



# Annual Report 2016-2017



## In Memoriam



Todivelo “Barrier”

Todivelo was known as ‘Todivelo Barrier’ because he was the primary person who operated the manual arm gate (barrier) located on the Ivoloina Station road which was just down the hill from his house. Todivelo and his family lived in the house for free in exchange for keeping an eye and ear open to prevent unauthorized vehicles from entering after operating hours. The MFG’s first Program Managers, Andrea Katz and Charlie Welch, who lived in the house next to Todivelo for many years, took the above photo of Todivelo, his wife Germaine, their children and nieces the couple helped raise. Charlie recounts “Todivelo was a friend and employee who could always be counted upon no matter what was asked of him”.



Monsieur Gimod Ramahavory

Monsieur Gimod Ramahavory dedicated his entire life to teaching. He was the Assistant Pedagogique for the rural schools around Ivoloina, but his Saturdays were spent crafting the MFG’s education program. He was instrumental in developing and teaching the first Saturday School in 1995/96. He also played a large role in writing the 64-page *Teachers’ Guide to Environmental Education*, completed in January 2004, and training teachers in its use. He was strict in an old school no-nonsense way, but only because he wanted all children to have the chance to improve their lives. And just as he had always said, he was a Saturday School and CAMP teacher until the very end. He will be remembered for and by all the lives he touched.



Justin Roilahy

Justin was a gentle, quiet man with a beautiful smile. In 2004 he was hired as a guide for researchers, including Amanda Armstrong, a PhD student who wrote in her dissertation acknowledgments: *I would also like to express my sincere gratitude to Monsieur Justin who served as both botanical guide and trail guide for all field campaigns and without his keen knowledge on the Malagasy vernacular name for plant and tree species as well as how many varieties exist in Betampona, the species list I compiled during the course of this research would not be nearly as comprehensive or accurate.* In 2008 Justin became the MFG’s full-time botanist, a job he dearly loved. We are lucky that Justin passed his passion and knowledge of plants to his son, Sylvan, who now serves as the MFG’s botanist.



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## Message from the Chair



The conservation needs of Madagascar are daunting to say the least, and I believe that the Madagascar Fauna and Flora Group (MFG) shows the power of partnerships in tackling these challenges to biodiversity. A consortium of zoos, botanical gardens and universities bring expertise that one of us could never bring alone. And different membership levels allow each institution, whether big or small, to share part of the larger whole of conservation in Parc Ivoloina and the Betampona Natural Reserve. This year we welcomed the Tennessee Aquarium as a new member.

Many of you helped the MFG support the village of Sahambala, near Betampona, with construction materials after a catastrophic fire destroyed over 50 homes, reducing pressures of wood exploitation from nearby forests. We also provided school supplies for over 35 children who were thereby able to continue their education. We owe a special thank you to Tim Tetzlaff of the Naples Zoo for

leading the online fund-raising effort. We also want to recognize the heroic work of our MFG managers in coordinating transportation of the supplies when, just over two weeks later Enawo, the third strongest tropical cyclone on record to strike Madagascar, created hazardous road conditions.

Although the challenges of biodiversity conservation can seem never ending and are aggravated by seemingly unsolvable poverty, I counter the feeling of despair by remembering that MFG sustains specific areas of focus where we make a positive difference for the people and wildlife in the regions we serve. Moving into its 30th year, the MFG is one of the longest-standing organizations providing consistent support from zoos and botanical gardens to protect endangered animals, plants and their habitats.

In this spirit of partnership, I would suggest that each member take credit for the entire MFG program, recognizing that along with our partners, we support conservation education, research, habitat protection and capacity building.

Misaotra betsaka (thank you) to each and every MFG member!

Eric Miller  
MFG Chair

## Message from Interim Director



2016 and 2017 have been busier than ever and mark an exciting new phase for MFG. MFG has worked hard to secure several substantial grants from prestigious sources such as the Darwin Initiative, the IUCN's SOS Lemurs campaign and the United Nation's Global Environment Fund to carry out various conservation and community development activities. The award of such grants is a testament to MFG's growing experience and good track record of accountability and effectiveness. The new grant activities have added substantially to the current workload for the MFG managers and teams on the ground but all address priority areas identified by MFG in recent years as being key to the long term conservation of many different species of plants and animals.

As ever, MFG is strengthened by our close partnerships with other organizations in these



endeavors such as Missouri Botanical Gardens and Kew Royal Botanic Gardens, highlighting our collaborative and comprehensive approach to biodiversity conservation.

It has been a very productive but also challenging year for MFG in many respects. Following the departure of our previous Program Director in April 2016, I stepped in as Interim Program Director for a year while continuing to also fulfill my role as MFG’s Research Director. Since I had been Program Manager from 2004 to 2008, it all felt very familiar and it was great to be working more closely with the whole MFG team again. During this transition period, the team in Madagascar responded excellently to their increased responsibilities and demonstrated yet again their amazing loyalty and dedication to MFG. I would like to take this opportunity to thank each and every one of them.

After a rigorous selection process, the Executive Committee appointed a new MFG Program Director, Dr. Virginia Rodriguez Ponga, who joined the MFG team in May 2017. She is a highly experienced veterinarian and program manager who has worked across Africa and is passionate about conservation. I am now very happily back to my role as MFG’s Research Director and helping to implement our exciting new grant projects.

The highly invasive Asian toad (*Duttaphyrnus melanostictus*) has been an ongoing issue over the past year. MFG has worked hard to update

our knowledge of the distribution of the toad and to implement an awareness-raising campaign in Madagascar about the environmental and human health risks posed by the toad. Its numbers continue to increase at an alarming rate, and efforts to control the toad or mitigate impact remain fraught with political, logistical and financial challenges. MFG continues to play a key role in trying to galvanize action and acts as the main point of contact for the IUCN on this issue.

MFG is truly embarking on a new and exciting phase as we continue to target conservation, education and research activities to make maximum conservation impact. MFG’s long history using a collaborative and community-based approach are really starting to pay dividends. In 2017 we launched the first ever Betampona Development Working Group to better coordinate all development initiatives around Betampona Reserve, working shoulder to shoulder with the region’s Mayors, organizations such as Marie Stopes International and our long-term partner, Madagascar National Parks. We thank you all, our members, supporters and partners. Without you, none of this would be possible- you are the backbone of the MFG!

Karen Freeman  
MFG Research Director

## Meet MFG Program Director Virginia Rodriguez Ponga, DVM



For Virginia, the size of the primate has changed, but the size of the conservation challenge has not. Prior to joining the MFG, she spent close to ten years in three African countries, the Congo, DRC and Cameroon. Like Madagascar, these are countries with high biodiversity, high poverty, weak institutions and poor governance. Virginia understands the difficulties and importance of working with communities and political leaders to find realistic solutions to reduce the pressures of a growing human population on limited natural resources. Her experience eased her participation in Betampona management planning meetings with Madagascar National Parks and overseeing the COKETES project (pg 25). We are very happy to have Virginia as part of the MFG team.



## An International Effort to Improve *Ex Situ* Breeding of the Critically Endangered Blue-eyed Black Lemur

On April 8, 2017 a pair of blue-eyed black lemurs (*Eulemur flavifrons*) born at Parc Ivoloina boarded a private airplane to begin their 60-hour journey to the Duke Lemur Center (DLC). The result of a unique international collaboration, three years in the making, this was the first import of lemurs into the U.S. from Madagascar in 22 years. Global collaboration in ex situ breeding programs was crucial to reduce inbreeding and increase the genetic diversity in each of three small regional populations: one in Madagascar (12 individuals); one in Europe (34 individuals); and one in the United States (28 individuals).

Thus in 2014, the DLC initiated discussions with the Government of Madagascar, MFG/ Parc Ivoloina, the AZA Species Survival Program (SSP), and the EAZA Endangered Species Program (EEP). A year later, the partners finalized priority actions, culminating in an official Protocol of Collaboration to implement a series of animal exchanges for the ex situ conservation of the species. The Protocol was signed by the Government of Madagascar's Ministry of the Environment, Ecology, and Forests (MEEF) and the international parties in July 2015.

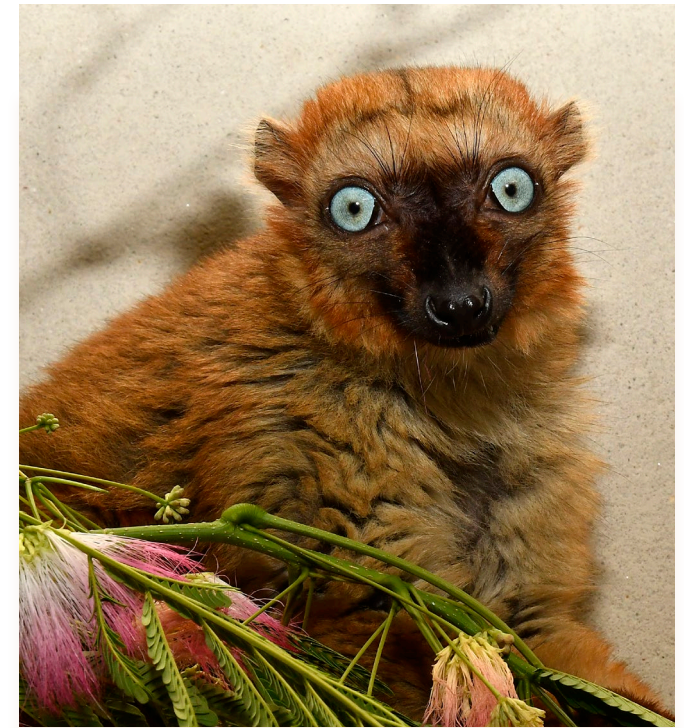
Over the course of the next 2 ½ years, all three key actions outlined in the Protocol were successfully accomplished:

- Parc Ivoloina received one breeding pair of blue-eyed black lemurs in October 2015, sent from two different Malagasy zoos, to enhance the breeding program in Madagascar.
- Mulhouse Zoological and Botanical Park (France) received one breeding pair of blue-eyed black lemurs from the Duke Lemur Center (USA) in November 2016, for the EEP breeding program.
- The Duke Lemur Center (USA) imported one breeding pair of blue-eyed black lemurs from Parc Ivoloina in April 2017, for the SSP breeding program.

Of the three lemur transfers, the import of the pair from Madagascar to the DLC was by far



Parc Ivoloina staff with researcher Peter Larsen and veterinarian Cathy Williams who accompanied the lemurs on the flights from Madagascar to the U.S.



Female Velona (“to live on, to survive”) and male Mangamaso (“blue eyes”) were born at Parc Ivoloina

the most challenging. The dossier of required documentation included 19 separate documents: US and Malagasy CITES permits; additional authorizations from Malagasy wildlife authorities; veterinary certificates; airline, customs and freight forwarders documents; and arrangements with the Centers for Disease Control approved quarantine facility. MFG staff in Tamatave made the lemur transfer their priority for many months, providing invaluable assistance with the Malagasy paperwork and in-country coordination. Now well-settled at the DLC, the pair bred this in December. The





The pair are the first lemurs imported from Madagascar in 22 years.

female has been confirmed pregnant and is due in April.

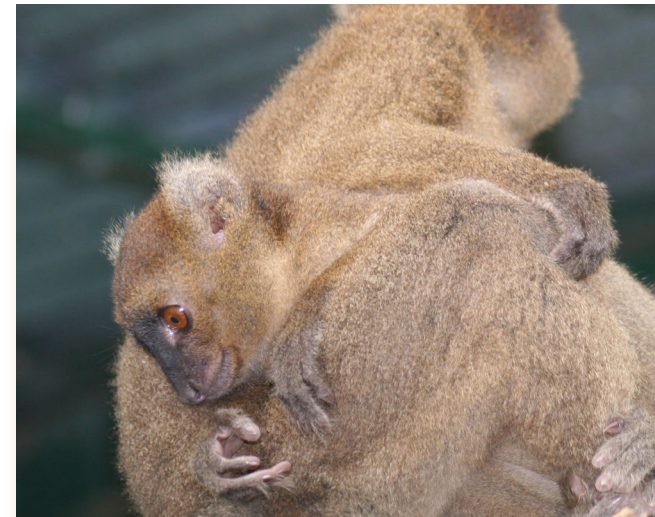
Of the two individuals sent to Parc Ivoloina, the five-year old male was known to be captive-born whereas the female, estimated to be two-years old, was most likely wild born. Following a 30-day quarantine, the two were successfully paired and on 15 September 2016 the female, Shera, gave birth. A first-time mother, she neglected the infant who died that same day. Because we know infant mortality is typically higher in primiparous females, failure is

not predictive of future maternal success and this proved to be the case with Shera. On 16 September 2017 she gave birth to and successfully raised her second offspring, a healthy and lively female named Raphine (in below photo at 3 months old).

Together these international exchanges of blue-eyed black lemurs mark an evolution in global cooperation to support conservation breeding programs.



## *Prolemur simus*



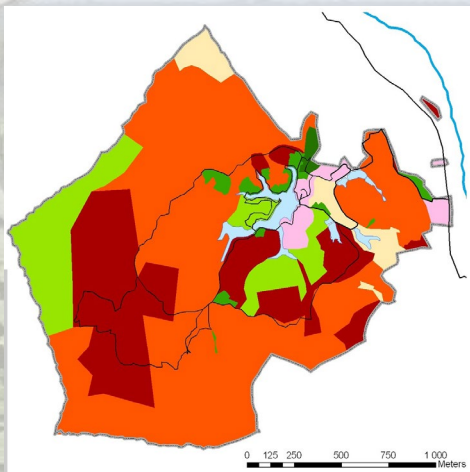
Raphaël, born to wild-born parents, is the most genetically valuable individual in the current ex-situ population

In 2007 the MFG initiated discussions with MEEF on the role of global *ex situ* breeding programs for lemurs and the importance of integrating Parc Ivoloina's greater bamboo lemur into the existing EAZA program. Obtaining the import/export permits took significant time but when the MFG and EEP signed an "Accord de Collaboration" in 2010 the *P. simus* breeding program became global. That year Raphaël was transferred to Europe where he sired a female offspring, Hajao, born in 2013 who, in 2017 gave birth to daughter Soa. In exchange, the EEP sent female Bekily and male Tethys to Parc Ivoloina where they were paired in 2011. Over the ensuing years they have become the program's most successful pair, producing five offspring of which all but the 2016 infant survived.



## Parc Ivoloïna's Forestry Station

Parc Ivoloïna's landscape retains the legacy of its colonial past, established in 1897 by the French as an experimental station to assess the performance of exotic trees and crops in Madagascar's tropical climate. Upon Madagascar's independence, the government continued producing eucalyptus and pine trees to meet local demands. As seen in the below map, exotic species still comprise 80% of Parc Ivoloïna's forest with the more invasive species disproportionately represented.



Red: secondary degraded forest

Orange: exotic trees

Lime: exotic plantation trees

Dark green: reforestation w/endemics

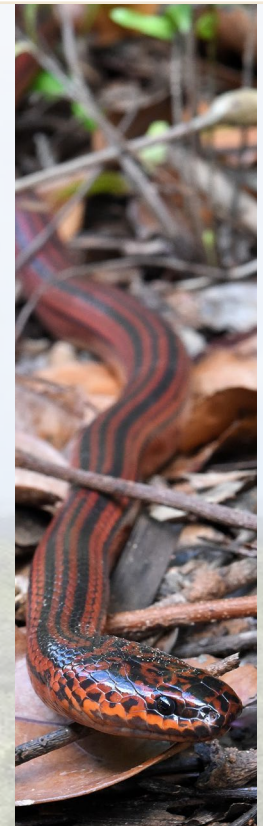
Nevertheless, the former Forestry Station serves many of the MFG's conservation, education, capacity building and research objectives, including *ex situ* plant conservation, invasive species control research, a site for school children to observe diverse native species and where university students can gain hands-on field experience.



Native vertebrates that inhabit Ivoloïna's forested landscape include 51 bird, 23 reptile, 18 frog (5 may be new) and 12 mammal species.



Forestry Station Manager, Jean Francois, is responsible for scheduling and overseeing all maintenance, tree nursery and reforestation activities. Maintenance activities include twice yearly clearing of hiking trails and the 12 km boundary, and the repair or complete replacement of visitors' infrastructure (as in below). During 2016/2017, a total of eight bridges, one staircase, four shelters and ten trash bins were rebuilt, and a new 1,510 meter trail was established. Because a long-term objective is to replace exotic trees with native trees, each year over 100 pines and eucalyptus are felled and used for Parc maintenance needs and for furnishing lemurs





exhibits. The wood is also available for use by staff and families living in surrounding villages. Those interested must submit a formal request and, if approved, plant three replacement seedlings in the Parc.

Seeds for reforestation are collected from trees in the Parc and nearby Analambo forest; in 2016 an additional 18 mother trees were identified, GPS points were recorded and their phenology will be tracked. The below table summarizes seedling production and plantings for 2016/2017.

Indicator	2016	2017
# species	15	15
# seeds collected	13,587	7,491
# seeds sown	13,000	7,491
% germinated	38%	40%
# species planted	35	15
# seedlings planted	2,701	2,039
% survival 6 mo	NA	62%



Preparing and maintaining reforestation plots is time consuming and heavy work, especially in areas thick with invasive plants. It takes approximately ten man-days to clear and weed a one hectare plot. Plots must be weeded three months after seedlings have been planted and yearly thereafter for up to ten years. Wooden stakes in the below photo show



where the young trees have been planted. In 2016 close to five hectares were cleared; in 2017 all 22 reforestation plots, totaling an area of 35 hectares, were cleared.

The MFG often obtains help planting seedlings from local groups that volunteer as part of their community service. In 2017 University of

Tamatave ISSEDD students and professors officially inaugurated their 20 ha plot by planting 2236 seedlings and naming it the Mandela Arboretum.

Fires are a significant problem at both Parc Ivoloina and Betampona. In both cases, MFG staff initiate discussions with local communities to identify how best to prevent fires entering the forest. Jean Francois met with leaders of three villages and together they developed a plan to help prevent and control fires, e.g. charcoal pits must have a



five meter firewall; designated key people must be informed before initiating a tavy burn; a tavy firewall must be 8-10 meters; they also considered using whistles for emergency communication.

In August 2016 a fire burned four hectares in the forestry station. To prevent an explosion of invasive species taking hold, 2039 seedlings were planted between January-April 2017; an October survey found a 62 percent survival rate.



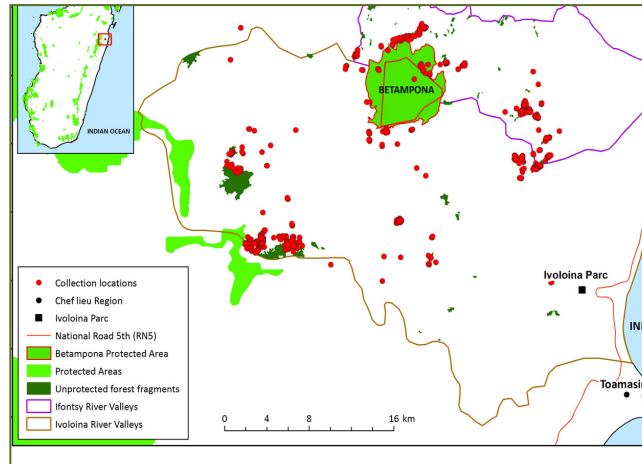
## Darwin Initiative Grant



Once part of a continuous rainforest along Madagascar’s east coast, Betampona Natural Reserve is the largest forest fragment in the human-dominated Ivoloïna-Ifontsy River Valleys. It is likely that the remaining small and degraded forest patches scattered throughout the two valleys will disappear within the next ten years. Because botanists have estimated that 14% of Madagascar’s native plants do not occur in any protected areas, the loss of these forest patches could result in species extinctions. While the likelihood of protecting or connecting the patches is low, collecting seeds for ex-situ conservation is a realistic option that does not preclude efforts to protect the forests.



Surrounded by a burned and degraded landscape, this forest patch is but one example of the many patches that will soon disappear and where the Darwin team collected seeds.



In 2016 the MFG, in partnership with Missouri Botanical Garden (MBG) and Royal Botanical Gardens Kew, was awarded a prestigious three-year Darwin Initiative Grant to fund *ex situ* conservation of plants in those doomed forest fragments. The project’s aim is to collect and preserve seed samples from native plants in these unprotected fragments by sending them to Silo National des Graines Forestières (SNGF) in Madagascar and RBG Kew’s Millennial Seed Bank in England.

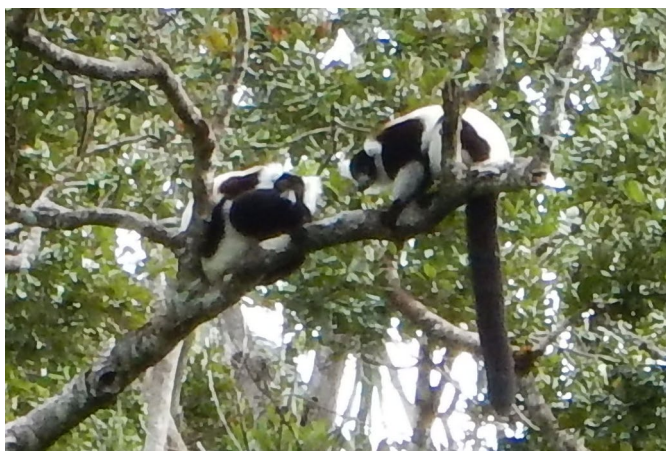


Indicators	As of Dec 2017
Number of field trips completed	11
Number of vouchered seed samples collected	738
Number of seed samples sent to seed bank	230
Number of seed samples sown	584
Number of seed samples germinating	376
Number of seed samples propagated & planted in Parc Ivoloïna	70
Number of seedlings planted out at Parc Ivoloïna	2,571





## IUCN's SOS - Save our Species Initiative



The growing human population in the Betampona region is experiencing higher levels of poverty and food insecurity driven by unsustainable farming practices and limited alternative income opportunities. Remote sensing data shows that community forest patches are decreasing in size and number and will likely disappear within a decade. A 2013 survey of 298 households in the Betampona landscape found timber was a near universal need; 96% of the respondents collected wood locally for cooking and 80% collected wood for construction (Golden et al 2014). The same study found 60% of the households had eaten 2,253 wild mammals over the past year; the average per family was five. The majority of respondents reported preferring chickens over bushmeat, but many experienced frequent die-offs of all or most of their flock. Annual chicken die-offs were also reported by families living in proximity to Makira and Masoala National Parks.

Collaborating with Chris Golden, Veterinarian Graham Crawford and colleagues, it was determined that the disease villagers referred to as “kopinda” was most likely Newcastle disease (NCD). Although NCD vaccines were available in Antananarivo, thermotolerant vaccines that can be carried to rural villages without losing efficacy were not available until 2016 when Crawford developed a relationship with veterinarians at the Malagasy Institute for Veterinary Vaccines (IMVAVET) and sponsored a I-2 ND vaccine production workshop that led to its local production.



The MFG was awarded a three-year IUCN SOS – Save Our Species grant to reduce the pressure on Betampona as a source of wood and bushmeat



through two conservation actions:

- 1) Providing families with fuel-efficient stoves that can reduce the use of firewood by 50%; 2100 stoves will be distributed over three years. The MFG will engage seven local women to distribute, train and encourage the recipients to use the stoves.
- 2) Initiating a NCD vaccination program to increase chicken production, reduce food insecurity and the pressure to hunt wildlife. The MFG will target 12 villages within close proximity to Betampona and adopt the “village vaccinator” model used in Africa and Makira/Masoala. The MFG will work with village leaders to select a person to become their village’s vaccinator. Vaccinators will be trained to answer questions about NCD, administer the vaccination, establish and maintain the vaccination schedule (every four months) and collect demographic data on each family’s chicken flock. These data will be used to monitor and evaluate chicken production over the three-year period.







## Betampona's Amphibian and Reptile Communities

An inventory of Betampona's plant and animal species is a significant undertaking which requires a substantial amount of time and the availability of taxonomic experts. The MFG is therefore very



grateful for the strong and long-term collaboration we have developed with Drs. Franco Andreone and Angelica Crottini who have organized and led teams of experts to carry out reptile and amphibian surveys in Betampona. Combining the time spent in the lab analyzing the molecular, morphological and bioacoustic data collected in the field with writing and submitting the results for peer review, it can take many years before a species list is finalized. For example, an initial inventory of Betampona's frog species conducted in 2007 and published in 2012 reported the occurrence of 76 taxa of which 36 still required formal description and taxonomic designations. Since then three pairs of frogs were determined to be the same species and an additional ten species were discovered bringing the total number of amphibians inhabiting Betampona to 83. Twelve species have been formally described and named, six of which are in the genus *Stumpffia* and, to date, three of the six are only known to occur in Betampona.

### Spotlight on *Stumpffia jeannoeli*

One of the three microendemic species of *Stumpffia* from Betampona, *S. jeannoeli*, was named after MFG Betampona Program Manager, Jean Noel in recognition of his dedication to the study of amphibians and reptiles and whose knowledge led to the identification of numerous new species. This diminutive species is typically found in the forest's leaf litter where males are known to call from a hidden position. Within Betampona, *S. jeannoeli* appears to be quite abundant and can be found throughout the Reserve.



*Stumpffia jeannoeli*



## Herpetologist Angelica Crottini describes Betampona as an extraordinary center of amphibian and reptile microendemism.



Progress has also been made with the genetic and morphological analyses of samples collected during the 2013 reptile survey in Betampona. The results have revealed 41 confirmed species, representing 30 genera and eight families. Another 17 candidate species await formal descriptions and, based on photographic records, Dr. Crottini's team believe that at least six additional species are known to occur in Betampona.



Jean Noel & Franco photographing frogs

### Chytrid Monitoring

The MFG has participated in the national chytrid monitoring plan since it began in 2011. Parc Ivoloina is one of eight sites selected to carry out biannual chytrid surveys of local frog populations. Twice a year Jean Noel and Jean Honoré spend several days collecting 40 swab samples from both *Mantidactylus betsileanus*, and *Ptychadena mascareniensis* and another 20 samples from *Heterixalus madagascariensis*. The samples are sent to the chytrid monitoring plan coordinator in Antananarivo who sends all samples to Europe for analysis. To date, chytrid has not been detected at Ivoloina. Betampona's frog populations are not screened; however Jean Noel and his team continually monitor frogs for any



signs of ill-health. The possibility of researchers or staff inadvertently introducing chytrid into Betampona's ecosystem is highly plausible.

Reducing this threat was ranked as a high priority in the 2016 – 2020 Sahonagasy Action Plan and the MFG implemented the recommended action by building a boot wash and dip station at the entrance to Betampona.



*Scaphiophryne spinosa*

Nine years of amphibian and reptile transect survey data from Sahabafoza and Sahambendrana, two herpetologically rich sites in Betampona as well as daily rainfall, temperature and humidity data collected within and just outside the reserve are being analyzed by Dr. Nicolus Dubos. Results will likely be published in 2018.



## Asian Toad Update



In 2014, Madagascar and the world heard the news that a population of the Asian common toad (*Duttaphrynus melanostictus*) had been established in Tamatave. Investigations initiated by an MFG/Mitsinjo team indicate that the invasion probably started as early as 2010, most likely with the accidental introduction of few individuals via commercial containers from Southeast Asia to Tamatave. Research comparing genetic samples from Tamatave's Asian toads were similar and/or identical to samples from one location in Cambodia and three locations in Vietnam, including Ho Chi Minh City, which has a major seaport and might have been the source for the introduction.

After a lag phase of a few years and taking advantage of the suitable climate, the toad population thrived. In 2014 the toad's population was estimated at 3.77 million adults spread over 108 km<sup>2</sup>. According to James Reardon, Invasive

Species Specialist, by 2017 that number had risen to 7 million adults and spread over 550 km<sup>2</sup> based on research carried out by graduate student Fulvio Licata. The impact of weather events was dramatically demonstrated following the March 2017 cyclone Enawo that hit the Toamasina region. Comparing the toad's distribution before and after Enawo showed that the resulting floods advanced the toad's spread by over 7,000 hectares. Licata calculated that the on-going invasion edge is advancing at a rapidly increasing rate of 2.5 km/year and Betampona Natural Reserve will be reached in the forthcoming years.

The ecological similarities with the cane toad's successful invasion in Australia (and Florida) gave rise to fears of another predicted catastrophe. In 2015, a National Toad Advisory Committee was assembled for the purpose of developing a coordinated strategy to control or, preferably, eradicate, the Asian toad from



Unregulated trash piles represent high quality habitat for Asian toads



Madagascar. As the participating member of the National Committee located closest to the toad invasion site and thereby better able to oversee and help coordinate toad surveys and other research objectives, the MFG was asked to head the committee. The MFG did facilitate site visits for the authors of the Eradication Feasibility Report, coordinated the distribution survey and toad control trials, developed an overall communication strategy in partnership with Vahatra and Island Conservation and executed an awareness raising campaign. Regrettably, a strategic plan to control the expansion of the Asian toad population has not been achieved. Such a plan requires governmental leadership and approval, and to date, intergovernmental disagreements over the best approach and control methods have not yet been resolved. Fund-raising efforts have also had limited success. The window of time when an eradication could have a chance of success is rapidly closing.



## Invasive Plants

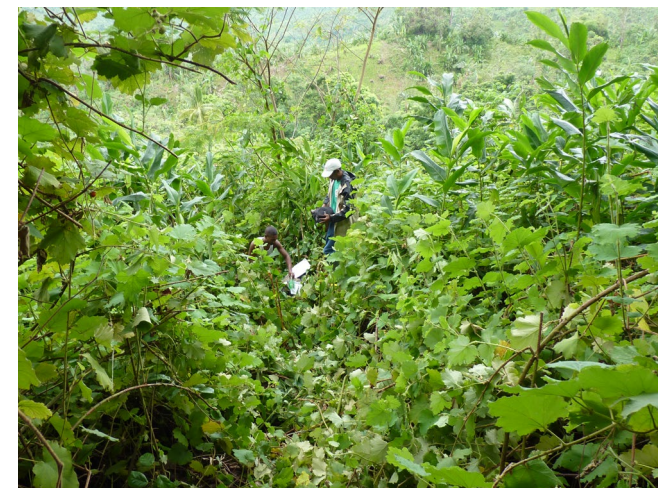
The IUCN has identified invasive species as second only to habitat loss as the most significant driver of species loss. MFG Research Director, Dr. Karen Freeman, quickly recognized the conservation threat invasive species posed to Betampona. Over the past 12 years, the MFG has prioritized applied research directed at identifying and critically assessing methods to control Betampona's three most invasive plants: strawberry guava, Molucca raspberry, and Madagascar cardamom.

Lala Randriatavy's PhD research was on Betampona's most pernicious invasive, strawberry guava. His results surprised all of us – if guava plants are coppiced and all new shoots cut every three months, the plant dies within approximately 18 months. This method is both less labor-intensive and less harmful to the soil. Digging and pulling out guava's very extensive and strong root system can cause significant collateral damage to surrounding native plants, adversely affect soil health and increase the



regeneration of invasive species, which often thrive in disturbed soil. Lala found that the best results are obtained when the area around the coppiced guava is planted with seedlings/saplings of native pioneer species.

Liantsoa Raharomanambina compared different methods to control Madagascar cardamom. Although a native pioneer species, it shares characteristics of an invasive species and, in Betampona, has formed dense patches that prevent natural succession. Liantsoa established nine 15 x 15 meter research plots and found that cutting cardamom to the ground in alternate 2.5 x 2.5 meter squares was successful when combined with the planting of native species in the cleared areas.



Njaratahina Razakaniaina's research identified that complete uprooting of Molucca raspberry was necessary because new shoots quickly sprout from the plant's long-lived perennial root system. Again, a critical component was follow-up weeding of invasive plants until sufficient shading by the native species inhibit germination. Although the students have finished their projects, the Betampona staff are now monitoring and managing (recording the regeneration of native species and removing invasives) the 15 guava, 12 Molucca raspberry and nine cardamom research plots every six months.

We are now confident we have reliable methods to manage the three invasive/native weed species that are the most problematic for Betampona. The next step is to work with Madagascar National Parks to develop a long-term control plan and to identify funding sources to facilitate the control work on a larger scale.



## Bark in the Park

In 2013 the MFG learned about then PhD student, Zach Farris, whose research showed an alarming correlation between an increasing number of dogs



in his forest study site and decreased detection of native carnivores and some lemur species. We had noticed more dogs in Betampona, a situation that concerned us and our colleague, Fidisoa (Fidy) Rasambainarivo, DVM. He had served as the MFG's veterinarian for two years and was well aware of the pathogens that dogs and cats can transmit to lemurs. Fidy, who had just entered into a PhD program at the University of Missouri, St. Louis was interested

in learning whether disease could play a role in the decreased detections, and that question became the topic of his PhD research. He discussed the project ideas with Zach who was very generous in sharing his camera trap experience and protocols.

Fidy established a grid of 30 camera traps to assess the frequency and distribution of interactions between dogs and the five endemic carnivores that inhabit Betampona. Interactions were defined as either direct contact (physical) or indirect contact (environmental) such as traveling on the same

forest trail. His analysis of the camera trap data showed that indirect interactions between exotic and native carnivores were frequent and were more likely to occur near the Rendriendry research station. No direct contact between dogs and Malagasy carnivores were seen.

To understand the potential role disease may play in declining native species populations, Fidy, with the owners' permission, obtained blood, fecal and ectoparasite samples from village dogs and cats. Using live traps, he also collected samples from

Left: This dog was repeatedly "captured" on camera traps located in different parts of the reserve. Below: In Betampona, broad striped vontsira are typically observed traveling in pairs.



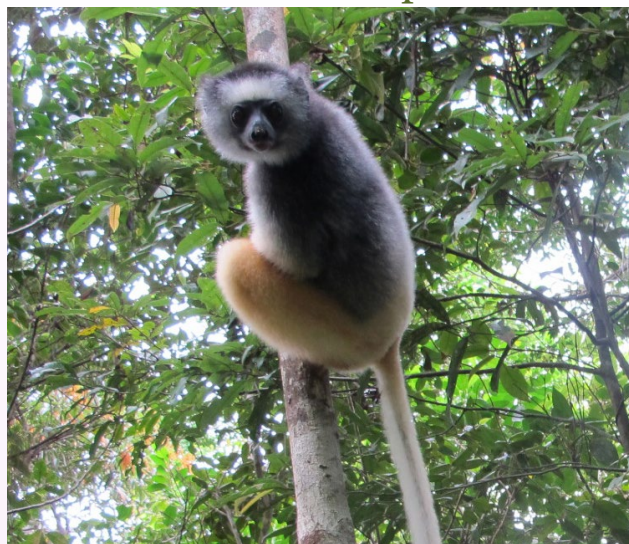


the native carnivores he captured. Villagers do not vaccinate or, with the very rare exception, neuter their dogs or cats. Not surprisingly, he found that dogs and cats are exposed to and can therefore transmit a range of pathogens such as canine parvovirus, canine distemper virus, *Toxoplasma gondii* and *Leptospira* to wild animals. The samples he collected from the endemic carnivores demonstrated that they are exposed to some of these pathogens. The impact of these pathogens on the five endemic species is not currently known with the one exception that the cause of death in a captive born fosa was encephalomyelitis from *T. gondii*.

Fidy was also interested in looking at whether there were certain individuals or species that acted as “super-spreaders”, that is, an individual that is disproportionately responsible for infecting others. Using *E. coli*, Fidy employed DNA fingerprinting to construct a microbial-sharing network between carnivores in Betampona. What he found was that microbial exchanges were very frequent and no individuals were central to the network. To the contrary, village dogs and cats share pathogens extensively with the endemic animals. It would not take many dogs to trigger a disease breakout; Fidy noted seeing several individually recognizable dogs in locations throughout much of the reserve.

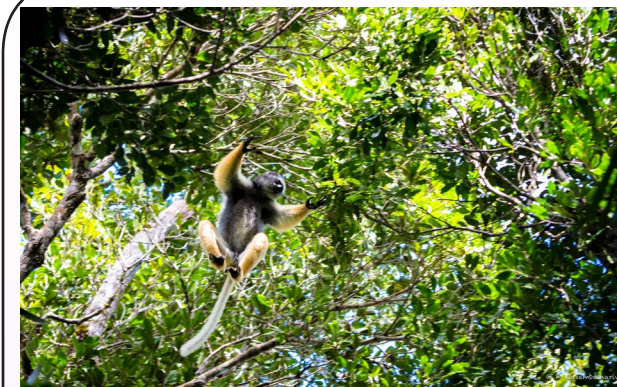
Fidy’s research has been published in peer-reviewed journals and shared with MNP who, in turn, have begun to raise awareness within surrounding communities that owners are responsible for preventing their dogs from entering the reserve.

## The Great Escape

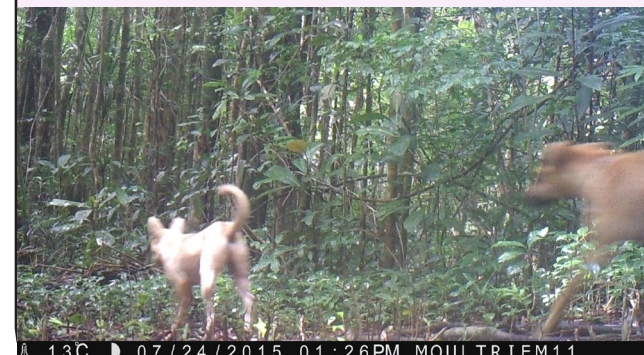


The world-wide population of dogs is estimated at 700 million to one billion - they are now the earth’s most successful carnivore and have become a significant threat to wildlife populations throughout the world, including Madagascar.

In addition to predation and disease transmission, dogs can negatively impact prey species by disrupting their resting or feeding activities (altering energy intake/output ratio) while harassing animals during the breeding or birthing season may cause a reduction in reproductive success.



In 2015, a dramatic interaction was observed by Betampona agents working in the reserve, who heard barking nearby. The agents observed a dog reared up against a tree, barking while excitedly pawing at the tree. They realized the dog was chasing a lone diademed sifaka frantically leaping from tree to tree; to them, the sifaka appeared fatigued. The dog fled when the agents yelled and ran towards it. We don’t know how often such encounters occur but, with more dogs entering Betampona, the number of encounters are sure to increase.





## Critically Endangered Indrids



Lana Kerker, who studied the feeding behavior and activity patterns of indri and diademed sifaka in Betampona Natural Reserve, graduated with her PhD in 2017. Lana and her team, comprised of graduate student Tantely Rakotondriamanana and MFG guides Cel Tevomanana and Doxy, rotated their all-day follows of six indri and three diademed sifaka groups from April 2013 through March 2014, obtaining a total of 1,301 and 605 hours of behavioral observations respectively.

Lana's results show that indri and sifaka spend the majority of their day resting followed by feeding. Indri are more folivorous than sifaka who eat a greater variety of both plant parts and species than the more folivorous indri. She found relatively little overlap in the food plants consumed by the two species with the exception of those that are

superabundant. Whereas both species come to the ground to consume soil, sifaka also spend time sitting on the ground while feeding on seeds of fallen fruit, resting and while engaged in rolling and grappling play bouts.

Lana used Kernel density estimations (KDE) to delineate the home range size of her focal groups as it provides a better reflection of where groups concentrate their activities. Sifaka had larger home ranges and significantly longer daily path lengths than indri. The KDE metric revealed that home range overlap between indri and diademed sifaka was quite low, a result that is confirmed by Lana's recording of only one encounter between the species during her 1,906 hours of observations. In this case, a diademed sifaka group came upon indri feeding in a large tree; the indri responded by moving approximately 20 meters to another tree and both groups fed without conflict. In contrast,



intergroup encounters of indri or sifaka groups with black and white ruffed or brown lemurs were common, uneventful (Lana once observed a brown lemur physically climb over a feeding sifaka without effect) and the two species could remain in sight of one another for hours.

Of the three critically endangered lemur species (black and white ruffed lemur, indri, diademed sifaka) that inhabit Betampona, the sifaka population is by far the smallest and at risk of local extinction. While four of the six indri groups produced offspring in 2013, no infants were born into the three sifaka groups, and a juvenile born in 2012 was found dead in August 2013. It is likely that the sifaka are suffering from inbreeding depression as a result of Betampona's isolation. The MFG is investigating the potential of developing a genetic management plan for discussion with Malagasy authorities.



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Some of the members of the 2013 herp research team.





## Leveling the Playing Field

In 2013 Fidy Rasambainarivo moved to St. Louis to begin his PhD at the University of Missouri. His interest in conservation medicine led him to study the transmission of pathogens from domestic to native carnivores in Betampona Natural Reserve. To do his research Fidy spent



his time between two worlds. For six months his world was a Malagasy forest. After the field season, he returned to his other world – the Parker Lab. As he comes to the end of his PhD, he thinks about all the skills he’s acquired from years of practice and hundreds of repetitions. Extracting DNA from blood, setting up a PCR and running an agarose gel for the suspected pathogens have almost become second nature. While he feels extremely grateful for having

the opportunity to navigate those two worlds, it disturbs him that most Malagasy students and scientists don’t have this option.

Although Malagasy students who accompany western researchers can gain valuable experience, their involvement is often limited to fieldwork and collecting samples. Very few participate in sample analysis or writing papers, and even less lead projects. Without access to laboratory facilities, Malagasy students are denied opportunities to learn molecular techniques that are often essential to informing and advancing conservation. Fidy wants to change this situation. When he returns to Madagascar, he and his partner, Liz Toomey, are launching Mahaliana ([www.mahaliana.org](http://www.mahaliana.org)), a molecular laboratory and training center. The



vision that drives their initiative is building the scientific expertise and leadership to conserve Madagascar’s biodiversity. The MFG looks forward to this much needed resource and our continued collaboration with Fidy.





## Learning by Doing

The Darwin Initiative Grant set out to achieve two goals: *ex-situ* plant conservation and building in-country capacity in conservation horticulture and field botany. The training component was developed around the opportunity for both the horticulturists and field botanists to develop their skills while taking part in an important conservation project. Candidates were recruited through appropriately placed advertisements, and a subset of the applicants were interviewed by the project's leaders. Motivated and environmentally-aware recent graduates from Malagasy universities were selected for the four botanist and five horticulturist positions; just under half of those hired were graduates from the University of Tamatave. Gender equity was an important goal; two of the botanists and horticulturalists selected were young women.



All the trainees moved to Parc Ivoloïna to begin their intensive three-month training course. Missouri Botanical Garden taxonomist, Richard Randrianaivo, and RBG Kew taxonomist, Solofo Rakotoarisoa, led the course for the botanists. Class work focused on plant taxonomy, record-keeping, database management, field mission planning and reporting. Practical training in the collection of voucher specimens, identification, collection and storage of high quality seeds and maintaining field notes was carried out at Parc Ivoloïna. Thereafter, Patrice Antilahimen, a highly skilled and experienced field botanist, took over by supervising and mentoring the young botanists as they began the field work. Patrice challenged the students at the onset to take charge of organizing the logistics of the field missions in addition to collecting the seeds once in the field. At the end of 2017 the team had completed 11 field trips and collected vouchered seed samples from 738 plants.

The horticultural students were trained by Lala Randriatavy, who has a long history with the MFG, and Alex Mamisoa, an experienced horticulturalist. They too began with classroom lectures before moving to the next phase of learning by doing. The team began by expanding and modernizing Parc Ivoloïna's existing tree nursery and creating a second nursery to accommodate all the seeds collected. The students were trained in compost techniques, the cleaning and pre-treatment of seeds, and the management and recording of observations of seedling development, non-chemical pest management and the planting-out of seedlings. A total of 2,925 seedlings were planted in Parc Ivoloïna's forestry station in 2017.





## A Force for Nature



Roderic Mahasoah's fascination with nature began at a young age; indeed, he clearly remembers the first time he saw a lemur. He was eight years old and it was his first visit to Parc Ivoloïna when he saw and fell in love with them. Two years later, his family moved south, near Berenty. He recalls spending all his free time exploring the forest near his home, observing lemurs, chameleons, snakes and birds for hours.

Years after he and his family moved back to Tamatave and Roderic was pursuing a career in tourism, he had a training opportunity to work as a guide back in Berenty. When he returned to the village where he had lived, he was profoundly shocked that the forest he so loved was gone; the trees turned into charcoal and lumber. That stark experience led to his decision to do all he could to protect his country's biodiversity and habitats. In 2009, he enrolled

in the University of Tamatave's Department of Natural Resources and, although he had to drop out a few semesters to earn money, he persisted and graduated with a B.S. in 2014 – a significant accomplishment when considering less than 3% of Malagasy students attend and even fewer graduate from college.

Roderic now serves as the President of Association Varecia at ISSEDD. Over the years, the Association's leaders have embraced the importance of modeling and mentoring leadership skills which is a likely reason professors have turned to the Association to assist them in leading student field trips and other university activities.

Roderic and ISSEDD's involvement with the MFG began in 2011, when he helped to organize World



Association Varecia, formed in 2007 by ISSEDD undergraduate students, has grown in size and scope of environmental activities.



ISSEDD students helping with toad awareness campaign hiking to reach rural villages

Environment Day (WED). Roderic got Association Varecia involved and they have participated in every WED since then. He has helped plan and organize ISSEDD's use of Ivoloïna's forestry station as a site for hands-on field experience and was instrumental in organizing ISSEDD students to assist in the Asian toad surveys. The MFG hired Roderic to help design and execute the Asian Toad Awareness campaign.

When Roderic expressed his interest in pursuing an advanced degree, he worked closely with Research Director Karen Freeman to select a topic (the distribution and habitat requirements of *Mantella laevigata* in Betampona) that helps advance the MFG's research objectives. He has completed his field research and is in the process of analyzing his results.



## Short-legged Ground Roller



Delaïd Rasamisan was inspired to study the short-legged ground roller, *Brachypteracias leptosomus*, because the IUCN had recommended monitoring its population size and habitat use throughout its range. To compare the roller's presence and use of primary and disturbed (defined as dominated by invasive plants) forest in Betampona, he established five 1-km line transects in each. His results were consistent with those from other sites; the presence of *B. leptosomus* was exclusive to primary forest with a high canopy (18 to 25 meters), deep leaf litter and decaying logs that host high levels of invertebrates, its primary food source. The total population size in Betampona is likely quite low but, because only eleven birds were observed, a reliable estimate could not be calculated due to the small sample. Habitat loss and degradation are the primary threats to this species. If *B. leptosomus*' ability to disperse over long distances is limited, lack of gene flow may be an increasingly important threat.

## Conservation Medicine

When Fidy Rasambainarivo carried out his PhD research in Madagascar, he offered veterinary students at the University of Antananarivo the opportunity to accompany him in the field. All veterinary students are required to complete and defend a research project in order to graduate, and the chance to work with Madagascar's endemic wildlife provides much needed experience for those students who have an interest in conservation medicine. In total, three students worked with Fidy for multiple field seasons, two of whom selected an aspect of the carnivore study as their research project. Hertz Andrianalaza investigated the prevalence of parvovirus in the village dogs the team sampled in 2014. Using the rapid canine parvovirus testing method, he found that the majority of the sampled dogs had been exposed. Along with camera trap data that revealed a high detection rate of dogs throughout the reserve, his findings

support the potential threat that dogs pose to endemic carnivores. Mamy Andriamihajarivo's project focused on classifying the gastrointestinal parasites found in these understudied carnivores. She was able to identify six families of gastrointestinal parasites and found that the ring-tailed vontsira carried more parasites than the other species sampled. A third student, Natacha Rasolozaka, volunteered for two years in a row in order to gain more experience working with Malagasy mammals.

When Fidy returns to Madagascar he will begin teaching a course in conservation medicine and will continue mentoring interested students. Although there are relatively few career opportunities for wildlife versus domestic animal veterinarians, there is significant value for all veterinarians to be aware of and reduce the potential of disease transmission between native and domestic animals.







Roela Lelaka received her DEA from the University of Tamatave on the use of medicinal plants by local families. She found that despite the availability of local health centers, families only seek medical care from the centers when very ill and when none of their traditional treatments have proven effective.



Vero demonstrates procedures to analyze soil samples for a class of University of Tamatave students. A total of 693 university students visited the lab in 2016/2017.

## MFG Staff Training



Families throughout Madagascar are confronted with the problem of how to increase food production on their existing plot. Although Christian Rambelison, MFG Capacity Building Manager, provides trainings in sustainable farming methods, some farmers are slow to adopt new practices. In 2017, the MFG provided Christian with an opportunity to learn about biointensive farming, an approach that has been enthusiastically adopted by some African farmers. He spent a month at GROW BIOINTENSIVE Agriculture Center of Kenya where he learned how they practice and train smallholder farmers to apply biointensive methods (double digging, companion planting, close placement of plants, cover and compost crops, etc.). This approach could be particularly useful for home gardens and the production of micronutrient rich vegetables that are often missing in rural Malagasy diets.



MIRADI is a conservation project management software program used by many conservation groups including MNP. In 2017 MNP held a training session for their agents and kindly made the opportunity available to MFG Managers Jean Noel and Jean Francois. MIRADI is being used in the development of MNP's Betampona Management Plan.



Trained by his father in plant identification, Sylvain Roli, MFG Betampona Conservation Agent, was able to expand his skills by participating in the Darwin Initiative's three-month field botanist training course held at Parc Ivoloina. Sylvain also joined the students and instructors on their field missions, providing him the opportunity see other forests and plant species.



## Socioeconomic Survey

University of Tamatave master's student, Angelo Rafilipo, undertook a socioeconomic survey of six fokontany (districts) neighboring Betampona Natural Reserve. To maximize the number of families surveyed, he enlisted the assistance of six ISSEDD undergraduate students. The detailed survey included questions on the age and sex of each family member, their level of education, the size and type of construction materials used to build their house and how far they travel to collect wood and water. They also asked whether they owned one or more cats, dogs, pigs, zebu, chickens or ducks and, if yes, did they vaccinate any of them. The final questions centered on the crops they grew, amount produced and the size of their fields. The results of the survey will help inform the communities' development needs.



Angelo (on right) headed the socioeconomic survey; the information will provide the MFG with more accurate demographic and economic data.

## COKETES



Emerentienne Mamatsa, MNP Director Betampona Natural Reserve, speaking at a festival organized to introduce communities to the COKETES initiative

The MFG was one of the eight NGOs that, along with MNP and the executing partner, the Ministry of Environment, Ecology and Forests (MEEF), received a five-year Global Environment Facility (GEF) grant titled “Conservation of Key Endemic Threatened and Economically-valuable Species” (COKETES). The grant advocates a species-based conservation approach as a means to complement the more widely practiced ecosystem approach. Twenty tree and one bird species that met the criteria of being endemic, threatened and economically valuable were identified and 16 sites with established conservation programs were selected recipients of the grant. At least 11 of the 20 tree species occur in Betampona Natural Reserve. An overarching objective of the grant is for local people to become motivated and enabled to participate and/or lead species conservation actions. While achieving this objective typically

requires removing barriers such as a lack of awareness, capacity and/or alternative sources of income, this initiative advocates a bottom-up participatory process to identify site-specific issues and solutions. To address this, the MFG has worked closely with MNP to introduce this new conservation and capacity building initiative to regional and local authorities, our conservation and development partners and the communities surrounding Betampona.

**Projet de « Conservation des Espèces Clés, Endémiques, Menacées et de Valeur Economique » / « COKETES »**  
Réserve Naturelle Intégrale de Betampona

**OBJECTIF GLOBAL**  
Promouvoir la conservation et l'utilisation durable de la biodiversité basée sur « l'approche espèce », en complétant la tendance dominante basée sur « l'approche écosystème ». Il s'agit de développer, mettre en œuvre et diffuser les stratégies locales de conservation et d'utilisation durable des espèces endémiques clés.

**QUELQUES ESPÈCES CIBLES DE LA RNI BETAMPONA**

- ✓ *Dalbergia normandii* (Hazovola)
- ✓ *Cordyla haraka* (Haraka)
- ✓ *Symphonia fasciculata* (Hazinina)
- ✓ *Labramia bojeri* (Nanto)
- ✓ *Ocotea racemosa* (Antafonana)
- ✓ *Dalbergia madagascariensis* (Pallesandre)
- ✓ *Dalbergia chapellieri* (Sovoka)

**RESULTATS ATTENDUS**

1. La prise de conscience, les connaissances, les capacités et l'engagement pour la conservation de la biodiversité basée sur l'approche espèce sont développés ;
2. La combinaison de l'amélioration des moyens de subsistance avec la conservation effective des espèces clés ;
3. La popularisation de la conservation des espèces dans la gestion de la biodiversité aux niveaux local, national et mondial.

*Dalbergia normandii*    *Ocotea racemosa*  
*Dalbergia chapellieri*    *Labramia bojeri*

MADAGASCAR FAUNE AND FORESTS GROUP  
RÉSERVE NATURELLE INTÉGRÉE DE BETAMPONA  
MADAGASCAR FAUNE GROUPE  
CONSERVATION • EDUCATION • RECHERCHE  
For life



## Saturday School

The Ivoloina Environmental Education Center (CEE) team developed a program to prepare children who are eligible and may be attending Ivoloina's Saturday School, to spend a day at the Parc. The CEE team organized the visits to not only enable the children to feel comfortable attending classes in an unfamiliar environment, but also to introduce them to the importance of understanding, appreciating and protecting Madagascar's unique plants and animals. To allow for smaller groups, children from the five primary schools were divided into three groups and visited the Parc on different days. In 2016, 211 children participated in the program and in 2017 the number totaled 258. The visit began at the CEE after which the children were taken on tours of the model station and the zoo. The visit ended with a nature walk on the Puzzle Trail.

The 2015/2016 school year saw two changes that impacted the secondary school entrance exam (CEPE) pass rates. The first was a governmental change from a competence-based to an objectives-based approach in teaching, a change that was instituted without providing teachers the necessary additional support and guidance through the transition. The second change was in how the MFG selected children for the Saturday School program. Previously the highest-attaining children had been selected to take part in the Saturday School program, but beginning with the 2015-2016 school



year, the priority for Saturday School places were given to low attainers, the very children who were in most need of additional help to boost their chances of passing the CEPE exams. This change continues to be reflected in lower Saturday School CEPE pass rates than were typically achieved in previous years. In addition, the poor performance

of one teacher led to especially low CEPE pass rates in one of the Saturday Schools which, in turn, lowered the 2015/2016 average pass rate even further. The teacher was replaced and the pass rate of Saturday School students is once again higher than those of the CISCO II students.



## Teacher Training

In an effort to increase communication among all Saturday School teachers, one or more of the CEE instructors visit the three Saturday Schools in communities near Betampona Natural Reserve. The goal is to meet with the teachers and ask about the challenges they may have experienced over the past few months. Together, the CEE staff and teachers talk through these issues and potential solutions. For example, one concern centered on teachers feeling rushed to get through all the lesson plans. This led to a discussion reinforcing the importance of ensuring that students understand and have mastered the current lesson before moving on to a new topic.



Two teacher training sessions took place in the fall of 2017. The participants included all eleven Saturday School teachers, three Chef ZAPs and three high officials from CISCO. The training focused on mastery of the new Saturday School curriculum including the specific objectives for upcoming 2017-2018 school year, information that should be included in weekly monitoring forms and report cards and the importance of developing engaging and animated methods to present lessons.

Summary statistics averaged over the four Saturday Schools	2016	2017
Number of eligible students	664	642
Number of Saturday School students selected at start of year	226	268
Number of students complete Saturday School course	232	235
Average attendance rate for each session	85%	85%
Average drop-out rate	13%	12%
Environmental education test results	97%	96%
Average CEPE pass rate Saturday School students	37%	67%
Average CEPE pass rate CISCO II	48%	51%

## Parents Club

The Parents' Club is an exciting new initiative that began in 2017. Parents from each EPP (Ecole Primaire Publique) select two representatives to attend a full Saturday School session with their child in January and a half day in March. The objectives include getting parents more involved in supporting and encouraging their child to learn by seeing for themselves what and how their children are being taught and, especially during the lean season (food shortages), that parents keep their child in school to help reduce the drop-out rate. It is hoped that these parents pass on what they have learned to other parents, so that the importance and value of an education is reinforced at home as well as school. The program is being trialed at Ivoloina but the CEE team hopes to introduce it to the other Saturday Schools as well.





## Youth Camps

### *Green Ambassadors Camp*

Green Ambassadors Camp is a program in which local secondary and high school students attend a residential week at the Ivoloina Conservation Training Center (ICTC). The aim of the program is to encourage and train young people to take positive action for the environment and to become positive role models for environmental protection in their schools, homes and communities.

Participating students spend time observing and experiencing nature in Ivoloina's forests and zoo, learning about biodiversity and ecological relationships. They develop practical skills in sustainable living such as recycling, compost making and building a fuel-efficient stove. Each student then plans a project that they will complete



in their school with the help of their fellow students.

In 2016, two camps took place, one for high school students and one for college students. In 2017, the timing of the program was restructured in order to fit the student projects better into the school calendar. To facilitate this, there was a single camp which was attended by both high school and college students.

### *Girls Science & Leadership Camp*

A camp for girls-only was born out of the MFG's 2013 celebration of International Woman's Day. The first Girl's Camp was so enthusiastically embraced by those who attended that they have become an annual MFG activity. These camps center on inspiring girls, ages 13 to 16, to continue their education, kindle an interest in science and envision themselves as leaders. Vero Ravololonarivo, ICTC Manager, was involved with planning and overseeing the first camp. Because she is both very passionate about advancing girls' horizons and a professional women in a scientific field while also being a wife and mother, she is a role model for the girls.

Each year, Vero puts a great deal of thought and planning into the camp, reviewing what has worked and the feedback she has received. Ranked at the top of the feedback is the opportunity to meet a diversity of professional



women with inspiring careers and with whom they can open up to express their aspirations, hopes and fears. Through these discussions, girls are made aware of their legal rights and introduced to the benefits of delaying childbirth until their education is complete. Other activities include team-building exercises and working in the lab.

In 2016, the 20 girls from four local secondary schools who attended the camp were selected based on their written responses to the below questions:

- What are your objectives before the age of 25?
- What are the characteristics that will set you on a good course in your life? Give an example from your own experience.



In 2017, the Girl's Camp, which had to be delayed due to the plague epidemic that hit Tamatave, was rescheduled for December and be reduced to two days. The 21 girls who attended were from the villages of Sahambala, Ambodiriana, Sahandahatra and Antetazambo and were selected by their schools' administrators.

Despite the forced changes to the schedule, the girls were nevertheless able to meet and interact with professional women. At the end of the camp, each girl agreed to organize other students and/or parents in an activity aimed at improving some aspect of their school's environment.

### *Gender and Development Symposium*

The success of the Girls Camp inspired Vero to organize a two-day symposium for girls, boys, men and women to discuss issues around gender based on the overarching theme: "educate young girls today to have a better future". Vero invited a diversity of people including members of

women's, parents', folkloric and youth associations, sand-mining workers and church representatives. In all, 37 people participated. Specific objectives included:

- to encourage parents to have their children continue their education beyond secondary school
- to understand the psychological stages adolescents and teenagers experience
- to know yourself, who you are on the inside and how you present yourself in the world
- to know what it is to be female, the roles and responsibilities
- to delay starting a family; to think about your current and future path in life and define your life goals
- to be part of establishing the society in which you want to live

The response from all age groups was very positive including many who said they intended to pass what they learned to others in their family and community while the folklorist planned to transform the messages into children's song lyrics.





## Outreach and Public Engagement

### Newsletter and Radio

Two editions of our eight page Malagasy language newsletter, Bitsik'Ivoloina are distributed each year to the local population living around Parc Ivoloina and Betampona Reserve. Each magazine contains articles about agriculture, Malagasy wildlife,

environmental issues and topical subjects. Games and puzzles with an environmental theme are also included. A wider audience is reached by our twice-monthly radio broadcast, Bitsik y ny Ala



Atsinanana (Whispers of the Eastern Rainforests), which can be heard throughout Tamatave and the surrounding areas. The themes for each program follow those of the environmental component of Saturday School. Practical tips for sustainable living and managing Madagascar's natural resources are also presented.



### World Lemur Festival

World Lemur Day celebrations took place at Parc Ivoloina in 2016 and 2017. The 2016 event began with a carnival procession to Parc Ivoloina where families took advantage of free admission to the zoo, participated in singing and dancing competitions and other activities. In 2017, Association Varecia and Alliance Française de Toamasina (AFT) partnered with the MFG to organize the celebration. At Parc Ivoloina, approximately 1,880 people enjoyed a wide variety of activities for children and adults, including face painting, mask making, story reading, film screenings and a lemur drawing contest. An eight-day exhibition at Alliance Française, highlighting Madagascar's rich biodiversity, with an emphasis on lemurs, attracted around 60 people each day.

Two of the winning drawings





## Asian Toad Awareness Raising Campaign



The primary objectives of the awareness raising campaign were to:

- inform people who lived within and just outside the Asian toad's zone of occupation about the risks and consequences of the toad's presence in everyday life and the environment.
- inform people what they can do to reduce the risk posed by the toad.
- teach people how to correctly identify the species.

Information was disseminated through a poster, radio announcements, a traveling exhibition and visits by campaign participants. The awareness raising team, led by Roderic Mahaso



and Vero Ravololonarivo, included 11 ISSEDD eco-volunteers who they had trained and a representative from DREEF Atsinanana (regional branch of the Ministry of the Environment, Ecology and Forests [MEEF]).

Each field trip began by meeting with the local authorities, e.g., President of the Fokontany. The team also took the opportunity to collect distribution data by asking people whether they had seen the toad.

In total, the team visited 98 villages from nine communes and spoke with 4,110 people who were encouraged to share the information with others in and beyond their community. Of the 98 villages visited, 43 had been invaded by the toads.







### 2017 Sahambala Fire

Thank you for the outpouring of generosity shown to those in need. We are particularly grateful to the many employees of Member zoos who made personal donations to help families rebuild their houses and children get the school supplies they needed.



Our gratitude to the Guhl Foundation for lighting up the CEE with their gift of solar panels in addition to their long-term support of the MFG's Saturday School Program.



Thank you Webster Groves Presbyterian Church for your donation that helps children stay in school.

We deeply appreciate Planet Foundation's continuing support of the MFG's work to build local capacity in applied conservation research & management, inspire young girls to become leaders, raise environmental awareness and provide training in sustainable farming.





## Thank You!



- Jenna Hollamby & Marty Boland for evaluating enrichment program & observing maternal care of *E. flavifrons* at the Ivoloina Zoo.
- Tracy, Charlotte & the Isle of Wight Zoo team for donating the results of your World Lemur Day fundraiser to the MFG.
- Seneca Park Zoo for funding the production of Bitsik'Ivoloina
- Jacksonville Zoo for funding transportation costs of the *E. flavifrons* to the Ivoloina Zoo.
- Sean Sutor and Greg Langaha for providing advice and training in amphibian husbandry & care of invertebrate cultures.
- Martin Reichard and Xander Schrijen for donating monthly for over 10 years!



## Thank You!

- Michele Davie & Zoo Atlanta for a grant to protect *Varecia* habitat & build an exhibit to house confiscated *Varecia*. And to Michele for also raising funds on World Lemur Day.
- For the donations from AAZK Chapters at  
Fort Wayne Zoo  
Little Rock Zoo  
Saint Louis Zoo
- Catharine Potter and the Companion Animal & Allied Services staff at Sparshott College Hampshire for your donation.
- Ragnhild Larkins and the Locus Technology team for their donation of Trovan transponders, implanters and a reader for Madagascar's ex-situ priority lemur species breeding programs.



## Thank You To Our Members

Our Members form the foundation of MFG and their ongoing support enables all our efforts in Madagascar. If you'd like to join our collaboration of zoos, botanical gardens, aquariums, and universities, see the benefits of each membership level at [www.madagascarfaunaflora.org](http://www.madagascarfaunaflora.org).

### Managing Members



Duke Lemur Center | Koln Zoo | Lemur Conservation Foundation | Missouri Botanical Garden | Naples Zoo  
Perth Zoo | Saint Louis Zoo | San Diego Zoo | Taipei Zoo | Tennessee Aquarium | Zoo Zurich

### Sponsoring Members

Cleveland Metroparks Zoo | Greenville Zoo | Isle of Wight Zoo  
Leipzig Zoo | San Francisco Zoo

### Contributing Members

Akron Zoo | Cango Wildlife Ranch | Dickerson Park Zoo | Jacksonville Zoo and Gardens  
Khao Kheow Open Zoo | The Living Rainforest | National Zoological Gardens South Africa  
Seneca Park Zoo | Tropical Butterfly House | Ueno Zoo | Wellington Zoo  
Zoological Park Organization Thailand

### Friends of the MFG

Happy Hollow Zoo | Lee Richardson Zoo | Maryland Zoo in Baltimore  
Milwaukee Zoo | Sacramento Zoo | St Augustine Alligator Farm



## MFG Financial Summary for 2016 and 2017

Revenue	2016	2017
Membership Dues	150,403.93	140,040.97
Donations	24,068.56	14,379.96
Donations Sahambala Fire	0.00	20,752.30
Madagascar In-Country Income	42,529.01	25,001.38
Other International	0.00	23,016.10
Grants	216,542.64	312,658.73
<b>Total Revenue</b>	<b>433,544.14</b>	<b>535,849.44</b>

Expenditure	2016	2017
Personnel	184,884.70	195,208.02
Operations	90,975.08	120,044.97
Dedicated Grant Expenses	113,099.12	172,005.91
<b>Total Expenditure</b>	<b>388,958.90</b>	<b>487,258.90</b>

<b>Net Surplus /Deficit for the Year</b>	<b>44,585.44</b>	<b>48,590.24</b>
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### Balance of cash and equivalents

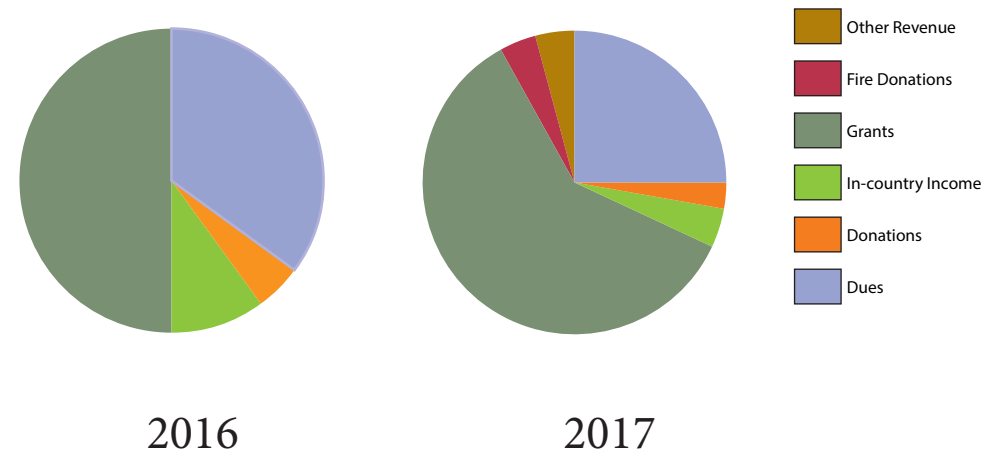
on 31st Dec/USD	2016	2017
Accounts payable/USD	87,839.42	90,628.93
Accounts receivable/USD	0	8,832.93

### Back Cover Illustration: About the Artist Stefano Faravelli

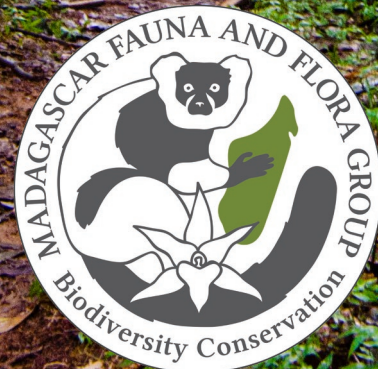
Stefano Faravelli is a well-known Italian artist who accompanied our herpetological collaborators on their 2013 field mission to update Betampona’s reptile species list. He has degrees in fine arts and moral philosophy which he combines with a keen interest in nature and travel to produce unique and beautiful travel diaries. In 2016, he published *Verde Stupore* (Green Amazement), a 93-page book filled with extraordinary sketches and drawings of Betampona’s biodiversity, research station and people.

Back Cover Photo: Fidy Rasambainarivo

### 2016 and 2017 Revenue Sources







## Madagascar Fauna and Flora Group

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