Vol. 25: 79–88, 2014
doi: 10.3354/esr00610

ENDANGERED SPECIES RESEARCH
Endang Species Res

Published online September 3

Contribution to the Theme Section 'Conservation and ecology of slow lorises'

FREE ACCESS

Traditions, taboos and trade in slow lorises in Sundanese communities in southern Java, Indonesia

Vincent Nijman*, K. Anne-Isola Nekaris

Nocturnal Primate Research Group, Oxford Brookes University, Oxford OX3 0BP, UK

ABSTRACT: For endangered species management a shared understanding of the different beliefs, opinions and factual knowledge that local people hold towards the target species is imperative. To take these views into account, detailed assessments need to be made of how they differ between individuals, and, crucially, what beliefs and views are shared. These assessments require an ethnozoological approach, using tools from both the natural and the social sciences. Here we focus on the beliefs, opinions and knowledge about Javan slow lorises *Nycticebus javanicus* in 12 Sundanese communities of West Java, Indonesia. Javan slow lorises are small, nocturnal, venomous primates that are threatened by habitat loss and over-exploitation for the illegal pet trade. Based on detailed interviews with 79 informants from June 2011 to June 2013, and using cluster and cultural domain analyses, we identify and document 5 different topics, i.e. trade and exploitation, taboos against disturbing or capturing, venomous primates, blood myths and mystical powers. The most salient topics were factual (activity pattern, habitat use) or related to the taboo on collecting or disturbing slow lorises. In communities with strong traditions, taboos and beliefs in place, slow lorises were found in seemingly unlikely habitats, in or adjacent to the villages; where these beliefs were absent, slow lorises were less known to the communities, and the slow lorises were either less abundant or extirpated. We conclude that it is imperative that any conservation programme implemented in West Java, be it management, mitigation, or education, must take into account the traditions, beliefs and taboos regarding slow lorises.

KEY WORDS: Slow loris · Conservation · Cultural consensus · Cultural domain · Venomous mammal

INTRODUCTION

In the field of endangered species management it has long been recognised that reaching a shared understanding amongst the different stakeholders involved is of paramount importance if collective decision-making processes are to be made. This notion is especially true in contexts where potential exists for plurality of views and where this can hinder the creation of solutions (Ancrenaz et al. 2007, Stone-Jovicich et al. 2011). This plurality can express itself in differences in beliefs, opinions and factual knowledge about different aspects of the conservation programme. Debates on the most effective means to mitigate any negative effects of species management decisions are often coloured by broadly contested debates on animal welfare, conservation and development. All agree that more effective management must draw on expertise and commitment from various levels of society, from the government down to communities, local smallholders and individuals living close to the area involved (e.g. Regmi et al. 2013). These parties, however, often disagree about the most effective division of responsibilities and about the fair share of total efforts that each should bear. Increasingly it is recognised that for effective management of endangered species it is imperative that the views of those living close to the wildlife, and therefore perhaps those that are most affected by any change in regime, are considered (Redford 2011). In

*Corresponding author: vnijman@brookes.ac.uk

order to reach a level of understanding about these views that allows them to be taken into account, detailed assessments need to be made of these views, how they differ between individuals and, crucially, what beliefs and views are shared. For these kinds of assessments tools from both the natural and the social sciences need to be employed, and, indeed, conservation increasingly involves interdisciplinary teams (Newing 2011, Redford 2011).

Such an approach was highlighted by Alves (2012, p. 3) when he pointed out that

> in order to secure a future for animal populations, conservationist[s] must understand not only the ecological but also the cultural and economic interactions that link ecological and social systems into a common regional system, and the feedback that govern these interactions.

The consideration of the relationships between humans and other animals, and the various ways in which these groups can interact, forms the basis of ethnozoology, or in the case of primates in particular, ethnoprimatology (Nekaris et al. 2010, Riley 2010).

Here, using a social science perspective, we explore the level of knowledge about a globally threatened primate, the Javan slow loris *Nycticebus javanicus*, in Sundanese communities in the southwestern part of the island of Java, Indonesia. This small cryptic animal is threatened, in part, by loss of habitat, as well as by the unsustainable exploitation for the pet market (Nekaris et al. 2009, 2013a). We aim to quantify the shared levels of knowledge about these animals amongst individuals and communities, as well as document any traditions, taboos and myths (if any) that may be relevant for conservation of the species. We show that such knowledge is key for developing region-specific community conservation programmes including education, intervention and habitat management.

METHODS

Study species and its ecological niche

Humans and Javan slow lorises are active during different times of the 24 h cycle. Javan slow lorises are nocturnal primates, which, in our study areas in southern Java, spend most of their time sleeping in bamboo patches during the day (K. A. I. Nekaris et al. unpubl. data). At night they become active, ranging over an area between 2 and 20 ha (Nekaris 2013). Slow lorises do vocalise in various contexts, but their high-frequency makes it difficult for human observers to detect and, for the uninitiated listener, they are easily mistaken for insect sounds. Our experience working in the study area, often at night, shows that the human farmers here rarely spend any time on their fields after dusk. The economy of the areas we worked was largely agricultural, with most activities taking place in fields or villages (Weersum 1982, Fauzi 2005). Those few that venture further afield, for instance entering nearby forest for wild boar hunting or bird catching, do so during the day, without staying overnight in the forest. In addition, there is a general reluctance to enter wildlands or forests at night, partially because of wide beliefs regarding the presence of ghosts and spirits in these areas (see Wessing 1988).

Slow lorises are the only venomous primate, and one of a small number of venomous mammals (Nekaris et al. 2013b). The venom comprises 2 components, saliva and oil from the brachial gland on the upper arm, which becomes active when the animal licks its brachial gland and mixes the two. When threatened, for instance when picked up by a human, slow lorises may administer a painful bite, which may cause swelling and tends to heal much more slowly than similar bites from non-venomous animals (Nekaris et al. 2013b). Some people experience anaphylactic shock that may lead to death (Wilde 1972), whereas others experience necrosis of the infected tissue (Nekaris et al. 2013b; see 'Results: Venomous primates'). The species is collected for the pet trade, and animals are sold at so-called bird markets (*pasar burung*) in cities. However, as slow lorises are protected under Indonesian law, this trade is not allowed; penalties can be imposed when these laws are broken that can lead to fines of up to ~USD 10 000 and imprisonment for up to 5 yr. Law enforcement, however, is lax, or, certainly at the village level, absent.

Study area and data acquisition

The study area stretches over some 7000 km^2 of what is known as the Parahyangan ('Abode of the Gods'), which is considered the heartland of the Sundanese. The Parahyangan is characteristed by its rugged mountains, with steep slopes and deep valleys, and large amounts of rainfall, typically exceeding 3000 mm yr^{-1}. The area is geologically active, with frequent tremors, earthquakes and, less frequently, volcanic eruptions. Landslides (from rockfalls to the destabilisation of entire hill sides, occasionally due to earthquake-caused liquefaction destabilizing slopes) and mudslides (when strong rains on hill or mountain slopes cause extensive erosion) are a common phenomenon. The main livelihood in these vil-

lages is agriculture, with rice grown at lower elevations and more temperate crops (carrots, cabbage, but also potatoes) in the higher regions. Terracing allows farmers to grow crops on the steepest of slopes, often up to elevations of 1800 m above sea level (a.s.l) and above. Of the villages in which we worked, the exception in terms of livelihood is Pangandaran, a fishing village adjacent to a strict nature reserve (*cagar alam*), where, apart from fisheries, tourism provides an important source of income. Most Sundanese identify themselves as Sunni Muslim, but, in more remote areas, such as the village of Ciptagelar, villagers still uphold pre-Islamic taboos and traditions venerating ancestral spirits (*karuhun*).

We collected data in 12 villages (*desa*) or hamlets (*kampung*), in 5 regencies (*kabupaten*), in the southern part of the province of West Java between June 2011 and June 2013 (Fig. 1). Listed in a west-to-east sequence these were: Ciptagelar in Sukabumi regency, situated at 1050 m a.s.l and visited in 2011; Cisitu, Sukabumi, 600 m a.s.l, visited in 2011, 2012 and 2013; Cipaganti, Garut regency, 1300 m a.s.l, visited in 2011, 2012 and 2013; Cipanas, 900 m a.s.l, visited in 2011, 2012 and 2013; Ciwangi, Garut, 850 m a.s.l, visited in 2012; Cibuan, Sumedang regency, 830 m a.s.l, visited in 2011 and 2012; Sedonghilir, Tasikmalaya regency 550 m a.s.l, visited in 2012; Sitamiyang, Tasikmalaya, 300 m a.s.l, visited in 2012; Leuwinangung, Tasikmalaya, 425 m a.s.l, visited in 2012; Balanggendong, Tasikmalaya, 410 m a.s.l, visited in 2012; Sukakerta, Ciamis regency, 650 m a.s.l, visited in 2012; and Pangandaran, Ciamis, 10 m a.s.l, visited in 2012 and 2013.

Interviews were conducted in Bahasa Indonesia, the national language that is very widely spoken on Java (Sneddon 2004), with key concepts repeated in Bahasa Sunda, the regional language spoken in this part of the island. The study was restricted to those individuals who indicated that they were born in the village where we conducted the survey, or that otherwise were long-time residents (and typically had moved into the area during childhood). Interviews were informal and open, allowing informants to talk freely about slow lorises, their significance in culture and myths or the beliefs surrounding them. To ensure independence of data, informants were interviewed individually; other members of the community sometimes were present, but only the responses of the informant were used in analysis. We explicitly did not talk about the protected status of slow lorises in Indonesia or their rarity unless informants initiated these topics. In each village, typically 3 to 6 informants were interviewed for a total of 63 interviews, with an additional 16 interviews conducted in Cipaganti (see 'Results: Cultural domain analysis'). At the end of each interview, key points were repeated to ascertain whether we captured the essence of the informant's opinions/expressions correctly. Informants did not receive gifts or money for their participation. The interview protocols followed the ethical guidelines proposed by the Association of Social Anthropologists of the UK and Commonwealth.

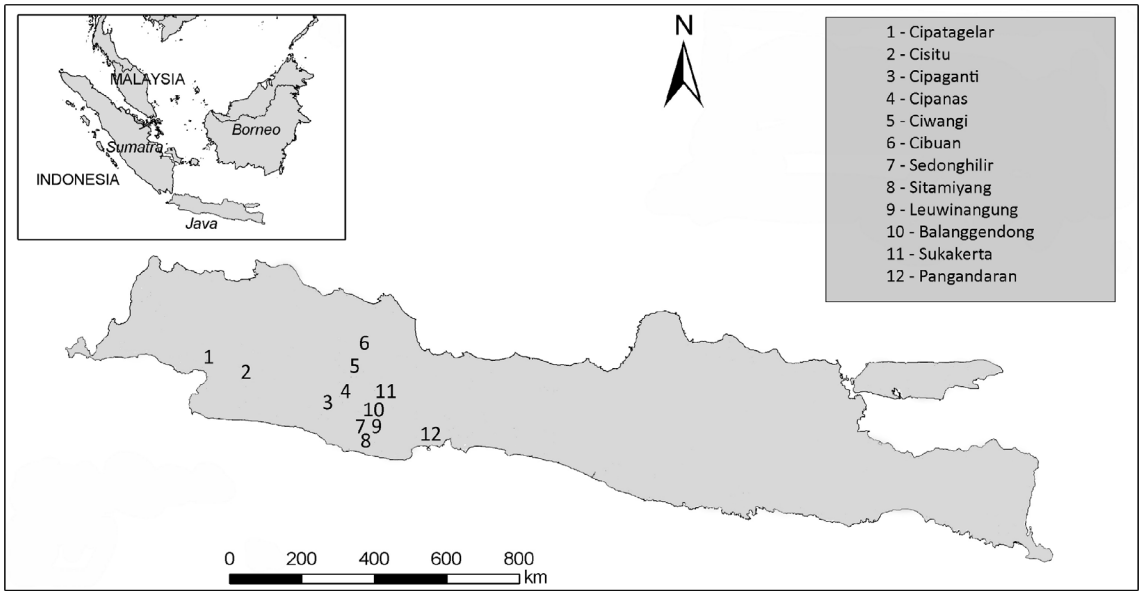

Fig. 1. The island of Java, Indonesia showing the 12 communities in the Parahyangan region of West Java where data on the beliefs of Javan slow lorises *Nycticebus javanicus* were collected between June 2011 and June 2013

Analysis

We analysed the data at the village level, pooling all informants from each of the 12 villages enabling us to determine for each area whether the belief in a number of key concepts was present or absent, and at the individual level, where informants' responses were treated as independent data points. At the village level, we noted 12 key concepts that could define the cultural domain and that would allow us to distinguish between villages. These 12 key concepts were: 'slow loris blood is to be avoided', 'slow loris blood/placenta causes land slides', 'slow loris bones have mystical powers', 'slow loris bite is powerful', 'slow loris bite is poisonous', 'slow lorises are the spirits of the afterlife', 'slow lorises are protected by Indonesian law', 'slow lorises have been caught in this area', 'slow lorises are kept as pets', 'slow lorises are dangerous', 'one cannot collect or catch them', and 'slow lorises bring bad luck when brought into the house'.

For each village the presence of these beliefs, either expressed in the form stated above or in a more extreme form, was recorded on a scale from 0 (not mentioned, absent) to 2 (most, if not all, respondents mentioned it, with strong convictions). This resulted in a 12 × 12 matrix. We subjected this to an UPGMA (unweighted pair group method with arithmetic mean) clustering analysis. UPGMA is a hierarchical clustering method, resulting in a dendrogram, reflecting the structure present in the pairwise dissimilarity matrix. The algorithm assures that the nearest 2 clusters are combined into a higher-level cluster, and repeats this until all objects are included. As we were interested in both how ideas and beliefs about slow lorises are related to each other and how these beliefs are distributed geographically, we ran the analysis twice: once with the beliefs and ideas expressed at the tips of the dendrogram and once with the villages at the tips (Fig. 2).

Once we identified the key concepts, we created a list of structured questions, and analysed this within the context of cultural domain or cultural consensus analysis (Romney 1999). Cultural consensus analysis allows one to identify cultural domains, i.e. define systems of knowledge that jointly refer to a single conceptual sphere that individuals use to interpret and respond to the world of experience (Romney 1999, Stone-Jovicich et al. 2011). The domain we were interested in deals with the knowledge, ideas and beliefs revolving around slow lorises. Culture comprises knowledge, and as such can be shared and learned, and the distribution (or sharing) of word and concepts varies amongst individuals. In 2012 we conducted in-depth interviews with 16 additional villagers from the village of Cipaganti in Garut, as here we found a good population of slow lorises present and there was a strong belief system in place regarding slow lorises. Informants were asked to share their knowledge of slow lorises with us, touching upon any topic they felt to be relevant. We converted these interviews into freelists, from which we extracted the frequency of occurrence for each item (i.e. what proportion of informants mentioned a particular topic) and the average rank for each item (i.e. were they mentioned early on or at the very end of the interview) (Puri 2011). This allowed us to check whether the domain is locally salient or meaningful, which items are included and which items are most salient. Salience was quantified by calculating Smith's S, with a higher value of S indicating higher salience (Puri 2011).

RESULTS

Knowledge, traditions and taboos

We observed slow lorises in the surroundings of 8 villages, and their presence was confirmed in 3 additional villages (Cibuan, Cisitu, Pangandaran) (see Voskamp et al. 2014). It is unclear whether slow lorises can be found near the village of Cipanas: we did not observe them, and information received from informants was ambiguous. In some areas, slow lorises were observed in the adjacent forest only, in some they were also observed inside the agroforests bordering the village (e.g. Cipaganti; Fig. 3), and in yet others we observed them in the village gardens. In most villages where we assessed the knowledge of slow lorises, the species was generally well-known. Levels of knowledge were lowest in the village of Pangandaran, where very few people recognised the species and there were no traditions or taboos associated with slow lorises. If anything, it was a species that was associated with the pet trade (Fig. 3). Slow lorises are present in the Pangandaran nature reserve, but few ventured there at night, and thus there was little first-hand knowledge of the species. In other villages, slow lorises live almost commensally with humans, and levels of knowledge were high. In the latter villages, as well as for instance in Ciptalegar, there were strong traditions, beliefs and taboos concerning slow lorises. The main ideas that emerged from the interviews with the informants are given below, presented in a non-specific order.

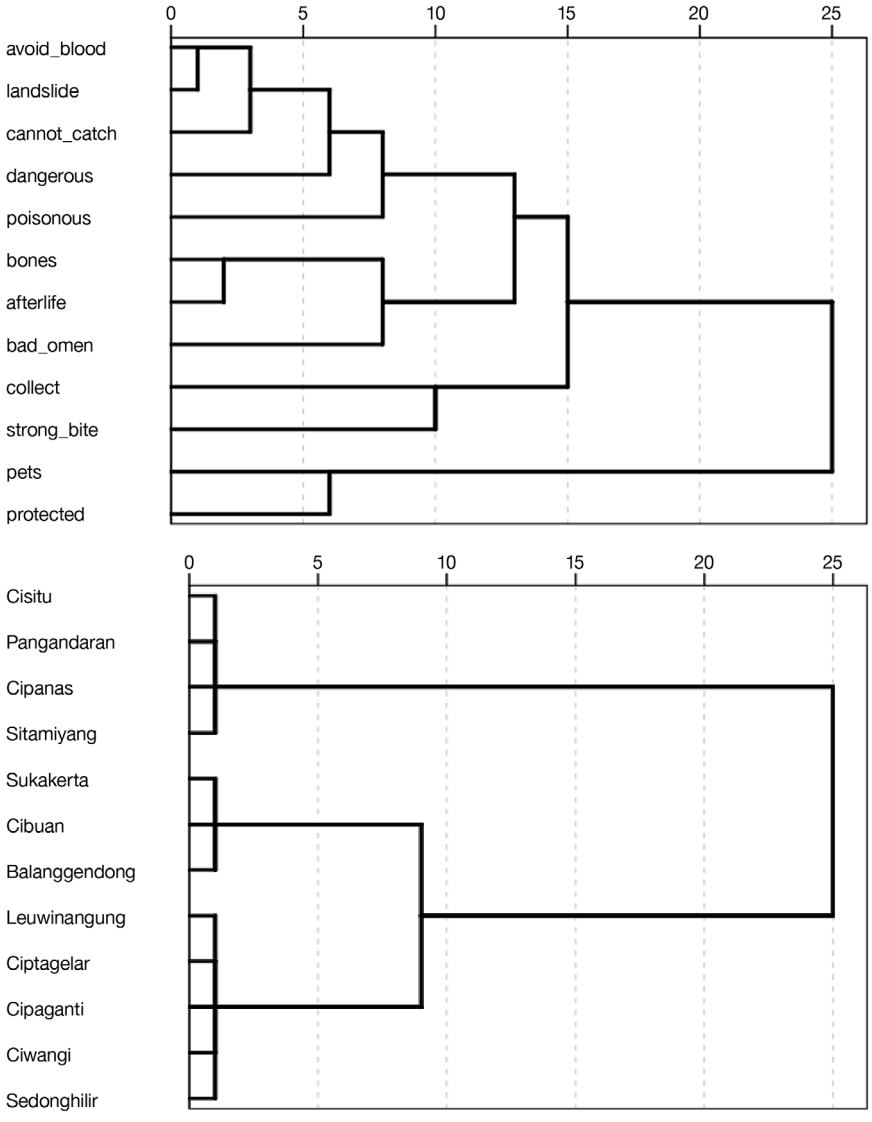

Fig. 2. Cluster analysis of topics associated with slow lorises *Nycticebus javanicus* in 12 Sundanese communities in southern West Java, Indonesia based on the views of 79 informants. Upper panel: clustering based on topics showing 4 distinct clusters each comprising between 2 and 5 topics; lower panel: clustering based on communities showing 3 distinct clusters each comprising between 3 and 5 villages

Trade and exploitation. Slow lorises have economic value as commodities in the pet trade. Either specialised collectors visit sites and typically spend a couple of days collecting slow lorises, or individual villagers know the value of a slow loris and collect them when encountering them opportunistically. They are passed on to middlemen and sold at one of the many bird markets in the towns. Informants that talked about slow lorises in trade were generally aware of the protected status of slow lorises, noted their rarity and explained the difficulties in finding and catching them. They were aware that slow lorises had a powerful bite, either through personal experience or by having observed someone else being bitten, and noted the severity of the wounds inflicted. In several villages it was explicitly stated that they were much less common now than they used to be, with informants linking this to over-exploitation.

Taboos against disturbing or capturing. In stark opposition to the above were the taboos regarding the disturbance of slow lorises or taboos against capturing or bringing slow lorises into one's house. Informants had strong convictions about not disturbing

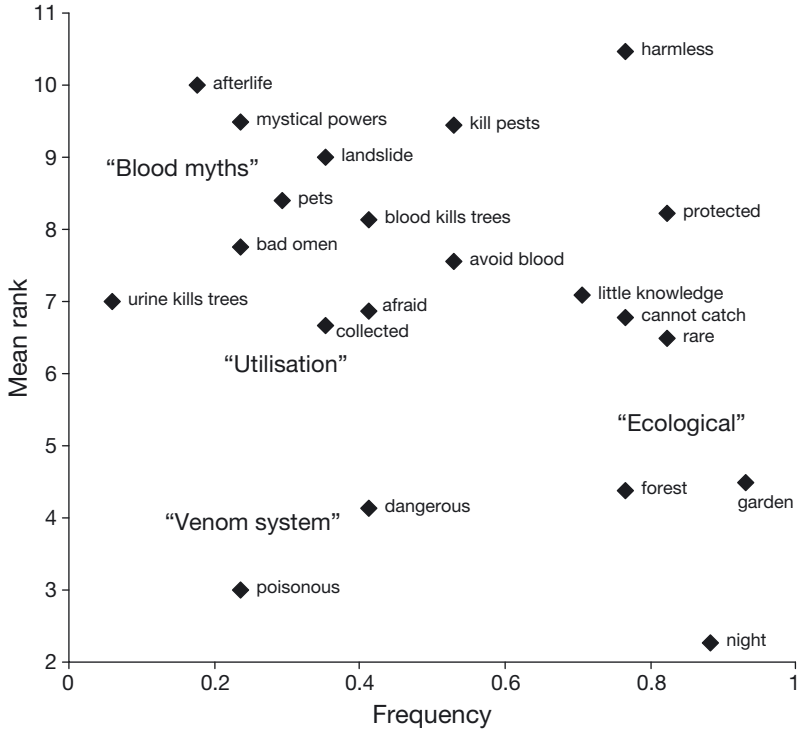

Fig. 3. Salience of knowledge, taboos and beliefs about slow lorises *Nycticebus javanicus* in Cipaganti, West Java, Indonesia, based on interviews with 16 informants. Lower mean ranks indicate topics mentioned earlier in the interview, and higher frequencies indicate more informants mentioned the topic

slow lorises when encountered in the forest or in/near their gardens. When a slow loris was accidentally picked up, either by, for instance, a dog, child, or someone else not aware of the taboo, and brought into the village, the animal had to be brought back to where it had been encountered without ado. Bringing a slow loris into one's house, and keeping it there, was to be avoided at all costs, as this would bring misfortune. One informant voiced the belief that this even would lead to one's house being burned down.

Venomous primates. We note here that local languages do not discriminate between the terms venomous and poisonous. A small number of informants were aware that slow lorises were venomous. As to emphasise the importance of this fact, this was often the first thing mentioned, as if to warn us not to get bitten by one. Few were aware of the exact mechanism of administering venom (i.e. mixing of saliva with brachial oil); the observable effects of being bitten by slow lorises were noted, including shock. Other than a painful bite, the informants mentioned the length of time it takes for slow loris bites to heal (comparing it unfavourably, for instance, with dog bites) and the occurrence of necrosis after being bitten. Informants knew of 2 different persons who had lost fingers due to necrosis, one had to have his hand amputated, and we received 1 report of a Japanese soldier in WWII who lost his whole arm due to a slow loris bite. One informant described that the slow loris' bite was worse than any leopard or snake, because there was no cure.

Blood myths. The blood of slow lorises is powerful, and several beliefs surround it. Central is that when the blood of slow lorises comes into contact with the ground it leads to (1) the soil drying out; (2) the soil cracking open, sometimes dramatically so; (3) trees or other vegetation drying out, leading to their death, with, according to some, nothing being able to grow there again; (4) landslides; and (5) the collapse of entire mountains. The blood of slow lorises can hit the ground in various way, firstly by humans killing the slow loris, and this therefore has to be avoided; secondly, as a result of fights between slow lorises or fights between slow lorises and other animals; and thirdly, after slow loris females give birth and the discarded placenta falls on the ground. A variation to the blood myths centre around slow loris urine hitting the ground or, during or after mating, sperm hitting the ground. In Ciptagelar, the blood myth was expressed most strongly: if a slow loris were brought into the village and even a single drop of blood touched the ground, the entire village would have to be moved to another location. Alternatively, presumably when the event took place outside the village grounds, a trench had to be dug around the infected area as loris blood would spoil the water supply.

Mystical powers. Slow lorises can be perceived as a bad omen, especially when brought into one's house (see above), and as such can be used to bring misfortune onto others. The mystical powers are either related to the animal when still alive, or to its body parts, first and foremost its bones. In Ciptalegar, slow loris blood was previously used to increase damage to enemies in battle, with blood applied to swords preventing any inflicted wound from healing. Finally, there are beliefs that slow lorises are linked to the afterlife. In Cisitu there was the belief that a slow loris must be left where it is (and may not be collected or moved) as it is guarding a gate to the afterlife.

Clustering of beliefs and ideas about slow lorises

The UPGMA clustering revealed several related groupings (Fig. 2). Firstly, the fact that slow lorises were kept as pets and knowledge of whether or not they were protected formed a tight cluster basal to all the other terms. In villages where slow lorises were, or had been, kept as pets, it was well known that the species was protected under Indonesian law. Related to this was a second cluster that branched off next and that was linked to the trade in the species. Knowledge about the powerful bite of a slow loris and the fact that slow lorises were, or had been in the past, collected in the area as to supply the pet market was tightly linked. This suggests that when people actively go out in search of slow lorises and catch and handle them, at least some of those people experience the painful bite of the slow loris.

Where the animals were left alone, in general, few people explicitly mentioned the force of the slow loris' bite. Ideas and beliefs about slow lorises as harbourers of the afterlife clustered with the notion that parts of slow lorises (primarily bones) could be used in witchcraft or, for instance, for a wife to make her husband more biddable.

The analysis at the village level, i.e. how beliefs and ideas about slow lorises clustered spatially, revealed a very clear tripartite relationship that was, however, not related to geographic distance (Fig. 1). The first branch clustered the villages of Cisitu, Pangandaran, Cipanas and Sitamiyang, situated in 4 different regencies. In the first 3 villages, we did not observe slow lorises, and overall levels of knowledge relating to slow lorises were generally low. Trade-related topics, including knowledge about the protected status of slow lorises and their being collected to fuel the pet trade, were widely discussed. The other villages clustered into 2 distinct branches, one containing the villages of Cibuan, Balenggendong and Leuwinangung, and the second branch containing the remainder of the villages. This third branch clustered those villages where taboos and traditions concerning slow lorises were strongest. Given that each branch contained villages from 3 or 4 regencies, no geographic structuring was indicated in the slow loris domain.

Cultural domain analysis

The informants in Cipaganti shared their knowledge and beliefs on topics ranging from factual and ecological, to ones related to the collecting, capturing and exploitation of slow lorises, and from blood myths and taboos to spiritual aspects of slow lorises. Fig. 3 illustrates the salience of these different topics, showing their frequencies (i.e. how many informants mentioned this topic) and their ranks (whether the topics are mentioned early on during the interview or at the very end, perhaps as an afterthought). It is clear that some day-to-day factual topics cluster together in the right-hand lower corner (mentioned often, early on during the interview): slow lorises are active at night and are infrequently encountered in the forest or the forest gardens. The unique venom system of slow lorises is mentioned by fewer informants (perhaps as it is not known to all), but, given its importance, this is mentioned early on and thus has a low ranking. Blood myths are usually mentioned later in the interview and by relatively few informants, resulting in a clustering in the left-hand upper corner in Fig. 3.

The salience of these topics can be numerically expressed by using Smith's *S*. For 22 topics mentioned by the informants, Smith's *S* ranged from 0.05 for the belief that slow loris urine (or semen) dropping on the ground will kill trees (mentioned by 1 informant) to 0.72 for the knowledge that slow lorises are active during the night. The most salient topics were mostly related to factual and ecological information, such as slow lorises living in the forest or forest gardens ($S = 0.46$ and $S = 0.63$, respectively), that they are rare ($S = 0.46$) and protected ($S = 0.39$) and indeed that they are active at night. Furthermore, the belief that one cannot or should not catch a slow loris was highly salient ($S = 42$). Topics related to trade and collecting were less salient: slow lorises having a strong painful ($S = 0.30$) or poisonous ($S = 0.20$) bite and that they are collected for the pet trade ($S = 0.15$) or being kept as pets ($S = 0.12$). Blood myths had an intermediate salience: coming into contact with the blood of slow lorises should be avoided ($S = 0.28$), blood causing trees to die ($S = 0.21$) or causing landslides ($S = 0.14$). Finally, the mythology surrounding slow lorises as being bad omens ($S = 0.11$), as having mystical powers ($S = 0.09$), or of being spirits of the afterlife ($S = 0.07$) was known to some informants, but it played a far less meaningful part in the slow loris domain in Cipaganti than other topics.

DISCUSSION

We documented through interviews and analysis the traditions, beliefs, taboos and myths surrounding a little-known, nocturnal and globally threatened

primate, the Javan slow loris. In this culturally homogeneous area there are differences in the levels of knowledge people have, but several major themes emerge showing shared traditions. There was a clear presence of taboos against disturbing or collecting slow lorises, in part linked to beliefs about the blood of slow lorises or their perceived importance as links to the afterlife. These beliefs were strongest where slow lorises were observed to live side by side with humans; where these beliefs had eroded or were simply not present, there was a greater incentive to exploit these animals (Fig. S1 in the Supplement at www.int-res.com/articles/suppl/n025p079_supp.pdf).

Taboos involving primates and the beliefs regarding not disturbing, collecting, or killing them are well-known from Madagascar, where there are specific *fadis* concerning different species of lemur (Wilson et al. 1989, Vargas et al. 2002, Jones et al. 2008). Similar taboos are present in parts of Africa and Asia as well. In some cases all primates are included in the taboo, but in other cases only 1 or 2 species are covered. For instance, in central Ghana, both the black-and-white colobus *Colobus polykomos* and mona monkey *Cercopithecus campbelli* were kept in high regard by locals and were not allowed to be disturbed or killed, but other primate species were treated as any other potential prey species (Fargey 1992, Saj et al. 2006). In Siberut, off the west coast of the Indonesian island of Sumatra, hunting was forbidden for Kloss' gibbons *Hylobates klossi* and the pale (but not the black) morph of the simakobu *Simias concolor*, despite primates being amongst the largest mammals on the island (Mitchell & Tilson 1986). In north Sulawesi, Indonesia, a clear taboo, based in local folklore, prohibits harming Tonkean macaques *Macaca tonkeana*, despite their frequent crop-raiding behaviour (Riley 2010). Throughout various parts of Asia, the Hanuman langurs *Semnopithecus* spp. or macaques *Macaca* spp. are revered as ancestors or as deities (Zinner et al. 2013), with populations persisting locally where they otherwise almost certainly would have perished.

It is clear from the above listing that these specific-species taboos can have important ecological ramifications for the protection of threatened populations of the different species involved. Invariably, these species are avoided for a variety of reasons, and not because they are, or have been, threatened (Colding & Folke 1997). Taboos represent unwritten social rules that regulate the behaviour and social interactions between humans, by putting restraints on certain actions. They can have a direct effect on the management and/or utilization of natural resources. At a local level, taboos can have a positive effect on the preservation of threatened species. As reviewed by Colding & Folke (1997, 2001) the merits of taboos, the ecological reasoning behind them and their value for conservation are manifold and crucial according to some, whereas they are largely irrelevant according to others. The truth probably lies somewhere in the middle, and, crucially, varies geographically (as seen in the case of the slow lorises reported here) and over time (with traditional beliefs, including taboos, eroding over time) (cf. Osemeobo 1994).

When reflecting upon the merits of taboos for threatened species management and here particularly, i.e. the merits of the taboos regarding disturbing or collecting slow lorises in Sundanese communities, it is important to realize that these taboos probably did not originate as a preservation measure. It is well known that certain species are revered, or at least left alone, because they play a role in creation myths, represent ancestors, or have a specific religious meaning. Alternatively, species may be avoided because of some observable characteristics (behaviour, appearance) or because of real or perceived toxicity (Zann 1983, Begossi 1992, Dumbacher et al. 2000). It seems that several of these factors may play a role in explaining the taboos and mythology surrounding slow lorises in Sundanese society. We suspect that slow lorises being venomous played an important role in the emergence of taboos, even though many informants may not be aware of this. In geologically active regions, such as the Parahyangan, disrespect for the land through, for instance, the clearing of land for agriculture can have fatal consequences, and it is tempting to link some of the slow loris blood myths to this.

It is clear that Javan slow lorises are traded heavily, as numerous observations in the Javan bird markets attest (Nekaris et al. 2009, 2010). However, in the Sundanese communities we worked in, the exploitation of slow lorises was, in general, rare. Exceptions were the villages of Cibuan and Pangandaran, situated in the northern and easternmost areas of the Parahyangan, as well as the more urbanised villages such as Cipanas. Having worked on Java for extensive periods, we have to acknowledge that the situation in our study area is not typical of the rest of Java. Indeed, we feel that the respect shown by many of our informants towards slow lorises is more a reflection of the past than of our present-day 24 h global economy. Elsewhere in Asia slow lorises are exploited frequently for their purported medicinal qualities or as a delicacy food item (Wang et al. 1996,

Wenjun et al. 1996, Lau et al. 1997, Li & Wang 1999, Starr et al. 2010; see also Alves et al. 2010), the difference between the two not always being clear, but this was not the case in southern Java.

In our study we showed that where a strong system of beliefs is in place regarding slow lorises and where respect, and to a lesser extent mythology, are part of the slow loris domain, these primates can live side-by-side with humans. We were initially surprised to see slow lorises, one of the most endangered primates on the planet (Nekaris et al. 2009), living adjacent to and even on village grounds. With information regarding the traditions and beliefs surrounding slow lorises in these villages, it has become clear that collecting (and hunting) does indeed play a major role in explaining the distribution patterns and local abundances of slow lorises. Where the species is left alone, it can thrive even in seemingly unsuitable habitats. It is imperative that any management programme or species action plan implemented in this part of Java has to take into account the traditions, beliefs and taboos regarding slow lorises.

Levels of tolerance, acceptance and demand have been shown to directly influence the attitude of local people towards primate conservation throughout their range (Lee & Priston 2005), and conservation programmes relying on local knowledge can be far more cost-effective than following a traditional approach (Ravaloharimanitra et al. 2011). In areas where taboos are absent and slow lorises are traded as pets, actions must be taken beyond the measures taken at the national level, including community conservation education (cf. Jacobson 2010). Bowen-Jones & Pendry (1999) have convincingly demonstrated that considering local attitudes is vital for conservation success. We have shown that non-hunting of slow lorises can largely be linked to an established social order rather than to a set of conservation ideals (cf. Osemeobo 1994, Saj et al. 2006). Taking advantage of these beliefs with a targeted conservation education approach may serve to transfer traditional beliefs to conservation action.

Acknowledgements. First and foremost we have to thank all the villagers of the Sundanese communities for their time and patience in sharing their views and knowledge unreservedly with us. We thank Wirdateti, Duan Ahmed, Resit Sözer, Andrew Walmsley, Dendi Rustendi, Aconk Zaelani and Adin Nunur. This project was funded in part by grants from the Leverhulme Trust (RPG-084), the Cleveland Zoo Asian Seed Fund, Dierenpark Amersfoort, Columbus Zoo, International Primate Protection League, Zoologische Gesellschaft für Arten- und Populationsschutz, and People's Trust for Endangered Species. We thank 2 anonymous reviewers for constructive feedback.

LITERATURE CITED

Alves RRN (2012) Relationships between fauna and people and the role of ethnozoology in animal conservation. Ethnobiol Conserv 1:1–69

Alves R, Souto W, Barboza RR (2010) Primates in traditional folk medicine: a world overview. Mammal Rev 40: 155–180

Ancrenaz M, Dabek L, O'Neil S (2007) The costs of exclusion: recognizing a role for local communities in biodiversity conservation. PLoS Biol 5:e289

Begossi A (1992) Food taboos at Buzios Island (Brazil): their significance and relation to folk medicine. J Ethnobiol 12:117–139

Bowen-Jones E, Pendry S (1999) The threat to primates and other mammals from the bushmeat trade in Africa, and how this threat could be diminished. Oryx 33:233–246

Colding J, Folke C (1997) The relations among threatened species, their protection, and taboos. Conserv Ecol 1: article 6, www.consecol.org/vol1/iss1/art6/

Colding J, Folke C (2001) Social taboos:'invisible' systems of local resource management and biological conservation. Ecol Appl 11:584–600

Dumbacher JP, Spande TF, Daly JW (2000) Batrachotoxin alkaloids from passerine birds: a second toxic bird genus (*Ifrita kowaldi*) from New Guinea. Proc Natl Acad Sci U S A 97:12970–12975

Fargey PJ (1992) Boabeng-Fiema Monkey Sanctuary — An example of traditional conservation in Ghana. Oryx 26: 151–156

Fauzi N (2005) The new Sundanese peasants' union: peasant movements, changes in land control, and agrarian questions in Garut, West Java. Institute for International Studies, Berkeley, CA

Jacobson SK (2010) Effective primate conservation education: gaps and opportunities. Am J Primatol 72:414–419

Jones JP, Andriamarovololona MM, Hockley N (2008) The importance of taboos and social norms to conservation in Madagascar. Conserv Biol 22:976–986

Lau MWN, Ades G, Goodyear N, Zou FS (1997) Wildlife trade in southern China including Hong Kong and Macao. In: MacKinnon J, Wang S (eds) Conserving China's biodiversity. China Environmental Science Press, Beijing, p 141–159

Lee PC, Priston NEC (2005) Human attitudes to primates: perceptions of pests, conflict and consequences for primate conservation. In: Paterson JD, Wallis J (eds) Commensalism and conflict: the human–primate interface. American Society of Primatologists, Norman, OK, p 1–23

Li W, Wang H (1999) Wildlife trade in Yunnan Province, China, at the border with Vietnam. TRAFFIC Bull 18: 21–30

Mitchell AH, Tilson RL (1986) Restoring the balance: traditional hunting and primate conservation in the Mentawai Islands, Indonesia. In: Else JC, Lee PC (eds) Primate ecology and conservation. Cambridge University Press, Cambridge, p 249–260

Nekaris KAI (2013) Family Lorisidae (angwantibos, pottos and lorises). In: Mittermeier R, Rylands A, Wilson DE (eds) Handbook of the mammals of the world, Vol 2. Primates. Conservation International and Lynx, Barcelona, p 210–235

Nekaris KAI, Llano Sanchez K, Thorn JS, Winarti I, Nijman V (2009) Javan slow loris *Nycticebus javanicus* É. Geoffroy, 1812. In: Mittermeier RA, Wallis J, Rylands AB,

Ganzhorn JU and others (eds) Primates in peril: the world's 25 most endangered primates 2008–2010. IUCN/SSC Primate Specialist Group, International Primatological Society, and Conservation International, Arlington, VA, p 44–46

Nekaris KAI, Starr CR, Shepherd CR, Nijman V (2010) Revealing culturally-specific patterns in wildlife trade via an ethnoprimatological approach: a case study of slender and slow lorises (*Loris* and *Nycticebus*) in South and Southeast Asia. Am J Primatol 72:877–886

Nekaris KAI, Campbell N, Coggins TG, Rode EJ, Nijman V (2013a) Tickled to death: analysing public perceptions of 'cute' videos of threatened species (slow lorises–*Nycticebus* spp.) on Web 2.0 sites. PLoS ONE 8:e69215

Nekaris KAI, Moore RS, Rode EJ, Fry BG (2013b) Mad, bad and dangerous to know: the biochemistry, ecology and evolution of slow loris venom. J Venom Anim Toxins Incl Trop Dis 19:Article 1, doi:10.1371/journal.pone.006921

Newing H (2011) Conducting research in conservation — a social science perspective. Routledge, Abingdon

Osemeobo GJ (1994) The role of folklore in environmental conservation: evidence from Edo state, Nigeria. Int J Sustain Develop World Ecol 1:48–55

Puri RK (2011) Documenting local environmental knowledge and change. In: Newing H (ed) Conducting research in conservation — a social science perspective. Routledge, Abingdon, p 146–169

Ravaloharimanitra M, Ratolojanahary T, Rafalimandimby J, Rajaonson A and others (2011) Gathering local knowledge in Madagascar results in a major increase in the known range and number of sites for critically endangered greater bamboo lemurs (*Prolemur simus*). Int J Primatol 32:776–792

Redford KH (2011) Misreading the conservation landscape. Oryx 45:324–330

Regmi GR, Nekaris KAI, Kandel K, Nijman V (2013) Crop-raiding macaques: predictions, patterns and perceptions from Langtang National Park, Nepal. Endang Species Res 20:217–226

Riley EP (2010) The importance of human–macaque folklore for conservation in Lore Lindu National Park, Sulawesi, Indonesia. Oryx 44:235–240

Romney AK (1999) Culture consensus as a statistical model. Curr Anthropol 40:103–115

Saj TL, Mather C, Sicotte P (2006) Traditional taboos in biological conservation: the case of *Colobus vellerosus* at the Boabeng-Fiema Monkey Sanctuary, Central Ghana. Soc Sci Inform 45:285–310

Sneddon JN (2004) The Indonesian language: its history and role in modern society. UNSW Press, Sydney

Starr C, Nekaris KAI, Streicher U, Leung L (2010) Traditional use of slow lorises *Nycticebus bengalensis* and *N. pygmaeus* in Cambodia: an impediment to their conservation. Endang Species Res 12:17–23

Stone-Jovicich SS, Lynam T, Leitch A, Jones NA (2011) Using consensus analysis to assess mental models about water use and management in the Crocodile River catchment, South Africa. Ecol Soc 16:Article 45, www.ecologyandsociety.org/vol16/iss1/art45/

Vargas A, Jiménez I, Palomares F, Palacios MJ (2002) Distribution, status, and conservation needs of the golden-crowned sifaka (*Propithecus tattersalli*). Biol Conserv 108:325–334

Voskamp H, Rode EJ, Coudrat CNZ, Wirdateti, Abinawanto, Wilson RJ, Nekaris KAI (2014) Habitat use and distribution of the Endangered Javan slow loris (*Nycticebus javanicus*). Endang Species Res 23:277–286

Wang Z, Chen H, Wu D (1996) The status on live wildlife trade near the port areas in Yunnan. In: Schei PJ, Wang S, Xie Y (eds) Conserving China's biodiversity. China Environmental Science Press, Beijing, p 197–210

Weersum KF (1982) Tree gardening and taungya on Java: examples of agroforestry techniques in the humid tropics. Agrofor Syst 1:53–70

Wenjun L, Fuller TK, Sung W (1996) A survey of wildlife trade in Guangxi and Guangdong, China. TRAFFIC Bull 16:9–16

Wessing R (1988) Spirits of the earth and spirits of the water: chthonic forces in the mountains of West Java. Asian Folkl Stud 47:43–61

Wilde H (1972) Anaphylactic shock following bite by a slow loris *Nycticebus coucang.* Am J Trop Med Hyg 21: 592–594

Wilson JM, Stewart PD, Ramangason GS, Denning AM, Hutchings MS (1989) Ecology and conservation of the crowned lemur, *Lemur coronatus*, at Ankarana, N. Madagascar. Folia Primatol (Basel) 52:1–26

Zann LP (1983) Traditional management and conservation of fisheries in Kiribati and Tuvalu atolls. In: Ruddle K, Johannes RE (eds) Contending with global change: traditional marine resource management in the Pacific Basin: an anthology. UNESCO, Rome, p 79–101

Zinner D, Fickenscher GH, Roos C, Anandam MV and others (2013) Family Cercopithecidae (Old World monkeys). In: Mittermeier R, Rylands A, Wilson DE (eds) Mammals of the world, Vol 3. Primates. Lynxs Edicions, Barcelona

Editorial responsibility: Brendan Godley, University of Exeter, Cornwall Campus, UK

Submitted: August 1, 2013; Accepted: May 5, 2014
Proofs received from author(s): July 31, 2014