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sustainable environment, education & development

SEED Madagascar Conservation Programme:

Annual Biodiversity Report (December 2017)

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The SEED Madagascar Conservation Research Programme (SCRP) has been working in the threatened littoral forests of Sainte Luce, south east Madagascar since its establishment more than 15 years ago. To full fill its primary aim of community based conservation SCRP has an extensive programme aimed at expanding the current limited International and local knowledge of the flora and fauna found within these last remaining littoral forest fragments. This is done within a context of disappearing forests and forest fragmentation, rising pressure on natural resources and under the constant threat of large scale mining commencing within the forest fragments themselves. A central tenant of the programme is to work closely with the local community, involving local children, increasing understanding and promoting grassroots conservation. The research programme integrates a range of projects and interventions to ensure that the landscape of the area, be it terrestrial, marine or social, interacts in such a way as to be sustainable and thriving.

This report summarises SCRPs work in 2017; including studies that have continued or been built upon from previous years, novel projects and SCRPs involvement in SEEDs wider environmental programmes. Reports, publications and further detail on previous work can be found on the SEED website.

LEMUR RESEARCH

The 'lemur transects' survey, one of SEEDs longest running research projects was established in 2010 and was conducted continuously throughout 2017 with over 80 hours of data collection within the protected S8 and S9 fragments and with over 40 hours of collection in community usage zones S7 and S17. This long term research will produce accurate monitoring of the population size, spatial distribution and density of the three nocturnal lemur species found in Sainte Luce; southern woolly lemur, *Avahi meridionalis* (endangered), fat tailed dwarf lemur, *Cheirogaleus medius* (least concern) and a proposed new species of mouse lemur, *Microcebus sp. nov.* (undescribed but likely at least endangered) . This year, SEED staff and volunteers conducted 80 lemur surveys that provided additional evidence of how critical Sainte Luce's littoral forests are to these lemurs.

In 2016, alongside SEEDs Executive Research Coordinator and Oxford Brookes PhD Student Sam Hyde-Roberts, SCRP began to look at the Sainte Luce mouse lemur population in a new light, with evidence of a new candidate species hidden in plain sight. Over the past 6 months a thorough array of biometric measurements have been recorded, and a large collection of genetic material has been attained (tissue, hair and fecal samples) in order to formalise this species as part of SEED's Project Microcebus. Furthermore a number of male and female adult mouse lemur individuals have been radio-collared in both fragments S8 and S9 using lightweight HOLOHil collars, enabling Sam to determine how the lemurs utilize their habitat and to explore the social structure of the sub-populations. In order to minimize animal stress and handling times, DNA samples were collected at the same as the animals were collared (in adherence with strict ethical codes of practice). The final stage of Project Microcebus is now underway with the genetic samples being sent to the German Primate Center (DPZ) for analysis in the coming weeks.

The tracking and study of radio-collared individuals is on-going, with 30 hours of lemur follows being conducted at night each month. The data collected on such nights allows Sam to build up a picture of the species home range, social structure, sleep site ecology and also reveals the details of the species diet. The collared individuals are followed throughout their ranges, but with captured animals all occurring in a relatively restricted area, it is possible to also observe how individual territories overlap. This study is already revealing novel details of this species private life, elucidating sleep site and nesting behaviour, dietary information and seasonality. In accompaniment with this final aspect, Sam and the SCRP team have also been conducting an in-depth phenology study, in order to better understand the forests seasonal cycles and improve our knowledge of forest structure, and how these rhythms direct lemur activity schedules.

This summer also saw the development of our collaboration with Oxford Brookes University as PhD candidate Elena Racevska arrived in Sainte Luce. Elena arrived in Madagascar in June 2017 and is studying the role of collared brown lemurs (*Eulemur collaris*) in the regeneration of the littoral forest of Sainte Luce and Mandena. She is collecting data on these lemurs' seed dispersal, as well as investigating secondary dispersers and seed predators in the area. Additionally, she will be surveying local population's reliance on forest resources. Her aim is to use these information to model the effects that potential local extinctions of this lemur species could have on local people's livelihoods.

During 2018 the SCRP team will analyse the data and present the initial findings on the relationship between logging and disturbance in different forest fragments has affected the lemur populations.

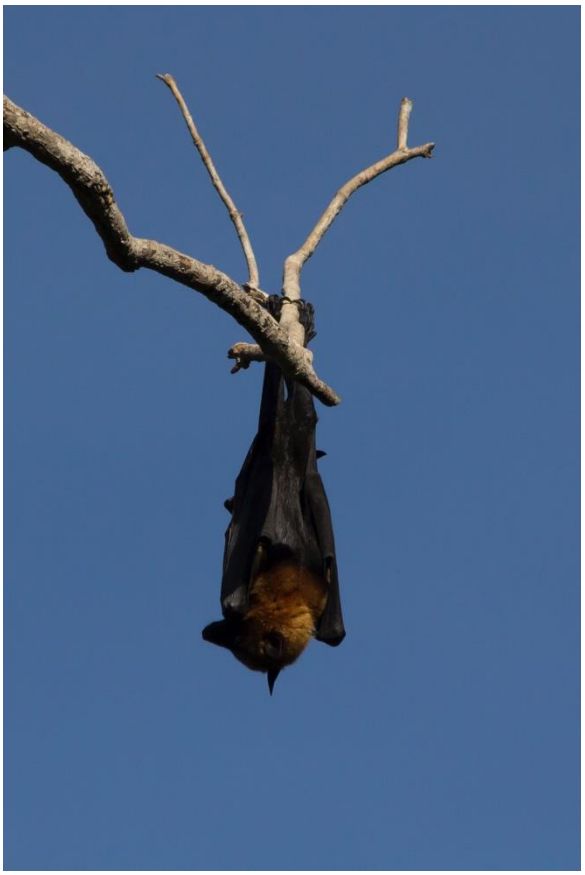
REPTILE AND AMPHIBIAN RESEARCH

Herpetological work within Sainte Luce has been ongoing since 2010, with genetic sampling and analysis conducted between 2015-16 confirming the presence and identities of 21 species of amphibian and over 46 terrestrial reptiles. These studies have revealed that the herpetological community of Sainte Luce is much richer than previously thought, with at least 15 novel candidate new species identified. These species are currently in the process of being formally described. Such species include an array of gecko's, 2 snake species, 3 skinks and 5 frogs. Our thanks to our collaborators and friends at the Center for Integrative Biology in Portugal and museums in Italy and Germany! However the team is still searching for a small number of species with extremely low levels of detectability, believed to be in the area. In order to locate these species, we are using a combination of pitfall trapping and habitat specific visual encounter surveys (VES). It is hoped that we are able to confirm the presence of several further species in Sainte Luce within the next few months.

2017 saw the start of SCRPs new long term monitoring programme for the reptiles and amphibians of Sainte Luce, with an adjusted methodology. Essentially the aims of this project are similar to those in the past, to collect vital information on species diversity and abundance, whilst providing an opportunity to identify temporal population trends. VES have been deployed along transects in S7, S8, S9 and S17 collecting distance information as well as local environmental variables. Surveys were carried out during the day and the night in order to maximise the chances of detecting a more accurate representation of the species and their numbers throughout these forest fragments. These surveys have also collected important spatial and temporal data for species including the critically endangered day gecko *Phelsuma antanosy* and rarely encountered species of snake belonging to the genus *Pseudoxyrhopus*.Currently over 1000 records of reptiles and amphibians have been recorded since January 2017 and preliminary analysis will be conducted in 2018.

BAT RESEARCH

Project Rufus has been running since January 2016 after receiving funding from the Rufford Foundation, Phoenix Zoo, Minnesota Zoo, James Hall, Clark Mitchel and Lake District Wildlife Park, with the aim of working with the engaged local community in order to protect and increase the local population of the Malagasy flying fox, *Pteropus rufus*, whilst providing a source of income for local communities. Construction of an eco-tourism bat hide, establishment of a 48 hectare community enforced conservation zone (Exclusion Zone) in fragment S6, and the training of two bat patrol officers selected by the local community has seen a dramatic increase in the numbers of these species. The proposed exclusion zone is within the community usage zone, so continued community support was absolutely essential for the success of the project.



The Malagasy flying fox is a keystone species that has seen a decline of over 30% in Madagascar over the last 20 years due to habitat loss and increased hunting pressures. The bats are vital pollinators and seed dispersers, not only making them important to the forest ecosystem but also as an ecosystem service for the local people of Sainte Luce. Since the establishment of the bat hide and Exclusion Zone, monthly population census research by SCRP has shown an approximate fourfold increase in numbers reported at the roost since September 2016, with upwards of 450 individuals estimated in June 2017. This increase is likely from a combination of factors such as natural recruitment from other regional roosts, as well as a more optimised rearing success due to the reduction in disturbance from the established exclusion zone. Sainte Luce is also one of the only Malagasy communities to pass the prohibition of bat hunting into law, further reducing disturbance to the flying fox population in the local area. SCRP will continue to visit the roost monthly in order to carry out population estimates and to monitor the exclusion zone in terms of logging and other human disturbances, supporting the local COBA to protect the roost.

In April, a site visit to the Exclusion Zone was conducted during a community meeting after concerns were raised about the size of the zone and community access to forest resources. The visit, led by SEED project staff, took place in the forest fragment S6 with participation from the Chef Fokontany, Chef COBA (COBA Chief), and a local community representative

from each of the target communities. Attendees were firstly shown the roost site and then taken around the perimeter of the Exclusion Zone, before a meeting was held in the forest. All attendees immediately confirmed satisfaction with the size of the Exclusion Zone and a fine system was agreed for infractions. Currently the formal *Dina* (local custom) is with the DREF (Directorate for Environment and Forests) awaiting ratification.

GPS collaring has unfortunately been unsuccessful this year due to issues with permit acquisition, the presence of young at the roost in S6, and the seasonal movements of the flying foxes with the colony temporarily deserting the roost site from late February to March. The colony has now returned to the roost site and SCRP staff have started initial surveys to determine suitable collaring locations for when the young fledge in April 2018.

BOTANICAL RESEARCH

The forest fragments in Sainte Luce receive differing levels of logging intensity for firewood and timber collection, with S6 and S7 designated as community usage zones. In order to quantify the differences between the forests where logging is permitted and the community protected forests, as well as assessing general forest structure, SCRP have been conducting surveys throughout 2017.

In each of the forest fragments 10 x 10m quadrats are constructed along existing transects. Their location is randomly calculated using a die to generate distance along transects, left/right of path and distance off the transect path. The methodology for the surveys falls into three activities: 1) understory density is calculated using a 3m pole divided in 0.5m sections; 2) leaf litter and canopy cover are measured in each of the quadrat quarters; 3) diameter of the trees at breast height. Each activity builds on our knowledge of the density of the forest cover.

These densities will be compared between the forests of S7, S8, S9 and S17. After 9 months of data collection we have significant results, which are to be used to support knowledge gained through the herpetological and lemur transect work.

As SCRP have conducted research on establishing the abundance and diversity of reptiles, amphibians and lemurs in both degraded and healthy forest fragments in Sainte Luce and by collating this data with the forest analysis results, we hope to theorise why these differences in biodiversity occur.

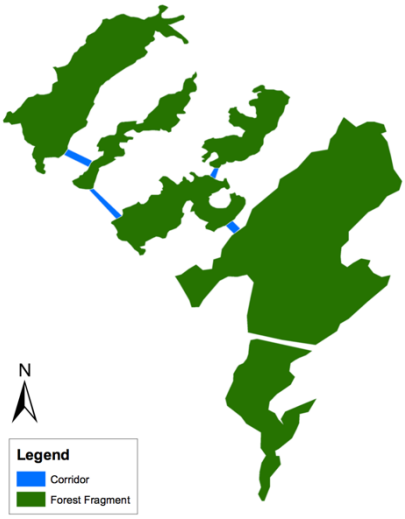
REFORESTATION

Reforestation is an integral part of conservation, and perhaps the most important activity that could take place in Sainte Luce. The remaining littoral forest fragments are isolated by expanses of scrubland and agriculture after being historically logged and cleared. Our reforestation project, Project Ala, is currently seeking funding and aims to reconnect four remnant forest blocks with the community protected fragment S8 North and SCRP has provided technical expertise in the development of this programme.

Four 20m wide habitat corridors are proposed to facilitate and promote the dispersal of the threatened red collared brown lemurs *Eulemur collaris* and southern woolly lemurs *Avahi meridionalis*, as well as the novel candidate mouse lemur species *Microcebus sp.*. In turn, the proposed corridors will provide additional habitat and dispersal opportunities for a number of taxa, including invertebrates, small mammals, amphibians and reptiles, such as the critically endangered day gecko *Phelsuma antanosy* which has isolated populations scattered across the remnants. SCRP aims to work with the community to create, maintain and promote these habitat corridors, using fast growing acacia to form the basis of the corridor, with secondary planting of pioneer native species (identified from edge species assessments in 2016). It is hoped that species diversity and richness will increase yearly post construction and that within 7-10 years mouse lemur and fat-tailed dwarf lemurs will be using the habitat corridors, with the larger lemur species following once trees reach further maturity.

In November the SCRP team met with the Chef of Sainte Luce as well as COBA and FIMPIA representatives to visit the proposed corridor sites and discuss the project, its feasibility and

the need for reforestation. All parties were completely engaged with the project, agreeing with the need for habitat corridors and we look forward to working with the community on this vital project in the near future. The current SCRP nursery has undergone maintenance and restoration in preparation for the project and has the capacity to produce thousands of seedlings. Current stocks of acacia being grown for initial planting are growing quickly, and once permits have been acquired for seed collection, corridor species can be harvested from the forests and germinated in our nursery.



INSECT RESEARCH

This year marked the completion of our dragonfly ecology survey. Dragonflies and damselflies were caught using nets to allow for identification, with environmental information recorded in order to examine their habitat preferences and categorising the species into three types; 1) those that rely on undisturbed forest, 2) those that are tolerant of secondary forests and degraded areas, and 3) those that depend on open environments. After conducting this survey for over a year we also now have seasonality data for these species. In 2018 the SCRP team will analyse the data for publication.

SCRP also undertook research to gain a better understanding of the invertebrate community in St Luce through the use of pitfall lines in S8 and S9. The SCRP team has also completed work on butterflies, collecting specimens for analysis and gathering information on distribution. This will allow greater understanding of the evolution and linage of these species, and add to knowledge on the fragmentation effects of the littoral forest of Sainte Luce.

Sam Hyde Roberts has also continued to study the seasonality and diversity of butterflies in Sainte Luce, and produced a first guide to the species of the area. Similarly Sam has

continued to collect and rear caterpillars opportunistically in an effort to fill in the missing ecological gaps that still exist in the field of Madagascar lepidopterology.

LOBSTER RESEARCH – PROJECT ORATSIMBA

Project Oratsimba has been promoting sustainable lobster fisheries management since June 2013. The project is currently in it's third phase, with the aim of strengthening local and regional capacity to implement adaptive, sustainable fishery management, economically empowering 850 fishers, contributing to poverty alleviation amongst 4,250 people in Sainte Luce, Elodrato and Itapera communities. A 13km^2 No Take Zone (NTZ) was established in July 2015 with the aim of providing the lobsters an area with an extended period of time to breed before fishing commenced. This year, Stephen Long published the 'Short-term impacts and value of a periodic no take zone (NTZ) in a community-managed small-scale lobster fishery, Madagascar[1]', observing an estimated 435% increase in catch compared with the average catch in the previous five months. There was also a 33% increase in the price fishers received.

Through January to October SCRP have been assisting Christin, our Oratsimba fisheries monitor, in measuring catch effort and catch composition in order to monitor the status of the fishery and compare data throughout the months. Weekly morning surveys have been conducted by our volunteers on the main fishing beach at Manafiafy, taking hands on measurements of the days catch.

Excitingly SEED Madagascar has been invited to submit to the second round of the Darwin Initiative, which if successful would bring an enormous expansion to the project looking to further increase the sustainability of the lobster fishery, improve the livelihoods of the local community, provide further employment opportunities, scale up to new communities and attempt to promote biodiversity in the regional seas. This year saw a new partnership with Blue Ventures, bringing their expertise and experience into the project, as well as supporting the initiation of new fisheries monitoring staff. SEED Madagascar has also

1 Long S (2017) Short-term impacts and value of a periodic no take zone (NTZ) in a community-managed small-scale lobster fishery, Madagascar. PLoS ONE 12(5): e0177858. https://doi.org/10.1371/journal.pone.0177858

joined the Mahari, a fisheries learning network, sharing experiences, novel ideas and best practice across organisations in Madagascar, hosted by Fort Dauphin this year.


MARINE TURTLES

Building on SEEDs previous work in Project Fanomena and working closely with local tourism industry, Project Fano is SEEDs newest research initiative within Sainte Luce, focusing primarily at marine turtle nesting success along a 6.4km stretch of coastline north of Manafiafy village. Loggerhead turtles *Caretta caretta* are known to nest along the beach, with anecdotal but unpublished reports of green turtle *Chelonia mydas* nesting. During the 2016/7 nesting season the community protected seven marine turtle nests. Despite best intentions, interference with the nests and mesh netting caused numerous issues for the hatchling turtles leading to incidences of mortality. This highlighted the need for action in Sainte Luce, where previously turtle numbers have reportedly dropped due to harvesting of adults and eggs.

Whilst primarily a baseline research project, SCRP have had the opportunity to work alongside Manafiafy Beach and Rainforest Lodge and the Turtle Association made up of community members, both of whom are working on nest protection and sensitisation within the community. The aims of SCRP is to produce a data on the nesting loggerhead turtle population and nesting success in Sainte Luce, whilst building the capacity of the Turtle Association as data collectors and leaders of community-led practical conservation activities alongside Manafiafy Beach and Rainforest Lodge.

In November SCRP began turtle patrols every morning in order to identify nesting turtles or traces of turtles from the previous night. The Turtle Association received training on data

collection and best practice, and will identify nests throughout the nesting season. This will provide baseline information for future research and monitoring.

ENVIRONMENTAL EDUCATION

The SCRP environmental education programme, Club Atsatsaky (Club A), is run on a weekly basis in Sainte Luce. The lessons take place in in Ambandrika and Manafiafy schools and over 100 children attend each week. Lesson topics during 2017 have ranged from conservation issues such as *tavy*, forest community ecology and sea litter, to animal specific classes including mouse lemurs, tenrecs and humpback whales. The lessons end with a game that includes the children and volunteers, which is a fun way to engage and interact with the class. For example, the whale lesson ended with an activity in the playground where the children had to guess the size of a humpback whale.

World Environment Day celebrations were held in June and involved the local school children working with SCRP to plant 134 fig and guava seedlings along the edge of S9. Not only was this a great hands on approach for the children to take part in reforestation, but was an integral part of SEED's aim to expand the forests in Sainte Luce. By planting more seedlings SCRP are not only aiding in reforestation, but also providing a valuable habitat for plants and animals.

SCRP could never carry out the work on our conservation programme without the help from our international volunteers and the partnership of local community and The Ministry of the Environment and Forest

This year we have built on our success from previous years and have had the opportunity to begin vital long-term monitoring research. From our baseline research on the development of habitat corridors in 2016, we have been able to fine tune our proposal for SEEDs wider reforestation work. The bat hide continues to generate eco-tourism revenue and since the implementation of the Exclusion Zone, flying fox numbers have increased. This year saw the beginning of arguably our most important research activity, forest structure analysis, and through the hard work of staff and volunteers key data on the fragments structure and health is being gathered. Another huge achievement is the successful implementation of Project Fano, which already has the potential to grow into a community led conservation project.