seed madagascar
sustainable environment, education & development

SEED Madagascar's Conservation Research Programme

ANNUAL REPORT 2020

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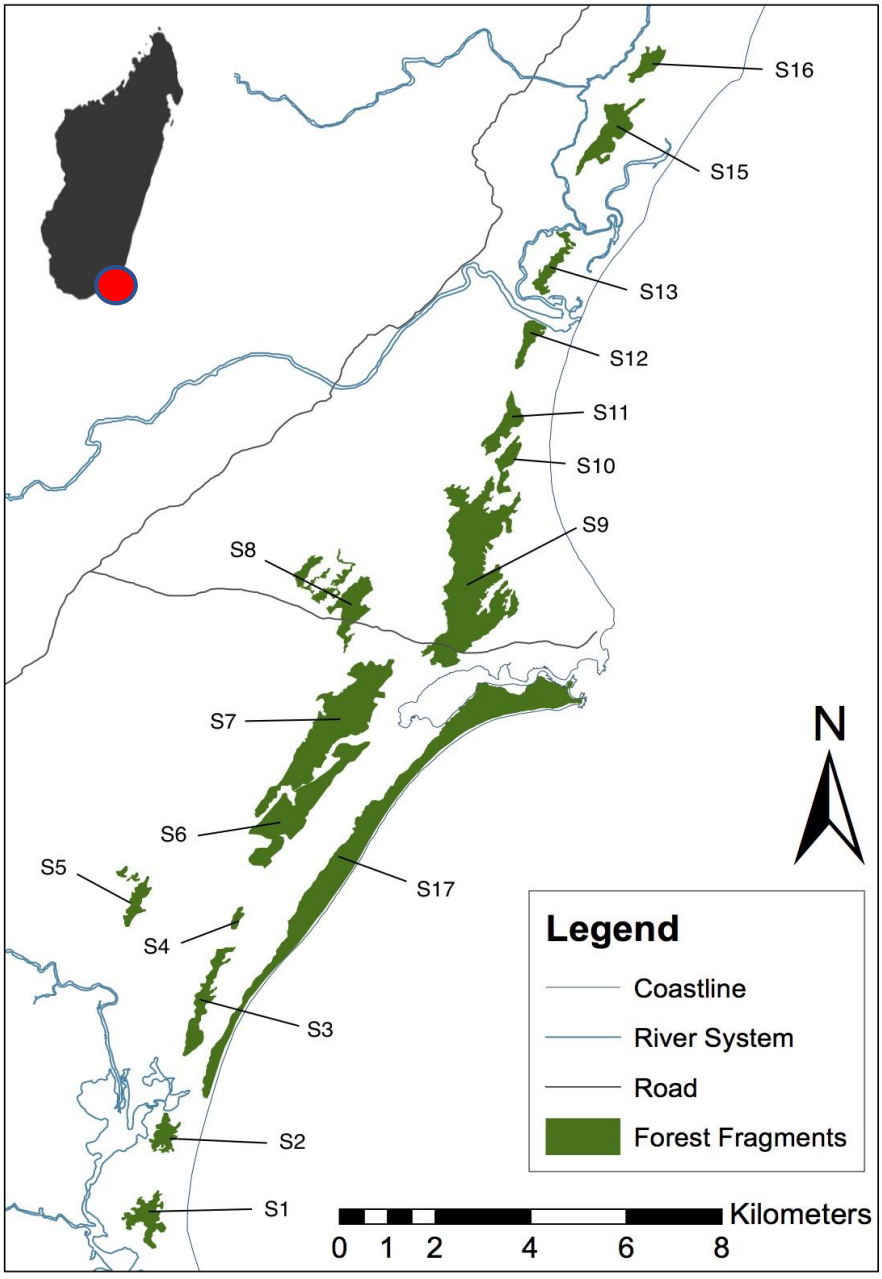
Executive Summary

This report summarises the activities of the SEED Conservation Research Programme (SCRP) during 2020. Since being established in 2010, SCRP has worked together with the SEED Environmental and Livelihoods Department, the Sainte Luce community, international institutions, and local authorities to understand the importance and use of the littoral forest and surrounding habitats. SCRP aims to expand scientific knowledge of the ecology and population trends of the native fauna and flora; and highlight the importance of biodiversity, conservation, and protection in the area. SCRP continues to carry out important biodiversity studies with the help of short-term volunteers, as well as working with the project teams within the Environment Department to conduct project research. This year has seen many challenges, with the COVID-19 pandemic interrupting long-term population monitoring, reducing staff capacity, and suspending the short-term volunteer programme that builds capacity within the research programme. Despite this, SCRP has adapted, focusing on capacity building local guides to continue with data collection. This year has also seen a restructuring of the conservation education programme, greater integration of the Project Development team to expand our biodiversity research, the publication of two studies, including the results from an eight-year palm project, and a contribution towards the latest lemur IUCN assessments.

Study Site

SCRP's work is focused in the littoral forests of Sainte Luce. At almost 2,000 hectares, these littoral forests are considered to be amongst the largest and most intact examples of this threatened habitat type remaining in Madagascar. Recent work suggests a key importance of this habitat within the larger and more comprehensive complex of remaining forests in the region. The forests are believed to be naturally fragmented; however, today they are under immense pressure from the local community and loggers for natural resources, and now the area consists of 17 disconnected forest fragments. Two fragments have already been severely deforested and extirpated for firewood and timber use, and the land is now used for agriculture. The entire area encompassing the Sainte Luce littoral forest is managed by QMM (QIT Madagascar Minerals), a mining company that has partnered with Rio Tinto and the Malagasy Government, to extract ilmenite from the sandy substrate, with operations set to begin in the near future. To mitigate some of the damage from the proposed mining plans, QMM has created conservation offset zones in which it is illegal to interfere with the forest fragments and the plants and animals they support. The S8, S9, and S17 fragments all have this protection status. The S6 and S7 fragments have been designated as community usage zones and provide community resources such as the firewood and timber needed for everyday use. SCRP works in all five of these fragments, with transects established in S7, S8, S9, and S17. Although SCRP does not have transects in the S6 fragment, SCRP regularly visits S6 due to its ongoing research on the Madagascar flying fox (*Pteropus rufus*) colony.



The fragments of the Sainte Luce littoral forest.

COVID-19 and its impact on the programme

Just like with many organisations and projects around the world, the COVID-19 pandemic has dramatically affected the activities of SCRP. The majority of international staff were repatriated to their home countries in April and continued to work remotely. Although some of the research has been able to continue with national researchers and local guides, this together with a loss of short-term volunteers has meant a reduction in the amount of research carried out in the field.

From January to March, SCRP operated in its usual format, with data collected for different projects over a ten-week scheme, which was also when volunteers joined the programme. From April until the end of the year, the reduced resource availability of time, staff, volunteers, and funding meant that certain research activities needed to be prioritised. There was also a shift in emphasis on capacity building national staff and local guides so that data collection could still continue.

The research activities and format of the Conservation Research Programme were quite different before and during the pandemic. SCRP conducts many long-term research studies (such as on lemurs and herpetofauna) as well as small biodiversity studies, with many of these only being possible due to the funding and capacity provided through the volunteering programme. SCRP also conducts the research side of many of the Environment Department projects that are funded externally, such as Ala and Mahampy. From April, with the team's capacity reduced, many of SCRP's long-term monitoring projects were put on hold, and the focus for the team shifted to data collection for the Environment Department projects that had strict project deadlines and donor requirements. Though the pandemic has set back some of our data collection and research, the SCRP team has been adaptable and resilient, and have been able to continue many important research projects.

SCRP biodiversity studies

Lemurs

SCRP started nocturnal surveys of three lemur species in Sainte Luce in 2011, with the aim to complete the dataset after ten years of collection. The aim of this study is to measure the density of the nocturnal lemur species and monitor population changes long-term using distance sampling techniques. Nine years of data has been collected, however the last year of data collection was interrupted by the COVID-19 pandemic. Despite this setback, there are plans to finish this data set and collect the last year of data when possible.

The three lemur species that have been monitored during this project are: the Anosy mouse lemur (*Microcebus tanosi*), Thomas's dwarf lemur (*Cheirogaleus thomasi*), and the Southern woolly lemur (*Avahi meridionalis*). All three species are Endangered (IUCN Red List, 2020) and are only found in the southeast of Madagascar. One diurnal lemur species inhabits the Sainte Luce littoral forest; the red-collared brown lemur (*Eulemur collaris*), which is also Endangered. Although SCRP does not currently study this species, there is a proposal being developed to provide a recent population estimate of this species.

Monitoring has been conducted in three different forest fragments, two of which are conservation zones, and one is a community-take zone. Once the dataset has been completed, SCRP will be able

to provide information not only of population change for the three species over ten years, but of changes within the forest fragments. Additional information is collected during the transects that could provide an insight on the habitat requirements of the study species. This includes tree species, tree size, and canopy cover.

During 2020, with the help from short-term volunteers, the SCRP team had 46 lemur observations over the 41 surveys that were conducted, equating to just over 15 km of transects surveyed.

The diurnal red-collared brown lemurs (Eulemur collaris) *are often seen around camp.*

Herpetology

SEED has conducted many different herpetological studies since 2010, such as specimen collection, genetic barcoding, and population monitoring. Our varied approach means that the SCRP team now possesses a comprehensive understanding of the herpetological community in Sainte Luce. Based on our previous work, we can now confidently confirm the presence of at least 21 distinct species of amphibian and 54 species of reptile at the study site. Furthermore, our genetic work indicates that 15 of these species represent candidate new species that still require formal identification and description. Since 2017, SCRP has conducted population monitoring of herpetofauna using distance sampling methods, similar to that of the lemur surveys, with the objective of monitoring species abundance and distribution. This data will be used to estimate population densities in different forest fragments, as well as the habitat requirements of the different species. With over 7,000 observations of herpetofauna over the three years of transects that have been conducted, this information will be invaluable for providing much-needed information on many of the herpetofauna species in Sainte Luce, particularly those that constitute new species. During 2020, SCRP and short-term volunteers had 975 herpetofauna observations over the 81 surveys conducted, equating to 29.6 km of transects surveyed.

SCRP staff taking measurements during a herp survey for a Heterixalus boettgeri *frog that had been spotted.*

While the herpetofauna monitoring has been put on hold during the COVID-19 pandemic, the SCRP team has been developing projects with the Project Development team to continue studying the herpetofauna in Sainte Luce.

Other biodiversity surveys

During the first quarter of 2020, SCRP conducted other biodiversity surveys which were put on hold due to the COVID-19 pandemic. Bird point counts were collected to supplement data collected in 2014 – 2017 and 2019. This will be used to confirm and add to the species list for the Sainte Luce area, and to look at potential guild diversity differences between the forest fragments.

SCRP also started a new project looking at fungal diversity between different forest fragments. Although it is very difficult to identify fungi to species level, they can be identified to family level. SCRP is collecting data to identify the diversity of fungi within Sainte Luce, between different fragments, and to create an inventory of the different families present in the area.

Fungi and dragonflies sampled during SCRP's biodiversity surveys.

Dragonfly surveys were being conducted in different waterbodies around Sainte Luce, with this information providing information on the dragonfly diversity in Sainte luce. These surveys will be repeated in six different mahampy wetlands that have different harvesting levels to determine how harvesting and the physical characteristics of the wetlands might affect dragonfly diversity.

Environment Department projects

Lobsters

Project Oratsimba has worked with fishers in Sainte Luce since 2013 and have expanded their work to other lobster fishing communities. The aim of the project is to protect lobsters from overfishing (an important source of income for most people living in Sainte Luce), while also providing a sustainable livelihood and income.

Person fishing from a pirogue in the estuary.

SCRP has been working with the Project Oratsimba team to monitor freshwater fishing activities within the estuary. The survey is being conducted to determine how the level of freshwater fishing changes with the closed lobster fishing season. The surveys are also being conducted during the COVID-19 pandemic to see how this situation may affect levels. Along with measuring how many people are fishing in the estuary, the methods of fishing are also noted. People tend to use either hand-held lines or mosquito nets, with mosquito nets being indiscriminate and removing different sizes and ages of fish, often removing the juvenile forms and potentially lowering recruitment into the populations. These surveys are important to conduct during the COVID-19 pandemic because the price of lobsters has dropped making lobster fishing (a main livelihood for people in Sainte Luce) financially unviable. With SCRP being based less in Sainte Luce compared to previous years, emphasis was placed on training SCRP's local guides who are based in Sainte Luce to lead these surveys.

Ala

Project Ala re-connects isolated remnants of the protected littoral forest fragment S8 through the planting of forest corridors. The main purpose of planting the forest corridors is to connect the isolated populations of the three nocturnal lemur species found in the S8 remnants. These lemur species are reluctant to cross open ground and disperse into new habitats, meaning that these populations are currently isolated from each other. Reconnecting these populations through corridors will enable the populations to interbreed and will ultimately increase the amount of habitat available to individuals.

Three of the four corridors were planted in 2019, and the fourth (Corridor 2) has been planted in 2020. The corridors were initially planted with *Acacia magnium* seedlings, with the aim that this introduced plant would help the native seedlings to establish and improve initial soil fertility. The planted seedlings survival and growth is monitored, and some of the acacia have now reached heights of over 2m.

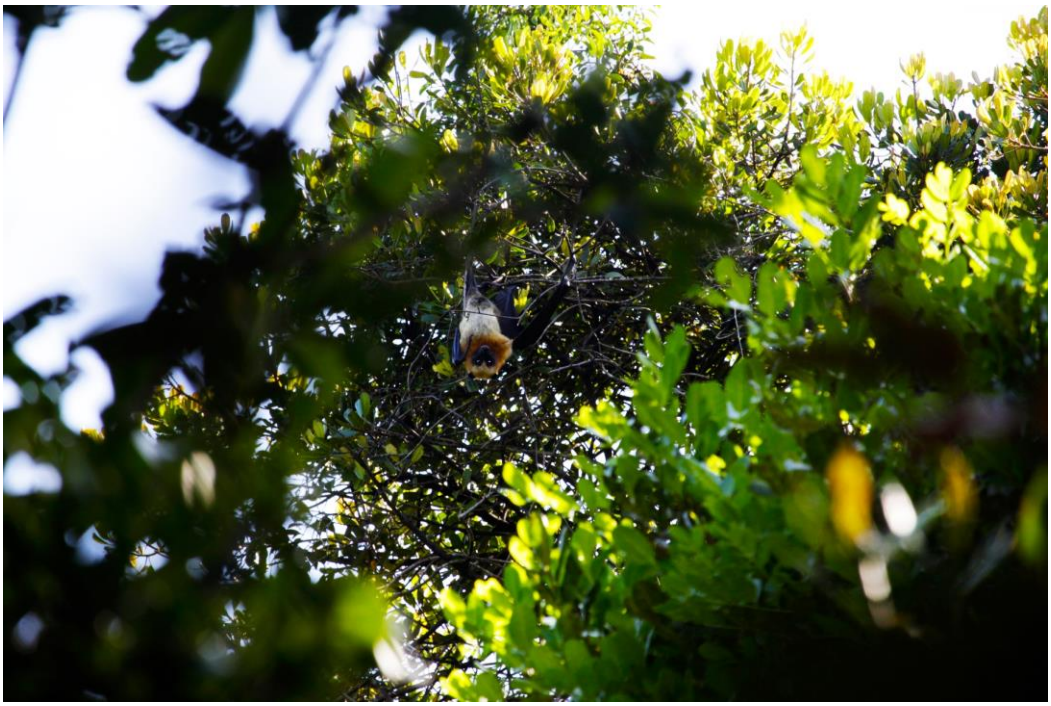
SCRP local guides Raziva and Babs measuring the acacia that was planted at the start of Ala project.

Baseline surveys have been established, monitoring how the number of lemur and herpetofauna observations changes within the corridors as they establish. No lemurs have been observed within the corridors. Following the clearance and planting of the corridors, the only herpetofauna species that were observed were skink (*Trachylepis* spp.) species, which are often found on open ground. However, six months following the planting of Corridor 1, a warty chameleon (*Furcifer verrucosus*) was spotted on the edge of the corridor. These surveys will be continued to see how these faunal observations change over time. SCRP, Project Ala team, and the local guides have been able to continue these surveys during the COVID-19 pandemic.

Flying Foxes

Project Rufus focuses on the *in-situ* conservation of *Pteropus rufus* (the Madagascan flying fox) through community engagement and scientific research. *P. rufus* populations have been declining throughout the country due to hunting and deforestation. To mitigate these effects, in 2017, a 48ha exclusion zone was established in S6 as part of Project Rufus Phase I, protecting the only *P. rufus* colony in Sainte Luce. The exclusion zone is an area agreed upon by the community where logging and hunting are prohibited. The Sainte Luce colony was estimated to contain 130 individuals in 2016, a decline from an estimated 300-350 individuals in 2000.

In 2020, SCRP was able to conduct some roost counts in the first quarter. SCRP now has nine months of bat roost count data, with the estimated roost numbers varying between each month. The most roosting bats were counted in June-July and October-November. This might suggest that at certain times of the year there is considerable individual migration between different roost sites, possibly linked to reproduction. Phase II of Project Rufus is currently being developed with the help of SCRP, and the team will be involved with the research aspect of the project.



A Pteropus rufus *roosting in native trees at the Sainte Luce site.*

Mahampy

The *Lepironia articulate* (Mahampy) species is a herbaceous wetland plant that is utilised by local communities for weaving baskets, hats, and mats. Project Mahampy aims to create weaving cooperatives to improve the price stability of mahampy products, as well as promoting sustainable harvesting practices within the community. SCRP is working with the Project Mahampy team to design a study to help understand the physical characteristics of the wetlands and the biodiversity of the wetland and how to monitor this long-term. SCRP has conducted some faunal and floral surveys of six mahampy wetlands in Sainte Luce, three of which are frequently harvested, and three are infrequently used. These surveys revealed that there were over 40 different species of trees found either within or on the edge of the wetlands. There were also a variety of animal species seen, such as different dragonflies, butterflies, and water invertebrates, amphibians, reptiles, and birds.

SCRP has also set up three quadrats in each of the six wetlands for long-term monitoring. The mahampy reed coverage will be estimated within the quadrats and how this changes seasonally and over time. Sedimentation levels, water height, and pH will also be measured in these quadrats. Finally, drone surveys are being conducted over the wetlands to monitor landscape changes.


The SCRP team surveying the mahampy wetlands and measuring reed height and density.

Club Atsatsaky and Community Education

Club Atsatsaky, or Club A, is SCRP's conservation club for the children of Sainte Luce, with this education programme being conducted since 2011. Lessons were conducted out of class in two of the villages, Ambandrika and Manafiafy, with the aim of this conservation club to educate the children on the forest and everything that inhabits it. Lessons were taught about different projects, fauna, and flora. Attendance would fluctuate between lessons, with class sizes ranging between 40-150 children, and the age range of the children between 3-16.

At the end of 2019, there were discussions about changing the structure of SCRP's conservation education. While we have been able to engage many different children over the years in Sainte Luce, SCRP sought to expand and develop the education sessions to include the wider community, and engage more with the adults of Sainte Luce about the work we are doing. From there, a three-pronged approach was taken that would engage with adults, children, and young adults. Due to the COVID-19 pandemic, we were unable to run the sessions targeted towards young adult professional development.

Children education days

Club A lessons were condensed into an education day that will be run once per quarter, with a half day each in Ambandrika and Manafiafy. SCRP conducted the first of one these education days with the Project Mahampy team, along with the help of SCRP's local guides from Sainte Luce. Over 150 children attended the Mahampy children education day in February. Children were split into four age groups so that activities could be tailored to the age of the children. Some of the activities included a mahampy wetland visit to learn about the animals, creating a food web of the wetland ecosystem, weaving, and learning about the cultural significance of mahampy in Madagascar. Four presidents of the Sainte Luce mahampy cooperatives led each activity, with SCRP supporting them. Our aim for the education day was for children to learn more about the mahampy wetland ecosystem and the need for sustainable harvesting, and to engage and involve more community members in teaching these lessons.

Local children learning about mahampy weaving and foodwebs in wetland ecosystems from the presidents of the different weaving associations in Sainte Luce.

Community information sessions

SCRP ran two evening information sessions that were attended by adults and children. Approximately 100 people attended the sessions that were run in Ambandrika and Manafiafy. Hoby, SCRP's head guide, ran the session, presenting information on SCRP's research, the unique nature of the local fauna and flora and how we go about monitoring key populations. The adults were relatively engaged, and asked a number of questions linked to Malagasy folklore; such as whether snakes are dangerous, and whether leaf-tailed geckos are bad luck. Overall, we thought the information session was successful and we will continue to run these once group gatherings are allowed.

Project Development

The Conservation Research Programme has been continually expanding and developing since its inception. SCRP has been working with the Project Development team to create generic proposals for future research projects to apply for external funding. This is to increase the capacity that SCRP would have for conducting further biodiversity research. SCRP has carried out research projects targeting many different taxa in the Sainte Luce littoral forest, though there are two vertebrate taxa

that have not yet been studied; freshwater fish and microbats. There are four projects that are currently being developed, with two focused on these vertebrate taxa to fill this knowledge gap.

Lemurs

With the final year of data collection on lemur population trends being interrupted by the COVID-19 pandemic, we have developed this into a small project where the lemur monitoring will be continued for one more year to finish the ten-year dataset. This final year of data collection will help to cement the population trends of the three nocturnal lemur species in Sainte Luce; southern woolly lemur (*Avahi meridionalis*), Thomas's dwarf lemur (*Cheirogaleus thomasi*), and Anosy mouse lemur (*Microcebus tanosi*). This project will also include one year of population monitoring of the only diurnal lemur species in Sainte Luce; the red-collared brown lemur (*Eulemur collaris*). The last population assessment of *E. collaris* in the Sainte Luce littoral forest was in 2011, and this project will provide a much-needed up-to-date population assessment.

Pygmy chameleon (*Palleon nasus*)

The genetic barcoding study conducted on herpetofauna by SEED suggests that the elongate leaf pygmy chameleon (*Palleon nasus*) that inhabits Sainte Luce is a candidate new species. SCRP is developing this project to continue collecting habitat information about the *P. nasus* from transect data, and to measure and photograph individuals in different forest fragments in Sainte Luce. This information will be combined with the genetic barcoding information that has already been collected to enable formal species description.

SCRP's head guide Hoby with a Palleon nasus.

Freshwater fish

SCRP is developing a study that will assess the freshwater fish diversity in the waterbodies near the Sainte Luce littoral forest. Local people within Sainte Luce utilise freshwater fish as a food source, and harvest the mahampy reeds in the wetlands to make mats and other products as a livelihood. We aim to assess the freshwater fish diversity in different waterbodies, and to use this information further to inform on the faunal diversity within mahampy wetlands and how this changes over time. For this survey, morphological data of trapped fish will be collected, along with tail clippings for

genetic study. SCRP is also looking at collaborating with international laboratories to conduct and pioneer eDNA sampling methods from fresh waterbodies in Madagascar.

Microbats

SCRP has worked with Megachiroptera (fruit bats) in the past and currently, but Microchiroptera are understudied in the Sainte Luce littoral forest. This study aims to assess the microbat diversity through the use of acoustic recorders and mist netting. Acoustic recorders would be set up in different sites around the Sainte Luce littoral forest to determine the areas that the microbats inhabit, and for species identification through their calls. Mist nets would also be set up in an attempt to capture individuals, and morphological and genetic data would be obtained from these individuals for species identification. The data from the acoustic recorders and mist netting would be combined to describe the microbat diversity within the area.

Publications

Palms population assessment

An eight-year study of two palm species (*Dypsis saintelucei* and *Beccariophoenix madagascariensis*) in Sainte Luce conducted by SCRP was recently published in the international journal *Palms*.

Citation:

- Hyde Roberts, S., Harris, S., Strang, K., Chrmrova, L., Guy, J.A., Rossizela, T.J., Rabehevitra, D. (In press). Palms on the brink: Conservation status of the Threatened palms (Arecaceae) *Dypsis saintelucei* and *Beccariophoenix madagascriensis* in the littoral forests of Sainte Luce, southeastern Madagascar. In press. PALMS. Vol 64 (4). Pp 177-190.

Abstract:

Initial population assessment of the palms *Dypsis saintelucei* and *Beccariophoenix madagascariensis* in the littoral forests of Sainte Luce in 2008 and 2011 revealed that despite their integral role as community resources, local populations were under significant pressure. Given their low abundance in the area, their utility, and increasing demand for resources driven by a rapidly expanding human population, these Threatened species warranted systematic and rigorous monitoring. Eight years after the last comprehensive baseline work, we reassessed the sub-populations of each species across four forest fragments. All previously recorded individual palms (n=239) were re-visited, and additional individuals (n=38) were identified. Results indicate that *D. saintelucei* has experienced a substantial decline, with a total mortality rate of 64%, whilst *B. madagascariensis* experienced a more modest, but still substantial loss (25%). The majority of losses (63%) can be attributed to anthropogenic factors. These findings underline the need for urgent conservation interventions, and in this paper, we offer several suggestions to mediate further losses and possibly reverse the trend.

Brown lemur dispersal

As part of our lemur monitoring project, the SCRP team observed and documented a rare natural colonisation event with important implications for lemur conservation.

Citation:

- Hyde Roberts, S., Racevska, E., Donati, G. (2020). The natural re-colonisation of a littoral forest fragment by the Endangered red-collared brown lemur (*Eulemur collaris)* in southeast Madagascar. In Press. Lemur News 22. Pp 24-26.

Abstract:

The biologically rich littoral forests of Sainte Luce support an isolated sub-population of Endangered red-collared brown lemur (*Eulemur collaris*). The area encompasses 17 disconnected forest fragments, separated by a matrix of ericaceous heath, grasslands, swamps and watercourses. Since the 1980s, this species has only been recorded within four forest patches. We detail this lemur's recent re-colonisation of a protected fragment and consider its broader implications for future conservation initiatives. This observation highlights the value of small, seemingly unimportant patches of forest and the importance of maintaining functional habitat connectivity.

Lemurs IUCN assessment

IUCN recently published the assessment of all four lemur species found in Sainte Luce, with all lemurs being classified as Endangered. SEED's long-term population assessment of the nocturnal lemurs of Sainte Luce contributed to this reassessment. Executive Conservation Coordinator Sam Hyde Roberts co-authored the assessment on the Anosy mouse lemur (*Microcebus tanosi*) and the red-collared brown lemur (*Eulemur collaris*). All four lemur species are declining and are further threatened by habitat loss and mining.

Citations

- Donati, G., Balestri, M., Campera, M., Hyde Roberts, S., Račevska, E., Ramanamanjato, J.-B. & Ravoahangy, A. (2020). *Eulemur collaris. The IUCN Red List of Threatened Species* 2020: e.T8206A115562262.
- Donati, G., Balestri, M., Campera, M., Ganzhorn, J., Hyde Roberts, S., Rakotondranary, S.J., Ramanamanjato, J.-B. & Rasoloarison, R.M. (2020). *Microcebus tanosi. The IUCN Red List of Threatened Species* 2020: e.T163024481A163024490.

Future Directions

This year saw a restructure for SCRP, with changes implemented on the development of new research projects, a focus on capacity building local staff, and a change in the way we engage with the community. SCRP will be continuing with this momentum through 2021 and will be aided in this with the establishment of a new Research and Conservation Committee within SEED. We will also look for funding to complete the long-term lemur monitoring dataset, as well as for other biodiversity projects. SCRP will continue to work with the different Environment Department project teams, continuing with fauna and flora surveys of the corridors to monitor changes for Ala, and studying the physical characteristics and biodiversity of the mahampy wetlands. We are also looking forward to welcoming back short-term volunteers in 2021 to increase our capacity in the field.

Concluding Remarks

This year has seen many different changes within SCRP, with a significant reduction in capacity. Despite this, the SCRP team has adapted, with international staff returning to their home countries but working remotely, and national staff running capacity building sessions with local guides to ensure robust data collection. This has included coordinating meetings over several time zones and conducting training workshops over video calling on new monitoring techniques and equipment use. This not only shows the resilience and dedication of the team and the Conservation Research Programme but also highlights the importance of capacity building within local communities, which has now enabled many of our studies to continue where possible.

Some of the SCRP team and volunteers