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Canopy

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MSc in Primate Conservation Newsletter

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Canopy

MSc in Primate Conservation Newsletter

Address:

Newsletter c/o Simon Bearder
Anthropology Department
School of Social Science and Law
Oxford Brookes University
Oxford
OX3 0BP

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Letter from Professor Simon Bearder

Canopy is produced twice yearly by students on the MSc in Primate Conservation as a means of disseminating information about their interests, activities and achievements. Effective conservation depends on collaboration and teamwork, and we hope that you will find this issue a useful source of contacts and links. On behalf of the staff team, I would like to thank the Editorial Committee for their hard work in putting together this edition – the first since the University introduced semesters instead of terms. Two recent developments at Oxford Brookes University that we particularly want to bring to your attention are the launch of a new Environmental Research Centre in the School of Social Sciences and Law, and our Conservation Seminar Series that is run by the Centre and organised by MSc students.

The Anthropology Centre for Conservation, Environment and Development (ACCEnD) has been developed to combine the strengths of staff and student research and give it a higher profile. The Seminar Series runs almost every week on Mondays from 6-7pm in the Lloyd Boardroom on the Gypsy Lane Campus and all interested parties are very welcome. If you would like us to add your name to the email contact list, please let us know, or if you are in a position to offer us a talk we would be delighted to hear from you. Examples of speakers for this semester include Ross Snipp, a past MSc student now working for the Zoo Federation, Jobogo Mirindi, a gorilla guide from Rwanda, Stuart Semple from Roehampton University, Laurentus Ambu and Nathan Sen from the Sepilok Orangutan Rehabilitation Programme, Colin Tudge, broadcaster and writer, and Joerg Ganzhorn, editor of Lemur News. The programme for semester two is now in progress and will run for 9 weeks from 31 January 2005.

Professor Simon Bearder
Chair, Course Planning Committee
November 2004

Contact: skbearder@brookes.ac.uk

Welcome to the third volume of the Oxford Brookes University MSc Primate Conservation newsletter. The aim of Canopy is to provide the wider primatology and conservation community with a representation of current and past works undertaken as by MSc students. The MSc Primate Conservation course has an interdisciplinary approach, focusing on all aspects of primate conservation from human-wildlife conflicts to conservation education, captive breeding, and population genetics. We hope this newsletter acts as a medium for communication between past and present students, those working in primatology, and those with a general interest in the topics covered in this issue.

For further information about this course or about how to apply, please contact:

Iris Geens, Taught Courses Administrator
School of Social Sciences and Law
Oxford Brookes University
Gipsy Lane
Oxford OX3 0NF
United Kingdom

Email: igeens@brookes.ac.uk
Telephone: +44 1865 483750
Fax: +44 1865 483937

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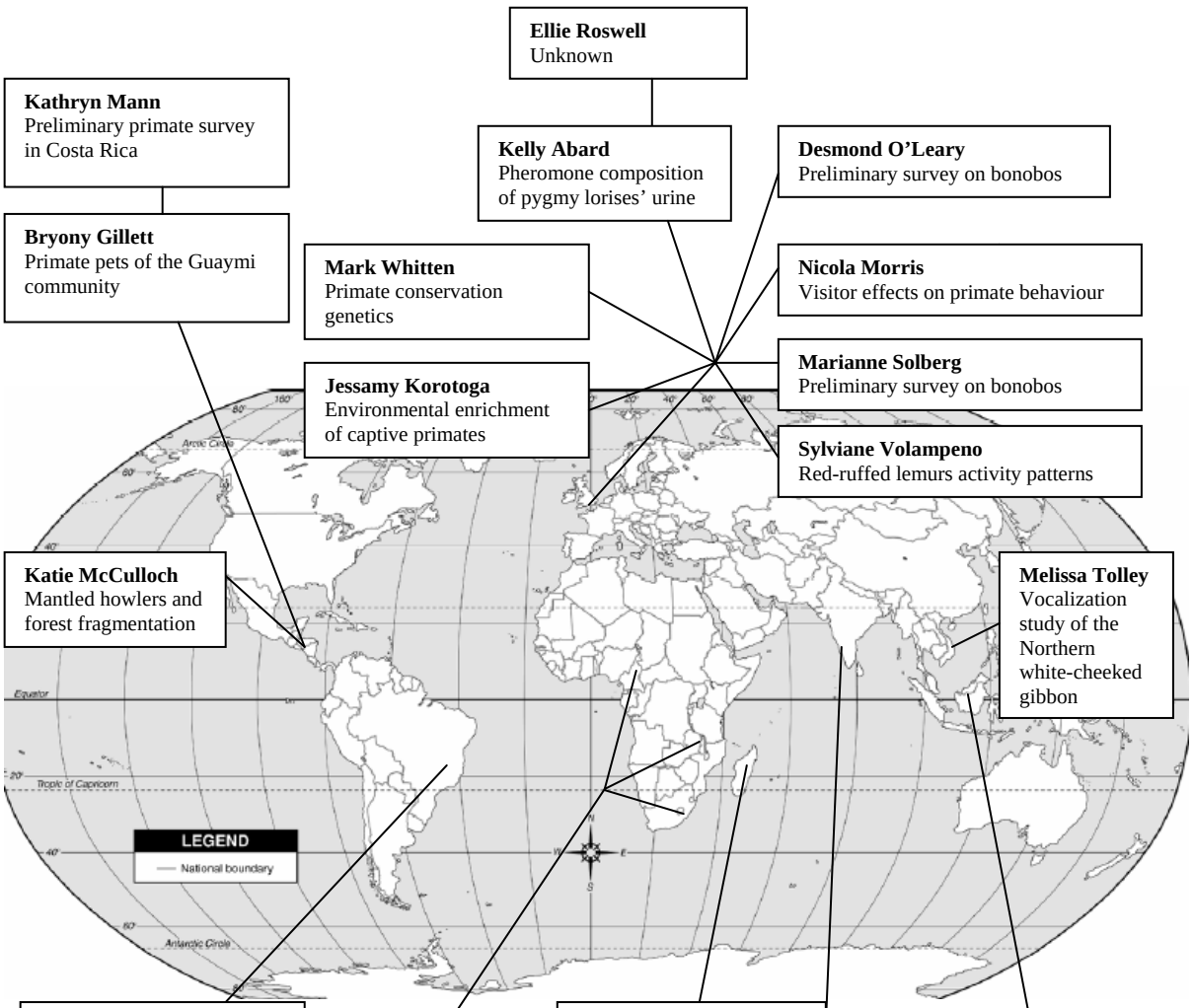

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Joining Forces for Amazonian Primates Conservation

"The Woolly Monkey Project and Ikama-Peru Project".

Angela Maldonado: lllugens@yahoo.co.uk

Large-bodied primate species are some of the most threatened of all mammals in the Amazon basin, this is caused by different human activities such as hunting by local communities, the pet trade and habitat fragmentation due to logging, road construction and extensive agriculture. These primates are grouped in the Atelidae family, which includes *Lagothrix* (woolly monkey), *Ateles* (spider monkey), *Alouatta* (howler monkey), *Brachyteles* (muriqui) and *Oreonax* (yellow-tailed woolly monkey).

Although all these species are present in protected areas, the pressure of hunting is still present. Lack of government support for national parks and reserves is common in Amazonian countries, and funding for research is limited or nonexistent. As a result of these human activities and the lack of research, some species of the Atelidae family are probably facing the risk of local extinction, as is the case of the yellow-tailed woolly monkey (Peru) and brown-headed spider monkey (Ecuador), classified by the IUCN (2004) as Critically Endangered (CE). Unfortunately, other species such as *Lagothrix* and *Alouatta*, that play a significant role as seed dispersers, especially for tree species founded in primary forest, are classified as Lower Risk–Least Concern (LR-lc) by the UICN (2000). It is important to note that these two species are heavily threatened by subsistence hunting.

In order to assess the human-wildlife issues, Ikama-Peru and The Woolly Monkey Project, lead by past year students from the MSc. Primate Conservation (Angela Maldonado, Lucy Molleson and Hannah Parathian), joined forces with the purpose of developing research and an environmental conservation education project with the indigenous communities of the Amacayacu National Park (Colombia) and local communities located in the Rio Mayo valley (Peru).

The aims of this project are: i) to provide up dated information about the conservation status of the primate community in one of the most over-populated areas in the Amazon through a census, and ii) the implementation of an education programme, using the woolly monkey as the flagship species, in order to raise conservation awareness.

The education campaign "Conservemos Nuestros Monos Amazonicos", will start next year and we look forward to expanding this campaign through the Amazon basin, sharing information and education material with other projects involved with primate conservation. Additionally, we expect to provide accurate assessment information that could be included in the next IUCN reclassification of *Lagothrix*.

Great Ape Talks at Bristol

Katie McCulloch: katiegrl44@aol.com

Every Tuesday for the past few months, Wildwalk-At-Bristol has been offering people an opportunity to learn about and connect with their closest living relatives. Beginning in October, Wildwalk hosted a series of lectures featuring well-known primatologists and conservationists discussing their great ape research and the threats currently facing gorillas, chimpanzees, and orangutans. The featured speakers included Jane Goodall, Steve Jones, Richard Wrangham, Penny Patterson, Ashley Leiman, and Ian Redmond. Through their talks, each speaker revealed their dedication to the study and conservation of great apes and their desire to share their enthusiasm for these species with others. Jane Goodall impressed the crowd by opening with a resounding chimpanzee pant-hoot and Ian Redmond displayed his commitment to mountain gorilla conservation by checking himself out of the hospital and carrying on with his talk, despite having a case of malaria.

The topics ranged from ape genetics and behaviour to interspecies communication and the imminent need for ape conservation. The audience was also treated to the opportunity to see these primates in the IMAX film *Jane Goodall's Wild Chimpanzees* and in wildlife photographer Karl Ammann's poignant photos of apes affected by the bushmeat trade, which were displayed throughout the IMAX building.. Wildwalk hopes to repeat this lecture series next year and continue raising public awareness of our similarity to apes and the urgent need to protect them.

If you missed the lecture series this year, digital video footage of each talk will be posted online in mid-December at www.at-bristol.org.uk.

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Adventures in Madagascar

Simon Downs: sifi1@btinternet.com

In September of 2003 I was able to live a dream and finally visit the one place on Earth I'd always longed to visit, Madagascar, the naturalist's paradise, and the only home to one of the most diverse range of primates, the lemurs. After a disappointing couple of days at the 'glorified zoo' called Berenty, my 'roving reporter' fiancée, Fiona, and I faced a camping excursion on Nosy Mangabe Special Reserve. This 520 ha island of lowland rainforest lies 5 km off the NE coast of Madagascar in the Bay of Antongil (Sterling, 1995). "If you are lucky," said our mainland guide Heri-lala, "you will see the aye-aye". This is the best chance a visitor will get to see this nocturnal lemur outside of a zoo. The aye-ayes elusive nature makes it highly difficult to see in its natural habitat. Introduced as part of a translocation project between 1966-67, (Petter, 1977) nine aye-ayes *(Daubentonia madagascariensis)* made Nosy Mangabe their home, successfully breeding, and increasing their population size away from the deforestation occurring in its native habitat. Other lemurs introduced onto the island include two diurnal species, the black and white ruffed lemur (*Varecia variegata variegata*) and the white fronted brown lemur (*Eulemur fulvus albifrons*), and two further nocturnal primates, the brown mouse lemur (*Microcebus rufous*) and the greater dwarf lemur (*Cheirogaleous major*) (Garbutt, 1999).

Having never camped under such conditions, our initial fears were raised when a fellow tourist came back from the island with a badly broken arm, having slipped during a night walk. Nosy Mangabe's trails are steep and unwelcoming, and mixed with the humid conditions can be testing for even the most ardent traveller. Not wanting to be put off at the chance of viewing the aye-aye in the wild I was able to convince Fiona it would be OK. The following morning we left the frogs in our room to their own devices as we journeyed over to the island. This particular journey, however, was one which would certainly test the strength of our relationship. Only 5 km, the rough conditions had the boat smashing against unwelcoming waves. The helmsman at one point decided to traverse the waves resulting in one 6 foot wave crashing over the boat soaking us all! "Next year...I'm booking the bloody holiday!" screamed Fiona holding on for dear life!

Safely on the island we were welcomed with a feast of wildlife. Unfortunately our guide wasn't so hot on identification. "What's that one called, Claudio?" "That….that is a crab." "Really...No pulling the wool over your eyes, is there?" Realising the disappointment on my face, Claudio did much to show us both the richness of wildlife on the island. From leafy tailed geckos to Mantella frogs, from Boas to the tiny chameleon species known as the Brookesia. But it was the aye-aye I wanted to see. As fascinated as I was with seeing this biodiversity, I was itching to get a glimpse of this elusive creature.

After one day of walking Fiona had decided to call it a day, the trails too precarious to attempt at night. Indeed, the conditions were treacherous. Not helped

by the repeated buzzing of mosquitoes and humidity which left you sweating underneath layers of protected clothing. Our first night was not only unsuccessful but nearly a complete disaster. With both our torches running out of power, I had to rely on Claudio's exceptional ability to see in the dark to get us back to camp. On my return, and aching all over, I told Fiona I didn't think I was able to do another walk like that again. I felt like the aye-aye had beaten me. Thankfully the following day our walks had revealed both the male and female white fronted brown lemur, one I hadn't previously observed before. However, despite all that we had seen during the day I could feel the depression setting in! My spirits lifted temporarily when I came across a large ground boa (*Sanzinia madagascariensis*). I gently pulled the snake from the undergrowth near our tent where it was trying to escape in order to get an idea of its size. The serpent quickly coiled up in front of me as if to say "You do THAT again and……!"

Come that evening, our last on the island, we were visited by another small group, and with them Julienne….Julienne!! Fantastic…Julienne, the famous aye-aye catcher from Gerald Durrell's 'The aye-aye and I'. Our 'guests' for this night, and more importantly this night walk, turned out to be Hilary Bradt (of the travel guides), Monique (the owner of Cortez Travel), and DUPC's own Charlie Welch. Inspired, and aches and pains aside, I reloaded my torch!

The first find was mine, *Uroplatus fimbriatus*, a male and female in courtship…strike one! Next, a *Brookesia peyrierasi*, a tiny chameleon only 4 cm in length.

guests, with whom, up to this point, I was still unfamiliar. On our way back I got talking to Charlie about Berenty, and the physical state of some of the ring tailed lemurs there.

The next day, just before our departure, Hilary came over and introduced herself…"Wow! Really?…Pleased to meet you!" etc etc. "Charlie would like you to have this" she said, presenting me with a ramy seed which the aye-aye had chewed upon then discarded the night before. We later met up again on the mainland and Charlie Welch invited us both to Parc Ivoloina in Toamasina, where I was allowed to see the aye-aye up close and personal and marvel in its technique of removing yoke from the inside of an egg!

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BOOK advertising!!!

It is done, but large, for that is not included here

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Foraging Behaviour of Free-ranging Silvery Marmosets at Jersey Zoo

Valérie Marchal: valemarchal@wanadoo.fr

Marmosets are small frugivore-insectivore monkeys that also forage on gum and latex in the wild. Species that are more gummivorous require smaller home ranges than those that focus on frugivory (Rylands and de Faria 1993). Compared to the wild, captive environments are characterized by a limited amount of space and a plentiful supply of food (Hardie and Buchanan-Smith 1997). Free-range management enables animals to learn and adapt to a natural environment, using skills similar to those in wild populations (Beck et al. 1991). At Jersey Zoo, the group of silvery marmosets (*Mico argentatus*) have been free ranging for many years, spending a significant amount of time foraging and developing a clear knowledge of food source locations. The study that I conducted during the summer of 2003 aimed to provide an analysis of time spent feeding on different food types and success in prey capture.

In June 2003, the group consisted of a breeding pair and eight offspring. They were followed four hours per day for four days each week, over six weeks from the middle of June until the end of July. The animals were observed on a random basis, using ten-minute focal samples with a 30-second interval between each session. All occurrences of prey capture attempts were recorded. The data were pooled and compared using a chi-square test.

During the six weeks of observation, the individuals spent 16% of their activity budget foraging. The group spent 76% of its foraging activity in bark gouging of cherry trees or eating fruits. Although the marmosets were observed in 148 trees in the zoo during this study, they were only observed gouging in 15 trees. Gouging activity represented more than half their foraging activity. The group was observed spending 3% of its activity budget eating fruits. This low percentage may be due to the availability of fruits in the zoo during the study period. The marmosets were only observed to eat mature cherries, and these were only available for four weeks. Prey capture attempts represented 18% of foraging activity. The individuals studied were only observed to catch small insects, and the average non-capture percentage was high (77.6%).

Kleiman (1989) identified four basic skills required by animals living in the wild (whether reintroduced or wild born); navigation through the environment, finding food, avoidance of predators, and establishing and maintaining functional social groups. The use of free-ranging management at Jersey Zoo provides an opportunity for the silvery marmosets to develop these crucial skills. This is particularly important when we consider the success of reintroduction programmes for marmosets in Brazil.

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The Effects of Enrichment on Resting Behaviour in a Captive Group of Red Ruffed Lemurs, *Varecia variegata rubra,* in Seattle, WA, USA

Tyann M. Marsh: 04057547@brookes.ac.uk

Enrichment programmes for animals in a captive setting attempt to stimulate the appearance of more naturalistic behaviours and curb unnatural behaviours (stereotypies) that may be harmful to individuals. As breeders of endangered species, zoos and aquariums need to provide a setting where natural breeding behaviours can occur (Shepherdson, et al., 1998). Both environmental and social enrichment can provide the environments necessary to facilitate successful captive breeding and rearing of young. The young, in turn, grow up behaviourally normal and as successful reproducers themselves. Enrichment can also help prepare captive-born animals for reintroduction into the wild (Shepherdson, et al., 1998).

Animal welfare is an important factor in how zoos choose to manage their facilities; unfortunately, it does not always take priority. However, with the wealth of information now available regarding the importance of habitat and social interaction opportunities, zoos have begun to lean in the direction of improved environmental and social enrichment. Woodland Park Zoo (WPZ) in Seattle, Washington, USA, holds regular meetings to discuss ways to better enrich the lives of all of their animals.

Zoos need visitors, and visitors like to see active animals. Woodland Park Zoo, like other zoos, relies on revenue from visitors to continue their conservation programmes. Active, healthy animals mean visitors are likely to enjoy their visit and return in the future. This study was conducted to determine whether enrichment could be used to increase activity in a group of red ruffed lemurs housed at WPZ. It was hypothesised that if the range of novel activities available to the lemurs were increased, they would spend more time being active and the visitors would enjoy their visit more.

The results indicated that enrichment actually had very little effect on activity levels. However, food items were the only form of enrichment allowed, and once the food was consumed the lemurs returned to their normal activity patterns, including a considerable amount of resting.

On one occasion, the lemurs acquired a rubber glove from an unknown source. This glove was a great source of interest, and kept three individuals quite active for about one hour. If captive animals were allowed access to suitable artificial objects while on exhibit, perhaps their level of activity would increase substantially. In many zoos, artificial objects are not provided on exhibit, on the basis that this would decrease the aesthetic value of the exhibit. Therefore, the effect of novel objects has not been fully investigated. It is likely that visitors would not be opposed to seeing a tiger play with a ball, or a lemur play with a plastic toy. In fact, this may even bring in more visitors. Currently in zoos, animals are often appear to be unusually inactive.

Provided the choice of object is carefully considered with animal health and safety in mind, what would be the harm in giving captive animals novel objects as enrichment. One argument against providing novel objects is that, for example, rubber balls are not found in the tiger's natural habitat, cargo nets aren't found in the trees of Madagascar, etc. Well, tigers and lemurs aren't found naturally in North America (or the U.K.). They were imported from the wild, and the well-being of the animals needs to be taken into account, not just the aesthetic value of the exhibits.

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A Comparison of the Captive Behavior of the Bengal Slow and Pygmy Loris (*Nycticebus bengalensis* and *Nycticebus pygmaeus*)

Anne Mieh: anne@2sheds.de

Compared to other primate species, little is known about nocturnal prosimians in the wild or in captivity, which hampers interest in their conservation. Despite having a very wide distribution, the genus *Nycticebus* (found in eastern India, Bangladesh, Myanmar, Thailand, Cambodia, Laos, China, Vietnam, Malaysia, Indonesia and the Philippines) is one of the least studied Asian prosimians. A lack of surveys and ecological research has resulted in three of the four listed species being declared Data Deficient.

Difficulties resolving *Nycticebus* taxonomy have allowed slow and pygmy lorises to be generally thought of as a single group with low conservation risk, rather than as separate species of unknown status. In-situ conservation programs also tend to manage them in the same manner, which may be responsible for the low reproductive success and high infant mortality of *Nycticebus* in captivity.

Closely-related species often differ in certain aspects of their morphology, locomotion, calls, reproduction, diet, social organization and habitat use. For conservation purposes, it is important understand of how these characteristics differ between species. Locomotion studies are appropriate for examination of interspecific differences, because locomotion and posture are considered to be influenced by variables that also distinguish species, such as anatomy, diet, habitat and social organization. Although most locomotion studies are often conducted in the wild, captive environments provide unique opportunities to observe individuals and their locomotive repertoires in detail. Galago research is a good example of where captive studies have been used to distinguish between species that are similar in appearance, such as *Otolemur crassicaudatus* and *Galago garnetti*.

The primary aim of this study was to contribute data on locomotion differences within the genus by comparing the behavior of *Nycticebus bengalensis* and *Nycticebus pygmaeus* pairs housed at London Zoo. These species were selected because they are believed to have the largest interspecific differences within the genus. *N. bengalensis* is approximately three to four times the mass of *N. pygmaeus*, and they occur sympatrically across at least part of their range. Nocturnal surveys have also already distinguished *Nycticebus pygmaeus* by its ‘smooth hand-over-hand run’.

The aims of this study were to 1) compare the activity profiles of the two pairs, 2)

compare the locomotor and postural behaviors of the two pairs, 3) determine exhibit use and pair preferences in terms of substrate width and inclination, 4) make predictions regarding interspecific locomotor differences, and 5) provide captive management suggestions.

Instantaneous focal animal sampling was used, recording the following data at one minute intervals for each individual: activity, posture (when stationary) or locomotor mode (when moving), substrate details (type, size and inclination), area occupied within the exhibit, whether it was scent marking, and a qualitative estimation of speed of travel. A number of differences between the species were found in terms of activity profiles, exhibit use, substrate preferences, speed of travel, and aspects of scent marking behavior. Within-species differences were also found in the activity profiles of each sex. Further differences in locomotive and postural behavior were not examined intraspecifically, as it would not have been possible to ascertain whether these differences were due to intersexual differences or individual variation. The small sample size in this study also made it difficult to conclude whether the differences observed between the two species are likely to be applicable to *N. bengalensis* and *N. pygmaeus* in general.

The Bengal slow loris was more active than the pygmy loris, spending a larger proportion of sample points travelling; the pygmy loris spent a larger proportion of sample points alert but stationary. These activity differences should be viewed with a certain amount of caution, as activity profiles have not been published for *N. pygmaeus* to date and a group housed at San Diego Zoo were reported as being far more active than slow lorises; further captive and wild research is required in this area.

The Bengal slow lorises had a larger proportion of sample points in normal-fast locomotion than *N. pygmaeus*, which tended to move more slowly but also had greater variability of pace. The pygmy lorises were able to travel excruciatingly slowly (to the human eye) and also speed walk. Interestingly, this has also been reported when comparing the locomotor speeds of slow lorises and slender lorises. Based on cranial characteristics, the pygmy loris has been described as an intermediate form of the slow loris and slender loris. *Nycticebus pygmaeus* may be more similar to the slender loris, possibly reflecting commonalities in diet and habitat preferences. Observations of pygmy lorises in the field provide further evidence that they are able to move more quickly than slow lorises.

Although both species had a larger proportion of sample points in non-suspensory modes than in suspensory modes, *N. pygmaeus* had more sample points suspensory for both locomotion and postures than *N. bengalensis*. Both species exhibited a total of thirteen broad-grained postures, seven of which were suspensory. However, they differed markedly in their use of these. The three most common postures for *N. bengalensis* were sit, quadrapedal stand and bipedal stand; for *N. pygmaeus* they were sit, stand and quadrapedal suspend (hanging from four legs). A comparison of fine-grained postural differences between the species revealed a greater diversity of postural behaviors for the pygmy loris. For example, only the pygmy loris was observed hanging from one or two arms, or adopting a vertical suspensory mode where all limbs were held in tension. Kinematic studies have also noted that slow lorises tend to avoid situations requiring them to suspend from their arms, which may be due to difficulties supporting their larger body size.

Differences were also observed between the proportions of sample points involving various locomotor behaviours. The three most commonly utilized locomotor behaviors for *N. bengalensis* were quadrapedal walk, vertical climb up and vertical climb down. *Nycticebus pygmaeus* was most often recorded quadrapedal walking, torso pronograde suspensory locomoting (upside down quadrapedal walking) and vertical climbing downwards. The greater amount of time spent in torso pronograde suspensory locomotion by the pygmy loris may be due to its smaller body size, as this form of locomotion would be energetically more expensive for larger species of *Nycticebus*. Other reasons may include dietary differences between the two species in the wild, particularly as the pygmy loris is a gum feeder (gum specialists are believed to use more suspensory forms of locomotion in order to find gum deposits under tree trunks).

Although *Nycticebus bengalensis* made use of the entire exhibit, *N. pygmaeus* was in the top third of the exhibit for over 90% of sample points. *Nycticebus pygmaeus* spent over 50% of sample points in the top right-hand section of one of the two exhibits, sometimes travelling slowly down to the middle level of the exhibit but then running back to the top right hand corner or into the passageway that connected the two exhibits. As this was the darkest area within the exhibit, the lorises may have been most comfortable there.

The two most often utilized substrates were branches and the ground for *N. bengalensis*, and branches and the ceiling for *N. pygmaeus*. It is not clear whether use of the ceiling was based on a preference for adopting torso pronograde suspensory locomotion, or an attempt to get as high as possible. Only two branches touched the ceiling in the *N. pygmaeus* exhibit, providing few locomotor and postural opportunities for the animals at this level. *Nycticebus bengalensis* rarely used the ceiling, which may have been because they did not need to be as high up in the canopy, or because their hands were too large to grip onto the frame of the lights securely.

Captive management recommendations relate to *Nycticebus pygmaeus*. Exhibits should take preference for the upper canopy into account by having small branches located at this level, allowing lorises to copulate in their natural suspensory position. A continuous network of substrates that reach the ground should be provided, enabling pygmy lorises to forage for crickets without needing to locomote on the ground. It is recommended that exhibits be made darker to encourage *N. pygmaeus* to utilize more of the exhibit, and also that areas with privacy from the public are provided. This could be achieved with leafy plants such as nontoxic ferns.

New exhibits for *Nycticebus pygmaeus* should be higher than 1.6 meters, or constructed in a manner where visitors observe from a lower level. Research has shown that small, arboreal mammals are particularly sensitive to the presence of visitors in zoos. Using one-way glass would be another method of providing pygmy lorises with privacy.

Both species would benefit from as many exploratory opportunities as possible, whether in the form of novel objects to investigate or enrichment feeds. Scatter feeds should be provided every day, and special effort should be made to attach pieces of fruit to twigs rather than simply placing them on the surface of large branches.

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Survey of *Hylobates agilis albibarbis* in Unprotected Primary Peat Swamp Forest: Sebangau Catchment Area, Central Kalimantan.

Cara Buckley: carabuckley123@hotmail.com

Introduction

Virtually no data are available on gibbons that inhabit peat swamp forest. The aim of this study, conducted from 28 June to 27 July, was to survey a population of *Hylobates agilis albibarbis* at Setia Alam Field Station. *H. a. albibarbis* is IUCN listed as Lower Risk: NT (Eudey, 2000). Setia Alam is located within the Sebangau Ecosystem, Central Kalimantan, Borneo. The Sebangau catchment area is an area of over seven thousand square kilometres of unprotected primary peat swamp forest.

Methods

Line transect methods were not used because they are not considered to be a reliable method for surveying gibbon populations, due to low gibbon visibility and unreliable behaviour upon detection (Brockelman and Srikosamatara, 1993; Nijman, 2004). As most gibbon species perform song vocalisations on most mornings from prominent locations, auditory sampling methods can be more appropriate for surveying these primates (Wilson and Johns, 1982; Brockelman and Ali, 1987; Mather, 1992; Brockelman and Srikosamatara, 1993; Nijman, 2004). Five sample areas were selected within a three square kilometre grid system. Each area was surveyed for four consecutive days by three teams of researchers stationed a measured distance apart at designated listening posts. These teams recorded compass bearing and estimated distance to singing groups. Density estimates were calculated by dividing the cumulative number of gibbon groups heard and identified at each point (the listening posts) by range area (distance over which songs were heard). Information regarding group size and age-sex classes were obtained by tracking calling groups and opportunistic sightings at listening posts. Ground surveys were also conducted (Estrada *et al*., 2004). Two major assumptions are associated with this methodology. Firstly, that all duets represent a group (National Research Council, 1981; Haimoff *et al*., 1986), and secondly that all groups would call at least once during the survey period (National Research Council, 1981; Haimoff *et al*., 1986).). Bias may be associated with density effects, environmental conditions, and seasonal variation in singing frequency (Chivers and Raemaekers, 1980; Haimoff *et al*., 1986; Davies, 2002; Sutherland, 2002; O'Brien *et al*., 2004). Accordingly, weather conditions were recorded at ten minute intervals during data collection, as well as maximum and minimum daily temperature and rainfall.

Results

A total of 65 song bouts were recorded over twenty days, resulting in nineteen groups being located within the grid system. Weather conditions were not particularly variable, and only once did rain during the night preceding data

collection influence the start times of singing groups (r_p=0.519, n= 20, p<0.02). Agile gibbons at Setia Alam called most frequently between 0500 and 0700 (73 per cent of calling). The average probability of calling on any given day for agile gibbons at Setia Alam is 0.620. This rose to 0.920 by day two and reached 1.0 by day three. Population density estimates yielded the following results: 2.2 groups per square kilometre or 7.4 individuals per square kilometre. Mean group size based on eight sightings of nine groups was 3.4 individuals. No sightings occurred during the ground surveys. Extrapolation of results indicates that the gibbon population in the region totals 5700 individuals, within one of the three major habitat subtypes identified for the Sebangau ecosystem: mixed swamp forest.

Discussion, outcomes and conclusions

This study combined two techniques. Density estimates were obtained through mapping of calls and information on group six. Age-sex classes were obtained by tracking calling groups (allowing researchers to achieve close proximity before gibbon groups were alerted) and through opportunistic sightings at the listening posts, where detection was not compromised by the noise of walking on uneven terrain (Ross and Reeve, 2003). Use of these techniques for gibbon surveys is recommended over line transect methods, especially when the research period is restricted, because gibbon calls can be heard over greater distances than visual detection would permit. Inclusion of auditory cues increases the sample size of encounters (Davies, 2002), although sightings can still be obtained by including the techniques outlined above, and are more prolonged than the brief sightings often obtained during line transects.

Total population estimates for *Hylobates agilis* (of which three subspecies are currently recognised, including *H. a. albibarbis*) are typically approximately 750,000 individuals (Chivers, 1977; MacKinnon, 1986). More recent estimates are not available. Overall, the distribution of Bornean gibbons is poorly documented (Brandon-Jones *et al*., 2004). This survey identified a relatively large population of *H. a. albibarbis* living in peat swamp forest, a unique habitat for gibbons (Chivers, 1977).

Anthropogenic disturbance continues to be a threat to fauna in the Sebangau region. It is hoped that these results will contribute to ongoing efforts aimed at obtaining protected status for the Sebangau region.

It is suggested that further research include surveys of the other two key habitat subtypes identified within the Sebangau ecosystem: low pole forest and tall interior forest (Morrogh-Bernard *et al*., 2003). Although the presence of gibbons in the taller interior forest has been established, density estimates were not obtained. Densities could then be compared with the densities reported in this study. It is also hoped that the groups mapped within the grid system will facilitate ongoing monitoring of demographic processes, and perhaps a behavioural study to determine if the behaviour of gibbons living in peat

swamp forests differs from that of gibbons in other habitat types.

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Does the Primate Related Education at London Zoo Affect its Visitors?

Clair Tucker:clair_tucker@yahoo.co.uk

Introduction

Over 600 million people worldwide visit zoos each year (IUDZG, 1993), representing an enormous audience and a huge opportunity to influence the environmental knowledge, attitudes and behaviours of the general public (Coe, 1996; Woollard, 1999). Experiences with animals, such as a visit to the zoo, can be formative in the development of positive attitudes to animals and conservation (Palmer & Suggate, 1996). If zoo education can promote even small positive changes in the behaviour of their many visitors, zoos may have a profound effect on the success of conservation initiatives, and ultimately the continued survival of many species and habitats.

Several factors influence peoples' conservation-based actions, including: background, prior experience, cognitive knowledge, attitudes, and belief systems (Maslow, 1998). As zoo education has the capacity to reach literally millions of people, a diverse range of backgrounds and prior experiences should be expected and encouraged. Creating the link between (i) seeing and learning about the animals and (ii) the actions that the general zoo-going public take is essential (Andersen, 2003), because it is only when people identify with a species that they will be inclined to look after it (Woollard, 2001; Stoinski et al., 2001). Successful environmental education should have a measurable impact on visitors' actions (Mace et al., 2004; Balmford et al., 2004); this can be achieved by affecting their cognitive gain and attitudes (Maslow, 1998), and should provide visitors with a obvious avenue for action. Environmental education has an up-hill struggle if it aims to deal with the issues of visitor expectations for the day, the novelty of the zoo environment, a negative attitude to learning, and promotion of positive actions without taking the fun out of a visit to the zoo!

London Zoo alone is visited by more than 170,000 people a year (Robinson, 2004b). With an urban location and a comprehensive collection of non-human primates, it is in an excellent position to educate visitors about the biology and conservation of our closest living relatives. Visitors to the ape and monkey enclosures are currently exposed to three types of primate related education: (i) interpretive signs, (ii) a touch table containing primate artefacts presented by a volunteer team, and (iii) explainers who give advertised talks or mingle with the visitors. These informal education materials are designed to improve visitors' knowledge of, and attitude to, primates and primate conservation (Robinson, 2004a). However, published studies regarding their effectiveness are not available; this information is required to identify strengths and weaknesses, and to make suggestions for future development.

Methods

This study was conducted between July 17th and August 10th 2004, on Mondays, Tuesdays, and one Saturday for comparison. Data was collected on an ad-hoc basis from zoo volunteers and also from visitors at the monkey and ape

enclosures. It was necessary to get an idea of what the zoo volunteers were discussing with the visitors. Qualitative semi-structured interviews are an ideal format for collecting this data; they result in in-depth, comparable information, even though conducted in an informal and unthreatening manner (Dawson, 2002; De Vaus, 2002; Oppenheim, 2003).

The remainder of the data focused on the opinions and attitudes of the zoo visitors. Exploration of this requires a relatively large quantifiable data set; quantitative questionnaires are the best format. Interview questionnaires were used, as they have the advantage of better return rates and better quality of data (Oppenheim, 2003). Data on perceived cognitive learning was gathered by asking visitors to rate the information content and information level of education materials. Visitor attitudes to primates were assessed via questions regarding use of additional education materials and ranking of humanitarian, primate related, and domestic animal charities, based on Balmford et. al.'s method (2004).

Conclusion

1. The primate related education at London Zoo seemed to have a positive effect on visitor zoo experience. In most cases the effects were independent of the visitor profile, indicating that the zoo is successfully catering for a diverse visitor base.

2. Education materials were attractive to visitors and used more often than not; however, there is room for improvement in the attractiveness of signage and touch tables.

3. Most visitors were inspired to learn more; this did not appear to be linked to their profile or use of any of the zoo education materials, and is likely to be related to either being a zoo visitor or the presence of the animals themselves.

4. Visitors were able to learn what they wanted from the various materials, providing a positive perceived cognitive gain. However, the data does not show the level of the gain.

5. The touch table presentation focus had a positive effect on visitor attitudes to primate conservation, as measured by ranking of a primate charity. Other aspects, including visitor profile, did impact choices, although not significantly. The interpretive signs had no effect on visitor attitudes.

Recommendations and Areas for Future Study

1. London Zoo should take advantage of improved visitor attitudes to primate conservation by offering them the chance to support primate charities on site.
2. There is scope for improvement of the interpretive signage around the primate enclosures, particularly those dealing with conservation, although further study is required before firm recommendations can be made. Data should be collected in relation to the extent to which visitors are using the signs.
3. Volunteers should be provided with more up-to-date conservation information and training in attracting visitors and handling sensitive conservation issues such as bushmeat. This would enable them to give presentations confidently and with a conservation and biological focus, further increasing the positive attitudinal effect that they have on zoo visitors.

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The Nocturnal Primate Research Group
Oxford Brookes University
Contact Professor Simon Bearder: skbearder@brookes.ac.uk

The World's Top 25 Most Endangered Primates – 2004

1) *Prolemur simus* - Greater bamboo lemur	Madagascar
2) *Eulemur albocollaris* - White-collared lemur	Madagascar
3) *Propithecus candidus* - Silky sifaka	Madagascar
4) *Propithecus perrieri* - Perriers sifaka	Madagascar
5) Undescribed - Mt. Rungwe galago	Tanzania
6) *Procolobus pennantii pennantii* - Bioko red colobus	Equatorial Guinea
Procolobus pennantii bouvieri - Bouvier's red colobus	Congo
Procolobus pennantii preussi - Preuss's red colobus	Cameroon
Procolobus pennantii epieni - Niger Delta red colobus	Nigeria
Procolobus badius waldroni - Miss Waldron's red colobus	Côte d'Ivoire, Ghana
7) *Cercocebus atys lunulatus* - White naped mangabey	Côte d'Ivoire, Ghana
Cercopithecus diana roloway - Roloway monkey	
8) *Procolobus rufomitratus* - Tana River red colobus	Kenya
Cercocebus galeritus - Tana River mangabey	
9) *Cercocebus sanjei* - Sanje mangabey	Tanzania
10) *Gorilla beringei* - Eastern gorillas	Rwanda, Uganda, DRC
Gorilla beringei beringei - Mountain Gorilla	
Gorilla beringei graueri - Grauer's Gorilla	
Gorilla beringei - Bwindi Population Bwindi Gorilla	
11) Gorilla gorilla diehli - Cross River gorilla	Cameroon, Nigeria
12) *Loris tardigradus nycticeboides* - Horton Plains slender loris,	Sri Lanka
Ceylon mountain slender loris	
13) Simias concolor - Pig-tailed langur	Indonesia
Simias concolor concolor - Pagai pig-tailed snub-nosed monkey	
Simias concolor siberu - Siberut pig-tailed snub-nosed monkey	
14) *Presbytis hosei canicrus* - Miller's grizzled surili	Indonesia
Prebystis hosei hosei - Hose's grizzled surili	Malaysia
15) *Trachypithecus delacouri* - Delacour's langur,	Vietnam
white rumped black leaf monkey	
16) *Trachypithecus poliocephalus* - Golden headed langur,	Vietnam
Tonkin hooded black langur	
Trachypithecus leucocephalus - White-headed black leaf langur	China
17) *Semnopithecus vetulus nestor* - Western purple-faced langur	Sri Lanka
18) Pygathrix nemaeus cinerea - Grey shanked douc	Vietnam
19) *Rhinopithecus avunculus* - Tonkin snub-nosed monkey	Vietnam
20) *Nomascus* sp. cf. *nasutus hainanus* - Hainan black crested gibbon	China
Nomascus sp. cf. *nasutus nasutus* - Cao-vit black crested gibbon	Vietnam
21) Pongo abelli - Sumatran orang-utan	Indonesia
22) *Leontopithecus caissara* - Black-faced lion tamarind	Brazil
23) *Cebus xanthosternos* - Buff headed tufted capuchin	Brazil
24) *Ateles hybridus brunneus* - Brown spider monkey	Colombia
Ateles hybridus hybridus - Variegated spider monkey	Colombia, Venezuela
25) *Brachyteles hypoxanthus* - Northern muriqui	Brazil

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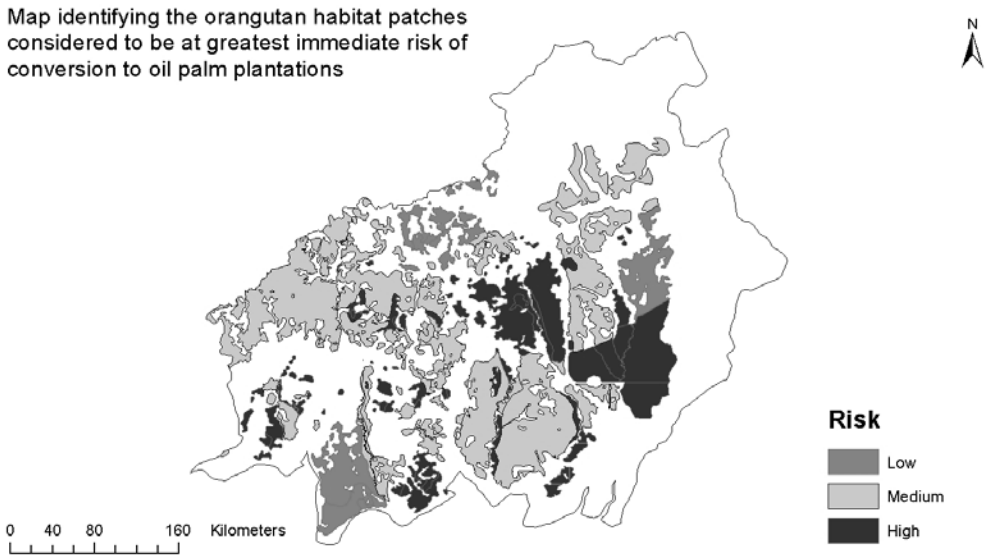
Palm Oil and the Bornean Orangutan: An Assessment of Habitat Risk Utilising GIS

Helen Buckland: helen@unblue.co.uk

This research involved an examination of the expansion of oil palm plantations in Central Kalimantan, Indonesian Borneo, which have been identified as a primary cause of the destruction and fragmentation in the habitat of the Bornean orangutan (*Pongo pygmaeus*)(Casson, 2003). Indonesia is a primary exporter of palm oil, and as worldwide demand increases, the amount of tropical forest destroyed to create plantations is escalating, threatening the country's biodiversity by reduction and fragmentation of the orangutans' habitat. Unless forest allocation policies are fundamentally altered, expansion in the palm oil sub-sector will continue to pose a significant threat.

The aim of this research was to utilise GIS techniques to identify the areas of orangutan habitat at greatest risk of destruction, degradation or fragmentation from conversion of the land to oil palm plantations, and to formulate recommendations for the expansion of the protected area network to encompass these populations. A predictive analysis of future land-use scenarios was conducted on the premise that inactive logging concessions have a high likelihood of being converted to plantations (Husson, pers.comm.). These future expansion scenarios were combined with current orangutan distribution maps to identify alternative sites for the establishment of plantations. Information about the ecology and habitat requirements of the Bornean orangutan was integrated in order to ascertain whether remaining habitat patches are likely to be able to support viable populations.

The 2004 Orangutan Population and Habitat Viability Assessment (PHVA) identified nine priority populations of orangutans for the focus of conservation effort within Central Kalimantan (Singleton et al, 2004). This revealed that 86% of orangutan habitat falls beyond the boundaries of protected areas, including seven of the nine priority populations. Habitat patch size and orangutan population density data were used to determine that approximately 48% of forest fragments that already contain orangutans are also potentially capable of supporting viable populations. Through an assessment of elevation, slope and precipitation data, it was predicted that 75% of Central Kalimantan would theoretically be suitable land for the cultivation of oil palms. By excluding those areas already under cultivation, as well as forest known to contain orangutans, three sites for potential large-scale plantations were identified. By incorporating a buffer zone around orangutan habitat units, these sites could be cultivated without a negative impact.



The map illustrates the orangutan distribution in Central Kalimantan, as well as the results of the analysis conducted to determine which habitat patches are at greatest immediate risk of conversion to oil palm plantations. This was assessed on the basis of each patch's distance from current protected areas, location in respect to active or expired logging concessions, and access status, which was defined as a function of proximity to roads, rivers and settlements.

Conclusions and recommendations were formulated:

Seven of the nine priority orangutan populations identified by the 2004 PHVA (Singleton et al, 2004) are outside the boundaries of protected areas, and at least 5 of these can be considered at high risk of having their habitat converted to oil palm plantations in the near future.

The current protected area network in Central Kalimantan should be extended, or a "conservation concession" scheme adopted, to encompass critical populations of orangutans and promote their long-term survival. Areas recommended to be included in this forest re-classification include the Mawas area, the Sebangau Ecosystem, and the adjacent Katingan Sampit area.

Future plantation development should be redirected to land that has already been degraded, for example by shifting the cultivation, rather than demanding the continued deforestation of undisturbed areas. This includes land allocated for plantation development that has been cleared but left uncultivated.

Future research should investigate the feasibility of converting the area that was previously cleared for the "Mega-Rice Project" into an area for large-scale cultivation of oil palms. This could contribute substantially towards reaching the government goals for expansion without further degrading the forests.

If the recommended redirection of plantation development is adopted, certain criteria to mitigate potential human-orangutan conflict should be adhered to. Of primary importance is the implementation of a buffer zone system that will inhibit encroachment of plantations into forest land, and discourage orangutans from entering plantations in search of food. Optimising productivity on land already under oil palm cultivation is an integral step in reducing the rate of expansion and the associated clearance of remaining forest

in Indonesia.

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Also see
"http//www.unblue.co.uk/palm"

Orangutan's Manufacturing and Use of Tools with Long-term Enrichment and Short-term Enrichment at the Los Angeles Zoo

Kelly Ablard-Hickman: berengei@netzero.net

The theory that *Homo sapiens* (humans) evolved from the great apes leads to the question of their intelligence. Cognitive abilities, as seen in the great apes, include being able to not only manufacture and use tools, but to do so in a creative and flexible manner. Russon (1999) states that orangutans (*Pongo pygmaeus pygmaeus* and *P.p.abelii*) are stereotyped as being "slow-moving…., the most obtuse, stupid, and boring of the apes." However, captive orangutans, for the most part, live in a very comfortable environment, where challenges do not confront them as in their natural habitat. Therefore, manufacturing and using tools in captivity may not be as consistent a behavior as in the wild. An observational study was conducted on four orangutans residing at the Los Angeles Zoo to ascertain whether or not these orangutans manufacture and use tools from both their long-term enrichment (permanent) and short-term enrichment (daily varieties). I wanted to determine if they are creative and flexible with their tool use, using the same tools for different tasks, and different tools for same tasks. My observations showed that items from short-term enrichment were used more frequently (63% of the time) than items from long-term enrichment (37% of the time), and that some items of both types were used creatively.

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Genetic Questions: Are you my mother?

Lindsay Morse: 03028198@brookes.ac.uk

There are many methods available for determining parentage in animal populations, and two of these were used in this study in an attempt to determine paternity and maternity in a population of Cross River Allen's galagos (*Sciurocheirus alleni cameronensis*). Pimley (2002) collected ear punch and blood samples from 14 galagos while studying their behaviour in the Mt. Kupe Forest Reserve in Cameroon. The galagos in this region appear to exhibit a 'dispersed harem' social organization (Pimley, 2002; Müller and Thalmann, 2000), and have been observed to sleep in female groups with up to three individuals. Males also appear to have large ranges that overlap the smaller ranges of the females. Assumptions can be made about social relationships and kin selection through behavioural observations, but can only be confirmed when compared with genetic data (Wien and Zitzmann, 2003; Pereira and McGlynn, 1997; Wimmer and Kappeler, 2002; Pimley, 2002; Müller and Thalmann, 2000).

This study focused on determining parentage in the population studied by Pimley (2002). The 12S gene of the mitochondrial DNA was sequenced within the study population for maternity testing. Twenty primers designed for *Galagoides demidoff* were then used to test the application of cross-species amplification between species of galagos, as cross-species amplification of microsatellite loci would indicate paternity between the sampled individuals. All fourteen samples were sequenced (12S mtDNA gene) and cross-species amplification was possible. Although blood samples were used in this study, other samples could have been used if they had been easier to collect, including faecal samples and shed or plucked hairs (with attached root) (Goossens, *et al.*, 2003; Taberlet and Luikart, 1999; Fernando *et al.*, 2003; Gagneux *et al.*, 1997).

Close analysis of the sequences showed little variation within individuals. However, the sequences indicated higher levels of variation compared to the Allen's galagos studied by Bayes (1998) and DelPero *et al.* (2000). The Allen's galagos studied by Bayes (1998) and DelPero *et al.* (2000) possibly should have been classified differently to the species in this study. Alternatively, the species in this study are lacking in genetic diversity. Six primers from *G. demidoff* were amplified, although there was little or no variation between the sizes of the amplified bands. In this case, further research is necessary to establish paternity and maternity.

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Bald Lemur Syndrome at Berenty Reserve, Southern Madagascar

Maria Koppen: maria_koppen@yahoo.com

In September 1999, *Lemur catta* at Berenty Reserve in southern Madagascar first exhibited extreme hair loss, which was termed 'bald lemur syndrome'. Individuals continued to lose their hair until September 2003, primarily during the birthing season in September and then recovering within a few months. However, in March 2004, several individuals had not fully recovered from their hair loss the previous September, indicating that the problem was escalating and recovery was slowing.

Several hypotheses have been formulated in an attempt to determine the cause of bald lemur syndrome. Tew (2003) investigated malnutrition, skin parasites, social stress and genetic abnormalities as possible contributing factors, but found no evidence to suggest that any of these were the underlying cause of hair loss. Jolly (pers. comm.) suggested that *Leucaena leucocephala*, an introduced plant species found within the range of the 'C1' troop (one of the worse affected troops at Berenty), may be the cause of bald lemur syndrome.

Leucaena leucocephala is used as a high protein food source for cattle and humans. It contains mimosine, a toxic amino acid that has been shown to cause hair loss, reduced fertility, and anorexia in non-ruminants. Many species of cattle possess necessary micro-organisms capable of degrading mimosine, thereby ensuring that they do not suffer from leucaena toxicosis.

In March 2004, focal sampling was undertaken at Berenty Reserve to investigate the general activity budget, agonistic interactions, nearest neighbour and feeding behaviour of 10 females of the C1 troop. Time limitations and working alone prevented sampling of the entire troop. Females were chosen as the focal individuals because they have displayed a greater extent of hair loss than males. A minimum of two 15-minute focal samples were carried out on each female each day. All data was entered into SPSS for statistical analysis, using Spearman's Rank correlation test and the paired t test. Where possible, results from this study were compared with those of Tew (2003), in order to document changes in troop and individual behaviour between September 2003 and April 2004.

Leucaena leucocephala did not appear to have any effect on activity budgets, social behaviour, dominance, rank, or agonism. Although this does not imply that the cause of bald lemur syndrome at Berenty Reserve is not *Leucaena leucocephala*, the results indicate that there has been little change in the behaviour of individual female *Lemur catta* upon recovery from bald lemur syndrome. Three possible conclusions arise: (i) *Leucaena leucocephala* is not responsible for bald lemur syndrome; (ii) *Leucaena leucocephala* is the underlying cause of bald lemur syndrome but during March and April consumption is at its lowest and therefore extreme hair loss is not observed, or (iii) individuals had not fully recovered from the effects of leucaena toxicosis in Spetember 2003, demonstrating similar activity budgets and low levels of agonism.

Although the results of this study are inconclusive, *Leucaena leucocephala* may

well be the cause of bald lemur syndrome. Bald lemur syndrome only occurs during seasons when food availability is low, coinciding with higher levels of *Leucaena leucocephala* consumption. It is suggested that the lack of food availability and subsequent consumption of *Leucaena leucocephala* increases the mimosine intake of *Lemur catta* to such an extent that the result is bald lemur syndrome.

Further longer-term investigation is required before a more complete understanding of bald lemur syndrome can be achieved. The is currently only limited data available regarding the level of consumption of *Leucaena leucocephala* by *Lemur catta*. Future research should be directed towards assessing the level of consumption, documenting changes in food availability, and also include behavioural, physiological, social and feeding analyses. Individuals in C1 troop would be very suitable as subjects for future studies, as matrilineal lines are already known. It is essential that individuals are monitored closely in order to establish how and why certain individuals are affected more than others. With future research, we may eventually be able to predict which individuals will be most affected and why; this may enable elimination of the cause of bald lemur syndrome at Berenty Reserve.

We climbed, and climbed until Julienne suddenly became excited. “Looky, looky, looky!” he quietly screamed, pointing to the canopy. There was a kind of mad but silent rush to see what he was pointing to. The human domino effect came into play as bodies slipped over in the damp conditions. Finally taking a grip of a tree, and with powerful torches pointing aloft, we saw three aye-ayes approximately 10m up. The head of the nearest one lowered to see what the commotion was all about. Slowly its large yellow eyes came into view. At last, seeing this most extraordinary primate sent a shiver down my spine. Its ability to send local people running in fear for their lives once setting eyes upon it became suddenly clear…it looked somehow unnatural, but at the same time made you feel exalted at how nature can create such majesty in form. My interest in lemurs carried over to our