Institution: Oxford Brookes University

Unit of Assessment: 5, Biological Sciences

Title of case study: Improving the welfare and conservation of nocturnal primates

Period when the underpinning research was undertaken: 2008 to 2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Anna Nekaris	Professor in Anthropology and Primate Conservation	[text removed for publication]
Vincent Nijman	Professor in Anthropology	

Period when the claimed impact occurred: August 2013 to October 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

Professor Anna Nekaris is a world leader in the conservation of endangered nocturnal primates, especially Asian lorises. Instrumental in driving changes to the legislation on the trade of CITES Appendix I-listed species in Japan, her work has also advanced the welfare of lorises in zoos and rescue centres worldwide. She has conserved their natural habitats in Asia, establishing a field site in Java (the Little Fireface Project) dedicated to their conservation through habitat restoration, installing 25 wildlife crossings and planting more than 10,000 trees, the training of future conservationists and education programmes for local communities, which have reached over 1,800 children across Western Indonesia. She has also increased global awareness of the plight of Asian lorises through social media campaigns and outreach activities.

2. Underpinning research

Since 2001, Professor Nekaris has provided key research insights that have actively contributed towards the conservation of a unique group of evolutionarily distinct primates known as the Asian lorises, which are endangered due to habitat loss, uses in traditional medicines and black magic, and the pet and photo prop trades. There are 12 species of small nocturnal animals found throughout South and Southeast Asia, seven of which Nekaris named or elevated from subspecies level and one of which has been included on the IUCN Primate Specialist group's list of the World's 25 Most Endangered Primates since 2010. Through Nekaris' field site in West Java, Indonesia, the Little Fireface Project (LFP), where researcher presence and data collection have been continuous since 2012, has studied more than 75 individuals of these Critically Endangered primates in one of the last habitats where they are found.

Illegal trade in lorises: cultural underpinnings and the aggravating role of social media

Although globally-threatened loris species are protected by international laws and national laws in their range countries, their illegal and unsustainable trade remains a major conservation challenge. To develop more effective conservation management strategies, Nekaris and her team have examined the impact of cultural practices and beliefs on the illegal loris trade in South and Southeast Asia. Their analysis of international records and their own fieldwork for the last 26 years in Laos, Cambodia, Thailand, Sri Lanka and Indonesia has revealed strong culturally specific drivers of the trade, even within single countries. Thus, whilst the live loris trade is more prevalent in Laos, Cambodia and Thailand, poaching for traditional Asian medicine is the main driver of the illegal trade in Cambodia **[R1]**. These findings are important because conservation practices in Asia are often generalised, which undermines the effectiveness of measures to protect lorises. Nekaris' work has also revealed how the internet fuels the demand for lorises as pets in Asia and elsewhere by portraying them as 'cuddly' animals. Using a novel approach, the Oxford Brookes University team analysed over 12,000 comments posted over a three-year period in response to a slow loris video shown on YouTube. Many viewers commented on how cute the animal was and

one of the more common responses was “where can I get one?”, suggesting that the demand for slow lorises as pets in Asia and elsewhere is enhanced by social media users’ watching the primates in videos **[R2]**. Critically, this study identified the internet as a powerful tool to study public perceptions of threatened animals in consumer countries.

Diet and feeding behaviour of lorises

Rescued and captive lorises are plagued by ill health, including dental diseases, obesity and decreased fertility. In a survey of lorises in North American zoos, of all lorises kept, there was a 0% reproductive success for larger slow lorises and 2-3% for pygmy slow lorises. Recognising that identifying their *in situ* diet, nutritional requirements and feeding behaviour would inform the provision of appropriate food to captive lorises, Nekaris and her team investigated the dietary and feeding habits of wild animals in their natural habitats and found that they fed mostly on insects and plant exudates, with the greatest proportion of their identified food items being plant saps and gums **[R3]**. This diet is markedly different from the typical frugivorous diet that they received in zoos or rescue centres, which had likely contributed to their health and behavioural problems. Nekaris further demonstrated that captive lorises fed with gum had improved health, especially reduced dental disease, increased fertility and increased activity **[R3]**.

Slow loris conservation

The greatest obstacles to the rehabilitation and reintroduction or translocation of rescued lorises are limited knowledge of their behavioural ecology, and the poor health and behavioural defects that rescued lorises often present. Nekaris and her collaborators examined these issues over a period of four years at the Little Fireface Project. With a very poor rate of reintroduction success (14 out of 18 animals died or disappeared), they noted the urgent need for wild behaviour studies before releasing animals to the wild. They further identified that issues such as gum in the diet, health checks, cage size and levels of stress during transit were critically important for the success of rehabilitation or translocation **[R4]**. These data were used also by Endangered Asian Species Trust in Vietnam, who went from an almost 100% death rate in reintroductions to almost 100% success. In a pioneering study in Java, Nekaris and her team also demonstrated the importance of water-pipe bridges to enable canopy connectivity in human-modified and fragmented landscapes. Implementation of the bridges extended the home range of slow lorises on average by 1.6-fold (2.57ha before, 4.11ha after), which increased the number of feeding trees visited **[R5]**.

Slow loris venom

All nine recognised species of slow loris are venomous. This is particularly challenging for practitioners handling these animals in rescue centres and zoos, and another important reason why lorises are unsuitable as pets. Nekaris has published medical accounts of the impact of slow loris venom on humans. Further, Nekaris and her team, through an 8-year study of wounding patterns, territorial behaviour and agonistic encounters of a free-ranging population of Javan slow loris, have provided the first strong evidence that venom is used differentially by both sexes to defend territories and mates **[R6]**. The study of slow loris venom was first brought to public attention in 2012 by Nekaris in a BBC documentary highlighting her conservation and venom research, *The Jungle Gremlins of Java* (https://www.bbc.co.uk/programmes/b01bcp7z).

3. References to the research

R1. Nekaris KAI, Shepherd CR, Starr CR, **Nijman V** (2010) Exploring cultural drivers for wildlife trade via an ethnoprimatological approach: a case study of slender and slow lorises (*Loris* and *Nycticebus*) in South and Southeast Asia. *American Journal of Primatology* 72(10): 877-886. DOI: 10.1002/ajp.20842

R2. Nekaris KAI, Campbell N, Coggins TG, Rode EJ, **Nijman V** (2013) Tickled to death: analysing public perceptions of ‘cute’ videos of threatened species (slow lorises–Nycticebus spp.) on Web 2.0 Sites. *PloS One* 8(8): e69215. DOI: 10.1371/journal.pone.0069215

R3. Cabana F, **Nekaris KAI** (2015) Diets high in fruits and low in gum exudates promote the occurrence and development of dental disease in pygmy slow loris (Nycticebus pygmaeus). *Zoo Biology* 34(6): 547-553. DOI: 10.1002/zoo.21245

R4. Moore RS, Wihermanto, **Nekaris KAI** (2014) Compassionate conservation, rehabilitation and

translocation of Indonesian slow loris. *Endangered Species Research* 26: 93-102. DOI: 10.3354/esr00620.

R5. Birot H, Campera M, Imron MA, **Nekaris KAI** (2019) Artificial canopy bridges improve connectivity in fragmented landscapes: the case of Javan slow lorises in agroforest environment. *American Journal of Primatology* 82(4): e23076. DOI: 10.1002/ajp.23076.

R6. Nekaris KAI, Campera M, **Nijman V**, Birot H, Rode-Margono EJ, Fry BG, Weldon A, Wirdatet W, Imron MA (2020) Slow lorises use venom as a weapon in intraspecific competition. *Current Biology* 30(20): PR1252-R1253. DOI: 10.1016/j.cub.2020.08.084.

4. Details of the impact

Nekaris' work on slow lorises has improved the welfare and conservation of this critically endangered primate by: driving changes in legislation; the development of more effective rehabilitation, reintroduction and translocation protocols; and by increasing international awareness of the plight of slow lorises through social media and education programmes. Much of this has been accomplished through the Little Fireplace Project (LFP) and its field site in Java, Indonesia, as a platform to engage local communities, and zoos and rescue centres around the world.

Improved legislation to reduce the illegal trade of slow loris in Japan

Nekaris' work has played a critical role in increasing awareness of the extent of the illegal loris trade in Japan **[S1]**, which (according to the Convention on International Trade in Endangered Species, CITES) imports the greatest number of slow lorises in the world. Her work informed the Japanese campaign against the wildlife trade that led to improved legislation on the pet trade of animal species listed in CITES Appendix I, including slow lorises. As stated by the Secretary General of the Japan Wildlife Conservation Society: "*Prof. Anna Nekaris has directly contributed to reduction of illegal pet trade of slow lorises and animal welfare for over 10 years in Japan… Prof. Nekaris was instrumental in helping to change this legislation through collating data on international trade in slow lorises, including presenting a report from Japan Wildlife Conservation Society (JWCS) on seizures in Japan*". The Secretary General has also highlighted the impact of Nekaris on Japanese society's awareness of slow lorises: *"Prof. Nekaris cooperated with Japanese national broadcasting corporation (NHK) on filming for the TV documentary 'Darwin Coming' and this programme was broadcasted on February 2016 in Japan, which was seen by millions of viewers and was the most popular show of that day on Japanese television"* **[S2]**. Following the approval of the new legislation in 2017, all permits issued in Japan must now have an expiry date and registered animals require a microchip **[S3]**.

The Little Fireface Project: a platform for the conservation of endangered lorises

The LFP, an award-winning conservation project **[S4a]** directed by Nekaris, under the auspices of Oxford Brookes University, is dedicated to the study of the ecology of slow and slender lorises and contributes to the conservation and ecology of loris species throughout their ranges **[S4b]**. As stated by The Zoo Review: "*One organisation which is very active in the field, helping to protect slow lorises, is the Little Fireface Project. Many zoos that work with slow lorises have stepped up to support this organisation in its goals to save slow lorises"* **[S4c]**. The zoos do this not only through funding the project, but by creating posters and outreach materials; co-writing the handbook for care of lorises in European Association of Zoos and Aquaria facilities; providing veterinary advice to the LFP field team; providing gum for rescued lorises; providing microchips for rescued and wild lorises; and organising keeper exchanges whereby zoo staff get to see lorises in the wild. In return, Nekaris and colleagues have worked with zoos to validate scientific equipment such as accelerometers; developed a pen pal programme between UK and Indonesian children for which they received a BIAZA Bronze Award; and attended keeper workshops and provided advice on housing of captive lorises. These achievements are largely due to the collaborative approach of the LFP, which has led to the development of a worldwide network of zoos and rescue centres that work together to create effective protocols to ensure the welfare of captive and wild slow lorises. Due to her internationally-recognised expertise, Nekaris is writing six out of 18 chapters of the protocols **[S4b]**.

Improvement of the welfare of slow lorises in captivity

The LFP's work to improve understanding of the behavioural ecology, feeding and captive breeding of slow lorises has improved their welfare and aided their reproduction in captivity in several zoos. According to feedback from the Curator of Conservation of the Cleveland Metroparks Zoo (USA), a collaborator and donor to the LFP: "*information such as including wild diets and behaviour were almost completely unknown before Nekaris' work*" **[S5a]**. The Director of NaturZoo Rheine Germany has stated: "*We also value the results of Prof. Nekaris and her department's studies on feeding ecology, habitat use and social organization having led to considerably improved management and propagation of slow lorises in zoological gardens"* **[S5b]**. Other institutions that partner with the LFP, including the European Association of Zoos and Aquaria Prosimian (EAZA) Taxon Advisory Group **[S5c]**, Shaldon Wildlife Trust (UK) **[S5d]**, and Gauhati University (India) **[S5e]** have also attested that the work of Nekaris and the LFP, have guided the development of their protocols for maintaining slow lorises in captivity and shaped their campaigns to make the general public aware of the plight of these animals.

Improved rehabilitation, reintroduction and translocation procedures

The work of Nekaris and the LFP, on the rehabilitation and translocation of endangered lorises, has directly influenced the efforts of rescue centres throughout South and Southeast Asia, improving survival rates in captivity and developing effective protocols for lorises to be released to the wild. The Director of the Indonesian foundation Yayasan Peduli Kelestarian Satwa Liar (Wildlife Preservation Foundation), a project partner of LFP, affirmed that *"Prof. Nekaris' research on the feeding ecology, social organisation, habitat use, and behaviour of slow and slender lorises has directly influenced our management of these animals in our rescue and rehabilitation centre. Her work has significantly helped improve the welfare of the slow lorises and also speed up their rehabilitation process* **[S6]**. With the limited capacities of rescue centres and the unsuitability of most confiscated lorises for reintroduction, rescue centres face difficult decisions about euthanasia. However, Nekaris has advocated for compassionate conservation, which balance the need for conservation with the demands of animal welfare. The Yayasan Peduli Kelestarian Satwa Liar Foundation has stated that *"Compassionate conservation, rehabilitation and translocation of Indonesian slow lorises (Moore, Wihermanto & Nekaris, 2014) has been one of the essential study materials and guidelines for us when establishing the rescue program"* **[S7]**. It is important to note that, previously, slow lorises were often so little known in rescue centres that they would typically die within weeks. Through training sessions in nine Asian countries (including Indonesia 2013, Japan 2017, Vietnam 2018 and with Love Wildlife Foundation in Thailand in 2019,) and more than 700 attendees in total, Nekaris has enabled many rescue centres to identify, for the first time, the animals entering their care, resulting in improved outcomes.

Increasing awareness through field projects, education and social media outreach

Nekaris' understanding of the cultural drivers underpinning the loris trade in South and Southeast Asia has allowed her to develop diverse education programmes that are implemented through the LFP. The programmes educate and inform school children, teachers and the general public about the plight of lorises. In addition, conservation activities, such as the installation of water-pipe bridges in the Cipangati region in Java, benefit not only the lorises, through increasing in their home ranges and landscape accessibility, but also provide benefits to local communities (water irrigation), helping to improve local farmers' attitudes towards wildlife. In 2019, Nekaris and colleagues helped farmers to certify their coffee as Wildlife Friendly by setting a requirement for a total hunting ban in the region. After the ban in 2019, Nekaris' team, which had found traps almost weekly, has not detected a single trap **[S8]**. Since 2013, the LFP has run several local education programmes, including the Nature Club (Klub Alam) and the Slow Loris Forest Protector **[S4b]**. Each week, approximately 60 local students aged 3-17 come to Klub Alam to learn about their local ecology. Through the Slow Loris Forest Protector programme, an interactive approach that combines creativity and science to educate children on the conservation of habitats, wild flora and fauna, the LFP has reached more than 1,800 children aged 11-13 across Western Indonesia **[S4b]**. At the heart of this programme is a children's book written by Nekaris, *Slow Loris Forest Protector*, that has now been translated into eight languages, including Indonesian, Vietnamese, Urdu, Spanish, French, Japanese, Greek and German, with at least 8500 copies distributed **[S4b]**. The educational campaigns of the LFP are supported by diverse teachers' packs developed by

Nekaris and her team, including *Building Bridges for Slow Loris Conservation* taught to 100 children in Java and shared online **[S4b]**. The LFP also implements other outreach activities such as the Slow Loris Outreach Week (S.L.O.W.), which has run every year since 2013. This consists of a worldwide week of activities to increase awareness of loris conservation and the impact of the trade on the species **[S9]**. Activities include the launching of short films and animations; partner zoos doing various activities and each year an education pack has been developed that is shared with the project partners (more than 50 zoos, rescue centres, other conservation groups). The National Geographic Society has endorsed the Outreach Week and stated: *"Professor Anna Nekaris and team once again lead us overactive humans to S.L.O.W. down for Slow Loris Outreach Week. The third annual S.L.O.W. has been drawing attention to the struggles of this small and distant relative of ours via the Facebook page of the Little Fireface Project, encouraging people to update their background image with a poster about slow lorises to help spread the word*" **[S10]**. Nekaris' YouTube study (R2) was used as the basis for International Animal Rescue's 'Tickling is Torture' campaign (https://www.ticklingistorture.org) as well as the Kukang Rescue Programme's 'I am not a toy' campaign (https://www.kukang.org/en/i-am-not-your-toy).The LFP also engages with the local and international community through various social media platforms to increase awareness of slow lorises. Its Twitter account (>4,600 tweets and 1,443 followers), Facebook page (>12,000 followers) where publications have reached a milestone of 8,000 likes and YouTube channel (531 subscriptions and 205,000 views) with a post that had more than 90,000 views, are key tools for increasing awareness about the plight of slow lorises **[S4b]**.

5. Sources to corroborate the impact

Impact on wildlife trade legislation in Japan
S1. The Japan Times, Slow lorises at high risk of illegal trade in Japan, report finds (4th February 2016)
S2. Letter attesting Nekaris' role in changes to Japan's legislation from Japan Wildlife Conservation Society
S3. Traffic (Wildlife Trade Specialists), *Japan tightens wildlife trade regulations* (9th June 2017)

The Little Fireface Project
S4a. Born Free website; Professor Anna Nekaris of Oxford Brookes University and the Little Fireface Project was awarded the McKenna-Travers Award for Compassionate Conservation in 2013 https://www.bornfree.org.uk/mta
S4b. LFP project website, http://www.nocturama.org/en/welcome-little-fireface-project/
S4c. The Zoo Review, *Little Fireface Project: The Un-Primates in Our Family Tree* (7th April 2019)

Improvements in the diet and management of slow loris in zoos and rescue centres
5a. Testimonial from Cleveland Metropark Zoo, US
5b. Testimonial from NaturZoo Rheine, Germany
5c. Testimonial from Chair of EAZA Prosimian Taxon Advisory Group
5d. Testimonial from Shaldon Wildlife Organisation, UK
5e. Testimonial from B.H College, Assam, India

Improving breeding in rescue centres
S6. Testimonial from Love Wildlife Foundation, Thailand

Improving rehabilitation, reintroduction and relocation
S7. Testimonial from Yayasan Peduli Kelestarian Satwa Liar PASAL Foundation, Indonesia
S8. Article in The Guardian (UK): Fleming, A. *Bridge over troubled forests: how Java's slow lorises are creeping back* (13 October 2020), available here

Slow Loris Outreach Week
S9. LFP project website, SLOW 2020 – Slow Loris Outreach Week(19-25th October 2020)
S10. National Geographic, *Slow Loris Outreach Week Is Here (Didn't You Know?)* (13th September 2014)