Saving the Critically Endangered greater bamboo lemur *Prolemur simus*

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Introduction

The greater bamboo lemur *Prolemur simus* (Fig. 1) is the only recognised species within the *Prolemur* genus, is listed as Critically Endangered by the IUCN (2012), and is considered as one of the top 50 most evolutionarily distinct and globally endangered mammals by the ZSL EDGE Programme (Collen *et al.* 2011). The global primatological community has considered the species to be one of the most endangered primates in the world for many years (Mittermeier *et al.* 2009).

The greater bamboo lemur is endemic to Madagascar, and whilst fossil records show it was once widely distributed across the island, it is now restricted to a patchy distribution within the remaining eastern rainforest belt, and a handful of outlying degraded habitat fragments. A paper by Wright *et al.* (2008) highlighted the crisis of the greater bamboo lemur, showing that in 2007 only 60 individuals were known in the wild. To compound the situation, only 22 were known in captivity, in seven institutions, and almost all captive individuals outside Madagascar are descendants of just two wild-born founders.



Figure 1. A Critically Endangered greater bamboo lemur *Prolemur simus* enjoying the early morning light at the isolated lowland site of Vohiposa, March 2012. (Photo: Hery Randriahaingo / The Aspinall Foundation)

Inspired by this critical situation, The Aspinall Foundation implemented a multi-disciplinary project from the end of 2008 to ensure that effective actions were identified and implemented as a matter of urgency to save this critically endangered species from imminent extinction (TAF 2008; King & Chamberlan 2008, 2009; Rakotonirina *et al.* 2011).

Since the signing of an "Accord de Siège" with the Ministry of Foreign Affairs on 5 June 2009, The Aspinall Foundation is officially recognised as an NGO in Madagascar, with the overall mission to work with local partners in Madagascar for the conservation of endangered species and their habitats (King & Chamberlan 2010). The aim of The Aspinall Foundation's "Saving *Prolemur simus*" project is to ensure the long-term persistence of the Critically Endangered greater bamboo lemur *Prolemur simus* (TAF 2008). To achieve this aim, the project has five objectives:

- 1. To play a key role in coordinating an urgent, collaborative response to the current crisis facing the greater bamboo lemur in the wild and in captivity
- 2. To organise as a matter of urgency a rapid but extensive survey of greater bamboo lemur distribution and abundance in the wild
- 3. To ensure that all known sites within the remaining rainforest corridors that support greater bamboo lemurs are effectively managed for their conservation
- 4. To develop management mechanisms for all small, isolated populations in habitat fragments outside the main rainforest corridors, for their persistence and their potential role as sources for release stock for potential future translocation, reinforcement or reintroduction strategies
- 5. To ensure the survival of any greater bamboo lemur groups or individuals restricted to sites or habitats that can not be protected

1. To play a key role in coordinating an urgent, collaborative response to the current crisis facing the greater bamboo lemur in the wild and in captivity

As Wright *et al.* (2008) noted, there is a need for coordination of efforts between all parties implicated in the crisis facing the greater bamboo lemur in the wild and in captivity. The Aspinall Foundation is in an ideal position to play a key role in such a co-ordinated response, as it bridges the divide between captive-breeding institutions and conservation management organisations. We have therefore tried to realise this objective primarily through facilitating improved communication between interested parties, and by promoting awareness of *Prolemur simus* conservation issues.

During 2012, our interactive Madagascar facebook webpage grew rapidly in popularity, and in addition to targeted email lists helps to facilitate communication between everyone interested in the conservation of Prolemur simus, and to raise awareness Prolemur conservation both nationally and internationally. We published one article in English in the international scientific journal Oryx (Olson et al. 2012), and four in French in the IUCN Madagascar Primate Specialist Group journal Lemur News (Bonaventure et al. 2012; Lantovololona et al. 2012; Mihaminekena et al. 2012; Randrianarimanana et al. 2012). We have further publications planned for 2013, including two concerning the micro and macro distribution of the primary food source of the species, large-culmed bamboos (Olson et al. in press; King et al. submitted).

Three members of our team participated in the IUCN lemur red-listing and conservation planning workshop in Antananarivo in July 2012, when *P. simus* was recognised as probably the only lemur species showing a positive conservation trend in recent years, resulting it in being removed from the list of the 25 most endangered primates in the world for the first time in a decade (Mittermeier *et al.* 2012).

We facilitated and participated in several meetings and workshops concerning conservation in and around the Ankeniheny-Zahamena Corridor, ensuring Prolemur sites received priority attention. Our team of national primatologists collected a further 72 Prolemur faecal samples during 2012, to add to the 166 samples collected in 2011, for genetic analysis by a research team from Henry Dorly Zoo. The results of this analysis will give valuable insights into Prolemur taxonomy and population parameters, including levels of connectivity between sites and population viability estimates which conservation-management decision-making concerning Prolemur sites.

2. To organise as a matter of urgency a rapid but extensive survey of greater bamboo lemur distribution and abundance in the wild

Following our successful collaborative surveys in 2009 and 2010, which resulted in a more than doubling of the number of known sites of P. simus in the wild (Ravaloharimanitra et al. 2011; Rakotonirina et al. 2011), we have reduced our efforts to undertake distribution surveys since 2011, concentrating mainly on trying to establish the northern and southern limits of the species range. In the south of the range, we again partnered with WWF-Madagascar to survey the Midongy-Vondrozo Corridor (Fig. 2), but as in 2010 and 2011 (Rakotonirina et al. 2013), our team found feeding signs but failed to obtain direct sightings. We did however find feeding signs within the Midongy du Sud National Park, which represent a small southern extension to the species range. We also found indirect and unconfirmed evidence of the species continued existence in the Ankarana National Park in the far north of Madagascar (Rakotonirina & King 2012; Fig. 2), which if confirmed would represent a huge northern extension to the known current range of the species. Another site worth surveying is the Mananara Nord National Park (Fig. 2), from where there is an old, unconfirmed record of P. simus presence (Dolch et al. 2010).

We continued our efforts to provide abundance data from the majority of the sites we discovered during previous years' distribution surveys. We located an extra Prolemur group at Vohibe at the confluence of the Mangoro and Nosivolo rivers (Figs. 2-3), bringing the total now to five groups at this site, comprising at least 27 individuals (Andrianandrasana et al. submitted). Our focus remains the Ankeniheny-Zahamena main Corridor (CAZ; Figs. 2-7), where we have now found eight groups within the main forest corridor containing approximately 70 individuals (including a new group at Sahanomana), another eight groups of approximately 60 individuals in secondary lowland bamboo thickets surrounding the Andriantantely forest fragment to the east of the corridor, and ten groups comprising at least 200 individuals at three isolated lowland sites to the south-east of the CAZ. Comprising approximately 330 individuals, these 26 groups in and around the CAZ therefore represent at least half the currently known population of *Prolemur simus*.

3. To ensure that all known sites within the remaining rainforest corridors that support greater bamboo lemurs are effectively managed for their conservation

Our distribution surveys at the beginning of the project demonstrated that the Ankeniheny-Zahamena Corridor

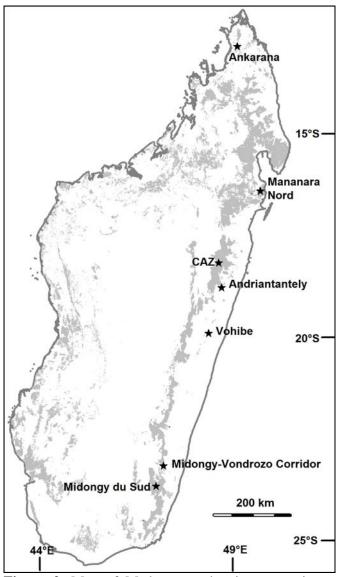


Figure 2. Map of Madagascar showing approximate locations of major sites mentioned in the text (stars), approximate forest cover (light grey), and major rivers (dark grey).

(CAZ), representing the central portion of the eastern rainforest belt (Fig. 2), supports several groups of greater bamboo lemur (Ravaloharimanitra et al. 2011), and could therefore be considered a priority site for the conservation of the species (King & Chamberlan 2010). The corridor is under the overall management responsibility of Conservation International, and is in the process of being zoned into many smaller (but continuous) management units, most of which will be managed by local communities (Ravaloharimanitra et al. 2011). Given the extensive but patchy distribution of the greater bamboo lemur within the CAZ, and the problems of illegal logging, mining and hunting almost (Ravaloharimanitra throughout et Randrianarimanana et al. 2012), we identified that the most effective way for The Aspinall Foundation to assure the survival of the species within the corridor in

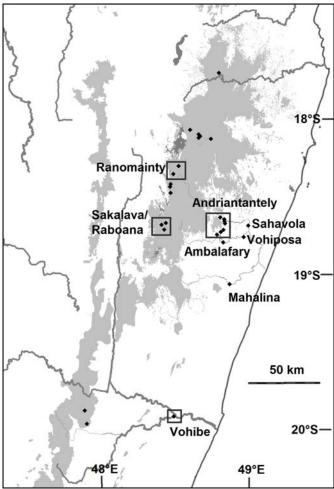


Figure 3. Map showing the sites in and around the Ankeniheny-Zahamena corridor (CAZ) and Nosivolo watershed, where The Aspinall Foundation is supporting local communities to conserve newly-discovered groups of Critically Endangered greater bamboo lemurs. Approximate forest cover is given in light grey, rivers and lakes in dark grey, and signs of greater bamboo presence noted during our collaborative surveys as diamonds.

the immediate term would be to hire local rangers to regularly patrol the specific sites that we had found to support the species, dismantling lemur traps and deterring illegal hunters, loggers and miners (TAF 2009). At the same time, these patrol teams would map the distribution of the greater bamboo lemur groups at each site, and monitor changes in group size, composition and behaviour. We therefore implemented this patrol system within the CAZ corridor from late 2009 and early 2010 (Ravaloharimanitra et al. 2011; Randrianarimanana et al. 2012), and since then have gradually increased our support of local communities responsible for the management of the most important sites for P. simus conservation (King et al. 2013). As we also incorporated nearby isolated sites into the same CAZ project, we will give more details of the results of this project under the next objective below.



Figure 4. A greater bamboo lemur in a stand of giant bamboo *Cathariostachys madagascariensis* at the highaltitude Ranomainty community-managed site in the Ankeniheny-Zahamena rainforest corridor, January 2012. (Photo: Lucien Randrianarimanana)



Figure 5. A greater bamboo lemur in a stand of the endemic bamboo *Valiha diffusa* surrounding the Andriantantely lowland rainforest, October 2011. (Photo: Tony King)

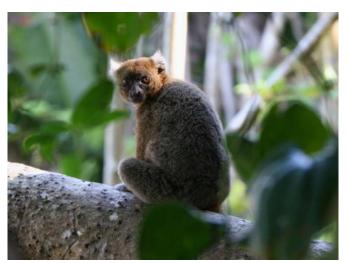


Figure 6. A greater bamboo lemur at the isolated lowland site of Sahavola, December 2011. (Photo: Tony King)



Figure 7. A greater bamboo lemur and baby at the isolated lowland site of Vohiposa, March 2012. (Photo: Hery Randriahaingo / The Aspinall Foundation)

4. To develop management mechanisms for all small, isolated populations in habitat fragments outside the main rainforest corridors, for their persistence and their potential role as sources for release stock for potential future translocation, reinforcement or reintroduction strategies

Whilst several known groups utilise bamboo stands within the remaining rainforest belt as described above, some groups occur in isolated habitat fragments that are in effect islands within a deforested agricultural landscape. Therefore, in addition to the protection of the rainforest corridor, an urgent complementary strategy to ensure the survival of the species is to secure the long-term persistence of these habitat fragments, and intensively manage the small, isolated populations

within them in what could best be described as a semicaptive breeding programme (TAF 2008). The first step is to ensure the sites, which usually occur outside protected areas, are protected and legally secured (TAF 2008). Once sites supporting isolated populations have been legally secured, the possibilities of using these populations as the source for potential captive-breeding, translocation, reinforcement or reintroduction can be investigated, in accordance with IUCN guidelines (IUCN/SSC 2012). As mentioned above, we are currently exploring genetic issues through collaboration with a research team led by E. E. Louis Jr. from Henry Dorly Zoo. We are also supporting numerous national primatologists and students to collect socioecological data concerning the species, which is currently limited.



Figure 8. The local community members who patrol the greater bamboo lemur sites to the east of the Ankeniheny-Zahamena forest corridor, January 2013. (Photo: Christelle Chamberlan)

Our initial distribution surveys discovered several new isolated sites supporting greater bamboo lemurs, especially to the east of the CAZ (Ravaloharimanitra *et al.* 2011; Fig. 3), but also elsewhere (Rakotonirina *et al.* 2011). In a similar strategy to that described above for sites within the forest corridors, we rapidly implemented patrol teams at most of these isolated sites from early 2010 onwards (Fig. 8; Ravaloharimanitra *et al.* 2011; Bonaventure *et al.* 2012; Lantovololona *et al.* 2012; Mihaminekena *et al.* 2012), to protect these groups and to ascertain their numbers, ranges, and threats – at nearby sites our surveys found evidence that greater bamboo lemurs had gone extinct in very recent years (Ravaloharimanitra *et al.* 2011).

At the isolated sites to the east of the CAZ, and at the sites within the main CAZ corridor described under the previous objective, we have therefore been working with various local partner organisations since 2010 to help the community associations responsible for the management of these sites to ensure the longterm conservation of the sites in general, and of the Prolemur groups within them. In addition to funding and supervising nine patrol teams of a total of 25 local community members to monitor the *Prolemur* groups at each site, collect basic information on other endangered lemurs such as black-and-white ruffed lemur, diademed sifaka and indri, and reduce direct anthropogenic pressures threatening the sites, we are working with the community associations (COBAs) to legalise their status and their management transfer agreements.

Inside the CAZ corridor (Fig. 3), we facilitated the creation of the Ala maitso COBA for the Ranomainty site in the Didy Commune, resulting in the signing of their management transfer contract in Nov 2012 (Fig. 9), and facilitated the renewal of the



Figure 9. The inauguaration ceremony for the signing of the management transfer agreement for the Ranomainty greater bamboo lemur site in the Ankeniheny-Zahamena rainforest corridor, November 2012. (Photo: Lucien Randrianarimanana)

management contract for the Mamelontsoa COBA in the Morarano Commune, signed in August 2012 (King et al. 2013). For the sites around the Andriantantely lowland rainforest, we continue to work on the creation of the Soafaniry COBA at Ambinanifanasana, and the evaluation and renewal of the Dimbiazanjafy COBA at Lanonana (Lantovololona et al. 2012). For the isolated sites to the south-east of CAZ (Fig. 3), we facilitated the creation of the Ainga Vao COBA at Mangabe and their management transfer contract for the Ambalafary which signed site, was in April (Ravaloharimanitra & King 2012; Ravaloharimanitra et al. in prep.), and are trying to officialise various COBAs for the Vohiposa site – however the process for Vohiposa is proving particularly challenging due to the complexity of the social context of this site (Bonaventure et al. 2012).

Once the management transfer contracts are completed, our support of each COBA can become more regulated (King et al. 2013), with levels of support linked to conservation performance. We continue to try to improve environmental and conservation awareness at the sites through the organisation of several information and communication missions to local communities (Chamberlan 2012; Ravaloharimanitra et al. submitted). Following the devastating Cyclone Giovanna in February 2012, thanks primarily to funding from Help Simus we were able to provide 440 corrugated iron sheets to help repair 15 schools damaged by the cyclone within villages surrounding our CAZ Prolemur sites (Chamberlan et al. submitted).

Outside the CAZ, with funding from Help Simus we have begun the "Ramaimbangy project" for the conservation of the *Prolemur* population at the

Vohibe site (Figs. 2-3), through hiring a team of 6 community members to patrol the forest on a weekly basis, and of a team of local animators to continue the education and communication programme initiated since 2011 (Andrianandrasana et al. in prep.). We also distributed a medicine against bilharzia, a disease very prevalent in the area. In the Midongy-Vondrozo corridor (Fig. 2) we funded extra patrol days for members of a WWF-supported community association, as an initial attempt at participatory monitoring of the Prolemur apparently occurring in their community forest. This was successful in that the local team undertook the monitoring over a period of several months, but they failed to get a good photo to finally confirm that the lemurs they were monitoring were indeed Prolemur simus.

There are several confirmed and unconfirmed sites currently not receiving any conservation actions specifically focussed on the species. Confirmed sites include several COBA-managed forests in the Didy commune at the north of the CAZ (Ravaloharimanitra et al. 2011; Fig. 2), so we recommend organising a preliminary 3-month population study of *P. simus* in these sites, including collection of faecal samples for population genetic studies, and the isolated lowland site of Mahalina (Rakotonirina et al. 2011; Fig. 2), where we recommend the initiation of a small-scale community-based conservation project.

5. To ensure the survival of any greater bamboo lemur groups or individuals restricted to sites or habitats that can not be protected

This is a kind of last-chance saloon for any groups or even individuals that are stuck in habitats that simply don't have a future. This would need to be undertaken within a strict, legal framework, but such animals could be captured and cared for at suitable sites, either in captivity or in suitable isolated sites within or close to the species range (TAF 2008, 2009). However, we continue to try to protect all known *Prolemur* sites, although prioritisation may be necessary soon.

Conclusions

The first four years of The Aspinall Foundation's "Saving *Prolemur simus*" project have seen remarkable advances in the conservation outlook for the greater bamboo lemur. This has been based on a commitment to collaborative conservation efforts promoting local community participation and empowerment. Community-based conservation requires long-term support, so we encourage contributions from anyone interested in helping ensure the survival of the unique greater bamboo lemur for generations to come.

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