

## RESEARCH ARTICLE



# Medicine, black magic and supernatural beings: Cultural rituals as a significant threat to slender lorises in India

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## Abstract

1. Trade of wildlife for use in traditional medicines, rituals, magical spells and cultural practices occurs globally and has been studied mostly in Africa and Asia.
2. The grey slender loris *Loris lydekkerianus* is used for both medicinal and ritual purposes, but little information is available on how the user is meant to extract their medicinal properties, or the potential impact these practices have on the species' populations.
3. From 2014–2021, we used open-ended interviews with 293 informants in three slender loris range states in Southern India to collect qualitative information on people's beliefs regarding the use of slender lorises in traditional medicine, black magic rituals and other cultural practices. To understand this further, we analysed data on 139 live slender loris rescues from three rescue and rehabilitation centres and one government organization in Bengaluru, India collected over an 18-year period.
4. We found that 116/139 live individuals had been involved in black magic rituals, including piercing, or burning the body and the eyes. These ritual practices occurred more often to female slender lorises and during the new moon. Data from 293 interviews revealed that astrologers regularly use live lorises for fortune-telling or for warding off evil. Slender loris body parts are used to make traditional folk medicine, develop black magic potions that bring people harm, hypnotize people or to thwart evil.
5. Habitat loss and anthropogenic pressures, coupled with the existing slender loris trade for cultural practices, are a cause for grave concern. Numerous deep-rooted superstitious beliefs and rituals continue to thrive in modern India, and this is potentially one of the major threats to India's already imperilled slender loris population. More research into the prevalence of loris use for black magic is needed to assess the impact on species sustainability.

## KEYWORDS

black magic, India, rescue centre, rituals, slender loris, wildlife trade

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## 1 | INTRODUCTION

The trade of wild animals consists of selling live animals, their body parts, derivatives and/or products, and affects a vast number of species globally (Fukushima et al., 2020; Nijman, 2010; Robinson & Sinovas, 2018; Scheffers et al., 2020). This trade poses a significant threat to biodiversity through population declines, as well as acting as a channel for invasive species introduction and spreading of disease (Wyatt, 2013). Conservationists are increasingly aware of the need for demand-side interventions that target the end consumers (Verissimo et al., 2020; Verissimo & Wan, 2018). Understanding the underlying motivations that drive the uses of specific products including wildlife parts and products, coupled with the societal and cultural contexts in which they are consumed, can create more effective behaviour change interventions (Davis et al., 2020; Michie et al., 2011).

Traditional medicine as defined as 'the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness' (WHO, 2013). Traditional medicine and scientific medicine have been often contrasted, and that it has been found that not all traditional medicines have proven scientific effects. Traditional medicine is a broad term referring to cultural medicine being used by communities, which may or may not have proven scientific effects such as Traditional Chinese Medicine, Indian Ayurveda, Siddha and Arabic Unani medicine, and to various forms of indigenous medicine (Gesler, 1992; Good, 1980; Thass, 2008; WHO, 2002). Traditional medicine therapies include medication therapies, e.g. using whole or parts of plants, animals and/or minerals (Alves et al., 2010), and non-medication therapies, e.g. acupuncture, manual therapies and spiritual therapies. In Cambodia, non-accessibility to modern medicine, high cost of drugs and resistance to several common diseases have caused advocacy for traditional medicine and to provide a platform to create a synergy between modern medicine and traditional medicine (Fokunang et al., 2011).

A less explored use of wildlife for traditional medicine links to the worldwide practice of using animals or their body parts for ritual, superstitious and magic purposes, including offerings, amulets, and ablutions, with aspects of the animal taking on profound symbolism (Ahmed, 2010; Ahmed, 2012; Alves et al., 2012; Dissa et al., 2017; Jensen, 2009). These terms are complex, and their definitions are often context-specific, but here we define superstitions as 'the belief in supernatural elements - that one event leads to the cause of another without any physical process linking the two events'. This includes elements of astrology, presage, witchcraft (Dissa et al., 2017). For magic, we follow Versnel (2016)'s definition as a 'manipulative strategy to influence nature by supernatural means'. Black magic has traditionally referred to supernatural powers or magic for evil and selfish purposes (Melton, 2001). The impacts of such practices on animal conservation may be overlooked, especially among less charismatic species (Chawla et al., 2020). Understanding how animals are

used in these various practices can also aid in conservation and intervention strategies (Jugli et al., 2020).

India is a megadiverse nation harbouring four biodiversity hotspots, where animals have long played an intrinsic role in cultural and religious life (Lee et al., 2014). Most Indian festivals follow a sophisticated calendar based on the solar, lunar and star positions and any animal sacrifices pertaining to these festivals are scheduled based on this calendar (Fuller, 2004). For example, the 'Navratri' is celebrated on the first nine lunar days (tithi) of the bright fortnight (i.e. the fortnight ending on full moon) of the lunar month of āśvina. The festival is also referred to as 'Durga pooja' in western India, Dasara in Karnataka, and Vijayadashami in Kerala. The goddess 'Durga' or 'Kali' is offered sacrificial animals in this ritual in the belief that it stimulates her violent vengeance against the buffalo demon (Fuller, 2004). The use of Indian wildlife in rituals has already been suggested to have a negative conservation impact. For example, during the Diwali festival, observed on Amavasya (new moon) when the goddess Lakshmi is worshipped, families may sacrifice an owl in their house, forcing the goddess of wealth, Lakshmi, to stay with them (Padhy, 2016). An increased trade in owls in India has been linked to this practice (TRAFFIC, 2018). In some states, traditions encourage people to poach a tiger (or leopards as substitutes) to acquire a paw of the right leg, to be used in black magic to gain fortune from 'god' (Niraj et al., 2019). A number of species, including the vulnerable primate the eastern hoolock *Hoolock leuconedys* and clouded leopard *Neofelis nebulosa* are used for various practices including harming others, to prevent bad omens and telling fortunes (Jugli et al., 2020). Golden jackals *Canis aureus* are poached for their 'jackal horns', a bony cone-shaped excrescence that can occasionally grow on jackal's skulls, which are sought by astrologers and by black magic practitioners from various religious groups across the country (Chawla et al., 2020). Over time, the harvest for such practices could lead to their decline, the impact of the over-harvest on population requires more research.

The use of wildlife in medicine and in rituals may overlap. A case in point is the small (105–320g) nocturnal primate, the slender loris *Loris* spp. endemic to southern India and Sri Lanka (Nekaris et al., 2010). Slender lorises are frequently found along forest edges and in plantations often close to human habitation and can even be found in urban and suburban areas (Kumara et al., 2006; Nekaris & Jayewardene, 2003). Most of the slender lorises' habitats are fragmented and many fall outside protected areas, making it easy to catch and trade them (Kumara et al., 2006; Sasi & Kumara, 2014). The ecology of slender lorises in urban parts of India is poorly known. Unlike other slow moving mammals, such as slow lorises *Nycticebus* spp., pottos *Perodicticus* spp., sloths (*Bradypus* spp.) and cuscus *Spilocuscus* spp., which are non-target species and hunted at any time due to ease in catching them (Alves et al., 2012; Latinis, 1996; Starr et al., 2010; Svensson & Friant, 2014), slender lorises are specifically targeted, primarily to be used in traditional folk medicines and ritual practices (Dittus et al., 2020; Radhakrishna & Singh, 2002; Situge, 2001). For example, in Sri Lanka, the eyes and their tears are purported to cure eye disease and are used as a love potion or

to see a deity, whereas eating their flesh is considered a cure for leprosy and can be used against the evil eye (Nekaris et al., 2010). In Tamil Nadu, India, in addition to the same beliefs regarding loris eyes, loris parts are used to treat a variety of illnesses and for making love potions (Kanagavel et al., 2013). Slender lorises are perceived to be harbingers of misfortune and may be killed on sight (Kanagavel et al., 2013; Kumara et al., 2006; Nekaris et al., 2010). Slender lorises are also used as an instrument by fortune tellers. Carried in a small box or cage, they are asked to choose cards from a deck, point to a length of string, or other fortune telling tasks (Ahmed, 2001; Nekaris et al., 2010).

Quantitative trade records for slender lorises are limited; examining data from the CITES Trade Database from 1978–2020, Nekaris et al. (2010, 2021, unpublished data) found 95 live slender lorises exported from India, Sri Lanka, Thailand and Lao PDR. Two-thirds of these were born in captivity. Inaccuracies in species identification and/or confusion regarding taxonomic identification species of lorises may result in lack of reporting when traded internationally (Groves, 2001; Kumara et al., 2006; Nekaris & Starr, 2015; Nijman et al., 2020). Most trade in slender lorises, however, occurs within countries and while there are no accurate records of transactions, information from newspapers and online adverts give some insights (Ahmed, 2012; Alves et al., 2010; Morgan & Nijman, 2020). For example, in 2015, Morgan and Nijman (2020) examined posts on a popular web site, where slender lorises were sold or requested as 'rice pullers', defined as objects that have supernatural properties. They found 156 buyers seeking lorises and 94 sellers; most offers for sale came from India, with Maharashtra, Tamil Nadu and Karnataka featuring most often as states where potential buyers were based. They also suggested potential seasonal variation linked to rituals in the selling of slender lorises (Morgan & Nijman, 2020).

In India, Schedule I, Part I of the Wildlife (Protection) Act, 1972 affords slender lorises the highest protection at the national level. More specifically, hunting, sale, transfer or possession of slender lorises or their parts (dead or alive) without prior permission from the Government is a violation of the law under Schedule I (Act No. 53 of 1972, enacted by Parliament of India, dated 9 September 1972). Internationally, slender lorises are included on CITES Appendix II, which strictly regulates their international trade without authorized permit or re-export certificate (Nekaris et al., 2010). They are listed as Near Threatened on the International Union for Conservation of Nature (IUCN) Red List (Dittus et al., 2020). Despite the strict laws, these ritual practices harming the species are still prevalent and need additional measures to curb them.

Slender lorises have long held cultural importance in southern India, being present in tales of the Parmbu and Pachchai regions since 300BCE, where they were revered as the spirit of the Goddess. They were even given offerings to mark the beginnings of holy festivals (Venkatesan, 2018). During the Pandya dynasty 1200–1300BCE, exploitation began when lorises were used aboard ships as living compasses (Venkatesan, 2018). Although it is clear that slender lorises still hold cultural importance and are traded locally in and around slender loris habitats, details about these practices

and their impacts on the animals are lacking. In the last 20 years, however, rescue centres have received slender lorises rescued after being used in rituals. We thus for the first time provide data detailing their use in black magic practices. We investigate the prevalence of black magic cases among slender loris rescues, the nature of these practices, whether demand rises around any month or the moon phase cycle, and whether there is a preference for a specific sex to be used in rituals. At the same time, we used participant observation and formal or informal interviews during six years of field work in three states in southern India to understand the context of these rituals, as well as the use of slender lorises and their parts in traditional medicine. We describe these results in relation to species conservation and encourage conservationists to remain vigilant about the conservation threats posed by black magic.

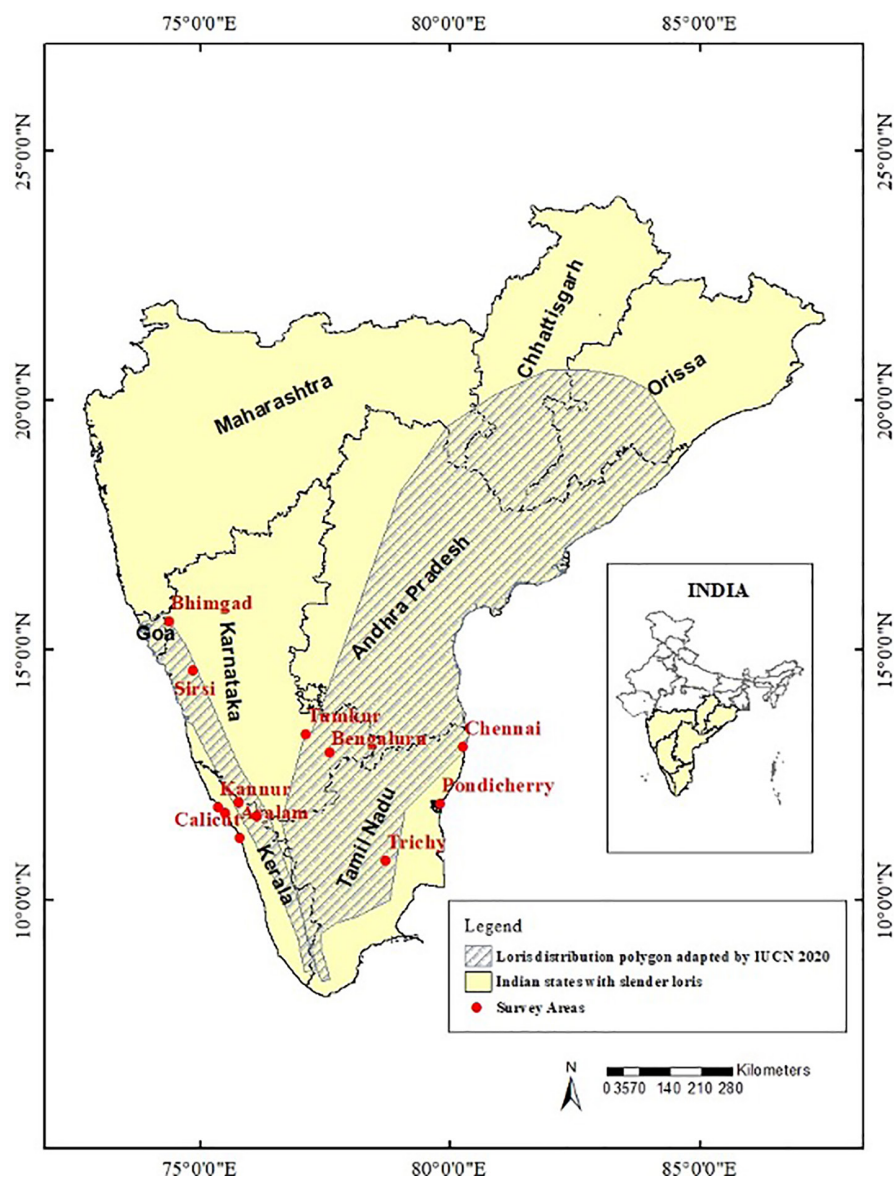
## 2 | METHODOLOGY

### 2.1 | Data collection

We collected data on the Mysore (*Loris lydekkerianus lydekkerianus*) and the Malabar (*Loris lydekkerianus malabaricus*) slender loris, which occur in Andhra Pradesh, Telangana, Karnataka, Kerala and Tamil Nadu, South India (Kumara et al., 2006).

We collected data on rescued slender lorises brought in for rehabilitation from one anonymous government organization (2002–2020). We collected additional data from three wildlife rescue and rehabilitation centres in Bengaluru, India: People for Animals (PFA; 2014–2020), Wildlife Rescue and Rehabilitation Centre (WRRRC; 2009–2020), and Avian and Reptile Rehabilitation Centre (ARRC; 2006–2020). These data included: date of rescue; animal's sex; weight at the time of rescue; medical case history of the rescued loris; photographs and videos where available. All sites only kept information on cases where slender lorises were alive at the time of admission. Thus, we do not have data on the records of lorises that were found dead during the rescue process, meaning numbers traded could be much higher. We collected data on the moon phase of the rescue days using the Android Application Phases of the Moon Version 6.1.9., created by M2Catalyst, LLC Moon images created by NASA/Goddard Space Flight Centre Scientific Visualization Studio Published by M2Catalyst, LLC. Data used in this paper will be available from the first author on request.

From 2014 to 2021, the first author collected data on the threats to the slender lorises while she was conducting ecological studies of slender lorises in 12 sites within Kerala, Karnataka and Tamil Nadu, in Southern India (Figure 1, Table 1). As she had spent a considerable amount of time (5 years in Kerala, 2.5 years in Karnataka and 2 years in Tamil Nadu, with few projects having overlapping timelines) with the local communities, she had developed a friendly relationship with both the inhabitants and the local forest officials. She used the participant observation method during the first stage of the project in each site to identify potential people to approach and to select potential questions to ask (DeWalt & DeWalt, 2002; Kawulich, 2005).



**FIGURE 1** South India showing the survey sites where people were interviewed regarding beliefs and uses of slender lorises using participant observation or snowball sampling methods. \*India map extracted from GADM database (<https://gadm.org>), version 2.5, July 2015.

After this period, inhabitants of local communities were also more willing to provide information voluntarily to the first author. She used the open-ended interviews with 193 informants, whom she directly approached, or they approached her, including government officials, and villagers allowing her to collect data on folklore, beliefs and ritual practices about slender lorises (Bernard, 1994, 2002). Because most people could not read or write, or otherwise would not have had previous experience with a consent form, verbal consent was given for all discussions and interviews. During the open-ended interviews, she followed a set of questions (Supplementary Material S1). She made continuous notes in her notebook or on data sheets. She then digitalised the data onto an Excel sheet and coded each practice that emerged from the interviews based on which ritual it is used (traditional medicine, black magic or non-black magic), part of the body used, live or dead and the reason for the ritual. These codes were collated into Table 2. From discussion with these participants, we used snowball sampling to meet with further 100 informants (Bernard, 2002). After contacting them by telephone, she met these

informants in person to collect more information. The details of the informants are provided in Table 1. Interviews lasted from 10 min to 1 h depending on the information provided. Additionally, we contacted two black magic practitioners in Karnataka and Tamil Nadu, who provided information about the reasons for trade and the details of the rituals they conduct. Our sampling strategy corresponds to non-probability convenience sampling (Newing et al., 2010). None of our informants were members of the gypsy community, and the information is partial, as it stems from interpretation by non-gypsy informants, and it has not been contrasted or verified with direct input from gypsy communities.

The data collection of the medical case studies about the slender lorises was done by accredited veterinarians from the Rescue and Rehabilitation Centres. For the participant observation and interviews with human informants, we followed the ethical guidelines proposed by the Association of Social Anthropologists of the UK and Commonwealth (ASA Ethical Guidelines 2011. <https://www.theasa.org>). Prior to the interviews, all participants were informed that their

TABLE 1 List of informants interviewed for beliefs and practices with slender lorises in South India (N = 293)

State	Data collection period	Place	No. of informants	Background of the informants
Kerala	2014 to 2018	Villages around Aralam Wildlife Sanctuary	20	Government Officials
		Villages around Aralam Wildlife Sanctuary	66	Villagers/relatives or friends of the villager, tea shop owners, shop keepers, farmworkers, resident landlords, homemakers
			13	Indian tourists visiting the sanctuary
		Wayanad District	17	A wildlife biologist from the Kurumbar tribe, his family, and community
		Kannur	6	Acquaintances of people from villages around Aralam WS
		Kerala, Karnataka	3	Co-passengers while travelling in bus or train
		Thalassery	7	Tea shop owner and customers
		Kozhikode	15	Tea shop owner and customers
Karnataka	2018 to 2020	Bhimgad Wildlife Sanctuary	85	Villagers (farmers, daily wage workers, housewives, cattle rearers)
		Uttara Kannada District	25	Villagers (Landlords, hunters, farmers, daily wage workers, tea shop owner, and customers)
		South Karnataka	7	Veterinary doctors and wildlife rescuers
		Bengaluru	13	Wildlife rescuers
Tamil Nadu	2019–2021	Chennai	2	Government officials
		Chennai	7	Wildlife rescuers
		Tiruchirappalli	5	Acquaintances of rescuers from Chennai
		Puducherry	2	Wildlife rescuers

participation was totally voluntary and anonymous. The data remained strictly confidential and they at any point could withdraw from a conversation; this was reiterated after completion. Additionally, we took their verbal approval to use their interview in our study. Ethical approval in India is linked to obtaining the research permits from the Forest Department of India; the permit numbers and dates are in the acknowledgements. In addition, for interviews with members of communities in protected areas, we gained additional approval from relevant local forest departments to gain access to these villages; 45% of the participants within these protected areas were interviewed in front of a forest official. It is possible that some people may have hesitated to give complete information due to the presence of a government official, and hence, the cases and severity could be more than what we report in this study (St John et al., 2015). Since most of the information collected within protected areas referred to traditions and beliefs, we think that the presence of a forest official did not bias the data collection since discussing these issues is not against the law. The information given on illegal activities within these protected areas might have been reduced.

## 2.2 | Data analysis

We used a generalized additive model (GAM) to test whether the moon phase influenced the periods when the black magic rituals

were performed based on data from rescue centres. For this analysis, we considered only the reports indicating that rescued slender lorises had new signs of aberrations, which were confirmed likely to be from black magic rituals by the rescuers or the veterinary doctor. We carried out statistical analysis using R v 4.0.3. We used an entirely restricted maximum likelihood method (REML) for model selection via gamm command in the package MGCv (Wood, 2018). REML is preferred over the maximum likelihood method for small sample sizes since it reduces the bias for the estimation of variance components (Wood, 2017). We manually selected cyclic cubic regression splines to consider the circularity of the variable moon phase (Wood, 2017). We fit the dependent variable (i.e. cases of slender lorises directly linked to black magic and presenting fresh wounds linked to rituals) to a quasi-Poisson distribution, as this distribution gave the best fit based on residual plots (Wood, 2017). We used GAM to provide a flexible approach because they do not assume a linear or other parametric form of relationship a priori and can be used to reveal and estimate non-linear effects of the covariate on the dependent variable (Wood, 2017). We considered significant values when the smooth term  $\pm 95\%$  confidence interval was higher or lower than the reference value (i.e. not crossing the reference line). We ran a generalized linear model (GLM) using the Binomial family to assess if there was any preference for a female or male loris when used in black magic compared to the other cases. For this, we considered 1 when linked to black magic and 0



TABLE 2 Summary of 293 responses regarding use of slender loris in South India gathered during interviews

	Body part	Practice to the Loris	Treatment	Indian state
Traditional medicine				
Live loris	Eyes	Burnt over fire or pierced with a red-hot rod to extract teardrop	Making kajal (a black paste) that is applied on human eye waterline to increase eyesight	Kerala, Tamil Nadu
Dead loris	Whole body	Extraction of fat (ghee)	Heal joint pain	Kerala
	Eyes	Eaten raw	Cure eye-related diseases; give good eyesight	Tamil Nadu
	Liver and eyes	Made into a potion	Cure leprosy	Tamil Nadu
	Faecal matter	Made into a potion	Cure leprosy	Tamil Nadu
Black magic				
Live loris	Effigy	Pierced their eyes, limbs, kidney, heart, anus, and head	Bring about danger to the targeted person	Karnataka
	Effigy	Eyes or the forelimbs are burnt	Bring about danger to the targeted person	Karnataka
	Effigy	Elbow or knee joints are broken	To heal ailments of the targeted person	Karnataka
	Effigy	Thin copper wires are used to tie the hind limbs	Obstruct the flow of blood in the targeted person	Karnataka
	Effigy	Killed by hitting the head on a rock	To kill the targeted person	Karnataka
	Whole body	Buried alive after a ritual; dug out after a few days to make magical potions of the rotting flesh	Reason unknown	Karnataka
Dead loris	Dead loris	Whole body burnt to ashes, which is then mixed with pig fat to make kajal	Hypnotize the targeted person	Tamil Nadu
	Dead loris	After a ritual, parts of the body are fed to dogs or cats	Reason unknown	Karnataka
	Liver	Make kajal	Brings destruction to the person on whom it is applied	Tamil Nadu
	Liver and eyes	Make kajal	Brings spiritual hypnosis to the targeted person	Tamil Nadu
	Urine	Make kajal	For hypnosis	Tamil Nadu
Non-Black magic rituals				
Live loris	Live animal	Stored in cages at home	To remove bad luck	Andhra Pradesh
	Live animal	Carried in wooden boxes by the Kurumba tribe	Foretelling god's word, cure ailments	Tamil Nadu
	Live animal	Carried in wooden boxes by tantric	To ward off bad omen	Tamil Nadu
	Live animal	Loris is circled over the child's head; then child is made to look at loris	To ward off evil	Tamil Nadu
Dead loris	Bones	Wrapped in loris skin; buried in house	To ward off evil	

when it was linked to other trafficking purposes. We used the package VEGAN (Dixon, 2003).

### 3 | RESULTS

#### 3.1 | Evidence from rescue centres

We recorded 179 cases from within Karnataka, where 139 registered cases related to slender lorises (*L. l. lydekkerianus*) in Bengaluru, Karnataka, 58 of which were related to black magic and 58 of which

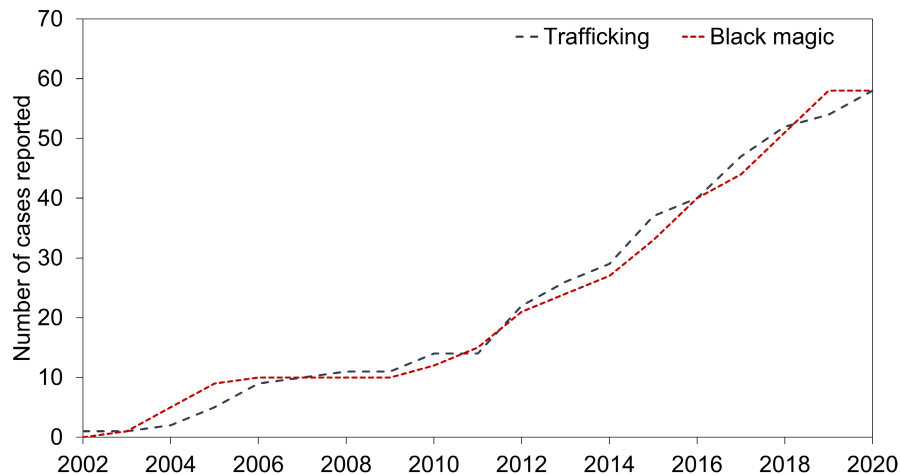
were classified as trafficking that were most likely connected to black magic. The other 21 cases were displaced lorises. We did not find any records of pet trade in any of the study areas. The number of cases related to black magic and the number of cases classified as trafficking within Bengaluru increased steadily between 2002 and 2020, with no peaks (Figure 2). We detected a monthly variation in the new cases of black magic, with peaks in May, June and September (Figure 3).

For 30 of the 58 reported cases directly linked to black magic, it was possible to detect fresh wounds linked to rituals that veterinarians estimated to be as recent as 2 days old. In some cases, we reported multiple fresh wounds in the same individual. We identified

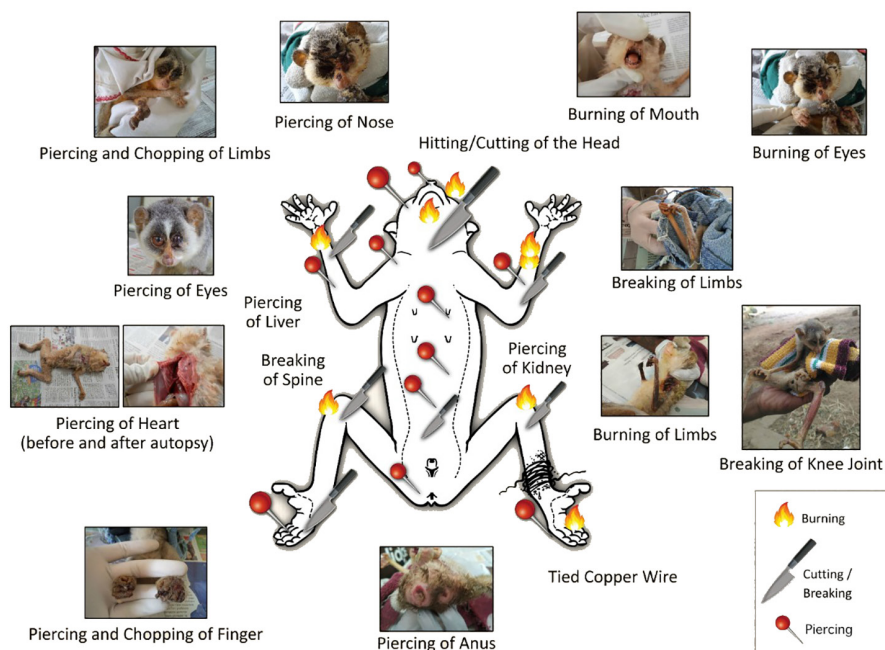
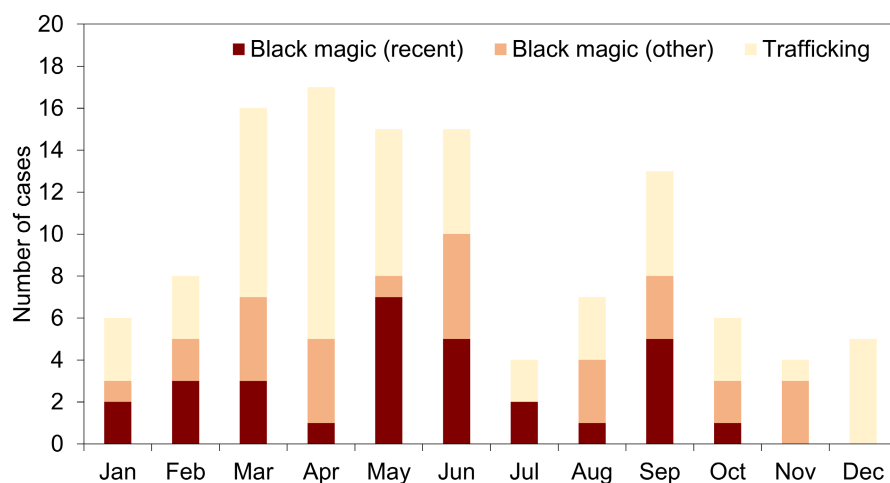
five mechanisms to inflict wounds to the body—burning (11 wounds), hitting (4), piercing (49), breaking (12) and cutting (2) (Figure 4). Wounds occurred all over the body (mouth, head, eyes, limbs, spine,

anus) and to the internal organs (heart, kidney). The most common wound was piercing the forelimb arm. From this, we could link the period of rituals to the moon phase (GAM, intercept =  $-0.22 \pm 0.18$ ,

**FIGURE 2** Cumulative number of cases related to trafficking and black magic of slender loris in the Bengaluru district between 2002 and 2020. Data are from three rescue centres and a governmental organization.



**FIGURE 3** Month-wise cases of illegal slender loris trafficking between 2002 and 2020 in Bengaluru, South India. Data are from three rescue centres and a governmental organization. Black magic cases were classified as recent if new signs of rituals were present on the animal and other if no details were present or if only old signs of rituals were present.

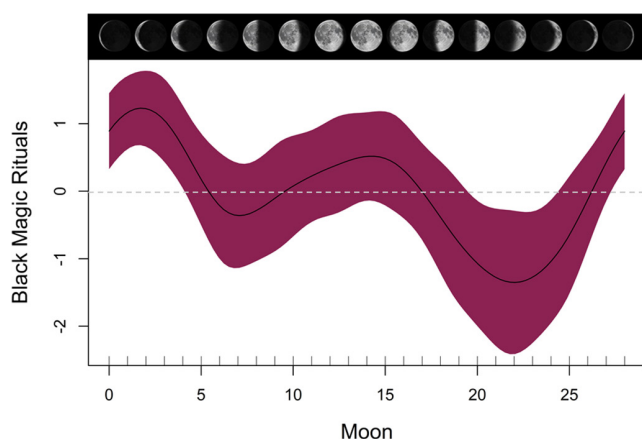


**FIGURE 4** Overview of the practices inflicted on grey slender loris (*Loris lydekkerianus lydekkerianus*) effigies, showing wound types and representative examples of animals rescued from trade. Size of the symbol increases with its increased use on that part of the body. Images by Roopa Satish. Illustration by DINTOONS.

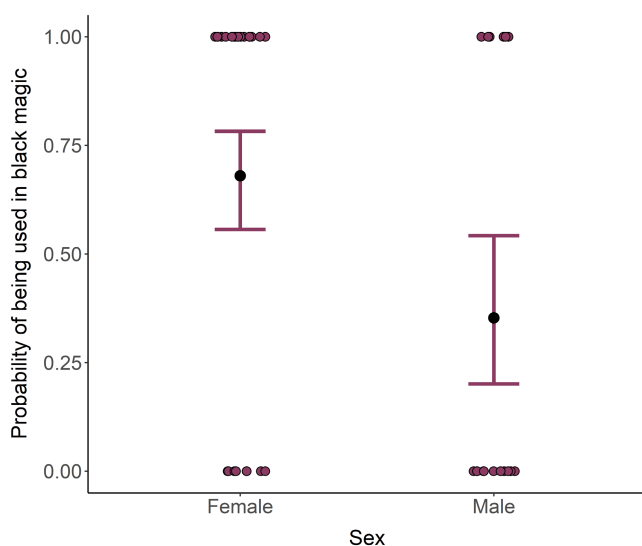
edf = 4.90,  $F = 2.74$ ,  $p = 0.004$ ), which explains 53.7% of the variance. Black magic practitioners perform rituals more frequently than the reference value in the proximity of new moon nights (Amavasya) and less than the waning crescent moon's reference (Figure 5). Female slender lorises had a 33% higher probability to be involved in black magic than males [GLM, intercept =  $0.75 \pm 0.43$ , sex(males) =  $-1.36 \pm 0.66$ ,  $Z = -2.05$ ,  $p = 0.040$ ] (Figure 6).

### 3.2 | Traditional uses of lorises

We were able to characterize people's knowledge, beliefs and uses regarding slender lorises into three categories: traditional



**FIGURE 5** Influence of moon phase on the cases of slender lorises directly linked to black magic and presenting fresh wounds linked to rituals. Data are smooth terms estimated via a Generalized Additive Model. The dashed lines indicate the reference value, and the purple area indicates the 95% confidence interval of the smooth term.



**FIGURE 6** Probability of male vs female slender lorises being used in black magic practices in South India. Values are estimated model means and 95% CI based on a logistic regression.

medicine, black magic rituals, and non-black magic rituals (Table 2). For traditional medicine, lorises were used live or dead to cure three conditions such as eyesight, heal joint pain or leprosy. Superstitions consider slender lorises to be evil or to carry dark magical powers. We found references to live lorises or their body parts being used in traditional folk medicine, in black magic practices, or for warding off evil. For black magic, live or dead lorises or their urine were used for five negative purposes shown in Table 2. Tears of lorises were added to kajal or kohl (a black paste applied to the eyes), which when worn, is purported to give the wearer powers of hypnotism. Non-black magic purposes were largely to ward off evil, and with the exception of keeping bones, the lorises were kept alive (Table 2). Qualitative examples are highlighted in Table 2.

Apart from the information received from informers listed in Table 2, a few additional instances were provided to us by informants from their experience with six gypsy individuals who used slender lorises in non-black magic rituals. Travelling gypsy tribes in Tamil Nadu carry live slender lorises in dark boxes to perform common non-black magic rituals. These gypsies are paid to use lorises to ward off evil or to cure ailments. While the slender loris is tied to a rod and whipped, a gypsy calls out to passers-by. This action is believed to rid them of evil. The loris is also placed on peoples' shoulders or heads or circled around peoples' heads for the same effect. The loris is sometimes forced to lick a person's afflicted body part to cure them. The loris is believed to take all the evil upon itself in this way. Similarly, circling a loris over the head of a prematurely born child, after which the child is made to look at the loris' face, is considered to render the child free from all evil.

The gypsies also sell live lorises to villagers to be kept at home; seeing a loris first thing in the morning is believed to remove all bad luck. One astrologer informant revealed that pulling out a loris' teeth using nail cutters aids in easy handling, and to avoid being bitten. According to an astrologer, lorises take anything that they are offered to fill in the gap in their teeth. The astrologers use this behaviour to their advantage in fortune-telling, where they provide a selection of coloured threads (black, red, green or yellow) to the loris, from which the loris chooses one. The loris will then quickly pick up a thread and put it in its mouth to fill the gap in its teeth. Later, that same thread is sold to the customer after conducting a few rituals.

Once the practitioner brings the loris back home, he ties a long rope around the loris' waist, and it is left on a tree to fend for itself. These ropes often cause cuts and potential infection. Despite more female lorises occurring in rescues, the interviewed practitioners considered lorises they caught to be male, probably due to the enlarged penis-like clitoris of females. Practitioners did not discuss a reason, however, for choosing one sex over another. Wildlife rescuers revealed that many of the practitioners reuse the lorises for multiple rituals. The practitioners believe that animals used in their rituals should not die in their house, as it is considered a bad omen. Hence, when the lorises are in intense pain or on the verge of dying, they dispose of the lorises beside the road or in a known loris



habitat. Disposing of the lorises also helps the practitioner to avoid potential legal risks in relation to the ownership of injured animals.

## 4 | DISCUSSION

Our data show that lorises are regularly trafficked for use in various ritual and traditional medicinal practices. Although some animals were kept alive in captivity, most were killed or given life threatening wounds. Although previous authors suggested that slender lorises have been extensively sold as pets (Ahmed, 2001; Singh et al., 2000), we found no evidence for the pet trade, at least in our study area. We also found no price estimates for any loris in this study, though previous study that involved data collected from an online e-commerce site (<https://rice-puller.com>), suggests they cost between US\$25 to US\$2500 per slender loris (Morgan & Nijman, 2020) based on the requirement and location of the buyer, meaning a substantial income for sellers. The reasons given for the trade were the use of slender lorises in cultural rituals, with the majority of the posts emphasizing the lorises' incredible supernatural qualities. Our findings extend previous research that slender lorises are considered magical creatures and associated with bad omens in India and Sri Lanka (Kanagavel et al., 2013; Nekaris & Jayewardene, 2003). The root cause of these perceptions or beliefs is not clearly understood. We recommend further research into understanding the beliefs and perceptions that lead to the use of the slender lorises in the paranormal rituals. Ethnographic text provide evidence of ritual performances, ceremonies and beliefs by rural and tribal peoples, where the belief of the existence of supernatural beings enforces people to perform rites, rituals and festivals (Sabar, 2017). Most of our reports, however, come from urban, cosmopolitan cities, with such practices being carried out by urban dwellers. The complex combination of users across sectors of Indian society means that demand-side interventions for these practices will be complex.

Our findings highlight the extortion of animals for cultural practices such as traditional magic and black magic and other rituals (Jugli et al., 2020). As primates with large forward-facing eyes, long limbs and no tails, lorises are often attributed human properties, which may help understand their extensive association with medicines and rituals (Nekaris et al., 2010; Svensson & Friant, 2014). The ease of catching slow moving animals may explain the similar use of other slow species such as sloths, cuscus and slow loris (Alves et al., 2012; Latinis, 1996). A number of healing properties were attributed to slender lorises in our study, including improving eyesight and curing leprosy. In Sri Lanka, Sinhalese and Tamils use slender lorises in a variety of traditional medicines, including wearing the bones or plucked hairs as talismans against 'the evil eye' (a look from another person that can cause bad luck), eating its flesh to cure leprosy, and using the eyes or their tears as a love potion or medicine (Nekaris et al., 2010; Still, 1930). These tears, in addition to having medicinal properties, supposedly have properties that enable one to see the deity that could bestow riches on the observer (Nekaris et al., 2010). We found evidence that using

loris tears for their medicinal properties is an ongoing practice in India. Asia's slow lorises (*Nycticebus* spp.) also are widely considered to heal leprosy and eye disease, as well as up to 100 other ailments (Starr et al., 2010), whereas the closely related African pottos (*Perodicticus*, *Arctocebus*) are considered as cures for weakness, coughs and aid in pregnancy (Svensson & Friant, 2014). Use of pottos is largely rural, but as for slender lorises, both urban and rural dwellers use slender loris medicine, and even rely on it, stating that western remedies only cure the symptoms, whereas loris remedies cure the disease. Kanagavel et al. (2016) pointed out the challenge of changing rural South Indian communities' preferences for wild animal products. Still, understanding who the purchasers are of slender loris medicine may aid in intervention programmes (Davis et al., 2020).

Our research also uncovered multiple ritual practices. Perhaps the least damaging of these is keeping the loris caged and alive as a good luck charm or fortune teller, a practice that has been reported before in both India (Tamil Nadu, Karnataka and Kerala) and Sri Lanka (Ahmed, 2001; Nekaris & Jayewardene, 2003). Other rituals involved warding off bad luck or ailments, or to get closer to a god and generally require the death of the animal. Similar practices involving the body parts of slow lorises have been reported including keeping or burying body parts of slow lorises in the house; wearing slow loris body parts as jewellery or keyrings; or revering slow lorises as guardians of the afterlife have been reported (Nijman et al., 2014; Nijman et al., 2015; Nijman & Nekaris, 2014). The body parts of pottos too are reported to be used in witchcraft, including their heart to protect from bad situations (Svensson & Friant, 2014). A major difference in treatment of slow lorises and pottos with slender lorises is that they are generally killed quickly (albeit potentially cruelly, such as being smoked alive) for their use in these rituals. Indeed, in several cases we recorded, slender lorises were killed relatively quickly to gain their eyes, skin, liver, fat or bones. Regardless of the conservation status, the abject cruelty and suffering faced by this protected species is something that needs to be addressed.

In India, the majority of the rescued slender lorises, however, were used as animal effigies—a unique contribution of this study. In the literature, effigies or 'voodoo dolls' are pierced, twisted or burnt in black magic rituals to affect the target that they represent and embody (Ball, 2019). Although the majority were female, users perceived these animals to be male, which could be related to their perception of the properties of the animals. The sex of the animal may also relate to the end user and might be important in behavioural interventions (Neto et al., 2009). Although many animals are used in rituals to cause ill luck (e.g. Alves et al., 2012), we could not find previous evidence for the use of lorises or other animals as effigies for the transfer of pain or injury to human counterparts. The use of effigies as representations of the target occurs in regions including Central and West Africa (*minkisi*—MacGaffey, 1990), Japan (*ushi-no-taki-mairi*—Salvador, 2013), Great Britain (*poppet*—Scott, 1985) and Tibet (*linga*—Cuevas, 2011). The key uses of slender loris as effigies correspond with those in other cultures where such voodoo dolls are used, including to bring about pain to the targeted person through

piercing their eyes, limbs, kidney, heart, anus or head with pins or nails or actually killing the person through the death of the animal (Wilburn, 2012). Although we have no records of the human target being connected to the doll, this is typically done by inscription of the name or a piece of hair or clothing belonging to the target of the spell and attaching it to the effigy (Graf, 1997). Although practitioners implied that this was the case, further studies should examine how the spells are carried out. Slender lorises are often regarded as small humans or human babies (Nekaris et al., 2010), which may provide a link to their use as effigies (Table 2; Figure 4). Particularly in regard to black magic, *similia similibus* is the use of ritual violence in magic that is of a persuasive nature (Faraone, 1988). Individuals in positions of weakness use magic dolls against those in positions of power (Faraone & Obbink, 1991). Frustrated individuals may feel the drive to use magic to improve their lives and the purpose behind piercing effigies has been said to afford them control (Ball, 2019; Graf, 1997), especially during key festivals.

Dickman et al. (2015) presented an exhaustive review of a school of thought called 'moral relativism'. They describe how cultural practices, both in developed and developing countries, such as killing wildlife or permitting invasive species, have resulted in significant harm to the native wildlife, whereas others encourage wildlife conservation. The authors advocate a need for universal principles, based on science for biological conservation. In Ecuadorian Amazon, the Kichwa people observe a festival, the *hista*, during which they hunt wildlife including some threatened species (Siren, 2012). Siren argues that wildlife conservation becomes essential even to keep the traditions such as the *hista* alive. Using animals for rituals is part of the cultures of many indigenous, local and traditional communities and the multifaceted nature of these cultural motivations makes understanding their drivers particularly difficult (Alves et al., 2012; Latinis, 1996; Lee et al., 2014).

Historical records suggest that slender lorises have been used in practices driven by cultural beliefs since 300BCE. King Vel Pari, a chieftain leader of tribal clans of the ancient Parambu region, who lived in the Pachchai malai region, believed that the slender loris was the spirit of a Goddess. Lorises were thus venerated and protected in their natural environment. During festivals, his subjects would offer fruit baskets as holy offerings to lorises; the consumption of the holy offering officially marked the beginning of festivities (Venkatesan, 2018). The exploitation of slender lorises is believed to have begun when kings of Pandya dynasty discovered that a slender loris, when on the ground, was always facing the northern direction. The Pandya king and his court then used the loris as a compass to sail abroad and harness riches, after which he grandly delivered these riches to his subjects (Venkatesan, 2018). Later, the locals started regarding the loris as a bad omen; the root of this belief is unknown.

We showed potential links to certain important lunar festivals that could lead to the use of lorises as effigies. Indeed, black magic rituals increased during the months of May, June and September. These findings were contrary to online trade where sales of slender lorises increased significantly in the last four months of the year (Morgan & Nijman, 2020). Those authors suggested that online sales,

which were largely through a web site based in New Delhi, might be related to blood sacrifice rituals during the Hindu festivals of Durga puja and Gadhimai (Morgan & Nijman, 2020). This could mean that slender loris rituals may be associated with different gods and festivals in different regions of India, or that they are kept in captivity for significant amounts of time before the ritual. At the same time, we found a rise in ritual occurrences during the Amavasya (no moon nights) and new moon nights. Indian astrology assigns great importance to the phases of the moon (often identified with mental energy), called lunar days (*tithi*) and they are divided into two periods, the bright half of the crescent moon (*sukla paksa*, from Amavasya to Purnima) and the dark half of the moon 'on the wane' (*krana paksa*, from Purnima to Amavasya) (Chenet, 1985). We also found the lorises were retained by practitioners for multiple rituals, so the exact month and lunar period of demand and the occasions and festivals associated with these needs to be clarified. More research into the prevalence of loris use for black magic is needed to assess the impact on the sustainability of this trade and its conservation implications.

## 5 | CONCLUSION

Understanding traditional cultural practices can be the foundation for programmes regarding sustainable resource use (Alves et al., 2012). Indeed, the overexploitation of slow lorises for these purposes has already caused extensive population declines and even extinction in parts of their range (Ni et al., 2018; Starr et al., 2010). Currently considered Near Threatened, we propose the growing use of slender lorises in medicinal and ritual trade a real threat. Over extraction of lorises might have already caused local extinctions. The literature on biocultural diversity reveals several positive outcomes of traditional stewardship systems such as spiritual reverence for natural elements in forests, pastures, and water bodies (Negi, 2010). Our study provides a counterargument to this literature by highlighting that certain cultural practices can also pose challenges to biodiversity conservation. Although our results are context-specific, they yield insights applicable to other conservation contexts (Dickman et al., 2015; Siren, 2012).

Creating a management framework to curb the demand of wildlife requires better understanding of prevalence, frequency of consumption, number of consumers and the extent of impact on wildlife by trade. A ban on wildlife trade can push trade underground, creating anthropogenic Allee effect around it and make it difficult to monitor. The anthropogenic Allee effect (AAE) suggests how scarcity can disseminate the seeds of further extinction. The AAE model has been used more frequently in the context of trophy hunting, raising worries that such hunting may sabotage rather than help conservation efforts (Harris et al., 2013). It is imperative that we proactively address the demand, or we will not be able to achieve the desired outcomes for both biodiversity conservation and human health (Verissimo et al., 2020). Most importantly, the support of local communities is essential in curbing loris trade, while sensitively removing negative beliefs surrounding slender lorises by using tailored

awareness measures for different communities. Lack of proper understanding of ecology, distribution, and behaviour of slender lorises in urban areas especially Bengaluru and Chennai, have made it difficult to have proper management plans to conserve them in the urban landscapes. In addition, there is a scarcity of knowledge about where slender lorises are caught for use in rituals carried. We call for ground research to understand the ecology of slender lorises, the roots and reasons for people's perceptions about lorises in different habitats and the development of programs targeted to change negative attitudes and involve people instead in conserving the lorises in their natural habitats.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHORS' CONTRIBUTIONS

S.D.G. and K.A.-I.N. conceived the study and gathered the ideas; S.D.G., R.S. and S.B. collected the information; S.D.G., K.A.-I.N. and M.C. analysed the data and led the writing of the manuscript; K.A.-I.N., V.N. and M.S. gave critical feedback to improve the quality of the manuscript; M.S. and S.D.G. secured the funds required for

the project. All authors commented on writing and approved final submission.

## DATA AVAILABILITY STATEMENT

Data are available at Oxford Brookes University's RADAR facility at the following link <https://radar.brookes.ac.uk/radar/items/643920fd-0aa0-4935-b8b8-539726896cff/1/>.

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## REFERENCES

- Ahmed, A. (2001). Illegal trade and utilization of primates in India. *Envis Bulletin: Wildlife and Protected Areas*, 1(1), 177–184.
- Ahmed, A. (2010). *Imperilled custodian of the night: A study on illegal trade, trapping and use of owls in India*. TRAFFIC India/WWF-India.
- Ahmed, A. (2012). Future of Indian lorises hangs upside down. *TRAFFIC Bulletin*, 15, 8–9.
- Alves, R. R., Rosa, I. L., Neto, N. A. L., & Voeks, R. (2012). Animals for the gods: Magical and religious faunal use and trade in Brazil. *Human Ecology*, 40(5), 751–780.
- Alves, R. R. N., Souto, W. M. S., & Barbosa, R. R. D. (2010). Primates in traditional folk medicine: A world overview. *Mammals Review*, 40(2), 155–180.
- Ball, A. C. (2019). *A new typology of magic dolls*. M.A. thesis submitted to the faculty at the University of North Carolina at Chapel Hill.
- Bernard, H. R. (1994). *Research methods in anthropology: Qualitative and quantitative approaches* (2nd ed.). AltaMira Press.
- Bernard, H. R. (2002). *Research methods in anthropology* (3rd ed.). Altamira Press.
- Chawla, M. M., Srivathsa, A., Singh, P., Majgaonkar, I., Sharma, S., Punjabi, G., & Banerjee, A. (2020). Do wildlife crimes against less charismatic species go unnoticed? A case study of Golden jackal *Canis aureus* Linnaeus, 1758 poaching and trade in India. *Journal of Threatened Taxa*, 12(4), 15407–15413.
- Chenet, F. (1985). Karma and astrology: An unrecognised aspect of Indian anthropology. *Sage Journals*, 101, 101–126.
- Cuevas, B. (2011). Illustrations of human effigies in Tibetan ritual texts: With remarks on specific anatomical figures and their possible iconographic source. *Journal of the Royal Asiatic Society*, 21(1), 73–97.
- Davis, E. O., Verissimo, D., Crudge, B., Lim, T., Roth, V., & Glikman, J. A. (2020). Insights for reducing the consumption of wildlife: The use of bear bile and gallbladder in Cambodia. *People and Nature*, 2, 950–963.
- DeWalt, K. M., & DeWalt, B. R. (2002). *Participant observation: A guide for fieldworkers*. AltaMira Press.
- Dickman, A., Johnson, P. J., van Kesteren, F., & Macdonald, D. W. (2015). The moral basis for conservation: How is it affected by culture? *Frontiers in Ecology and Environment*, 13(6), 325–331.
- Dissa, Y., Adjouro, T., Traore, A., & Yorete, A. (2017). A case study of the effects of superstitions and beliefs on Mali socioeconomic development. *International Journal of African and Asian Studies*, 30, 71–80.
- Dittus, W., Singh, M., Gamage, S. N., Kumara, H. N., Kumar, A., & Nekaris, K. A. I. (2020). "*Loris lydekkerianus*". *The IUCN Red List of Threatened Species*, e.T44722A17970358.

- Dixon, P. (2003). VEGAN, a package of R functions for community ecology. *Journal of Vegetation Science*, 14, 927–930.
- Faraone, C. A. (1988). *Talismans, voodoo dolls and other apotropaic images in ancient Greek myth and ritual*. Ph.D. Dissertation submitted to Stanford University.
- Faraone, C. A., & Obbink, D. (1991). *Magika Hiera: Ancient Greek magic and religion*. Oxford University Press.
- Fokunang, C. N., Ndikum, V., Jiofack, R. B., Ngameni, B., Guedje, N. M., Tembe-Fokunang, E. A., Tomkins, P., Barkwan, S., Kechia, F., Asongalem, E., Ngoupayou, J., Torimiro, N. J., Gonsu, K. H., Sielinoui, B. T., Angwafor, F., III, Nkongmeneck, A., Abena, O. M., Ngogang, J., Asonganyi, T., ... Kamsu-Kom, K. (2011). Traditional medicine: Past, present and future research and development prospects and integration in the National Health System of Cameroon. *African Journal of Traditional, Complementary, and Alternative Medicine*, 8(3), 284–295.
- Fukushima, C. S., Mammola, S., & Cardoso, P. (2020). Global wildlife trade permeates the tree of life. *Biological Conservation*, 247, 108503.
- Fuller, C. J. (2004). *The camphor flame: Popular Hinduism and Society in India* (Vol. 46, pp. 83–85). Princeton University Press.
- Gesler, W. M. (1992). Therapeutic landscapes: Medical issues in light of the new cultural geography. *Social Science & Medicine*, 34(7), 735–746.
- Good, C. (1980). Ethno-medical Systems in Africa and the LDCs: Key issues in medical geography. In *Conceptual and methodological issues in medical geography* (pp. 93–116). University of North Carolina at Chapel Hill, Studies in Geography.
- Graf, F. (1997). *Magic in the ancient world*. Translated by F. Harvard University Press.
- Groves, C. (2001). *Primate taxonomy*. Smithsonian Institution Press.
- Harris, R. B., Cooney, R., & Leader-Williams, N. (2013). Application of the anthropogenic allee effect model to trophy hunting as a conservation tool. *Conservation Biology*, 27(5), 945–951.
- Jensen, A. (2009). Shifting focus: Redefining the goals of sea turtle consumption and protection in Bali. *Independent Study Project (ISP) Collection*, 753, 1–62.
- Jugli, S., Chakravorty, J., & Meyer-Rochow, V. B. (2020). Tangsa and wanchu of north-East India use animals not only as food and medicine but also as additional cultural attributes. *Food*, 9(4), 528.
- Kanagavel, A., Parvathy, S., Nameer, P. O., & Raghavan, R. (2016). Conservation implications of wildlife utilization by indigenous communities in the southern Western Ghats of India. *Journal of Asia-Pacific Biodiversity*, 9(3), 271–279.
- Kanagavel, A., Sinclair, C., Sekar, R., & Raghavan, R. (2013). Moolah, misfortune or spinsterhood? The plight of slender Loris *Loris lydekkerianus* in southern India. *Journal of Threatened Taxa*, 5(1), 3585–3588.
- Kawulich, B. B. (2005). Participant observation as a data collection method. In *forum qualitative Sozialforschung/forum: Qualitative. Social Research*, 6(2), Art. 43.
- Kumara, H. N., Singh, M., & Kumar, S. (2006). Distribution, habitat correlates, and conservation of Loris lydekkerianus in Karnataka, India. *International Journal of Primatology*, 27(4), 941–969.
- Latinis, K. (1996). Hunting the cuscus in western Seram: The role of the phalanger in subsistence economies in Central Maluku. *Cakalele*, 7, 17–32.
- Lee, T. M., Sigouin, A., Pinedo-Vasquez, M., & Nasi, R. (2014). *The harvest of wildlife for bushmeat and traditional medicine in east, south and Southeast Asia: Current knowledge base, challenges, opportunities, and areas for future research*. Occasional Paper 115 CIFOR.
- MacGaffey, W. (1990). The personhood of ritual objects: Kongo 'Minkisi'. *Etnofoor*, 3(1), 45–61.
- Melton, J. G. (Ed.). (2001). *Black magic. Encyclopedia of Occultism & Parapsychology* (5th ed., Vol. 1, pp. A–L). Cengage Learning.
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 42.
- Morgan, B., & Nijman, V. (2020). Little people and Rice magic: The internet trade in slender Lorises in South Asia. In K. Nekaris & A. Burrows (Eds.), *Evolution, ecology and conservation of Lorises and Pottos (Cambridge studies in biological and evolutionary anthropology)* (pp. 357–360). Cambridge University Press.
- Negi, C. S. (2010). Traditional culture and biodiversity conservation: Examples from Uttarkhand, Central Himalaya. *Mountain Research and Development*, 30(3), 259–265.
- Nekaris, K. A. I., & Jayewardene, J. (2003). Pilot study and conservation status of the slender Loris (*Loris tardigradus* and *L. lydekkerianus*) in Sri Lanka. *Primate Conservation*, 19, 83–90.
- Nekaris, K. A. I., Shepherd, C. P., Starr, C. R., & 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, 877–886.
- Nekaris, K. A. I., & Starr, C. R. (2015). Conservation and ecology of the neglected slow loris: Priorities and prospects. *Endangered Species Research*, 28(1), 87–95.
- Neto, N. A. L., Brooks, S. E., & Alves, R. R. (2009). From Eshu to Obatala: Animals used in sacrificial rituals at Candomblé 'terreiros' in Brazil. *Journal of Ethnobiology and Ethnomedicine*, 5(1), 1–10.
- Newing, H. S., Eagle, C. M., Puri, R. K., & Watson, C. W. (2010). *Conducting research in conservation: Social science methods and practice*. Routledge.
- Ni, Q., Wang, Y., Weldon, A., Xie, M., Xu, H., Yao, Y., Zhang, M., Li, Y., Zeng, B., & Nekaris, K. A. I. (2018). Conservation implications of primate trade in China over 18 years based on web news reports of confiscations. *PeerJ*, 6, e6069.
- Nijman, V. (2010). An overview of international wildlife trade from Southeast Asia. *Biodiversity and Conservation*, 19(4), 1101–1114.
- Nijman, V., & Nekaris, K. A. I. (2014). Traditions, taboos and trade in slow lorises in Sundanese communities in southern Java, Indonesia. *Endangered Species Research*, 25(1), 79–88.
- Nijman, V., Nekaris, K. A. I., Das, N., & Zhang, M. (2015). Slow Loris arm key-rings. *Oryx*, 49(3), 391.
- Nijman, V., Robbins, T., Jackson, A., Maddock, S. T., & Ang, A. (2020). Molecular phylogeny, taxonomy and conservation of slender Lorises. *Primate Conservation*, 34, 1–9.
- Nijman, V., Shepherd, C. R., & Nekaris, K. A. I. (2014). Trade in Bengal slow lorises in Mong La, Myanmar, on the China border. *Primate Conservation*, 28, 139–142.
- Niraj, S. K., Sethi, S., Goyal, S. P., & Choudhary, A. N. (2019). Poaching, illegal wildlife trade, and Bushmeat hunting in India and South Asia. In J. L. Koprowski & P. R. Krausman (Eds.), *International wildlife management: Conservation challenges in a changing world* (pp. 157–170). JHU Press.
- Padhy, S. (2016). Over-religious activity, a threat to biodiversity: A case study (2): Save the owl (Aves: Strigidae). *Journal of Biodiversity*, 7(2), 104–109.
- Radhakrishna, S., & Singh, M. (2002). Conserving the slender loris (*Loris lydekkerianus* lydekkerianus). In National Seminar on Conservation of Eastern Ghats, March 24–26, pp. 227–231.
- Robinson, J. E., & Sinovas, P. (2018). Challenges of analyzing the global trade in CITES-listed wildlife. *Conservation Biology*, 32(5), 1203–1206.
- Sabar, B. (2017). Religious beliefs and practices among Chuktia Bhunjia tribe of Odisha: Looking through anthropological lens. *The Oriental Anthropologist*, 17, 303–323.
- Salvador, J. M. (2013). The cursing kit of Ushi no koku Mairi. *Preternature: Critical and Historical Studies on the Preternatural*, 2(1), 73–91.
- Sasi, R., & Kumara, H. N. (2014). Distribution and relative abundance of the slender Loris *Loris lydekkerianus* in southern Kerala, India. *Primate Conservation*, 28(1), 165–170.
- Scheffers, B. R., Oliveira, B. F., Lamb, I., & Edwards, D. P. (2020). Global wildlife trade across the tree of life. *Science*, 366(6461), 71–76.



- Scott, C. (1985). *Cunningham's encyclopedia of magical herbs* (1st ed.). Llewellyn Publications.
- Singh, M., Kumar, M. A., Kumara, H. N., & Mohnot, S. M. (2000). Distribution and conservation of slender lorises (*Loris tardigradus lydekkerianus*) in southern Andhra Pradesh, South India. *International Journal of Primatology*, 21(4), 721–730.
- Siren, A. (2012). Festival hunting by the Kichwa people in the Ecuadorian Amazon. *Journal of Ethnobiology*, 32(1), 30–50.
- Situge, H. (2001). The Loris in lore and literature. *Loris.*, 22(2), 14–17.
- St John, F. A. V., Mai, C.-H., & Pei, K. J. C. (2015). Evaluating deterrents of illegal behaviour in conservation: Carnivore killing in rural Taiwan. *Biological Conservation*, 189, 86–94.
- Starr, C., Nekaris, K. A. I., Streicher, U., & Leung, L. (2010). Traditional use of slow lorises *Nycticebus bengalensis* and *N. pygmaeus* in Cambodia: An impediment to their conservation. *Endangered Species Research*, 12(1), 17–23.
- Still, J. (1930). *The jungle tide*. Mackwood and Sons.
- Svensson, M. S., & Friant, S. C. (2014). Threats from trading and hunting of pottos and angwantibos in Africa resemble those faced by slow lorises in Asia. *Endangered Species Research*, 23(2), 107–114.
- Thass, J. J. (2008). Siddha medicine- background and principles and the application for skin diseases. *Clinical Dermatology*, 26(1), 62–78.
- TRAFFIC. (2018). *Festival of lights casts shadow over owls in India: TRAFFIC urges strong action to curb their illegal trade and sacrifice* (pp. 1–4). TRAFFIC Bulletin.
- Venkatesan, S. (2018). *Veera Yuga Nayagan Vel Pari*. Vikatan Prasuram (Publishers). 1408 pp. [in Tamil]
- Verissimo, D., Sas-Rolfes, M., & Glikman, J. A. (2020). Influencing consumer demand is vital for tackling the illegal wildlife trade. *People and Nature*, 2, 872–876.
- Verissimo, D., & Wan, A. K. Y. (2018). Characterizing efforts to reduce consumer demand for wildlife products. *Conservation Biology*, 33, 623–633.
- Versnel, H. S. (2016). *Magic*. Oxford Classical Dictionary.
- WHO. (2002). *WHO traditional medicine strategy 2002–2005*. World Health Organisation.
- WHO. (2013). *Executive board 134th session. Provisional agenda item 9.1. Report by the Secretariat*. EB134/24.
- Wilburn, A. (2012). *Materia Magica: The archaeology of magic in Roman Egypt, Cyprus, and Spain*. University of Michigan.
- Wood, S. N. (2017). *Generalized additive models: An introduction with R* (2nd ed.). Chapman and Hall/CRC.
- Wood, S. N. (2018). *Mgcv: Mixed GAM computation vehicle with automatic smoothness estimation*. R package version 1.8-24. Retrieved from <https://rdrr.io/cran/mgcv/>
- Wyatt, T. (2013). The local context of wildlife trafficking: The Heathrow animal reception Centre. In D. Westrehuis, R. Walters, & T. Wyatt (Eds.), *Emerging issues in green criminology: Exploring power, justice and harm* (pp. 142–163). Palgrave Macmillan.

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