Does forest management and researchers' presence reduce hunting and forest exploitation by local communities in Tsitongambarika, Madagascar?

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Abstract

Hunting wildlife is one of the major threats to biodiversity. For effective conservation programs in countries where hunting and shifting agriculture are the main source of subsistence, forest management should determine a reduction in hunting pressure and forest exploitation. The presence of researchers has been promoted as one of the main ways to slow down anthropogenic pressures on animal populations. The aim of this study was to test whether local management and the establishment of a research station had a role in decreasing forest exploitation by villagers living adjacent to a remote forest in southeast Madagascar. To test this, we interviewed local people from nine villages at various distances from the recently established research station of Ampasy, northernmost portion of the Tsitongambarika Protected Area, to explore how people use the forest with particular focus on hunting. Also, we performed transects to estimate snare and lemur encounter rates before the beginning of local forest management, at the instalment of the research station, and one year after. Local communities seem to have decreased the impact on the forest after the beginning of the forest management, and have further decreased it after the establishment of the research station. Participants from villages not involved in the local management were more reluctant to declare their illegal activities. In conclusion, a combination of local management and related activities (e.g. installation of a research station) can assist in temporarily reducing forest exploitation by local communities; however, community needs and conservation plans should be integrated to maintain long-term benefits.

Keywords

forest management, hunting, lemurs, pirogue, research station, snares, Tsitongambarika

Introduction

Hunting wildlife, mainly for commercial purposes, is amongst the major threats to biodiversity (Nijman, 2010; Jenkins et al., 2011) and has significantly reduced animal populations (Rao et al., 2010; Melo et al., 2015). In particular, long-lived species with slow reproductive rates are more affected (Rao et al., 2010). Various methods have been used to estimate hunting pressure, each with strengths and weaknesses. Market surveys are a common way to estimate the level of hunting (Allebone-Webb et al., 2011), although this method does not estimate subsistence hunting (Golden et al., 2013). An alternative method is estimating the density of snares (Barelli et al., 2015) but in this case opportunistic hunting is not considered. Interviews are frequently used to estimate hunting pressure or bushmeat consumption (Rao et al., 2011; Golden et al., 2013), but a common issue of this last approach is how to obtain reliable responses, since participants may be reluctant to declare illegal activities (Knapp et al., 2010; Nuno & St John 2015). A further approach consists of estimating population fluctuations by monitoring the density of animals over time, although in this case it is difficult to separate the effect of hunting from those of other ecological factors (Barelli et al., 2015; Melo et al., 2015).

For effective conservation programs in countries where hunting and shifting agriculture are the main source of subsistence, forest management and the creation of alternative sources of income should determine a reduction in hunting pressure and forest exploitation. Also, local stakeholder and community perceptions should be taken into account (Hill, 1997). Previous studies (e.g. Newmark et al., 1993; Little, 1994) suggested that even a light interaction between NGOs, research organisations, and local communities can have a positive impact upon attitudes toward wildlife. However, several studies reported a failure of forest management programs mainly due to the lack of long-term funding (e.g. Little, 1994; Webber et al., 2007).

In addition to forest management, the presence of researchers has been recognized as one of the factors that play a role in reducing anthropogenic pressures on threatened species (Marsh et al., 1999; Wrangham & Ross, 2008; Schwitzer et al., 2014). This is based on the rationale that local communities might decrease their hunting activity, and exploit the forest less, as a consequence of having direct benefits from researchers' presence, such as new job opportunities (Wrangham & Ross, 2008; Schwitzer et al., 2014). In addition, researchers can provide training to local assistants, as well as increase awareness of the importance of the forest, and this is likely to facilitate future research and ecotourism (Schwitzer et al., 2014). Evidence to support the hypothesis that researcher presence decreases hunting pressure comes from two studies which investigated abundance of primates in Tai National Park, Ivory Coast (Campbell et al., 2011; N'Goran et al., 2012); these studies found a positive association between species densities and distance to the research station, due to a lower hunting pressure close to the research station. Also, the benefits of long-term research in an area have been linked to an increase in animal population size (Fedigan & Jack, 2012; Nakamura, 2012), although this has not been directly linked to the presence of a research station. However, the opposite has also been reported, with a population of primates having been hunted to near-extirpation despite the presence of a large, fully operational field station (Nijman, 2005). Similarly, but without presenting data to support their claims, Bezanson et al. (2013) argued that the presence of researchers, and especially the establishment of extensive trail systems, allow for greater access and increased poaching opportunities.

Madagascar is a biodiversity hotspot in which many endemic species are threatened (Myers et al., 2000). Ninety-four percent of lemurs, one of the island's flagship taxonomic groups, are threatened with extinction (Schwitzer et al., 2014). Here, hunting wildlife is mostly for subsistence (Golden et al., 2014; Razafimanahaka et al., 2013), since bushmeat represents a cheap alternative to domesticated meat (Golden et al., 2014; Borgerson et al., 2016). In fact, poverty, poor health, and child malnutrition are strong predictors for illegal hunting (Borgerson et al., 2016). Bushmeat consumption was recently suggested to be more widespread than previously thought (Golden, 2009), with recent studies focused on this topic (e.g. Razafimanahaka et al., 2013; Golden et al., 2014; Borgerson et al., 2016).

The Tsitongambarika (TGK) Protected Area, in south-eastern Madagascar, was established in 2008 (Birdlife International, 2011) and has been co-managed by the NGO Asity Madagascar and KOMFITA (Community Forest Management) since 2013. A research station was established in 2015 at Ampasy, northernmost portion of TGK. The TGK forest is a good model with which to test the influence of a research station on area forest since no long-term research has been previously conducted in the area, thus local communities have never had prolonged exposure to researchers. Furthermore, this area has no exposure to tourism which can be a potentially confounding factor (Krüger, 2003; Wright et al., 2014).

The aim of this study was to evaluate the determinants reducing pressure on lemur populations in the northernmost portion of TGK. We hypothesised that researchers' presence and local management have significantly benefit lemur communities and the forest. In particular, we predicted:

1) anthropogenic pressure on the forest to be reduced after local management commenced;

2) people from villages close to the research station and involved in the local management to decrease their forest use after the research station installation more than people from further away villages . We also expect villages not involved in the local management to not decrease their impact on the forest;

3) active snare occurrence to be greater prior to the start of the local management, and to substantially decrease after the research station was established;

4) cathemeral (i.e. active throughout the 24h; Donati et al., 2016) lemurs encounter rates to increase after the installation of the research station since they are expected to be the main targets of hunting due to their comparatively large body size.

Study area

This study took place at the Ampasy research station (S 24°34’58’’, E 47°09’01’’), in the northern-most portion of TGK (Figure 1). The research station is located at the forest edge in the Ampasy valley, ca. 7.6 km from Iaboakoho (around 60 km north of Fort Dauphin). Local people depend mainly on fishing and traditional practices, including shifting agriculture (Birdlife International, 2011). They also depend on the forest for timber, firewood, medicinal plants, and lianas to make lobster traps, while the importance of hunting in the area is not well-known and potentially underestimated in previous reports (Birdlife International, 2011). Hunting in TGK has been reported as a major threat for collared brown lemur *Eulemur collaris*, and practised also on other endemic species including southern bamboo lemur *Hapalemur meridionalis*, Madagascan flying fox *Pteropus rufus*, fossa *Cryptoprocta ferox*, and blue coua *Coua caerulea* (Birdlife International, 2011).

Methods

Data collection: interviews

We collected data via semi-structured household interviews (Golden, 2009) from nine villages in the municipality of Iaboakoho, selecting a maximum of 10 people from each village. In total, 72 people were interviewed in June 2016 (Table 1). We included all villages within two walking hours from the research station.

A translator with previous experience and who speaks the local dialect was hired to assist with the interviews. Additionally, a local guide helped in recruiting male heads of households, asking for their participation in interviews. Convenience sampling was used to select individuals for interviewing, therefore selecting those available in the village at a given time (Henn et al., 2009). The interview included eight questions (Table 2), starting with general questions on forest use and proceeding into more specific questions about hunting. Indirect questioning techniques (Nuno & St John, 2015) were employed to avoid dishonest answers, although we cannot exclude the presence of false negatives.

Following the questions, a series of 16 pictures were presented (Table 3), each of a different animal species. The pictures shown were of endemic species we had observed in TGK since research began at Ampasy. We asked if the respondent had seen each animal and whether or not they had eaten it. Pictures were tested with four local guides to ensure their easy recognition. In particular, we asked interviewees to independently (i.e. one-by-one) provide the vernacular names of the species shown, assuring the overall consensus for each picture. In order to maximize the reliability of data, images were not limited to lemur species as we did not want to reveal our main research focus (e.g., participants may have avoided answering honestly if they knew our focal species; Nuno & St John, 2015).

Data collection: snare and lemur counts

We established eleven transects of 1 km length using pre-existent trails. We evaluated the number of snares by walking all transects after the research station installation (May 2015) and at the end of the study (July 2016). We considered all traps visible at maximum 20 m from the transect. Also, we considered data collected in July 2012, before the local management in the Ampasy valley (Nguyen et al., 2013). The same transects were walked in 2012 and 2015, although more areas were censused in 2012. We plotted GPS points of the snares found to compare the data collected in 2012 with our data, considering only traps along our established transects. Eleven out of the 16 traps found in 2012 (Nguyen et al., 2013) were located within the area monitored in 2015. Each transect which occurred mostly in the forest (nine out of eleven) was walked once a month from May to July 2015 and from May to July 2016 to estimate encounter rates of collared brown lemurs and southern bamboo lemurs. Transects were walked at an average speed of about 1.0–1.5 km/h, starting in the early morning (6:30-7:30) or late afternoon (15:00-16:00).

Ethics statement

Research was approved by the Oxford Brookes University Ethics Committee. We obtained permission from the Ministry of Environment and Forest (54/16/MEEMF/SG/DGF/DAPT/SCBT.Re). In conformity with local customs, we asked for consent from the mayor of the Iaboakoho municipality before commencing interviews. Before each interview, we explained all research details to participants, avoiding to reveal our main target (i.e. lemurs hunting) to favour honest responses (Nuno & St John 2015), stating that participation was voluntary with the opportunity to withdraw at any time. Village names are not provided to guarantee participant anonymity.

Data analysis

For interviews, we grouped villages into three categories depending on the distance from the research station/continuous forest and the potential influence of local management: “close-involved”, “close-not involved”, “far-involved”. “Close-involved” were villages closest to the research station (4.3-5.0 km) and the continuous forest (2.1-3.3 km) that were involved in the local management, especially after the research station installation, and for which the Ampasy valley was the preferred access point to the forest. “Close-not involved” were the villages close to the research station (4.3-5.0 km) and the continuous forest (2.1-3.3 km) which were not or marginally involved in the local management and for which another valley was the preferred access to the forest. “Far-involved” were the villages furthest from the research station (6.2-7.6 km) and the continuous forest (4.2-4.7 km) that were involved in the local management from the very beginning, and for which the Ampasy valley was the preferred access to the forest. To calculate the distance from the research station/continuous forest, we plotted GPS points of each village on ArcGIS and calculated the straight-line distance to the research station/continuous forest. We considered a village “involved” in the local management when most of the villagers were employed by Asity-KOMFITA, received funding from Asity-KOMFITA to favour sustainable agriculture, and/or participated to conservation education programs promoted by Asity-KOMFITA. We considered the single household as statistical unit and we ran multiple Generalised Linear Models to test the influence of distance/management on the variables derived from the interviews. Villages were considered as subjects since people within each village may show similar habits more often than people from different villages in the same Distance-Management category. Variables were linked to logistic/probit (in case of binary and ordinal variables) or loglinear poisson/log-negative binomial (in case of counts) distributions. The lower value on the Quasi-Likelihood under Independence Model Criterion (QIC) had been used to select the link function. In case of open questions, we categorised answers, as shown in the results, to allow for statistical comparison. Fisher's Least Significant Difference post-hoc tests were performed for pairwise comparisons in case of significant effects. We report only significant results for post-hoc tests.

For snares, we performed Wilcoxon test between count of traps per transect in 2012 and 2015 to test whether there was a reduction due to the local management, and between 2015 and 2016 to test whether there was a further reduction due to the presence of the research station. To test whether cathemeral lemur encounter rates increased from May-July 2015 to May-July 2016, we performed Wilcoxon test by comparing the same transect per month between years. Statistical tests had been performed in SPSS 22 considering $p<0.05$ as significance level.

Results

Interviews

Overall, 20.8% of participants entered the forest daily, 38.9% weekly, 16.7% monthly, 18.1% rarely, and 5.6% never. No significant differences were found in the frequency of people who use the forest at least once a week (Figure 2) between villages (Distance-Management effect: Wald $\chi^2=1.861$, $p=0.394$).

Compared to now, 77.8% of participants used the forest more frequently before the local management, with significant differences between villages (Figure 2) (Distance-Management effect: Wald $\chi^2=13.536$, $p=0.001$). Fewer people from "close-not involved" villages acknowledged to reduce forest use after the local management when compared to "close-involved" ($p=0.001$) and "far-involved" ($p=0.001$) villages.

All participants used the forest for timber and firewood. Many participants (54.2%) used the forest to build pirogues. The percentage of people who built pirogues (Figure 2) did not vary between villages (Distance-Management effect: Wald χ^2=2.022, p=0.364). For hunting, we only considered participants who included lemurs as response to what they hunted (question 4). Overall, 65.3% of participants used the forest to hunt lemurs. This percentage varied between villages (Distance-management effect: Wald χ^2=7.289, p=0.026; Figure 2). People in "close-not involved" villages declared to have hunted lemurs less frequently than people living in "close-involved" villages (p=0.003).

The answers to question 5 (What did you do the last time you went into the forest?) were: 57.8% timber or firewood, 26.6% collect fruits, lianas, or crops, 14.1% pirogues, and 1.6% fishing (Figure 3). Distance-management resulted as a significant factor determining the answer "timber or firewood" (Wald χ^2=14.016, p=0.001). In particular, people from "far-involved" villages answered "timber or firewood" more than "close-involved" (p=0.046) and "close-not involved" (p<0.001) villages. Distance-management resulted as a significant factor determining the answer "pirogue" (Wald χ^2=8.306, p=0.016). In particular, "close-not involved" villages answered "pirogues" more than "far-involved" villages (p=0.008). No differences between villages were found in the answer "collect fruits, lianas, crops" (Distance-management effect: Wald χ^2=0.594, p=0.743).

Participants which answered the last time they ate lemurs was after the beginning of the local management was 18.6%, while 8.6% stated they never ate lemurs. As for the follow-up question (how did you procure it?), 63.0% answered "opportunistic hunting" (mainly via slingshot), 20.4% answered "snares", and 16.7% answered it was a "gift" from relatives/friends. Opportunistic hunting was not dependent on distance-management (Wald χ^2=2.151, p=0.341). The use of snares was dependent on distance-management (Wald χ^2=23.390, p<0.001) with more participants who answered snares in "close-involved" than in "far-involved" villages (p<0.001; Figure 4).

Commenting on their village, 45.8% of participants answered that people in their village still hunt, 25.0% said that people from their village hunted before, and 29.2% did not know. The answer to question 7 (Do you think that people from your village hunt now?) was different between villages (Distance-management effect: Wald χ^2=8.712, p=0.013). Villages “close-not involved” declared that people in their villages still hunt less than “far-involved” (p=0.016) and “close-involved” (p=0.048) villages. Overall, 37.5% of people interviewed answered that people in neighbouring villages still hunt, 19.5% said that people from their village hunted before, and 43.1% did not know. The answer to question 8 (Do you think that people from the neighbouring villages hunt now?) differed significantly between villages (Distance-management effect: Wald χ^2=6.438, p=0.040). Fewer people living in ”close-not involved” villages declared that people from neighbouring villages still hunt when compared to the people who live in “close-involved” villages (p=0.049; Figure 4).

The number of species eaten by participants (Figure 5) differed significantly between villages (Distance-management effect: Wald χ^2=15.393, p<0.001). People living in villages “close-not involved” declared they ate less species than the people who live in villages “close-involved” (p<0.001) and “far-involved” (p=0.006). Also, villages “close-involved” ate more species than villages “far-involved” (p=0.049). The number of lemur species that participants have eaten differed significantly between villages (Distance-management effect: Wald χ^2=15.793, p<0.001). People living in villages “close-involved” declared they ate more lemur species than the people in “close-not involved” (p<0.001) and “far-involved” (p=0.001) villages.

The species most widely eaten in the area is the brown mesite, whilst the most commonly eaten lemur species is the collared brown lemur, followed by the southern bamboo lemur (Table 4). Aye-aye and Madagascar red owl are taboo, although one person ate the latter. Most participants ate small-sized species Peters's sheath-tailed bat and Anosy mouse lemur when young or caught them for their children. Several participants sold ring-tailed mongoose tails for traditional medicinal purposes to Chinese people.

Snare and lemur count

Snares numbers significantly decreased from 11 in 2012 (1.00 traps/km) to four (0.36 traps/km) in 2015 (N=11, Z=-2.121, p=0.034), and further decreased significantly from 2015 to 2016 when zero snares were found (N=11, Z=-2.000, p=0.046).

Number of observations of cathemeral lemurs significantly increased from May-July 2015 to May-July 2016 (N=27, Z=2.575, p=0.010). In total, individuals spotted between May and July 2015 were nine southern bamboo lemurs (0.33 individuals/km and 0.07 groups/km) and six collared brown lemurs (0.22 individuals/km and 0.04 groups/km), while between May and July 2016 we spotted ten southern bamboo lemurs (0.37 individuals/km and 0.22 groups/km) and 54 collared brown lemurs (2.00 individuals/km and 0.41 groups/km).

Discussion

Our study shows that the number of traps decreased after the beginning of the local management, and further decreased after the installation of the research station. Furthermore, the encounter rate of cathemeral lemurs (hunting main targets) increased after the installation of the research station. Seventy-eight percent of participants declared they frequented the forest more often prior to local management commencing. These are indications that anthropogenic impacts on the area have been alleviated, to some degree, via forest management by Asity and KOMFITA. These negative impacts continued to decrease after the installation of the research station, mainly as a consequence of the increased involvement of “close-involved” villages.

Impact of forest management

The positive impact of the local management is likely to be referred in particular to the new job opportunities offered to local people and the actions to reduce impact on the forest. Around 20 people from “far-involved” villages were hired by Asity-KOMFITA to patrol the forest and reprimand those carrying out illegal activities. Other people, mainly from the “far-involved” villages, were supported by a training on sustainable agriculture. As part of the local management of the area a “buffer zone” was set in which local people are allowed to extract timber and firewood, and hunt exotic species (e.g. wild boar *Sus scrofa*). The “buffer zone” includes small forest patches close to “far-involved” villages. Conversely, the “core zone”, in which most of the Ampasy valley is located, is regularly patrolled and activities are more strictly regulated. The effectiveness of this patrolling may be limited, however, since the agents do not have direct enforcement authority and they live in close proximity with people they are meant to be reporting on (Reuter et al. 2017). Conflicting interests are thus likely to arise from this situation.

Some illegal activities like pirogue construction appear to be still important in the areas, since the municipality of Iaboakoho is the main pirogue supplier for Fort Dauphin (Birdlife International 2011). Building a pirogue is a long process, usually taking around one month to complete. In addition to the impact of this long process, pirogue builders often engage in other activities too, e.g. opportunistic hunting (Gardner & Davies, 2014). Based on Asity reports many pirogue builders ceased this activity and they are now employed within the community (Faniry Rakotoarimanana, pers. comm.). Also, the *dina* (i.e. local law) includes fines (around 3 USD) for people caught building pirogues without permission and to obtain this permission (only one pirogue is allowed for each villager) a tax must be paid to the local community (Birdlife International, 2011). We must consider, however, that pirogue prices range from 400,000 Ar (120 USD) to 1,200,000 Ar (360 USD), which is well above the typical local monthly salary of approximately 150,000 Ar (45 USD) (Faniry Rakotoarimanana, pers. comm.). One of the actions decided by the area local management committee is to destroy illegal pirogues when located in the forest, which has effectively reduced pirogue production in recent years (Rakotoarimanana, 2016), although this previously created conflict between the NGO and local communities. It is clear the necessity to understand the needs of the community and mediate these with conservation goals. To achieve this goal, it is crucial to consider the link between enforcement and incentives by implementing projects that could encourage individuals to engage less intensively in extractive activities to ultimately modify these destructive behaviours (Reuter et al. 2017). Encouraging individuals to participate in alternative activities with similar profits, such as forest patrolling or sustainable agriculture, is certainly an approach that needs to be strengthened further in the future. The fact that most of the personnel hired at the research station were previous hunter and/or pirogue builders in the area goes in this direction.

Despite the use of indirect questioning techniques (Nuno & St John 2015), we realize that the results obtained via interviews may be biased since participants might have been hesitant to declare their illegal activities (Knapp et al., 2010; Jenkins et al., 2011), especially if ongoing. In particular, "close-not involved" villages may have been more reluctant to declare lemurs hunting/eating. For the same reasoning, they may have been reluctant to declare that people from their villages or from neighbouring villages hunt at the same level as people living in "close-involved" and "far-involved" villages. This might mean that hunting is more widespread there than in the other villages. In fact, by speaking informally with our collaborators, it emerged that "close-not involved" villages have access to other areas of the continuous forest far from the research station where opportunistic and snares hunting persists.

Impact of researchers' presence

The increase in encounter rates of cathemeral lemurs after the installation of the research station is likely to not be caused by factors such as patrolling and improved environmental conditions (e.g. habitat quality) since these factors remained stable between 2015 and 2016 (Campera unpub. data). Rather, it is likely that the effect of researcher presence favoured an increase in lemur encounter rates as a consequence of animals habituation to human observers and indirect deterrence against hunting. The main impact of researcher presence towards decreasing anthropogenic pressure is mainly related to the creation of new job opportunities (Wrangham & Ross, 2008; Schwitzer et al., 2014). Despite the limited amount of full-time employees (Table 5), the Ampasy research station involved several part-time workers within the local community. Employees were hired from different villages, with equal selection between sexes to favour fair advantages throughout the community. Salaries were higher than the average local salary to favour positive community involvement, but not too high to avoid social disequilibria. In fact, favouring individuals with high social standing and creating social disequilibria has been indicated as a possible cause of failure of forest management program (Webber et al. 2007). Another important consequence of the research station was the supply of food consistently bought from the local community (Table 6). We estimate that the research station produced an increase of 1.2-1.8 percent in the amount of food bought from the Iaboakoho community considering the average daily expense of 3,000 Ar (1 USD) per household (Faniry Rakotoarimanana, pers. comm.). Thus, the food market for a fully operational research station near a small community, such as Iaboakoho, has the potential to generate new job opportunities and increase local farmer incomes. However, the management of the research station needs further improvement (e.g. constant and long-term presence of researchers) to increase the benefits over the local community.

Implications and conclusion

Longitudinal involvement by Asity-KOMFITA and the continuation of research projects in the area are pivotal towards ensuring local sustainable development. Continuous monitoring is necessary to control the impact of anthropogenic activities over time and reliably estimate wildlife populations (Fedigan & Jack, 2012; Nakamura, 2012). Promoting ecotourism may also work as good way to increase community income and create alternative job opportunities for local people by conserving the forest (Schwitzer et al., 2014; but see Krüger, 2003 for the negative impacts of ecotourism on wildlife conservation). At the moment, however, promoting ecotourism in the Iaboakoho community is challenging due to the lack of a paved national road from Fort Dauphin (making an already remote site further inaccessible) and inadequate infrastructure. Besides the research station, additional development strategies are carried out by Asity-KOMFITA such as sustainable farming, tree nursery and reforestation, effective enforcement of the *dina*, and environmental education (Rakotoarimanana, 2016; Balestri et al., forthcoming). All these activities have been shown to create long-term benefits for both local ecosystems and communities (Manjaribe et al., 2013). However, the effectiveness of these actions in the TGK area and the timeline for their implementation remains to be seen.

In conclusion, it is evident that a combination of local management and related development strategies, such as the installation of a research station, can assist in significantly reducing forest exploitation by local communities. However, only a prolonged effort to maintain conservation management can avoid failure of conservation programs (Webber et al. 2007). Also, illegal activities still persist in the area, especially in villages not involved in the local management. A full integration between community needs and conservation plans needs to be in place to maintain long-term benefits.

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Author contributions

Conceived and designed the paper: MC, MP, FB, MB, VN, GD. Collected data: MC, MP, FB, MB, TME. Wrote the paper: MC. Revised the paper: MP, FB, MB, TME, VN, GD.

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Biographical sketches

Marco Campera, Megan Phelps, Fiona Besnard and Michela Balestri study various aspects of lemur biology, including behavioural ecology and niche partitioning, commensalism with humans, and the role taboos and myths play in their conservation. Vincent Nijman has a broad interest in primate conservation. Timothy M. Eppley and Giuseppe Donati work on a wide range of nocturnal, cathermeral and diurnal lemur species, focussing on their behavioural ecology and working with Malagasy partners to improve their conservation status.