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Expedition report

Parrot colpa and geophagy behaviour, and vertebrate species lists from the El Gato region of the Tambopata-Candamo Reserved Zone, Amazonia, Peru.

Expedition dates: 27 May – 8 July 2001
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Abstract

This study was part of an expedition to the Tambopata-Candamo Reserved Zone of the Peru Amazon run by Biosphere Expeditions from 27 May to 8 July 2001. It investigated parrot geophagy and compiled vertebrate species lists in an effort to elucidate behavioural patterns and reasons for geophagy behaviour, as well as human and tourist impact on the clay licks (colpas) and the area in general. A small colpa was discovered by the expedition and seven parrot and one pigeon species were observed feeding at it over a period of 23 observation days. The study found that the most likely reason for clay eating is detoxification. It also found that on the small colpa discovered, there was evidence of a correlation between parrot body size and feeding behaviour: the smaller species were more likely to feed more often, whereas the larger species tended to be wary and fed less often, or stayed off the colpa altogether. Whilst the smaller species appeared to be unaffected by human interference around the study site, the larger ones were thought to be disuaded from feeding by the presence of the researchers, even though hides were constructed. Because of this the study concludes that, in contrast to large and open clay licks, small colpa sites as the one discovered are unlikely to be suitable for prolonged and sustainable touristic use.

El presente estudio fue parte de una expedición a la Zona Reservada Tambopata Candamo de la Amazonía Peruana, llevada a cabo por Biosphere Expeditions del 27 de Mayo al 08 de Julio del 2001. Se investigó la geofagia de los loros y se recopiló listas de especies vertebradas en un esfuerzo por dilucidar patrones de comportamiento y razones que conlleven al comportamiento de la geofagia. Asimismo se investigó el impacto humano y turístico en las Colpas de arcilla y en toda el àrea en general. La expedición detectó una pequeña colpa donde se observaron siete especies de loros y una especie de paloma colpeando en ella por un período de 23 observaciones por día. El estudio encontró que el motivo más adecuado para la ingesta de arcilla es la destoxificación. También se observó, que en la pequeña colpa descubierta, había una correlación entre el tamaño corporal de los loros y el comportamiento en la alimentación: a menor tamaño de la especies, más frecuentes son las ingestas de arcilla, mientras que las especies de mayor tamaño tendían a se más cautelosos y se alimentaban con menor frecuencia, o se mantenían fuera de la colpa todos juntos. Mientras que las especies más pequeñas parecen no verse afectadas por la presencia humana en el área de estudio, las de mayor tamaño se piensa que son prevenidas de alimentarse ante la presencia de los investigadores , a pesar de haberse construídos escondites especiales. Debido a ésto, el estudio concluye que, en contraste con las grandes colpas abiertas, las pequeñas colpas, como la descubierta, no son adecuadas para un uso turístico sostenible y prolongado.

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1. Expedition Review

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our 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. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, 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 an expedition to the Tambopata-Candamo Reserved Zone in Peru from 27 May to 8 July 2001. The expedition discovered and studied a parrot colpa (site where birds congregate to eat mud from a cliff wall). It also conducted visual encounter surveys in an effort to generate species lists.

With the development of Peru's tourist industry, human pressures on previously little disturbed Amazonian habitats have increased. Visitors are attracted by the spectacular colpas and there are currently over a dozen ecotourist lodges in Tambopata with plans for more to be built in the future. However, colpas are a limited resource and to date there are no restrictions in place to control visitor numbers. Data gathered during this expedition provides important baseline information for decision-makers in Peru who are considering the management options for tourism in the area. Other landmark vertebrates are also affected, not always in a negative way. For example, monkeys may be hunted less frequently today, as local people begin to appreciate them as tourist attractions, rather than a foodstuff. Similarly, ocelot numbers may also be on the increase, as they too are regarded as an asset, rather than a pest killing chickens and other livestock. However, these are hypotheses based on anecdotal accounts and experiences and it is important to gain a scientific insight into what is really going on.

1.2. Research Area

In terms of biological diversity, the research area is amongst the richest in the world. Research conducted over the last 20 years or so has shown that the Tambopata-Candamo Reserved Zone harbours more species of birds (587), butterflies (1,230) and many other animal taxa than any other location of comparable size (Pearson & Beletsky, 2001). The area is also home to a number of landmark animals listed in the Red Data Book of endangered species published by IUCN (the International Union for the Conservation of Nature). Amongst them the giant river otter (*Pteronura brasiliensis*), giant armadillo (*Priodontes giganteus*), giant anteater (*Myrmecophaga tridatyla*), ocelot (*Felis pardalis*), jaguarundi (*Felis yagourandi*), jaguar (*Panthera onca*), harpy eagle (*Harpia haryja*), crested eagle (*Morphous guianensis*), spectacled caiman (*Caiman crocodilius*), and black caiman (*Melanosuchus niger*). Over 150 different species of tree can be found within 100 m^2 alone, and the WWF and IUCN have identified the Tambopata-Candamo Reserved Zone as a 'Centre of Plant Diversity'.

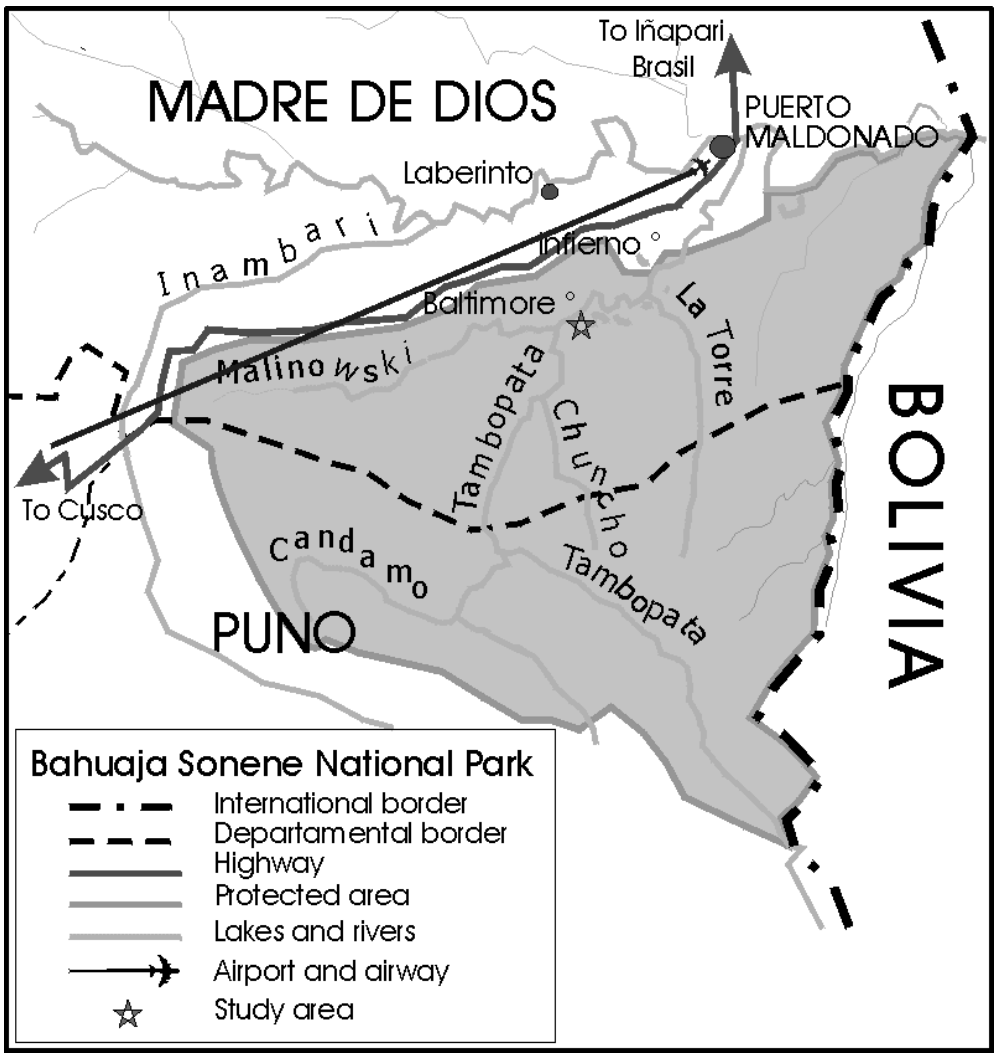

Fig 1.2a. Map of the Tambopata-Candamo Reserved Zone (now part of the recently created Bahuaja Sonene National Park) with base camp location (★).

1.3. Dates

The expedition ran over a period of six weeks divided into three two-week slots, each composed of a team of international research assistants, guides, support personnel and an expedition leader. Expedition team dates were

27 May - 10 June 2001
10 June - 24 June 2001
24 June - 8 July 2001

Dates were chosen to coincide with the dry season when data are most valuable, because the environment is usually relatively stable, except for friajes (see below).

1.4. Local Conditions & Support

The Tambopata-Candamo Reserved Zone lies within the confines of the Amazon basin in SE Peru with a sub-tropical climate and distinct wet and dry seasons. It originated in the late 1970s as the small Tambopata Reserved Zone comprising about 5,000 hectares, but was much enlarged to 1.5 million hectares in 1990 and now covers altitudes from 240 to 3,500 metres, and habitats ranging from sub-tropical moist forest, to cloud forest, to tropical savannah. In September 2000 it was central in the creation of the Bahuaja-Sonene National Park which now covers 2.7 million hectares, protecting an ecosystem which holds several world records in flora and fauna species numbers and is recognised as one of the planet's hotspots of biodiversity. Rainfall averages 2,000 mm per year and humidity is about 75%.

Expedition base

The expedition was based in a remote region along the Tambopata river, about 4½ hours upriver from Puerto Maldonado. Transport to and from base camp was by boat, most studies were conducted on foot or from hides.

Base camp consisted of simple cabins made from wood and bamboo with basic amenities and a nearby waterfall as a 'luxury power-shower'. Team members stayed in twos or threes inside the cabins. All meals were prepared for the team and vegetarians could be accommodated. There was no electricity at base camp.

Field communications

There was an Inmarsat Mini-M satellite phone at base for emergency calls. This, however, proved to be very unreliable and eventually refused to work completely. The system was later replaced by an Iridium phone which works very reliably. Motorola Radius SP10 two-way radios were used for communication around base, but their coverage was very limited.

Transport & vehicles

Team members had to make their own way to the Puerto Maldonado assembly point. From there transport to and from base camp was by boat, provided along with other logistical support by WASAI Lodge & Expeditions, Puerto Maldonado. Most studies were conducted on foot or from hides.

Medical support & insurance

The expedition leader was fully trained in wilderness medicine and the expedition carried a comprehensive medical kit. Further medical support was provided through a medical post in the nearest village across the river, although this post was found to be manned rarely. The nearest hospital was in Puerto Maldonado (approx. 4 hours by boat). All team members were required to carry an adequate travel insurance covering emergency medical evacuation and repatriation. There were no major medical incidents. The only minor incidents included one incident of hand lacerations from palm roots (treated by cleaning and stitching), insect bites (treated with antihistamine), and shin lacerations (by a local who came to the expedition for help and was stitched). To the credit of our cook, there were no cases of serious diarrhoea throughout the entire expedition.

1.5. Local Scientist

The expedition's local scientist was meant to be Antonio W. Salas, a Peruvian herpetologist. However, he proved to be extremely unreliable and made unreasonable and unagreed salary demands half an hour before the expedition's departure! As a result he was removed from the expedition by the expedition leader who from then on designed and led the scientific investigations. Mr Salas' departure meant that the planned study on frogs could not be carried out, so the expedition concentrated on parrot behaviour on colpas and visual encounter surveys instead.

1.6. Expedition Leader

This expedition was led by Matthias Hammer, founder and Field Operations Director of Biosphere Expeditions. Born in Germany, he went to school there, before joining the Army at 18, and serving for several years amongst other units with the German Parachute Regiment. After active service he came to the UK and was educated at Christ Church, Oxford (studying for a BA in Biological Sciences), and King's College, Cambridge (studying for a PhD in Biological Anthropology). During his time at university he either organised or was involved in the running of several expeditions, some of which were conservation expeditions (for example to the Brazil Amazon, Madagascar, and the Indian Himalayas), whilst others were mountaineering/climbing expeditions (for example to the Russian Caucasus, the Alps, the Rocky Mountains, and the Seychelles). With Biosphere Expeditions he has led teams all over the globe. He is a ski instructor, mountain leader and survival skills instructor. He lives in an old gatekeeper's cottage in the Broads National Park.

1.7. Expedition Team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds

27 May - 10 June 2001

Heather Cashmore (UK), Janet Cherry (UK), Daniella Scherrer (CH), Stefanie Warneke (D), Elisabeth Ziervogel (D). Guide: Juan Julio Durand. Adviser: James Littlewood. Boat driver: Walter. Cook: Giovanni. Support personnel: Eduardo.

10 June - 24 June 2001

Oscar Campbell (UK), Janet Cherry (UK), Sîan Morgan (UK), Karin Rack (NL), Daniella Scherrer (CH), Stefanie Warneke (D), Elisabeth Ziervogel (D). Guide: Bruno Castagnetto. Local student: Carlos Moscoso. Adviser: James Littlewood. Boat driver: Walter. Cook: Giovanni. Support personnel: Eduardo.

24 June - 8 July 2001

Jill Armstrong (UK), Leigh Barrett (UK), Oscar Campbell (UK), Samantha Elson (UK), Jenny Holden (UK), Sîan Morgan (UK), Elisabeth Shaw (UK). Guide: Bruno Castagnetto. Local student: Carlos Moscoso. Adviser: James Littlewood. Boat driver: Walter. Cook: Giovanni. Support personnel: Eduardo.

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1090 per person per two week slot. The contribution covered accommodation and meals, supervision and induction, a permit to access and work in the Reserve, all maps and 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	20,959	
Expenditure		% of which spent directly on project
Co-ordination and permits	455	100
Logistics inc. accommodation, supplies, transport	4,345	100
Staff inc. salaries, tips, gifts	2,415	100
Equipment and hardware	3,881	81
Communication	1,496	100
Travel	508	100
Team recruitment Peru (as estimated % of PR costs)	3,600	100
Income – Expenditure (unadjusted)	4,259	
Income – Expenditure (adjusted to % spent on project)	4,996	
Total percentage spent directly on project	76%	

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 provide an expedition contribution and give up their spare time to work as research assistants, none of this research would have been possible. The expedition team were J. Armstrong, L. Barrett, O. Campbell, H. Cashmore, J. Cherry, S. Elson, J. Holden, S. Morgan, K. Rack, D. Scherrer, E. Shaw, S. Warneke, E. Ziervogel. The support team included amongst others our invaluable guides J.J. Durand, B. Castagnetto, and our local student C. Moscoso. J. Littlewood was instrumental in designing the research project and in providing essential help and advice. Biosphere Expeditions would also like to thank WASAI lodge and its staff for providing all-important logistical support, as well as Land Rover, Patagonia and Gerald Arnhold for their sponsorship.

1.10. 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. Parrot behaviour and geophagy at the El Gato colpa

2.1. Introduction

Geophagy, defined as the ingestion of soil, is a common occurrence for many species of birds and other animals, including humans. Diamond et al. (1999) and Gilardi (1996) list a host of examples including isopods, butterflies, parrots, pigeons, cracids, grouse, bears, koala, rabbits, rodents, tapir, zebra, cow, goat, sheep, tortoises, many lemur and monkey species, chimpanzees, and last but not least, humans, especially pregnant women of traditional hunter-gatherer societies. Despite this, the function of geophagy remains unclear, although Diamond et al. (1999) have shown convincingly that in New Guinea and Peruvian birds at least, geophagy serves to bind poisonous and/or bitter-tasting secondary fruit and seed compounds of the birds' diet, thereby removing potentially harmful substances from the digestive system and minimising their effects. There is also evidence that geophagy provides grit to many weak-billed birds (Best & Gionfriddo, 1991), essential minerals to mammals and butterflies, buffers against gastric pH swings to ruminants (Jones & Hanson, 1985), as well as a cure for diarrhoea in chimpanzees (Krishnamani & Mahaney, 2000; Mahaney et al., 1996).

Reported here are incidences of geophagy by seven species of parrots and one species of pigeon from a small colpa along the El Gato river in the Peru Amazon. This colpa has never been studied before and showed no evidence of human impact. Although not analysed, soil samples from the colpa as well as random samples from other mud cliff walls along the El Gato were taken. It is hoped that these samples will be analysed at a later stage in an effort further to elucidate the function of geophagy in the birds observed. As it is, this study concentrates on the behavioural patterns displayed by the birds visiting the colpa.

There are currently over a dozen ecotourist lodges in Tambopata with plans for more to be built in the future. Visitors are attracted by the spectacular bird gatherings at colpas. However, colpas are a limited resource and to date there are no restrictions in place to control visitor numbers. Data gathered during this expedition provides important baseline information for decision-makers in Peru who are considering the management options for tourism in the area.

2.2. Location, Material and Methods

Location

This study was carried out as part of a research expedition conducted by Biosphere Expeditions. The expedition ran from 27 May to 8 July 2001, and studies were conducted between 3 June and 4 July 2001 along the El Gato river in the Tambopata-Candamo Reserved Zone. The Tambopata-Candamo Reserved Zone lies within the confines of the Amazon basin in South East Peru with a sub-tropical climate and distinct wet and dry seasons. It originated in the late 1970s as the small Tambopata Reserved Zone comprising about 5,000 hectares, but was much enlarged to 1.5 million hectares in 1990 and now covers altitudes from 240 to 3,500 metres, and habitats ranging from sub-tropical moist forest, to cloud forest, to tropical savannah. In

September 2000 it was central in the creation of the Bahuaja-Sonene National Park which now covers 2.7 million hectares, protecting an ecosystem which holds several world records in flora and fauna species numbers and is recognised as one of the planet's hotspots of biodiversity (Mittermeier et al., 1997, Mittermeier et al., 1998). Rainfall averages 2,000 mm per year and humidity is about 75%. The expedition was based in a fairly remote region along the Tambopata river, about 4½ hours upriver from Puerto Maldonado (see Figures 1.2a and 2.2a). Transport to and from base camp was by boat, most studies were conducted on foot or from hides. The expedition base was at the confluence of the small El Gato and the much larger Tambopata river (S 12º 51.415', W 69º 26.752'), the colpa further upriver along the El Gato (S 12º 51.419', W 69º 26.739'), about 2 kilometers or 40 minutes walk from base.

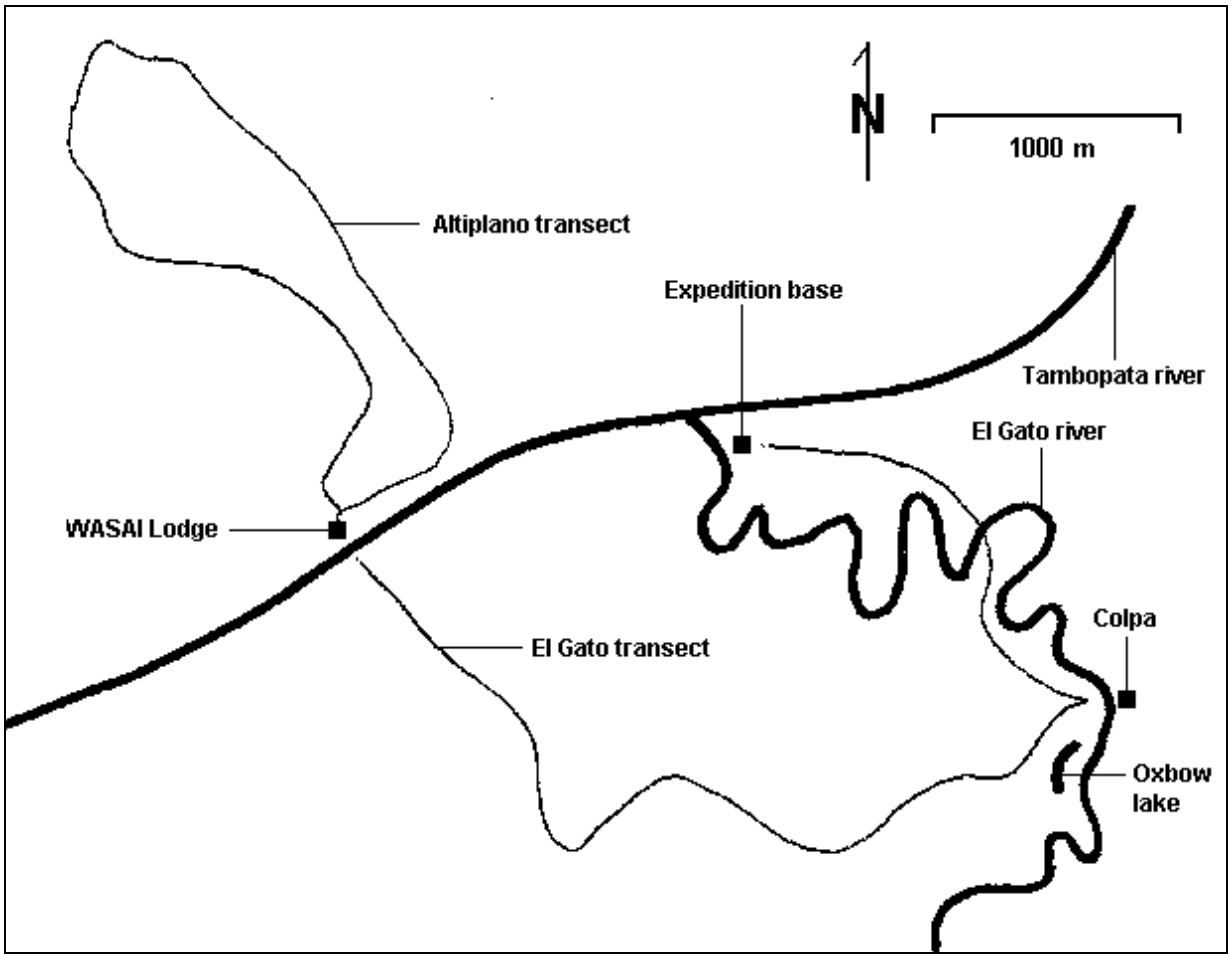

Fig. 2.2a. Study site and transect trails. Expedition base S 12º 51.415', W 69º 26.752', colpa S 12º 51.419', W 69º 26.739'. See Figure 1.2a for base camp location.

The colpa site was discovered after conversations with local people who led the expedition to the site. The colpa itself consisted of two vertical pillars of mud which had eroded out of the continuous mud cliff along the El Gato river. The pillars were between 6 to 8 metres tall, standing about 1 metre apart. The mud cliff wall was about 12 metres high. The El Gato river is a small tributory to the much larger Tambopata. It is shallow and rarely deeper than 2 metres. Its width at the colpa was 8 metres. It meanders strongly and high mud cliff walls are usually found on the outside bend, whilst the inside bend is flat. This pattern was present at the colpa and a hide was constructed directly opposite the colpa on flat ground covered in thick bamboo growth which turned into rain forest about 10 metres from the river banks.

The distance between the hide and the colpa was about 15 metres. The colpa faced North East so that the sunrise point was almost exactly behind the colpa as seen from the hide. That meant that the colpa was in the shade for most of the day, only getting some diffuse sunlight in the afternoon.

The area around the colpa is mixed primary and secondary rain forest with relatively little human impact. Some trails were in existence on either side of the El Gato, but they were rarely used and the expedition did not encounter any local people on the trails at any time during the expedition. Some hunting is practiced by relatively few people for subsistence. Human activity is concentrated along the Tambopata river and rapidly drops off with increasing distance from that main waterway. Before the declaration of the National Park, large-scale timber extraction was common, but has since then disappeared save for some small-scale subsistence extraction. Some localized small-scale gold mining is also practiced illegally.

Survey methods

The expedition's survey team consisted of several paying, untrained expedition team members who gave up their holiday time to assist in this research project. Their work and the expedition contribution they paid made this research possible. Teams were on site for two weeks and then changed over, with some people staying for more than one two week slot. Team sizes varied between 5 to 7 expedition team members + 1 expedition leader + 1 guide + various support personnel (the latter not participating in the survey). Expedition team members were trained in animal including bird recognition on site by the guides, the expedition leader and by other team members with experience in ornithology and natural history. Field guides were also provided.

From the expedition base a trail was constructed to the far side of the colpa and a hide was built directly opposite. Hide surveys were conducted daily in the period 3 June to 4 July, interrupted 7 to 10 June for an expedition excursion and a team changeover, and 17 to 21 June by another team changeover and a friaje (a freak weather event in the form of a periodic cold front from the Antarctic reaching Peru bringing with it high winds and rain and dropping temperatures to around 8º C). During such friajes there is very little bird or other animal activity and the expedition retreated to Puerto Maldonado. In total 23 observation days were logged.

For the first four days 12 hour daylight observations were made to ascertain hours of parrot feeding activity. As locals suggested and Gilardi & Munn (1998) found, these were found to be in the morning and from then on the expedition concentrated on the morning hours. At least two people would walk around 40 minutes to the hide and stay there in shifts of between 2 to 3 hours before being relieved. In the beginning observations were only made from within the hide which consisted of a box made from branches and covered on three sides and on top by foliage. There was a small observation 'window' facing the colpa. Towards the end of the expedition, when we felt that the birds were sufficiently habituated to our presence, we made observations from the cliff above the colpa and from the riverbank opposite the colpa to the left of the hide with observers in the open, in clear view of the birds. These studies were conducted 28 June to 4 July to ascertain flight paths and behavioural patterns before and after feeding at the colpa. All observations were recorded in a central log.

On 3 July samples were collected from the colpa at preferred feeding sites on the two pillars, from random mud cliff sites along the river, and from what was thought could be another colpa site because it showed faint signs of beak activity. These samples were sealed in standard 35 mm film cartridge and await analysis.

2.3. Results and Observations

During the 23 observation days seven parrot and one pigeon species were observed feeding at the colpa (see table 2.3a). In addition six other parrot species were seen in the area (see table 2.3b).

Table 2.3a. Species observed at the colpa (by frequency of observations). Observations made from hide. See also Appendix 5.1.

Name	Mass (g)[1]	Feeding times observed	Preferred feeding site	Days observed (out of 23)	Av. group size	Remarks
Dusky headed parakeet *Aratinga weddellii*	110	06.30 – 09.30	A, then B	15	21	Clear and hot days seem to encourage early feeding, usually first to feed.
Orange cheeked parrot *Pionopsitta barrabandi*	140	06.30 – 08.40	A, B, once D	9	13	Large variation in group size 2 – 40.
Pale vented pigeon *Columba cayennensis*		08.00 – 09.50	B	5	2	Always small groups 1 – 3, feeding long, often spooking parrots.
Rock parakeet *Pyrrhura rupicola*	75	08.40 – 10.20	C, sometimes B	4	6	Always in groups of 5 or 6, wary.
Cobalt winged parakeet *Brotogeris cyanoptera*	67	08.20 – 10.20	A and B	4[2]	13	Only species seen gathered in afternoon around colpa but not feeding[3].
Blue headed parrot *Pionus menstruus*	293	06.40 – 08.30	A and B	1	4	Small groups, always let other species go first.
White eyed parakeet *Aratinga leucophthalamus*	190	08.20 – 08.35	no information	1	1	Only one observation.
Scarlet macaw *Ara macao*	1015	15.39 – 16.28	n/a	1	1	Only one observation, fed 50 m to right of colpa. Wary.

Feeding sites: A = lower part of right hand pillar = site 3 of clay sample collection (see Table 2.3c), B = upper part of right hand pillar = site 4 of clay sample collection, C = behind top part of left hand pillar = site 5 of clay sample collection, D = upper part of left hand pillar. Superscript notes: 1 = according to Terborgh et al. (1990), 2 = days observed feeding only, 3 = this supports observations by Gilardi and Munn (1998) who report an afternoon peak of activity for *Brotogeris spp.* (see also *Borotgeris sanctithomnae* in table below).

Table 2.3b. Other parrot species observed at or around the colpa, along the trail to the colpa and around base. See also Appendix 5.2.

Name	Mass (g)[1]	Remarks
Red and green macaw *Ara chloroptera*	1250	Frequently seen throughout study area, perched in trees around colpa. Observed looking down on hide.
Blue and yellow macaw *Ara ararauna*	1125	Not very frequently seen, but seen perched in forest and flying over base camp. Not observed perching at the colpa.
Chestnut fronted macaw *Ara severa*	430	Often seen in flight crossing Tambopata river. Not observed perching at the colpa.
Mealy parrot *Amazona farinosa*	800	Ubiquitous. Gathered every day in very large numbers around colpa in early morning, very vocal. Only once attempted to descend to colpa but was disturbed (see Appendix 5.2, 15 June). Observed looking down on hide.
White bellied parrot *Pionites leucogaster*	155	Sometimes seen in forest and three times observed perched near colpa, usually in trees in background some distance from the colpa.
Tui parakeet *Brotogeris sanctithomnae*	67	Seen flying in flocks, usually in afternoon, confirming similar observation by Gilardi and Munn (1998). See also *Brotogeris cyanoptera* in table above.

Superscript notes: 1 = according to Terborgh et al. (1990).

General behavioural observations

During the six week expedition period it appeared that the birds were feeding on a daily basis. Days when we did not observe feeding activities were either short observations days (like 6, 11, 12 June when observations were conducted only until 07.30, or 22 June when there was only one afternoon shift), or days just after the friaje (like 23 June). Towards the end of the study, birds, especially the smaller and more agile species, certainly appeared more habituated, and total activity increased. We could even have several observers in full view and close to the colpa without being able to discern a change in behavioural patterns from purely hide-based observations. Indeed in the last seven days when we conducted open-air observations, there was more feeding activity than in previous days, when observations were only made from within the hide. Notable exceptions were the larger-bodied species like *Amazona farinosa* (mealy parrots) and the macaws that were frequently observed perching in the trees around the colpa, but either never fed, as in the case of *Amazona farinosa*, or were only observed feeding once, as in the case of a pair of *Ara macao* (scarlet macaws). All this may have implications for tourist activity at colpas.

The peak activity period was in the early morning, there was little or no activity during the hottest part of the day, and little activity in the afternoon, except for *Brotogeris* spp. The weather seems to have a definite effect on activity patterns. Most noticeably during the cold, windy and rainy periods of the friaje there is no activity. Conversely, and as a general rule, hot sunny weather seems to encourage early and vigorous feeding activity, whereas low cloud cover and mist seem to discourage it.

On 1 July this was very apparent when it was very misty until the sun had burnt off the mist by 06.45. Almost as soon as this had happened, birds started arriving and feeding. 27, 29 and 30 June show similar patterns with very early feeding starting 06.35 on hot and sunny days. On 28 June there was low cloud early in the morning and on that day activities did not start until 08.42. However, there are clear exceptions to this general rule as on 14 June, an overcast and grey day with heavy rain around noon, there was very pronounced activity, starting very early in the morning at 06.40. Whatever the starting time, activities were usually over and the birds gone by 10.20 at the very latest.

Amazona farinosa and *Aratinga weddellii* (dusky headed parakeets) were usually the first to arrive, with *Aratinga weddellii* trailblazing their way to the colpa. Strangely, *Amazona farinosa,* stayed in the trees and were never observed feeding (although they made an attempt at descending to the colpa once on 15 June, but were spooked). Birds usually perched in the trees around the colpa, mostly vocalising loudly, until what appeared to be a critical mass of support was reached. This was especially apparent on one day when some individuals of *Aratinga weddellii* perched in the trees, but did not descend for what appeared to be lack of numbers. This was in stark contrast to all other days, when *Aratinga weddellii* would usually arrive in larger numbers, descend and feed. The descent would start by some individuals flying what could be described as reconnaissance turns around the colpa and back to their original perch position. Small groups of one to four individuals would then cross over to the trees and bushes surrounding the colpa and gradually move vertically and horizontally through the foliage until they could mount the clay cliffs. Departure, on the other hand, was usually in large, often multi-species flocks, either as a result of the birds being spooked or in what appeared to be normal behaviour once all the birds had fed.

The only afternoon activity observed was by *Brotogeris cyanoptera* (cobalt winged parakeet) who were seen on several occasions perched around the colpa, but not feeding, at between 15.30 and 17.30. This observation supports those made by Gilardi & Munn (1998) who also report afternoon activity for *Brotogeris* spp. in Manu, an area not far from the present study area. The only descending and feeding observed for a pair of *Ara macao* was also in the afternoon, from 15.39 to 16.26.

The colpa was somewhat limited in size (compared to the huge clay cliffs like El Chuncho or TRC (Tambopata Research Centre, an ecolodge) that attract tourists and ecotourist lodge developments in the area), so the maximum number of birds to fit on the colpa was 60 – 70 of the relatively small-bodied *Aratinga weddellii*, usually together with some other species. Despite forming such large multi-species assemblages on the colpa, the birds always arrived in small groups (like reported by Diamond et al. 1999), and usually flushed as a big flock (unlike reported by the same authors). Those authors also observed, as we did, birds evidently flying into the site from far away. From our base camp we could often observe small groups coming from across the Tambopata and heading for the colpa, thus covering a distance of at least 3 to 4 kilometres. As in Diamond et al.'s New Guinea expedition, this would suggest that colpas are few and far between. However, talking to local people gave us the impression that they were quite common and that the birds would always have alternative sites they could use in case they were disturbed. A few years ago only a handful of colpas were known in the area, but with increasing pressures of tourism and more research being conducted new sites are being found frequently. We could even

'discover' a colpa on our 4 hour boat ride from Puerto Maldonado to base camp, right on the Tambopata and next to a well-known ecotourist lodge which seemed to be unaware of the colpa on its doorstep, or if not, seems to be reluctant to show it to its tourists - a highly unlikely scenario.

All birds, except perhaps *Columba cayennensis* (pale vented pigeon), and less so *Pionus menstruus* (blue headed parrot), seemed wary and nervous approaching the colpa, and were very easily flushed during the approach or once on the colpa. We agree with Diamond et al. (1999) that this is likely to indicate alertness to predators, especially hawks. Wariness can probably also explain the practice of posting 'sentinels', whereby not all the individuals of a flock feed at once, but some are positioned on surrounding lianas, facing away from the colpa and seemingly observing. Feeders and sentinels would then frequently change positions. This was observed in species that tended to visit the colpa in larger flocks numbering 10 or more. Those visiting in smaller numbers, like for example *Pionus menstruus*, never committed themselves to the colpa first, but always waited for other species to start feeding, before they would approach.

Observations on individual species are as follows:

Aratinga weddellii (dusky headed parakeets)
Usually fed in big groups of 10 up to 70, but arrived and crossed over to the colpa as small groups of 1 to 4. *Aratinga weddellii* was the lead species and thus almost always the first to feed. They would arrive early, perch in the trees until what appeared to be a critical mass of other individuals of the same species was assembled. Then the descent out of a number of 'launch trees' would start. These launch trees were tall trees on the far side of the El Gato out of which the colpa could be seen clearly. *Aratinga weddellii* would gather in these trees, usually on the very top branches, some would fly reconnaissance turns, and then small groups would descend into the foliage next to the colpa and start working their way towards the clay. Many small groups would follow in quick succession once the first group had gone. Some birds would then feed, whilst others would act as sentinels. The birds were very vocal throughout. Their preferred feeding site was the lower half of the right hand pillar.

Pionopsitta barrabandi (orange cheeked parrot)
Usually fed in groups of less than 10, but were also observed once in a group of more than 40. Would never arrive first at the colpa. Mostly after and in association with *Aratinga weddellii*, but much more quiet and unobtrusive. They would usually perch deeper in the foliage of the launch trees, but then display similar behaviour to *Aratinga weddellii* of crossing and working their way to the colpa. They were once observed to fly a reconnaissance turn. They appeared more aggressive and were observed displacing each other and other species from the colpa. They did not appear to post sentinels, relying on associate species instead, but also appeared to be very wary and exceptionally quiet. However, when spooked they would take flight noisily. They did not seem to have a preferred feeding site, ranging all over the colpa to wherever there was space.

Pyrrhura rupicola (rock parakeet)
Fed in small groups of around 5. Closely associate with parakeets on and around the colpa. When leaving colpa or flushed, they take off noiselessly. They would usually perch deeper in the foliage of the launch trees, but then display similar behaviour to *Aratinga weddellii* of crossing and working their way to the colpa. They post sentinels and are very wary, even getting spooked by an Oropendula flying over once. Once seen to displace a parakeet. Preferred feeding site behind the upper part of the left pillar.

Brotogeris cyanoptera (cobalt winged parakeet)
Flew around colpa in very large groups and usually fed in groups of at least 10. Very vocal, but also cautious, posting sentinels. Approach like *Aratinga weddellii* out of launch trees with reconnaissance turns, and then through thin foliage and lianas. Also fed by themselves, usually later than *Aratinga weddellii.* When flushed they showed the highest persistence of all species, often settling deep into the foliage of nearby trees and bushes, then flying in small groups into launch trees, then back towards the colpa. Also observed around colpa on several afternoons, but not feeding. Preferred feeding site on right hand pillar.

Pionus menstruus (blue headed parrot)
Fed in small groups of a few individuals (although they were observed during an excursion to the large colpa at El Chuncho to feed in much larger groups). Do not appear to go through complicated approach procedure – instead seem to rely on *Aratinga weddellii* or *Pionopsitta barrabandi* which they always associate with. Once these species feed, *Pionus menstruus* flies in trees on top of colpa. Approach from then on is quite slow. Not easily spooked once approaching or feeding. Not very vocal and no reconnaissance turns observed. Preferred feeding site top right hand pillar.

Aratinga leucophthalamus (white eyed parakeet)
Only once observed feeding in group of 4. Came by themselves from launch tree and fed for 15 minutes.

Columba cayennensis (pale vented pigeon)
Feed in small groups of one or two and are very hard to spot on the approach, probably because of their silent advance and camouflage colours (hence lack of data). Do not appear to associate with any of the parrots but follow their own schedule. They often spook parrots when approaching or landing on the colpa, perhaps because of their size, colouring (reminiscent of some raptors?) and being quite cumbersome. Once feeding, they are the least wary of all the birds and usually feed for a long time, hardly getting spooked. No conclusive data on approach behaviour or preferred feeding sites.

Ara macao (scarlet macaw)
Only observed feeding once, in the afternoon and about 50 metres to the right of the colpa on some mud cliff overgrown by vegetation. Pair arrived and perched in an emergent tree above colpa, vocalising loudly, then proceeded towards cliff quietly. One bird then dipped its head under the vegetation to feed, whilst the other stayed outside the vegetation displaying what appeared to be sentinel behaviour. After some ten minutes of this both birds slipped behind the foliage and could be seen feeding on the clay cliff. Throughout this process only very faint and quiet vocalisations could be heard. On take-off vocalisations were loud and distinct.

Other macaws were regularly seen around the colpa, perching in trees and vocalising (see Table 2.3b). They were also seen twisting their heads to look straight down onto the hide. Whether our presence prevented them from feeding is unknown, but perhaps likely, as local people have reportedly disturbed macaws feeding several times around the El Gato colpa.

Amazona farinosa (mealy parrot)
This species was never observed feeding, but is mentioned here because it gathered in trees around the colpa every day in very large numbers, vocalising loudly. Five members of this species were observed once coming close to the colpa and starting to descend, but they were spooked and never returned. More typically numerous small groups of this species would arrive at around the same time as *Aratinga weddellii* first thing in the morning, perch in high trees and vocalise so much so that the forest would be filled with the calls of what would be over a hundred individuals. However, they would never approach the colpa but instead leave in groups until most of them had disappeared by about 09.00. Like the macaws, they were also seen twisting their heads to look straight down onto the hide. Whether our presence prevented them from feeding is unknown, but perhaps likely.

Soil samples & preferential feeding sites

Different species seem to prefer particular feeding sites either on or behind one of the two pillars. Preferences are given above and samples were collected from these preferred feeding sites on 3 July, as well as from random mud cliff sites along the river, and from what we thought could be another colpa site because it showed faint signs of beak activity. These samples were sealed in standard 35 mm film cartridge and await analysis.

Table 2.3c. Soil samples taken. To date these samples have not been analysed and thus no discussion about them appears below.

#	Type	Position S	Position W	Remarks
1	Random	S 12º 51.517‘	W 69º 26.754’	Very hard clay wall ca. 250 m upstream from El Gato colpa.
2	Macaws	S 12º 51.439’	W 69º 26.733’	Soft clay behind foliage. Macaw feeding site.
3	Colpa	S 12º 51.419’	W 69º 26.739’	Medium soft clay. Taken from lower part of right hand pillar (area A) on colpa.
4	Colpa	S 12º 51.419’	W 69º 26.739’	Medium soft clay. Taken from upper part of right hand pillar (area B) on colpa.
5	Colpa	S 12º 51.419’	W 69º 26.739’	Soft clay in shade. Taken from behind upper part of left hand pillar (area C) on colpa.
6	Random	S 12º 51.142’	W 69º 26.858’	Medium hard clay, broke off in chunks. From exposed cliff ca. 2300 downstream from El Gato colpa.
7	Random	S 12º 51.303’	W 69º 27.196’	Random sample from small cliff immediately to left of potential colpa, ca. 2300 downstream from El Gato colpa.
8	Colpa?	S 12º 51.303’	W 69º 27.196’	Small cliff (potential colpa with bill marks?). On El Gato. Sample from one side of potential colpa.
9	Colpa?	S 12º 51.303’	W 69º 27.196’	Small cliff (potential colpa with bill marks?). On El Gato. Sample from other side of potential colpa.
10	Random	S 12º 51.303’	W 69º 27.196’	Random sample from small cliff immediately to right of potential colpa.

2.4. Discussion

Not much work has been done on avian geophagy, either in the tropics, or elsewhere. James Gilardi and others have published some important contributions on parrot geophagy (Diamond et al., 1999; Gilardi et al., 1999; Gilardi & Munn, 1998), but the bulk of it remains poorly understood. What then can this study add to current knowledge, what are the answers it can give and what new questions does it raise?

Geophagy's function

Psittaciformes, or parrots, are one of the most diverse avian orders numbering in excess of 300 species. Although spectacular in appearance and, for better or for worse, prized as pets, their ecology and phylogeny remains poorly understood. Parrots generally feed on seeds and fruit, have low reproductive output, are long-lived and occupy a variety of different habitats (Forshaw, 1989; Juniper & Parr, 1998). Their activity patterns in the Neotropics during the dry season show a peak in the morning and again in the late afternoon; away from colpas they show little evidence of aggregating at roost sites or forming multi-species groups (Gilardi & Munn, 1998). May to August, the period during which this expedition was conducted, is the dry season which usually presents frugivores with minimum food availability (Janson & Emmons, 1990). However, parrots by specialising in eating seeds and unripe fruits inedible to most other animals, appear to have escaped this limitation. Evidence for this comes from habitat use and foraging behaviour studies by Gilardi & Munn (1998) and from interference competition studies by Fleming (1979), showing that parrots appear to have superabundant resources. They achieve this through adaptations such as strong bills, muscular tongue, high bill, tongue and foot dexterity, but most importantly through behavioural and physiological adaptations that allow them to tolerate the high level of bitter-tasting and toxic substances present in unripe seeds and fruits. Diamond et al. (1999) and Gilardi et al. (1999) have shown that parrots can tolerate quinidine doses up to 40 times higher than humans (relative to body weight), and that Peruvian soil consumed by them binds even more quinine and tannic acid than does pure kaolin, thereby reducing its toxicity by at least 50%.

It is well known that parrots premasticate their food thus quickly exposing themselves to plant toxins. This appears to be why parrots feed on clay in the morning, thereby predosing themselves with toxicity-reducing soil, before foraging for the day. In this context this study supports the findings of Gilardi & Munn (1998), and goes some way to answering Diamond et al.'s (1999) question of why parrots feed early in the morning.

Feeding behaviour – timid mealies and macaws

One of the biggest puzzles of this study was why macaws and *Amazona farinosa* were often at the site, but were only once observed feeding, as is the case for the former, and never in case of the latter. We thought that body size and perhaps resultant agility may have something to do with it. Species most often seen feeding and in the biggest numbers tended to be the smaller ones ranging from 67 – 140 g (see Table 2.3a). *Aratinga weddellii* were by far the most active species at the colpa and also appeared to be one of the most agile in terms of their ability to move onto and off the colpa, to move through the branches around the colpa, and quite literally to take flight quickly.

Similarly, *Brotogeris cyanoptera*, although not observed as often as other species, appeared to be particularly persistent in their attempts at feeding, returning quickly to the colpa even after having been spooked several times in quick succession. Both of these species would act independently of others and usually appear at the colpa first.

Contrast with this the behaviour of *Pionopsitta barrabandi*. Although seen feeding quite often, it always associated with other species (usually *Aratinga weddellii*) and never fed by itself. Although Terborgh et al. (1990) lists their mass difference as only 30 g (110 vs. 140 g), at El Gato at least *Pionopsitta barrabandi* appeared appreciably larger and less agile than *Aratinga weddellii.* A similar argument can be made for *Pionus menstruus*, weighing in at almost 300 g and also always associative and appearing cumbersome.

It is not unreasonable to suppose that *Amazona farinosa* at 800 g and macaws at over 1000 g must find it even more difficult to move around on a small colpa, and escape from potential predators. We are here aware of the danger of anthropomorphising, but to us it also seemed that these species were the ones most aware of our presence. On several occasions we noticed them sitting in the trees above our hide, tilting their heads and looking down on us. It is well known that macaws are very intelligent and aware (Juniper & Parr, 1988; Sparks & Soper, 1990). Could it be that a combination of risk of predation and heightened awareness of our presence was responsible for them not feeding? We thought so.

Compared to the huge mud cliff colpas at El Chuncho, TRC and Manu, the El Gato colpa is tiny and much more 'claustrophobic'. The opening created by the El Gato is no wider than 15 metres, with overhanging trees and branches. The El Chuncho river, on the other hand, creates an opening of 100 metres or more between the colpa and the opposite bank. The approach of an aerial predator would thus be much harder to notice at El Gato with much shorter response times. Was there simply not enough space on the small El Gato colpa once the 'lead' species (such as *Aratinga weddellii*) had taken the risk of descending? Or did the conditions favour small, agile birds with short reaction times? But why would *Amazona farinosa* and to a lesser extent the macaws then waste energy and come to the colpa every single day without feeding? Did they want to feed, but were too wary to descend because we were there? It is interesting to note that at El Chuncho, *Amazona farinosa* and *Pionus menstruus* would often feed and in much larger groups. It is also interesting to note that the single pair of *Ara macao* that eventually did come down to feed did so in the afternoon and not on the actual colpa but some distance away, under cover of the vegetation.

Unfortunately none of these questions can be answered conclusively by this study, but our hypothesis to be tested by future studies would be that conditions at El Gato favoured the smaller, more agile species and that the large parrots, already wary, wanted to feed, but were put off by a combination of unfavourable conditions and our presence. Perhaps a much better and less detectable hide or remote camera studies would be a way forward.

Site selection

What makes parrots chose one site over another? What makes them chose a particular spot on the colpa? All along the El Gato and other rivers there is an abundance of mud cliffs that to our human eyes look just like the colpas. The chemical properties of the mud certainly makes a difference and selection for toxicity-reducing mud will be strong and rule out many sites. The samples collected by this expedition awaiting analysis may go some way to answer this question. For now we have to content ourselves with our observation made during sample collection that our random samples were invariably composed of much harder clay that came off in chunks, whereas the clay from the colpa was much softer and more pliable. It thus appears likely that a combination of chemical (such as anti-toxicity) and physical properties (such as sufficiently soft mud for the parrots to be able to scrape off in edible portions) play an important role. The El Gato site was in the shade most of the day, thus keeping the mud pliable and soft. If risk of predation as discussed above plays its part too, as it almost invariably does, then it becomes clearer how a multitude of possible sites will fall by the wayside for one reason or another, and how colpas may actually be a relatively rare commodity. Having said that, local people have told us that the El Gato colpa over the last years has oscillated from left to right by a few tens of metres, with the birds preferring the cliff and pillars to the right of the current feeding site for some, and to the left in other years. We were not able to verify this and the current study cannot explain why this should be so. Similarly, why different species seem to prefer different areas on one and the same colpa remains a mystery. On this, however, soil analysis may be able to throw some light.

Colpas and tourism

Everyone who has seen parrots feed on a colpa knows why people travel large distances to see this, one of nature's great spectacles. The discovery of colpas and their value to tourism has spawned a remarkable change in the area. Where previously there were only subsistence farmers, loggers and gold miners, there are now over a dozen ecotourist lodges with plans for more in the near future. Colpas are a limited resource in this sense, so the question of how to use them sustainably is an important one.

The El Gato site does not lend itself to touristic use. It cannot be reached conveniently by boat, it is quite small and it lacks the presence, on a regular basis, of the most spectacular macaw species. In a way, our study was a miniature experiment on the impact of prolonged human presence, because we behaved how tourists would behave, coming into the hide in the morning, sitting there and observing, and leaving once the birds had left. We may have been more aware and careful about our impact than the average tourist, but to the birds this would have made little difference. What would most likely make a difference is that we occurred in much smaller numbers.

Our miniature experiment appeared to show that the small, agile species were hardly affected. In fact they became so accustomed to our presence that we were even able to conduct observations in full view and quite close to the colpa. The story is different for the larger species, exactly those that would be more interesting for tourists. As discussed above we are likely to have made a difference to them and regrettably altered their behaviour, preventing them from feeding. However, at large sites like El Chuncho where observation points are much further away than at El Gato, even the large-bodied species appear to behave normally.

It appears, then, that small-scale tourism on large colpas, conducted sensibly from observation points that are sufficiently far away is less likely to have a detrimental effect than tourist activity on small colpas. We stress here the words small-scale, sensibly and far away. Mass tourism on small colpas would almost certainly destroy natural behaviour patterns and may deprive parrots of a much-needed resource.

It would be very interesting to know what the 'tourist carrying capacity' of a colpa is; that is at what point does regular tourist observation have a detrimental effect? Unfortunately this study can provide no clues to what would be an important figure.

Fortunately mass tourism to the area is unlikely because of the costs involved. The current system on the whole seems to work reasonably well for both birds and locals. The birds have their habitat protected, the locals by and large seem to benefit, either directly or indirectly, from tourists coming to their area. However, there are obvious concerns: to name but a few, most of the lodges are foreign-owned with only a small percentage of their revenues remaining in Peru; in the busy summer months there is a constant stream of tourist boats going up and down the Tambopata; money value is skewed by the presence of tourists and there is undoubtedly an impact on the environment, especially near the large colpas, where most of the tourists would concentrate. We can only hope that common sense on all sides will prevail and that this study has gone some way to showing what a special place, worth protecting and studying, the Tambopata is.

3. Vertebrate species lists

3.1. Introduction

Increasing economic development is putting a strain on the natural resources of the Peruvian Amazon. Farming and tourism are on the rise, especially along the Tambopata River, an area renowned for its biodiversity (see above). Rapid Assessment Programs (RAPs) and species lists are snap-shot studies of an area, investigating the flora and fauna present in order to allow later studies to determine relationships and impacts that may exist. This expedition collated species lists and conducted interviews amongst local people as a supplementary study to the main parrot study and lists them here in an effort to make this information accessible to the public and the wider scientific community.

3.2. Location, Material and Methods

Location

For details of dates and expedition base camp location see 2.2., for a map of the area and visual encounter survey transects see Figures 1.2a and 2.2a. Species lists were compiled on two separate meandering transects. One on the base camp side (El Gato transect, 5.5 km), and the other on the WASAI side (Altiplano transect, 5.1 km) of the Tambopata river. Interviews were conducted in the surrounding area at local communities and farms.

Visual encounter survey methods

Meandering transects were either cut through the forest (El Gato transect) or were already in existence (the Altiplano transect being a tourist trail maintained by WASAI). They were marked at 100 metre intervals by the expedition team. Transects were walked at random times of the day, and some after nightfall, throughout the expedition. At least two team members would walk the transect and record any obvious species encountered on the way (and concentrating mainly on mammals), their number, time of observation, behaviour and other notable events. Tracks encountered were also recorded.

El Gato transect: Mixed primary and secondary rain forest with relatively little human impact. Some trails were in existence, but they were rarely used and the expedition did not encounter any local people on the trails at any time during the expedition. Some hunting is practiced but only by few people and then only for subsistence.

Altiplano transect: Mainly secondary forest with clear evidence of timber extraction, farming and hunting. The transect also incorporated about 400 metres of higher altiplano ground which would never get flooded.

On both transects human and small-scale tourist activity is concentrated along the Tambopata river and rapidly drops off with increasing distance from that main waterway.

Interview methods

At the beginning of the expedition on 1 and 2 June, team members conducted interviews with eight local people and guides with the help of a translator and in an effort to gain further insights on the local fauna and flora, as well as the behaviour of mammals and birds at the colpas. Interviews were conducted based around a number of set questions which were designed to be as un-leading as possible. The interviewee was encouraged to express his or her views freely at all times.

Night time observation studies

On a total of seven nights observation studies were conducted at two sites. The first site was what locals identified as a mammal colpa on the far side of the Tambopata, about 10 minutes upstream from the expedition base camp, and 15 minutes walk into the forest. The second site was a riverbend and bank of the El Gato river with numerous tracks littering the area, about 5 minutes walk from the colpa on the colpa side of the river.

At the mammal colpa site a tower immediately above the colpa was constructed. At the El Gato site observations were made from the top of a 10 metre high mud cliff overlooking the river and a tent was erected at the cliff edge for observers.

Observers would take shifts throughout the night and, equipped with night vision goggles, were to record any large animals and their behaviour. Unfortunately neither study yielded any results in terms of observation. The reasons for this are largely unknown.

General methodology

The expedition's survey team consisted of several paying, untrained expedition team members who gave up their holiday time to assist in this research project. Their work and the expedition contribution they paid made this research possible. Teams were on site for two weeks and then changed over, with some people staying for more than one two week slot. Team sizes varied between 5 to 7 expedition team members + 1 expedition leader + 1 guide + various support personnel (the latter not participating in the survey). Expedition team members were trained in animal recognition on site by the guides and the expedition leader. Field guides were also provided.

3.3. Results and Observations

Table 3.3a. Results of interviews with local people and guides conducted 1 and 2 July.

Name & age	James Littlewood, 29	Luis Alberto Saavedra, 26	Gearo Herrera, 60	Alberto Arimaya Perez, 42
How long in area / occupation / location	9 mths / guide / WASAI	6 yrs / farmer / ½ way between El Gato and Baltimore	12 yrs / lodge owner / Baltimore	9 yrs / landowner-farmer / Baltimore
How many colpas does person think exist at El Gato & El Chuncho	1 mammal, 1 bird colpa (WASAI / El Gato), 5 bird colpas over 1 km and one very long mammal colpa at El Chuncho. Beyond El Chuncho, 1 spider, 1 howler monkey colpa.	2 mammal colpas (1 as Rafaele), other unspecified (perhaps Balitmore lodge)	1 mammal colpa only (as Rafaele) + another mammal colpa near his lodge. 21 bird, 1 mammal colpa at El Chunco, both on right side of river.	3 mammal + 1 bird colpa at El Gato. 1 mammal + 1 bird at El Chuncho.
What kind of animals / birds at each colpa above	Macaws, parrots, parakeets, parrtolets? (no pigeons – misidentification). Tapir, peccary, deer, capibara, monkeys, agouti.	Paca, peccary, tapir, deer. Sometimes Spix's guans.	Tapir, peccaries, sometimes some monkeys (!), birds.	Tapir, deer, paca, peccary.
In more detail: species list for colpa	El Gato: seen scarlet macaw only, but is sure that b/y and chestnut-fronted, possible r/g, red-bellied there as well. Yellow-crowned, mealy, blue-headed, orange-cheeked parrots. Dusky-headed, white-eyed, rock, tui, blue-winged parakeets. White lipped, collared peccaries, red & grey brocket deer, (+ red holwers and black spiders at colpa beyond El Chunco only).	Collared peccary.	White lipped peccary. Red/green, blue/yellow, scarlet macaw. Blue headed, mealy, yellow crowned parrots. Some pigeons. Spix's guans.	Collared peccary, white lipped peccary, blue/yellow and scarlet macaws, mealy, yellow crowned and blue headed parrots.
Other animals in area	Jaguar, puma, giant anteater, ocelot, jaguarundi, night monkey, common squirrel, saddleback tamarin, dusky titi, brown capuchin, red howler, black spider.	Brown capuchin, dusky titi, night monkeys. Tayra.	Common squirrel, capuchin, dusky titi monkeys, Puma jaguar, ocelot. Agouti, capybara.	Puma, jaguar, ocelot, jaguarundi, common squirrel monkey, saddle back tamarin.
Time of day and (weather) conditions	Birds: from dawn to 9 am only if clay is dry and it is bright. If it is dull early on, they may come later. More likely to see in dry season (September being best month). Mammals: mainly at night.	On really hot sunny days peccaries use colpa. Other mammals around 02.00. Nothing in rain.	Nothing in the rain. Mammals at night. Birds early in the morning 06.00-07.00.	Mammals mainly night time when moon is waning and sometimes on cloudy days (ie little light). Birds early in the morning about 07.00 when skies are clear.
Source	Own experience (sightings, tracks).	Own experience.	Own experience.	Own experience.
Misc	Cynical about desire for education (easier hunts).	Never get any feedback from biologists. Need to know what to do to help protect animals for the future.	12 yrs ago lots of wildlife, then decline after 3/4 yrs, now recovering. In dry season lots of jaguars by riverside. Forest is dry, so they come to river for water.	Would like to talk more with biologists about wildlife. Would like to be taught formally about wildlife.

Table 3.3a (continued). Results of interviews with local people and guides conducted 1 and 2 July.

Name & age	Yolanda Cruz-Condori, 26	Rafaele Roman, 33	Eugenio Ani Ceto Collazo, 42	Mariano Guispe Gutierres, 34
How long in area / occupation / location	6 mths / nurse / Baltimore	11 yrs / landowner-farmer / before El Gato on same side	5 yrs / cook at WASAI / WASAI	6 yrs / farmer / oppos.WASAI
How many colpas at El Gato & El Chuncho	1 mammal colpa only (as Rafaele).	1 mammal colpa only (opposite his place).	3 at El Chunco, 4 at El Gato.	Parrot colpa. Just left before El Chunco, 15 mins into the forest mammal colpa (not visited for 5 yrs).
What kind of animals / birds at each colpa	Peccary, agouti, tapir.	Tapir, paca, deer, peccary.	2 mammals + 1 macaws at El Chunco. El Gato: 1 bird, 3 mammals.	Parrots, tapir, deer, peccary.
Species list for colpa	Collared peccary, white lipped peccary.	Collared peccary, white lipped peccary.	El Gato: scarlet macaw, red/green macaw, blue/yellow macaw, blue headed parrot, mealy parrot, yellow crowned parrot.	Macaw, parrot but did not know species except white-lipped peccary.
Other animals in area	Capibara, suirrels, saddle back tamarin, night monkey.	Common squirrel, dusky titi, night monkey, ocelot, agouti.	Common squirrel mokey, brown capuchin, saddleback tamarin, Southern 2 towed sloth, giant anteater + juvenile.	Puma. Monkeys: brown capuchin, red howler, saddle back tamarin, dusky titi, squirrel monkey, agouti, paca, jaguar (juvenile), ocelot, armadillo.
Time of day and (weather) conditions	Did not know.	Waning and small moon (little light) at night.	Small birds 06.00. Macaws 08.00-09.00, or sometimes 11.00 and 15.00 (nothing in rain). Mammals at night, any time when moon is waning and there is little light. Activity specially high if day before was hot. No activity during rain.	Does not know. Sees monkeys almost every day, at any time of day.
Source	Own knowledge.	Own experience.	Own experience.	
Misc	Need to learn more from biologists so that we do not make mistakes and do the wrong thing.	Appeared to be genuine. Biologists do good work and it is important they pass on what they learn to ordinary people.	Appeared to be genuine, knowledgeable, intelligent. Used to be hunter, which he now regrets. Would like more information or education on animals and their conservation.	Appeared to be genuine.

Table 3.3b. Results of the visual encounter surveys (concentrating mainly on mammals).

Species	Frequency encountered	Frequency on El Gato	Frequency on Altiplano	Average number encountered	Maximum number encountered	Minimum number encountered	Remarks
Primates							
Saddle backed tamarin *Saguinus fuscicollis*	10	9	1	5	12	2	Always high up in trees, moving in groups. Only once seen on Altiplano transect.
Common squirrel monkey *Saimiri sciureus*	11	10	1	19	>100	2	Almost always in large groups, often in association with *Cebus albifrons*. Only once on Altiplano.
White fronted capuchin monkey *Cebus albifrons*	4	4	0	8	12	5	Always in association with *Saimiri sciureus.*
Red howler monkey *Alouatta seniculus*	9	8	1	4	5	2	Always in family groups.
Carnivores							
Ocelot *Leopardus paradalis*	2	1	1	1	1	1	Altiplano encounter tracks only. El Gato encounter visual of animal sitting in tree.
Giant river otter *Pteronura brasiliensis*	1	1	0	1	1	1	Seen from El Gato colpa hide. Single individual (lone male?) periscoping in river in front of hide.
Tayra *Eira Barbara*	4	4	0	1	1	1	
Peccaries & deer							
White lipped peccary *Tayassu pecari*	3	2	1	18	>20	15	
Collared peccary *Tayassu tajacu*	3	3	0	~1	2	1	
Red brocket deer *Mazama americana*	1	1	0	1	1	1	
Rodents							
Black agouti *Dasyprocta fuliginosa*	1	1	0	1	1	1	
Northern Amazon red squirrel *Sciurus igniventris*	3	3	0	1	1	1	
Amazon dwarf squirrel *Microsciurus flaviventer*	2	2	0	1	1	1	
Other							
Tapir *Tapirus terrestris*	3	2	1	1	1	1	All encounters tracks of single individual only.
Brown throated three toed sloth *Bradypus variegatus*	1	1	0	1	1	1	Dead individual found by the side of transect.
Snake, unidentified	7	6	1	1	1	1	
Frogs, unidentified	4	2	2	1	1	1	
Walks without encounters	2	0	2	-	-	-	

Notes: Giant anteater and caimans were also seen around camp.

El Gato vs Altiplano

From the relative frequencies of encounters and the fact that two Altiplano walks yielded no results, it is immediately obvious that the El Gato side is higher in biodiversity, even when taking into account that 9 transect walks were conducted on the Altiplano, and 17 on the El Gato side.

This is not surprising since the El Gato side consists of mixed primary and secondary rain forest with relatively little human impact, whereas the Altiplano side consisted mainly of secondary forest with clear evidence of timber extraction, farming and hunting. The transect also incorporated about 400 metres of higher Altiplano ground which would never get flooded and had fewer signs of human disturbance. Here more diversity would have been expected, but was not actually found. The reasons for this are largely unknown, but are probably connected to the fact that the Altiplano section was relatively short, only skirted the edge of the Altiplano, and was used as a tourist trail by WASAI lodge.

4. References

Best, L. & J. Gionfriddo (1991) Characterization of grit use by cornfield birds. Wilson Bull. 103: 68-82.

Diamond, J., K. Bishop & J. Gilardi (1999) Geophagy in New Guinea birds. Ibis 141: 181-193.

Fleming, T. (1979) Do tropical frugivores compete for food? Am. Zool. 19: 1157-1172.

Forshaw, J. (1989) Parrots of the world. Blandford, London.

Gilardi, J. (1996) Ecology of parrots in the Peruvian Amazon: habitat use, nutrition and geophagy. PhD dissertation, University of California at Davis.

Gilardi, J., S. Duffey, C. Munn & L. Tell (1999) Biochemical functions of geophagy in parrots: detoxification of dietary toxins and cytoprotective effects. J. Chem. Ecol. 25: 897-992.

Gilardi, J. and C. Munn (1998) Patterns of flight activity, flocking, and habitat use in parrots of the Peruvian Amazon. Condor 100: 641-653.

Janson, C. & L. Emmons (1990) Ecological structure of the nonflying mammal community at Cocha Cashu Biological Station, Manu National Park, Peru, p. 314-338. In: A. Genry (ed.) Four Neotropical rainforests. Yale University Press, New Haven, CT.

Krishnamani, R. and W. Mahaney (2000) Geophagy among primates: adaptive significance and ecological consequences. An. Behav. 59: 899-915.

Mahaney, W., R. Hancock, S. Aufreiter & M. Huffmann (1996) Geochemistry and clay mineralogy of termite mound soil and the role of geophagy in chimpanzees of the Malahe mountains, Tanzania. Primates 37: 121-134.

Mittermeier, R., P. Gil & C. Mittermeier (1997) Megadiversity: earth's biologically richest nations. Conservation International, USA.

Mittermeier, R., N. Myers & C. Mittermeier (1998) Hotspots: earth's biologically richest and most endangered ecoregions. Conservation International, USA.

Jones, R. & H. Hanson (1985) Mineral licks, geophagy and biogeochemistry of North American ungulates. Iowa State University Press, Ames, IA.

Juniper, T. & M. Parr (1998) Parrots: a guide to the parrots of the world. Pica Press, Sussex.

Pearson, D. and L. Beletsky (2001) Perú: the ecotravellers' wildlife guide. Academic Press, London.

Sparks, J. & T. Soper (1990) Parrots: a natural history. David & Charles, London.

Terborgh, J., S. Robinson, T. Parker, C. Munn & N. Pierpont (1990) Structure and oranization of an Amazonian forest bird community. Ecol. Monogr. 60: 213-238.

5. Appendix

5.1. Day-by-day colpa observations of feeding. Observations made from hide.

Day	3 June 2001	4 June	5 June	6 June	7 June - 10 June	11 June	12 June	13 June	14 June	15 June	16 June	17 June - 21 June
Weather, moon phase	V. humid and misty, light drizzle, overcast & grey. Hot.	Humid morning, clear day.	Clear day. Full moon.	Clear day. Hot.	7 June – 9 June Expe-diton ex-cursion to El Chuncho colpa 10 June Puerto Maldo-nado team change-over	Cloudy with some rain. Not so hot. ½ moon.	Very misty, humid. No rain. Later sunny and hot.	Overcast , grey but dry. Later sun and afternoo n rain.	Overcast , grey but dry. Heavy rain at noon then sunny.	Overcast and low cloud rising and clearing. Noon rain, then overcast. No moon.	Overcast and low cloud, sunny later.	Friaje and team change-over
Activity period and type of activity	08.55 09.20 2 DHP 14 CWP feed 09.30 09.40 2 PVP feed	07.11 07.24 50 DHP 10 OCP feed dis-turbed & flush 13.20 13.50	No activity	No activity (but only obser-vations until 07.15)		No activity (but only obser-vations until 07.30)	No activity (but only obser-vations until 07.25)	08.40 09.23 DHP feed in several bouts 25+ 5+ RP 2 PVP join	06.40 08.00 40+ OCP 36 DHP feed	06.39 07.17 5 MP descend but do not feed 25 DHP 3-5 OCP feed dis-turbed & flush	08.21 08.40 12 OCP 28 DHP 3 CWP feed dis-turbed & flush	
Feed area	No info	DHP:A OCP:B	No info					DHP:A RP:B>C	DHP:A,B OCP:A.B	No info	DHP:A,D OCP:A CWP:A	
Obser-vation period	05.50 17.00	05.32 16.15	04.30 17.00	05.45 07.15		05.15 07.30	05.50 07.25	05.55 10.14	06.20 10.38	05.52 09.20	05.50 11.30	

22 June	23 June	24 June	25 June	26 June	27 June	28 June*	29 June*	30 June*	1 July*	2 July*	3 July*	4 July*
Thin, high cloud clearing abruptly. Cool, not at all humid.	Dense mist lifting by 07.00. Then very sunny but cool.	Cloudy, then sunny. Cool. ¼ moon.	Cloudy, then sunny. Quite warm.	Very overcast, windy, cool. No rain.	Sunny, very thin patchy cloud.	Low mist rising to reveal clear sky. A little cool.	Clear, very hot.	Very hot and sunny.	Mist, burning off at 06.45, then sunny.	Overcast Low and thin cloud slowly breaking . Some sun.	Very cloudy. Quite cool. Then hot and humid.	Morning slightly overcast, then hot and sunny. Full moon.
16.15 1 giant river otter in El Gato river in front of hide! (no morning obser-vations)	No activity. Colpa still very damp from friaje.	08.05 08.47 1 PVP 6 DHP feed	08.22 08.37 9 DHP feed	07.10 07.23 4 DHP feed 08.50 08.53 5 DHP feed dis-turbed & flush	06.55 07.00 30 DHP 1 BHP feed dis-turbed & flush 07.10 07.23 3 OCP 2 BHP above clopa but dis-turbed 08.02 08.15 9 DHP 1 BHP feed	08.42 09.02 11 DHP 6 RP feed dis-turbed by PVP & flush 09.14 09.56 3 PVP feed	06.35 07.10 20 DHP 5 OCP 1 BHP feed 08.15 08.18 25 DHP feed dis-turbed & flush 08.20 08.35 4 WEP feed	06.51 06.53 20+ DHP 4 OCP feed dis-turbed & flush 07.00 07.46 21 OCP 6 DHP 1 BHP feed	07.13 07.20 12+ DHP feed 09.05 09.31 5 RP feed	07.30 07.45 60+ DHP 2 OCP 3 BHP feed dis-turbed & flush 08.32 08.39 11 CWP feed 15.39 16.28 2 SM feed to right of colpa	09.04 09.11 2 PVP feed 09.30 10.20 20+ CWP 6 RP feed	06.44 08.24 20+ DHP 2 OCP 1 BHP feed in several waves
n/a		No info	DHP:A,B	DHP:A,B	DHP:A,B	RP:C DHP:A.B	OCP:D, A		RP:C,B	OCP:B DHP:A	PVP:A,B CWP:A, B RP:A,B, C	DHP:A
15.50 16.50	07.05 09.30	07.00 09.45	06.35 09.09	06.35 09.30	06.55 09.50	06.35 09.56	06.35 09.00	06.25 09.00	06.25 09.38	06.40 09.20+	06.15 10.20	06.18 09.43

Feeding sites: A = sample site 3 = lower part of right hand pillar, B = sample site 4 = upper part of right hand pillar, C = sample site 5 = behind top part of left hand pillar, D = upper part of left hand pillar. Bird species: BHP = Blue headed parrot, CWP = Cobalt winged parakeet, DHP = Dusky headed parakeet, MP = Mealy parrot. OCP = Orange cheeked parrot, PVP = Pale vented pigeon, RP = Rock parakeet, SM = Scarlet macaw, WEP = White eyed parakeet. * = see also open observations appendix 5.2.

5.2. Day-by-day colpa observation results. Observations made from open observation points above and behind, and in front of colpa.

Day	28 June*	29 June*	30 June*	1 July*	2 July*	3 July*	4 July*
Weather, moon phase	Low mist rising to reveal clear sky. A little cool.	Clear, very hot.	Very hot and sunny.	Mist, burning off at 06.45, then sunny.	Overcast. Low and thin cloud slowly breaking. Some sun.	Very cloudy. Quite cool. Then hot and humid.	Morning slightly overcast, then hot and sunny. Full moon.
Species seen	RGM MP WBP OCP DHP RP PVP	RGM MP BHP OCP DHP WEP PVP	RGM MP WBP DHP WEP	SM MP BHP OCP DHP CWP RP	SM MP OCP DHP RP CWP PVP	RGM MP BHP WBP OCP DHP CWP RP	SM MP BHP WBP OCP DHP CWP RP
Behaviour observed	RGM Few individuals sitting in trees around colpa, observing and vocalising but showing no signs of wanting to descend. MP In trees all around colpa, including "launch trees". Very numerous and vocal, but showing no signs of wanting to descend. WBP Few individuals sitting in high trees in background. Not very vocal. OCP Not very many, generally mixing in with DHP and never feeding first. Very vocal when taking off from colpa. Easily spooked. RP Few individuals, mixing with DHP and never feeding first. Very quiet and easily spooked. BHP As RP. DHP First to arrive and feed. Arrive in small groups 1 – 6 strong, fly into "launch trees" opposite hide, a few circle around colpa, then descend in small groups to trees around colpa and make their way onto colpa to feed. Leave in large groups, usually using El Gato river as flyway. Very vocal throughout.	RGM MP BHP OCP DHP As 28 June. WEP Two individuals mix in with DHP and feed but are startled and soon fly away. PVP Very unobtrusive and quiet, but large cumbersome when landing on colpa, thus often spooking parrots. Not very easily spooked themselves and therefore tend to feed for a long time. DHP OCP BHP feed.	As 29/30 June WEP Do not feed. DHP OCP BHP feed.	As 29/30 June SM as RGM Parrots do not arrive until mist lifts at 06.45. Only DHP and RP feed. RP in small group mimicking DHP approach and take-off behaviour, including doing their own reconnaissance turn. CWP do not feed but are very vocal and in large group. Often seen in afternoon too, but never feeding.	As 29/30 June CWP feed this time, displaying similar behaviour to DHP. DHP OCP BHP feed also.	As 29/30 June DHP around but do not descend to colpa to feed. Despite presence of many species, only CWP, RP and PVP feed.	As 29/30 June RP seen in launch trees but do not descend to colpa. DHP OCP BHP feed.
Observation period	06.42 09.15	06.30 08.38	06.25 08.17	06.46 09.30	06.58 08.30	06.19 10.50	06.37 09.54

Bird species: BHP = Blue headed parrot, CWP = Cobalt winged parakeet, DHP = Dusky headed parakeet, MP = Mealy parrot. OCP = Orange cheeked parrot, PVP = Pale vented pigeon, RGM = Red and green macaw, RP = Rock parakeet, SM = Scarlet macaw, WBP = white bellied parrot, WEP = White eyed parakeet. * = see also hide observations appendix 5.1.

5.3. Expedition leader's diary

21 - 29 May

I am here in Peru to run an expedition to investigate monkeys, frogs and macaws of the Amazon basin, near and around the Tambopata river. A guy called Antonio Salas is meant to be our main herpetologist (frog expert) and coordinator, but when I arrive in Lima it quickly becomes clear that he has organised almost none of the things we agreed on over 16 months ago! As a result I have to do a lot of running around and shopping myself, first in Lima and then a few days later in Puerto Maldonado, the gateway to the Amazon lowlands of Peru. Almost every day I find out about more things that Antonio has not organised. The expedition team will arrive on 27 May and I have a mad rush around to get everything organized (or so I thought). The day the team arrives and we are meant to leave, Antonio drops his last bombshell and now demands excessive and unagreed amounts of money. After a short sharp exchange I remove him from the team and we set off without him on 28 May. Unfortunately it turns out that not only has he not organised our permits to work in the National Park, he has also advised me wrongly on which kind of permits we need. As a result we are turned back at the National Park entrance and told to go back to Puerto Maldonado to get the correct permits. We have no option but to return (a 3 hour boat trip one-way).

30 May

After the chaos of the last few days with us being turned back at the checkpoint because we did not have the right permits, we buy some tourist permits for the team and rather than having them wait around in Puerto Maldonado, I send them to base camp with Juan Julio (JJ), our local guide. They leave early in the morning and arrive at base with no problems around lunchtime. In the meantime I run around in Puerto Maldonado gathering paperwork for the research permit and show INRENA (the ministry responsible for the permit) the papers as we receive them. Late in the afternoon they agree to give us the research permit, so the next day I can go join the team at base, while Bruno (a local guide and someone who has helped me in the mad rush for paperwork) sorts out the actual transfer of permits to camp.

INRENA say it was an absolute world record at getting the paperwork and permits together and approved. It took us 36 hours of running around, begging, and arm twisting. Usually it takes 3-4 weeks - if I hadn't met Bruno, James and JJ, who all helped enormously, I would not have had a chance. Some things are irritating and slow in Peru and bureaucracy reigns supreme (we even had a Biosphere Expeditions stamp made up on the spot to give our papers that certain extra!), but other things, which would be a nightmare to organise at home, seem no problem here. For example, we organised guides and a local student for 6 weeks with a couple of days notice without too many problems here - no chance of that at home I would imagine!

31 May

I hitch a ride to our base camp at El Gato ("the cat") river with some tourists bound for WASAI Lodge (which is relatively close to our base) and arrive at around lunchtime. The team are settled in and have started cutting some trails into the forest. Since we have lost Antonio, we sadly had to drop our frog project from the expedition and now concentrate exclusively on monkeys, macaws and other parrots. For this we have to cut trails to parrot observation points - and we will also use the trails for visual encounter surveys of monkeys and other landmark animals (visual encounter survey is nothing but a fancy name for recording the animals seen on the way to the observation points and back to the pick-up point).

We cut trails until lunch and then rest until 15.00, because it is just too hot to work around noon, especially cutting trails which is hard work. After 15.00 we split into two groups and start cutting trails to the bird colpa. A colpa is a mud cliff where birds or mammals come to feed on the clay. The theory is that they need the clay particles to remove from their bodies toxins, which are ingested with their diet of fruit and nuts. Colpas are divided into those that are visited by birds (mainly parrots and macaws) and by mammals (such as deer, peccary, tapir etc.) and those that hunt them (such as jaguars and ocelots). Bird colpas are mainly active during the day, especially in the early morning. Mammal colpas during the night, when the moon is waning and it is relatively dark. But noone really knows exactly which animals come to the colpas at exactly what time, and what their behavioural patterns are once they are there, so the main body of our research work will be to find out about those unknowns.

There are two colpas in the vicinity of camp. One bird colpa on our side of the Tambopata river, and one mammal colpa on the far side. Our camp is at the confluence of the large Tambopata and the much smaller El Gato river. The bird colpa is on the El Gato, the mammal colpa is inside the forest. The El Gato has small 2 metre high cascades just in front of our "dining room window". We bathe there every day and use it as our "luxury power shower" to wash off the sweat and dirt of the day's work.

There will be two trails going to the bird colpa from either side, one starting from base and the other a little upriver (we need our boat to reach that trailhead). The trails will also be the "meandering" transects for our visual encounter surveys. Today we cleared those trails coming from either side. Quite hard work in groups of 3 or 4. The first person does the rough work of cutting the biggest branches of tree and bamboo, the second cuts smaller branches and starts to clean up roughly, and the third treads everything down and cleans the trail. Most plants have some protection of one sort or another. Either spikes or ants or biting insects, so you have to be very careful where you put your hands and feet, where you cut with your machete and where the cut branch is going to fall. Bamboo quite often have fresh water in them and as such provide a welcome drink (except when the water is old and foul and you poor it all over your hat and shirt as I did!). Guess it adds that certain kind of extra odour to your already sweaty clothes! Despite all that, in the forest it is much cooler than around open camp, and everyone seems to enjoy slashing their way through the forest with big machetes for the sake of science! Naturally we do not see many animals, as we are crashing and slashing our way through.

Since we rise with the sun at 05.30 we go to bed at around 21.00. All our meals are prepared in our kitchen/common room cabin by Giovanni, our cook, now known as "Don Giovanni". He cooks from local produce and from supplies we have brought with us from Puerto Maldonado. Fish, chicken, some beef, lots of fruit and fruit juice, eggs, crackers, jam etc. Everyone seems happy with his cooking - always important on expeditions with no access to other luxuries.

1 June

I stay back in camp to sort out all our gear and set up our base properly, while some of the others finish cutting the trail and start constructing the hide for the colpa. One group takes the boat and interviews the local people about their experiences and knowledge about animals and the colpas. They return at about lunchtime by which time I have finished setting up communication, safety and research equipment, moved in myself and hoisted the Biosphere Expeditions flag on the flagpole I had dug in earlier.

We have our usual siesta until 15.00 and people rest, go swimming, read, write their diaries etc. After 15.00 we start the process of dividing the trails into 100 metre sections for our visual encounter surveys, so that we always have a marker when we see an animal and can thus compare our notes and compile data more easily. GPSs do not work under the dense tree cover, so we have to use strings to measure out 100 m increments and mark them along the trails. Quite a laborious and slow process. Two groups starting from each trailhead. Our path is shorter and we reach the colpa as it starts getting dark. The others take longer and radio for the boat in the darkness. We go upriver under a cloudless star-filled sky and collect them before they are eaten alive by the mosquitoes on the riverbank. Everyone is quite tired and not many people stay up after dinner.

2 June

We split into two groups again. One group takes the short way from camp to the colpa and finishes constructing hides and clearing the last 100 m or so into the hide from any branches etc., so that our approach is as quiet as possible. The other group takes the boat with me up to the trailhead and we start marking out the tape we had set every 100 m the day earlier. Half way through, our marker pen runs out and we have to cut it open and use leaves and water to squeeze out the last bit of ink to write on the tape. We just about manage to mark our way to the colpa when it starts getting dark and we have to stop and make our way to base.

The results of the interview are entered into the computer. Most people list quite a few parrot species at the colpas and also peccary, deer, agouti and other mammals at the mammal colpa. All of them say that rain prevents any bird activity and that bright moonlight restricts mammal activity. They also all say that biologists come to talk to them, but they never hear anything back, despite the fact that they would like to know more about the wildlife and how they can help to preserve it!! James, an experienced wildlife guide from the UK is sceptical, saying that they would probably use the information for more efficient hunting.

Over dinner we design our first 12 h survey at the bird colpa. We will have four shifts of three hours each, covering all daylight hours. We also design the data entry sheets for the colpa work. The trail we have marked out from camp to the colpa and then back to the riverbank will also serve as our transect for visual encounter surveys. Two people will share a shift and I will do the first one by myself, so our expedition team of 7 people can cover 4 x 3 = 12 hours. Once the schedule is set, everyone hits their beds quite early.

3 June

I get up at 4.30 to get ready and then walk the short way to the colpa. In the pitch dark it takes me about 40 minutes and I get to the colpa just as it gets light. I set up quickly and then cut myself a little observation "window" into the hide, which is basically a box made from bamboo and palm fronds. As day breaks, I can hear the first parrots arriving in the trees around me. Spotting them is much more difficult. Although they are all around in the trees, I can not make them out at all - only when they move can I pinpoint them, but before I raise my binoculars to my eyes, it is already too late and they disappear into the foliage. It is quite misty and you can see the droplets hanging in the air. The parrots stay in the trees and talk to each other, but make no move towards the mud cliff across the small El Gato river in front of me. There are lots of noises around, many of which I can not identify. I wish JJ, our guide, was with me now so that he could explain to me who makes the different noises, but he is in the next shift. So I have to be content with catching glimpses and trying to identify the birds from the field guide I have with me.

When JJ and Stefanie arrive for their 08.30 shift, the parrots are still in the trees. None of them have shown at the colpa. JJ tells me they are mealy parrots. The air has cleared now and I leave JJ and Stefanie to their shift. On the way back to camp I mark out the last missing markers with a spare (and working!) marker pen. It turns out that the whole transect is 5.5 km long from one end to the other - quite a good length for a transect.

There is not much more activity at the colpa today and the visual encounter surveys do not yield much. Back to bed early as I have the first shift again tomorrow.

4 June

Up at 04.30 again. On the way to the colpa I see a massive bird spider or tarantula sitting on the trail. As I shine my torch on her she scuttles away. I am in the hide again before dawn. Just after dawn the first birds arrive and sit in the trees. Although they make a lot of noise whilst sitting there, they do not appear to want to come to the colpa to feed. An hour or so passes and then suddenly a whole flock of dusky headed parakeets arrive at the colpa and start to feed. They have green and yellow bodies with grey heads. There are about 50 of them fighting for space on the clay wall. Soon after about 10 orange cheek parrots join in. They have even more striking colours: green bodies with black heads, orange cheeks, and very bright red and orange underwings. From 20 metres away in my hide it is an amazing spectacle to watch. Sadly, after only 5 minutes or so they all take off in one swoop and I am left hoping that the pictures will come out!

The next shift arrives with tales of howler monkeys on the trail. As I walk back I do not see them, but instead spot a troop of brown capuchins and common squirrel monkeys in the trees above (they often travel through the canopy together and sometimes even share in the care of their young). There is not much more activity at the colpa today. I walk the entire trail once more to check all the markers and to put ropes in the steepest and most slippery places. I also make a map of the trail and river. This takes me about 3 hours and on the way I join Heather and Janet as they come back from their shift. We walk the trail in the middle of the day. It is ok in the forest, but once we get out onto the riverbank and into the sun, it is boiling hot. Luckily we only have to wait for a few minutes until our pick-up boat arrives ahead of time to take us back to camp.

Then straight into the river by the waterfalls with all my clothes on to wash them while I am sitting in a shallow part of the river. Armed with a brush and some soap it is much easier (and far less muddy!) to wash them while they are still on me. Finally a long swim whilst the clothes are drying in the baking sun.

JJ says that he spotted the macaws sitting in the trees above the hide actually looking down on the hide. This makes us think that they may be very wary to behave normally while we are around, so in the evening we speak to James, the experienced local guide. He says that he can not help since he only ever saw them when he disturbed them and he has not done a long-term, 12 hour survey as we are doing. He suggests some small ways of improving the hide, but otherwise has no words of wisdom.

5 June

I do not have the first shift today, so I can have a lie-in until 07.00 and then have a delicious pancake breakfast conjured up by our cook Don Giovanni. Daniella and I have the second shift, so we leave at 07.30. On the way we see a troop of red howler monkeys. Once in the hide, the first shift consisting of JJ and Elisabeth tell us that there were again lots of noises, but that none of the parrots came down. We have made some improvements to the hide, but they do not seem to have made a difference. Our 08.30 - 11.30 shift is dead boring with nothing happening at all. All the other shifts unfortunately make the same experience. It is frustrating, but I guess that's what you get when you do original research on animals that have not been habituated to humans and in a location that no-one has ever studied before. Just about everything is new to us and to science and we are just learning the hard way. Tomorrow we will do our last batch of 12 hours and then cut down to the important times of the day as revealed by our study so far. It's a bit frustrating for the team, but they seem to understand that this is original research with unpredictable animals. It was a shame that I was alone when the best feeding event so far happened.

6 June

I am on the first shift again. As usual, there are lots of parrots in the trees around and the forest is full of loud vocalisations. This time I leave the hide and walk around amongst the trees, trying to spot the birds. There are several hundreds of them, dotted around the colpa in the tallest trees! I can see mealy parrots and orange-cheeked parrots, and I can hear the odd macaw calling in the canopy. It occurs to me that the area might not only be a colpa but also a roosting site. Perhaps parrots often roost in the same place with several species gathering overnight? Since I cannot hear them arrive, I am hopeful that my theory will be right. If it is, it could be that the parrots wake up and then decide whether to feed on the clay. If they decide not to, they just fly away and go about their day's business without visiting the colpa. It is known that macaws do not have to feed every day, so this might explain why we have only seen feeding activity twice so far.

I remember the main gathering trees and decide to call off the 12 hours survey. Instead we get the whole team together and prepare paths to the gathering trees. Three trees on the far side of the El Gato river, and two trees and the existing hide on the nearside. We work until lunchtime and then rest. In the afternoon JJ takes the team to the other side of the Tambopata river for our first exploratory walk to the mammal colpa (where we are hoping to start night-time work next week).

7 June

The whole team gathers at 04.30 and we walk to our observation points. My theory goes out of the window as day breaks and the team observes parrots arriving in the trees (later I read that parrots actually don't do much roosting at all!). They arrive quietly (which is why I missed them in the hide) and then only start vocalising as day breaks. An hour after sunrise the forest is filled with the chattering of many species of parrot and the occasional hoarse voice of the macaws dotted around. But again none of them come to the colpa to feed. We return to base with one laughing eye for having witnessed such a natural spectacle and one crying for not having seen them feed at the colpa.

The rest of the day is spent with getting ready for our trip to El Chuncho, a series of parrot, macaw and mammal colpas about 1½ hours upriver. We want to go there to compare behavioural patterns and to observe mammals at colpas for the first time. We leave at 16.00 and arrive just as the sun sets. On the way to El Chuncho (literally "mate", as in colloquial for friend) the river narrows and starts splitting into several channels separated by mud and stone beaches. Huge trees swept down with the rains over the years lie in the river and the strong current makes them sway or bend in the stream. The biggest trees with remnants of their buttresses protruding from the water look like giant stranded whales. Walter, our boat driver skilfully steers us through the torrent and small rapids. We pitch our tents as night falls and Giovanni conjures up a meal. We then reccee the trail to the mammal colpa in the dark. On the way two tapirs come crashing through the forest towards us, chased by something we can not identify in the dark. Probably a puma rather than a jaguar, as they chase, whereas jaguars tend to stalk and ocelots are too small to attack tapirs. The animals crash through the night only a few metres away from us and there is definitely some heightened tension in the group afterwards as we make our way back! Unfortunately some of the team also stood in a leaf cutter ant trail while we were frozen to the ground and now start stripping down in the pitch dark, jumping in circles as they try to dissuade the ants from clutching to their clothing. And just to round off the night, we find a HUGE tarantula camped on the trail. As JJ approaches she disappears into her burrow under a tree root. JJ then carefully inserts a stick into the burrow and out she comes in defence of her home. She really is big, easily covering a large dinner plate. By now most of us have had enough excitement for the night and we crash in our tents, for some uneasy sleep for some of the team.

8 June

We are up very early in the morning again to go to the big macaw colpa, just a minute or so upstream from our forest campsite. As we arrive a multitude of parrots and parakeets start gathering. We see blue headed parrots, orange cheeked, mealy and dusky headed. Then the macaws start arriving, unmistakable by their calls and with their deep full strokes and long tails in flight. We see red and green, scarlet and even a pair of blue and yellows. What a spectacle! But again none of them decide to come down and feed. They seem to gather, vocalise and then fly off together. This time, however, we are sure that it is not because of us. Firstly because our observation point is much further away, about 100 metres across the river from the colpa, and secondly, because these birds are known to be much more habituated to human presence, as some jungle lodges take tourists to this colpa on a regular basis to observe them feed.

Slightly disappointed we leave for a trip further upriver to look for some more possible colpa sites. The river gets even wilder up here and as we go further and further, we catch our first glimpses of the Andean foothills and Bolivia in the distance, covered in cloud and cloud forest. It's another day's journey to there, past some class 3 and 4 rapids – too much for our sturdy wooden boat. We turn back wondering what we would find up there. As we turn around we let the currents take us downriver and with a quiet engine observe quite a few birds, capybara, and a caiman long the riverbanks.

Back in our jungle camp by 16.00 and ready for the night shift at the colpa. As night falls we sit on the beach and observe the night sky. The Milky Way is very clear out here in the still and clean air with no lights other than our own anywhere to be seen. The moon rises at around 20.00. Unfortunately it is almost a full moon and a clear night so that the night is very light. As a result we are not very hopeful to observe any animals at the mammal colpa, as they do not tend to feed on bright nights. Our shift system armed with nightsights can only confirm this well-known fact. As we take two-hour shifts in pairs, saying hello to our tarantula on the way to the observation point, none of us sees any animal activity.

9 June

Up early again and to the macaw colpa. The birds treat us to the same spectacle as yesterday: lots of them in the trees, but none of them feeding at the clay. At least it shows us that it is not unusual to have no feeding for several days. We decide to interview some of the local guides about the feeding behaviour at El Chuncho in an attempt to get a statistical handle on how often we can expect the birds to feed on average.

Breakfast of pancakes and banana on the boat and then back to our El Gato base. The rest of the day is spent with personal admin and the introduction of a new trail for our visual encounter surveys. Tomorrow some more people will arrive in Puerto Maldonado to stock up the team (all of those currently here will stay another two weeks).

10 June

An early morning start to Puerto Maldonado. Janet is coming and Heather has decided not to stay the extra few days, but to leave today, since she is worried that she will otherwise miss meeting her friends in Cusco. We arrive in Puerto at about 09.00 and then rush around to buy supplies, send e-mails, communicate with our logistics people, confirm flights etc. Three more people join the team today. Sian and Oscar, a couple of bird-watchers and amateur naturalists from the UK, and Karin from the Netherlands, who has been with us in Poland on the wolf expedition in March/April this year already. They are all at the assembly point in WASAI with a few hours to spare. At 13:00 we pack up and load up the boat. Our previous guide JJ is replaced by Bruno who will be with us for the next month. We are also expecting our local student, Carlos, but he has an essay crisis and so promises to join us in a few days.

The trip upriver goes without a hitch and this time we have no problems at the checkpoint. We arrive at base in the dark and after moving in, introductions and dinner, I take the new people through the basics. I also summarise for the whole team what we have done so far, what we have learnt and what we intend to do over the next two weeks. We go to bed at around 21.00 as the newcomers are understandably tired from the trip. The rest of the team, who have had a lazy day at camp, stay up talking around the dinner table.

11 June

Janet and Daniella have the early morning shift in the hide. They leave at about 04.50 and return around 08.00, just as the rest of us are preparing to move off. It is cloudy today and there was some light rain. The parrots gathered, but none of them came down to feed.

The rest of the team is ready by 08.00 for an introductory walk along our 5.5 km El Gato trail. Bruno does an excellent job of pointing out various plants, animals and tracks. We show the hides to the newcomers and explain how the visual encounter surveys work. Janet and Daniella meet us in the boat at the end of the trail and we cross the river over to WASAI. I go back to base for some admin and data entry, whilst the rest of the team walk the newly opened Altiplano trail and mark it out with our 100 m markers. It turns out to be 5.2 km long, comparable in size to our existing El Gato trail. Soon we will be using both trails for our visual encounter surveys.

I collect the team from WASAI (the start and finish of the trail) at 14.30 and we go back to base for a late lunch. Then siesta and dinner at 19.30.

12 June

Stefanie and I are on the early morning shift. It is quite misty in the morning again and as day breaks visibility is reduced down to about 50 m. We hear the usual cacophony of noises all around us, but none of the parrots come down to feed. We move out at 07.30 and run into Oscar and Sian on the way, who have started on their visual encounter survey. We meet at the river crossing, where there is lots of parrot activity, so we decide that they should spend an hour or so in the hide on the off-chance that any parrots may decide to feed (which they don't).

Stefanie and I then make our way back to base where the rest of the team is waiting. We split into two groups. One to walk the Altiplano trail, and the other to reccee the mammal colpa site on the far side of the river. Eduardo, who owns the land on which he has built our bas camp cabins, shows us the site and we find four shotgun shells in evidence of hunting there. We also find plenty of tracks and decide on a good site for an observation tower. This will be two metres off the ground to keep away from the mosquitoes (no repellent allowed in the hide, as the animals would surely smell it a mile away), and big enough for three people, so that two can sleep, whilst one is on watch. We can get all the materials from the forest and intend to start construction as soon as possible.

Walter, our boat driver, collects Oscar and Sian from their walk at about 11.00, and us from the colpa half an hour later. We then return to base. Elizabeth and Janet, who were on the Altiplano trail are picked up just after 13.00 and lunch is at 13.30. Then our usual siesta and at 15.00 there is another two groups doing visual encounter surveys on the El Gato and the Altiplano trail. I stay back for data entry and some rest. For some reason I feel really worn out and tired today.

13 June

What a great day! I have the second shift in the colpa hide and 10 minutes after I arrive am treated to an hour-long display of dusky headed and rock parakeets, as well as two pigeons feeding. After the first careful approaches it is a constant flurry of activity with up to 30 birds on the clay at any one time, picking, flying off, sitting in the branches around the colpa, chirping, taking off in one swoop, only to return again a few minutes later. I take plenty of photos and record it all in our notebook. In between a couple of raptors appear for good measure, but I forget to photograph them! It seems the colpa is yielding some results. Whether it is simply good luck or whether the birds are getting used to our presence, I do not know. I just hope others will be lucky too, since so far it was only JJ, Stefanie and I who have seen parrots feeding.

My walk to and from the hide is exciting too. First I find a dead bird spider, orange from the fungus that has killed it and with fruiting bodies sticking out of its body and hairy legs. I have seen something similar with ants in Brazil. Apparently the fungus attacks the muscles first without killing the arthropod outright, then it attacks the nervous system and starts to change the behaviour of its host. The ant (or spider) is compelled to climb as high up a tree as possible and then to anchor itself to a leaf by its fangs. The fungus then kills the animal and starts growing out of the corpse a fruiting body, which then disperses its spores over as wide a range as possible! Other arthropods breathe in or ingest the spores and the whole cycle starts again. I found the bird spider upside down on the floor, so maybe it has suffered from just this fate and fallen down from out of a tree?

I also see two snakes and a troop of saddle back tamarin monkeys chirping in the trees, watching me, and climbing higher into the canopy as I get closer to take some pictures. Finally, whilst I was in the hide, there was a big splash in the river on my right from what I assumed was a big animal crossing the river in my direction. As I sat alone in my dead-end hide, I was left wondering what would come to visit me in a few minutes, but nothing ever came!

The others are either on encounter surveys or over on the other side of the river to construct the hide. After lunch I join them. They have felled a palm tree and made planks for the floor of our observation tower from it. We lug them through the forest absolutely drenched in sweat and dirt. I hope this hide is going to yield some results!

14 June

My wish has come true as Elizabeth and Karin, who shared the first shift in the parrot hide today, are treated to the best display of feeding activity yet. Over the space of an hour they see over 100 parrots and parakeets vying for space on the clay cliff. Furious note-taking is interspersed with binocular-peering and picture-taking. It really seems the birds have become accustomed to our presence here (touch wood)!

Stefanie and I walk along the river in preparation for a river reccee within the next few days. I want to follow the El Gato along most of its length to see whether there are any alternative, undiscovered colpa sites anywhere along it. Most of the river cannot be seen from the trails, so the only way to make sure is to follow it along the bank or swim and wade it. Everyone is quite keen to come on this outing, but some are not quite sure whether they are up to it. We'll talk about it over dinner tonight….

The tower is being built as well, with Bruno and Eduardo in charge of construction. Daniella especially seems to enjoy doing this and returns sweaty and dirty, but with a big smile on her face.

Over dinner we decide to do the river outing sometime next week, not now, as the birds only seem to be getting used to us now and we do not want to scare them off by wading past the colpa in a big group.

15 June

Oscar and Sian have volunteered for the first shift again and see several species of parrots and parakeets feeding. Stefanie and I take the second shift and are less lucky. We do not see any parrots, but there is quite a bit of activity with a roadside hawk eating a small animal in a tree next to the colpa, a drab water tyrant flies by, and a few Spix's guans (a kind of partridge bird) fooling about in the trees. Elizabeth and Oscar are on the Altiplano trail and Bruno takes the rest to the mammal colpa for more tower-building.

In the afternoon Stefanie, Karin and I help out with more building work. The tower is now almost finished and it's quite an impressive structure. We will probably finish it tomorrow and then we will leave it for a day or two, hoping that it will rain so that our smells are washed away.

16 June

Oscar and Sian, our bird-watchers of the team, take the first shift again and once more are rewarded by feeding birds; dusky headed parakeets and orange cheeked parrots today. The second group of Elizabeth and Daniella arrive and also catch a few minutes of the feeding activity. Daniella was the last one not to have seen the parrots down at the colpa, so everyone has seen them at least once now.

Janet takes me on the Altiplano trail, which I have not been on before. It is immediately obvious that the forest around is secondary forest, which has re-grown after some human disturbance. The undergrowth is much thicker than in primary forest, where tall trees are well developed and shade out the plants on the ground. There are many gaps in the canopy in secondary forest and bushes and small plants can grow much more vigorously near the ground. Secondary forest also harbours far fewer animals and this is immediately obvious as you walk the trail. There are fewer encounters, fewer noises and generally far less activity all around. Janet and I, for example, only see a single partridge-like bird and otherwise little else.

Sian and Oscar on their long walk back from the hide have discovered a carcass somewhere in the forest. They did not actually find it, but could smell the odour of decay and saw several vultures flying low in the forest. They looked for it, but ran out of time, so we will have to search for it after the weekend.

The tower is finished and ready for action. Starting Monday we will have three people in it for one night shift. Two people sleeping, whilst one is awake looking for animals with the night sights. Over night our wish of rain is fulfilled as a massive thunderstorm rolls in and it rains continuously from midnight onwards.

17 June

The thunderstorm was the announcement for our first experience of friaje, the cold wind from the plains of Patagonia. Today is Sunday, our rest day, and it has been raining continuously since midnight. The river has risen a few metres within a few hours and the El Gato waterfalls have gone. The ground around the camp is turning into a brown mixture of puddles and mud and the temperature has dropped to below 10° C. Might not sound cold, but when you are used to 30+ and then get below 10 the next day, it is cold – and combined with the strong wind whistling through our cabins it is freezing. Luckily our roofs of palm leaves are perfectly waterproof, so the team either amuse themselves with mind puzzles in the kitchen / common room, or sleep off some of the early shifts of the past week. I use the time with data entry and for catching up on letters, e-mails and other such things.

In the afternoon, when the cold has crept into most of us, we take a very cold boat ride downriver to a local football match. The pitch is a level piece of pasture ground hacked out of the forest, with two goals and the pitch lines demarcated by cleared grass. The teams look serious in their matching strips and football boots. We join the game just before half-time and watch as they play on a waterlogged pitch. The locals support their teams and one old, very large lady is particularly vocal in her encouragement, much to the amusement of everyone around. A couple of locals also sell cigarettes and sweets out of buckets and I discover some very nice home-made cake for about 20 pence a piece. We all share half a cake and then make our way back to camp, picking up some extra blankets on the way. Everyone by now is quite cold but with the extra insulation of the thick blankets we all spend a relatively comfortable night despite the cold.

18 June

The friaje is still with us. It had rained almost continuously since midnight, so there was no point in doing an early shift, since there is never any activity in the rain. We wake up to a cold morning and have hot soup for breakfast. One group then sets off to check the tower (there are lots of fallen trees and branches in the forest from the thunderstorm, so one may have hit our tower but it turns out to be fine), and afterwards they look for the carcass that Oscar and Sian had smelt on Saturday. This turns out to be a dead adult peccary which probably died of collateral hunting damage and they bring back the head to boil off the bones.

A second group does the Altiplano walk, and a third goes with me to check on the bridge (ie fallen tree) across the El Gato on the way to the hide and about half an hours walk from camp. The path is under water in parts, but not very badly. There are some leaves and small branches in the way, but they are cleared very easily. The fallen tree lies across the river at an angle and the last third is under about 30 cm of water. This may be a good opportunity to check for other colpas along the El Gato, since it may now be more or less navigable in a pecke-pecke (the local variety of shallow boat with an outboard whose propeller can be set at a very shallow angle to the water). It is called pecke-pecke in imitation of the lawnmower-like sound the engine makes when running. They are much slower than a normal outboard engine, but can navigate much shallower waters.

In the afternoon we follow that plan through and take Eduardo's pecke-pecke upriver. The El Gato winds and twists its way through forest we have not seen before and to get to the fallen log by boat takes just as long as walking it in more or less a straight line on our path. It is a beautiful boat ride along a tunnel of trees and we find a site with evidence of birds feeding there. I thought so! The parrots always seem to have one or two alternative sites so that if they are disturbed at one site, they can go to another to feed. We take a GPS reading and if we have time will try to open another path to this colpa for a small comparative study. Unfortunately the river has dropped by half a metre by the afternoon and when we get to the fallen log that was submerged in the morning, it no longer is and therefore is no longer navigable with our boat. Reluctantly we have to turn back. On the way back we hit a large log in the water and the small boat rocks wildliy backwards and forwards. We almost go in, but just about manage to stay afloat.

The weather is still miserably cold, wet and windy. Because all the cabins are open there really is no getting away from the cold and the wind. After a while it creeps into all your bones and the only way to keep warm is to do something active. But there is not much to do as all the animals are shivering in their holes or trees and do not seem to want to be very active (who can blame them?!). Team spirit is rapidly deteriorating because there is really not much to do except playing cards and feeling cold. We have no idea how long this friaje is going to last, but usually they last for anything from a few days to over a week. The locals seem to think that we have at least another few days in store, so I suggest retreating to Puerto Maldonado and staying in a hotel until the weather clears. This has an immediate effect on the team who eagerly agree to this plan. "There are telephones and internet cafes in Puerto Maldonado and we can have our clothes washed and have hot showers!", seems to be the general chorus. After the retreat is agreed on, the mood changes from subdued to excited and we sit down to dinner in much better spirits.

19 June

We rise with the sun and there is a burst of activity as people start packing up for the trip to Puerto Maldonado. After a pancake breakfast we leave at around 08.00 for the coldest boat trip ever. As we sit in the boat shivering, wearing all available layers of clothes and wrapped in sheets of plastic and blankets, the scene reminds me of arctic explorers of the Victorian age, rather than an expedition to the forests of the Amazon basin. Bruno resorts to wrapping his feet in toilet paper before putting his socks back on, and we huddle together in groups under blankets to keep each other warm. With the low temperatures and the wind chill of the boat ride it really is VERY cold. We reach Puerto Maldonado around noon, frozen to the bone, but happy we have made it. Bruno and I find a hotel with hot showers and we eagerly move in, handing bundles of dirty washing to the lady at reception as we unpack.

We have a late and very big lunch and then decide to go to the cinema in the afternoon. They are showing “Castaway” in English with Spanish subtitles. The cinema is quite cold, although the temperature in Puerto seems to be much higher than in the forest. It is also not as humid, so the cold does not creep into your bones as well as at El Gato. The rooms have no heating (none of them do in this part of South America), but the beds are soft and comfortable and we ask for plenty of extra blankets and spend a good, restful night after the cinema and a pizza meal.

20 June

The team go to nearby “monkey island” while I stay back for admin and e-mailing. Monkey island is run by a local lodge and houses monkeys that were impounded by the ministry INRENA, either from smugglers, hunters or from people holding them illegally as pets. Usually it is not known where the animals came from, so reintroduction is out of the question, as they would be very unlikely to be accepted by a troop outside their own territory. There are about 15 monkeys of different species on the island and the team come back with stories of them being tame, playful and mischievous. Our hotel also features some captive macaws, who are basically a bunch of thugs, and a much more friendly tame white bellied parrot who comes and sits on your shoulder and gently nibbles your ear. Although we pity the birds with their primary feathers cut to prevent flight, it is interesting to see them so close after fighting for glimpses of them though the forest canopy.

After dinner we go to a bar and start an impromptu salsa party with much dancing, tequila-consuming and some sore heads in the morning!

21 June

The friaje is on its way out. The cloud is breaking and it is noticeably warmer, although there is still continuous cloud cover and only bits of blue sky. We spend most of the day buying supplies for the next team, and making arrangements for tomorrow and Sunday.

Bruno, our guide, Sian, Oscar and Karin (who all still have two weeks left) are going to catch a boat to El Gato tomorrow morning. Elizabeth, Stefanie, Daniella and Janet (whose time on the expedition finishes Sunday) decide that it’s not worth going to El Gato again and arrange a short trip to Cuzco instead. I will wait for the new team members and together with them meet Bruno and the rest of the team at El Gato Sunday evening. So everyone’s busy arranging their schedules and we meet for dinner and a quiet drink later in the evening.

22 June

The friaje is over. By mid-day the cloud has gone and the sun is shining again as if nothing had ever happened. It is not quite as stiflingly hot as usual - that will take another two or three days, but at least we have come through the worst.

Bruno, Sian, Oscar and Karin leave in the morning, and Elizabeth, Stefanie and Janet depart a couple of hours later for Cuzco. Jenny and Leigh, two members of the new team, are already in Puerto Maldonado and I bump into them at WASAI. I take them on a quick tour of town while buying more supplies and we have lunch together.

Then more running around to INRENA to make sure the permits for the new team will be ready for Sunday. In the evening we go to the cinema (The Mexican) and have pizza afterwards.

23 June

Elizabeth (Liz) has arrived in the morning and a little later Jill arrives on the TANS flight, so there is only Samantha to go and Liz thinks she will be arriving tomorrow. We all meet, some help Walter (the boat driver) and me to buy fuel for the last group. A final visit to INRENA and I have the permit for the last group in my hand. We then arrange for all the newcomers to go to Lake Sandoval and the Monkey Island with James as a guide. They are really lucky and see lots of wildlife including a whole family of 8 giant river otters near the lake! James thinks this team will be really lucky. We’ll see….(Back off into the field tomorrow).

24 June

Sunday. Assembly day. Four out of the five for the new team are already here and ready to leave. We buy some more supplies and then sit and wait at WASAI and wait for Samantha (Sam) to arrive. Her flight gets in late and she arrives at WASAI with 15 minutes to spare until assembly time. Everyone is ready and Sam does not need to buy any more supplies for herself, so we head straight down to the waiting boat and set off. It is sunny but still not as boiling hot as before the friaje. While the boat is making its way upriver, I run through what we have done already and what we want to achieve over the next couple of weeks. On the way we see a caiman, a peccary, river turtles and lots of birds, so it really seems like this team will indeed be lucky.

We arrive at base just as night falls and haul our supplies up the bank and into the kitchen. The newcomers move in and introductions are made. Sian, Oscar, Karin and Bruno have spent a tranquil couple of days at camp monitoring the colpa and talking long walks. Oscar saw a giant river otter swimming in the El Gato right in front of the hide! The parrots are still feeding, the waterfall is still there (and we take a moonlit dip). Over dinner we once again run through the research plan for the next two weeks with everyone, and hit our cabins at around nine.

25 June

Leigh and I take the first shift (now starting at 06.30, rather than 05.30, because our research has shown that there is usually no activity before 06.30). Leigh has never been to the forest before and it is living up to expectation. On our walk into the hide we see a toucan and hear the mealy parrots and parakeets vocalising in the trees all around us. We spend two hours in the hide and just as our relief is approaching, dusky headed parakeets start flying into the trees above the colpa and descending down towards it. The two of us and our relief team (Oscar, Sian and Karin) crowd into the hide and all five of us are treated to a short spectacle of 10 dusky headed parakeets feeding on the clay for about 10 minutes.

Leigh and I then walk back to camp and Bruno takes all the newcomers (except Leigh who is tired from the early shift) on an introductory walk through the forest. We all meet back at camp for lunch and then have our usual, this time quite short siesta (although it still isn't that hot and the water in the El Gato is quite cool and refreshing). Around 15.00 I take the newcomers through the safety procedures, show them how to use a compass and GPS and take them through the nearby features on our map. We then all go to the mammal colpa to see whether our tower is still there. It is and we plant an official-looking sign "research in progress – do not approach colpa" in Spanish at the trailhead to prevent hunters (and others) from coming to the colpa. There are fresh tapir and puma tracks and we plan the first three-person shift for tonight.

Back for dinner and Bruno, Jill and Jenny (who have volunteered for the first shift) get ready and leave at nine. Unfortunately the river, which is already low, has dropped even further and it is becoming dangerous to pass the rapids at night. So before they have even made it to the colpa, they have to turn back and we need to come up with an alternative plan for tomorrow.

26 June

I get up at 05.30 for another early morning shift (this time with Sam) and to a cold and overcast morning. Grey clouds hang thick in the sky, there is quite a bit of wind, but no rain. When Sam and I walk to the hide, the forest is very quiet with hardly any mealy parrot vocalisations. We do not see much wildlife on the trail either. In the hide 4 dusky headed parakeets sit around in the trees around the hide, but are too jittery to actually come down to feed. We think that it might be because there are too few around and there was therefore no safety in numbers.

At 08.30 our relief of Oscar and Liz arrives with Jenny and Sian in tow who have come out for the walk. Oscar shows me where he saw the giant river otter on the far bank the other day and I swim over to look for tracks, but cannot find any. They have also found the carcass of a three-toed sloth on the way. It is a bit off the trail and they found it when they startled a king vulture on the ground.

They all then set off for an introductory Altiplano walk, whilst Bruno and Carlos take the boat to ask for a very strong lamp up and down the river. Armed with this lamp Bruno, Jill and Jenny get across the rapids for their night shift.

27 June

The mammal colpa night shift returns with tales of mosquitoes biting them through their clothes and thick blankets, but no animals at the colpa. Jenny in particular is badly bitten. The lamp they used to dare the rapids no longer works, but after the first shift's experience noone seems to be particularly downcast that we cannot cross the rapids again today!

I have the early shift at the colpa with Sam and we see dusky headed parakeets coming down to feed for a few minutes. Otherwise it stays pretty quiet and the second shift does not see much either.

28 June

Because this group seems quite energetic and wants to do quite a lot of work, we decide to extend our morning surveys at the colpa. From inside the hide it is impossible to see any movement of birds amongst the trees all around us (although we can hear lots of birds in the trees). We also think the birds are now habituated enough to be able to tolerate the clear view of an observer. So we split the group into two shifts of four people each. Two on the cliffs above the colpa (a new observation point a little to the side of the colpa). The other two on the hide side, one in our usual hide (but with the view extended by removing some of the wall coverings), the other on the riverbank. All four observe the other side of the river with a clear view of the trees on the opposite bank. We synchronise watches, define observation sectors and begin recording parrot movements through the trees, arrivals, departures, feeding etc. All this should give us a much clearer picture what is happening at and around the colpa, rather than just on the clay cliff itself. The new shifts are 06.30 – 08.30 and 08.30 until activity stops, usually at around 10.30.

I am with Sam in the second shift on the colpa side and we record quite a bit of movement until about 10.00 when everything quietens down. We do not see any feeding, but the previous shift does (and also quite a bit more movement). It is really interesting to watch the parrots move through the tress, arrive, leave, vocalise, gather together and move around. A much clearer picture emerges almost immediately, because now we are not just sitting and looking at the colpa cliff, but we are watching the parrots gather and then move around, to the colpa or off again.

After our second shift we then split. The hide team walks back to the bank opposite WASAI doing the visual encounter survey as per usual. Sam and I continue cutting the trail along the riverbank on the colpa side in the hope of finding an insertion point for our planned river tour of taking samples from the clay cliffs and mapping the course of the river on the way. About 15 minutes walk from the colpa we discover a beautiful river bend, complete with beach and beautiful views of the forest. We climb down a vertical cliff wall hanging onto roots as we descend. In the river valley the beaches are littered with tracks and scats of capybara, tapir, and there are some cat tracks too, probably ocelot. It really feels like out of 'Lost World' down here on the riverbank and we decide that this may be a good alternative site instead of the tower we cannot now reach.

In the afternoon we take a tent there and Sam, Sian and I volunteer for the first night's shift. When we walk to the tent in the dusk at 20.30, Sam notices a pair of eyes looking at us from above. When we look through our nightsights we find it's an ocelot sitting only a few paces away! He is completely unfazed by our presence and we can even shine a torch light on him - he only blinks lazily but stays in his place. I know this behaviour from Poland where a lynx who is above you would feel in control of the situation and not run away. We keep looking at him for about 5 minutes when he decides he's had enough and silently moves away.

Once at the tent, we organize ourselves into 3 x 3 hour shifts. It is a cloudless night. There is a half moon out until 01.00 and the Milky Way stands out against the dark sky. There are hardly any mosquitoes, so it is a pleasant warm night without being eaten alive. Unfortunately we only hear a troop of night monkeys and see a single caiman, but the experience is unforgettable.

29 June

After the shift at the river Sam, Sian and I go to above the colpa to put in our early shift there. We see lots of movement of orange cheek parrots, dusky headed parakeets, mealy parrots and macaws, and are beginning to discern some patterns. The dusky headed parakeets, orange cheek parrots and also perhaps blue headed parrots are coming in towards the colpa from one side of the river, then sit and wait in a tree above it and then fly down onto the colpa to feed. Several small groups gather in the tree and then descend in several bouts towards the colpa. We observe this pattern three times. Mealy parrots and macaws are also dotted around, but they do not show any signs of wanting to come down and feed.

At 08.30 our shift is relieved by Liz and Carlos, and we walk back. I am quite tired after the night and fall asleep until lunch. Liz and Carlos see an eagle high above the colpa. The others see little on their shifts or walks. It really looks like most of the activity is taking place early in the morning, especially when it is a bright and sunny day like today and there is no mist or clouds.

After lunch Bruno takes some people on an unsuccessful fishing trip, whilst I take Liz on a newly cut trail along the El Gato. The new trail is our attempt of getting to the possible colpa we discovered a couple of weeks ago, but we could not get to it for 70 metres or so of bamboo thicket which would take us a day or two to cut though.

Bruno has an infected thumb and eyelid and I administer some first aid, but we may have to send him back to Puerto Maldonado tomorrow if it gets worse.

30 June

Oscar, Liz and Leigh have the night shift at the beach and get lost on the way there in the dark. Not badly though, and they find their way there eventually. Unfortunately they are not rewarded for their troubles and see nothing during the night. In the morning, however, at the colpa they see lots of activity and feeding (it's hot and sunny which seems to encourage activity). We are also beginning to distinguish definite behavioural patterns of approach and feeding which is quite rewarding for everyone.

Bruno's eye and thumb are still not better, so I take him to WASAI to ask about boats to Puerto. There's one tomorrow and I tell him to take that and see a doctor. But late that day there is in fact another boat with students going to Puerto, so Bruno leaves us. Whilst we are as WASAI, an accident victim arrives with a gash in his leg from getting squashed by a boat. We take him over to El Gato and I stitch him up and bandage and clean the wound, by now infested with flies.

In the afternoon we go through our behavioural records and unite them into one account of observation. Other than that we chill and make plans for our final week here.

1 July

Carlos, Jenny and Jill have the night shift and again see nothing and then proceed to the colpa for observations. It's quite misty in the morning, but steaming hot, so to start with there is relatively little activity, but as soon as the sun burns off the mist, there's a whole lot of parrots of all kinds of species around. Lots of them flit about, some of them now display the familiar behaviour of wait and see before feeding. Five scarlet macaws also join in, but do not feed. When Oscar and I take over, the macaws are still there and the area around the colpa is still busy. A flock of rock parakeets, of whom we've seen relatively little so far, comes and waits, is spooked and eventually feeds. For some reason they are much more jittery and much quieter than the other species.

Macaws and mealies make themselves scarce, especially the mealies, who at the start of the expedition filled the forest with their chatter, are now hardly seen. Whether this is due to our presence or for some other reason, we can only speculate about….

My walk back from the colpa turns out to be eventful as our turn to observe and photograph scarlet macaws (maybe the same ones as at the colpa?) in a tree along the path. I also see a flock of masked crimson tanagers, beautifully black and red small birds, along the riverbank, and a troop of saddleback tamarins. All do me the favour of appearing not too far away, without obscuring foliage and in good sunlight for taking photos.

In the afternoon Sam, Liz and I cut more trail for our river insertion point on Tuesday. The idea being to go as far up river as possible and then to walk, wade and swim back along the river, taking notes and samples from the colpa and mapping the course of the river. It takes us two hours of hard work to cut 10 minutes worth of trail. We are absolutely drenched in sweat, a tree with fire ants falls on me and I get bitten, but we finally reached the river, exhausted but happy. Then a quick walk back along the trail, heads down and thinking of the bath in the river, which we have eagerly!

2 July

I had the morning off while the others in their shifts observed the best activity yet. Over 80 parrots of 3 different species feeding today! It is very hot and sticky and the weather makes us quite lethargic. Jenny and Leigh are quite badly bitten and suffer from the effects but still manage to put a smile on their faces and work quite hard.

In the afternoon everyone goes ostensibly on the Altiplano walk, but many somehow get stuck at WASAI where there is a freezer full of beer!

Liz, Sam and I go to the hide where we saw the cobalt winged parakeets yesterday at around 15.30. We arrive at roughly the same time today and a few minutes later a pair of scarlet macaws arrive and perch in an emergent nearby. Then they slowly make their way down to the cliff! The first macaws to do so while we watch! They are very wary and it seems to me they want to feed at the colpa but know we are there. Eventually they make their way down to the foliage about 50 metres to the right of our colpa. One of them stands guard while the other dips its head into the foliage to take a bite of the clay. After a few minutes they both disappear and we can see them feeding on the clay through the foliage! After half and hour or so they leave and we are left wondering whether it was us putting them off feeding in front of us in our "normal" colpa, or whether it is usual for them to feed there and we have just not noticed them until today.

3 July

Carlos and I go to WASAI in the morning to communicate with Puerto by radio. Bruno is coming back tomorrow with the beer and chocolates. The others do their shifts and there is more and more activity at the colpa. Once again several species come down to feed. In the afternoon we split into two groups for our most dangerous activity of the expedition. The plan is to wade, swim, walk along the river, to gather clay samples and to map the river's course. Liz, Sam and I are in one group, Oscar, Carlos, Leigh and Jenny in the other. Jill and Sian opt out and stay at camp as safety backups. We all walk to the insertion point for Oscar's group, just below some small rapids. To the humming of Indiana Jones tunes they wade in and are off towards the camp.

Liz, Sam and I walk for another half an hour until we reached the point we cut a couple of days ago. We walk into the river and almost immediately I am up to my chest in water. Sam is fighting to keep the GPS dry, swimming with one hand in the air, and later we try to scale the muddy, slippery cliffs to get to the places the birds have been eating at. The colpa looks very small close up and there are cobalt winged parakeets around us, seemingly protesting at our intrusion. We push on disturbing some small caimans, swimming past beaches littered with capybara, agouti and cat tracks, scaling dead trees, rocks and other obstacles on our way. After three hours in the water the tips of our fingers are wrinkled and we are getting tired. But around the bend we can already hear the rush of the rapids – our destination. We take a random sample from a mud cliff and finally clamber onto the bank, sodden but happy. After another 30 minutes walk on dry land we are back at camp.

Oscar's group arrives a few minutes after us. They too had a good time, but Leigh, Jenny and Oscar were badly bitten on the way, and Leigh was almost dragged off by the current somewhere upstream. Everyone is tired and I'm glad that the samples are collected, the river is mapped, and everyone is back safe and sound, and in good spirits.

4 July

Our last day at the colpa. I take the early shift with Jenny and Jill, and we are treated to a good farewell display. Three times in two hours the dusky headed parakeets come down to feed with orange cheek and blue headed parrots coming to join them. In a way it is a shame we have to leave. Patterns of behaviour are becoming obvious, but as it often is in science, when you are getting close to answering some questions, the answers to them actually throw up more questions! As I walk back I realize that this will be my last time on this path (at least for this expedition) and a little sadness is mixed with the satisfaction of having gathered so much useful information.

5 July

We leave our camp and 05.30 to go to El Chuncho, just like a little over a month ago. There is a full moon and as we haul our gear into our boat we can hear thunder and see lightening in the distance. We pass the checkpoint without any problems. The river is much lower than a month ago, and as we turn into the El Chuncho river, Bruno, Giovanni and I have to jump out to drag the boat over some gravel while the rest of the team shouts encouragement ("go on Indie!"), hums the Indiana Jones tune, and takes photos! As we draw closer to our campsite, the weather worsens, and by the time we arrive, there are masses of grey clouds and heavy rain. We make our way straight to the colpa not hoping for anything, but despite the rain see about 25 blue headed parrots feed in the drizzle. But as the rain gets stronger they too have enough and sit wet and sulking in the trees before flying off. Later we go for a walk through the forest and see a big troop of squirrel monkeys who through their inquisitiveness come quite close. A torrential downpour catches us and by the time we make it back to the boat and its protecting roof for lunch, we are well and truly soaked.

After lunch our plan of going further upriver unfortunately comes to nothing as our boat driver has miscalculated the fuel and we do not have enough left for a and excursion and then all the way back to Puerto Maldonado. On the bright side the weather is clearing up and by 14.00 there is blue sky again. We walk up the riverbank and see a tree full of beautiful blue and yellow macaws. They let us get quite close and also do a few turns above our heads. They really are stunning birds with bright blue and golden wings which light up in the sunlight.

On the way back some of us ford the river towards an island where we see a group of capybara before swimming back across. After dinner we take another walk under a starry sky with the full moon painting beautiful silhouettes of the forest against the sky.

6 July

We visit the big colpa once more and although it is still rainy, we watch blue headed parrots feed and over 70 macaws gather in the trees. There are blue and yellows, red and green, and scarlet macaws all around – what a spectacle!

We leave El Chuncho around midday and head back towards El Gato. The weather is worsening and we all look forward to going back to Puerto Maldonado tomorrow to finish off the expedition.

7 July

In the morning we pack up our camp, haul all our gear into the boat and say our good-byes to Eduardo. After a four hour boat ride we reach Puerto Maldonado around midday, exhausted but happy. There are clean towels, clean sheets and most of the luxuries of life in town waiting for us. I think everyone had a good time and is happy with the amount of useful data we have gathered on this expedition and which should help conservation in this unique part of the world. We'll be back for more in 2002!