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EXPEDITION REPORT

Expedition dates: 4 – 17 August 2013
Report published: July 2014

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

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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

Marcelo Mazzolli & Matthias Hammer (editors)
Biosphere Expeditions

Abstract

An expedition to the Tamshiyacu Tahuayo Community Regional Conservation Area was conducted with Biosphere Expeditions in 2013; this was the second Biosphere Expeditions survey in the area. The study area is located in the Loreto Region of Peru by the Tahuayo River. The total area surveyed was 24 km^2, encompassing three major types of forest: terra firme, palm swamp forest and seasonally flooded forest. The area was surveyed from 6 to 9 August and from 13 to 16 August 2013. The aim of the survey was to determine patterns of distribution and frequency of wild felids, primates and other flagship species in the study area.

Seventeen volunteers were trained, in two groups, to help collect data. The first group consisted of 12 persons and the second group of five.

Sampling entailed recording mammals by sight and via six camera traps distributed around the study site. Twenty-six species were recorded, 17 with arboreal habits (including nine primate species), two aquatic, and seven with terrestrial habits, including one jaguar and one jaguarundi captured by the camera traps.

Primates, in particular the saddleback tamarin and moustached tamarin, were recorded in a larger number of cells than other mammal groups.

The addition of a cell grid pattern to the sampling methods in 2013 resulted in an increase of the sampled area compared to 2012, including previously unsampled terra firme (non-flooded) forest, doubling the number of species recorded (n=13).

Resumen

Una expedición al Área de Conservación Comunal Regional Tamshiyacu-Tahuayo fue conducida con Biosphere Expeditions en el año 2013; este fue el segundo muestreo en el área. El área de estudio está localizado en la región de Loreto en el área del río Tahuayo.
El área total muestreada fue de 24 km^2, abarcando tres principales tipos de bosque, terra firme, bosque de pantano de palmeras y bosque estacionalmente inundable. El área fue muestreada del 06 al 09 y del 13 al 16 de agosto del 2013.

El objetivo principal del muestreo fue determinar los patrones de distribución y frecuencia de felinos silvestres, primates y otras especies bandera en el área de estudio.

Para la colección de datos 17 voluntarios fueron entrenados en dos grupos, el primer grupo consistió de 12 personas y el segundo grupo de cinco.

El muestreo consistió en el registro de mamíferos por avistamiento y por el despliegue de seis trampas cámara en el sitio de estudio. Veintiséis especies fueron registradas, 17 de hábitos arborícolas (incluyendo nueve especies de primates), dos acuáticos y siete con hábitos terrestres incluyendo un jaguar y un jaguarundi capturados por las cámaras trampa.

La adición de una red de celdas a la metodología de muestreo en el 2013 permitió cubrir un área más grande que el año anterior incluyendo tierra firme (bosque no inundable) que no fue previamente muestreada, doblando el número de especies registradas en año pasado (n=13).

Contents

Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

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 4 to 17 August 2013. 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 on 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 *Área de Conservación Regional Comunal Tamshiyacu Tahuayo*.

Previous work on the trail grid at the Tahuayo River Amazon Research Center (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 Center, but there is still a big gap in 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 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 on to 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 that inhabit rivers and lakes, and 550 species of birds (Gobierno Regional de Loreto), such as the harpy eagle and razor-billed curassow. Eighty-seven 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 4 – 10 August | 11 – 17 August 2013 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 27.3ºC with a maximum of 32.0ºC. Rainfall totalled 7.66 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 four 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 key (indicator) species, and at the Yavari River Project monitoring primate populations. 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 Fettak 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. Joining Biosphere Expeditions in 2008, she now runs the German office and German-speaking operations and leads expeditions whenever she can. Malika is also 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):

4 – 10 August 2013

Garry Caudill (USA), Véronique Continelli (Belgium), Valérie Duvivier (Belgium), Patrick Green (UK), Grace Heathcote (Australia), Gary Heathcote (Australia), Conny Kirstein (Germany), Thomas Mayer (Germany), Johannes Rech (Germany), Sven Strohschein (Germany), Leanne Thomas (UK).

11 – 17 August 2013

Kathy Hecht (USA), Stuart Hecht (USA), Conny Kirstein (Germany), Thomas Mayer (Germany), Sven Strohschein (Germany).

1.8. Expedition budget

Each team member paid towards expedition costs a contribution of £1,120 per person per one-week slot in 2013. The contribution covered accommodation and meals, supervision and induction, special non-personal equipment, and 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., or 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	17,469
Expenditure	
Base camp and transport includes all board, lodging and transport to and from base camp	6,510
Equipment & hardware includes all research materials purchased or hired	400
Staff includes salaries, travel and expenses	1,693
Administration includes registration fees, visas, sundries, etc.	43
Team recruitment Peru as estimated % of PR costs for Biosphere Expeditions	6,516
Income – Expenditure	**2,307**
Total percentage spent directly on project	**87%**

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 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 and 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.

Copies of this and other expedition reports can be accessed via www.biosphere-expeditions.org/reports. Enquires should be addressed to Biosphere Expeditions via www.biosphere-expeditions.org/offices.

2. Research on felids and primates

Alfredo Dosantos Santillán
Tahuayo River Amazon Research Center

Marcelo Mazzolli
Biosphere Expeditions

2.1. Introduction

The study site has a great diversity of largely unresearched flora and fauna, save for some studies on the ecology and management of ungulates (Bodmer et al. 1994) and on primates.

A previous study in the Blanco River (Puertas et al. 1995) reports densities for 14 species of primates, with the owl monkey being the most abundant (25 individuals per square km) followed by both species of tamarins, the saddleback tamarin and moustached tamarin (21.7 ind./km^2). Squirrel monkeys were recorded at a density of 18 ind./km^2, brown capuchins at 7.7 ind./km^2, and woolly monkey and white-fronted capuchin at 7.2 ind./km^2 and 5.6 ind./km^2, respectively.

Within the Loreto Region in Peru, the establishment of the Tamshiyacu Tahuayo Community Regional Conservation Area and the implementation of a wild feline and primate monitoring programme by Biosphere Expeditions are the first steps towards the protection of their habitat. To ensure effective management and conservation, however, additional input from ecological and social studies throughout Loreto is needed for a rounded study. Since 2012 Biosphere Expeditions has concentrated its efforts in the area of the Tahuayo River in the Peruvian Amazon. This report covers the continuation of survey work in this area of the Tamshiyacu Tahuayo Community Regional Conservation Area, conducted in August of 2013.

2.2. Methods

Study site

The Tamshiyacu Tahuayo Community Regional Conservation Area is located in the Loreto Region of Peru, is 421,000 hectares in size, and is covered by diverse habitats. There is palm swamp forest dominated by a palm tree species locally called aguaje (*Mauritia flexuosa*), as well as seasonally flooded forest with its four sub-types of habitats: bajial, which stays flooded for around six months of the year, lower restinga (flooded for three to four months annually), higher restinga (zero to two months), and terra firme, which is never flooded (Figure 2.2a).

Surveys were conducted at the Tahuayo River Amazon Research Center using three methods. Transect surveys on foot and by canoe, as well as camera trapping. A grid of 2 x 2 km quadrats was created using GIS. An existing trail gird (Figure 2.2a) was used to cover four of those quadrats by intensive foot surveys and camera trapping. Six more quadrats (Figure 2.2b), two of them in non-flooded forest or terra firme, were covered by a variety of the above methods. For example, G7 was covered by all three - foot, canoe and camera trapping.

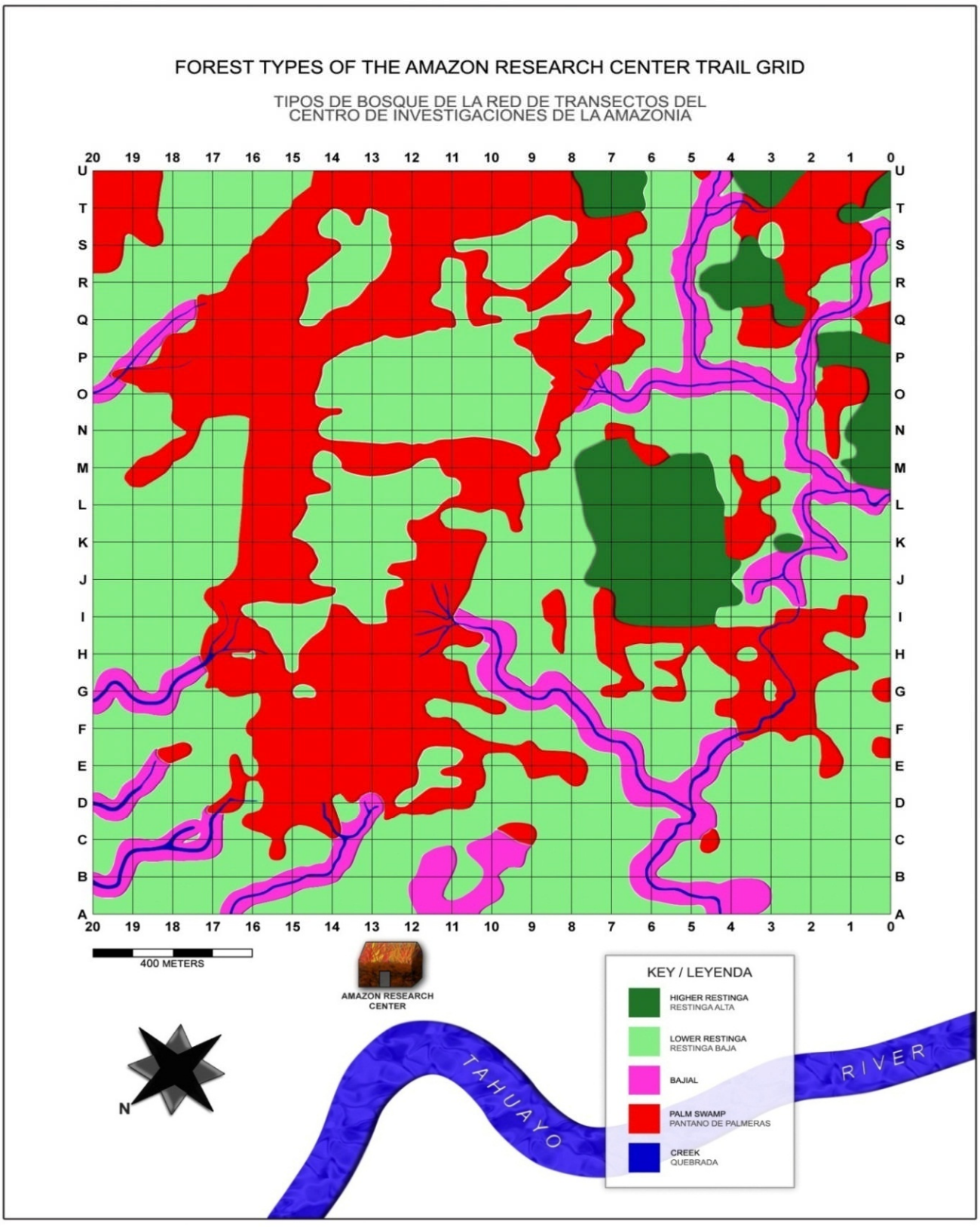

Figure 2.2a. Map of the trail grid and the forest types around the Tahuayo River Amazon Research Center.

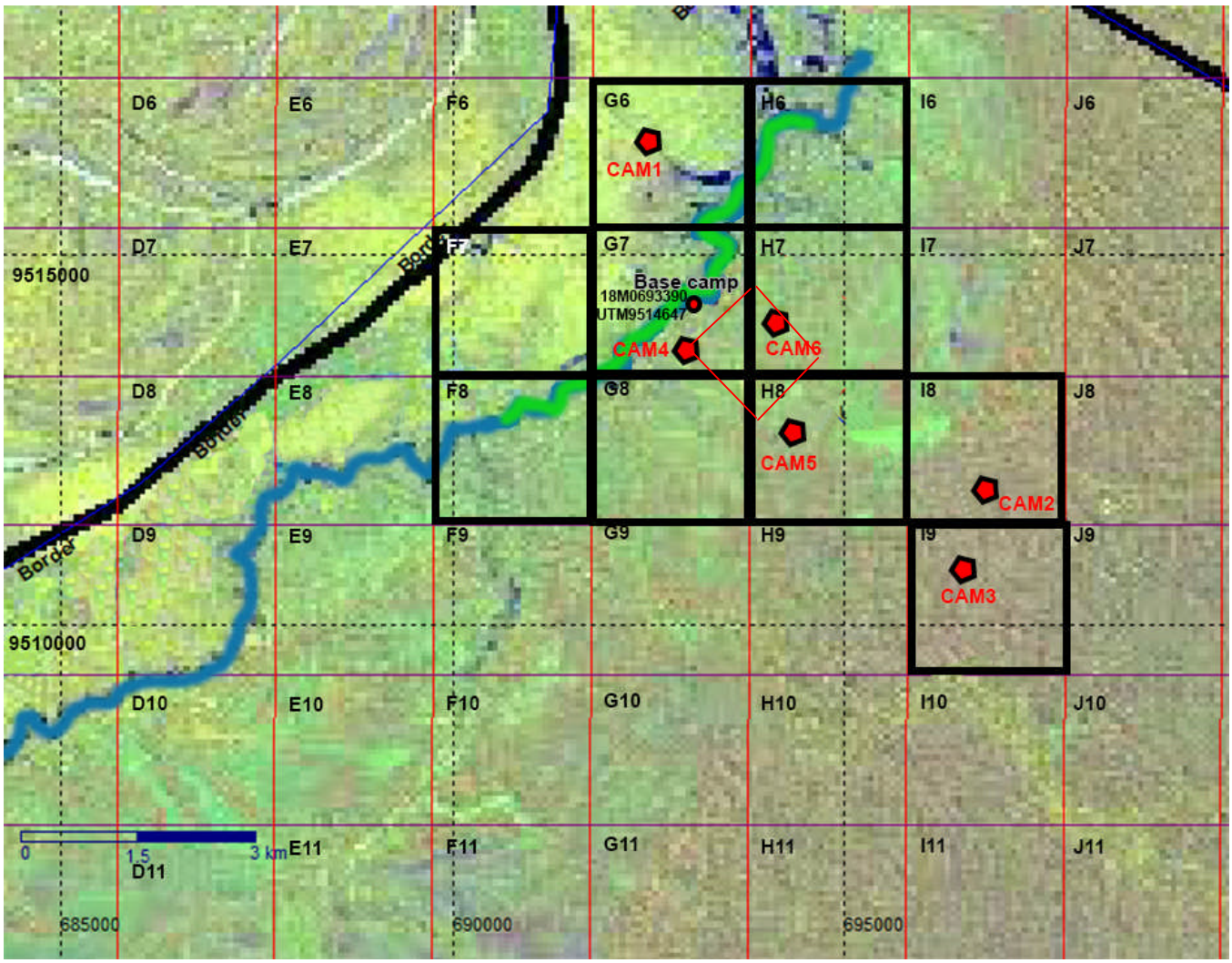

Figure 2.2b. Map showing quadrats sampled, location of base and camera trap locations. Green line over the river shows the maximum extent of canoe surveys. The existing trail grid is shown as a red square.

Training of participants

A total of 17 volunteer in two groups, the first consisting of 12 volunteers and the second group of five volunteers, were given talks and practical lessons in learning the use of GPS, research techniques, safety, skills and procedures during the first two days of their stay. 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.

Ecological sampling

Data on mammalian presence were collected from field surveys in a continuous quadrat grid of 2 x 2 km, each coded by a combination of letters and numbers. Resampling of quadrats was carried out where possible, taking into account that wildlife species will be present in some instances and absent in others, thus the presence or absence of a species from a certain area can only be confirmed with repeated sampling (Table 2.2a).

Data collection procedures included camera trapping and recording any mammal signs, vocalisations or sightings in the quadrat sampled. Data sheets were used by volunteers to record information, including the exact GPS position and cell number along with details such as species observed, number of individuals (in the case of a sighting), characteristics of tracks left by species and type of habitat where they were recorded. Volunteers also took a mammal species identification card to ID the species sighted, and had local assistants to help them primarily to identify the species upon an encounter. Once the volunteers were back to the expedition base, all data collected were transferred to the respective spreadsheet in a laptop.

Land transect census

A land transect census was carried out in a system of trails covering four quadrats (Table 2.3a); each trail was 2 km long and trails were walked daily. Upon an encounter with wildlife species the volunteers collected data about species, time, distance of the subject from the observer, bearing and number of individuals (if possible), as well as general observations about behaviour, weather conditions, code of the transect, and the date of the sampling. The volunteers performed repeated samplings on the four quadrats as follows: G7 with eight resamplings, G8 with three, H7 with 14 and H8 with six resamplings during the eight days of survey in the trail grid system. The quadrat H7 occupied most of the trail system, hence the high number of resamplings, which sometimes occurred twice a day in two different trails located in this quadrat.

River census

River censuses were carried out along the Tahuayo River by canoe radiating out from the expedition base to collect data about species presence and frequency. The river census covered an area of five quadrats.

Upon a sighting, the species was recorded, alongside the location of the sighting using a GPS, as well as group size and other variables. Data were recorded on data sheets and then transferred to a laptop at the expedition base. The volunteers also used GPS data to determine the distance paddled.

Camera trapping

Six digital, motion-activated cameras (Reconyx HyperfirePro, www.reconyx.com) were placed in the study area in six quadrats. The location for each camera is detailed in Table 2.2a and shown in Figure 2.2b. Team members carried a GPS to obtain geographical coordinates of locations for each camera trap through the cell grid and surrounding forest. All camera traps were set or removed together so each camera stayed for the same period of time in one location.

Table 2.2a. Sampling history of individual cameras.

ID	GPS coordinates	Quadrat	Date installed | removed (dd/mm/yyyy)	Trap nights
Reconyx 1	18M 0692664 UTM 9516458	G6	06/08/2013 | 16/08/2013	10
Reconyx 2	18M 0696905 UTM 9511569	I8	06/08/2013 | 16/08/2013	10
Reconyx 3	18M 0696570 UTM 9510695	I9	06/08/2013 | 16/08/2013	10
Reconyx 4	18M 0693287 UTM 9513685	G7	06/08/2013 | 16/08/2013	10
Reconyx 5	18M 0694261 UTM 9512603	H8	06/08/2013 | 16/08/2013	10
Reconyx 6	18M 0693998 UTM 9513894	H7	06/08/2013 | 16/08/2013	10
			Total trap nights	**60**

2.3. Results

Species occurrence

Over eight days of surveying, volunteers walked a combined distance of 87.7 km, paddled a combined distance of 34.69 km and camera-trapped a total of 60 nights using six camera traps, each of them totalling 10 nights of sampling. During the sampling period and with all the different methodologies, 10 quadrats were covered (see Table 2.3a for details on sampling and cells sampled).

A total of 26 species of mammals were recorded, nine of which were primates.

Primates, in particular the saddleback tamarin and moustached tamarin, were recorded in a larger number of cells than other mammal groups (see Table 2.3b). The quadrat most often sampled (H7) was also the one with the largest number of species recorded.

For the camera trap sampling, the quadrat with the most species recorded was I9, including jaguarundi (*Herpailurus yagouaroundi*), red brocket deer (*Mazama americana*), agouti (*Dasyprocta fuliginosa*) and nine-banded armadillo (*Dasypus novemcinctus*). In quadrat H7, three mammal species were recorded using camera traps, jaguar (*Panthera onca*), tayra (*Eira barbara*) and collared anteater (*Tamandua tetradactyla*). A paca (*Agouti paca*) was recorded by camera traps in I8 and, in H8, an agouti (*Dasyprocta fuliginosa*). The cameras located in quadrats G6 and G7 did not record any species. A detailed list of species recorded during the survey is given in Table 2.3b. This table includes species recorded by camera traps and river censuses as well as chance encounters.

Table 2.3a. Quadrats and the different methods applied in the study. Columns show methods employed and resampling, except for camera traps.

Quadrats	Sampling method / Resampling		
	Canoe survey	Foot survey	Camera trapping
F7	2		
F8	1		
G6	4		X
G7	5	8	X
G8	1	3	
H6	1		
H7		14	X
H8		6	X
I8			X
I9			X

Methods differed in the number of species each was able to record. Camera traps recorded 10 species, river (sight) censuses detected nine species, and transects (sight) recorded 18 species. These are unweighted results, meaning that more effort was employed on the trails, which may have biased results by inflating the numbers of species detected by sight during transects. Each method also differed by detecting exclusive species not recorded by other methods, mostly depending on the habits, behaviour and habitats of species, as well as on the nature of the sampling method. For instance, transects recorded pygmy marmoset, moustached tamarin, white-fronted capuchin, brown capuchin, two-toed sloth, owl monkey, Bolivian squirrel, Amazon dwarf squirrel, agouti, tayra and yellow-crowned bush-tailed rat. River censuses had exclusive species recorded as well: three-toed sloth, giant river dolphin, neotropical river otter and pink dolphin. Exclusive species recorded by camera traps were paca, agouti, red brocket deer, nine-banded armadillo, jaguarundi and jaguar (Figure 2.3a).

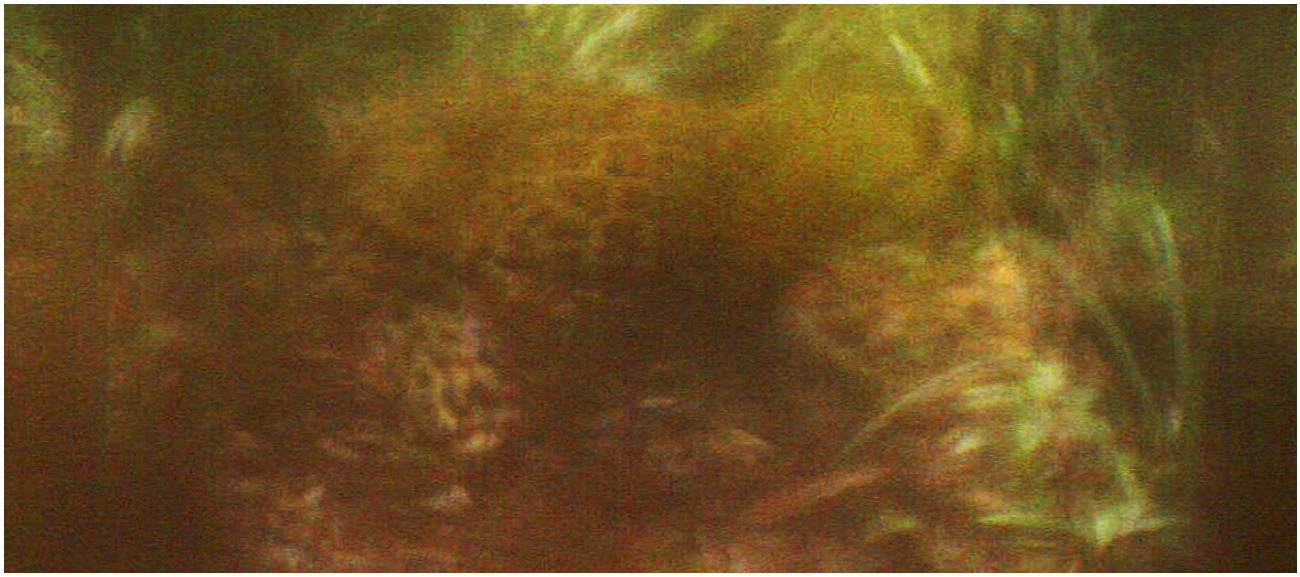

Figure 2.3a. Jaguar recorded by camera trap. The dark patches are a fungus that grew on the camera trap lens, preventing proper focusing.

Table 2.3b. Species encountered during the survey in the Tahuayo River Amazon Research Center.

Common name	Scientific name	Quadrats									
		F7	F8	G6	G7	G8	H6	H7	H8	I8	I9
Pygmy marmoset	*Cebuella pygmaea*								x		
Saddleback tamarin	*Saguinus fuscicollis*				x	x		x	x		
Moustached tamarin	*Saguinus mystax*				x			x	x		
Squirrel monkey	*Saimiri sciureus*				x			x			
Owl monkey	*Aotus nancymaae*								x		
White-fronted capuchin	*Cebus albifrons*							x			
Brown capuchin	*Cebus apella*							x	x		
Red titi monkey	*Callicebus discolor*							x	x		
Saki monkey	*Pithecia* sp.							x	x		
Two-toed sloth	*Choloepus didactylus*							x			
Three-toed sloth**	*Bradypus variegatus*			x	x				x		
Collared anteater	*Tamandua tetradactyla*				x				x		
Coati	*Nasua nasua*					x		x			
Amazon red squirrel	*Sciurus* sp.				x			x	x		
Bolivian squirrel	*Sciurus ignitus*							x			
Amazon dwarf squirrel	*Microsciurus flaviventer*					x		x			
Agouti	*Dasyprocta fuliginosa*							x			
Paca	*Agouti paca*									x	
Brocket deer	*Mazama* sp.							x			
Tapir*	*Tapirus terrestris*							x			
Jaguar	*Panthera onca*							x			
Jaguarondi	*Herpailurus yagouaroundi*										x
Tayra	*Eira barbara*							x			
Neotropical river otter**	*Lutra longicaudis*							x			
Giant river otter**	*Pteronura brasiliensis*				x						
Yellow-crowned brush-tailed rat	*Isothrix bistriata*				x						
Pink river dolphin**	*Inia geoffrensis*			x	x						

* Recorded by river census only.

River censuses

A total of nine mammal species were recorded during river censuses. Table 2.3c shows the details of the species recorded and the cells where they were observed.

Table 2.3c. Species recorded during river censuses along 34.69 km and their frequency.

Common name	Scientific name	Total frequency	Frequency per quadrat					
			F8	F7	G6	G7	G8	H6
Red titi monkey	*Callicebus discolor*	10	1	-	3	6	-	-
Squirrel monkey	*Saimiri sciureus*	2	-	-	1	1	-	-
Saddleback tamarin	*Saguinus fuscicollis*	2	-	-	-	2	-	-
Saki monkey	*Pithecia sp.*	1	-	-	-	1	-	-
Three-toed sloth	*Bradypus variegatus*	1	-	-	1	-	-	-
South American red squirrel	*Sciurus sp.*	1	-	-	-	-	-	1
Collared anteater	*Tamandua tetradactyla*	1	-	-	-	1	-	-
Giant river otter	*Pteronura brasiliensis*	1	-	-	-	1	-	-
Neotropical river otter	*Lontra longicaudis*	1	-	-	-	1	-	-
Pink dolphin	*Inia geoffrensis*	2	-	-	1	1	-	-
South American coati	*Nasua nasua*	1	-	-	-	1	-	-
TOTAL		**23**	1	0	6	15	0	1

Frequency

For the estimation of frequency (relative abundance), only data collected from line transect censuses were used. Results are shown in Table 2.3d.

Table 2.3d. Frequency of mammal species along 87.7 km walked during transects.

Common name	Scientific name	Groups*/Individuals sighted	Frequency per quadrat			
			G7	G8	H7	H8
Pygmy marmoset	*Cebuella pygmaea*	1	0	0	0	1
Saddleback tamarin	*Saguinus fuscicollis*	19	3	1	14	1
Moustached tamarin	*Saguinus mystax*	17	5	0	4	1
Squirrel monkey	*Saimiri sciureus*	8	4	0	4	0
Owl monkey	*Aotus nancymaae*	1	0	0	0	1
White-fronted capuchin	*Cebus albifrons*	2	0	0	2	0
Brown capuchin	*Cebus apella*	5	0	0	4	1
Red titi monkey	*Callicebus discolor*	8	0	0	4	4
Saki monkey	*Pithecia* sp.	9	0	0	8	1
Two-toed sloth	*Choloepus didactylus*	1	0	0	1	0
Collared anteater	*Tamandua tetradactyla*	1	3	0	0	1
Coati	*Nasua nasua*	3	0	1	2	0
Amazon red squirrel	*Sciurus* sp.	5	2	0	2	1
Bolivian squirrel	*Sciurus ignitus*	1	0	0	1	0
Amazon dwarf squirrel	*Microsciurus flaviventer*	2	0	1	1	0
Agouti	*Dasyprocta fuliginosa*	1	0	0	1	0
Tayra	*Eira barbara*	2	0	0	2	0
TOTAL		**86**	**17**	**3**	**50**	**12**

* Number of groups sighted applies to primate species and coati; the rest give number of individuals recorded.

2.4. Discussion and conclusions

The addition of a cell grid pattern to the sampling methods in 2013 allowed for coverage of a bigger sampled area than the previous year, including terra firme (non-flooded) forest, which doubled the number of species recorded from the previous year (n=13).

The results show that cell G7 had the greatest number of species and a greater frequency per species over two sampling methods, river census (number of species = 9; and frequency of total species = 15) and transect census (number of species = 14; and frequency of total species = 50). However, H7 has been resampled 14 times and the other cells were resampled eight, three and six times for G7, G8 and H8, respectively, which suggests that the greater frequency of sightings per species and the greater number of species recorded for H7 are a result of a greater resampling. During the river census, G6 (n=4 species and four resamplings) and G7 (n=9 species and five resamplings) showed a similar relationship, although the difference in resampling was smaller. In all situations, resampling has a noticeable effect on the results.

A previous study by Puertas et al. (1995) in the Tahuayo–Río Blanco area and the Yavarí Mirí River near the study site found a similarity in terms of species richness, recording 11 species. There was also a similarity in terms of the most frequent species, i.e. the medium- and small-sized species such as owl monkey (Río Blanco: 25 ind./km^2; Yavarí Mirí: 24 ind./km^2; TRARC: 1 group sighted), saddleback tamarin (Río Blanco: 22 ind./km^2; Yavarí Mirí: 38 ind./km^2; TRARC: 19 groups sighted) and squirrel monkey (Río Blanco: 18 ind./km^2; Yavarí Mirí: 57 ind./km^2; TRARC: 8 groups sighted). However, results in terms of large-bodied species were considerably different: for instance, woolly monkey (Río Blanco: 7 ind./km^2; Yavarí Mirí: 25 ind./km^2; TRARC: 0 groups sighted), brown capuchin (Río Blanco: 8 ind./km^2; Yavarí Mirí: 11 ind./km^2; TRARC: 5 groups sighted) and saki monkey (Río Blanco: 4 ind./km^2; Yavarí Mirí: 5 ind./km^2; TRARC: 9 groups sighted). The relative abundance of the saddleback tamarin in the three sites coincides with results from other studies carried out in different locations of the Peruvian Amazon (Aquino et al. 2005; Aquino et al. 2009) due to the almost non-existent hunting pressure for this species as a result of its small body size (0.3 kg) and also due to its higher reproductive rate. However, the relative abundances of large-bodied primates are different between the three sites. For example, the woolly monkey had the highest abundance (among large-bodied monkeys) in the Yavarí Mirí area, but it was not recorded in this study, although both the Rio Blanco area and the Yavarí Mirí area are placed in a vast terra firme forest where the woolly monkeys are more abundant in relation to the flooded forest. Also, not long ago hunting of primates was strictly prohibited in the area, but the large-bodied primate population is still recovering from previous hunting pressure.

Only two species from the 26 total species recorded were wild felids: jaguar and jaguarundi. In spite of the small number of records for felids, the results are important. Predators regulate prey populations, so the presence of a large predator such as the jaguar may indicate the presence of a sufficient population of prey species. Between March and May of 2012 the area suffered a severe record flood season and the effects on the wildlife abundance of the area may still persist, affecting the number of records of wild felids. This is likely to have changed the distribution patterns 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.

Recommendations for further work

This study is the beginning of a set of standardised wildlife censuses and constitutes the first baseline 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.

The addition of the cell grid to the sampling method has been a great improvement. Some fine tuning needs to be done, such as equalising the resampling of the different methods applied where possible. Taking into account the relationship between the sampling effort spent during the survey and the results, ideally a bigger number of quadrats should be surveyed more often to increase the number of species recorded and frequency of sightings. Also, the resampling should be even for all quadrats, where possible. The use of a cell grid was implemented starting in 2013, and from now on it will be applied as a standard method, as well as an improvement in the distribution of the survey.

For this year the volunteers had help from the local people from the Tahuayo River. They are excellent wildlife trackers and can recognise species from calls, etc., thereby constituting a great asset for the project. Last year, volunteers collected little river census data. The scenario changed this year, and therefore the participation of local assistants needs to be encouraged. Besides the fact that local assistants are of great help for the volunteers in the field, their participation in the project will also help to broadcast the benefits for the local people of the flora and fauna of the region.

2.5. Literature cited

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Appendix I: Expedition diary and reports

A multimedia expedition diary is available at http://biosphereexpeditions.wordpress.com/category/expedition-blogs/peru-213/.

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