Aldabra Research Station
Scientific Coordinator's Annual Report
2014

Compiled by: Heather Richards

INDEX

List of acronyms used in this report

ASC	Aldabra Scientific Coordinator
FRA	Field Research Assistant
ISTO	Invasive Species Technical Officer
SFRA	Senior Field Research Assistant
CC	Cinq Cases
DDM	Dune D'Messe
DJL	Dune Jean-Louis
WGT	West Grande Terre
IAS	Invasive Alien Species
POPs	Persistent Organic Pollutants
GEF	Global Environmental Fund
ZARP	Zurich-Aldabra Research Platform

1. INTRODUCTION

2014 was another eventful and exciting year on Aldabra with the new SIF marine programme, the continued targeting of the invasive species that threatened Aldabra's biodiversity, detailed analysis of some of the long-term monitoring data to allow informed review of these programmes, the return of tourists visitors to Aldabra and the amazing discovery of the thought to be extinct Aldabra Banded Snail! This report provides a summary of the research and monitoring activities carried out on Aldabra during 2014 and an analysis of the some of the data collected in the context of long-term trends.

1.1. Research staff

The hosting of Maritime Training College students for their work experience at the end of 2013 proved to be an excellent way of recruiting new keen research staff with all three students offered contracts in 2014 and they have been a great addition to the team. The mix of new staff eager to learn and experienced staff with the knowledge and willingness to train such as Catherina Onezia made for a very productive and positive team. We also welcomed new staff and said farewell to others as detailed in the table below. For details of the Logistics Team staffing please refer to the Island Manager's Annual Report 2014, however, it should be emphasised that the support, participation and collaboration of the logistics staff has been greatly appreciated and is essential for research and project activities. A number of the Logistics staff have played an active role in the research monitoring this year and this closer collaboration between the teams worked very well. The fantastic hard work, dedication and enthusiasm of all Aldabra staff have enabled the research activities detailed in this report to be undertaken.

Table 1. Research staffing on Aldabra in 2014.

Position	Name	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Notes
ASC	Heather Richards	X	X	X	X	X	X	X	X	X	X	X	X	
Takamaka Team leader	Terence Mahoune	X	X	X	X						X	X	X	
Senior Ranger	Catherina Onezia			X	X	X	X	X	X	X	X	X	X	
SFRA	Daig Romain	X	X	X	X	X	X	X	X	X	X	X	X	
FRA	Julio Agricole		X	X	X	X								
Ranger	Dainise Quatre		X	X	X	X	X	X	X	X	X			
Trainee Ranger	Sheril de Commarmond	X	X	X	X						X	X	X	Promoted to Ranger Oct
	Stephanie Marie	X	X	X	X	X				X				Trainee ISTO Oct - Dec
	Rebecca Filippin	X	X	X	X	X	X	X	X	X	X			Promoted to Ranger May
	Shiira Padayachy												X	
ISTO – Takamaka	Jamie McAulay	X	X	X	X									
	Frankie Gamble	X	X	X	X	X					X	X	X	
	Oskar Guy	X	X	X	X									
	Julio Moustache		X	X	X	X								
Trainee ISTO	Stephanie Marie										X	X	X	
Hunter – Takamaka	Nick Page	X	X	X										
Project Officers	Christina Quanz	X	X	X	X								X	EMS Project Officer
	Martijn van Dinther	X	X	X	X	X	X	X	X	X	X			IAS Project Officer

	Philip Haupt		X	X	X	X	X	X	X	X	X	X	X	GEF Project Coordinator
Resident Researcher	Janske van de Crommenacker	X	X	X	X									
External Consultants / Researchers	Dr Dennis Hansen		X	X										ZARP Researcher
	Richard Baxter		X	X	X									ZARP Researcher
	Wilfredo Falcon	X	X	X	X									ZARP PhD Student
Logistics staff assisting with Research	Marvin Roseline	X	X	X	X	X	X	X	X	X	X	X	X	Logistics Assistant – Assisting Martijn van Dinther with IAS work
	Yanny Didon						X	X	X	X	X	X	X	Logistics Assistant / Shop Keeper assisting with Research monitoring
	Giovanni Rose											X	X	Cook assisting with Research monitoring

1.2. Notable non-research events

Table 2. 2014 Transport Schedule

Flights	Assumption Crossings	Supply Boats
19th January	19th January	28th February – Enterprise II
16th February	31th January	16th June – Enterprise II
13th March	7th February	26th September – Ave Maria
10th April	17th February	30th November – Enterprise II
13th May	14th March	
27th October	10th April	
7th December	9th May	
14th December	13th May	
	26th October	
	27th October	
	7th December	
	14th December	

January

On 19th January photographer Imran Ahmad and his wife Debbie Tan Hwee Yee departed Aldabra following a trip to take photographs of the atoll with a focus on the marine environment.

March

13th March – 10th April Tom Peschak and a National Geographic photograph team spent a month on Aldabra including a visit to Cinq Cases and Middle Camp taking photographs to accompany an upcoming feature article on conservation in the Seychelles.

November

Seabird Yacht visited Aldabra 18-19th November.
Four day Zegrahm charter expedition to Aldabra (Island Sky yacht) 27-29th November
Lady Anja II visited Aldabra 19-30th November

December

7th-14th December lottery ticket winners, NatGeo writer, Aldabra House architects and Exhibition Designer, CEO and mechanic Marcus visited Aldabra.

1.3. Notes on monthly schedules

Throughout the year the monthly research programme was set by the ASC following discussion with the Senior Ranger and SFRA. Figure 1 shows a map of Aldabra with all monitoring locations. All routine monitoring data was collected in accordance with the methodology detailed in the respective protocols. The specifics of existing monitoring methods are not therefore detailed in this

report; please refer to the monitoring protocols for full details. If any changes in methods have occurred during 2014, these have been discussed in the relevant section of this report.

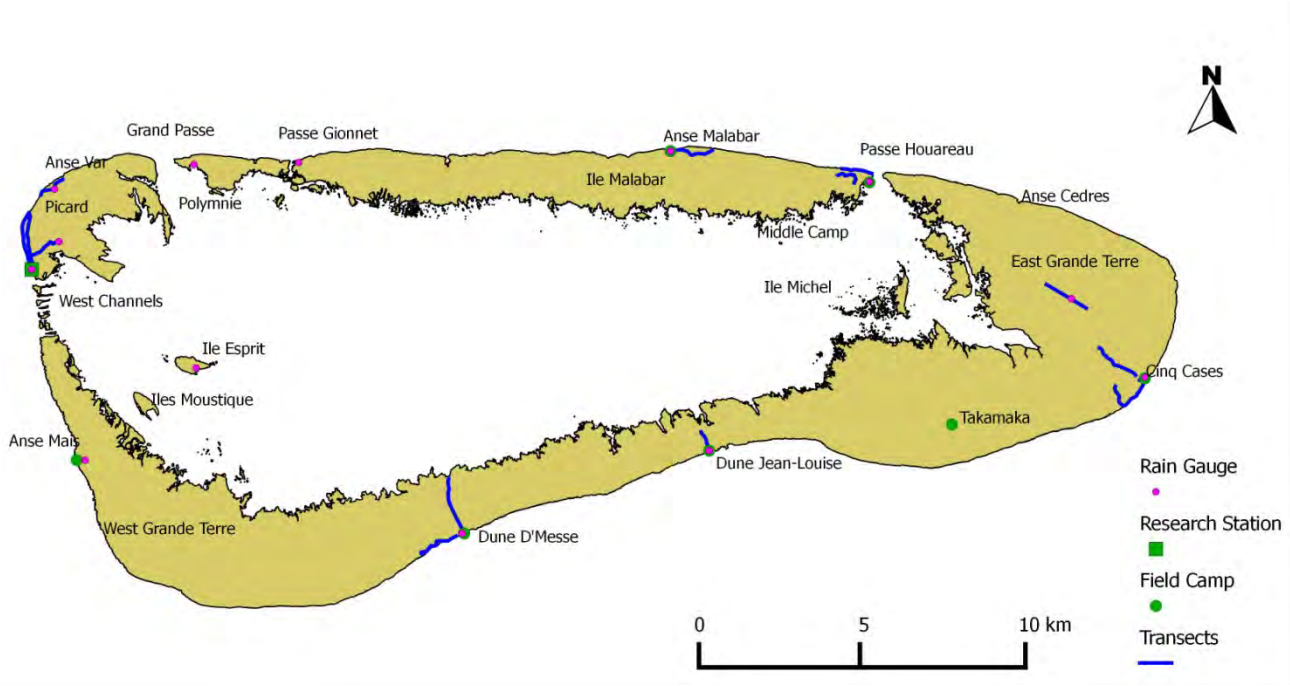


Figure 1. Aldabra Atoll with camps and locations of monitoring transect/activities.

MONITORING PROGRAMMES

2. CLIMATE

A set of weather variables are recorded every morning at 8.00am at Aldabra Station, Picard. In addition monthly rainfall data is collected from 12 rain gauges (excluding the Research station) across the atoll.

2.1. Dry and wet bulb temperatures

The Stevenson screen was turned towards the southern hemisphere on 9th March, and back towards the northern hemisphere on 6th October. Only readings taken before 8:30am were included in this analysis. The dry bulb temperatures recorded in 2014 were consistent with patterns observed in previous years (Figure 2).

In keeping with previous assessments, only the wet bulb temperature data from May 2010 onwards is included (Figure 2), as most previous data is incomplete or inaccurate (see 2010 Annual RO report). Wet bulb temperature patterns for 2014 are in-keeping with normal trends observed.

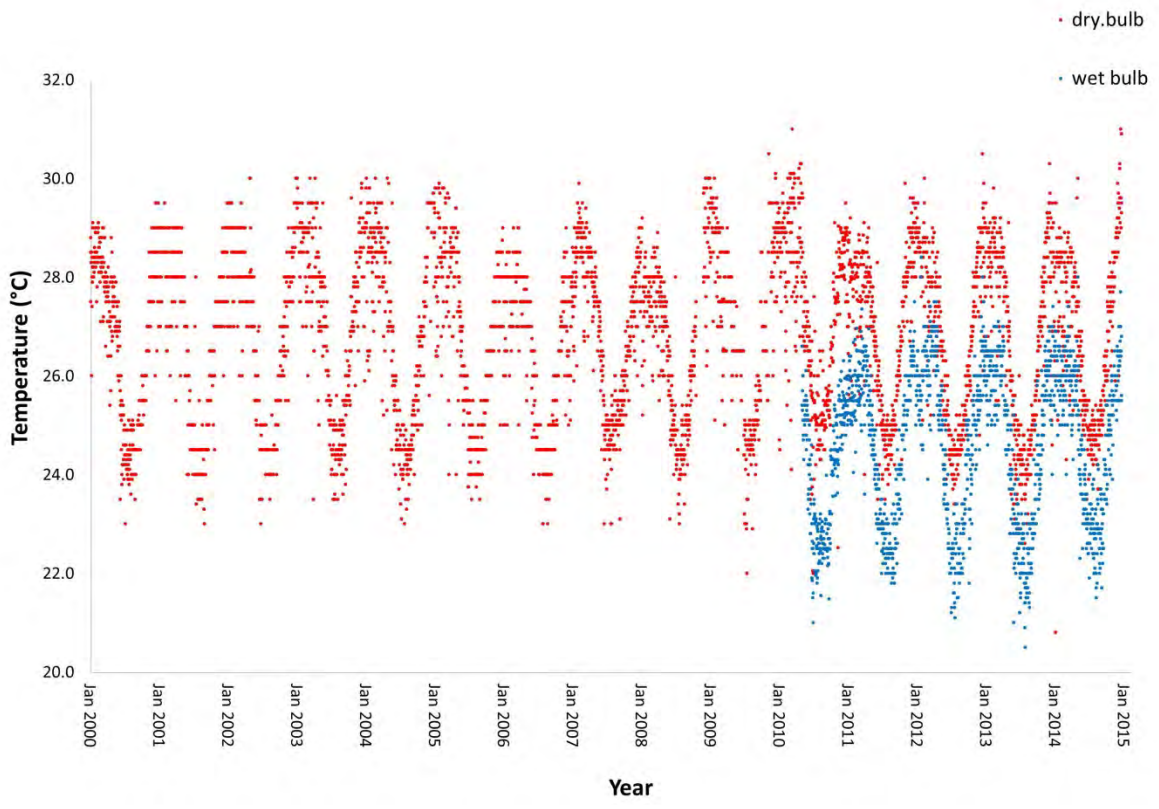


Figure 2. Daily dry bulb (red dots) and wet bulb (blue dots) temperatures (°C) recorded at the Aldabra Station between 2000-2014 (May 2010 – Dec 2014 for wet bulb only).

2.2. Maximum and minimum temperatures

The monthly maximum and minimum long term averages have been calculated using monthly averages from 2000–2013, certain monthly averages have been omitted from this long-term average due to concerns raised by previous Research Officers over the reliability of this data, please see earlier annual reports from more information.

In the beginning of 2014 (January – April) maximum monthly temperatures were slightly lower than long-term averages (2000-2013 average), however, during the rest of the year maximum temperatures were consistent with long term patterns (Figure 3), except for October 2014 when maximum temperatures were higher than normally. The accuracy of the existing maximum thermometer was checked by installing a new maximum thermometer, both were monitored throughout 2014 and showed consistency in maximum temperatures recorded. Therefore, it is recommended that the new maximum thermometer is kept safely in storage as a spare and the existing thermometer can continue to be used.

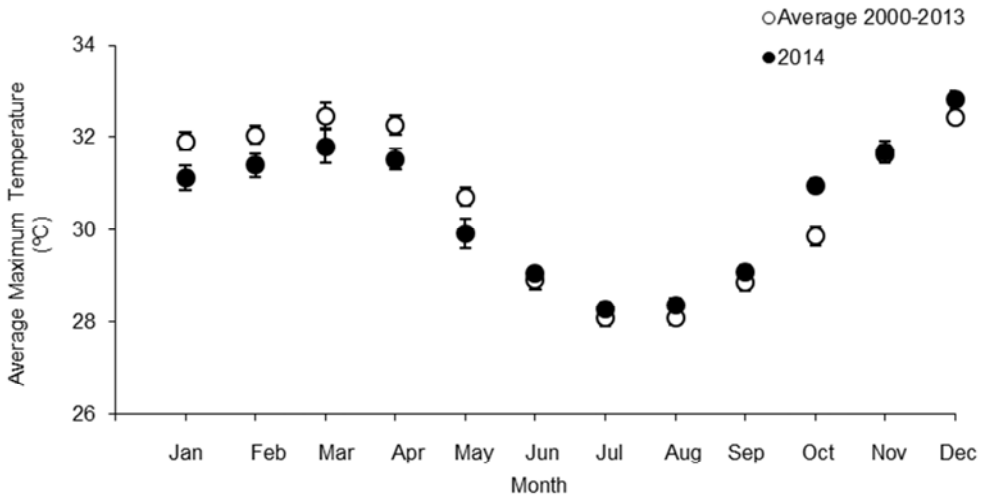


Figure 3. Maximum average monthly temperature comparing 2014 (black dots) to the long term monthly averages 2000-2013 (white dot) with s.e.

January and February 2014 had on average lower minimum temperatures compared to the long-term minimum temperature trends (Figure 4). From March to May 2014 minimum temperatures were fairly consistent with long term trends; however, in June and July minimum temperatures were higher than normal. From August onwards the minimum temperatures were within the range of long term minimum temperature patterns (Figure 4). These minimum temperatures are those obtained from the new minimum thermometer installed in December 2013, the old minimum thermometer, which was thought to be recording inaccurate temperatures, continued to be monitored throughout 2014 to determine whether there was a consistent difference between the temperature values for the new and old minimum thermometers, so that values could be back calibrated if appropriate. Unfortunately, there does not appear to be a consistent pattern and therefore it is suggested that the old minimum thermometer is removed and sent back to La Meteo as faulty.

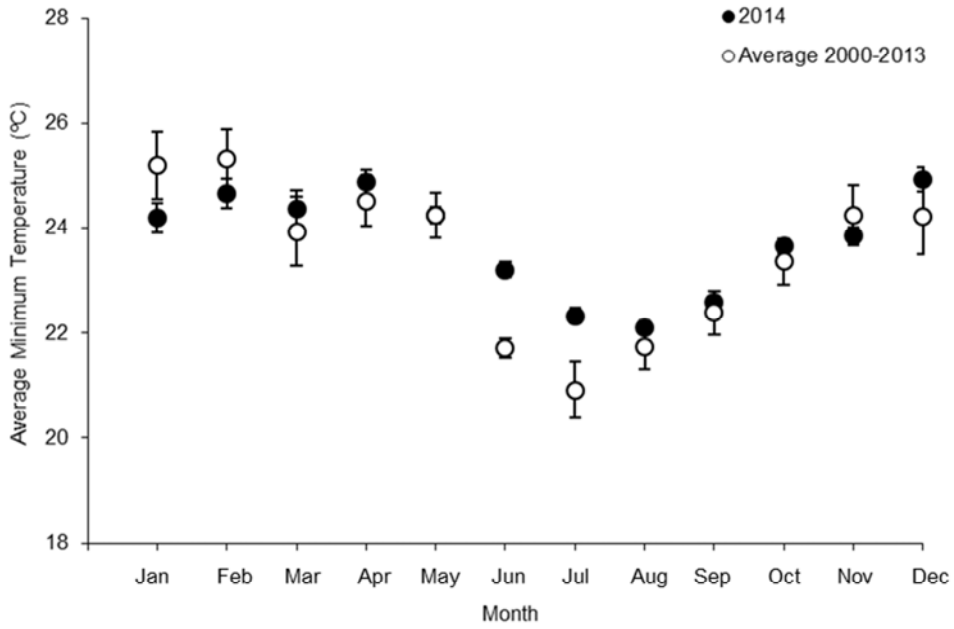


Figure 4. Minimum average monthly temperature comparing 2014 (black dots) to the long term monthly averages 2000-2013 (white dot) with s.e.

2.3. Rainfall at Picard Station

January and March 2014 were very wet months with considerably more rainfall compared to average rainfall values (2000-2013). In contrast February and April received less rainfall than would be expected (Figure 5). The drier months of the SE-monsoon received similar rainfall to normal patterns, with the exception of June which received lower rainfall than average. The start of the NW-monsoon saw rainfall consistent with normal patterns, however, the end of the year was very dry, with December receiving less than half the average rainfall expected for this month.

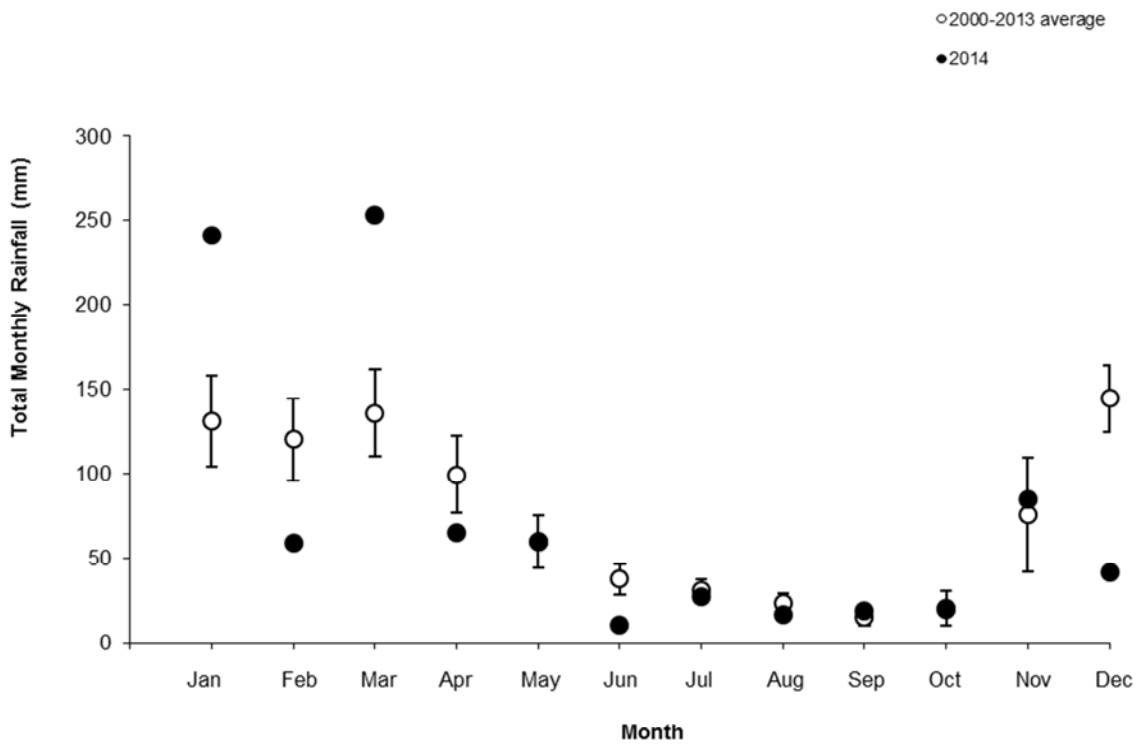


Figure 5. Total monthly rainfall (mm) (closed dots) recorded in 2014 at Aldabra Station, Picard compared to average total monthly rainfall (mm) for 2000-2013 (open dots) with SE.

2.4. Rain gauges around the atoll

Rain gauges are checked once per month (aside from Picard), however, if a Camp was missed, the rainfall data for the following month represented a two month period, this was split between the two months in keeping with the monthly proportions for the geographically nearest rain gauges.

At all locations the cumulative annual rainfall data for 2014 was considerably higher compared to the previous 13 years (Figure 6), aside from Picard Research Station where it was consistent. With Cinq Cases Groves and Passe Gionnet receiving the greatest rainfall in 2014.

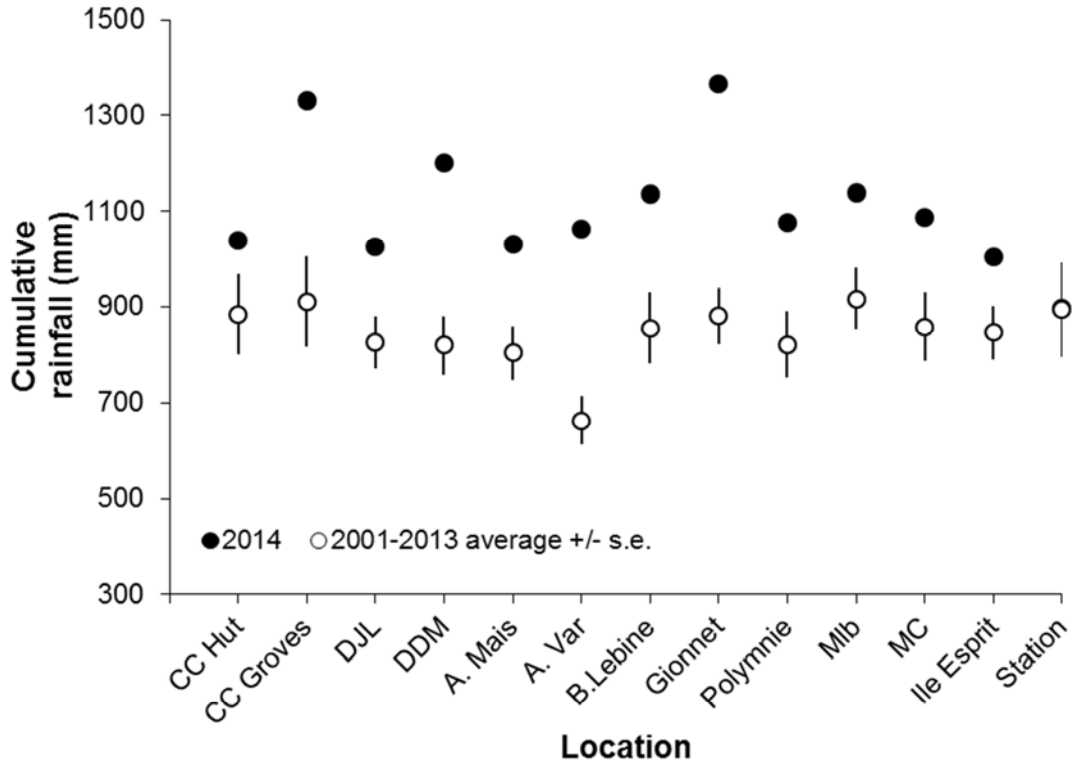


Figure 6. Annual rainfall totals for the rain gauges around the atoll in 2014 compared to 2001-2013 averages (± s.e.)

Consistent with normal rainfall patterns Aldabra experienced two seasons (dictated by wind direction), the dry south-east monsoon (May–October) and the wetter north-west monsoon (November–April) (Figure 7). All areas of the atoll generally received high amounts of rainfall in the first four months of 2014, and then little rain before November as anticipated. As previously discussed Picard Station received lower rainfall in February, but this appears isolated to this locality. In March Cinq Cases Groves and Bassin Lebine received comparatively less rainfall, in contrast Passe Gionnet received an unusually large amount of rainfall in September. Rainfall started to increase in November as expected, however, across the atoll the lower than average rainfall was experienced for this time of year.

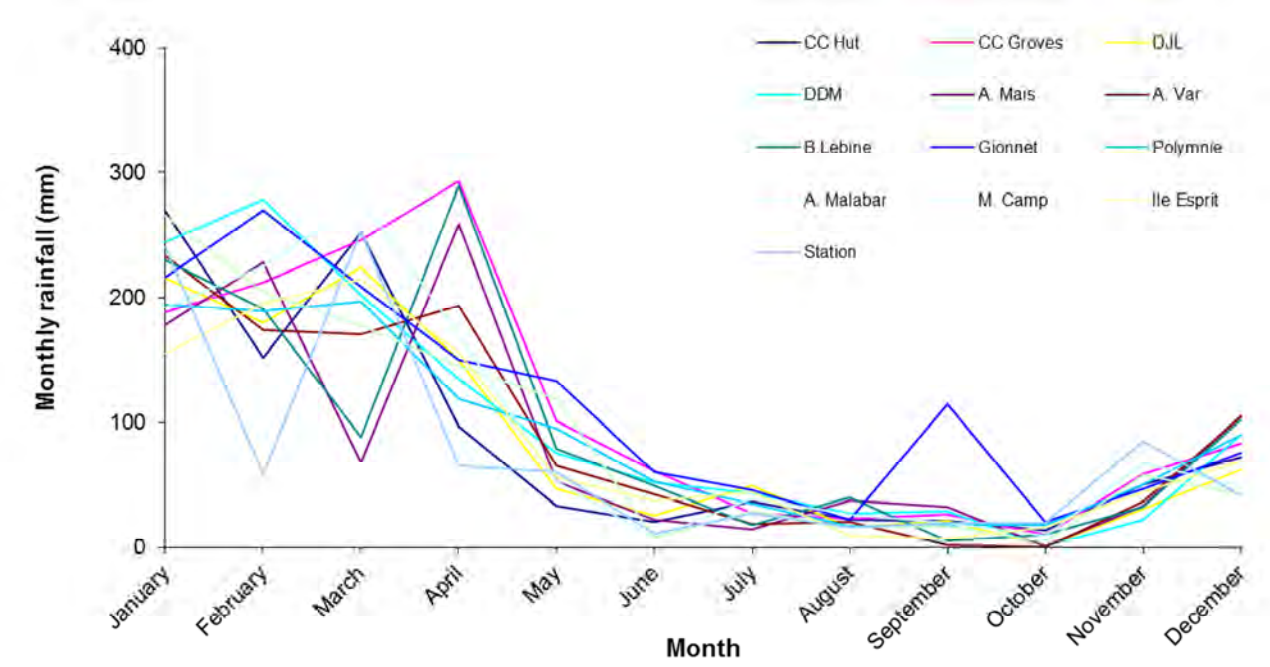


Figure 7. Monthly rainfall totals for 2014 for all atoll rain gauges

2.5. Automatic Weather Station

The Automatic Weather Station (AWS) was recording climate variables throughout 2014, albeit the wind sensor on the WXT-520 is faulty, giving inconsistent data. Seychelles National Meteorological Services (NMS) is aware of these issues and proposed to see if they can replace the sensors or the complete WXT-520.

The data was being downloaded onto Martijn van Dinther's laptop due to problems with the Skype laptop and then transferred to the fileserver manually, however, prior to his departure in October Martijn set up the system to again use the Skype laptop in the Library. A better long-term solution needs to be found for the downloading of the data from the AWS, however, technical IT support is needed to realise this solution.

A discussion was initiated in 2014 regarding the future of the AWS, the costs of continuing to maintain the AWS are high, data received for some variables is inconsistent and not comparable to the long term data set from the manual readings and it is has been very difficult to get NMS technicians to Aldabra to make the necessary repairs. It was suggested that a windguru spot station might be a cheaper and more practical solution as this would also feed into more reliable weather predictions which would be incredibly useful. Further research into this option is needed particularly in terms of obtaining the data collected and feasibility of this device for the harsh environment on Aldabra.

It was proposed to move the AWS box inside the research block to better protect the components from the elements. In addition it was thought that the mast would benefit from some guy ropes / cables to better secure the mast. This improvements should be undertaken in 2015.

Martijn produced a handover document providing details on the AWS and data storage, which can be found on the fileserver at \Monitoring\Climate\Automatic weather station.

3. TERRESTRIAL ENVIRONMENT

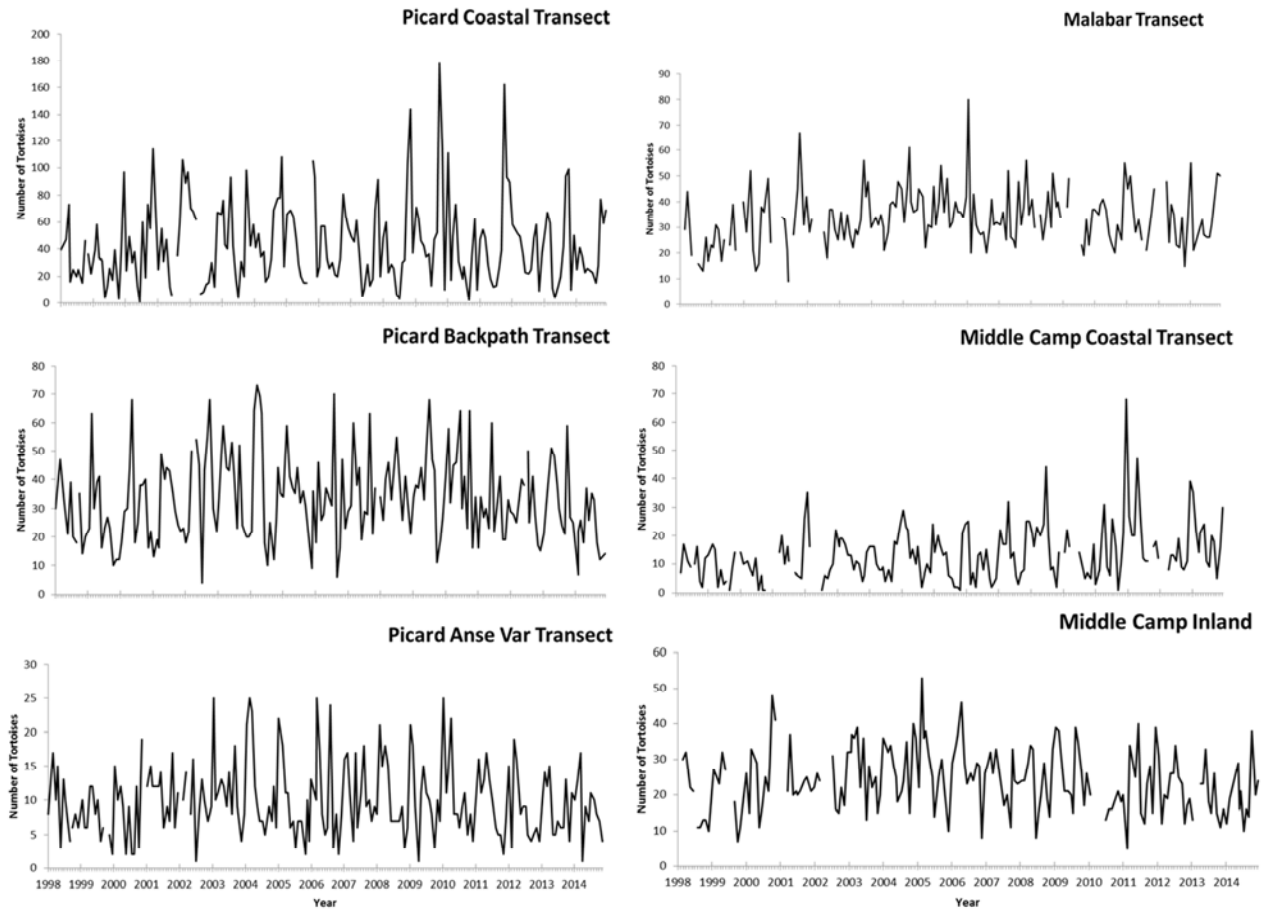
3.1. Giant tortoises *Aldabrachelys gigantea*

3.1.1. Regular transect monitoring

The 12 tortoise transects around the atoll have been monitored on a monthly basis since 1998. The seasonal differences in tortoise numbers in these areas is apparent, in addition to the considerable variation in abundance of tortoises across these areas (Figures 8). It can be seen that tortoise numbers for 2014 were within the normal range and that patterns observed over the years suggest a very stable population.

Dr Lindsay Turnbull (ZARP, University of Oxford, UK) completed the analysis of this long term dataset in 2014 and a manuscript based on these results was submitted to a peer-reviewed journal towards the end of the year. The paper detailed that the subpopulations differed in density but these differences could entirely be accounted for by differences in vegetation type. However, large differences in the size of animals and the degree of sexual dimorphism remain. There are also differences in observed sex ratios but this could be due to difficulties in sexing smaller animals. Comparisons with historical data reveal that phenotypic differences among the subpopulations of tortoises on Aldabra have been apparent for the last 50 years with no sign of diminishing. The paper concluded that the tortoise population on Aldabra is subject to varying ecological selection pressures, which gives rise to stable morphotypes in discrete subpopulations.

Following completion of the analysis of the long term data set the tortoise monitoring programme is being reviewed to ensure that the monitoring is appropriate to answer the key questions to inform management and to ensure it is resource efficient. Due to the longevity of the giant tortoises it is deemed unnecessary to monitor the 12 transects as frequently as is currently the case and potentially two surveys, one in each season would be sufficient. Reducing the resource requirements in this way would then make time available for other giant tortoise research such as getting the most out of individually marked tortoises on Picard. It was suggested that potentially additional transects could be included to get a better representation of the atoll and the length of some of the existing transects could be changed. Further discussion will be undertaken in 2015 to finalize any decisions on the future tortoise monitoring programme.



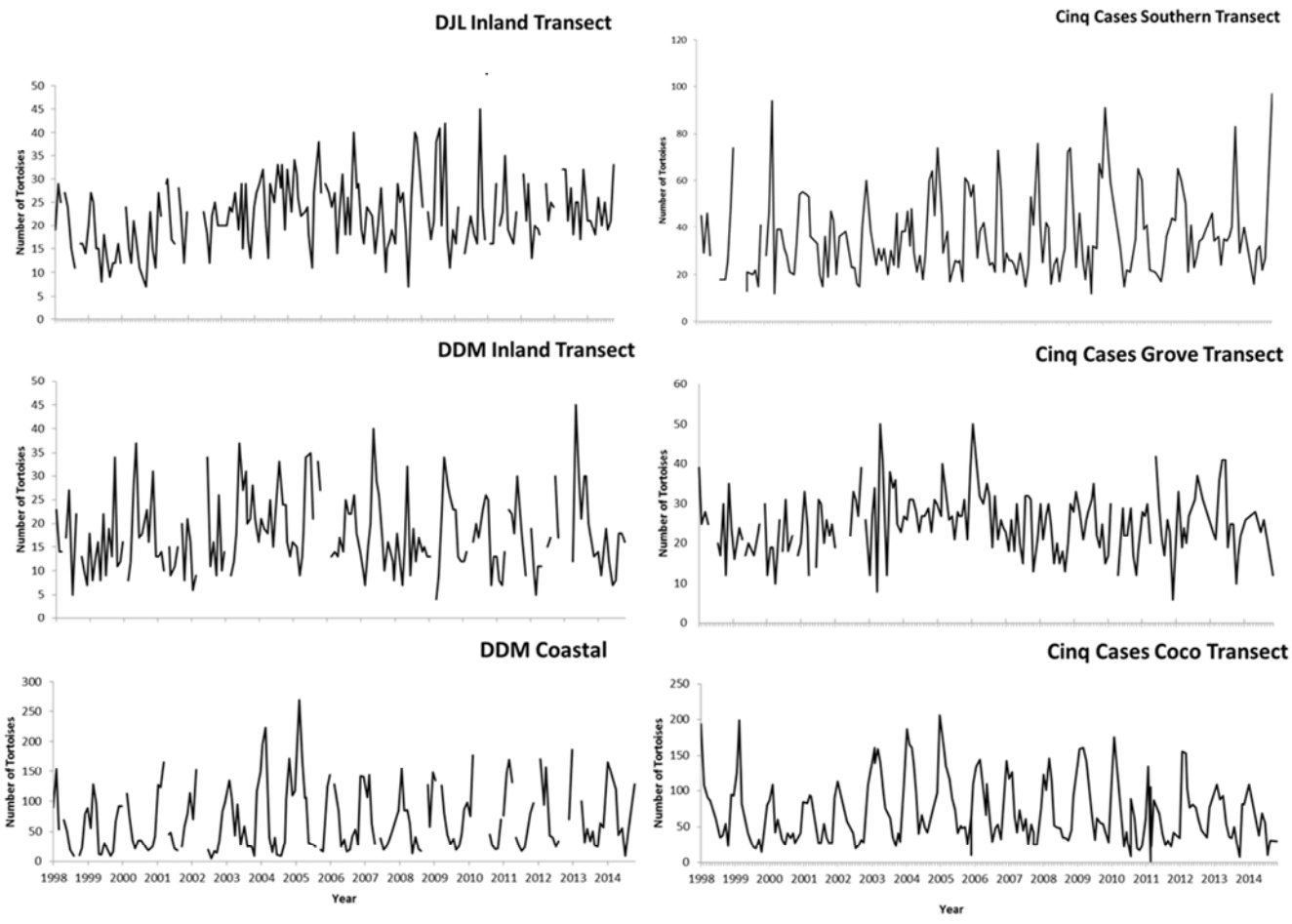


Figure 8. Seasonal patterns in tortoise numbers for the 12 monitored tortoise transects (1998–2014)

3.1.2. ZARP project (Zurich-Aldabra Research Platform) (*contributed by Richard Baxter*)

Blood Sampling

A further nine blood samples were obtained from tortoises on Picard, these individuals had been Toasted but not previously sampled. This was undertaken as part of a training session to teach the technique of obtaining a blood sampled from a giant tortoise carried out with the Aldabra Research Team in May 2014.

The duplicate blood plasma samples for the tortoise hormone study were transported to SIF Head Office, Mahé in May 2014.

GPS transmitters

GPS data was collected from the GPS tagged tortoises around the atoll when possible. The data was then sent to Movebank where it is stored and cleaned. The tagged tortoises on all islands repeated similar individual-based movement patterns seen in previous years. Tortoises that are typically sedentary remained in these areas, not ranging far from their core home range. Long distance movements were seen for a number of individuals, most notably DJL 2 who moved from Dune Jean-Louis to near Dune d'Messe, a distance of around 12km, following a similar path between the dunes each year.

The tags were maintained by SIF staff to ensure they remained attached. Tagged tortoises away from Picard, where tortoises have a three digit identification mark, had small marks engraved on their marginal scutes so they can be recognised in the field by the SIF rangers. The transmitters were also engraved with the codename of the tortoise (e.g. DJL1), so they can be identified if they become detached.

Unfortunately, a number of tags became detached from tortoises or the tortoise was found deceased (Table 3). Tags potentially become detached after sustaining damage from tortoises moving through thick low lying vegetation which wears down the epoxy coating. The bond between the tag and the tortoise becomes weaker and then falls off. Where possible, tags were reattached to the original tortoises, but when they could not be located, tags were attached to new tortoises in vicinity of the tortoise monitoring transect that the tortoise was originally associated with. The same procedure was applied to tags that came off deceased tortoises.

Table 3. Summary of GPS Tagged Tortoises which lost their tags in 2014

Tortoise	Date	Notes
Coco 1	10/09/2014	Deceased, approximate date of death 13/06/2014. Tag deployed on a new tortoise.
Malabar 2	27/08/2014	Detached tag: approximate dat 24/08/2014. It took several follow up visits to find the tag. Not reattached as the tag (#1975) is faulty.
DdMCST 2	26/06/2014	Detached tag: Approximate date 26/01/2014, deployed on a new tortoise on 29/08/2014
CAD	24/03/2014	Detached tag: Approximate date 26/01/2014, reattached to CAD 06/05/2014

Exclosures

Figure 9. One of the 'exclosures' at Cinq Cases (Dennis Hansen)

In February / March 2014 Julio Agricole, Rich Baxter, Wilfredo Falcon, and Dr Dennis Hansen constructed five 6x6 m enclosures, or rather 'exclosures', with paired control areas demarked (Figure 9). The logistics of constructing these exclosures in such a remote part of Aldabra were challenging, with 800-900 kg of wood, wire mesh, and metal bolts hauled up to 2 km inland, across difficult terrain in a huge team effort. During the next 5-10 years the exclosures should yield important insights into the dynamics of the reportedly very close association between tortoises and their habitat. For example, how does tortoise grazing affect plant and invertebrate community dynamics, and nutrient cycling?

Masters project

Richard Baxter, University of Zurich MSc student under the Zurich Aldabra Research Platform (ZARP), has recently submitted his thesis on Giant Tortoise movement and activity. Rich's research was carried out to understand patterns of Aldabra Giant Tortoise *Aldabrachelys gigantea* movement in response to climatic variation, in the context of future climate change effects on keystone species. Giant Tortoises are cold-blooded and may be especially vulnerable to climatic changes as their basic life history traits are related to temperature. Understanding their responses to climatic variation should therefore help to predict and prepare for the effects of climate change.

The Aldabra Giant Tortoise is an ecosystem engineer, which means that it has significant impacts on its habitat. Changes in the tortoise population therefore could have substantial direct and indirect effects on Aldabra's habitat structure and composition. Richard's MSc examined the effects of different factors on tortoise (i) home range size; (ii) movement and activity; and (iii) habitat use. He used GPS tags to track 31 tortoises in different regions of Aldabra and from this collected an average of 26 months of fine-scale movement data for each tracked individual.

The movement data so far has shown that tortoise home range size varies considerably and significantly between different sexes, seasons and regions. Rainfall and temperature both affect home range size. Movement types appear to be of three different categories (called 'residents', 'local migrators' and 'migrators') but more information is needed to confirm and explore this intriguing finding. Tortoises spent most of their time on grasslands and in scrub areas. The proportion of vegetation type use differed between regions and seasons. Tortoises showed a daily pattern of activity with two peaks, which is related to temperature. The optimum temperature range for greater tortoise activity is 25– 32°C. Rainfall also appeared to have a strong effect on tortoises' activity patterns over the year. Rich's research forms an excellent foundation for understanding and predicting the effects of changing climate on this important keystone species on Aldabra. His results provide new and valuable insights into the movement ecology of the Aldabra Giant Tortoise, which highlight the need to consider the limiting factors affecting their movements for the management of the atoll in the face of climate change.

ZARP PhD – From understanding to predicting: Giant tortoises as drivers of the seed dispersal network of Aldabra (***contributed*** by Wilfredo Falcón)

Wilfredo Falcón was present on Aldabra from October 2013 until May 2014 as part of the study of the seed dispersal network of the atoll, and the role of giant tortoises as potential drivers of the network, as well as assisting with other relevant fieldwork activities.

Plant–frugivore interactions were sampled using three methodologies: observations, camera traps, and faecal analysis.

Camera traps - Upon the arrival of the camera traps on the supply boat (December 2013), 15 Bushnell camera traps were deployed mainly on Picard –but also covered some species at Cinq Cases and Takamaka (Grand Terre). Up until May a minimum sampling effort of 896 camera trap days were undertaken, and 17 of the approximately 40 target plants were covered (Figure 10). Training on the Bushnell Natureview HD camera trap operations was given to SIF Rangers and a camera trap monitoring protocol was produced.

Figure 10. Screen shots from camera trap footage obtained during the field season: a) an Aldabra giant tortoise and b) a turtle-dove eating fruits of *Solanum aldabrensis*, and c) an Aldabra fruit bat and d) a Blue Pigeon on *Ficus reflexa*.

Observations - During the field season, focal and opportunistic observations of frugivory events were documented. Moreover, SIF staff contributed with their frugivory observations. Some of these covered plants that have not been monitored using camera traps.

Faecal/stomach content analysis – Faecal content sampling focused mainly on giant tortoises from the Groves and Coco transects (Cinq Cases, Grand Terre), and from the Anse Var transect (Picard). Faecal content from Blue pigeons, and Fruit bats, were opportunistically checked for presence of seeds, which were later identified. Moreover, the Takamaka Fody Eradication Team provided stomach contents from 26 Fodies (Aldabra and Madagascar), 1 Bulbul and 1 Sunbird. Stomach contents mainly contained seeds of grass/sedge species, as well as *Ficus* seeds.

Seed-Gape size – In addition to document the plant-frugivore interactions to study the seed dispersal network of the atoll, we are studying the existing variation in terms of the physical constraints that may limit these interactions, and how animals may adapt their feeding behaviours in response these limitations. For this, we are measuring the fruit and seed width and length, as well as the frugivore gape width. Ripe fruits were collected when available on Cinq Cases and on Picard, and we started to collect data on bird gape width during the mist netting efforts to collect Aldabra Fody DNA samples. In addition, the collected seeds were dried and stored for future reference and to complement the existing seed collection.

Preliminary seed dispersal network of Aldabra atoll – Based on a literature review of the recorded plant–animal interactions of Aldabra Atoll, a preliminary seed dispersal network was drawn (Figure 11). The resulting network is highly nested, and shows a high degree of modularity. Wilfredo is analysing the plant–animal interaction data collected during the season to construct an empirically-derived seed dispersal network to a) confirm the reported interactions (some of the species reported in the literature –like the white-eyes– may not be seed dispersers), and b) to incorporate new interactions. This will allow for a more robust analysis of the plant–frugivore interactions on Aldabra.

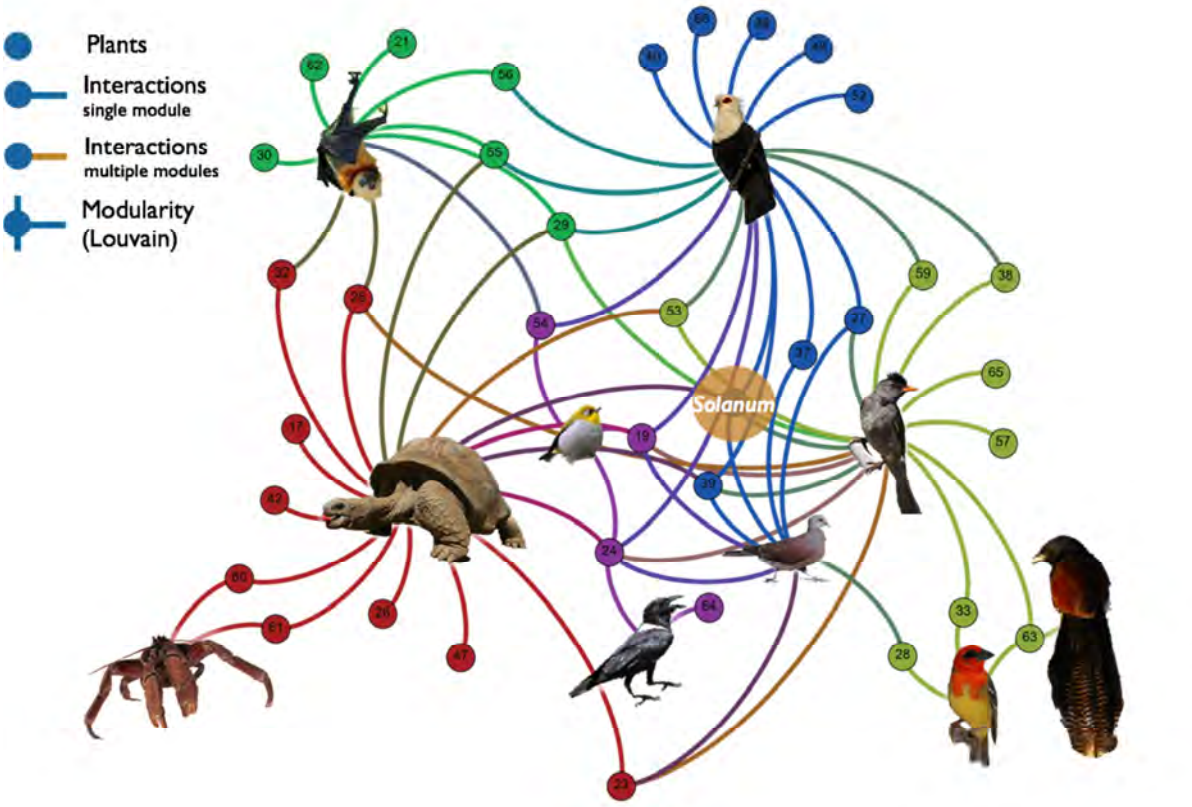


Figure 11: Preliminary seed dispersal network of Aldabra based on the plant–animal interactions reported in the literature. Different colours depict different modules in the network (based on the Louvaine method of community detection).

Seed gut retention time (GRT)

To carry out the gut retention time trials (GRT), two tortoise enclosures were constructed on Picard. A preliminary 2-week trial (housing and feeding tortoises) was conducted to assess the suitability of the tortoise enclosures, and adjustments were made. After this, two seed GRT trials were run during the season (late January- early March & March - April) for a total of 15 tortoises. Tortoises of different sizes and sexes were selected from the vicinity of the enclosures and placed inside the enclosures. The tortoises were weighted and the third dorsal scute width was measured. They were fed with natural vegetation and provided with water daily. After a couple of days of conditioning, tortoises were fed with a total of 120 colour-coded beads and one ingestible dispersal tracker (IDT) embedded in rice to simulate seeds of different sizes. Following this, tortoise scats were checked for beads and recovered beads were detailed and counted.

Due to difficulties such as tortoises escaping, refusing to eat the beads and the sandy substrate meaning it was difficult to recover the beads the mean percentage of recovered beads per tortoise was 61%; lower than the expected 85% based on the GRT trials with the Galápagos tortoises (Figure 12). The mean GRT until the first beads were detected was 12 days (n=14). Moreover, the mean GRT when ≥50% of the beads were recovered was 15 days, and a mean of 20 days passed until we recovered the last beads (n=11; only tortoises with ≥50% of recovered beads included). Although the general trend (based on a non-parametric loess fit on the data) seems to indicate that the bead size has an effect on the GRT, with larger beads having a shorter GRT than smaller ones, there is considerable variation. It is expected that no significant differences will be found when the survival statistical analysis is performed.

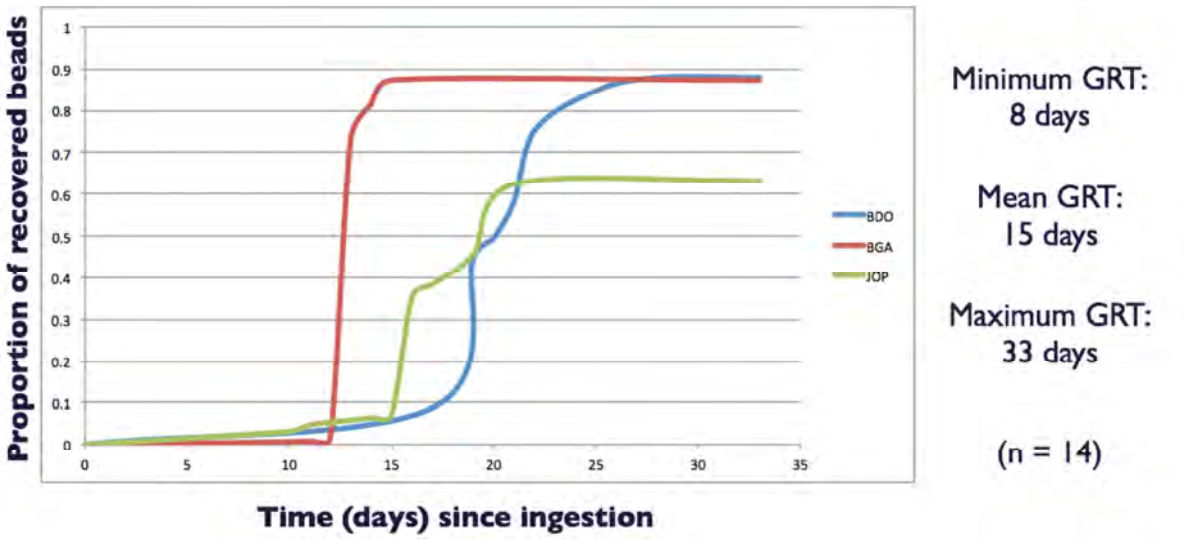


Figure 12. Visualisation of the total proportion of beads recovered for three Aldabra giant tortoises.

More GRT trials will be conducted in the coming seasons, and the enclosures will be reinforced and modified to prevent escapees and loss of beads in the sand. The aim will be to get information about the GRT for at least 30 tortoises where the percentage of recovered beads is ≥80%.

Experimental field test of the model IDTs

IDTs were fed to tortoises and they withstood gut passage, however, after performing tests to determine the detection range of the IDTs under various vegetation coverage conditions, it became evident that the detection range was not sufficient to be able to relocate them in field conditions. Communication with BioTrack is ongoing to find a solution.

Solanum aldabrensis population genetics

A potential extension that may be added to the project is to investigate spatial aspects of animal-mediated seed dispersal using a population genetics framework. The Aldabra tomato (*Solanum aldabrensis*) was identified as a potential candidate species for this study. This plant possesses fleshy fruits with high seed loads, and the observed spatial distribution on the atoll (and plant–frugivore interactions observations) suggests that it is highly dependent on animal-mediated seed dispersal. The Aldabra tomato seems to rely on giant tortoises and other frugivores for within island seed dispersal, but it may also be dispersed by species that move between islands (e.g. Turtle-doves, Blue pigeons). Leaf samples from different locations of the atoll were collected and dried in silica gel to test for the applicability of different genetic markers developed for other *Solanum* species and assess the genetic variation present in the species to inform the study design.

Turf species composition

As part of the ZARP long-term study of the effects of giant tortoise grazing pressures on the turf plant community dynamics in Cinq Cases, plants in the turf areas were identified to species level, and samples were collected. On Polymnie, where giant tortoises are absent, turf-like areas identified in previous years were revisited and the different plant species present in these areas were collected for identification. Despite having a similar species composition as the tortoise turf areas studied at Cinq Cases, and presumably due to the lack of grazing pressure, the difference in terms of dominance of certain species on Polymnie, and higher vertical growth (~30cm from the ground)

was notable. *Tephrosia aldabrensis* and *Lagrezia oligomeroides* dominated the turf-like areas on Polymnie, while in Cinq Cases they seem to have a more scattered distribution.

3.2 Birds

3.2.1. Landbird point counts

Landbird data has been collected by means of point counts on seven transects across the atoll since 1999 using similar methods, however, data prior to 2002 is incomplete. Janske van de Crommenacker completed analysing this dataset in 2014 and an article was submitted to the journal Bird Conservation International. The findings concluded that populations of all landbird species assessed (sunbird, turtle-dove, blue pigeon, Aldabra fody, drongo, white-eye and bulbul) except for the Aldabra drongo increased over this period. Abundance was associated with season and habitat, and interactions were found between season and location that differed for each species. Bird count results were affected by the timing of monitoring, number of observers and weather conditions. These results will be used to review the strengths and weaknesses of the current monitoring programme and make recommendations for improvements. In 2015 review of this monitoring programme will be made in light of these recommendations and any improvements implemented.

The monitoring programme only obtains sufficient data for seven of the 13 landbird species monitored (Figure 13). As part of the monitoring programme review it will be discussed whether alternative methods for assessing the other six landbird species (white-throated rail, Madagascar coucal, Madagascar sacred ibis, Madagascar kestrel, Madagascar nightjar and pied crow) should be pursued. The general pattern for the seven landbird species, for which there is sufficient data for meaningful analysis, remained consistent in 2014 (Figure 13). Although the average number of white-eyes and turtle-doves per transect was lower in 2014 compared to 2013, for both species 2013 had a noticeably high transect average, and the figure for this year is more consistent to that of previous years (Figure 13).

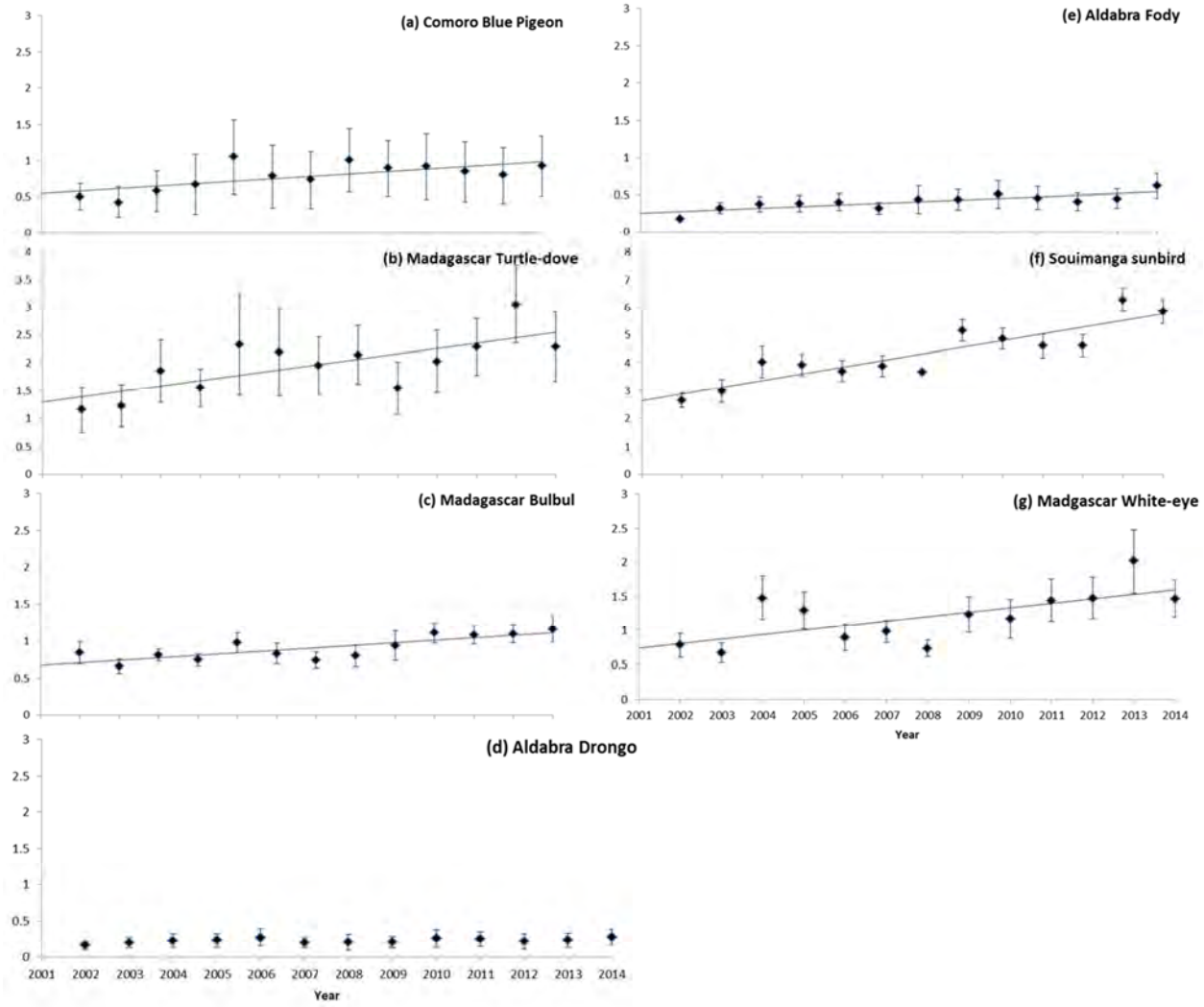


Figure 13 Trends in Aldabra landbird counts (average number of birds per transect point ± s.e.) across all seven landbird transects (2002-2014)

3.2.2. Landbird genetics (*contributed by Janske van de Crommenacker*)

Of the 13 land bird species resident on Aldabra, only one (the Aldabra drongo) is a recognised endemic species. The others are all described as subspecies derived from close relatives in the Western Indian Ocean region, mainly Madagascar. SIF Resident Researcher, Janske van de Crommenacker, with assistance from the Durrell Institute of Conservation and Ecology, University of Canterbury (Kent, UK), conducted phylogenetic analyses on the Aldabra fody and Aldabra rail from previously collected landbird blood samples. For more details on work activities undertaken in 2014 and detailed methodologies of the genetic analysis please refer to the Resident Researcher monthly reports and final report on this work.

Key project aims and rationales are:-

1. Confirmation of taxonomic status (fody, rail)

The genetic research focuses on the Aldabra fody (***Foudia eminentissima aldabrana***) and the Aldabra rail (***Dryolimnas cuvieri aldabranus***), because they are the most likely contenders for species status and because of conservation management purposes (i.e. with the threat of the introduced Madagascar fody invasion) and symbolic status (i.e. from a fund-raising and IUCN protection perspective, having a study that confirms the Aldabra rail population to be a separate species would help a great deal).

The Aldabra Rail's appearance and behaviour seem to be sufficiently different to its ancestral population on Madagascar to justify its re-classification from sub-species to species: the Aldabra Rail, unlike its remaining living rail relatives in the Western Indian Ocean, has lost the ability to fly. DNA was successfully extracted from the toe-pad tissue from museum specimens of the three rail sub-species; Aldabra Rails, Assumption Rails (now extinct) and Madagascar Rails, which were kindly supplied by the Natural History Museum of London in Tring.

To construct a phylogenetic tree a selection of DNA was amplified to allow assessment of the genetic differences between the three sub-species. The public digital GenBank database was used to compare the DNA sequences of these rail samples with those of close and further relatives elsewhere in the world, to get a better picture of the relationship of ***Dryolimnas*** rails with other rails. Through the American Museum of Natural History in New York, Janske also obtained specimens of Aldabra Rails that lived on Picard before their extinction on this island.

Interesting differences were found in the genetic markers between rails from Ile aux Cedres compared to rails from other Aldabran islands. Possibly the Ile aux Cedres rails represent remnants from the old Grand Terre population. Fine-scale genetic differences, such as between Aldabra Rails living on Aldabra's different islands (Picard, Polymnie, Malabar and Ile aux Cedres) or between the current reintroduced population on Picard and its pre-extinction population give insight into the population historic population movement and inter-relatedness between the islands. Understanding more about the genetics of these unique rails will also help SIF make decisions on the conservation management of the population.

Analysis of the genetic data suggests that the Aldabra rail population is sufficiently evolutionarily different to the other rail sub-species to be treated as a separate conservation management unit, the genetic analysis is still be progressed and will be finalised in 2015. The combination of this genetic analysis with the distinct morphology (Figure 14) and behaviour should be sufficient evidence to prompt the elevation of the Aldabra rail to an endemic species.

An attempt was made to sex the rail samples, Robert Prys-Jones had stated that the sex of the museum rail specimens is not always accurate, molecular methods described in Bantock ***et al***. 2008

were trialled. This method of sexing did not work, possibly because different reagents were used compared to that described in the paper. Following this the P2/P8 primers, that were used successfully with the fody samples, were tested but unfortunately this also did not work.

Figure 14 Janske van de Crommenacker taking morphometric measurements from rail museum specimens (left) and fody museum specimens (right)

2. Assessment of hybridisation between introduced Madagascar fodies and endemic Aldabra fodies was undertaken using DNA analysis. Following the discovery of an introduced Madagascar fody population in the Takamaka region (early 2012), the field team identified a number of 'suspicious' fodies which showing a mixture of Aldabra and Madagascar features, give raise to the concern that hybridisation between the invasive and native fodies had occurred. The Madagascar fodies were thought to derive from Assumption Island where they were introduced in the 1970s. The DNA analysis, that included Madagascar fodies (from Assumption as reference, and from Takamaka), Aldabra fodies (from other Aldabran island as reference, and from Takamaka) and 'suspicious' fody samples (from Takamaka), along with a reference set of closely related fodies from the Western Indian Ocean region (from Warren ***et al.*** 2012), confirmed that hybridisation had occurred (Figure 15). This further confirmed the importance of eradicating the remaining Madagascar fodies as an urgent priority. The study confirmed that the Madagascar fodies indeed derived from Assumption, and that hybridization had occurred only recently.

The fody samples were genetically sexed using the primers P2 and P8.

The Aldabra fody was recently elevated to species status (Safford & Hawkins 2013), but this result was based on only three samples used in Warren ***et al***. 2012. The current study, that added 23 more samples to answer this query, confirmed earlier indications that the bird should be treated as a distinct species (***Foudia aldabrana*** instead of ***Foudia eminentissima aldabrana***).

It was genetically confirmed that the suspicious fody caught and culled at La Gigi was fortunately a pure Aldabra fody. This was a relief as so far no confirmed 'suspicious' or Madagascar fodies have been seen outside of the east Grande Terre / Takamaka area.

(N.B. In February 2015 the fody hybridisation manuscript was submitted for publication in Diversity & Distributions. The paper was provisionally accepted with major revisions in April 2015.)

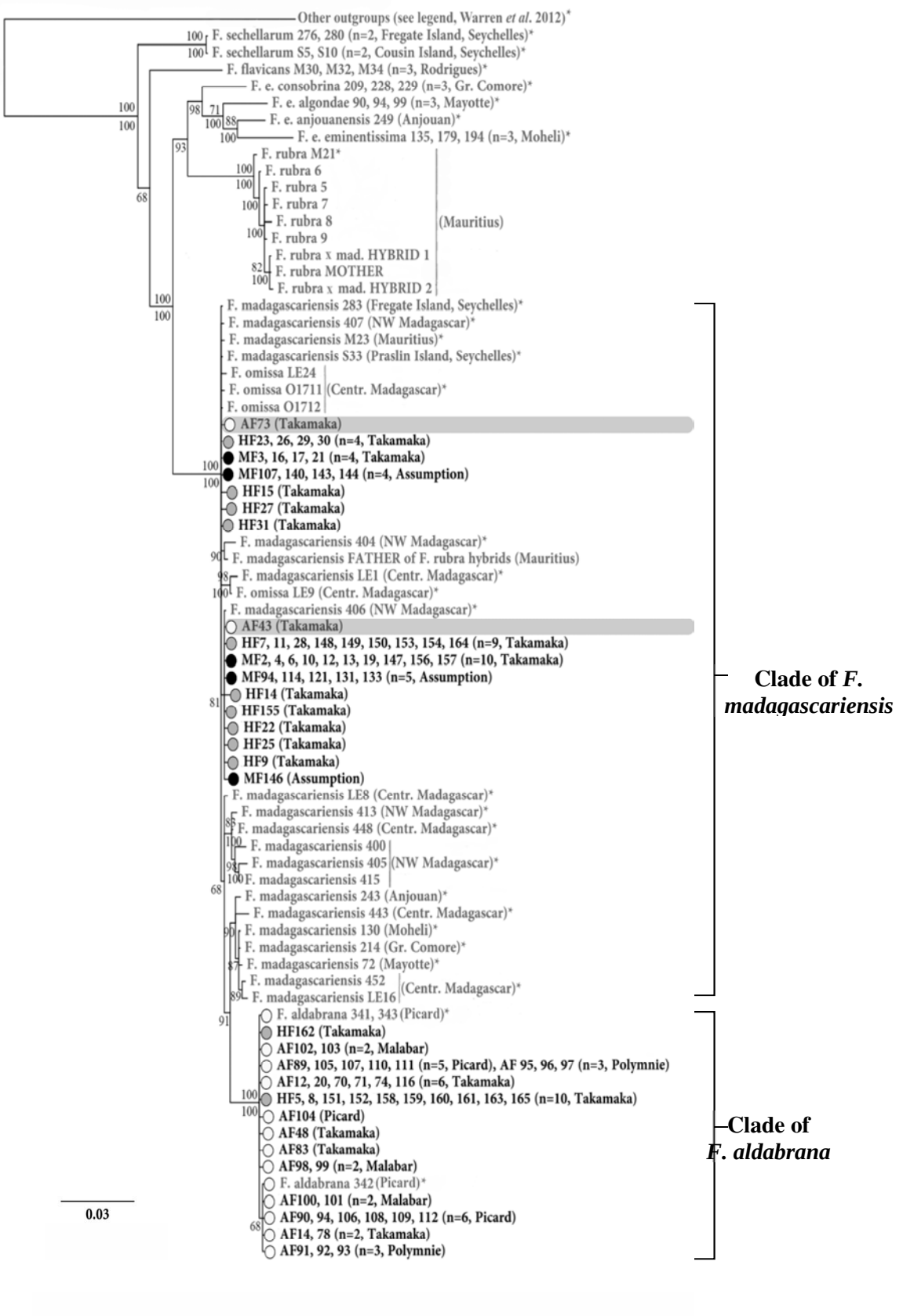


Figure 15. Bayesian analyses of *Foudia* concatenated mitochondrial (ATPase 6 & 8 and ND3) data. Consensus of the last 175,000 trees after 20 million generations of the GTR + I model. Bayesian branch support values (>60%) are indicated below bootstrap values (heuristic search, 1000 replicates) from a ML tree constructed using the TrN + I model (where TrN + I is Tamura-Nei with invariable sites) as per Warren *et al.* (2012). Some nodes are represented by multiple individuals that share the same haplotype (sample sizes are given in between brackets). Birds caught on Aldabra and Assumption are written in black and are marked with a circle to emphasize that they were identified in the field as *F. aldabrana* (white circle), *F. madagascariensis* (black circle) or hybrid (grey circle). The two Aldabra fodies

falling in the Madagascar fody clade are highlighted in grey. The Mauritius fody hybrids are given in capitals. Outgroups that are not shown in the tree (upper node) include the genera *Euplectes*, *Ploceus, Quelea* and *Malimbus* from Africa, and *Ploceus* from Asia (Warren *et al.* 2012). Other samples that were used from the dataset of Warren *et al*. (2012)'s dataset are marked with an asterisk. AF=Aldabra fody, HF=putative hybrid and MF=Madagascar fody.

3.2.3. Landbird nest success monitoring

Starting in October 2013 and continuing throughout the landbird breeding season until April 2014, the research team located and monitored landbird nests on Picard to provide further data on the nesting success of Aldabra's landbirds and possible causes of failure. Following on from the studies of Wanless in 2000/2001 and Šúr 2011/12 it was recommended that additional data was required for a meaningful analysis of nesting success.

The 2013/2014 landbird nest monitoring used the same methodology as in 2011/2012 study, but the study area was extended to include the entire area between La Gigi in the south and the start of the Anse Var tortoise transect in the north. A protocol was written and a database set up for this monitoring. The focus of search effort was the coastal path, which was often undertaken on the way back from daily turtle tracks. Of the nests found, 32% were inside or adjacent to inhabited or uninhabited buildings. It was recommended that the 2014/2015 monitoring of landbird nesting should focus on nests away from buildings to provide more representative data on nesting success in natural conditions.

In general the previous studies suggest that the overall nesting success of the Aldabra landbirds is relatively low; however, nesting success varied considerably between years. Disappointingly none of the nesting attempts monitored for blue pigeon, bulbul, coucal or pied crow were successful, however, for all of these the sample size was small therefore it was recommended that additional nests for these species should be located if possible during the 2014/2015 study.

For those landbird species where a reasonable number of nests were monitored the percentage of successful nests in the 2013/2014 breeding season was fairly consistent with 2011/2012 success rates (Table 4).

Table 4. Percentage of successful nests 2011/12 compared to 2013/14, sample size in brackets.

Species	Percentage Successful 2011/2012	Percentage Successful 2013/2014
Aldabra Fody	18% (n=9)	11% (n=38)
Drongo	26% (n=18)	29% (n=7)
Sunbird	28% (n=38)	33% (n=75)
White-throated Rail	50% (n=17)	57% (n=7)

In anticipation of the 2014/15 landbird breeding season a protocol detailing the rational and methodology for the landbird nest monitoring programme was drafted. The same methods as those used in the 2013/14 study were used, with additional component of assessing the impact of habitat type on nesting success. Habitat type can have a major effect on nesting success for a number of reasons. The status (introduced vs native) of the coastal tree *Casuarina equisetifolia* on Aldabra has long been discussed, and the IUCN site management priorities for Aldabra include the need to assess the impact of this species. Several species of landbird utilise Casuarina for nesting. The monitoring aimed to also investigate nesting success in the different habitats of mixed scrub and Casuarina dominated. To standardise the search effort in the two habitat types, two quadrats of 50x50 m^2 were demarked in each habitat type. The 2014/15 landbird nest monitoring is currently ongoing and the results will be presented following the completion of the landbird breeding season in April.

To improve consistency and accuracy of the data collection and storage a new field recording sheet was designed and Access database created. This should provide observers with better information in the field to accurately assess breeding status and nest contents and improve data entry to reduce common errors identified from the 2013/2014 data.

3.2.4. Wader counts

Settlement Beach wader counts (waders, herons and terns) are undertaken every two weeks at low tides when the reef is exposed. In addition, wader counts are also undertaken on the Dune Jean-Louis coastline, Dune Patate area and Dune d'Messe generally once per month. In general the monitoring results suggest that numbers of the common wader species encountered are fairly stable. However, 2014 saw a marked increase in dimorphic egrets, ruddy turnstones and common greenshank encountered. Whilst numbers of Whimbrels and Bar-tailed godwits remained high compared to pre-2010 figures (Figure 16).

There is seasonal variation in the wader species that occur on Aldabra, with migrant species generally present or occurring in much greater numbers during the north-west monsoon (e.g. crab plovers, bar-tailed godwits etc.) and disappearing or reducing in number during the south-east when they travel to their breeding grounds. In addition tide height, weather conditions and time of low tide are all likely to influence the abundance of waders during the counts. Unfortunately there was not sufficient time for Resident Research, Janske van de Crommenacker, to assess the wader data set as a result of other research priorities. Detailed analysis of the data obtained from the wader counts to look at the influence of tide height, weather conditions and time of low tide on the abundance of waders, identify trends and allow for an informed review of the wader monitoring programme should be undertaken.

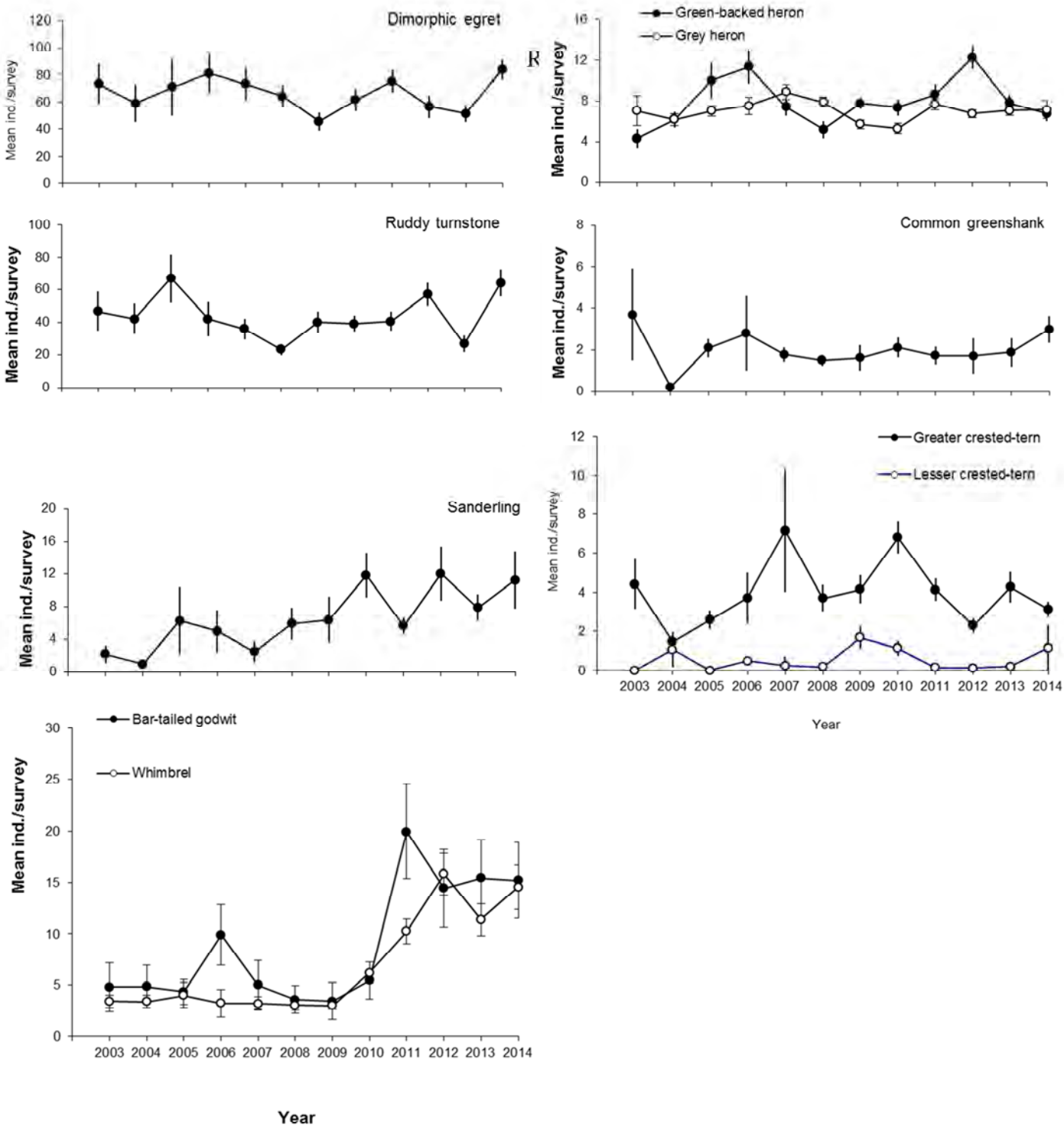


Figure 16. Mean number of individuals per survey for ten of the most commonly observed species in the wader surveys 2003–2014.

3.2.5. Crab plover daily counts

Daily crab plover counts are undertaken in combination with the turtle track monitoring. In general the average number of crab plovers encountered in 2014 were slightly lower (with the exception of September) than the historical averages (Figure 17), however, they are within the normal range (with the exception of April). In keeping with observations since 2012, crab plovers appear to be migrating away from Aldabra earlier to breeding compared with 2007-2012, illustrated in April when there was a noticeably low number of crab plovers encountered.

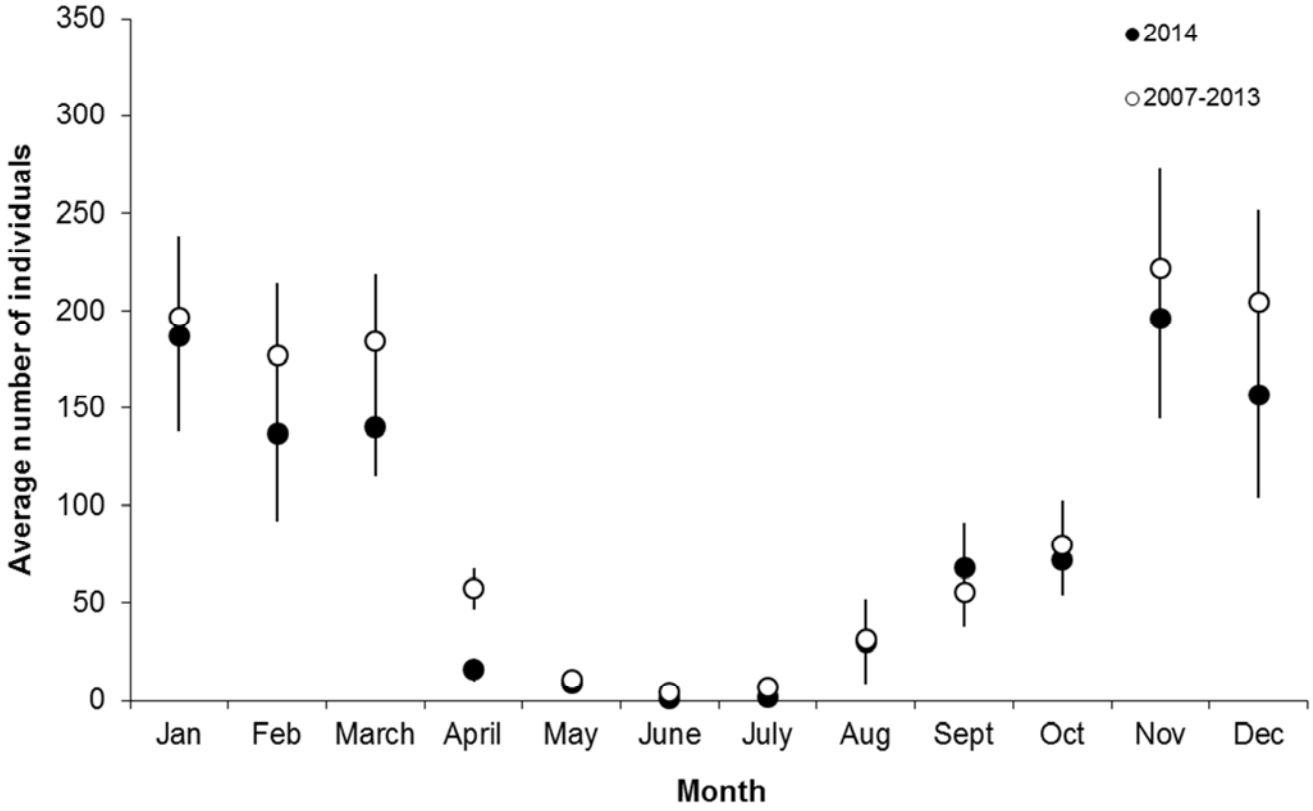


Figure 17. Average daily encounter rates of crab plovers in 2014 compared to those of 2007–2013.

3.2.6. Tropicbirds

Red-tailed and white-tailed tropicbird nests are monitored every two weeks on a spring low tide on La Gigi islets, Picard. The number of new nests found in 2014 was lower than in the previous three years since the monitoring methods changed (see 2013 ASC Report for details), with approximately 20% fewer nests found in 2014 compared to 2011-2013 (Figure 18). This fall in new nests found was consistent in both red-tailed and white-tailed tropicbirds. It is not known what caused the reduction in nesting activity this year but should 2015 present another fall in new nests this should be looked into further as the previous three years had very consistent nesting. It is unlikely that this is a product of observer error as the field staff rotated around and comprised experienced staff that had been involved in the monitoring in previous years.

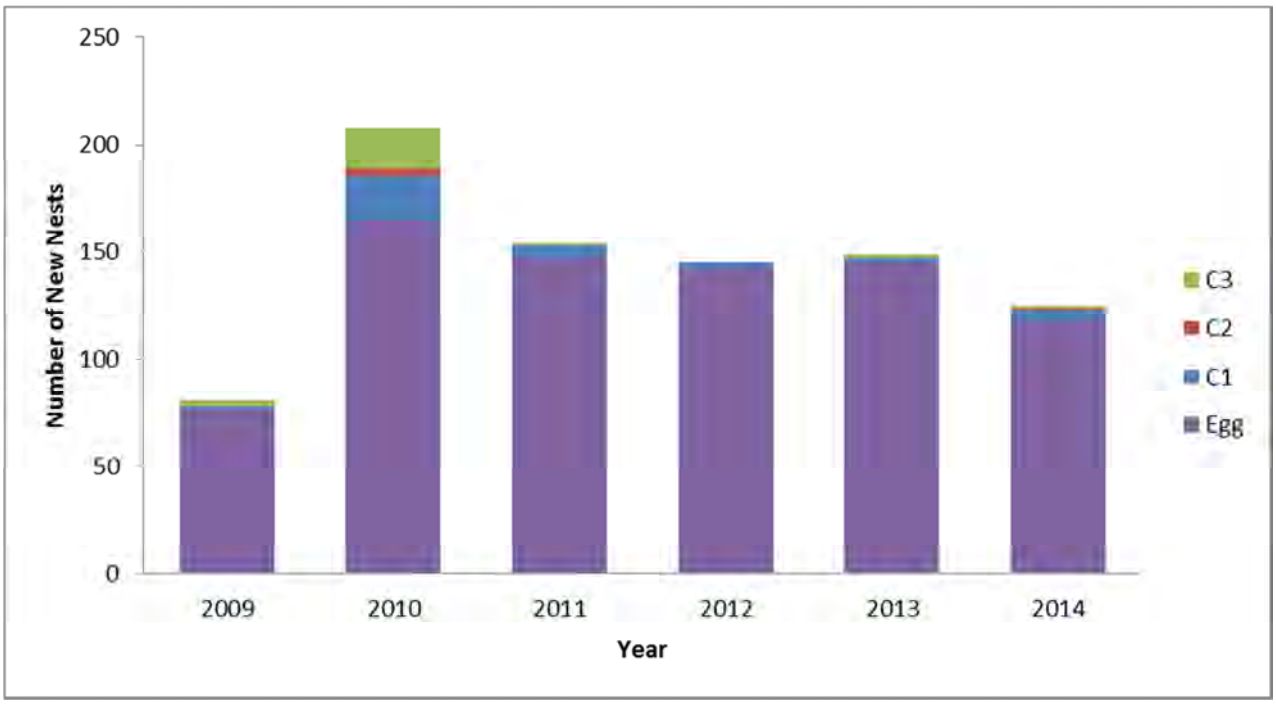


Figure 18. Total number of new tropicbird nests found 2009-2014 illustrating stage of nest when initially found

To further investigate causes of nest failure camera traps continued to be placed at active tropicbird nests throughout 2014. However, disappointingly technical issues could not be resolved, with cameras failing to capture critical footage at nest failure times and no further predation events were documented. Later in 2014 it was decided to cease to continue deploying the cameras due to poor results and they were taken to trial on landbird nests instead. The use of remote cameras has the potential to yield very useful information on causes of nest failure and nest predators, however, the trigger mechanisms on these Acorn cameras may not be appropriate and reliable for this purpose.

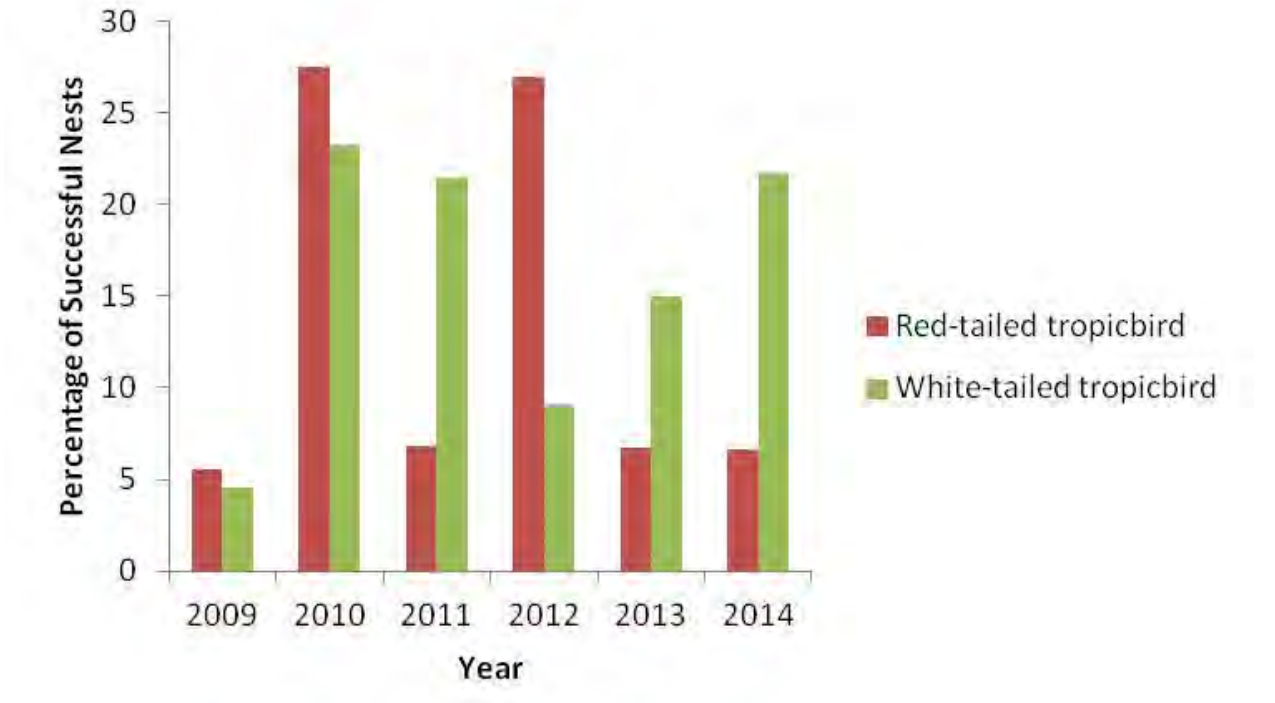


Figure 19. Successful (nests reaching C3 so assumed fledged) nests for red-tailed and white-tailed tropicbirds (2009–2014) as a percentage of total number of new nests found

Tropicbird nests are considered to be successful when the chick reached C3 stage; therefore the chick is fully feathered nearing fledging. Percentage of successful nests was calculated by dividing total number of nests reaching C3 stage by total number of new nests found (for data prior to 2011 new nests found at egg stage was used as it was thought to be most representative of new breeding attempts prior to 2011), per year (Figure 19).

Nesting success of both Red-tailed and White-tailed tropicbirds is seen to vary with year, this is particularly marked in Red-tailed tropicbirds. For the Red-tailed tropicbirds nesting success was much higher in 2010 and 2012 at >25% compared to the other years where it was <8%. However, for the White-tailed Tropicbirds 2010, 2011 and 2013 had comparatively high nesting success at between 15-23% but with lower success in 2009 and 2012 when less than 10% of nests fledged. 2014 was a reasonably productive year for white-tailed tropicbirds with 21.7% of nests successfully fledgling a chick, however, it was a comparatively poor year for red-tailed tropicbird with only 6.6% of nests being successful (Figure 19). This again illustrates the surprising observation that the nesting success is not consistent between the species, as there are a number of factors which could contribute towards increased nest failure which would likely be the same for both species (greater predation, less food available). The difference between the species in nest site preference, White-tailed tropicbirds generally preferring champignon holes and Red-tailed tropicbirds open sites under vegetation, could be one possible explanation for this difference, with Red-tailed tropicbirds nests more exposed to the elements and more vulnerable to avian predators. It would be very interesting to obtain further information on the causes of nest failure for the two species to better understand this different in breeding success of these species of tropicbirds which use the same islets to nest.

Tropicbird dataloggers

Following the retrieval of one of the ten geo-locaters in deployed on red-tailed tropicbirds in 2013 no further loggers have been recovered. Dr Jannie Linnebjerg proposed sourcing additional funding to deploy more data loggers on Aldabra's tropicbirds. SIF are in favour of continuing with this project and hopefully following securing additional finances more tropicbird data loggers could be deployed.

3.2.7. Caspian terns

Consistent with previous patterns Caspian terns were sighted on Aldabra from February until mid-September 2014. Figure 18 illustrates the distribution and frequency of observations involving at least two Caspian Terns (assumed / potential pairs) (Figure 20 and 21).

Figure 20. Caspian Tern pair resting on sand bar (Heather Richards)

Figure 21. Caspian Tern Sightings consisting of at least two individuals (assumed pairs) during 2014 and location of likely successful breeding attempts

Pairs were observed in a number of locations known to have been used for nesting previously (Figure 21), however, the only confirmed successful breeding attempts were confined to Champignon des Os (Table 5; Figure 22) where two healthy chicks and then juveniles were seen and assumed to have fledged. The 2014 breeding success of two fledglings is consistent with normal patterns with typically two or three juvenile Caspian terns produced per year on the atoll. There is the potential that pairs seen in the east of the lagoon or at less frequently visited areas could be breeding without detection. In general areas where pairs are observed are treated with caution and not visited unless necessary to avoid disturbance to ensure nesting is not discouraged.

Figure 22. Caspian Tern chicks Champignon des Os (Catherina Onezia)

Table 5. Summary of Caspian Tern breeding activity on Aldabra 2003-2014

Year	Location	Stage Observed	Number of Nests
2003	Ile Esprit	Nest	1
	Ile Moustique	Egg	1
	Anse Grande Poche	Egg and Chick	3
	Dune Jean-Louis Beach	Nest?	1?
2004	Ile Esprit	Egg	2
	Anse Owen	Egg	1
	Anse Grande Poche	Egg and Fledgling	1-2
	DDM landing stage	Fledgling	?
	WGT beach 6	Fledgling	?

2005	Anse Grande Poche	Egg, Chick	2
	Cinq Cases – Coco	Fledgling	?
	Anse Takamaka	Fledgling	?
2007	La Gigi	Chick	1
2010	Settlement Beach Z4	Sub-Adult	
2011	Settlement Beach Z3	Juvenile	
2012	Ile Moustique	Juvenile	1?
	DDM beach 24	Juvenile	
	Settlement Beach Z4	Juvenile	
2013	Petite mentor endans	Chick	1
	Champignon des Os	Juvenile	1
	Ile Moustique	Juvenile	1
2014	Champignon des Os	Chicks & Juveniles	2

The opportunistic sightings data collected for Caspian Terns is strongly influenced by observer presence at localities throughout the atoll illustrated with the majority of sightings of multiple birds occurring on Picard. It is therefore, not possible to draw accurate conclusions on Caspian tern numbers or population trends from analysis of this data.

3.2.8. Madagascar Pond-heron

In 2014 61 observations of Madagascar Pond-herons (MPH) were recorded on Aldabra, additional sightings were made in the Cinq Cases region during the rat / cat monitoring trip but due to GPS failure these data was unfortunately lost. The majority, in keeping with previous years, were confined to the east of Grande Terre (Figure 23). However, observations were also made at DDM and West Grande Terre. The islet near Ile aux Cedres where the observation of the large group of 17 adults in non-breeding plumage was made in 2013 was checked in 2014 during the breeding season but no groups of MPH were seen there or at the surrounding islets. All observations were of adults, aside from one observation of a juvenile in the Takamaka area – H grid, this is the second year in a row that a juvenile MPH has been observed in this area confirming that successful breeding is occurred on East Grande Terre.

Figure 23. Madagascar Pond-heron sightings in 2014 (white circle = non- breeding plumage, black circle = breeding plumage).

Consistent with observations described in 2012–2013 annual reports MPH in breeding plumage were sighted between November and March (Table 6). Consistent with normal observations, comparatively few MPH were seen in breeding plumage, only 11 of the 61 sightings included a breeding individual.

Table 6. Summary of Madagascar Pond-herons sighted in breeding and non-breeding plumage in the period 2009-2014. Months in which MPHs in breeding plumage were sighted are coloured in grey.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2009						0/5	0/12	0/6	0/2	0/3	4/1	-
2010	1/1	-	1/4	0/5	0/11	0/15	0/9	0/2	0/2	0/5	-	4/2
2011	3/3	0/6	3/10	0/16	0/16	-	0/5	0/2	-	-	-	-
2012	2/3	4/7	3/4	-	-	-	-	0/7	1/7	0/1	2/10	1/2
2013	-	3/9	0/5	1/8	0/9	0/9	0/7	0/5	0/2	-	3/4	4/7
2014	4/8	1/8	1/10	0/4	-	0/7	0/9	-	-	1/2	1/6	3/6

SIF's paper on the results of the first 4 years of the MPH monitoring programme was published in the journal Ibis in 2014, reference - Bunbury, N. (2014) Distribution, seasonality and habitat preferences of the endangered Madagascar Pond-heron *Ardeola idae* on Aldabra Atoll: 2009–2012. *Ibis* 156: 233–235.

3.2.9. Flamingos

In keeping with the recommendations of 2012 no opportunistic flamingo monitoring was undertaken in 2014 to minimise impact on this species which is highly sensitive to disturbance (for further details refer to Greater Flamingo Exploration in the region of Cinq Cases (April & May 2012) by Catherina Onezia (Z:\Monitoring\Birds\ Flamingo\Reports). A monitoring protocol is currently being drafted for discussion, proposing how the Aldabra flamingo population can be monitored whilst ensuring we do not have an adverse impact on this species, this should be reviewed and implemented in 2015.

Although no targeted monitoring of flamingos was undertaken in 2014 chance encounters and involuntary observations of this species still occurred which are summarised in the table below. Due to the presence of the Madagascar fody eradication team in the Takamaka area and the systematic grid searches 14 observations of flamingos were documented from this area with the remaining observations being in the Cinq Cases region. Consistent with previous sightings all observations were confined to East Grande Terre. A large flock of >50 flamingos was seen four times this year illustrating the Takamaka / Cinq Cases area supports a healthy population of flamingos (Figure 24).

Figure 24. Flock of ~70 flamingos seen in Cinq Cases region of Grande Terre in February (Nick Page)

Table 7. Chance flamingo observations in 2014

Date	Time	Location	Group composition	Activity
23/02/2014	11:00	Date Palm	4	Disturbed into flight
23/02/2014	11:45-12:15	Between Takamaka & Cinq Cases	1	Standing & preening
23/02/2014	14	Cinq Cases	~70	Feeding & interacting much honking heard
05/04/2014	09:30	Takamaka M-grid	59	Flying
05/04/2014	11:40	Inland pool between Takamaka and Cinq Cases	5	Feeding, disturbed into flight
12/06/2014	09:30	Coco Transects Points #13, between coco-landing transects, seems to be in a pool	A large flock (not seen)	Vocalising
13/06/2014	07:00	Landing stage point #0 Transects Southern	~60	Flying and Vocalising
15/07/2014		South Transect, Cinq Cases	1	Feeding
15/07/2014		South Transect, Cinq Cases	2	Flying
14/08/2014	08:00	Cinq Cases, Landing stage area	2	Feeding
11/09/2014	07:30	Small tidal pool going to landing stage, Cinq Cases	1	Feeding
11/10/2014	07:45	Small tidal pool going to landing stage, Cinq Cases	1	Feeding
12/11/2014	07:06 - 7:30	Takamaka point G15	~13	Flying
15/11/2014	07:16	Takamaka point L12o	4	Flying
17/11/2014	06:40	Takamaka point F5m	3	
10/12/2014	07:37	Takamaka point G13	7	Flying
10/12/2014	07:53	Takamaka point G13h	12	Flying
12/12/2014	8:28 - 8:42	Takamaka point G10-G11 (Flamingo Pool)	1 - 14	Wading in pool
12/12/2014	07:20	Takamaka point G13c	30	
12/12/2014	07:30	Takamaka point G9	32	
13/12/2014	07:26	Takamaka point G12i	5	
13/12/2014	08:48	Takamaka point G8e	13	Flying
19/12/2014	07:39	Takamaka point M4o	1	
21/12/2014		Pool area after mangroves, Cinq Cases	50-60	Flying
22/12/2014		Coco Transect	7	Flying

3.2.10. Frigatebird census

In January and February 2014 the fourth consecutive annual frigatebird census was conducted. For full details of the survey and data analysis please refer to the frigatebird census on Aldabra 2014 and 2015 Report (July 2015).

The 2014 survey estimated the total number of breeding pairs of Lesser Frigatebirds to be 5480 and for Greater Frigatebirds 2360 on the atoll. This represents a decrease in comparison to the 2013 census, however, it is consistent with the fluctuating patterns of breeding pairs observed previously. The colonies at Grande Poche and Middle Camp were more noticeably smaller in comparison to the previous year (Figure 25), reflecting that the reduction in breeding pairs was more pronounced in the Greater Frigatebirds with – 46% reduction in breeding pairs compared to 2013, compared to only -17% in Lesser Frigatebirds. According to the fluctuating patterns of

breeding activity observed to date it is anticipated that the 2015 Frigatebird census should record an increase in numbers of breeding pairs.

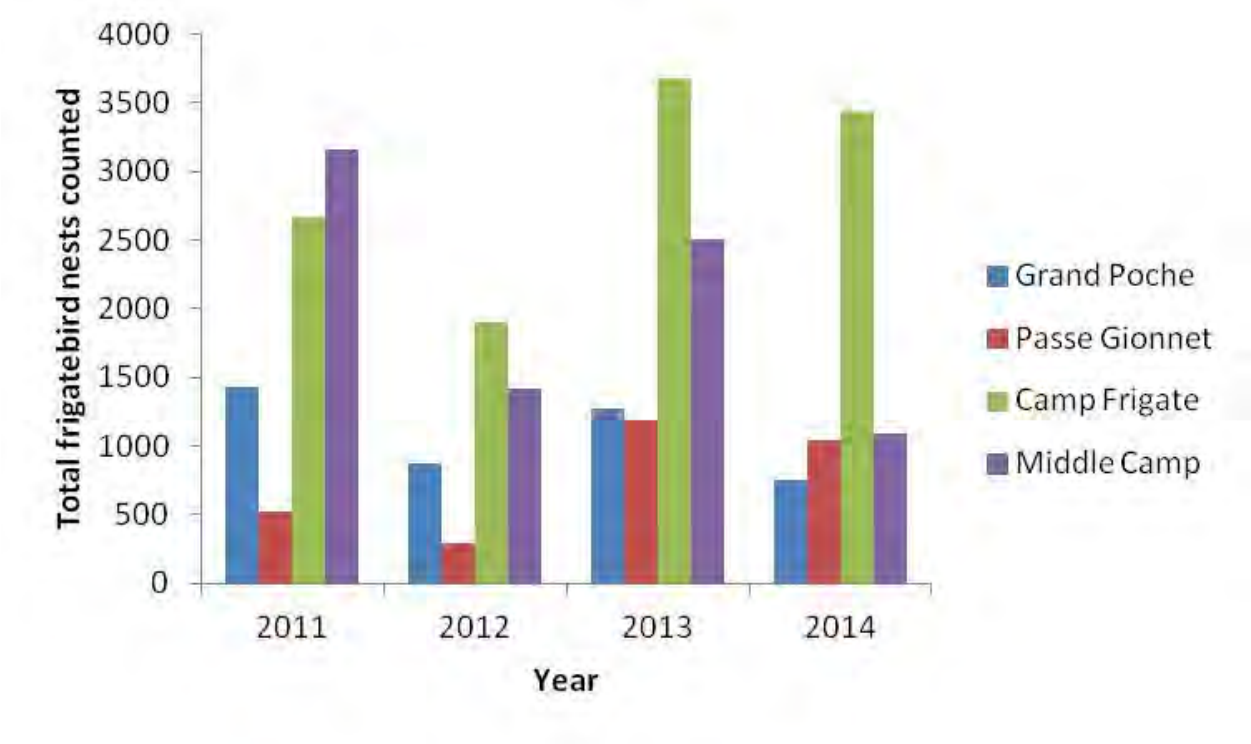


Figure 25. Number of nests counted in each of the four frigatebird colonies on Aldabra (2011-2014)

The most welcome discovery of the survey was finding frigatebirds nesting again at the former colony area to the south of Passe Gionnet. Aldabra's frigatebirds are known to be sensitive to human disturbance and tourists used to visit the Passe Gionnet colony. This area has the narrow channels and fast currents which increase the disturbance to the colony of boat trips. The link between tourism and a colony being abandoned is unconfirmed but it was following a period of high tourist activity that frigatebirds stopped breeding at this area of Passe Gionnet. Regulations to reduce the impact of tourists on Aldabra's frigatebirds were implemented following the first two annual surveys. At the same time the number of visitors to the atoll dropped substantially due to the threat of piracy in the region. Tourism has since picked up but visitors no longer visit Passe Gionnet and boat trips to see the frigatebirds are limited to Grande Poche, which, due to the layout of the colony means that the boat can maintain a more suitable distance from the birds and disturbance is minimised. Although, only a small number of nests were counted large numbers of frigatebirds were seen wheeling in the sky in this area from afar, which was not the case during the previous year. This is fantastic news as it suggests that the measures put in place to reduce disturbance to the frigatebirds are working.

Figure 26. Eleonora's Falcon (Catherina Onezia)

3.2.11 Vagrant and annual migrant birds

Table 8 summarises the vagrant and annual migrant bird sightings for 2014, all observations were reported to the Seychelles Bird Records Committee. The African Palm Swift was an exciting spot by Giovanni Rose, this species has only been seen on two previous occasions in the Seychelles, both in the Aldabra group. The sighting of the Malagasy Kingfisher (*Alcedo vintsioides*) in March was excitingly the first record of this species for the Seychelles. A couple of the bird visitors remained on Aldabra for a while, such as the

Eleonara's Falcon (Figure 26), at least three individuals were observed on Picard and birds were observed for a period over a month mainly in Zone 4.

Table 8. Vagrant birds observed on Aldabra in 2014

Date	Species	Location of sighting	Number of birds
07/01/14	European cuckoo (*Cuculus canorus*)	Picard	1
22/01/14	Mascarene martin (*Phedina borbonica*)	Station, Picard	1
17/02/14 – 23/02/2014	Eurasian golden oriole (*Oriolus oriolus*)	North Settlement Beach, Picard	1
03/03/14	Barn swallow (*Hirundo rustica*)	Research Block, Picard	1
30/03/14	European roller (*Coracias garrulus*)	Old Settlement, Picard	1
30/03/14	Spotted flycatcher (*Muscicapa striata*)	Old Settlement, Picard	1
31/03/14	Red-backed shrike (*Lanius collurio*)	Takamaka (H-Grid)	1
22/04/14	Mascarene Martin (*Phedina borbonica*)	Old Settlement, Picard	1
02/06/14	African Palm Swift (*Cypsiurus parvus)*	Station, Picard	1
25/06/14 – 30/10/14	Saunders'Tern (*Sterna saundersi*)	Lagoon, Champignon d'Os and Ile Challand, Grande Terre	5 - 175
06/10/14 – 11/10/14	Common Swift (*Apus apus*)	Station, Backpath Picard	2
09/10/14	Common ringed Plover (*Charadrius hiaticula*)	Cinq Cases Coco Transect Pt 12-13	1
14/10/14 – 22/12/14	Broad-Billed Roller (*Coracias garrulous*)	Settlement Beach, Coastal	1-3
23/10/14 – 26/10/14	Common House Martin (*Delichon urbica*)	Station, Settlement Beach and Backpath, Picard	2-5
28/10/14	Antarctic Skua (*Catharacta Antarctica*)	Zone 2 Settlement Beach, Picard	1
29/10/14 – 08/12/14	Eleonora's Falcon (*Falco eleonorae*)	Coastal Picard, mainly zone 4	1-3
13/11/14	Spotted Flycatcher (*Muscicapa striata*)	Station, Picard	1
19/11/14	Common cuckoo (*Cuculus canorus*)	Zone 4 Settlement Beach, Picard	1
02/12/14 - 2015	Eurasian Golden Oriole (*Oriolus oriolus*)	Station, Picard	2-4
04/12/14	Tree Pipit (*Anthus trivialis*)	Backpath, Picard	1
22/12/14	Eleonora's Falcon (*Falco eleonorae*)	Beach 39 Cinq Cases, Grande Terre	1
29/12/14	Red- Backed Shrike (*Lanius collurio*)	Station, Picard	1

Great White Egrets (*Egretta alba*) were observed throughout 2014 in the east of the atoll, principally seen from Middle Camp feeding on the exposed reef at low tide and at Cinq Cases around inland pools.

3.3. Vegetation

3.3.1. Phenology transects

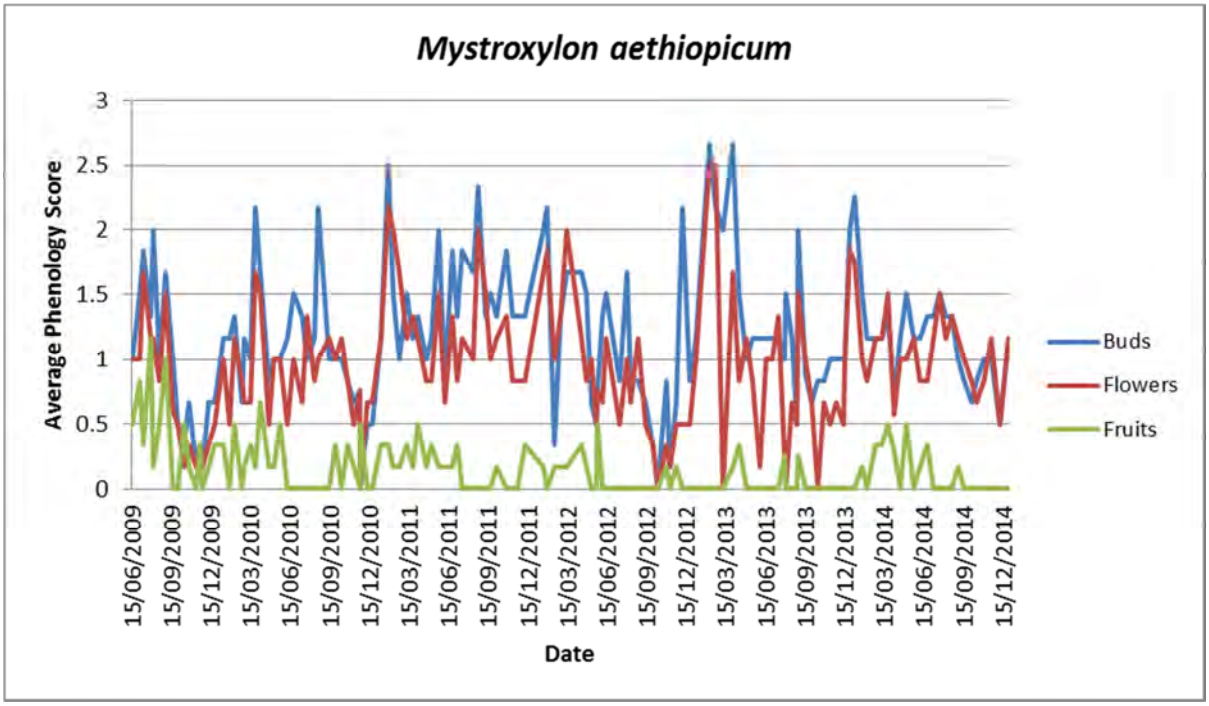
During 2014 phenology surveys were conducted every two weeks on the 33 species monitored as per the monitoring protocol. Detailed phenology monitoring has now been undertaken on Picard since 2009, providing a data set which can be used to illustrate the biological characteristics of the different species as well as examine annual patterns and change. In general the patterns for 2014 were consistent with those observed previously (Figure 27).

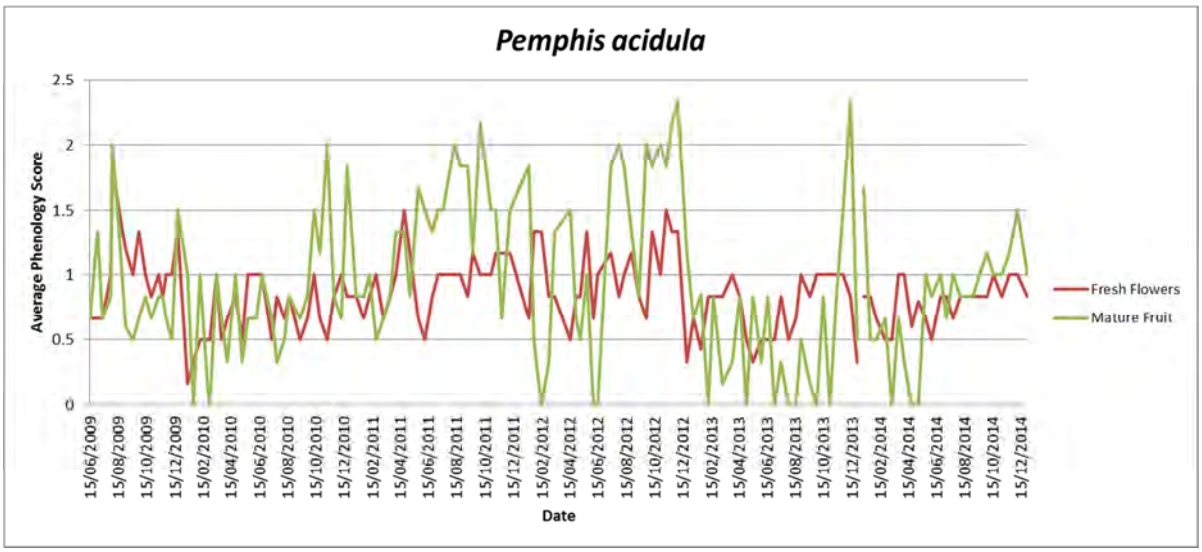
During 2014 a number of the plants monitored died and these were replaced with a healthy individual of the same species and assigned a new identification number, details provided below. For several species it has been difficult to find healthy replacements for inclusion in the phenology monitoring. Despite numerous searches along the phenology transect and even into the vegetation it has so far not been possible to locate other *Jasminium elegans*. Also there is no more *Tournefortia argentea* on the coastal path, therefore there are not sufficient individuals monitored of this species (only three individuals remaining at the end of 2014), one solution which should be

considered is monitoring plants at La Gigi, however, this would involve adding an additional section onto the phenology transect. To add additional *Pandanus tectorius* which were needed to the survey, three plants were taken in the thick scrub between Coastal path and Backpath behind House No. 1, despite being off the path it has worked fine to monitor these plants at the start of Zone 2.

Jasminium elegans 11C and 11D removed May (replacements not found)
Pleurostelma cermuum 31D died May (31H assigned in May but subsequently died in December)
Lomatophyllum aldabrense 12B and 12D died in May (replaced by 12K July; additional individual taken previously when one plant appeared in poor health)
Gagnebina commersoniana var aldabrensis 29D died in May (replacement found in early 2015)
Pandanus tectorius 17E died in October (17H, 17J, 17K added in July)

Consistent with previously observed patterns some species flowering and fruiting simultaneously (e.g. *Pemphis*, *Mystroxylon*, Figure 27) and throughout the year whereas other species flower and fruit successively and seasonally only in the wet season (e.g. *Trianolepsis, Clerodendrum*). What can be seen is that ripe fruit were not recorded for *Clerodendrum* in 2011/12 and 2013/14 seasons when fruiting would be expected, which is of concern (Figure 22). However, unripe fruit were recorded in these years suggesting that potentially the ripe fruit were removed before they could be observed in the phenology monitoring.




Pemphis acidula
Average Phenology Score
2.5
2
1.5
1
0.5
0
15/06/2009
15/08/2009
15/10/2009
15/12/2009
15/02/2010
15/04/2010
15/06/2010
15/08/2010
15/10/2010
15/12/2010
15/02/2011
15/04/2011
15/06/2011
15/08/2011
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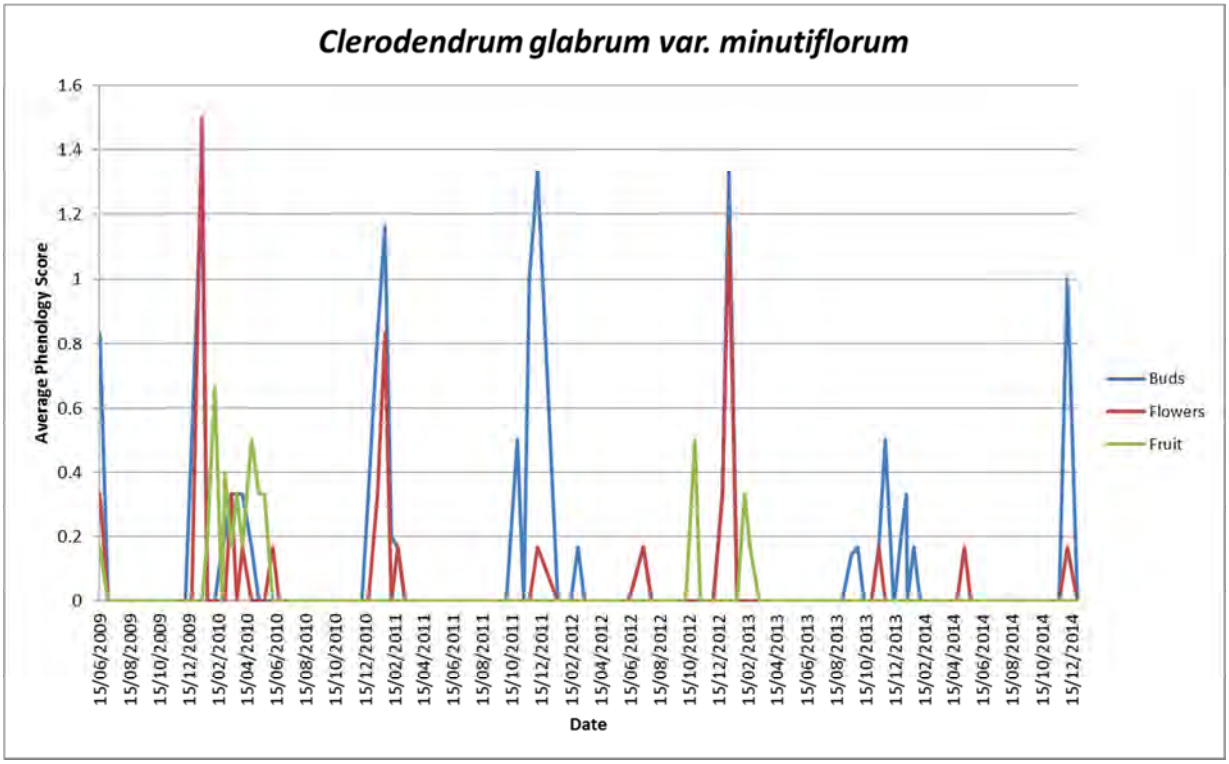
15/08/2013
15/10/2013
15/12/2013
15/02/2014
15/04/2014
15/06/2014
15/08/2014
15/10/2014
15/12/2014
Date
Fresh Flowers
Mature Fruit


Clerodendrum glabrum var. minutiflorum
Average Phenology Score
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
15/06/2009
15/08/2009
15/10/2009
15/12/2009
15/02/2010
15/04/2010
15/06/2010
15/08/2010
15/10/2010
15/12/2010
15/02/2011
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15/08/2013
15/10/2013
15/12/2013
15/02/2014
15/04/2014
15/06/2014
15/08/2014
15/10/2014
15/12/2014
Date
Buds
Flowers
Fruit

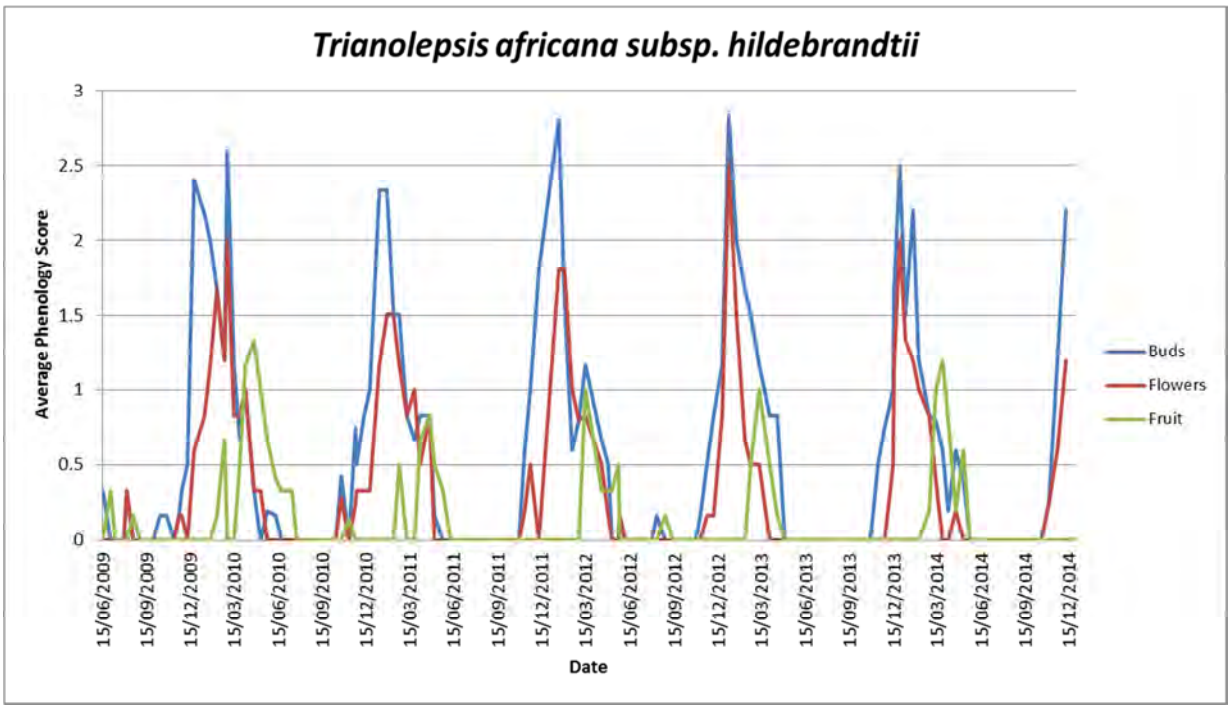
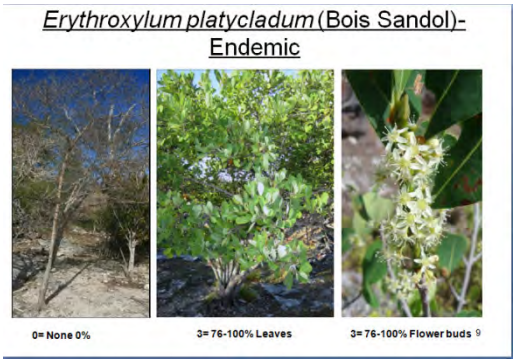


Figure 27. Average phenology scores recorded every 2 weeks from 2009 to 2014) of flower buds, fresh flowers and mature fruit presence for four species: (a) *Mystroxylon aethiopicum,* (b) *Pemphis acidula*. (c) *Clerodendrum glabrum var. minutiflorum*, (d) *Trianolepsis Africana subsp. hildebrandii*

3.3.2. Phenology Photo Guide



The much anticipated phenology plant photo guide was finalised by Catherina Onezia in 2014 (Figure 28). This fantastic document is designed to assist new SIF staff in plant and phenological status identification and to ensure that data is collected consistently in the field. This guide is a great reference document for plant phenology on Aldabra and can be found on the fileserver at \Monitoring\Vegetation\Vegetation surveys\Phenology.

Figure 28. Exert from the Phenology Photo Guide illustrating the different percentage categories in the phenology monitoring

3.3.3. Ochna Pinning

Pinning is a method which is a great tool to look at cambium activity and the results are able to give an indication of tree growth within a small space of time, in this instance, one year. The method involves damaging the cambium with a small pin every month. The tree quickly regrows and repairs the damage but by marking the site with the date, you can see the cambial activity over that month. This allows you to link the static rings to active wood production.

The final *Ochna ciliata* Pinning was undertaken on 7th February, the three remaining ochna that have now been pinned once a month for over one year were cut down and sent to Zurich for analysis.

Tree ring measurements from the deciduous tree species *Ochna ciliata* and monthly rainfall data from the period 1969–2012 were used to investigate long-term productivity and rainfall trends by John Shekeine (University of Zurich, ZARP MSc student). Due to a lack of consistent growth rings across samples, it was not possible to link the tree ring chronologies to the long-term rainfall record (1969–2012) or, use the tree rings as a proxy to analyse temporal trends in Aldabra's productivity.

John Shekeine's manuscript titled Primary productivity and its correlation with rainfall on Aldabra Atoll should be published in 2015.

3.4. Coconut crabs *Birgus latro*

Since 2006 coconut crabs have been monitored twice per month on Picard as per the protocol on both Backpath and Coastal path. In contrast with the past few years the number of coconut crabs encountered on these transects decreased in 2014, particularly evident on the Backpath Transect (Figure 29). This is not necessarily cause for concern as it appears that in general there were slightly fewer coconut crabs encountered during the second part of the year which could be as a result of weather conditions (dry December) or the timing of the monitoring events. This dataset has been used to assess seasonal patterns, difference in male/female composition, moult stage and effect of moon phase on encounter rates. It is aimed to analyse the coconut crab dataset for publication which will feed into a review of the monitoring programme. It would be advantages to review this monitoring programme in 2015 to ensure that it is fit for purpose to answer important management focused questions and that the resource allocation to this activity is appropriate.

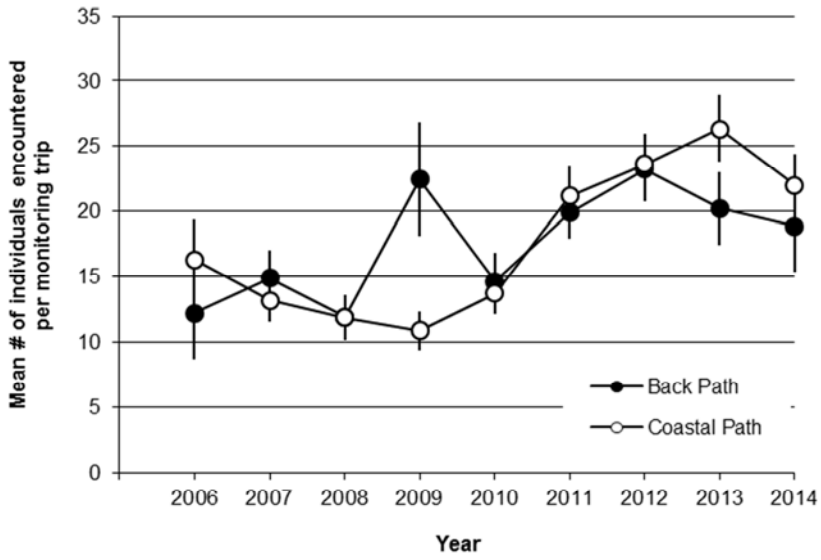


Figure 29. Mean number of coconut crab individuals encountered per monitoring trip in 2006-2014 (± s.e).

3.5. Aldabra Banded Snail (*Rhachistia aldabrae*)

The Aldabra banded snail (*Rhachistia aldabrae*, Figure 30), declared extinct in 2007, was re-discovered alive and well at Aldabra on 23rd August 2014. Before the discovery, the last living individual of this endemic species, was recorded in 1997. Subsequent searches yielded only shell remains and no living specimen has been recorded until now. The snail's apparent demise was linked to declining rainfall on Aldabra (in a paper by Gerlach in 2007) and was widely publicised internationally as one of the first casualties of climate change impacts.

Figure 30. Aldabra Banded Snail (Catherina Onezia)

The team of SIF staff were exploring Passe Gionnet Channel area of Malabar Island, when the snails were found. The snails were spotted by the keen eyes of Shane Brice when he noticed a snail that he didn't recognise in dense mixed scrub on Malabar. Senior Ranger and Assistant Training Officer Catherina Onezia's suspicions were immediately raised as the snails were found on one of Aldabra's endemic trees Bwa Mamzel (*Allophylus aldabricus*). On searching the area further, the team located several individuals, including juvenile snails. The discovery of the young snails is very encouraging as the last juveniles were recorded in 1976. The juvenile snails were considered to be particularly vulnerable to desiccation as a result of reduced rainfall.

One of the aims of the field expedition was to document invertebrates observed, but the team never dreamed that they would make such a find. The snails are unmistakeable, with beautiful elongated deep purple shells lined with bright pink bands. Identification of the snail was confirmed by mollusc experts Dr Vincent Florens (University of Mauritius) and Pat Matyot.

There is still very little known about the ecology of this rare snail but the rediscovery provides an incredible second chance to protect and study this historical species in the wild and ensure that it is not lost again. Climate change may not have caused the demise of this snail, but climate change impacts remain a likely threat to this species and many others globally.

In October a follow up visit was made to the site of the rediscovery to check the status of the snail before the season changes from the southeast monsoon and to gain a better understanding of the snail's abundance, distribution and density. Intensively searching an approximately 1600 m^2 area, the team recorded 21 trees with Aldabra Banded Snails. The team did not have to move far between *Allophylus aldabricus* trees to find snails and a total of 31 snails were recorded. Three of the snails were at neonatal stage (less than a single whorl in addition to the larval shell), 14 were juveniles (2–7mm) and 14 were sub-adults or adults (7–14mm).

Interestingly two snails were seen on tree species other than *Allophylus aldabricus,* one on *Tarenna supra-axillaris* and one on *Terminalia boivinii,* both of which are native to Aldabra. All snails observed on this trip were inactive; however, most of the individuals recorded previously had moved to new locations suggesting that the snails are in estivation. Estivation protects these animals against heat and dryness.

A trip to the area should be planned in the north-west season to search a larger area and document snail abundance and activity during the wet season. An appropriate monitoring strategy should be considered for this rare Aldabra invertebrate.

3.6. Invertebrate Finds

During the extended trip to Cinq Cases in February / March Wilfredo Falcon and Dennis Hansen documented two interesting invertebrates. One, a beetle-larvae, which is responsible for digging the plentiful circular holes found in the inland tortoise turf. Another, a trap-door spider, which was found in sand next to the massive *Guettarda* trees between the Cinq Cases hut and the coast. Both of these ambush predators wait for unsuspecting prey to walk by, which is then grabbed, dragged into the hole and devoured. Identification of both is pending.

4. MARINE ENVIRONMENT

4.1. Turtles

Track counts of green and hawksbill turtles were conducted on potential turtle nesting beaches around the atoll (Figure 31) throughout 2014.

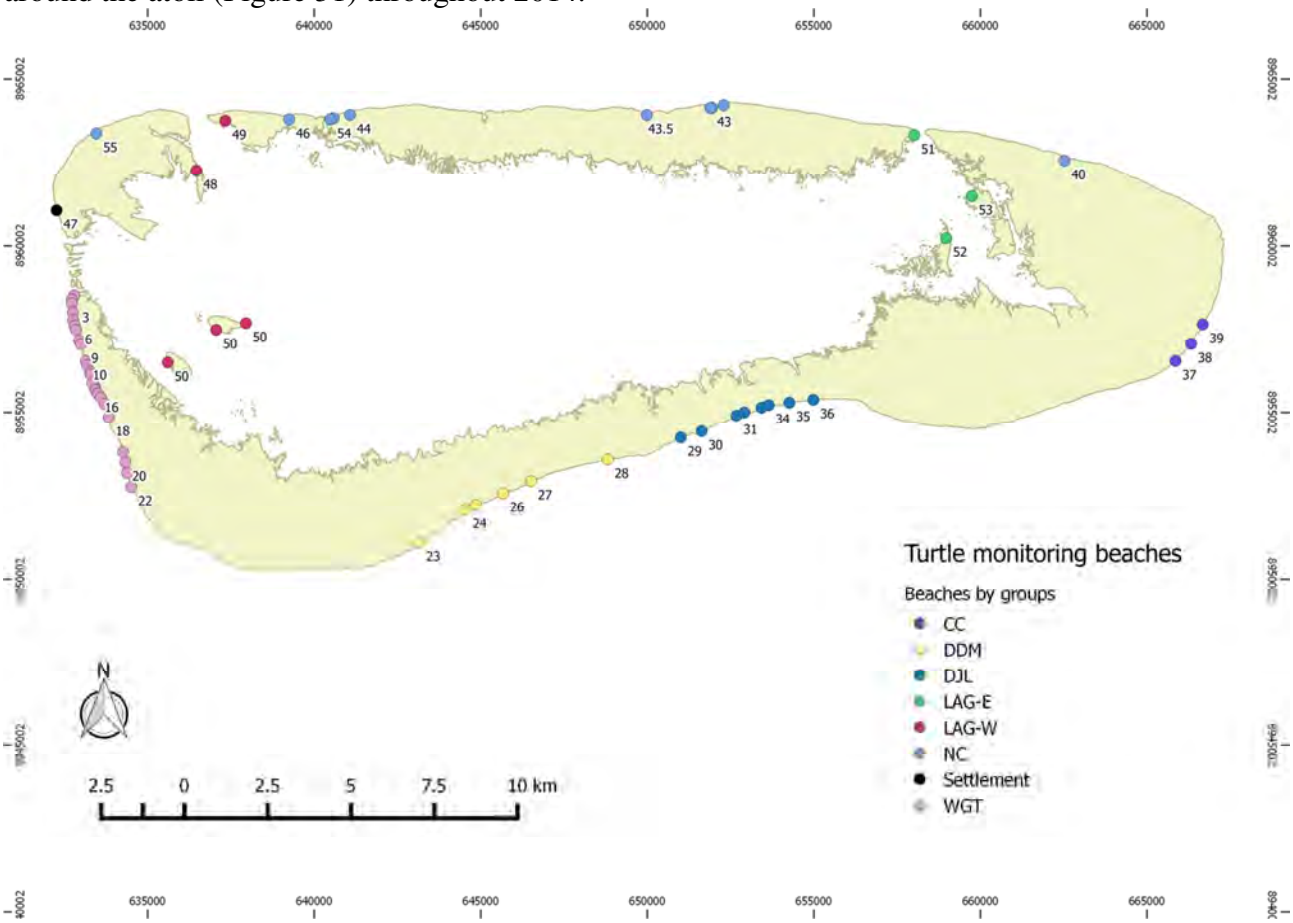


Figure 31. Numbered beaches on which turtle track counts are conducted and beach groups shown (derived from turtle track count field protocol by Mortimer 2009). The outside beaches with green labels are monitored principally for green turtle tracks and the lagoon beach with brown labels are monitored mainly for hawksbill turtle tracks

4.1.1. Track counts of green turtles

The green turtle track surveys conducted during 2014 are summarised in Figure 32 and Table 9 and compared to the previous seven years. The number of surveys conducted in 2014 on the turtle beach was similar to previous years.

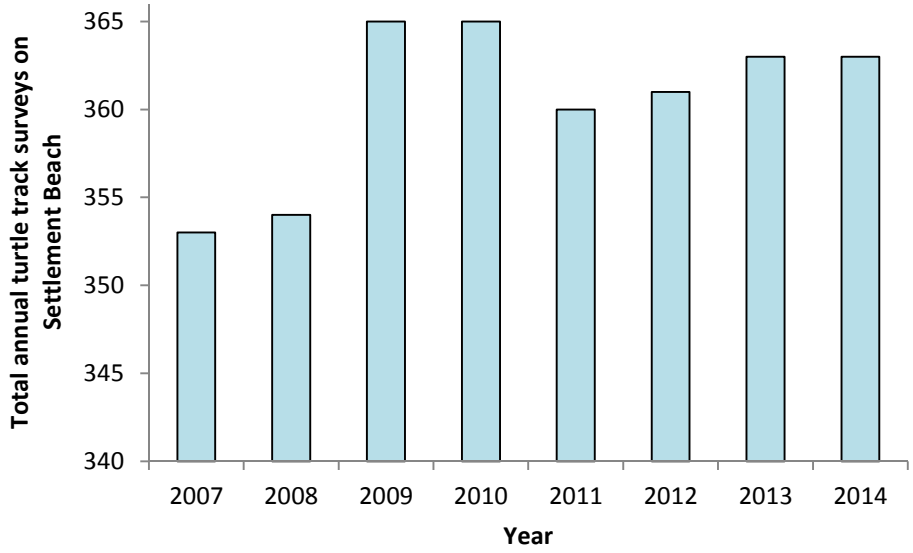


Figure 32. Number of turtle track surveys conducted on Settlement Beach 2007-2014

Table 9. Number of turtle track surveys conducted on the beach groups 2007-2014

Location	2007	2008	2009	2010	2011	2012	2013	2014
WGT	50	27	35	41	40	33	45	**37**
DDM	19	14	16	16	22	16	20	**10**
DJL	20	12	13	16	20	17	20	**12**
CC	15	10	16	10	23	19	15	**7**
NC	20	15	21	19	20	26	22	**11**
Lagoon	5	3	12	10	9	11	16	**12**
AnseVar	18	16	12	14	12	14	18	**13**

Settlement Beach

Daily data was collected throughout 2014 on Settlement Beach turtle tracks, including GPS coordinates of each emergence track and whether it was considered to be a successful nesting attempt.

In 2014 the pattern of turtle emergence was similar to that of 2010 with an increase in nesting up until the peak in May (Figure 33) and numbers decreasing towards an annual low during November. The peak in turtle emergences in 2014 was not as high as that observed in 2013, however, was consistent with nesting in recent years (Figure 33).

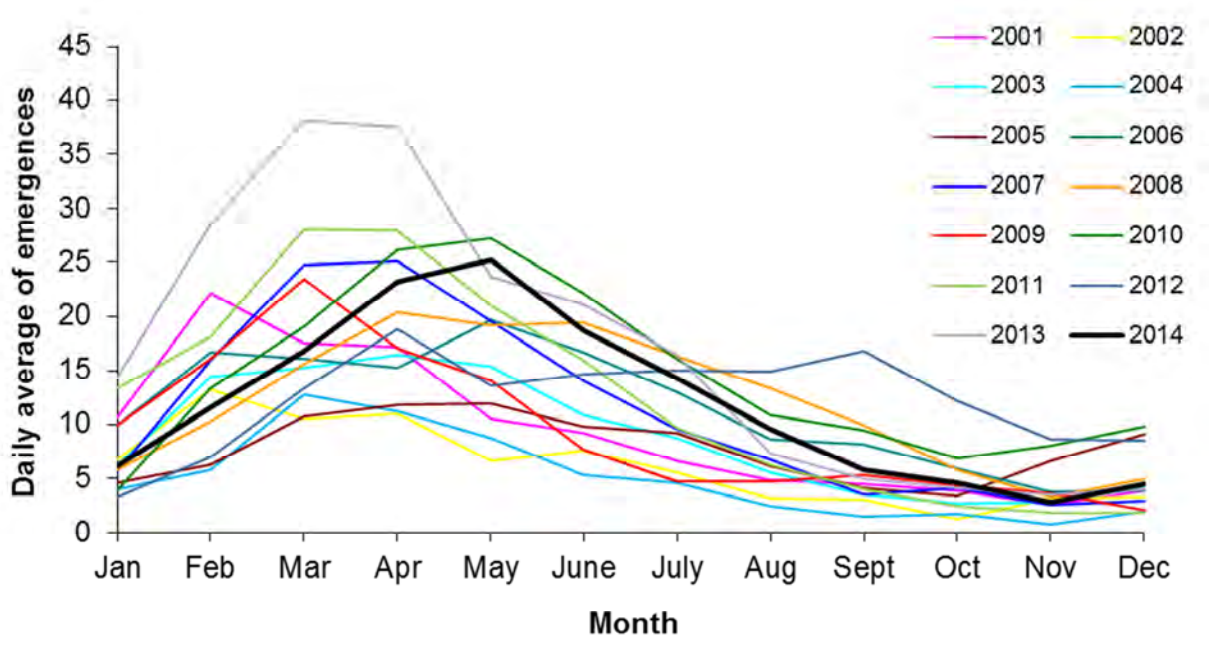


Figure 33. Daily averages of green turtle emergences on Settlement Beach (2001-2014)

A total of 4398 turtle emergences were documented on Settlement Beach in 2014 (Table 10), again this is lower than the highest recorded total in 2013 but consistent with the high total emergences seen since 2010. There is no cause for concern as the number of nesting females coming ashore on Picard is still high compared to historic information.

Table 10. Total number of emergences and calculated average emergence (Total emergence /total track counts) on Settlement Beach for each year in the period 2000-2014.

Year	Total # track counts	Total # emergences	Total # VF	Total # HM	Total # ESBO	Average # emergences per day
2000	116	444	375	23	46	--
2001	134	1181	1021	60	100	--
2002	136	801	653	57	91	--
2003	167	1452	1254	76	122	--
2004	178	894	801	34	59	--
2005	206	1649	1435	61	153	--
2006	274	3010	2599	161	250	--
2007	353	3937	3393	213	331	11.2
2008	354	4189	3547	211	431	11.8
2009	365	3407	2774	209	424	9.3
2010	365	5211	4627	199	385	14.3
2011	360	4500	3789	232	479	12.5
2012	359	4426	3690	278	458	12.3
2013	362	6128	5245	375	508	16.9
2014	**363**	**4398**	**3728**	**294**	**376**	**12.1**

West Grand Terre

Turtle track counts on West Grand Terre were undertaken four times per month, by foot when logistically possible. At WGT there is not such a clear pattern in the number of emergences but this is likely due in part to the lack of consistency with the monitoring in comparison to Settlement

Beach. The peak in nesting activity on WGT was in June, later than Settlement Beach, which has also been observed in previous years. The number of emergences remained reasonably high until August when they started to decrease until November when nesting started to increase again (Figure 34).

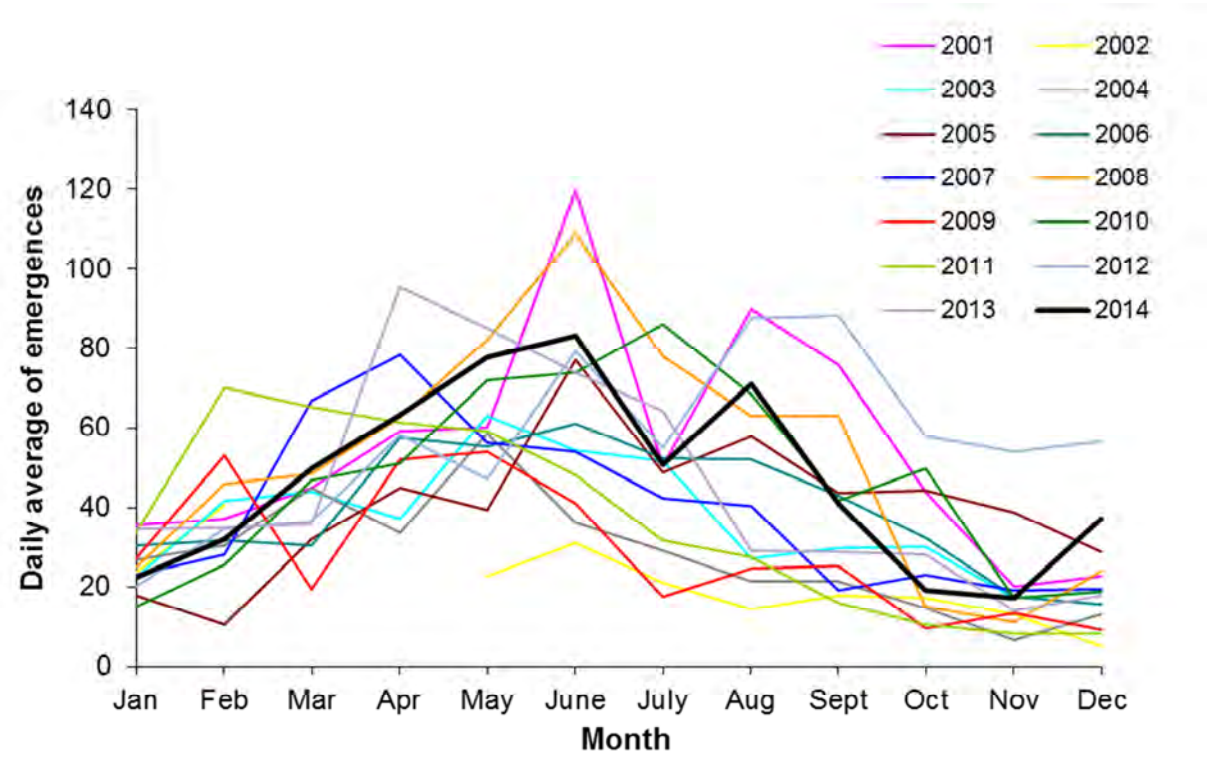


Figure 34. Daily averages of green turtle emergences throughout the year on WGT, for the period 2001-2014.

4.1.2. Track counts of hawksbill turtles

During the period September–March, track counts of hawksbill turtles are conducted, where possible, every two weeks on the beaches inside the lagoon (Figure 31). According to Mortimer (Aldabra Turtle Monitoring Protocol 2009), probably fewer than 30 hawksbill females emerge yearly on Aldabra. Although consistent with limited nesting by hawksbill turtles on Aldabra 2014 had more observed nesting than in most previous years (Table 11).

Table 11. Monthly totals of hawksbill turtle emergences on the lagoon beaches 2003-2014, with the number of surveys conducted in brackets.

Month	**Total number of hawksbill emergences (# surveys)**											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Jan	4 (4)	4 (3)	3 (2)	6 (2)	2 (2)	2 (1)	6 (1)	n/a	2 (1)	2 (1)	0 (1)	3 (2)
Feb	1 (2)	0 (1)	n/a	3 (1)	2 (1)	3 (2)	n/a	n/a	5 (2)	2 (2)	2 (3)	0 (2)
Mar	n/a	0 (1)	n/a	0 (2)	0 (1)	n/a	n/a	1 (2)	0 (2)	0 (0)	1 (1)	1 (1)
Sept	0 (1)	0 (1)	3 (1)	0 (1)	n/a	n/a	n/a	0 (2)	n/a	0 (2)	0 (2)	0 (3)
Oct	1 (2)	0 (1)	0 (1)	1 (1)	n/a	n/a	1 (4)	3 (2)	4 (2)	1 (2)	0 (3)	3 (2)
Nov	0 (3)	2 (1)	1 (3)	1 (2)	4 (1)	n/a	3 (2)	2 (2)	4 (3)	4 (2)	3 (2)	4 (1)
Dec	2 (1)	2 (1)	9 (2)	3 (2)	n/a	n/a	14 (4)	11 (2)	2 (1)	2 (1)	5 (2)	9 (2)
Total	**8 (13)**	**8 (9)**	**16 (9)**	**14 (11)**	**8 (5)**	**5 (3)**	**24 (11)**	**17 (10)**	**16 (11)**	**11 (11)**	**11 (14)**	**20 (12)**

4.1.3. Turtle tagging

In total 306 nesting green turtles were encountered during tagging activities in 2014, of these 147 were newly tagged and the remaining 159 were re-sightings (Table 12). As a result of the satellite tagging project there were increased efforts in turtle tagging in February – June 2014 resulting in a high encounter. As a result of other research priorities the in-water turtle tagging was not undertaken as often as in previous years and sessions were run mainly to allow for staff training. With the upcoming collaboration with IFREMER it is anticipated in-water turtle tagging will have increased importance to facilitate this research. A total of 16 juvenile turtles were encountered during in-water tagging events, most of which were new green turtles.

Table 12. Summary of turtles encountered during tagging sessions 2003-2014 and the total for this period.

	Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Green turtles													
Nesting	Encountered	203	455	490	346	378	126	126	148	446	285	**306**	**3309**
	Newly tagged	160	272	337	231	219	56	71	85	187	176	**147**	**1941**
	Re-sighted	43	183	153	115	159	70	55	63	259	109	**159**	**1368**
In-water	Encountered	162	162	159	106	66	33	12	41	46	48	**14**	**849**
	Newly tagged	105	118	108	97	62	27	9	34	43	41	**13**	**657**
	Re-sighted	57	44	51	9	4	6	3	7	3	7	**1**	**192**
Hawksbill turtles													
In-water	Encountered	0	2	38	42	38	17	7	20	32	7	**2**	**205**
	Newly tagged	0	0	33	30	20	10	2	11	23	6	**1**	**136**
	Re-sighted	0	2	5	12	18	7	5	9	9	1	**1**	**69**

Of the nesting green turtles re-sighted in 2014 the 'oldest' had been tagged in 1997 (Figure 35). In contrast to previous years five turtles were re-sighted that had been encountered in the two years prior to 2014. The highest number of re-sightings came from 2008 (Figure 35) with higher numbers of turtles encountered which had been seen 2005-2011. It is assumed that the lack of re-sightings of 2009 turtles is a product of the fewer turtles encountered in that year.

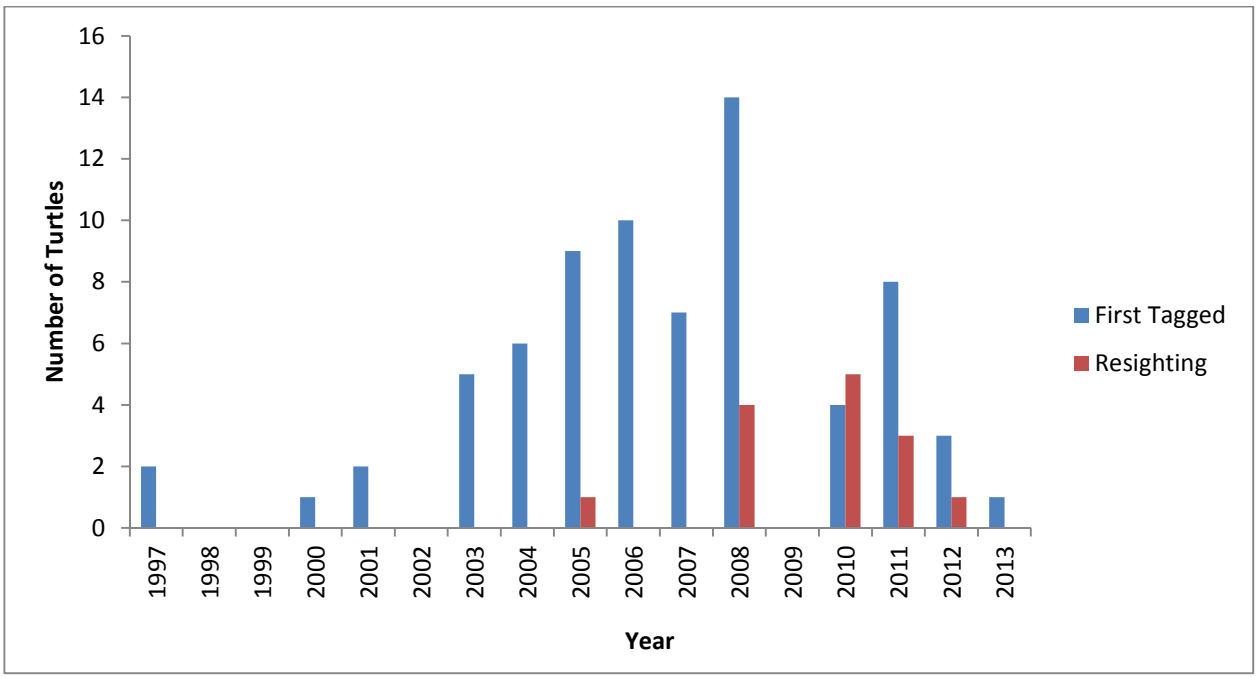


Figure 35. The year of tagging and re-sighted years for nesting turtles re-sighted in 2014

4.1.4. Green turtle satellite tagging

Since turtles are highly migratory species, it is vital to understand the linkages between breeding and foraging sites in order to apply an appropriate conservation management strategy for the species. In 2011 SIF started to use satellite telemetry to find out where Aldabra's nesting Green Turtles migrate to once they leave the protection of the atoll. Having a better understanding of the areas used by the Green Turtles is critical in fully understanding the threats facing the Aldabra green turtle population.

Figure 36. 'Alda' with new sat tag attached making her way back to the sea

The final two satellite tags were deployed in 2014 as part of the SIF Green Turtle satellite tagging project. New epoxy glue recommended by the tag manufacturer was used in addition to utilising fiberglass strips in the attachment of the tags to try and improve length of time the tags remained active. In May 2014 following several months of intensively monitoring the nesting turtles on Settlement Beach, the Aldabra research team attached a satellite tag to 'Alda' (SCA0191-SCA0192; Figure 36) on 14th May. 'Alda' had been observed nesting on at least three occasions prior to the date she was found completing her nest. She was also known to have nested on Aldabra in 2007.

'Alda' departed Aldabra waters immediately after receiving her tag, travelled rapidly west, then north-west to reach the Tanzanian coastline west of Zanzibar Island. In eight days Alda covered more than 900km (Figure 37)! Following this massive journey she travelled to the shallow waters to the east of Zanzibar Island before continuing northwards to north-east of Tanga. Alda remained in this location west of the Pimba Channel in the shallows around Fungu Nyama for over a month before contact with the tag was lost. What is interesting is that where Alda remained to feed is just

to the north of the Tanga and Coelacanth Marine Park. The Tanga and Coelacanth Marine Park is known to have numerous and extensive sea grass beds and World Wildlife Foundation has identified this area as an important feeding area for sea turtles. It is known that three species of marine turtles are found in Tanga waters: olive ridley (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*).

Tanzanian turtle populations are generally in decline, mainly due to loss of nesting sites but also due to incidental and deliberate capture in gill nets. The taking of turtles is however, prohibited in Tanzania. The information obtained from Alda shows that, at least in this individual turtles case, Aldabra is providing nesting habitat for turtles that feed on the Tanzanian coastline.

To identify suitable candidates for the tags, intensive monitoring using the atoll-wide flipper tagging programme was conducted to find turtles that were towards the end of their breeding season. This reduces the chance of the tag being knocked off during mating and ensures that the female would be leaving Aldabra waters soon. Both of the turtles fitted with satellite tags this month had been present on Aldabra since early March. 'Alda' had been observed nesting on at least three occasions prior to the tag being fitted. Encouragingly both of the turtles are seasoned nesters on Aldabra, as 'Alda' nested on Picard in 2007 and the other female in 2005.

On 20th May the last satellite tag was attached to SEY8034-SCA6337 who had been seen to repeatedly nest on Aldabra this year and had been nested previously in 2005. This turtle was assumed to have had the satellite tag fitted when she was on her penultimate nesting attempt as she remained in Aldabra waters generally off West Grande Terre for a further two weeks before migrating away.

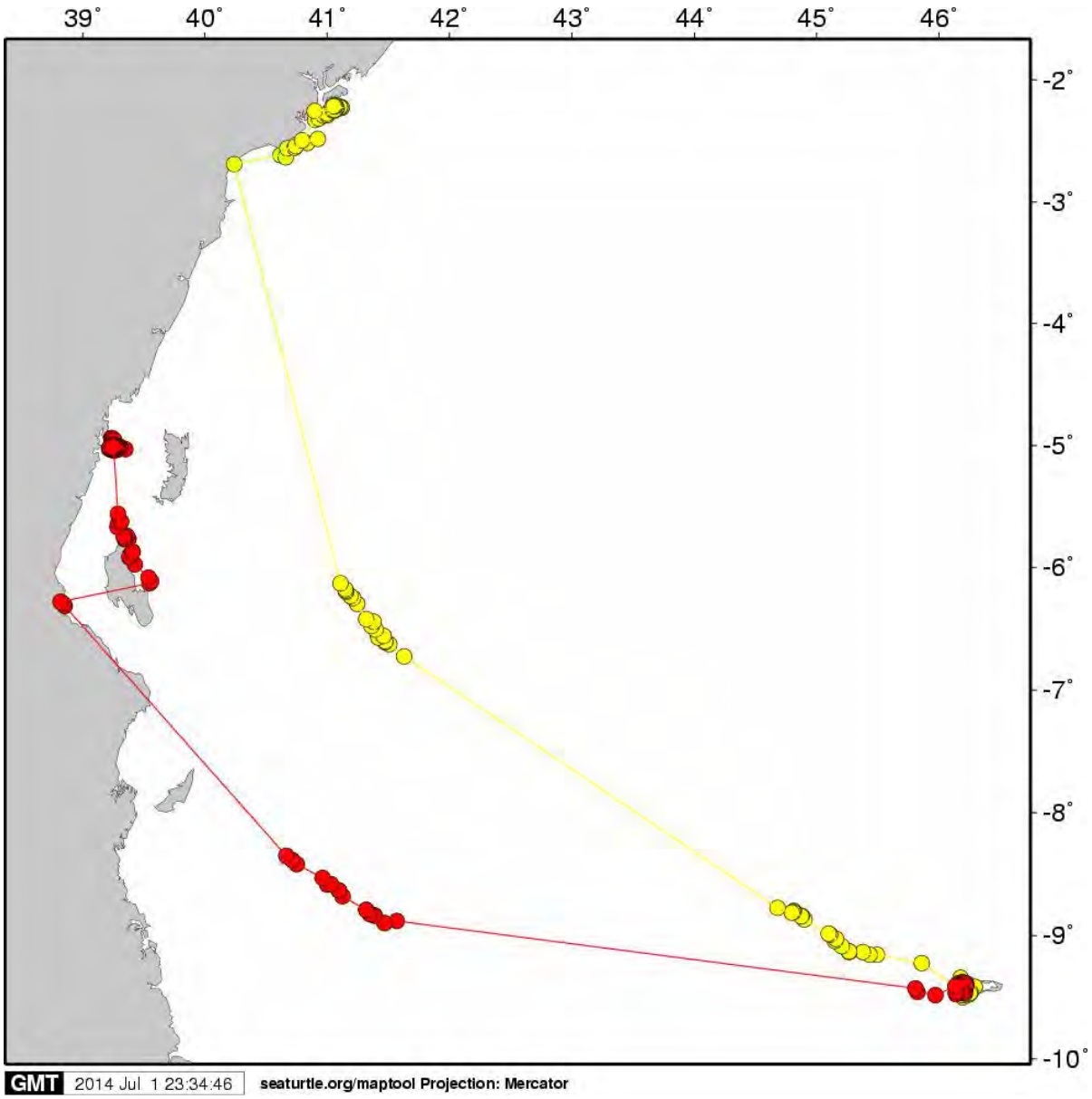


Figure 37. The journeys of 'Alda' (red) and 107799 (yellow) following departing Aldabra

Consistent with Alda, she travelled rapidly towards the African coastline, although on a slightly different path heading north-west and then north reaching the Kenyan coastline east of Kipini after a >1000km journey (Figure 37) in less than eight days. She then travelled north along the coastline before reaching the shallow waters to the south of Pate island. This turtle then remained in this area until contact was lost with the tag.

The first six satellite tags were deployed in 2011/2012, but disappointingly the tags did not transmit for as long as had been hoped. However, even this short-term data showed that Aldabra's turtles migrate away from the atoll to the Amirantes (Seychelles), northern Madagascar via the Comores, and the Somalian coastline and the Tanzanian / Kenyan coastline. This illustrates that Aldabra's turtles use the waters of at least six different countries and demonstrates what an important breeding site Aldabra is for the turtles of the Western Indian Ocean (Figure 38).

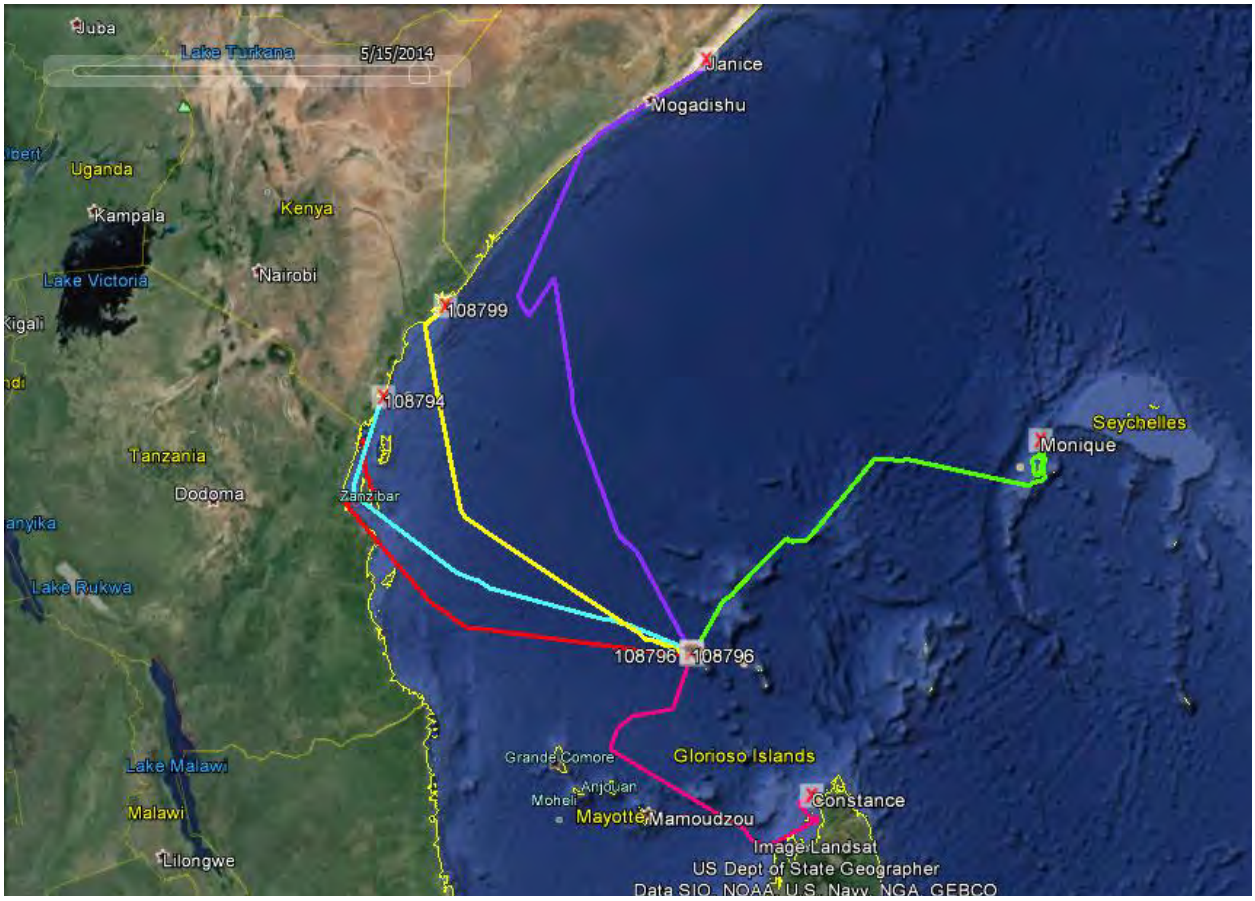


Figure 38. Map showing the journeys of all six turtles fitted with satellite tags that departed Aldabra waters following nesting

4.2. Subsistence fishing

In 2014 a total of 45 subsistence fishing trips were undertaken, of which 20 trips involved both bottom fishing and trolling, 15 only trolling and 10 only bottom fishing. A total of 1005 fish were caught that weighed in total 2811.7 kg, which represents an increase in total catch compared to 2013 (Figure 42).

Catch per unit effort (CPUE) provides a measure of fishing efficiency, which are used to inform stock management decisions. It can be seen that consistent with previous years, Trolling yielded a greater CPUE in comparison to bottom fishing, meaning that in respect of time spent, trolling is more efficient than bottom fishing (Figure 39 & 40), as greater weight of fish is yielded by trolling compared to bottom fishing for the same amount of time. However, consistent with 2013 the CPUE for both bottom fishing and trolling declined in 2014 compared to previous years with the declined more marked in trolling. In comparison to 2012 it can be seen that the CPUE for both bottom fishing and trolling fell in 2013, which was particularly marked in trolling. Trolling CPUE is now the lowest it has been since consistent recording of fishing effort in 2006 (Figure 39 & 40).

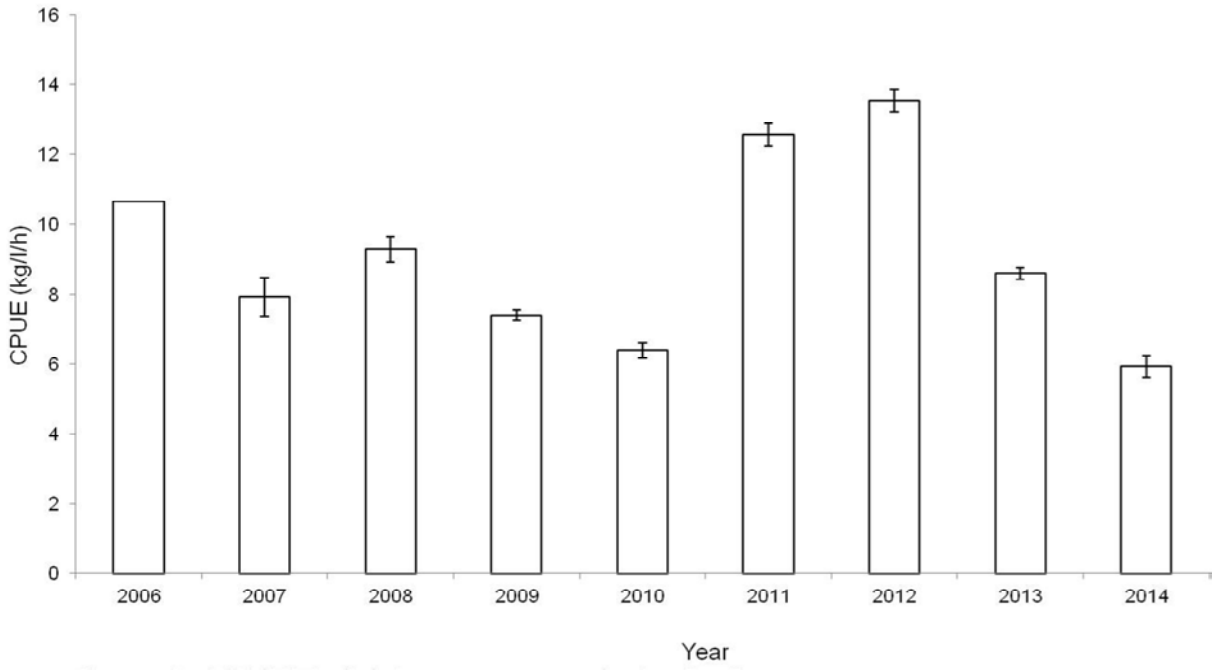


Figure 39. Trolling Catch per Unit Effort (CPUE, kg/l/h) (± s.e.) 2006–2014, CPUE calculated per trip. There is insufficient data from 2006 to include an error bar.

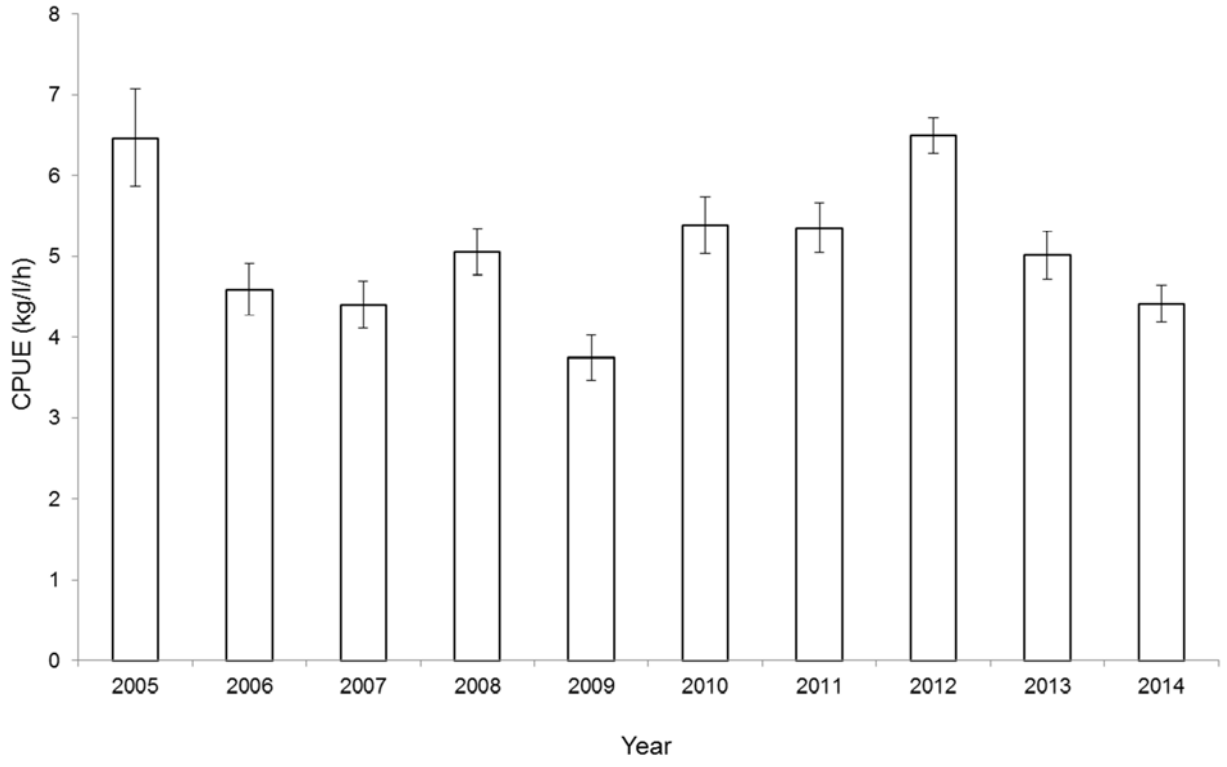
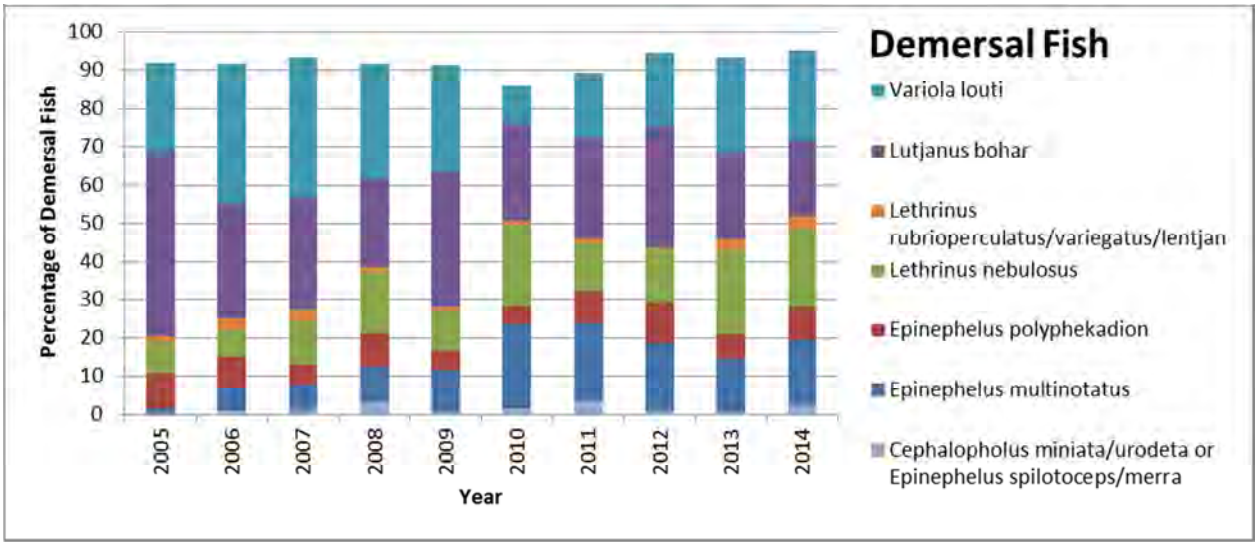


Figure 40. Bottom Fishing Catch per Unit Effort (CPUE, kg/l/h) (±s.e.) 2006–2014, CPUE calculated per fishing trip

In 2014 the total fish catch (weight) increased in comparison to 2013 (Figure 34), meaning 2014 is the third highest annual subsistence fish catch since accurate records have been kept. Trolling

contributed to a smaller proportion of the total fish catch weight in comparison to 2010-2012 (following the introduction of proper trolling rods in 2010) but rose compared to 2013; possibly because appropriate trolling lures and fishing gear limited trolling activities in the second part of 2013.

The five demersal fish species that are caught most often in the subsistence fishing have made up more than 80% of the total demersal catch over the past eight years (Figure 33). The five species comprise four piscivorous predators (***Variola louti, Lutjanus bohar, Epinephelus polyphekadion and E. multinotatus***) and one benthic invertivore (***Lethrinus nebulosus***). Three of these species are slow-growing, long-lived species and consequently are vulnerable to fishing pressure. However, the consistency in composition of the top five species may indicate that there has not been a trophic shift towards smaller, meso-predators which suggests a healthy marine ecosystem and stable fishery. There is variation between years as to the importance of these species to the fishery but there is no consistent trend across the years.



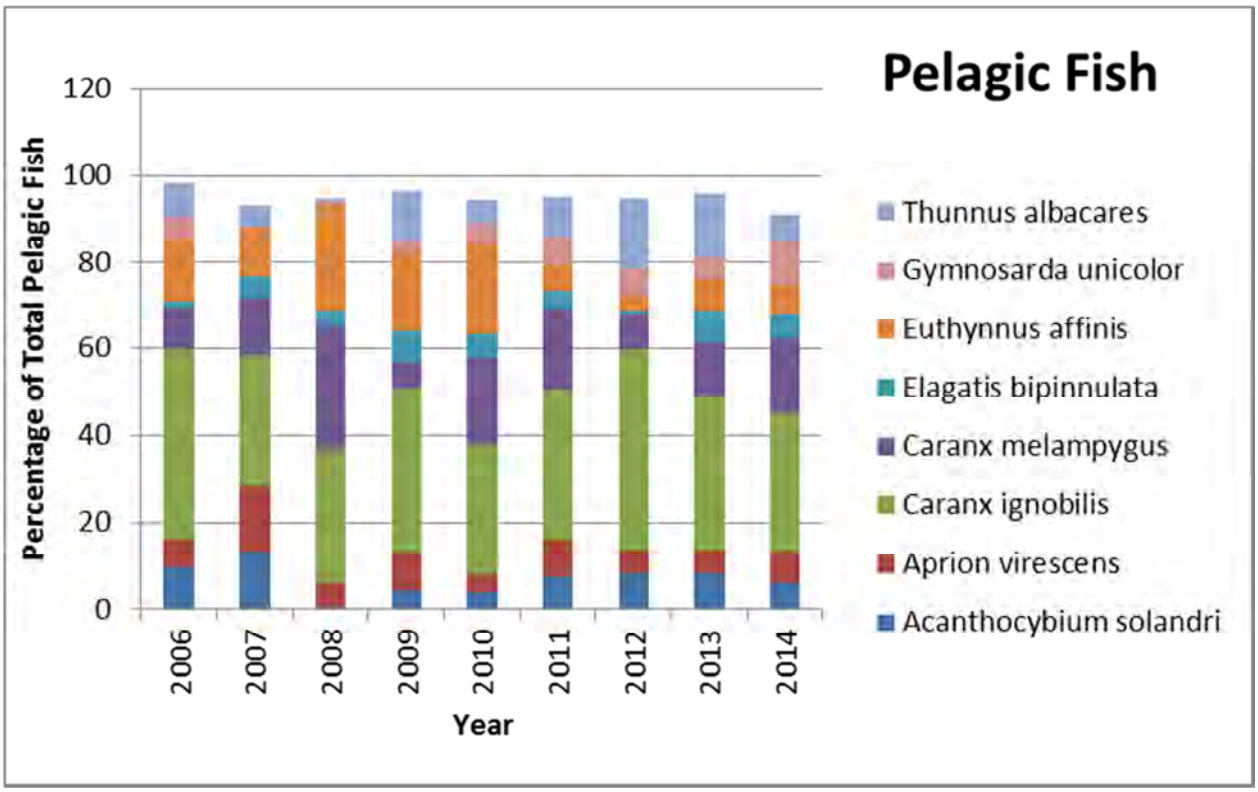


Figure 41. Fish species that represent >1% of the total number of fish caught for demersal and pelagic fish catch (2006-2014)

Pelagic fish catches remain dominated by *Caranx ignobilis* and a varying contribution of a further six species (Figure 41). Consistent with the demersal fish the composition of the pelagic catch has remained fairly consistent over the past nine years. All of these fish species are characterised by shorter life cycles and quicker turnover time and are therefore less vulnerable to fishing pressure compared to the demersal fish species.

Table 14 details fish species caught in 2014 which have been asigned categories on the IUCN Red List of Threatened Species as "Near Threatened", "Vulnerable" or "Endangered". Of these seven species the Napolean wrasse is of most concern as it has been assessed as endangered as a result of severe declines in all places where data is available, occuring very soon after fishing begins, reducing numbers by more than 50% and where management is not effective. The IUCN states that it is a species which appears to be highly conservation dependent. The Giant Grouper, the largest reef-dwelling fish in the world, is also of particular concern as this has been assessed as vulnerable to extinction, the IUCN state this is in recognition of its vulnerability to exploitation. It is rare even in areas unexploited by fishing and has been nearly eliminated for areas heavily fished. The Camouflage Grouper also needs consideration as has been categorised as "Near Threatened" and is one of the top five most commonly caught demersal fish in the Aldabra subsistence fishery (75 individuals caught in 2014). The IUCN state that although widely distributed the Camouflage Grouper is particularly susceptible to overfishing.

Table 14. Fish species caught on Aldabra in 2014 which the IUCN has categorised as "Endangered", "Near Threatened" and "Vulnerable" to extinction

Name	Species	Number of individuals caught	Total Weight (kg)	Average weight (kg) ± s.e.	IUCN Status
Napoleon wrasse / Aya Zerar	*Cheilinus undulatus*	1	19.3	-	Endangered
Giant Grouper	*Epinephelus lanceolatus*	1	13	-	Vulnerable

Brown marbled grouper / Vyey goni	*Epinephelus fuscoguttatus*	6	19.5	3.25 ± 0.8	Near Threatened
Camouflage grouper / Vyey masata	*Epinephelus polyphekadion*	75	179.2	2.4 ±0.1	Near Threatened
Malabar Grouper	*Epinephelus malabaricus*	1	17	-	Near Threatened
Rovin coral grouper / Babonn zannannan	*Plectropomus pessuliferus*	2	31.9	15.95 ± 1.45	Near Threatened
Yellowfin tuna / Ton zonn	*Thunnus albacares*	8	81.3	10.1 ± 2.9	Near Threatened

In keeping with the fishery of previous years a total of 36 identified fish species were caught in 2014, however, less than half of these have been assessed by the IUCN. As mentioned in last year's report, the IUCN Red List of Threatened Species is not necessarily the best means for estimating the vulnerability of fish to fishing pressure because of the widespread nature of tropical marine fish contradicting the qualifying criteria and a large number of fish species have not been assessed or lack the data to be assessed. A possibility for consideration in the future is an assessment of the intinsic vulnerability of Aldabra fish speices to fishing pressure based on their life history characteristics which might be a better means for informing fishing activities on Aldabra. In particular for long-lived, slow-growing species (e.g. Potato Grouper, Napolean Wrasse etc.) it is important to consider the role of big old fecund female fish which produce exponentially more offspring than smaller individuals.

Although attempted, it is unfortunatly not usually possible to release fish once caught because of barotrauma resulting from bringing the fish up very quickly from depth. As a result of the high shark abundance slow retreival is not really an option. Deflating the swim bladder may be an option to return individuals suffering from barotrauma but requires training and equipment. With the current fishing methods it is unavoidable to catch these species. No-take zones were proposed by Philip Haupt in 2014 which capture a representation of the marine habitat types on Aldabra, with reference to the reef map, and protect particularly sensitive areas for fish such as potention fish spawning agrigation sites. The no-take zones were designed to be practical to implement, maintaining some of the important fishery locations close to Station. The proposed zones were discussed with the Aldabra Team and HO Management prior to presenting to the SIF Board for approval in 2015. It is hoped that the implementing of these no-take zones will increase the sustainability of the subsitence fishery and reduce the impact on the fish community safeguarding certain areas from fishing pressure. These no-take zones will create a baseline with which to monitor potential impacts of the subsitence fishery on Aldabra. The no-take zones will be implemented in 2015 and will form an essential component of the expanded MPA.

To provide further data pertinent to the subsistence fishery GPS coordinates for the catch location of each individual fish caught will be collected so this can be related to species, size and weight. This will provide more detailed information which can be assessed with the reef map to look at habitats use and fish composition and size from specific areas and ultimately allow for better assessment of the impact of subsistence fishing. Philip Haupt has been creating a Cybertracker to allow this data to be collected using the Trimbles whilst at sea and this should be in place in early 2015. With almost three tons of fish being caught in 2014 (Figure 42) it is vital to understand if this could be having an adverse impact on fish abundance / composition to allow for effective conservation of this resource and management of the MPA.

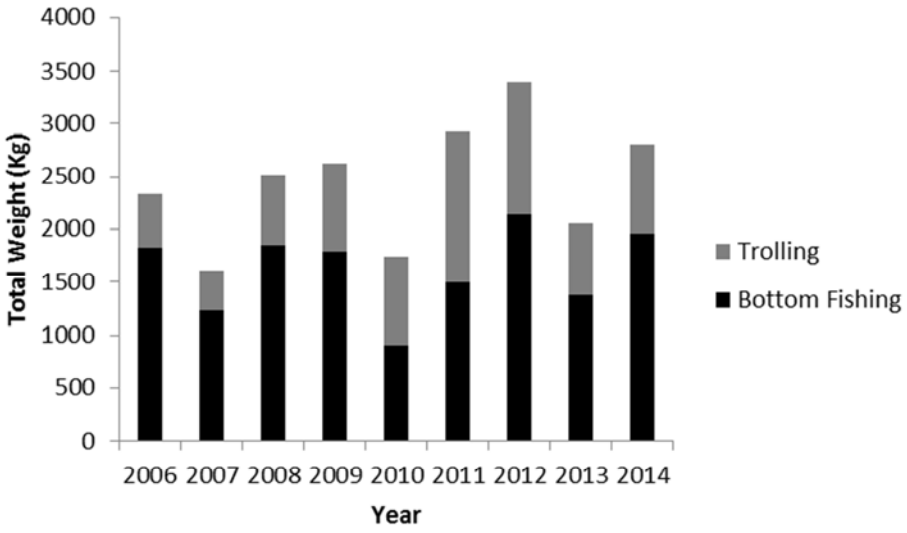


Figure 42. Total fish catch weight (kg) for 2006–2014 showing proportion of weight caught by trolling and bottom fishing methods

4.3. Marine mammals

4.3.1. Cetaceans

Figure 43. Humpback whales (left; Heather Richards) and False Killer Whales (right; Catherina Onezia)

The first humpback whale for 2014 was observed slightly earlier than normal on 28th June from Picard and observations continued through the south-east until 15th October. There were noticeably more observations in July this year in contrast to 2013 where the most observations were in August (Figure 44). A total of 88 sighting of humpback whales were recorded during these months (Figure 36), which is not quite as many as in 2013 but significantly more than in 2011 and 2012. Consistent with 2013 observations of larger / multiple groups of humpback whales were made in the waters off Cinq Cases when visited, with an observation of a group of 5 individuals and one of 7 whales both from Cinq Cases and no groups of this size observed at other locations. Possibly the whales congregate here preferring the larger area of shallower water compared to the steeper profiles on the north and west coastlines.

Consistent with previous years most observations were of 1–2 individuals, however, almost 20% of sightings comprised a group of 3 or more whales. A total of 14 observations in 2014 included a juvenile in the pod and on three occasions there was seen to be at least two juveniles within a larger group which is very positive.

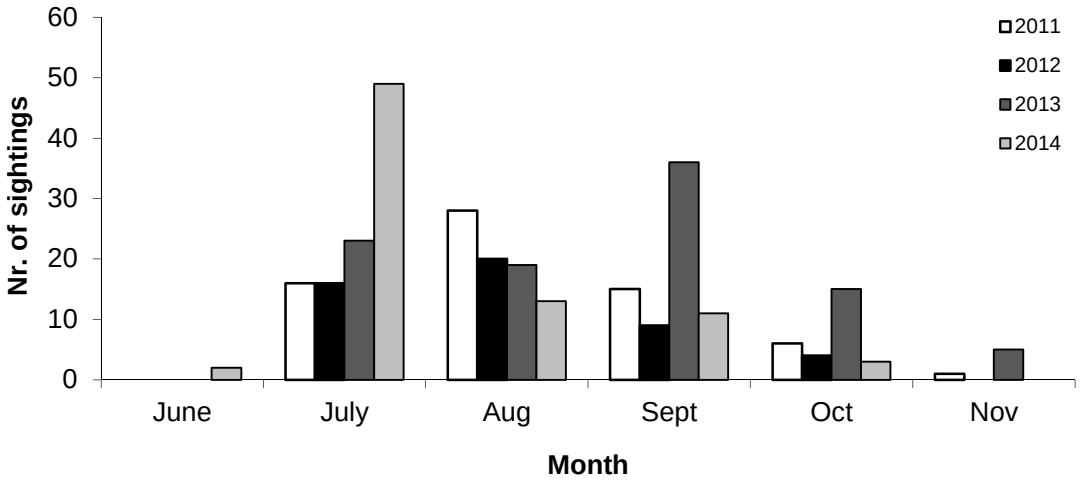


Figure 44. Number of humpback whale sightings (2011-2014)

In addition to the humpback whale sightings three other interesting cetaceans were seen in Aldabra waters during 2014. On 17th March an observation was made of 5-7 thought to be Dwarf sperm whales (*Kogia sima*). On 25th March four False killer whales (*Pseudorca crassidens*) were seen off the coast of Picard (Figure 43), photographs were taken and the identification was confirmed by Dr Jo Bluemel (MCSS). Later on 9th May during the crossing to Assumption a pod of 8-10 Sperm whales (*Physeter microcephalus*) was sighted approximately 10km to the south-east of Aldabra.

A total of 17 observations of dolphins were recorded in 2014, of these the majority of sightings consisted of spinner dolphins. However, one observation was made in August of a pod of 50-100 thought to be common dolphins (*Delphinus delphis*). The pod size of the spinner dolphins varied but was generally between 10–150 individuals. It was noticed that the recording of dolphin sightings was neglected to some extent in 2014 and further encouragement and facilitating the documenting of observations was applied later on in the year.

4.3.2. Dugongs

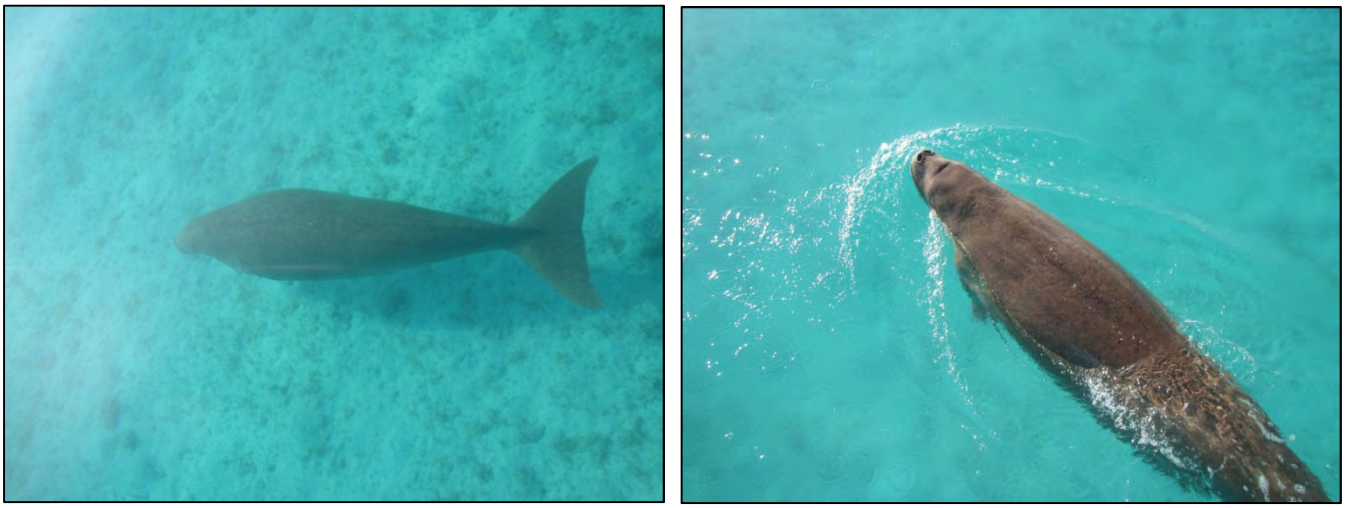


Figure 45. Dugong sighted on 23rd December near Le Esprit (Daig Romain)

In 2014 nine observations of dugongs were made in Aldabra waters, five were seen in the lagoon in the Ile Esprit area and four sightings were made within the reef (Figure 46). It is interesting to note the increase in observations outside the lagoon in recent years. On two occasions it is likely that it

was the same individual seen on more than one occasion. All of the sightings consisted of a lone individual (Table 15), it is thought that the dugong seen on two observations in November was a juvenile on account of its size. The dugong seen in December close to Ile Esprit afforded staff a fantastic sighting as it was not disturbed by the presence on the boat and the water transparency was amazing (Figure 45). Details of these observations can be found in table 14.

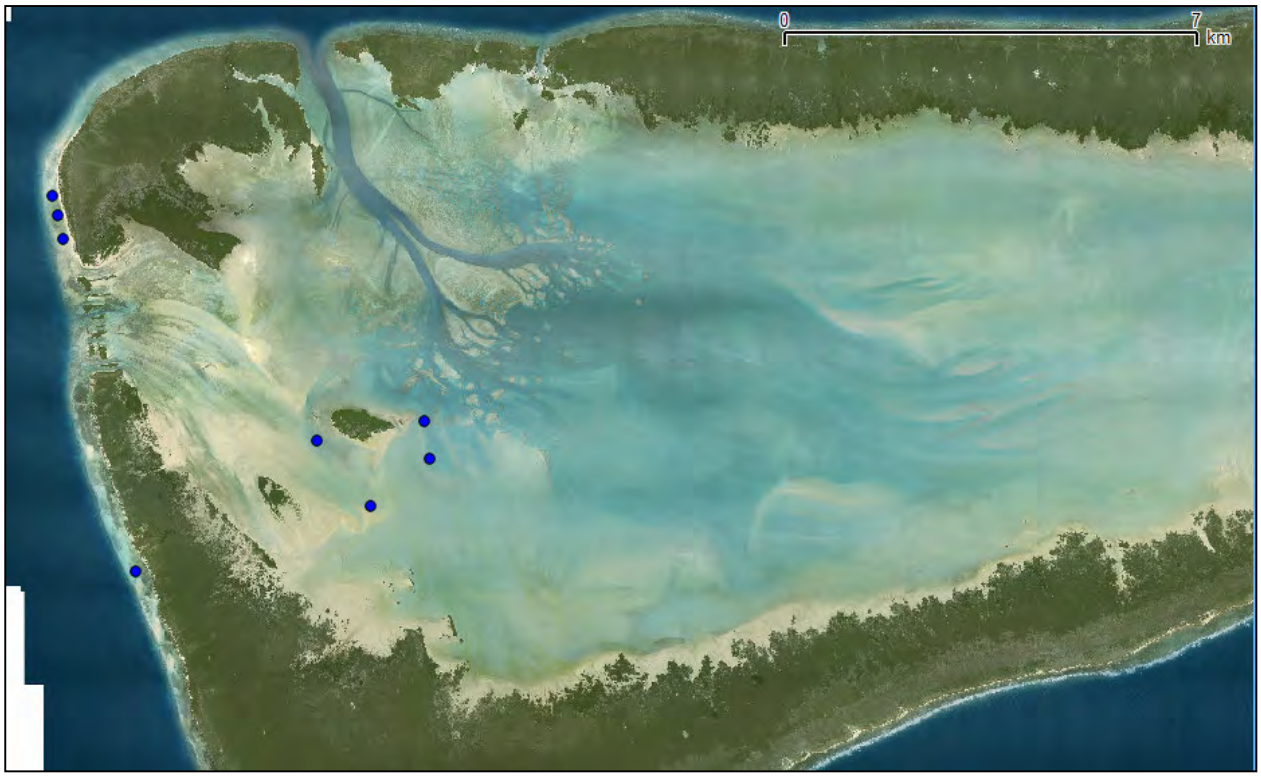


Figure 46. Map illustrating 2014 dugong sightings

Table 15. Dugong Observations in 2014

Date	# Dugongs	Location	Details
3rd January	1 Adult	1-2km south Ile Esprit	10-15m from the boat; came up twice to breath before swimming off
20th January	1 Adult	In front of Station, Picard	400m from shore
30th August	1 Adult	Between Ile Moustique and Ile Esprit	Thought to be feeding on seagrass
30th September	1 Adult	SE Ile Esprit	Early morning
30th September	1 Adult	SE Ile Esprit	Mid-morning; assumed to be the same individual as earlier sighting; feeding on seagrass, very calm and underwater video taken
2nd October	1 Adult	Beach 15 WGT	Close to shore on seagrass patch in front of beach
11th November	1 Juvenile	Settlement Beach Zone 2	Very close to shore only 5m from sand! In seagrass patch, remained in same area for quite a while
12th November	1 Juvenile	Settlement Beach Zone 2	Similar area to previous day, assumed to be same individual, remained in same area for 30 minutes
23rd December	1 Adult	South-SE Ile Esprit	Very calm, swimming slowly and coming up to breath close to boat, excellent video taken.

The value in using aerial surveys to further our knowledge of the dugong population at Aldabra was established in 2013 when 14 separate individuals were identified using a gyrocopter and helicopter. Through the WIOMSA Dugong Project it is anticipated that further data on Aldabra's dugongs will be achieved using acoustic receivers and potentially other methods. Discussions were ongoing in 2014 regarding this project but implementation has been slower than anticipated but it is expected

that this will be progressed in 2015. In addition the use of drones to carry out dugong surveys has been further investigated and it is hoped that this technology will be trialed on Aldabra in 2015 to assess its suitability.

4.4 Marine Projects

4.4.1. Aldabra Marine Research and GEF Project (*contributed by Philip Haupt*)

Aldabra's Marine Research and GEF Project

This year was the fourth year of the GEF Protected Areas project (GEF-UNDP-GOS), and the funding mechanism behind the exciting year of marine research and conservation at Aldabra Atoll. The key objectives under this GEF project for 2014 were to identify and nominate an area for MPA expansion, map the reef habitats, develop a marine monitoring programme, and draw up a new management plan for Aldabra. Project coordinator, Philip Haupt, spent the year on Aldabra to implement the marine programme developed under this project.

In 2014 a habitat map was developed of the Aldabra Outer Reef by combining satellite image and data collected in the field (Figure 47). The most immediate and significant finding of the mapping exercise was that the Aldabra Marine Protected Area (MPA) needs to be expanded because not all of the atoll's reefs are currently fully within the 1km MPA around the atoll. The Aldabra Marine Monitoring Programme that was developed in 2013, was successfully repeated in 2014 building on the foundations laid in 2013, and institutionalised the marine programme with SIF.

Reef mapping and MPA expansion

A habitat map of the reefs is important because it informs SIF on how much of what habitat type there is, and how these habitats change over time. Knowing the extent and spatial distribution of habitat is important as it informs management, planning and research. In this case, the outcome was particularly useful for SIF, as it was shown that an area of 3.35 km^2 of coral reef on the eastern side of the atoll is currently unprotected, and could therefore be used as evidence that MPA needs to be expanded. The area nominated for protection has been prepared and will be submitted to the Government of Seychelles, later in 2015.

The reef habitat map showed that Aldabra's atoll is surrounded by a thin veneer of ca 56km^2, which is as wide as 2km in some areas, while only 300m in the steeper parts of the atoll. Eleven major distinct habitat types could be discerned from statistically meaningful types derived from the field data collected in 2013. The distribution of habitat types showed that Aldabra was rich in seagrass beds in the outer lagoon reef, and surrounded by coral and reef rock rich habitats on the steeper slopes. The west coast is marked by well-developed spur and groove coral formations, with large sandy spits in between the coral rich spurs. The north coast is characterised by steep forereef slopes, and high concentrations of rare and endangered coral species, *Physogyra lichtensteini*, an EDGE listed species. High concentrations of macro-algae, *Halimeda* species, were common along the eastern side of the atoll. The South Coast reefs of Aldabra were surprisingly rich and diverse in coral, but also highly variable in the richness from one reef spur to the next.

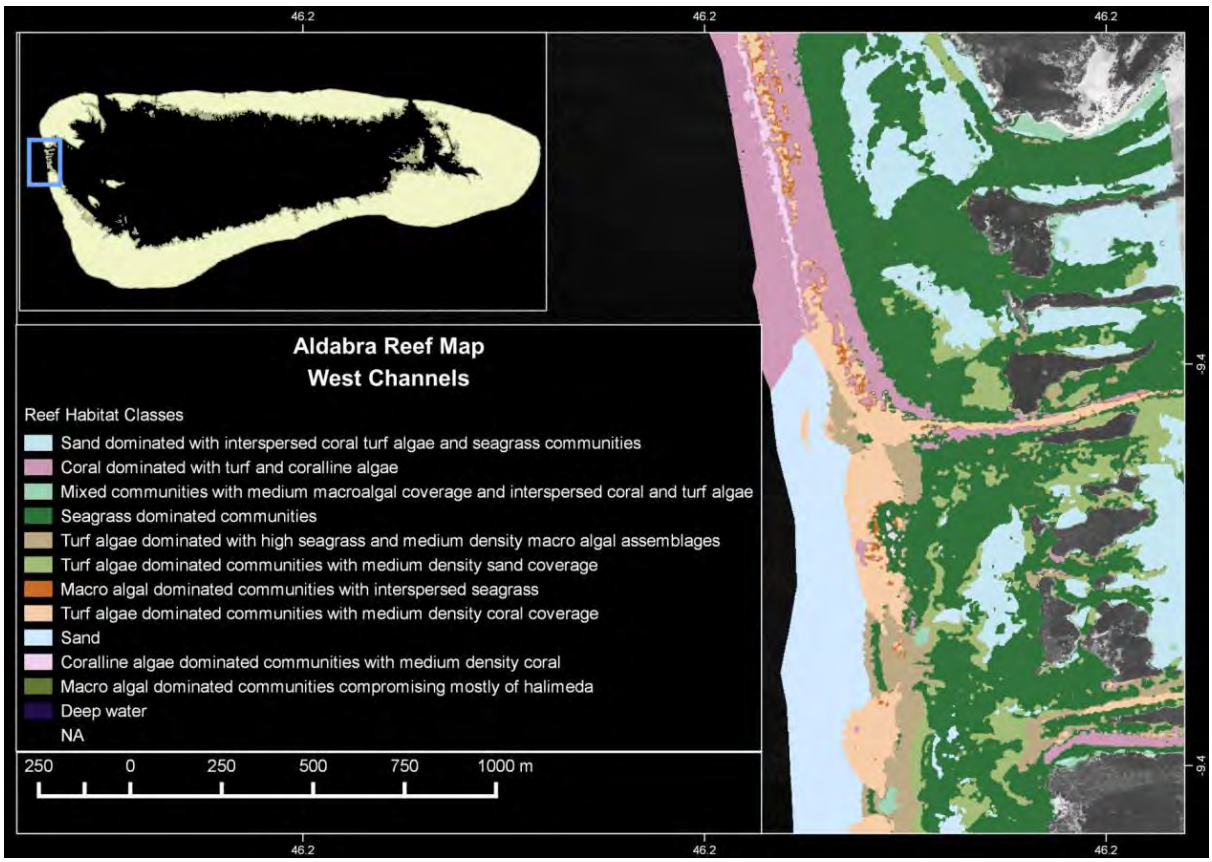


Figure 47. Exert from reef habitat map

The thin veneer of rich coral reef at Aldabra points to the vulnerability to human induced and natural disturbances, and consequently the importance of careful management and conservation thereof. In 2015 the planned expansion of the Aldabra MPA will hopefully provide the necessary protection to this diverse and amazing ecosystem coupled with the new marine monitoring programme to keep track of how well the reefs are doing.

Marine monitoring

SIF started its marine monitoring programme in October 2013. The challenge for 2014 was to repeat the monitoring programme without the additional on the ground support that the project enjoyed the previous year from external partners. The exciting Aldabra Marine Monitoring Programme, which included two components, namely the Aldabra Reef Monitoring (ARM), and the Baited Remote Underwater Video systems (BRUVs) were both successfully repeated, and ensured that staff were trained and that the programme became institutionalised within SIF.

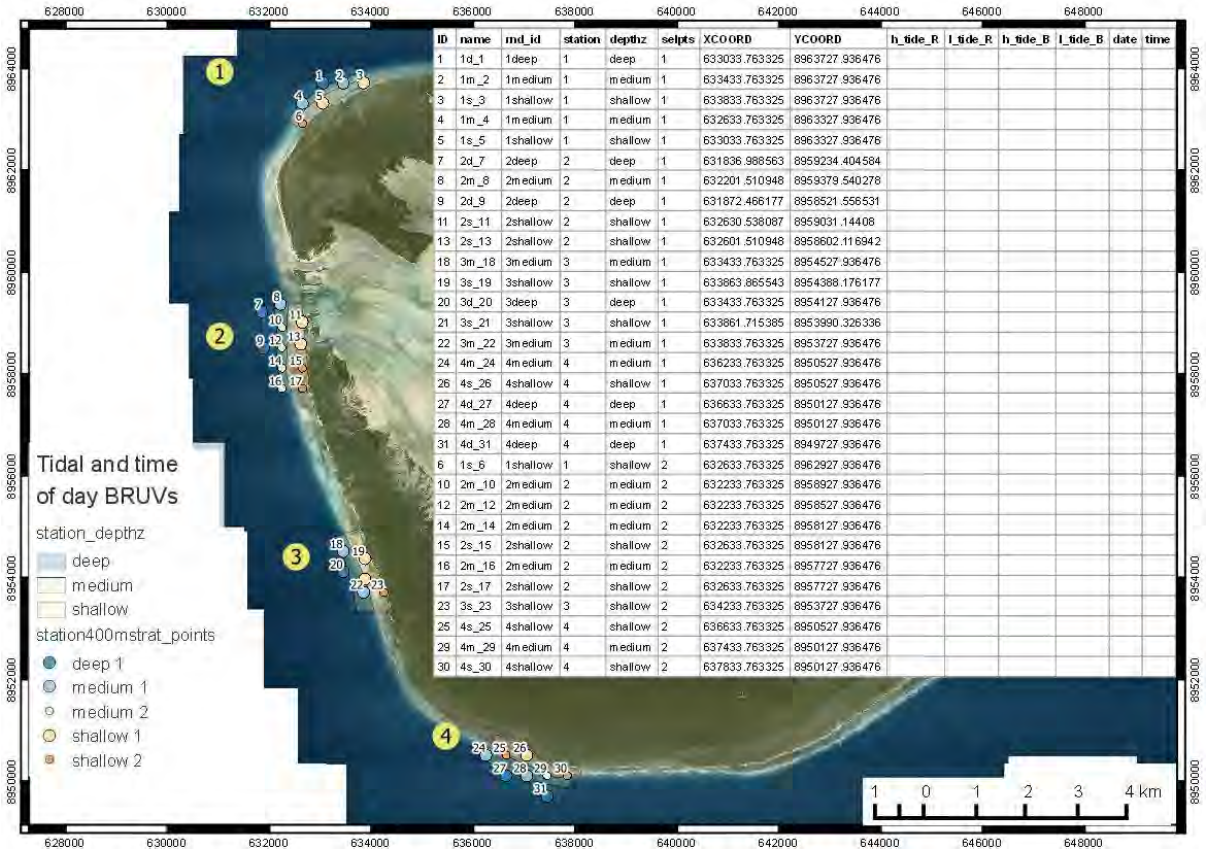
The ARM was setup to monitor how the Aldabra reefs change in their benthic cover composition over time, and how that in turn affects the fish community thriving on these reefs. This allows SIF to keep track of how healthy the Aldabra reefs are, and record changes thereto in relation to *in situ* water temperature and sea level changes. In 1998 coral bleaching as a consequence of elevated water temperatures devastated much of the Seychelles reefs. Aldabra is one of the few sites were the recovery process could be monitored in the absence of human interference, and is therefore a regionally important marine monitoring site.

Twelve permanent sites were monitored for benthic cover and fish communities at two depths, namely 15 and 5m. Temperature and water level dataloggers were deployed at selected sites around the Atoll in different depths to allow correlative studies between environmental variables and the reefs. Benthic cover surveys measure the percentage live hard and soft coral, dead coral, and algal covered reef structures, while fish counts and size estimation indicates of how well the system is balanced. For example, when algal growth is increased we may expect to see an increase in algal

feeders. Similarly, we could add another scenario to this, where when fishing pressure increases, top predators are removed, which allow smaller predators to dominate, and perhaps remove more of the algal feeders, which in turn may lead to an overgrowth of algae on the reefs. Initial surveys suggest a slow and steady increase in both hard and soft coral cover, while fish communities appear to be stable. The continued recovery of coral reef growth subsequent to the 1998 mass mortality is a sign of hope that marine ecosystems can recover when given the chance.

In 2014 unbaited Remote Underwater Video systems (RUVs) and Baited Remote Underwater Video systems (BRUVs) were deployed, this time to assess the effect of time of day and tide. BRUVs were deployed during spring tides to study the effect of tides during its maximum. The spring high tides are early in the morning and late evening, while the low tides were during the midday. Four areas along the Aldabra west coast were chosen, and 5 baited, and 5 unbaited samples were collected from each (Figure 49). The footage captured some interesting data (Figure 48), and a few rare sightings were made, including a dugong which swam in the direction of the Aldabra main channel.

Figure 48. BRUVs footage showing a large potato grouper bumping a shark at the bait canister



ID	name	rnd_id	station	depthz	selpts	XCOORD	YCOORD	h_tide_R	l_tide_R	h_tide_B	l_tide_B	date	time
1	1d_1	1deep	1	deep	1	633033.763325	8963727.936476						
2	1m_2	1medium	1	medium	1	633433.763325	8963727.936476						
3	1s_3	1shallow	1	shallow	1	633833.763325	8963727.936476						
4	1m_4	1medium	1	medium	1	632633.763325	8963327.936476						
5	1s_5	1shallow	1	shallow	1	633033.763325	8963327.936476						
7	2d_7	2deep	2	deep	1	631836.988563	8959234.404584						
8	2m_8	2medium	2	medium	1	632201.510948	8959379.540278						
9	2d_9	2deep	2	deep	1	631872.466177	8958521.556531						
11	2s_11	2shallow	2	shallow	1	632630.538087	8959031.14408						
13	2s_13	2shallow	2	shallow	1	632601.510948	8958602.116942						
18	3m_18	3medium	3	medium	1	633433.763325	8954527.936476						
19	3s_19	3shallow	3	shallow	1	633863.865543	8954388.176177						
20	3d_20	3deep	3	deep	1	633433.763325	8954127.936476						
21	3s_21	3shallow	3	shallow	1	633861.715385	8953990.326336						
22	3m_22	3medium	3	medium	1	633833.763325	8953727.936476						
24	4m_24	4medium	4	medium	1	636233.763325	8950527.936476						
26	4s_26	4shallow	4	shallow	1	637033.763325	8950527.936476						
27	4d_27	4deep	4	deep	1	636633.763325	8950127.936476						
28	4m_28	4medium	4	medium	1	637033.763325	8950127.936476						
31	4d_31	4deep	4	deep	1	637433.763325	8949727.936476						
6	1s_6	1shallow	1	shallow	2	632633.763325	8962927.936476						
10	2m_10	2medium	2	medium	2	632233.763325	8959227.936476						
12	2m_12	2medium	2	medium	2	632233.763325	8958527.936476						
14	2m_14	2medium	2	medium	2	632233.763325	8958127.936476						
15	2s_15	2shallow	2	shallow	2	632633.763325	8958127.936476						
16	2m_16	2medium	2	medium	2	632233.763325	8957727.936476						
17	2s_17	2shallow	2	shallow	2	632633.763325	8957727.936476						
23	3s_23	3shallow	3	shallow	2	634233.763325	8953727.936476						
25	4s_25	4shallow	4	shallow	2	636633.763325	8950527.936476						
29	4m_29	4medium	4	medium	2	637433.763325	8950127.936476						
30	4s_30	4shallow	4	shallow	2	637833.763325	8950127.936476						

Figure 49. Map showing the localities where BRUVs were collected in 2014

Initial review of BRUVs data, shows the abundance of large long lived predatory fish species, e.g. potato grouper, ***Epinephelus tukula*** and reef sharks, e.g. silver tip shark, ***Carcharias*** fish, which is reflective of a healthy reef ecosystem. The results of these studies will analysed during 2015 and years to follow and is expected to have meaningful findings for the management of Aldabra Atoll.

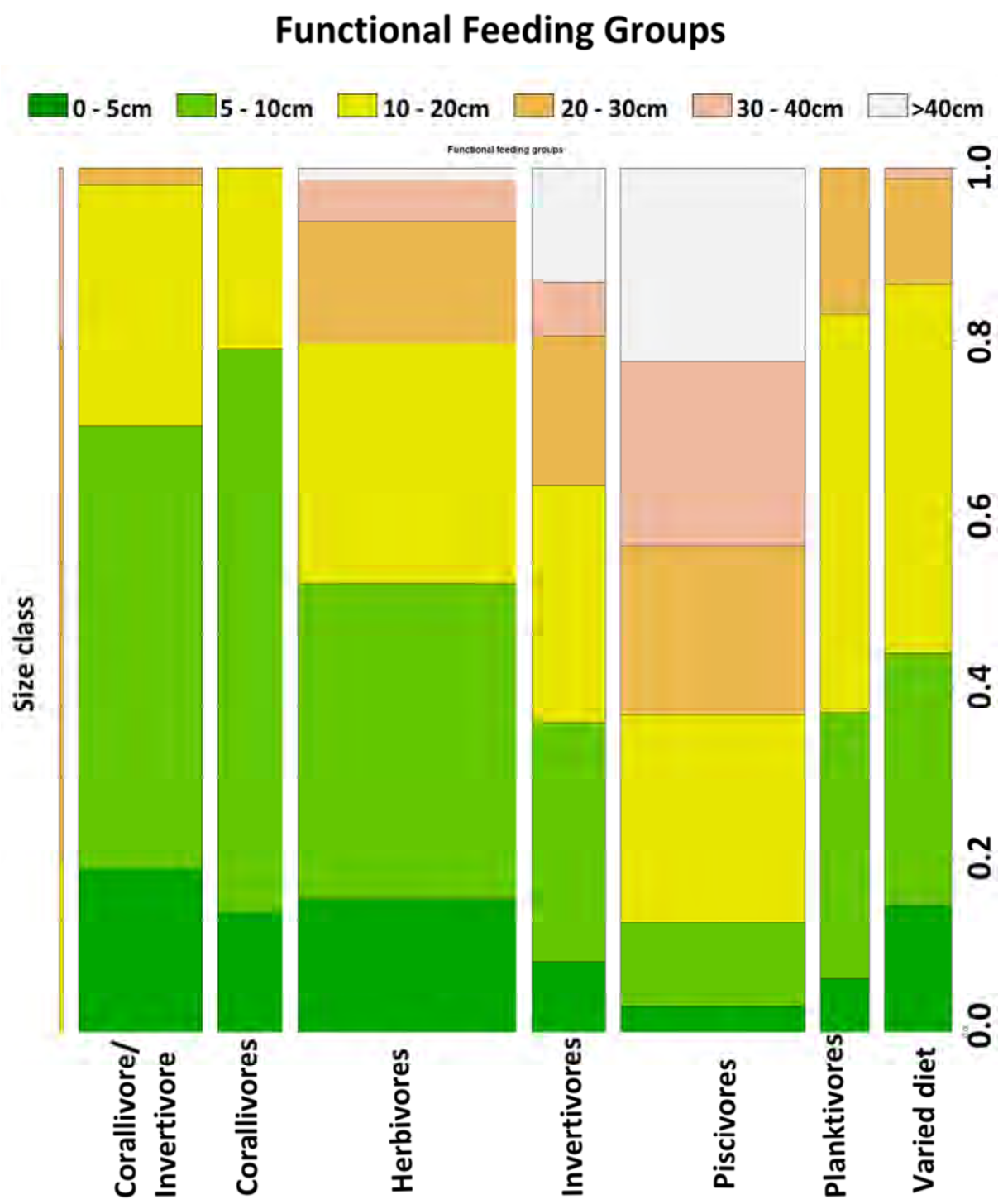


Figure 50. Summary of functional feeding groups and size of fish compiled from SCUBA fish survey on the 12 marine transects (2013 and 2014)

Analysis of the SCUBA fish monitoring data for the twelve transects monitored over the first two years of the Aldabra marine monitoring demonstrated the abundance of large predatory piscivores (e.g. sharks and groupers) and abundance herbivores that help to keep the reefs clean, further indicative of a healthy marine ecosystem (Figure 50).

4.4.2. Tidal gauge

The tidal gauge at Ile du Bois has suffered from a number of problems as a result of strong current and wave action and is currently not functioning. The cost of repairs was similar to replacing the units and therefore this further investment was not seen as justified. Philip Haupt suggested an alternative water depth gauge, manufactured by the same company as the temperature loggers currently in use, which would be a more robust solution in comparison to the existing set up and would be downloaded in the same way as the temperature loggers. Analysis of data obtained from the water depth gauge could yield information on: (1) a tidal model for Aldabra; (2) the tidal lag between the inside and the outside near to channel mouths; and (3) the tidal lag between further sites, and the outside. The study of water flow would be of particular interest in conjunction with the temperature at the same locations. The purchase of a water level metre was approved; a dispatch error resulted in a water level metre for shallower depths than desired being provided but as a goodwill gesture a second deeper logger was provided at no charge. These two water level metres (with integrated temperature loggers) were deployed in 2014, one in Passe du Bois on the southern side of the channel mouth and the other at AMP transect 1 at 15m depth. The loggers were set to take water level and temperature readings every 30 minutes and will require downloading annually.

Initial results suggest that a time lag between the outside and the inside of the lagoon is highly correlated with tidal phase. Spring tide lag periods may be as much as 1h 18 minutes, whilst neap tides are closer to 42 mins. The tidal range is 3.6m at maximum from data recorded so far.

5. INVASIVE SPECIES

5.1. Madagascar fodies and red-whiskered bulbul eradication at Takamaka

(compiled from Takamaka Team Leader, Terence Mahoune's weekly and season reports)

Second Season

The introduced Madagascar fody eradication programme on Aldabra moved into its second season of the project, the team at Takamaka focused on culling the remaining Madagascar fodies (MF) and any suspicious fodies (SF), which have hybridized with the MFs, distorting and diluting the genetic makeup of the native Aldabra fody (AF). Madagascar fodies and red-whiskered bulbuls were introduced to Assumption (27km from the SE Coastline of Aldabra Atoll) in the 1970s and have increased in numbers over the years. Takamaka is the part of Aldabra closest to Assumption, and the general thought is that Madagascar fodies have flown / been blown and settled in this region. Madagascar fodies are known to have hybridized with both Mauritius fodies and Seychelles fodies on other islands.

Hybrid birds have been confirmed from the Takamaka region using DNA analysis. The hybrids have a mix of characteristics making identification in the field difficult and therefore the decision whether to cull a bird.

A full-time eradication team was re-established in January 2014, comprising a core team of 5 staff recruited specifically for the introduced bird eradication project at Takamaka supplemented by Aldabra research staff. The Takamaka team suspended intensive eradication efforts in mid-April 2014 when the Madagascar fody-breeding season ended and it became very difficult to distinguish them from Aldabra fodies. In the second season of targeting these introduced birds a total of 12 Madagascar fody and 132 suspicious / hybrid fody were culled and 89 Aldabra fody of which 86 were banded were blood sampled (Figure 51).

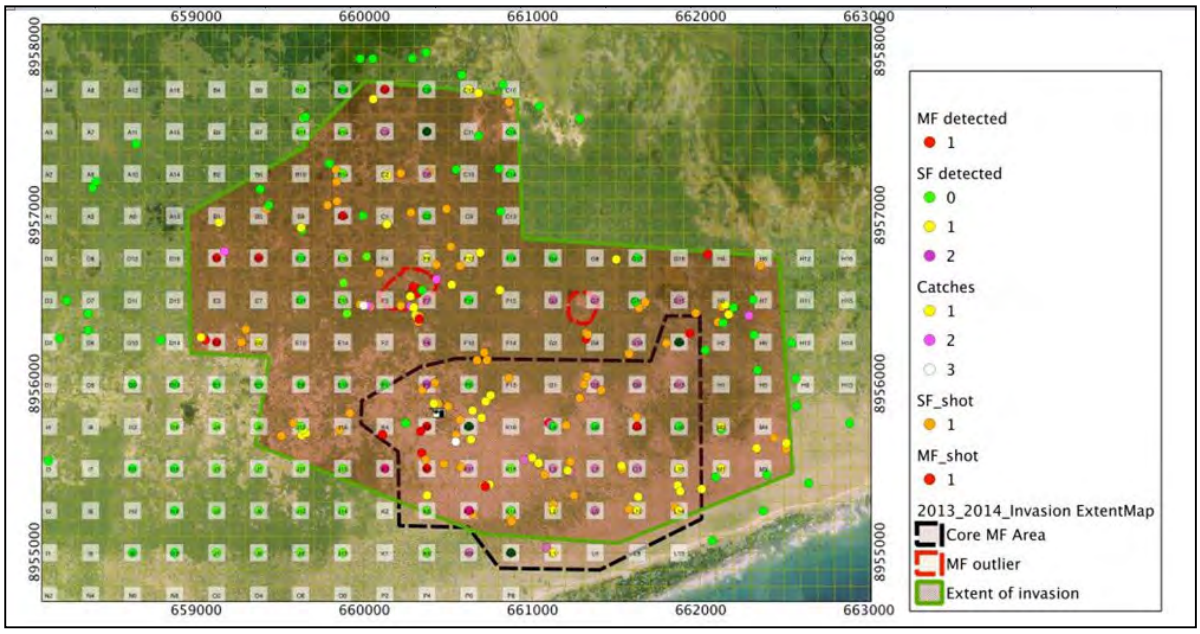


Figure 51. MF, SF/Hybrids distribution and numbers culled at Takamaka at the end of the breeding season

We deem that SFs/hybrids are well established at Takamaka and have extended their invasion principally eastwards (Figure 51), but the impact of shooting and mist-netting of MFs in the core fody area during the breeding season has reduced their numbers substantially. It was felt likely that only a few pure MF individuals still remain at Takamaka by the end of the second season and targeting these would be a priority for the following breeding season before they increase in number.

Third Season

Intensive MF eradication work started again at Takamaka in November 2014 with a focus on conducting a detailed bird survey covering Takamaka and adjacent areas to get a good understanding of range and abundance of remaining MF and SF individuals to inform targeted eradication efforts in early 2015. The season is currently ongoing but the initial findings of the bird survey suggest that the number of remaining pure MFs is small.

References for further details:-

- Mahoune, T. (June 2014) *Eradication of introduced birds at Takamaka, Aldabra.* SIF Second Season Report [\Monitoring\Eradication\Takamaka - MAD FODY & RWB\2014 Takamaka project\Reports\End of 2nd Season Report]
- Mahoune, T. (October 2013) *Takamaka, Aldabra Invasive Bird Eradication Project Handbook including methods and protocols* [Monitoring\Eradication\Takamaka\2013 Takamaka project\Protocols]
- Takamaka Weekly Progress Reports [Reports Research\Projects\IAS]

5.2. Rats and Cats

5.2.1. EC rat and cat eradication feasibility project

(*compiled from Grant Harper & Martijn van Dinther's Reports*)

The two year study to investigate the possibility of eradicating introduced black rats and feral cats from Aldabra concluded this year and provided findings and recommendations on the feasibility and methods for an eradication. These will inform the Aldabra Rat and Cat Eradication Plan which

will document the next steps towards an eradication attempt and the planning and logistics for such an operation. This document is expected to be completed in 2015.

Rats

Figure 52. Weighing a rat captured on one of the Picard transect lines (Martijn van Dinther

The rat trapping transects to gather information on the relative abundance, population structure, breeding status, morphometrics and diet of rats in the three main habitats (Pemphis, mixed scrub and mangrove; Figure 52) and to assess season variations were repeated three times in 2014 on Picard. In addition rat trapping was also undertaken at Anse Mais and Cinq Cases to compare rat densities and condition on Grande Terre.

At Cinq Cases both the calculated densities and actual individuals caught seem to be about 30–40% less than found on Picard. The mean weight of both adult sexes is almost half (male -47.36%, female -41.19%) that of rats caught on Picard.

The surprising result from the 6th season of the rat population study on Picard in September was the presence of young juveniles (4-8 weeks old) and several pregnant females in scrub and pemphis habitats. This had not been recorded in the previous year trapping season. It is likely that this occurred as a result of the high fruit productivity resulting from this "wet" year allowing for continued breeding throughout this south east monsoon season. This further suggests that dry conditions would increase the effectiveness of an eradication attempt as the rats are likely to be less abundant and reproduction would be lower.

Bait trials

Mangrove habitat, which has been established as well utilised by rats, will be highly problematic and will be the greatest stumbling block to eradication. The twice daily inundation by seawater would wash bait away. In January 2014 a trial of using bait bolas in the Mangrove forest was undertaken aimed as a potential means for tackling this issue. The bait bolas comprised of pellets of non-poisonous bait with a marker dye connected with a string and were thrown into the canopy of the 60x60m grid at a distribution of approximately 113 kg bait per hectare. Three nights of killing trapping with 15 traps proceeded catching four rats, three of which had consumed the bait. The trial was repeated in March resulting in the capture of 18 rats all of which had eaten the bait. The trial establishes a potential means for effectively distributing poison in the mangrove habitat, however, the application of these bolas on a large scale would need to be resolved.

Cats

Figure 53 Cats captured on the camera traps at Anse Mais

To try and obtain better information on cat densities and home range sizes on Grande Terre camera traps were deployed at Anse Mais and Cinq Cases. Cats were caught on camera (Figure 53), however, there was some difficulty in distinguishing between individuals. Cats at Anse Mais seemed to have more variation in the colouration of the pelt making individuals easier to recognise compared to Cinq Cases. The footage from the camera traps is still being analysed.

Two male cats were caught at Anse Mais in October providing further data on morphological measurements, sex, age and weight.

References for further details:-

- Harper, G.A (April 2013) *Population ecology and impacts of black rats and feral cats on Aldabra Atoll, Seychelles*. SIF Report [Monitoring\Eradication\EC rat and cat feasibility study 2013-2014]
- Monthly IAS Reports (Martijn van Dinther) [Reports Research\Monthly Reports\Project Reports\EC-projects]

5.3. Control of invasive plants

5.3.1. Sisal (*Agave Sisalana*)

(Compiled from Martijn van Dinther's sisal and monthly reports)

Sisal is the only exotic plant species on Aldabra to date which has been identified as posing a sufficiently severe threat to warrant eradication. Under the EU-funded project a stated objective is to research and develop, including feasibility trials, and implement plans to eradicate sisal from Aldabra. Following preparatory evaluation of the remain distribution of sisal on Aldabra and potential control methods in 2013, the use of chemical control with herbicides was recommended to tackle the remaining three patches of sisal (Picard Backpath, Polymnie and Ile Michel). A feasibility trial to assess the most effective application and concentration of the herbicide (Tordon 101) was initiated in November 2013 and the plants in the study continued to be monitored until July 2014 to determine the outcome of the different treatments and inform the best means for sisal eradication on Aldabra.

No plants in the control (NT) or cut (C) treatments died. Cutting the growth tip weakened 25% of sisal plants within 6 weeks after treatment, but these plants recovered swiftly and, after 3 months,

almost no negative effects were detectable. Spray treatments only were highly ineffective, all plants in the spray treatments recovered and no sprayed plant died.

Herbicide of ≥20% concentration applied directly to the cut growth tip significantly increased sisal mortality (high concentration: 80% died after 6 months; $\chi 2=24.3$, $p<0.0001$; medium: 35% died after 6 months; $\chi 2=7.00$, $p=0.0082$; Fig. 10). Fewer plants died at low ($t = 4.2$, $p < 0.001$) and medium ($t = 3.2$, $p =0.003$) herbicide concentrations of neat-to-cut treatments, than at high concentration (Figure 54).

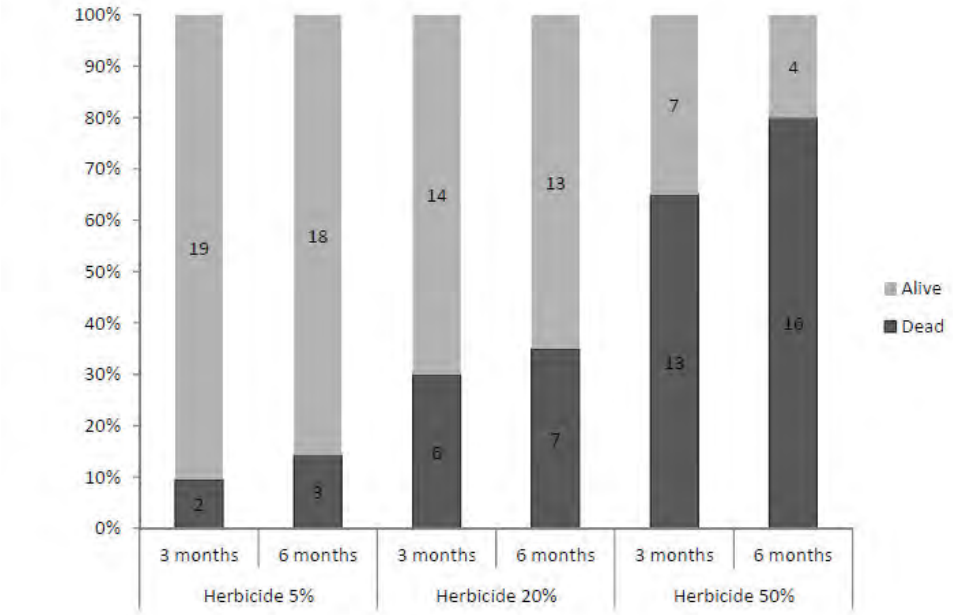


Figure 54. Percentage mortality in sisal plants treated with 5%, 20% or 50% Tordon 101 herbicide concentration neat-to-cut, after 3 months and 6 months.

No non-target effects were recorded throughout the experiment and all native plants surrounding the treated sisal were unaffected by the herbicide (independent of application technique).

From the results of the herbicide trial it was clear that applying a high concentration of herbicide neat-to-cut was most effective. To maximise the effectiveness of the herbicide for the eradication (and minimise the need for re-application), a larger stump surface (than only the growth tip) was created by cutting off the top half of the plant (Figure 55). A 30% concentration of herbicide was used as it was deemed to be more economical and reduced the risk to non-target species on Aldabra.

Figure 55. Larger stump surface area treated with 30% herbicide concentration (dyed red)

All sisal plants were treated at Picard Backpath and Polymnie in June 2014 and were seen to be dead or dying during follow up monitoring visits at the end of the year. The sisal patch at Ile Michel was very dense making access to all plants difficult, therefore several visits were needed to

treat all the plants. By the end of 2014 only a small group of 10-15 plants remained to be treated with herbicide and this is planned for January 2015.

Follow up monitoring in the coming year is vital to ensure sisal does not return to Aldabra. Surveys every 3 months at all three locations will be undertaken in 2015 to check for any re-sprouting that need to be tackled. Visits to Ile Michel will be particularly important due to the vast root system, which could re-sprout. So far the eradication of sisal using herbicide neat-to-cut seems to be very effective with no non-target effects and it hoped by the end of 2015 Aldabra will be sisal free!

References for further details:-

- Van Dinther, M. (2014) Report on Management and monitoring of sisal (*Agave sisalana*) by Aldabra Research Station (1972-2013) and research into sisal eradication, feasibility trials and eradication of sisal from Aldabra Atoll. [Monitoring\Eradication\Control of invasive plants\Agave sisalana\Sisal Eradication project 2013-2014\Report]
- Monthly IAS Report (Martijn van Dinther) [Reports Research\Monthly Reports\Project Reports\EC-projects]

5.4. Biosecurity

Introduced alien species pose one of the biggest threats to the biodiversity of Aldabra. Removing these exotic species once introduced is incredibly difficult, costly and for some species possibly unachievable. It is therefore vital that this threat is given the highest priority when supplies and people are being brought to the island to prevent the introduction of these pests. To properly address this risk and inform future biosecurity procedures EU Project consultant Dr Grant Harper created a Biosecurity Plan for Aldabra in 2014. All staff on Aldabra have been made aware of the risk that these species present and remains vigilant for invaders especially when receiving supplies.

The Biosecurity Plan details actions to be taken by SIF to strengthen their biosecurity procedures, progress was made during 2014, however, this remains a critical area for improvement due to the major risk that alien species present to Aldabra's ecosystem.

In February a large amount of construction material in slings arrived on Aldabra with the beaching of Enterprise II. At the end of March a number of *Tabebuia pallida* seedlings were found germinating in the slings of construction sand. The seedlings were physically removed and burnt and follow-up monitoring of the sling was carried out to identify any other alien plants that may have arrived with the construction materials and ensure that they are removed and destroyed.

During the checking of the construction slings Catherina Onezia found a snail which was suspected to be a juvenile African land snail (*Achatina immaculata*), the identification was confirmed by snail experts (Jim Murray and Fabrice Brescia). The construction slings were treated with salt and continued to be monitored. Due to the highly invasive potential of *Achatina* which is not found on Aldabra it is very worrying and further highlights the urgent need to implement a proper biosecurity protocol on Aldabra.

In 2014 formal biosecurity reporting following transport was introduced and institutionalised to document issues and communicate how biosecurity considerations can be improved. Personal parcels coming to Aldabra were subjected to a more vigorous screening and checking process in line with biosecurity measures. A memo was requested providing a clear list of which vegetables and fruit are not allowed to come to Aldabra and any other considerations to inform staff and their

families so they can prepare personal parcels accordingly, this is still pending and should be issued in 2015 as a priority.

SIF Head Office staff received training on the detection of pests and diseases in preparation for the implementation of a biosecurity plan for Aldabra. Quarantine and plant protection officers from the Seychelles Agriculture Agency were invited to train head office staff in screening for pests and diseases from fresh products bound for Aldabra. Staff were shown how to look for signs of insect scars, where to look for hidden insects in leafy material as well as how to prevent pests from reaching Aldabra.

In November whilst unloading Philip Haupt spotted a gecko whilst carrying a plank of fascia board. The gecko was caught and contained in a plastic tube and was later confirmed as *Hemidactylus frenatus* by Dr Nik Cole from photographs sent. This is a highly invasive gecko species and now very common across most Indian Ocean islands and thought to displace other geckos. It was great that the gecko was noticed and prevent from accessing Aldabra, however, it again highlights that it is very feasible for alien invaders to arrive on the supply boat and the need for more stringent biosecurity measures prior to the supplies arriving on Aldabra.

On the same supply boat in November the construction wood received was seen to be infested with fungus and a species of small fly. The wood was stacked close to the beach and covered with a tarp in the exposed sun with the hope that the heat build-up underneath the tarp would kill anything unwanted. The wood was also sprayed with insecticide. There is a need to review the transportation of construction materials and what can be done to reduce this biosecurity risk prior to arrival on Aldabra.

The arrival of several alien invasive species to Aldabra in 2014 highlights the urgent need to treat biosecurity as an absolute priority in 2015. The constraints are understood; however, unless more effective biosecurity is introduced SIF has the potential to introduce species that will adversely impact Aldabra's fauna and flora with each transport. Transport planning and lack of control remains the key issue undermining SIFs ability to implement proper biosecurity measures. In keeping with previous experience the scheduling of the supply boats was made at short notice leaving little time to prepare supplies and insufficient opportunity for through biosecurity planning and examination. Until the issue of transport planning and a proper system on the vessel for supplies to be stored away for contamination in transit is resolved this will continue to limit biosecurity control effectiveness.

6. MISCELLANEOUS

6.1. Protocols

Landbird Nest Monitoring
A draft of the landbird nest monitoring protocol was circulated for final comment at the end of 2014 detailing the rational and methods for the data capture of the landbird nest monitoring on Picard. The protocol will be finalised in 2015 to ensure consistency in future monitoring and serve as a reference for the research team.

Encrusting Sponge
In September a project proposal drafted by Philip Haupt and Daig Romain containing protocol methods was approved for the monitoring of the invasive sponge (*Terpios hoshinota*). Sponge

colonies at dive sites at AMP1 (Picard Station), Anse Var and Polymnie were mark out for the monitoring and will be revisited throughout the north-west to document sponge growth with results expected in early 2015.

- Research Proposal for monitoring potential nuisance sponge (*Terpios hoshinota*) growth in relation to infected coral colonies at Aldabra Atoll [Monitoring\Marine\sponge\Sponge analysis]

SCUBA Survey Protocol

The protocol for the SCUBA survey marine monitoring was finalised and circulated to HO for comment and approval.

- SCUBA Based Methods Protocol by Philip Haupt [E:\Monitoring\Marine\SCUBA_benthic_and_fish_surveys\protocol]

BRUV/RUV Protocol

The protocol for the BRUV and RUV marine monitoring were circulated by Philip Haupt to HO for comment and approval in October 2014 and finalised in 2015.

- GoPro BRUV Monitoring Manual for Aldabra Atoll [\Monitoring\Marine\BRUVs\protocol]

6.2. Specimen collection

External researchers regularly request the inclusion of samples from Aldabra in their research to contribute to a national, regional or international research picture. Approval for specimen collection must be given by Seychelles Bureau of Standards (SBS) and a research agreement finalised with SIF prior to sample collection. In 2014 biological samples were collected as part of two studies as detailed below.

***Ligia* Isopods**

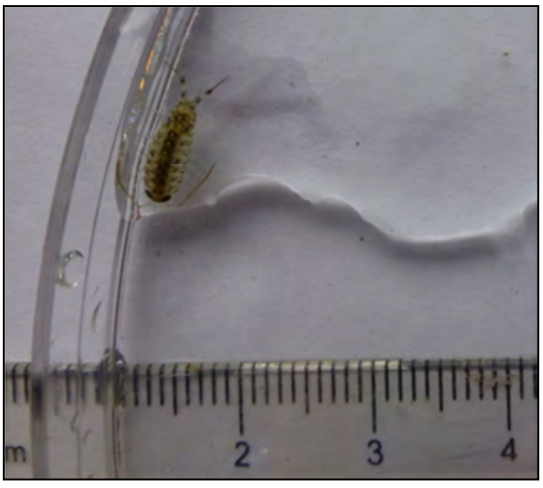


Figure 56. *Ligia* isopod

The *Ligia* isopods (Figure 56) requested by Dr Carlos Santamaria of Sam Houston State University in Texas were located in the inland pool area of Bassin Cabris. Photos were sent to confirm the identification, following which 20 individuals stored in ethanol were sent back to Mahé for onward transport in February. These isopods are very interesting as they harbor high levels or genetic diversity and may be informative on the evolutionary processes that affect coastal organisms.

Following analysis of the *Ligia* isopod specimens collected on Aldabra Carlos Santamaria provided some preliminary findings in October. *Ligia* isopod samples from Silhouette, Mahé and Cousine were also included in his analysis. The populations from these inner Seychelles islands were very similar (95-99% COI similarity), while the Aldabra population was divergent (81% COI similarity). When combined with his dataset from the region (Tanzania, Sri Lanka, Thailand, Madagascar, etc), the samples from Mahé, Cousine and Silhouette appear to have an "Eastern" origin (are more closely related to those from Sri Lanka and Thailand), while those from

Aldabra appear to have a "Western" origin (more closely related to Madagascar and Tanzania). Dr Santamaria is looking to publish these results and will keep SIF updated on progress and possible other research ideas.

***Ornebius* Crickets**

A request was received from Sylvain Hugel, a specialist on the Orthopteran fauna of the Indian Ocean islands for additional samples of the cricket genus *Ornebius* from Aldabra for inclusion in a phylogenetic study. Following confirmation that the necessary SBS and MTA permits had been obtained and advice on how to catch and locate the crickets received the team carried out night searches to locate the crickets. The team located a number of different crickets and it was confirmed from a photograph that one of these was a sub-adult male of the *Ornebius* genus. Later searches provide another male specimen but a female was not found, these samples were sent back to Mahé for onward transport and analysis.

Specimens and natural interest items sent to Mahé

An accumulation of specimens and items such as bones, rocks and shells collected on Aldabra of interest were sorted and sent to Mahé on the supply boat in June. It was communicated that these items would be nice to have in the education centre at the Vallée de Mai or certain things such as the full skeleton of the last goat on Aldabra might be useful for the Aldabra House. As a result of limited storage, deterioration due to insect damage and lack of audience or proper facilities for displaying these items it was decided it was more appropriate to have these on Mahé / Praslin so they could be put to good use.

6.3 External Projects

6.3.1 Seismology

Figure 57. Seismic station deployment

To investigate seismic activity in the region the University of Frankfurt Seismology Group led by Dr Lindenfeld provide five seismic stations, each consisting of a datalogger (Omnirecs Data Cube; Figure 57), these were deployed on Picard between 11-14th February. Due to the specifics of both the arrangement of the seismic stations and the deployment this required considerable effort with an access track having to be cut in the pemphis and quantities of sand being carried to the deployment sites. In addition the batteries in the devices lasted for 10 days so the five units had to be visited to replace batteries. All seismic station collected data for at least two months prior to their removal and return to Mahé for onward transport and analysis.

In November Dr Lindenfeld came to Mahé to discuss the initial results of the seismic data collection and discuss possible future research collaboration. There were no signs of local earthquakes (up to 100km) but interesting amplitudes corresponding to the tides and wave energy were detected. Regionally (100-1000 km) some earthquakes in the Western Indian Ocean (Comoros region) were recorded, an area from which not many seismic records are available so particularly interesting. Tele-seismic (> 1000 km) activity was detected, for instance an earthquake in Chile was recorded. A surprising finding was that all station have small amplitudes ('gaps') at the same time interval (2-3 min) during low tide which would be interesting to further investigation, one hypothesis was possible correspondences with slack tide. The data is still be analysed to see whether it is sufficient for a publication.

6.3.2 POPs in Plastic Pellets

SIF agreed to assist Pellet Watch in monitoring the Persistent Organic Pollutants (POPS) levels in the environment using international pellet watch http://www.pelletwatch.org/, which looks at POPS in plastic particles and marine waters. Aldabra was asked to assist as an island with virtually no population, to collect plastic resin pellets from the beaches to be sent for analysis. In conjunction with the turtle track monitoring on Settlement Beach plastic pellets were looked for and several dedicated searches were carried out in March / April. Although plenty of other marine plastic waste was collected no plastic resin pellets were found.

6.4. Staff training

Throughout the year, various presentations and training courses were given to (and in some cases provided by) Aldabra staff (Table 16). The Tropical Coastal Ecosystems course run by edX was a fantastic learning tool and very applicable for Aldabra and a great preparation for the marine monitoring. All lectures from the course were saved to the fileserver for future use.

Figure 58. Research Team presented with Tropical Coastal Ecosystems certificates

Table 16. Presentations and training given to and provided by Aldabra staff.

Date	Training / Presentation	Participants	Given By	Notes
03/03/14 – 05/03/14	Marine mammal identification training (on Mahé)	Catherina Onezia	Marine Conservation Society Seychelles	Identification of cetaceans in Seychelles waters
28/04/14	Tropical Coastal Ecosystems Training	Catherina Onezia Daig Romain Dainise Quarter Rebecca Filippin Heather Richards Philip Haupt	Online edX International experts	7 week training course, comprising lectures, knowledge tests, discussion topics, activities and additional reading with final assessment.
01/05/14	ZARP Update Presentation	All Aldabra	Richard Baxter Wilfredo Falcon	Summary of ZARP activities over the last 8 months
Early May 2014	Tortoise radio tracking and blood sampling	All Research Team	Richard Baxter	Practical skills in ZARP tortoise work
30/07/14	Zotero library catalogue system Training	All Research Team	Heather Richards	
04/08/14	Sisal Herbicide Trials and Eradication Plans Presentation	All Aldabra	Martijn van Dinther	
16/08/14	Tour Guiding Training	All Aldabra	Catherina Onezia	Practicing how to give a tour along the coastal path to tourists
21/08/14 – 23/08/14	Passe Gionnet Expedition – Training	Daig Romain Dainise Quatre Catherina Onezia Giovanni Rose Shane Brice	Catherina Onezia Daig Romain Heather Richards	Bird and habitat transect survey methods Mangrove survey RUVs Night insect monitoring

		Heather Richards		
August / September 2014	GVI Training Course in marine survey methods and Advanced PADI diving certification	Sheril de Commarmond	Global Vision International	One month course on Mahé
16/09/14	GIS Training	All Research Team	Philip Haupt	Basic skills and new GIS techniques for those that had already mastered the basics
October 2014	Fishing identification and size class Training	All Aldabra	Philip Haupt	In water size class training and additional study materials on fish id provide for study
24/10/14	Rat and Cat Eradication Feasibility Update Presentation	All Aldabra	Martijn van Dinther	
October 2014	Cybertracker Training	All Research Team	Philip Haupt	
10/12/14	Mangrove Presentation	All Aldabra	Kennedy Warne (NatGeo)	
11/12/14	Antarctica	All Aldabra	Kennedy Warne (NatGeo)	
12/12/14	Maori relationships with their forest	All Aldabra	Kennedy Warne (NatGeo)	
13/12/14	Aldabra Research Presentation	All Aldabra and visitors	Heather Richards Catherina Onezia Sheril de Commarmond Daig Romain Philip Haupt	

6.5 Expeditions

6.5.1 Gionnet Channel Expedition

The expedition to explore the Gionnet Channel area of Malabar took place between the 21st to 23rd August. The focus of the expedition was to explore a less regularly visited part of Aldabra and give opportunity for staff training in survey techniques not currently used in the routine monitoring. Activities included surveys for the extinct Aldabra brush warbler with associated vegetation classification, mangrove study, RUVs survey in a mangrove pool and night insect study. The expedition was a great success and the rediscovery of the thought to be extinct Aldabra banded snail highlights how worthwhile such activities can be.

References for further details:-

- Expedition to Gionnet Area 21-23rd August 2014 Report (Monitoring\Exploration\Expedition Gionnet Area\Report).

Figure 59. Passe Gionnet Expedition Team

6.6 Bats (contributed by Martijn van Dinther)

In the north/ west walls of staff house No 6 (last house on the right towards old settlement) resides a colony of Aldabra free-tailed bats *Chaerephon pusilla* (Molossidae) (Miller 1902). It is a very small

insectivorous bat endemic to Aldabra and is recorded as vulnerable (D1+2) IUCN red list 1996 (Hutson *et al*. 2001). Between July 2013 and October 2014 the size of the colony was seen to grow from 8-12 individuals to 109 (20/10/2014). It is thought that the population of this species on Aldabra is most likely dependent on useable roosting locations. There is concern for the bats using house 6 in the longer term when renovations and maintenance to the house are required. Further discussion was had about the type of work to the house that would be possible without disturbing the roost and whether it was possible to attract the bats to an alternative roost site.

Further Reading:-
Conservation of Bats in House No. 6 by Martijn van Dinther [\Monitoring\Bats]

7. ALDABRA SCIENTIFIC PUBLICATIONS OF 2014

Bunbury, N. (2014) Distribution, seasonality and habitat preferences of the endangered Madagascar Pond-heron *Ardeola idae* on Aldabra Atoll: 2009–2012. *Ibis* 156: 233–235.

Phillips, K. P., Mortimer, J. A., Joliffe, K. G., Jorgensen, T. H., and Richardson, D. S. (2014) Molecular techniques reveal cryptic life history and demographic processes of a critically endangered marine turtle. *Journal of Experimental Marine Biology and Ecology* 455: 29 -37.

8. LOOKING TOWARDS NEXT YEAR

2015 should be an action packed and production year on Aldabra which will hopefully see the expansion of the Marine Protected Area further protecting the atolls amazing marine ecosystem, better understand the rediscovered Aldabra Banded snail and striving to achieve a major goal in the tackling of invasive species by eradicating sisal. The two alien bird eradication programmes on Assumption and at Takamaka, Aldabra should be nearing their goal of restoring Aldabra to its status of 'alien avifauna free' and removing the threat of alien birds arriving from neighbouring island, Assumption. With the significant efforts being invested in removing alien species that arrived previously and threaten the ecosystem of Aldabra, effective biosecurity measures to prevent further invasions will be a key priority for 2015.

Following the investment and training in establishing a SIF marine monitoring programme the further integration of the marine surveys into the regular research activities will be key. Monitoring of the marine environment is critical to the effective management of the marine protected area. There is much anticipation for the commencement of collaborations to use new technology to further understand the movements and abundance of some of Aldabra's marine megafauna, juvenile turtles (IFREMER) and dugongs in 2015.

The completion of the much anticipated Aldabra Management Plan will provide important structure and focus for the management of the atoll for the coming years. Following the analysis of tortoise and landbird long-term datasets, reviews of these monitoring programmes will be undertaken aiming to improve the reliability of results, conservation effectiveness and resource efficiency of these programmes. The increasing use of Cybertracker programmes with the Trimbles will improve accuracy and efficiency of data recording in the field.

With the increase in tourist visitors to Aldabra it will be important that SIF manages this demand carefully to ensure that the delicate Aldabra ecosystems and important research activities are not compromised. SIF will ensure that Aldabra continues to act as an inspiration, reaching audiences through education, research and media outputs and ultimately the Aldabra House.

2015 will surely be another year filled with fantastic opportunities to understand and discover more about Aldabra's incredible and unique ecosystems and through continued effective team work SIF will continue to successfully manage and protect this marvelous place for the future.

9. ACKNOWLEDGEMENTS

All of the 2014 successes, research and monitoring activities discussed in this report are the results of amazing team work both on Aldabra, within SIF and beyond. Huge thanks to the 2014 Aldabra Team who's enthusiasm, cooperation, hard work and dedication enabled plans to be realised and made for a fantastic working environment: Wilna Accouche, Julio Agricole, Alain Banane, Samuel Basset, Richard Baxter, Patrick Banville, Jude Brice, Shane Brice, Sheril de Commarmond, Yanny Didon, Janske van de Crommenacker, Martijn van Dinther, Wilfredo Falcon, Rebecca Filippin, Frankie Gamble, Oskar Guy, Dennis Hansen, Philip Haupt, Jamie McAulay, Terence Mahounce, Stephanie Marie, Julio Moustache, Catherina Onezia, Christina Quanz, Dainise Quatre, Shiira Padayachi, Nick Page, Daig Romain, Giovanni Rose, Marvin Roseline, Joel Souyave and Danny Valentino.

The Logistics Team has been invaluable for not only facilitating the research team but also for their fantastic active participation, keen eyes and interest in the research activities. This close partnership and cooperation between the research and logistics teams on Aldabra has been essential and is greatly appreciated.

We are very thankful for the instrumental support, guidance and inspiration of the SIF Head Office especially Dr Frauke Fleischer-Dogley, Dr Nancy Bunbury, Rowana Walton, Wilna Accouche, Marille Benoit, Daniel Baccus, Mary Maria and all of the other staff members who assisted. The presence of HO staff on the atoll was greatly appreciated and facilitated productive discussions. Effective communication has been essential in identifying solutions to problems, enabling better understanding and allowed for a greater team connection despite the distance.

The specialist advice, support and encouragement offered by the following was greatly appreciated: The SIF Board of Trustees (who we look forward to having on Aldabra in 2015 for the AGM), Katy Beaver, Lindsay Chong-Seng, Dr Jim Groombridge, Dr Rebecca Klaus, Dr Christopher Kaiser-Bunbury, Dr Jannie Linnebjerg, Pat Matyot, Dr Jeanne Mortimer, Dr Erik Postma, Dr Sara Rocha, Dr David Rowat, Dr Gabriela Schaepman-Strub, Adrian Skerrett, Sidney Suma, Dr Lindsay Turnbull and Dr John Turner.

We are extremely grateful for financial support received from the following:-
GEF (Global Environment Fund) – 'Protected Areas project', (ID3925), Marine protected Area expansion project.
European Union – Invasive Species project activities
UNESCO - Takamaka bird eradication project
University of Zurich – ZARP Tortoise work

I am incredibly grateful to continue to have the opportunity to work is such a unique, fascinating and exciting place. Aldabra has a place in my heart and I feel hugely privileged to contribute to the understanding and protection of this unique and amazing ecosystem. My heartfelt thanks to all those who have assisted me and the team in making 2014 another year follow of achievements on Aldabra. We look forward to 2015 which promises to be another exciting year on Aldabra.