

# IMPACT REPORT

2019



## 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, universities, and other conservation organizations, which as a collective body works with Madagascar government authorities and in-country staff to achieve conservation action, research, capacity building and education efforts in eastern Madagascar.

The Saint Louis Zoo has assumed chairmanship of the MFG twice; first with Jeffrey Bonner, Ph.D., Dana Brown President and CEO, from 2003–2006, and second under Eric Miller, DVM, former Executive Director of the WildCare Institute, from 2006–2018. In May 2019, Eric retired and Lisa Kelley, Ph.D., became Executive Director of the WildCare Institute and Director of this Center. Lisa currently serves as Secretary on the MFG Board. Bob Merz, Assistant Director of the WildCare Institute, also is the Assistant Director of this Center.

## In-Country Location

The Center supports efforts at both of the MFG's primary conservation research sites, Parc Ivoloina and Betampona Natural Reserve. Both sites are located in Eastern Madagascar (Fig. 1).

- » 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 endemic wildlife.
- » 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. Betampona is a

small center of endemism for both amphibian and reptile species. MFG's continual research presence has protected Betampona from large-scale habitat loss and degradation despite the fact that it is surrounded on all sides by village activity.



Figure 1. Primary locations of MFG presence in Madagascar. Image accessed from [madagascarfaunaflora.org/where-is-the-mfg.html](http://madagascarfaunaflora.org/where-is-the-mfg.html)



A drone photo taken from Betampona shows the proximity of habitation and cultivation to the rainforest and the connectedness of those different elements. Photo courtesy of Dr. Fidy Rasambainarivo.

## Theory of Change

The Center's goal to reduce direct pressures on Madagascar's threatened and endangered species is approached primarily through the four objectives of the MFG. These objectives are: 1) conservation action to reduce or remove direct threats and maintain or build viable habitat, 2) building in-country research capacity, leadership and/or management, 3) conducting research that informs conservation management needs and/or methods, and 4) community development with a focus on

both local communities and local and national authorities. However, a fifth objective specific to the Center is acquisition of outside funding.

## 2019 Major Accolades and Accomplishments

- » The Center, in partnership with MFG and Washington University in St. Louis, under the umbrella of the Living Earth Collaborative (LEC), received a \$500,000 donation from a philanthropist

who has a particular interest in the conservation of Madagascar's unique and enigmatic flora and fauna. His generous donation will fund a multi-year project with objectives to: 1) translocate critically endangered diademed sifaka (*Propithecus diadema*) and black and white ruffed lemur (*Varecia variegata*) to Betampona Natural Reserve, 2) restore 10 hectares of degraded forest within the reserve, and 3) conduct a comparative behavioral, genetics and health study between black and white ruffed lemurs and diademed sifaka in Betampona with black and white ruffed lemurs and diademed sifakas in Vohibe. In contrast to Betampona, which is a relatively small forest fragment, Vohibe is a 382,000-hectare moist, evergreen forest that remains connected to a stretch of forest known as the Ankeniheny-Zahema Corridor. The Principal Investigators and primary researchers of this project include Washington University professors Emily Wroblowski, Ph.D., and Krista Milich, Ph.D.; and the Center's Affiliate Scientist, Fidy Rasambainarivo, Ph.D.

- » Karen Freeman, Ph.D., who is funded through the Zoo as the MFG's Director of Research, secured several sources of funding to address two major invasive species threats to eastern Madagascar ecosystems. The first funding source was a \$150,000 Critical Ecosystem Partnership Fund (CEPF) grant, which is a two-year grant to eradicate the house crow and develop local capacity to identify and take rapid action to remove invasive species. The second source of funding was secured through a memorandum of understanding (MOU) with a mining company who remains anonymous. Through this MOU, the company will fund a two-year biological control project on the highly invasive and toxic Asian toad.
- » Also in 2019, the Zoo, along with the Missouri Botanical Garden, received the 23rd World Ecology Award from the Whitney R. Harris World Ecology Center at the University of Missouri—St. Louis (UMSL) for their decades of conservation work in Madagascar.

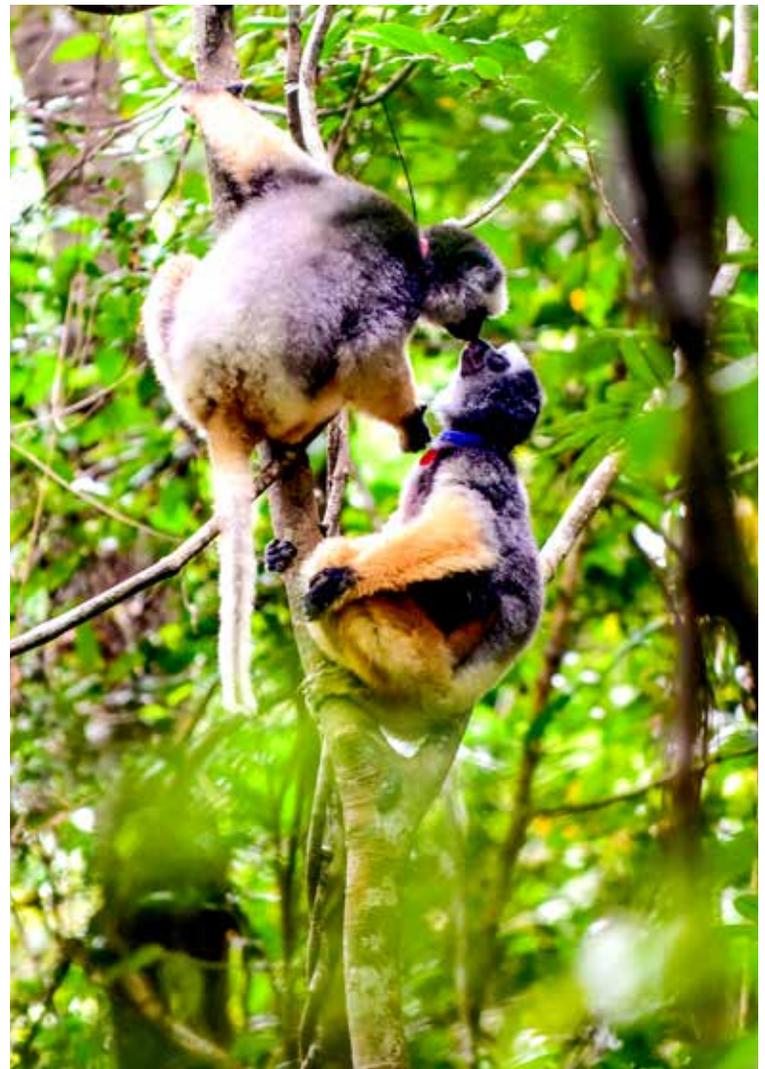
## Center Impact

Through his role as Saint Louis Zoo Affiliate Scientist, Fidy spends three-fourths of his time working on mutually agreed upon high priority projects of the MFG and the Zoo. Here we highlight the key results for two of these projects.

### Project 1: Genetic Management Project of the Diademed Sifaka

*Research that informs conservation management needs/ methods*

*Building in-country research capacity, leadership and/or management*



Diademed sifakas (*Propithecus diadema*), one of the main study species of our Betampona efforts and target of the translocation project. Photo courtesy of Dr. Fidy Rasambainarivo.

Based on historical and GIS data, Betampona has been isolated from other large tracts of forest since at least 1950, and possibly as early as 1927. With the nearest forest tract over 40 km away, researchers estimate that there has been no gene flow within the diademed sifaka, black and white ruffed lemur and indri populations for at least five generations. Translocations are one way to encourage gene flow and prevent inbreeding depression. A generous anonymous donor enabled the Center to initiate this ambitious multi-year genetic management project, which will ultimately result in the larger LEC project described above in the Major Accomplishments section. We agreed on the need to prioritize the diademed sifaka due to its perilously small population.

From December 2018 through December 2019, Fidy led three capture missions to collar and collect health assessment data on the diademed sifaka. The objectives of these missions were to radio-collar individuals for home range data, collect baseline samples on genetic data and to assess health and disease status. Other team members included six Betampona agents, one veterinary student, and Stephen Andrianarivo, who is a master's student enrolled in the Higher Institute of Sciences, the Environment and Sustainable Development (ISSEDD) program at the University of Toamasina. These expeditions provided them a rare opportunity to learn

and practice methods and techniques commonly used to care for the health of endangered wildlife both in the wild and in zoo care.

The teams were able to identify eight different groups of sifakas. Most of the groups consisted of paired individuals, and no group exceeded three individuals. Only one group included a subadult, and only one group had an infant.

Following the capture missions, Dr. Rasambainarivo conducted molecular analysis of the blood samples. He also trained researcher Alicia Raharimandimboisoa to extract DNA from these blood samples and conduct PCR analysis. Their preliminary results did not reveal any blood-borne parasite in these lemurs. Further laboratory analyses are ongoing to evaluate the health of these lemurs and establish a biomedical baseline for this population.

Since February, Stephan Andrianarivo has been studying the home range of groups of radio-collared sifaka. Under the supervision of Juliana Rasoma and the technical advice from Fidy, Stephan established that home range sizes from the groups of Betampona vary between 30 and 80 hectares. This information is essential to selecting potential sites to release a new group into the reserve (Figure 2).

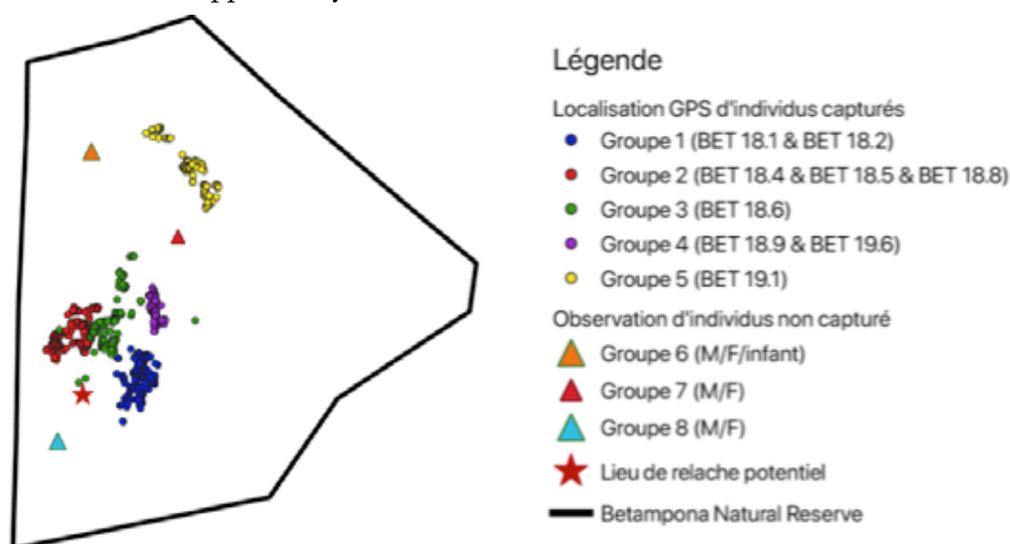


Figure 2. Circles represent home ranges of radio-collared groups. Triangles represent sightings of groups not included in the ranging behavior study. Stars represent the potential site for the future translocation. The black outline is the delineation of Betampona Natural Reserve.

## Project 2: Newcastle Vaccination Poultry Project

*Conservation action to reduce or remove direct threats and maintain or build viable habitat*

*Building in-country research capacity, leadership and/or management*



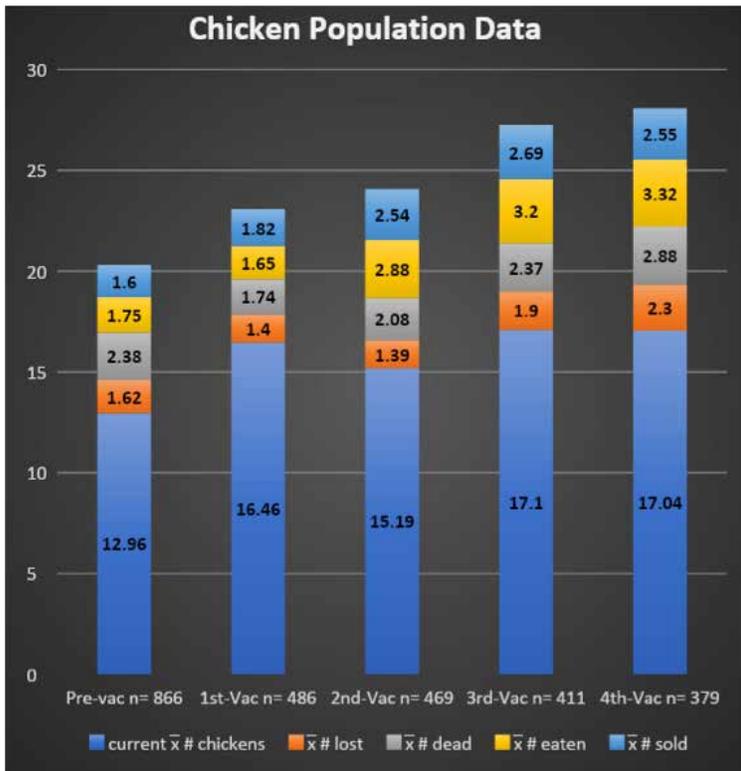
Chicken vaccination during one of the campaigns. Photo courtesy of Dr. Fidy Rasambainarivo.

In many rural areas in Madagascar, people eat forest animals out of necessity as the only means to obtain protein. Ecologist and epidemiologist Dr. Christopher Golden, who studied bushmeat consumption in three rural areas neighboring protected reserves (including Betampona), found that families preferred chicken to bushmeat. However, production was often low due to disease outbreaks. In 2013, wildlife veterinarian Dr. Graham Crawford, and two colleagues who were poultry scientists, concluded that the primary culprit was Newcastle disease (NCD), a highly contagious disease for which vaccines have proven very effective.

However, this vaccine requires refrigeration to remain effective, something that is not possible throughout most of rural Madagascar. In 2016, Graham received a Saint Louis Zoo Field Research for Conservation grant to partially fund a NCD vaccination study on chickens in six villages adjacent to two protected areas in Northeast Madagascar. In 2018, Dr. Karen Freeman co-wrote an IUCN Save Our Species (SOS) Lemur grant to pursue a parallel study in 12 villages adjacent to Betampona. Since 2019, Fidy has been overseeing the data collection and analysis of this project.

Not all households (HH) in the 12 villages participated in the vaccination campaigns when first initiated in May 2018; some joined later, some missed a vaccination campaign or did not complete the detailed order survey. The graph represents HHs that, regardless of when they joined, have consistently participated in each subsequent census and round of vaccinations. We define a consistent household as one that has vaccinated their chickens during three or more consecutive vaccination campaigns. The graph reveals a number of positive outcomes:

- 1) there has been a 22% increase in the number of consistently participating HH,
- 2) the average number of dead or lost chickens decreased by 40-58% following vaccinations,
- 3) there have not been any NCD outbreaks in the 12 targeted villages,
- 4) flock size has increased by 14% in four-vaccination HHs, and
- 5) a reduction in the number of lost/dead chickens has enabled HHs to consistently consume and sell chickens.



Note: The high number of pre-vaccination chickens eaten is likely due, in part, to the habit of eating sick chickens before they die.

Figure 3: Results of Newcastle Disease Vaccination Study after one year of data. The vertical axis is number of households surveyed. Each bar depicts the average size of chicken flock, the average number of chickens lost, the average number of chickens that died but were not eaten, the average number of chickens sold and the average number of chickens eaten per household per survey.

## Media Coverage and Publications Produced in 2019

In 2019, Fidy was twice invited by the U.S. Embassy of Madagascar to speak on behalf of his work and the Zoo. For the first talk, Fidy was invited to discuss his research on the transmission of diseases between domestic and wild animals. This was the topic of Fidy’s dissertation research, which he conducted in Betampona while he was a Ph.D. student at UMSL. The talk was part of the Etalk event series organized by the U.S. Embassy.

Fidy was invited back to present a first-of-its-kind virtual tour of the Saint Louis Zoo. Zoo Public Relations and WildCare Institute staff worked together to create the virtual tour to show on National Zoo Lovers’ Day. In addition to the tour, Fidy gave a presentation on the conservation work in Madagascar supported by the Zoo

### From Alexandre Cottin, Foreign Service Officer at U.S. Department of State, Madagascar

“A massive “THANK YOU” for all your help (at the Saint Louis Zoo), which led to a very successful program. The video was of great quality and was very well-received. Fidy did an outstanding job adding his own expertise and background to complete the presentation.”



Dr. Fidy Rasambainarivo, Affiliate Scientist, presenting his conservation work at the U.S. Embassy in Madagascar.

## 2019 Publications

Below are articles published in 2019 coauthored by Dr. Karen Freeman. In addition, the WildCare Institute also provided some financial support for the Dubois et al. paper.

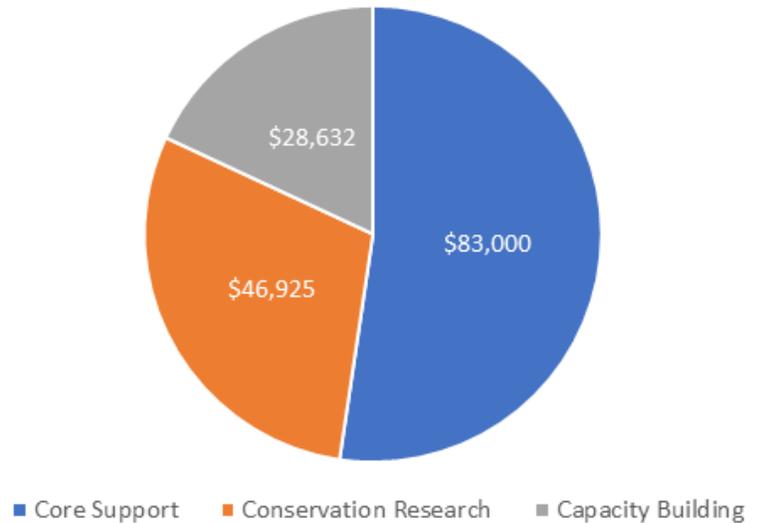
Dubois, N., Morel, L., Crottini, A. et al. High interannual variability of a climate-driven amphibian community in a seasonal rainforest. *Biodiversity and Conservation* 29, 893-912 (2020).

Licata, F., Ficetola, G.F., Freeman, K. et al. Abundance, distribution and spread of the invasive Asian toad *Duttaphrynus melanostictus* in eastern Madagascar. *Biological Invasions* 21, 1615–1626 (2019).

## 2019 Center Budget Allocation

In 2019, the WildCare Institute allocated \$115,000 in operating budget to the Center. This money went to membership dues and salaries for Karen, Fidy, Juliana, and Betampona agents, wildlife conservation research and capacity building. This sum equated to around one-third of the total operating budget of the MFG, excluding the grants that the organization receives independently. In addition, the Center received \$3,632 through a WildCare Institute Field Conservation grant to send Fidy, five Malagasy students and a Co-Principal Investigator to two major international conferences, and \$9,925 through a WildCare Institute Field Research for Conservation Grant to have Maris Brenn-White, DVM, MPVM, Saint Louis Zoo Institute for Conservation Medicine Research Fellow, conduct a health study on confiscated radiated tortoises at a turtle rehabilitation center in southern Madagascar. Last, the Center continued to receive \$30,000 from a generous anonymous donor for the genetic management of the critically endangered lemurs in Betampona. In total, \$158,557 of WildCare Institute money was designated to Center-supported wildlife conservation efforts in Madagascar in 2019 (Figure 4).

Figure 4. 2019 Budget Allocation for the Center for Conservation in Madagascar.



## Stories from the Field

**From Fidy:** 2019 marks Fidy’s first full year in Madagascar after completing his degree at UMSL and the beginning of Mahaliana Labs that he founded with Elizabeth Toomey and the support from a Saint Louis Zoo Field Conservation Grant in 2017. Mahaliana is the first of its kind research and training center whose goal is to advance conservation research in Madagascar, especially by Malagasy scientists. The name Mahaliana means “to spark interest” in Malagasy and aims to provide the space, equipment and mentorship for Malagasy students and scientists to ask their own questions and find answers to the pressing problems facing biodiversity that they encounter on a daily basis, information that is necessary for decision makers to write or change policies for the survival of species and the environment.

To this date, Mahaliana has provided training to more than 50 students on the use of advanced biological techniques and is growing a strong community of

collaborative scientists that are passionate about Malagasy biodiversity and will further the scientific knowledge needed for the preservation of endemic species of Madagascar. There is a saying in Malagasy: “Izay mitambatra vato, izay misaraka fasika,” which literally translates to “those who work together are as strong as a rock, and those who work alone are like the sand.” Although the threats facing biodiversity and the efforts needed to conserve Madagascar’s unique fauna and flora may seem overwhelming at first, we are starting to see a way forward thanks to the longstanding efforts of the Zoo for conserving the biodiversity of Madagascar through research, conservation action and most importantly capacity building.

## Lessons Learned

One of the best investments for this Center has been to pay for Karen and Fidy’s salaries through contracts with the MFG. While this money helps alleviate some of the financial obligations of the MFG, the Center in turn is able to claim credit and monthly progress updates on Karen and Fidy’s on-going and developing projects. Moreover, because Karen and Fidy are well-known among Zoo staff, and because both are energetic and approachable individuals who are always willing to provide current written updates and presentations, they provide an element of accessibility and relatability to the Zoo’s conservation work in Madagascar. This helps alleviate one of the primary issues of this Center, which is that it can sometimes be difficult for people to appreciate the conservation need in an area of the world too remote and too expensive to ever experience firsthand.



One of the trainings organized at Mahaliana to “demystify advanced laboratory techniques.” Photo courtesy of Dr. Fidy Rasambainarivo

## Plans for the Future

The Center's three-year plan includes:

1. *A continued focus on the genetic management study of Betampona's diademed sifaka and black and white ruffed lemur population, with the objective to integrate this study within the larger Living Earth Collaborative project.* While Fidy and his team have been on target with goals to collect genetic, health, demographic and home range data on diademed sifakas in 2019, travel restrictions due to the pandemic will inevitably delay his ability to collect similar data on black and white ruffed lemurs in 2020. Juliana is currently looking for a student to collect that data. Similarly, although our Washington University collaborators have hired a highly qualified post-doc to conduct the comparative lemur studies in Betampona and Vohibe, the post-doc's start date has been delayed until January 19, 2021.
2. *Continuation of the Newcastle disease chicken vaccination program.* Fidy continues to analyze data collected for this study. Once travel restrictions to Madagascar are lifted, Fidy will continue to monitor the data collection after each round of vaccinations to ensure data quality and to address any problems or challenges that could negatively impact the success of this program.
3. *Addressing invasive species issues.* Much of Karen's time will be devoted to overseeing multiple invasive species threats. These include: a) the control on the spread of the Asian toad into areas of high biodiversity throughout eastern Madagascar, b) the eradication of the house crow from Madagascar 3) the removal of invasive plants within 10 hectares of Betampona, which will then be replanted with native trees.
4. *Collaboration with the Saint Louis Zoo Institute for Conservation Medicine (ICM).* The Center will support or collaborate with ICM through projects focused on the health evaluation and infectious disease testing for confiscated radiated tortoises that are to be reintroduced back into their native habitat; the co-mentorship of a Living Earth Collaborative Post-doc with Dr. Sharon Deem and Dr. Carol Lesogoral (Washington University), who will conduct a health and sociocultural study on zebu and zebu herders in southern Madagascar; and through support for any collaborative research and capacity building efforts at Mahaliana.



An indri at Betampona Natural Reserve.