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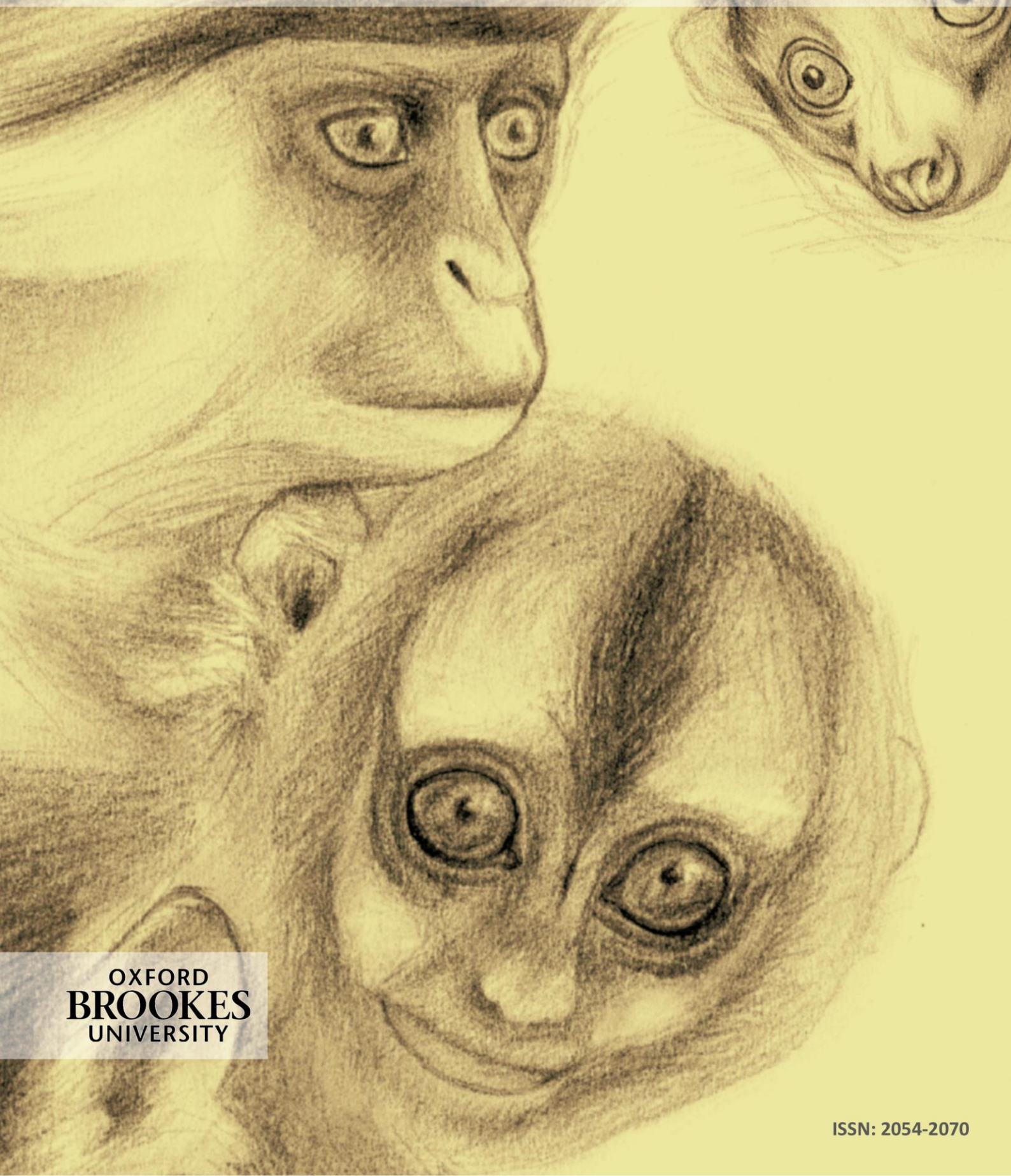

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Letter from the editors

Whether it feels like it or not, spring is finally upon England. In ritual celebration of which, each year, the Primate Conservation MSc current cohort prepare for dispersal, in a march as old as time (est. 2000). As the map included in this issue demonstrates, our researchers will make the difficult and at times dangerous journey to begin the task of propagating conservation as far afield as Ghana, Colombia, Japan and but also here in the UK.

It also means that the spring PSGB meeting is soon upon us, this year hosted by our own Primate Conservation MSc. The topic is the evolution of nocturnal behaviour in primates, us included, so expect talk of circadian rhythms, crypsis, cathemerality and cultural perceptions of darkness. It's a fascinating, expansive subject.

The International Primate Society's own conference will be held in Hanoi, Vietnam this year. In honour of this, our own theme for this issue of Canopy is *Asian primates*. The continent is home to great apes, lesser apes, big-noses and no-noses, often arrayed in such a glorious palette that it would put a bag of jellybeans to shame. But Asia may also be more than a canvas for the order's most colourful examples; it may be the birthplace of the anthropoids, the bough which produced the monkeys, apes, us. What better way to celebrate such formative diversity than to dedicate our issue to the East?

Moving on to recent events, as the conservation world continues to turn, we have seen glimmers of progress as the illegal wildlife trade continued to gain the prominence on the world stage it is due, with two conferences hosted here in the UK. Leaders attended, promises were made and we can hope that the world will be scrutinising to make sure they are kept.

Since our last issue we have also borne the tragic news of the death of several of primatology's and conservation's most stalwart defenders and valuable, dedicated contributors, Dr Alison Jolly, Cyril Rosen MBE and our own once-module leader Dr Corri Waitt. It is with both deep sorrow and buoyant pride that this spring issue is dedicated to their outstanding lives and far-reaching legacies.

Best wishes,

The Editors

Kathleen, Bryn, Magdalena, Charlotte, Stephanie, Amanda & Louisa

Letter from the module leader

In front of you you hold the latest issue of Canopy, the journal of the MSc in Primate Conservation. Canopy started as a modest effort 12 years ago to inform a small inner circle about the research our students do, and at that time it came as a hard-copy only. Quickly, however, the journal was simultaneously published as an online version, freely accessible from every corner of the globe. More recently, the status of the journal became even more 'official' as it acquired its own International Standard Serial Number (ISSN). Number 2054-2070 is now lodged together with some 1.6 million others at the International Serials Data System Register in Paris, giving Canopy its own unique identifier.

With Canopy getting more international recognition and the XXV International Primatological Congress taking place in Vietnam this year, the focus of this issue is on Asia. With respect to primate conservation this attention is well-deserved. The diversity of primates in Asia is arguably only surpassed by the level of threat the primates face on this continent. I had the pleasure of working in various parts of Asia and while throughout Asia we primate conservationists have our work cut out for us, I could not think of a more rewarding place to work.

Gleaning over old issues of Canopy, and looking at the map where our students have worked and where some of them came from, Asia is well-represented. Over the last thirteen years our students have conducted studies on the primates in 15 of the Asian primates range countries - Yemen, Saudi Arabia, Afghanistan, Pakistan, Bhutan, Myanmar, Brunei and East Timor are the only primate range countries where our student have not conducted projects. Some of these countries are amongst the most isolated and difficult ones to work in, but judging by the number of student's projects that have been conducted, it is clear that many Asian countries were particularly welcoming. And indeed still are, as numerous of our former students have set up shop in Asia and either work there permanently or consider it their second home from home.

I am sure that there they will bump into some of their fellow students, as a large number of students originate from Asia (India, Nepal, Vietnam, Malaysia, Singapore, Indonesia etc.) and made Oxford their home from home for one year.

So where ever you are, and where ever you are from I truly hope you will enjoy the latest copy of Canopy. I prefer to read the paper version but I am sure it does equally well on your IPad, laptop or good old fashioned computer screen. Happy readings!

Vincent Nijman
Professor in Antrophology

Obituaries

Dr Alison Jolly

The loss of Dr Alison Jolly last February has devastated us all. Alison was not just a primatologist but a symbol for many field researchers and conservationists. Through her books and sensible, bright individuality she inspired generations of young scientists and conservationists. Alison was well known as one of the first field primatologists and in many aspects she was for the Malagasy lemurs the equivalent of what Jane Goodall has been for chimpanzees. Starting in 1962, her name has been linked to the most charismatic lemur species, the ring-tailed lemur. Since then she has been a prominent figure in the field of Primatology and Biological Anthropology, having written over 100 scientific and popular articles and featured in 20 television programmes. She was a very prolific and gifted writer and her production included the classic primatological textbook, The Evolution of Primate Behavior (1972). Alison was President of the International Primatological Society from 1992 to 1996 and received its Lifetime Achievement Award in 2010. She was awarded the Osman Hill Medal by the Primate Society of Great Britain in 2008. Alison's celebrity reached a height that in June 2006 a new species of mouse lemur, *Microcebus jollyae*, was named after her. Over time Alison's approach to conservation became holistic and conservation education her first priority. The set of six illustrated storybooks, the Ako project, narrates the adventures of young lemurs in Madagascar and is a beautiful example of the importance she played in new generations of Malagasy. Alison Jolly was a pioneer and she will be greatly missed by the scientific and conservation community.

By Dr Giuseppe Donati
Senior lecturer in Primatology and Biological Anthropology

Dr Corri Waitt

It is with great sadness that we report that Dr Corri Waitt lost her battle with cancer and died on Friday 21 March 2014. Corri is remembered fondly by the many students to whom she taught Captive Management for several years on the MSc in Primate Conservation. Corri also served for two years as the Student Link Coordinator and is remembered for her caring nature and her inspiring guidance and compassion. In addition to her many academic achievements, Corri is particularly remembered by the MSc for her constant perseverance in establishing strong ties with the UK zoo community. She also published work with many MSc students, helping them significantly in their aspiring careers: Dave Dellatore on mother-infant cannibalism in orang-utans; on female reproductive parameters in Javan gibbons with Sarah Hodgkiss; social housing with Javan langurs with Iris Droescher; improving the welfare of captive macaques through enrichment with James Robins; the impact of browse on R and R in gorillas with Diana Marsillio; and stereotypies in captive primates and the use of inositol with Fam Shun Deng.

Corri was passionate about animal welfare, promoting farm education for school children and launched an initiative called FarmAbility which gives adults with learning difficulties experience of practical farming and animal welfare. For this she was awarded the prestigious Grahame Maher prize for projects that make sustainable and lasting change. Corri also wrote a popular science book 'The Wisdom of Chickens' which was awarded the Royal Society of Literature's Jerwood Award. She will be enormously missed by the animal conservation and welfare community.

By Prof. Anna Nekaris
Course Leader of MSc Primate Conservation

Cyril Rosen MBE

Those of you who follow the work of the International Primate Protection League (IPPL) will know of the founder of the UK branch, Cyril Rosen, who died on 21 December 2013, aged 86. Cyril was an extraordinary person in so many ways, from his unstinting fight for the welfare of primates to expertise in show jumping, equine psychology, mathematics and the development of the dental industry, in particular, the Centrifugal Casting Machine. He will be remembered for his unstinting support for primate conservation and welfare, recognised in 2007 by the award of the Primate Society of Great Britain Conservation Medal. We were particularly favoured by his considerable generosity at Oxford Brookes University. He was the first donor to the Habitat Country Scholarship Fund, which helped pay fees for students on the MSc in Primate Conservation, and he also supported many Final Research Projects with valuable advice and sponsorship. A gentle and inspiring man, he is greatly missed. Sadly, the UK branch of IPPL is now closed but the excellent work continues through the IPPL.

By Prof. Simon K Bearder
President, Primate Society of Great Britain (PSGB), Professor Emeritus, Anthropology; MSc in Primate Conservation

Can biodiversity loss in Vietnam be attributed to the demand for wildlife and wildlife products? A case study from Cat Tien National Park

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The trade of wild fauna and flora, both nationally and internationally, poses a severe threat to biodiversity across the globe. Wild animals are exploited for an array of purposes including use within the meat, medicine and pet trades. The wildlife trade is particularly destructive in Southeast Asia, a region which has been acknowledged as the global centre for illegal wildlife trade (Sodhi *et al* 2004; Rosen & Smith 2012).

Currently in possession of 10% of the worlds wild fauna, along with a high number of endemic species (Nguyen *et al* 2007), the biodiversity of Vietnam is in need of great protection from the 'insatiable demands of the Asian people's needs for concoctions of wild animals for amulets, remedies and aphrodisiacs' (Alves *et al* 2010). Ho Chi Minh City (HCMC) in Southern Vietnam has been identified as 'the largest trading network for medicinal plants and animals' (Nguyen & Nguyen 2008). Whilst wildlife is undoubtedly traded within the city centre, logic states that it must be sourced from areas of forest outside of HCMC. Cat Tien National Park (CTNP) is situated 160km north east of HCMC, and is easily accessible from the city due to the development of large modern highways.

Semi-structured interviews were used to collect qualitative data from 110 participants living in the villages surrounding Cat Tien National Park. Interviews lasted approximately 60 minutes and were conducted in both Vietnamese and English with the aid of an interpreter. Responses were recorded by hand in English, yet participants were given the opportunity to have responses read back in Vietnamese to ensure they were happy with the information they had given.

During data collection, numerous topics were addressed, including forest resource extraction, perceptions of law enforcement, and the various uses of animals and animal products. The use of animals in traditional Vietnamese medicine will be the focus of this short review, as this has received little attention within the existing literature.

Results showed that knowledge regarding animal based medicine was widespread, with a total of 29 animals being identified as having medicinal properties. The 'monkey' was mentioned by 74% of participants, representing the most common response to questions regarding medicinal animals. It is thought that macaques (*Macaca* spp.) are the

primates most commonly used in traditional Vietnamese medicine; however gibbons (*Nomascus* spp.), black shanked douc langurs (*Pygathrix nigripes*), and pygmy lorises (*Nycticebus pygmaeus*) were also mentioned. The most common use of primates is for the formation of a paste. This is made when entire carcasses are cooked and reduced for up to a week to generate a thick sticky paste, which is stored in a container with rice wine. The paste and wine concoction is taken once a day and is thought to promote good health, give strength and repair bad backs and aching bones. Other uses of primates include the consumption of primate brains from a live primate, which is thought to improve intelligence and cure headaches, and the application of dried loris fur to open wounds, which is thought to prevent bleeding and increase the rate of repair.

Although relatively difficult to access, the data collected show that primate medicines are, along with the snake, the animal medicines used most commonly used by the Vietnamese people. The most desired medicines are those which are hardest to find. With the extinction of the Western Black rhino and rapidly dwindling levels of wild tigers, rhino horn and tiger bone are highly sought after and can fetch extremely high prices (Gratwicke *et al* 2008; Brook *et al* 2012). One participant reported that he purchased 2cm of rhino horn for 300,000,000 VND (9,189 GBP), a staggering amount considering that the average annual household income for the village in which the participant resided was calculated at 80,000, 000 VND (2435GBP).

The most efficient way to curb the effects of the wildlife trade on biodiversity would be to achieve a complete change of attitudes amongst consumers. If individuals no longer desired wildlife, there would be no reason for the continuation of practices such as hunting and trapping. Although ideal, attitude change is no easy task and can take many years to achieve; thus numerous other strategies have been put forward as a means of bringing about a more immediate solution to the problems caused by the wildlife trade.

The trading of wildlife across national borders is monitored by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Despite this, the use of counterfeit CITES permits, disguising CITES listed species as non listed species and the complete concealment of wildlife and wildlife products, all contribute to the increase in wildlife trade (Nguyen 2008; Rosen & Smith 2010). The recruitment of more border control officials and the provision of increased training would go some way in reducing the amount of illegal goods smuggled across international borders.

A reduction in the creation and distribution of animal based medicines within Vietnamese borders could be facilitated through increased monitoring of law officials. 25% of interviewees (n=27) believed that local Kiem

Lam (forest rangers) were either working alongside hunters or were too lazy to act when they saw wildlife law being broken. Increased monitoring of law officials would decrease the likelihood of collusion between Kiem Lam and criminals, and improve public opinion of the forestry department (Ormsby & Kaplin 2005).

A final recommendation to reduce the demand for animal based traditional medicine is through increased and focussed education programmes, tailored to fit individual villages by addressing the issues most relevant to them (Trewhella *et al* 2005). Under CTNP's current education system, one member of each household is invited to attend an education workshop. That person is expected to relay information to the rest of the family; however it is believed that this does not occur, with 42% of participants never receiving any environmental education. The interviewing process also revealed that people are most likely to engage in pro-conservation behaviour if they believe it will benefit them personally, something which should be considered during the development of future education plans.

The global demand for animal based traditional medicine is posing a significant risk to faunal biodiversity, especially in the region of South East Asia. This increasingly lucrative trade has received surprisingly little attention within the literature, meaning that further research is urgently required in order for an effective management plan to be put into place.

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Intra- and inter-group communication in the Southern-Bornean gibbon (*Hylobates albibarbis*) in the National Laboratory for Peat-Swamp Forest, Sabangau Catchment, Indonesia

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Generally speaking, gibbons are small, territorial, monogamous, arboreal apes with groups being formed by a mated pair and their offspring (Tenaza 1975; Chivers 1977). All extant gibbon taxa inhabit the forests of South and South-East Asia. Currently there are 16 gibbon species (with 12 subspecies) recognised by the IUCN Red List of Threatened Species (2013) and as many as 18 species (with 7 subspecies) recognised in the literature (Thinh *et al* 2010), making them the most diverse group of apes.

Researchers working on an array of gibbon taxa have attempted to untangle the function of gibbon solo songs and duets. Theories on the function of gibbon songs include mate attraction (Raemaekers *et al* 1984; Mitani 1988), mate defence (van Schaik & Dunbar 1990), territorial defence (Mitani 1985; Cowlishaw 1992), pairbond formation and maintenance (Haimoff 1984; Cowlishaw 1992; Geissmann & Orgeldinger 2000), and pairbond advertisement (Haimoff 1984; Cowlishaw 1992). Some of these proposed functions have roles within the family group (intra-group communication) and some of them have roles between family groups (inter-group communication). Each male and female has a distinct individual voice and follows a sex- and species-specific song pattern (Raemaekers & Raemaekers 1984), and there is at least some evidence to support each of the aforementioned song functions. However, all of these theories are based on playback experiments and/or on recordings made directly under the groups, or as closely as possible, and based on analysing the songs from the point of view of the singers, not another group hearing the gibbons at distance, i.e. the receivers.

The focal species of this study is *Hylobates albibarbis*. Until recently, *H. albibarbis* was considered a subspecies of *Hylobates agilis* but has now been elevated to species level (Geissmann 2007). This species is distributed throughout much of Central and West Kalimantan on the island of Borneo (Cheyne 2010). There are several forested areas that house large populations of *H. albibarbis* but the largest contiguous population of this species is found in the Sabangau National Park with an estimated 30,000+ individuals (Cheyne *et al* 2007). The importance of this large population is highlighted by the fact that *H. albibarbis* is listed as Endangered on the IUCN Red List of Threatened Species (2008) on the basis of major, unceasing threats to its

habitat and its removal from the forest for the pet trade, despite its classification in the CITES Appendix I (Geissmann 2007).

The study site is located within the Sabangau National Park in the NLPSF (Natural Laboratory of Peat Swamp Forest). The NLPSF covers an area of 500 km^2 within the 9,200 km^2 Sabangau River catchment with all research being conducted in a 9 km^2 grid system extending south and west from the Setia Alam base camp. The peat-swamp forest in Sabangau has been categorised into five distinct habitat sub-types, based on their respective structures and vegetation composition (Page *et al* 1999). The entirety of the 9 km^2 grid system lies within the mixed-swamp habitat-subtype.

In this study, the degradation rate of the duet song of wild, southern-Bornean gibbons (*Hylobates albibarbis*) and its potential implications for intra- and inter-group communication was investigated. This was achieved by recording two gibbon groups (Group C and Karate) at two different distances. The recordings were taken from under the singing group and at a distance of 350 meters (the first distance at which a loss of entire notes was present in the spectrograms) simultaneously. A ZOOM H2 Handy Recorder and a ZOOM H2n handheld recorder were used to record the gibbon duets. Both of the recorders were fitted with a Hama RMZ-10 Zoom-Universal directional external microphone each.

The 350 m distance was established by recording the duet of both groups every 50 meters away from the focal singing group, starting at 0 m and ending at 600 m, and acoustically analysing each recording with Raven Pro 1.4 software. The individual recording at the 0-10 m position followed the gibbons until such time as they had completed their duet, sending an SMS to the phone of the individual recording at the 350 m position every 20 minutes with an updated GPS coordinate which allowed that individual to reposition themselves accordingly to continuously maintain a distance of 350 m from the gibbons.

The terminology for the basic temporal structures of the gibbon song follows, loosely, Haimoff (1984) but with several personal changes aimed at making the phrase-level classification more efficient for acoustic analyses. A spectrogram of the distinct duet song that *H. albibarbis* sings is displayed below (see Figure 1).

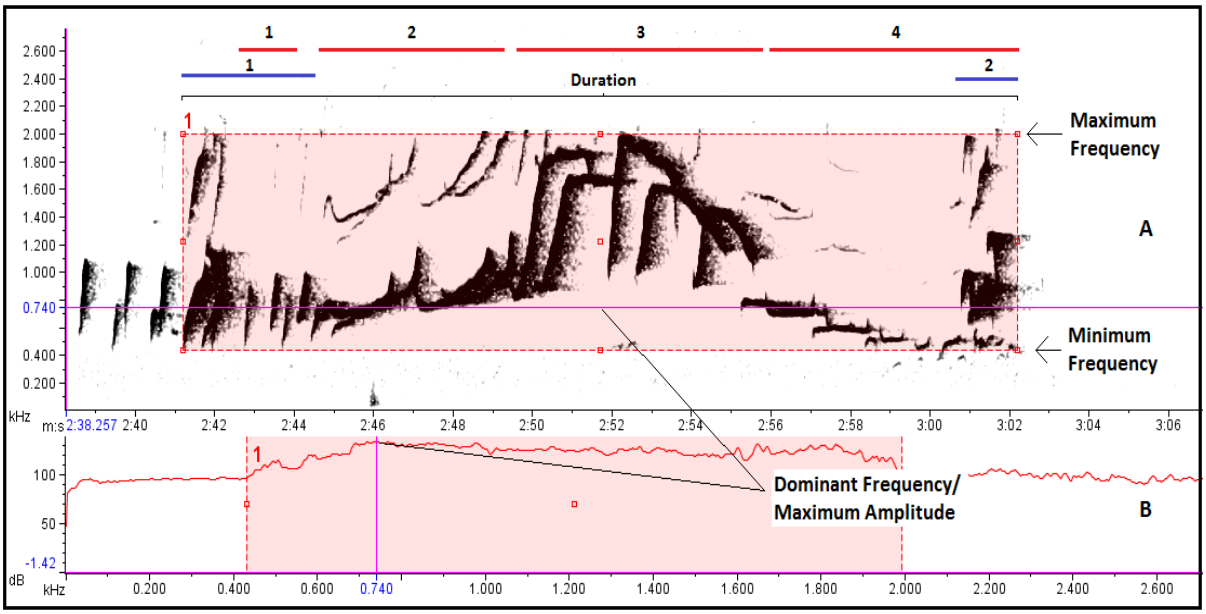

Figure 1: Labelled spectrogram showing how some of the acoustic variables were measured. The red lines denote the four female phrases (1. female organisational phrase (FOP); 2. female introductory phrase (FIP); 3. female climactic phrase (FCP); 4. female terminal phrase (FTP)) while the blue lines denote the two male phrases (1. male organisational phrase (MOP); 2. male terminal phrase (MTP). A is a spectrogram and B is a power spectrum.

A total of 40 duet songs were recorded for each group at the two distances, meaning that a total of 160 duet songs were included in the analysis. The duet songs were analysed for 46 acoustic and temporal variables. The variables selected were: no. of notes, duration, minimum frequency, maximum frequency, dominant frequency, and maximum amplitude for each of the 6 phrases in the duet sequence (or song) as well as for the duet sequence as a whole. No. of total male notes, no. of total female notes, no. of complete male phrases and no. of complete female phrases in the duet song were also included.

Principal component analysis was performed to summarise this set of variables into a total of four principal components (PCs). A one-way multivariate analysis of variance (MANOVA) followed by post-hoc Tukey's test was then performed. There was a significant difference for PC1 ($p < 0.01$), PC3 ($p < 0.01$), and PC4 ($p < 0.01$), but not for PC2 ($p > 0.05$), between the duet sequences recorded under Group C and those recorded at 350 m away. These results reflect the significant loss of amplitude across all parts of the song, as seen in the spectrograms, eventually leading to the degradation of entire notes, particularly in the female organisational phrase, the female terminal phrase and the male organisational phrase. There was a significant difference for PC1 ($p < 0.01$) but not for PC2 ($p > 0.05$), PC3 ($p > 0.05$), or PC4 ($p > 0.05$), between the duet sequences recorded under Karate and those recorded at 350 m away. The duet song of

Karate seems to degrade in much the same way as the duet song of Group C. However, only one of the phrases, the female terminal phrase, appears to suffer a significant loss of notes.

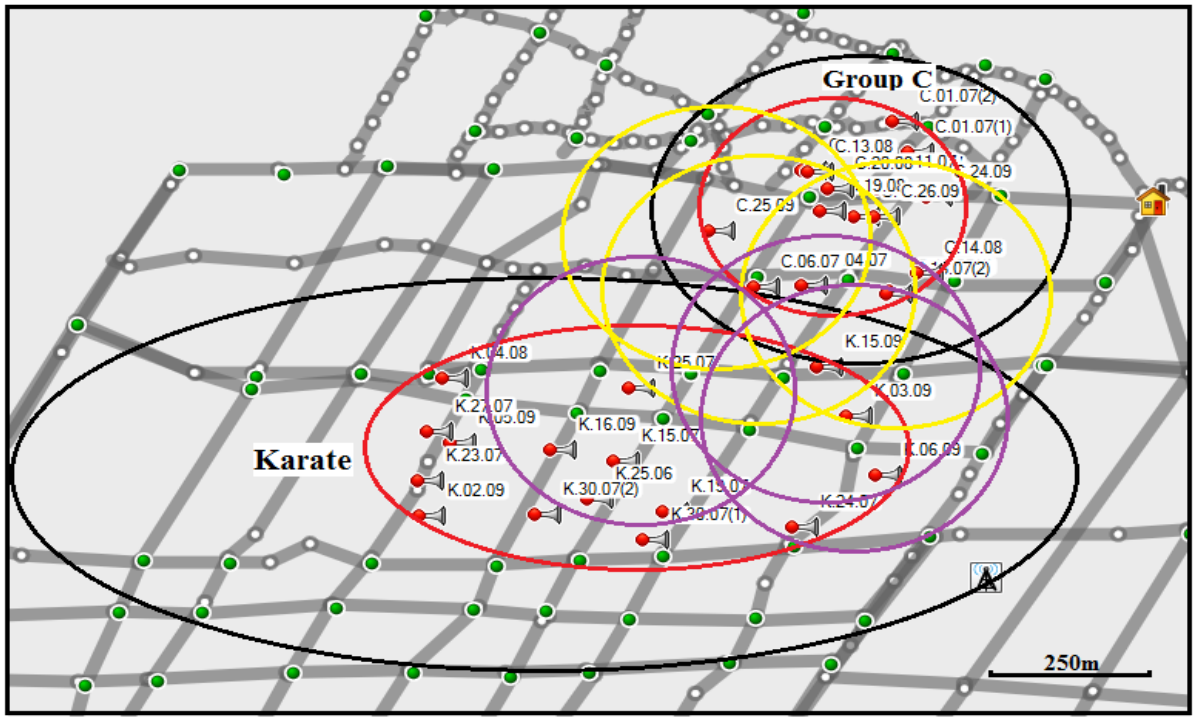

Figure 2: Map of singing tree GPS points within the NLPSF grid system. Black lines mark the boundaries of Karate's and Group C's home ranges. Red lines highlight the core areas in which the singing trees are focused. Purple circles show the broadcast range of Karate's duet song before loss of notes (radius: ~ 350 meters) around some of the outermost singing tree GPS points while the yellow circles denote the same for Group C.

GPS data showed that the gibbons were mostly singing from within core areas of their home range which means that around 70-75% of songs sung by both focal groups were structurally compromised by the time they reached an adjacent group's home range (see Figure 2).

The findings of this study suggest that inter- and intra-group communication may be much more complex than previously thought. It can be said with some confidence that 350 m is the distance at which the duet song of *H.albibarbis* begins to become structurally compromised. This finding, combined with the apparent preference of the two focal groups in this study for singing from core areas within their respective home ranges, means that several compelling hypotheses can be presented, but no concrete conclusions can be drawn:

1 - The gibbon duet song is firmly maintaining a defensive function as previously suggested by many previous studies (e.g. Raemaekers & Raemaekers 1984; Mitani 1985). If the entire song can only be heard from within that

group's home range then it may only be important for the entire song to be heard by an 'invading' adjacent group, i.e. when a receiver ('invading' adjacent group member) hears the song of another group in its entirety, they know that they are occupying and/or approaching an actively defended territory. Upon receiving this message, they can choose to continue forward or retreat. The degraded song, that preliminary tests show can be heard up to ~900 meters away, may simply serve as a positional indicator beyond 350 meters.

2 - The gibbon duet song has both a defensive and offensive function. When the song is sung from the core area of a group's home range, it serves a defensive function. This is usually the case. However, on the occasions when it sung from close to a home range boundary, thus penetrating one or more of the adjacent groups' home ranges, it may signal intent to expand and/or invite a confrontation.

3 - Considering that organisational phrases seem to become degraded first, e.g. the MOP, the FOP, and the FTP (which may cue the MTP), there may be certain parts of the song that are purely intended for inter-group communication and certain parts that are purely intended for intra-group communication. The faster degrading organisational phrases may only be important for intra-group communication, with the adult male and adult female cueing each other up to accurately launch a solid duet sequence, allowing for the slower degrading parts to reach their intended target more efficiently each time. These slower degrading elements, e.g. the first few notes of the MOP and the FTP, the FIP, the FCP, and the MTP may be the only important elements for inter-group communication.

The duet song of this species of gibbon is highly adapted to long distance sound transmission in a dense forest and is a wonderful example in support of Morton's (1975) acoustic adaptation hypothesis.

As there is evidence to suggest that gibbon singing behaviour has functions in territorial defence, mate defence, strengthening the pairbond, as a ranging mechanism, reproductive behaviour, social behaviour, distinguishing between individuals, and distinguishing between species, studies like this one could potentially have huge implications in both how they are housed in captivity and in assessing what effects deforestation may have on their ranging behaviour and reproductive success. Gibbons housed in captive settings are known to vocalise far more frequently than those living in the wild (S. Cheyne, pers. comm.). The findings of this study suggest that it is predominantly 'invading' adjacent groups that hear the duet song in its entirety. Captive gibbons housed in close proximity to other groups hear the entire song of neighbouring groups on a far more regular basis. This may be stimulating them to sing (in defense) more

frequently and potentially lead to additional and unnecessary stress.

This species of gibbons lives sympatrically with ~ 6 other primate species including the largest known wild population of the critically endangered orangutan (*Pongo*). It has been suggested that gibbons may be one of the most effective seed dispersers in Asian forests (McConkey & Chivers 2007). The loss of this gibbon species would mostly likely have a detrimental effect on the forest ecosystem and thus, a detrimental effect on the other primate species also. The more we can learn about how this species utilises its peat-swamp forest habitat, the more effective conservation management plans can be made to protect them.

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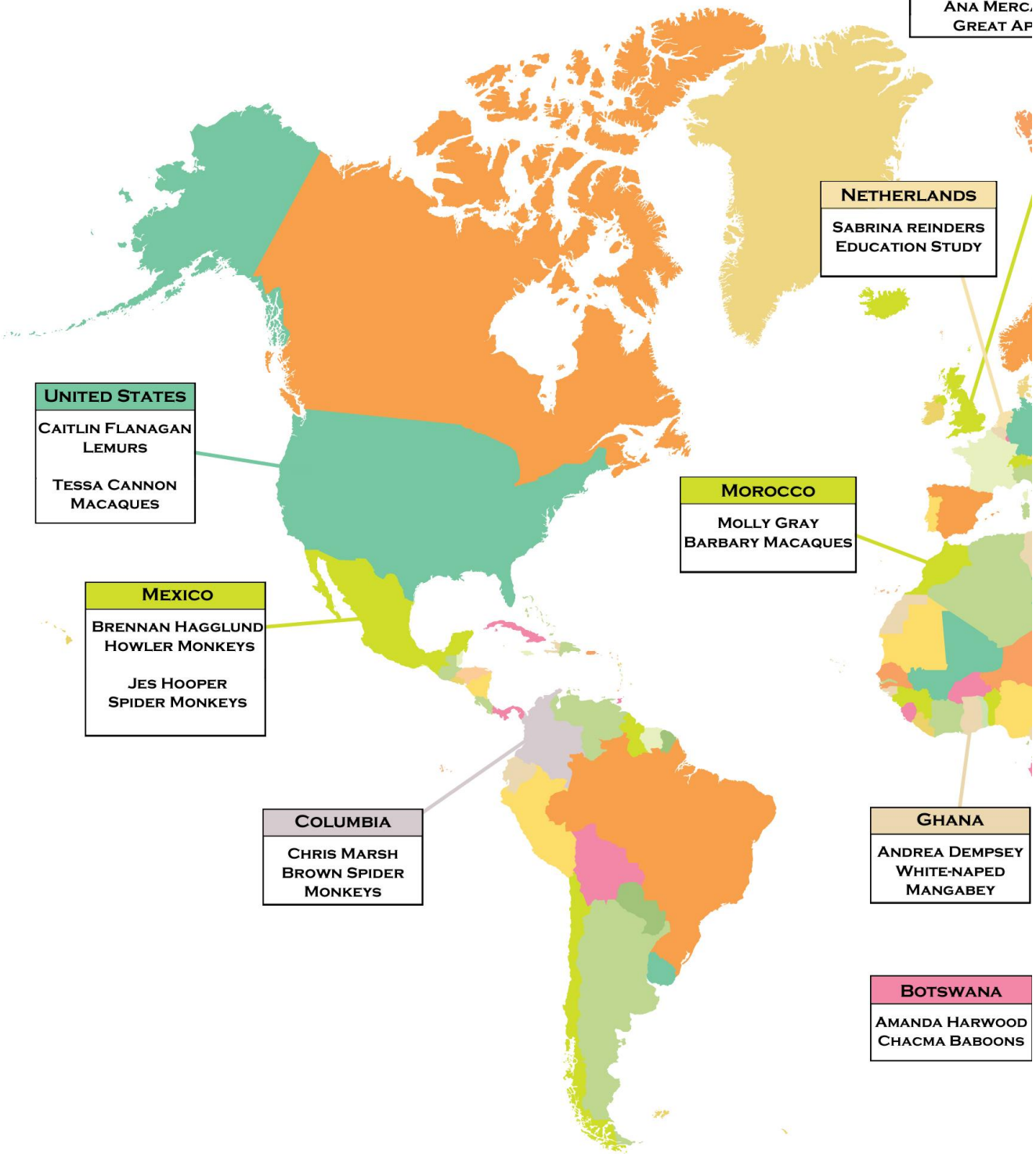
2014 MSc Primate Conservation student field research locations



United States

Caitlin Flanagan
Lemurs

Tessa Cannon
Macaques

Mexico

Brennan Hagglund
Howler Monkeys

Jes Hooper
Spider Monkeys

Columbia

Chris Marsh
Brown Spider Monkeys

Netherlands

Sabrina Reinders
Education Study

Morocco

Molly Gray
Barbary Macaques

Ghana

Andrea Dempsey
White-naped Mangabey

Botswana

Amanda Harwood
Chacma Baboons

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Laura Will
Pet Trad

Yvonne Mo
Zoo Stud

Amy Beec
Zoo Stud

Sarah Han
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Asier Gi
Slow Lori

Ana Merc
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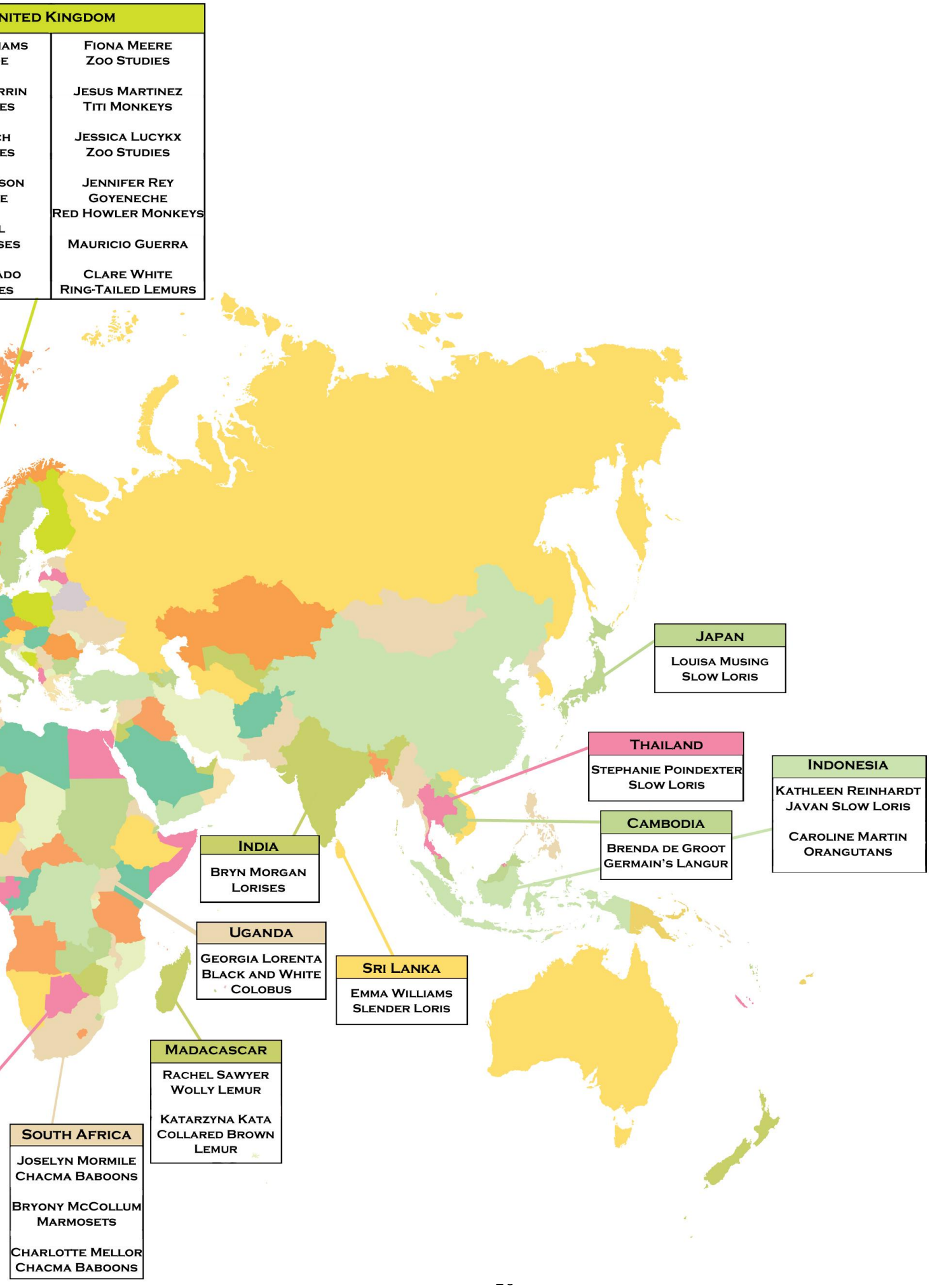
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COLOBUS
SRI LANKA
EMMA WILLIAMS
SLENDER LORIS
MADACASCAR
RACHEL SAWYER
WOLLY LEMUR
KATARZYNA KATA
COLLARED BROWN
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SOUTH AFRICA
JOSELYN MORMILE
CHACMA BABOONS
BRYONY MCCOLLUM
MARMOSETS
CHARLOTTE MELLOR
CHACMA BABOONS

Behavioural monitoring of southern yellow-cheeked gibbons (*Nomascus gabriellae*) in two stages of rehabilitation at Dao Tien Endangered Primate Species Centre, Vietnam

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Reintroduction is emerging as an important tool in the conservation of many threatened species. The *in situ* rehabilitation and reintroduction of animals confiscated from illegal trade plays a prominent role in wildlife conservation and welfare. Behavioural assessment during the pre-release rehabilitation process has been identified by the IUCN Reintroduction Specialist Group as an essential step in ensuring successful reintroductions to the wild (Baker 2002). However, many reintroduction programmes continue to reintroduce animals without adequate pre- and post-release monitoring (Bennett 1992; Cheyne 2009). Although the reintroduction of great apes has received much attention during the past decade, very little information on the rehabilitation and reintroduction of gibbons has been published.

For this study, pre-release behavioural monitoring was carried out on five pairs of southern yellow-cheeked gibbons (*Nomascus gabriellae*) in two stages of rehabilitation at Dao Tien Endangered Primate Species Centre, in southern Vietnam. Dao Tien aims to rehabilitate and reintroduce ex-pet gibbons, in order to re-establish southern yellow-cheeked gibbon populations in areas of regenerating forest, as well as boosting existing wild populations, within Cat Tien National Park (Kenyon *et al* 2012). *Nomascus gabriellae* is the most southerly distributed species of the Nomascus genus (crested gibbons), occurring in southern Vietnam and north-eastern Cambodia, east of the Mekong River (Rawson et al 2011). *Nomascus gabriellae* is categorised as Endangered on the IUCN Red List (IUCN, 2012).

Behavioural data were collected between 9th May and 11th July 2012, using a focal interval sampling method (Altmann 1974). Focal pairs consisted of two opposite sex pairs and one same-sex female pair in phase 1 of rehabilitation (caged socialisation enclosures), and two opposite sex pairs in phase 2 of rehabilitation

Figure 1: Khoi, a young male gibbon in phase 2 of rehabilitation at Dao Tien.

(semi-free forested enclosures). The aim of this study was to determine the suitability of focal pairs for release and to provide the centre with

objective data on which to base decisions regarding their rehabilitation programme.

Results were quantitatively analysed using non-parametric statistics. Activity budgets were compared to the behavioural checklist for rehabilitating gibbons, proposed by Cheyne *et al* (2008), and behavioural budgets reported in various studies of wild gibbons. Most focal individuals exhibited behaviours satisfying the key criteria for gibbon reintroductions, indicating that they are on track for future release. Gibbons in the semi-free tree training stage (phase 2) demonstrated activity budgets closest to that reported for wild Nomascus gibbons, but failed to make full use of their forested enclosures. Two focal gibbons exhibited abnormal behaviours which may threaten their suitability for release. Suggested ways of reducing the occurrence of abnormal behaviours include improved environmental enrichment and reduced exposure of affected individuals to humans.

Like many *in situ* reintroduction programmes, the value of the reintroduction programme at Dao Tien extends far beyond the direct impact of the reintroductions themselves. The continually developing education programme at Dao Tien focuses on raising awareness of the threat of wildlife trade on Endangered primate species locally, nationally and internationally. As a result of this work, Dao Tien contributes significantly to the conservation of *N. gabriellae* in Vietnam.

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Tell me more: Expanding conservation education in Sri Lankan hotels to encourage responsible tourism

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Sri Lanka, along with the Western Ghats of India, was identified as one of the world's first biodiversity hotspots (Gunawardene *et al* 2007). It is home to a wide range of endemic species but is also quickly losing forest coverage, placing the continued existence of these species in jeopardy (FAO 2010; Lindström *et al* 2012). In addition Sri Lanka is also one of the world's top wildlife-watching destinations for charismatic creatures, including the Asian elephant (*Elephas maximus*), leopard (*Panthera pardus kotiya*), sloth bear (*Melursus ursinus inornatus*), blue whale (*Balaenoptera musculus*), and sperm whale (*Physeter macrocephalus*), known collectively as Sri Lanka's Big Five (de Silva Wijeyeratne 2011). As tourism to the country begins to show a significant increase following the end of a decades-long civil war and the devastating 2004 tsunami, Sri Lanka is in a unique position to build its wildlife and ecotourism sectors responsibly, nearly from the ground up (Richter 1999; Robinson 2008). As previous research has shown, and data from this study corroborate, tourists are interested in learning about these issues, which they consider an enhancement to the experience of simply seeing wildlife (Moscardo 1998; Webb 2002; Ballantyne *et al* 2009).

While there are many forums for educating tourists about the country's natural features, in this project I specifically explore the market for conservation and responsible tourism messages targeting tourists in a hotel setting. Traditionally, tourists are exposed to education information only after choosing activities and outings, at which point they are committed to their choice, regardless of what they may learn about its conservation impact or alternative options later (Beeton 1998). Further, those tourists who do not choose to participate in wildlife tours essentially self-select themselves out of conservation education opportunities. Guests educated in a hotel setting still have time to modify their activity plans and prepare for their upcoming experience. With this preparation, guests have an opportunity to get more out of their wildlife tour experiences and develop a deeper understanding and connection to Sri Lankan wildlife.

Responsible tourism (also called ethical tourism) includes a range of requirements generally serving to minimise negative economic, environmental, and social impacts (International Centre for Responsible Tourism 2013). For wildlife watching, responsible tourists (and guides) follow a series of basic tenants, including 1) keeping an appropriate distance, dependent

upon the animal's size and temperament, to avoid stressing the animal or transmitting disease, 2) not crowding or surrounding animals, 3) not blocking escape routes or getting between members of a group (particularly mothers and babies), 4) not shouting, waving, shaking branches, or otherwise trying to elicit reactions from wildlife, and 5) not feeding wild animals. Failure to adhere to these guidelines can be detrimental to the animals by altering their natural behaviours (including feeding and mating activity), creating a dependency on humans as a food source, increasing aggressiveness, and increasing the risk of disease transmission (both to and from the animals) (see Roggenbuck 1992 for review; Fa 1992; Roe *et al* 1997; Orams 2002). In addition to harm caused to wildlife, irresponsible tourist behaviour can negatively impact other tourists, generating feelings of anger and stress, decreasing the quality of the experience, and lowering satisfaction rates (Roggenbuck 1992).

In this study I used a combination of semi-structured interviews and surveys to assess hotel guests' attitudes towards wildlife/conservation education and responsible tourism experiences. I was partnered with Jetwing Hotels, one of the three largest hotel chains in Sri Lanka, and conducted my project in five of their hotels. Approximately half of my study participants (n=65) expressed interest in learning about local wildlife (51.6%), conservation issues (42.4%), and ways they could help make a positive contribution (47.4%). When asked about specific types of educational activities, participants expressed interest in nature trails (82%, total n=28), species identification sheets (59%, total n=56), and information centres (56.3%, total n=63). Some particular topics of interest identified by guests include wildlife highlights, explanations of wildlife behaviours, facts about endangered species, and local ecosystems.

Of those who responded to questions regarding responsible tourism, 23.1% of participants (n=15) indicated they had observed other tourists acting inappropriately around wildlife and 38.5% (n=25) had concerns with the way they saw wildlife being treated, either by tourists or locals (including tour guides). Of the eight individuals who expanded upon their concerns, five related to the treatment of elephants (issues including untreated infections, exploitation of the animals for tourists/money, use of the bullhook, and restraint by chaining). Other respondents expressed discomfort with the presence of a leashed monkey being used as a photo prop and a snake charmer on the beach.

Based on the results of this study, placed into the context of existing literature regarding tourist education interests, I developed a suite of educational material (including information booklets, online information sheets, species identification guides, physical displays, and posters) highlighting local wildlife, ecosystems, conservation threats, and aspects of responsible tourism. This material has been presented to Jetwing, along with a recommendation paper

assessing their existing wildlife/conservation education programme and offering suggestions as to how they could expand the number of opportunities available to improve their guests' experiences and to positively support the wildlife and ecosystems tourists are paying to visit. Although Jetwing is not in a position to control responsible tourism factors such as overcrowding at national parks or animal exploitation (i.e. elephant rides, photo prop animals), there are many opportunities to educate visitors about the realities of these actions on wildlife and ways to act responsibly when faced with these situations.

Although this study included only a small data set, thus limiting the scope of the resulting conclusions, the emerging trends support the notion that at least a sizeable portion of guests do want to learn about wildlife and conservation while on holiday. If Jetwing implements education programmes with a wildlife, conservation, and responsible tourism focus, they have the opportunity to be leaders amongst the Sri Lankan tourist industry and set a valuable standard towards which others can strive, while at the same time improving guest experiences and creating a more positive attitude towards local wildlife.

Education material developed for this Jetwing can be found online at:
https://www.dropbox.com/sh/46rrcr5796rvtdc/0MRj26vnDy

Unbranded material available for public use can be found online at:
https://drive.google.com/folderview?id=0B2UqDY9OfN_NdjRiZGswdlV0Q3c&usp=sharing

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Assessment of habitat, population density and parasites of the Javan slow loris (*Nycticebus javanicus*) in Ciapaganti, Garut-West Java

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Indonesia's forests contain some of the most biologically rich ecosystems in the world and encompass more than one-half of the rain forests remaining in tropical Asia (Brookes *et al* 2000; Miettinen *et al* 2011). Indonesia is not only floristically-rich, but also arguably houses the world's greatest primate diversity, including six out of the eight slow loris species (*Nycticebus* spp). Despite an extensive amount of research on primates, the ecology of the Indonesian slow lorises are still fairly unknown (Nekaris *et al* 2008). These small nocturnal primates have shown a steady decline (IUCN 2012). This is likely to be caused by habitat loss, the increasing number caught for the pet trade and traditional medicine (both locally and abroad) (Nekaris *et al* 2008; Nekaris *et al* 2010; Starr *et al* 2010). Intensive human land use can be found across much of the slow loris habitat. This makes the slow lorises vulnerable to anthropogenic activities (Thorn *et al* 2009). Disturbance by humans, including habitat destruction, can affect host-parasite interactions in significant ways and is often associated with an overall greater prevalence of parasite infection (Gillespie *et al* 2005). Here I focus on the Critically Endangered Javan slow loris (*Nycticebus javanicus*), endemic to the island of Java. Studies on the Javan slow loris, its distribution and conservation status are urgently recommended (Nekaris *et al* 2008). Therefore, this study assessed the habitat, population encounter rate and parasite burdens of the Javan slow loris living in Cipaganti, West Java.

Using transects we assessed the population abundance, and using T-square sampling methods we assessed the habitat of a Javan slow loris population living in West Java. Faecal samples and skin samples were

collected opportunistically to get baseline data on the parasites this population harbours. Gastrointestinal parasites were revealed using Sodium Nitrate flotation techniques (Dryden 2006).

We found that the population encounter rate is 1.43 individuals/km based on 26 encounters. The tree density was 190 trees/ha and the average distance between trees was 4.5 m. We measured 100 trees and calculated that most of the trees (n=43) in the habitat were not connected to any other tree. Even though the habitat has a low tree density, 71% of the tree species found in the habitat are part of the Javan slow loris diet. Thus even though this habitat is classified as farmland, there is a high abundance of Javan slow lorises.

We sampled eight individual Javan slow lorises for parasites and found seven individuals infected with gastrointestinal parasites. We report hookworm (*Necator* spp.) eggs and adults, pinworm (*Enterobius vermicularis*) eggs and adults, and *Trichostrongylus* eggs and adults. One of the lorises presented a skin rash and we took samples for ectoparasite diagnostics. The ectoparasite species could not be identified, but had close resemblance to a skin mite species.

Compared to other results our encounter rate is relatively high. Two other studies conducted in Gunung Gede Pangrango National Park, West Java, Indonesia give a slow loris encounter rate of 0.02 individuals/km and 0.20 individuals/km (Nekaris *et al* 2008). The visibility on transects during the night was up to 49 m. As encounter rate increases with higher visibility (Duckworth 1998), this could be a reason why our encounter rate is so much higher than that of previous studies. For a strictly arboreal primate (Nekaris *et al* 2008), the Javan slow loris' habitat from this study site is not ideal. Our area would not have been classified as suitable for sustaining a loris population. The connectivity is low, with an average connectivity of 1 and most trees not being connected at all. Even though the habitat of these lorises is disturbed, 71 % of the trees found in the habitat are food sources for these lorises. The trees are either gum-producing trees or nectar-producing trees and the Javan slow lorises have been observed eating from these trees (Wiens *et al* 2006). Therefore this habitat might be more suitable to sustain this Javan slow loris population then is assumed by only looking at tree density and connectivity.

The gastrointestinal parasites, pinworms and *Trichostrongylus*, which we found in this study are transmitted via ingestion of eggs in contaminated food or soil. While hookworm eggs hatch in soil and mature to rhabditiform (first stage) larvae that moult to produce infective filariform larvae, which penetrate skin and migrate to the gut (Cuomo 2009). Mite larvas burrow themselves in the skin of the host and go through three stages before

they can reproduce and lay more eggs. They are dependent on the skin of the host as a food source to complete their lifecycle (Arlian & Vyszenski-Moher 1988). We suggest that more research should be done on population abundance of the Javan slow loris. Due to the high food abundance in Ciapaganti, we also suggest that more research should be done on the habitat use of the Javan slow loris. In disturbed habitat, such as the agroforest in Ciapaganti , the survival of the slow lorises is very much reliant on the local people.

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Saving the Critically Endangered Javan slow loris (*Nycticebus javanicus*) through ecology, education and empowerment

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The Javan slow loris (*Nycticebus javanicus*) is endemic to the Indonesian island of Java. Java has faced both recent and historical deforestation (Nijman 2013) reducing the distribution of the Critically Endangered Javan slow loris (*Nycticebus javanicus*) to a fraction of its former size (Thorn *et al* 2009). Like the other members of its genus, the Javan slow loris is a venomous, nocturnal strepsirrhine, which is targeted heavily by the illegal wildlife trade (Nekaris & Jaffe 2007; Nekaris *et al* 2010). As a result of this it is now classed by the IUCN as Critically Endangered (Nekaris *et al* 2013) and listed as one of the 25 most endangered primates (Mittermeier, 2012).

The Little Fireface Project was set up by Professor Anna Nekaris in 1993, originally as a part of the Nocturnal Primate Research Group of Oxford Brookes University. The LFP team aims to conserve lorises through studying their ecology, educating people on their role in the ecosystem, and thereby empowering people living in loris range countries and indeed all over the world to want to save these animals.

As a result of the illegal wildlife trade rescue centres across Indonesia are full of lorises and attempts at reintroductions have often failed (Moore 2012). Studying aspects of loris ecology will hopefully help identify potential reintroductions sites and aid future reintroductions. A field station was set up in 2011 in Cipaganti, Garut District, to perform the first long-term behavioural studies of wild slow lorises. So far researchers have examined activity budgets of the species, and home range analysis has shed light on male and female home range size as well the degree of overlap between individuals. Recent work has investigated loris sleep site use uncovering that amongst the sparse plants in their agroforest environment, lorises primarily sleep in bamboo patches. We also are focusing on how lorises adapt in other ways to living in an agroforest environment including examining infant dispersal and diet. The team is also investigating, both in the wild and in rescue centres, the role of loris venom in their ecology. Finally, the team will soon be expanding its work to civets and small cats!

As slow lorises have become popular pets, with monthly market surveys we investigate the presence of lorises and other nocturnal animals in Java's animal markets. Over the past six months, lorises were rarely observed sold openly as traders are becoming aware of their threat status and that trade is illegal. Large confiscations by officials in Java of Sumatran slow lorises destined for trade do indicate that despite being illegal, a loris is still a desirable

pet. Workshops have been held for law enforcers and rescue centres to teach them to identify different species of nocturnal mammals found in markets and distinguish those that are traded illegally from animals that can be kept as pets legally.

One of the main focuses of the work by the team in Java is on education. Both adults and children are taught about the positive impacts of lorises in their forests and on their farms. Monthly movie nights, talks with farmers and biannual pride festivals teach adults about trees essential to loris survival, ecosystem services performed by the loris and the work done by LFP. The launch of a book pack in 20 schools is ongoing and has been met with great success. The children are especially engaged in tasks that stimulate creativity such as making loris face masks. A weekly afterschool nature club takes interested children outside to teach them about their local environment and wildlife. It is aimed that through education the people of the local community will be aware of the plight of the slow loris and will want to conserve them.

The Little Fireface Project activity involves social media in conservation. Growing Facebook, Instagram and Twitter accounts all help to expand the range of people who are aware of loris conservation. An important aspect is the evaluation of the role of social networking and the internet in loris trade. For instance, recently, Nekaris *et al* (2013) found that viral YouTube videos of slow lorises were often accompanied by comments such as "I want one," but no conservation message as to the status of these animals. Ongoing efforts by the LFP team hope to see a change in such attitudes over time. We believe that a diverse approach is needed to conserve this unique group of primates.

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Selamatkan Yaki – Save the Sulawesi Macaques

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The tropical forests of the Indonesian archipelago are home to an incredible diversity of plant and animal species. However, with a growing population of over 200 million, pressures on the environment are increasing with heavy demands for forest resources including food and timber. Indonesia is now losing its precious forests faster than any other country worldwide, threatening many of its incredible primate species with extinction.

Sulawesi, the largest island in the Wallacea biodiversity hotspot, has the greatest endemism in Indonesia and it is estimated that 25% of its bird species and 62% of its mammal species are unique to the island. If we exclude bats, it's a massive 98% of mammals (Holmes & Phillips 1996). Amongst this wealth of biological diversity resides a rather special monkey species. The charismatic Sulawesi crested black macaque (*Macaca nigra*) is one of 7 macaque species found only on Sulawesi, endemic to the Eastern tip of Sulawesi's Northern peninsula. Restricted to small forest fragments in the province of Minahasa, they live in large, philopatric multi-male multi-female groups, with an alpha male at the top of the hierarchy (Kinnaird & O'Brien 2000). Characterised by their distinctive crest of hair, entirely black face and body colouration and bright pink, heart shaped bottom (ischial callosities), these monkeys are a striking and iconic species.

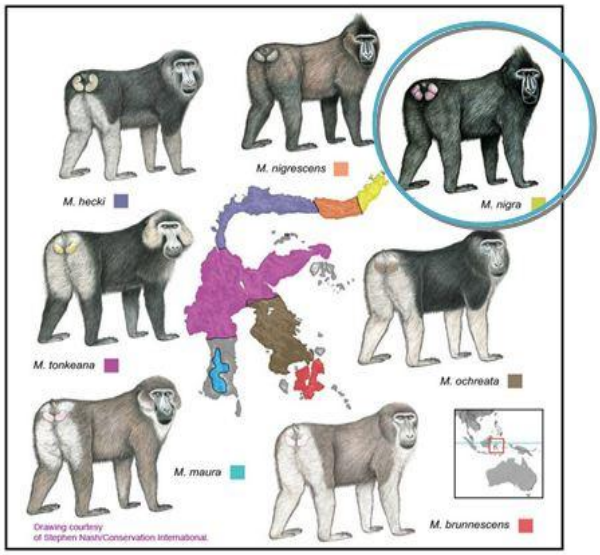

Figure 1: Of the seven endemic macaque species found in Sulawesi, *M. nigra* are the most highly

Unfortunately, the populations of these macaques have experienced severe declines in recent years, with estimates as high as 90% in the last 20 years (Melfi 2010). Extensive population surveys carried out in the 1970s recorded high densities of around 300 individuals/km^2 (Mackinnon & Mackinnon 1980). However, over the following years, repeat surveys revealed dramatic drops in densities, to 76 individuals/km^2 (Sugardjito *et al* 1989); a further 10 years later population estimates were as low as 23.5 animals/km^2 (Rosenbaum *et al* 1998). Following these population trends, this species is now classified as Critically Endangered

by the IUCN Redlist and faces a high risk of extinction (Supriatna & Andayani 2008).

So what has caused such dramatic and rapid decline in numbers? Aside from extensive habitat loss within which, due to their radiation, is an already restricted range, *M. nigra* face a more unusual yet devastating threat to the survival of the species. The consumption of macaques in Minahasa is a long held tradition which has grown in parallel to human population expansion, and has thus been identified as the primary threat to the species' survival (Lee 2000). The predominantly Christian population in Minahasa lack religious constraints over wildlife consumption as in other regions of Indonesia, and monkey is considered a delicacy with a majority of hunting meeting demands as ceremonial food rather than for subsistence (Lee 2000). Hunting rates have been demonstrated to be highly unsustainable (Lee 2000; O'Brien & Kinnaird 2000), which has led to local extirpation of other species throughout Minahasa (Clayton & Milner-Gulland 2000; Burton *et al* 2005) highlighting the strong requirement for immediate conservation action.

Despite Sulawesi's incredible biodiversity and the extinction risks of numerous species, it receives relatively little conservation attention, with efforts and resources often centralised in regions containing megafauna with greater recognition and popularity (Wilson *et al* 2005). However, a group of researchers have established strong connections within the Minahasan region and developed a conservation programme which may bring hope for the species and their habitat. Selamatkan Yaki ("Save the Macaques") is an integrated conservation programme focused on protecting the last remaining populations of macaques and mitigating the threats they face. Working partnerships both *in-situ* and *ex-situ* have combined to identify the anthropogenic threats posed to the current population of *M. nigra* within their native range, culminating in the production of a Conservation Action Plan for the species. A multitude of approaches addressing the conservation objectives comprise research, education, the improvement of ecotourism infrastructure and sustainable development. Long-term cooperative efforts will invest resources into improving agriculture techniques and sustainability and developing alternative livelihood strategies.

Collaborating with national and international stakeholders, raising awareness forms the central motivation of the project, disseminating information to local communities, government bodies and universities in the form of presentations and the distribution of education materials. It is hoped that the species can be recognised with pride as a valuable flagship, highlighting the wealth and diversity of the flora and fauna in North Sulawesi.

These activities, if implemented successfully with continued support from all stakeholders, will not only ensure the future survival of this fascinating primate, but also the habitat for

some of the richest and most unique species in the world.

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University Events

Seminar Series

The seminar series is a weekly event which events guest speakers to present their research. We are currently in the process of recruiting speakers for our winter semester. If you are interested in attending or presenting please do not hesitate to get in contact with us. Contact details are provided within the contents pages.

27 Jan	**Dr Ian Redmond** (Ape Alliance, Hope4Apes)
03 Feb	**Mariel Harrison & May Shirkhorshidi** (Imperial College London)
10 Feb	**Dr Kimberly Hockings** (Oxford Brookes University)
17 Feb	**Dr Maren Huck** (University of Derby)
24 Feb	**Andrew Walmsley** (Andrew Walmsley Photography)
3 March	**Jamie Craig** (Cotswolds Wildlife Park & Gardens)
10 March	**Carly Chadwick** (University of Salford)
17 March	**Hannah Parathian** (Oxford Brookes University)
24 March	**Dr Andrew Smith** (Anglia Ruskin University)
31 March	**Tim Eppley** (University of Hamburg)

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