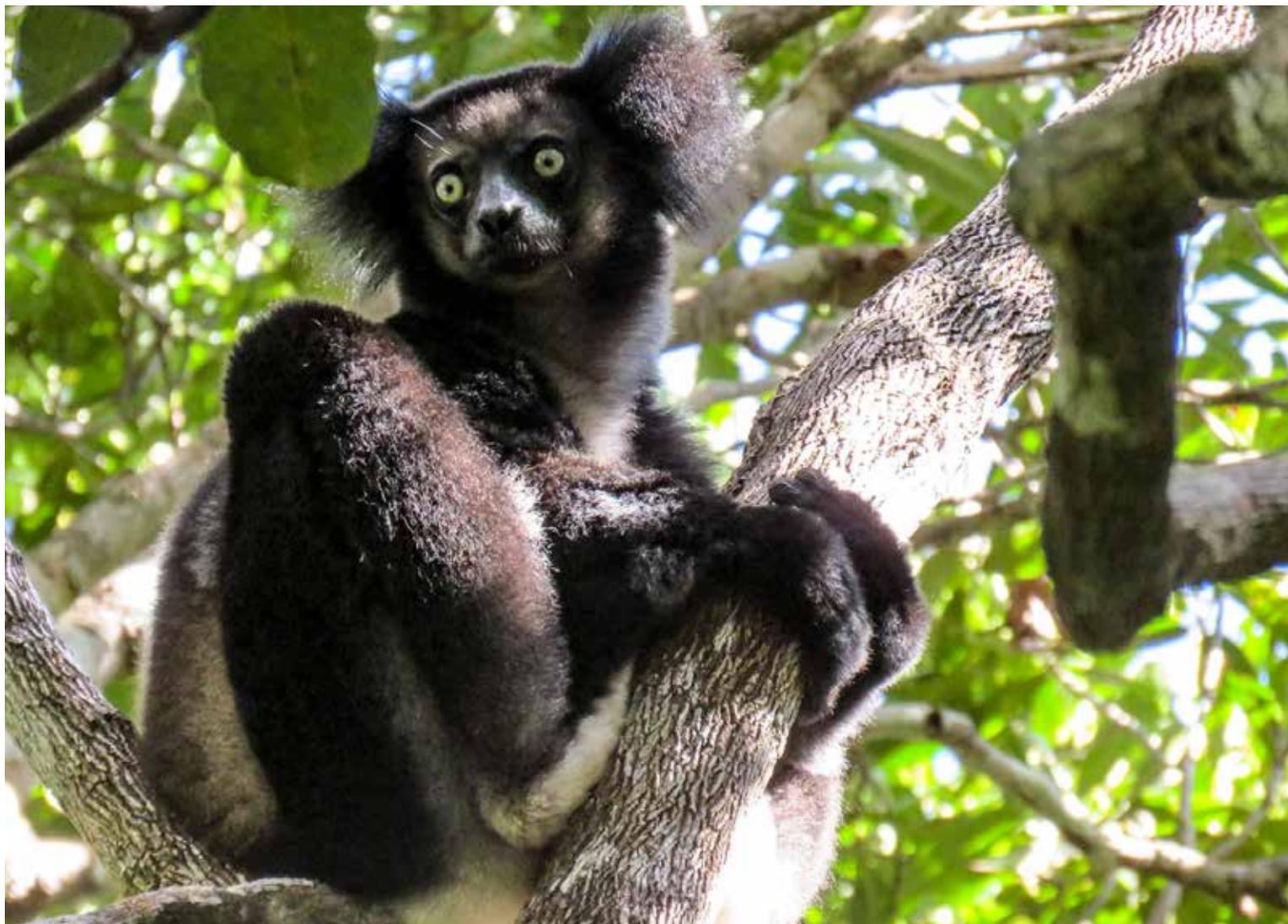


# IMPACT REPORT

2018



## Center for Conservation in Madagascar



Photo 1: Diademed sifaka in Betampona Natural Reserve

## Background Summary

Founded in 2004, the Center for Conservation in Madagascar is one of the original centers of the Saint Louis Zoo WildCare Institute. The basis of the Center is the Madagascar Fauna and Flora Group (MFG), which is an international non-governmental organization that collaborates with and supports in-country staff to achieve its conservation mission. The Zoo has invested expertise and funding in this organization since its inception in 1988. The Saint Louis Zoo has assumed chairmanship of the MFG twice; first with Dr. Jeffrey Bonner, President & CEO of the Saint Louis Zoo, from 2003 to 2006, and second under Dr. Eric Miller, former Executive Director of the WildCare Institute, from 2006 to 2018. In July 2018, Eric retired from his chairmanship and Tim Tetzlaff, Director of Conservation at the Naples Zoo, became the current chair of the MFG. In May 2019, Eric retired as the Executive Director of the WildCare Institute. Dr. Lisa Kelley succeeded Eric, and she is also the Director of this Center. Both Eric and Lisa are active board members of the MFG. Other Center staff include MFG's Director of Research, Dr. Karen Freeman; Dr. Fidy Rasambainarivo, the Center's Affiliate Scientist; and Dr. Juliana Rasoma, MFG Research Assistant.

## In-Country Location

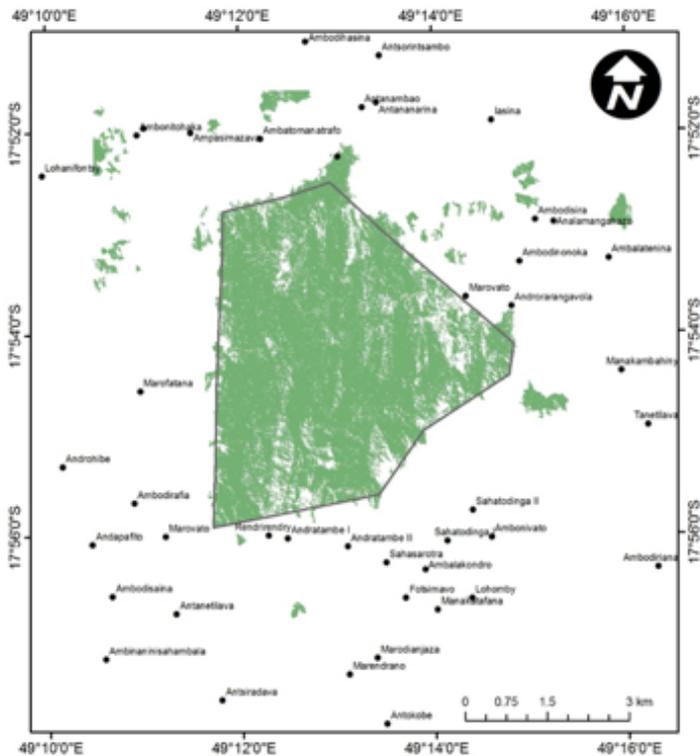
The primary geographic scope of the MFG's conservation fieldwork and research consists of 1) Parc Ivoloina and 2) Betampona Natural Reserve.

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 (Figure 1), Parc Ivoloina is also home to a four-hectare zoo that only exhibits endemic wildlife.
2. Betampona Natural Reserve is a 2,228-hectare rainforest fragment that contains high levels of plant and animal diversity (Figure 2). Recent research has shown Betampona to be a small center of endemism for both amphibian and reptile species. There is little doubt that the MFG's continual research presence has protected Betampona from large-scale habitat loss and poaching.

Figure 1. Primary locations of MFG presence in Madagascar.



Figure 2. Betampona Natural Reserve and the surrounding area.

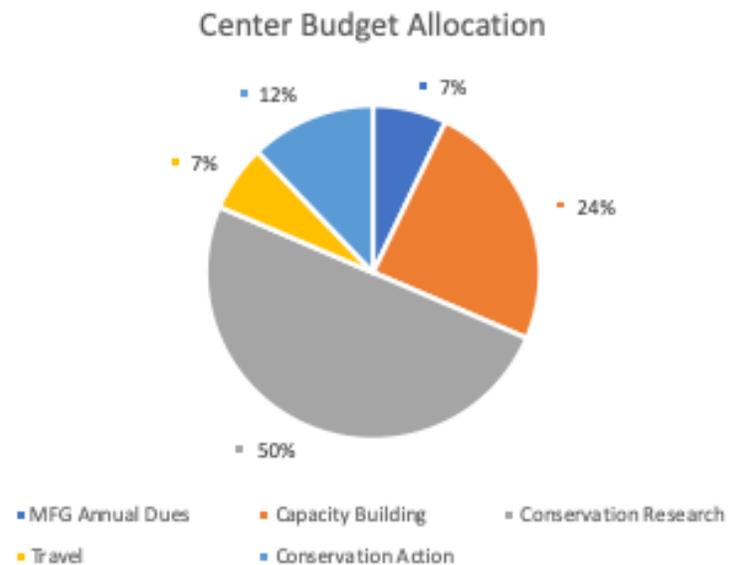


## 2018 Center Budget Allocation

In 2018, the WildCare Institute allocated \$100,000 in operating budget to the Center. In addition, the Center received \$9,987 from a WildCare Field Research for Conservation (FRC) Grant to study the habitat preferences and dispersal speed of the highly invasive Asian toad, as well as \$30,000 from an anonymous donor for a lemur translocation project. In total, \$139,987 of WildCare Institute money was designated to this Center in 2018. Fifty percent of the funding was allocated to conservation research, which includes research supplies, equipment, travel expenses and the salaries of Dr. Freeman, Dr. Rasambainarivo and Research Assistant Dr. Juliana Rasoma. Twenty-four percent of the funding was spent on capacity building, which encompasses training for Malagasy research and veterinary students and farmers in sustainable agroforestry. Conservation action, which comprised 12 percent of the budget, includes a project to help Madagascar National Parks develop policies and an

action plan to control domestic dogs from straying into Betampona and a community-based reforestation program aimed at restoring Betampona's perimeter. The remaining funds were used for annual dues (7 percent) and travel (7 percent).

Figure 3. 2018 Budget Allocation for the Center for Conservation in Madagascar



## Theory of Change

The Center's theory of change is to maximize the effectiveness of the already established MFG which, in 2018, celebrated its 30-year history as a trusted conservation Non-Governmental Organization (NGO) in eastern Madagascar. The MFG employs a staff of over 60 Malagasy and works with the Malagasy government to achieve its conservation objectives. The Center's support has primarily focused on three of the MFG's four conservation strategies aimed at: 1) increasing in-country conservation, research, management and leadership capacity, 2) implementing conservation action to reduce the threats and increase the sustainability of eastern Madagascar's endemic fauna and flora populations and 3) identifying and carrying out research that informs biodiversity conservation and management strategies.



Photo 2: Dr. Rasambainarivo with students and colleagues in the lab he founded, Mahalaina

## 2018 Significant Achievement

- » In 2018, Fidy Rasambainarivo, DVM, who was the recipient of the joint University of Missouri-St. Louis/WildCare Fellowship, successfully defended his Ph.D. dissertation titled “Interactions and Pathogen Transmission between Carnivores in Madagascar.”
- » Following his graduation, Dr. Rasambainarivo was hired by the Center to oversee several important conservation research programs, including a chicken vaccination project aimed at decreasing bushmeat hunting and a lemur translocation project (see below).
- » In addition, Dr. Rasambainarivo founded Mahalaina, a laboratory that aims to provide Malagasy students with access to many of the molecular techniques that the University of Missouri-St. Louis made available to him. He returned to Madagascar with a strong commitment to advance conservation science and the capacity of Malagasy researchers.

## 2018 Center Impact

### Key Impact 1

#### Newcastle Vaccination Poultry Project: The Securement of an IUCN SOS Grant and Progress to Date

In 2013, the Center funded Dr. Christopher Golden (Harvard T.H. Chan School of Public Health) to conduct research on the use of natural resources by villagers living near Betampona. Dr. Golden found that 60 percent of the families ate an average of five wild mammals in the previous year. Of the 2,253 mammals eaten, tenrec species and the endangered mouse lemur were the most consumed but the range included other endangered species such as fosa, aye aye and one indri. He also found that, although villagers preferred chickens over all wildlife species, chicken production was low due to regular disease outbreaks. This led Dr. Golden to team up with wildlife veterinarian Dr. Graham Crawford (San Francisco Zoo) to help identify the cause of these outbreaks. Dr. Crawford, along with two poultry

scientists, concluded the primary culprit was Newcastle disease (NCD), a highly contagious disease but one for which vaccines have proven very effective.

Because a thermotolerant form of the NCD vaccine was not produced in Madagascar, Dr. Crawford partnered with the Malagasy Institute for Veterinary Vaccines to develop it. A 2016 Saint Louis Zoo FRC grant helped support the development and evaluation of a sustainable NCD vaccination program in six villages in Northeast Madagascar, Dr. Golden's primary research site. Based on their positive results, Dr. Freeman applied for and was awarded an IUCN Save Our Species (SOS) Lemur grant to initiate an NCD vaccination program in 12 villages adjacent to Betampona. In 2018, 12 villagers were trained to administer the vaccine and collect births/deaths/sales/consumption data needed to evaluate the program.

In 2018, after more than six years of an iterative process of applying for grants and implementing the research, the research team has been able to begin this important conservation initiative aimed at reducing bushmeat hunting in Betampona. Preliminary analyses indicate that poultry production has increased since implementation of the program.



Photo 3: Leaders in each of the 12 targeted villages selected one person to become their "village vaccinator."



Photo 4: Research projects offer invaluable training opportunities. Dr. Rasambainarivo (left) mentors biology graduate student Stephan Andrianarivo (middle) and veterinary student Alicia Raharimandimbisoa (right) who accompanied him on the December capture mission.

## Key Impact 2: Genetic Management of Critically Endangered Lemur Species: Progress Made after a Donation from an Anonymous Donor

For some species, Betampona's size and isolation is the greatest threat to their survival. The reserve is too small for large-bodied lemur species such as the diademed sifaka (*Propithecus diadema*), black-and-white ruffed lemur (*Varecia variegata*) and indri (*Indri indri*) to occur in self-sustaining populations and the reserve is too isolated for dispersal and gene flow to prevent inbreeding. The possibility of developing a corridor to connect Betampona to a forest in which these species are found (~40 km) is highly unlikely. Consequently, periodic translocations of unrelated individuals will be required to prevent inbreeding depression and local extinction. After obtaining the approval of the MFG and Madagascar National Parks to pursue this approach, the generous donation of an anonymous donor enabled the Center to develop a research plan for the two most critically endangered species *P diadema* and *V variegata*.

In 2018, Dr. Rasambainarivo initiated collection of the baseline data required to undertake and evaluate a translocation program, including: 1) current population size and sex ratio, 2) health assessments of Betampona

and donor populations, 3) genetic samples to assess level of inbreeding and genetic diversity of the populations, home range size and location of social groups, and births.

Dr. Rasambainarivo and his team were able to make good progress toward collecting the above data for the diademed sifakas in Betampona, whose population is estimated to be no greater than 25. In December, the team collected health and genetic samples from seven individuals representing four groups. They placed radio collars on at least one individual per group and colored collars on the others. They also captured and collected samples from three black-and-white ruffed lemurs and adapted a ruffed lemur vocalization survey by adding two people to locate and collect group size and composition data.

Our objectives for 2019 are to 1) capture, collar and collect samples from additional individuals of both species, 2) map the home range of both species existing social groups, 3) identify a source population for *P. diadema* and apply for the required permits to relocate them, 4) capture, collar and collect samples from potential *P. diadema* translocation candidates and 5) analyze the health and genetic samples.

## Stories from the Field: Knowing Who's Who

In December, we learned a lot more about three of the 10 lemurs captured by Dr. Rasambainarivo and the Betampona team. On day one of the mission, a male diademed sifaka was captured and, per the exam protocol, was scanned with a microchip reader when 000714A199 flashed on the screen. This male was first captured in 2012 when his group of four was part of a year-long study comparing the behavioral ecology of sifaka and indri. The male vanished in 2013, his fate unknown until December 2018 when he was found successfully paired with an adult female. Incredibly, on day three the team captured a female black-and-white ruffed lemur and a female diademed sifaka who were first captured as adults in 2007. We therefore know that both are at least 13-14 years old. A study found the median age of 219 wild Verreaux's sifaka females was 10 and the oldest known age was 23-24. Is this true for diademed sifaka? We don't yet know.

Photos are also enabling us to document important life-history data. In November, a Betampona agent took a photo of a collared indri carrying a 5- to 6-month-old infant. Because she too was first captured in 2007, we know that she is a reproductively healthy female of 14+ years. As we amass life history of known individuals, we will contribute to a growing body of research that is revealing the multiple genetic and environmental variables that contribute to the aging process in human and non-human species.



Photo 5: Female indri first identified in 2007 was sighted with an infant in 2018.

## Lessons Learned

**Identifying, implementing and evaluating a targeted conservation initiative takes time.** The Newcastle Vaccination Poultry Project has been an on-going project that has continued for much longer than anyone would have predicted. The initial identification that disease in poultry may lead to increased bushmeat hunting, to identifying the disease, to developing a thermotolerant vaccine that can withstand the elements, to securing funds to initiate a Betampona vaccination program, has taken six years. In addition, it will still take years and an adaptive management approach to address concerns and problems expressed by participants, such as chicken deaths despite having vaccinations.

Another example that conservation takes time is represented by the Bellati et al publication, which illustrates the time it can take to analyze all the genetic samples collected from, in this case, a 2012 FRC-funded field expedition in Betampona.

## Publications Produced in 2018

Bellati A, Scherz MD, Megson S, Roberts SH, Andreone A, Gonçalo M, Rosa GM, Jean Noël, Jasmin E, Randrianirina JE, Fasola M, Glaw F, Crottini A. 2018. Resurrection and re-description of *Plethodontohyla laevis* (Boettger, 1913) and transfer of *Rhombophryne alluaudi* (Mocquard, 1901) to the genus *Plethodontohyla* (Amphibia, Microhylidae, Cophylinae). *Zoosyst. Evol.* 94(1) 109–135.

Rasambainarivo, FT, Andriamihajarivo MN, Dubovi E, Parker PG. 2018. Patterns of exposure of carnivores to selected pathogens in the Betampona Natural Reserve landscape, Madagascar. *Journal of Wildlife Disease.* 54 (2) 386-391.

Rasambainarivo, FT, Goodman SM. 2018. Diseases Risk to Endemic Animals from Introduced Species on Madagascar. In Miller, R. E., Lamberski, N., & Calle, P. (Eds.) *Fowler's Zoo and Wild Animal Medicine Current Therapy, Volume 9.* Elsevier Health Sciences.

Reardon JT, Kraus F, Moore M, Rabenantenaina L, Rabinivo A, Rakotoarisoa NH, Randrianasolo, HH. 2018. Testing tools for eradicating the invasive toad *Duttaphrynus melanostictus* in Madagascar. *Conservation Evidence* 15, 12-19.



Photo 6: Reclassified amphibian found in Betampona and described by Bellati et al (2018).

## Plan for the Future

The Center's three-year plan includes a strong focus on:

1. the genetic management of Betampona's *P. diadema* and *V. variegata* populations. The securing of a donation through The Living Earth Collaborative will enable the expansion of this important work through the participation of two Washington University primatologists with expertise in population genetics and behavioral ecology. We expect to collect sufficient genetic, health, demographic and home range data on both species to develop a detailed genetic augmentation plan and begin *P. diadema* translocations by year two and *V. variegata* by year three.
2. the chicken vaccination program. Dr. Rasambainarivo will collect, review and analyze the data after each round of vaccinations to ensure data quality as well as identify and address any problems or challenges that could negatively impact the success of this program.
3. invasive species issues. Through grants and other funding sources, much of Dr. Freeman's time will be devoted to overseeing programs aimed at:
  - » Controlling the spread of the Asian toad into areas of high biodiversity
  - » Eradicating a small population of the highly invasive Indian crow
  - » Restoring 10 hectares of forest in Betampona by removing guava and planting the cleared area with native trees
  - » Increasing local capacity through building an Invasive Species Learning Network within the Tamatave area to increase awareness of invasive species threats
  - » Developing community responsibility for detection and reporting of invasive species to the relevant authorities so they can take immediate action

Funding is also available to develop surveillance, early detection and interception methods to prevent entry and establishment of new potentially damaging invasive species through Tamatave's port.