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SEED Madagascar Conservation Programme

Annual Report

2019

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Executive Summary

This report summarises the research and community conservation activities of the SEED Conservation Research Programme (SCRP) during 2018 in the littoral forests of Sainte Luce, Anosy region. Established in 2010, SCRP is dedicated to increasing understanding of the littoral forests and surrounding habitats of Sainte Luce, championing local conservation and expanding the scientific community's knowledge of the unique flora and fauna of Madagascar. It continues to work dynamically, identifying and prioritising research, engaging the local community through regular education sessions and livelihoods-focused conservation activities and maintaining dialogue with stakeholders. The SCRP team has continued work on long term research projects, has initiated several new projects and has maintained strong relationships and co-management with the local community.

Ongoing projects

Lemurs

Throughout its eight year history, SEED's lemur studies have covered aspects of research including habitat type, behaviour and abundance, now focussing exclusively on the latter until 2021. SCRP studies the 3 nocturnal species found in Sainte Luce; the Anosy mouse lemur (*Microcebus tanosi*), Thomasi's dwarf lemur (*Cheirogaleus thomasi*) and the Southern woolly lemur (*Avahi meridionalis*). SCRP employs a simple distance sampling method for its lemur studies, along predetermined transects within the S7, S8, and S9 forest fragments. Surveys use torchlight to spot the eye shine of individual lemurs, measuring the distance from transect for each sighting, as well as other basic situational information. During 2018, SCRP completed 62 transects across all forest fragments, comprising over 165 hours of survey time and covering 239km.

The results from these studies will be used to infer the spatial-temporal differences in abundance and density of nocturnal lemurs in the littoral forests of Sainte Luce, across a 10 year period. Conclusion of these studies in 2021 will represent an incredible achievement for SCRP, with a powerful continuous ten-year dataset to explore and inform future conservation options. Unfortunately, preliminary analysis of the dataset shows that lemur observations were low in 2018 when compared to previous years, with the lowest number of observations recorded since 2013, despite completing the most transects since 2015. A total of 147 observations were recorded across the 62 surveys and is suggestive of a continual decline in nocturnal lemur numbers across Sainte Luce. This trend emphasises the urgent need for conservation work in the area.

Formerly transects were also conducted within the S17 forest fragment, concluding in mid-2018 with presence confirmation of all 3 nocturnal lemur within the fragment. Access to this fragment is challenging, whilst the shape of the forest makes accurate long term population monitoring extremely difficult.

Taking measurements of an Anosy mouse lemur (Microcebus tanosi)

SCRP's lemur transects in 2018 have been complementary to the work of SEEDs Executive Conservation Research Coordinator, Sam Hyde Roberts, who recently completed the data collection phase of his PhD, based at Oxford Brookes University, UK. Through this work DNA barcoding work has now definitively confirmed the identity of all 3 nocturnal lemur species in Sainte Luce for the first time, and Sam is now part of the team assessing the species conservation threats for the imminent IUCN update.

Over the past 6 months Sam has continued to capture and record important biometric data on mouse lemurs, fitting 8 mouse lemur individuals with BioTrack radio collars since August. These collared individuals have enabled a first study of *Microcebus tanosi*, elucidating the ecological and behavioural habits of this little known species. In total over 20 mouse lemurs have been fitted with radio-collars since 2017 and morphological data has been collected for 40 individual mouse lemurs, whilst home range and territory size is currently being determined. It is clear from preliminary evidence that male individuals have larger ranges than females (>1Ha), and that the home ranges of multiple females overlap that of a single male. Furthermore for the first time, the sleep site ecology of the species is beginning to be better understood, with *Pandanus dauphinensis* seemingly playing a crucial role in the species ecology.

The research has included study of the competing small mammal community and 197 animals (8 species) have been recorded and measured. Wider occupancy surveys have also revealed that the distribution of mouse lemurs in the southeast is very complex, but tentatively we believe that we have discovered a physical boundary between *M. tanosi* and *M. ganzhorni*.

In addition to Sam's work, SEED are also now in the process of establishing a strong research collaboration with Oxford Brookes University, with the aim of stimulating novel research projects and attracting further academic interest to Sainte Luce. In 2017 and 2018, SEED hosted PhD student Elena Racevska, whose work focuses on the secondary seed dispersal capacity of *Eulemur collaris* and local attitudes towards lemurs.

Left to right: Thomasi's dwarf lemur (Cheirogaleus thomasi), Southern woolly lemur (Avahi meridionalis)

Herpetology

SEED's herpetological studies have been on-going since 2010, with the objective of monitoring species abundance and distribution. Over this period a multitude of survey techniques and methodologies have been employed, including the implementation of a long-term distance sampling protocol, genetic barcoding work and specimen collection and analysis. This varied approach, along with the thorough investigation of all leads that concern interesting observations, means that we now possess a very comprehensive understanding of the herpetological community. We can confidently confirm that 21 distinct species of amphibian and 54 species of reptile occupy the littoral habitats of Sainte Luce.

The genetic barcoding assessment undertaken between 2015-2017 in collaboration with CIBIO in Portugal has been instrumental in identifying a number of candidate new species and correcting numerous previously published misidentifications. Our results have revealed 6 new frog species that will now require formal description in the coming years. One of these frogs, a tiny Microhylid species will soon be described and in fact belongs to a new genus. Furthermore, it is now clear that 2 chameleon species, 2 snake species, 3 geckos and several skink species are also currently un-described and await description. In total, our investigation and efforts revealed 16 new species of amphibian and reptile. Specimens from a small number of extremely cryptic species, whose genetic markers lie on the threshold for new species classification are still being sought in order to finalise the population assessment. In such cases, an in depth morphological study will be required for trait comparison. Importantly, monitoring the abundance and distribution of priority species can now take place more effectively.

Importantly, we also now know that some species are incredibly rare in Sainte Luce, including a number of frog species that have only been observed a handful of times since

our studies begun, and in some cases are known from single chance observations. Such species remain enigmatic despite our huge efforts, and therefore their conservation status in the littoral forests is unclear. A small number of species found in Sainte Luce are known regional endemics, including *Phelsuma antanosy, Zonosaurus analanelany* and *Pseudoxyrhopus kely.* Our results now clearly show however that more species may be restricted to the area than previously thought, including *Guibemantis diphonus*, a critically endangered species, as well as new species of *Boophis*, *Mantidactlyus*, and *Flexiceps*.

In contrast, over the past year several Nile Crocodile (*Crocodylas niloticus*) observations have been made in the river systems of Sainte Luce. This represents an encouraging sign for a species that has been heavily persecuted in the area, with sightings being very rare in previous years.

In 2017 the herpetological methodology was changed to align with the lemur protocol, adhering to a robust methodology and standardising data collection across both surveys. A distance sampling protocol is now used to assess herpetological density and abundance within forest fragments S7, S8, S9 and S17. These measures are designed to monitor species abundance over time, and can be indicative of overall ecosystem health. During 2018, the team completed over 50 daytime surveys and over 40 nocturnal surveys. Data will be collected continuously until 2022, when full analysis will be used to compare and contrast the density and abundance of herpetological species across spatial and temporal scales and ultimately inform conservation strategy planning.

SCRP's continued herpetological surveys will present a large body of data for analysis and publication when it concludes in 2022. Whilst transects will remain the principle focus, other aspects, such as further discovery of cryptic species, will be incorporated into SCRP's studies on an ad-hoc basis, yielding important information for herpetological knowledge of the area. Recently, two manuscripts have been submitted to scientific, peer-review journals (PloS One and Herpetology Notes) and should be published early in 2019, complementing our collaborative work published in Zoosystematics and Evolution earlier in the year. A further manuscript submission in Spring 2019 is planned outlining the DNA barcoding work completed last year.

Phelsuma anatanosy

Project Oratsimba has worked with fishers since 2013 in three communities surrounding the SCRP research area to protect lobster stocks and breeding grounds from overfishing whilst providing a sustainable income for members of the communities where it operates. SCRP, have assisted with data collection for the past **3** years through weekly data collection on catch composition, size, weight and species of individual lobsters, and number of gravid females. Analysis is currently being completed on the effects of a No Take Zone on the lobster fishery and the communities that depend upon it. In August this year, SEED was visited by their partners from University College London, UK, who presented the Marine Protected Areas Governance framework to the team.

Several species of lobsters can be found around Sainte Luce, summarised in Table 1.

Table 1: lobster species of Sainte Luce

Spiny Lobster species	Slipper lobster species
Panulirus longipes	*Parribacus antarcticus*
Panulirus homarus	*Scyllarides squammosus*
Panulirus penicillatus	*Arctides regalis*
Panulirus ornatus	

Left to right: Panulirus longipe, Panulirus ornatus

Fano

Project Fano, SEED's sea turtle research initiative ran from October 2017 – March 2018 and focused primarily on measuring marine turtle nesting success along a 6.4km stretch of coastline running north from Manafiafy village. Loggerhead turtles (*Caretta caretta*) are known to nest along this beach, with anecdotal and unpublished reports of green turtles (*Chelonia mydas*) nesting here also.

SCRP worked closely with a local ecolodge, Manafiafy Beach and Rainforest Lodge (MBRL), and the Turtle Association, made up of local community members, on nest protection and sensitisation within the community. SCRP, MBRL and the Turtle Association held several meetings and outcomes included: confirmation of the Turtle Association commencing nest patrols on the 9th November; SCRP providing written protocols as refresher training for the patrol; MBRL sharing the portfolio of caught turtles with photographs, tag numbers and biometric measurements; training by SCRP for tagging best practice; creating a nest stewardship scheme with financial compensation for hatching success.

In March, the SCRP team were fortunate enough to take part in the rescue and release of a rare adult leatherback turtle (*Dermochelys coriacea*), which had been captured by local fishermen. The individual had a carapace measuring over 1m in length, indicating that it was likely over 30 years old and therefore sexually mature. MBRL and the Turtle Association managed to negotiate a settlement for its release with the fishermen, whilst the SCRP team helped prevent the individual from becoming dehydrated or burnt. Likely part of the South West Indian Ocean subpopulation, comprising only 148 individuals, the release of this individual represents an important conservation action.

Left to right: Hatching sea turtles, turtle nesting site.

Forest Analysis

The littoral forests of Sainte Luce are naturally highly fragmented, with fragmentation exacerbated by local and external anthropogenic influences such as community logging. Assessment of the unique structure of each fragment and the differences in composition between community use and protected forest fragments is important in generating a broader understanding of the littoral forest ecosystem. Consequently, in order to assess these differences and develop a more in-depth knowledge of the ecosystem, SCRP have been conducting forest analysis surveys since July 2017. Data collection has continued throughout 2018, and concluded in December.

In each of the forest fragments, 10 x 10m quadrats are randomly selected using a die to generate distance along transect, left/right of path and distance from the transect path. During each quadrat, the team monitors three principle aspects of the forest structure: 1) understory density; calculated using a 3m pole divided in 0.5m sections; 2) leaf litter and canopy cover; recorded in 4 randomly selected locations within the quadrat; and 3)

diameter at breast height of trees with a diameter >10cm. Quadrat study sites were mapped on QGIS at the end of the third scheme of 2018, highlighting any gaps where data were absent. The final scheme of 2018 was then aimed at filling these gaps along transect paths whilst still using a random selection method. Altogether, the SCRP team collected data from 249 forest quadrats across the S7, S8 and S9 forest fragments.

Analysis of this 17-month data set will produce an in-depth summary on the structure, density and health of each forest fragment in Sainte Luce. In order to ensure a conclusive and robust study, data collection efforts will commence again in 5 years time to enable a comparative assessment of forest health, logging intensity and changes in forest structure on a temporal scale.


Left to right: Measuring canopy cover and forest density.

New projects

Ala

Project Ala is a forest corridor project designed to re-connect isolated remnants of the protected littoral forest fragment S8, which have been separated by land clearance for farming and zebu grazing. Connection of these remnants is principally designed to facilitate the dispersal of 3 nocturnal lemur species, the southern woolly lemur (*Avahi meridionalis*, EN), Anosy mouse lemur (*Microcebus tanosi*) and Thomasi's dwarf lemur (*Cheirogaleus thomasi*) allowing discontinuous sub-populations to interbreed, improving the conservation prospects of these species and the forest in general.

Project Ala is due to start in early 2019 and SCRP have been preparing with the clearance of Corridor 1, measuring 20m wide and 55m long, with two 8m firebreaks on either side, between the main S8 body and the first remnant. SCRP have prepared 800 viable acacia seedlings, over 900 native seedlings and growth pots for the planting of further seeds at the

Degraded land in Sainte Luce

start of 2019 with protocols for monitoring mortality rates of seedlings established in the nursery.

Expansion of the nursery will begin in 2019 to allow the successful growth and monitoring of both native and non-native tree species for transplantation to the corridor sites. Research into growth and survival rates of different species in different growth mediums will be conducted throughout 2019.

Land clearance will continue at corridors 2,3 and 4, with acacia planting will beginning in the second quarter of 2019. In the future baseline surveys on lemur abundance, herpetological abundance and forest structure for comparison pre and post-corridor construction will be undertaken allowing the efficacy of the corridors at facilitating movement of different species to be established.

Mangroves

The mangrove system in Sainte Luce has a sparse distribution existing along the edge of the estuary and further inland along the river system. This system serves as an important community use zone, used principally as fishing grounds, and are currently not harvested for their wood. SCRP conducted 3 preliminary surveys of the mangrove system, using GPS to mark out the extent of the habitat and to estimate the density of mangroves. The team also took seedpod samples of potential mangrove trees, identifying 2 true mangrove species, *Bruguiera gymnorrhiza and Rhizophora mucronata*. As there are only 4 genera of mangroves in Madagascar, containing just 8 species, this represents a notable collection.

The next stage of the project will involve a combination of remote sensing techniques to establish the extent of the mangroves coupled with community use interviews to assess their utility. Interviews will be focussed on fishing activity in the mangroves, with the possibility of project expansion depending on initial results. Due to the sparse nature of the forests, remote sensing data may need to be supplemented with point centred quarter surveys along transects. The project has great potential for expansion, with abundance surveys for a variety of taxa and more detailed studies of the nature of each mangrove species among possible avenues for exploration.

Dypsis

Beginning in November 2018, Project Dypsis, will reassess the population of *Dypsis saintelucei,* an IUCN endangered and regionally endemic palm. Sainte Luce currently contains the largest population of Dypsis, with approximately half of the 300 known individuals. In 2011 and 2012, SEED mapped the adult, sub-adult and juvenile populations of *D.saintelucei*. The 120+ hours of field research revealed the total frequency, overall health and ecological preferences of the local population. Additional components included seed cultivation and reintroduction efforts to boost numbers, and COBA capacity building and youth conservation education. To conduct the reassessment, all recorded adults (n=147) and sub-adults (n=33) were revisited during November and December 2018 using their GPS coordinates. For known and undiscovered individuals, information was collected on: presence/absence, health/cause of death, habitat type, reproduction and biometric measurements. Additionally, every tree was tagged with luminous orange tape and renumbered according to a new system. Due to the very low abundances in S6 (4) and S9 (1), and complete absence in S17, the majority of the 45 hours of field research took place in S7 and S8.

In January 2019, the final stage of data collection will be conducted on *D.saintelucei* juveniles. Due to their vast numbers, fixed quadrants will be created to continue monitoring a smaller sub-set in S7. Methodology will be consistent with that used to survey the adult population, but with additional focus on the harvesting of young leaves. Juvenile leaves are used for lobster trap construction, and can result in inhibited palm growth and overall health when removed.

As 83% of Sainte Luce's population resides in S6 and S7 (previous SEED data), two of the designated community logging and future mining zones, it is critical to boost the population in the protected forests of S8 and S9. Replanting efforts concentrated on S8 during the original phase of the project in 2011/2012, and personal observations have confirmed reasonably high occurrences of juveniles. However, despite being the most highly protected forest fragment, there is only a single known *D.saintelucei* adult remaining in S9. Therefore, during January and February 2019, SEED will seek permission from QMM to transplant 250 9-month old saplings from the SCRP tree nursery into a variety of habitats in S9, where they will be monitored monthly.

D.saintelucei

Community Engagement

Club Atsatsaky

Club Atsatsaky, or Club A, is SCRP's conservation club for the children of Sainte Luce. Conducted twice a week, once at Ambandrika school and once at Manafiafy school, the club informs and educates the children about conservation issues pertaining to Sainte Luce. Attendance fluctuates between 40 and 150 children, with this year's World Environment Day Club A, focusing on the theme of plastic pollution, reaching over 300 children.

Topics are addressed in 3-lesson blocks to give the children repeated emphasis, with examples including humpback whales, lemurs and spiders. During lessons, a member of SCRP international staff leads, with the team using a projector to show a presentation involving images and films, engaging the children more deeply and helping to bridge the language barrier. Engagement from the children is assessed through a "thumbs-up thumbs-down" system to roughly gauge the understanding of the class. SCRP also holds a quiz on the topics covered at the end of each scheme, once again as a measure of engagement and understanding.

In 2019 SCRP aims to continue the more structured nature of Club A sessions, with future topics set to include turtles, snakes and the structure of the forests. There will also be several lessons run in tandem with some of the new projects starting in 2019, such as project Ala and Rufus phase II.



Left to right: Conservation team and Club A children collecting rubbish on Manafiafy beach, World Environment Day 2018 celebrations

World Environment Day

The global theme for World Environment Day 2018 was "plastic pollution", having recently come to the fore of environmental issues through programmes such as Blue Planet II. SCRP held a special Club A session at Manafiafy school, attended by over 300 children with a quiz, and face-painting station for the children (and adults!) followed by conducted a beach clear up, with SCRP showing the difference between plastic debris and natural debris such as

shells and wood. A film presentation was held for the community just outside Ambandrika village, showing clips of some of the devastating effects of plastic pollution and other anthropogenic influences on the natural environment.

Future Directions

2019 is shaping up to be a big year for SCRP. Project continuation of the lemur and herpetological transects will remain the primary activity of SCRP, with review of data collected so far scheduled for mid-2019. Planting and research undertaken through Project Ala will aid lemur and forest conservation in Sainte Luce for many years to come and progression of new projects, such as Mangroves and Dypsis, will add to local and International knowledge. SCRP will also recommence research on the dispersal and feeding behaviour of the flying fox, *Pteropus rufus*, and carry out a mapping survey and species composition analysis for the swamps in the Sainte Luce area.

Concluding Remarks

2018 has been a very successful year for SCRP. The conclusion of Forest Analysis represents a significant milestone for the team, whilst the continued work on lemur and herpetological transects is already yielding powerful datasets for both. The introduction of new research projects has expanded the scope of research covered by the team, and will yield some interesting insights into different aspects of the ecology of Sainte Luce. Finally, new projects, such as Ala, represent tantalising prospects for the new year, helping to conserve this fragile ecosystem for many years to come.