



Emergency funding secured from the Environment Trust Fund for ring-necked parakeet eradication: bounty payment for sightings is still active!

More than 500 ring-necked parakeets have been culled since the parakeet eradication project was launched in 2013. The intensive eradication phase of the project finished at the end of July 2016, and a bird shot in May 2016 was thought for some time to have been the last remaining wild parakeet in Seychelles. Two follow-up monitoring sessions have been carried out on Mahé since last July and no parakeets were observed.



Ring-necked parakeet © SIF

In March 2017, ten months after the last sighting, a report from a former team member confirmed that there is at least one parakeet remaining on Mahé. Whether there is only one bird on the island or a few, the sighting was considered an emergency situation given the advanced stage of the eradication and the high reproductive rate of the birds. Emergency funding was requested from the Environment Trust Fund to track this bird, determine whether it is only one or several individuals, and cull it and any remaining birds to conclude the project. The Environment Trust Fund thankfully and quickly approved funding to support SIF complete the eradication of this major invasive species and a ring-necked parakeet team was immediately recruited and deployed to follow-up on the sighting.

The bounty awards of **RS 200 for a parakeet sighting** which is confirmed by the eradication team, and **RS 2000 for a confirmed sighting which then leads to a cull by the team**, remain in place. If you have any information on recent sightings of these birds the team can be contacted on 2523623. Any remaining birds are likely to be very wary and cautious so please do not attempt to catch or approach them but instead call the team and provide as much information as possible on the times and dates you saw the bird, how many you saw, what they were doing etc. The more detail you can provide the more likely it is that the team can confirm the sighting for the bounty. We remain optimistic that eradication success will be declared within the next two years, and the assistance of the public and other SIF partners is integral to this success. We are extremely grateful for the emergency funding provided by the Environment Trust Fund, and for the speed with which it was approved.

Seychellois students selected to represent Aldabra at UN Ocean Conference, New York

Three Seychellois school students were selected to attend the UN Ocean Conference in New York. The students were selected as representatives of Aldabra, having all visited the atoll as part of the Eco-schools Award in the last three years. The Ocean Conference (5-9 June) was conceived to support the implementation of Sustainable Development Goal 14, to “*conserve and sustainably use the oceans, seas and marine resources for sustainable development*”.



The trip participants, from left to right: Maria Brioche, Neil Commettant, Jean-Yves Mancienne and Alvania Lawen © SIF

The UNESCO World Heritage Marine Programme was given a slot at the General Assembly on World Oceans Day in order to advocate for the conservation of marine World Heritage Sites. The three students selected to represent Aldabra and Seychelles were Alvania Lawen, Jean-Yves Mancienne and Neil Commettant, with Maria Brioche, the SIF education and outreach programme officer as chaperone. Be sure to check out our newsletter next month for more details and for photos of the group in New York!

SIF projects and science coordinator attends training on coastal zone monitoring and management

Annabelle Constance, the SIF projects and science coordinator, recently attended a three-day training programme on baseline coastal data acquisition, management and applications in the Indian Ocean Region. The training took place in Mauritius and was organised by the University of Western Australia. The main aim of the training was for participants to gain skills in the key elements of coastal zone monitoring and management, including best practice standards for data acquisition and management. Participants on the course came from numerous Indian Ocean countries including Mauritius, Madagascar, Kenya and Seychelles.



Course attendees © SIF

Annabelle found the training very informative. The topics chosen for discussions were relevant to her line of work and the lead presentations were of a high standard. The training was also useful in providing a forum of discussion for issues and concerns relating to coastal zone management within the region. Thank you to the University of Western Australia for running the programme and to the University of Mauritius for hosting it!



Short distance seed dispersal results in strong genetic structuring in the coco de mer

An SIF-co-authored paper was published last month in peer-reviewed journal *Conservation Genetics* on seed dispersal patterns and genetic structure of coco de mer populations. The lead author, Emma Morgan, completed her PhD thesis at the end of last year, investigating genetic and demographic processes underlying reproduction in the coco de mer. Following three successful field seasons at the Vallée de Mai and elsewhere on Praslin and Curieuse; and analysis at University ETH Zurich, Switzerland, the first results are now available.

The iconic coco de mer palm produces the largest seeds in the plant kingdom but how far do these seeds disperse; and what effect does this limited dispersal potential have on genetic diversity and inbreeding in the remaining coco de mer populations? Using a molecular genetic method, each tree in the sampled sites was genotyped using 12 microsatellite loci; and from this, measurements of genetic diversity were calculated. The mother and father trees of each young plant were identified, and it was found

that the average seed dispersal distance was just 8.7 ± 0.7 m. This resulted in an intense fine-scale spatial genetic structure, with neighbouring pairs of male and female trees being closely related. Inbreeding levels were high, and genetic diversity levels were also relatively high across all populations, although these differed in disturbance and habitat fragmentation.



Mature coco de mer fruit landed just below its mother tree at the Vallée de Mai © Emma Morgan

The results support what was already suspected – that seed dispersal distances are mainly very short, and seedlings usually establish in dense clusters around the mother tree, or if they are growing on a steep slope, in elongated ellipses downhill of the mother tree. The high relatedness levels at all life stages is consistent with the idea that mating between nearby pairs is common in coco de mer.

The evolution of a very large seed has resulted in an unusual breeding system characterised by high levels of inbreeding. This raises the question of how *Lodoicea* avoids the problems of inbreeding depression? One possibility is that deleterious recessive alleles have been purged from this long-lived species over generations for thousands of years. Another is that infrequent long-distance pollen or seed dispersal (e.g. downhill) may be sufficient to prevent inbreeding depression at the population level. Although inbreeding does not appear to reduce reproductive success of coco de mer, the

potential consequences of disrupting the natural patterns of genetic structure are unknown. We clearly still have much to learn about this fascinating species but future research investigating the pollination, germination and establishment consequences of moving seeds to alternative sites will help to inform its management and conservation.



Tight cluster of non-mature coco de mer plants growing around an adult female coco de mer © Emma Morgan

References:

Morgan EJ (2016) Genetic and demographic processes underlying reproduction in *Lodoicea maldivica*, the largest-seeded plant in the world. PhD Thesis, ETH Zurich. <http://dx.doi.org/10.3929/ethz-a-010861630>

Morgan EJ, Kaiser-Bunbury CN, Edwards PJ, Fleischer-Dogley F, Kettle CJ (2017) Keeping it in the family: strong fine-scale genetic structure and inbreeding in *Lodoicea maldivica*, the largest-seeded plant in the world. *Conservation Genetics*, DOI: 10.1007/s10592-017-0982-2

Vallée de Mai science coordinator attends DESMAN course in Jersey, UK



Course participants © SIF

Vicky Stravens, the Vallée de Mai science coordinator, had the fantastic opportunity to attend the annual Durrell Endangered Species Management Graduate Certificate (DESMAN) course that ran from late February to the end of May 2017. The course covered a range of topics including facilitation and communication skills, leadership, introduction to statistics, GIS, conservation management, and threats to biodiversity to name a few. For the three months of the course the participants were trained in different techniques, and gained knowledge and skills on how to better and enhance conservation actions to save species from extinction. This is the mission of the Durrell Conservation Trust and Vicky is the third member of SIF staff to attend the course.

With a range of participants from different countries including the UK, Madagascar, Mauritius, China, Rwanda, Indonesia and St Lucia, Vicky enjoyed learning about conservation actions in other countries. She was interested to learn that like her small island nation home, bigger countries are experiencing similar threats and challenges to conservation.



The participants came to Durrell from many different countries © SIF

Vicky expressed her gratitude to SIF for the great support and encouragement that made her participation in the course a success. Vicky stated that she has “learnt a vast array of techniques and skills which will be of benefit to daily work”. In addition to the knowledge gained, Vicky also succeeded in securing a small equipment grant with funds to go towards *sooglossid* frog research in Vallée de Mai - well done Vicky! Thank you to Durrell for hosting a successful course once again.

Measuring the mighty coco de mer – a mammoth task!

Although the coco de mer is an iconic palm, the long lifespan of the trees means that there is still uncertainty about many aspects of this flagship species. In an effort to increase our knowledge of the life span, longevity and growth rates of coco de mer, monitoring sessions are periodically undertaken by SIF to measure the leaf growth of marked individual palms.

The research team conducts this monitoring in the palm forest of Fond Peper, as this forest appears to have a more natural stand structure. When the monitoring started at Fond Peper in 2009 75 individual coco de mer palms were selected, including 15 individuals from each life stage: seedling, juvenile, immature, adult male and adult female. The individuals were randomly

selected and marked. By the end of 2015 enough data had been gathered on the seedling, juvenile and immature palms to estimate their growth rates and these were removed from the monitoring programme. However, due to the slower growth of the mature trees and the difficulty in measuring them, more data was required on adult male and female trees, and these continued to be monitored in Fond Peper.



Measuring coco de mer trees means climbing high up into the canopy © SIF

Measuring adult coco de mer trees is no easy task; it requires a team member to climb high up into the canopy to measure the hugely long leaf stems, or petioles, using a specially adapted measuring tape. Measurements start with the youngest leaf, and the person in the tree calls down to the person recording data what state the leaf is in and its new length. Even communicating the measurements can be challenging and both team members have to concentrate to hear and record the numbers accurately. This is then repeated with each successive leaf. As the leaves get larger this becomes more and

more difficult, with the person in the tree having to accurately throw the measuring tape the full length of each enormous leaf!



SIF senior ranger Terance Payet near the top of a coco de mer © SIF

For this growth monitoring session, 12 trees were completed in May and the team is working hard to complete all of the remaining trees before the end of June!

Biodiversity Day march celebrates Seychelles environment



A participant in the Biodiversity Day march © SIF

The theme for international Biodiversity Day this year on 22nd May was '*Biodiversity and sustainable tourism*', a fitting theme for Seychelles as the beautiful and rich biodiversity

of the islands attracts tourists from all over the world. Protecting the natural biodiversity of the country is therefore not only important for the inherent value of the biodiversity itself, but also because of its contribution to the tourism sector of the economy.

To celebrate Biodiversity Day this year, members of the Vallée de Mai clubs in the schools on Praslin, and staff from the Vallée de Mai and Cousin Island Special Reserve, gathered together on Friday 26th May to march to raise awareness of the importance of protecting the natural biodiversity of Praslin and neighbouring islands. The march started at Grand Anse Crèche and ended at the District Administration office. While walking the children shouted and sung messages about protecting terrestrial and aquatic flora and fauna.



A participant in the Biodiversity Day march © SIF

After the march each school did a short performance focused on a particular theme; Grand Anse Primary School performed a song about 'sustainable fishing and tourism', Vijay International School reflected on 'protecting our feathered friends' and Praslin Secondary School focused on 'sustainable tourism'. Cousin Island staff also gave a short presentation on the different bird species found on Cousin island. Each group was then presented with a certificate for their participation in the biodiversity day march this year. Thank you to all the students for your enthusiasm and passion for the environment!



aldabra atoll

Research finds that increasing droughts on Aldabra are impacting tortoise habitat

An SIF-co-authored paper on the impact of increasing drought conditions on Aldabra giant tortoise (*Aldabrachelys gigantea*) habitats was published in the peer-reviewed journal *Ecological Indicators* this month. The aim of the research was to increase understanding of the effects of climate change, in particular the frequency of droughts, on giant tortoise habitats. The paper is an outcome of the Zurich-Aldabra Research Platform (ZARP) collaboration.



Aldabra giant tortoise at sunset © Fotonatura

The research used long-term monthly rainfall data collected between 1969 and 2013 to identify how many periods of drought occurred each year. The authors found that in the 1970s there was an average of two 'drought months' per year which has increased to about six 'drought months' per year today. Satellite imagery between 2000 and 2013 was then analysed to determine how Aldabra's vegetation responded to the frequency of droughts. It was found that Aldabra's vegetation is highly responsive to changes in rainfall, with a large increase in vegetation in times with the fewest drought periods and a decrease during times with the most drought periods. When comparing different vegetation types, open mixed scrub and grasslands, which are the preferred habitats of tortoises, showed the greatest decline in vegetation activity during droughts, and the greatest increase in average greenness during non-drought periods.



Tortoises in their preferred habitat of open mixed scrub and grasslands © SIF

The paper concludes that increased drought frequency could impact the tortoise population on Aldabra, in both the short term, by limiting the quality and quantity of food and shade available within preferred habitats, and in the long-term, by changing habitat composition across the atoll. As climate change continues to affect weather patterns in the region, research that investigates the relationships between species and their environment will be a vital management and information tool for Aldabra.

Reference:

Haverkamp PJ, Shekeine J, de Jong R, Schaeppman M, Turnbull LA, Baxter R, Hansen D, Bunbury N, Fleischer-Dogley F, & Schaeppman-Strub G. (2017). Giant tortoise habitats under increasing drought conditions on Aldabra Atoll—Ecological indicators to monitor rainfall anomalies and related vegetation activity. *Ecol. Indicators* 80: 354-362.

New project launched to implement Aldabra biosecurity plan

SIF has recently started a new project funded by the Indian Ocean Commission and European Union to improve biosecurity measures for Aldabra, entitled, *'Institutionalisation and implementation of biosecurity measures to ensure sustainable conservation management of biodiversity on Aldabra Atoll'*.

Invasive alien species (IAS) have long been recognised as a major threat to biodiversity, in particular on islands. SIF has been actively addressing and researching IAS for several years under several projects which have led to eradications of key IAS, but to maintain the successful outcomes of these projects and ensure the protection of Aldabra it is essential to have strong biosecurity measures in place.



The black rat and sisal, invasive alien species historically and currently occurring at Aldabra © SIF

The term 'biosecurity' refers to all policies and measures that an authority implements to minimise the entry and spread of, and mitigate the harmful effects of invasive and pest species. Aldabra's relatively undisturbed ecosystem and comparative lack of invasive species, makes the arrival and establishment of new invasive species the most serious threat to the biodiversity and ecological integrity of the atoll. A comprehensive biosecurity plan for Aldabra has already been developed, which includes a risk assessment, identification of invasive species pathways and an outlined step-wise approach to implement effective biosecurity measures for Aldabra at all levels.



Yellow crazy ant, myna and African land snail, invasive species that currently occur on Mahé, that are deemed to be high and medium risk species for invasion of Aldabra © SIF and Wikipedia

The plan has been partially enacted, but full implementation has not been possible so far due to the additional time, investment and resources required. Currently SIF lacks the required infrastructure, materials, facilities, and related institutionalised procedures to conduct highly effective and essential biosecurity measures to

protect Aldabra in the long-term, where invasive alien species could quickly become impossible to control and have irreversible negative impacts. The new project will help to mitigate these threats to Aldabra's biodiversity and ecological integrity by strengthening biosecurity measures and infrastructure, addressing the pathways directly 'on the ground', creating an institutional framework by incorporating management and monitoring procedures, and creating biosecurity roles at Aldabra and in SIF Head Office.

The overall expected result of the project is the prevention of future invasive species introductions to Aldabra and substantially reduced threats from invasive alien species. Putting these measures in place is also an essential prerequisite for future eradications of IAS still occurring on Aldabra.

Aldabra, a turtle nesting paradise...

In 1968, when a 10-day survey was conducted on Picard Island's Settlement Beach on Aldabra to record nesting turtles, not a single turtle was found. Rampant over-exploitation of turtles over the previous 150 years had led to the near extinction of green turtles not only on Aldabra, but across the Indian Ocean.



Turtle tracks as evidence of emergences © Adam Mitchell

In July 2016, the SIF team recorded 558 turtle emergences on the same beach (over 18 a day)

and a total of 5719 emergences over the year. In fact, sometimes so many emerge that it's hard to tell exactly how many there are!



Large turtle at Aldabra © SIF

Unlike many parts of the world where turtle nesting beaches and the turtles themselves are physically protected, we don't fence nests or move them to safe areas, we don't protect eggs or hatchlings from natural predation, and we don't 'headstart' baby turtles (where they are reared in captivity for a time so that they're bigger and more likely to survive when released). How, then, has the turtle population rebounded so much on Aldabra where in other places they have needed so much more direct intervention?

Firstly and most importantly, Aldabra is very strictly protected and managed and has no resident human population. There is no poaching of adult turtles, no loss of turtles as by-catch due to fishing and no development to compromise key nesting areas. This results in better survival chances of adult females, which, in a long-lived species is a critical component of population stability and increase.

Secondly, although rats are present in abundance, Picard lacks many of the invasive species introduced to other parts of the world, such as cats, mongooses or monitor lizards, which predate hatchling turtles at unnaturally high levels. Predation is still common, and baby

turtles fall victim to herons, crows, crabs and sharks, but this is natural predation at a level the population can sustain. Introduced rats also prey on turtle eggs and hatchlings on Aldabra but clearly not at a high enough rate to limit population growth.



Green turtle hatchlings © SIF

Thirdly, there are no extraneous light sources on the island. When turtles hatch, normally at

night, they navigate to the water by heading towards the lightest area. In a natural situation this will be the relative safety of the sea, as it is more reflective of moonlight and starlight than the land. However, human development on or near beaches can confuse hatchlings, and they will often head towards streetlights or buildings which leave their lights on overnight such as hotels. Although a lighthouse has been part of Aldabra's essential infrastructure since 2012 monitoring has shown no effect on the turtle hatchlings.

In summary, it is heartening that in places like Aldabra, protection is enough to not only safeguard the remaining turtle population but to boost the population dramatically over time without the need for other interventions. It is only with close monitoring that these trends can be quantified, so turtles will remain a key part of Aldabra's research programme for a long time, and we hope to see a continued increase in the atoll's turtle population.

Articles contributed by: Nancy Bunbury, Maria Brioche, Annabelle Constance, Adam Mitchell, Emma Morgan, Terance Payet, Lynsey Rimbault and Vicky Stravens; **Editing by** Nancy Bunbury and Lynsey Rimbault