as there were no medical or other emergencies.

1.5. Expedition scientist

The expedition's local biologist was Alfredo Dosantos Santillán. Born in Iquitos, Peru, Alfredo graduated in Biological Sciences at the National University of the Peruvian Amazon at Iquitos. Alfredo has worked for several conservation projects and has played a role in the creation of three protected areas. He has also acted as a consultant for WWF at the Yurua River Project and for The Wildlife Conservation Society at the Pacaya Samiria National Reserve monitoring wildlife key (indicator) species, and at the Yavari River Project monitoring primate population. He works actively for the preservation of the Amazon forest and the cultural patrimony of different ethnic groups in many different locations in the Peruvian Amazon.

1.6. Expedition leader

This expedition was led by Malika Fettak. Malika is half Algerian, but was born and educated in Germany. She majored in Marketing & Communication at the University of Frankfurt, which led her to jobs in PR & Communications. She has travelled widely, especially in Africa and Northern Europe. Her love of nature and the outdoors, and taking part in a few Biosphere expeditions, persuaded her that a change of career was in order and here she is since 2008, leading expeditions and desperately trying to make herself useful around the office :) Malika is a keen sportswoman - triathlon, skiing, volleyball, etc. and enjoys the outdoors.

1.7. Expedition team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were (with countries of residence in parentheses):

19 – 25 August 2012

Teresa Duddy (USA), Barney Eden (UK), Bozena Goraj (The Netherlands), Felix Haselböck (Austria), Klaus Haselböck (journalist, Austria), Raphael Marks (UK), Rosa Marks (UK), Gabriela Munoz (journalist, Australia), Libby Ross (Australia), Prudence (Penny) Stevens (Australia), Sarah Thurman (UK), Stephen Tusler (Australia), Tine Van Bortel (UK).

26 August – 1 September 2012

Herbert C Connor (USA), Eva Ho (USA), Catherine Marshall (journalist, Australia), Linda Ann Mawhinney (UK), Peter Nacke (Germany).

1.8. Expedition budget

Each team member paid towards expedition costs a contribution of £1,090 in 2012 per person per one-week slot. The contribution covered accommodation and meals, supervision and induction, special non-personal equipment, all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses like telephone bills, souvenirs etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	16,445
 Expenditure	
Base camp and transport includes all board, lodging and transport to and from base camp	6,674
Equipment & hardware includes all research materials purchased or hired	898
Staff includes salaries, travel and expenses	3,958
Administration includes registration fees, visas, sundries etc	157
Team recruitment Peru as estimated % of PR costs for Biosphere Expeditions	6,400
 Income – Expenditure	 - 1,642
 Total percentage spent directly on project	 110%*

*This means that in 2012, the expedition ran at a loss and was supported over and above the income from the expedition contributions by Biosphere Expeditions.

1.9. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members (who are listed above) who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff (also mentioned above) were central to making it all work on the ground. Thank you to all of you, and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank members of the Friends of Biosphere Expeditions and donors, as well as Swarovski Optik for their support in terms of finance and equipment.



1.10. Partners

For this expedition, Biosphere Expeditions was partnered with Amazonia Expeditions and the Tahuayo River Amazon Research Center. Through our expedition base at the Tahuayo River we were also involved with the local community, creating jobs for local people, providing health care, improving the educational services and building capacity through training & creating assets.

1.11. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given below.

2. Abundance, habitat preference and feline research

Alfredo Dosantos Santillán
Tahuayo River Amazon Research Center

Matthias Hammer & Adam Stickler (editors)
Biosphere Expeditions

2.1. Introduction

Surveys were conducted at the Tahuayo River Amazon Research Center in the Tamshiyacu Tahuayo Community Regional Conservation Area, using the largest grid of transect lines for the scientific study of mammals in the entire Amazon, it is 4 square km in size and has 42 transects (each 2 km long), which makes 84 km in total. The transect grid covers four different subtypes of habitats (higher and lower restinga, bajial, palm swamp, creek), which makes it an excellent resource for comparative analysis of species habitat use patterns (see Figure 2.2a).

2.2. Methods

Training of team members

For the first two days team members were given talks and practical lessons in learning the use of GPS, research techniques, safety, skills and procedures. The first excursions into the forest were conducted under the supervision of Biosphere Expeditions staff. After a few days, team members were confident enough to navigate in the forest, install camera traps and collect data from wildlife sightings.

Distance sampling

Line transect survey techniques were used to collect data on wildlife abundance and habitat preference. Line transect surveys have been widely used over the last three decades to quantify primate population abundance in tropical forests. However, the detail of the census methodology applied by different investigators remains highly variable despite a number of reports attempting to standardise primate census techniques (Jason and Terborgh 1980, Defler and Pintor 1985).

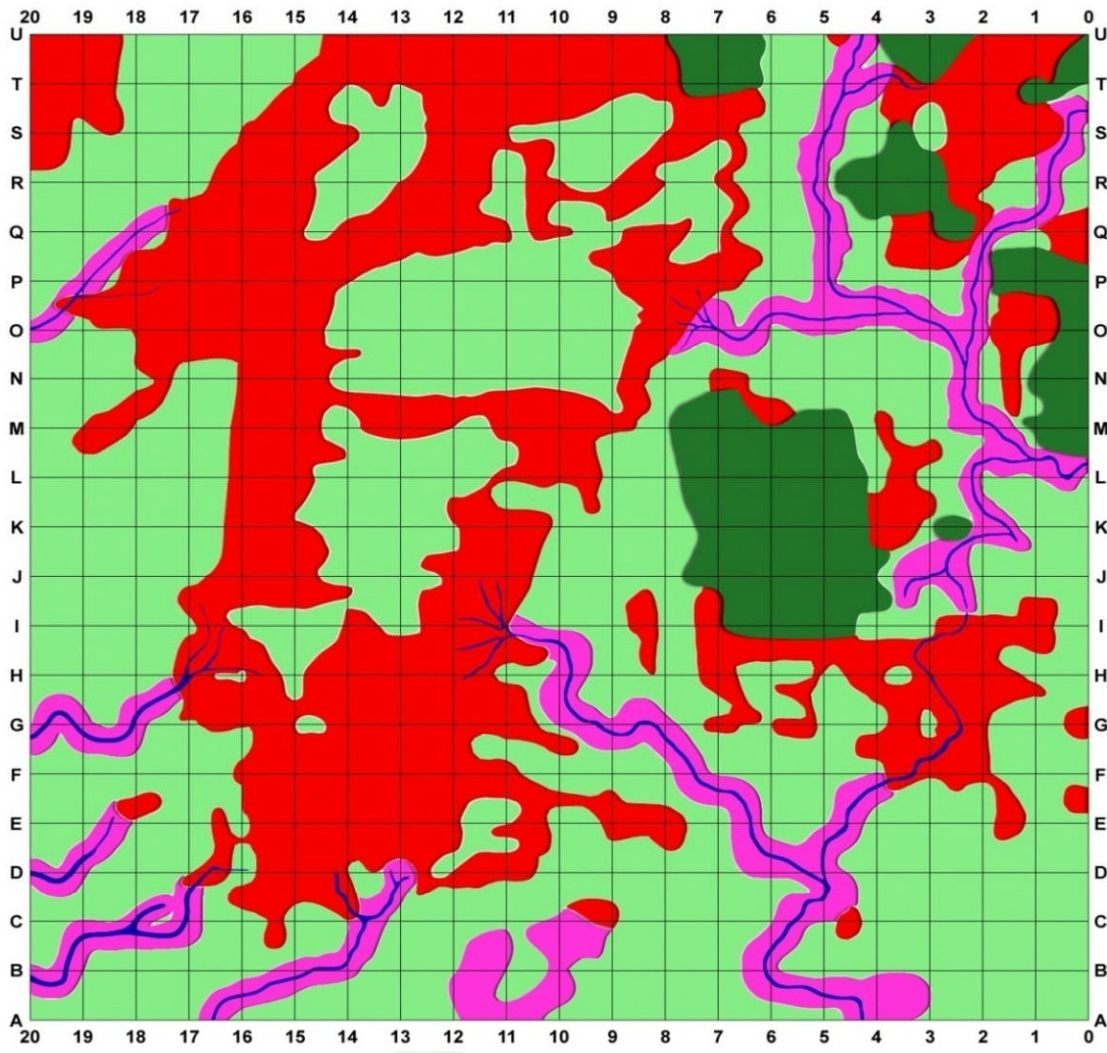
The trails to be surveyed were randomly selected the day before collection. The team was split into groups and each walked at a speed of 1.25 km/h, a distance of between 2 and 4 km every day.

Upon detecting wildlife, the team members recorded the time of the sighting, the species, group size, radial distance, bearing to the animal sighted, location along the transect by GPS coordinates, the nearest grid intersection, behaviour and other observations.

River transect distance sampling was also attempted, but did not yield enough useable data, probably because most volunteers were too busy paddling and mastering the local canoes to spot and record wildlife. This activity will be reviewed in 2013.

FOREST TYPES OF THE AMAZON RESEARCH CENTER TRAIL GRID

TIPOS DE BOSQUE DE LA RED DE TRANSECTOS DEL CENTRO DE INVESTIGACIONES DE LA AMAZONIA



400 METERS



KEY / LEYENDA	
■	HIGHER RESTINGA RESTINGA ALTA
■	LOWER RESTINGA RESTINGA BAJA
■	BAJIAL
■	PALM SWAMP PANTANO DE PALMERAS
■	CREEK QUEBRADA



Figure 2.2a. Map of the trail grid and the forest types around the Tahuayo River Amazon Research Center. Palm swamps are habitats that are by and large dominated by palm species called locally aguaje (*Mauritia flexuosa*). As its name suggests palm swamp is a wet habitat. Lower restingas are habitats that are flooded for three to four months of the year. Higher restingas are habitats that are flooded from two to zero months of the year. Bajial are habitats that typically stay flooded for six months of the year.

Camera trapping

Eight digital, motion-activated cameras (Reconyx Hyperfire Pro, www.reconyx.com) were placed in the study area. The location for each camera to be installed was chosen using www.random.org for a random selection from 10 possible locations for each camera. The total camera trap effort was 48 camera trap nights (Table 2.2a). Team members carried a GPS to obtain geographical coordinates of locations for each camera trap through the trail grid. Camera traps were set and removed at the same time, so each camera stayed for the same period of time.

Table 2.2a. Sampling history of individual cameras.

ID	Date installed	Grid coordinates	GPS coordinates		Date removed	Species	Total trap nights
C1	21/08/2012	E0	18M	UTM	24/08/2012	–	6
	28/08/2012		0693000	9513382	31/08/2012		
C2	21/08/2012	C2	18M	UTM	24/08/2012	–	6
	28/08/2012		0692986	9513682	31/08/2012		
C3	21/08/2012	E4	18M	UTM	24/08/2012	–	6
	28/08/2012		0693276	9513692	31/08/2012		
C4	21/08/2012	K6	18M	UTM	24/08/2012	Margay	6
	28/08/2012		0693892	9513430	31/08/2012		
C5	21/08/2012	E8	18M	UTM	24/08/2012	–	6
	28/08/2012		0693728	9514106	31/08/2012		
C6	21/08/2012	K10	18M	UTM	24/08/2012	–	6
	28/08/2012		0694195	9513740	31/08/2012		
C8	21/08/2012	C14	18M	UTM	24/08/2012	–	6
	28/08/2012		0693741	9514592	31/08/2012		
C9	21/08/2012	A16	18M	UTM	24/08/2012	–	6
	28/08/2012		0693736	9514874	31/08/2012		
Total trap nights							48

2.3. Results

Species occurrence

Only one of the cameras (C4) recorded a feline species, a margay (*Leopardus wiedii*) (see Figure 2.3a), right at the beginning of the expedition on 22 August 2012, a few hours after the camera trap was set.



Figure 2.3a. Margay captured on camera trap C4.

Other than camera traps yielding proof of presence, footprints of tapir, collared peccary and brocket deer (likely red brocket deer *Mazama americana*) were also identified.

A detailed list of species recorded during the surveys and by chance encounter is given in Table 2.3a. This table includes sightings from both the line transect censuses and also from chance encounters.

Over six days of surveying volunteers walked a combined distance of 44 km and seven species of primates were registered. Of these, one species (brown capuchin *Cebus apella*) was recorded using the chance encounter data sheet; the rest were recorded during the line transect census.

Table 2.3a. Species encountered during the survey at the Tahuayo River Amazon Research Center.

Common name	Latin name	Type of record*	Location on transect grid
Brown capuchin**	<i>Cebus apella</i>	S	O15
White fronted capuchin	<i>Cebus albifrons</i>	S	T14
Saki monkey	<i>Pithecia sp</i>	S	F13, T13, J8, G0
Red titi monkey	<i>Callicebus discolor</i>	V, S	A10, J4, H14, I13, O9, G11
Common squirrel monkey	<i>Saimiri sciureus</i>	S	A10, U14, Q7, F6, K6, P14, M7
Black-chested moustached tamarin	<i>Saguinus mystax</i>	V, S	A8, A10, E15, A10, I6, M8
Saddleback tamarin	<i>Saguinus fuscicollis</i>	V, S	D13, B10, A10, N13, K1, P3, D14, N8
Margay	<i>Leopardus wiedii</i>	C	K6
Tapir	<i>Tapirus terrestris</i>	T	I13
Brocket deer	<i>Mazama sp</i>	T	L14, L13, L15, L10, N16
Southamerican coati	<i>Nasua nasua</i>	S	A4, S7
Tamandua	<i>Tamandua tetradactyla</i>	S	J14
Paca	<i>Agouti paca</i>	S	A14, U12

*Recorded through track (T), vocalisation (V), camera trap (C) or by direct sighting (S).

**Recorded by chance encounter only.

Abundance

For the estimation of relative abundance only data collected from line transect censuses were used. Results are shown in the table 2.3b.

Table 2.3b. Relative abundance of mammal species along 44 km walked.

Common name	Latin name	Number of groups sighted
Red titi monkey	<i>Callicebus discolor</i>	5
Saddleback tamarin	<i>Saguinus fuscicollis</i>	4
Black chested moustached tamarin	<i>Saguinus mystax</i>	2
Saki monkey	<i>Pithecia sp</i>	1
Common squirrel monkey	<i>Saimiri sciureus</i>	6
White fronted capuchin	<i>Cebus apella</i>	1
Tamandua*	<i>Tamandua tetradactyla</i>	1

Distance 6.0 was not used for the population density due to the small sample size. (Distance is a piece of software that allows researchers to design and analyse distance sampling surveys for wildlife populations. Distance needs at least 20 sightings per species for the software to work)

Habitat occupancy

Total sightings were counted, including the ones from line transect censuses and chance encounters and including all recorded taxa (primates, and other mammal species). For some, such as the tapir, footprint records were also used. Species were recorded most frequently in the palm swamp forest, with a frequency of 16 sightings, followed by lower restinga with 11 sightings, and bajjal and higher restinga both with 6 sightings (Table 2.3c and Figure 2.3d).

Table 2.3c. Habitat preferences recorded during the expedition.

Species	Type of habitat*			
	Palm swamp	Lower restinga	Higher restinga	Bajjal
Saddleback Tamarin	2	3	0	3
Moustached tamarin	1	2	2	0
Squirrel monkey	3	1	2	1
Red titi monkey	3	1	1	1
Saki monkey	3	1	0	0
White fronted capuchin	1	0	0	0
Brown capuchin	1	0	0	0
Paca	1	1	0	0
Tamandua	0	1	0	0
Margay	0	0	1	0
Tapir	0	1	0	0
South American coati	1	0	0	1
TOTAL	16	11	6	6

*Palm swamps are habitats that are by and large dominated by palm species called locally aguaje (*Mauritia flexuosa*). As its name suggests palm swamp is a wet habitat. Lower restingas are habitats that are flooded for three to four months of the year. Higher restingas are habitats that are flooded from two to zero months of the year. Bajjal are habitats that typically stay flooded for six months of the year.

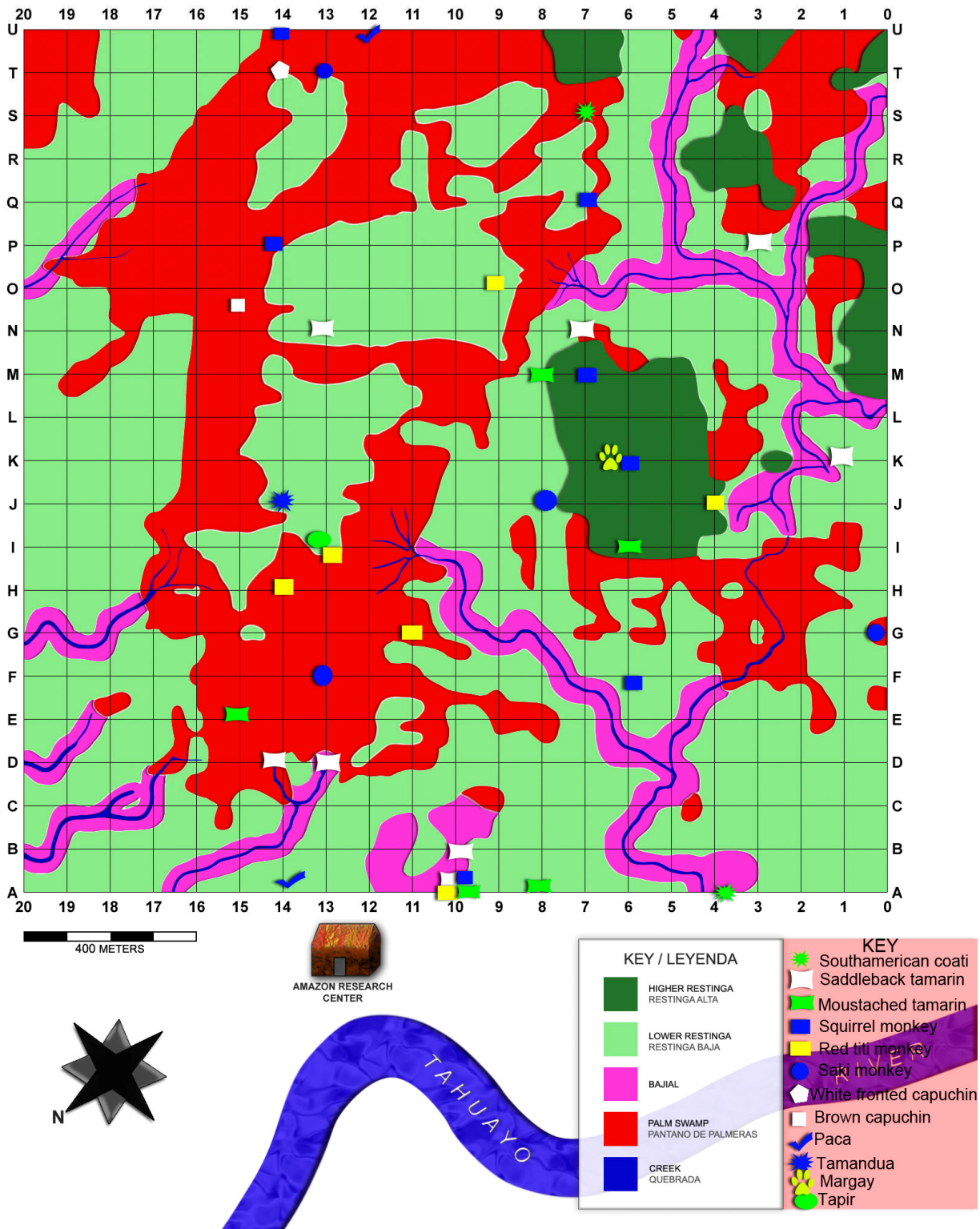


Figure 2.3d. Species occupancy in four types of forests in the Tahuayo River Amazon Research Center Trail Grid.

2.4. Discussion and conclusions

Species presence and habitat occupancy

During the survey no species of large felines were recorded, the only feline species recorded was the margay (*Leopardus wiedii*). The fact that it was captured by camera trap only hours after the camera was set, strongly indicates that the cat was not bothered by the human smells and other signs of human presence.

The reason no other cats were captured is probably because of the relatively short period of sampling and the small study area, confined to the trail grid. In addition, previous records suggest that large felines are not very abundant. For example, work employing GPS telemetry in 2003 and 2004 found densities of only six to seven jaguars per 100 km² in the Brazilian Pantanal region, compared with 10 to 11 using traditional methods of tracking and sign surveys; this suggests the widely used traditional sampling methods may inflate the actual numbers of cats (Soisalo and Cavalcanti 2006). Moreover, cats utilise very large areas, much larger than the trail grid sampling area. During another study in the Brazilian Pantanal, it was found that jaguar home range is 142 km² during the dry season and 13 km² during the wet season due to extensive flooding. Puma home range was found to vary from 26 to 52 km² (Nowel and Jackson, 1996); so, the probability of camera-trapping cats during a short-term volunteer expedition is small.

Another reason for absence may be the fact that between March and May the area suffered a severe record flood season. This is likely to have changed the distribution pattern of terrestrial species due to the fact that there was no dry land for almost two months, which caused the felines and other large terrestrial mammals to move away towards dry areas.

The results show that the most common habitat for wildlife sightings was the palm swamp forest. The plant species dominating this type of habitat is a palm tree locally called "aguaje" (*Mauritia flexuosa*). These trees bore a great amount of fruit during the sampling period and the fruits are a very important food item for various groups of mammals (especially primates and rodents) and birds. This explains why palm swamp forest was the most preferred type of forest for several species.

Recommendations for further work

This study is the beginning of a set of standardised wildlife censuses and constitutes the first base line survey for further wildlife monitoring activities. Future surveys should follow the same standardised survey methodology so that results can be used to detect changes in parameters such as species presence, abundance and distribution, habitat use, biodiversity, etc. In collaboration with the Tahuayo River Basin Management Committee, fact-based decisions can be taken regarding management and resource use in the reserve.

In addition, it would be desirable to include track records during the data collection, this information can then be used to increase the data set in future.

2.5. Literature cited

Defler, T. and D. Pintor (1985) Censusing primates by transect in forest of known primate density. *Int. J. Primatol.* 6:243-259.

Gobierno Regional de Loreto. Report on

http://www.procrel.gob.pe/www/wfr/wfrACRs.aspx?id_contenido=332&id_idioma=es&id_contenido=330

Janson, C. and J. Terborg (1980) Censo de primates en selva húmeda tropical. *Publicaciones del Museo de Historia Natural "Javier Prado", Serie A (Zoología)* 28: 1- 39.

Nowell, K and P. Jackson (1996) Wild cats – Status Survey and Conservation Action Plan. IUCN/SSC Cat specialist group. IUCN, Switzerland.

Puertas, P. and R..Bodmer (1993) Conservation of a High Diversity Primate Assemblage. *Biodiversity and Conservation* 2: 586-593.

Soisalo, M. and S. Cavalcanti (2006) Estimating the density of a jaguar population in the Brazilian Pantanal using camera-traps and capture–recapture sampling in combination with GPS radio-telemetry. *Biological Conservation* 129(4): 487.

Appendix I: Expedition diary and reports



A multimedia expedition diary is available on <http://biosphereexpeditions.wordpress.com/category/expedition-blogs/peru-2012/>.



All expedition reports, including this and previous expedition reports, are available on www.biosphere-expeditions.org/reports.