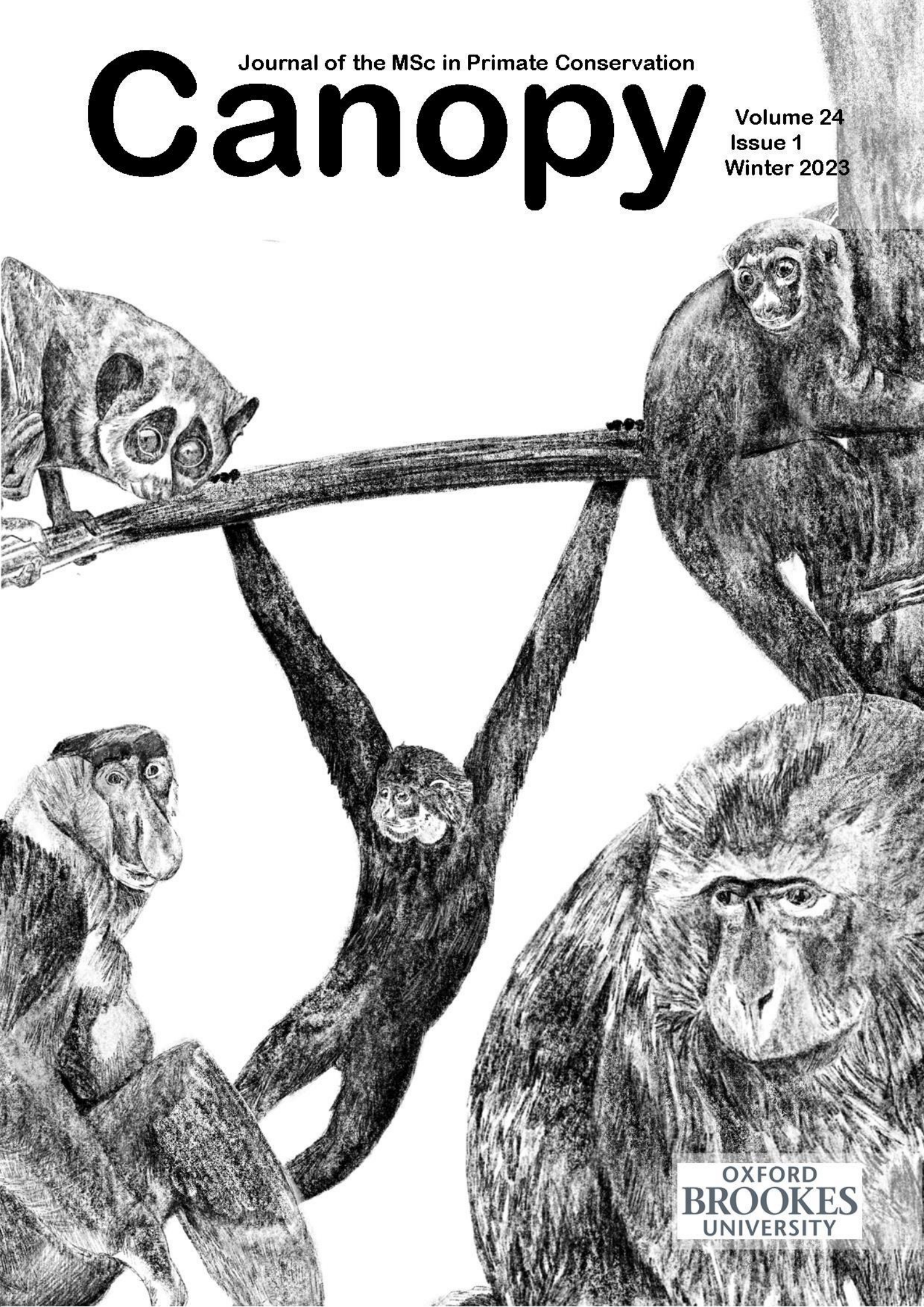
Journal of the MSc in Primate Conservation

Canopy

Volume 24
Issue 1
Winter 2023



OXFORD BROOKES UNIVERSITY

Canopy
Journal of the Primate Conservation
MSc and MRes Programmes
Oxford Brookes University

ISSN
2054-2070

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
The cover art of this issue of Canopy was designed by one of our cohort's MRes student Katie Farrell. We would like to thank her for the beautiful hand-drawn illustrations as her artistic touch brings beauty to the journal's teacher feature edition. She chose to draw primates that represent our lecturers' work and we truly appreciate her talent and dedication.

Table of Contents

Letter from the Editors

Welcome to the 2023 winter edition of Canopy, a collaborative endeavour by the passionate minds emerging from our master's program in Primate Conservation. This journal stands as a testament to the dedication and expertise fostered within our academic community, bringing together a collection of articles authored by past students, each contributing a unique perspective to the realm of primate conservation. In this issue we have decided not to follow a set topic, but rather to showcase our lecturer's areas of expertise as a result of recent changes occurring at Oxford Brookes University, as each of them are core elements of the MSc program. Our contributors delve into diverse topics, spanning from habitat stability to the pressing issues of the primate pet trade, and the delicate interplay between human and primate societies. Each article is a testament to the interdisciplinary nature of primate conservation, showcasing the intersection of biology, anthropology, ecology, and environmental science. The research presented here not only reflects the academic rigour instilled in our program, but also underscores the commitment of our community to drive positive change in the conservation landscape. We extend our gratitude to our lecturers for their guidance and mentorship, and for instilling in us an even deeper passion for primate conservation than we thought possible. This program would truly not be the same without you. A special thanks goes out to Dr Magdalena Svensson for overseeing this project and for always assisting and guiding us throughout the whole MSc. May this journal inspire curiosity, foster awareness, and contribute to the ongoing dialogue aimed at securing a future where primates thrive alongside us, reminding us of our shared responsibility in safeguarding the natural world.

Happy reading!

Aislinn, Lilli, Marie-Laure & Madeline

Letter from the Course Leader

In this introduction to this issue, I celebrate the last 23 years of the MSc in Primate Conservation, alongside the pathways and the MRes, at Oxford Brookes University, Oxford, UK. Our course, in 2008, was one of only two courses ever from Oxford Brookes to receive the Queen's Anniversary Prize for Excellence in Higher and Further Education, which celebrate innovation, excellence, and public benefit. Only 318 of these prizes have been given by the Palace since 1994, and they can only be received once. Our course has only grown and improved since that 2008 landmark achievement.

On top of our current cohort of 19 students, we have had the pleasure to train 538 students from all over the globe (less than half from the UK, and the others from 59 other countries) who came to Oxford to study what some would call a "too specialised course." But their passion for primates, our closest relatives, brought them together leading as well to a tightly knit network of alumni who still support these aspiring conservationists. Of our student projects, 103 of them have been on the primates listed amongst the World's 25 Most Endangered by the IUCN Primates Specialist group. These students have worked in 75 countries, including all the major primate range countries, with Madagascar, Indonesia, DRC, Ecuador, Peru, Uganda and Sri Lanka topping the list. They have worked on 38 different conservation, ecology, and welfare related topics, providing 54 major surveys of lesser-known taxa, 32 education and outreach projects, 27 studies focussing on human primate interactions, with studies of primate behaviour topping the list at 54. This work has led to 100s of scientific publications, conference presentations, and work that has led to legal changes for primate conservation and welfare throughout the globe.

The achievements of these students go on – 13 of them from 12 different countries are members of the IUCN Primates Specialist group – more alumni than from any other single university. They make up a substantial membership of the International Primate Society and the Primate Society of Great Britain, presenting 100s of talks and posters over the years. The list of prizes won by these alumni goes on and on - Whitley Award for Nature by Princess Anne (Angela Maldonado 2010; Josia Razafindramanana, 2012; Ekwoge Abwe 2013; Camille Coudrat 2022 shortlist); Josia also won the Tusk Trust's Wildlife Ranger Challenge Award in 2020, the Whitley-Segre Fund for Nature Award in 2018 among others; Els van Lavieren won the Future for Nature Award (2010); George Owoyesigire was the Inaugural Winner of the Steve H. Taylor Conservation Award by Cleveland Metroparks Zoo, alongside winning the Tusk Trust Award in 2019; and most recently Ekwoge Abwe won the Prince William Award for Conservation in Africa (2023).

The list of charities, NGOs, and rescue centres founded or run by our alumni also goes on and on. These include Sumatran Orangutan Society (Helen Buckland), The Orangutan Project (Panut Hadisiswoyo), Green Hill Bukit Luwang EcoLodge (Andrea Molyneux), Project Anoulak Laos (Camille Coudrat), Wild Solutions Kenya (Yvonne de Jone), CARE South Africa (Samantha Dewhirst), Mikajy Natiora Association Madagascar (Sylviane Volempeno), Neotropical Primate Conservation (Sam Shanee), Entropika Colombia (Angela Maldonado), the Sloth Sanctuary Costa Rica (Sam Trull). The list could fill pages!

We were deeply looking forward to celebrating our 25 years in 2025. Sadly in 2023, Oxford Brookes University announced severe staffing cuts including to the Department of Anthropology, which could deeply impact primate conservation. This has left a deep sense of bereavement among staff, students, and the global alumni network. Even if the university changes its mind, the possibility that such a deeply successful course that has true impact could be at risk makes us realise the great importance of our actions for conservation and how few people in the world care. Primates DO matter. Our alumni and students matter. And we hope that no matter the future of the course, our legacy will live on through their positive actions.

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

Letters from Staff Members

Professor Anna Nekaris

Recognized for her exceptional commitment since 1994 to conserving slow lorises and other nocturnal primate species, Prof. Nekaris received an end-of-year award by the Order of the British Empire (OBE) from King Charles III for services to conservation. Her achievements include elevating slow lorises to CITES Appendix I, collaborating with the Japanese government on microchipping CITES I listed species, and conducting pioneering studies in Asia. The founder of the Little Fireface Project in 2011, she actively contributes to biodiversity conservation, enforcing hunting and littering bans, installing wildlife bridges, and implementing sustainable farming practices. As one of People's Trust for Endangered Species' (PTES) five Conservation Partners since 2002, Prof. Nekaris plays a crucial role in the Conservation Partnership Programme, providing support to global experts. Beyond her prolific academic career, she has featured in BBC documentaries, presented a TED talk, and earned prestigious awards. Nida Al-Fulaij, CEO of PTES, commends Prof. Nekaris as an inspiring and dedicated conservationist, highlighting her well-deserved OBE, with the formal ceremony scheduled for 2024.

*My name is **Professor Anna Nekaris**. I have been leading the MSc in Primate Conservation under many different guises – Course Tutor – Subject Lead – Programme lead – for 23 years as of 2024! When I was asked to join the course staff in 2001, I doubted my abilities to do so, as I came from a traditional anthropology background. At that time, coming from an American university where conservation may only be one lecture at the end of a primate ecology course, it seemed something that had to be done alongside "real science." At the same time, conservation was my true passion and why I wanted to study primates in the first place. It was the dream of Prof Emeritus Simon Bearder, the founder of the course, to put conservation front and centre of a master's programme. He was initially shunned by the University for a seemingly absurd notion – who on earth would join such a specialist course? - and even today, people giggle at us calling us the "monkey people" – but we are so much more. What I love about the course is seeing the direct impact that students make during their time with us through campaigns, fieldwork with some of the world's most endangered primates, welfare work with some of the most neglected species, and so many other creative ideas that go beyond those typical ecology studies that are denied by many traditional universities. These include making films, training materials about illegal wildlife trade for practitioners, art exhibitions, puppet shows, and so much more. I also love the network that our graduates provide. They come to do the MSc Primate Conservation because of that overriding love and passion to study and conserve primates. And rarely does that passion that drives them to such a unique course die. This means our alumni are simply splendid, keeping in touch, supporting new students, and working with us as colleagues, writing IUCN Red List assessments, major papers on primate conservation, and working to change international laws and writing international guidelines to protect primates. The list of awards and honours received by our alumni could fill several pages, and we are deeply proud of them and their achievements. There can be no greater reward for an educator than seeing that the education you gave made a difference with such impact, not only to the individual, but truly to the world. We often use the word Species Champion to refer to an individual who truly can change the fate of a species. Well, we have Primate Champions, and no matter what the future of our course at Oxford Brookes University, the world is a better place because of the more than 500 champions we have helped to launch into it.*

Dr Magdalena Svensson

*My name is **Dr Magdalena Svensson** and I am the Laboratory Technician in Biological Anthropology and Primatology as well as an active member of the Nocturnal Primate Research Group, based here at Oxford Brookes University. My expertise is in conservation and ecology of nocturnal primates, mainly focusing on bushbabies, pottos, angwantibos and night monkeys. Research interests also include primate vocalisations, census methods, wildlife trade, human-primate interactions and IUCN Red List assessments.*

The MSc in Primate Conservation means a lot to me. I did the degree myself in 2007-2008 and it set me off on a completely new path in life, provided me with a network of colleagues and fellow conservationists around the world, and now allows me to work with enthusiastic students coming on to the course(s) every year, who are following the same passion as I did (and still do). I think the aspect that sets the Primate Conservation group at Oxford Brookes University apart from any other degree is the amazingly supporting group of alumni and staff members you join when enrolling.

In a world and time where biodiversity conservation is ever increasingly important, I think this course, with the transferable skills you learn, is invaluable in getting more conservationists out into the world. Further encouraging students who are already determined to save primates and their habitats.

Dr Susan Cheyne

Originally from Scotland I have worked in Asia since 1997 and in Indonesia since 2002. I have a focus on primate ecology and conservation looking into the illegal pet trade of gibbons and studying the rehabilitation and reintroduction successes of these threatened apes as well as focusing on conservation research to inform actions for small ape conservation. While working in Indonesia I have built a deep interest in the conservation of wild cats across Indonesian Borneo. As a co-director of Borneo Nature Foundation International, I lead a team working on the conservation of primates and wild cats where we are using camera trap technology to understand the movement, distribution and conservation status of these threatened cats. I am passionate about working with local communities for establishing protected areas and for reaching out through conservation education to people around the world. As vice-chair of the IUCN Primate Specialist Group Section on Small Apes, I aid communication between gibbon experts worldwide, providing digital resources and practical help to conservation and education projects, and helping fellow gibbonologists get their work funded. I am delighted to be able to bridge my conservation work with teaching aspiring conservationists. I have taught on the MSc in Primate Conservation since 2010 but I have been involved in supporting MSc students from Oxford Brookes at my field sites in Indonesia since 2004. Teaching on the MSc and supervising dissertations is on of the most rewarding aspects of my career. To provide conservationists with training, skills and support to create the next generation of decision-makers for conservation is a privilege. To be a part of a world-class team of lecturers and conservation researchers helping deliver this world-class course is challenging and inspiring and seeing the achievements and impacts for conservation of the hundreds of alumni from the course is

truly incredible. Being active in conservation research, I can bring this knowledge and real-world experience to the students to help them stay at the forefront of the ever-changing world of conservation. The range of skills and dedication to conservation of my colleagues who run the MSc combined with the enthusiasm and commitment of our students means it is a true honour to be part of this team and the wider MSc students, past, present, and future.

Professor Kate Hill

My research and teaching lie mainly within the sub-fields of Anthrozoology and Conservation Social Science, but I'm probably best known for my work on Conflicts Around Wildlife (more commonly referred to as Human-Wildlife Conflict). I've done fieldwork in West and East Africa, and the UK, and have supervised students working in these areas as well as southern Africa, South and Central America, India, Indonesia and the US.

I joined the Department of Anthropology at Oxford Brookes in January 2000, and taught the very first MSc Primate Conservation cohort later that year while on maternity leave! It was a fantastic opportunity to develop and teach a module that was so strongly linked to my own research interests and expertise – even with a 3-month-old who never slept when I needed to! Human-Wildlife Conflict, as it was then called, was scheduled for the graveyard slot – 6-9pm on Wednesday evening, after the students had already had a full day of classes. Yet they arrived in the session buzzing with ideas, and enthusiasm, and I often had to chase them out at 9pm – they would have kept on talking but I was dead on my feet and needed to go home! Many things have changed since then. People-Primate Interactions as the module is now called, is first thing on Monday morning, I'm no longer chronically sleep-deprived, and while some of the themes we consider in the module bear some resemblance to those in earlier versions of the module, a lot has changed. The anthropological content is much greater, and the emphasis is much more firmly on the importance of social science perspectives in primate conservation than previously. This is very much in line with developments in primatology and conservation policy and practice more generally. What hasn't changed however is (i) the wonderful energy, engagement, and intellectual curiosity of the students each year, (ii) the module teaching is based around discussions rather than formal lectures and (iii) every group I've worked with has challenged me to reflect on my own thoughts and position about conservation issues and perspectives, including those that relate directly to my research.

I feel a certain poignancy reflecting on my experience of teaching on the MSc over the last 23 years. It has been a great privilege and pleasure to be part of such an exceptional degree course. The course would never have come into existence without the vision and drive of its founder, Professor Simon Bearder. Simon's passion for primates, his encouragement and support for staff and students alike, and his recognition that conservation is about more than just biodiversity, provided an excellent foundation for the course to develop into the unique cross-disciplinary programme we now provide.

This course is very special for many reasons but perhaps most importantly to me, it is special because of the students who have passed through it and their amazing contributions to primatology and conservation, both directly and indirectly. I very much hope this will continue to be the case for many years to come.

The importance of the habitat stability through the years for a western hoolock gibbon (*Hoolock hoolock*) released

Sarah Banet-Eugène
Cohort 2017-2018
sarahbe1207@gmail.com

Gibbons are considered some of the rarest primates on earth (Melfi, 2013). Gibbon populations have declined over the last 30 years, due to loss of habitat and illegal harvesting of gibbons from the wild, primarily to supply the illegal pet trade (Geissmann, 2007; IUCN, 2013). This habitat loss leads to fragmentation of forests, and being strictly arboreal, maintenance of habitat quality is essential for gibbon persistence (Nijman 2004; Geissman, 2007). western hoolock gibbon (*Hoolock hoolock*) one of the three species of the *Hoolock* genera, have a home range through northeast India, Bangladesh and Myanmar and are currently facing threats such as habitat loss, hunting for traditional medicine and illegal trade (Walker *et al*., 2009). Their population is estimated to be around 7,000 individuals, it was among the 25 most endangered primates in the world in 2005 and 2008 and is listed as Endangered on the IUCN Red List (Brockelman *et al.,* 2008). Hoolock gibbon's principal habitat has declined by more than 30% since the beginning of the 21st century, the remaining habitat is fragmented, and unsuitable (Das *et al.,* 2006). Due to those threats, rehabilitation centres are welcoming an increasing number of gibbons coming from the illegal trade. Rescue centres are a safe place for these primates and many of these centres are working to rehabilitate the gibbons. If conditions allow it, following the IUCN guidelines (Campbell *et al.*, 2015), the centres are reintroducing them back to the wild. "Rehabilitation and Reintroduction" refers to the conservation of wild-born, captive-raised animals to re-establish a population in the respective species' historical range but where the species has become locally extinct due to human pressures (Cheyne, 2009). Before deciding to conduct the release, the IUCN guidelines require researchers to make sure the criteria are met to ensure, first, that the release is the best solution for the concerned individuals. Further, for a successful release the habitat should be secured and be suitable to carry the reintroduced population (Kleiman, 1989). The habitat conservation can be handled with monitoring, which is also needed to estimate an area suitable for establishing a new population (Walton *et al.,* 2013; Haskell *et al.,* 2017). The habitat of the western hoolock gibbon being highly fragmented throughout its range, makes the knowledge before planning a reintroduction, the suitability of the release site, and the behaviours of the animals in concern, even more crucial. Ramwalkanggre Community Forest Reserve (FR), an evergreen forest, was chosen for the release and where I conducted a habitat assessment. Here, I present data from Ramwalkanggre Community FR in Meghalaya state, India, where a single floating female,

Susanna, was previously surveyed. I confirmed her presence with sight and with her calls (Buckley *et al.,* 2006; Timmins & Duckworth, 2013).

Protected by villagers, Ramwalkanggre Community FR has an estimated surface area of 248 hectares. This reserve does not belong to the government, but the villagers are claiming to protect Ramwalkanggre FR. Ramwalkanggre FR is surrounded by villages, as well as rice, tea and arecanut plantations (Fig. 1).

Figure 1. Study site, Ramalkanggre Forest Reserve.

One part of the habitat assessment concerned the stability of the habitat through the years. Gibbons being arboreal, the need of a continuous canopy to enable them to travel and find feeding trees is crucial. Satellite images of Susanna's territory from the past ten years were analysed. The surface for each year was compared with the present surface, to see if the forested area has been decreasing.

Using Google Earth Pro, I found three different aspects of Ramalkanggre FR. The first one is from 2008, ten years ago. The forest was less dense, especially around Susanna's estimated Territory 2 (thickest blue polygon in Fig. 2). The second aspect was in 2010, the forest had become denser compared to 2008 and looked more similar to the current stage (medium thick, black polygon in Fig. 2). The last aspect was from 2015. The forest had become less dense, but not as severely as in 2008, but we can observe a difference with 2010 (yellow line in Fig. 2). The difference could have been accentuated by the quality of the satellite images. Nowadays, the satellite images are of higher quality compared to 2008 and the years after. I also compare the area deforested through the years in hectares. In 2008, around 22.51 ha of the Ramalkanggre FR was deforested compared to 3.93 in 2010 and 28.52 in 2015. In 2018 the whole forest was intact with 248 ha of continuous canopy.

Figure 2. Map of Ramalkanggre FR from 2008 to 2018, highlighting the changes around the territory of the wild single female hoolock gibbon. Thick line represents 2008, Medium thick line represents 2010 and the thinnest line represents 2015. The study site being delimited by the green line.

The evolution of the territory over the last ten years allows an overview on the possible degradation of the canopy in the territory, especially where the released female gibbon was sighted. The whole FR remained intact

except mainly near the area of Territory 2. The maximum degraded forest represents around 11.5% of the forest overall. This can be explained by logging conducted by the villagers. They used the forest, mainly for the bamboo, to build their houses and facilities. Prior to the release, an agreement was made with the villagers: they would use the forest resources only for their facilities and not for business and they would take bamboo from different areas, not all from the same place. Furthermore, Google Earth Pro satellite images ten years ago are not as reliable as today's satellite images, therefore the forest should still be monitored to ensure minimum degradation through the years. Gibbons being canopy users and specialists at feeding on fruit from the terminal branches of the tallest trees, the habitat should be able to provide a high diversity of fruit feeding trees, old enough to reach the canopy. Ramalkanggre FR is characterised by high biodiversity. A high number of mature trees which gibbons use to call from and as sleep sites, make it a good potential habitat for gibbon releases. However, its status as a Community Forest Reserve implies that it is handled by the surrounding villagers only, therefore, cannot qualify as safe in the long term.

This part of the project to conduct a release was essential to ensure that the habitat was not repeatedly facing threats for degradation which are nowadays, the major threats on hoolock gibbons.

REFERENCES

Brockelman W, Molur S & Geissman T (2008). *Hoolock hoolock.* The IUCN Red List of Threatened Species 2008.

Buckley C, Nekaris KAI & Husson SJ (2006). *Survey of Hylobates agilis albibarbis in a logged peat-swamp forest: Sabangau catchment, Central Kalimantan*. Primates, 47(4): 327-335.

Campbell CO, Cheyne SM & Rawson BM (2015). *Best Practice Guidelines for the Rehabilitation and Translocation of Gibbons*. Gland, Switzerland: IUCN SSC Primate Specialist Group, pp. 4-47.

Cheyne SM (2009). Challenges and opportunities of primate rehabilitation – gibbons as a case study. *Endangered Species Research*, 9: 159-165.

Das J, Biswas J, Bhattacharjee PC & Mohnot SM (2006). First Distribution Records of the Eastern Hoolock Gibbon Hoolock Hoolock Leuconedys from India. *Zoos' Print Journal*, 21(7): 2316-2320.

Geissmann T (2007). Status reassessment of the gibbons: results of the Asian Primate Red List Workshop 2006. *Gibbon Journal*, 3: 5-15.

Haskell DE, Webster CR, Bales AL *et al.* (2017). Assessment of wildlife habitat attributes at restoration projects on northern Wisconsin Lakeshores. *Northeastern Naturalist*, 24: 391-412.

IUCN (2013). *IUCN Red List of Threatened Species*. Version 2014.3. Available from: www.iucnredlist.org [Accessed 20 April 2018].

Kleiman DG (1989). Reintroduction of captive mammals for conservation. *BioScience*, 39: 152-161.

Melfi VA (2013). Gibbons: probably the most endangered primates in the world. *International Zoo Yearbook*, 46: 239-240.

Nijman V (2004). Conservation of the Javan gibbon *Hylobates moloch:* population estimates, local extinctions, and conservation priorities. *The Raffles Bulletin of Zoology*, 52: 271-280.

Timmins RJ & Duckworth JW (2013). *A survey of gibbons and other wildlife in the Bokeo section of Nam Kan National Protected Area, Lao PDR*. Fauna & Flora International, Cambridge, UK.

Walker S, Molur S, Brockelman WY *et al.* (2009). *Western hoolock gibbon Hoolock hoolock*. Bangladesh, India, Myanmar.

Walton KM, Spalinger DE, Harris NR *et al.* (2013). High spatial resolution vegetation mapping for assessment of wildlife habitat. *Wildlife Society Conservation*, 37(4): 906-915.

Eco-resorts as potential arcs for endangered species: A case study of slow lorises (*Nycticebus bengalensis*) in Thailand

Luke Quarles
Cohort 2021-2022
lukequarles22@gmail.com

Primates are globally imperilled with 93% facing active declines and ~68% threatened by extinction (Estrada & Garber, 2022; IUCN, 2022). Habitat loss along with direct loss from hunting and trapping act as constant pressures eroding the foundations of healthy populations. Attempts to control these declines come in varied forms but, for the purposes of this brief article, I will focus on habitat protection and its limitations as well as the relatively underexplored avenue of safeguarding vital habitats and species by using private land.

Historical attempts to legally protect public lands such as national parks have not guaranteed habitat preservation. In fact, practices such as illegal logging, poaching, and agricultural encroachment have been tolerated and even encouraged by local authorities in some regions (Gaveau *et al.,* 2016). While efforts to protect public lands have had varied results, privately protected areas display growing potential to benefit primate conservation efforts. Eco-resorts present a relatively understudied source of private habitat protection and restoration. Eco-resorts have displayed their potential to assist habitat conservation through forest protection, restoration, and the implementation of no-take zones within coastal reef ecosystems (Blangy & Mehta, 2006; Gjertsen & Gjertsen, 2010), but the exact impacts of resorts have not been extensively studied. I present a case study from Thailand, where I assessed the viability of a resort habitat for an endangered species of native slow loris (*Nycticebus bengalensis*).

Slow lorises (*Nycticebus* spp. and *Xanthonycticebus* spp.) are a group of nocturnal and cryptic strepsirrhine primates that live from south to southeast Asia (Nekaris & Starr, 2015). All nine recognised species of slow loris are listed by the IUCN Red List as either Vulnerable, Endangered, or Critically Endangered (IUCN, 2022). Unlike primates that can leap between gaps in the forest, lorises need continuous canopy to travel safely since they are incapable of jumping (Nekaris & Bearder, 2007). Slow lorises have a remarkably specialised diet, mainly eating exudates including gum, sap and phloem. Approximately half of the diet of slow lorises is gum followed by nectar, insects, leaves, flowers, and fruit (Rode-Margono *et al.,* 2014). Due to the ease of catching them in human-disturbed landscapes, there is also a trend for individuals and rescue centres to release them into forests where they are likely not adapted (Nekaris & Starr, 2015), leading to a high death rate.

To gauge the viability of eco-resort habitat for this endangered and specialised primate, I collected behavioural, and habitat use data over a two-month period at the Khao Lak Merlin (KLM) Resort, in Phang Nga Province, Thailand. The resort was 6 ha and was characterised as a highly human-modified old growth jungle. Older vegetation had been preserved, but other sections of the grounds were converted into manicured lawns and gardens for tourists (Fig. 1). The resort was partnered with the conservation NGO the Love Wildlife Foundation who, in 2020, helped them place canopy rope bridges to connect the resort to the plantation across the road and link fragmented portions of canopy within the resort.

Figure 1. An aerial view of the Khao Lak Merlin Resort. Displaying dimensions and general tree cover.

I followed four wild individuals (*N. bengalensis*), two adults (1 female and 1 male) and two subadult individuals of indeterminate sex. I performed focal sampling from 18:00-6:00h and collected data every five minutes (Altmann, 1974; Campera *et al.,* 2020). I also collected feeding and social behaviour through continuous sampling. Data analysis was performed with descriptive statistics, in Microsoft Excel (version 16.63.1), due to the exploratory nature of these data.

I collected 1,393 events across the family unit to determine activity budgets. On average, the lorises spent the largest portion of their time feeding and exploring, followed by socialising, grooming, travelling, and maintaining alert posture. Lorises additionally displayed a handful of other behaviours at relatively low frequencies.

I observed a total of 608 feeding events and most feeding events were on tree gum, followed by insects, fruit, palm sap, flower nectar, bamboo shoots, flowers, and vertebrate prey. All observed wild individuals fed on the gum of one particular tree species, the sea almond (*Terminalia catappa*). Additionally, I observed the lorises gouging on and eating the sap of a palm species (*Areca catechu*) that has previously not been recorded as a food source. Lastly, a vast proportion of fruits consumed came from latex-rich fruits.

I determined that the individuals used artificial substrates 0.8% of the time to travel between fragmented areas of canopy. I was also only able to record canopy bridge use a couple times because I was only recording focal individuals. The ranging patterns of the wild lorises at KLM were clearly restricted by features of the human-dominated landscape, such as the fragmented canopy and converted land, minimising their home range. Though, their

activity budgets were relatively unaffected when compared to prior research. The only notable difference was that socialising was higher in proportion to other study sites where it made up less than 1% of the activity budgets (Swapna *et al*., 2010; Rode-Margono *et al*., 2014). The high rate of affiliative socialising potentially indicates that the needs of the individuals are being sufficiently met within the resort (Li & Rogers, 2004). However, conclusions are tenuous, and more data is needed over a longer period of time in order to form strong conclusions.

The diet of the lorises was balanced in a relatively expected manner, but with more fruit consumption than expected (Rode-Margono *et al*., 2014). While the presence of exudates in the majority of fruits offers a viable explanation for this phenomenon, the novel gouging of the palm tree inhibits my ability to form concrete conclusions about the suitability of the habitat. It is unknown what purpose the palm serves in the diet of the lorises and what benefits or drawbacks it confers. Though my results are not conclusive, the KLM Resort has clear elements indicating that its habitat is viable and can support slow lorises. It is my assessment that the KLM Resort is an all-too-small haven in a patchwork of degraded and fragmented habitat. The resort is likely a highly contested area that cannot sustain more than one small family unit. However, it does show that lorises can thrive in human-dominated resort landscapes. If the neighbouring resorts could be motivated to increase their native tree density in a collaborative effort with KLM and Love Wildlife Foundation, the effects for slow lorises could only be positive. Though the privately owned and managed lands of resorts remain relatively understudied, KLM presents strong evidence for their status as untapped arcs for endangered species. Beyond simple protection, KLM also has the power to foster a love and understanding of the species within local and native Thai visitors who spend time at the resort. While the resort is a centre for loris activity, it will also be essential to look externally in the future. These animals must come from and disperse to somewhere outside the resort, so a key next step will be to survey the area around the resort and attempt to understand the wild lorises around Khao Lak.

At the end of my stay, I conveyed my findings and suggestions to the owner and staff at KLM. I described the individual lorises, relayed my preliminary findings on their ranging habits, diet, sleeping sites, and their use of artificial substrates. Then we spent two hours walking the grounds of the resort and I provided my suggestions for ways to improve the lives of the lorises through a variety of means: new canopy bridges, planting food source trees (*T. catappa*), and covering bright lights with domes (Fig. 2).

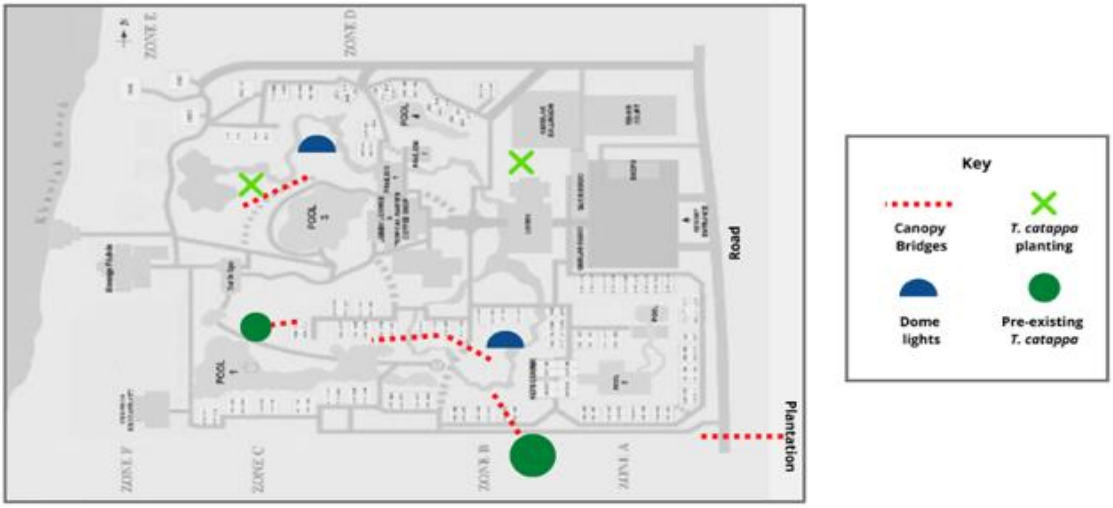


Figure 2. A visual representation of the habitat improvements made to the KLM resort based upon my research.

REFERENCES

Altmann J (1974). Observational study of behavior: sampling methods. *Behaviour*, 49(3-4): 227-266.

Blangy S & Mehta H (2006). Ecotourism and ecological restoration. *Journal for Nature Conservation*, 14(3-4): 233-236.

Campera M, Brown E, Imron MA & Nekaris KAI (2020). Unmonitored releases of small animals? The importance of considering natural dispersal, health, and human habituation when releasing a territorial mammal threatened by wildlife trade. *Biological Conservation*, 242: 108404.

Estrada A & Garber PA (2022). Principal drivers and conservation solutions to the impending primate extinction crisis: Introduction to the special issue. *International Journal of Primatology*, 43(1): 1-14.

Gaveau D, Wich SA & Marshall AJ (2016). Are protected areas conserving primate habitat in Indonesia. In: Wich S & Marshall AJ (eds). *An introduction to primate conservation*. Oxford: Oxford University Press. pp. 193-200..

Gjertsen H & Niesten E (2010). Incentive-based approaches in marine conservation: applications for sea turtles. *Conservation and Society*, 8(1): 5-14.

IUCN (2022). The IUCN Red List of Threatened Species v. 2022.1. Available at: http://www.iucnredlist.org [accessed 23 July 2022].

Li Z & Rogers E (2004). Habitat quality and activity budgets of white-headed langurs in Fusui, China. *International Journal of Primatology*, 25(1): 41-54.

Nekaris KAI & Bearder SK (2007). The lorisiform primates of Asia and mainland Africa: diversity shrouded in darkness. In: Campbell CJ, Fuentes A, Mackinnon KC, Panger M & Bearder SK, (eds). *Primates in Perspective.* Oxford: Oxford University Press. pp 24-45.

Nekaris KAI & Starr CR (2015). Conservation and ecology of the neglected slow loris: priorities and prospects. *Endangered Species Research*, 28(1): 87-95.

Rode-Margono EJ, Nijman V, Wirdateti W & Nekaris KAI (2014). Ethology of the Critically Endangered Javan slow loris *Nycticebus javanicus* E. Geoffroy Saint-Hilaire in West Java. *Asian Primates*, 4(2): 27-38.

Swapna N, Radhakrishna S, Gupta AK & Kumar A, (2010). Exudativory in the Bengal slow loris (*Nycticebus bengalensis*) in Trishna Wildlife Sanctuary, Tripura, northeast India. *American Journal of Primatology*, 72(2): 113-121.

Changes in the behavioural ecology of collared brown lemurs in a regenerating forest fragment 2002–2015

Lesley McIlroy
Cohort 2021-2022
lesley_mcilroy@yahoo.co.uk

This study was a desk-based project on the behavioural ecology of a population of collared brown lemurs (*Eulemur collaris*) in the littoral forest at Mandena, in southeastern Madagascar. By analysing various aspects of their ecology over multiple years the aim was to see if behavioural changes corresponded with positive changes in what was a heavily degraded but then protected habitat.

The littoral forests in southeast Madagascar are low-lying rainforests, growing on poor quality, sandy soil within 2-3 km of the coast (Bollen & Donati, 2005). The littoral forest at Mandena is highly fragmented and degraded but the two largest fragments, M15 and M16, were given protected status prior to the start of this study, becoming part of the Mandena Conservation Zone (Fig. 1).

There are 148 hectares of forest, separated by an area of swamp which takes the total area to 230 hectares (Campera *et al.*, 2014). Normalised Difference Vegetation Index uses satellite readings to create a vegetation index, indicative of levels of forest productivity. This index showed that mean forest quality in the Conservation Zone improved significantly over the years 2001–2018 (Donati *et al.,* 2020). The area outside of the protected zone is still heavily affected by anthropogenic disturbance including mining. The mining company QIT Madagascar Minerals made a commitment to balance their environmental impact by maintaining biodiversity in the area, as part of which they funded assistants to collect data on the lemurs in M15 and M16. It is their data, taken from 2002–2015 that is used in this study (Donati *et al.*, 2007a).

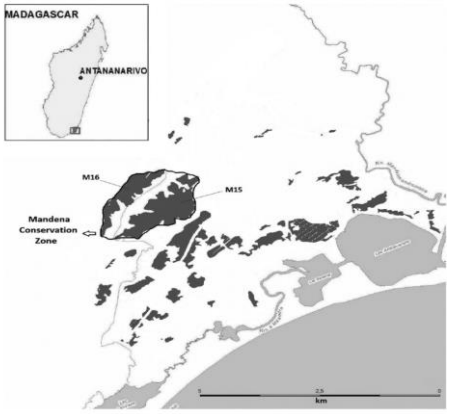


Figure 1. Map showing location of Mandena and configuration of forest fragments. The two large fragments M15 and M16 are the study area (Donati *et al*., 2020).

The study species*, E. collaris*, is a medium-sized strepsirrhine primate. They are arboreal, primarily frugivorous and known to show great behavioural plasticity (Donati *et al.,* 2007a). They have large home ranges as fruit is a very scattered resource both spatially and temporally. Madagascar has unpredictable fruiting patterns, both within and between

years, and extended periods without fruiting (Erhart & Overdorff, 2008). The study population were originally from fragments M3 and M4, some 3 km away, but were translocated to M15/M16 during 2000–2001 as M3 was being destroyed by logging for charcoal production. There were no other *E. collaris* in M15/M16 at this time as the previous population had been hunted out prior to the establishment of protected status (Donati *et al*., 2007a).

Data were collected using instantaneous focal sampling at five-minute intervals (Altmann, 1974) in the hours between 6am and 6pm. Total observation hours varied across days, months and years depending on the accessibility of the animals and climatic conditions. A range of variables were monitored focusing on the question *Did habitat and substrate use change over the study period?* Data were divided into seasons based on Campera *et al*. (2014) who found fruit abundance to be higher from November to April and scarce from May to October. Habitat use was examined as proportions of total observations while substrate height use was looked at as seasonal means. Data were analysed using Generalised Linear Models to look at the effect of time and season and to see if there was any interaction between the two.

Habitat was divided into three types; forest, swamp, and edge. The prediction was that the lemurs would, as an arboreal and frugivorous species, show a preference for forest habitat, since tree size is a proxy for fruit productivity. The species has been seen to show dietary flexibility during times of fruit scarcity which can mean use of other areas to meet nutritional needs (Donati *et al.,* 2007b). Despite this, their digestive anatomy is poorly adapted to a highly fibrous, folivorous diet, so they maintain high levels of frugivory even in periods of fruit scarcity (Donati *et al.,* 2007b). The swamp at Mandena provides a valuable fallback resource in the form of *Brexia madagascariensis* flowers which were extensively fed on by the lemurs (Campera *et al.,* 2014).

The interaction between season and time showed a positive effect on forest use and a negative one on swamp use in relation to the season of fruit scarcity. This suggests that as the quality of forest habitat improved it may have enabled the lemurs to find fruit more easily in the forest during periods of scarcity. It is also relevant to remember this is a translocated population. Translocated animals must learn an entirely new landscape with reference to food resources and predator avoidance and this can take weeks to several years to achieve (Franks *et al*., 2020). Thus, it may also be the case that increasing local knowledge contributed to an increased ability to forage in the forest during the lean season. Edge habitat was the least used, which showed a negative result in relation to time. Again, it could be that the improvement in

both forest quality and local knowledge enabled the lemurs to select less open (and therefore high-risk) areas in which to feed. Height in the trees used by the lemurs showed a positive change over time. This may relate to increased tree size once the area had protected status. It is also likely that as forest quality improved it would result in an increase in leaf cover and connectivity, which, along with familiarity with the territory, would be important factors in predator avoidance. Lemurs are vulnerable to aerial predation by birds of prey so they often avoid high, open areas in daylight (Donati *et al.,* 1999). Denser leaf cover would make the lemurs less visible to predators and may enable them to feed higher in the canopy without increased vulnerability. Their other major predator, the fossa (*Cryptoprocta ferox*) is an agile arboreal predator (Wright *et al.*, 1997). Increased connectivity would give the lemurs more possible escape routes in case of attack. The results of this study indicate that lemurs respond to positive as well as negative changes in habitat quality although this may not be apparent in the short term. Restoration of habitat is complex and there are no guarantees the habitat will be as it was before (Chapman *et al.,* 2010). It is important therefore that long-term monitoring is used to indicate whether protection and restoration are succeeding for particular species and the ecosystem as a whole.

REFERENCES

Altmann J (1974). Observational study of behaviour: sampling methods. *Behaviour*, 49(3-4): 227-266.

Bollen A & Donati G (2005). Phenology of the littoral forest of Sainte Luce, southeastern Madagascar. *Biotropica*, 37(1): 32-43.

Campera M *et al.* (2014). Effects of habitat quality and seasonality on ranging patterns of collared brown lemur (*Eulemur collaris*) in littoral forest fragments. *International Journal of Primatology*, 35(5): 957-975.

Chapman CA *et al.* (2010). Understanding long-term primate community dynamics: implications of forest change. *Ecological Applications*, 20(1): 179-191.

Donati G *et al.* (1999). Cathemeral activity of red-fronted brown lemurs (*Eulemur fulvus rufus*) in the Kirindy Forest/CFPF. In: Rakotosamimanana B, Rasamimanana, H, Ganzhorn JU & Goodman SM (eds). *New Directions in Lemur Studies* (pp. 119-137). Springer, Boston, MA.

Donati G *et al.* (2007a). Translocation as a conservation measure for an endangered species in the littoral forest of southeastern Madagascar: The case of *Eulemur collaris*. In: Ganzhorn JU *et al.* (eds). *Biodiversity, Ecology, and Conservation of Littoral Ecosystems in Southeastern Madagascar, Tolagnaro (Fort Dauphin).* Smithsonian Institution Press. pp. 237-245.

Donati G *et al.* (2007b). Feeding over the 24-h cycle: dietary flexibility of cathemeral collared lemurs (*Eulemur collaris*). *Behavioral Ecology and Sociobiology*, 61(8): 1237-1251.

Donati G *et al*. (2020). Life in a fragment: Evolution of foraging strategies of translocated collared brown lemurs, *Eulemur collaris*, over an 18-year period. *American Journal of Primatology*, 82(4): e23106.

Erhart EM & Overdorff DJ (2008). Population demography and social structure changes in *Eulemur fulvus rufu*s from 1988 to 2003. *American Journal of Physical Anthropology*, 136(2): 183-193.

Franks VR *et al.* (2020). Changes in social groups across reintroductions and effects on post-release survival. *Animal Conservation*, 23(4): 443-454.

Wright PC *et al.* (1997). Predation on Milne-Edward's sifaka (*Propithecus diadema edwardsi*) by the fossa (*Cryptoprocta ferox*) in the rain forest of southeastern Madagascar. *Folia Primatologica*, 68(1): 34-43.

Primate pet trade across and out of Asia: collection and analysis from the CITES Trade Database

Bethany Fletcher
Cohort 2020-2021

The wildlife trade has been on the rise over the past few decades and is recognised as a global threat to conservation that has lasting long-term effects on the survival of wild populations (Soulsbury *et al.,* 2009; Nijman *et al.,* 2011). A lot of wildlife trade is for pets, and nowhere is more prominent for this than Asia. This area of the world is identified as the main hotspot for trade and primates are among the most popular (Nijman, 2010; Nijman *et al.,* 2017; Lappan & Ruppert, 2019). Recent accounts of primates in Asia highlight that more than half are on the verge of extinction (Blair *et al.,* 2017; Estrada *et al.,* 2017), for example, slow lorises (*Nycticebus* spp.), squirrel monkeys (*Saimiri* spp.), and macaques (*Macaca* spp.). The demand for primates as pets is not only driven by exports outside of Asia, but also in primate-range Asian countries. Local trade has become a major driving force with the majority of individuals being illegally captured within several protected areas, such as national parks and nature reserves (Nijman *et al.,* 2017).

I aimed to produce an investigative study to explore the live primate pet trade exportation rates across and out of Asian-range countries between a forty-year period (1980-2018). This research was conducted through the collection and analysis of data gathered from the CITES Trade Database. CITES is an international agreement between governments who aim to ensure that wildlife trade is monitored and regulated correctly, without threatening the survival of a species (CITES, 2021). Data was downloaded on the export of primates traded as live indiciduals (search was done by order of primates, with the exporting range set to all Asian countries); reports were limited to the source code "wild". As CITES does not specifically state a category for pets, I enlisted the pet trade under the category "personal". CITES interprets this purpose code as the 'movement of personal property for the person trading the specimen, not to be traded commercially'.

Over the forty-years prior to 2018, I found a total of 17 Asian-range countries exporting primates as pets, in which the Philippines was reported as the country trading most (27 individuals in total). Of these 17 countries found, I identified a total of 101 live individuals from 13 primate species. Within the Philippines, 27 cases of exported trades were found to be of *Macaca fascicularis,* however, this was only between 1980-1999. After analysing the overall data, it was clear that live trades were mainly conducted between 1990-1999 (n=46). Between 2000-2009, the cases dropped considerably

(n=11). A further reduction was identified in the year period 2010-2018 (n=4), whereby the most traded species were *Chlorocebus pygerythrus* (*N*=3), and *Macaca mulatta* (n=4), with *M. mulatta* traded out of only two countries: Uzbekistan and Viet Nam. The Philippines was the most common country to trade, followed by Japan (n=15), Malaysia (n=14), and China (n=8). Lebanon and Uzbekistan trade the least since 1980 (n=2). When comparing this to the data of species mostly traded, *M. fascicularis* was the most known primate to become a pet, followed by *M. mulatta* (n=16), *Pan troglodytes* (n=8), and *Saimiri sciureus* (n=7).

The main results of my research found considerable differences between the countries of export in Asia, and the quantity of a primate species traded to be a pet over the past forty years. Overall, however, since 1980, the trade of wild primates as pets from these Asian-range countries has significantly decreased, not increased as I had initially thought. With as many as fifteen individuals accounted for on the CITES Trade Database between 1980 and 2018, it was evident that exportations were conducted most frequently during both the 1980s and 1990s (86%), with 14% of trade rapidly declining in the 21st century. However, when I compared this to the previously published studies on a similar context to my research, it was demonstrated that since 1995, primate exports for the pet trade are on the rise (Nijman *et al.,* 2011; Nijman *et al*., 2017; Norconk *et al.,* 2019). It was suggested that this could be due to the CITES Trade Database either reporting on inadequate documented records, lack of data on locally traded individuals (Nekaris & Nijman, 2007; Robinson & Sinovas, 2018), or that illegal trade is most commonly responsible when greater numbers are involved.

With primate pet trade set to be on the rise, it is now more important than ever that interventions are put in place to reduce this activity, not only in Asia, but globally (Norconk *et al.,* 2019). Interventions may include, for example, raising awareness by educating local communities on the risks of primates as pets, increasing knowledge of local customs and legislations, and by encouraging primatologists, as well as the general public, on how they can become a counterforce to prevent more trade (Nijman *et al.,* 2011; Blair *et al.,* 2017; Lappan & Rupert, 2019). As the CITES Trade Database only monitors and regulates legal live trade and does not gain overall access to empowering trade through legislation, it needs to be improved immensely. It was clearly found that such reports were missing figures and years of potential exports within and out of Asia, however, this may be due to an illegal trade occurring and CITES does not report on illegal trade, unless seizures were correctly reported. Trade of primates must be regulated much more closely to prevent them becoming pets.

REFERENCES

Blair ME *et al.* (2017). Multidisciplinary studies of wildlife trade in primates: Challenges and priorities. *American Journal of Primatology,* 79: 1-6.

CITES (2021). *The Convention on International Trade in Endangered Species of Wild Fauna and Flora*. Available from: https://trade.cites.org/ [Accessed on 14 September 2021].

Estrada A *et al.* (2017). Impending extinction crisis of the world's primates: Why primates matter. *Science Advances,* 3(1): 1-16.

Lappan S & Ruppert N (2019). Primate research and conservation in Malaysia. *Primates,* 34: 35-40.

Nekaris KAI & Nijman V (2007). CITES proposal highlights rarity of Asian nocturnal primates (Lorisidae: *Nycticebus*). *Folia Primatologica,* 78(4): 211-214.

Nijman V (2010). An overview of international wildlife trade from Southeast Asia. *Biodiversity and Conservation,* 19(4): 1101-1114.

Nijman V *et al.* (2011). Primate conservation: measuring and mitigating trade in primates. *Endangered Species Research,* 13(2): 159-160.

Nijman V *et al.* (2017). Changes in the primate trade in Indonesian wildlife markets over a 25-year period: Fewer apes and langurs, more macaques, and slow lorises. *American Journal of Primatology,* 79(11): 1-13.

Norconk MA *et al.* (2019). Reducing the primate pet trade: Actions for primatologists. *American Journal of Primatology,* 82(1): 1-9.

Robinson JE & Sinovas P (2018). Challenges of analyzing the global trade in CITES-listed wildlife. *Conservation Biology,* 32(5): 1203-1206.

Soulsbury CD *et al.* (2009). The welfare and suitability of primates kept as pets. *Journal of Applied Animal Welfare Science,* 12(1): 1-20.

Review of crop foraging by gorillas, orangutans, and bonobos

Jennifer Vickers
Cohort 2019-2021
jennofvenus@gmail.com

Primate species are declining at an alarming rate as a result of anthropogenic disturbance such as habitat loss (Cowlishaw & Dunbar, 2000). The demand for agricultural resources is increasing at extraordinary rates, but the agricultural land base needed is dwindling (Bruinsma, 2003). Widespread habitat conversion brings people and wildlife together, which leads to competition over space and resources. This can lead to crop foraging which is when wild animals damage or consume plant crops and is a foraging strategy by wild animals that causes conflict between humans and wildlife (Hill, 2017). Wild animals can crop forage because of reduced wild food availability, crop availability, food preference, nutrient needs, and more. Primates learn quickly and have a highly adaptable nature. This, along with their dietary and behavioural flexibility, allows them to successfully use agricultural areas which can make them bothersome when living in close proximity to humans (Else, 1991). A broad assumption why primates crop forage is that wild food is less available due to habitat loss or degradation, so they resort to crop foraging (Choudary, 2004). Crop foraging can impact local livelihoods and hinder conservation efforts. Conflict mitigation strategies are difficult to develop for large-bodied, cognitively complex species such as great apes (Campbell-Smith *et*

al., 2012). Comprehensive studies of crop foraging by endangered wildlife is lacking but important for managing human-wildlife conflict.

This study is modelled after Hockings and McLennan's (2012) "From forest to farm: systematic review of cultivar feeding by chimpanzees – management implications for wildlife in anthropogenic landscapes". Hockings and McLennan's study was based solely on chimpanzees, while this study investigates the other great apes. Comprehensive analyses of crop selection by great ape species, besides chimpanzees, are lacking. This study aims to assess which crops and parts of the crops are preferred by gorillas, orangutans, and bonobos for foraging. In this paper, a comprehensive literature review was conducted to understand patterns of crop foraging and consumption by gorillas, orangutans, and bonobos. This study assessed patterns of crop foraging in relation to species feeding behaviour, agriculture exposure, crop availability, and overall preferred crops.

I found that gorillas, bonobos, and orangutans all crop foraged throughout their ranges. All species foraged on a range of crops and plant parts; gorillas on 15 plant parts from 9 crop species, orangutan on 39 plant parts from 13 crops and bonobo on 4 plant parts from 4 crops. Based on my study, it is suggested that gorillas prefer to crop forage for bananas and eucalyptus, but do not seem to like cassava or yam. They also probably prefer to eat the pith part of the crops. It is also probable that orangutans prefer to crop forage for rubber and durian, and they prefer to eat the fruit part of the crops. Finally, bonobos appear to prefer to crop forage for sugarcane, and possibly bananas. No comments can be made about the parts of the crops that bonobos prefer to eat.

Mitigation strategies to deter crop foraging are especially challenging to develop for great apes and require an understanding of the species' behavioural ecology and ecological flexibility. Species that have protected status, including all the great apes, are supposed to be deterred, translocated, or tolerated. Consistent and proactive management is required to mitigate great ape crop foraging. Management choices such as crop foraging barriers, guarding, buffer zones, and behaviour-based management strategies have been used to help mitigate the human-ape conflict (Hill, 2018). Developing these mitigation strategies requires background knowledge such as that provided by this study.

In anthropogenic landscapes, protection of small areas of habitat is rarely a sufficient conservation strategy because great apes require wider ranges and will leave the forest to crop forage (Graham *et al.,* 2009). Effective and sustainable strategies will require a combination of methods to target great ape behaviours, protect habitat, as well as increase local people's tolerance and secure their livelihoods (Treves *et al*., 2006). Studies such as mine help gain an understanding of great ape crop foraging behaviour as compared to anthropogenic activity. This can have potential for informing

local people of the crops that have higher potential to cause human-ape conflict.

It is recommended that researchers consider crop foraging and selection by wildlife species of greater importance. Most sites where mammals, especially great apes, are studied are in anthropogenic landscapes where they are exposed to crops. Crop foraging should be considered as part of wildlife adaptation to its environment. Widespread conversion of natural habitats for agricultural use is leading to increases in wildlife populations' exposure to cultivated foods or crops. If researchers are to develop effective management strategies to reduce human-ape conflict, they must first gain understanding about the responses of endangered wildlife populations to changing environments and contact with agriculture. To supplement the findings of these studies, it will be necessary for there to be a greater number of future studies that report confirmed crop foraging observations, especially for gorillas and bonobos. In addition, these future studies need to report the part of the crop that is eaten for all species. Finally, it will be necessary for there to be more harvested data for the geographic regions that contain the habitats for gorillas, orangutans, and bonobos. Having this information will make it possible to confirm the crops and parts of the crops these great ape species prefer to forage. As a result, it will be possible to provide more definitive inputs to be used for the development of crop foraging mitigation strategies.

Information about which crops are consumed by great apes has the potential to help stakeholders develop sustainable wildlife management practices that can benefit humans and great apes. Both the economic needs of local people and the conservation of endangered great apes must be considered when assessing the suitability of particular crops to prevent and mitigate human-ape conflict.

REFERENCES

Bruinsma J (2003). World Agriculture: Towards 2015/2030: An FAO Perspective. London: Earthscan.

Campbell-Smith G, Sembiring R & Linkie M (2012). Evaluating the effectiveness of human-orangutan conflict mitigation strategies in Sumatra. *Journal of Applied Ecology,* 49(2): 367-375.

Choudhury A (2004). Human–elephant conflicts in northeast India. *Human Dimensions of Wildlife,* 9(4): 261-270.

Cowlishaw G & Dunbar RI (2000). *Primate Conservation Biology*. Chicago: University of Chicago Press.

Else JG (1991). Nonhuman primates as pests. In: Box HO (ed). *Primate Responses to Environmental Change*. pp. 115-165. London: Chapman & Hall.

Graham MD, Douglas-Hamilton I, Adams WM & Lee PC (2009). The movement of African elephants in a human-dominated land-use mosaic. *Animal Conservation,* 12(5): 445-455.

Hill CM (2018). Crop foraging, crop losses, and crop raiding. *Annual Review of Anthropology,* 47(1): 377-394.

Hill CM (2017). Crop raiding. In: Fuentes, A (ed): *The international Encyclopedia of Primatology*. Hoboken: Wiley.

Hockings KJ & McLennan MR (2012). From forest to farm: Systematic review of cultivar feeding by chimpanzees – Management implications for wildlife in anthropogenic landscapes. *PLoS ONE,* 7(4): 0033391.

Treves A *et al.* (2006). Co-managing human–wildlife conflicts: A review. *Human Dimensions of Wildlife,* 11(6): 383-396.

"Human shield", habituation, and trail implementation- the complex world of field biology

Lucas Schauer
Cohort 2021-2022
lucas.schauer@colorado.edu

Field research is an essential aspect of wildlife and environmental conservation, especially in the face of oncoming exacerbations in the effects of climate change. We need to collect as much information about as many species as we can now, before more species fall to Critical Endangered status or worse, so we can save the fragile food webs and ecosystems around the world. Two fundamental components of researching wildlife behaviour have arisen over the years- the insertion of trail systems into a target species home range, and their habituation to researcher presence (Plumptre *et al.*, 2013). These two strategies have created a perplexing dynamic between the wildlife and researchers which has only recently begun to be identified and described as the "human shield" effect. This is characterised as when prey species, such as primates, benefit from a radius of decreased predation around humans due to their predator's human-avoidant disposition, spatially altering the expression of a variety of behaviours (LaBarge *et al.*, 2020). I decided to study the Verreaux's sifaka (*Propithecus verreauxi*) of Kirindy Mitea National Park, Madagascar because its main predator, the fossa (*Cryptoprocta ferox*), is a notoriously elusive predator species. The predator's avoidance of humans, combined with lemurs' tendency to quickly habituate and adapt to anthropogenic environmental changes (Williamson & Feistner, 2003), suggests that this particular predator-prey relationship would be significantly impacted by the "human shield" effect.

Over the course of eight weeks through the dry season at Kirindy Mitea National Park (May-June 2022), data on canopy cover and height use for the Verreaux's sifakas collected *ad libitum* along line transects which emphasised animal behaviour alterations based on proximate distance from research trails. My study highlighted not only the strength and complexity of the "human shield" effect, but also that trail systems, while valuable to research, need to be constructed in a way which enables the target species to exist outside the easy reach of humans.

This project is influential to the fields of wildlife research and conservation by shedding light on the potential pitfalls of the current methodologies we rely so heavily on in field biology. Researcher-established trails can impact wildlife behaviour by creating a "human shield" which interrupts the natural predator-prey relationships present in nature (Berger, 2007). Habituation is also a risky

endeavour due to its desensitisation of target species to humans, putting them at risk of being hunted or captured, and exchanging pathogens with humans (Devaux *et al.*, 2019). Our ideas of what is effective in wildlife research is largely based on our personal success in conducting research, instead of what is most conducive for the wildlife to continue natural behaviour expression. While a degree of trail implementation and habituation is important to conduct research efficiently, these ideas need to be further evaluated in order to determine the extent to which necessary changes can be made.

National parks and research stations both require trails to allow researchers and tourists access to the forest and the life within. More access means more knowledge and more money, which is great for business and conservation funding. There is, however, a metaphorical line that should not be crossed in terms of retaining a sense of 'wild' in those areas. For instance, the fact that trails are important for manoeuvrability in dense vegetation cannot be denied, but trail systems should be implemented in ways that ensure animals still have substantial room where they can exist more than 10 m from the nearest point of anthropogenic influence (i.e. trails or human presence). Habituation has been seen as a key aspect of ecotourism, such as the gorillas of Rwanda and whale sharks of Cabo san Lucas, Mexico, but it is also hazardous for desensitising wildlife to, arguably, their biggest threat - humans. We therefore should do our best to maintain a healthy relationship of respect, fear, and distant appreciation with the wildlife.

Further data analysis needs to be conducted on the ways in which anthropogenic influence impacts the vertical spatial use of the target species, as well as additional research conducted on the predators of the target species. With these two aspects added, one could reasonably draw enough conclusions to determine the adequate number of trails required, with respectful distances apart, which could be implemented to conduct efficient research without inhibiting the natural predator-prey relationships.

REFERENCES

Berger J (2007). Fear, human shields and the redistribution of prey and predators in protected areas. *Biology Letters*, 3(6): 620-623.

Devaux CA, Mediannikov O, Medkour H & Raoult D (2019). Infectious disease risk across the growing human-non human primate interface: A review of the evidence. *Frontiers in Public Health*, 7: 305.

LaBarge LR, Hill RA, Berman CM *et al.* (2020). Anthropogenic influences on primate antipredator behavior and implications for research and conservation. *American Journal of Primatology*, 82(2): e23087.

Plumptre A, Sterling E & Buckland S (2013). Primate census and survey techniques. In: Sterling E, Bynum N & Blair M (eds). *Primate Ecology and Conservation: A Handbook of Techniques*. pp. 10-26. Oxford: Oxford University Press.

Williamson EA & Feistner AT (2003). Habituating primates: processes, techniques, variables and ethics. In: Setchell JM & Curtis DJ (eds). *Field and Laboratory Methods in Primatology: A Practical Guide.* Cambridge: Cambridge University Press. pp. 25-39.

The use of personality in improving the management and welfare of captive bonobos

Lou Savigny
Cohort 2022-2023
lousavigny2@gmail.com

Early studies of animal personality yielded valuable insights into our knowledge of personality in non-human primates (hereafter referred to as 'primates') and its evolutionary links with human personality, especially in great apes. However, it is only in the past decade that this knowledge has been applied to studies with a more ecological and conservation-oriented approach. Indeed, while 70% of primate personality studies were conducted in laboratories before 2010 (Freeman & Gosling, 2010), Norman *et al.* (2021) found that between 2010 and 2020, zoo-housed and free-ranging primates accounted for 39% and 25% of such studies respectively, while laboratory studies dropped to 36%. This suggests that personality researchers are increasingly shifting their focus to primates living in more natural conditions with better welfare. Following this more recent approach, links between personality and behavioural or physiological variables are increasingly documented and highlight that critical components of primate life such as foraging strategies, social interactions and psychological well-being are substantially influenced by personality (Gartner & Weiss, 2018; Robinson & Weiss, 2023). In the light of the growing recognition of primates' needs for appropriate behavioural development to ensure long-term welfare, it is crucial that we understand how personality affects these components. Here, I discuss how personality knowledge on bonobos (*Pan paniscus*) and primates more generally can help improve their well-being in captivity, as long as the stability of personality traits is assessed.

Particularly in captive environments, understanding the impact of personality on primate behaviour and well-being can be of great value. Knowledge of individual personality profiles can help in the decision-making surrounding group compositions (Gartner & Weiss, 2018). For example, personality ratings may be a valuable aid in identifying gorillas (*Gorilla* spp.) who are better suited to live in bachelor groups (Schaefer & Steklis, 2014) or changes in group composition can be decided according to homophily of personalities, which is known to affect relationship quality in bonobos (Verspeek *et al.*, 2019) and chimpanzees (*Pan troglodytes*; Massen & Koski, 2014). Different personality profiles may also prefer different types of environmental enrichment and might respond differently to varying levels of human interaction or exposure (Gartner & Weiss, 2018). In squirrel monkeys (*Saimiri sciureus*),

more playful and less cautious individuals were found to be more likely to spend time close to visitors and to voluntarily participate in research activities (Polgár *et al.*, 2017). Personality can also have an impact on physical and psychological well-being. Subjective well-being appears to be negatively associated with anxiety-related personality traits like neuroticism in chimpanzees, while positively related with traits underlying confidence and positive social interactions like dominance (Weiss *et al.*, 2009). In addition, links between personality and behavioural and physiological welfare indicators are increasingly suggested (Robinson & Weiss, 2023). For instance, personality can predict indicators of stress, such as self-directed behaviours in chimpanzees (Herrelko *et al.*, 2012) and abnormal behaviours in bonobos (Laméris *et al.*, 2021). Overall, these recent insights highlight that increased understanding of personality in the context of behaviour can help real-world applications designed to improve the welfare of primates in captivity (Gartner & Weiss, 2018; Norman *et al.*, 2021; Robinson & Weiss, 2023).

If personality data are to be used to predict individuals' behavioural tendencies, personality needs to be stable over time. Yet, in bonobos, personality traits appear to be stable over a few years but not so much over the long-term, i.e., over periods longer than ten years, and comparable findings are documented for chimpanzees (Rawlings *et al.*, 2020). Short-term consistency is useful in proving that behaviours are sufficiently stable to be considered as constituting personality traits. However, consistency over longer periods provides important insights into the influence of environmental factors on the stability of these traits (Stamp & Groothuis, 2010). Poor long-term consistency suggests that environmental factors may lead to fluctuations in personality stability over an individual's lifetime. Indeed, over a decade, many aspects of primates' group dynamics are expected to change as individuals age: youngsters become parents, dominance hierarchies evolve, group compositions change, and certain individuals are transferred in other groups. Such social dynamics are known to have major consequences on the behaviour of highly social primates such as chimpanzees (Pascual *et al*., 2023) and bonobos (Caselli *et al.,* 2023), and may therefore lead to personality changes.

Information about the temporal stability of personality traits provides key insights into their predictive power, which in turn has implications for the use of personality profiles in the management and welfare of primates. On the one hand, personality traits with high temporal consistency can be used reliably to predict long-term behavioural tendencies. This can be of great help in ensuring and improving the welfare of long-lived animals such as bonobos. On the other hand, when

personality traits show less temporal consistency, or only short-term consistency, real-world applications of personality should be approached cautiously. Where possible, regular rounds of ratings should be carried out to obtain the most accurate individual personality scores (Rawlings *et al.*, 2020). Otherwise, the predictive power of personality may be overestimated, which could ultimately lead to unsuccessful applications.

In sum, primate personality research offers a greater understanding of behavioural tendencies at the individual level, something that can be essential to use in captive environments. However, if we are to apply personality data to major topical issues of primate management and welfare, the long-term stability of personality traits needs to be assessed.

REFERENCES

Caselli M, Malaman B, Cordoni G *et al.* (2023). Not lost in translation: Changes in social dynamics in Bonobos after colony relocation and fusion with another group. *Applied Animal Behaviour Science,* 261: 105905.

Freeman HD & Gosling SD (2010). Personality in nonhuman primates: a review and evaluation of past research. *American Journal of Primatology,* 72: 653-671.

Gartner MC & Weiss A (2018). Studying primate personality in zoos: implications for the management, welfare and conservation of great apes. *International Zoo Yearbook,* 52: 79-91.

Herrelko ES, Vick S-J & Buchanan-Smith HM (2012). Cognitive research in zoo-housed chimpanzees: Influence of personality and Impact on welfare. *American Journal of Primatology,* 74: 828-40.

Laméris DW, Staes N, Salas M, *et al.* (2021). The influence of sex, rearing history, and personality on abnormal behaviour in zoo-housed bonobos (*Pan paniscus*). *Applied Animal Behaviour Science*, 234: 105178.

Massen JJM & Koski SE (2014). Chimps of a feather sit together: chimpanzee friendships are based on homophily in personality. *Evolution and Human Behavior*, 35: 1-8.

Norman M, Rowden LJ & Cowlishaw G (2021). Potential applications of personality assessments to the management of non-human primates: a review of 10 years of study. *PeerJ*, 9: e12044.

Pascual A, Kalcher-Sommersguter E, Riba D & Crailsheim D (2023). Long-term assessment of captive chimpanzees: Influence of social group composition, seasonality and biographic background. *Animals*, 13: 424.

Polgár Z, Wood L & Haskell MJ (2017). Individual differences in zoo-housed squirrel monkeys' (*Saimiri sciureus*) reactions to visitors, research participation, and personality ratings. *American Journal of Primatology,* 79: e22639.

Rawlings B, Flynn E, Freeman H *et al*. (2020). Sex differences in longitudinal personality stability in chimpanzees. *Evolutionary Human Sciences,* 2: e46.

Robinson LM & Weiss A (2023). Primate personality and welfare. In: Robinson LM & Weiss A (eds). *Nonhuman Primate Welfare: From History, Science, and Ethics to Practice.* pp. 395-411. Cham: Springer International Publishing.

Schaefer SA & Steklis HD (2014). Personality and subjective well-being in captive male western lowland gorillas living in bachelor groups. *American Journal of Primatology,* 76: 879-889.

Stamps J & Groothuis TGG (2010). The development of animal personality: relevance, concepts and perspectives. *Biological Reviews*, 85: 301-325.

Verspeek J, Staes N, Leeuwen EJCV, Eens M & Stevens JMG (2019). Bonobo personality predicts friendship. *Scientific Reports*, 9: 19245.

Weiss A, Inoue-Murayama M, Hong K-W *et al.* (2009). Assessing chimpanzee personality and subjective well-being in Japan. *American Journal of Primatology*, 71: 283-292.

Seminar Series

The seminar series is a weekly event which invites guest speakers to present their research. We are always looking to recruit speakers for our seminar semester. If you are interested in attending or presenting, please do not hesitate to get in contact with us. Contact details are provided within the contents pages.

Upcoming talks for next semester are:

29 Jan	**Dr Claire Cardinal** (Oxford Brookes University) *Encounters in the forest: studying human-wildlife interactions in south-east Madagascar*
5 Feb	**Dr Sergi López-Torres** (University of Warsaw) *Recent advances in the study of early lorisid evolution*
12 Feb	**Dr Simon Maddock** (Newcastle University) *Fantastic amphibians and where to find them: ecology and conservation of caecilians*
19 Feb	**Lucero Vacaleon** (WildCRU, University of Oxford) *Foraging behaviour in jaguars: estimating prey availability in Calakmul, Mexico*
26 February	**Dr Mark Harrison** (Borneo Nature Foundation International) *Peat, primates, people and other wildlife on Borneo*
4 March	**Herizo Andrianandrasana** (University of Warwick) *Conservation for people and biodiversity in Madagascar - what we have learned?*
18 March	**Leah Fitzpatrick** (Oxford Brookes University) *Conservation and evolution of the world's only venomous primate*
8 April	**Amanda Bartlett** (University of Portsmouth) *Callitrichids in captivity: creating evidence to understand the effects of the captive environment*
15 April	**Juliet Wright** (Wildlife Conservation Society) *From livelihood interventions to demand reduction campaigns: exploring ways to make the wild meat trade more sustainable in Central Africa*

2023-2024 Cohort of the MSc Primate Conservation

Come visit us on the web!

http://www.brookes.ac.uk/primates

@PrimConsOBU

@primate_conservation_obu