seed madagascar

sustainable environment, education & development

SEED Madagascar Conservation Programme: Annual Biodiversity Report (December 2016)

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For more than 15 years, SEED's Conservation Programme research team (formerly Azafady Conservation Programme), together with our international volunteers, have been working in the area of Sainte Luce in the Anosy Region. Situated in the heart of the newly designated conservation zone, our permanent campsite is surrounded by five fragments of littoral forest, offering SEED Madagascar a unique opportunity to research a unique and increasingly threatened ecosystem. Madagascar's littoral forests are home to an enormous variety of endemic plants and animals. It is our hope that through our holistic approach that integrates practical conservation, education and community engagement, we can promote and conserve the area's outstanding biodiversity.

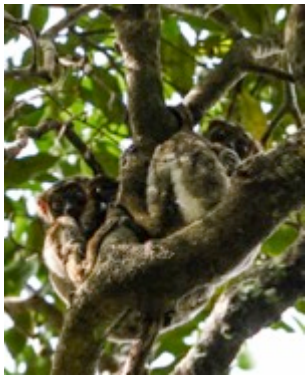
This report summarises our work in 2016 including studies that have continued or been built upon from previous years, as well as our new research initiatives.

LEMUR RESEARCH

Throughout 2016 we have continuously conducted 'lemur transect' surveys – one of SEED's longest running projects. Ongoing and year-round data collection is crucial for accurately monitoring population size, density and the spatial distribution of lemur species inhabiting the forest fragments of Sainte Luce. Even though this study has been running for over five years, some of the forest fragments still remain under-sampled and therefore we continue sampling, strengthen our data before publishing the results in the near future. By investigating the suitability of the various forest habitats for the different lemur species, we aim to also assess the plausibility of future translocation in instances of lemur extirpation. In the long term, translocation could play a key role in mitigating the impacts of logging and planned mining activity in the area, making this research essential to the maintaining current biodiversity levels found within the forest.

This year SEED has collaborated with PhD student Sam Hyde-Roberts in his study into the effects of forest fragmentation on genetic diversity, which has sought to reveal the true identity of mouse lemurs in Sainte Luce. In order to obtain key genetic samples for in-depth analysis in conjunction with key phenotypical information, skin tissue and hair samples were obtained, morphometric measurements were recorded and photographs were taken – all in adherence with strict ethical codes of practice. These measures may lead to the exciting discovery of a new species endemic to Sainte Luce.





In addition to population data, we are also interested in the feeding habits of the diurnal red-collared brown lemurs, *Eulemur collaris*. Currently, these lemurs are only found in two out of the five forest fragments in Sainte Luce. Both areas are still threatened by illegal logging as well as uncontrolled slash and burn agriculture. Protecting and expanding the brown lemur's existing habitat and their population size is thus a high priority for SEED, especially given the species' integral role in seed dispersal and forest regeneration. Based on our preliminary results from our on-going feeding lemur study, we discovered that brown lemurs preferentially feed on leaves and flowers, followed by berries and insects. We also found that although the tree species most commonly used by lemurs vary slightly across seasons, there are a certain few they feed on year-round. We identified the top eleven tree species that lemurs visit regularly and in light of this information, we instigated a new study at the beginning of this year to identify and quantify the distributions and densities of these lemur feeding trees in S9 (a brown lemur stronghold). These densities will then be compared to those in the forest fragment S8, which is a potential candidate for brown lemur reintroduction. If results indicate that there are too few feeding trees in S8 to support brown lemurs, we will begin efforts to replant and protect existing populations. Conversely, if the results show that the feeding tree populations in fragments S9 and S8 are comparable, it will provide key evidence to support a translocation or introduction of brown lemurs to S8.

REPTILE AND AMPHIBIAN RESEARCH

SEED's herpetological surveys have been running since 2010, with the primary goal to complete a comprehensive species list for the area of Sainte Luce. This will simultaneously inform the verification of an older species list produced by the mining company QMM in 2007.

Based on our DNA barcoding analyses conducted this year in our collaborating laboratory in Portugal, we have now identified 66 different species of terrestrial reptiles and amphibians including a number of novel candidate species across numerous taxa. In the

Sainte Luce area, we have identified 20 species of amphibian and 46 species belonging to the Squamata (excluding marine turtles).

Of the amphibians, 12 species belong to the large endemic family the Mantellidae, 6 are microhylids, and the families Hyperolidae and Ptycadenidae are each represented by a single species. Among the squamates, the familial composition is as follows: Lamprophiidae snakes (18), Boidae (2), Geckos (10), Chamaeleonidae (4), Scincidae (7), Gerrhosauridae (2), Opluridae (1) and Crocodylidae (1). We also provided a new set of gene sequences for all markers in order to bridge the current gap in knowledge that exists in and around the study area. The project advances the case for Sainte Luce to be formally recognised as a protected area and encourages more serious discussion about the long-term survival of its forests, human and wildlife communities.

Auxiliary to the DNA project, we have set up two standard lines of pitfall traps, burying 11 buckets in the ground every 10 metres and constructing a 100m plastic barrier to connect them. The purpose of this passive sampling technique is to gain a better understanding of the more secretive and fossorial species present in the community, including those which may not be detectable by standard search methodologies. Traps are checked every day, recording which small mammals, amphibians and reptiles might have fallen inside. Some of the new candidate species have been discovered this way, and on occasion we have collected whole specimens. Interesting specimens found this year include the highly secretive skink *Amphiglossus* cf. *punctatus*, the arcane snake *Pseudoxyrhopus kely*, hedgehog tenrecs, pygmy shrews and some of the smallest frogs in Madagascar.



2016 has also seen the start of a new study to assess the diversity of the frogs within the streams in two different forest fragments – S7 and S9. Since March 2016, we have been conducting night frog surveys in newly mapped-out streams in the two forest fragments discussed above. Each stream is initially subdivided into transects 20m in length and these are then systematically searched for amphibians. Basic habitat descriptions are recorded along with the associated morphological data for each frog observed in the transect. In time, this technique will allow us to gain a clearer understanding of how differences in management and the amount of logging in various forest fragments can affect frog species diversity and distribution in Sainte Luce.


BAT RESEARCH

After a series of successful grant applications, Project Rufus has now been initiated. This new project has been developed to protect the colony of flying foxes (*Pteropus rufus)* that currently roost in one of the forest fragments in Sainte Luce (S6). Flying foxes are considered a keystone species in fragmented habitats where they make significant contributions to pollination and seed dispersal. Successful conservation activities will therefore have a positive conservation impact not solely on this species, but also on the entire forest ecosystem. However, the roosts in Sainte Luce are located in an area of forest designated as a 'community-usage zone', which has been under constant threat from logging, hunting and pressure from heavy human disturbance. Therefore, as the first step towards conserving the resident bat population, an exclusion zone or 'no logging' area was proposed to the local community, alongside an environmental education and bat conservation awareness campaign. With community support this exclusion zone, which also asserts that no humans should approach within 200m of the roost site, has now been successfully established. To ensure these rules aren't breached, SEED are supporting members of the local community to patrol the area. We have also completed the construction of an elevated and camouflaged viewing platform, which is anticipated to generate a sustainable income from local eco-tourism and aid in scientific research. The bat hide was built by using sustainably sourced wood and constructed by local laborers.

The last stage of this conservation project will be to conduct cutting-edge research both on the bats and the colony itself, in order to understand more about their spatial ecology and to further inform conservation. We aim to fit three adult bats with GPS tracking devices to monitor their movement, map their seasonal distribution and inter-colony interactions, and to investigate their activity patterns. This research will provide useful data for future habitat management and protection.

The bats need to be carefully captured by setting up fine meshed, aerial nylon nets in known feeding areas with Eucalyptus, Sisal and Ficus. Trapping is carried out by our team at night when the bats are active, with the help of local bat specialist Fetra Arivony Rakotondrazanany from the conservation group Voakajy Madagasikara. We have spent considerable time attempting to capture the bats, yet they have so far proved elusive and with the bats now entering their annual birthing season, trapping has now been placed on hold until early next year. Finally, tarpaulins were placed around bats' roost to collect faecal samples in order to analyse contents of their diet. Any seeds collected will be germinated in our nursery.



BOTANICAL RESEARCH

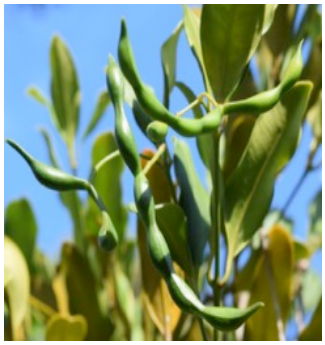
The littoral forests of Madagascar are known to hold extremely rich assemblages of endemic plant species. However, very little is known about them in Sainte Luce. This year, we dedicated extra time to learn more about plants around our campsite as well as initiating a number of new botanical projects.

In 2013, we planted 300 seedlings of two threatened endemic palms, namely *Dypsis saintelucei* and *Beccariophoenix madagascariensis.* We recently revisited these plots, assessed the status and condition of all of the individuals we could locate, and developed a 'Manual to monitoring of a transplanted juvenile palms' that can now be used to regularly monitor their progress in the years to come. Each transplanted individual has been measured and the health state categorized based on the percentage of leaf damage. Both of these palms could potentially be of economic importance within the local community and therefore data on their growth rates could be crucial if we are to protect and increase their populations.

The remaining littoral forest fragments in Sainte Luce provide a unique habitat for a number of different endemic plant and animal species. Forest fragmentation limits species' populations and reduces the area of suitable habitat. SEED aims to protect and expand forest habitat by connecting some of the recently separated fragments. In order to connect these forest patches, we plan to replant endemic tree species in corridors between fragments. This initiative will aid the reforestation of the degraded landscape as well as providing a valuable habitat for plants and animals. We therefore designed a survey to identify the most common tree species found within 10 meters of the forest edge. The trees that grow along the edge of the forest are likely best suited to recolonizing disturbed areas, and may be suitable for habitat corridors, due to their tolerance to the sun and low quality soil. The data from the edge species surveys will help inform which tree species to plant and in what abundance to best re-establish an endemic population and for the development of potential habitat corridors. We hope that

a successful replanting regime will extend the overall forested area of Sainte Luce and can ultimately benefit animal dispersal between fragments.





In the past year, we have considerably expanded the content of our nursery as well as giving it a 'new look' by labeling the beds and replacing the old roofs with new *Ravenala* leaves. Hundreds of planting pots were made by filling black plastic sleeves with soil and these used to accommodate seeds of various different plant species. Seeds were collected from the surrounding forest fragments under our current research permit and the plant species targeted fall broadly into five main categories: a.) fruiting trees such as guava and fig (important for both people and bats), b.) forest specialist species found only in the forest interior, c.) species exclusive to the forest edges, d.) medicinal plants and e.) endemic palms mentioned above. In the past, planting pots used in our nursery consisted of a mixture of topsoil and zebu dung in 1:1 ratio, but we are currently experimenting with adding other components such as shredded coconut husks. These have proven to aid in better water retention and this ability might become very beneficial for the sand-based soil in Sainte Luce. We have also successfully created a hot compost pile by alternately layering different green (such as living ferns and organic food waste) and brown matter (such as dried leaves and dung) collected from around the campsite. The pile is then watered and turned 3-4 times before it's left to rot for two weeks. We are currently at the stage of drying the compost in the sun and plan to use it in making new batch of planting pots next year. As a part of our research collaboration with Toliara University we hosted two MSc students for 10 weeks and assisted in their data collection on medicinal plants and endemic palms. We hope to host more students from both local and international universities in the next year.



INSECT RESEARCH

Insects are perhaps one of the most understudied groups of animals on the planet and Madagascar is no exception. The majority of insect groups in Sainte Luce remain largely unknown, having never been comprehensively sampled therefore presenting an exciting opportunity to discover new species.

Sainte Luce is one of the best-preserved patches of littoral forest habitat in Madagascar. As these forest fragments degrade, however, many insect species may disappear before they have ever been discovered. After our collecting permits were granted in August 2016, we initiated an extensive project to sample the insects in Sainte Luce in order to create the first species checklist for this area. This will be of immense value to scientific audiences due to the novelty of the project. Since August, we have concentrated our efforts on collecting beetles, bugs and parasitoid wasps, many of which can be collected simply using an ordinary umbrella and a beating technique. This involves placing the umbrella upside-down under vegetation that we wish to sample, whilst the tree/bush in question is then hit vigorously. Insects that fall into the umbrella are then examined and collected. All insects that we collect will be exported to the Natural History Museum in London and SEED will work with appropriate specialists in identifying these.

This year, we continued to sample butterflies but with more focus on smaller elusive families and nocturnal moths. As part of our butterfly research, we also opportunistically collected caterpillars and reared them into adults; this information will provide us with invaluable insight into the butterfly life cycle as well as offer crucial information on their ecology and life history. We also continued to catch dragonflies and damselflies, examining their habitat preferences and categorising the species into those that rely on undisturbed forest, those that are tolerant of secondary forests and degraded areas, and those that depend on open environments. This would provide largely unknown and therefore important information on their ecology. Although dragonflies have already been studied in Sainte Luce by international specialists and an initial species checklist provided in 2008, our photographic sampling in the past year has already revealed 11 new species not recorded from Sainte Luce so far and we anticipate more of these in the near future after sampling different seasons. This included one species which had been thought to be potentially extinct and hasn't been seen anywhere in the world for more than a century. It is only the male of this species that is known to science and therefore it is our goal to capture this species again, particularly a female as the appearance is completely unknown, and to sample their DNA.

ENVIRONMENTAL EDUCATION

SCP's community environmental programme, Club Atsatsaky, has run successfully in Sainte Luce over the past year. With over 100 students attending each class, the popularity of Club A speaks for itself. The lessons aim to educate young community members on the importance of the unique environment in which they live. Examples of topics from this past year include: slash and burn agriculture, composting, pollution and littering and the water cycle. The programme also acts as a platform enabling volunteers to interact with the community by planning fun activities and games to engage students in the classes. Seventy enthusiastic students were also able to visit the wildlife reserve Nahampoana where children had the opportunity to plant orange tree seedlings and learn about the importance of various animals in their ecosystem.

The large annual community event 'World Environment Day' was held in June and was a huge success. This year's global focus was the 'illegal wildlife trade' and during lessons leading up to the day, children received sessions on the animals from Sainte Luce that could become victims of wildlife trafficking or hunting: lemurs, parrots, flying foxes and lobsters. The children led a large parade, with members from all three hamlets wearing face masks of the four threatened animals. The day concluded with a colouring competition and an educational quiz. The event not only increased community awareness of the threats posed to their forests from external elements, but also brought the community together for a very joyous occasion.

World Lemur Day was another important date in our 2016 calendar. Volunteers hosted a lemur drawing competition in our regular environmental education classes, with prizes given out to the winners.

Lastly, the 'end of scheme quizzes' tested the children on the knowledge that they had obtained during the previous weeks lessons, providing a window into the success of our methods. Test results showed very positive rates of learning from students and highlighted the importance of our work with Club Atsatsaky.

Thank you everyone for a great year!

This was another successful year for our conservation programme and we couldn't have done it without all the help from our international volunteers and staff. We have reached many of the goals that were set last year; we are one step closer towards protecting the fruit bat colony, have implemented vital background projects necessary for the development of habitat corridors, completed species inventories for small mammals, birds and herpetological assemblages and began researching a novel animal group on our list – insects.

We can proudly say that we have started many new and exciting projects that will expand our knowledge and in the long-term continue to build our understanding of the lesser known animal groups in Sainte Luce. Yet there is still a lot to learn about the incredibly diverse and rare littoral forests of Sainte Luce, therefore we are all looking forward to taking the research forward in 2017 and once again expanding world knowledge of this incredibly important forest.

SEED Madagascar Conservation Programme