Projet Tsibahaka: conserving the crowned sifaka *Propithecus coronatus*

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Introduction

Created in 2009 with the signing of an "Accord de Siège" with the government of Madagascar, the mission of The Aspinall Foundation (TAF)'s Madagascar Programme is to work with local partners for the conservation of endangered species and their habitats (King and Chamberlan, 2010). The initial focus of the programme has been developing a collaborative and wide-ranging conservation project to ensure the survival of the Critically Endangered (IUCN, 2011) greater bamboo lemur *Prolemur simus* (King and Chamberlan, 2010; Rakotonirina *et al.*, 2011). Following a similar logical framework to that of the *Prolemur* project, we initiated our "Projet Tsibahaka" in late 2009. Aiming to ensure the long-term conservation of the Endangered (IUCN, 2011) crowned sifaka *Propithecus coronatus*, the project has five major objectives (TAF, 2009, 2010), which we discuss here.

Objective 1: to facilitate urgent conservation actions for the crowned sifaka in general

An immediate priority identified in our original proposal (TAF, 2009) was the development of an information-sharing network to aid decision-making processes regarding the conservation of the crowned sifaka. In partnership with Groupe d'Etude et de Recherche sur les Primates de Madagascar (GERP) and the Madagascar government, and with funding from the European Association of Zoos and Aquaria (EAZA), we co-organised a two-day crowned sifaka workshop in Antananarivo in February 2011, which assembled participants from national and international organisations working with the species (MEF/GERP/TAF, 2011).

Objective 2: to survey the probable historic range of the crowned sifaka to find currently unknown populations or potential reintroduction sites

Our initial efforts at developing the information-sharing network resulted in a better understanding of the current known range of the crowned sifaka in the wild (TAF, 2010). In partnership with GERP we then organised several surveys throughout central Madagascar, discovering seven previously unknown sites with crowned sifaka in the Bongolava, Betsiboka and Boeny Regions, and one area where small numbers of sifaka resembling crowned sifaka occur sympatrically with larger numbers of the closely related Decken's sifaka (TAF, 2010; Rakotonirina *et al.*, in press). By adding these records to published distribution records of *P. coronatus*, Decken's sifaka *P. deckenii* and Verreaux's sifaka *P. verreauxi* taken from Wilmé *et al.* (2006), with three additional records of *P. coronatus* from Andranotongo (19.356°S, 46.213°E) (Tattersall, 1986), a site south of the Manambolo River (approx. 19.148°S, 44.866°E) (Thalmann and Rakotoarison, 1994), and Dabolava (Razafindramanana and Rasamimanana, 2010), it appeared that further surveys were necessary between the Mahajilo, Manambolo and Tsiribihina Rivers to ascertain further the species limits in this region (TAF, 2010; Rakotonirina *et al.*, in press). Therefore, we organised a mission to this area in November and December 2011, discovering three new crowned sifaka sites in the Menabe Region (L. Rakotonirina and A. Rakotoarisoa, unpubl. data). We will publish full details later, but to summarise, two of these new sites contained melanistic individuals (Fig. 1) living together with typical crowned sifaka and, therefore, appear to be the only known melanistic crowned sifaka populations apart from a single group recently discovered at Dabolava (southeast of Miandrivazo) (Razafindramanana and Rasamimanana, 2010). One of the new melanistic populations was found in a zone of highly fragmented forests

Fig. 1: A melanistic sifaka photographed in the southwest of the crowned sifaka range in the Bemahatazana Commune, Menabe Region, December 2011.
(Photo: L. Rakotonirina)

10 km southeast of Ankavandra (18.803°S, 45.390°E; altitude 490–780 m), only 60 km south of the population of melanistic Decken's sifaka we surveyed in 2010 (TAF, 2010; Rakotonirina *et al.*, in press), but separated by the Manambolo River. Therefore, there may be (or have been) gene flow here between crowned and Decken's sifaka causing the melanistic tendencies on both sides of the river (although other hypotheses have been proposed) (Petter and Peyrieras, 1972; Rakotonirina *et al.*, in press). The other melanistic population is 90 km further south, in gallery forest 14 km southwest of Bemahatazana (19.611°S, 45.288°E; altitude 85 m), closer to

the range of Verreaux's sifaka but again separated from the range of that species by a large river, the Tsiribihina. According to local people there are more sites supporting sifaka in these areas (L. Rakotonirina, unpubl. data), which we should consider surveying as soon as possible, incorporating the collection of samples for genetic analysis.

Within the central region of the crowned sifaka range, GERP organised missions to some of the new sites we discovered in 2010, to add to the available information on population sizes and habitat descriptions, and to collect faecal samples for genetic analysis (Rakotondrabe *et al.*, in prep.). We organised and funded an additional mission to Ankirihitra (16.782°S, 46.480°E; altitude 30–90 m), a mosaic of fragmented forests in the Boeny Region, located 25 km southwest of the Anaboazo site we have reported previously (TAF, 2010; Rakotonirina *et al.*, in press). The team found relatively large numbers of crowned sifaka remaining in this area (5 forest fragments surveyed over three days from 31 October to 2 November 2011; 11 groups encountered comprising a total of 46 individuals including 6 infants; group size ranging from 1 to 7, mean 4.2 ± 1.72 SD; 7 of the groups encountered in the labohazo forest fragment), but also many threats including heavy hunting pressure, severe habitat destruction, and habitat fragmentation (Fig. 2) (Rakotonirina and Rakotoarisoa, 2011).

Fig. 2. Habitat destruction and hunting pressure in the Ankirihitra Commune, Boeny Region, November 2011. (Photos: L. Rakotonirina)

Objective 3: to support the management of protected areas containing crowned sifaka

The largest known populations of crowned sifaka exist in the fragmented dry deciduous forests between the Betsiboka and Mahavavy Rivers near Mahajanga in northwest Madagascar (Mittermeier *et al.*, 2010). The region currently benefits from significant technical and financial support from numerous organisations and, therefore, is not currently a priority area for further support from TAF (TAF, 2010).

Objective 4: to develop management mechanisms for unprotected sites containing crowned sifaka

When we wrote our original project proposal (TAF, 2009), the only unprotected site we knew of was at Dabolava, but our collaborative surveys have now discovered several others in the Boeny, Betsiboka, Bongolava and Menabe Regions of central Madagascar. We remain technical partners for the Dabolava conservation project (Razafindramanana and Rasamimanana, 2010), coordinated by GERP with funding from various sources including EAZA, the crowned sifaka EEP, and Cotswold Wildlife Park. Unfortunately a fire in September burnt a large portion of the already small habitat here (GERP, 2011), and the long-term conservation of the site and the small group of sifaka remains challenging. The establishment of conservation activities at the sites we discovered in 2010 was included as an objective of an EAZA-funded project coordinated by GERP and named "Conservation of the crowned sifaka (*Propithecus coronatus*) through *in situ* and *ex situ* metapopulation management". Within the framework of this project, research missions were undertaken at three of the seven sites during 2011, including some awareness-raising activities among local communities (GERP, 2011). We recommend that the development of conservation programmes at all or most of these sites should remain a priority for the overall conservation of the species. For the Boeny Region, we have contacted two potential facilitators to propose a budget for transferring the management responsibility of the Anaboazo site to the local community, which would then allow us to support the community to conserve the site and the sifaka. Conservation work is also desperately needed for the Ankirihitra forests west of Anaboazo (see earlier; Fig. 2), and the new sites in the Menabe Region.

Objective 5: to ensure the survival of any crowned sifaka groups or individuals restricted to sites or habitats that cannot be protected

This objective will be realised through the "metapopulation project" described earlier. The first group identified as a potential group for translocation within the context of the metapopulation project is one of those discovered in 2010 in the Bongolava Region, owing to the isolation of the small forest fragment where it lives. We have been advising GERP on how to make translocation or reintroduction proposals based on IUCN guidelines (IUCN, 2002; Beck *et al.*, 2007). A proposal has been submitted by GERP to the MEF to use some of the individuals to reinforce the Dabolava population, while incorporating some others into the European Endangered Species Programme (EEP) captive-breeding population at Lemurs Park in Madagascar. The proposed translocation of the sifaka has been delayed while waiting for results of a genetic analysis, so from late November some local rangers have been hired temporarily to protect the group (GERP, 2011).

Conclusions

Over the first two years of our Tsibahaka project our most significant contribution to the conservation of the crowned sifaka has been the surveying of large areas of central Madagascar to ascertain the true distribution of the species and to locate previously unknown populations. Such information is critical to allow realistic assessments of species abundance and status, and to design appropriate species-level conservation interventions (Rakotonirina *et al.*, 2011). The challenge now is to ensure that this newfound knowledge is incorporated into the development of an effective collaborative programme to ensure the long-term conservation of the crowned sifaka across its full range.

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Body masses of wild lemurs

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Introduction

Wild lemur body masses have often been reported incorrectly in the literature. Prior to the early 1990s, when the last of four major publications on lemurs and primate body masses were compiled (Petter *et al.*, 1977; Tattersall, 1982; Mittermeier *et al.*, 1994; Smith and Jungers, 1997), the body masses of very few wild lemurs had been published. The authors of the latter publications may thus have reported body masses of lemurs held in captivity instead, or referred to earlier publications of captive body masses, without explicitly stating that these had derived from captive individuals. Lemurs are particularly prone to obesity in captivity; thus, body masses derived from captive lemurs may be substantially higher than those of their wild conspecifics (Terranova and Coffman, 1997; Schwitzer and Kaumanns, 2001, 2009). Unfortunately this practice seems to have continued in subsequent publications, with authors usually citing one or more of the above-mentioned four sources when referring to wild lemur body masses. In addition, in the last decade, lemurs have been subject to major taxonomic revision, particularly in the nocturnal families Cheirogaleidae and Lepilemuridae. Between 2000 and 2008, 39 species were newly described and 9 other taxa resurrected (Mittermeier *et al.*, 2008). Many of the recently described species are only known from single locations. Body masses of newly described species were often published as part of the morphometric data used for the species descriptions. But it is sometimes difficult to combine the latter with previously published body masses to obtain larger sample sizes, as it is not always clear which of the currently recognized species older publications refer to. Body mass data have also seemingly been reproduced in some publications without citing the original sources, thus duplicating data from the same animals and potentially biasing any attempt of a meta-analysis.

This has resulted in unintentional inaccuracies, albeit mostly minor, in a lot of the publications involving a meta-analysis of lemur body mass, and it is an ongoing problem (Catlett *et al.*, 2010; Matthews *et al.*, 2011; Kamilar *et al.*, 2012). Furthermore, it has contributed to a situation where colony managers of captive lemur collections are frequently faced with obesity and derived secondary problems in their animals, partly as a direct result of too high target body masses taken from the literature and assumed to be wild lemur body masses. *Ex situ* assurance colonies and breeding programmes are vital tools to protect animal species from extinction, and with shrinking wild habitats and progressing climate change they are becoming ever more important. However, excessive body mass can lead to breeding problems and infertility, and it renders affected individuals unsuitable for reintroduction into their wild habitats (Schwitzer and Kaumanns, 2009). Obesity can thus considerably compromise captive propagation programmes.

Up to now, no publication has attempted to compile the published wild body masses of all extant lemurs in a comparative way. The aim of this short report is to provide a basic overview of male and female lemur body masses for all species for which such measurements have been published. These can potentially be used for research, such as correlating primate body mass with ecological variables, as target body masses for captive colony managers, by vets for diagnostic purposes, as well as for species identification and to assess the age or maturity of individuals.

Methods

A literature search was performed using search engines such as Google Scholar and the search terms "lemur" and "mass" or "weight", and then specific searches were performed for each genus, species and subspecies using current and previous taxonomic classifications. Several thousand hits were manually screened for wild adult body mass data. For each result, the authorship and details of data collection were