



Centre ValBio

Annual Report 2019



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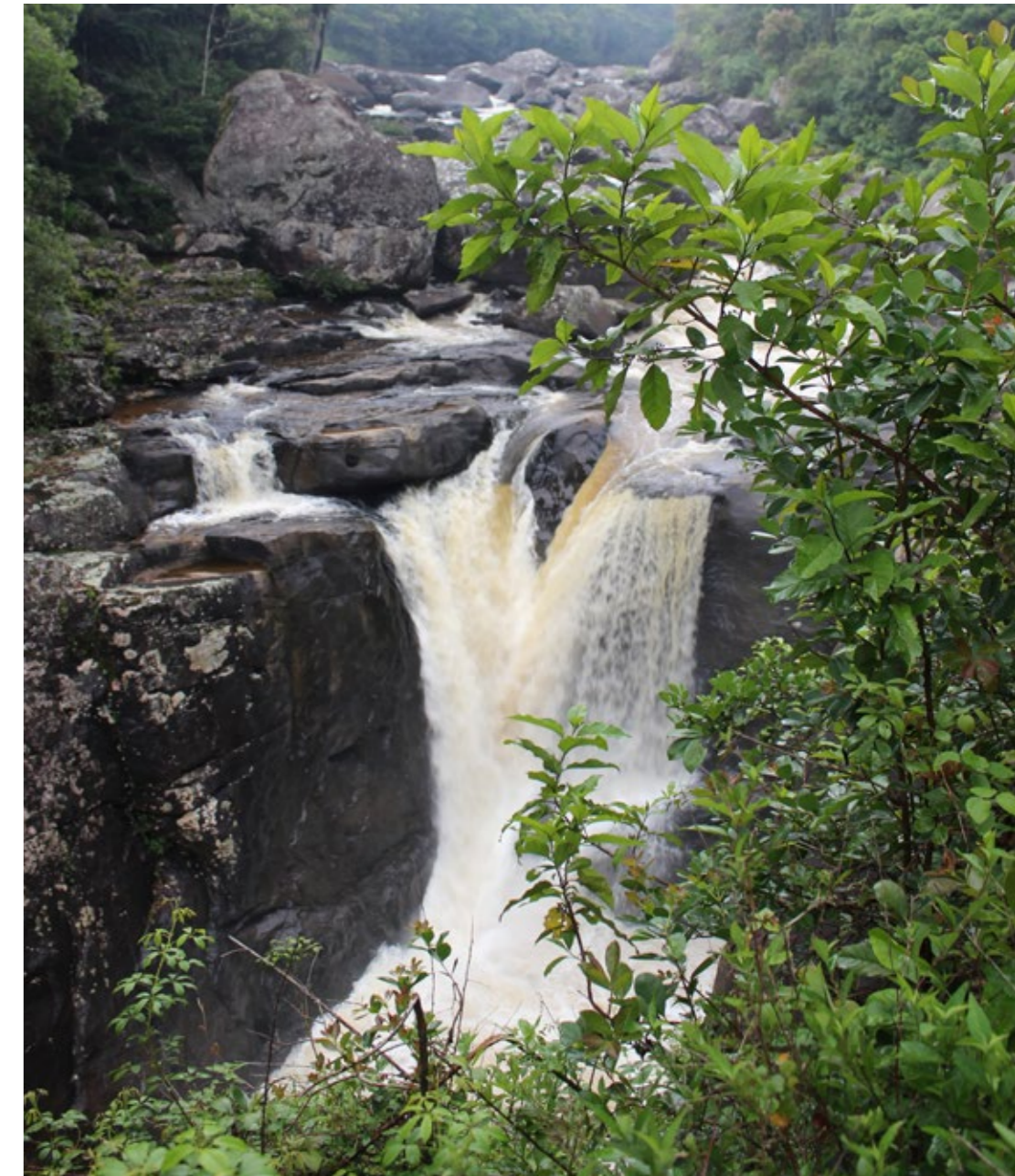
History of CVB

In 1986, primatologist Patricia Chapple Wright was given a seemingly impossible task: to travel to the rainforests of Madagascar and find the greater bamboo lemur, a species that hadn't been seen in the wild for thirty years. Not only did Dr. Wright discover that the primate still existed but that it lived alongside a completely new species, the golden bamboo lemur. What followed was a love affair with an animal and a country that continues to this day. Dr. Wright is best known for her study of lemurs in Ranomafana National Park ('RNP'), which she helped establish in 1991.

Centre ValBio ('CVB') was created by Dr. Patricia Wright in 2003 under the Institute for the Conservation of Tropical Environments' agreement with the Government of Madagascar. The richness of the critically endangered plants and animals, contrasted with the poverty of the people, inspired her to help both survive in harmony.

CVB's mission is:

- To promote world-class research and biodiversity training opportunities in one of the world's most biologically diverse and unique ecosystems;
- To promote environmental stewardship by providing conservation education and developing ecologically sustainable economic development opportunities within local communities; and
- To provide the local villagers with the knowledge and tools to improve their quality of life through projects focused on health and well-being.





Letter from the Executive Director

auguration on January 17 began with a rainy blessing from the ancestors and speeches by the local officials as well as Serge Bednarczyk, representing the donor of the project.

In January, Michael Docherty was chosen as our Administrative Director for Centre ValBio. Michael, who has a background in finance, had been an AFID finance volunteer for CVB since April 2018 and we are proud to choose him to lead the CVB and be the link to Stony Brook University. We had major promotions within our staff: Lovasoa Razafindravony to be head of the Education Department, Dr. Ando Rakotoniaina to be head of the Health and Hygiene Department, and Nicolas Rasolojatovo, head of reforestation.

In February, Centre ValBio Research Station was a finalist for the St Andrews Prize for the Environment. Michael Docherty and I journeyed to St Andrews, Scotland, to give a presentation and receive the prize of \$25,000 to be applied to our SPICE for Life project, which involves reforestation of endemic trees and high value crops including vanilla, wild pepper, and cinnamon.

In February, Stony Brook University sponsored a Centre ValBio strategic planning

session attended by Board members Mark Krasnow, Steig Johnson, Jim and Robin Herrnstein, as well as Benjamin Andriamihaja, Ed Norton, Sr. (PIVOT board member), Nicole Sampson, Dean of SBU Arts and Sciences, Hodan Hassan, CVB Development Strategist, and Dexter Bailey, VP for Advancement. The Planning Session, led by the organization JUMP, was very useful and a document outlining five main points was developed. Highlighted were new directions in database technology and molecular genetics.

In July, the Association of Tropical Biology and Conservation (ATBC) held their international meetings in Antananarivo and CVB was a sponsor. This was the second largest international meeting ever held in Madagascar. The first was the International Primatological Society meetings held in 1998. Ten of our CVB staff, 12 of our Malagasy graduate students, and eight of our research scientists attended and gave presentations. Our CVB researcher, Onja Razafindratsima, was Master of Ceremony. CVB researcher and SBU Ph.D., Dr. Jonah Ratsimbazafy, was the main organizer, and I was on the organizing committee. The meeting ran seamlessly, and was a great success. Many biologists visited CVB before and after the conference.

CVB National Director, Pascal Rabeson, represented CVB at the Society of Conservation Biology International Congress in Kuching, Malaysia. He gave a presentation about CVB's community monitoring of biodiversity in forest fragments.

In late July, CVB accomplished the first step in our translocation of *Prolemur simus*, the greater bamboo lemur, from Ivato Commune near Vondrozo to Ranomafana National Park. The twelve bamboo lemurs were captured, collared, and released and will be translocated to Ranomafana National Park in early 2020.

Nathan Montague, our ICTE Finance Coordinator hired in July, visited CVB in September to brainstorm with the CVB finance staff to make financial transactions more efficient.

In October at Stony Brook University I received the Herrnstein Family Endowed Chair in Conservation Biology, with over 140 attendees at the investiture ceremony; Michael Bernstein, Provost of SBU; Dr. Zang, the head of the Research Foundation; and Nicole Sampson, Dean of Arts and Sciences, awarded me the honor, with Drs. Robin and James Herrnstein, the donors, on the stage with me.

As part of the CVB expansion that was encouraged by the Madagascar Ministry of the

Environment, Ecology and Forests, we are continuing our collaboration with MICET and Rainforest Trust in making a protected area in the unexpected rainforest in south-central Madagascar. This special relict forest is well on the way to being legally recognized as a protected area, with ten official trained rangers. Phoenix Conservancy, a US NGO, completed over 4 kilometers of firebreaks around the Ivohiboro forests.

Two biodiversity surveys were conducted in 2019 by CVB in the "Lost Rainforest of Crystal Mountain". In November, the CVB/AMNH biodiversity inventory teams discovered three possible new species: a giant land snail (leopard snail), an aquatic leech, and a *Brookesia* (tiny chameleon). Genetic work is now needed to verify these new species. Beatriz Ortiz Jimenez, my new Stony Brook post doctoral fellow, and I trapped small mammals. Beatriz is a landscape ecologist, who after receiving her Ph.D. from the University of Michigan, is my NIH IRACDA post doctoral fellow at SBU for three years, and will study the landscape genetics of small mammals in the Lost Rainforest. The US ambassador's wife, Suja Pelletier, and teen-aged son, Ketan, assisted us in the biodiversity surveys. The camera traps revealed ring tailed mongoose for the first time, as well as the 2kg common tenrec.

Our paper describing the rare fungus attacking *Chrysophyllum* is in revision in *Frontiers in Forests and Global Change: Pests, Pathogens and Invasions*. *Calophyllum*, an endemic tree in the avocado family, is an important feeding tree for six species of lemurs. The fungus, carried by a bark beetle, has caused mortality of over 65% in this tree species.

This year's special guests included the new US Ambassador, Michael Pelletier, and his wife. Steven Quake, Co-president of the Chan Zuckerberg BioHub, San Francisco, Andrea and Lubert Stryer, from the Board of the Chan Zuckerberg Initiative (CZI), Dr. Cristina Tato and Rebecca Egger from CZI, and Farhad Imam from the Bill and Melinda Gates Foundation. Chien Lee, renowned wildlife photographer, returned to shoot material for the "Visions of Ranomafana" book.

Finally, my best wishes for a productive and successful 2020.

Sincerely,

Dr. Patricia C. Wright
Founder and Executive Director
Centre ValBio

2019 Highlights

SBU Projects
External Visitors
CVB Activities

Jan. 6 - 12
Ecological and Epidemiological Modelling Mada (E2M2) workshop

Jan. 10 - Dec. 1
Hunter College CUNY, research on *Varecia* reproduction and physiology

Mar. 17 - 20
The Colorado Springs School Study Abroad (22 people)

Apr. 30
Mark Krasnow, long time CVB researcher, elected to the US National Academy of Sciences

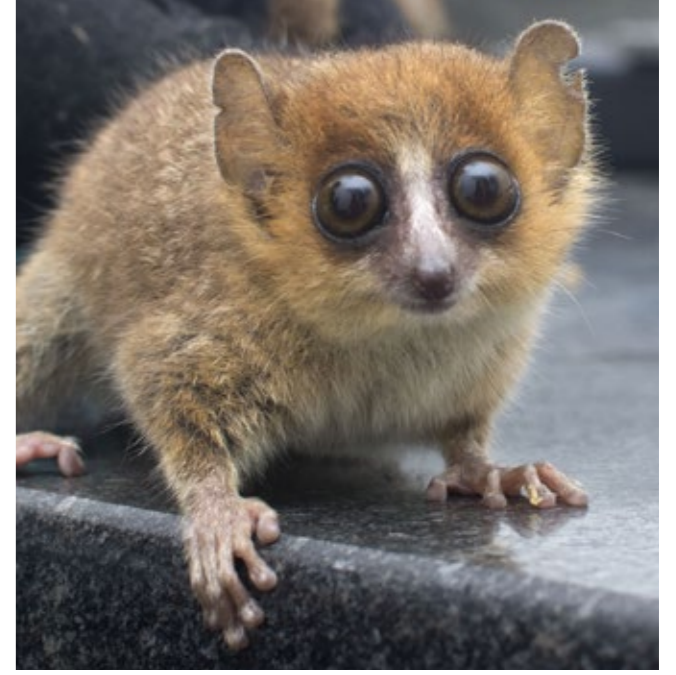
May 13 - 17
Conservation International Workshop (10 people)

July. 1 - 15
National Geographic expedition, community service focus (17 people)

Aug. 12 - 23
Stephen Quake of Stanford University and the CZI Biohub visits with his daughter Zoe

Oct.
Eliette Noromalala is awarded Fulbright Scholarships

Oct. 25
Centre ValBio lead World Lemur Day Festival in Ranomafana, with the US ambassador Michael Pelletier as honoured guest



Mar. 15 - 17
Patricia Wright visits Manchester University for the British Society for Parasitology 2019 Spring Meeting

Apr. 1
Mariah Donohue is awarded Fulbright U.S. student program

Jun. 3 - 8
University of Florida Study Abroad (15 people)

Jun. 15 - 29
Buena Vista University faculty visit to plan future Study Abroad

Jul. 30 - Aug 3
56th Annual Association for Tropical Biology and Conservation (ATBC) meeting in Antananarivo, seven CVB staff attending

Sep. 18 - Nov 22
SBU Study Abroad, biodiversity courses (14 people)

Oct. 9 - Nov 7
Dr Mark Krasnow and his team visit to continue their study of mouse lemur genetics

Jan. 4 - 23
SBU Winter Intern Program, biodiversity and community focus (12 people)

Jan. 11 - Feb. 15
Naina Nicolas Rasolonjavato and Kimmerling Razafindrina attend the Durrell Conservation Academy training on regional capacity building in biodiversity conservation and monitoring, held in Mauritius



May 29 - Jun. 30
SBU Study Abroad, biodiversity courses (11 people)

Jul. 3 - 19
SBU Dental Team undertakes community service visit (12 people)

Jul. 11 - Dec. 1
Brett Scheffers' team research climate change via amphibian canopy position

Jul. 27 - Aug. 5
Expedition to Ivato to capture 12 *Prolemur simus*

Oct. 17
Dr Patricia Wright is awarded the Herrnstein Family Endowed Chair in Conservation Biology at SBU

Nov. 12 - 25
Expedition to the Analamary/Ivohiboro "Lost Rainforest" by Dr Patricia Wright and the wife and son of the US Ambassador

Nov. 30
Dr Patricia Wright marries Noel Rowe at Centre ValBio

Jan. 9
SOS IUCN Biodiversity Research Centre - topping out ceremony

Jul. 7
Marc Hoffman, Patricia Wright, and Noel Rowe attend biodiversity hero, E.O Wilson's 90th birthday party at Walden Pond, Massachusetts

Jul. 22 - 25
CVB National Director Pascal Rabeson attends the Society for Conservation Biology's 29th International Congress for Conservation Biology (ICCB 2019) in Malaysia

Oct. 18
Education pavilion funded by Gems of Madagascar completed at Kianja Miatso

Oct. 21 - 23
Representatives from the Chan Zuckerberg Initiative and the Gates Foundation visit to discuss their Madagascar projects

Dec. 16
PIVOT and the Ministry of Health inaugurate major infrastructure projects at three facilities



This year we have worked hard to deepen our relationship with Malagasy government. We renewed our headquarters agreement with the Ministry for Environment and Sustainable Development, extending the partnership that has lasted so many years. We also participated in World Lemur Day in Ranomafana.

We were excited to learn this year that the government had agreed to turn Ivohiboro into a protected area, which will protect many undiscovered species. We are continuing with our work in Karianga to gain it the same special status.

As we have done for the last 17 years, CVB worked closely with MNP, and this year

we welcomed their new National Director, Mamy Rakotoarijaona Ph.D., who was previously Site Director of Ranomafana National Park.

Lastly, we are expanding our network of collaborators, welcoming our first researchers from the University of Hildesheim in Germany and University of Brasilia in Brasil, in addition to our presence at the Association for Tropical Biology and Conservation meeting.

Tsihy be lambanana ny ambanilantra.

- Dr. Benjamin Andriamihaja,
ICTE Country Director



This year, Centre ValBio has continued its internationally-significant research on the environment, flora, and fauna inside and outside of Ranomafana National Park. As scientific and technical partner of Madagascar National Parks (‘MNP’), CVB helps MNP to manage this protected area by sharing information on the research we have facilitated. To date, almost 1,000 publications have resulted from the studies and research undertaken in Ranomafana, a fact of which we are immensely proud.

229 researchers came to CVB this year to either continue or start their research. One remarkable example is the work done by Steve Collins and the African Butterfly Re-

search Institute, who have collected over 3,000 butterflies representing 189 species. This demonstrates that research at CVB is constantly expanding and developing, integrating new knowledge into our understanding of the rainforest biome.

Integrating activities including biodiversity, conservation, education, health, and reforestation, combined with the support of administration, IT, finance, and logistics, cannot be done without hard work by all of our exceptional staff, and I would like to thank them all and wish them good health and prosperity in life and work.

- Pascal Rabeson,
CVB National Director

Looking back at 2019, we made some truly amazing progress at Centre ValBio. None of this would have been possible without the wonderful collaboration of our partners; the people power of our now 134-person strong staff, the strong showing of volunteers, the government of Madagascar, and last but not least our ever-growing ranks of researchers.

For instance, plans are underway to expand how many Study Abroad partners we work with; hopefully we will be able to welcome groups from different continents, making CVB more diverse throughout the year.

In keeping with this push to make our network of partners more global, 2019 saw the

beginning of a collaboration with the University of Manchester into how the essential oils of endemic plants can combat “*Trichuris*”. This exciting project will continue in 2020, when we also hope to welcome the UK ambassador to see our conservation successes.

We have started a push to keep our maintenance down so as much as possible goes to our teams on the front lines of conservation, biodiversity, education, and health. This has already resulted in a renegotiation of our internet costs with the generous Telma Foundation, and discussions regarding electricity costs are underway.

- Michael Docherty,
ICTE/CVB Administrative Director

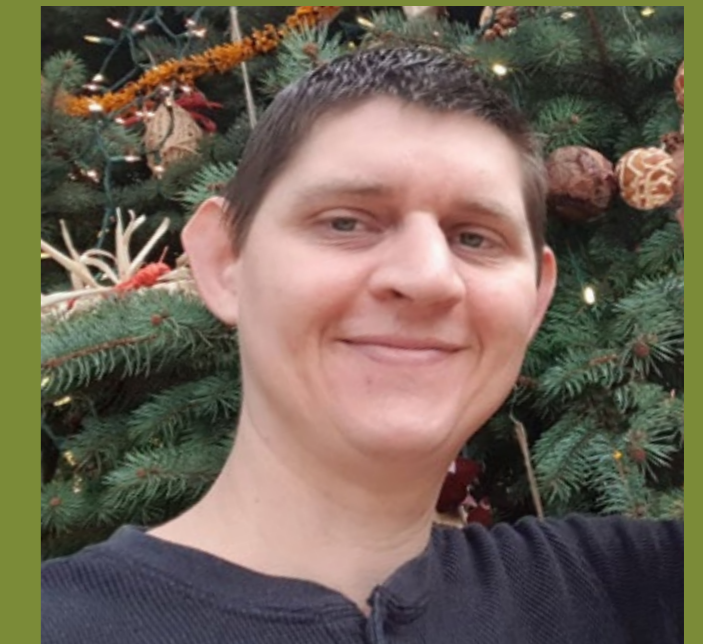


I am extremely proud to say that 2019 saw the “closing up” of the SOS Biodiversity Research Centre. With the exterior sealed we were able to make significant progress on the new data centre which will house all of the digital side of CVB’s research and collections. With the completion of this facility, combined with the final fitting out of the building quickly coming together, this new resource for Ranomafana will soon be fully brought online. This will significantly increase CVB’s capabilities. I look forward to seeing the augmentations from this facility complement our existing I.T. infrastructure, allowing CVB to remain competitive as one of the most cutting-edge conservation campuses in the tropics.

Work has continued on the Razana drone system, which utilises long endurance drones equipped with machine learning to monitor the forest in real-time, giving researchers information that would previously have taken weeks to gather. This will be complemented by the AfterRes system, which employs drones that dissolve without residue to leave behind a high-tolerance mesh relay network.

I feel truly blessed to be a part of such an amazing scientific hub, and look forward to watching it continue to grow, train, and inspire over the next decades.












- Jesse McKinney,
ICTE/CVB Chief Technology Officer

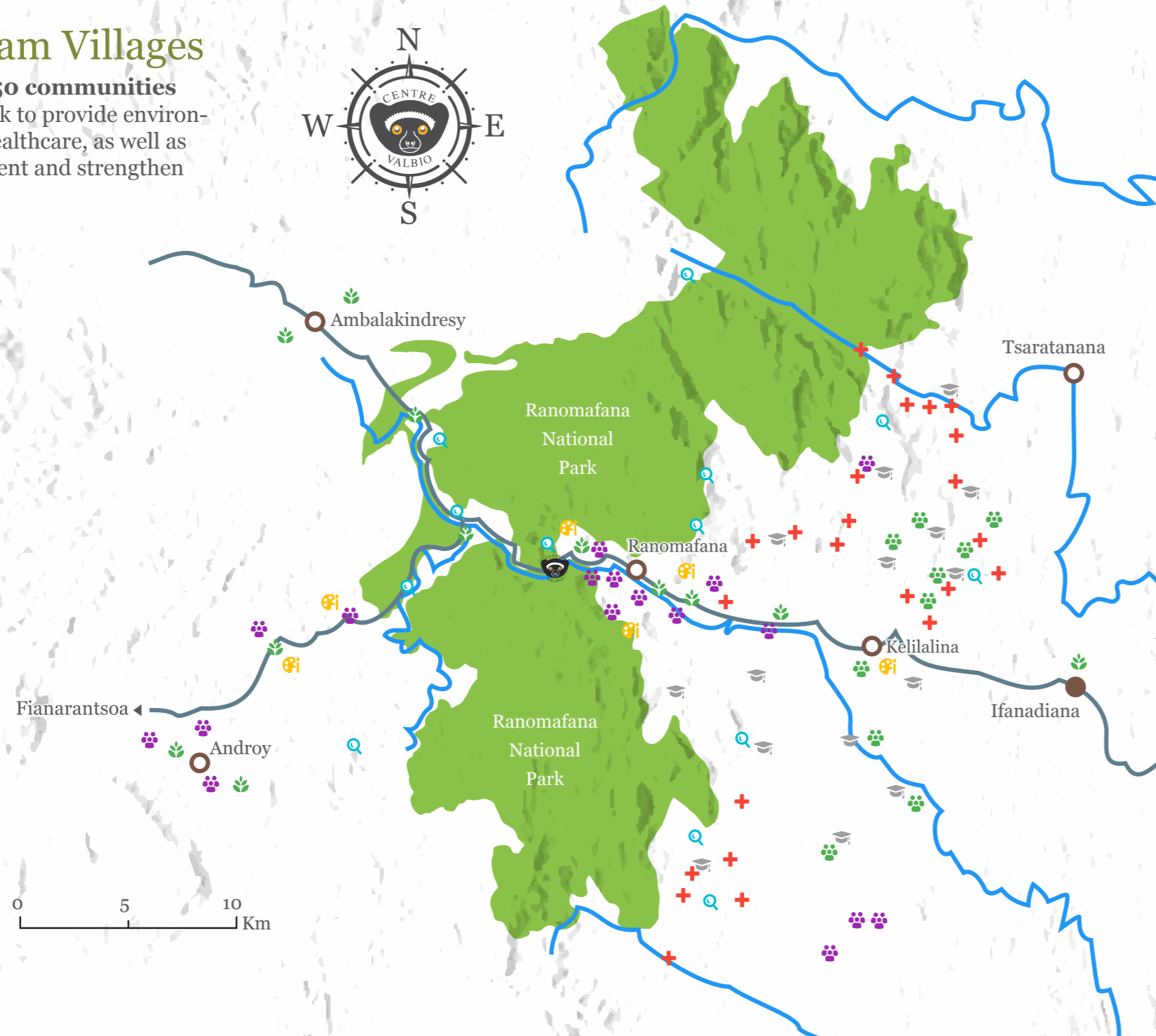


Map of CVB Program Villages

Centre ValBio is working in over **50 communities** around Ranomafana National Park to provide environmental education and access to healthcare, as well as to facilitate community development and strengthen income-generating opportunities.

Key

-  Conservation Club
-  Conservation Club & Reforestation
-  Reforestation
-  Health
-  My Rainforest, My World
-  Participatory Ecological Monitoring
-  Environmental Art
-  Road
-  River
-  District
-  Commune



Research

Long-term Surveys

Centre ValBio continued to monitor the demography, diet, and social behavior of the greater bamboo lemur (*Prolemur simus*) and golden bamboo lemur (*Haplemur aureus*). Four groups of *Haplemur aureus* with 25 individuals in total in Talatakely forest site have given birth to five newborn infants this year. The greater bamboo lemur (*Prolemur simus*) has also been continuously monitored. Despite the rarity and the presence of only one group with two individuals in Talatakely, a translocation project to add more groups at the site has been planned in order to save the population from local extinction.

The long-term research on plant phenology with regular monthly observation and data collection on growth, DBH, fruiting, and flowering patterns in rainforest tree species has been continued. 342 individual trees were measured. Spreading disease on forest tree species has been monitored and diagnosed in collaboration with the University of Fianarantsoa. The *Calophyllum* species has been studied within five sites: Mangevo, Valohoaka, Vatoharanana, Talatakely, Sahamalaotra, and found to be infected by a rare tree fungus. Within the three surveyed *Calophyllum* species (*C. paniculatum*, *C. mulvum*, and *C. drouhardii*), respectively

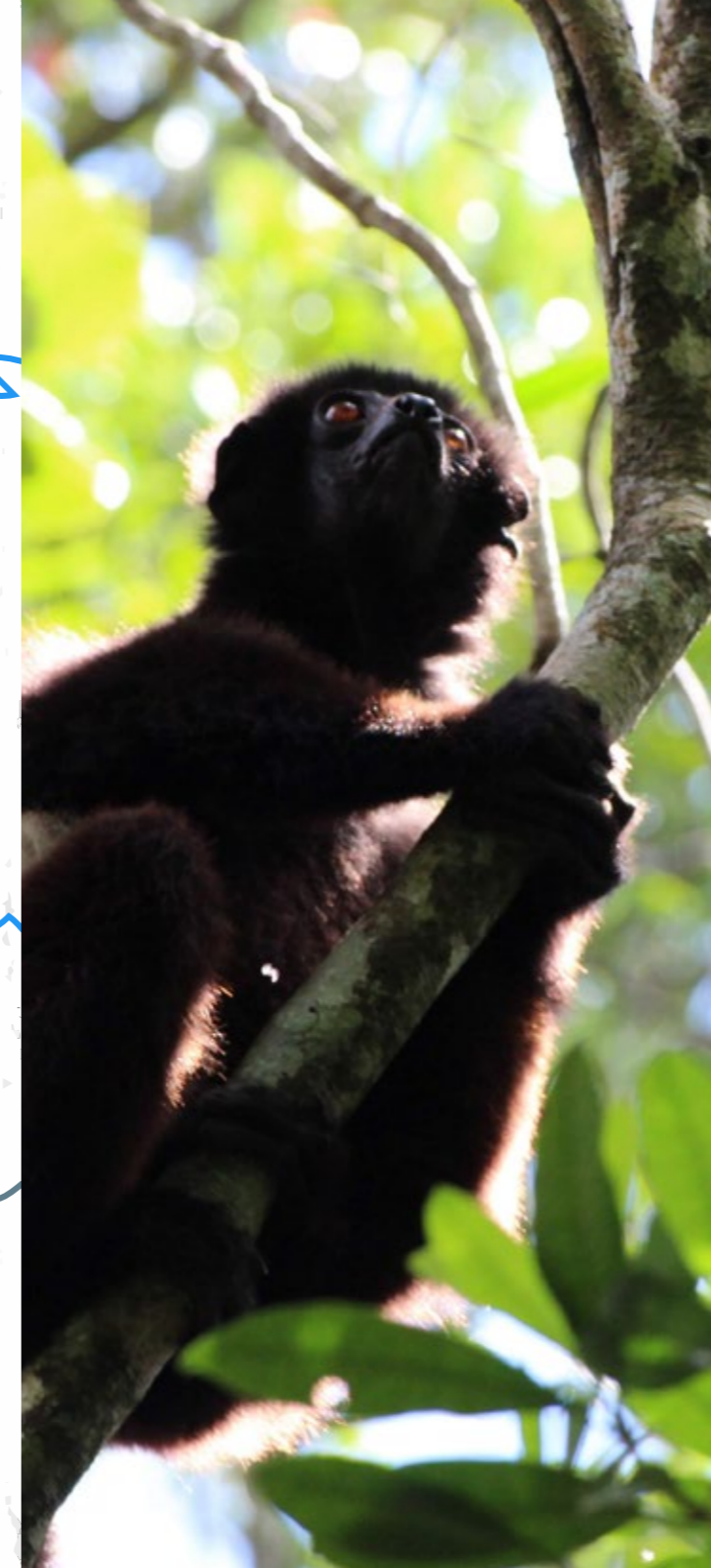
53.03% (n=1254), 17.52% (n=194), 1.25% (n=240) of the monitored trees were found dead. This plant species is an important food for six species of lemurs.

Propithecus edwardsi

Surveys on Milne-Edwards' sifaka, *Propithecus edwardsi*, have been conducted for more than thirty years by Patricia Wright and the CVB research team. Four groups of *Propithecus* from the two different sites (Valohoaka and Talatakely) have been monitored. This year, four newborn infants were born respectively on July 7th and 10th for Talatakely; and August 27th and 23rd for Valohoaka forest. The Talatakely female gave birth to an infant during two successive years. A new rival male entered in the group of Talatakely and killed the newborn infant in late August. The previously born male infant was also missing from the group. "Orange Blue" male, over 20 years old, was last seen heading west towards Sakaroa.

Long-term Monitoring

The long-term project "Tropical Ecology Assessment and Monitoring" ("TEAM") has been continuing this year at six separate sites. Rare species of terrestrial vertebrates, including the endangered lemur species aye-aye and Milne-Edwards' sifaka, were found, mostly within array 3 in the Andemaka and Bevoahazo sites of the northern part of the



park. Six carnivore species were also recorded and the fossa species *Cryptoprocta ferox* was noted in abundance. In relation to the climate, a total rainfall of 2,514 mm with mean temperatures ranging from 6 °C to above 29 °C were recorded. Dr. Steig Johnson with students from the University of Calgary visited some of the TEAM and “Participatory Ecological Monitoring” (‘PEM’) sites this year, to observe, discuss, and train CVB technicians on reforestation and camera trap methodology. These sessions were very well received, and gave the team many ideas for the future. We hope to welcome Dr. Johnson back next year.



Centre ValBio Biodiversity Surveys and Monitoring

Biodiversity Surveys at Ivohiboro forest

Under the collaboration of Centre ValBio, MICET, and the Rainforest Trust, a “rapid biological assessment for target species conservation” was conducted at Ivohiboro forest. Two field teams, working respectively on lemur and small mammal species, conducted daytime and nocturnal surveys. Camera and Sherman traps were used to detect other terrestrial vertebrates and small mammal species. Daily lemur surveys focused mainly



on the ring-tailed lemur, *Lemur catta*.

A second expedition occurred, headed by Patricia Wright and Pascal Rabeson, and including Mark Sidall (curator of invertebrates at AMNH), Suja Pelletier, Mai Fahmy, and Beatriz Otero. They discovered a new species of snail and possibly multiple leeches, as well as observing four groups of *L. catta*.

Prolemur simus surveys at Ivato Karianga

This year in a collaboration with MNP, CVB began a project to translocate 12 greater bamboo lemurs (*Prolemur simus*) from fragmented forests near Ivato to RNP.

A CVB team, along with veterinarians including Haja Rakontondrainibe, Tobias Gräble, Sina Feyer, and Cornell veterinary student Bekah Weatherington took health data on the lemurs. The veterinarians and the CVB darting team captured 12 animals and fitted them with radio collars and gave them medical checkups. Both ecto- and endoparasites were studied by Ezzeldin Enan. Amanda Du Bour studied feeding behavior after the 12 lemurs were released. Plant samples were collected for laboratory nutritional analysis. Bekah Weatherington looked closely at the feasibility of the project to translocate *Prolemur simus* to RNP. Eight local guides were trained to be able to follow and observe marked *Prolemur simus* by using a radio telemetry transmitter.

Prolemur simus surveys at Talatakely, RNP

In parallel with the Ivato Karianga project, two *Prolemur simus* individuals at Talatakely have been monitored. A team of CVB researchers and MNP representatives investigated the state of the group and the habitat type of Talatakely forest, to identify and discuss the potential large quarantine cage for the future translocation of the 12 greater bamboo lemurs.

Invasive Tree Disease

The spread of the fungus disease on the plant species *Calophyllum* has also been monitored. Surveys of forest sites of Valohoaka, Mangevo, Bevoahazo, Vatoharanana, and Sahamalaotra were conducted.

Participatory Ecological Monitoring at RNP surroundings:

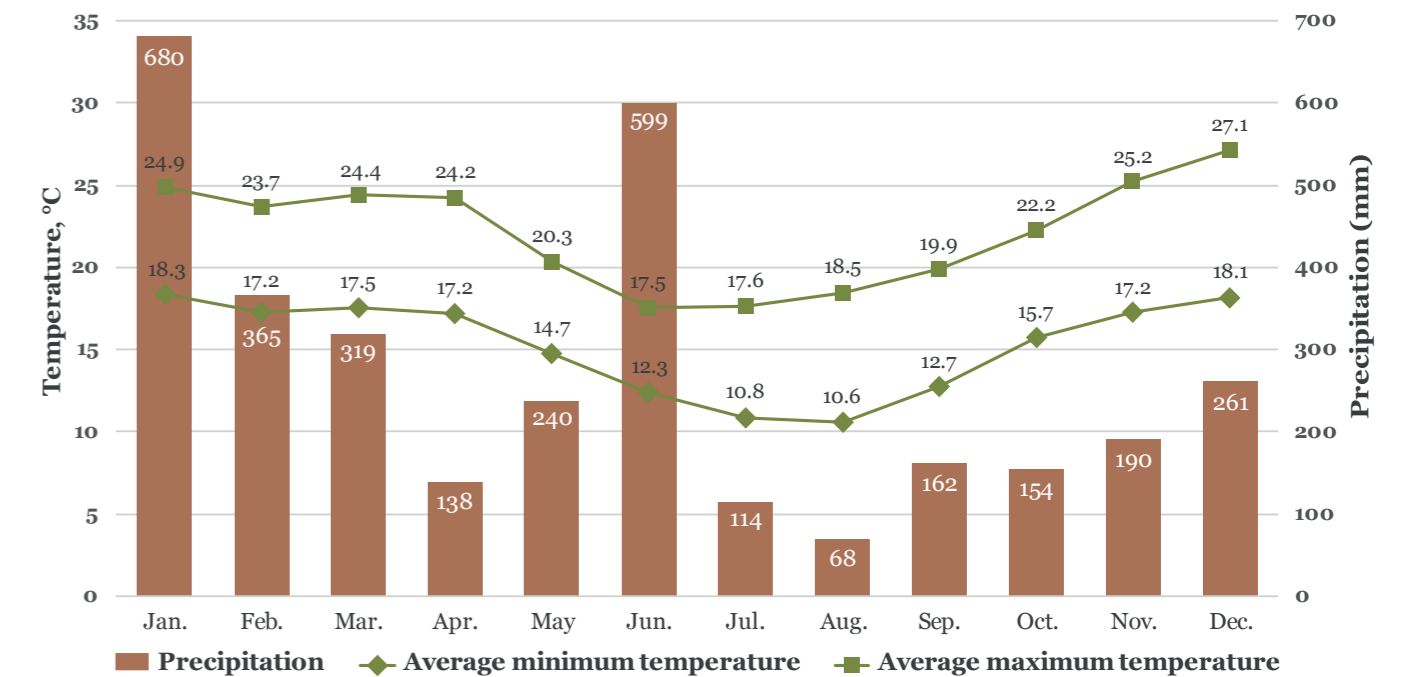
Kathryn Alessi, as part of her master’s thesis at City University of New York, compared human activity in four fragmented forest areas; Ambatolahidimy, Mangevo, Sahavanana, and Amboasary, south of RNP. In addition, biodiversity surveys within Ranomafana National Park, including Vatoharanana and Sakaraoa, were also conducted. Along two sets of two kilometer transects, primate and bird species, along with other vertebrates such as small mammals and chameleons, were surveyed.



Team Climate Data

As with 2018, January was the wettest month with **680 mm** of precipitation, closely followed by June with **599 mm**. The total amount of precipitation in 2019 was **3,291 mm** compared to **4,043.6 mm** in 2018. August overtook September as the driest month, with rainfall of just **68.4 mm**. The maximum temperature was a sweltering **35.5 °C** recorded in December, and the lowest temperature was **7 °C** recorded in August. December was the hottest month on average, at **22.6 °C**.

2019 Climograph of Ranomafana





Conservation

Lemur Translocation Project Ivato Karianga

This year, Centre ValBio invested in strengthening and expanding the collaboration we have with the local community in Ivato Karianga. This will help us with the planned translocation of the greater bamboo lemur (*Prolemur simus*) from the threatened forest fragment at Mahasoa to the safe and expansive habitat of Ranomafana National Park.

To demonstrate to the community that we were serious not only about biodiversity, but also their local community, we organised a small development project. Two large solar panels along with a battery were donated, giving them access to free electricity for the first time. As an in-kind donation, the community provided labour and construction materials. Following this, we donated 1,000 copies of a wildlife-themed colouring book, along with ten each of our resident artist Alain Rasolo's lemur, bird, and reptile posters to the local primary school. Afterwards, 200 notebooks and pens were distributed to the 4th and 5th grade students.

Following consent from Madagascar National Parks, two preparatory missions were undertaken. Firstly, a capture and release of a group consisting of 12 individuals in

the Mahasoa forest. The team consisted of CVB technicians along with Tobias Gräßle, a veterinarian from Germany (see p. 40), and Bekah Weatherington, a veterinary student from the USA (see p. 42). With this expert help on hand to ensure the safety and comfort of the lemurs, extensive samples were taken to understand the health of the individuals. Following this mission, local people were enlisted to monitor the lemurs, under supervision from CVB. Then a second mission was undertaken, again with a team of CVB technicians and veterinarians, to attach radio collars to five individuals, to assist with tracking.

Local preparation at Centre ValBio for the translocation has also progressed, with a site identified for the initial quarantine enclosure where the lemurs will stay before being released into Ranomafana National Park. Additionally, a botanical plot for bamboo was established, to allow nutritional analysis at a later date.

With preparations largely complete, we are hopeful that the translocation will be completed as soon as our dedicated team is able to return to the field, and we can monitor the lemurs as they get to know their new home in Ranomafana!



Reforestation

In collaboration with Catholic Relief Services and The St Andrews Prize for The Environment, CVB continued its successful village reforestation project. Core operations in Ranomafana comprise two nurseries managed by the CVB Reforestation Team: the upper campus endemic tree nursery, and the Kianja Maitso tree nursery operated in collaboration with Madagascar National Parks. Each nursery can now produce roughly 10,000 seedlings each per year, many of which get planted around Ranomafana National Park. At the upper campus nursery, 9,450 seedlings were grown, enabling us to conduct several reforestation sessions. For instance, as well as the seedlings used

for the SPICES project (see p. 16), 3,220 seedlings were planted around the village of Ranomafana by CVB's staff and stakeholders including the gendarmes of Ranomafana, National Geographic student expeditions, University of Florida study abroad students, and many others!

At Kianja Maitso, nursery construction was completed at the end of November, with seedlings expected from January 2020 onwards. This is the second major nursery operated by CVB, and represents a large increase in capacity.

Farther afield, in Kelilalina, construction of 11 endemic tree nurseries in separate villages



was completed in October, with seeds sown from these nurseries becoming available by November. In order to have the seedlings ready in these nurseries, numerous seed collection sessions were conducted, resulting in 389 kilograms of seeds being gathered. These nurseries are managed by the CVB Reforestation Team in conjunction with local communities that are motivated to reclaim their natural forest. Each of these tree nurseries will produce upwards of 5,000 seedlings that can be planted in the 2020 reforestation campaign. Given this, we are targeting a total of 55–65,000 seedlings planted during 2020 around these villages. Hopefully, this will usher in a new era of harmony with the forest.



SPICES Project

This year, after being a finalist for the St Andrews Prize for the Environment, as well as gaining funds from our partnership with Catholic Relief Services (CRS), we have been able to expand our reforestation programs to include SPICES (Securing and Protecting Investments and Capacities for Environmental Sustainability).

The SPICES project teaches and encourages local farmers to grow endemic trees with high value crops like vanilla orchids and rainforest black pepper growing on these trees. In the SPICES project, the main component is the introduction of the agroforestry system to the local community. Native trees are planted and high value plants, such as vanilla or wild pepper, will be placed on the branches and trunk.

Indeed, there are 24 mother nurseries in the SPICES project. These mother nurseries are found in two regions and 18 communes. Each nursery will annually produce: 12,000 saplings of indigenous plant species, 18,000 saplings of spice species such as cloves, cinnamon, vanilla, wild pepper, other valuable spices, and 2,000 fruit trees. In total, one nursery would annually produce 32,000 seedlings.

The main role of CVB in the SPICES project



is ensuring the production of 12,000 trees of endemic species in the mother nurseries. A training workshop on construction and maintenance of nurseries was held by CVB and CRS technicians in August with 24 nurserymen and women from the 24 mother nurseries and CRS and CVB technicians.





Community Outreach

Centre ValBio is working in over **50 communities** around Ranomafana National Park (RNP) to provide environmental education and access to healthcare, as well as to facilitate community development and strengthen income-generating opportunities.

Environmental Education

Rainforest Class

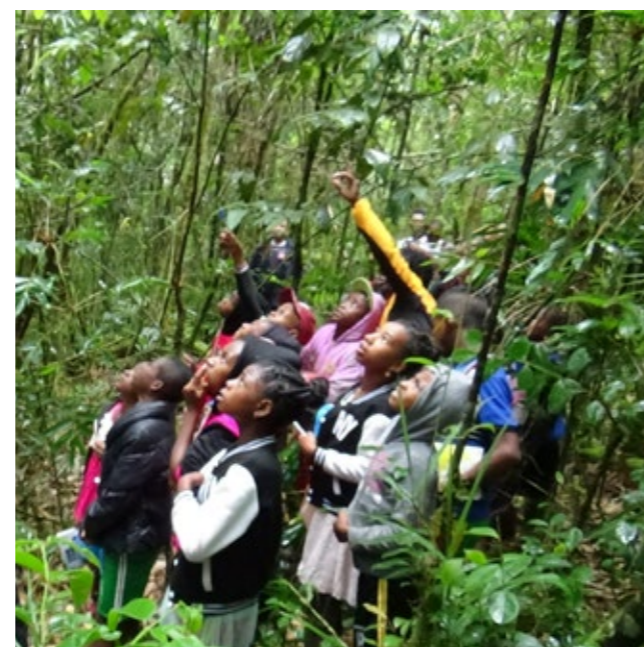
Rainforest Class is an eco-friendly educational program for schools. The program, supervised by Jean Némèse Randriarimanana, works with 16 public schools along the main road in Ranomafana National Park. The main goal is to teach and inspire the children to understand the value of biodiversity.

This year took a participatory approach; our team worked with 4th graders as well as secondary and high schools to better understand biodiversity, the rainforest, techniques for planting trees and better practices in hygiene and sanitation. Visits to Ranomafana National Park were very inspiring for the children. Biodiversity posters of Ranomafana National Park, illustrated by Jessie Jordan, were used as a tool to teach local biodiversity to students. In total, 1,715 students were involved, of which 54.16% were from primary, 38.60%

were from secondary, and 7.18% were from high schools. In addition, 20 teachers were trained about environmental education in October 2018.

My Rainforest, My World

This program entered its fourth year of conservation education in remote primary schools. This school year, 305 students from 15 schools benefited from a four days a week of class. As part of the program, two trainings were organized to prepare the intern teachers for the school year. As a result of the program, production of vegetables increased of 31% compared to last year, and 284 more native trees were planted.



As part of a collaboration between long-term partner Oakland Zoo and Centre ValBio through The Three Graces Foundation, a new two classroom school was built in Ranovao. The Community of Ranovao, southeast of Ranomafana, as well as the Commune of Ranomafana also collaborated with the funding and construction.

The students of the program had the chance to visit Ranomafana National Park and presented their work to their parents through a project presentation. Each student who graduated to the next grade received a backpack, and as you can see below these were very well received!



“I have eight children and five of them are in school. My wish is that they will all succeed and will have a better life than I had. I believe that if they succeed in study, even if they go back to do agriculture in the remote village, it will be different and they will be more productive than I am.”

- Father of one MRMW student in Aboasary



Environmental Arts

In June, residents celebrated the annual Environmental Day with a parade, speeches, dances, and music in the commune of Androy west of RNP.

Artists-in-Residence

Deborah Ross, a wildlife artist and professor at The School of Visual Arts, NY, led a series of nature and watercolour workshops in Ranomafana in the spring of 2019. The first series was with the children of Ranomafana sponsored by Madame Josiane of MNP and CVB. She was assisted by Tre Lawrence, Jean Nemese, and Jean Claude. The children were led through the National Park by park guides and learned about their plant and animal neighbours in the forest. The next several sessions were held in Kianja Maitso for the children to paint the observations of the forest in watercolour. Great happiness was felt by all. Deborah also ran a series of painting workshops with Lova Razafindravony and the rest of CVB Education Team for participants in the My Rainforest, My World programme. These included forest hikes and painting sessions for the children to describe their forest encounters.

Deborah's art classes for local children have become very popular, and we look forward to welcoming her and her students back very soon!



Jessie Jordan returned to help coordinate January's inauguration of the new SOS Biodiversity Research Center. She continued to utilize her skills in graphic design towards important CVB communication pieces throughout the year. She developed a biodiversity illustration featuring over 50 endemic species found within Ranomafana's forest, then crowd-sourced funds to print and distribute copies to schools and public education spaces throughout the region in collaboration with the Education Team. Later

in the year she raised funds and spearheaded an epic 24 hour World Lemur Day Festival in Ranomafana, which attracted thousands of people from many different backgrounds, including the US Ambassador. She has not only proven herself as an exceptional team player, but also as a budding leader in the field of wildlife conservation. Jessie continues to use her creative skills to cover stories on the frontlines of conservation through social media.



Alain Rasolo, Malagasy artist, worked on designing CVB's annual report. With National Geographic Student Expeditions, he developed and helped to paint a Madagascar and a world map mural, featuring iconic fauna and flora species, in Kelilalina's primary school. Rasolo continues to create intricate watercolors of Ranomafana's species and other scientific illustrations for wildlife conservation and education. In August, he joined a team of researchers from the association Timarcha (Sorbonne Université) as a field artist, illustrating the beauty of Isalo's canyons and the variety of its ferns. Rasolo also helped with the organization of Ranomafana's World Lemur Day Festival. With funding, his artworks can be printed and used as educational materials in classrooms around Ranomafana and throughout Madagascar.

Conservation Clubs

Conservation Clubs, one of the educational programs at CVB, inclusively integrate local communities into biodiversity conservation programs such as reforestation, farming, and well-being promotion. In addition, art, music, hygiene, and sanitation activities have been promoted with the collaboration of the villagers to encourage life quality improvement. CVB Conservation Clubs, in partnership with CRS, work in the communes of Ranomafana and Kelilalana.

This year Conservation Clubs have introduced new technologies to mobilize communities: scientific audio-visual materials about farming and modern agriculture. In collaboration with Scientific Animation Without Borders (SAWBO) they used audio visual materials to instruct farmers about composting, water filtration, and the use of cassava flour to improve nutrition. **Four** illustrated videos were produced, translated into the Malagasy language and broadcast during expeditions to remote villages.

Conservation Clubs partnered with BeLocal Group (an NGO focused on social engineering and based in USA) to encourage and empower communities to challenge local issues. This year, BeLocal conducted workshops and demonstrations about the production of biochar (green charcoal). **Five** pilot villages

were trained in hopes of having more villages produce biochar next year.

Thanks to funding from Bergen Highlands/Ramsey Rotary Club, the construction skills of Ny Tansika, the workforce of the CVB Conservation Clubs, and local government officials, boreholes were built in Nanda and Ambanja. Now over **600** people have safe, drinkable water.

Through expeditions to the remote villages, Conservation Clubs followed up with village members about vanilla farming, hygiene, and sanitation. In Ambohiniaonana, **five** Conservation Clubs were given training on how to grow and to produce high quality vanilla. More than **100** vanilla plants have been monitored for good farming practises. In



Miandrivany, **22** members of Conservation Clubs were able to maintain a social fund using the profits from cash crops such as coffee. As they can make money from this income source, people are excited to continue cash crop farming.

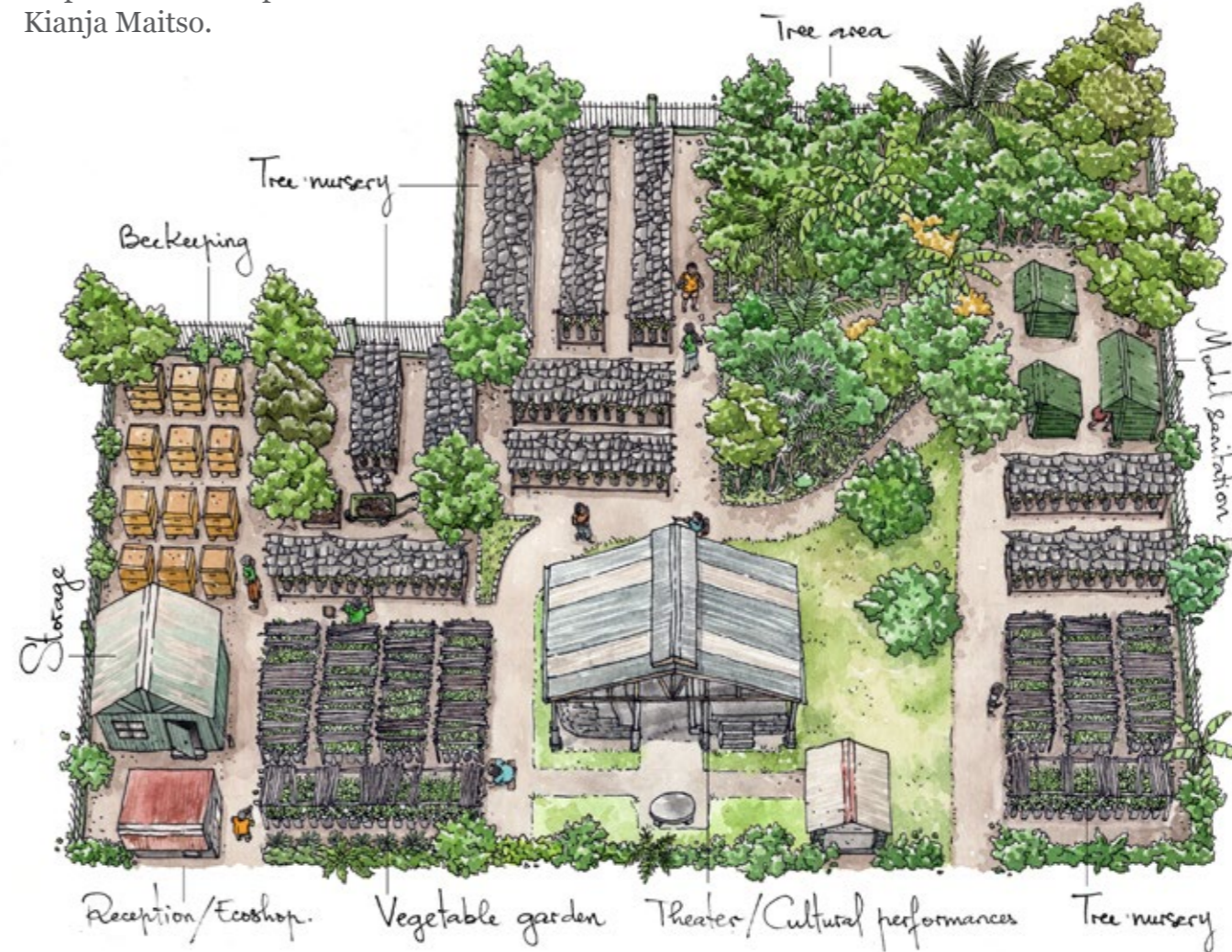
Promoting young people in community leadership and commitment, Conservation Clubs participated in the third CRS Youth Summit hosted at Centre ValBio this year. The conference gathered **106** participants from public and private sectors. The main focus was the potential for Malagasy youth to take charge of their future. The summit encouraged youth to have a positive influence and to remember the motto “we will be victorious”.

Conservation Clubs also collaborated with Cultivating New Frontiers in Agriculture (CNFA) in the Farming-to-Farming project takeoff in Vatovavy Fitovinany region this year. This project is funded by USAID and supported by volunteers. The Minister of Agriculture has launched trainings about fish farming, aiming to strengthen the capacity of fish-farmers in the region. CNFA donated tools and equipment such as digital scales, files, and measurement tests for water quality to trainees. **Nine** fish farmers from Conservation Clubs in Miandrivany and Andranomainty benefited from this project.

Kianja Maitso

In October, Gems of Madagascar (a Colorado-based charity run by Michelle Rahm that has been supporting Madagascar and Ranomafana for a number of years) generously funded the construction of a covered amphitheatre and pavilion at Kianja Maitso.

This greatly enhances the capabilities of the project, and the space is already becoming a hub for the community. This includes on-going production of saplings to support the national reforestation drive.





Community Healthcare

CVB Health Team

The CVB Mobile Health Team continued to work with and serve 24 remote villages around Ranomafana National Park.

In total, 2,250 patients were seen, some multiple times. As with previous years, respiratory illnesses were the most common problem.

There was over a 100 case decrease in malaria cases treated from 2018 to 2019, which remain the second most frequent illness encountered. This decrease could be caused by the increase in use of bed nets.

This year, 46% of the treated patients were under the age of 14. For children, respiratory diseases, malaria, and diarrhoea are especially dangerous. For that reason, improving medical care access for young people in remote areas remains one of the Team's biggest challenges.

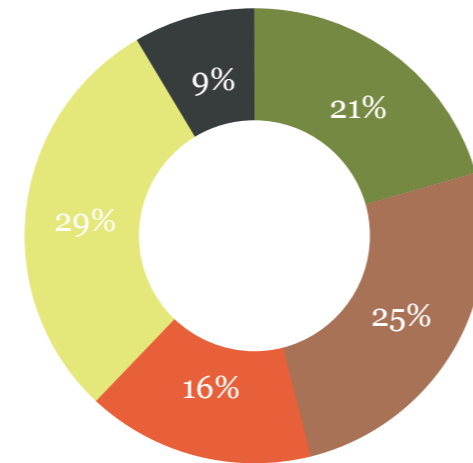
Another focus over the past twelve months has been to follow the evolution of chronic diseases such as high blood pressure, asthma, and epilepsy. 8% of the patients treated had one of these three diseases.

During 2019, the Team developed a strategy to improve sanitation and hygiene awareness in villages when they were visited during

expeditions. Using both audio and visual resources, the Team raised awareness in their target population of basic activities villagers could perform to improve their health. It was a success, and a good experience for the Team to expand their outreach in this way.

2019 was another successful year for the Health Team in terms of teaching and cooking demonstrations, with 150 completed. The Team trained around 500 people in 20 villages. The ingredients used are based on locally available products, and the team modifies the demonstration to accommodate this. The Team started this initiative to help combat malnutrition with healthy, affordable eating.

Distribution of Treatment by Age



■ 0 to 4 ■ 5 to 14 ■ 15 to 24
■ 25 to 59 ■ 60 & Older



The Team was pleased to continue their partnerships with local, national, and international organizations and institutions. Notably, Pivot generously supplies the Team with 40 essential drugs from the WHO model list of essential medicines.

Nationally, Centre ValBio has been represented in national and regional PHE workshops four times.

The Team also assisted the Stony Brook Dental Team when they performed free tooth extractions for local villagers.

Looking ahead, the Health Team plans to identify and train educational leaders in villages. These individuals will work to improve health awareness in villages, culminating in a formal agreement with the village for a yearly action plan. This will help to empower the villages to feel in control of their healthcare.



2019 Treatment Breakdown

Diarrhea

44

Oral Health

134

High Blood Pressure

135

Malaria

225

Respiratory Health

590



CVB Technology Development Initiative

The Research Technology Department at Center ValBio is tasked with developing the next generation of scientific tools to expand the abilities of the campus and its researchers to conduct the cutting-edge research that sets Centre ValBio apart. In 2019, CVB announced two projects Razana and AfterRes.

Razana (a Malagasy word meaning ancestor spirits) will utilize long endurance drones equipped with onboard machine learning computers to greatly increase our knowledge of the forest and our ability for rapid detection of forest disturbances. The entire Razana drone system has been engineered by Jesse McKinney to meet the needs of conservation researchers for a low cost, fully autonomous ecological drone that can in real-time report back what it observes even at extremely long distances from its launch site. Razana will utilize the drone launch complex on the north campus to take off, stay airborne for around five hours while monitoring the ecosystem for a wide array of parameters or disturbance, then land back at Centre ValBio all on its own. The Razana drone has a modular compartment allowing for five second swaps of a number of payloads. Likewise, physically operating the drone is simplistic, requiring no trained pilot and both missions and ma-

chine learning models can be developed anywhere in the world, and remotely uploaded allowing data to be gathered regardless of the physical location of the researcher. Following trials, we hope to be exporting this drone to a number of scientific campuses around the world, creating a global surveillance network and a community to further develop and share hardware, core software, and machine learning models.

The AfterRes system will use swarms of dissolving drones that crash into tree canopy as a means of rapidly populating areas that are ultra-remote with a high fault tolerance data network for research. The drones are built using a biodegradable polymer material 3D printed around a specially engineered internal structure. This structure provides necessary flight performance while promoting full, rapid decomposition into completely non-toxic compounds. In dry season trials this full decomposition happened in under 30 days, in wet season we expect it to occur in less than three days. After deployment, all the electronic components left behind—flight controller, mesh telemetry unit, battery, and even motor—undergo a metamorphosis into a fully functioning mesh network relay, capable of both long distance backhaul transmission and end user connectivity.



BeLocal Group

BeLocal, a NGO created in 2016 (represented in Madagascar by Leila Esmailzada, Andry Andriamiadanarivo, Caroline Rojotahina, and Jessie Jordan), is dedicated to finding global solutions to local challenges. Charcoal is a major threat to the forest, and home charcoal use contributes to the leading causes of death and illness in Madagascar. Previous interventions, like chimneys, efficient stoves, and ethanol, have had little success. However, BeLocal is introducing a fuel alternative made from agro-waste that is cheaper and more efficient than conventional charcoal through a data-driven, iterative process.

In 2019, BeLocal has made significant headway on the Charbon Maitso (Green Charcoal) initiative. They started the year with a Train-the-Trainer workshop hosted at Centre ValBio. The workshop trained 20 participants from rural villages who were interested in learning how to join the movement towards sustainable fuel in Ranomafana. To maintain consistent follow-up and guidance with the new trainees, BeLocal began collaborating with local Peace Corps volunteers. Throughout the year, the new trainees spread their knowledge by holding independent workshops in their own communities. In under six months, Charbon Maitso had a regular presence in five villages around RNP.

The new Charbon Maitso groups made adjustments to improve the quality of their product based on data-driven feedback and adjustments to make their production more efficient. This research has improved their product's performance to compete with traditional lump-wood charcoal prices.

The groups then began to see Charbon Maitso as an income generating activity. Long-term field researchers at Centre ValBio made the first purchase of Charbon Maitso to bring out with their field team to cook their meals. In addition, the outdoor kitchen at Centre ValBio is making the transition to using this more sustainable fuel alternative.



Restoring the Lost Forest of Ivohiboro

To create a brighter future for the Lost Forest of Ivohiboro, CVB partnered with the Rainforest Trust and the Phoenix Conservancy in 2019 to safeguard the forest from wildfire and begin restoring the isolated rainforest. The Phoenix Conservancy focuses on the restoration of critically-endangered ecosystems, and has been developing a restoration plan for Ivohiboro with CVB since 2017. The Rainforest Trust save endangered wildlife through community engagement and local partnerships. The joint plan was put into

action in 2019, creating a first line of fire defense for Ivohiboro, while restarting forest regeneration.

With the assistance of more than 200 local villagers, approximately 3.5 km of initial firebreaks were constructed in November 2019 to protect Ivohiboro's northwest section. Thousands of seeds of fast-growing pioneer species were sown along fire-protected berms. These pioneer species tolerate harsh conditions found in fire-degraded grasslands, acting as nurse plants that provide shade, nutrients, and shelter for rainforest species. This in turn creates a new front line for rainforest, allowing Ivohiboro to begin expanding

into inhospitable degraded areas.

At all stages, the restoration plan creates economic opportunities tied to forest stewardship. Whether through employment building firebreaks and restoring rainforest, or by selling locally-collected pioneer seeds to The Phoenix Conservancy for reforestation, local community members benefit directly from caring for their forest.



Research Station Use

In 2019, Centre ValBio hosted **381** individuals from **36** different countries conducting research in Ranomafana National Park and its surrounding communities, using our laboratory, participating in training, workshop, or Study Abroad programs, or taking a tour of our facilities and attending a lecture.



Researchers

229 individual researchers stayed at CVB in 2019. The average length of stay was **27.7** days. The majority of researchers were American (**60.26%**) and Malagasy (**21.4%**). This year, CVB welcomed visitors from all **six** inhabited continents!

Scientific Tourists and Tour Groups

The total number of people given tours in 2019 was **2,127**. The majority were students (**1,792** students) and the rest were scientific tourists and ordinary visitors (**335** people).

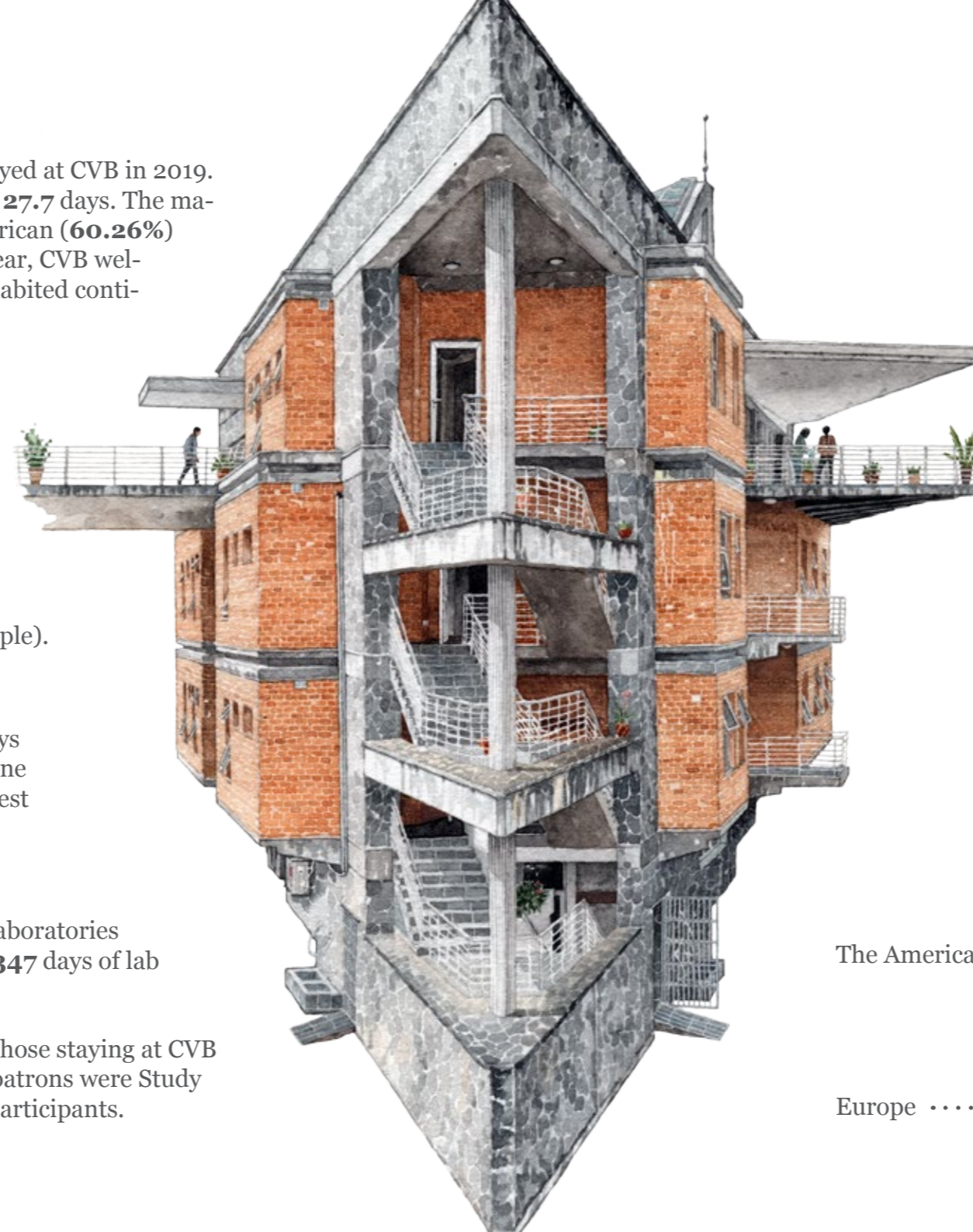
Station Days

The total number of station days increased in 2019 to **4,957**. June through October were the busiest months.

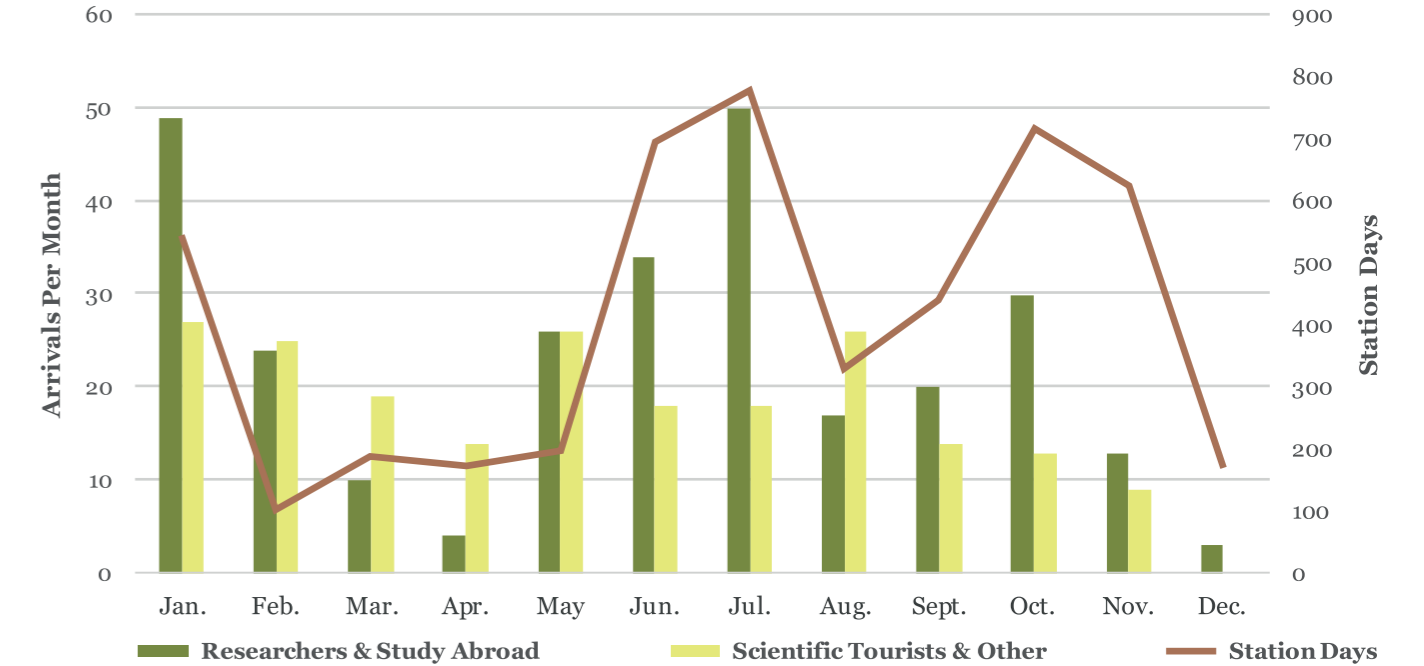
Laboratory Use

24 researchers used the CVB laboratories in 2019, for a total number of **347** days of lab use.

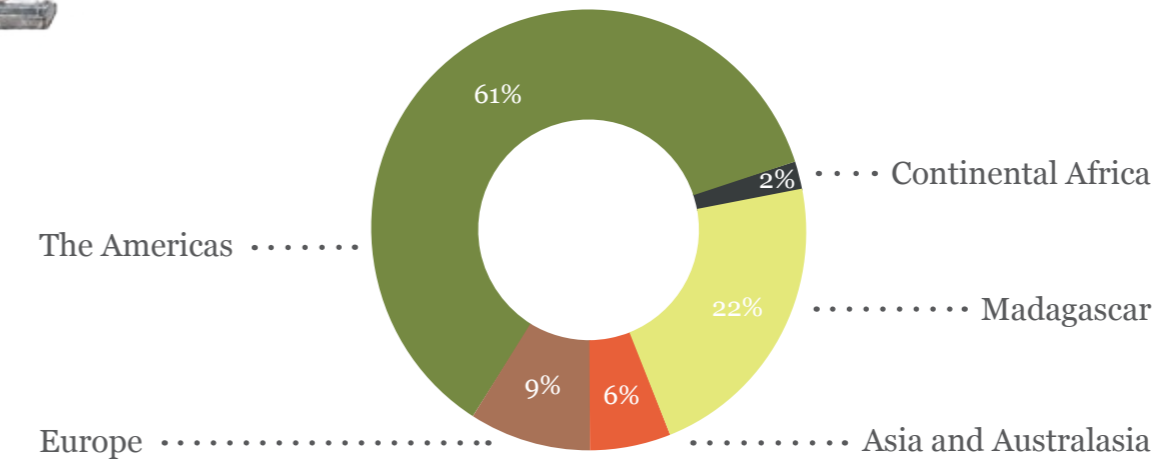
Researchers made up **25%** of those staying at CVB in 2019, while **75%** of station patrons were Study Abroad, course, or workshop participants.



Arrivals Per Month & Total Station Days



Station Users By Origin





*Year in
Numbers
&
Countries
of Origin
of CVB Guests*

348

Total scientific visitors

433

Individual visitors

4,957

Station days at CVB

6,721

Free healthcare consultations provided

140

Study Abroad students

36

Countries from which CVB received visitors

90,000

Square meters of land reforested

c.1,500

People participated in World Lemur Festival

826

Scarves sold by Famiova

8,355

Days spent in the field

30

CVB scientific publications

4,957

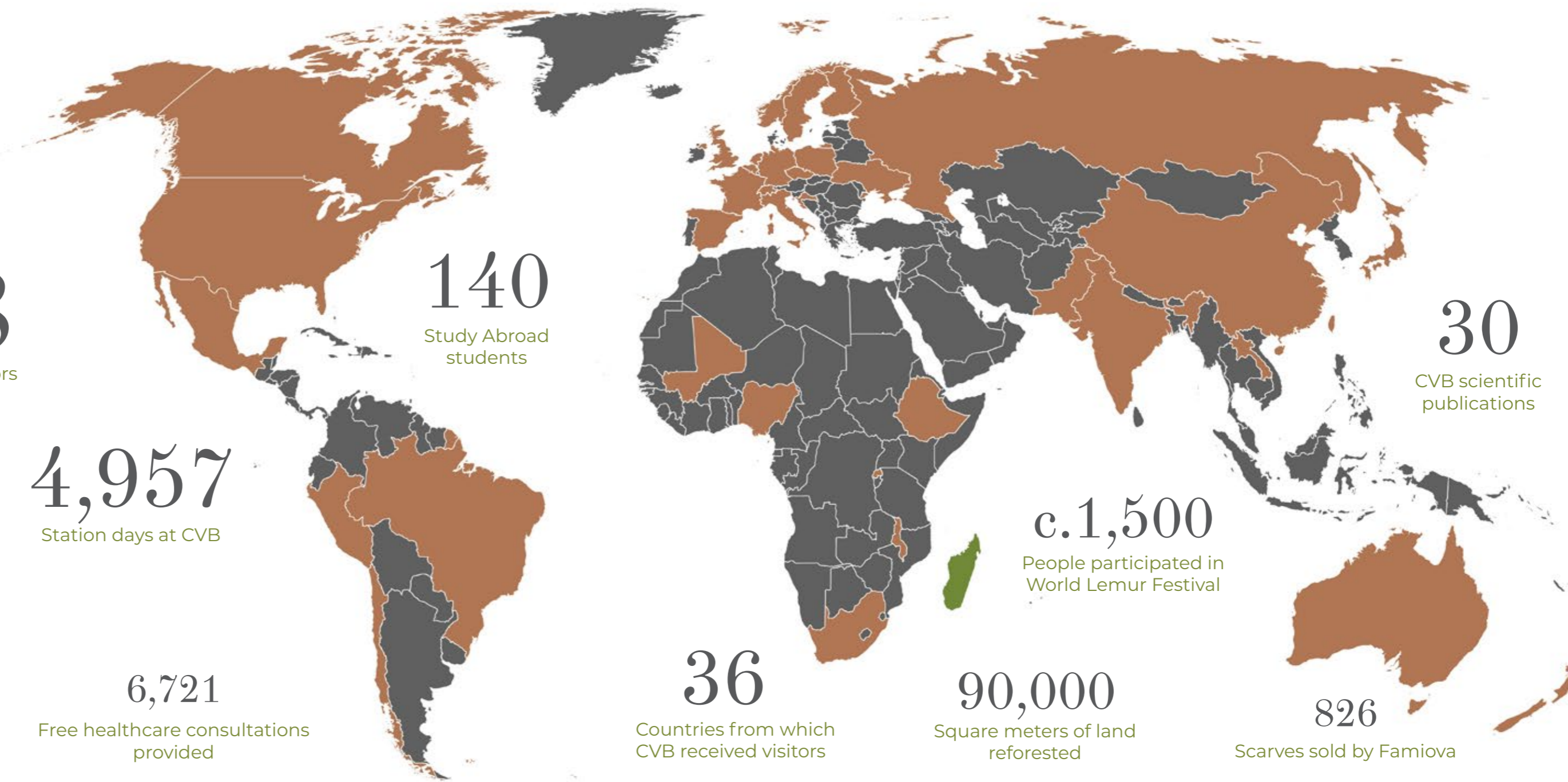
Station days

1,949

Field trips visitors (all nationalities)

12,952

Followers on social media



2019 Researchers

Kathryn ALESSI (The Graduate Center, City University of New York) and Manda Haingotiana RAKOTONDRABE (École Normale Supérieure, University of Antananarivo) evaluated and assisted with the existing Centre ValBio Participatory Ecological Monitoring programme through inventory and evaluation of any lost or damaged forest within six fragmented forests in the southern region of Ranomafana National Park.

Andrea BADEN (Hunter College, City University of New York) and her team: Ford BENDELL, Tre LAWRENCE, Randy JUNGE (Columbus Zoo and Aquarium), Timothy WEBSTER (University of Utah), Fidy RASAMBAINARIVO (University of Missouri-St. Louis), Eliette NOROMALALA (University of Antananarivo), and Mirana Jeanne Evah RAHARINIRINA (University of Antananarivo) continued their long-term research surveys and monitoring, and looked at the breeding physiology and infant care strategy of *Varecia variegata* at Mangevo forest.

Carly BATIST (City University of New York) and Mendrika Nina RAZAFINDRAIBE (University of Antananarivo) examined how behaviour, vocal communication, and social structure determine territoriality, predator-prey interaction, and breeding strategy in *Varecia variegata*.

Aina BRIAS-GUINART, Marketta VUOLA (both University of Helsinki), and Andrianirina Odile RAFANAMBINANTSOA (University of Fianarantsoa) investigated the impacts of education on the conservation of the biodiversity within Ranomafana National Park.

Molly CAIN (Indiana University) and Mario MUSCARELLA investigated how rice fields impact water resources in Madagascar by surveying sites surrounding Ranomafana National Park.

Gabriella CARVAJAL (Stony Brook University) recorded lemur vocalizations within Ranomafana National Park to serve as acoustic references for threatened lemur species.



Santiago CASSALETT (City University of New York) continued to examine the implications of lemur nutritional niches on species coexistence and conservation.

Steve COLLINS, Colin CONGDON, Ian BAMPTON (all from the African Butterfly Research Institute), and Jean Claude RAZAFIMAMPIANDRA (University of Antananarivo) continued to conduct systematic reviews by collecting lepidoptera specimens in Ranomafana and surrounding area to investigate the role of development and phenotypic plasticity in speciation, as well as the ecological functions and evolutionary patterns of sexual characteristics.

Mariah DONOHUE, Eric KOWALEWSKI (both University of Kentucky), and Stella NOMENJANAHARY (University of Antananarivo) studied the role of intestinal microbiomes in speciation and sexual selection in *Eulemur* hybrids *E. cinereiceps* and *E. rufifrons* in Ranomafana, Isalo, and Andringitra National Parks in the southern region of Madagascar.

Amanda DU BOUR (Northern Illinois University) and Maherizo Nirina Jacqueline RANDIMBISON (University of Antananarivo) investigated the nutritional values of dietary components for *Prolemur simus*, and also assessed the feasibility of the lemur translocation project for RNP.



Mark Krasnow & Team

As the sun goes down over the cloud forest, most researchers are finishing dinner and getting ready for bed. One group, however, are just starting their day's work. Haja and Mahery Razafindrakoto, Caitlin Karanewsky, and Zeph Pendleton don headlamps and go out to the forest with Victor Nirina Rasendry and Justin Rakotonjatovo to check on traps set that afternoon. The first GPS marked location they check is furthest from the field station, and they work their way back along the trail as they collect the traps. Most of them are empty, but some contain a small primate hiding at the back of the metal box, lured in by a generous slice of banana.

The mouse lemur, the smallest prosimian in the forests of Ranomafana National Park, may hold the genetic keys to understanding primate biology, behavior, conservation, and disease. It is for this reason that the Krasnow group ventures out into the dark each night in search of more data. Many genetic studies rely on manipulation or modification of the study species' genes but, with many individuals and dozens of assays, it is possible to find naturally occurring mutations in relevant genes. Each lemur gets a full veterinary exam, a variety of blood tests, and a small biopsy of skin from the ear, which is used to grow their cells. The exams take an hour or two, then all the animals are released back into the forest, at the exact locations where they were captured. So far the team has identified dozens of animals with abnormal traits and has begun mapping the genes underlying these traits. The ambitious long-term goal is to examine all the mouse lemurs on the island!

In order to achieve such an ambitious goal, the Krasnow team has enlisted the help of Hanta Rasamimanana, Soatra Rakotonomenjanahary, and their ENS students at the University of Antananarivo to help teach hands-on science to high school students near the research station. This program is continuously expanding to more schools, and we hope that some of the students involved

will become our future scientific collaborators.

As is so often the case in science, the Krasnow team made an unexpected discovery while conducting their study. Examination of the genomes of some of the individuals indicates that they belong to two separate species! This came as a surprise to everyone at Centre ValBio since the mouse lemurs at this field station have been studied for many years by many different researchers without any indication that they were not a single species. In fact, even the Krasnow team's detailed phenotypic exams do not seem to reveal obvious differences. However, the mouse lemurs themselves must be able to distinguish between each other since they do intermingle but appear not to interbreed.

The Krasnow lab mouse lemur genetics project is ongoing and we are excited about uncovering the mechanisms by which these "super-cryptic" species distinguish themselves, continuing to identify individuals with unique traits and map the responsible genes and mutations, and further developing our understanding of the biology, behavior, and conservation of this fascinating primate. The team is very thankful for the help they have received from Pat Wright and from everyone at CVB. The project would not be possible without it!

Dr. Onja H. Razafindratsima

Seed dispersal by animals (zoochory) is a common mode of dispersal for many plant species worldwide, especially in tropical ecosystems. In the rainforest of Ranomafana National Park, in particular, a majority of plant species have traits adapted for zoochory. Using the diverse fauna and flora in RNP as a model system, Dr. Razafindratsima's research seeks to provide new insights to advance the field of seed dispersal ecology, including the impacts of animals on plants – from the individual level to population and community levels, the implications of this plant-animal interaction on the ecology of both partners, and the consequences of losing animal seed dispersers on ecosystem health.

Dr. Razafindratsima has been studying the multi-faceted aspects of seed dispersal by three large-bodied lemur frugivores (red-bellied lemur, red-fronted lemur, and black-and-white ruffed lemur) in Ranomafana, since 2010 when she was a Ph.D. student at Rice University. She led a dedicated team of research technicians and local guides at Centre ValBio in Ranomafana along with Malagasy university students in field expeditions aimed at collecting data on lemur feeding and defecating, which were combined with an investigation of the lemur movement patterns in several field sites within RNP and

a set of experiments within the forest. Dr. Razafindratsima's Ph.D.'s research demonstrated that nonrandom seed dispersal by lemur frugivores could positively affect plant populations, and structure the spatial associations and the interactions between plants within a community. From these perspectives, losing these large-bodied lemurs would influence vital ecosystem services to human well-being, such as a decrease of the forest's potential to store carbon.

Dr. Razafindratsima recently started an Assistant Professor position at South Dakota State University. Her research group plans to continue working on this important subject amidst the rainforests of Ranomafana.



“I hope my work will have important conceptual implications for understanding the dynamics and functioning of plant communities and the ecological impacts of plant-animal interactions in biodiverse tropical environments.”

- Dr. Onja Razafindratsima

Mai FAHMY (Fordham University) and **Mark SIDDALL** (American Museum of Natural History) accompanied the expedition to the Lost Forest to continue their work using iDNA analysis to identify biodiversity otherwise not recorded.

Zo Ella Samuel FENOSOA (University of Antananarivo) continued to study the dissemination of the parasitic plant *Bakerella* sp. by frugivores and the effects of its infection on the community of plants in humid forests in eastern Madagascar.

Mark HOFFMAN (Technische Universität Braunschweig) and **Mahandry ANDRIANARIMISA** (University of Antananarivo) conducted surveys and genetic identification of entomologic diversity, especially of prey insects and parasites of the herpetofauna within Ranomafana National Park.

Steig JOHNSON (University of Calgary) monitored and evaluated the “Tropical Ecology Assessment and Monitoring” and “Participatory Ecological Monitoring” projects.

Roxanne KARIMI (Stony Brook University), **Luis FERNANDEZ** (Wake Forest University), **Claudia VEGA** (Centro de Innovacion Cientifica Amazonica), and **Kenneth DAVIS** (United Nations Environment Programme) followed up with the rapid environmental assessments of mercury release, fate, and

transport by picking up traps put along roads and near suspected areas as part of Madagascar's National Action Plan to reduce mercury usage.

Katherine KLING (Stony Brook University) continued to conduct surveys of the population of *Eulemur rubriventer* in the corridor and forest fragments of Andrambovato, Ambalavero, and Tolongoina.

Mark KRASNOW, **Caitlin KARANEWSKY**, **Jozeph PENDLETON** (all Stanford University), **Andriamahery RAZAFINDRAKOTO** and **Hajanirina Noeline RAVELONJANAHARY** (University of Antananarivo) continued the long-term monitoring of mouse lemur population, investigating mouse lemur genotypes and phenotypes, with the goal of detecting genetic disease and divergence, in mouse lemurs in and around RNP. They also pursued their teaching program at Kelilalina high school with the École Normale Supérieure, University of Antananarivo.

Chien LEE and **Pearl LEE** (both C.L. Wildlife Photography and Nature Tours) conducted biodiversity photographic projects within Ranomafana National Park and surroundings, with the long-term objective of producing educational and recreational books promoting Ranomafana National Park.

Amanda MANCINI (City University of

New York /NYCEP) and **Mirana Jeanne Evah RAHARINIRINA** (University of Antananarivo) conducted botanical evaluations at five sites to assess forest regeneration over the past 25 years since the creation of Ranomafana National Park.

Omer NEVO (Institute of Evolutionary Ecology and Conservation Genomics, Ulm University) and **Diary RAZAFIMANDIMBY** (University of Antananarivo) continued their project on chemical ecology of seed dispersal by lemurs.

Beatriz OTERO-JIMINEZ and **Maminaina Haja Fabrice RAZAFINDRABE** (University of Antananarivo) conducted complementary biological inventories within the forests of Ivohiboro and Analamary, in the southeast of Madagascar.

Urmi PODDAR (Stony Brook University) and **Maherizo RANDIMBISOA** (University of Antananarivo) investigated a forest restoration pilot project along the forest corridor and Tolongoina areas in Ambalavero and Ambodivanana.

Timothy RAXWORTHY (Hampshire College) continued surveys on vanilla bean farming in Madagascar, looking at the economic and social aspects of policy and development.

Onja RAZAFINDRATSIMA (South Dakota State University) and Veronarindra RAMANANJATO (University of Antananarivo) continued to investigate the mechanisms behind, and consequences of, the spread of *Psidium cattleianum* in the rain forest of Madagascar.

Amanda Kathryn ROWE (Stony Brook University) and Eva Stela NOMENJANAHARY (University of Antananarivo) led a team of American and Australian researchers, Centre ValBio technicians, and local guides to conduct preliminary work in Zombitse Vohibasia National Park (ZVNP) in Southwestern Madagascar. Amanda's work focuses on understanding the community ecology of the cheirogaleids in the park (*Cheirogaleus medius*, *Mirza coquereli*, *Microcebus murinus*, *Phaner pallescens*). Additionally, Amanda's team conducted nocturnal surveys to estimate population density and abundance for all nocturnal lemurs in ZVNP, including *Lepilemur hubbardorum*, a sportive lemur endemic to ZVNP and its peripheral zones.

Akiko SAWADA (Chubu University) and Tsinjo Sombiniaina Annick ANDRIATIAVINA (University of Antananarivo) examined at the feeding ecology of three groups of bamboo lemur; *Hapalemur aureus*, *Prolemur simus*, and *Hapalemur griseus* within Talatakely and Sahamalaotra forests.

Brett SCHEFFERS (University of Florida) and his team: David KLINGES (University of Florida), Zachary LANGE, and Julia LATERZA-BARBOSA (both John Carroll University), along with representatives from the University of Antananarivo and Madagascar National Parks, Simplicie RAZAFINDRANAIVO and Tsitohaina ANDRIAMBOLOLONA respectively, surveyed and evaluated the role of climatic change and species interaction for determination of the tri-dimensional distribution of Malagasy amphibians, by combining field studies and laboratory experimentation.

Thomas SNYDER (Seneca Park Zoo Society), Anthony VODACEK (Rochester Institute of Technology), and Tsinjo Sombiniaina Annick ANDRIATIAVINA (University of Antananarivo) conducted their project on Madagascar forest modeling and measuring biodiversity impacts and efforts within Vatoharanana and Talatakely inside Ranomafana National Park, as well as surveys of species of amphibians, birds, spiders, and arthropods at Vatoharanana and Talatakely forests via audio and remote sensing.

Patricia WRIGHT, Ezzeldin ENAN, Ryan ROTHMAN, Thomas KELLY, Gregory TAM (all Stony Brook University), Amanda DUBOUR (Northern Illinois University), Bekah WEATHERINGTON (Cornell University), Tobias GRAESSLE (Robert Koch Institute),

Sina Feyer (Freie Universität Berlin) and Haja RAKOTONDRAINIBE, along with Madagascar National Parks, investigated the feasibility of the translocation project for *Prolemur* individuals. Field research occurred both inside and outside of protected areas in Mahasoa, Mangarabaka, and Ranomafana.

Patricia WRIGHT, Marloes LEEFLANG (Royal Zoological Society of Antwerp), Alexandra SHEA, Lucas BOGAERT, Elisanda BARO (both Joves i Ciència, Fundació Catalunya-La Pedrera), Claire WARSEK (University of Wisconsin-Madison), Fidy RASAMBAINARIVO (University of Missouri-St. Louis), Eliette NOROMALALA, Henikaja RASOAVIARIMANANA (both University of Antananarivo), Haja RAKOTONDRAINIBE, and Centre ValBio conducted long-term health monitoring of *Propithecus edwardsi* and *Varecia variegata* inside RNP.



Brett Scheffers & Team

When you take a walk through the forest, what is most noticeable to you? Maybe it is the hoots and chatter from distance calls on a high branch. Or the slices of light from above that cut between leaves. Perhaps the immense trunks of trees, stretching upwards to heights that may play host to unseen creatures and communities. Those who have walked the trails of Ranomafana have certainly spent time looking up at the mysterious canopies, envisioning what may be hiding there just out of sight.

For our research group, looking up wasn't enough. Due to the nature of the organisms we study – amphibians and reptiles, or collectively called herps – we climb. Many of the herp species found in the eastern rainforests of Madagascar are arboreal, living above the ground, and some may almost never touch the forest floor. To only study the forest communities at ground-level is inherently a flat perspective, and to fully understand the complexity of forests is to appreciate their three-dimensional structure. Armed with harnesses and ropes, we ascend to the canopy to explore the many layers that make up a rainforest.

Our particular interests lie in understanding how forest canopies, and their inhabitants, will respond to climate change. As the planet

warms and becomes more variable, so does the forest, but potentially not at the same rate across the vertical spectrum (from forest floor to canopy). The canopy is more exposed to the sun than the forest floor – perhaps arboreal herps are more tolerant of warm temperatures, and may be more tolerant to climate change than their terrestrial neighbors.

Thanks to the laboratory facilities available at CVB, we are able to further explore these relationships *ex-situ* (outside of the natural environment). After capturing and identifying herps, we head to CVB to perform experimental trials: we place frogs in an arena that offers a range of temperatures, and observe where each individual relocates to, and therefore the temperatures it prefers. After finishing these trials, we carefully return all organisms back to the exact same tree they were found in. Then it's off on a deep dive into the data, to find patterns that may match our predictions. What species preferred the warmer temperatures? Which ones were found higher in the canopy? Who will be resilient to climate change, and who needs further attention to ensure they persevere?

We're eager to discover soon, before time runs out on the unique biodiversity of these forests.

- David Klinges





Tobias Gräßle

I pictured Madagascar quite differently before my first visit last year. Documentaries had led me to anticipate a pristine wilderness with lemurs all over the place, but the drive from Antananarivo to Centre ValBio revealed another reality—large-scale habitat loss. Anthropogenic driven habitat loss constitutes one of the major threats to biodiversity all over the world, but in Madagascar the degree of destruction is particularly striking.

Luckily it is not all bad news. Natural paradises still exist scattered across the island. One of them, Ranomafana National Park (‘RNP’), is illustrative of how communities living around protected areas can work with

researchers, government organizations, and NGOs to protect and restore wildlife habitats. Here sustainable ecotourism helps bring income to local communities and CVB’s state of the art research facilities bring researchers, such as myself on the Greater Bamboo Lemur Translocation Project.

The overall objective of the project is to move individuals from a population of critically endangered greater bamboo lemurs (*Prolemur simus*) living in a degraded unprotected forest in the Karianga region into RNP. As part of this project, in August a diverse team of CVB technicians, researchers, and veterinarians conducted the first stage of the project—assessing current population size and individual health to decide on animals suitable for translocation.

For this, lemurs were tranquilized and as part of the veterinary team I monitored the anesthetized lemurs closely, as their wellbeing is of uppermost importance during such interventions. Furthermore, we collected an extensive sample set from each animal, so that many different research groups could use them to help assess the health and risks facing these animals—amongst them the Leendertz Lab at the Robert Koch-Institute, where I am currently working on my Ph.D.

Our research is focused on the epidemiology and evolution of infectious wildlife diseases,

in particular those affecting primates. Diseases are a natural part of any species’ ecology, but anthropogenic habitat loss has led to fragmented and depleted populations of primates, leaving many vulnerable to being critically affected by disease. Understanding the drivers of wildlife mortality has become an integral part of conservation. The Leendertz Lab helps to implement wildlife health monitoring at several primatology field sites across Africa, maintaining an emphasis on building local capacity.

Most of the diseases we investigate are zoonoses—capable of jumping from animals to humans and vice versa. As over 60% of all emerging human infectious diseases are estimated to have zoonotic origins, wildlife diseases should clearly be considered a significant threat to global health—exemplified by lethal diseases like Ebola, SARS, coronavirus, and the plague. On the other hand, human and livestock pathogens can infect wildlife as well, meaning that increasing anthropogenic disturbance may bring another threat to wildlife; our diseases. By monitoring pathogens impacting wildlife populations, we can help human populations living in proximity to wildlife by designing strategies that minimize their risk of infection, while also protecting wildlife.

Beatriz Otero Jiménez

In 2016 the CVB team visited an unexpected rainforest in south central Madagascar, the Ivohiboro-Analamary forest. This forest is surrounded by human created savannah, and has been isolated from any other rainforests for more than 500 years. CVB led the first scientific expeditions to this unique forest and I joined the team as a postdoctoral researcher in 2019. My research explores how animals move between forest patches and

how the land between patches can promote or prevent species from using this space. At the Ivohiboro-Analamary forest I am part of the team that studies the diversity and health of nocturnal lemurs, such as the mouse and dwarf lemurs, and the native rodent species. We use morphological and genetic data to investigate how the populations within the forest are doing, how different species move across the landscape, and to identify species present.



Our hope is that this research will provide important evidence to support the conservation of this forest and that it will help in the development of conservation strategies that will support these species.

- Beatriz Otero Jiménez



Bekah Weatherington

The greater bamboo lemur (*Prolemur simus*) is one of many species in Madagascar found nowhere else in the world outside of captivity. Greater bamboo lemurs are listed as critically endangered and were even believed to have been extinct 50 years ago until Dr. Patricia Wright made it her mission to find them.

The future of this species remains precarious due to anthropogenic threats leaving remaining populations fragmented and more susceptible to disease. The loss of natural habitat and food sources pushes the lemurs into human-inhabited areas, thereby increas-

ing human-lemur interactions and the likelihood of disease transmission across species boundaries. The fight for the conservation of endangered species like greater bamboo lemurs reveals an increasing need for further research to fill vast knowledge gaps and veterinary intervention to treat diseased individuals as well as mitigate the spread of disease through populations.

As a veterinary student at Cornell University, Bekah spends most of her time wrapped up in her studies of the fundamentals of veterinary medicine. However, she jumped at the opportunity to explore her passion for conservation medicine and work on this issue. She utilized a summer to collaborate with Dr. Wright and a team of lemur experts to collect a variety of samples from a group of greater bamboo lemurs. These samples will be used to establish what is normal in a healthy individual so that veterinarians will be able to identify and treat lemurs that are abnormal in the future.

The efforts made by Bekah and Dr. Wright also sought to improve the relationship between the lemurs and people who find their habitats bleeding into one another. As a part of this research, people in an affected village were employed to collect behavioral data and fecal samples on the aforementioned lemur population. By establishing a working relationship with the local village and initiating

long-term data collection on the group of interest, Bekah and the team have set up the necessary scenario to translocate the group of lemurs from the village to the pristine rainforests of Ranomafana National Park in the near future. This effort will serve to relieve the village of some of the habitat-deprived lemurs that have resorted to crop raiding and to introduce them into a protected environment where their food source is plentiful.

This project also strives to champion for the conservation of the species on a larger scale by allowing the mixing of genes between the new population and the two greater bamboo lemurs that already live within Ranomafana National Park. This would increase the genetic diversity of greater bamboo lemurs, giving them a better chance at surviving their rapidly changing environment.

While the rest of Bekah's year has been busy with classes, performing spay and neuter surgeries for low income pet owners in Honduras, and preparing to start her clinical rotations in 2020, she is excited to continue working on the project and she hopes she can find the time to return to Madagascar to follow up with the greater bamboo lemurs she has come to care for so dearly.



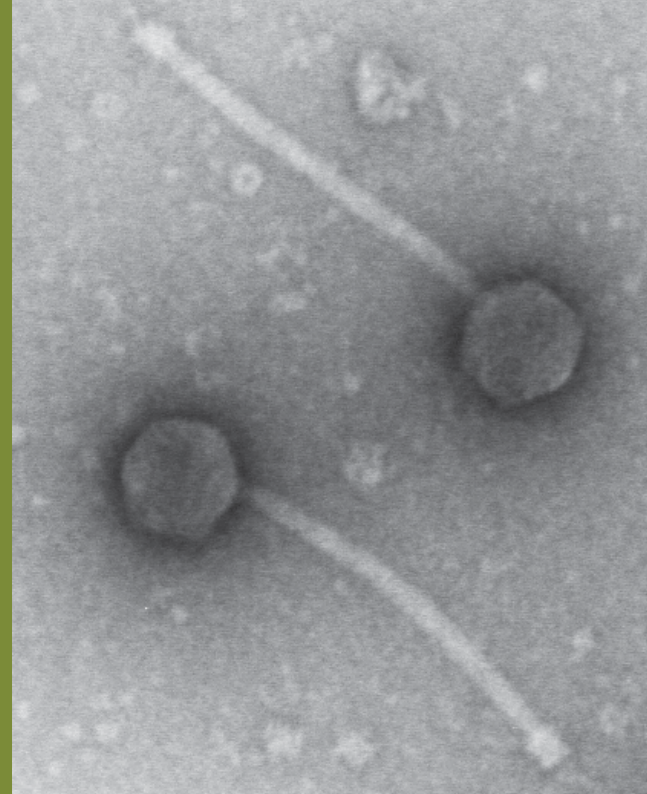
Kathryn Alessi

With the long-term goal of reducing the practice of tavy, my team worked in six villages conducting biodiversity observations in fragmented forests and surveys focused on household composition and food security. The forest observations are part of Centre ValBio's Participatory Ecological Monitoring project in which flora and fauna are counted along transects in each area to monitor changes in biodiversity and man-made pressure. With consistent monitoring, this data can be used to determine improvements in forest conservation. The household surveys provide perspectives on family size, household wealth, employment opportunities, land

ownership, and food production. This information presented us with further insight into people's daily activities and the agricultural challenges they face.

My hope is to use the collected data to devise community-based solutions that will alleviate major issues in food production and provide income-generating activities to these communities to reduce their reliance on tavy farming. A strong focus on sustainable food security solutions as a long-term initiative could have an overwhelmingly positive impact on health and nutrition for the local people and support forest conservation in the generations to come.





genomically characterize them. Over 17,000 phages have been discovered, 3,000 of which are genomically characterized. Their diversity is great, and they harbor hundreds of thousands of genes of unknown function. This is truly the dark matter of the biosphere.

With his colleague Debbie Jacobs-Sera, Dr. Hatfull is investigating if there are new and interesting types of bacteriophages in Madagascar, exploring its many novel and interesting environments. Working with Hanta Rasamimanana and her students from the Ecole Normale Supérieure in Antananarivo, ten new phages were isolated from Ranomafana using the bacterial host *Mycobacterium smegmatis*, and were given de-

lightful names such as MalagasyRose, Antisirabe, and Curiosium. The genomes of these ten phages show them to have a number of interesting features, and MalagasyRose is unlike any of the previously sequenced 1,800 phages that infect exactly the same type of bacterium.

Every spoonful of dirt contains millions of individual bacteriophage particles, and there are so many more phages to be discovered and characterized. Phage discovery provides opportunities for students to engage in authentic scientific research and phage genomics promotes a deeper understand of genetics and molecular biology. The secrets of Madagascar phages are ready for investigation!

Graham Hatfull — Bacteriophages – viruses that infect bacteria – are the most numerous biological entities in the biosphere. They are abundant and they are everywhere! They are highly diverse genetically, and we are keen to figure out what different types exist, what genes they carry, and how they have evolved. Furthermore, their ability to infect and kill specific bacteria presents therapeutic possibilities in which phages could be used to control antibiotic-resistant life-threatening bacterial infections.

Dr. Hatfull develops research-education programs in which students discover new bacteriophages, name them, purify them, and



Mai Fahmy

For my Ph.D. dissertation, I am using terrestrial blood-feeding leeches (*Chtonobdella* spp.) as a proxy for biodiversity by analyzing the vertebrate DNA in their bloodmeals. Biodiversity inventories are valuable tools with which researchers assess the status of target taxa. Often, these inventories are limited, only detecting specific taxonomic classes. However, with leech-derived ingested DNA (iDNA), researchers can obtain broad-spectrum incidence data on mammalian, avian, reptilian, and amphibious wildlife, all by simply analyzing the blood in the guts of leeches. I am interested in cataloguing Madagascar's highly threatened biota through iDNA to expand and optimize noninvasive inventorying strategies.

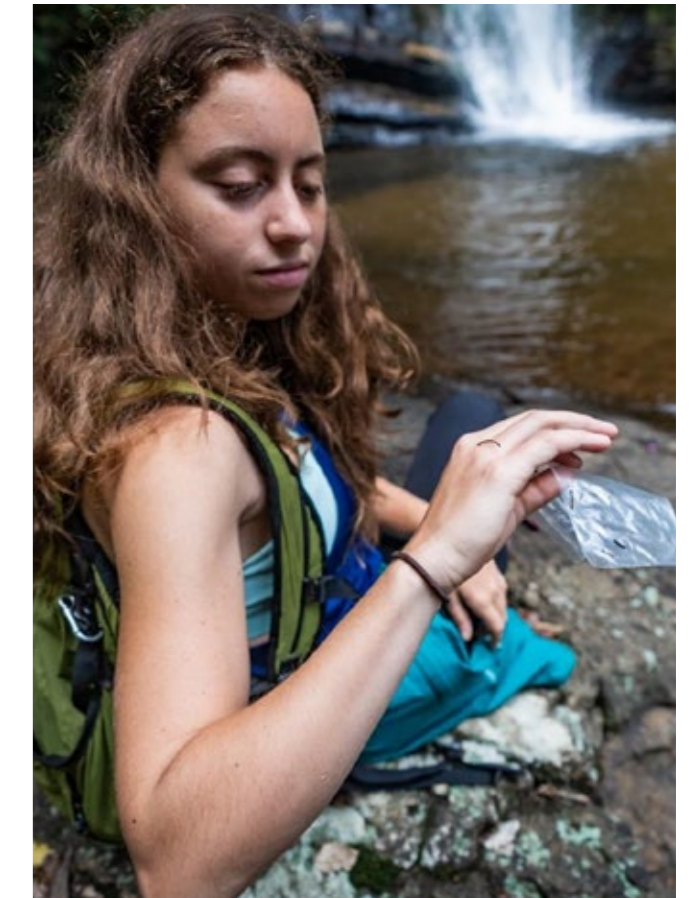
iDNA surveys have been tested in various blood-feeding invertebrates such as mosquitoes and carrion flies. However, unlike these volant hematophagous invertebrates, leeches appear to be ideal candidates for iDNA because they are able to retain the DNA of up to four distinct taxa on the order of months and are not highly mobile, maintaining site fidelity. Terrestrial leeches are found across the Indo-Pacific, a region which simultaneously harbors high rates of endemism, diversity, and environmental threats thereby allowing us to target some of the world's most endangered species. Additionally, leeches cap-

ture distinct diversity, mostly that of small, ground-dwelling animals often too small to trigger camera traps and easily missed on visual line transect surveys. iDNA provides conservation biologists with a valuable snapshot of species living in a specific area and helps fuel interest in protecting sensitive areas from the rampant deforestation that is occurring in Madagascar and beyond.

Previously, I had collected 600 leeches from Ranomafana National Park for iDNA analysis, finding that leeches feed on a wide variety of hosts, including snakes, frogs, birds, mammals, and even amphibious fish. Once the leeches have been collected, the iDNA is extracted, sequenced, and queried against a global genetic database. iDNA which matches sequences in the database with high confidence reflects the fauna on which the leeches had fed. Low confidence matches represent species which are not represented on the database or are likely new to science. Through the guts of leeches, I have been able to identify species threatened with extinction as well as exotic invaders. I believe this method holds potential for delimiting the distributions of both threatened and invasive species for ecological monitoring.

Most recently, I joined Dr. Patricia Wright's expedition to the Lost Forest, a largely unexplored stretch of primary forest in south-central Madagascar isolated for at least 100

years. Preliminary expeditions by the CVB team previously uncovered an unusual amalgamation of species, some of which may be new to science. I collected over 1,400 leeches from the Lost Forest for iDNA analysis which will help us determine the mysterious species composition of this newly discovered forest fragment. The results of this research may help elevate the forest to protected status.





Aina Brias Guinart and Marketta

Vuola are Ph.D. students in the Global Change and Conservation research group led by Dr. Mar Cabeza at the University of Helsinki (Finland). They carried out the project “MaTsi” in Ranomafana and the villages of Mangevo and Amboditanimena in November-December 2019. The Malagasy team members included research assistants Odile Andrianirina Rafanambinantsoa and Matthieu Pierre (Master’s Students from the University of Fianarantsoa) and workshop facilitators Caroline Rojosoanotahina (University of Fianarantsoa), Maria Hariniaina (University of Antananarivo) and Toky Tsihory Randriamamonjy (University of Tamatave). MaTsi project was funded by FinCEAL Plus BRIDGES project.

MaTsi project

Protected areas are often established in areas populated by humans. In many cases, including Ranomafana, their establishment requires a change in livelihoods for the local communities, such as a shift away from hunting, collecting forest products, and slash-and-burn agriculture. To support this shift, conservation actors have been implementing development projects to provide alternatives. However, to date, local communities continue to struggle to find sustainable livelihoods. To address these issues, our research team conducted a project called MaTsi (Mampifandray ny Tsirairay), loosely translated as “Bringing all stakeholders together”. The aim of the project is to create a model of the natural resource use around Ranomafana National Park. The qualitative model included the Actors, Resources, Drivers, and Interactions (ARDI) influencing the natural resource use in the socio-ecological system of Ranomafana following a methodology developed by Etienne et al. (2011). The model was participatory, consisting of nine workshops with two local communities along with other stakeholders: conservation and development NGOs, local associations, government representatives, Madagascar National Parks, and Malagasy researchers. By giving everybody a chance to express themselves, we aimed to include different forms of knowledge (local environmental knowledge, expert knowledge

of conservation and NGO practitioners and government representatives, and scientific knowledge) in one model. We also wanted to offer a chance for all these stakeholders to meet and discuss shared problems. The final model will be shared with the NGOs and government authorities to potentially facilitate their work with local communities with a wider understanding of the obstacles to their livelihood development. Our work in Ranomafana will continue with our Ph.D. projects, Aina’s focusing on environmental education and Marketta’s on artisanal gold mining in and around protected areas of Madagascar.



Baovola Alisoa Kotomangazafy

Inside Ranomafana National Park, Centre ValBio’s Reforestation and Biodiversity Teams noted that over 50% of *Calophyllum paniculatum* observed died during the year. The illness responsible starts with the leaves, which begin to fade, then the trunks and finally the roots dry out and die. The reason for this mortality is still uncertain.

Several hypotheses are being investigated. One is the possibility that climate change has enhanced the vulnerability of the plant to predators. Alternatively, perhaps there has been an increase in the prevalence of insects that produce toxins within the trees. Lastly,

there is the possibility that a microorganism, pathogenic fungi, or bacteria is directly attacking the plant.

To demonstrate that *Calophyllum paniculatum* is a valuable resource, chemical analysis has been performed which demonstrates that the nuts of the tree contain an oil composed of sterols, leucoanthocyanins, polysaccharides, and tannins. This oil is also rich in polyunsaturated fatty acids. In previous studies of another species, *Calophyllum inophyllum*, the nuts were shown to possess a fatty oil that displays anti-bacterial and anti-fungal properties.

Investigations should be continued to identify the specific sterols and leucoanthocyanins in the oil, and also possibly the leaves and latex from the trunk, which possess these properties. In related species, *Calophyllum inophyllum* and *Calophyllum teismanii*, anti-viral compounds named calophyllolide have been identified. My research into *Calophyllum paniculatum*’s chemical components hopes to identify similar pharmacologically useful compounds.

One of my approaches is based on researching strategies for producing young plants resistant to the attacks of whatever insects or microorganisms are causing the problem, by using endophytic and mycorrhizal fungi. This is sensitive to the regeneration of the

species as it avoids disturbance to the ecosystem. It is not done in a natural habitat but on young plantations of *Calophyllum paniculatum* that are either cultivated in a nursery or in vitro to produce resistant plants that could be reintroduced into the natural habitat.

My other research involves phytochemical studies on the active molecules in aromatic plants. These plants could be a source of income for surrounding population, helping to fight against poverty and deforestation at the same time. The final goal is to design a program of reforestation using these species combined with a value chain of sustainable income.





Ford Bendell

Although it is one of the more charismatic lemur species in Madagascar, relatively little is known about the critically endangered black-and-white ruffed lemur (*Varecia variegata*). Fortunately, thanks to Dr. Andrea L. Baden and her team, steps are being taken to understand this enigmatic species. As an ecosystem engineer, *Varecia* plays a critical role in seed dispersal and facilitates biodiversity. Primarily foraging and traveling high in Madagascar's rainforest canopy, this lemur presents a unique challenge for researchers as it is difficult to detect and follow from the forest floor. Because of this, Dr. Baden has utilized a robust team of trained researchers continually since 2017 to collect data on radio-collared individuals.

Under the guidance of Dr. Baden, Ford Bendell acted as the field project manager for the Ranomafana Ruffed Lemur Project (RRLP) at the Mangevo field site during 2019. This comprehensive study examines a wide variety of traits and behaviors related to *Varecia* with the goal of understanding the demography, life history, and reproductive strategies of this highly arboreal primate. Answering these questions requires extensive data collection, and in turn, an extensive team. The project employs 10 local Malagasy technicians and guides, some of whom have been working with Dr. Baden since 2005.

Bendell supervised day-to-day operations and ensured research activities were conducted in accordance with the project's objectives. While logistics and planning were his main priorities, he also performed data collection analysis to both support the project's core research and formulate new questions in collaboration with Dr. Baden.

Varecia reproduce on a boom and bust cycle, only having offspring every 2–4 years. Excitingly, mating was observed in 2019. *Varecia*, like birds, construct nests high in the canopy in order to birth and rear their young. This event presented a rare opportunity to document maternal care, prompting Bendell and Dr. Baden to attend the Cornell Tree Climbing Institute's Research Canopy Training. As a result, Bendell utilized rope-based

techniques to ascend the nest-use trees at Mangevo in order to collect data that would have been unobtainable from the ground. Through direct observation and by installing 15 wildlife trail cameras in order to capture images of activity near the nest site, the team successfully gathered novel data.

In combination with previous behavioral observations, Dr. Baden's group aims to further collect data related to tree phenology and nest site selection in hopes of answering questions related to *Varecia*'s reproductive strategies and intraspecific relationships.



Mariah Donohue

My Ph.D. research uses one of the only purported hybrid primate species—*Eulemur rufifrons* x *E. cinereiceps*—to test the hypothesis that the gut microbiome (GM) contributes to host speciation. The relationship between hosts and symbiotic microbes is ancient and obligatory, as the GM has evolved to perform critical functions aiding in host immunity and digestion. Despite the link between host fitness and GM function, very few studies have explored the role of the GM in host diversification and speciation. I hope to fill this gap through a long-term comparative

study of GM function, as well as host behavior, ecology, and demography across seasons using *Eulemur* hybrids and parental species. Elucidating the factors that contribute to GM patterning today will provide key insight into how GMs may have shaped eukaryotic biodiversity. I hope this research will inspire future empirical and theoretical work investigating the role of the GM in host speciation by natural selection. Importantly, this work will enhance our understanding of how ecological variables, such as habitat disturbance, alter the GM—thus enhancing our ability to assess and conserve endangered species.



Academic Training & Capacity Building

Stony Brook at CVB

SBU Dental Students

For the 15th year in a row, Dr Larry Wynn, along with Dr Hamil Willoughby, led a group of dental students from Stony Brook University. From June to July, these dental students treated a total of 672 patients at free dental clinics in Ranomafana and Kelilalina for a variety of tooth problems in both young and old patients. As dental coverage is not currently provided by the state, this mission is vital to the health of the local community.

Sadly, this was the final group to be led by Drs Wynn and Willoughby, who have passed on the baton. A gigantic thank you is due to them for their incredible work here!

SBU Undergraduates

This year we successfully completed three SBU Study Abroad programs, with a total of 26 students participating in the winter, summer, and fall programs. Our third, tenth, and 26th such programs respectively!

In January, students participated in the second winter program under the guidance of teaching assistants Leila Esmailzada and Ryan Rothman (both long-term collaborators

of Centre ValBio). Students dedicated themselves to three-week internships on a range of topics, with a primary focus on human health. One student from the State University of New York at Buffalo joined the group, highlighting the importance of the program to conservationists all over New York state.

SBU's summer program took place in May and June, again led by Ryan along with Amanda DuBour, Frank Rabenahy, & Tharcisse Ukizitambara. During this session, six U.S. students were exposed to a range of experiences, including the Malagasy language, health, environmental education, ecosystem diversity, and scientific research. The pro-



gram included lectures, field work, and a cross-country trip. Students also designed independent research projects, covering a large spectrum of issues. Projects were then presented at CVB in Ranomafana and at the University of Fianarantsoa.

From September to November, 10 students (nine from the USA and one local) participated, led by Frank and Tharcisse again, along with Laura Marsh and Amanda DuBour. As well as SBU, a student from Duke participated, highlighting the diversity of the programme. Teaching focused on biodiversity, education, Malagasy culture and language, ecosystem diversity, and human impact.

Other Study Abroads

Every year, groups of students come from around the world come to study at CVB. In 2019, **110** students from high school and university participated in Study Abroad programs.

University of Florida

CVB was proud to welcome back the University of Florida for a fourth year in a row for their course on biodiversity and conservation in a developing country. Students worked on a variety of projects including reforestation, health, and lemur research, and they also immersed themselves in traditional local culture.



The Colorado Springs School

Centre ValBio was delighted to host a group of eight students from The Colorado Springs School. As part of their cultural immersion in Madagascar, they spent time at Centre ValBio experiencing the forest in the setting of a research institute. A visit to a local village was arranged, where they were taught how to make spoons and bowls out of cassava leaves, and see a zebu sacrifice to the ancestors. The students even received traditional hats as gifts! Of course, no visit to Centre ValBio would be complete without a hike in the forest, after which the students got to see local bands and dancers perform songs about conservation and the rainforest.

National Geographic Student Expeditions

For the third year in a row, National Geographic Student Expeditions came to Madagascar. Alicia Lamb (returning for another year!) and Michael Drake led this year's expedition. They brought 14 students from the United States and China for nearly three weeks of community service work with Centre ValBio's Reforestation and Education Teams.

The students learned about agriculture and soil erosion mitigation work, and helped our resident artist paint educational murals in local classrooms. The murals were interpretive maps of Madagascar in the primary school and a world map in the secondary school featuring some iconic wildlife from different regions. Not only do these maps offer a permanent method of teaching and inspiring children, this year in tribute to National Geographic the Winkel tripel projection was used!

Highschool Programs

Centre ValBio was also lucky enough welcome back Culture Connect for a second year. This programme introduces students to the environment, economy, culture, and people of Madagascar, and gives students a chance to examine local and global issues.



“Nothing can compare to the adventures we had in Ranomafana accompanied by the most dedicated, kind, and qualified researchers and guides. It is a unique and immersive experience; not only in terms of being part of scientific research, but also in terms of learning about the local culture, flora, and fauna. We were provided with the best learning and working environment and that’s why we will certainly carry these memories for a long time.”

— Elisenda & Lucas

Volunteers and Interns

Ezzeldin Enan (Stony Brook University) completed an internship that saw him assist in various laboratory activities, including faecal DNA sampling, necropsies, laboratory management, and personal research on parasite transmission in lemurs.

Alexandra Eck (Stony Brook University): As part of her final year of her technological systems management degree at Stony Brook, Sasha came to CVB to begin the major task of updating the Centre ValBio website, while assisting the Education Team in presenting a fish farming project into the local education curriculum.

During July, CVB had the pleasure of hosting two high school interns from Spain, under the Joves i Ciència programme. Lucas Bogaert and Elisenda Baró spent productive weeks assisting with the long-term *Propithecus* monitoring. We hope to welcome back more students in the coming years!

Training in Mauritius

Nicolas Rasolonjatovo, Head of Reforestation, was selected to go to Mauritius for regional capacity building programme on biodiversity conservation and monitoring funded by CEPF, led by Durrell Conservation Training Ltd, and implemented by Mauritian Wildlife Foundation.



Madaworks

Madaworks is a non-profit organization that was created to change girls’ lives by providing scholarships to allow them to go to secondary school as well as to support women’s sustainable artisanal weaving collectives that are based in Madagascar. In July 2019 Madaworks hired an Operations Manager, Hajanirina Randrianarivelo, to help support the girl scholars and manage the field operations in Madagascar. She works out of Centre ValBio. Five new scholars were selected from the villages of Ambalakindresy, Kelilalana, and Ranomafana for the 2019-2020 school



year. The annual Madaworks awards ceremony was held at Centre ValBio in October 2019. All 14 of the current Madaworks scholars attended the ceremony with their parents. Board members Dr. Patricia Wright and Prisca Andriambinintsoa awarded the certificates. Julie Rakotozafy from Sahavondrona, who received a Madaworks scholarship when Madaworks launched in 2015, recently graduated from nursing school in Fianarantsoa this February. Madaworks continues to support the artisanal weaving collectives by buying their products for Madaworks fundraisers.

FIMARA

Centre ValBio again worked closely with the FIMARA members (mostly traditional healers and ampanjaka [kings] of villages) throughout the year, improving medicinal plant production in the Ranomafana region.

Following the improvements made last year, where two rooms were built (one to store raw plants until dried and the other to keep the plants before extracting oil), the capabilities of the association were further enhanced. With the help of the Green Climate Fund in Madagascar, the FIMARA alembic was repaired and improved.

Following these essential improvements, one and a half litres of lemongrass oil and three

litres of ravintsara oil have been produced. This represents a massive increase in efficiency, and bodes well for the future success of the FIMARA association.

The association has continued planting lemongrass in Mahatsarabe, as well as training the members of FIMARA to grow lemongrass in their own field. Furthermore, to increase commercialisation the alembic is also now available for rent to other people or cooperatives, with the money going to FIMARA.

Sunshine Comes First

Susan Cummings-Findel, founder of Sunshine Comes First (‘SCF’), visited Ranomafana again in March/April to check on the progress of the many entrepreneurship and education projects funded by SCF. These include an internship by Koela at Centre ValBio as she pursues her studies at university, and continued support for the Famiova women’s weaving group

Famiova

In 2005, CVB spearheaded the formation of Famiova, a group of 17 local women. Famiova’s incredible cotton and raw silk scarves are one of CVB’s most popular souvenir items at the Eco-shop, and the talents of the weavers increase every year. Following last year’s renovation, this year’s work has focused on the construction of a room for silkworm farming.

SOS Biodiversity Research Center — Roof Raising Celebration

In January we were delighted to welcome numerous friends, dignitaries, collaborators, and partners to Centre ValBio for the roof-raising ceremony for the new SOS Biodiversity Research Centre.

As well as the Mayor of Ranomafana and the Chef District of Ifanadiana, honoured guests included Russell Mittermeier, IUCN Chair of the Species Survival Commission's Primate Specialist Group and President of Conservation International, and Serge Bednarczyk, representing the donors behind this vital enhancement to CVB's infrastructure.

Festivities began with a zebu sacrifice at dawn, and when the ribbon was cut the building entered the next phase of its life.

Following this, a traditional ceremony was held in honour of the ancestors, and communal meal was presided over by the local ampanjaka. A drinking horn was also passed around. Then, a large crowd gathered to hear speeches given at the Education Amphitheatre, and the building received a second blessing: this time with water, as the skies opened and the heavens showed their approval!

This ceremony was a communal way to celebrate what will be an important component in our infrastructure. As the building will not only provide a collections room and a new laboratory space, but also offices for staff and researchers, a server room, and a conference room, it will greatly enhance how we can operate. CVB is growing and developing to accommodate all of the scientific research that must be done in order to understand the rainforest, as it is only by integrating the work of a huge array of experts that we will appreciate the complexities of the tropical biome.



Honours & Awards

Centre ValBio, with Dr. Patricia Wright at its helm, continues to draw international attention and acclaim for its dedication to conservation, community, and innovation.

- **January: Roof raising** for the IUCN Save our Species Biodiversity Research Center.
- **February 19–22:** Patricia Wright and Michael Docherty visited St Andrews, Scotland, as finalists for the **St Andrews Prize for the Environment**
- **March 22:** Staff members Telo Albert and Rabaovola Bernadette visit **SBU** and **U. Arizona**



- **April 15–17:** Patricia Wright was the keynote speaker at the **British Society of Parasitology** conference in Manchester, U.K., with a talk titled “Primate Parasites in Madagascar: Contrasting Lemurs and Humans”
- **April 1:** Mariah Donahue, CVB researcher, was accepted into the **Fulbright U.S. Student Program** for research in Madagascar on the microbiome of brown lemurs
- **April:** Sarah Kariko, CVB researcher, inaugurated the **spider education fund**.

April 30: Mark Krasnow, Chairman of the CVB Board, Professor of Biochemistry at Stanford University, and Howard Hughes Medical Institute investigator, was elected to the **U.S. National Academy of Sciences**

- **May:** Dr. Elise Lauterbur, CVB researcher, received her **Ph.D.** from Stony Brook University. In August she commenced a **postdoctoral fellowship** with Dr. David Enard in the Department of Ecology and Evolutionary Biology University of Arizona, USA

- **July:** Fanny M. Cornejo is appointed by the Rainforest Partnership as their **Country Director** for Peru
- **July 21–25:** Pascal Rabeson, CVB National Director, presented CVB’s Participatory Ecological Monitoring (‘PEM’) success at the **Society of Conservation Biology’s 29th International Congress** for Conservation Biology
- **July 21–27:** PIVOT **board meeting** held at CVB
- **July 30–August 3:** CVB helped organize and attend the **Association for Tropical Biology and Conservation (ATBC)’s 56th annual meeting**, held in Antananarivo. Presentations were given by Lovasoa Razafindravony (Head of Education), Caroline Rojotahina (Conservation Clubs), Fara Rakotoarison (Health Team), Patricia Wright, and Dina Andrianoely (Biodiversity)
- **August 15–20:** Special guest Stephen Quake, Co-President of the **Chan Zuckerberg BioHub**, visited Ranomafana with his daughter, Zoe
- **August 28th:** Dr. France A. Córdova, director of the **National Science Foundation**, visits Centre ValBio with her husband

- **October 17:** Patricia Wright received the **Herrnstein Endowed Chair in Conservation Biology** at Stony Brook University
- **October 18–26:** Visit by representatives from the **Chan Zuckerberg Initiative** and the **Bill and Melinda Gates Foundation**
- **October 26:** CVB & Jessie Jordan organise **World Lemur Day** in Ranomafana, which was honoured by the attendance of US Ambassador Michael Pelletier and Mission Director USAID Madagascar John Dunlop
- **November 15:** **Noromalala Eliette**, CVB researcher, received the **J. William Fulbright Foreign Student Scholarship** to go to the USA for studies at the University of Illinois at Urbana-Champaign and Hunter College, City University of New York
- **November 30: Wedding of CVB** founder Patricia Wright and PCI (Primate Conservation Incorporated) founder Noel Rowe held at CVB, presided over by Benjamin Andriamihaja and Christopher Chapple
- **December 20:** Mamy Rakotoarijaona Ph.D. was chosen as **Director General** of MNP

WISE Tropics, Inc.

Newly incorporated as an NGO in New York in 2019, WISE Tropics supports biodiversity research, environmental awareness through the arts, restoration ecology, climate change monitoring, and conservation education. 2019 projects include: the Field Guide to the Trees of Ranomafana, illustrated by Jana Grabner; the CVB Biodiversity Research Report, illustrated by Jesse Jordan; environmental materials, illustrated by Alain Rasolo; biodiversity microproject initiatives; the purchase of field equipment; World Lemur Day celebrations in Ranomafana; participatory science programs for children in remote villages; and Conservation Clubs. WISE Tropics also funded two local girls to attend higher education: Julie Rakotozafy, in her last year of nursing school; and Iliash Elimanantso; for her third year of graduate school at the University of Mahajanga. Iliash’s doctoral dissertation is entitled “Behavior and Ecology of the World’s Smallest Chameleon”.





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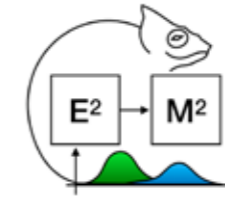
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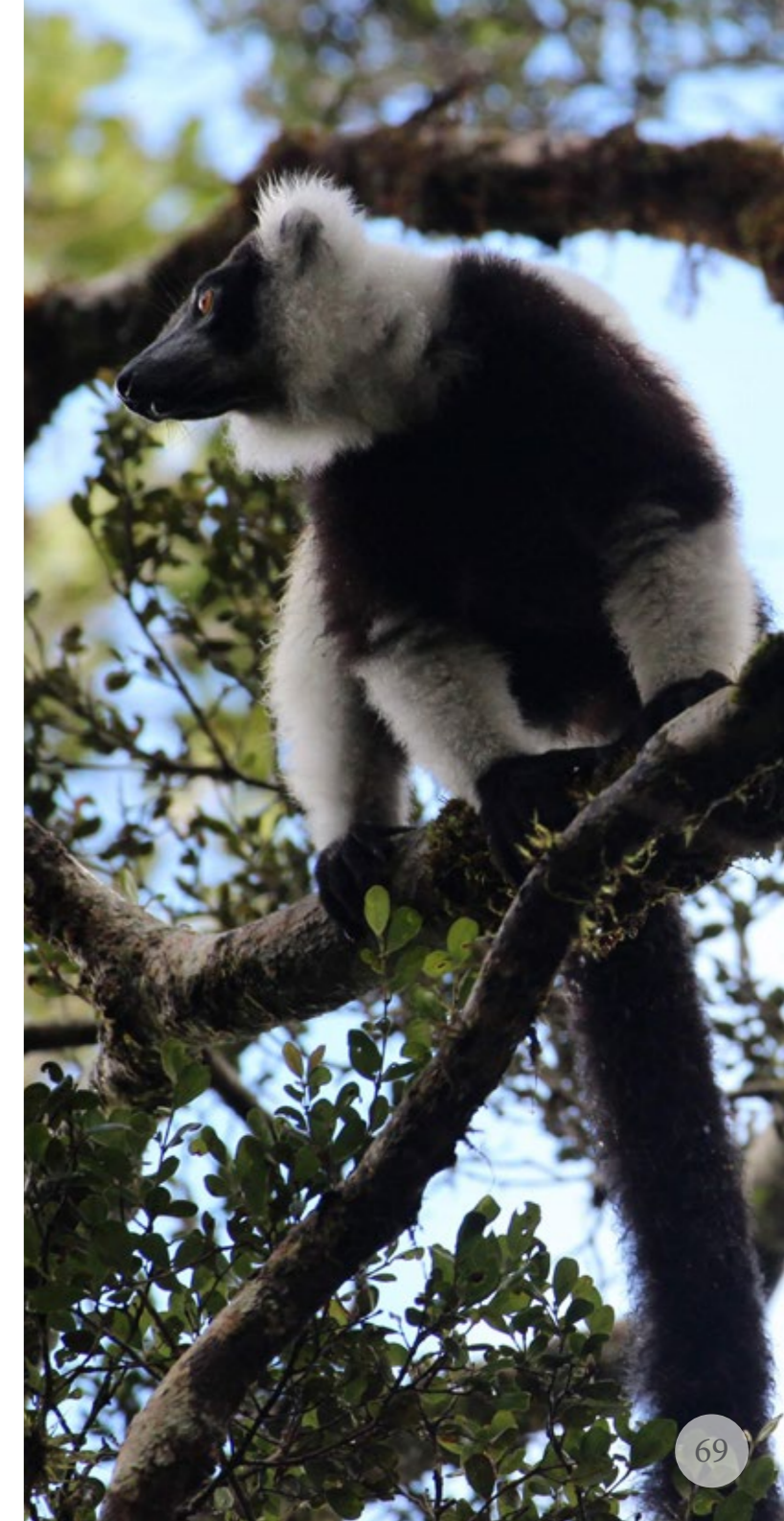


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