1. Details application:

Project: Home range size and group structure of the northern giant mouse lemur *Mirza zaza*

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Project period: Feb/2013-Oct/2013

Total budget: Approximately $15000

Academic advisors: Dr Christoph Schwitzer, Dr Marie José Duchateau

2.Contents:

3. Abstract:

The recently discovered northern giant mouse lemur *Mirza zaza* has not yet been subject to detailed scientific study. The current fragmented knowledge of the species (morphology, range, microhabitat structure and reproductive ecology) has enabled an IUCN Red List re-assessment and led to a change in status from Data Deficient to Endangered (C. Schwitzer, pers. comm.). *Mirza zaza* is a small nocturnal primate of only 300 g that lives in north-western Madagascar, including the Sahamalaza Peninsula. The lowland semi-humid forest that occurs in this part of the island is degrading rapidly due to slash-and-burn agriculture, which is a great threat to the wildlife living there. This study investigates the nocturnal movement patterns and genetic structure of the *M. zaza* population living inside the Sahamalaza – Iles Radama National Park. A minimum of 10 individuals of *M. zaza* will be caught with live traps and equipped with GPS backpacks to follow their movements during the night. Recapture will enable download of the data and analysis of home range size and movement patterns. Tissue samples will be taken from each caught individual, and microsatellite analysis at the German Primate Centre, Göttingen, will reveal relatedness between individuals. We expect that the lemurs are unable to cross large open spaces between forest fragments and thus that their home ranges are limited by forest fragment size. A consequence of this would be limited genetic exchange, meaning that all individuals within one fragment are more related to each other than to individuals of other fragments. We expect to find different patterns for males and females, as males may move from one group to another for reproduction. The results of this study will contribute to the knowledge of this recently discovered and highly endangered primate species and can guide ongoing and future conservation actions in the region.

4. Involved people and institutions:

4.1 People involved

	Name	Role	Qualifications	Contact Number
1.	Rascha Nuijten, BSc	Principal researcher	MSc student ‘Behavioural Ecology’ at Utrecht University	+31 (0) 654904577
2.	Dr. Christoph Schwitzer	Project coordinator and scientific advisor	Head of Research Bristol Zoo Gardens, secretary AEECL	+44(0)117 974 7358
3.	Dr. Marie José Duchateau	Project examiner	Master program coordinator ‘Behavioural Ecology’ at Utrecht University	
4.	Prof. Dr Peter Kappeler	Scientific advisor for analysis of tissue samples (genetics)	Professor Behavioural Ecology and Sociobiology German Primate Centre Götingen	
5.	Guy H. Randriatahina	Contact person AEECL in Madagascar	Program director AEECL	
6.	NN (to be assigned)	Local researcher / student assistent		

4.2 Institutions involved

	Organization	Description of affiliation	Contact Name	Contact Number
1.	The Association Européenne pour l'Etude et la Conservation des Lémuriens (AEECL)	The project will be done for AEECL, takes place at AEECL's research station; results will support conservation work of AEECL.	Guy H. Randriatahina	
2.	Madagascar National Parks (MNP)	The project will report to MNP in order to make results available for conservation in Madagascar in general; MNP is issuing permits.	M.ISAIA Raymond.	
3.	Bristol Conservation and Science Foundation (BCSF)	Organisation of scientific advisor	Dr. Christoph Schwitzer	cschwitzer@bristolzoo.org.uk
4.	Utrecht University, the Netherlands	The research is conducted as part of the MSc program of the principal researcher at Utrecht University.	Dr. M.J.H.M. Duchateau	M.J.H.M.Duchateau@uu.nl
5.	German Primate Center - Göttingen	Analysis of tissue samples for genetic diversity and relatedness will take place in Göttingen	Matthias Markolf / Prof P. Kappeler	mmarkol@gwdg.de

5. Introduction:

Madagascar has been depicted as one of the world's most important biodiversity hotspots due to a very high endemism of both plants and vertebrates, especially with respect to the size and isolation of the island (with 1580 x 580 km the fourth biggest island in the world, behind Greenland, New-Guinea and Borneo that separated about 85 million years ago) (Myers et al. 2000). An example of this endemic diversity is the radiation in primates that has occurred on Madagascar, probably from one African ancestor some 54 million years ago (Yoder et al. 1996, Yoder et al. 2003, Poux et al. 2005), that resulted in the occurrence of true lemurs (Lemuridae), indriids (Indridae), aye-aye's (Daubentoniidae), sportive lemurs (Lepilemuridae) and mouse lemurs (Cheirogaleidae) (Horvath et al. 2008, see Fig. 1). All these collectively called 'lemurs', although this is not a correct taxonomic term, are grouped in the superfamily of Lemuroidea which itself is placed in the suborder of the Strepsirhini. Because the radiation went very fast (in evolutionary terms) there is still much debate about the exact taxonomic relationships between the families within this suborder (Horvath et al. 2008, Mittermeier et al. 2008). The closest relatives of the lemurs outside Madagascar nowadays are galago's and pottos in Africa and the lorises in south-east Asia. No monkeys or apes are present on Madagascar because the island separated before they evolved on the mainland of Africa and Asia. Within the lemurs, Mittermeier et al. (2010) recognize 5 families, 15 genera and 101 taxa, and already two new taxa have been described since (C. Schwitzer, pers. comm.).

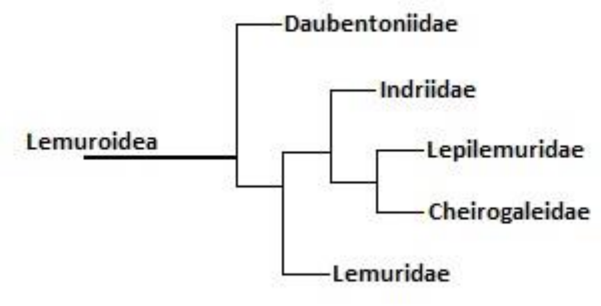

Figure 1. Taxonomy of the superfamily Lemuroidea, a superfamily within the suborder Strepsirrhini. Five families are recognized, but there is still no consensus on their exact relationships (Horvath et al. 2008).

The Cheirogaleidae (mouse lemurs) are the largest lemur family, containing 32 recognized taxa (Mittermeier et al. 2010; C. Schwitzer, pers. comm.). Recently Kappeler et al. (2005) described a new member of the Cheirogaleidae; the northern giant mouse lemur *Mirza zaza* (Fig. 2). This small nocturnal lemur was thought to be another population of *M. coquereli*, a mouse lemur living in the lowland dry forests of western Madagascar (Andrainarivo et al. 2008). Up till 2005 *M. coquereli* was the only species in the genus *Mirza* (giant mouse lemurs), but the northern subpopulation in Sahamalaza appeared to be separated at the species level (Kappeler et al. 2005). This northern giant mouse lemur was called *M. zaza* to emphasize the importance of the next (human) generation in nature conservation as *zaza* means 'children' in Malagasy language. *M. zaza* is significantly smaller in almost all body measures except body length and testes volume, and showed genetic differences with *M. coquereli* (Kappeler et al. 2005). Both species have the same variation in pelage color and only weigh about 300 grams (adult weight). Despite the significant differences in body measures, this similar weight is probably caused by the fact that almost all captured *M. zaza* females were pregnant, which resulted in a higher average weight for this group (Rode 2010). In the field *M. zaza* can be best distinguished from *M. coquereli* by the morphological characteristics ear length, tail length and canine length as these were the most pronounced differences (Kappeler et al. 2005). However, their ranges do not seem to overlap so they will probably not both be encountered at the same site (Kappeler et al. 2005).

Figure 2. Picture of *Mirza zaza* by prof. dr. Kappeler. *M. zaza* is smaller in almost all body measures compared to *M. coquereli* and differs in some behavioural features as well. This, together with genetic differences found in the same study, made it clear that the two should be separated at the species level (Kappeler et al. 2005).

M. zaza is nocturnal and sleeps in arboreal self-constructed nests during the day. Often individuals return to the same nest site every day (Rode 2010, Rode et al. 2011). Contradictory to *M. coquireli,* that always spends the day alone (Kappeler et al. 2005), *M. zaza* spends the day in the nest with at least two individuals (range 2-8 individuals, Rode 2010). The nesting groups consist of females, young and several males with fully developed testes (Rode 2010). Because of this, and the large testes volume relative to body size (even significantly larger than the testes of *M. coquereli,* Kappeler et al. 2005, Rode 2010), *M. zaza* is thought to be highly promiscuous and does not have a strict mating season (Rode et al. 2011).

The main habitat of *M. zaza* is the dry deciduous and semi-humid forest of north-western Madagascar (Rode et al. 2011). Its current range of occurrence is probably confined by the Mahavavy nord river and the Maeverano river (Markolf et al. 2008). For nesting sites, tall trees with many lianas are preferred (Rode 2010). During nightly activity areas with high forest density and tall trees are preferred for foraging over random microhabitat (Rode 2010). It is generally thought that small primates need to be highly insectivorous in order to obtain enough protein and other food sources and be able to digest it (Atsalis 1999). Mouse lemurs are known to feed on all sorts of things, including insect secretions, arthropods, tree gum, fruits, flowers and nectar. If mouse lemurs occur sympatrically, species seem to specialize in the use of vertical forest strata for feeding, more than in overall diet composition (Radespiel et al. 2006). In the dry season, insect secretions and gum are the main resources (Radespiel et al. 2006). *M. zaza* is also known to feed on insect secretions in the dry season (Rode et al. 2011), and the habitat of *M. zaza* seems to be associated with high densities of mango trees (Markolf et al. 2008). Most probably the northern giant mouse lemur has a similar omnivorous diet compared to other mouse lemurs as described above.

In order to have access to enough resources like the mentioned food items for *M. zaza*, animals move about in a certain area. In literature they have since long been called 'home ranges' (Burt 1943) but only recently the concept and methods to reliably estimate home range size have been developed (Laver and Kelly 2008). Home ranges, defined as 'an area frequently traversed by an animal or group of animals' (Kenward et al. 2001), for *M. zaza* have been estimated by Rode (2010) to range from 0.5 to 2.2 ha for individuals and between 1 and 2.4 ha for groups (MCP method). Group home ranges were not overlapping whereas individual home ranges overlapped between 60-98% (Rode 2010). For *M. coquireli* it is known that males increase their home range in the mating season (Kappeler 1997) but for *M. zaza* no difference between male and female home range was observed (Rode 2010). However, because the results of Rode (2010) are based on only 8 radio-collared animals of three different groups (smallest group of n=1), more data is needed to verify these results. Also, estimates of home ranges should be made in forest fragments with different degrees of degradation; possibly more degraded forest fragments will result in larger home ranges for both individuals and groups as resources will be further apart in these fragments (Mclaughin et al. 2000, Merker 2006).

5.1 Threats and research goals

Habitat declines, habitat fragmentation and degradation often lead to species declines or even to species extinction (Turner 1996). Decline and fragmentation of a specific habitat confronts species living there with a reduced area, increased isolation and new ecological barriers (Ewers and Didham 2007) but also more (human) disturbance and immigration of non-native species (Turner 1996). Within one fragment, there might not be enough resources (food, water, nest sites etc) to sustain a (sub)population, due to fragment size but also due to abiotic factors like wind, water and soil chemistry that change because of edge effects (Kupfer et al. 2006). Also, the areas in between forest fragments might act as dispersal barriers for some species so that two subpopulations get isolated from each other (Harper et al. 2007). No dispersal will lead to limited gene exchange within the species, with the result that all individuals living in one fragment will soon be related to each other because no other mates are available (Ewers and Didham 2006). This inbreeding (mating between two related individuals, Frankham et al. 2010), results in low genetic diversity, more homozygous individuals for all traits and the accumulation of deleterious alleles in the population (Frankham et al. 2010). Eventually this can lead to an inbreeding depression (ie fitness of individuals is affected by inheriting alleles that are identical by descent, because there is an increased chance of becoming homozygous for a deleterious allele, resulting in the expression of the deleterious effect; Bosse et al. 2012) which greatly increases the chance of (local) species extinction (Ewers and Didham 2006, Frankham et al. 2010). A review of tropical forest fragmentation shows that in nearly all cases fragmentation has led to (local) species extinction and that less species are present in smaller forest fragments (Turner 1996) due to either of the explained factors above.

The dry deciduous and semi-humid forest in north-western Madagascar is threatened by slash-and-burn agriculture and forest clearance (Rode et al.2011). In the last 25 years of the 20th century this forest type in Madagascar has decreased by 40% (Harper et al. 2007, Moat and Smith 2007 in Rode et al. 2011). An analysis of aerial photographs and Landsat images between 1950 and 2000 also showed a decrease in 'core-forest' (forest >1 km from a non-forest edge) of 80% (Harper et al. 2007) meaning that there are more small fragments now than in 1950. Given this rapid decrease and fragmentation of habitat, it is plausible that factors like subpopulation isolation and inbreeding affect *M. zaza*, including all risks described in the former paragraph. This would mean that there is no or limited dispersal between isolated forest fragments, and that individuals within one group/forest fragment are more related to each other than to individuals from other groups/forest fragments. Males might show a different pattern than females as it is known for the closely related *M. coquireli* that males disperse further from their natal site than females (Kappeler et al. 2002). Eventually the lack of gene exchange between subpopulations can lead to the extinction of *M.* zaza in some forest fragments due to inbreeding depression. The status of the population of *M. zaza* in the wild is not clear at the moment; population estimates range from 16.500 (based on occurrence in forest fragments ≥1 km^2) – 177.500 (based on a 80% occupancy of total forest area) with a rapidly declining trend (Rode 2010, Rode et al. 2011). This is illustrated by the fact that Kappeler et al. (2005) found 1086 individuals/km^2 of *M. zaza* in one forest fragment (a density several times higher than for *M. coquereli* in the Kirindy forest, Kappeler 1997), while three years later that same forest fragment had almost disappeared and only a few individuals were found there by Markolf et al. (2008). After a study by Rode (2010) on the conservation ecology, morphology and reproduction of *Mirza zaza,* the IUCN Red List status was changed from Data Deficient to Vulnerable based on an extent of occurrence of less than 2000km^2 and continuing decline (Rode 2010). At the recent IUCN SSC Lemur Red List Workshop in Madagascar in July 2012, the status of *M. zaza* was changed again to Endangered (C. Schwitzer, pers. comm.). Not much research has been conducted since its discovery by Kappeler et al. (2005) (all prior research in the Sahamalaza region can be found on the website of the Association Européenne pour l'Etude et la Conservation des Lémuriens, AEECL 2012). For *Mirza zaza,* Roos and Kappeler (2006) were the first to describe the conservation status of *Mirza zaza,* and Markolf et al. (2008) described the species' range. In 2010, Johanna Rode studied the (micro)habitat requirements, morphology and reproductive ecology of the species. Apart from the presence of the (AEECL) in the area and the occurrence of the species in the UNESCO Biosphere Reserve and national park on the Sahamalaza Peninsula, no species-specific conservation actions have been taken. General conservation actions in the area are restricted to the Sahamalaza program of AEECL, which involves the replanting of trees in the area, education at local schools and strategies to take the pressure of the forest (initiation of a community based natural resource management program) (AEECL 2012). Further (ecological) research is necessary to collect the information needed to properly assess the effect of habitat decline and fragmentation on this species' demographic and genetic status (regarding extinction risk) and its habitat requirements (in terms of home range size and level of degradation of forest fragments) so that proper conservation measures can be taken.

The research goals are therefore: 1) To investigate the nocturnal movement patterns of *Mirza zaza* in forest fragments of different size and with different degrees of forest degradation (Rode 2010) and determine the home range of individuals and groups of *Mirza zaza* in these areas by use of GPS backpacks that record the location of the individual several times per day; (2) To determine group composition and relatedness within and between groups based on genetic analysis (microsatellite analysis at German Primate Centre - Göttingen); 3) Gain knowledge on the possibility of dispersal by individuals to other forest fragments (ie possible mechanisms of gene exchange between groups) via information from GPS backpacks (see research goal 1).

The information gained in this study is important to guide and support future conservation measures by communicating minimum forest fragment size needed to support a viable (sub)population of *Mirza zaza* and (depending on the results) recommend locations for replanting trees (eg in gaps between forest fragments) or even translocate individual lemurs from one fragment to another to enhance gene transfer. Also the (genetic) relatedness between individuals within and between forest fragments will reveal whether the population currently has high levels of inbreeding, which has consequences for its status of endangerment. Next to the mentioned contributions, the project proposed here will also be important for technical reasons. It will be the first time that GPS backpacks are applied to such small nocturnal mammals that live in a tropical environment. This study will be a technical challenge and can generate the does and don’ts for future research.

6. Methods

6.1 Geographic location

The research will be conducted in the north-west of Madagascar in an area that is called the Sahamalaza peninsula (see Fig. 2), located at a transition zone between the Sambirano evergreen forest region in the north and the western dry deciduous forest region in the south (AEECL 2012). In this area the research station of Association Européenne pour l'Etude et la Conservation des Lémuriens (The Lemur Conservation Association, AEECL) is situated. Figure 3 shows a map of the project location (research station indicated by a red star) within Madagascar, from Madagascar National Parks (MNP) and Wildlife Conservation Society (WCS).

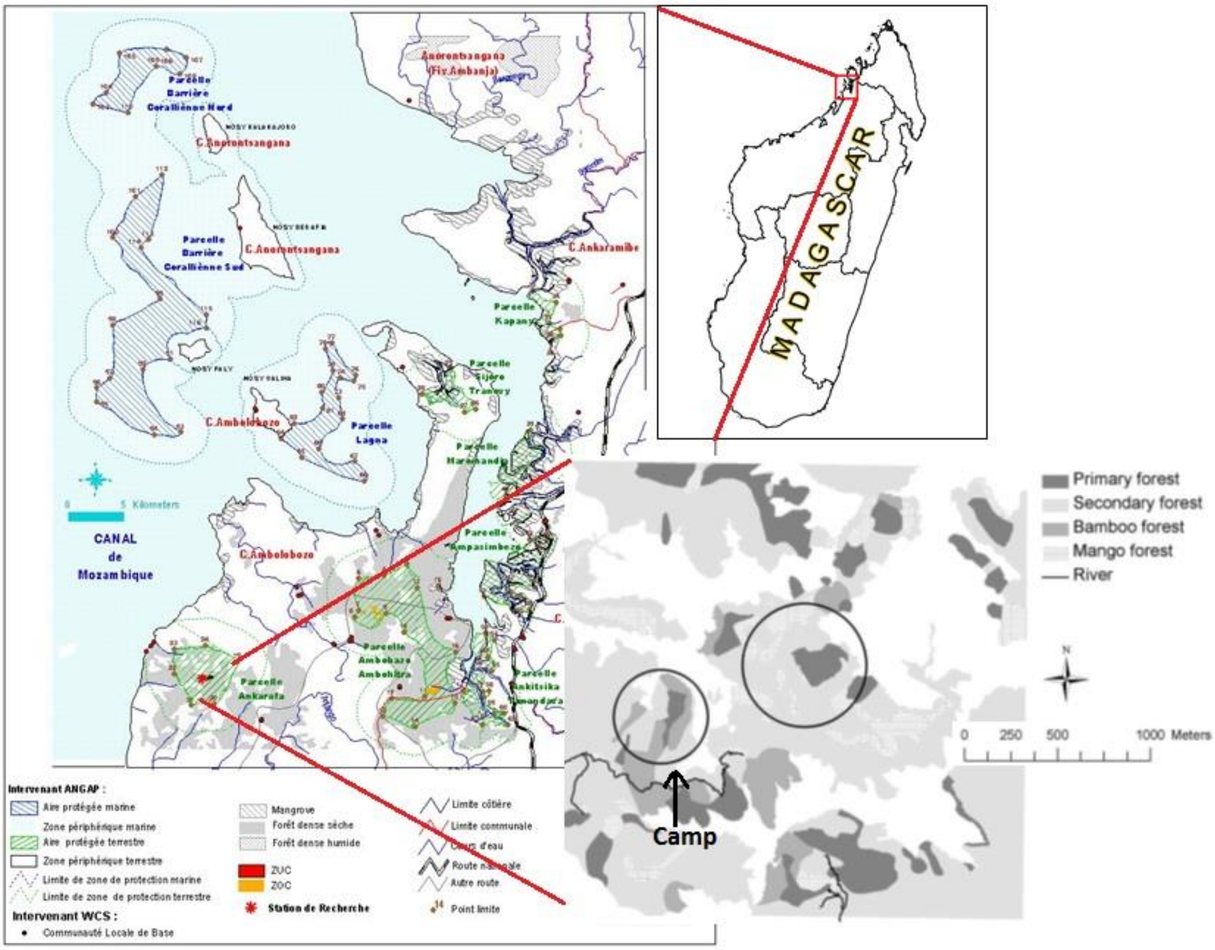

Figure 3. Map of the location of the Sahamalaza peninsula within Madagascar and the research area of AEECL (Ankarafa forest) within the Sahamalaza peninsula. In the neighboorhood of the research station (indicated by 'Camp') are forest patches of different types (both in species composition as in level of degradation).

6.2 Design and implementation

To study the movement patterns of *M. zaza,* six GPS backpacks (<12 gr per backpack, which is less than 5% of the body weight of *M. zaza*, Wikelski et al. 2007) from Telemetry Solutions (Telemetry Solutions 2012) will be used. These devices will be attached to a harness-like structure that can be placed around the waist and neck of the target species. Before the project starts these GPS-backpack will be tested in captivity at Duke University Primate Centre, where several individuals of *M. zaza* are housed, to ensure the backpacks do not constrain them in their movements and are suitable to give a reliable view of the movements of the individual. The GPS backpacks will record the location of the individual six times a day (0am, 3am, 5am, 12am, 19pm and 21pm) with a focus on the night-hours because *M. zaza* is nocturnal. Rode (2010) found that the lemurs emerge from their nests everyday between 5:15 and 6 pm and return between 5 and 6 am, which made us choose the previous recording times. During the day they will sleep in one nest (Kappeler et al. 2005, Rode 2010), which will be recorded by the 12am recording. To attach the GPS backpacks to the lemurs, they will be lured into traps (Tomahawk live traps size 12) using pieces of banana (Rode 2010). The traps will be set at the beginning of the night and to prevent too much energy loss of the caught individuals they will be checked three and six hours after placement as well as on the next morning. The caught individuals will be briefly anaesthetized (0.01ml ketamine per 100g body weight of 0.1 mg/ml; Rode 2010) to be able to take some body measures and equip them with the device before they will be released again in the same site. The body measures include body weight, body length, tail length, head length, head width, canine height, ear length, hind foot, femur, tibia, humerus, radius and testes volume and can later be compared to previous body measures of *M. zaza* (Kappeler et al. 2005, Rode 2010). The batteries in the GPS backpacks will last for a minimum of 27 days, where after the individual needs to be recaptured and the device removed (A. Tran, Telemetry solutions, pers. comm.). Previous studies showed that recapture is often possible because the individuals get used to the new food source (banana in the cage, the lemurs will become 'traphappy', Rode 2010). The locations stored in the GPS backpacks can then be downloaded on a computer and visualized using GIS software such as ArcGIS. The batteries of the GPS backpacks can be recharged and re-used to track the movements of other individuals (in other forest fragments). In total at least two and possibly three battery shifts will be done, which leads to ideally 12-18 followed individuals. After downloading the data, home ranges will be calculated by using two different methods: the minimum convex polygon (MCP) and the kernel method. The MCP creates the smallest polygon that includes all data points, the kernel method creates a home range based on a probability distribution of all data points. The outcomes of both methods can be compared to obtain a reliable measure for the home range sizes.

During the short time that the individuals are anaesthetized in the field, a small tissue sample will be taken from the ear (2 x 2 mm) to carry out genetic analysis at the German Primate Centre in Göttingen (microsatellite analysis). The ear samples will be taken with a special Ear Punch (Kent Scientific Corporation US, Rode 2010). In between the capture and the re-capture of the individuals equipped with the GPS-backpacks other areas will be visited (Fig. 3) to collect body measures and tissue samples from other individuals. To prevent disease transmission, standard procedures will be followed (for example, gloves will be worn at all times during handling and the ear punch will be made sterile in between the individuals).

6.3 Activities and their contribution

• **Activity 1:** General presence of researcher in Sahamalaza → **contribution:** Scientific attention and awareness raising of local, regional and national people and organizations.
• **Activity 2:** Training of local field assistants and research assistant (student) in the used research methods → **contribution:** Education, training and capacity building of national researchers and local people.
• **Activity 3:** Capturing and fitting GPS backpacks of *Mirza zaza* in different forest fragments → **contribution:** Gaining insight in nocturnal movement patterns of *Mirza zaza* (determine home range size) and experimenting with GPS backpacks on such small nocturnal mammals.
• **Activity 4:** Collecting small tissue samples of subpopulations in different locations for genetic analysis → **contribution:** Determining relationships between individuals within and between groups and subpopulations. Gather information on dispersal of individuals between groups and information about whether these small lemurs cross open habitat between the forest patches.
• **Activity 5:** Provide reports to AEECL, MNP and MICET and submit articles to the journal Madagascar Conservation and Development, IUCN Species Survival Commission/Primate Specialist Group's Lemur News and if appropriate further peer-reviewed journals → **contribution:** make information gained from this study available to a large public

7. Evaluation of success:

The project will be regarded a success when at least 10 individuals have been tracked with the GPS backpacks and have their home ranges assessed. Also tissue samples from individuals of at least four different groups should be collected in order for the project to be stated successful. Success will be assessed on a continuous basis during data collection, with weekly phone calls to the project coordinator in the UK, and management adapted accordingly. A personal measure of success for the principal researcher is the submission of the final thesis for this project.

8. Timetable:

The total duration of the project is approximated at nine months. The principal researcher will be in the field (research station in the Ankarafa Forest, northwest Madagascar) for three months to do at least two 'battery shifts' with the GPS backpacks. In the first week we will catch as many *Mirza zaza* as possible and equip them with the GPS backpacks. From all caught individuals a small tissue sample and body measures will be taken. After three to four weeks we will re-capture the individuals in order to download the data saved by the data loggers. In the meantime other sites where *Mirza zaza* is known to occur will be visited to collect tissue samples. After re-capture of the first individuals equipped with the GPS backpacks, a decision will be made on which subpopulation the backpacks will go next. Depending on whether or not we will be able to capture enough *Mirza zaza* in time, we might do two or three different rounds with the backpacks.

Activity	Month								
	1	2	3	4	5	6	7	8	9
Preparation of field work	■								
(Re-)capture of *M. zaza*		■	■	■					
Collecting tissue samples		■	■	■					
Data entry + analysis					■	■	■		
Genetic analysis						■			
Writing report						■	■	■	■

9. Licenses needed for research activities:

	Authorization; permits or license name	**Description**	**Status** (Applied for/ not yet applied for)
1.	Madagascar National Parks (MNP): Research permit	All researchers working in any protected area in Madagascar need a research permit. The proposal to obtain this permit must be sent to MNP 2-3 months before initiating the research.	Will be applied for after proposal has been granted
2.	Ministry of the Environment, Forests (MEF): Collecting and export permit	Permit for the collection and export of biological samples (i.e. ear biopsies samples), MNP notifies the MEF about the researcher's intention to collect and /or export samples. MEF issues the permits after the researcher's arrival in Madagascar.	Will be applied for after proposal has been granted
3.	Dutch Embassy of Madagascar: "Visa transformable"	Visa to enter Madagascar, appropriate for researchers working in the country longer than 3 months.	Will be applied for after proposal has been granted

10. Budget specification:

	Activity	Description	Budget estimate	Time for completion	Source of funding
1.	Return flight	Return flight from the Amsterdam (Netherlands) to Antananarivo (Madagascar) with KLM or Air France	~$1.500 (KLM or air France)	-	Ruffords small grants (deadline upcoming)
2.	GPS backpacks	Buying 6* GPS backpacks (<15 grams) from Telemetry Solutions. GPS device batteries last for at least 27 days (with 6 fixes a day), and are rechargeable. *6 is minimum needed for statistical analysis of results	6 x $1.575 = $9.450	Two or three battery shifts (depends on how difficult it appears to be to catch the lemurs)	Mohamed bin Zayed species conservation Fund (deadline upcoming)
3.	**Genetic analysis of tissues**	**Analysis at German Primate Centre in Gottingen under supervision of Prof. P Kappeler. Calculation:** **~30 samples times ~$3,20 for DNA extraction. ~10 markers and primer pairs of ~$65,00. 30*10 reactions of ~$580,00 ($193,00 per 96 reactions). Duplication and extra for mis-reactions ~$1160,00.**	**$2.500**	**~one month data analysis at German Primate Centre, Goettingen.**	**Primate Conservation Inc (this application)**
4.	**Subsistence + equipment in the field**	**Live in and around the research centre at Ankarafa and buy research material (head torch, batteries, tent, rain gear, etc.). Subsistence and materials must also be paid for Malagasy student. Pay for licenses.**	**~ $1.900**	**Approxi-mately three months**	**Primate Conservation Inc (this application)**
	Total budget		**$15.350**		
	Total from PCI (this application)		**$4.400**		

11. Background and CV principal researcher:

11.1 Background Principal researcher

Currently I am in the Master program ‘Environmental Biology’ at the University of Utrecht in the Netherlands, specializing in Conservation Biology. Prior to this project I conducted a research project in South Africa with Global Vision International where we followed several radio-collared predators (lions, leopard, cheetah, spotted and brow hyena) and did regular prey counts (impala, giraffe, kudu, buffalo, etc) and elephant-damage surveys to determine the capacity of Venetia-Limpopo nature reserve. I also conducted a six-month research project at the Netherlands Institute for Ecology (NIOO), studying the migration of Bewick’s swans by means of GPS collars. This revealed some important stop-over sites and drivers behind the migration speed that can guide conservation actions in the near future. Next to this I wrote a thesis about the evaluation of conservation projects in developing countries that combine their efforts with sustainable development initiatives. For this project I worked for three months at the Integrated Conservation and Development Project ‘Projet Grands Singes’ in Cameroon.

The research project proposed here will help me in gaining the experience (both in research organization, research methods and writing skills) and the knowledge I need to become an excellent and dedicated conservation biologist. Madagascar is a biodiversity hotspot where the fauna is currently threatened by habitat loss, poaching and human encroachment. Working in such an environment will strengthen my motivation for the conservation of species and their environment and I am keen on contributing to the conservation of the target species/habitat in this study.

11.2 CV Principal researcher

[CV can be found in attachment]

12. References:

AEECL, 2012-last update, Association Europeenne pour l'Etude et la Conservation des Lemuriens. Available: www.aeecl.org. [09/30, 2012].

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