

IMPACT REPORT

2024-2025



Center for Conservation in Madagascar

Background Summary

The Center for Conservation in Madagascar is one of the original Centers of the Saint Louis Zoo WildCare Institute. The Center's primary goal is to reduce direct pressures on Madagascar's threatened and endangered species. To achieve this goal, the Saint Louis Zoo works through a consortium known as the Madagascar Fauna and Flora Group (MFG). The MFG was founded on the principle that uniting individual institutions under one umbrella significantly increases the contribution any one facility can make on its own. The MFG is an international, non-governmental organization comprised of zoos, aquaria, botanical gardens and universities. The Saint Louis Zoo was a founding member of the MFG and has been committed to wildlife conservation efforts in Madagascar since the late 1980s, with the earliest efforts focused on conservation research and wildlife recovery efforts of lemur species. Saint Louis Zoo is a Diamond level patron member of the MFG, which is the highest level of commitment.

Since 2018, the Center has also collaborated with Dr. Fidy Rasambainarivo through his role as an Affiliate

Scientist of the Zoo. Projects supported through this collaboration have included the genetic evaluation and management of critically endangered lemur species in Betampona Natural Reserve, a chicken vaccination project for Newcastle Disease, carnivore behavioral ecology research, a cat and dog control program and awareness campaign, lemur health research at Parc Ivoloana, biomedical evaluations, and capacity building through the development and training that occurs at Mahaliana Labs, a research and training center in Madagascar with wet labs for in-country diagnostic testing.

The Center's approach is guided through the four objectives of the Madagascar Fauna and Flora Group, the three pillars of the WildCare Institute, and the aims of Mahaliana Labs.

1. Wildlife recovery and management through conservation action to reduce or remove direct threats and maintain or build viable habitat
2. Applied conservation research to inform



Dr. Karen Freeman



Dr. Fidy Rasambainarivo

conservation management needs and/or methods

3. Building in-country research capacity, leadership and/or management through mentoring and technical training
4. Community development and policy with a focus on local communities and both local and national authorities

Lisa Kelley, Ph.D., the Executive Director of the Saint Louis Zoo WildCare Institute, serves as the Director of this Center. She also serves as Secretary on the MFG Executive Board. Key contributors to this report are Karen Freeman, PhD, Executive Director of the Madagascar Fauna and Flora Group, and Dr. Fidy Rasambainarivo, Assistant Professor of East Carolina University, Co-founder & Scientific Director of Mahaliana Labs, and Affiliate Scientist of the Center.

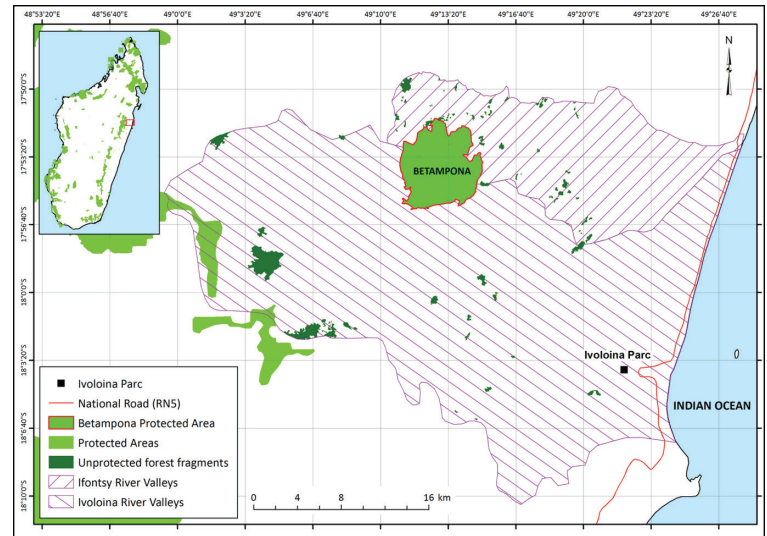
Location and Focal Species

The Center supports efforts at both of MFG's primary sites, Parc Ivoloina and Betampona Natural Reserve. Historically, the focal species have centered around Betampona's three critically endangered primates, the black-and-white ruffed lemur (*Varecia variegata*), the diademed sifaka (*Propithecus diadema*) and the indri (*Indri indri*). In addition, for over 20 years there has been an active herpetology team, led by Angelica Crottini, PhD, an Associate Professor at the University of Florence, Italy, who has been instrumental in the scientific identification and description of 16 endemic and newly identified amphibians within Betampona. In addition, Dr. Rasambainarivo has been actively studying the carnivore community in and around Betampona



since 2017.

Both Betampona and Parc Ivoloina are located in



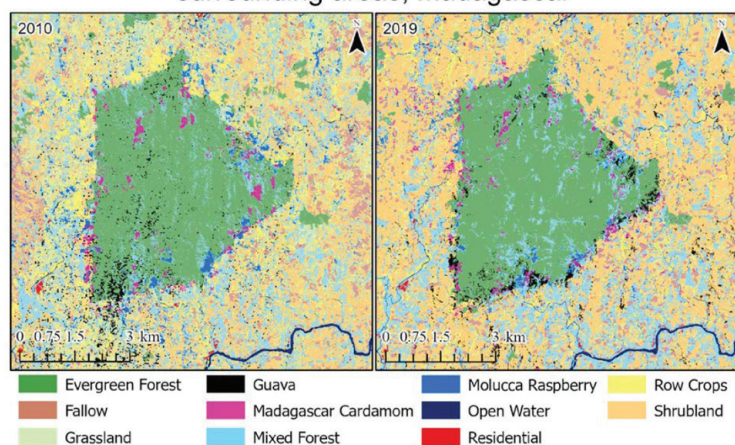
Eastern Madagascar (Fig. 1).

Figure 1: The two primary location sites supported through the Center. Betampona Natural Reserve is a protected lowland rain forest. Parc Ivoloina is one of only two nationally recognized zoos in Madagascar.

Parc Ivoloina is a former forestry station that has been transformed into a 282-hectare conservation education, research and training center. Located just 30 minutes north of Tamatave, Parc Ivoloina also is home to a four-hectare zoo for native wildlife, and serves as a refuge for black-and-white ruffed lemurs that have been confiscated by authorities from private homes. Aside from Parc Ivoloina, Madagascar only has one other zoo.

Designated as a reserve in 1927, Betampona Natural Reserve is Madagascar's oldest protected area. It is a 2,228-hectare rainforest fragment that contains high levels of plant and animal diversity. MFG's continual research presence and community engagement has protected Betampona from large-scale habitat loss and degradation despite the fact that it is surrounded on all sides by village activity. In fact, research completed in 2021 through Saint Louis University's Geospatial Institute confirmed forest coverage at Betampona has increased by 28% in the mixed forest category

Land cover types of Betampona Nature Reserve and surrounding areas, Madagascar



and a remarkable 59% in the evergreen forest category (Figure 2).

Figure 2: GIS Illustration of 10-year forest growth at Betampona Natural Reserve, both in total area and in forest type.

Publications

Apakupakul K, Nieto-Claudin A, Rakotonanahary TF, Catenacci LS, Rasambainarivo F, Randrianarisoa S, Sacristán C, Madueño E, Raphael BL, Deem SL. Molecular Identification of *Mycoplasma agassizii* in Confiscated Tortoises in Madagascar. *J Wildl Dis.* 2025 Jan 1;61(1):258–261. doi: 10.7589/JWD-D-24-00040. PMID: 39434422.

Bonadonna, G., Ramilijaona, O. M., Raharivololona, B. M., Andrianarimisa, A., Razafindraibe, H., Freeman, K., ... & Milich, K. M. (2024). Response of diademed sifaka (*Propithecus diadema*) to fosa (*Cryptoprocta ferox*) predation in the Betampona Strict Nature Reserve, Madagascar. *Ecology and Evolution*, 14(4), e11248.

Rasambainarivo, F. T., Randrianarisoa, S., Rasolofoniaina, O. A., Rice, B. L., & Metcalf, C. J. E. (2024). Assessing the impact of preventative measures to limit the spread of *Toxoplasma gondii* in wild carnivores of Madagascar. *Conservation Biology*, e14300.

Grants

Field Conservation Grant: Protecting lemurs and their habitat in Vohibe forest: Ground, drone and satellite monitoring for detection of illegal activities and

conservation (Wroblewski, Washington University in St. Louis) \$10,000 USD

Field Research Conservation Grant: Understanding and mitigating impacts of the invasive Asian toad on five micro-endemic frog species at Parc Ivoloina (Freeman, Madagascar Fauna and Flora Group) \$9,995 USD

IUCN's SOS Lemurs Grant Reduction of wild meat collection and wild wood harvest by promoting community-centred alternative livelihoods (Freeman, Madagascar Fauna and Flora Group) \$333,665 USD

Center Impact

Living Earth Collaborative Restoration Project.

Written by Dr. Karen Freeman

The Living Earth Collaborative is a formal partnership between the Saint Louis Zoo, Missouri Botanical Garden and Washington University in St. Louis. The project Karen describes below began in 2019.

Building on the strong foundations laid during the Living Earth Collaborative project to restore key forest habitat areas for critically endangered lemurs such as the black and white ruffed lemur (*Varecia variegata*) and the diademed sifaka (*Propithecus diadema*) in the Betampona Strict Nature Reserve, the MFG restoration program has now more than tripled the area treated. In 2024, a further 20 ha were restored to add to the 10.4 ha restored during the three years of the Living Earth Collaborative (LEC) project. This highlights the successful scaling up of the interventions thanks to the more intensive methods developed in the LEC project and new funding provided by the Critical Ecosystem Partnership Fund.

In total the Betampona nursery, situated in our research station at Rendrirendry just outside the Betampona Reserve, produced 30,880 trees in 2024, of which 24,339 have already been planted in Betampona restoration plots. These trees are highly diverse with representatives from 32 families, 78 genera and 86 species. The mortality rate is just 1.99% in the nursery, which is very low compared to other plant nurseries in Madagascar.

Importantly (and unlike many similar projects) as well as treating new areas, we continue to commit to

maintaining plots that were established in earlier years' restoration efforts. A total of 14.5 ha were surveyed to measure tree growth. In addition, new regenerating, invasive plant seedlings were weeded and dead trees were replaced. This ongoing maintenance of restored areas is vital in the initial years, post planting, to prevent invasive plants regaining their stronghold and smothering the young trees. Encouragingly the regeneration rate of invasives was very low and that of native pioneer species was high. In some plots that were established initially around three years ago, the canopy is already starting to close. In November 2024 we carried out an on-site inspection with the new Operations Manager at Betampona for Madagascar National Parks, and they were delighted with the progress. We have made some improvements to the invasive plant weeding protocol that will reduce the duration for which ongoing maintenance is necessary and maximize natural regeneration. We are currently going through the formal written approval process to implement the changes.

It is the high species diversity of planted trees and the ongoing plot maintenance that are the main contributing factors in MFG having been selected by Missouri Botanical Garden (MBG) as one of just two programs in Madagascar, to develop The Global Biodiversity Standard (TGBS) certification process for responsible forest restoration practices in Madagascar.

This standard, developed and championed by Botanical Gardens Conservation International, is being promoted worldwide to distinguish between poorly conceived or executed restoration or reforestation schemes and those that are implementing best practices to conserve the maximum possible genetic diversity⁴. According to MBG, MFG has one of the best restoration programs in Madagascar. MFG will now work on developing a



formal restoration plan for Betampona to proceed to the next step of the TGBS formal certification process.

Likewise, we had good success with the community restoration initiative with 27,542 trees and 10.98 ha planted over the course of 2024. Events such as World Environment Day and World Lemur Day organized by MFG in collaboration with local partners have proved a great focal point for promoting community restoration efforts. A particular success was the local football tournament in November 2024, which was aimed to encourage young people to participate in restoration activities. Each football team was required to commit to plant 500 native trees in order to enter the competition. This initiative alone encouraged 277 young people to participate in planting a total of 11,553 trees (4.62 ha). The football tournament was a big hit with local communities, particularly with the young people taking part, so we aim to make this a regular ongoing annual event.

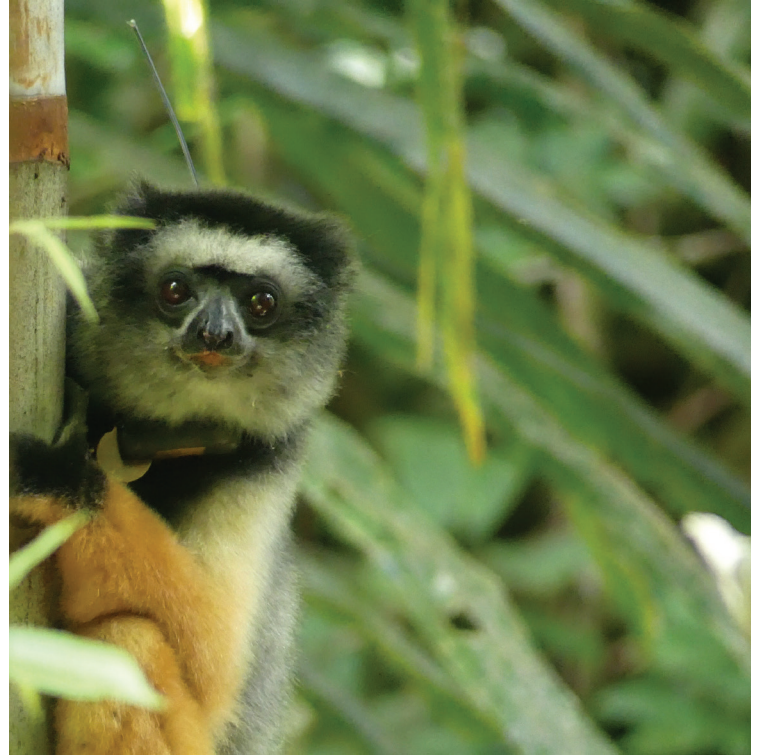


Carnivores Play a Crucial Role in Regulating Prey Populations and Exert a Cascading Influence across Entire Ecosystems: The Endemic Carnivore Project.
Written by Dr. Fidy Rasambainarivo.

Prey species often adjust their spatiotemporal activity patterns to avoid encounters with predators, while predators may likewise modify their behavior to maximize hunting success. For example, predators may time their activity to coincide with periods when prey are active or especially vulnerable, such as during reproduction or disease outbreaks. Conversely, prey may alter their habitat use or activity patterns to evade predation.

Anthropogenic factors—such as habitat loss, fragmentation, and the introduction of invasive species—further complicate these dynamics and can introduce novel threats to already vulnerable species. As human populations expand, carnivores are increasingly forced to navigate fragmented and human-dominated landscapes, which can alter their movement patterns, dispersal capacity, behavior, and exposure to pathogens.

In Madagascar's Betampona Natural Reserve, two endemic and endangered species—the fosa (*Cryptoprocta ferox*) and the diademed sifaka (*Propithecus diadema*)—play key roles in the local mammalian community. The fosa, Madagascar's largest extant carnivore, is listed as vulnerable by the IUCN. Although lemurs are their preferred prey, fosas exhibit notable dietary flexibility, also consuming rodents, reptiles, amphibians, invertebrates, birds, and even domestic chickens.



The diademed sifaka, a critically endangered lemur species native to Madagascar's eastern rainforests, has a severely limited population in Betampona, with fewer than 20 individuals remaining and in urgent need of conservation action.

Recent findings supported by the Saint Louis Zoo WildCare Institute (Bonnadonna, 2024 [see above for full reference]) suggest that predation by fosas—compounded by low reproductive rates, disease exposure, and limited genetic diversity—may pose a significant threat to the survival of the diademed sifaka population in the Betampona Strict Nature Reserve.

Ongoing research is investigating the movement ecology of both fosa and *Propithecus diadema* in Betampona, with the goal of assessing predation risk and understanding how anthropogenic habitat changes influence their spatial behavior and resource selection. High-resolution GPS collars have been deployed on five fosas and four groups of diademed sifakas, enabling simultaneous tracking of predator and prey. These data allow researchers to delineate home ranges and to identify environmental features influencing spatial preferences, particularly for the fosa.



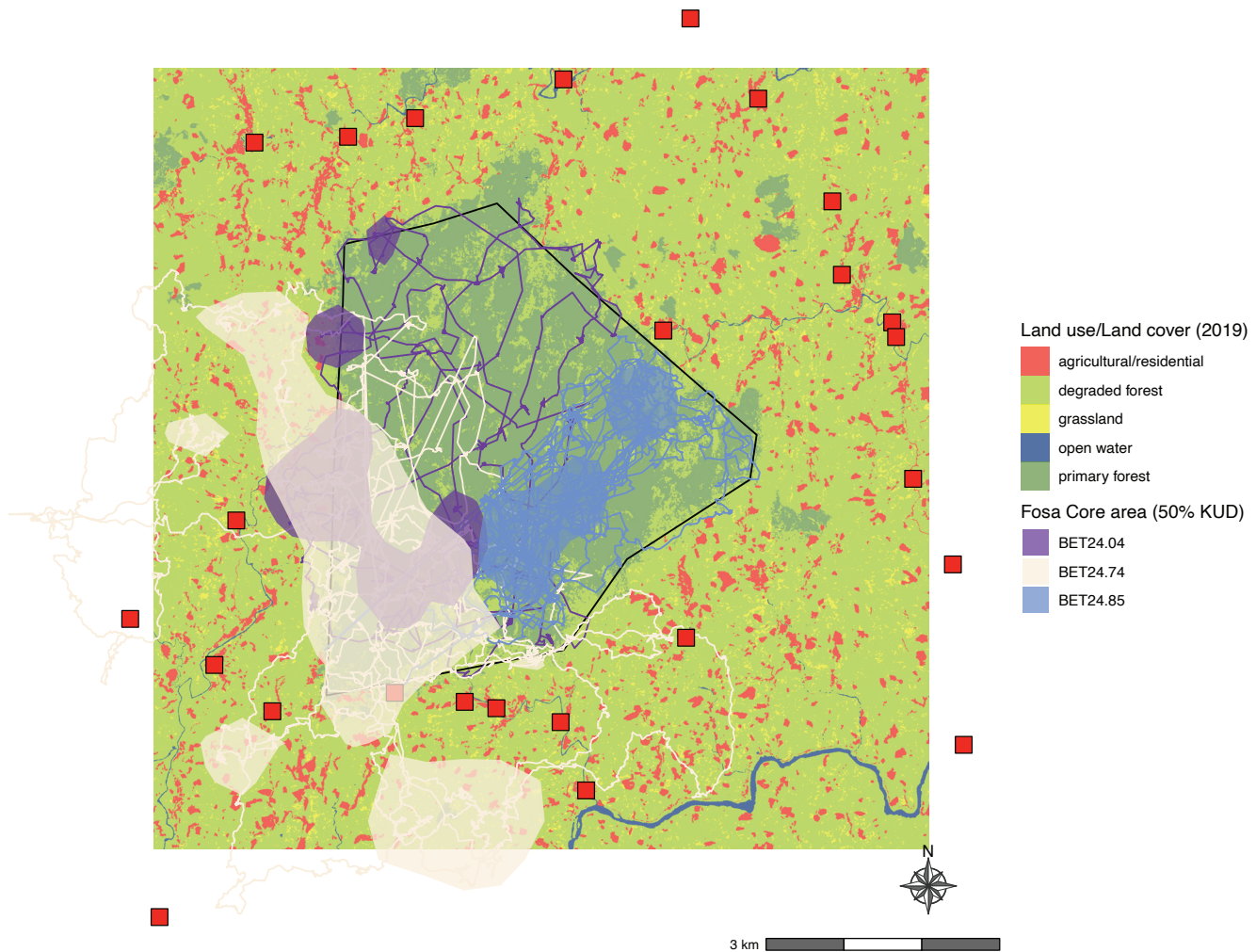


Figure 3: Ranging patterns of male and female fosa.

Preliminary analyses reveal marked differences in space use between male and female fosa. Male fosa in Betampona exhibit a home range exceeding 10 km² spanning both natural and human-altered habitats (figure 3). This range overlapped with those of two to three diademed sifaka groups. In contrast, females maintained smaller home ranges (2–5 km²) and rarely ventured beyond the forest boundary (Blue in figure 3). Fosa home ranges directly overlapped with that of diademed sifaka groups, and future analysis will evaluate the spatiotemporal overlap and assess actual predation risk.

In addition, these findings may inform strategies for mitigating human–wildlife conflict. The spatial data collected could help identify critical habitat features influencing human–fosa interactions and guide the

placement of management interventions—such as buffer zones, physical barriers, or habitat corridors - to minimize conflict and promote coexistence.



Stories from the Field

Fontsimavo and Andratambe: An Exemplary Mobilization for Climate Resilience.

*Written by Jean Christian Rambeloson,
Project Coordinator for the Madagascar Fauna and
Flora Group; Translated by Dr. Karen Freeman*

On June 22, 2024, following the regional celebration of World Environment Day, the villages of Fontsimavo and Andratambe witnessed an unprecedented community mobilization. Through targeted ecological restoration of the Fontsimavo River banks, local communities chose to take action against the recurring effects of floods and cyclones that threaten their homes and livelihoods.

An intergenerational dynamic driven by young people

This wonderful initiative was born out of a well-orchestrated and inclusive communication campaign involving local authorities, the principals of the public primary schools of Fontsimavo and Andratambe, the president of the local cooperative, and the Community Committee (CoBa). This collaborative effort brought together 121 participants from the two fokontanys, 61% of whom were men and 39% women. What is particularly noteworthy is the strong mobilization of young people: 61% of the participants were schoolchildren under the age of 18. Alongside them, 20% were under 45, and 19% were over 45. This is clear proof that young people are actively involved in the future of their environment!



2,500 plants to stabilize the banks

Three plots strategically located along the river have been planted with 2,500 native species, selected for their role in soil stabilization and river flow regulation. These plantations aim to mitigate bank erosion and limit flood damage.

Sustainable engagement of local communities

The villagers actively participated in planting the seedlings. The owners of the affected land committed to ensuring regular monitoring and maintenance of the plots, with technical support from MFG nurserymen and community workers stationed in the area.

A step towards increased climate resilience

This joint action illustrates a growing awareness of the challenges of climate change. It also constitutes a model of participatory governance for sustainable management of natural resources at the local level.



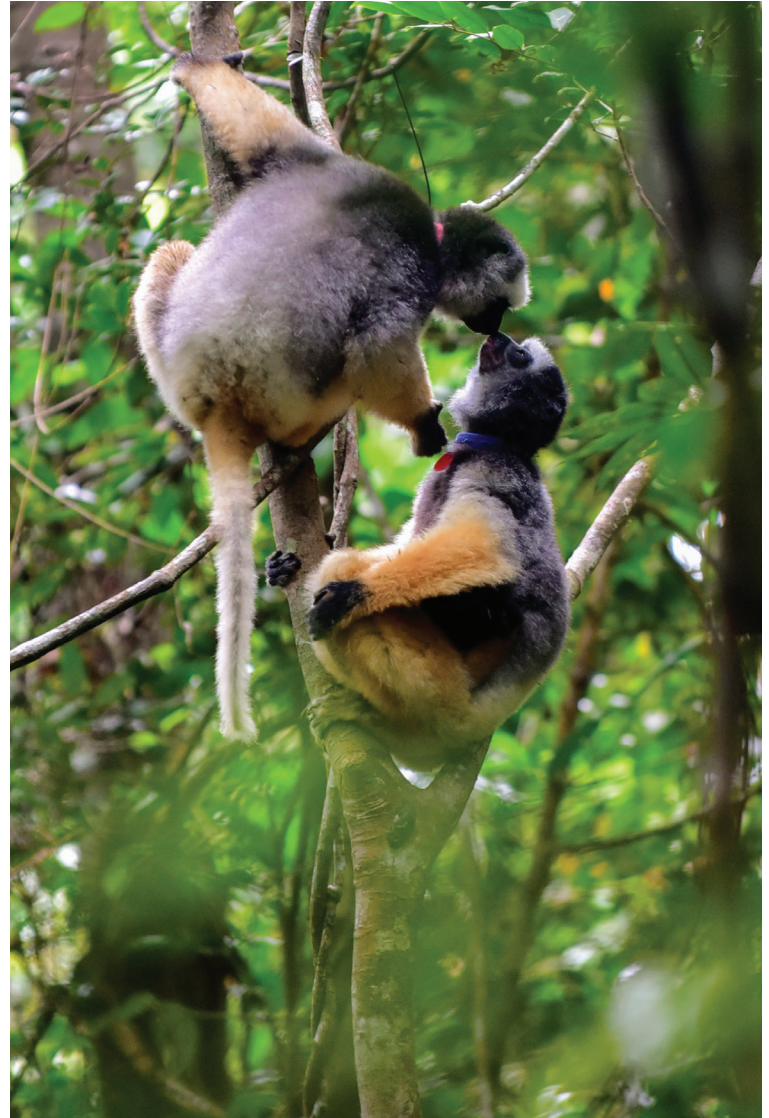
Plans for the Future:

The diademed sifaka population in Betampona is at critically low numbers with a high mortality rate. In addition, as discussed in the 2024 report, genetic studies confirm that this population suffers from inbreeding. Even more troubling, this critically endangered species is at risk throughout the country, resides in few well protected areas, and does not do well in human care, which means there is no assurance population in zoos. Unfortunately, this is true of nearly all sifaka species, a beautiful and iconic group of animals that are unlike anything else in the Animal Kingdom.

In an effort to reverse what seems to be the inevitable fate of the diademed sifaka, the Saint Louis Zoo WildCare Institute Center for Conservation in Madagascar is spearheading a project that will engage specialists in this species' ecology and behavior, as well as global experts in genetics, habitat restoration and conservation planning to create a comprehensive long-term recovery strategy that will stabilize this population and serve as a foundation for future recovery efforts of the other sifaka species. Partners of this project will include: Saint Louis Zoo (Dr. Lisa Kelley), Madagascar Fauna and Flora Group (Dr. Karen Freeman, Jean Jacques Jaozandry, Ingrid Porton), Northern Illinois University (Dr. Mitch Irwin), East Carolina University & Mahaliana Labs (Dr. Fidy Rasambainarivo), Missouri Botanical Garden (Dr. Gunter Fischer, Dr. Chris Birkinshaw), Washington University in St. Louis (Dr. Emily Wroblewski, Dr. Krista Milich, Jen Mandeville, Dr. Crickette Sanz, Dr. Jonathan Losos) Conservation Planning Specialist Group (Dr. Phil Miller), Turin University (Dr. Marco Gamba), the Aspinall Foundation (Maholy Ravaloharimanitra).

Donors

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Mahaliana
IT ALWAYS STARTS WITH A QUESTION

