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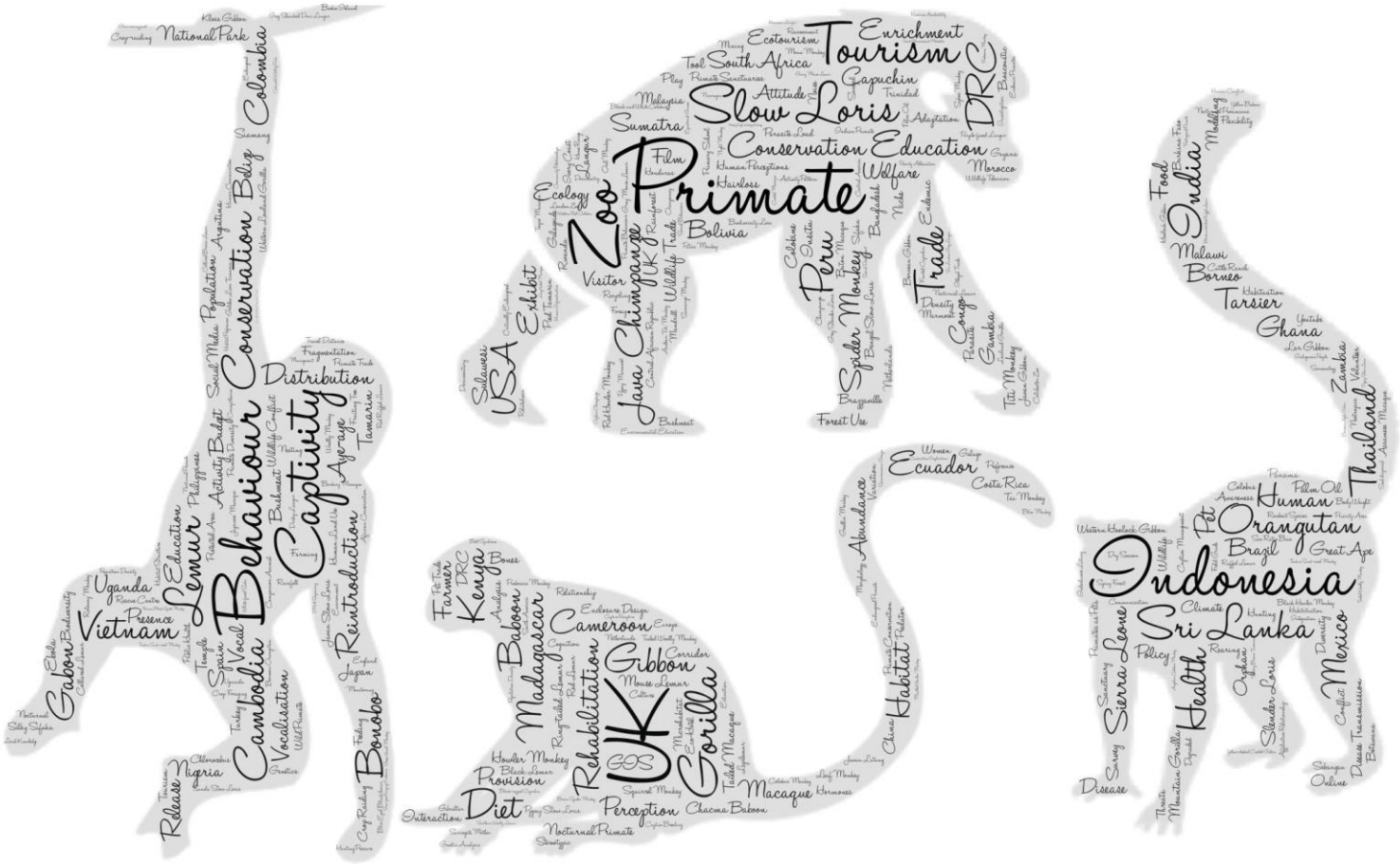

20TH ANNIVERSARY

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Canopy
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Address
Canopy c/o Vincent Nijman
Faculty of Humanities and Social Sciences
Oxford Brookes University
Oxford
OX3 0BP
UK

Website
MSc Primate Conservation:
http://www.brookes.ac.uk/primates

Front Cover
Word cloud designs created by Celeste Williams and Jordan Williams

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Letter from the Editors

Welcome to a very special edition of Canopy - celebrating twenty years of Primate Conservation at Oxford Brookes University! It's a challenge to summarise twenty years in just one issue, which is why we have made this a special bumper, anniversary edition!

Each editor has chosen one article from the past twenty years of study, which appeals to them, illustrating the diversity of interest this year from those taking the MSc. With nine articles covering topics as varied as the activity budgets of lar gibbons to an investigation into EU and UK legislation for long tailed macaques, the use of enrichment for a rehabilitation centre in India to tourist impacts on free-ranging primates this issue still only covers a fraction of the wide scope of primate conservation which has grown significantly over the past twenty years.

We also interview Dr Alison Cronin, MBE director of Monkey World – Ape Rescue Centre in Dorset, to find out about the sanctuary's work rescuing and rehabilitating primates and Alison's ongoing fight to legislate the primate pet trade in the UK. It's a fascinating insight into the park's 33 year history, Alison's tireless campaigning and what she thinks the next twenty years of primate conservation will hold.

The future of primate conservation was a question we also asked of an Alumni from every cohort of the past twenty years. They also told us where their MSc in Primate Conservation has taken them and what their dissertation topic was, as current students we were curious to see what opportunities there were for primate conservationists and whether people had stayed in their initial area of interest.

It was fascinating to see the wide range of species and topics covered with some firm favourites throughout the years. Our cover celebrates this diversity of species and subjects from all the MSc dissertations through the years with a primate appropriate word cloud created from the titles of all the dissertations in the past twenty years of the course.

We hope you enjoy this bumper issue of Canopy celebrating 20 years of Primate Conservation at Oxford Brookes University. Here's hoping to another twenty years with more positive outcomes for primates and conservation throughout the world.

Thank you for your continued support and interest in primate conservation at Oxford Brookes University.

The editors

Letter from the Course Leader

Looking back on 20 years of primate conservation at Oxford Brookes University

Back in 1999, Professor Simon Bearder wrote to me while I was still completing my PhD at Washington University, St Louis, and asked me to advertise a new course he had validated – the MSc Primate Conservation, in the School of Social Sciences and Law. Having been inspired by the long-running and successful summer schools at Jersey Zoo, Professor Bearder thought there was a place for people who were passionate about studying primates but also in preventing their extinction. The course was met a bit with ridicule, a bit with interest – were there enough people who would do such a course and why would a bunch of monkey people study alongside lawyers, sociologists and international relations experts? But with primatology's long tradition within anthropology departments, and the already multiple decades presence of the Nocturnal Primate Research Group within Oxford Brookes University, the course was validated.

That first cohort was about 15 students from all over the world. I was invited to give a seminar to that group, and met them again in 2001, when I was hired to be the course tutor. Thus I have met every one of the over 400 students who have cared for primates enough to take this course over the last 20 years. These students came from many backgrounds. Some were traditional ecologists, many were anthropologists or psychologists. But so many others came from backgrounds as diverse as languages, literature, business and art. Many were active zoo keepers who wanted to learn more, or those who had volunteered in rescue centres and caught the bug. Others were retired or just a bit older but wanted to change their lives or become better informed. But by joining the course, they suddenly were with a cohort of people who felt the same as them – and every year when it happens, and those people who had been the only one in their family or friend group who had the monkey madness, meet their cohort of like-minded human primates, it never ceases to be magical.

Our students have done amazing things, working in over 50 countries, and on over 150 primate species. Though the apes still 'win' in being the most selected species to be studied, our students have also studied the more obscure primates, including mangabeys and kipunjis, aye ayes and indris, needle-clawed galagos and lorises, uakaris and titi monkeys, and tarsiers and snub-nosed langurs. They have created primate conservation education curricula, developed web sites, made films, and evaluated all these. They have named new species, rediscovered old ones, and found rare primates in countries where they were not known to occur. They have looked at primates from the perspective of humans, and humans from the perspective of primates. They have helped to improve husbandry practices and assessed the release of primates back to the wild. In short, they have made a significant and global contribution to primate conservation.

The story does not end with the accumulated effort of students' work on the course. Our alumni continue to strive to improve the plight of primates though their NGOs including Neotropical Primate Conservation, Project Anoulak, Lambas for Lemurs, and West African Primate Conservation Action, among many many more. Our students have published more than 100 scientific articles, presented more than 200 presentations at professional conferences, and sometimes 30 or more alumni, still active in the field, reunite at various primatological congresses. Our alumni have contributed authorship to listings for the IUCN Red List, appeared on international television documentaries, and helped to change international regulations for the conservation of primates. And they continue to help each other through this magnificent network – those that went on and succeeded continue to help the next generation with that generosity of spirit that helps them to conserve some of the most threatened species on earth.

I honestly cannot believe it has been 20 years since the course started. And I am ever thankful to be part of this community of conservationists. Let's look forward to another 20 years, and to a time when primates are safe and a course like this is no longer needed.

Anna Nekaris, Professor in Anthropology and Primate Conservation and Course Tutor

Alumni Interviews

As this is the 20th anniversary of the MSc Primate Conservation course and the 20th edition of Canopy, we thought it would be interesting to catch up with some course alumni to see what they did their MSc dissertation on, what they are doing now and what they think the next 20 years holds for primate conservation.

Amanda Webber (Cohort 2000-2001)

What was your master's dissertation on?

It examined the reactions and preferences of children in middle childhood to wildlife television – particularly focusing on differences in pace and style.

What do you do now?

I work at Bristol Zoological Society as a Higher Education Manager, responsible for a team of lecturers and relationships with academic partners. I also co-lead the Madagascar project for the society.

What do you think is the future of primate conservation for the next twenty years?

I 'hope' we will see greater understanding and collaboration between researchers from different disciplines.

Victoria Smith (Cohort 2001-2002)

What was your master's dissertation on?

It was focused on investigating the human communities of the Sabangau forests in Indonesia, their demography, attitudes and impacts.

What do you do now?

I'm the Client Manager for Pioneer Expeditions, a responsible travel tour operator who organize off the beaten track adventures in locations such as Madagascar and the Galapagos Islands.

What do you think is the future of primate conservation for the next twenty years?

I think that generally there is increased awareness about the impact of habitat loss; however, the next twenty years will be a critical period for primate conservation and conservation organisations will continue to face big challenges.

Matt McLennan (Cohort 2002-2003)

What was your master's dissertation on?

For my Masters dissertation I looked at the effects of different group size and composition on the welfare of captive chimpanzees, comparing 3 social groups at 2 zoos.

What do you do now?

I went on to do a PhD at Oxford Brookes in 2005 researching a previously unstudied group of wild chimpanzees in Uganda. After finishing, I resumed studying the chimpanzees at Bulindi and it's now a unique long-term study. In 2015, with my partner Jackie, I set up the Bulindi Chimpanzee and Community Project - a grassroots conservation project that provides support to local households, to help them accommodate the

chimpanzees in their landscape and facilitate coexistence. The project now reaches over 100 villages and helps conserve multiple groups of 'village chimpanzees'.

What do you think is the future of primate conservation for the next twenty years?
I believe the future of primate conservation lies in finding ways for humans and primates to coexist. Many primates will only survive in coming decades if the benefits of conserving them (and areas of habitat) outweigh the costs considerably - so primate conservation is dependent on understanding the human dimensions of conservation, addressing conflicts, misunderstandings and inequalities, and by improving people's lives.

Mandy Archer (cohort 2001/02 and 2002/03 Part time)

What was your dissertation on?
I looked at bringing conservation education into the UK education system, with specific emphasis on endangered primates, rainforest degradation and conservation. The project looked at the psychology of learning, the UK curriculum and different learning styles. I put together an education pack to be used in workshops, which included interactive elements as well as educational information of the topics to be covered; a support pack for the teachers to help with delivery, promotional materials for the workshops and a website to compliment the workshops.

What do you do now?
I still work at Oxford Brookes supporting undergrad and postgrad students in the department of social sciences both academically and pastorally. This includes the students on the primate conservation MSC and MRes, so I am still very much involved in the course and the department. I am also still organising the annual trip to Apenheul Primate Sanctuary each October. The trip is still as popular as ever and the coach journey still as long as it always was!

What do you think is the future of primate conservation over the next 20 years?
Things still look bleak for the future of some of the most critically endangered primates, as well as the planet. On the bright side we still have many enthusiastic scientists looking at climate change, conservation and technology to help fight the battle. Every year there are new students studying at Brookes who will be the future scientists and conservationists; With world class academics teaching here at Brookes, I am optimistic that we stand a chance of making a difference and I am proud to see these students graduate every year

Helen Buckland (Cohort 2003-2004)

What was your master's dissertation on?
I created a predictive model using GIS to identify the areas at forest most at risk from oil palm expansion in Central Kalimantan, Indonesian Borneo.

What do you do now?
I'm the Director of the Sumatran Orangutan Society (SOS), a conservation charity which exists to protect orangutans, their forests and their future. We deliver impact through frontline projects and partnerships which tackle the causes of deforestation as well as the symptoms, and strategic, impactful campaigns, bringing people together to work towards our vision of a safe future for orangutans in the wild.

What do you think is the future of primate conservation for the next twenty years?
I think that a greater emphasis on co-existence between human and non-human primates will lead to some exciting projects that put communities at the heart of conservation. We also need to think

of primates as icons for the global fight against climate change - as charismatic animals that act both as ambassadors for their incredible forests as well as barometres for the health of those ecosystems, primate conservation represents a key nature-based solution to address global challenges.

Sam Trull (Cohort 2004-2005)

What was your master's dissertation on?

This is one of my favorite questions that people ask me because then I get to see the look on their face when I explain that I measured aye-aye testicles every two weeks for a year! I was investigating if aye-ayes had any seasonal variation in the size of their testicles…spoiler alert…they don't! Most lemur species have been found to be very seasonal breeders, even in captivity. Finding out that aye-aye testicles didn't vary in size was good support for their non-seasonal breeding.

What do you do now?

I am the co-founder and Sloth Director of "The Sloth Institute" (TSI) in Costa Rica. We work to improve the welfare and conservation of sloths by conducting novel research on sloths as well as the rescue, rehabilitation and release of orphaned and injured sloths. We also have educational campaigns like our "Say No to Sloth Selfies" campaign and initiatives like our "Sloth Speedways" program to connect fragmented habitat. I started TSI 5 years ago, but I have been living in Costa Rica for 7 years now. I originally came to Costa Rica excited to work with monkeys but I stayed for the sloths! Although I feel a little bit like a traitor, everything I learned working with primates for so long and of course in the MSc program is applicable to sloths.

What do you think is the future of primate conservation for the next twenty years?

I think continuing to support small grass-roots nonprofits working in country is super important. The overhead costs are so much lower than for giant conservation orgs and their ability to truly be invested in a community is so important and I think is the only way to create a lasting impact. In addition, I think continuing to figure out how primates and humans can better co-exist is important because there sadly just aren't many 'pristine habitats' anymore. In general, In general, I feel future research should be more about how to apply the data to aid in conservation. One of the main goals of TSI is to blend rescue/rehab and science because historically they don't always overlap yet both fields need each other for a complete conservation plan. I think this combination will continue to increase in importance as the climate changes as well. Just like we saw in Australia, populations of species we once thought were 'safe' (like Koalas) could change in status in a very short period of time. Sadly, even small changes in the climate can have a devastating impact on wild populations and I think that trying to mitigate this damage will be our greatest challenge as conservationists over the next 2 decades.

Sam Shanee (Cohort 2005-2006)

What was your master's dissertation on?

My dissertation was a feasibility study for re-introduction of Critically Endangered brown headed spider monkeys in a small private reserve in north western Ecuador.

What do you do now?

Since 2007 I have been working in community-based conservation and anti-trafficking work for threatened primate species in Peru for a small NGO (www.neoprimate.org) I helped set up with others from the MSc. We mainly work in northern Peru, and aside from helping rescue animals, we are helping local communities mange protected areas on their lands (over 80,000 ha so far) through capacity building, reforestation, and research. In the last couple of years, we have been starting new projects in Peru and also set up a branch of NPC in

Colombia where our first project, making the species action plan for *Ateles fusciceps*, in now well underway.

What do you think is the future of primate conservation for the next twenty years?
Unfortunately you have caught me on a pessimistic day, so I think realistically primate conservation, and conservation in general will be in a very bad way in the near future. Between now and then it is just a case of saving as much as we can of what we can, so hopefully there are some primates and habitats left for the future. Daily I see smoke from forest fires and we are constantly called by authorities to help with rescuing animals from the illegal trade, and this is a situation repeat throughout the world's tropics. I honestly believe things will get much worse before they get any better. Research is important, but action is more important now, we know enough about what is going on to do something about it, so ALL fieldwork MUST have conservation as one of its key components.

David Ehlers Smith (Cohort 2006-2007)

What was your master's dissertation on?
I conducted a GIS analysis of the distribution of Borneo's primates and overlaid the land-use practices - mainly oil palm plantations - to assess the likely impacts and future trends.

What do you do now?
I'm currently finishing my fifth year as a post-doctoral research fellow at the University of KwaZulu-Natal in South Africa, where I'm supervising 5 PhD and 3 MSc students and conducting research on the functional connectivity of fragmented forests and grasslands of eastern South Africa, using bird and mammal communities as surrogate taxa for informing conservation management and guiding policy.

What do you think is the future of primate conservation for the next twenty years?
I believe the actions of the next 5-10 years will be a looking glass to the picture in 20 years. At current rates of climate change natural habitat conversion and human population increase, however, if things remain unchanged, primates will be just one order within the greater mass extinction of all biodiversity.

Tim Eppley (Cohort 2007-2008)

What was your master's dissertation on?
I conducted a preliminary study on the feeding ecology of the southern bamboo lemur in littoral forest fragments in southeast Madagascar.

What do you do now?
I am currently a Postdoctoral Associate with San Diego Zoo Global, a position that is split between Collections Husbandry Science – Primates, and Population Sustainability for the Institute for Conservation Research. I am currently using lemur behavioral ecology data to help direct lemur conservation efforts in the rainforests of northeast Madagascar, with a special focus on red ruffed lemurs and aye-aye.

What do you think is the future of primate conservation for the next twenty years?
I think that primate conservation, like all of conservation, is at a critical point as the earth will be faced with unprecedented levels of habitat degradation and population growth over the next 20 years. In spite of these challenges, emerging technologies are becoming more affordable and I believe these advancements for finer-grained data will greatly assist primate conservation efforts around the world.

Camille Coudrat (Cohort 2008-2009)

What was your master's dissertation on?

I conducted my master's dissertation on primate surveys in the Cardamom Mountains in western Cambodia, which resulted in a peer-review publication (Coudrat *et al*. 2011. *Oryx*, 45: 427–434).

What do you do now?

After completing my masters, I continued on with a PhD also at Oxford Brookes University; I conducted my PhD research in Laos on the species distribution, abundance and conservation in Nakai-Nam Theun National Protected Area, central-eastern Laos: implications for future local wildlife conservation project, from which several papers were published. This led me to the founding in 2014 of the non-for profit Association Anoulak (www.conservationlaos.com) dedicated to the long-term conservation and study of wildlife in their natural habitats in Laos, in particular in Nakai-Nam Theun National Park.

What do you think is the future of primate conservation for the next twenty years?

With the current rate of biodiversity loss, our work will need to concentrate on direct on-the-ground conservation actions, which will have to include collaborations between the in-situ and ex-situ experts. Understanding the ecological behavior of the most threatened species is important to be able to plan long-term species conservation with ex-situ breeding programs and in-situ reintroductions. I believe that conservation programs need to adopt a landscape approach to benefit to multiple species, ecosystems and local communities. My work in Laos at the local level these past 5 years have also shifted my focus on community work; the future of conservation will ultimately be the result of local communities' livelihood security and attitude towards nature.

Felicity Oram (Cohort 2009-2010)

What was your master's dissertation on?

My dissertation was a case study of three mother-daughter dyads titled "Infant development of wild orangutans living in degraded habitat". I continued with this work as a sideline to my PhD to contribute to the following paper: van Noordwijk *et al*. 2018. *J Human Evol*, 125: 38-49.

What do you do now?

I completed a PhD at the local university here in Sabah - University Malaysia Sabah last year. I am now a conservation practitioner working as Project Director for PONGO Alliance, a new initiative that engages oil palm plantation growers to provide essential collaborative support necessary to maintain wild orangutan meta-population viability in the mature planation-fragmented forest landscape of the Kinabatangan. I supervise two Malaysian MSc students also working on aspects of nonhuman primate adaption to anthropogenic change and am also a member of the IUCN Primate Specialist Group - Human - Primate Interactions - Subgroup - Primates in agro-ecosystems (human-primate-interactions.org).

What do you think is the future of primate conservation for the next twenty years?

Primatology is increasingly about human-nonhuman primate interactions - The future of primatology depends on field researchers who are not only fully committed to truly understand their study species in the face of anthropogenic change but are just as interested to work collaboratively with humans at all levels in locally relevant ways.

Lucy Radford (Cohort 2010-2011)

What was your master's dissertation on?

I did a literature-based study looking at the impacts of involving women in conservation initiatives in rural parts of primate range countries.

What do you do now?

I work for Sumatran Orangutan Society, a charity based just outside Oxford.

What do you think is the future of primate conservation for the next twenty years?

I think (and hope!) that many primate conservation projects will move towards using social science to inform their programmes. There is a growing body of research in this area and awareness seems to be growing about the fact that people MUST be properly included in conservation initiatives.

Penny Wallace (Cohort 2011-2012)

What was your master's dissertation on?

Working with the Angkor Centre for Conservation of Biodiversity (ACCB), I conducted over 200 interviews with local community members to establish the extent to which people in the area relied upon the forest as an income source within Phnom Kulen National Park, Northwestern Cambodia.

What do you do now?

I have worked for TRAFFIC, an NGO specializing in monitoring wildlife trade, for 4.5 years. My role is to coordinate TRAFFIC's work on wildlife crime and illegal trade. This includes liaising with TRAFFIC colleagues globally to ensure our work on wildlife crime is coordinated, complimentary, and is working towards our overall programme goal, being involved in strategic planning, priority setting and monitoring and evaluating TRAFFIC's impact in the area of wildlife crime, liaising with partner organisations and stakeholders, and working on project activities.

What do you think is the future of primate conservation for the next twenty years?

The future of primate conservation is multi-faceted. The use of new and emerging technologies, research and education and data sharing amongst NGOs, governments, law enforcement and other stakeholders could be key tools for future conservationists working across the sector, from site-based management to illicit trade.

Daniel Bergin (Cohort 2012-2013)

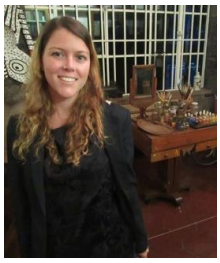
What was your master's dissertation on?

I started an investigation into the trade of Barbary macaques in markets in Morocco, though it became obvious that macaques were not the only species that were under threat from trade in North Africa so I included every species that I could find in the markets – ultimately 39 species, including tortoises, leopards, zebras, ostriches and owls.

What do you do now?

I mostly work with NGOs to help them develop more effective wildlife trade demand reduction campaigns that reach a greater number of people and have a bigger impact. I work for GlobeScan, an independent research consultancy and a B Corp (a business that is legally required to consider the ethical impact of its decisions on its workers, customers, suppliers, community, and the environment). We do consumer surveys that gather information on who is buying wildlife products, why they are buying them and how we can reduce or stop people buying them.

What do you think is the future of primate conservation for the next twenty years?
I think we are facing an uphill battle, but I think the knowledge we have, the resources and the will to change things are stronger than ever. We are seeing people embracing technologies that will lead to a huge increase in the efficiency of many field data collection techniques and I hope to see this become more widespread. I think we will see more collaboration with other disciplines (computer scientists for example) as this can dramatically improve our research effectiveness and efficiency. I think people now understand that primate conservation does not exist independently from community engagement, land management, climate change research, etc. and I think we will see increasingly effective initiatives as these, and other research areas, are brought together.



Denise Spaan (Cohort 2012-2013)

What was your master's dissertation on?
My master's dissertation aimed to understand the ecological factors that affect detectability and site occupancy of the Critically Endangered brown headed spider monkey in Tesoro Escondido, NW Ecuador.

What do you do now?
I am a postdoctoral researcher at the Universidad Michoacana de San Nicolas de Hidalgo, in Mexico. My research looks at understanding how Geoffroy's spider monkeys are affected by anthropogenic, natural and climatic changes in their environment through a mix of approaches including behavioural studies, population monitoring and vegetation ecology.

What do you think is the future of primate conservation for the next twenty years?
I think that primate conservation will become increasingly multidisciplinary, and focus on international collaborations between partners from academic and applied conservation. I hope that community-based conservation programs become more common.

Jesus Martinez (Cohort 2013-2014)

What was your masters' dissertation on?
My masters' dissertation focused on an analysis of seasonal and interspecific variations on behavioural and ranging data of free ranging groups of the two Bolivian endemic and threatened titi monkeys.

What do you do now?
After finishing the master's course, I returned to the Wildlife Conservation Society to work as a Researcher on threatened wildlife. My work is focused on research for conservation, trying to provide valuable information about wild species to inform conservation actions. In addition, my work has expanded to include activities more directly linked to biodiversity conservation, for example, I was involved in the development of management plans for protected areas in my country. This has resulted in an area of around 1.4 mil ha that will be managed to conserve biodiversity and promote the sustainable use of natural resources by local people. As a result of this work, the two endemic titi monkeys are now seen as conservation ambassadors promoting potential benefits for all the biodiversity in that area, which includes other endemic and iconic wildlife.

What do you think is the future of primate conservation for the next twenty years?
In my opinion, the work in primate conservation needs to be done in collaboration with other conservation efforts in order to face the increasing threats to primate biodiversity. We still need to continue the effort to understand the variety of biological and ecological features of primate species to better understand their requirements to ensure their conservation. The fact that new species are still being discovered and the lack of biological and ecological information for most of the primate species represent an important signal about what kind of research is required.

Elena Racevska (Cohort 2014-2015)

What was your masters' dissertation on?

My MSc dissertation was on the human-animal relationships between captive western lowland gorillas and their keepers. I aimed to investigate whether these relationships can be regarded as a type of enrichment. I was very happy to publish some of my results in Canopy, and some in Journal of Zoo and Aquarium Research.

What do you do now?

I have returned to Oxford Brookes University and am currently in the final stages of my PhD write up, exploring how the presence of the red-collared brown lemur, a frugivorous lemur, hugely important as a seed disperser, affects forest regeneration, and in turn, the lives and livelihoods of the local human communities living in proximity to the forest. I am currently also an associate lecturer on two modules for undergraduate and master's students. I really enjoy teaching and would love to stay in academia.

What do you think is the future of primate conservation for the next twenty years?

I think that both the importance of and the opportunities for public engagement and education are increasing, and so is the public interest in the conservation issues. It is therefore up to everyone working in conservation to share not only the knowledge gained first hand, but also to highlight any way, big or small, in which members of the general public can help with conservation efforts - or at least not worsen them. It's important to find a balance, however, between raising awareness of all the issues faced by the numerous primate species worldwide, and sharing the positive stories of conservation success, however small, to inspire people in believing that it is still not too late to save these iconic animals.

Claire Cardinal (Cohort 2015-2016)

What was your master's dissertation on?

I created an innovative education programme in Java and Viet Nam that combined science and puppetry to inspire teenagers to value their native wildlife. My aim was to promote caring attitudes towards wild animals alongside knowledge gain.

What do you do now?

I am continuing on with a PhD at Oxford Brookes. I am using an ethnoprimatological approach to investigate the impact of hunting by humans on lemur ecology and demography in south-eastern Madagascar.

What do you think is the future of primate conservation for the next twenty years?

I think that collaboration will be key to future successes in primate conservation. Collaboration between conservationists, collaboration between disciplines, so that we can share experience of successful and unsuccessful strategies. And most importantly, supporting conservationists in primate range countries to help them develop skills and resources to protect their local wildlife and habitats.

Marika Roma (Cohort 2016-2017)

What was your masters' dissertation on?

For my master's dissertation I investigated the tourist effect on lemurs and how different levels of interaction with lemur's influence tourists' perceptions.

What do you do now?

Right now, I'm working for Lush Italy but I'm also looking for a new occupation (hopefully in conservation!). Last year I worked for 4 months as Forest

Conservation Manager on Nosy Komba.

What do you think is the future of primate conservation for the next twenty years?
This is an equally interesting and scary question. I think that primate populations will decrease and that some of the most habitat-specific species will likely go extinct but, as environmental awareness and technology are spreading, I also think that we will manage to protect a good majority of the species and that we will do our best to keep them viable. Maybe I'm an incurable optimist, but if we take seriously what climate scientists tell us and manage to amend our mistakes, I really think there might be a positive outcome to this situation.

Ellie Darbey (Cohort 2016-2017)

What was your masters' dissertation on?
It was on factors influencing the presence of samango monkeys in Afromontane forest patches of Nyika National Park, Malawi. Things did not quite go to plan - which I'm sure is the case for everyone, and we ended up just not having enough data to determine clear reasons for monkey presence in a forest patch. However, we did find quite a few monkeys in this extremely isolated habitat, and it was the first record of them there since the 70s so that was exciting!

What do you do now?
I am currently the Scientific Events Coordinator for the Zoological Society of London (ZSL). As well as organising free monthly lecture series on specific science & conservation topics (www.zsl.org/science/whats-on), I also produce the ZSL Wild Science podcast with the speakers from each event, and manage the Science department's social media.

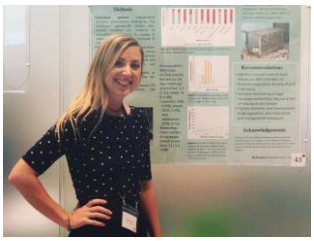
What do you think is the future of primate conservation for the next twenty years?
This is a really difficult question to answer, but the only thing I feel I can confidently say is that the future of primate conservation will only improve if we encourage interdisciplinary collaboration. There are obviously the well-known greatest threats to primate species, but we will only be able to combat these by working together as they are not issues affecting solely one taxa. Hopefully science communication will have a part to play as well, to connect researchers across different fields, and encourage or inspire young people to pursue environmental sciences or conservation as a career.

William Westwood (Cohort 2017-2018)

What was your master's dissertation on?
I conducted interviews with the residents of and pilgrims to Mihintale, Sri Lanka. An important religious and archaeological site, Mihintale claims to be the world's first wildlife sanctuary. My aim was to form a clear understanding of how the local primate populations are conceptualised within the context of the surrounding religious site.

What do you do now?
Something completely different funnily enough, I work for Oxford Brookes in outreach and widening access for students from disadvantaged backgrounds.

What do you think is the future of primate conservation for the next twenty years?
That's a difficult question. With so many facets of the field, I think all the branches will continue to develop as pressure on species increases. Though I suspect more and more focus will be given to understanding the effects of extreme anthropogenic landscapes on primate populations. Pristine habitat is dwindling and if large populations are to continue to exist, it may have to be in human manufactured landscapes. Although that is a bit pessimistic. I encountered an inexhaustible amount of energy and passion in the community, if a solution can be found, I believe primatologists can!



Devan Schowe (Cohort 2018-2019)

What was your masters' dissertation on?

My master's dissertation focused on evaluating the source and welfare status of the northern pig-tailed macaques used to harvest coconuts in southern Thailand.

What do you do now?

Right now, I am in the process of applying to jobs focusing on either fund-raising or research/data analyst positions with wildlife trade/conservation-oriented organizations. I plan to work for a few years and then apply for PhD programs to continue working on my master's topic or a related area.

What do you think is the future of primate conservation for the next twenty years?

It is my hope that primate conservation will improve through increased efforts put towards protecting the earth's resources in a time where events related to global climate change are at an all-time high for our lifetime. With an increased emphasis on the protection of these resources, e.g. land protection, perhaps we can simultaneously protect other species that live in these rich areas as well (i.e. primates). I also hope that we can use the popularity of social media as a tool to continue to raise awareness about online practices that perpetuate the decline of primate species (e.g. harmful selfies). We have an incredible amount of current resources to improve primate conservation- we just need to put them to good and logical use!

Annette Gunn (Cohort 2018-19)

What was your masters' dissertation on?

Nocturnal mammals in Ba'Aka culture, Dzanga-Sangha Protected Areas, Central African Republic. I was doing a nocturnal survey but with a focus on Milne-Edwards's pottos and golden angwantibos and the relationship that the Ba'Aka have with nocturnal mammals in their traditional culture.

What do you do now?

As a recent graduate, I am currently the first UK intern for West African Primate Conservation Action (WAPCA), a Ghana-based conservation NGO working to protect the habitats and populations of mangabeys and guenons in West Africa. Additionally, I am refining some papers for publication, preparing to present my research at the British Ecological Society Annual Meeting (Belfast, 2019), organising the second BIAZA Nocturnal Primate Workshop at ZSL London Zoo and completing a variety of illustration commissions.

What do you think is the future of primate conservation for the next twenty years?

With positivity in mind, I am hopeful that populations of threatened primates (and other wildlife species) may increase in the next twenty years due to heightened collaborations between conservationists, educators, zoological collections, landowners, government officials and society. I believe that this is attainable through continued conservation education and injections of in-country governmental support to supplement local human communities (who rely on income from these activities) and break down the syndicates that thrive on illegal trading. It is now up to us to monitor the changes, convince the appropriate parties and direct our passion towards making the next twenty years a success for all species.

The effects of structural and feeding enrichments on captive western hoolock gibbons at the rehabilitation and release centre HURO Programme, India

Lauren Arnaud-James
Cohort 2018-2019
lauren.arnaudjames@gmail.com

There is an estimated presence of 32 different primate species in India (Kumar *et al.*, 2009), however, only one species of small apes: the western hoolock gibbon (*Hoolock hoolock*). Gibbons are arboreal, territorial and mostly monogamous (Ahsan, 1995), characterised by their unique vocalisations and which can be heard over more than 2 km (Brockelman *et al.*, 1973). Three species of hoolock gibbons have been identified, the eastern hoolock gibbon (*H. leuconedys*), the western hoolock gibbon (*H. hoolock*) (Groves, 1967) and the Skywalker hoolock gibbon (*H. tianxing*, Fan *et al.*, 2017). The western hoolock gibbon is classified as one of the most threatened gibbon taxa in the world (Mittermeier *et al.*, 2009) and is categorised as Endangered in India on the IUCN Red List (Borah *et al.*, 2014). Most threats to hoolock gibbons are anthropogenic, such as the pet trade, habitat degradation, or illegal hunting (Chetry & Chetry, 2011). The presence of gibbons and other primates is essential to their habitat since they disperse seeds (Cheyne, 2009), act as pollinators or food for predators (Gupta, 2005). Hence, rehabilitation and release centres can play a major role in the conservation of western hoolock gibbons in India, since rescued individuals can be rehabilitated and released in a suitable habitat when ready, ensuring viable wild populations.

The aim of this study was to assess the impacts of different enrichments in various enclosures in a gibbon rehabilitation centre in the northeast of India. From May to July 2019, two types of enrichments were tested (environmental enrichment EE and feeding enrichments FE) in three enclosures: one enclosure housing an individual subadult male, one enclosure housing an adult pair, and one enclosure housing a family of four (one adult female, one adult male, one male sub-adult and one juvenile). Each enclosure was observed two hours a day, between 6am to 4pm, six days a week, using the instantaneous sampling method (Altman, 1974) with 3-minute intervals to guarantee independence of data (Akers *et al*., 2013). A total of 184 hours of data was collected. The male housed alone, Ragnar, displayed a large amount of stereotypical behaviour (SB) which was recorded on a continuous basis to record the length of time and the frequency of the swinging displayed. The main behaviour, location in the enclosure, substrate used, proximity with other individuals and weather were recorded for each focal point. The

behaviours were mutually exclusive: an individual engaged in feeding was recorded as 'Feeding' regardless its position (sitting or hanging for example, as these behaviours fall into the 'Resting' category). Four weeks of observation have been conducted: a first test-week without any enrichments to record behaviour in initial conditions, a second week with the EE, a third week with the FE, and a fourth week with a return to initial conditions, to assess how the behaviour and activity of the individuals changed over various enclosure conditions. The EE consisted of a swing attached to the top of the enclosure, while the FE consisted of three different items: a bamboo tube with a cover, a bamboo tube with a hole, and milk cardboard bottles cut in half and slotted together.

The results show a greater interaction with the FE than with the EE, which correlates with other studies conducted on enrichments in captive primates, reinforcing the assumption that FE is an effective tool for captive animals in order to enhance wild behaviours and to provide environmental complexity in the captive settings (Clark & Melfi, 2011). Out of the three different enrichments, the milk bottle was overall the enrichment most interacted with, which could be explained by the flexibility and manoeuvrability of the material: indeed, objects which can be easily moved around and destroyed have higher interaction recorded than more rigid objects (Videan *et al.*, 2005), since it provides the individuals with control on their environment and sensory stimulation (Bloomsmith, 2017), which is essential to captive animals. The milk bottles were small, light, and easy to chew on or play with. The FE had a great influence on the swinging patterns of Ragnar, who drastically reduced his time spent in swinging and replaced with a significant increase in play bouts. The effects of the swing on the SB were not as important, which suggests that FE can not only increase the time spent foraging and feeding (Celli *et al.*, 2003), but can also fulfil other goals, such as integrating play activities. However, Ragnar engaged in SB again when all the enrichments were removed, which suggests that enrichments do not necessarily have long-term effects but allow temporal enrichment. The swing mostly sparked interest in the younger individuals who used it to hang or sit or integrated it in their locomotion patterns, while older individuals were not seen engaging with the swings. These results suggest that different enrichments can have different effects on different individuals, hence the importance of integrating various enrichments regularly, to stimulate all individuals and all behaviours. Overall, the enrichments affected the activity budgets of the individuals, since behaviours such as resting decreased when enrichments were present, and play, social, feeding, and locomotion behaviours increased. These results suggest that enrichments positively impacted the activity patterns of the gibbons,

since they reduced their time spent in idle activities and increased their general activity.

The study also looked at height and substrate use by the gibbons: overall, the gibbons at the rescue centre use behaviour-appropriate heights similar to those of wild gibbons. Indeed, some behaviours are displayed at high, medium or lower levels of the canopy (Gittins, 1983), and those patterns were displayed by the gibbons at the rescue centre. For example, resting usually takes place in high layers of the canopy to avoid predators (Cheyne *et al.*, 2012). The presence of a bamboo platform and a hammock in two enclosures allowed the individuals to rest in high levels of the enclosures. One of the enclosures did not contain a high substrate for resting but the individuals instinctively used high levels of the bamboo substrates to rest. Additionally, all the gibbons displayed a preference for the bamboo substrates which composed the structure of the enclosures.

Several important conclusions can be made from this study: enrichments should be an integral part of rehabilitation, they should be varied, regular and of different nature, as well as suit the needs of individuals and groups. Additionally, when designing enrichments, the notions of control and predictability, the material, weight, mobility, and other possible uses should be considered.

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The role of sacred groves and community forests in biodiversity conservation: An example from Outamba-Kilimi National Park

Zoe Cooper
Cohort 2017-2018
zoecooper1@hotmail.co.uk

Over the last 8,000 years the Earth's forest cover has almost halved, with much of this lost in the last four decades (Bryant *et al.*, 1997). The disappearance of natural forests in developing countries is a problem because it negatively affects the livelihoods of people dependent on forest products and services (Sunderlin *et al.*, 2005). An estimated two hundred and forty million people live in forested areas, constituting 18.5% of the 1.3 billion people living on environmentally fragile lands (World Bank, 2003). These communities acknowledge the important role of the forest in providing fertile agricultural land, vital medicinal plants, building materials, food, a source of income and protecting watersheds, amongst other socio-economic, cultural and environmental values (Ite, 1997). It is commonly assumed that rural indigenous people are more respectful of their environment than most other societies (Colchester, 2000) but, in reality, people's relationships with forests are diverse and dynamic. It is now widely accepted that it is likely that low population densities and limited technologies, rather than a specific conservation ethic, have played a large role in the preservation of many forests (Horowitz, 1998). Due to this, protected areas (PAs) have more often than not been created with a strict preservationist perspective, often referred to as a 'fortress and fines' model (Heinen & Mehta, 2000). Through this model, local communities are prohibited from utilising natural resources, which they previously relied on for their livelihood and subsistence needs. This imposition of rules has often generated negative attitudes towards PAs, PA staff, and conservation as a whole (Sunderlin *et al.*, 2005), often leading to illegal natural resource extraction.

The issue with denying local communities usufruct rights to resources inside a PA is that

they are left with no other livelihood options, and are, as such, often pushed deeper into poverty. One solution to this issue has been the creation of community forests. A community forest is a forested area outside, but often near to, a PA. Community forests are managed by the local communities and the aim is to improve the livelihood and welfare of rural people, whilst also conserving natural forest systems through local participation and cooperation (Bhattarai, 1985). Local community groups negotiate, define, and guarantee among themselves an equitable share of the management functions, entitlements, and responsibilities for a given set of natural resources (Borrini-Feyerabend *et al.*, 2000). Community forests are designed to reduce the pressure on the natural resources inside PAs. At Bardia National Park (NP), Nepal, proximity to the buffer zone community forest was found to be an important factor. Those closest to the community forest had provisions for resource extraction and were thus less dependent on park resources (Shova & Hubacek, 2011). Community forests do not completely stop local communities from using the resources inside PAs, however, they provide a great number of provisions, which local people will exploit before utilising those inside the boundaries of a PA. Here, I explore the benefits a community forest is bringing for local people and conservation in Outamba-Kilimi National Park (OKNP), Sierra Leone.

OKNP is Sierra Leone's first National Park, officially gazetted in 1995. It is located in the Northern Province (9.7324°N, 12.0261°W) and is part of the newly demarcated Karene District. My research was undertaken in the Outamba Section of the park, encompassing 750km^2. Outamba is a mosaic landscape made up of eight major vegetation types; woodland savannah, open savannah on rock outcrops, open savannah, riverine forest, high forest in valleys, farm bush, and farmland. Outamba is unusual as a NP, in that there are around 30 communities living within the boundaries of the NP. During the set up of the park, the aim was to relocate all the villages that lived inside the proposed boundaries. However, due to a lack of funding and a civil war (1991-2002), the relocation never happened. Thus, communities living inside the boundaries are forced to illegally extract resources from the forest for survival. The study village and location of the community forest is the village of Kotor, located in the 1 mile buffer zone that surrounds the park. Kotor is part of the Tambakha Chiefdom and the Fintonia or Paramount Chief Section of Tambakha. The Tambakha Chiefdom are predominantly Susu people, who follow Islam mixed with traditional beliefs. Kotor is larger village, consisting of 38 houses, and approximately 480 people. Communities within the buffer zone are legally allowed to continue traditional techniques of farming and

resource extraction to a certain limited extent.

Semi-structured interviews were the main method used to gather information in Kotor. With the aid of my translator information was gathered on the beliefs, rules, rituals, and animal presence in the community forest (Gray, 2004). Interviewees were selected with the help of my field guide and translator, however, focused around one family who owned the land on which the community forest was located. This family were well respected in the village, with one man being the 'youth leader' in Kotor, a position of an elder who is in charge of men up to the age of 30 in the village. He also controls the community forest since it is part of his family's land.

Photo elicitation methods were also used to gather information on animal presence in the community forest. A total of 72 flashcards of mammals, whose known range are in or near to OKNP, were used to conduct pile sorting exercises. Pile sorting is known to be a powerful method for exploring and contextualising norms (Yeh *et al.*, 2014). Participants were asked to divide the species into piles in relation to the community forest. The piles were; 'seen often', 'seen' 'seen but not often', 'not seen' and 'unknown'. Transcripts were entered in NVivo and coded in nodes for simple analysis. These qualitative data are presented descriptively and analysed to put it into the context of the literature.

The people of Kotor have access to what was once known as a sacred grove, which has been conserved since the time of their forefathers. Legend says that trees from the sacred forest were used to build the original 30 houses, which first made up the village of Kotor. Since then, the people of Kotor have guarded the forest and tailored it to their needs, planting trees within it, which are useful for their livelihoods. In 2011, the Sustainable and Thriving Environments for West African Regional Development (STEWARD) Programme came to Kotor to turn their sacred grove into a community forest. This process involved extending the original sacred grove and placing some level of protection over the land area. The community forest now stands at 107 ha. Together, Kotor and STEWARD agreed to extend the area and protect the forest for the animals. Today the main uses of the community forest are for medicinal plants and building materials for their houses.

Every belief surrounding the community forest is deeply embedded in traditions, witchcraft, and secret societies. The community forest is home to a cave, next to which sacrifices of livestock are made, along with an offering of gold. Ceremonies are held for various reasons which are very secretive. One such ceremony, which is often cited, was one which ensures that all women that year will give birth to a health baby. There is a belief that, since there are living things that

they use from the community forest, they must also give something back, hence the sacrifices. They believe this helps them to live a fruitful life. For example, everywhere else in Tambakha Chiefdom communities experience shortages of water on an annual basis. Kotor never experiences a shortage of water. Although this is likely due to their close proximity to the large Kaba River, they attribute this to their secret societies and respect for the forest.

It has long been believed that the devil resides within the community forest. As the devil lives there hunting is, and reportedly always has been, strictly forbidden. The belief is that, if you were to even try to hunt, or set a trap, the hunt would fail, and you would be persecuted by the devil. This strict prohibition on hunting has meant that the community forest is abundant in fauna, including many primate species and elephants. Results from the pile sorting exercise revealed that all bar six of the 72 mammals on the flashcards were reported to have been seen in the community forest, which would make the community forest extremely abundant in terms of mammalian fauna.

The members of Kotor do still rely on the natural resources of OKNP to sustain their livelihoods. However, without the community forest, they would be relying on those resources much more intensely, having negative effects on the conservation of the park. Ensuring the survival of the cultural significance and religious taboos that surround the community forest will be imperative for its survival and the preservation of the resources that Kotor rely on so heavily. Notions of the sacred play an important role in protecting certain areas of forest, as well as species that make no direct economic contribution to the residents (Horowitz, 1998), such as the animals of the community forest. A community forest may be considered a common resource pool, and as all co-owners directly experience the costs and benefits of resource management, it is in their interest to monitor each other's behaviour. Thus, the longevity of the community forest is ensured by the needs of current and future generations.

Overall, the community forest serves an extremely important purpose, both for the livelihoods of the people of Kotor and the conservation of the animals of OKNP. The variety of species reported to be seen in the community forest is very high, considering the size of the forest. Although the reports may not be entirely accurate, it points towards the community forest harbouring populations of important species. The conservation value the community forest brings to OKNP is twofold. From one perceptive, it lessens the pressure of natural resource use by Kotor, one of the largest villages in Tambakha, on the park. This allows these resources to be exploited by the biodiversity of OKNP. On the other hand, the existence of the community forest and the

ability of the members of Kotor to exploit its resources have likely garnered more positive attitudes towards the park and its conservation aims. Conserving the cultural and social norms and taboos that surround the community forest will be imperative to its success and survival, in particular for the fauna of the community forest, which right now are in a haven, protected by the religious taboos around hunting.

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Gibbon responses to tourist density in a novel semi-free ranging environment

Deborah Davidson
Cohort 2018-2019
ddavidson618@gmail.com

In the wake of the exponential growth of the wildlife tourism sector (Paramati *et al*., 2017) there is growing urgency to better understanding of how best to view and interact with wildlife while causing the least amount of damage to their overall conservation and individual welfare. While traditional wildlife viewing areas such as zoos and aquariums have fostered a long-term research presence, animal responses to visitor density in free-roaming/semi-captive areas have scarcely been recorded. However, the

few reports that do exist state the apparent species-specific nature of reactions and interactions, making individual species assessment vital (McKinney, 2014; Bach & Burton, 2017).

Lar gibbon behavioural research has a well-established presence in both wild and captive settings dating back to the 1920's. This makes them an excellent species to study in new or novel habitats, as scientists have an existing understanding of their behaviour. Many conservationists believe that the survival of gibbon populations and their genetic diversity are reliant on the maintenance of wild areas (Fan & Bartlett, 2017); however, traditionally wild areas, even protected ones, are becoming increasingly sparse. With deforestation, shifting agricultural practices, and growing ecotourism ventures, there are very few places where animals, especially primates, are left undisturbed by humans (Estrada *et al*., 2017). Understanding how gibbons behave and adapt to different managed environments, and the humans that come with them, can inform better management strategies and prevents harmful human-primate interactions through educating tourists (ie. signs, speech before park entry, etc.) or limiting interactions with certain species (McKinney, 2014). Captive spaces and other human controlled settings provide opportunities for ethologists to evaluate the spectrum of habitats species can cope with and deduce what is most important for their welfare.

I investigated the behavioural responses of two lar gibbons (one adult male and one adult female) in accordance with tourist density in a novel semi-captive environment at Monkeyland primate sanctuary in Plettenberg Bay, South Africa. There are approximately 400 individuals across 10 primate species free roaming the forest including two lar gibbons (*Hylobates lar*). All inhabitants of the forest originate from a variety of captive backgrounds (ie. labs, zoos, safari parks, homes, breeding farms, etc.) and undergo a strict quarantine and dehumanization process upon arrival. Monkeyland is open to the public all days of the year from the hours of 8:00 to 17:00. Tour groups range from one to a maximum of sixteen individuals and are only allowed into the forest with the presence of a trained guide who enforces a strict no touching policy between humans the primates.

For the female, vigilance rates were similar across all tourist density categories, with a slightly higher rates in the presence of 0-4 tourists (none and small tourist groups, Fig. 1). The female's resting behaviour occurred twice as much in accordance with small or no tourist groups. Unlike the male, whose bipedalism was relatively evenly distributed throughout tourist group size, the female was significantly more bipedal in the presence of large tourist groups. Brachiation rates were

highest in the absence of any tour groups. The females feeding rates remained consistent across all tour group categories. Self-grooming occurred at a significantly higher rate in the presence of medium tour groups for the female but not the male (Fig, 2). Additionally, the female was significantly less vocal in the absence of tourists. The female showed no significant differences in rates of aggression across all tourist categories (χ^2 2100,27 =83.002, p=0.00).

The male was significantly more vigilant in the presence of medium and large groups, while resting twice as much in the presence of small groups of tourists and no groups of tourists ($\chi^2$2010,27=133.4, p=0.00). Feeding occurrences and small tourist group presence were positively correlated. Vocalisation rates for the male were not significantly correlated with tour group size. Interestingly, self-grooming occurred at a much higher frequency in the presence of small and large tour groups, with the lowest frequency in the absence of tourists. Rates of aggression by the male in the presence of large tour groups were not statistically significant but were approaching significance (p=0.06).

Both the male and female gibbon at Monkeyland displayed a number of significant differences in behaviour when in the presence of large compared to small tourist groups, consistent with Cooke and Schillaci's (2007) observation of individuality in behavioural responses across multiple sampled gibbons. Both sexes rested significantly less in the presence of medium and large tour groups and significantly more when small or no tour groups were present. This is important to highlight for wildlife tourism managers who are considering how certain

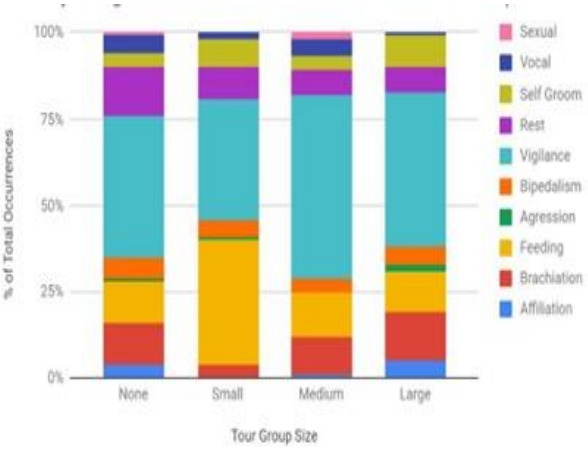

Figure 1. Activity budget of adult female *H. lar* in relation to tourist density

maximum and minimum visitor densities may affect the daily routines of the animals being viewed. Conversely, this result may add to the growing body of literature that show moderate visitor presence providing enriching or novel stimulation for captive animals (Fernandez *et al*., 2009). The increased vigilance by the male and increased bipedal travel by the female in the presence of higher tourist densities could point towards a stress response from the gibbons regarding high tourist density, however, the absence of any threat, territorial displays, stereotypies and ability for the gibbons to easily move out of sight, point towards the conclusion that while tourist density does affect their behaviour, it

does not appear to have a significantly deleterious effect on their welfare. My results add to the greater conversation of how tourist numbers and interactions affect wildlife in managed settings, however, it is vital to reiterate that these results are species and habitat specific.

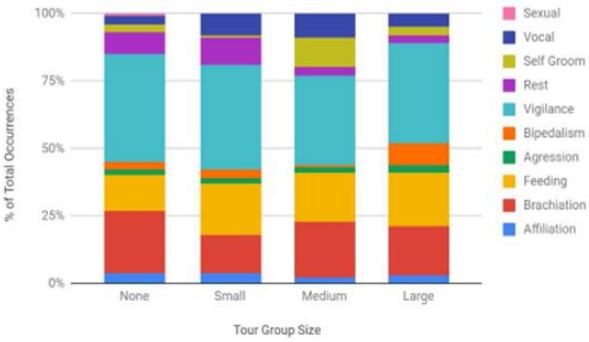

Figure 2. Activity budget of adult male *H. lar* in relation to tourist density

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A brief assessment of Minyak kukang (slow loris oil)

Matthew Gardiner
Cohort 2017 – 2018
matthewsgardiner@hotmail.com

There are five species of slow loris present on the archipelago of Indonesia: the Javan slow loris (*Nycticebus javanicus*), sunda slow loris (*N. coucang*), bangka slow loris (*N. bancanus*), Bornean slow loris (*N. borneanus*), and the Kayan River slow loris (*N. kayan*) (Estrada *et al.,* 2018). All wild populations face a number of threats and the IUCN Red List lists all assessed species as having decreasing populations (*Ibid*). Trade is the largest, and due to widespread internet availability/usage ever increasing threat to these cryptic animals (Nekaris *et al*., 2010; Estrada *et al.,* 2018).

Slow lorises populations face a wealth of additional threats in the wild; one of these which have received relatively little attention is traditional mysticism. Traditional mysticism is often linked with traditional medicine which

has been highlighted as a significant threat on several occasions; yet remains largely unquantified (Nekaris *et a*l., 2010). Mystic beliefs differ from traditional medicine as they do not seek to cure an ailment, or perceived ailment but are employed as 'magic' to influence the users' life and fortune. Lorises are exploited in traditional medicine in numerous ways; dried, fermented in rice wine, consumed and various accounts of slow loris derivatives being used in traditional 'cures' (*Ibid*). However, little is published about the role of 'magic' on slow loris species conservation. Magic is a prominent cultural belief within Indonesia and the widespread adoption of the internet is expanding this practice (Hardon *et al.,* 2015).

Slow loris oil (*minyak kukang*) has been mentioned within academic, and popular articles on several occasions as "used for traditional medicine and as a love potion" where the animal is "*burned alive to obtain a liquid*" (Anonymous 2008) – however, much knowledge on this use stems from non-peer reviewed sources and requires additional investigations to quantify the frequency, usage and contents of minyak kukang within Indonesia (Nekaris *et al.,* 2010). To assess the influence of slow loris oil I evaluated content from online advertisements selling the product; with a focus on method/contents, medicinal/traditional usage and where available, sales metrics.

The two largest online sales channels within Indonesia: Tokopedia.com and Bukalapak.com were assessed using the search term "minyak kukang". Information was categorised and collated to allow comparisons between sellers. The top 20 google.co.id search results for the term "*minyak kukang*" were also assessed for additional qualitative information on minyak kukang from the sellers, manufacturers and users of the product.

Slow loris oil was offered by 59 different sellers on Tokopedia.com (n=37) and Bukalapak (n=22). The price ranged from 10,000 Rp to 1,200,000 Rp with a mean value of 338,772 Rp (~£17.20); with the highest selling offer (n=108) costing 100,000 rupiah (~£5.08). The combined products received to date 1,5174 views and 259 site confirmed sales. Ten offers have received customer reviews with a mean rating of 4.16 stars (out of a maximum of ten). Combined the offered products have been added to 310 users 'wish lists'. Sales, views and associated metrics can be found in table 1. The practice is attributed to traditional beliefs from the Bnjarese ethnic group of Borneo.

Table 1. *Detailing the mean customer sales, offer price, product views, 'wishlist' (whereby a buyer stores the product for later purchase), review (1 – 5 star rating) and total site confirmed sales.*

	Offers	*Price (Rp)*	*No. sold*	*Views*	*Wishlist*	*Review (1 - 5)*	*Total sold*
Tokopedia	39	324,640.36	6.44	237.77	6.97	4.10	147.00
Bukalapak	22	312,643.48	4.87	6,852.00	66.00	4.25	112.00

The sited traditional usage as a 'love potion' does not adequately summarise the traditional/mystical belief associated with slow loris oil. The oil is advertised as binding or locking individuals together; creating a strong bond which can be romantic in nature; but can also be used to control a person or even to "*untuk menjinakkan hewan buas seperti macan dan singa*" (tame the savage animals like tigers and a lions) (Tokopedia 2018). The mystic belief states the affected person will become emotionally unable to be separated from the user.

The oil is also promoted as a sexual aid. One seller describes the power and usage as 'lust' oil: "*Membuat "basah" lawan jenis tanpa bersetubuh! (bagi pengguna pria), Mampu membuat "ereksi" lawan jenis tanpa bersetubuh! (bagi pengguna wanita)*" (Make "wet" opposite sex without intercourse! (for male users). Able to make the opposite sex "erection" without intercourse! (for female users): Translation by the author). Such mystical sexual aids are becoming commonplace amongst younger men and women within Indonesia (Hardon *et al*., 2015).

Different lorises are described as being used to create different oils. A loris in oestrous is proposed as creating the most effective lust oil, a male loris can be used to make good fortune oil, a deceased member of a breeding pair of lorises is proposed as making the best love-binding oil. Such beliefs stem from several main discourses; traditional mystical knowledge, ecological information about slow lorises, religious affiliation/beliefs and scientific explanations.

A commonly proposed belief stems from ecological information based on the grip of lorises when in trees: "*tidak akan lepas kecuali si Kukang itu sendiri yang ingin melepaskan nya"* (will not be released unless the slow loris himself wants to release it) (Tokopedia, 2018). Beliefs relate to other documented superstitions and beliefs relating to slow lorises. It is documented by sellers/manufacturers of the oil as an additional reason for the superstition as a 'love potion' stems from lorises mating system and proposed monogamous breeding pairs. Sellers detail how loris mates embrace each other to sleep, breed for life and embrace when one of the pair dies; with the second dying shortly after. It is proposed this

affinity can be transferred to the user and their chosen target.

Figure 1. Detailing examples of product images from Tokopedia.com of 'minyak kukang'.

Biological explanations of the effect of slow loris oil are also profiteered. Explanations rely on descriptions of pheromones the primate vomeronasal organs and the affect this has on 'brain chemistry'. Sellers of the oil discussing the oil detail it can be consumed applied as a balm or smoked kept as a charm or even dried and burned as incense. Such usages of the oil remain largely devoid from academic accounts.

Traders in the oil detail it a being produced from the deceased animals' bladder the whole fermented body of the loris or simply as 'slow loris secretions'. Some oils are sold complete with pieces of *"kulit, lemaknya dan daging*" (the skin, fat and meat) and even bones to prove authenticity. There are additional offers of "conservation-friendly" slow loris oils which claim to be from "naturally deceased" slow lorises. Advertisements which detail the origin of the animal detail predominantly Bornean species, but Banten region (westernmost Java) is also present; implying the Critically Endangered *N. javanicus* may be involved in the trade (Estrada *et al.,* 2018).

The sites Tokopedia.com and Bukalapak.com display numbers of sales which were executed through the sites order management/processing system on the product page. The sales total 259 bottles, across 18 sellers (range of number sold is 107) (bottle volume is not detailed on listings). What should be noted is these sales only represent 'active' listings and do not count 'discontinued' product listing meaning this figure is likely underestimating the actual sales. The reported figures are likely underestimate the amount sold even further as WhatsApp contact numbers are provided providing an avenue for prospective buyers to contact sellers directly and 'haggle' – a common practice within Indonesia; and this also allows the sellers to avoid site costs applied on a per sale basis.

Whether the advertised products represent genuine slow loris derived substances remains unknown; regardless this indicates a demand for the product is present. Traditional medicine and mysticism remains a conservation impeding influence on already dwindling slow loris populations within Indonesia. The easy access of sales through digital purchasing may increase the practices

influence to a greater number of people; especially younger members of society. The influence of magical practice on slow loris numbers requires further research.

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The Monkey Business and the UK: To what extent does EU and UK legislation protect long-tailed macaques bred in overseas farms but used for experiments in the UK

Mike Gill
Cohort 2017-2018
mikegill1310@outlook.com

Every year around 3,000 long-tailed macaques (*Macaca fascicularis*) are imported into the UK to satisfy the needs of pharmaceutical contract research organisations (CROs). *M. fascicularis* has long been considered one of the most abundant anthropoid species in the world. However, many researchers argue that *M. fascicularis* has experienced rapid declines in localised populations during the last few decades. CITES, and many NGOs suggest that the demand for macaques used globally in research procedures is a significant conservation pressure. Also, of concern are the welfare standards at breeding farms in Asia and Mauritius, that supply the needs of western researchers. Limited legal enforcement means that improvements are unlikely to be mandated in range country farms. European and British law sets a high statutory standard for the welfare of all animals used in research, and furthermore primates are recognised as "special". All research in Britain is 3Rs centric and conducted by large global companies with sophisticated supply chain management policies. Here I investigate to what extent the welfare and conservation needs of macaques in overseas supplier farms are addressed by UK legislation.

Welfare and conservation concerns

Long-tailed macaques supplied for research represents a substantial global trade

supplying >40,000 macaques per annum (Gill & Nijman, in process). Animal rights organisations and parties at CITES meetings have expressed concerns related to the conservation and welfare of long-tailed macaques as a consequence of the international trade. These fall into three broad areas.

Firstly, the capture of wild macaques sold to breeding farms who fraudulently sell them as captive bred has been highlighted as being responsible for considerable suffering and an extirpation threat for local populations. This "laundering" of wild populations enables the import of wild macaques for research in contravention of the EU prohibition on wild caught individuals (EU, 2010).

A second issue relates to the suspicion of poor welfare standards in macaque breeding farms in Asia and Mauritius. Many undercover investigations have produced documentary and video evidence indicating poor conditions and mistreatment at farms in both Mauritius and South East Asia (Thew, 2002; Seltzer, 2010; Thew, 2014).

The third welfare issue is associated with extended transport times due to the activism of the animal rights lobby. Whilst organisations such as PETA, Cruelty Free International, and Born Free have failed to achieve their aim of banning procedures using primates in the UK, they have succeeded in convincing all British Airports and Airlines to refuse to handle macaques imported for research purpose. Consequentially all macaques now have to be flown into mainland European Airports and then flown by charter airlines to Manchester and distributed by lorry to pharmaceutical companies in the UK, thereby extending the stress associated with transport (Honess *et al*., 2004).

What British and European law exists to protect animals used in research?

In the last 10 years the EU has developed a comprehensive range of guidance and directives that should ensure the welfare and provenance of macaques used in procedures (along with most other animals). On 25 September 2007, the European Parliament adopted a declaration urging the Commission to end to the use of great apes and wild-caught monkeys in scientific experiments; and to establish a timetable for replacing all primates in scientific experiments with alternatives. The response of the commission argued that it was not possible at present to establish a timetable to replace primates with other animals due to the importance in fundamental research and human drug testing.

EU Guidelines regarding the use of primates for experimental and research purpose require that "All non-human primates in a facility should be identified with a permanent and unique laboratory identification code before weaning…..Microchips can be injected

into accessible sites the wrist for larger animals or scruff of the neck for smaller species" (EU Commission, 2007, p. 42). The EU directive of 2010, paragraphs 30 and 31, stipulate that non-human primates, dogs and cats should have a personal history file from birth covering their lifetimes in order to be able to receive the care, accommodation and treatment that meet their individual needs and characteristics (EU, 2010, p. 46). If this guidance was embraced by all stakeholders with the UK and EU, then the laundering of wild macaques into the supply chain could more easily be mitigated against.

The 2010 EU Directive essentially prohibits the use of wild caught macaques in scientific experiments and drug testing. Article 9, paragraph 1, stipulates "Animals taken from the wild shall not be used in procedures" (EU, 2010, p. 41). Seemingly this rule should have prevented the continued use of wild caught macaques for research purposes throughout the EU. CITES requires that the source of all species of macaques, which along with other primates are listed on Appendix II (CITES, 2017b), should be reported by both exporting and importing countries (CITES, 2017a; CITES, 2013). In a world where the rules were universally followed this would ensure that only captive bred macaques can be used for research and testing purposes.

According to the EU Directive of 2010/63, all member states must start annual reporting regarding the implementation of the Directive by November 10 2018 (EU, 2010, p. 50). Particular emphasis is made regarding comprehensive reporting in several areas, including the country of origin and confirmation that the macaques imported are the offspring of captive born parents.

Historically the UK has prided itself on having some of the strictest laws in relation to the use of live animals used in research (Festing & Wilkinson, 2007; Wells, 2011). The 1986 Animals in Scientific Procedure Act (ASPA) was amended in 2012 (Home Office, 2012) and a new body the Animals in Science Committee (ASC) (ASC, 2018) was set up to replace the previously named Animal Procedures Committee (APC). An inspection body works alongside the APC, called the Animals in Science Regulation Unit (ASRU).

So do these laws actually help Long-tailed macaques bred in overseas farms?

The framework of EU 2010/63 and the subsequent British response, ASPA 2012, talk in detail about the special status of primates. Directive 17, states that "Furthermore, the use of non-human primates is of the greatest concern to the public" (EU, 2010, p. 276/34). ASPA lists primates as schedule 2B animals that are additionally protected in relation to their care and use (Home Office, 2012; Home Office, 2014). Table 1 below shows specifically how EU2010/63 and amended ASPA 2012 set a framework that seemingly ensures the welfare of primates in breeding facilities. However, as the legislation does not apply

beyond the EU, or mandate research license holders from within the EU to ensure compliance for non-EU suppliers, it is effectively useless in promoting welfare in Asian and Mauritian breeding farms. On my initial reading of 2010/63 I felt that the implementation of these directives would safeguard the welfare of macaques purchased from breeding centres overseas. This, I felt, would mitigate at least some of the welfare and conservation issues that have been highlighted in Mauritius (Seltzer, 2010) and South East Asia (Fuentes *et al*., 2011; SSN, 2015). The amended ASPA 2012, seemed to largely incorporate the EU directive into EU law. The truth, as I learned, was that despite the so-called special status of primates, neither UK or EU authorities considered that it had any responsibility to ensure minimum welfare standards in overseas breeders.

The only apparent exception to the legislative indifference regarding happens outside the EU, is that in compliance with EU 2010/63 and ASPA 2012, site 2c establishment license holders in the UK must produce an annual return stating whether primates are wild caught. Given the apparent lack of inspections and monitoring these annual returns e.g. (Home Office, 2017) must be regarded as essentially a paper exercise.

The Home Office in drafting ASPA 2012 effectively excludes the possibility of breeders outside the UK from obtaining a site 2C establishment license even if they wanted to apply, and thereby try and comply with welfare requirements. The Home Office ASPA Guidelines state that "An establishment license holder must be subject to jurisdiction within the United Kingdom" (Home Office, 2014, p. 18) thereby excluding the possibility of a voluntary system. This also effectively relieves ASRU of any responsibility in conducting overseas inspections. Despite the specific requirements for all authorised breeders (only a site within the EU can be authorised) to keep records from birth of all primates (thereby helping to ensure provenance), the amended ASPA guidelines provide an escape clause for animals procured from outside the EU "Where the animal comes from a source outside the EU, or where the individual history file is not available, you should start one as soon as possible" (Home Office, 2014, p. 27).

EU and UK legislation does not ensure welfare in breeding farms in Asia and Mauritius. Nor does guidance from the ASC and ASRU, mandate or encourage CROs within the UK to motivate breeders to abide with the spirit of EU 2010/63 and ASPA. To what extent welfare standards are maintained or indeed what these standards should be is entirely at the discretion of individual CROs.

Table 1: *UK & EU Legislation and the Welfare of Primates sourced from Non-EU Breeding Farms*			
Welfare Issue	**EU2010/63**	**ASPA Amended 2012**	**UK Law related to purchases from Non-EU Breeding Centres**
Inspections frequency	Annually (page 36)	Annually (page 91)	No obligation for UK license holders to apply standards on supplier
Inspections Unannounced	Proportion unannounced Article 34	"visits will often be unannounced" (page 91)	No obligation for UK license holders to apply standards on supplier
Enclosure size (minimum)	$3.6m^3$ per animal as Table 6.3	$3.5\ m^3$ per animal as per (home Office 2014)	No obligation for UK license holders to apply standards on supplier
Animal Welfare Bodies	Compulsory at breeders Articles 26/27	License holders must have Animal Welfare and Ethical Review Body on site as per schedule 3 of ASPA	No obligation for UK license holders to apply standards on supplier
Permanent Marking	Permanent marking at weaning Article 32	Permanent marking at weaning or receipt from overseas as per condition 10	No obligation for UK license holders to apply standards on supplier
Care And Accommodation	Checked daily article 33	Checked daily as per condition 14	No obligation for UK license holders to apply standards on supplier
Record Keeping	Individual life history record Article 31	Individual life history as per condition 14	No obligation for UK license holders to apply standards on supplier
Authorisation of breeders, suppliers,	Approval required by competent Authority Article 20	Approval by Home Office	No obligation for UK license holders to apply standards on supplier
Animals taken from the wild	Prohibited Article 9	Prohibited unless by Home Office Approval	License holders should exercise due diligence when procuring macaques overseas. Annual reporting of breeding status of animals purchased
Breeding Strategy	Closed colonies Article 28	Self-sustaining Colonies as per (home Office 2014)	Annual reporting of wild or captive status for all macaques procured

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The use of ecological niche modelling and geographic information systems (GIS) to identify suitable reintroduction site locations for *Nomascus* gibbons in China

Emma Horton
Cohort 2018-2019
emmalouisehorton@hotmail.com

Range contractions are seen in species globally as a result of human activities and associated habitat loss and population declines (Estrada *et al.,* 2017). This effect is highly evident in China, where prolific loss of native species in central and southeast China is attributed to accelerated human population expansion over the last 400 years (Turvey *et al.,* 2015). For Hylobatids in China, which are now only present in small and fragmented populations in southwest China, on Hainan Island and a population in Tibet, reintroduction and translocation programs are going to be crucial in securing their future in this region (Fan, 2016). However, whether areas in central and southeast China are climatically suitable for modern gibbon species is under debate (Dunbar *et al*., 2019). These regions were historically occupied by gibbons (Turvey *et al*., 2015), however such gibbons may have been different species with different fundamental climatic niches. Alternatively, climate change may have played a role (Dunbar *et al*., 2019), along with anthropogenic pressures (Turvey *et al*., 2015), in extirpations in these regions. Chinese gibbons experience the coldest and most seasonal environments of all extant Hylobatids (Guan *et al.,* 2017), during the winter they can experience minus temperatures and snow, and they exhibit energy conserving strategies. *Nomascus* and *Hoolock* occupy geographically distinct areas in China (Fan, 2016) and may have different realised and even fundamental niches, sharing a common ancestor 6.69-8.34 million years ago (Thinh *et al*., 2010). Whether either could survive in central and southeast China, in

regions noted to experience increased temperature seasonality and reduced rainfall, is unknown (Dunbar *et al*., 2019). Therefore this study had four main aims: 1) to determine which bioclimatic variables best explain the current distribution of mainland Chinese *Nomascus*; 2) to identify climatically similar regions to their current distribution; 3) within climatically similar regions to identify areas with suitable biological and physical attributes, absent of threats; and 4) to make recommendations for priority areas to further investigate for suitability for reintroductions/translocations, and to consider for protected status.

This study used a high performing ecological niche modelling program called Maxent (Version 3.4.1.) (Elith *et al.,* 2011), which produces maps of predicted habitat suitability, whereby the mean values of environmental variables at locations predicted to be suitable are close to the mean values of environmental variables at presence points used to train the model (Elith *et al*., 2011), to address the first two aims. The model was created for mainland Chinese *Nomascus* (*N. nasutus, N. concolor* and *N. leucogenys*), the genus with the widest distribution in China (Fan, 2016), using current bioclimatic data (1950-2000) (Hijmans *et al.,* 2005), and modern (last 20 years) presence points (IUCN Red List data) across the full geographic realised niche of the three species in China, Laos and Vietnam. Followed by a geographic information system (GIS), and satellite image (Google Earth), analysis to investigate beyond climate the suitability of habitat areas for supporting viable gibbon populations, addressing aims 3 and 4. Whilst *Nomascus* may live in a anthropogenically truncated or even sub-optimal niche in China, considering the available data, this was the best method of confidently establishing habitat which falls within the survivability of Chinese *Nomascus*, thus potentially suitable for reintroduction sites. However, it is acknowledged their fundamental niche may be greater.

This final model had extremely high performance and successfully generalised to other *Nomascus* species, predicting Hainan as suitable habitat as well as the majority of the distribution of the southern white-cheeked

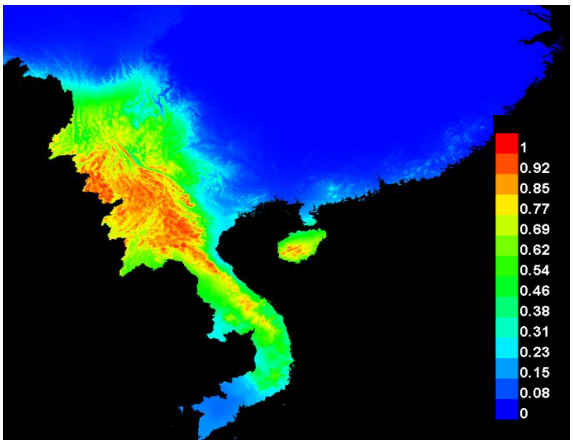

Figure 1. Showing the area in China, Laos and Vietnam predicted by the Maxent model as containing suitable habitat (i.e. >0.5 on scale).

gibbon (*N. siki*) and the red-cheeked gibbon (*N. gabriellae*) in Laos and south through Vietnam (Fig. 1). The model did however exclude the cao-vit gibbon (*N. nasutus*) from suitability predictions and did not generalise

to Hoolock gibbon populations. The model found that the best predictor of mainland Chinese *Nomascus* presence is temperature seasonality, and the model predicts regions outside of Yunnan as too temperature seasonal for gibbon presence. It is unknown whether the association of mainland Chinese *Nomascus* with regions of lower temperature seasonality in China is ecological or based on an anthropogenically truncated niche space and association with areas sub-optimal for human agriculture. Yunnan is colder and drier than elsewhere in southern China, therefore there does not appear to be any biological reason mainland Chinese *Nomascus* could not inhabit central and southeast China, and indeed the cao-vit gibbon exists in an area of greater temperature seasonality than predicted suitable by the model. However, equally central and southeast China may experience adverse weather conditions associated with temperature seasonality, such as typhoons, which were not accounted for in this study. Regardless, analysis of spatial data indicated very few areas exist outside Yunnan with human population densities compatible with gibbon presence (<100/0.86km^2). Therefore, the southwest corner of Yunnan, below Lincang prefecture and left of the Red River, was determined as the optimum spatial location in China for reintroductions. This region contains climate highly similar to that experienced by current populations, and data indicates low human population densities (<100/0.86km^2), and numerous large patches (>60km^2) of evergreen broadleaf forests, at suitable altitudes (≤2,700 m.a.s.l), capable of holding viable population sizes (>100 individuals) (Frankham *et al.,* 2002).

Whilst numerous forest patches in southwest Yunnan have potential, two areas were proposed for further exploration, a forest patch in Mengla county (>250km^2) partially within a protected area, and three forest patches spanning Menglian, Ximeng and

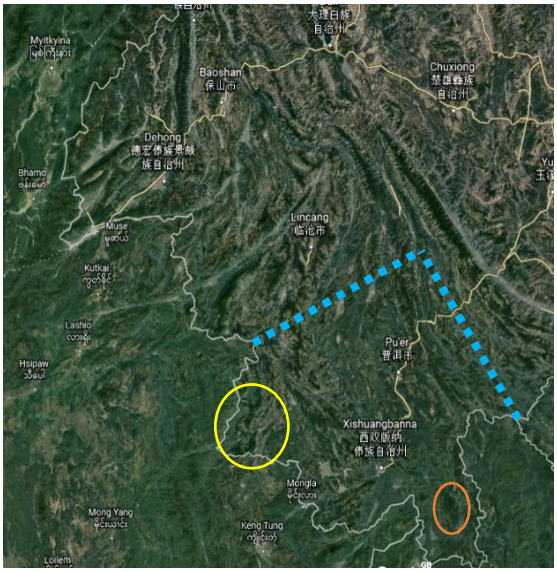

Figure 2. Showing the area of interest (below the blue lines) in the southwest Yunnan for potential reintroduction site location. With the three forest patches spanning Menglian, Ximeng and Lancang counties (yellow), and the forest patch in Xishuangbanna (orange).

Lancang counties (>150km^2, >60km^2 and >90km^2) (Fig. 2). Collectively these areas could hold an estimated >1,800 gibbons. However, human activities such as settlements, ports, roads and agriculture are present on the outskirts of these forests, and there is encroachment at forest edges via plantations visible on satellite images. The persistence of

forest areas relies on increasing the protected area network, which in southwest Yunnan currently consists of only seven areas, all in Xishuangbanna (World Database of Protected Areas), of which only the site in Mengla contains broadleaf evergreen forest. Chinese law protects gibbons and their habitats, however low enforcement is reported (Ren *et al.,* 2015). Therefore, reintroduction sites would require active protection as has proved successful for cao-vit and Hainan gibbons (*N. hainanus*, Fan, 2016). There is great potential to return gibbons to forests in southwest Yunnan, with benefits not only for gibbon conservation but for ecosystems with gibbons being important seed dispersers (McConkey & Chivers, 2007). It is recommended that the results of this study are used to guide ground surveys to confirm levels of human disturbance, vegetation suitability and existing fauna, and identify priority areas for reintroductions, expanding and enforcing the existing protected area network accordingly.

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Assessing the effect of the captive environment on the activity levels of walkthrough housed ring-tailed lemurs at two UK zoos

Danielle Pryke
Cohort 2016-2017
daniellepryke1995@gmail.com

Over the past few decades, it has become increasingly important for zoos to understand how the captive environment influences the behaviour of non-human primates. More recently, enclosures which allow visitors to get closer to a species, such as walkthrough exhibits, have increased in popularity (Davey, 2007). Ring-tailed lemurs (*Lemur catta*) are undoubtedly the most common species of primate kept in captivity (Twycross Zoo, 2016) and are also one of the most popular species housed within walkthrough exhibits. Therefore, it is essential for zoos to assess the impact of these exhibits on ring-tailed lemur activity.

Behavioural data were collected from two different groups of walkthrough housed ring-tailed lemurs. The first group of lemurs were housed at Zoo B and consisted of eight males. The second group of lemurs were housed at Zoo C and consisted of four males and two females. A total of 80 hours of data were collected per group and the observation sessions were split into morning (10:30am to 1:00pm) and afternoon (1:30pm to 4:00pm). Lemur behaviour was recorded at five-minute intervals using instantaneous scan sampling, and the visitor number was also noted. Behaviours were classified into two categories, active and inactive, for the full list see Table 1. In addition, the temperature (°C) was recorded every 30 minutes during each session using a Therma Hygrometer. The total activity budgets for each group of lemurs are displayed in Table 1.

Table 1. *Overall % of each behaviour expressed between the two zoos, excluding the number of observations out of sight.*

Active Behaviours	**Zoo B**	**Zoo C**
Individual Locomotion	9.94	10.19
Group Locomotion	0.59	0.25
Sunning	2.13	4.07
Feeding	2.70	7.02
Foraging	46.96	2.82
Scent Marking	0.14	0.03
Vigilance	0.26	0.48
Playing	0.00	0.36
Allogroom	2.00	7.65
Self-Grooming	1.16	4.75
Vocalisation	0.34	0.15
Aggression	0.03	0.00
Interspecies Interactions	0.01	0.10
Human-Animal Interactions	0.14	0.68
Inactive Behaviours		
Resting	10.19	21.87
Huddling	23.40	39.56
Resting	10.19	21.87
Huddling	23.40	39.56

The group of lemurs housed at Zoo B spent 66.4% of observations performing active behaviours. Whereas, the group at Zoo C, spent 38.6% of observations active. The results from the Generalized Linear Model (GLM) indicate that the difference between

the two zoos was the most significant factor influencing lemur activity (see Table 2). The lemurs at Zoo C were observed to perform a lower percentage of active behaviours compared with Zoo B, displayed in Figure 1. The average visitor number was the only factor positively associated with active behaviours. Furthermore, both groups of lemurs were observed spending a higher percentage of time engaging in active behaviours during the afternoon session, as shown in Figure 2. The results from the GLM indicate that active behaviours were not influenced by the average temperature (°C).

Measuring the activity levels of a species within captivity can be essential for identifying good welfare. Furthermore, an inadequate environment can be a major cause of abnormal behaviours, reduced stimulation and health problems (Mason *et al.,* 2007).

The present study demonstrated several associations between the captive environment and ring-tailed lemur activity levels. The difference between the enclosures at the two zoos had the most significant impact on lemur activity, with Zoo C demonstrating a negative effect. The walkthrough at Zoo C was covered in dense bamboo, whilst the enclosure at Zoo B provided large areas of open space. Moreover, the lemurs at Zoo B were observed spending 46.96% of their time foraging. Whereas, at Zoo C the lemurs spent only 2.82% of their time foraging. In captivity, foraging is considered an important natural behaviour and can provide a good indication of environmental stimulation (Dishman *et al.,* 2009). This evidence suggests that the enclosure at Zoo C has negatively impacted lemur activity levels due to the lack of stimulation and foraging opportunities provided. In addition, the time of day was shown to affect lemur activity. The lemurs at both zoos were observed to increase their performance of active behaviours during the afternoon session (1:30pm to 4:00pm). Though, the present study did not fully assess the activity levels of the lemurs over a 24-hour period. Wild ring-tailed lemur populations have expressed similar patterns, increasing their activity levels from 2:00pm onwards (Donati *et al.,* 2013).

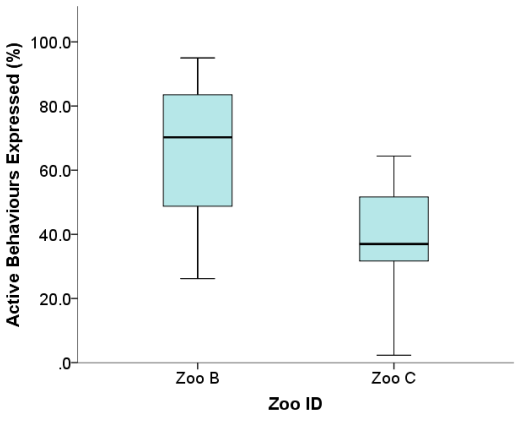

Figure 1. Comparison between the percentage of active behaviours expressed by the lemurs at each zoo.

Furthermore, an increase in the visitor number was associated with an increase in lemur activity levels. Similar results have been observed in previous research (Collins *et al.,*

2017). However, the present study cannot determine if this association is stimulating (positive) or stressful (negative) for the lemurs housed within the walkthrough. Further research is needed to identify if the increase in activity is associated with a positive or negative response as visitors become very close to these individuals.

Table 2. *Generalized Linear Model assessing the influence of enclosure, time of day, temperature and visitor number on the activity level of ring-tailed lemurs.*

Parameter	B	Sig.
Intercept	77.307	.000
Zoo ID:		
- Zoo C	-35.669	.000
- Zoo B	0[a]	
Session:		
- 10:30– 13:00	-7.823	.041
- 13:30– 16:00	0[a]	
Average Temperature	-.643	.176
Average Visitor Number	1.744	.009
Scale	219.631[b]	

a) Set to zero because this parameter is redundant. b) Maximum likelihood estimate

Ring-tailed lemur activity levels can be influenced by many factors associated with the captive environment. The present study identified an association between activity levels, enclosure design, visitor number and time of day. However, temperature was not associated with the lemur activity levels.

Further research is needed to identify whether these effects are positive or negative, as individuals can be active but may be displaying behaviours indicative of stress. Research targeting cortisol levels would supply an enhanced understanding of the response by captive ring-tailed lemurs to the environmental changes. Furthermore, additional research is needed to establish whether captive lemurs have similar circadian rhythms to wild lemurs and if they are impacted by changes in the zoo environment.

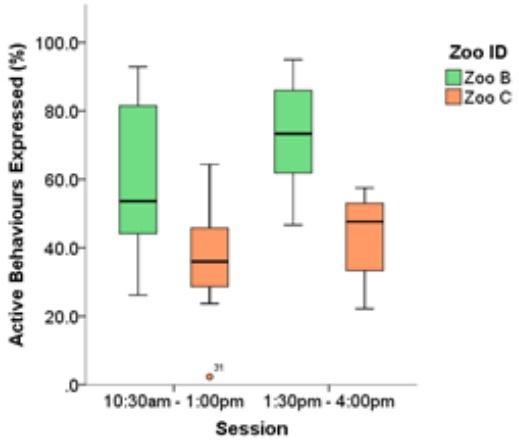

Figure 2. Comparison between the percentage of active behaviours expressed by the two lemur groups during the two observation sessions.

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Investigating the use of northern pig-tailed macaques to harvest coconuts in southern Thailand

Devan Schowe
Cohort 2018-2019
devan.schowe@gmail.com

'Companion commodities' refer to wild animals traded globally for human economic gain. The exploitation of wild animals specifically for trade impacts approximately one third of all bird and mammal species. This trade often compromises the mental and psychical well-being of the animals (Collard, 2013) due to the difficulty of meeting most species-specific needs in a captive setting (Mallapur & Choudhury, 2003). Failure to meet these needs in captivity often results in the development of abnormal behaviours as coping mechanisms, the experience of excessive fear, stress, or boredom, and diseases acquired from chronic malnutrition or physical inactivity (Soulsbury *et al.*, 2008). Further, successful rehabilitation and release are rarely viable options for wild animals involved in trade due to the development of unnatural behaviours, a marked deficit in knowledge of appropriate social behaviour, and a consistent dependence on humans for survival (Guy *et al*., 2013). Despite being among the most socially complex and diverse species (making replicating their natural environments almost impossible in captivity), nonhuman primates are traded throughout the world to meet the demands of pet ownership and traditional medicine. This trade often occurs at unregulated and thus unsustainable rates (Estrada *et al.,* 2017). Perhaps one of the least documented examples of primate trade is the use of northern and southern pig-tailed macaques (*Macaca leonina; M. nemestrina)* for coconut harvesting in Southeast Asia. Coconut farmers have trained pig-tailed macaques to harvest coconuts for up to one hundred years in Thailand, Malaysia, and Indonesia (La Rue, 1919). Further, monkey training schools that train and sell pig-tailed macaques to coconut farmers are also open to the public throughout Thailand and function as another revenue source reaped from the coconut trade (Schmidt-Burbach, 2015).

In attempts to begin quantifying the exploitation level of pig-tailed macaques involved in the coconut trade, the present study examined the sourcing and welfare status of northern pig-tailed macaques used to harvest coconuts in southern Thailand. We interviewed 89 coconut farmers from May-June 2019 in the following provinces: Surat Thani, Chumphon, and Prachuap Khiri Khan. Using informal and semi-structured interviews (Newing, 2011) and with the help of local translators, we gained insight into the impacts of the coconut trade on wild northern pig-tailed macaques. To assess individual welfare, we used an independent coding scheme based on Schuppli and Fraser's (2000) framework

adapted from the 'five freedoms' of animal welfare. This framework considers freedom from hunger, thirst, discomfort, disease/injury, and psychological distress (Farm Animal Welfare Council, 1992).

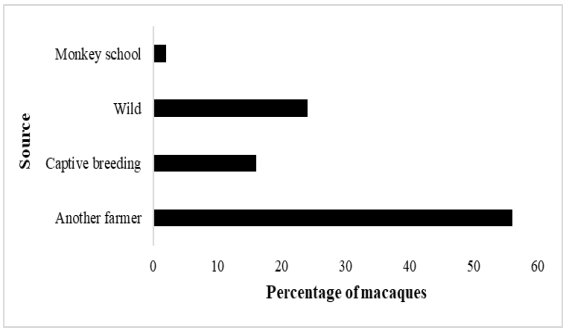

Figure 1. The percentage of northern pig-tailed macaques involved in the coconut harvest trade in southern Thailand sourced from each category (n=263) as reported by 86 coconut farmers.

Among all three provinces, the coconut farmers collectively owned 279 macaques, 158 of which we were able to observe for individual welfare evaluations. We discovered that coconut farmers most frequently sourced their macaques from the following: 80% from another coconut farmer and directly from the wild, with the remaining 20% from independent captive breeding and monkey schools (Fig. 1). According to our individual welfare assessment, none of the macaques achieved optimal welfare, with the majority of individuals achieving a welfare score indicating that between 40-50% of their overall needs were appropriately met in captivity (Fig. 2). The welfare category that demonstrated the lowest levels of appropriateness included psychological distress, with the majority of individuals experiencing physical restraint due to a leash, no daily provision of enrichment, and no ability to hide from stressors. Almost 90% of farmers reported that their macaques were aggressive (i.e. bit or scratched a human).

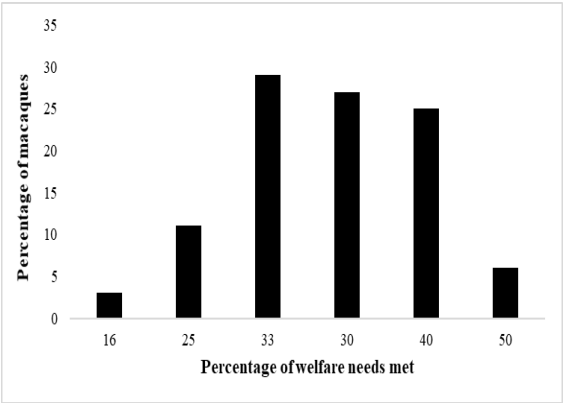

Figure 2. The distribution of welfare needs appropriately met for 158 northern pig-tailed macaques used for coconut harvesting in southern Thailand. Macaque welfare was scored with an independently developed scoring scheme based on Schuppli & Fraser's (2000) 'five freedoms' framework.

These results highlight the importance of prioritising 1) the regulation of both domestic and international trade of northern pig-tailed macaques involved in the coconut trade to ensure sustainable extraction rates from the wild and 2) improving the individual welfare of working macaques. Increasing trade surveillance, tightening legislation, monitoring ownership practises more closely, and ensuring improved welfare conditions would benefit both coconut farmers and macaques, as improved individual welfare may increase overall agricultural output and decrease the aggression apparent in most farmer-macaque relationships. As a species already listed as Vulnerable with a decreasing population trend (Boonratana *et al.*, 2008), quantifying all threats to this species is crucial in ensuring

their population stability into the future. This study emphasises the importance of shedding light on the existing welfare conditions and exploitation of working animals of both wild and domesticated origins.

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Effects of captivity on the activity budgets of lar gibbons (*Hylobates lar*)

Keith White
Cohort 2017-2019
keithwhite65@hotmail.co.uk

The keeping of gibbons in a captive environment and recreating an appropriate habitat is essential to enable them to exhibit species-specific behaviour. It has been hypothesised that the quality of the captive environment may affect gibbon behaviour as expressed in, or by, their activity budgets (Hoff *et al.,* 1997).

This research was designed to provide baseline data on the activity budgets of captive lar gibbons (*Hylobates lar*). In this study individuals from two family groups of lar gibbons, one from the Lake District Wildlife Park (Group 1) and the second from South Lakes Safari Zoo (Group 2) were observed and activity budgets constructed from the data collected. The two groups

were compared with each other and with published data of wild gibbon groups.

Activity budgets of groups 1 and 2 were similar however, differed significantly from wild gibbons (Fig. 1). They spent the greater percentage of their time resting (63-71%) compared with wild gibbons (26%). However, wild gibbons spent significantly more time feeding/foraging (33%) compared with the captive groups (8-14%) (Bartlett, 2009). There was also a significant difference in the time engaged in locomotory behaviour with the captive groups (7-10%) compared to wild gibbons (24%) (Fig. 2). However, there was no significant difference in the percentage of time engaged in brachiation between the wild groups (48%) and captive groups 1 and 2 (37-45%) (Fleagle, 1976).

Social interactions between wild gibbons and Group 2 compared equally (11%) compared with Group 1 (4%) however, all engaged in allogrooming for the greater percentage of their social interactions (Bartlett, 2003). In vertical spatial usage Group 2 and wild gibbons spent the greater percentage of their time at the high level (65-78%) (Nijman, 2006). Group 1 favoured the middle level (61%) however, this level is preferred by the majority of captive gibbons and is likely explained by the lack of sufficiently high physical enrichment structures in their enclosures (Ogden *et al.,* 1983). The significant differences in the results between the captive groups and the wild gibbons in resting, feeding/foraging and locomotion are likely explained by captive gibbons being supplied with food on a daily basis at regular intervals thereby reducing the time they spend in such activities (Amarasinghe & Amarasinghe, 2011). There is a concern that substantial periods of inactivity may induce boredom which can manifest itself in stereotypical behaviour (Altmann, 1999) however, no stereotypical or abnormal behaviours were observed in any of the gibbons during this study.

It is recommended that Group 1 being provisioned with further physical enrichment structures of a more vertical design and Group 2 provided with rotational enrichment items such as puzzle feeders, cardboard boxes and mirrors. It is anticipated that these additions will provide the opportunity and incentive for the gibbons to reduce periods of inactivity and increase species-specific activity budgets.

It is concluded that the stability and dynamics of both study groups along with their naturalistic enclosures show that captive lar gibbons do exhibit wild-type activity budgets. However, if the captive habitats at both establishments were subjected to increased environmental enrichment it would offer the gibbons the chance to express more locomotory behaviour and less resting periods thereby seeing an increased normalisation of their wild species-specific activity budgets and associated behaviours.

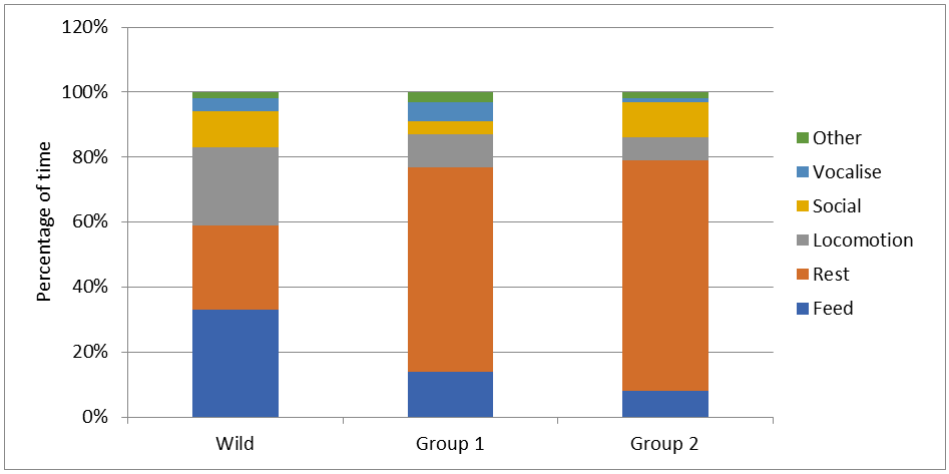

Figure 1. Activity budgets for wild and captive gibbons.

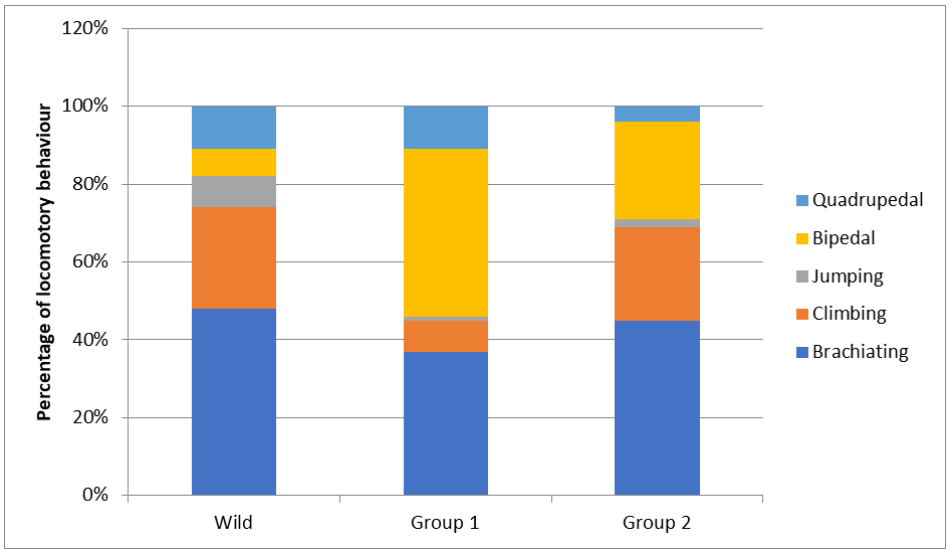

Figure 2. Locomotory behaviour for wild and captive gibbons.

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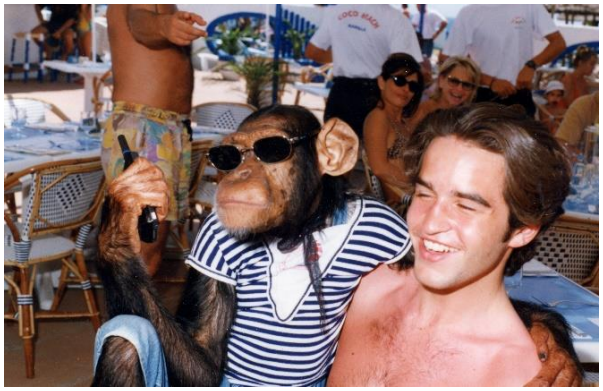
Interview with Dr Alison Cronin, Director of Monkey World

Editor Charlotte Daniels sat down with Dr Alison Cronin MBE, director of Monkey World – Ape Rescue Centre and recipient of an honorary doctorate from Oxford Brookes University in 2018, to discuss the work of the sanctuary and where she believes primate conservation is heading.

CD: I wondered if we could start with a little background about how Monkey World started.

AC: Monkey world was started in 1987 by my husband, Jim Cronin, who decided he wanted to start a zoo or wildlife park that made a difference and had a purpose, rather than simply displaying animals to visitors. He had read an article about the abuse of illegally smuggled chimpanzees on Spanish beaches, sold as infants for tourists to be photographed with. After hearing about Simon and Peggy Templar who were rescuing some of the refugees Jim approached the Spanish authorities whom immediately agreed to give him every chimpanzee confiscated if he built a wildlife park in England. At the time, there were up to 100 chimpanzees working on the beaches. With no where to put the chimpanzee, photographers were released with a fine and the chimpanzee still in their custody.



Jim and his friend Jeremy Keeling (our animal director) knew they would need to rely on visitors to continue the park funding as even today there is no funding for assisting with CITES confiscations. With a government guaranteed loan of £90,000, Monkey World settled in Dorset, a location away from other zoological collections with a high tourist foot flow. Soon after getting started the first 9 chimpanzees arrived from Spain, and since then we have only ever grown as per the needs of the rescues.

CD: How has the focus of the park changed over the years?

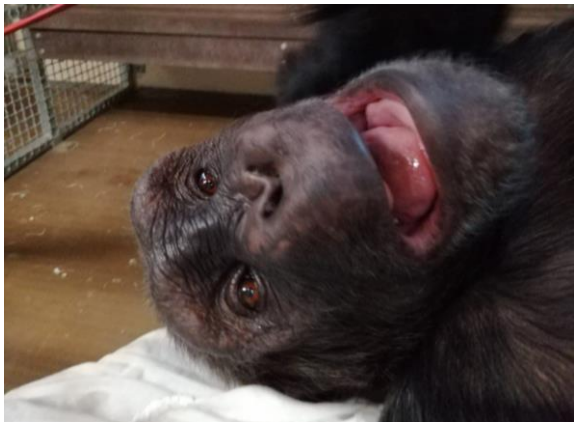
AC: As Monkey World's reputation grew, we started discussing the wildlife trade with other rescue centers, including Pingtung Rescue Centre in Taiwan who were being buried under the weight of orangutans and gibbons. The Taiwanese authorities were being incredibly proactive confiscating wildlife and due to their location in the South China Sea, was a hub of wildlife trafficking. We worked with Dr Kurtis Pei and his team to try and rehome as many smuggled primates as we realistically could to help lessen the load at Pingtung. We took on the first group of gibbons and orangutans in 1999/2000, but then not long after that we started getting calls to take on golden cheeked gibbons from a menagerie in France, as well as acting as expert witnesses for a case in the UK of a dealer who was found with a multitude of illegally smuggled wildlife, including four slow loris and a young golden cheeked gibbon.

After Jim and I returned to Vietnam, which was losing wildlife rapidly, we approached the authorities with our friend Kurtis to discuss setting up a sister sanctuary in Dao Tien, southern Vietnam. We now work with the Vietnam government to keep smuggled animals in the country before they are sent around the globe, and we've been doing that for 13 years now. Sadly, Jim passed away before we managed to get Dao Tien open and it's something that is emotional for me to think about.

We've rehomed more laboratory primates than, I hazard to say, any other rescue operation going. The rescue centres for chimpanzees in America have potentially hundreds of chimpanzees, taken from the military or pharmaceutical laboratories, but that is only chimpanzees. Monkey World is the largest primate rescue operation globally both in terms of the geographic range that we cover. We've assisted 28 different governments and the species and the circumstances from which we get them has varied greatly. Our current ongoing issue is the legal trade of primates as pets in Britain today, it's a real problem and one that we're buried underneath.

CD: What has been one of the biggest success stories of Monkey World's history?

AC: In terms of the one that caused me the most emotional angst, that would be Naree [chimpanzee] who arrived in 2018. Jim and I found her 15 years ago when we were doing undercover work in Thailand tracking illegal orangutans and gibbons. We went to a circus show at Sriracha Tiger zoo and as part of the circus show there was this chimpanzee that looked like the elephant man. She was fully dressed walking upright in the circus ring and trained to pull a rickshaw around with tigers and orangutans. When the show ended, I went over to the circus ring and made chimp vocalisations and she came running over to say hello and clearly was friendly. I was trying to look inside her mouth to see what was happening with her face, but she was immediately called back over and taken away into the back. At that point we had nothing to lose so we walked up, introduced ourselves honestly and openly to the people working at the show and asked if we could discuss the issues with her face, so they took us behind the scenes where we sat down and Naree was brought out of her cage. Naree was sweet as can be, she jumped in my lap and gave me a big hug. When I looked inside her mouth, there were no teeth bar her four in the back of her mouth. We'd seen that before in a completely different country, the owners knock out their teeth with blunt instruments, and I'm not trying to be dramatic and weird about it, people think I'm being emotive and saying "knocked them out", but it's true because the shards of broken tooth and root are left in the gumline so the animals end up with infected and enraged gumlines.



With Naree, her adult teeth never grew in so presumably that means her teeth were knocked out when she already had her adult teeth, I mean not that any situations are better or worse but to knock out adult teeth is much more traumatic. What we suspect happened with the shape of her face is that the infection went up into the roots of those teeth that were still left in her mouth and the infection got into her sinuses, so what you're seeing is bony scar tissue that's grown over her nose leaving her with this weird appearance on her mouth and then these over grown sinuses on her face. We launched a huge campaign to get the Thai government to confiscate the chimp which was clearly illegal. We asked the Thai embassy about it and gave them information about all the illegal apes we found but they didn't want to talk about it, so we launched a campaign and got signatures and had people write to the Thai embassy which they did and in a matter of weeks of us going up and meeting the officials at the Thai embassy a raid was done at the zoo and Naree was confiscated and then made to disappear. I heard rumors about her, in fact a year or two later I was sent a photo of her at a government wildlife centre so we knew they had her and we kept pushing to get her, but then I was told she was gone and it was suggested that she might have been sold to a Chinese zoo in exchange for Chinese wildlife. We always revisit rescues but, in this instance, we had totally lost her. Then all of a sudden last year (2017) I was

contacted by a French lady who had been hired to work at a wildlife centre in Thailand to help train staff improve conditions, and there was a single chimpanzee there that she was concerned about because it was very lonely, the Thai people weren't sure how to work with her. They asked if Monkey World would be able to give the chimpanzee a home but said I should know that it's a funny looking chimp with facial deformities and they called her Natalie, and I knew instantly. I got goose bumps, it had to be Naree and sure enough when photos came through it was! So, after 15 years she reappeared, and again tragically something Jim wasn't around to witness what we had started together. I was invited by the Thai authorities to come over and meet Naree so I went out to Thailand to the government wildlife centre and there she was! It took then almost a whole year to get the paperwork bundle done because it wasn't a usual thing for the Thailand to be sending CITES confiscations to another country, but we got through it and got Naree back here, and it was really emotional both for Naree's sake but also personally because it was a 15 year battle that one. She is quite special.

CD: You've recently successfully campaigned for DEFRA to put a call out for evidence on the UK primate pet trade. How will that effect the sanctuary and the primates currently privately owned?

AC: There are a two different campaigns running in tandem now, and Monkey World has been on this longer than anybody else. We started campaigning for a complete ban on the trade of primates as pets. In 2004 we handed in a petition of more than 65,000 signatures for that ban and it was to quite a receptive and responsive labour government, but nothing changed at all. Instead there were infinite committee meetings and to the detriment of primates in the UK, in my opinion, a code of practice was drawn up by DEFRA as to how a person should keep a primate properly as a pet or in private hands. Quite frankly, in my opinion, the code of practice is a complete waste of space and really does nothing but provide a simple DIY guide on how to keep a monkey at your home. It really doesn't tick any boxes and causes more problems than it helps; it gives unscrupulous breeders and dealers and owners, who were either ignorant at best or at worst abusive, the ability to say "this is what the government says we should be doing".

At that point in time it dawned on me that maybe we needed to change our tactic; we should ask appropriate circumstances, regardless of whether they are kept in a zoo, wildlife park, private home or even in a laboratory, if a primate is deserving of a certain standard of care it shouldn't matter where it lives. It doesn't make sense there are 5 different laws governing the care of, for example, a capuchin and they're all very different. So, what I suggested to the government is that all the legislation and administration that surrounds a zoo or a wildlife park, which isn't easy to achieve, should be applied to the care of all primates. If we must do that for our primates here, why shouldn't every other primate in the country have that standard of care.

People started listening to me and I gave evidence at a select committee review and we started a petition and collected over 110,000 signatures. So, whilst it isn't a ban, in affect it will curtail and stop the trade. It is being discussed that we would immediately make illegal the sale and trade of primates so you're not allowed to pay money for them or exchange goods or services for them so that there will be no financial incentive anymore. Then beyond that, any primates that currently exist would be affectively registered, sort of like a grandfather clause, and if their circumstances and environments are appropriate the people would be allowed to keep them throughout their lifetime until they died and then there'd be no more. The biggest thing at this point, after 30 years of fighting and bringing in so many primates from the British pet trade, is I'm prepared at least to be making little steps forward. I'm prepared to work with anybody, and it would be fantastic if there could be cross-party agreement on this because it is something that think everybody agrees is just nonsense. A lone primate should not be kept in a bird cage in someone's sitting room, I think we can all agree with that.

CD: This year is the 20th anniversary of the MSc in Primate Conservation! As an alumnus of Oxford Brookes, we wondered what you think the next 20 years of primate conservation holds?

AC: I'd like to say that I'm optimistic for the work that we do here at monkey world, but I'm actually very pessimistic because humans just seem to be exploiting the world on an ever-increasing basis. Habitats are being destroyed faster than ever before, and unless something changes, I can't see situations improving. I don't want to have all the primates here at the park, but there is nowhere else for them to go. At Monkey World, the difference is that we look after individuals as opposed to populations, and that's something I will always hold true to. However, there are no more healthy breeding populations of woolly monkeys in captivity in the world, they've all died, aside from ours. If our knowledge of how to keep a healthy population of woolly monkeys at the park can be shared with rescue centres in South America to help them keep confiscated woolly monkeys alive, so they can go back out into the wild, so that the law enforcement can be ratcheted up and refuges be put back in the forest, then perhaps the individuals we have here in Dorset can make a difference and I guess that's my glimmer of hope in our little monkey world.

2019-2020 Cohort of the MSc Primate Conservation

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