Aldabra Research Station
Scientific Coordinator's Annual Report

2012

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Culling of last goat on Aldabra – August 2012

INDEX

1. INTRODUCTION

This report contains a summary of the research and monitoring activities carried out on Aldabra during 2012 and an analysis of the data collected. It was a very important year, especially in terms of the PV system being commissioned for use, resulting in the major achievement of Aldabra Research Station now running fully from solar power. Furthermore, there were several developments with regards to invasive species on Aldabra. Both good and bad news were brought: the good news was the completion of the goat eradication in August, but unfortunately the bad news was the discovery of a population of Madagascar fodies and a Red-whiskered bulbul (both introduced on Assumption) of which the study and control forms a new and urgent challenge. Both the abovementioned projects were prioritized above the routine monitoring, and in some cases this resulted in cancellation of camps / general monitoring to allow for allocation of staff and resources towards the two prioritized programmes.

1.1. Research staff

Table 1 shows the people that were working in Aldabra's research department during 2012. Some people changed position during the year and therefore occur in the table more than once. Detailed information about arrival / departure dates can be found in the monthly ASC reports.

Table 1. Research staffing on Aldabra in 2012.

Position	Name	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Notes
ASC / RO	Janske van de Crommenacker	x	x	x		x	x	x	x	x	x	x	x	On Assumption as team assistant (April) and team leader (Oct-Nov) of the EC bird eradication project
AASC	Joël Souyave	x												After his annual leave Joel became Island Manager (Feb 8th)
Relief ASC	Philip Haupt				x	x	x						x	Standing in Apr (ASC on Assumption) Dec 19th - Jan 17th (2013) (annual leave ASC)
Senior Rangers	Stan Denis	x	x	x										
	Catherina Onezia						x	x	x	x	x	x	x	
Rangers	Andy Gouffé		x	x			x	x	x	x	x	x	x	Earthwatch course on Mahé in April
	Catherina Onezia	x	x	x	x	x	x						x	Started as Senior Ranger from end June onwards
	Bevil Narty	x	x	x	x	x	x							
	Jakawan Hoareau	x												Relief Ranger
	Curtis Baker											x	x	Assisting Assumption EC project Oct-Nov, afterwards promoted to Ranger
Trainee Rangers	Curtis Baker				x	x	x	x	x	x				
	Michel Malbrook						x	x	x	x	x	x	x	
	Shanni Etienne										x	x	x	
Project Officers	Michal Šúr	x	x	x										GEF Project Officer
	Richard Baxter	x	x	x	x	x	x	x	x	x	x	x		ZARP Project Officer
	Martijn van Dinther	x	x	x	x	x	x	x	x	x	x	x	x	GEF Project officer, from October onwards IAS Project Officer

Volunteers	Arjan de Groene										x	x	Reef Mapping Project
	Calum Ferguson										x	x	Reef Mapping Project
	Lotte Reiter											x	Reef Mapping Project
External consultants / Researchers / Project staff	Peter Haverson	x	x										GEP consultant
	Darryl Birch		x	x									GEP consultant
	Dennis Hansen				x	x	x						ZARP project
	Rebecca Klaus											x	Reef Mapping Project
	Michelle Etienne											x	Reef Mapping Project
	Naomi Adeline											x	Reef Mapping Project

1.2. Notable events

In addition to the monitoring results that will be discussed in the report, the year 2012 was marked by the following notable non-research events:

- **January:** Aldabra was visited by the cruise ship M.V. Clipper Odyssey (Zegrahm Expeditions) on January 20th and 21st. There were flights on January 23rd and 30th.
- **February:** Aldabra was again visited by the cruise ship M.V. Clipper Odyssey on February 3rd and 4th. The supply boat (Enterprise II) arrived on February 8th and 9th, and beached in front of Staff House #6. A large cargo of PV system equipment, batteries, construction materials and a generator was offloaded (Figure 1). There was a flight on February 25th with which the power house contractor team (Brian Rose Constructions) departed. Joël Souyave took up the position of Island Manager, following up Marc Jean-Baptiste.

Figure 1. Placement of solar batteries, set-up of the solar panel frames and a group photo after accomplishing the carrying of all heavy materials.
(*photographs by Christina Quanz and Darryl Birch*)

- **March:** Following a visit of two technicians from the German PV system supplier, the PV system was commissioned for use on the 31st of March, which meant a retreat from the noisy Station generator after a long era (Figure 2). There was a flight on March 28th.

Figure 2. Explanation of PV system to Aldabra staff by German technicians, and a group photo on the day that the system was taken into use (*photographs by Rich Baxter and Christina Quanz*).

- **April:** There was a flight on April 4th.
- **May:** A crossing was conducted on May 9th to pick up Janske van de Crommenacker from Assumption where she assisted with the EC Bird Eradication project.
- **June:** A one-day visit by the President to inaugurate the PV system, planned on June 8th, was cancelled and postponed until later in the year. The supply boat (Enterprise II) came from June 16th – 18th, and this transport was used for the transfer of staff between Aldabra and Assumption (because of the rough seas in the SE season).
- **September:** From September 16th to 20th, Aldabra was visited by the yacht Lady Anja II, owned by Mr Ernst Pilcher who is an SIF Honourable Member. The supply boat (Enterprise II) came from September 18th – 20th. There was a flight on September 18th.
- **October**: There was a flight on October 15th. A relief Island Manager, Ralph Ernesta, was hired to temporarily replace Joel Souyave who went on annual leave. On October 23rd a filmcrew (Starlight) arrived on Aldabra for the filming of a 3D movie.
- **November**: On November 2nd the filmcrew departed. There was a flight on November 16th, Joel Souyave returned from his annual leave. This month again a Presidential visit was planned, but once more it was cancelled.

- **December:** There were flights on December 5th and 19th. In the period of December 5th to 19th Aldabra was visited by three technicians: an internet technician from South-Africa, Jan van de Westhuizen, came to fix the internet that had not been working for the past few weeks. Two SNMS consultants, Hencel Hollanda and Patrick Alcindor, came to repair and re-install the AWS. The Seychelles Port Authority vessel 'Alouette' made a special call to Aldabra on December 10th to set up a lighthouse (Figure 3), which was built on the previous lighthouse location. On December 17th the 30th anniversary of Aldabra as UNESCO World Heritage Site was celebrated. The supply boat Ave Maria came on December 21st and 22nd.

Figure 3. The newly placed lighthouse, and repair work of the satellite dish (*photographs by Martijn van Dinther and Joel Souyave*)

1.3. Notes on monthly schedules

During the whole year the monthly research program was set by the ASC in assistance of the Senior Ranger. During the last months of the year some monitoring and camps that required a boat needed to be cancelled due to shortage of fuel. Figure 4 shows a map of Aldabra with all monitoring locations.

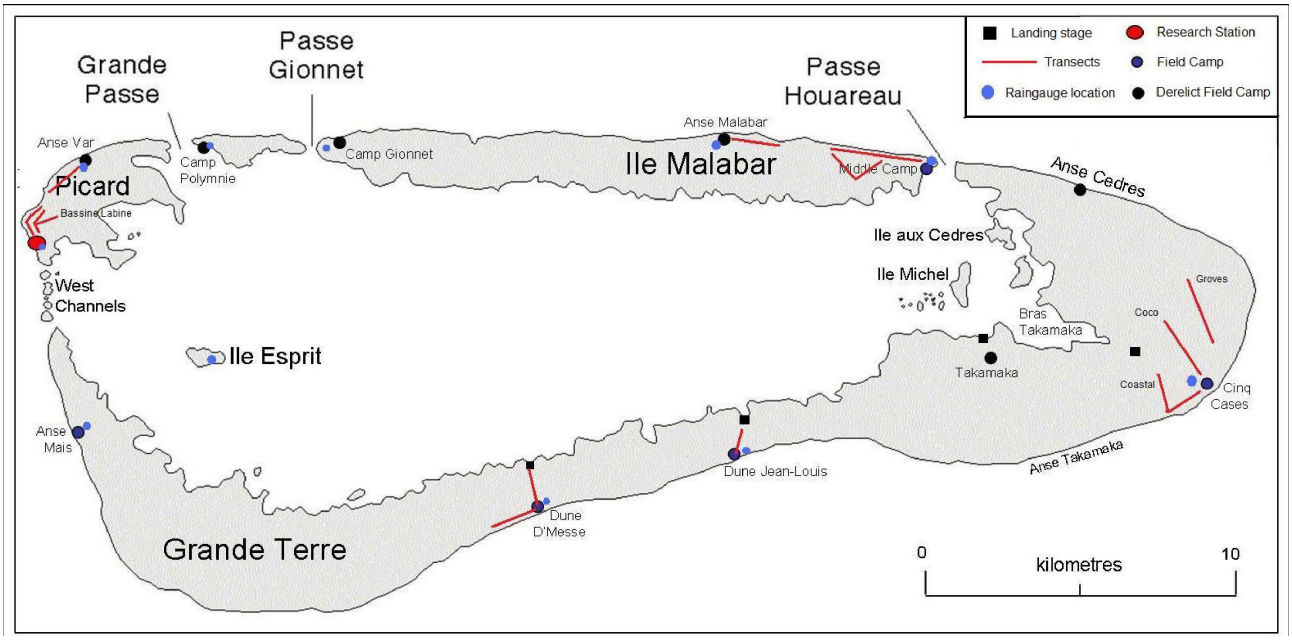

Figure 4. Map of Aldabra Atoll with camps and locations of monitoring transect/activities.

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MONITORING PROGRAMMES

2. CLIMATE

2.1. Picard meteorological readings

A set of weather variables is taken every morning at 8.00am at Aldabra Station. Furthermore, monthly rain data is collected from several locations all over the atoll. Paragraphs 2.2 until 2.4 concern the weather variables measured at Station, and in paragraph 2.5 the atoll-wide rain data is shown.

2.2. Dry and wet bulb temperatures

Surface air temperature is measured with dry and wet bulb thermometers that are read every morning at 8.00am at Aldabra Station. The thermometers are placed vertically on a wooden stand in the Stevenson screen (a white louvered box at a height of 1.25m above the ground, protecting the thermometers from rain, direct radiation from the sun and providing adequate ventilation so as to indicate the temperature of free-moving air). The Stevenson screen was turned towards the southern hemisphere on March 15th, and back towards the northern hemisphere on October 15th. As temperatures in the morning are rising rapidly, recording the temperature 30 minutes later than usual – e.g., due to other monitoring activities – can substantially influence the data collected. For this reason, only readings taken until 08.30am are considered for the analyses. The dry bulb temperatures in 2012 showed a normal pattern in comparison with previous years (Figure 5).

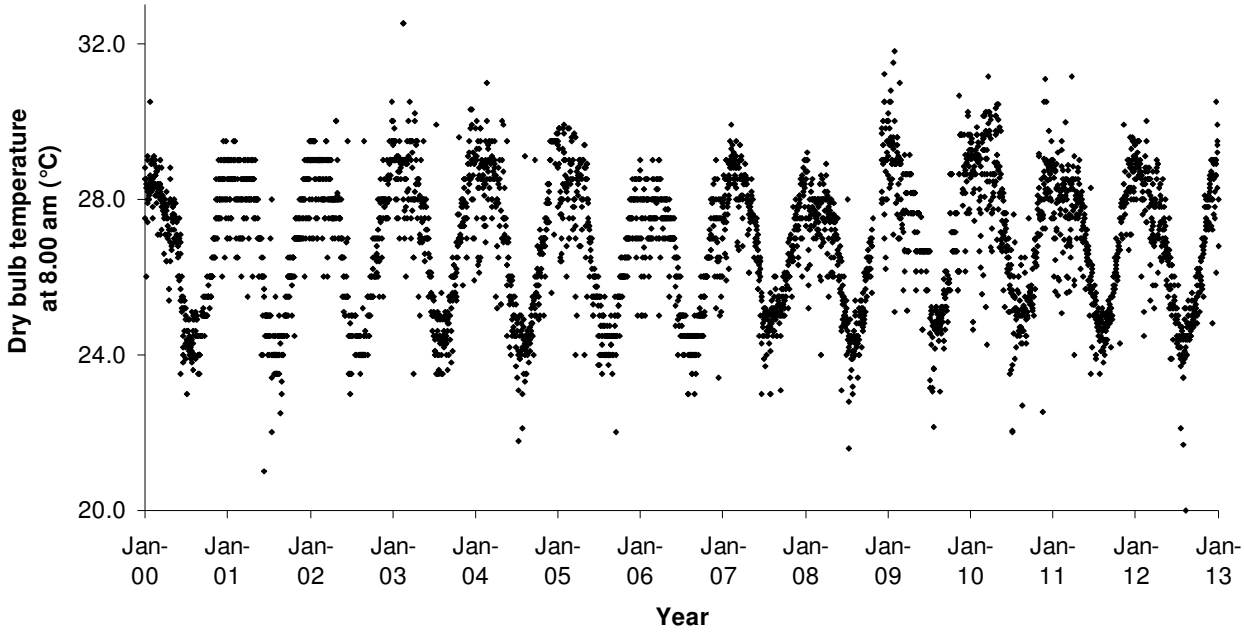


Figure 5. Timeline with daily dry bulb temperatures at the Aldabra Station (8.00am) during the period 2000-2012.

For the wet bulb temperatures only the data from May 2010 onwards is shown (Figure 6), as most data of previous years is incomplete or faulty (see 2010 Annual RO report). Patterns in 2012 looked similar to the period before.

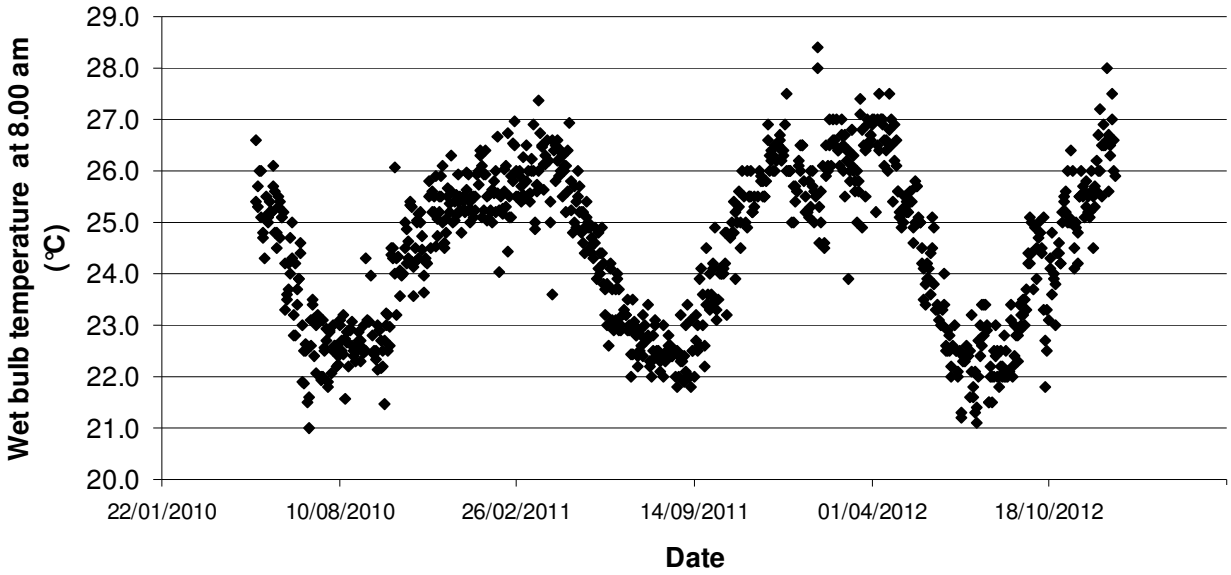


Figure 6. Timeline with daily wet bulb temperatures at the Aldabra Station (8.00am) during the period May 2010-December 2012.

The difference between the dry and wet bulb temperatures provides information for calculating the dew point, vapour pressure and relative humidity. The temperature of the wet bulb will always be lower than that of the dry bulb, unless the air is 100% saturated in which case it will be equal. Relative humidity typically increases during the NW season, as shown in Figure 7. Over the past two years the relative humidity seems to show a slightly upward trend, with the 2012 SE season being more variable than 2010 and 2011.

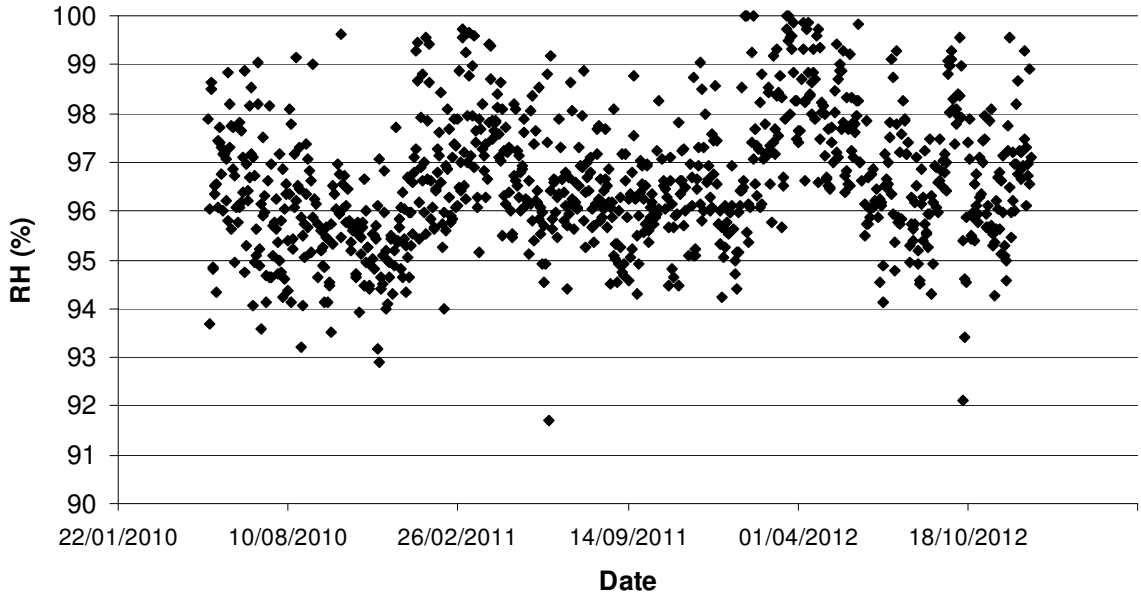


Figure 7. Relative humidity data at the Aldabra Station during the period May 2010-December 2012, as calculated from the daily wet bulb and dry bulb temperature records.

2.3. Maximum and minimum temperatures

A common problem during the last decade was that the maximum and minimum thermometers were not properly reset. Therefore only the maximum and minimum temperature data from May 2010 onwards are usable (Figure 8). The figure shows that minimum temperatures during 2012 were lower than previous years, whereas maximum temperatures are comparable. To test whether this trend is genuine, we will deploy a second minimum thermometer and compare the values with the currently used minimum thermometer. However, no oddities in performance of the thermometer were picked up during the monitoring.

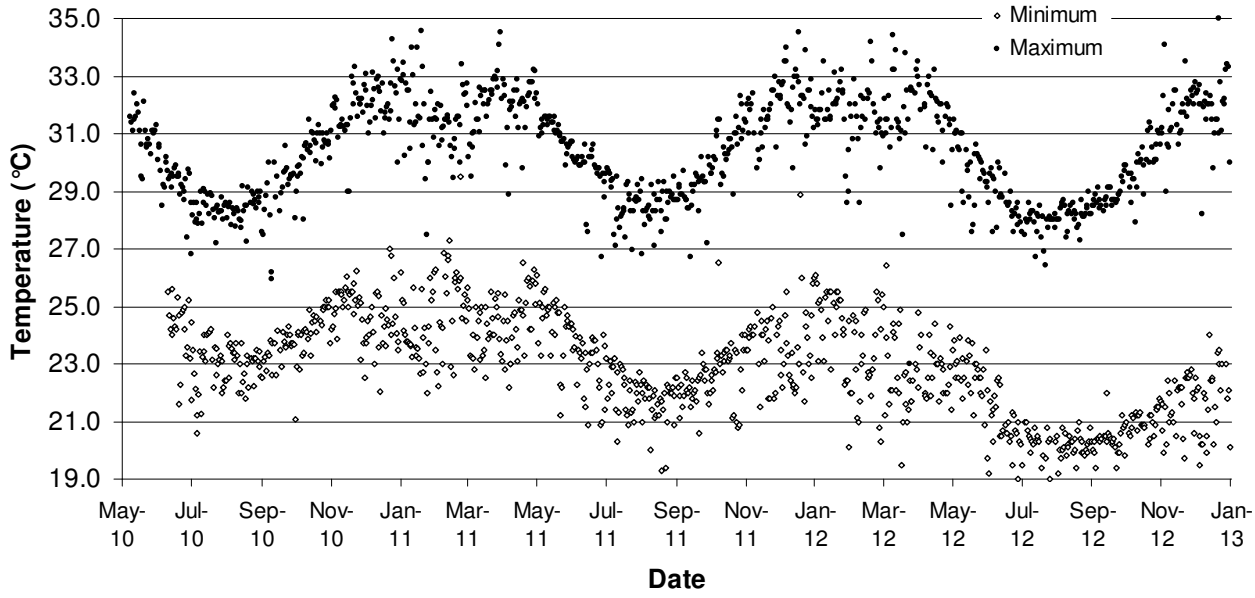


Figure 8. Timeline with daily maximum and minimum temperatures at the Aldabra Station during the period May 2010 - December 2012.

2.4. Rainfall at Picard Station

In the first few months of 2012, rainfall at Station in 2012 deviated substantially from 2000-2010 averages: compared to the last decennium, January was very dry, but this was made up by a very wet February (Figure 9). April was considerable wet as well. The dry (SE) season followed a normal pattern with only very little rainfall, but it was followed by a late onset of the wet season. The first bit of rain fell in November, whereas this normally starts in October. December was again considerably wet.

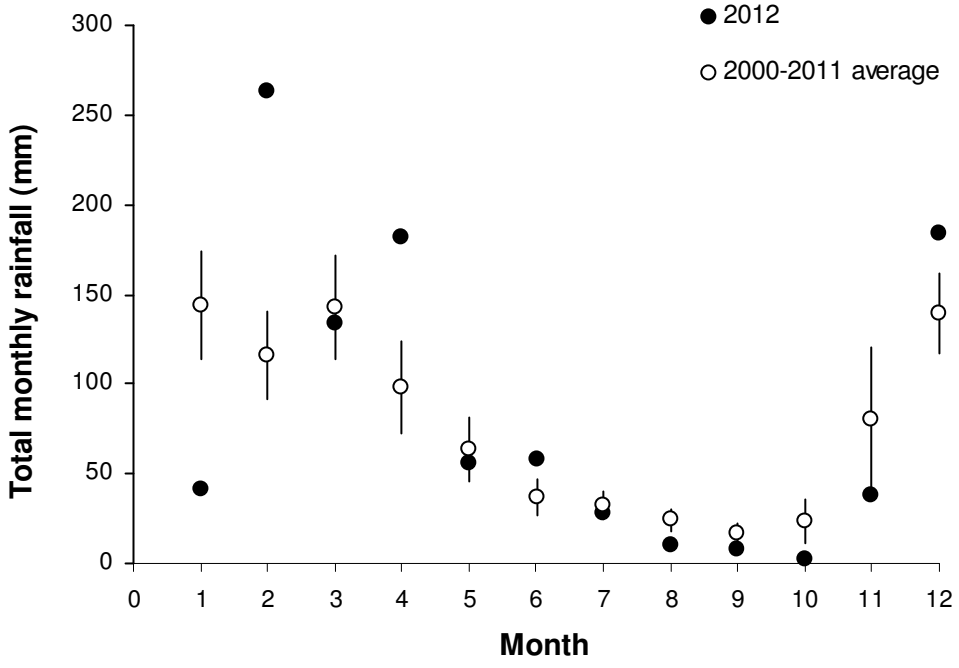


Figure 9. Total monthly rainfall measured at Aldabra Station on Picard during each month of 2012, compared to the average annual cycle of 2000–2011.

2.5. Rain gauges around the atoll

At most locations the cumulative annual rainfall data of 2012 was wetter than the last decade (except DDM, Figure 10). In this figure no clear pattern arises of which area/island on the atoll is wetter than others.

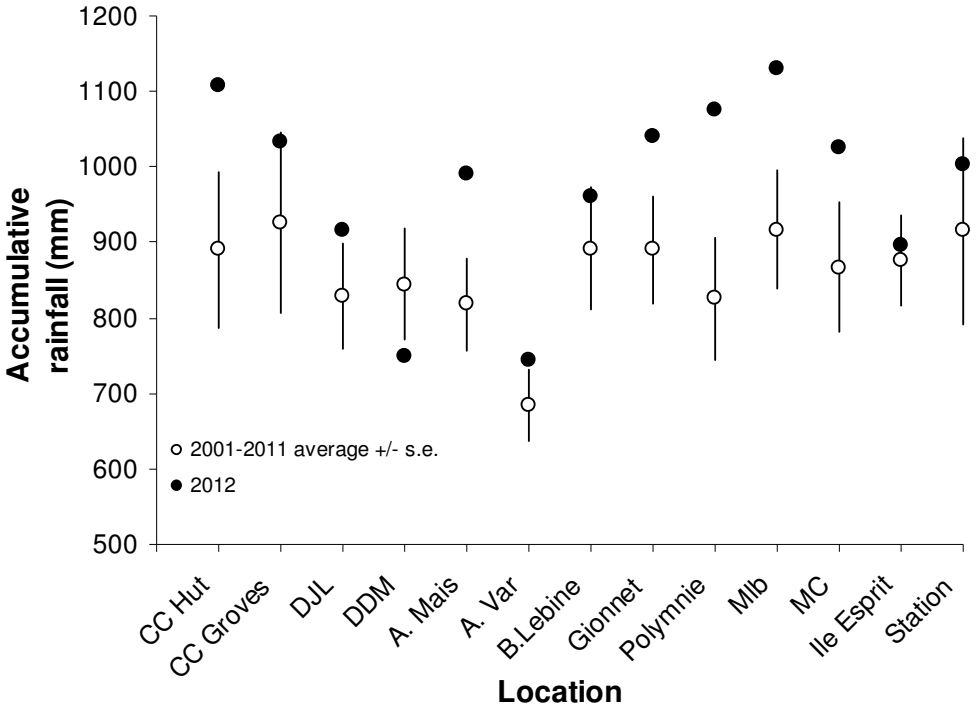


Figure 10. Annual rainfall totals for 2001-2011 (± s.e.) and 2012 for the rain gauges around the atoll.

Figure 11 shows the seasonal patterns of all locations with a clear distinction between wet and dry monsoon.

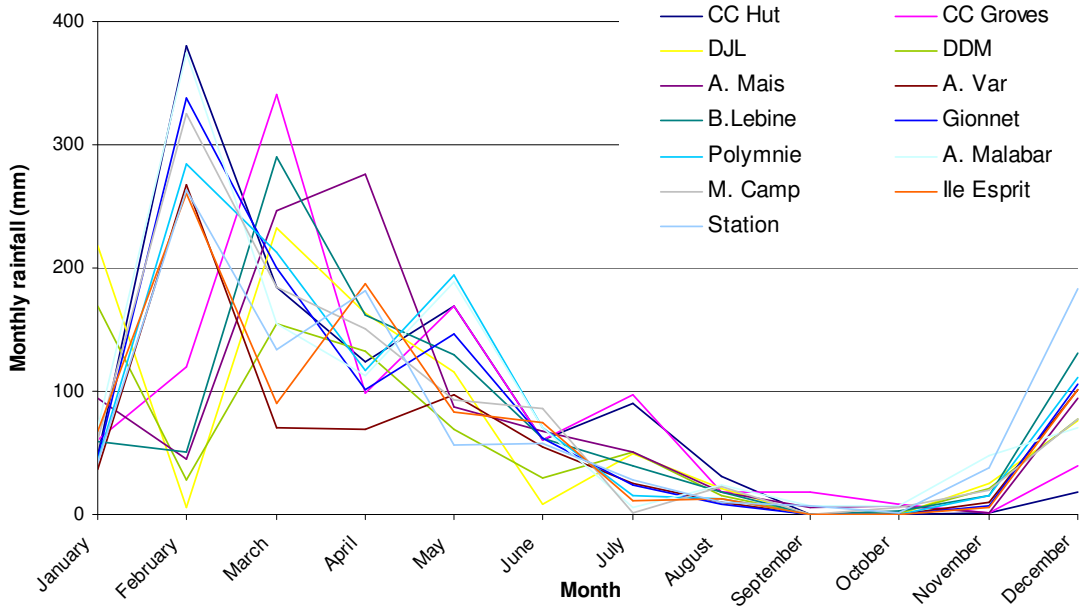


Figure 11. Monthly rainfall totals for 2012 for all the rain gauges around the atoll.

2.6. Automatic Weather Station

In November 2010 the automatic weather station with satellite link-up was installed on Aldabra by a team of two employees from Seychelles National Meteorological Services (SNMS). Many start-up problems were encountered in 2011 (e.g., wrong data card, configuration problems, malfunctioning transmitter) and unfortunately these continued over the past year.

In March 2012 the AWS mast was lowered upon request of SNMS / HO to test the functioning of the AWS. It turned out that the device itself is properly functioning, but further re-installation was pending on arrival of an internet module from Vaisala. In July, this module arrived at HO, but it could only be sent with the first transport in September. In October the AWS was lowered and the Ethernet module installed. The AWS was tested and found functioning properly: data is available on the Skype laptop in the library where it is being logged every minute in a text file.

Figure 12. Lifting up the AWS after repair (*photograph by Janske van de Crommenacker*)

Communication with the QML (base station with Ethernet module) was established, but remote communication was not possible, most likely because of a wrong set-up. Furthermore, the antenna connection for the GOES satellite transmitter was corroded and the top connector came completely lose from the cable when disconnecting. Checking with a multi-meter showed no signal between antenna and cable, meaning that possibly the antenna is corroded on the inside. Further inspection of the system also showed heavy corrosion on the negative pool of the battery due to salt spray in the air, and a new battery should be placed. It was suggested that it may be wise to move the actual QML-base station inside the library where it is better protected from the elements. Arrangements were made to have technicians from SNMS on the early December flight to calibrate the system settings and to realign the transmission antenna.

As planned, two technicians from SNMS Office, Hencel Hollanda and Patrick Alcindor, spent two weeks on Aldabra to reconfigure the AWS settings, realign the transmission antenna to the appropriate communication satellite and to make the necessary technical adjustments and repairs as required. After their visit, the AWS was operational with a well-functioning satellite communication and data retrievable from the skype laptop computer in the library. The AWS aerial was mounted onto a separate supporting metal bracket that was specifically prepared and installed onto the corner of the eastern wall of research block (Figure 12). This was necessary so to facilitate the lowering and/or lifting of the main AWS supporting pole for equipment maintenance/repairs. Unfortunately, shortly after their departure the 16 port network switch broke down that also connected the AWS. This resulted in SNMS not receiving any data anymore from the Station from half December onwards. However the satellite communication still worked fine.

3. MARINE ENVIRONMENT

3.1. Turtles

Track counts of green and hawksbill turtles are conducted on a selection of beaches (Figure 13).

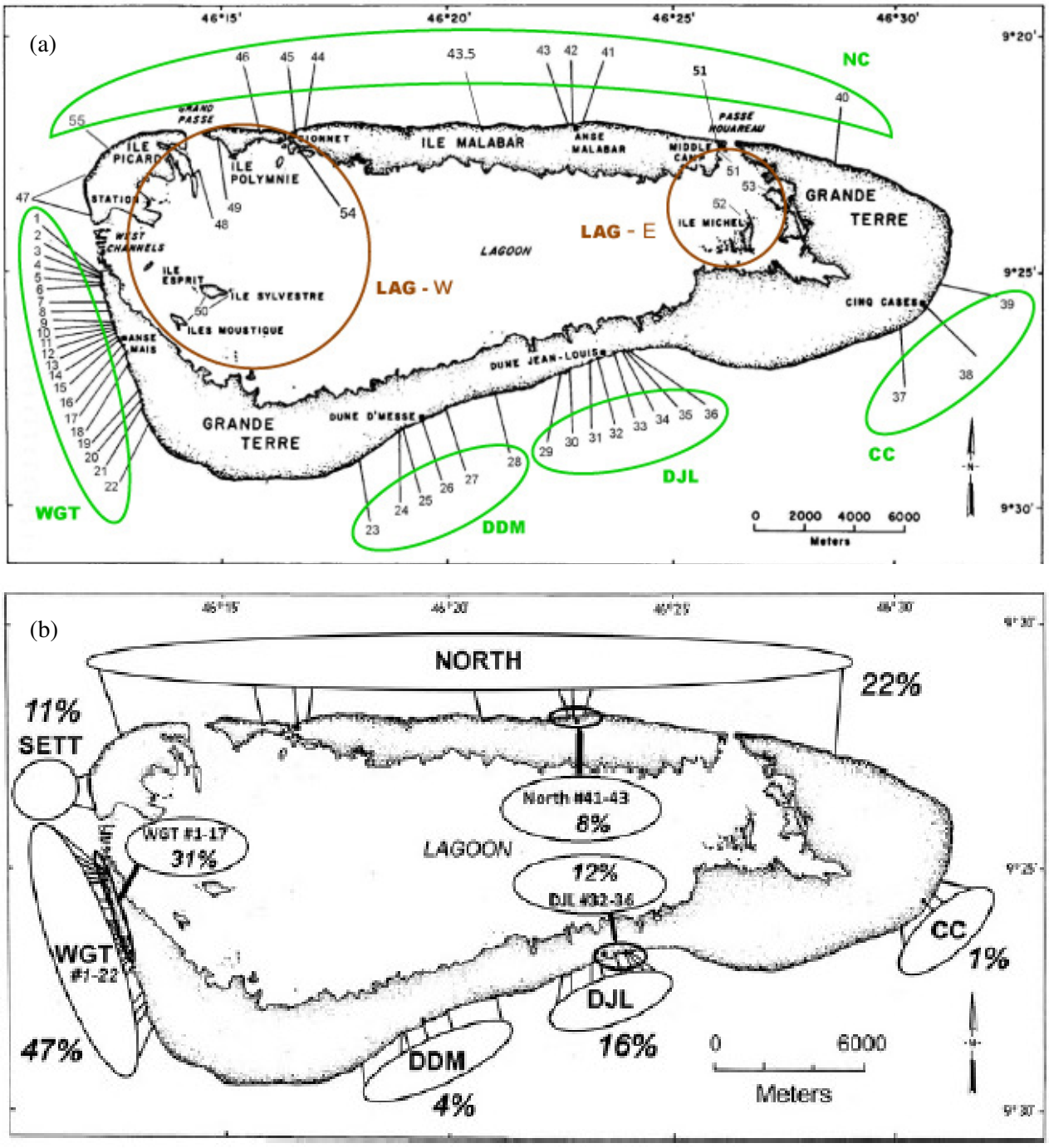


Figure 13. (a) Numbered beaches on which turtle track counts are conducted (derived from turtle track count field protocol by Mortimer 2009), and (b) the percent contribution to the estimated total nesting at Aldabra made by each site (based on the 2003-2004 to 2007-2008 nesting season) (Mortimer *et al*. 2011).

3.1.1. Track counts green turtles

The green turtle track surveys conducted during 2012 are summarized in Table 2. Due to fuel shortage and prioritization of more urgent projects as described in the Introduction, the number of turtle track counts conducted are less than previous year.

Table 2. Number of turtle track surveys conducted on the various beach groups during 2012.

Location	Month												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
SB	31	27	31	30	31	30	31	31	29	30	29	31	**361**
WGT	3	1	4	3	4	3	3	3	2	3	2	2	**33**
DDM	0	3	3	1	2	1	2	2	0	0	1	1	**16**
DJL	0	6	1	1	1	1	2	2	0	1	2	0	**17**
CC	3	0	2	2	2	2	0	0	4	0	2	2	**19**
NC	2	2	2	1	3	2	2	3	3	2	2	2	**26**
Lagoon	1	2	1	n/a	n/a	n/a	n/a	n/a	2	2	2	1	**11**
A.Var	1	1	1	0	2	2	1	1	1	2	1	1	**14**

* Only surveyed between September and March

Table 3 shows the number of track counts done in 2012 in comparison with previous years (starting with 2007 as older data is stored in older FileMaker Pro versions and therefore not accessible).

Table 3. Number of turtle track surveys conducted on the various beach groups during 2012 compared to earlier years.

Location	2007	2008	2009	2010	2011	2012
SB	353	354	365	365	360	**361**
WGT	50	27	35	41	40	**33**
DDM	19	14	16	16	22	**16**
DJL	20	12	13	16	20	**17**
CC	15	10	16	10	23	**19**
NC	20	15	21	19	20	**26**
Lagoon	5	3	12	10	9	**11**
A.Var	18	16	12	14	12	**14**

Settlement Beach

As in previous years, data collected on Settlement Beach (each morning at 7pm) included GPS coordinates of each individual track and an assessment whether the turtle was likely successful or not in laying eggs during her emergence. This year we started writing down the GPS coordinates when tagged turtles were encountered, to study individual nest site selection and group nesting behaviour when the dataset is large enough.

In Figure 14 the monthly totals of emergences and the totals for each type on Settlement Beach are shown. A slight peak in number of emergences occurred in April, followed by a stable period with high emergences rates until the end of September.

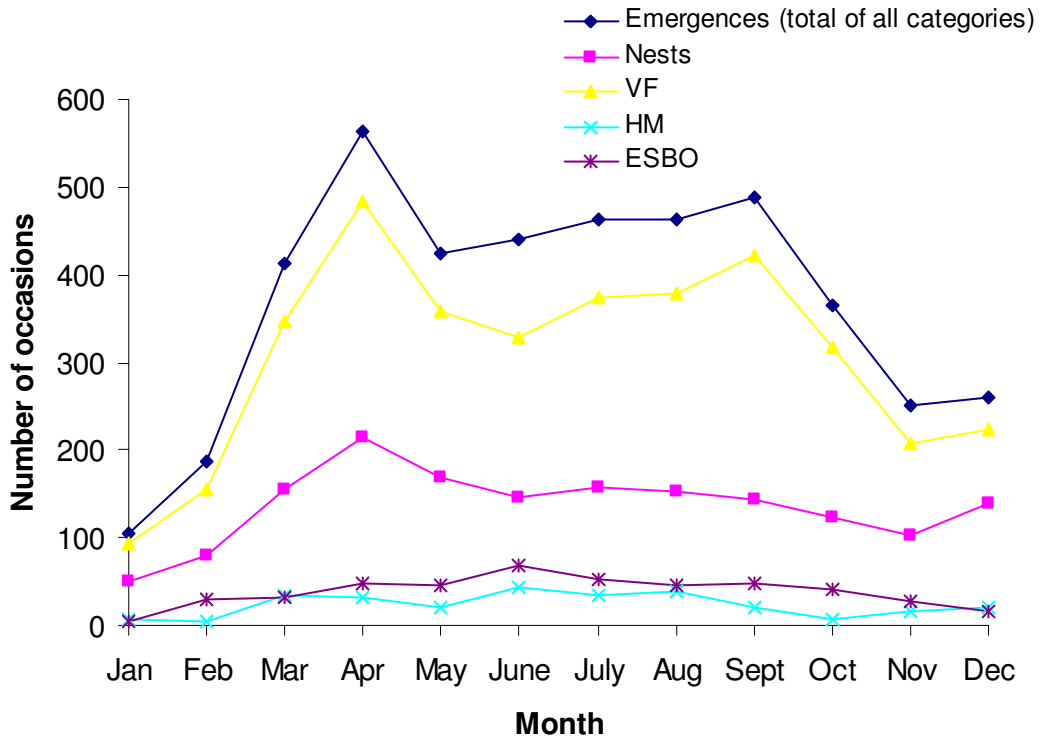


Figure 14. Annual patterns of green turtle emergence types encountered on SB during 2012 (Nest = visually judged to be a successful nest, ESBO = 'emergence stopped by obstacle', HM = 'half-moon' track (no digging), VF = 'very fresh' - emergence from previous night, which involved digging attempts).

The 2012 pattern differed from those of previous years (Figure 15). Normally, a high nesting peak occurs in March / April, with an average of ca. 25 emergences per day (in the last few years). After the peak, the numbers of emergences normally decrease until the new peak gently starts in December. In 2012 however, the April peak was lower with on average 18 emergences per day, followed by a long period with high emergence rates.

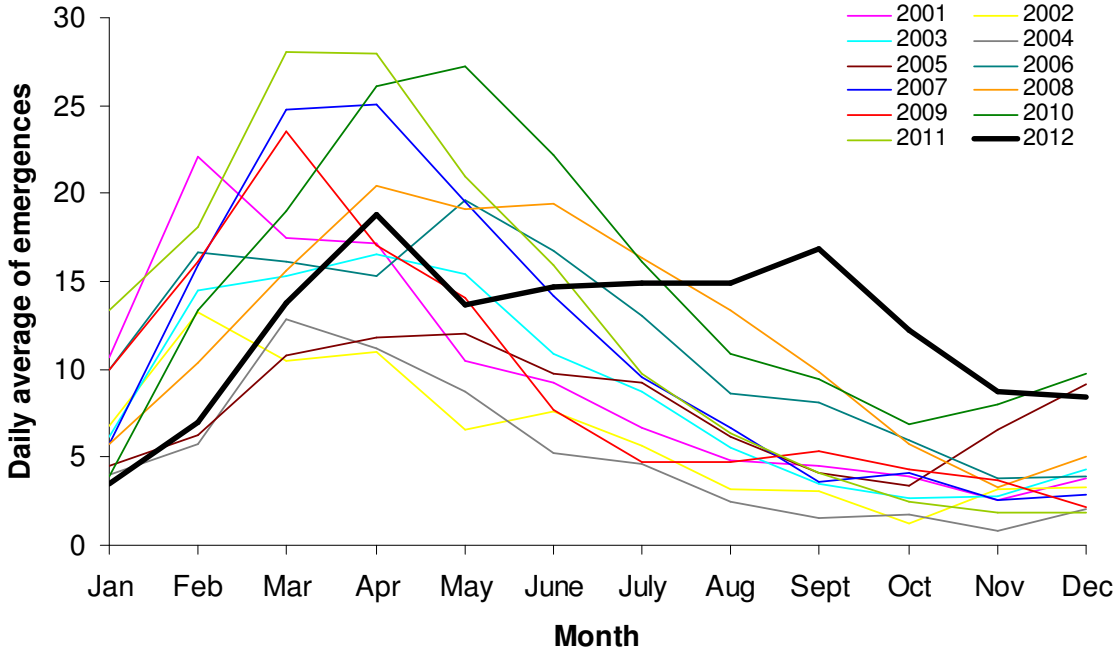


Figure 15. Daily averages of green turtle emergences throughout the year on Settlement Beach, for the period 2001-2012. The graph shows the timing and height of the nesting peak. As turtle tracks counts on SB were not conducted on daily basis before 2006, daily averages instead of monthly totals are taken.

Reasons for the difference may vary. In a publication by Mortimer *et al.* (2012) it was suggested that nesting seasonality of green turtles could be associated with sea surface temperatures (SST). Another possibility could be that reproductive females form separate foraging groups that forage at different feeding grounds, and that differences in the arrival of these groups influence the extent and shape of the feeding peak. Another important factor is the abortion of generator usage in March with the initiation of the PV system, which could also have played a role in nesting patterns. A more detailed investigation of the number of emergences per zone does hardly support the latter hypothesis: in 2012, after the abortion of generator usage, the number of emergences in zone 1 (the zone closest to the Station) did not increase (Figure 16a). However, there has been a gradual rise of green turtle nesting activity in zone 1 (Figure 16b). Note that zone 1 does typically yield less emergences due to the smaller size compared to the other zones.

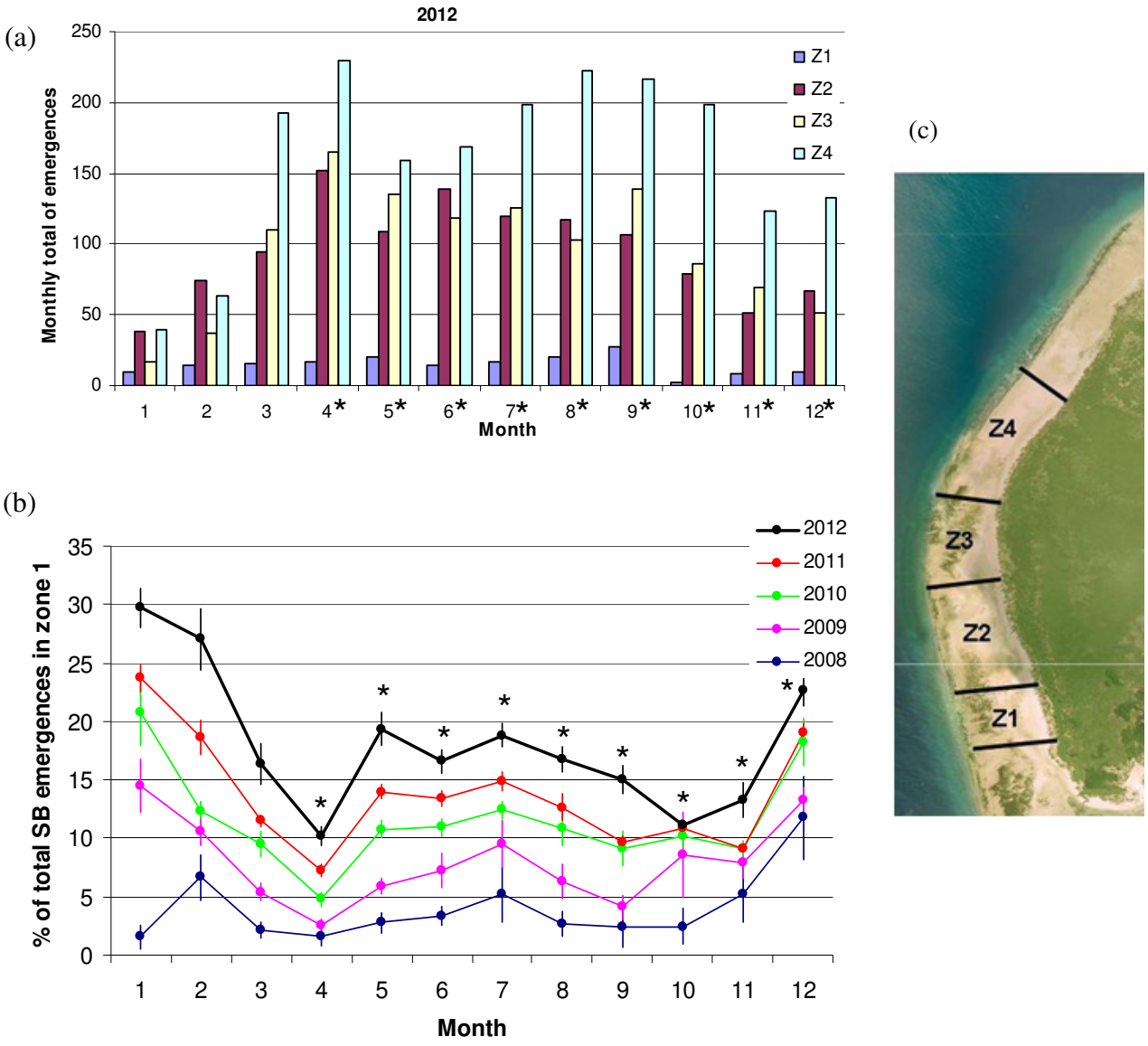


Figure 16. (a) Monthly totals of emergences counted per zone on SB in 2012, and (b) monthly averages of emergence counted in zone 1 as percentage of the total number of counts on the whole SB over the past five years (* = months in which the generator was not used). The location of the zones is shown in (c).

Despite the difference in seasonal pattern, 2012's annual total of emergences was comparable to that of previous years (Table 4). With a total of 4426 emergences, 2012 ended up on the third place after 2010 (5211 emergences) and 2011 (4500 emergences).

Table 4. Total number of emergences on Settlement Beach for each year in the period 2000-2012.

Year	Total # track counts done	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**	**11.15**
2008	**354**	**4189**	**3547**	**211**	**431**	**11.83**
2009	**365**	**3407**	**2774**	**209**	**424**	**9.33**
2010	**365**	**5211**	**4627**	**199**	**385**	**14.28**
2011	**360**	**4500**	**3789**	**232**	**479**	**12.5**
2012	**359**	**4426**	**3690**	**278**	**458**	**12.33**

West Grand Terre

Turtle track counts on West Grand Terre are normally done twice per month, either by foot or – when seas are rough – by boat. In previous years the nesting peak at WGT seemed to be timed later than the peak at SB, occurring between May and July instead of March - April. In 2012, the WGT peak was building up slowly to a maximum average of ca. 80 tracks per month in August / September (Figure 17).

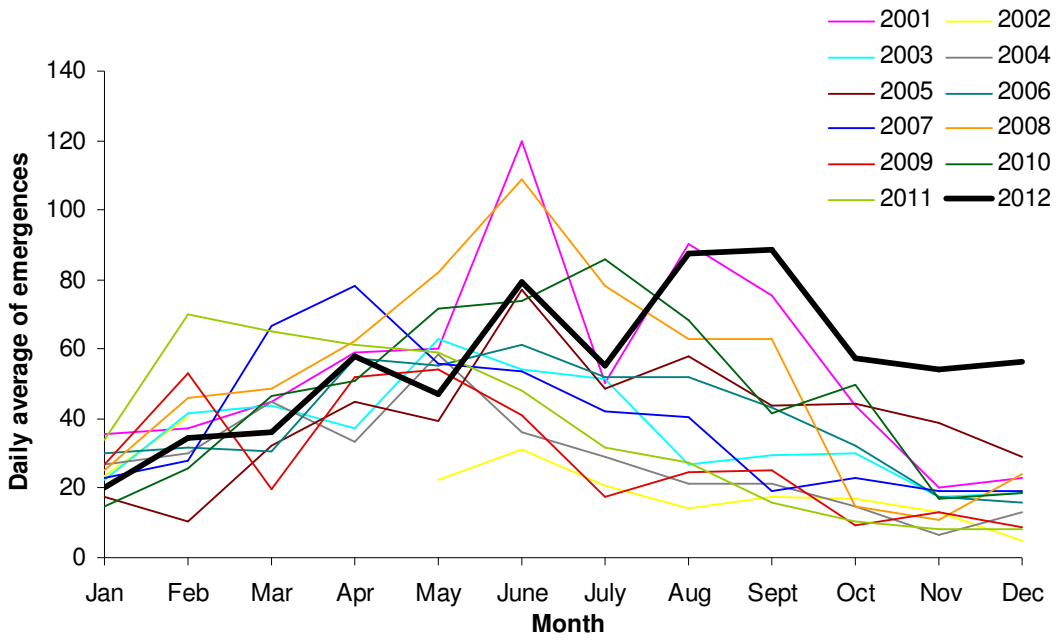


Figure 17. Daily averages of green turtle emergences throughout the year on WGT, for the period 2001-2012.

3.1.2. Track counts of hawksbill turtles

During the period September–March, track counts of hawksbill turtles are conducted every two weeks on the beaches in the inside of the lagoon. According to Mortimer (see Turtle track count Field Protocol 2009), probably less than 30 hawksbill females emerge yearly on Aldabra. With the current efforts there are too few data to reliably interpret the results (Table 5). More surveys should be done on a regular basis to get more insight in daily patterns, but this is only possible on the days that the morning tide is sufficiently high to access the lagoon. During these high (spring) tide circumstances, surveys are however problematic because the water level nearly reaches the top of the beaches and tracks may be washed away. If more information is to be gained on hawksbill nesting, more camping trips to these beaches, in combination with regular surveys (more often than twice a month) should be conducted.

The question why hawksbills do nest in the lagoon rather than on the outside beaches remains to be answered. Possibly, hawksbill turtles avoid the outside beaches as these intensively used for nesting by the more dominant green turtles. Besides the potential competition in the water, the many green turtles could destroy hawksbill nests, which generally are dug less deeply. Another hypothesis is that the sand structure on most crests of the outside beaches is too dry and 'loose' for hawksbills to nest than the lagoon beaches, which have finer sand and are moister owing to the denser vegetation. There is little data on outside nesting, and only very few sightings of hawksbill tracks are recorded. Jeanne Mortimer requested if the team could focus on picking up hawksbill tracks. Extra attention was given to distinguishing hawksbill tracks (they have a different 'footprint' pattern) during the track counts on Settlement Beach and on camp, and to observing possible hawksbill emergences during afternoon boat trips along the outside reef. The extra attention did not result in many hawksbill emergence sightings: only one hawksbill female was encountered nesting on beach 43 (Malabar) in January. It was newly tagged, and unfortunately no sample was taken as there was no sampling gear present at the Malabar camp.

Table 5. Monthly totals of hawksbill turtle emergences on the lagoon beaches in 2010, 2011 and 2012, with in brackets the number of surveys conducted.

Month	Total number of hawksbill emergences (# surveys)		
	2010	**2011**	**2012**
January	n/a	2 (1)	2 (1)
February	n/a	5 (2)	2 (2)
March	1 (2)	0 (2)	0 (0)
September	0 (2)	n/a	0 (2)
October	3 (2)	4 (2)	1 (2)
November	2 (2)	4 (3)	4 (2)
December	11 (2)	2 (1)	2 (1)
Total	**17 (10)**	**16 (11)**	**11 (11)**

3.1.3. Turtle tagging

In 2012, 446 nesting green turtles were encountered during tagging missions. 187 Turtles were newly tagged, and there were also many re-sightings both of turtles tagged earlier in the season or in earlier years (Table 6). During in-water tagging mission ('rodeo') in the lagoon, 78 turtles were captured, of which most were green turtles.

Table 6. Summary of turtles encountered / tagged during tagging operations in 2007-2012.

Year		2007	2008	2009	2010	2011	2012
Green turtles							
Nesting	Encountered	346	378	126	126	148	**446**
	Newly tagged	231	219	56	71	85	**187**
	Re-sighted	115	159	70	55	63	**259**
In-water	Encountered	106	66	33	12	41	**46**
	Newly tagged	97	62	27	9	34	**43**
	Re-sighted	9	4	6	3	7	**3**
Total newly tagged		**328**	**281**	**83**	**80**	**119**	**302**
Hawksbill turtles							
In-water	Encountered	42	38	17	7	20	**32**
	Newly tagged	**30**	**20**	**10**	**2**	**11**	**23**
	Re-sighted	12	18	7	5	9	**9**

The 'tag search databases' on the Fileserver contains all tagging information from 1995 onwards. According to the databases, 3364 individual nesting green turtle females have been tagged since 1995 (see Figure 18). Since 1996, 713 green turtles and 303 hawksbill turtles have been tagged during in-water tagging events.

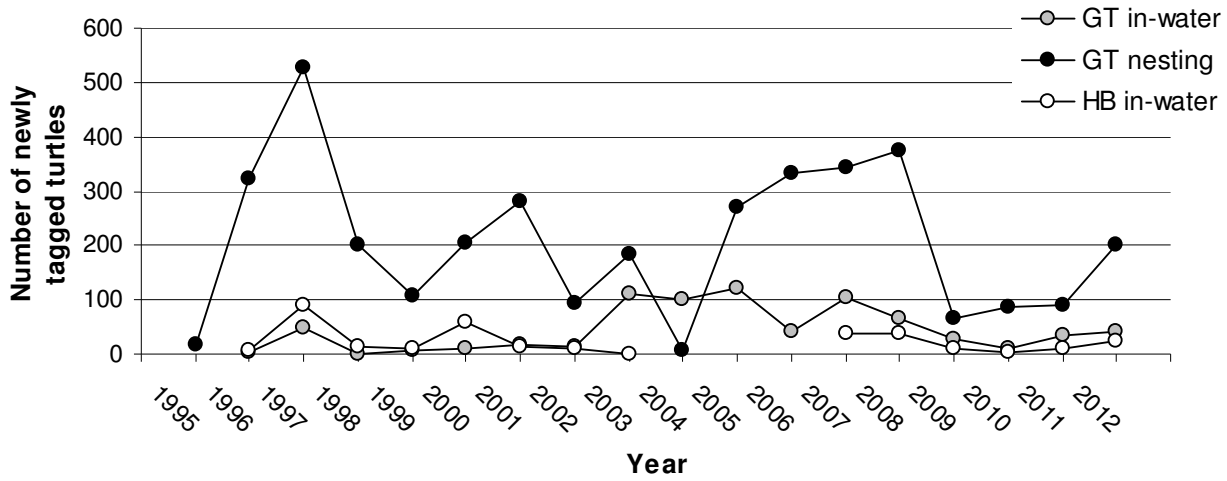


Figure 18. Atoll-wide yearly totals of newly tagged green and hawksbill turtles in the period 1995-2012.

The 'tag search database' can also be used to look up the re-sighted turtles. Figure 19 shows all re-sightings (excluding re-sighted turtles that were first tagged in 2012 and turtles that were re-sighted in the same year as in which they were tagged). The 'oldest re-sightings' were five turtles that were first tagged in 1996. Note that no turtles that were first tagged in 2010 and 2011 were encountered. This agrees with literature reporting that female green turtles may return repeatedly to the same nesting grounds after intervals of only two, three, four or more years spent at their feeding grounds (Carr *et al*. 1978, Hughes 1982, Mortimer 1988).

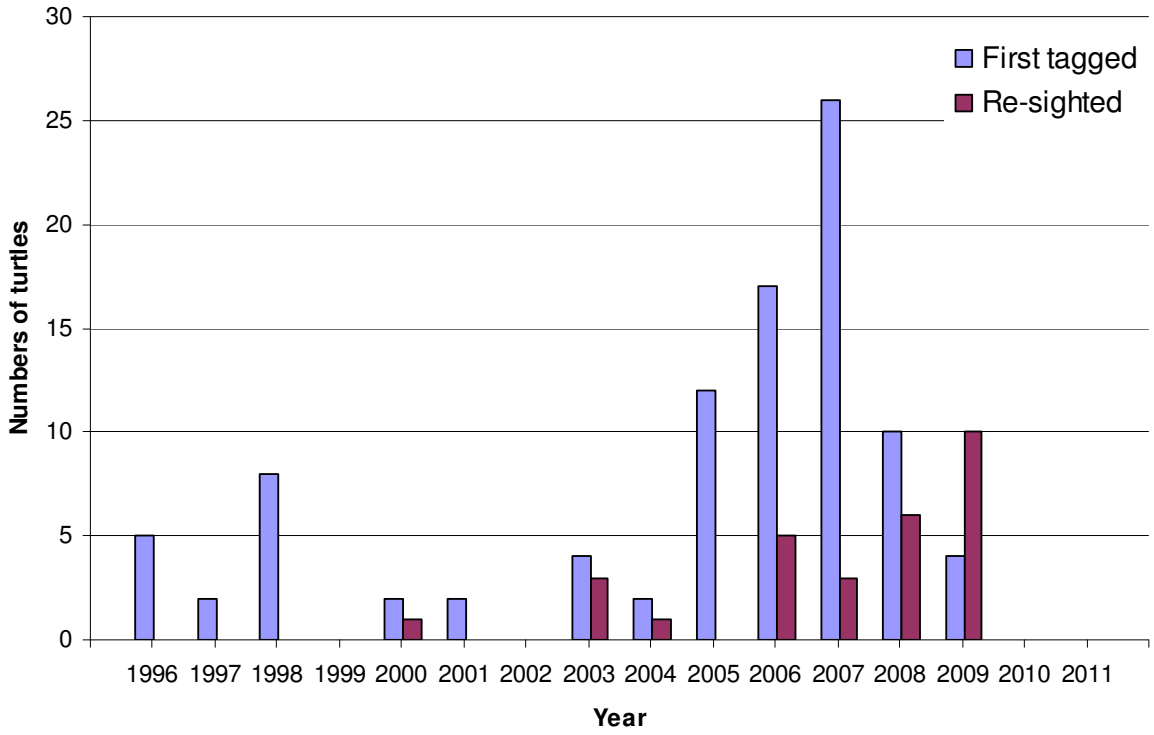


Figure 19. Turtles captured in 2012 and first tagged or re-sighted in previous years.

A few turtles were re-sighted between the year of first tagging and 2012 (Figure 19, Table 7). It seems that mainly turtles tagged / re-sighted in 2005, 2006 and 2007 were returning in 2012. Table 7 shows the turtles with multiple sightings over the years: some individuals were sighted with intervals of four years (SEY4626/E0264 and SEY4638/ SCA2113). However, it is important to note that it is delicate to interpret these data, e.g., as tagging is not done every (full) night many emergences have been missed and the dataset does thus not entail the full number of emergences.

Table 7. Green turtles captured in 2012 with one or more re-sightings in previous years.

Date	Right tag	Left tag	First tagged	Re-sighting1	Re-sighting2
21/02/2012	E0066	SCA4383	1996	2006	
23/02/2012	SCA2142	SCA2143	2008	2009	
23/02/2012	E0066	SCA4383	1996	2006	
27/03/2012	SCA2142	SCA2143	2008	2009	
27/03/2012	none	SEY3258	1998	2003	
21/04/2012	SCA2142	SCA2143	2008	2009	

23/04/2012	E0066	SCA4383	1996	2006	
23/04/2012	SCA2142	SCA2143	2008	2009	
23/04/2012	E0066	SCA4383	1996	2006	
27/04/2012	SCA2142	SCA2143	2008	2009	
27/04/2012	none	SEY3258	1998	2003	
07/05/2012	SEY5861	SCA0366	2003	2007	
07/05/2012	SEY8014	SCA3144	2005	2008	
08/05/2012	SEY8461	SCA3145	2006	2009	
08/05/2012	SEY8461	SCA3145	2006	2009	
18/05/2012	SEY5861	SCA0366	2003	2007	
08/06/2012	SEY8545	SCA2198	2006	2009	
30/06/2012	SEY8014	SCA3144	2005	2008	
06/07/2012	SEY8545	SCA2198	2006	2009	
12/07/2012	SEY1860	SCA4728	1997	2006	
01/08/2012	SEY5838	---	2003	2008	
09/08/2012	SEY4626	E0264	1996	2000	2008
03/09/2012	SEY5895	SCA2084	2003	2008	
15/09/2012	SEY4638	SCA2113	2000	2004	2008
25/09/2012	SCA5776	SCA0466	1998	2007	
25/09/2012	SEY6337	SEY0851	1997	2003	

3.1.4. Green turtle satellite tagging

Background
In the beginning of 2011, a grant from ISSF was received that made it possible to establish a new direction to Aldabra's turtle monitoring programme: the satellite tracking of a number of female green turtles to identify areas they migrate to forage. The data will help improve understanding of which threats these turtles are exposed to away from Aldabra and how these can be addressed.

A successful atoll-wide monitoring and flipper-tagging programme on the turtles has been operating for over 40 years and is producing important data. However, despite being such a significant site and thousands of tagged turtles, satellite telemetry has never been used on turtles from Aldabra and it is not known to where these breeding turtles migrate. This is essential to understand the threats they are exposed to when away from Aldabra either within the Seychelles or further afield.

Since turtles are highly migratory species, to effectively conserve them it is vital to understand the linkages between breeding and foraging sites. Potential trans-boundary issues can only be identified and addressed using such a holistic approach. Tagging returns have produced some data but, even after decades, such findings are limited and labour intensive, with up to several hundred tagged turtles required for a single tag return (elsewhere) and indicative of only a single location of the turtle. Satellite tracking therefore has clear additional benefits to the long-term tagging programme.

The method of tag application can be found in the ASC Annual report of 2011.

Results
Six turtles were tagged (Table 8). Not all turtles were given names, as it was planned to organize a school competition with as prize the name-giving of a turtle.

Table 8. Satellite-tagged turtles and details of their transmissions.

Name	Sat tag ID	Metal tag ID (R/L)	Date sat-tagged	Date departure Aldabra	Lost signal when & where
Monique	108797	SCA3123/SCA3155	17 Oct 2011	7 Nov 2011	7 Dec 2011, Remire Island (Amirantes)
Wilna	108798	SCA4323 / SCA4324	23 Feb 2012	10 Mar 2012	Aldabra
Constance	108793	SEY3326 / SCA4427	22 June 2012	17 Sept 2012	Nosy Valhila, Northern Madagascar
Roxanne	108794	SCA4582 / SCA4584	26 June 2012	22 Sept 2012	Mombasa, Kenya
Janice	108795	SCA0135 / SCA0136	08 July 2012	03 Aug 2012	Mogadishu, Somalia
108796	108796	SCA4554 / SCA4556	10 July 2012	08 Aug 2012	Aldabra

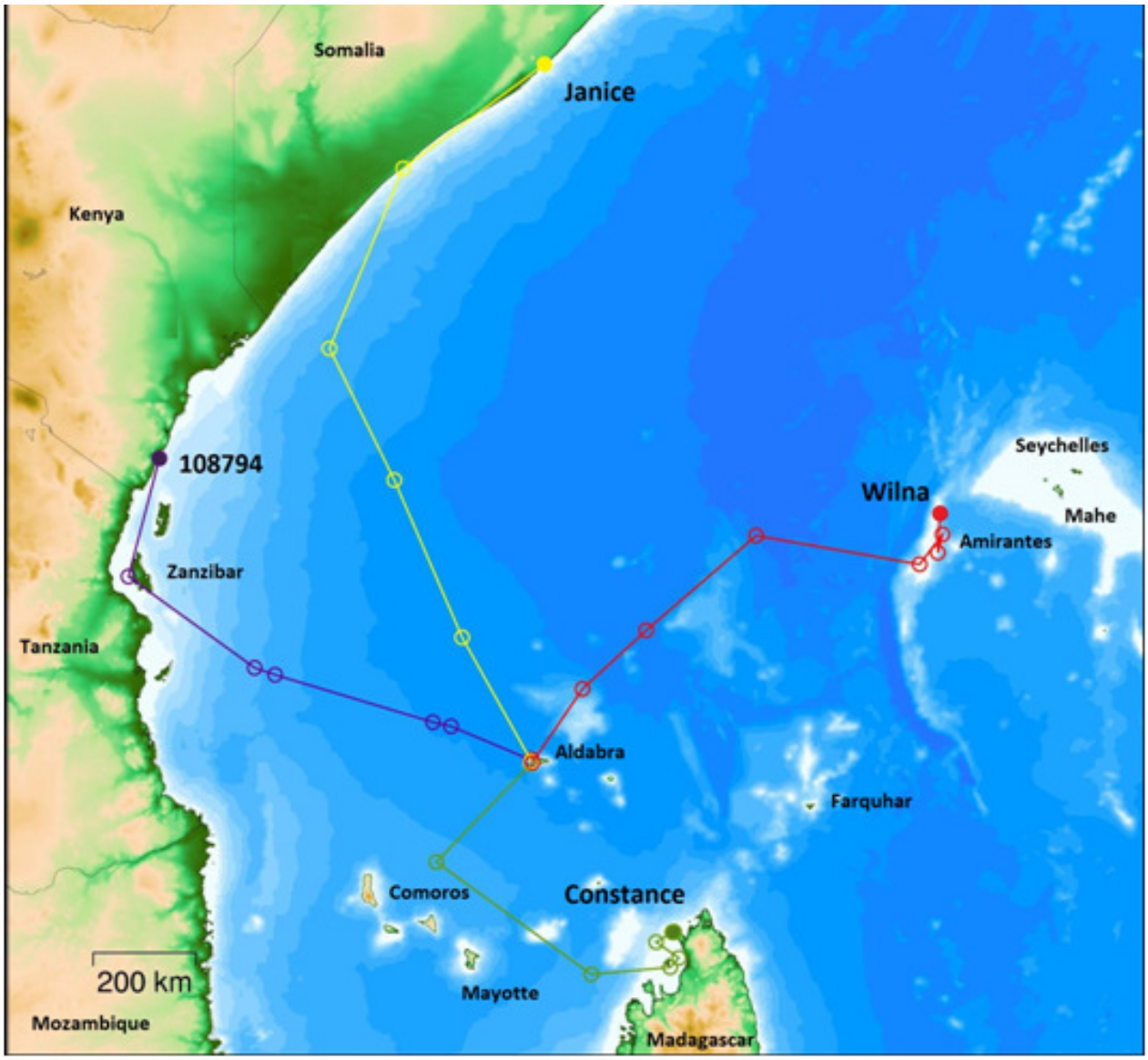


Figure 20. Travels of all six sat-tagged turtles.

Discussion
Of the six deployed tags, four yielded very interesting post-breeding migration data (Figure 20). The two others had not yet left Aldabra when the tag stopped transmitting (Table 9). The data of the four tags so far confirmed that Aldabra's nesting green turtle females disperse in different directions that they use the waters of at least six different countries. Despite of the bad luck of early tags failure / loss, this is extremely interesting and deserves a follow-up study.

Table 9. Summary of transmission data received by the various satellite tags.

Tag	Location	Deployment date	Last transmission	# Days of data transmission	Displacement
108797 Monique	226	17/10/2011	07/12/2011	51 days	928 km
108798 Wilna	93	23/02/2012	10/03/2012	16 days	21 km
108793 Constance	257	22/06/2012	17/09/2012	87 days	425 km
108794	323	26/06/2012	22/09/2012	88 days	930 km
108795 Janice	230	08/07/2012	03/08/2012	26 days	1369 km
108796	229	10/07/2012	08/08/2012	29 days	1 km

The transmission might be lost due to the following reasons, but is related either to the adhesive (epoxy) or anti fouling paint used:

- **Anti-fouling paint on GPS antenna:** Suggestion from turtle researcher Colin Limpus (professor at Queensland University): if the tags are not protected by anti-fouling paint over the GPS antenna, then the rapid growth of algae will hold seawater on the surface of the tag when the turtle surfaces to breathe. Apparently it only needs about 1mm of seawater to prevent reception of the GPS satellite transmission. This will give the impression that the tags are lost. Our transmission data does seem to show poorer before loosing the signal which might support Coin's hypothesis. However, the Sirtrack protocol states specifically NOT to paint the antenna.
- **Epoxy:** The tags could have been knocked off due to a weak attachment. The epoxy that was used to attach the first two tags was over date, and new epoxy was ordered and used for the next four tags. Still the tags stopped transmitting. Martijn contacted MASepoxy explaining our protocol; curing times between layers, ambient temperature, humidity etc, but got no reply. The epoxy used by us is a different brand than stated in the Sirtrack attachment protocol, but does have similar properties.Colin Limpus' research group uses fibre glass strips to bridge between tag and carapace to create a broader area of attachment.

As we do not want to risk the loss of more expensive tags, the project has been put on hold until it is clear why the tags stopped transmitting.

Seaturtle.org
The site has not been set up yet as the project has not yet been finalized.

3.2. Subsistence fishing

In 2012 Aldabra staff conducted 46 subsistence fishing trips, of which 28 trips involved both bottom fishing and trolling, nine trips involved only trolling and nine trips involved only bottom-fishing. A total of 1111 fish were caught that weighed in total 3893 kg (Figure 21), which was similar to 2011 (when 55 trips yielded 1316 fish with a total weight of 3807 kg) but over double as much as in 2010 (37 trips, 567 fish, total weight 1742 kg). The increase in the last two years is mostly due to larger staff occupation: a team of contractors was present to build the PV system power house (October 2011 – Feb 2012, see large catches during these months in Figure 21), EC invasive bird eradication project (Aldabra providing fish to Assumption) and visiting researchers (ZARP, Reef Mapping Team).

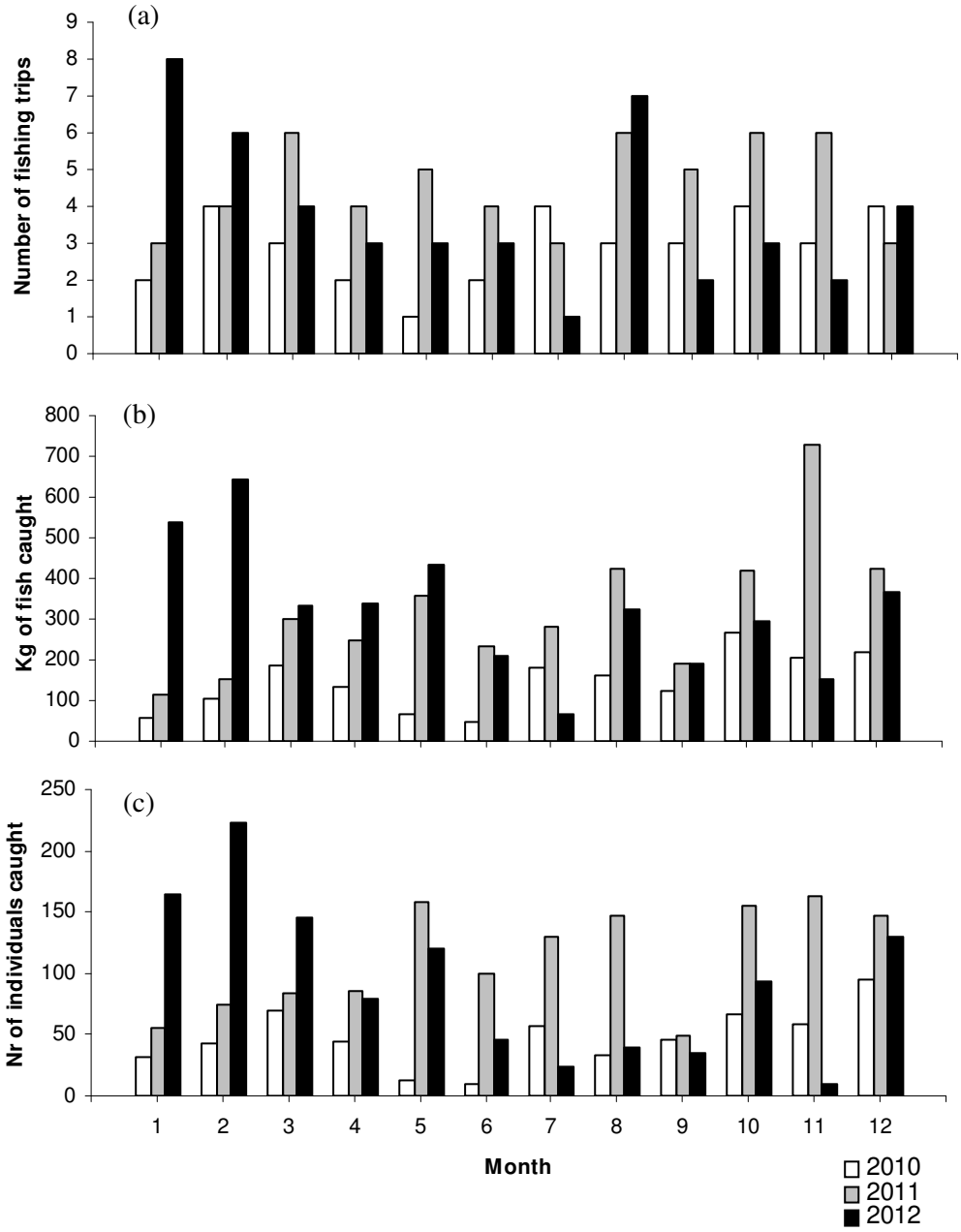


Figure 21. (a) Monthly subsistence fishing efforts in 2010, 2011 and 2012, along with (b) monthly numbers of individuals and (c) kg of fish caught.

Every fishing trip the catch details and weight / length data are recorded, and these can be used to calculate the catch per unit effort (CPUE). This statistic, that takes into account the number of fishing lines * the number of hours, gives a measure for effectiveness of catching. Figure 22 shows that trolling in general yield more fish (both in number and weight) than bottom fishing, but there is quite some variation between trips. This large variation is caused by the fact that very large fish are caught by trolling, whereas the fish caught by bottom fishing are more constant in weight. Trolling was most effective in the first few months of the year.

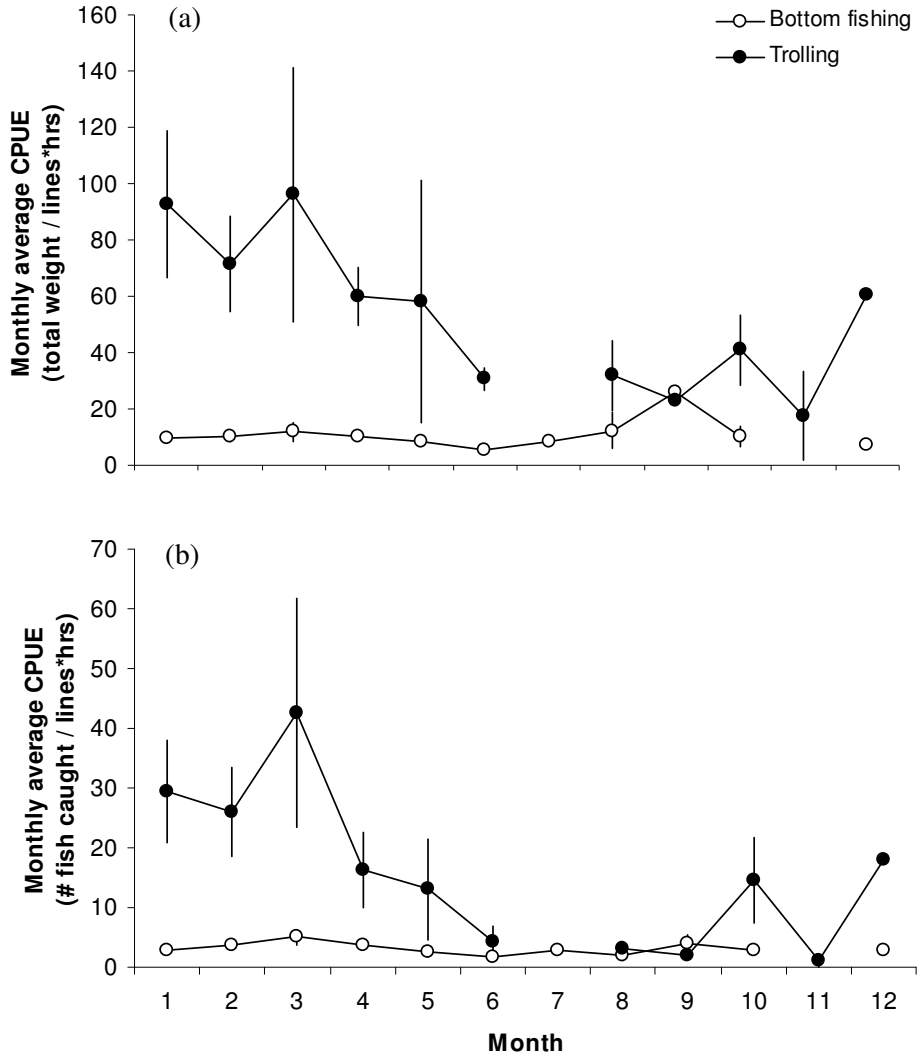


Figure 22. Monthly averages of the (a) weight and (b) number of fish caught (calculated as Catch Per Unit Effort (CPUE), i.e., number of fishing lines*number of hours).

Table 10 shows a list of all fish caught in 2012. The total weight caught consisted of more than twice as much kg of bottom (demersal) fish caught (2584.1 kg, 968 individuals) than pelagic fish (1252.3 kg, 134 individuals). The three most caught species of bottom fish were: (1) Varavara, (2) Kwasan and (3) Vyey plat (see Table 10 for English / scientific names), and for the pelagic fish the same top three included: (1) Karang ledan, (2) Tonn zonn, and a shared (3) of Karang ver and Kin fis.

Table 10. Summary of measurements of all the fish caught during subsistence fishing trips in 2012.

Species	*Species (Latin)*	Nr. of indivi-duals caught	Total weight (kg)	Average weight (kg) ± s.e.	Average length (cm) ± s.e.
Demersal fish					
Bengal/Bluestripe snapper / madras	*Lutjanus bengalensis*	1	0.2	0.2	25.4
Blacksaddled coralgrouper / Babonn Sesil	*Plectropomus laevis*	5	43.8	8.76 ± 0.72	78.4 ± 2.65
Blacktip grouper / Madanm dilo	*Epinephelus fasciatus*	3	0.7	0.23 ± 0.15	18.3 ± 9.15
Brown marbled grouper / Vyey goni	*Epinephelus fuscoguttatus*	15	96.7	6.44 ± 0.86	67.83 ± 3.34
Brown spotted grouper / Vyey makonde	*Epinephelus chlorostigma*	1	3.9	3.9	57.3
Camouflage grouper / Vyey masata	*Epinephelus polyphekadion*	102	291.3	2.86 ± 0.12	51.32 ± 0.80
Common bluestripe snapper / Pwason femme	*Lutjanus kasmira*	1	0.4	0.4	25
Coral/flagtail hind or Foursaddle/Honeycomb grouper / Vyey zannannan	*Cephalopholus miniata/urodeta or Epinephelus spilotoceps/merra*	12	9.8	0.89 ± 0.14	35.16 ± 1.19
Giant grouper / Vyey krab	*Epinephelus lanceolatus*	2	54	27 ± 8.5	107.85 ± 3.35
Grouper / Vyey	*Epinephelus*	1	7.5	7.5	73.5
Humpback red snapper / Terez	*Lutjanus gibbus*	4	2.8	0.7 ± 0.12	31.35 ± 1.44
Marbled coral grouper / Vyey babonn	*Plectropomus punctatus*	2	15.4	7.7 ± 2.8	73.75 ± 9.75
Moontail seabass/Yellow edged lyretail / Kwasan	*Variola louti*	182	407. 7	2.24 ± 0.06	47.72 ± 0.51
Potato bass / Vyey toukoula	*Epinephelus tukula*	4	56.1	14.03 ± 2.33	92.28 ± 4.91
Red mouth grouper / Vyey galfa	*Aethaloperca rogaa*	2	4.7	2.35 ± 0.05	50.5 ± 5.5
Red sea grouper / Red sea grouper	*Cephalopolis hemistiktos*	1	1.2	1.2	37.2
Redgill/slender/pink ear emperor / Baksou	*Lethrinus rubrioperculatus/variegatus/lentjan*	4	4.7	1.18 ± 0.21	39.63 ± 1.92
Rovin coral grouper / Babonn zannannan	*Plectropomus pessuliferus*	4	39.6	9.9 ± 3.96	77.88 ± 15.18
Snubnose emperor / Madanm beri	*Lethrinus borbonicus*	1	0.5	0.5	29.5
Snubnose grouper / Vyey sat	*Epinephelus macrospilos*	1	1.4	1.4	48.5
Spangled emperor / Kaptenn rouz	*Lethrinus nebulosus*	138	380.1	2.75 ± 0.09	51.61 ± 0.53
Trigger fish / Bours	*Balistidae spp*	2	2.5	1.25 ± 0.05	36.5 ± 1
Twinspotted red snapper / Varavara	*Lutjanus bohar*	308	715	2.32 ± 0.09	45.36 ± 0.61
Whiteblotched grouper / Vyey plat	*Epinephelus multinotatus*	169	435.4	2.58 ± 0.09	50.70 ± 0.53
Yellowlip emperor / Bawa	*Lethrinus xanthochilus*	3	8.8	2.93 ± 0.30	53.83 ± 0.83
Total demersal fish		**968**	**2584.1**		

Pelagic fish					
Barracuda / Barracuda	*Shypraena spp*	1	0	0	0
Bluefin trevally / Karang ver	*Caranx melampygus*	11	58.8	5.35 ± 0.40	61.9 ± 1.53
Bonito/Kawakawa / Bonit	*Euthynnus affinis*	5	11.35	2.27 ± 0.45	47.58 ± 4.54
Dogtooth tuna / Ton ledan	*Gymnosarda unicolor*	8	130.9	16.36 ± 3.92	101.04 ± 7.93
Dolphin fish / Dorad	*Coryphaena hippurus*	1	3	3	80.5
Giant trevally / Karang ledan	*Caranx ignobilis*	62	471.44	7.60 ± 0.60	69.92 ± 1.71
Great barracuda / Tazar	*Shyraena barracuda*	4	19.5	4.88 ± 3.54	53.83 ± 32.63
Green jobfish / Zob gri	*Aprion virescens*	7	27.56	3.94 ± 0.84	63.37 ± 4.55
Rainbow runner / Galate	*Elagatis bipinnulata*	1	4.2	4.2	67.4
Sailfish / Sailfish	*Istiophorus platypterus*	1	42.5	42.5	217.6
Wahoo / Kin fis	*Acanthocybium solandri*	11	145.35	13.21 ± 1.28	124.56 ± 3.41
Yellowfin tuna / Ton zonn	*Thunnus albacares*	22	337.7	15.35 ± 1.51	91.37 ± 3.41
Total pelagic fish		**134**	**1252.3**		
Other / Other	Other	9	56.3	6.26 ± 4.48	69.68 ± 23.62
Grand total		**1316**	**3806.6**		

3.3. Marine mammals

3.3.1. Cetaceans

The first humpback whale (Figure 23) observation of 2012 was dated on July 11th, and the humpback season lasted until October 19th. In this period, 48 sightings of humpback whales were recorded (Figure 24; compared to 66 sightings in 2011). Of 2012's sightings, 15 sightings included one individual, 25 sightings included two individuals, five sightings included three individuals, and there were three sightings of four individuals. Unlike last year, when the pairs or groups often included young calves, only one sighting this year included a calf. In addition to the lower number of sightings, the whales were also markedly less 'showy' in their behaviour: compared to last year less breaching, fluking and spy-hopping was seen.

Figure 23. Three adult humpback whales were observed from very close by Aldabra staff and visitors of the Lady Anja II (*photographs by P. Katerl*)

Whenever possible, photos were made for sake of recognition of individual tail patterns. These were sent to Michel Vély (www.megaptera.org) for investigating whether individuals seen on Aldabra are the same as those seen in the region of Réunion, Mayotte, Madagascar and the Comores.

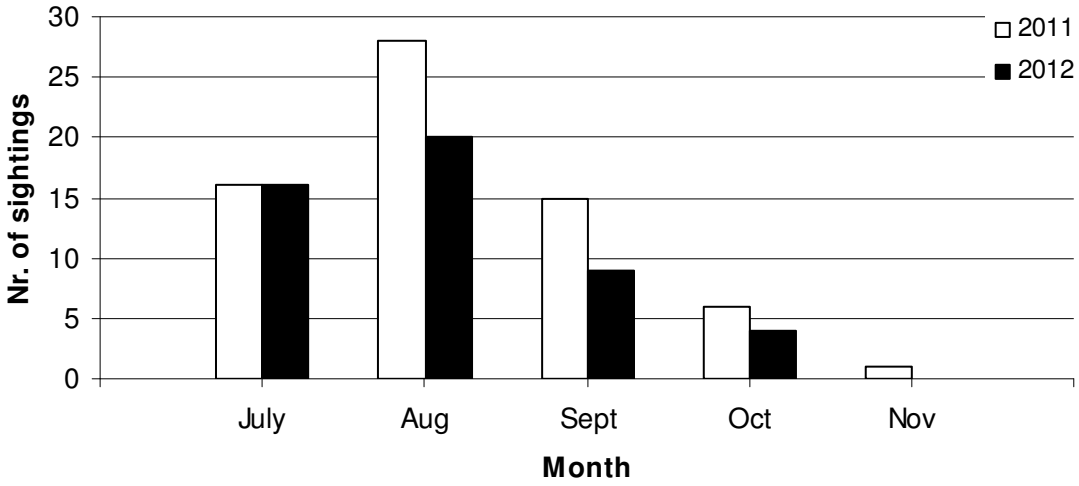


Figure 24. Monthly distribution of humpback whale sightings in the 2011 and 2012 season.

Other whale sightings included a small group of minke whales (April 20th, three individuals seen off-shore at Cinq Cases) and a group of pilot whales (December 19th, a group of 10-15 individuals seen halfway on the crossing from Aldabra to Assumption).

Throughout the year, 29 sightings of spinner dolphins were recorded, ranging from five to 150 individuals per sighting and spotted on different location all around the atoll. In November two sightings of groups of bottlenose dolphins were recorded (a group of 50-70 individuals in front of Station and a smaller group of 15-25 individuals off South Grand Terre).

3.3.2. Dugongs

A dugong was sighted on the outside of Aldabra Atoll during a fishing trip (boat: Bizou) on February 20th 2012 at around 2pm. The animal was spotted by all seven staff onboard, i.e., Murvin Green (skipper), Peter Haverson (ringneck parakeet and GEP project), Barney Marengo (logistics assistant), Ranger Andy Gouffé, and three EMS construction workers. The adult dugong was swimming approximately 50m off the reef edge just past the north end of Settlement Beach (i.e., between Settlement Beach and Anse Var). Unfortunately no photographs were taken as there was no camera onboard.

When the animal was initially spotted by Murvin Green, about 25m away from the boat, it was swimming in between green seaweeds / algae. Only the head was sticking out of the water, possibly eating the algae. Shortly afterwards it dived down and Murvin saw the rest of the body including the tail, which had a pale brown colour. No obvious scars or wounds were noticed. Then he alarmed the rest of the staff onboard. Murvin stopped the boat and searched, and everybody saw it again with the head sticking out of the water, about 35m away from the boat. The dugong was swimming away from them towards the Settlement. It swum on the surface, sometimes diving and coming up again. Murvin tried to alert the Station but got no reply. They followed the dugong for 15 minutes before turning around and continuing the fishing trip.

4. TERRESTRIAL ENVIRONMENT

4.1. Giant tortoises

4.1.1. Regular transect monitoring

The currently used long-term database contains monitoring data of 12 tortoise transects around the atoll at monthly intervals, in the period from 1998 until present. The database includes data on the sizes of tortoises in the form of the widths of their third dorsal scute.

Plotting of the long-term tortoise encounter rates on the transects (Figure 25) shows that population trends are generally stable. Seasonal patterns are visible on each of the transects. Note that the y-axes of the panels in Figure 25 differ in their scales, meaning that encounter rates differ largely between the transects.

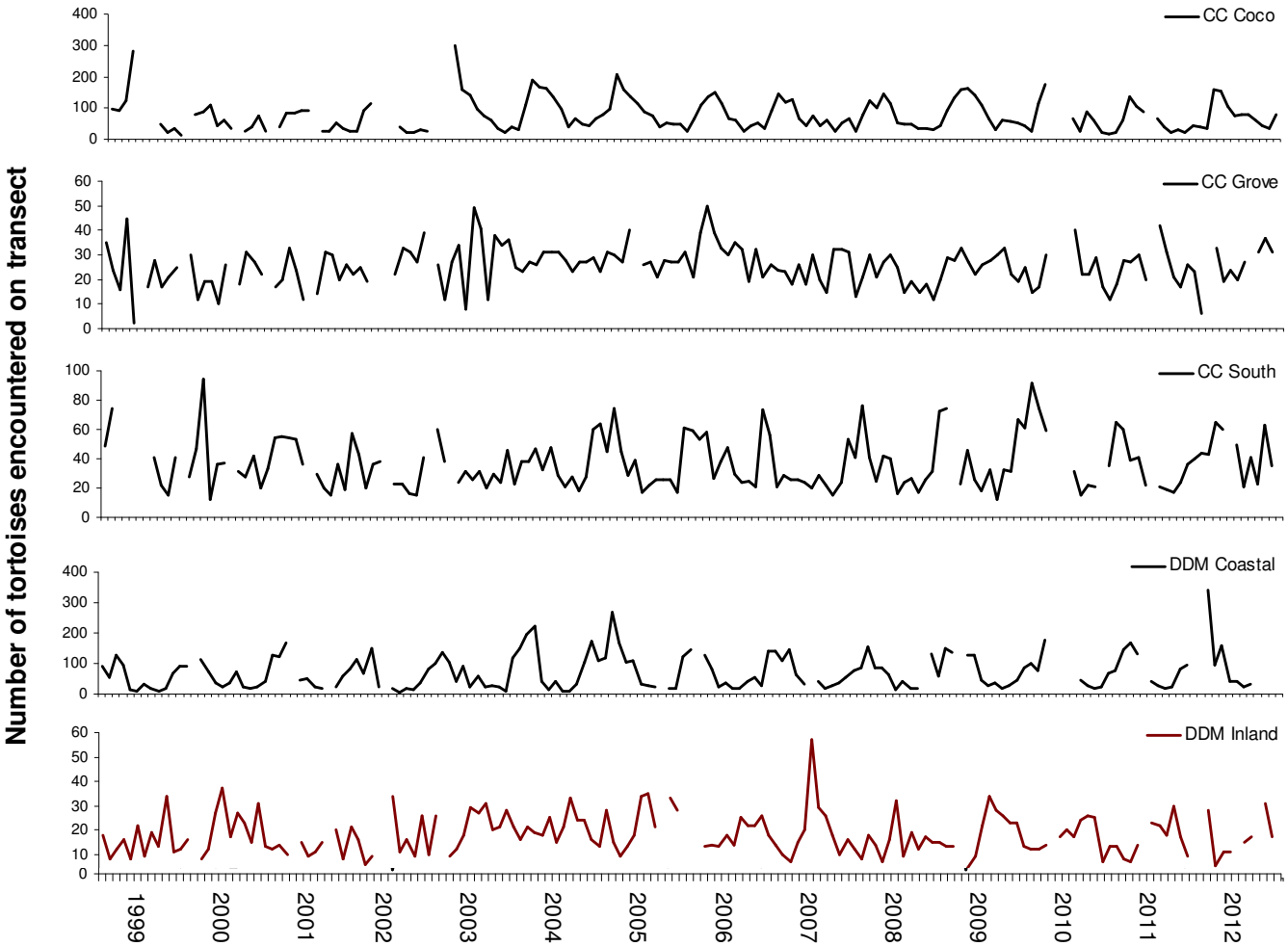


Figure 25. Long-term trends (1999-2012) of numbers of tortoises encountered on all 12 tortoise transects

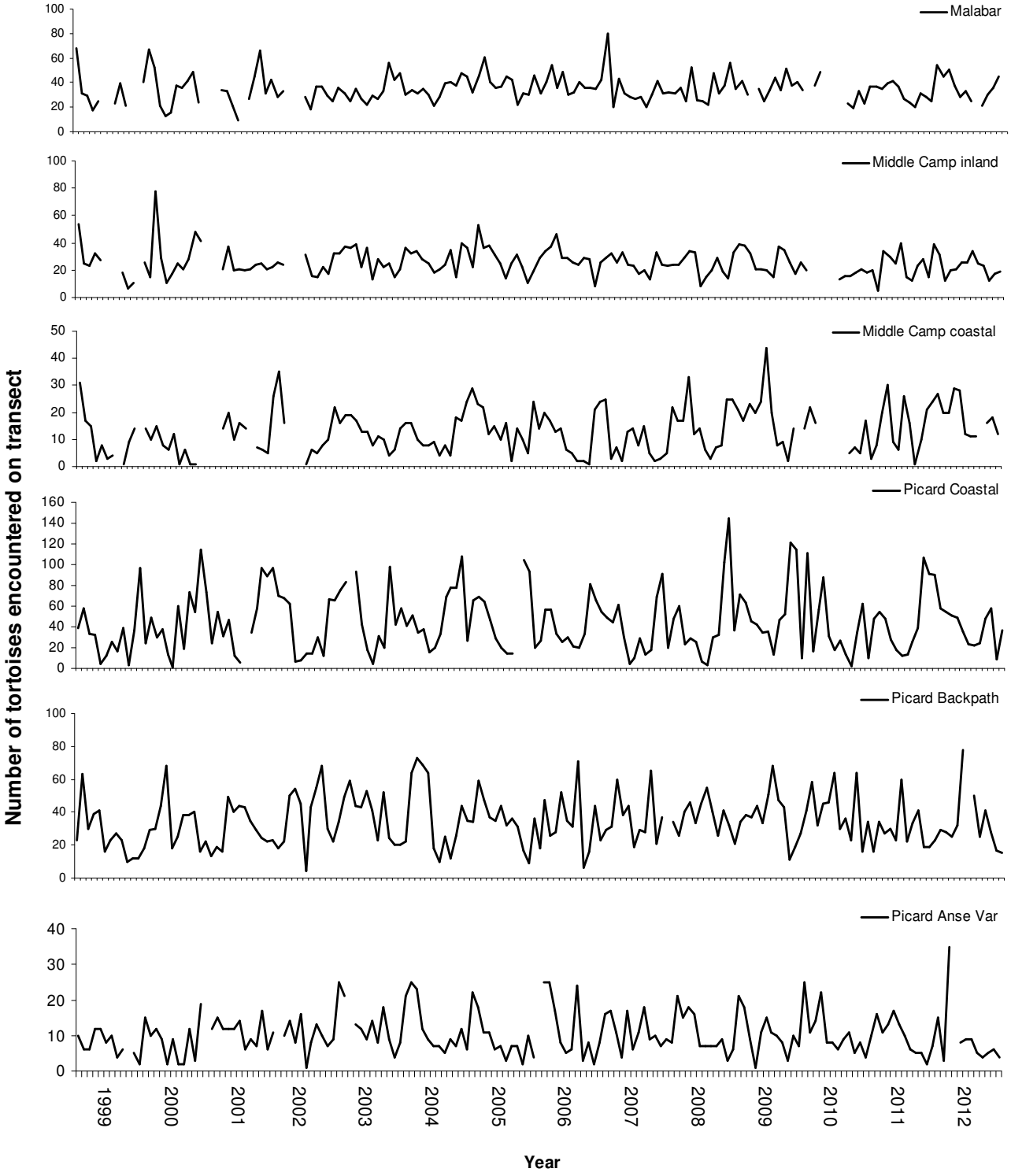


Figure 25 (cont.). Long-term trends (1999-2012) of numbers of tortoises encountered on all 12 tortoise transects.

Figure 26 shows the size differences (measured by 3rd scute size) between the different islands. Tortoises on Grand Terre are in general much smaller than those on Malabar and Picard. On the two latter islands, sex differences are much more pronounced than on Grand Terre. With the ever-changing team composition of research staff, it is important that all observers are well trained in how to measure the third scute and are urged to look out for baby tortoises as well (these are easy to overlook). These factors are important in keeping the data consistent over time.

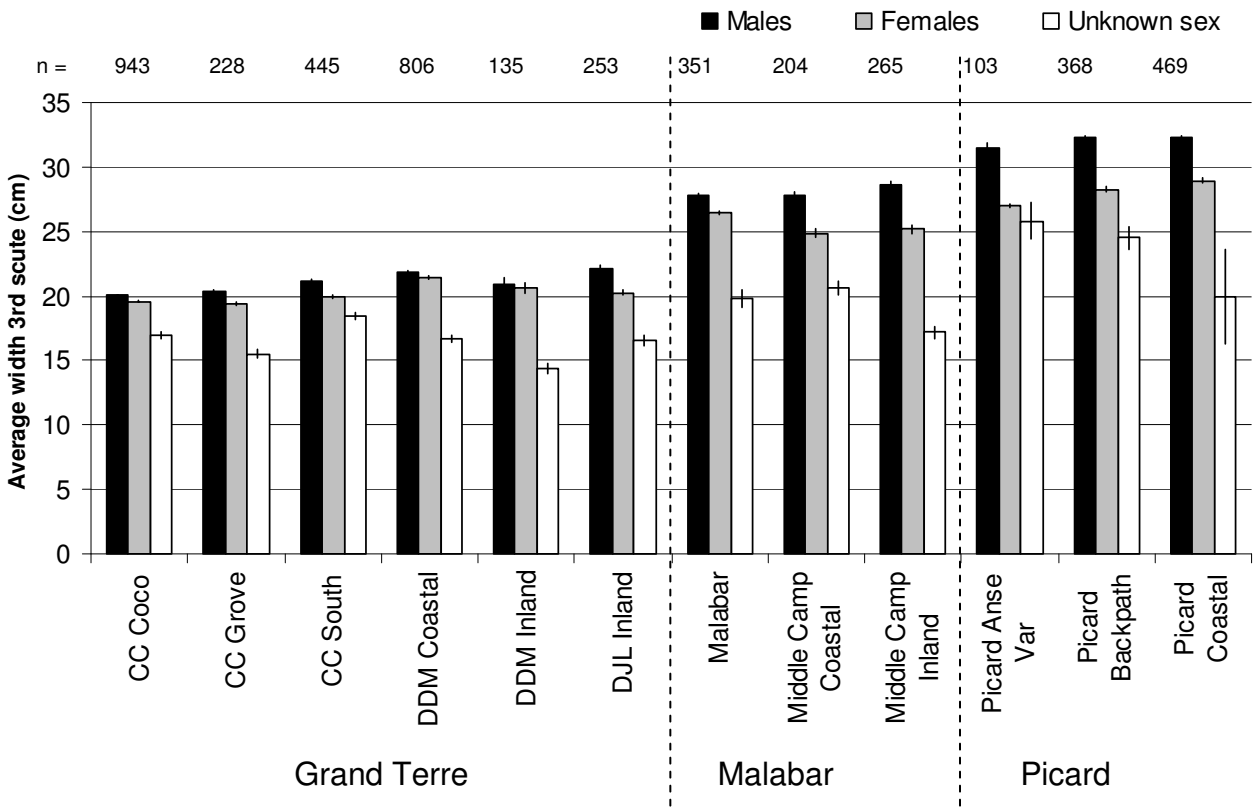


Figure 26. Average (± standard error) scute widths of tortoises encountered on the 12 transects in 2012.

4.1.2. ZARP project (Zurich-Aldabra Research Platform)

Background

The ZARP project that was started in September 2011, has been running throughout 2012 with the presence of Project Officer Rich Baxter. The long-term study of the Aldabra giant tortoises is a collaboration led by SIF and four post-doctoral researchers from the University of Zurich (Dr. Dennis Hansen, Dr. Erik Postma, Dr. Gabriela Schaepman-Strub and Dr. Lindsay Turnbull). Key objectives for the project focus on: (1) marking, measuring and sampling a large proportion of the Picard island tortoise population to provide 'baseline' data for the majority of an island's wild tortoise population; (2) giant tortoise population dynamics and genetics; (3) linking tortoise densities and behaviour to vegetation dynamics; and (4) linking vegetation dynamics to climate variability and trends (see 2011 ASC Annual report for more details).

ZARP Project Officer

Achievements for the ZARP project are as follows:

- Developed marking method and blood collection techniques
- Toasted: 1003 tortoises were marked on Picard
- Blood samples from Picard: 347
- Blood samples from other islands: 144
- 86 tortoises were weighed on Grand Terre, 28 tortoises were weighed on Malabar
- 27 tortoises were weighed on Picard, including Gato who has an average weight of 117.3kg
- Blood smears were taken from 8 tortoises on Picard
- A successful trial was completed for collecting and spinning down large blood samples for hormone analyses
- 31 GPS transmitters and iButton (temperature loggers) were attached to tortoises around the atoll. 8 on Picard, 6 on Malabar and 17 on Grand Terre

- The tag data was downloaded throughout the year showing movement patterns of individuals (see Figure 27)

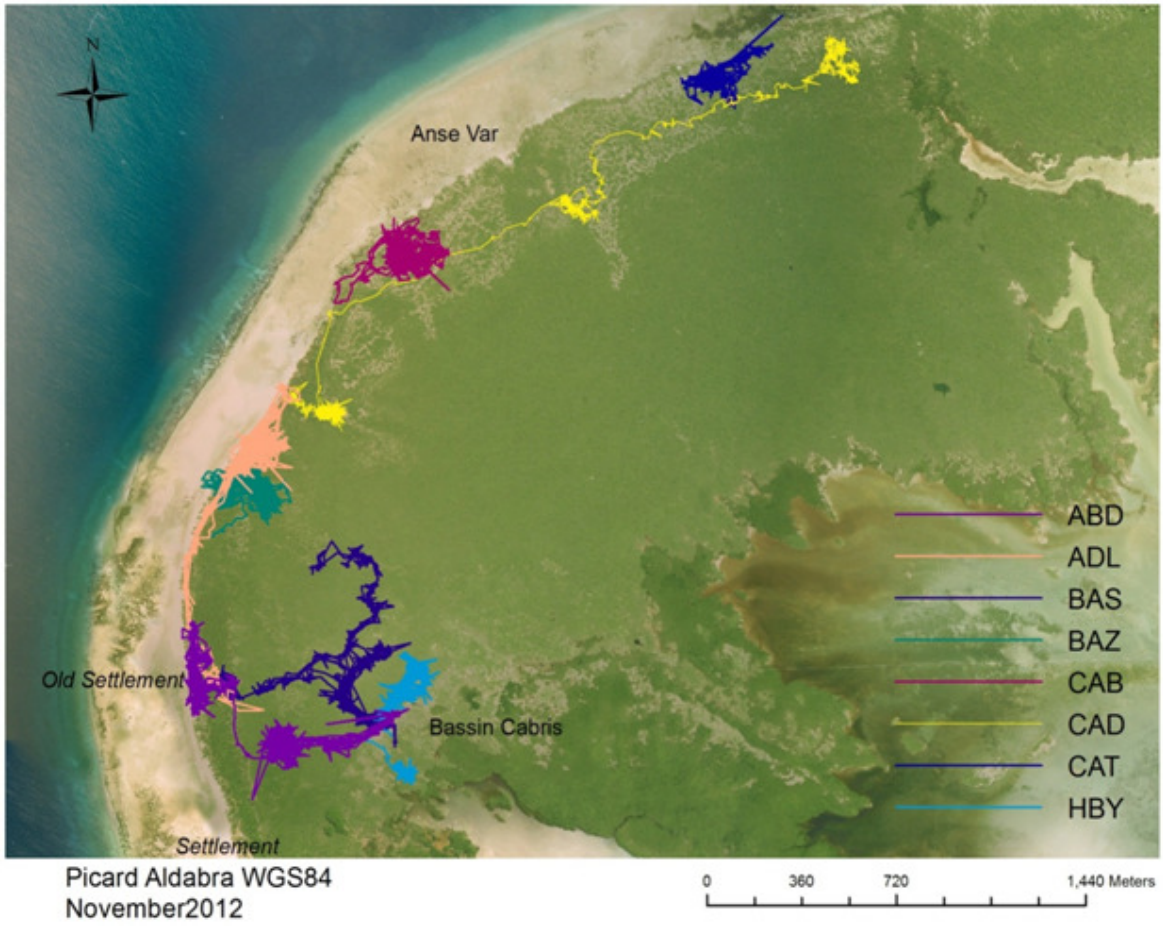


Figure 27. GPS transmitter movement patterns of giant tortoises on Picard

- Front right humerus bones were collected from 4 deceased tortoises on Grand Terre and Picard. These are to be used to investigate life-history of the tortoises
- Ochna ciliate tree samples were collected from three different areas on Aldabra: Picard, Dune d'Messe and Cinq Case. Ten samples were taken from each area and transported to Zurich. They will be used to investigate seasonal productivity compared with satellite image analysis
- All tortoise monitoring transects were walked to reclassify vegetation along each section to see if any changes have occurred over the past 15 years
- All transect sections were marked by GPS and photographed
- Seasonal vegetation change throughout the year was photographed on Picard Backpath and Coco Transect on Grand Terre
- 9 juvenile tortoises of known maternity were enclosed to investigate development and to collect blood samples from to identify the father. One juvenile that was injured during an attack by a rail was added to cohort
- Polymnie searches to find of tortoise habitation. No evidence so far has been found.
- A survey of Ile Michel was carried out and it has a population of 23 tortoises
- Tortoise dissection (Figure 28)
- Training rangers in toasting and blood collection techniques

Figure 28. Necropsy of male giant tortoise and investigation of stomach / gut contents (*photographs by Janske van de Crommenacker*)

4.1.3. Tortoise food preference experiment (*contributed by Dennis Hansen*)

During his visit in April – June, external ZARP Researcher Dr. Dennis Hansen conducted a food preference experiment with as aim to investigate the role of colour in food preference of giant tortoises (Figure 29). Tortoises were presented with five differently coloured balls (~2 cm diameter) of cooked rice. The rice was coloured with food colour in the colours white, yellow, red, green, and blue. Rice balls were presented to actively foraging or moving tortoises in a random sequence, in a single row, spaced ~8cm apart, on a wooden board that was placed 20-180 cm in front of a tortoise. The colour of the first-chosen rice ball was recorded, as were the colours of any subsequently chosen ones. In total, more than 120 individual tortoises were tested, most of them on Picard, with a few each on Malabar and Grand Terre. The overall pattern of colour preference, from most to least preferred first choice, was yellow (~50%), white (~35%), red (~10%), blue (~3%), and green (~2%).

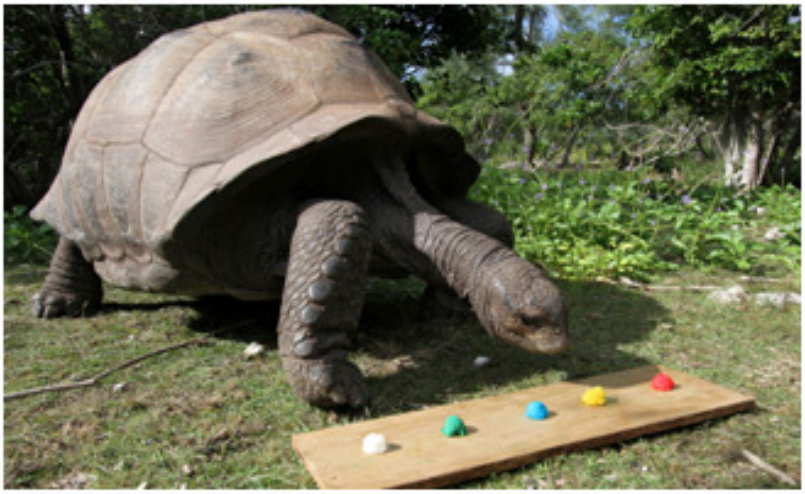


Figure 29. Dennis Hansen conducting a feeding experiment on Aldabra tortoises, who seemed to enjoy the participation (*photographs by Rich Baxter and Dennis Hansen*)..

4.2. Coconut crabs

Since 2006, coconut crabs are surveyed twice per month on both the Backpath and Coastal path (Picard), where all individuals within a 10-m wide transect are recorded. Collected data includes carapace length, colour morph, moult stage and sex. Also the weather circumstances and moon stage (the surveys are done in the evening after sunset) are recorded, of which the correlations with coconut crabs encounter rates are explained in the 2011 ASC Annual report. This report also contains an analysis of the carapace length data.

Seasonal patterns in encounter rates differ between the two locations (Figure 30): on Backpath there is a strong seasonal pattern in which more males are seen during February and March. In contrast, Coastal path no such distinct peaks are seen. In general, more males are seen than females and fewest crabs are encountered at the end of the dry season. The latter could be expected as the coconut crabs need a humid environment for their breathing organs to function.

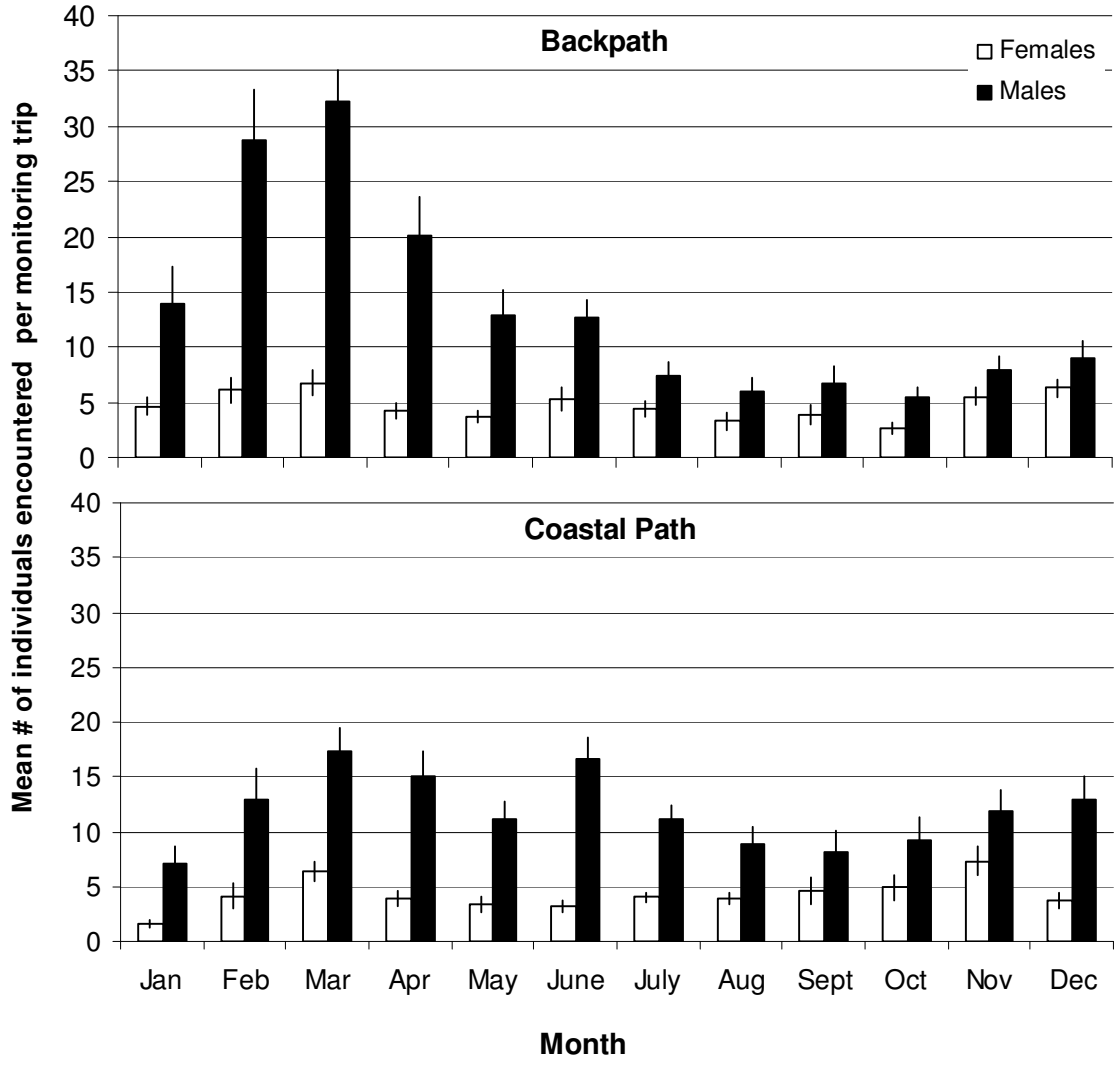


Figure 30. Seasonal patterns of coconut crab encountering rates (separated per sex), based on 2006-2012 data.

Plotting the seasonal patterns over the past six years (Figure 31) shows again that the seasonality is more obvious on the Backpath. Furthermore, encounter rates have been fairly stable on even somewhat increasing over time.

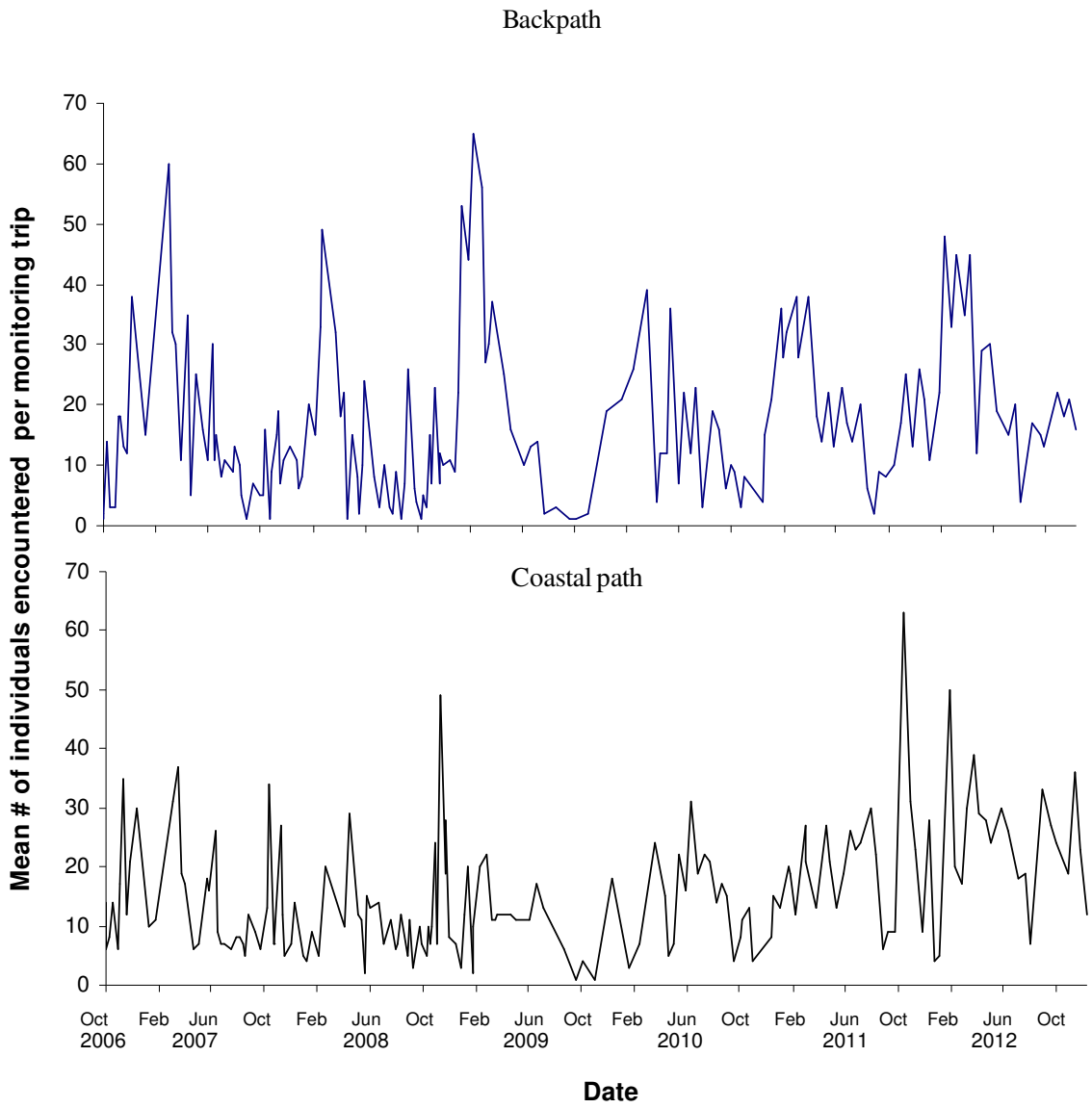


Figure 31. Mean number of individuals encountered per monitoring trip in 2006-2012.

When plotting the same data per year it appears that there is indeed an upward trend in encounter rates, particularly at the Coastal path (Figure 32).

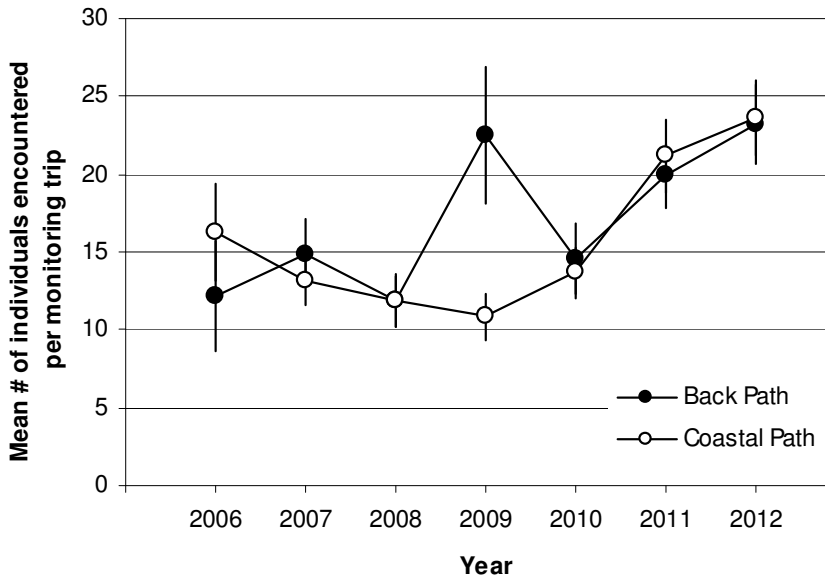


Figure 32. Mean number of individuals encountered per monitoring trip in 2006-2012.

4.3. Vegetation

4.3.1. Phenology transects

Phenology surveys are conducted twice a month, and each of the 33 species surveyed was represented by six individuals throughout. *Pandanus tectorius* and *Tournefortia argentea* are represented by three and four individuals respectively, as additional mature individuals of these species have not been found near the survey path.

Throughout the year a few monitored plants died and another plant of the same species was assigned as a replacement. The following plants were replaced:

- February: *Canthium bibracteatum* (ID: 5G), transect 2 (replacing dead plant with ID 5C)
- March: *Trianolepsis africana subsp. hildebrandtii* (ID: 26H), transect 1 (replacing dead plant with ID 26F, transect 3)
  Jasminium elegans (ID: 11G), transect 1 (replacing dead plant with ID 11D, transect 3)
- April: *Tournefortia argentea* died (transect 1), no replacement found as there are no other *Tournefortia*'s near the trails.
- August: *Tarenna supra-axillaris* (ID: 23G), transect 1 (replacing dead plant with ID 23F)
- September: *Solanum aldabrense* (ID: 22K), transect 1 (replacing dead plant with ID 22G)
  Solanum aldabrense (ID: 22L), transect 1 (replacing dead plant with ID 22I)

As the phenology program runs since 2009, it is possible to investigate variation in annual patterns. In Figure 33 patterns of leaf coverage and fruit presence are shown for a selection of six plant species. Judging from the figure there do not appear to be any remarkable differences between years, indicating that 2012 was a normal year. Plotting the data also brings forward the different strategies of species occurring on Aldabra (e.g., defoliation in the dry season (*Allophylus*, *Gagnebenia*, *Ochna*; Figure 33a, c, d) versus no defoliation (*Cassipourea*, *Pemphis*; Figure 33b, e) and fruits year-round flowering and fruiting simultaneously or successively, etc.). A more detailed summary of these species differences in characteristics can be found in the 2011 ASC Annual report.

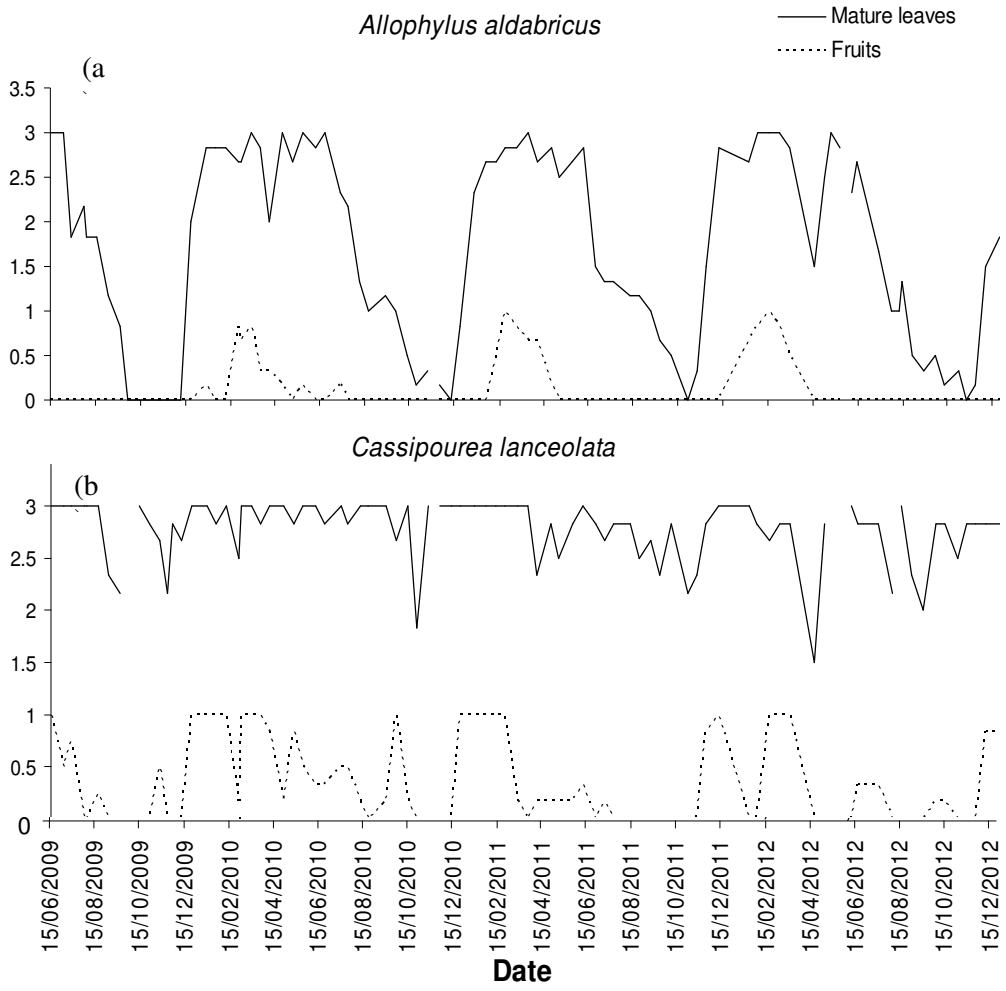


Figure 33. Average (± s.e.) phenology scores over time (2009-2012) of leaf coverage and fruit presence for a selection of five plant species: (a) *Allophylus aldabricus,* (b) *Cassipourea lanceolata,* (c) *Gagnebenia commersoniana var aldabrensis*, (d) *Ochna ciliata* and (e) *Pemphis acidula*.

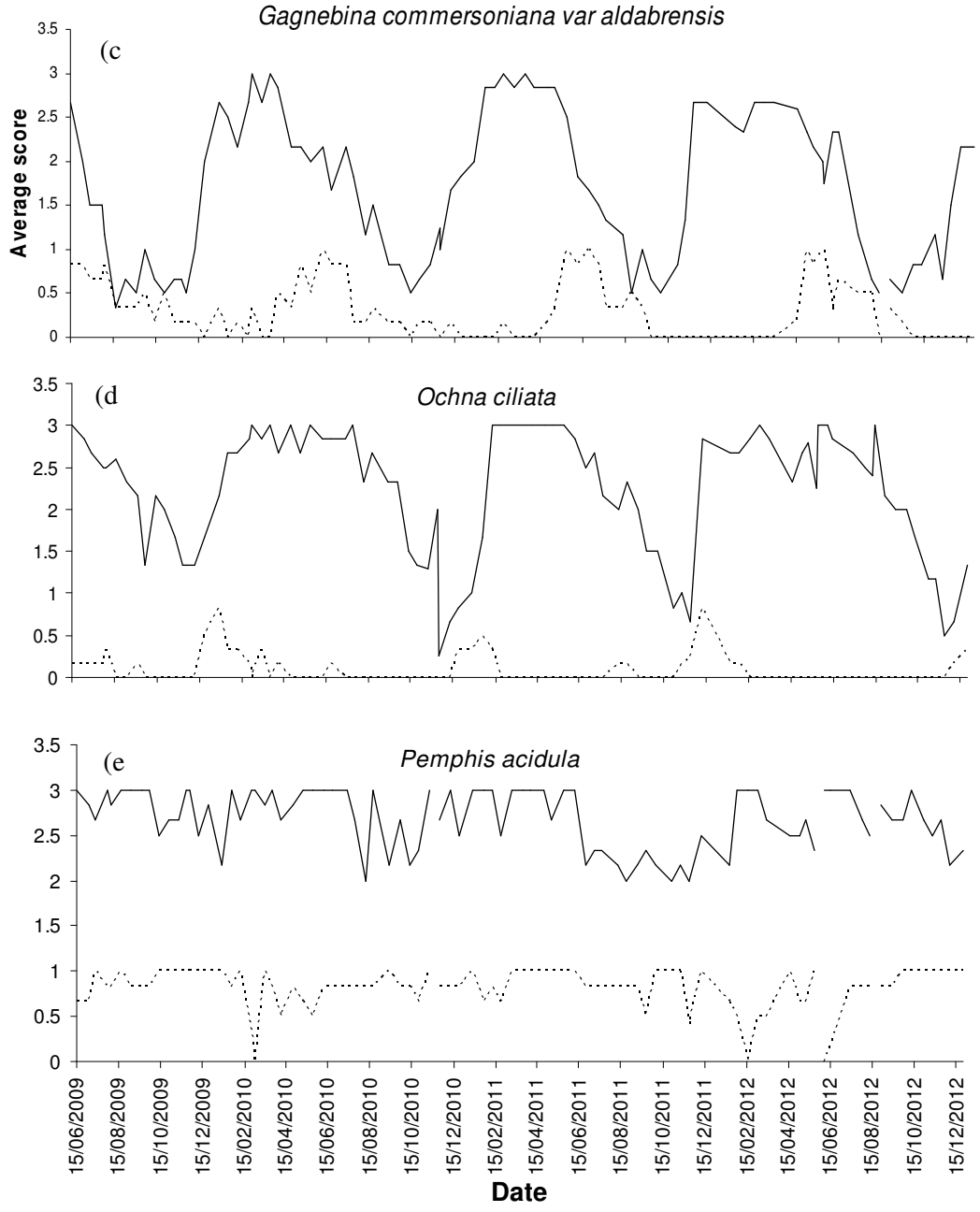


Figure 33 (cont.). Average (± s.e.) phenology scores over time (2009-2012) of leaf coverage and fruit presence for a selection of five plant species: (a) *Allophylus aldabricus,* (b) *Cassipourea lanceolata,* (c) *Gagnebenia commersoniana var aldabrensis*, (d) *Ochna ciliata* and (e) *Pemphis acidula*.

5. BIRDS

5.1. Land birds

5.1.1. Land bird transect point counts

Land bird data have been collected by means of roughly the same method since 1999. While writing up the land bird point count protocol a number of issues arose, which are reviewed in the 2011 ASC Annual report (i.e., observer bias, miscommunication between observers, seasonal variation in detection probabilities). A detailed assessment and revision of Aldabra's landbird monitoring programme is planned for 2013. Main aim is to take a more management directed approach, i.e. by providing feedback into active management, so to better align the monitoring with key aims of SIF regarding conservation of Aldabra. The programme should better account for the logistics and capacity of the Aldabra Research Station, and produce reliable, high quality data.

Figure 34. Roost of Comoro blue pigeons at Takamaka (*photograph by Janske van de Crommenacker*)

When analyzing the current land bird point count data, two issues should be considered:
- the total number of birds seen per transect should be divided for the number of counting points of that particular transect
- the occasions in which no birds of a particular species have been seen on a transect should be included in the calculation of monthly/yearly means. If this is not done, the outcome will be an overestimation as only the positive counts are included.

The long-term trends in Figure 35 show that no landbirds are visibly declining. Most species are stable over time (coucal, crow, drongo, fody, ibis, kestrel, rail), or increase compared to the last decade (blue pigeon, bulbul, white-eye, turtle dove, sunbird).

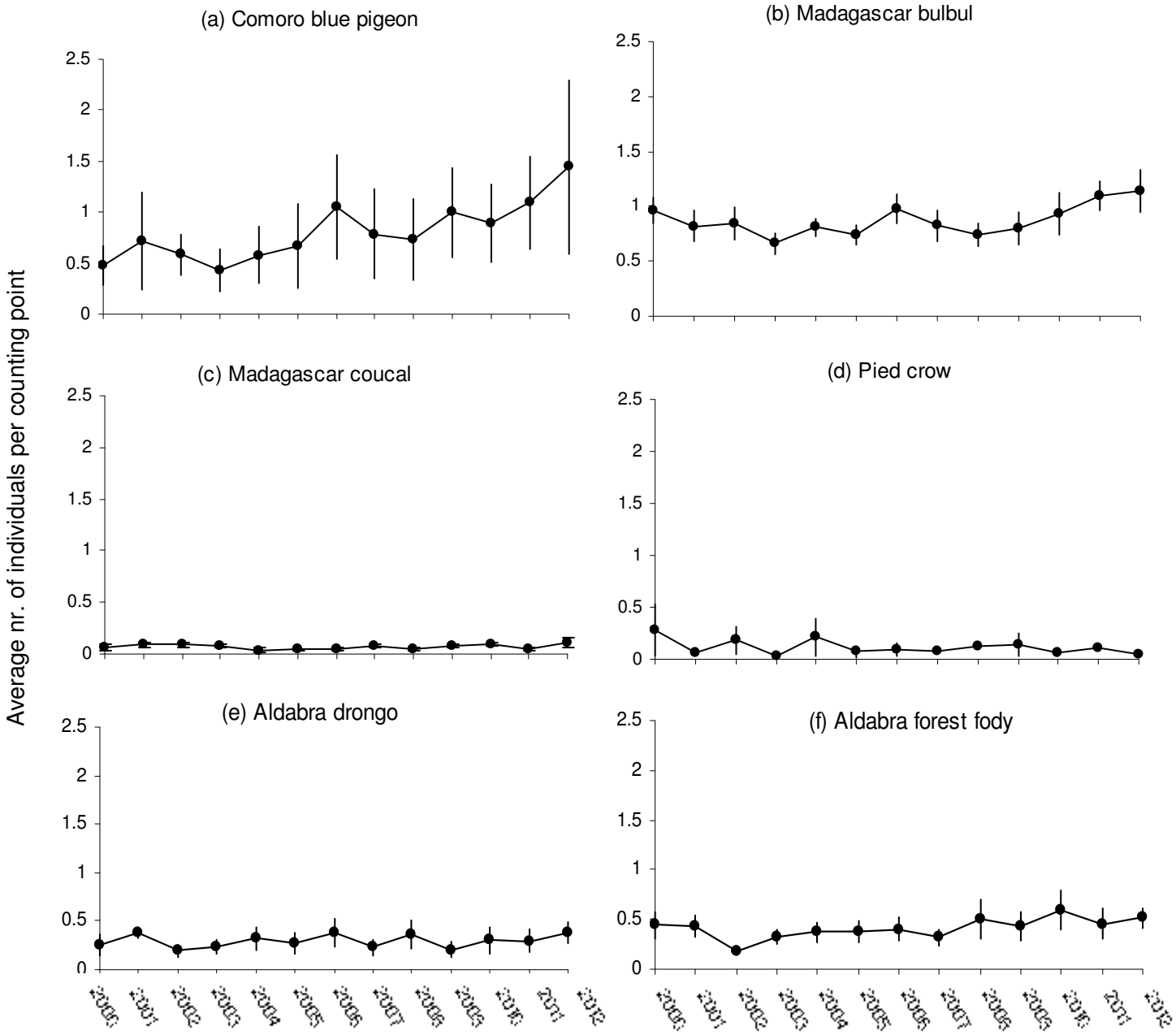


Figure 35. Trends in land bird counts (average # of birds per transect point ± s.e.) over all transects in 2000-2012. A plot for the Madagascar nightjar is omitted as these birds are very rarely detected in counts.

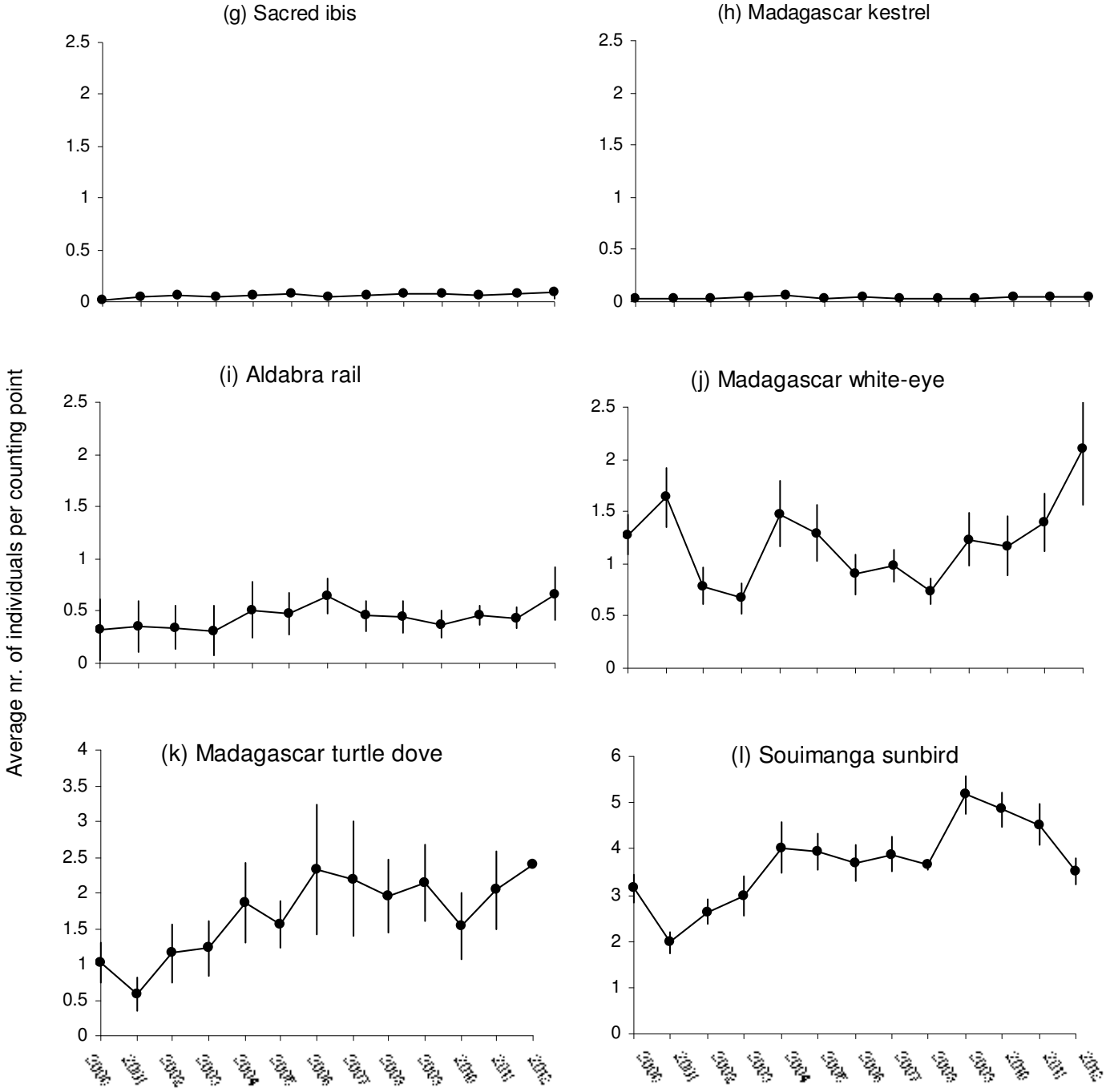


Figure 35 (cont.). Trends in land bird counts (average # of birds per transect point ± s.e.) over all transects in 2000-2011. Note that the y-axis scales of the panels k and l differ from the others.

5.1.2. Land bird genetics

The Aldabra drongo is currently the only land bird species living on Aldabra that is recognized as endemic. All other species are considered sub-species under the Madagascar species; however, this taxonomic status requires further investigation. DNA extracted from blood samples can be used for genetic analyses and determination of species status. From 2011 onwards, sampling of land birds has been started. Most species were caught using mistnets, only the rails were caught with a hand net. All birds were measured and sampled for DNA (from each bird two blood samples were taken; Table 11) and where possible birds received a unique combination of two plastic colour rings (one on each leg). Rails received one numbered metal ring (SAFrings, 7 mm diameter). The ringing of rails with a plastic ring has been aborted, as these were giving problems (sliding off, unfolding).

It is aimed to conduct the genetic analyses for taxonomic status determination and phylogenetic relationship of Aldabra's landbirds in 2013. Priority will be given to the Aldabra rail *Dryolimnas cuvieri aldabranus*, the Aldabra forest fody *Foudia eminentissima aldabranus*, the Madagascar bulbul *Hypsipetes madagascariensis rostratus*, and others will be analysed if time allows. A subsequent aim is to make recommendations for IUCN threat status listing based on red list criteria.

Table 11. List of land birds captured, sampled and ringed until end 2012.

Species	Latin name	# individuals sampled in 2011	# individuals sampled in 2012	Total samples collected so far	Locations of capture
White-throated rail	*Dryolimnas cuvieri aldabranus*	18	10	28	Settlement, Back Path, Anse Polymnie, Middle Camp
Madagascar bulbul	*Hypsipetes madagascariensis rostratus*	10	13	26	Coastal, Back Path, Anse Mais, Takamaka
Madagascar white-eye	*Zosterops maderaspatanus aldabrensis*	1	12	13	Back Path, Takamaka
Aldabra drongo	*Dicrurus aldabranus*	2	0	2	Back Path
Madagascar turtle-dove	*Streptopelia picturata coppingeri*	11	0	11	Settlement, Back Path, Anse Mais
Aldabra fody	*Foudia eminentissima aldabrana*	2	26	28	Settlement, Back Path, Takamaka, Anse Polymnie
Comoro blue pigeon	*Alectroenas sganzini*	0	2	2	Takamaka
Madagascar coucal	*Coua serriana*	0	1	1	Takamaka
Souimanga sunbird	*Cinnyris sovimanga*	0	11	11	Anse Polymnie, Takamaka, Middle Camp
Madagascar nightjar	*Caprimulgus madagascariensis aldabrensis*	1	0	1	Bassin Lebine trail

5.1.3. Land bird nesting success survey

As a side project in the time available between other projects, Michal Šúr (GEF Project Bird Survey Consultant) also conducted a land bird nesting success survey.

On islands where introduced predators pose a threat to the native species, regular monitoring of nesting success of endemic birds can provide information on their recruitment trends and conservation status. The black rat (*Rattus rattus*) is the main introduced nest predator on Aldabra. Yet its impact on nesting success of endemic land birds on Aldabra has not been studied in detail. Breeding success of multiple land bird species was studied by Wanless (2000-2001), but the data from this study have never been processed and no conclusions could be drawn. The data collected this time is insufficient to draw any conclusions but it provides a basis for more detailed and intensive study in the near future.

Nest monitoring in the 2011/2012 season started in mid-November 2011 when the breeding commenced. The last remaining nests were checked in mid-March 2012. The peak in nest monitoring was in December with up to 40 nests being checked daily. The searches were conducted in the area between the Research Station and Old Cemetery and between the Coastal and Back Path in a strip approximately 2km long and up to 200m wide with total area of approximately 18ha. Approximately 60% of the monitored area can be described as dense mixed scrub, about 30% as Casuarina woodland and remnants of coconut plantation and remaining 10% as open areas around the Settlement and Research Station. A large number of nests (approximately 52%) was monitored in the vicinity of inhabited or uninhabited buildings. Markers on the Back Path and Coastal Path were used for reference to locate the nests. The nests were not marked by any temporary markers. The nest monitoring time was split into a time for locating new nests and time for checking the existing nests. Nest searches were conducted early in the morning starting with the first light (after 6am) and existing nests were checked on daily basis in the afternoons (usually after 3pm). While morning searches were often done in a smaller area and were mainly focused on finding rail nests, afternoon checkups covered the whole area visiting all known nests. By splitting the nest monitoring in this manner and keeping to the same route every afternoon it was easier to make sure that no nests were accidentally omitted.

In total 140 nests were located and monitored between November 2011 and March 2012. The outcomes are in Table 12.

Table 12. Summary of monitored nests between November 2011 and March 2012. Percentage of failed and successful nests are given where n ≥ 10.

Species	Total monitored	Abandoned	Successful	Failed	Unknown outcome
Coucal	3	1	1	0	1
Drongo	19	0	5 (26%)	13 (68%)	1
Fody	17	7	3 (18%)	6 (35%)	1
Kestrel	1	0	1	0	0
Nightjar	5	0	4	0	1
Rail	26	1	13 (50%)	4 (15%)	8
Sunbird	49	4	14 (28%)	24 (49%)	7
Turtle dove	18	5	3 (17%)	8 (44%)	2
White-eye	2	0	0	2	0
Total	**140**	**18**	**44 (44%)***	**57 (56%)***	**21**

***** Percentages are given for known outcomes only.

A brief comparison with the 2000/2001 outcomes (see report for more details) shows that there seem to be more successful nests (44% compared to 24%) in the 2011/2012 season. However, only very few fody, white-eye and no bulbul nests were currently monitored in 2011/2012, which were the species that had the highest predation rate in 2000/2001. A detailed discussion of the results can be found in the report. Overall, it was concluded that the nest success of Aldabra land birds is fairly low (particularly drongos, fodies, sunbirds and turtle-doves). To be able to do a meaningful analysis of nesting success collection of more field data is needed. Ideally a large amount of nests over a longer period of time (at least one breeding season) should be monitored under a separate project with at least one full time staff appointed for it. An accessible area should be chosen where as many as possible nesting attempts should be monitored. If it is possible to include nest searching and monitoring as part of the routine monitoring in the future this should be considered as it would be the most efficient way to collect considerable data over several seasons.

The land bird nest success report can be found at the fileserver:
Fileserver\Monitoring\Birds\Landbird nesting successReport_Landbird nest monitoring_ MSur_final_May12.

5.1.4. Pigeon inter-island migration

It is interesting to note that in early January 2012, at least 10,000 turtle doves and 900 blue pigeons were counted to fly in the late afternoon (between 4.30 and 7.00 pm) from Grand Terre over Passe Hoareau towards Malabar. The counters (Martijn van Dinther and Janske van de Crommenacker) were sitting in front of the Middle Camp hut and were using tally counters. This suggests that the doves/pigeons prefer Malabar to roost at night and Grand Terre to feed during the day. Possibly, the absence of cats on Malabar plays a role for the pigeon's preference to roost there.

5.2. Waders and seabirds

5.2.1. Wader counts

Every two weeks a wader survey is done on Settlement Beach. The counts are done during low tide when the reef is exposed and preferably in the early morning when temperatures on the reef are not too hot. The count also includes a few non-wader species, such as herons, egrets and terns. In addition, on the coastal stretches near Dune Jean-Louis and Dune d'Messe the monitoring is done on opportunistic basis. Interpretation of the wader data is tricky as many factors can potentially influence the number of birds seen. Seasonal migration is obviously an important factor, but also local parameters such as weather conditions and tide play important roles. With regards to the latter, the water level has important implications for the amount of accessible wader habitat in the lagoon. For example, high spring tides in the lagoon can force most crab plovers and other waders out onto the outer beaches.

Figure 36 shows monthly averages for six of the most commonly sighted waders on Settlement Beach in 2012, revealing a seasonal pattern with a peak in occurrence in the wet season and a drop in the dry SE season when most of the birds migrate to the northern hemisphere / Arabian Sea area.

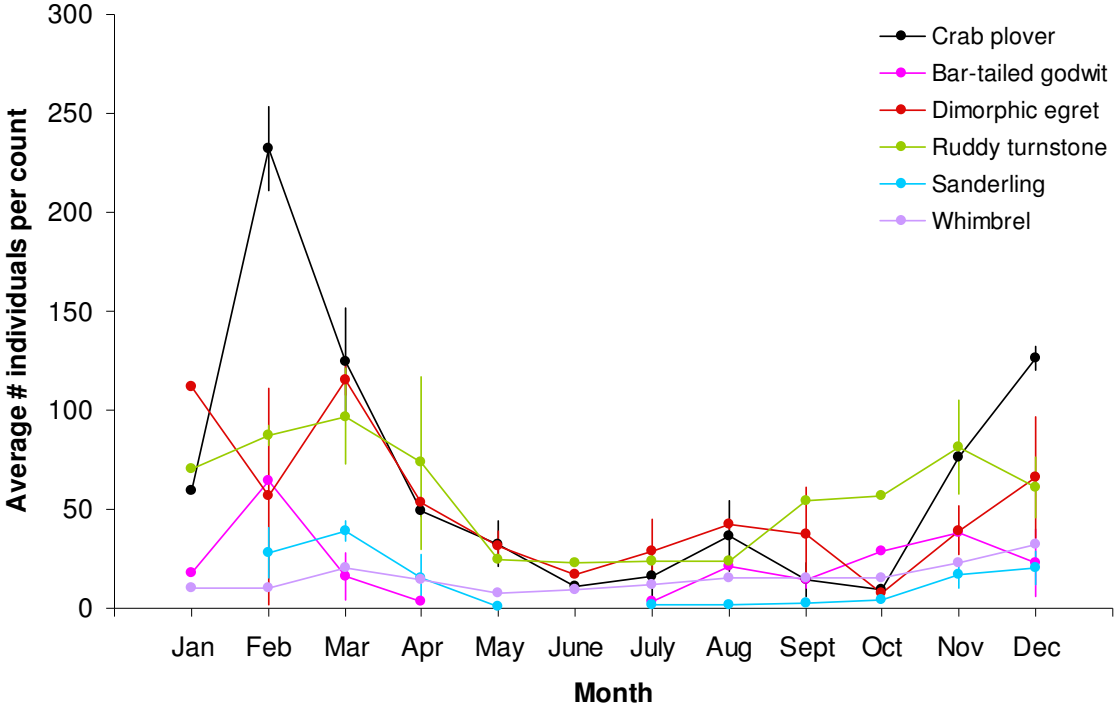


Figure 36. Average monthly counts of the six most common waders / shorebirds (crab plovers, bar-tailed godwits, dimorphic egrets, ruddy turnstones, sanderlings and whimbrels) in 2012 on Settlement Beach.

Figure 37 shows the sighting rates over the last years differ per species. In 2012 a decrease was seen in the number of dimorphic egrets encountered, and an increase in the number of whimbrels (the last three years compared to earlier years). Most other species showed fairly stable patterns.

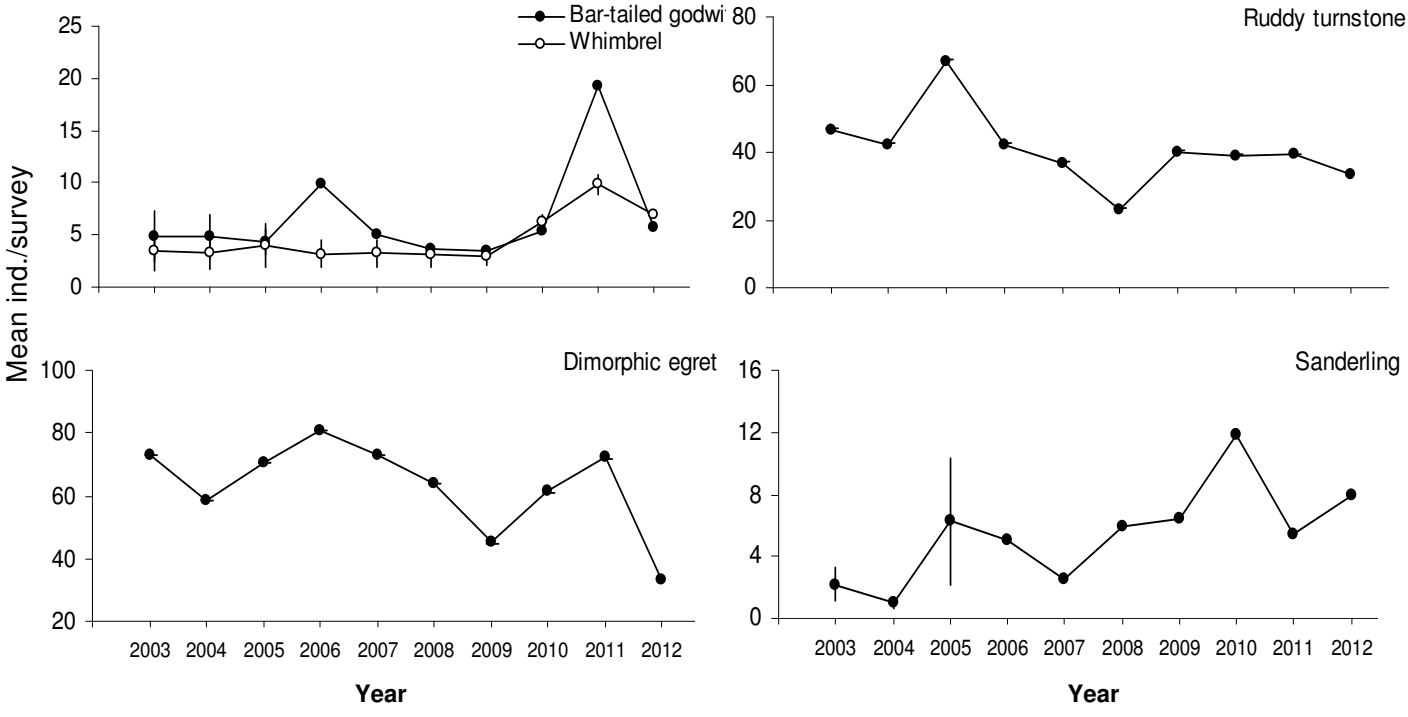


Figure 37. Mean number of individuals encountered during wader surveys for different species of waders / shore- and seabirds on Settlement Beach for the period 2003-2011.

5.2.2. Crab plover daily counts

Crab plover numbers were counted daily on Settlement Beach in combination with the turtle track count. Encounter rates in 2012 dropped in March, which was earlier than the 2007-2011 average and could indicate an earlier migration of crab plovers off Aldabra (Figure 38). The post-migration peak at the end of the year in 2012 was rather low compared with the historical average.

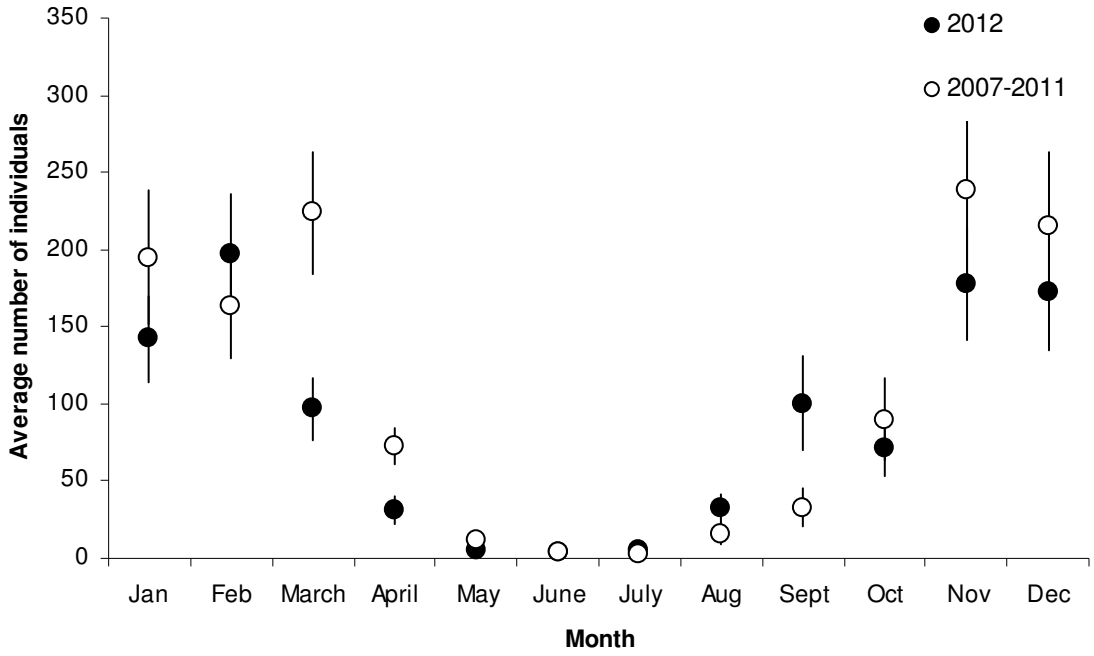


Figure 38. Average daily encounter rates of crab plovers in 2012 compared to those of 2007-2011.

5.2.3. Caspian terns

Caspian terns were sighted from mid February until mid October. At least a total of 13 assumed pairs were found (potentially) breeding on the sites summarized in Table 13.

Table 13. Sites with confirmed or supposed breeding of Caspian terns in 2012.

Location	Island	No. of breeding pairs	Successful?	Notes
La Gigi	Picard	1	Yes?	We did not observe a chick at La Gigi, but a juvenile was flying with an adult at SB
Anse Grand Poche	Picard	1 or 2	?	Not sure whether breeding, but alarmed when encountered
Anse Polymnie	Polymnie	1	?	Not sure whether breeding, but alarmed when encountered
West Grand Terre beaches	Grand Terre, beach 17	1	?	Not sure whether breeding (or this is La Gigi pair)
Dune d'Messe	Grand Terre	1	Yes	Seems like they were breeding as a

				juvenile was spotted flying with two adults
Dune Jean-Louis	Grand Terre. Seen a pair at beach, but also one at the lagoon landing stage	1	?	Not sure whether breeding
Takamaka	Grand Terre, one pair seen flying above platin near camp, one at Bra McKenzie and another at the flamingo pool	1 or 2	?	Not sure whether breeding
Cinq Cases	Tidal pool near landing stage path	At least 1	Yes	Not sure whether breeding, but alarmed when encountered
Champignon des Os (near DJL)	Lagoon islet	1	?	Seen incubating
Ile Esprit	Lagoon island	1	?	Not sure whether breeding
Ile Moustique	Lagoon island	At least 1	Yes	Fledgling seen, accompanied by five adults
Ile Michel	Lagoon island	1	?	Nest observed
Middle Camp	Malabar	1	?	Resting on beach, probably not breeding

From the collected opportunistic sighting data it is difficult to analyze long-term occurrence rates of Caspian terns on Aldabra, as they strongly depend on the number of visits at different locations and the sighting probability by the observer. In 2011, ten assumed breeding pairs were found. The recorded sightings of 2010 are less regular and pairs were only recorded around the Settlement / La Gigi, Dune d'Messe and Dune Jean-Louis. It is not sure if these were the only birds seen or that sightings elsewhere have not been recorded. Caspian tern sightings were also recorded in the period 2003-2005 (i.e., between this period and 2010 there is a gap in the data), but the number of sightings per year are too few to make a fair estimation of number of breeding pairsvas is done for 2011 and 2012. The encounter rates of Caspian terns during the bi-weekly wader counts suggest a fairly stable multiple-year trend.

5.2.4. Dimorphic egrets: black / white ratio

The dimorphic egrets, that are resident on Aldabra, occur in black and white morphs. The dimorphism is known not to be linked with gender, but further not much is known about the distribution of the two morphs. To get a better picture of this, we opportunistically started recording the number of white and black morphs seen on Settlement Beach (e.g., during turtle track counts or wader counts) from mid 2011 onwards. In addition, it would be interesting to perform white / black morph counts in the lagoon and observe nests to indentify the morphs of the parents.

Black morph egrets are generally less frequently seen than white morph individuals (Figure 39). The November 2011 sighting (encircled in Figure 39; with more black morph birds seen than white morph individuals) did not recur in 2012, which weakens the earlier hypothesis that the change in distribution was linked with their breeding behaviour.

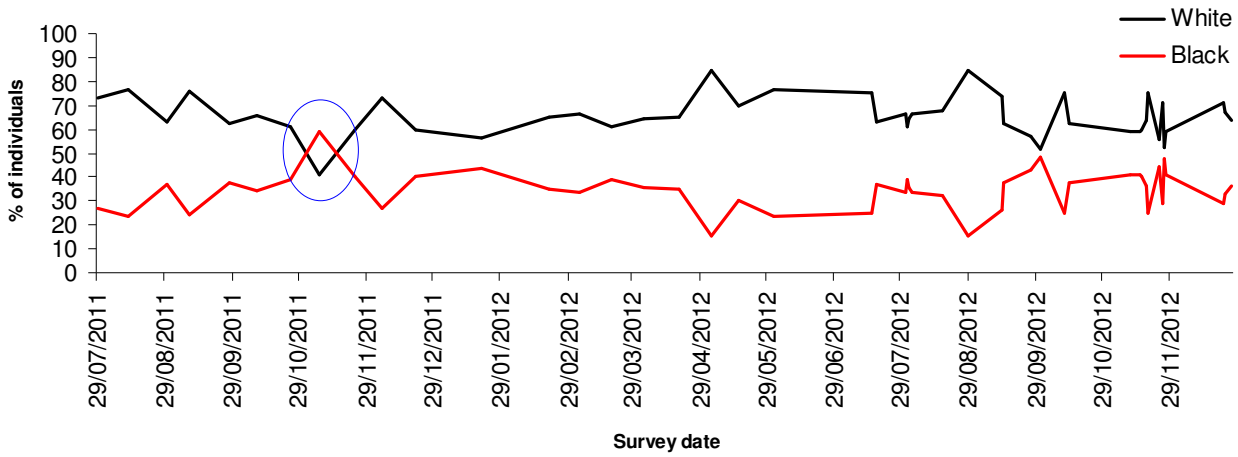


Figure 39. Percentages of white and black morph dimorphic egrets on Settlement Beach throughout mid 2011 – 2012.

5.2.5. Opportunistic wader / seabird sightings

A number of interesting seabird sightings were recorded in 2012. Firstly, during the frigatebird census it was observed that Aldabra's lagoon holds thousands (estimation >5000) of brown noddy's. They were seen flying, resting and in lower extent nesting. Nesting mainly occurs in small groups on small champignon rocks in the lagoon or channels. Sooty terns were frequently heard flying by the outer reef edges. Sightings of sooty terns were recorded between June and October. A tropical shearwater was found incubating an egg on islet 8 in June (same spot as last year), but the attempt failed as the fairly well-grown chick disappeared earlier than it could have been fledged. In November a new chick was found there which may have fledged successfully. A fairy tern was seen nesting on the champignon near Passe Gionnet (April), and a white-tailed tropicbird was heard feeding a large chick at the rocky edge of Bassin Lebine (July). In November a group of 50 greater crested terns (adults and juveniles) was seen resting on Anse Grand Poche.

5.2.6. Crab plover ringing

The metal numbered bird SAFrings (7 mm diameter) have arrived but no ringing was done yet.

5.2.7. Tropicbirds

Red-tailed and white-tailed tropicbird nests are monitored every two weeks on a spring low tide at La Gigi, Picard. In addition, data loggers were deployed to track their migration routes (see Section 6.2). Both species of tropicbird nest on small 'champignon' islets in the lagoon (numbered LG01-LG18) and on a well-vegetated rocky headland on the southern tip of Picard. Nesting activity of red-tailed tropicbirds is higher than the red-tailed tropicbirds, and the average number of newly found nests per monitoring trip was highest in 2010 in comparison with the other three years (Figure 40). There is no indication that routine monitoring would impair tropicbird nesting activity (i.e., more nests were found in 2012 than at the start of the programme in 2009). Note that 23 monitoring trips were done in 2009, 28 in 2010, 24 in 2011 and 21 in 2012.

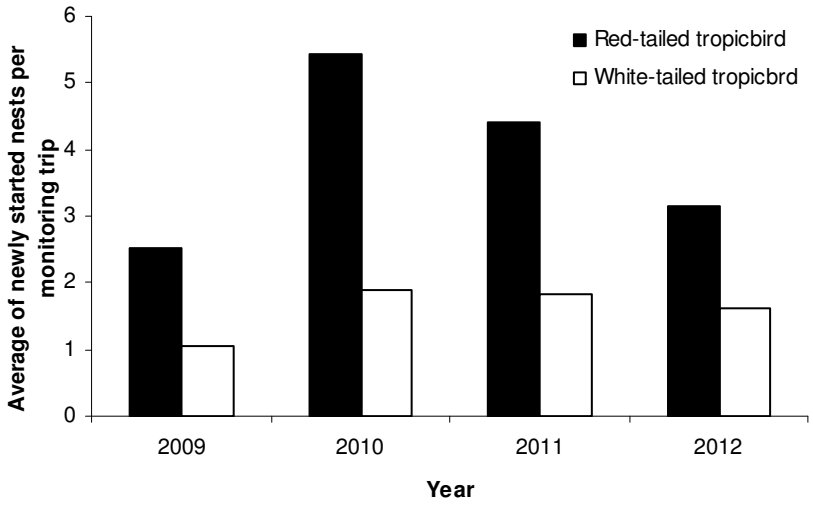
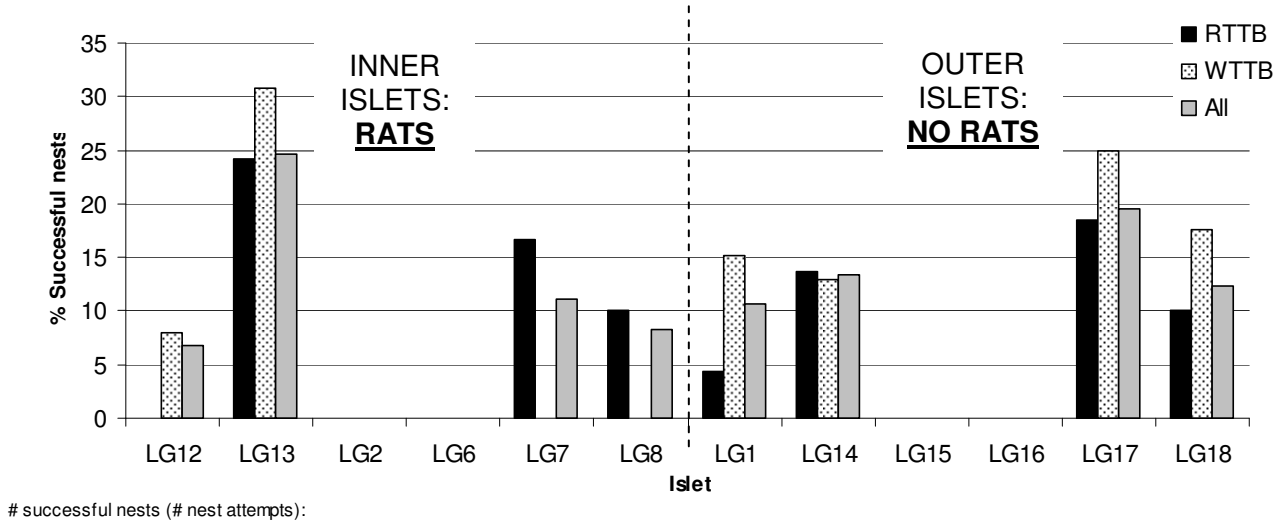


Figure 40. Average number of new red- and white-tailed tropicbird nests found per tropicbird monitoring trip in 2009-2012.

Nesting success rates of tropicbirds at La Gigi are generally very low: less than 10% of the nests of both species succeed. Main reason for this is thought to be predation by rats, as rat traces are often found in the form of chewed egg shells. In 2011 it was tested with chew blocks whether rats are present on all the monitored La Gigi islets. It turned out that rats are present on inner islets, but absent on outer islets. If rats would be the main cause for nest failure, it is expected that success rates at the inner islets would be lower than on the outer islets.

Nest success rates are calculated by dividing the number of nests that reach a c3 chick stage by the total number of new nesting attempts. Based on the 2009-2012 data, overall success rates do not differ between inner and outer islets (average inner: 8.48% and outer: 9.32%) despite the confirmed presence of rats on the inner islets. This result does not support the hypothesis that nests on inner islets are prone to rat predation to a greater extent than nests on the outer islands. Possibly, predation by herons or other predators also plays a significant role. This might be the case as occasionally also fairly large-grown chicks are predated. To help identify the cause of egg and chick failures, it is planned to install some trail cameras at nesting sites as part of the rat eradication feasibility study. Success rates for each islet, both overall and for each species separately, are plotted in Figure 41.



successful nests (# nest attempts):

	LG12	LG13	LG2	LG6	LG7	LG8	LG1	LG14	LG15	LG16	LG17	LG18
RTTB	0 (6)	43 (178)	0 (2)	0 (2)	1 (6)	2 (20)	1 (23)	6 (44)	0 (6)	0 (0)	15 (81)	4 (40)
WTTB	3 (38)	4 (13)	0 (0)	0 (7)	0 (3)	0 (4)	5 (33)	4 (31)	0 (0)	0 (9)	4 (16)	3 (17)

Figure 41. Percentages of successful tropicbird nests on inner and outer La Gigi Islets, based on all data of 2009 – 2012.

Figure 42 shows seasonality patterns of nesting for both species, by plotting the average number of active nests found each month (taking into account the number of monitoring sessions performed during that particular month). Red-tailed tropicbird nesting shows a peak in December until March, whereas the white-tailed tropicbirds show no obvious seasonality in their nesting numbers and remain low (relative to the RTTB) throughout the year.

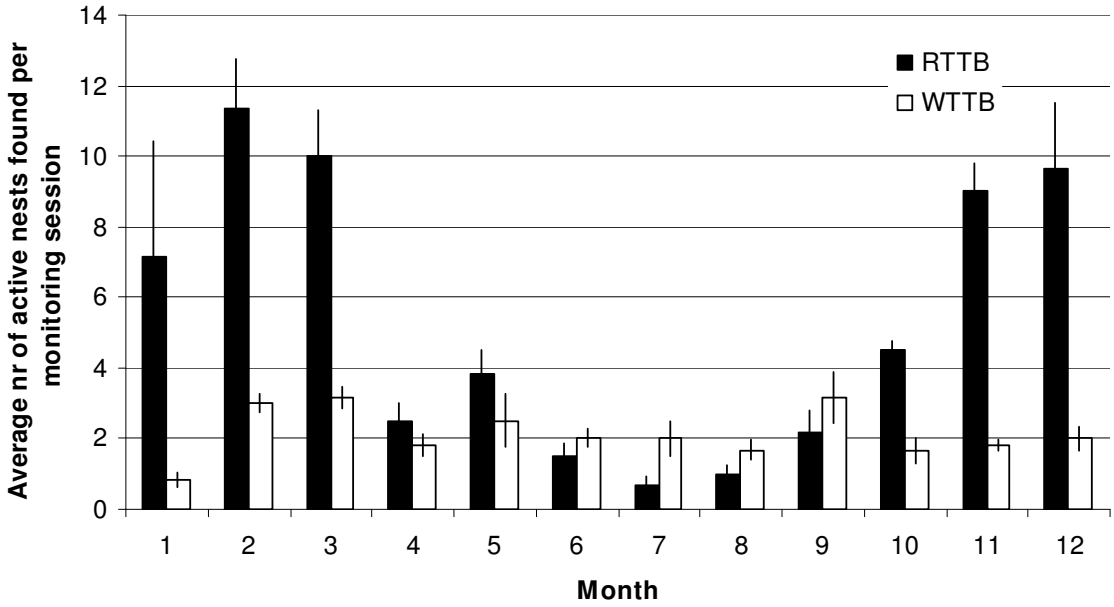


Figure 42. Monthly averages of active nests found for RTTB (red) and WTTB (grey), based on data of 2009-2012.

5.2.8. Madagascar Pond Heron

In total, 39 opportunistic sightings of Madagascar Pond Herons were recorded on Aldabra (all in the East Grande Terre region, Figure 43)). All records were recorded by a GPS coordinate. All birds were judged to be adults, and 13 of the 59 sightings were recorded as displaying breeding plumage.

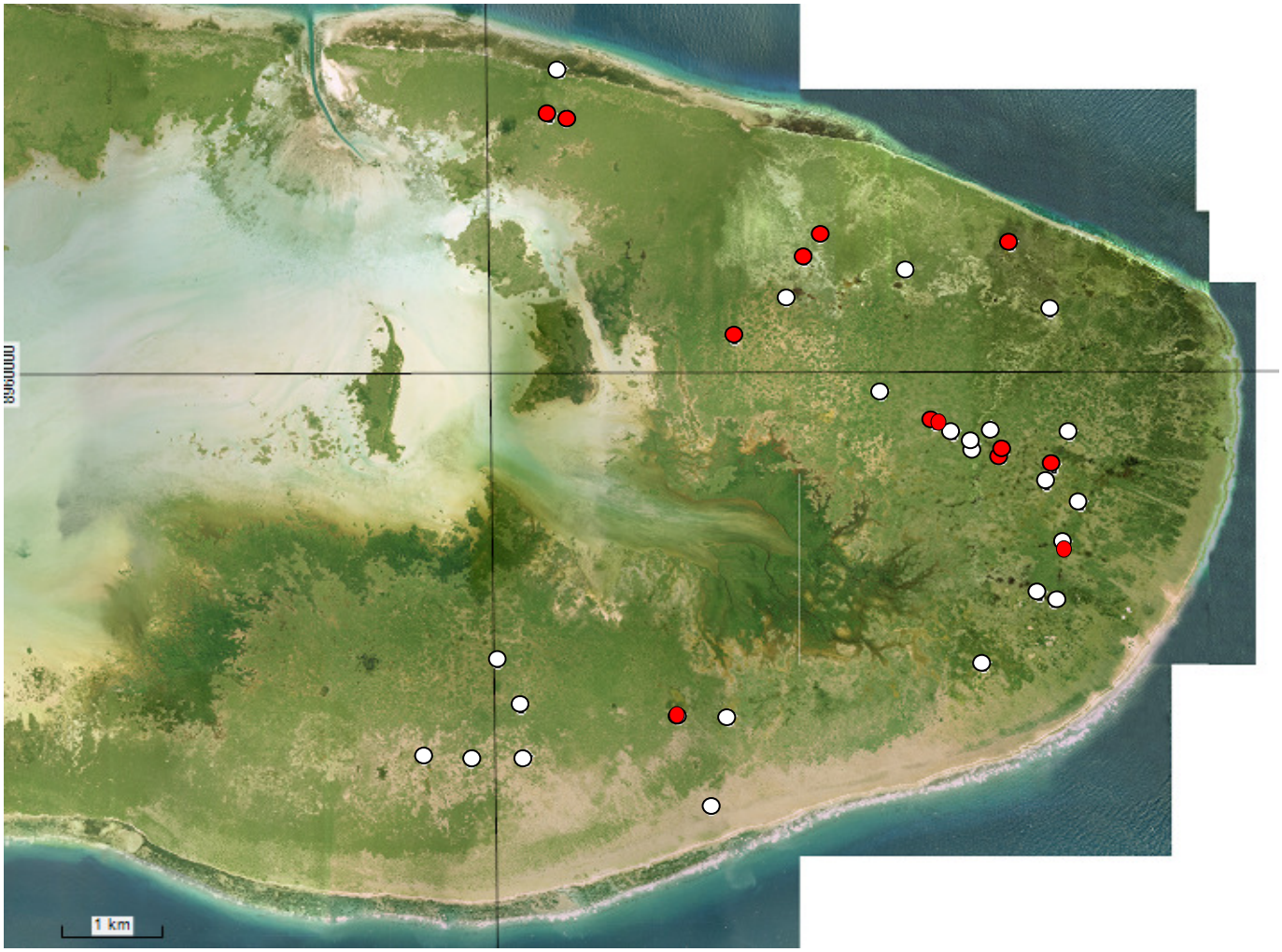


Figure 43. Madagascar Pond Heron sightings in 2012 (red = breeding plumage, white = non-breeding plumage).

Table 14 shows that in the last few years, MPHs in breeding plumage have been sighted solely in the period of November until March (except for one sighting of an individual in breeding plumage in September 2012). Although evidence is scarce, it seems that Aldabra's MPHs do breed seasonally rather than year-round.

Table 14. Summary of Madagascar Pond Herons sighted in breeding and non-breeding plumage in the period 2009-2012. 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

5.2.9. Flamingos

In April and May, two expeditions (20-23 April and 5-7 May) were conducted to search for nesting sites of the greater flamingos at East Grand Terre. During the visits, several flamingo sightings were recorded and a nesting site was found west of the Cinq Cases landing stage in a large pool partially surrounded by mangroves and Mahoe/ Protia Oil Nut (*Thespesia populnea)* (Figure 44, 45).

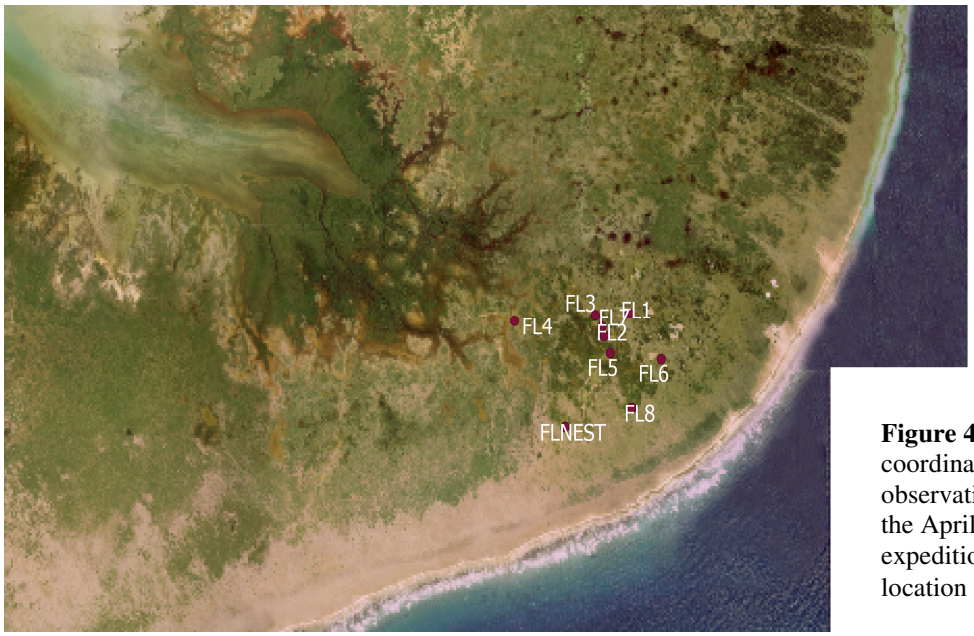


Figure 44. Cinq cases region with coordinates of the flamingo observations and nesting sites in the April and May 2012 expeditions (FLNEST indicates the location of the nesting site).

In total 17 nesting mounds with seven eggs in total were counted (Figure 45), but no chicks were seen. However, despite of being careful not to be seen or to make any noise, the flamingos grew wary and left the site. Afterwards it appeared that nesting was abandoned, most likely to be due to the disturbance caused by the teams. See for more details the report (Z:\Monitoring\Birds\ Flamingo\Reports) written by Senior Ranger Catherina Onezia.

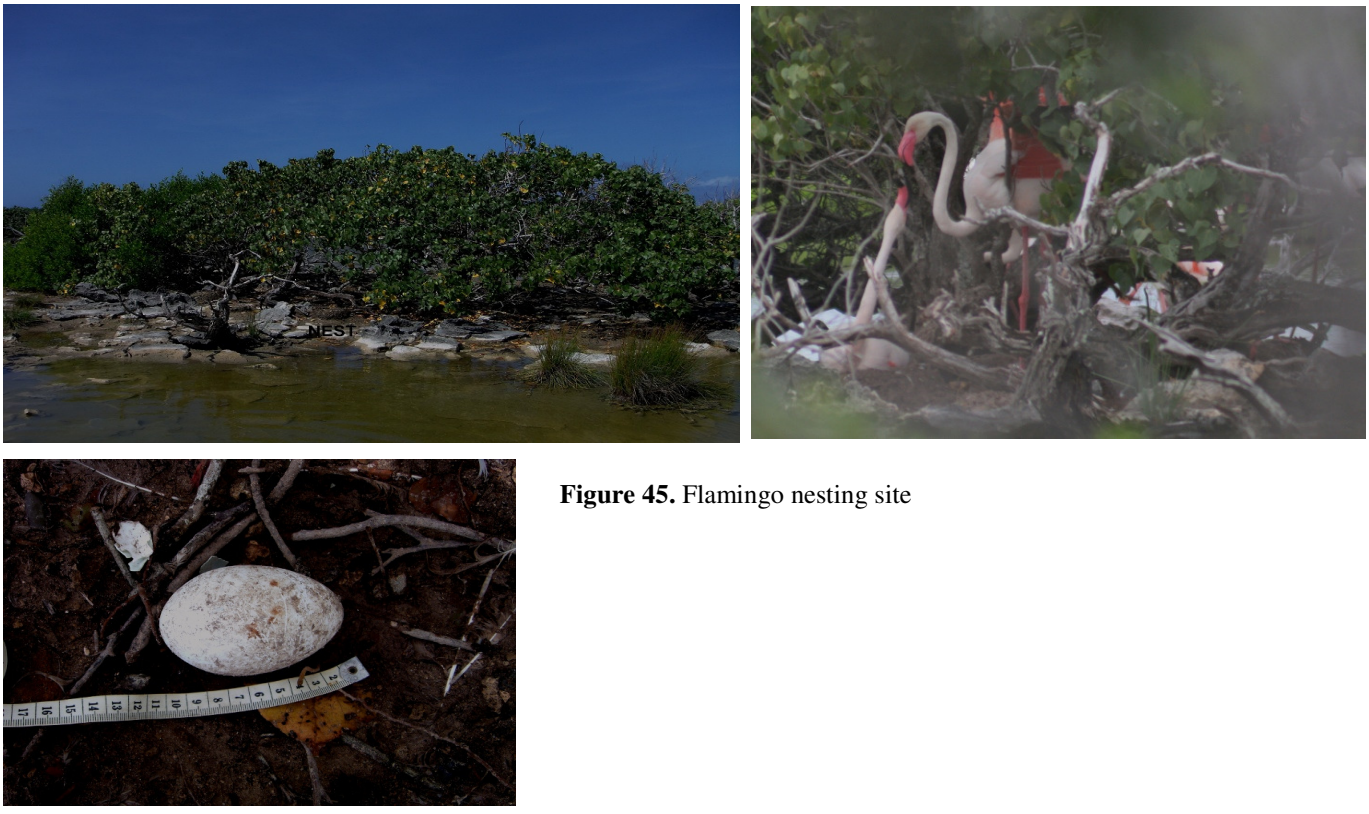


Figure 45. Flamingo nesting site

Following the abovementioned report it was decided that no more opportunistic monitoring should be done of this species except for an annual organised count following discussion and development and approval of a protocol. Unintended flamingo encounters were obviously still recorded, which resulted in the list of Table 15.

Table 15. Selection of flamingo sightings during 2012 (after the April / May expedition).

Date	Time	Location	Group composition	Activity
03/07/2012	12:00	300m SW of landing stage path near old exclosure	64	Fd, Inf, R
05/07/2012	10:00	Flamingo Pool Takamaka	7	Fd, Inf, R
21/07/2012	08:40	From CC hut	>10 but <15	Inf
21/07/2012	18:00	CC mangroves (near landing stage)	12	Inf, V

5.2.10. Frigate bird census

In January 2012 a frigatebird census, led by Michal Šúr (GEF Project Bird Survey Consultant), was conducted as follow-up of the census of 2011. Although the second part of the survey was carried out in 2012 its reporting was included in the Annual ASC Report of 2011. As a follow-up, a third census is planned for early 2013 which will be included in the 2013 ASC Annual Report.

In addition to the summary given in the 2011 Annual ASC report, the following documents can be consulted for more information on the frigatebird census:

- Frigatebird census report 2011: Fileserver\ Monitoring\ Birds\ Seabirds\ Frigatebirds\ frigatebird census\Frigate_census_2011\ReportFrigatebird report 2011_final_220411
- Frigatebird census report 2012: Fileserver\ Monitoring\ Birds\ Seabirds\ Frigatebirds\ frigatebird census\ Frigate_census_2012Frigatebird census on Aldabra in 2012
- Manuscript: 'Frigatebirds on Aldabra Atoll: population census, recommended monitoring protocol and sustainable tourism guidelines' by Šúr, Bunbury & van de Crommenacker, accepted in *Bird Conservation International* January 2013.

5.3. Vagrant birds

For all vagrants that were reported in 2012 (Table 16), a Seychelles Bird Records Committee form was submitted to A. Skerrett with photos (to be found in the respective ASC Monthly Reports). Records were included in monthly SBRC reports.

Table 16. All vagrant birds reported to SBRC in 2012.

Species	Date	Reporter	Location
Spotted flycatcher (*Muscicapa striata* race *neumanni*)	03/01/2012	Catherina Onezia	Settlement, Picard
Red-billed duck (*Anas erythrorhyncha*) (a.k.a. Red-billed teal)	10/01/2012	Joel Souyave	Cinq Cases area
Black-winged pratincole (*Glareola nordmanni*)	11/01/2012	Catherina Onezia	Cinq Cases area
Northern wheatear (*Oenanthe oenanthe)*	11/01/2012	Catherina Onezia	Cinq Cases area
Great white egret (*Egretta alba*)	27/01/2012	Michal Šúr	Middle Camp
Spotted flycatcher (*Muscicapa striata* race *neumanni*)	31/01/2012	Michal Šúr	Settlement, Picard
House martin (*Delichon urbicum*)	06 & 07/02/2012	Darryl Birch	Cinq Cases hut
Reed cormorant	12/02/2012	Darryl Birch	Cinq Cases area

(*Phalacrocorax africanus*)			
Barn swallow (*Hirundo rustica*)	14/02/2012	Michal Šúr	Settlement Beach, Picard
Black kite (*Milvus migrans)*	12 & 15/02/2012	Many different staff	Settlement, Picard
Northern wheatear *(Oenanthe oenanthe)*	01 & 04/03/2012	Catherina Onezia	Settlement Beach, Picard
Mascarene martin *(Phedina borbonica)*	11/03/2012	Janske van de Crommenacker	Lagoon islet near Pt. Tanguin
Yellow (-headed) wagtail (*Motacilla flava lutea*)	29/03 & 05/04/2012	Many different staff	Settlement, Picard
Great white egret *(Egretta alba)*	21/04/2012	Catherina Onezia	Cinq Cases area
Little Tern *(Sterna albifrons)*	21/04/2012	Catherina Onezia	Cinq Cases area
Mascarene Martin *(Phedina borbonica)*	06/05/2012	Catherina Onezia	Cinq Cases area
Reed Cormorant *(Phalacrocorax africanus)*	06/05/2012	Catherina Onezia	Cinq Cases area
Broad-Billed Roller (*Eurystomus glaucurus*)	19/11/2012	Catherina Onezia	Dune D'Messe
Tree Pipit (*Anthus cervinus)*	25/11/2012	Catherina Onezia	Old Settlement, Picard
Broad-billed roller (*Eurystomus glaucurus*)	26/11/2012	Murvin Green	Near Takamaka Beach
Red-billed Teal / Duck (*Anas erythrorhyncha)*	30/11/2012	Catherina Onezia	Cinq Cases area
Broad-billed roller (*Eurystomus glaucurus*)	05/12/2012	Catherina Onezia	Back path
Eurasian Golden Oriole (*Oriolus oriolus*)	19/12/2012	Catherina Onezia	Old Settlement

6. OTHER RESEARCH ACTIVITIES

6.1. Tidal gauge *(Contributed by Christina Quanz)*

Tidal gauge - Summary 2012

The tidal gauge (Figure 46; Valport Tidemaster) at Passe du Bois was working fine throughout the first quarter of 2012. However, in early April the data recorded started to look strange (very high values or minus values) and it was discovered (on April 13th) that the sensor cable broken. While snorkeling on the bottom below the former pole, the broken pole was found together with the remaining end of the cable (incl. sensor). After consulting SNMS it was decided to replace the broken cable with the sensor cable of the second tidal gauge that was still in stock to be installed inside the lagoon. The manufacturer advised that a minor error could occur since the cable and data logger were calibrated to each other. It was decided to accept this error and go ahead, since the data was not perfect anyway due to outstanding leveling exercise (to determine exact height of the sensor above MSL). The logistic team reinforced the metal structure, and tried to secure the pole in the champignon as well and placed back the sensor cable. A quote for a new sensor cable was sourced.

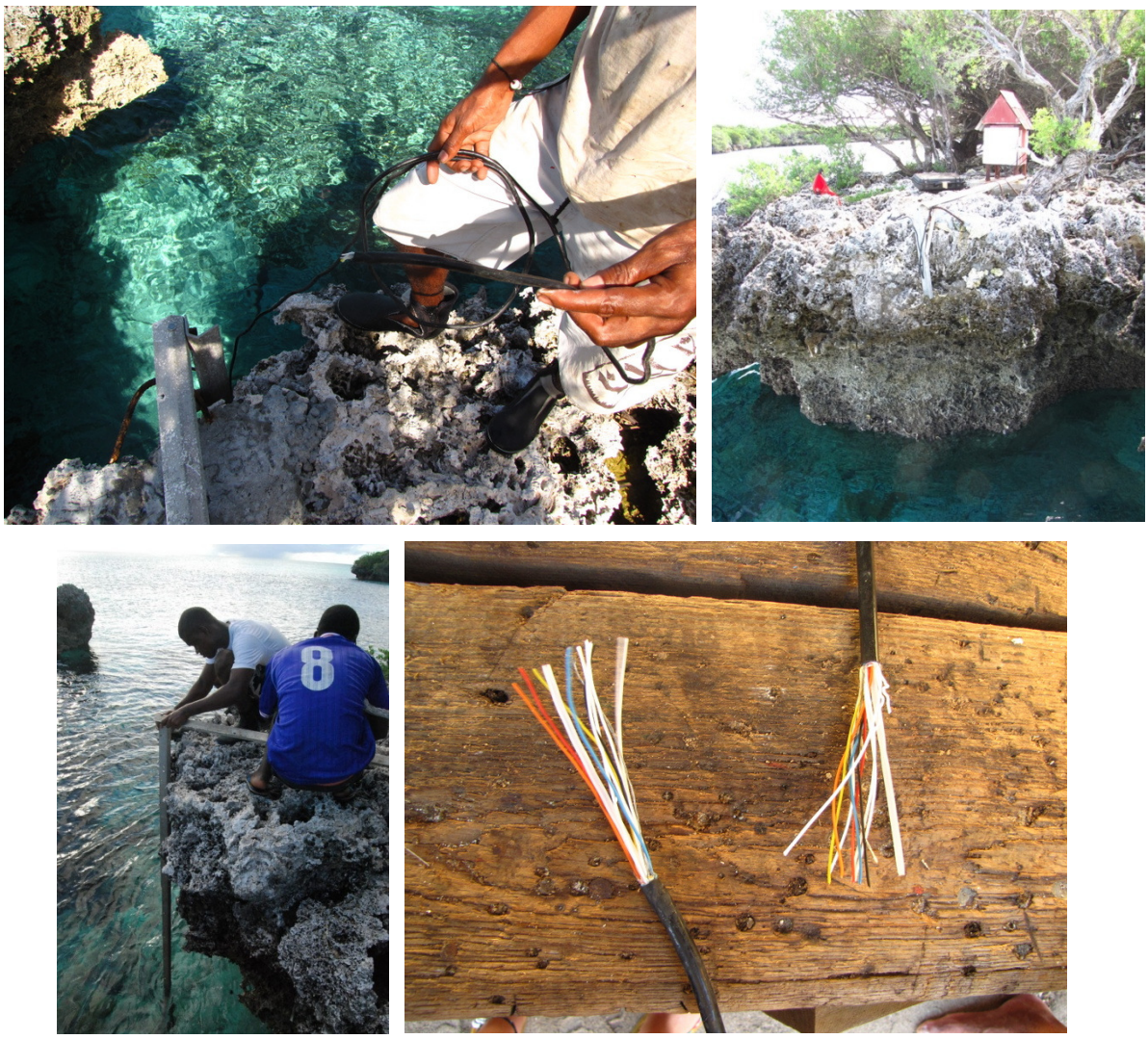


Figure 46. Broken tidal gauge sensor cable, with bottom left the original metal structure to which sensor cable was connected.

During the monitoring events in the first weeks after replacement of the cable, the data seemed to be realistic. However in May suddenly strange values were recorded again (minus values or very high values). After consulting with SNMS and Valport it was then decided to return the data logger to HO. From there it would be forwarded to Valport (UK) for reparation of the cable and re-calibration to the data logger. Both pieces of the cable were sent in case Valport could just remove the sensor from the broken part and fix it back on the remaining longer (20m) part, instead of purchasing a complete new cable.

In the meantime, the data logger from the second tidal gauge was placed at Passe du Bois (since this one was paired to the cable that was placed there in April). Afterwards, the tidal gauge recording went back to normal. Unfortunately, the recording stopped early August due to low batteries earlier than expected. Unfortunately the used type was not in stock, and the tidal gauge went offline until arrival of supply boat at the end of September. After placing the new batteries the tidal gauge data collection went fine until end of December. By then, the data logger was found switched off for no obvious reasons. What might causing this is currently being investigated.

Towards the end of the year the housing was found in a bad state, with the door and side wall fallen off. The logistic team is planning to repair it early 2013. It is rather unlikely, but eventually due to the data logger being unprotected (broken housing) some external influence could have been related to the unit switching off.

Follow up tasks for 2013 include:

- Returning data logger and broken cable to Valport UK for reparation → Head office
- Repairing existing housing for tidal gauge and maintenance work (red oxide painting), Checking up of metal structure to hold sensor cable → Aldabra
- Monitoring and elaborating reasons for tidal gauge switching itself off → Aldabra
- Leveling exercise needs to be carried out by expert → HO organize
- Following return of 1st tidal gauge from UK and shipment to Aldabra, organize expertise to place second unit in lagoon in the coming NW 2013/2014 season together with leveling exercise (for both units)

6.2. Tropicbird dataloggers

Aldabra supports the largest breeding population of red-tailed tropicbirds (*Phaethon rubricauda*) and white-tailed tropicbirds (*P. lepturus*) in the Seychelles. The migration patterns of these breeding birds are not known, and it is essential to improve understanding of their ecology and potentially the threats they are exposed to when away from Aldabra. To effectively conserve them it is vital to understand the linkages between breeding and foraging sites.

Figure 47. Datalogger attached to plastic bird ring (*photograph by Martijn van Dinther).*

Jannie Linnebjerg (Universities of Aarhus and Copenhagen, and EC project consultant on Assumption) was able to provide SIF with 27 light level geo-locaters (GLS) that were a left-over from her PhD project. At the time of arrival on Aldabra (December 2011), the loggers still had approximately one year of battery time left. Light level geolocation is the calculation of position from ambient light level readings with reference to time, and is a highly effective technique for tracking long distance migratory species.

The logger (geolocator) is a battery powered instrument with an in-built microprocessor and a memory for data storage. After data download, decompressed data is processed by software to estimate position: latitude from day/night length, and longitude from the absolute time of local midday/midnight.

The data loggers were pre-attached on 6.5 mm plastic bird rings (as advised by SAF; Figure 47). In the outer and inner shell of the ring, two small holes were drilled and the inner ring is partially removed between the two holes. The data logger is attached to the ring by use of a tie-wrap (weather resistant and UV resistant nylon 6.6 cable ties with stainless steel locking tabs) and self amalgamating tape. The partial removal of the inner ring between the two holes allows the tie-wrap to fall within the inner ring thus preventing an extra loop inside the ring that could irritate the birds' leg. When attaching the ring on the birds' leg super glue was used to bond the inner and outer ring.

The data loggers were attached to ten red-tailed tropicbirds during routine tropicbird nest monitoring on the La Gigi islets (Table 17). Not all loggers were deployed as their battery time was running short by the time that we had the possibility to deploy them to the birds. To allow for individual recognition, birds received two coloured rings: one coloured ring with the data logger on the right leg and one coloured ring on the left leg.

Table 17. Dataloggers deployed on red-tailed tropicbirds.

Tag #	Ring R	Ring L	Date deployment	Islet	Nest ID	Nest stage	Blood ID
12094	Pink	Yellow	14 Apr 2012	LG13	494	Egg	R004
12105	Purple	Light blue	28 Feb 2012	LG13	468	C3 chick	R003
12113	Pink	Pink	17 Jan 2012	LG13	420	C2 chick	R002
12118	Pink	Blue	10 Jan 12	LG13	n/a	Resting	R001
17577	Orange	Orange	29 May 2012	LG17	No ID yet	Egg	R005
17582	Lt Green	Lt Green	13 June 2012	LG13	No ID yet	Egg	R009
17584	Yellow	Green	28 June 2012	LG13	503	Egg	R010
17585	Purple	Purple	06 June 2012	LG1	No ID yet	Egg	R007
17587	Blue	Red	30 May 12	LG13	No ID yet	Egg	R006
17589	Red	Yellow	06 June2012	LG1	No ID yet	Egg	R008

The handling and measuring of the birds was best done by two persons (one holding the bird and one measuring; Figure 48). Birds were weighed and their tarsus, bill and wing were measured. From each bird a blood sample will be taken by puncture of the leg vain with a needle and collection of the blood with a capillary. The sample was placed in 96% alcohol and stored in the fridge. All data, along with the protocol is saved on the fileserver in the folder Monitoring\Birds\Seabirds\ Tropicbirds\ Data logger project. More information about the deployment of each bird can be found in the monthly reports of Martijn van Dinther.

Figure 48. Blood sampling, ringing and measuring of a red-tailed tropicbird.
(*photographs by Martijn van Dinther and Rich Baxter*)

6.3. Reef Mapping Project (*contributed by Philip Haupt*)

In December 2012 SIF undertook the long awaited reef mapping project survey work with new project partners from Dr John Turner and Dr Rebecca Klaus from University of Bangor. Rebecca joined the team on Aldabra to provide guidance with the fieldwork.

The atoll was divided into 83 transects, 1 km apart (Figure 49). Thirty dives were conducted in total. Four surveys were done per site, two in 15 and 5m water depth. Photoquadrats (camera mounted to PVC frame) were used to record photographs of the benthic cover. A visual assessment of the site to derive a habitat assessment score (HAS), based on rugosity of the landscape, the number of coral growth forms, composition of seafloor, and high level overview of live cover. Underwater visual census of fish species selected as representing functional feeding groups was recorded for 7 minutes at each site.

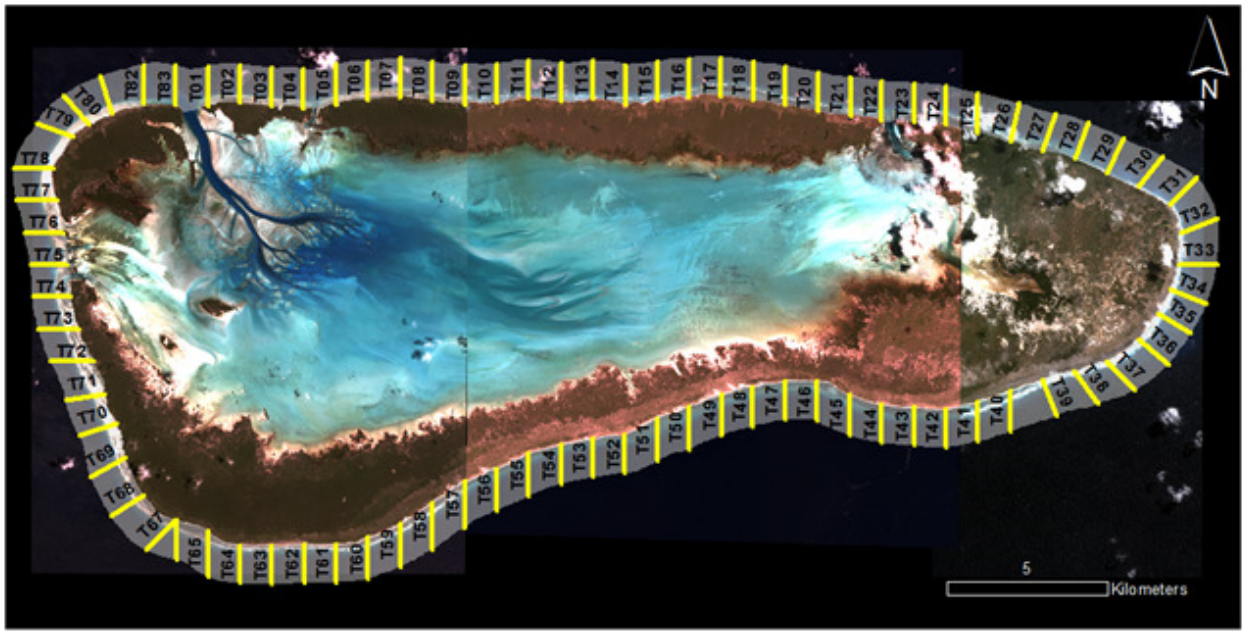


Figure 49. The 83 dive transects at 1km intervals around Aldabra

Once divers were back on the boat a qualitative site information sheet was completed for each site. Video data were collected from 350 sites selected from randomly stratified unsupervised habitat classification, and from the 83 transects. Videos spanning a min of 2 minutes per site were collected using a SeaViewer Drop Camera. The shallow lagoon reefs (inaccessible to boat on the low tide or under high swells) were recorded from camps in U-shape transects both sides of access points on low tides using GoPro cameras mounted on PVC poles, time synced with GPSs.

Boat based operations were conducted from the Research Station Middle camp to facilitate quick access to the remote parts on the east and south east of the Atoll, and later on from other camps for shallow water video surveys on foot.

The team consisted of Philip Haupt (project coordinator), Dr Rebecca Klaus (project partner), Michelle Etienne (GEF PAs project manager), two Trainee Rangers, namely Michel Malbrook and Shanni Etienne, and three Volunteers, namely: Arjan de Groene, Lotte Reiter, and Calum Ferguson, and a medical doctor, Naomi Adeline. The two project skippers were Jude Brice (Senior Skipper), and Murvin Green (Skipper). A fantastic team effort, great spirit and luck of good weather saw all the data collected by 16 January 2013 (Figure 50). The data will be analysed in conjunction with high resolution aerial imagery to compile a reef habitat map for Aldabra Atoll.

Figure 50. Reef mapping team at work: transect dives, navigation and sessions with the Sea Viewer (*photographs by Calum Ferguson, Lotte Reiter and Rebecca Klaus*).

7. INVASIVE SPECIES

7.1. Goat Eradication Program (GEP)

2012 is marked by a major milestone in Aldabra's conservation history: the last Judas-goat was shot, resulting in a goat-free Aldabra. A summary of the final GEP stage is provided below. Details of the expeditions, discussions and results can be found on the Fileserver in the following folder: \\ ALDABRASERVER\ fileserver\Monitoring \Eradication\ Goats\ Goat monitoring 2012.

The last sighting of NJGs was reported in March 2010, when the Aldabra team managed to shoot two NJGs. During 2011 and 2012, no NJGs (non-Judas goats) were sighted. Regular GEP trips were performed throughout 2012, with the following notable events:

- In **January** it was checked by SIF staff whether all collars of the JGs were transmitting, given the earlier reception problems. Signals were received from J1 and J12 (one location), and from J8 and J10 (other location), both in the CC area. During an exploration trip to Takamaka (11 January), no goats were sighted and no signs of goat droppings and/or tracks were found. External IAS consultants Peter Haverson and Darryl Birch came to Aldabra to help finalize the last stages of the GEP programme. The initial aim of this phase of the programme was to be able to provide the necessary information to assist SIF in assessing whether the atoll is goat-free and the eradication programme a success. The first assignment for Peter (Darryl came at the end of January) was, with help of SIF staff, to conduct an extensive search of Grande Terre Island on the Aldabra Atoll, for the presence of any remaining NJ goats. A first field reconnaissance expedition was done between the 24th and the 27th January, with as aims to establish the condition of the hunting rifles, to observe the methodology of the GEP monitoring team, see the field set-up and to gain an insight into the terrain and vegetation. Searches for the JGs were conducted in the Eastern region of Grande Terre, using telemetry equipment. J10, J8, J1 and J12 were seen, and J7 was found to be dead. Its remains and the radio collar of J7 were found near to Deep pool surrounded by fresh droppings.

- In **February** the next aim was to gather equipment and supplies for the extended field stage of the searches, devise a logistical plan and to zero the rifles. Darryl and Peter (only the first half of the trip, then he left Aldabra) went into the field from the 1st to at least the 21st Feb with rotating SIF staff with as main aim to cover Eastern Grande Terre, Takamaka, Dune Jean Louis, Dune d'Messe and WGT regions with systematic searches on foot. The signs the team were looking for were droppings, tracks in dry and wet areas, paths in dry areas, access points into vegetation, high browsing and significant vegetation damage of trees, live animals, calling/ bleating, smell of goat and goat urine, and sleeping / laying up scrapes. During this extensive search 939.48 kms were walked, covering a surface area of 46,974km²! No signs of goat presence were found. Bearing in mind the extent of the survey, the team was confident to be able to state that there are no longer any goats on Grande Terre. After this conclusion the aim of a next expedition was to locate, monitor and cull three of the remaining four Judas goats on Eastern Grande Terre. This would stimulate the last remaining Judas goat (J8) into actively searching for any additional goats that were remaining within his range, and to retain him as a final contingency for three months following this culling stage, in case additional goats were found/ missed during the search phases.

- On **March** 13th, all four Judas goats were found together on the edge of a large open area 500m SW of Point Hodoul (Figure 53). There were no additional goats with them. J12 and J10 (Figure 51a, b) were shot from cover, and J1 and J8 ran off into cover out of range. J1 was shot (Figure 51c) in a coastal area between Anse Cedres and Point Hodoul (Figure 53) on the 21st of March. Blood and DNA samples were collected from all goats and their collars were removed.

After this expedition, the youngest male J8 was left with the mission to find any goats which were hiding. Upon their return from Aldabra the consultants recommended that J8 should be left by himself for the next three months. Darryl left Aldabra at the end of March.

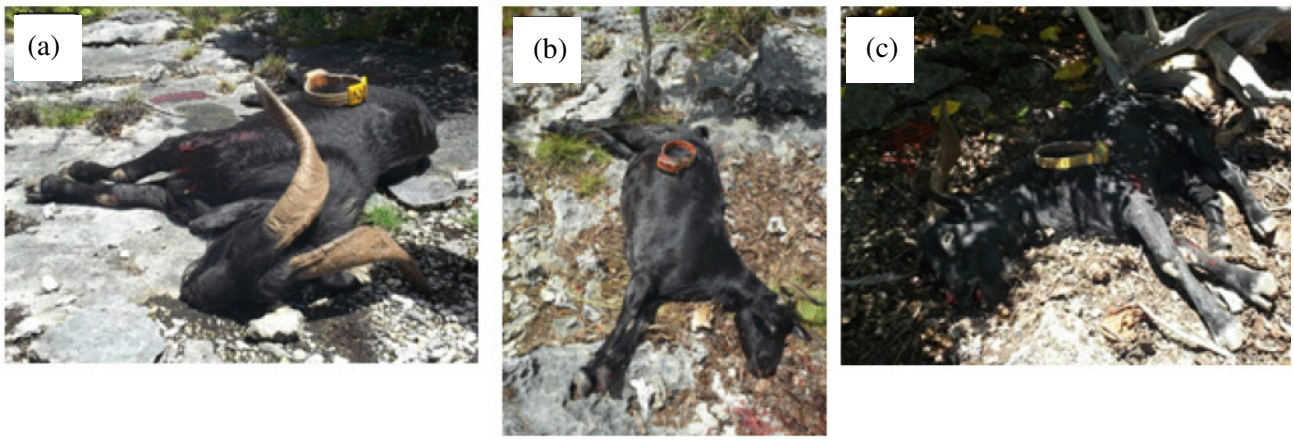


Figure 51. (a) Male JG J12, (b) female JG J10 and (c) male JG J1 after being shot.

- It was decided to give J8 one to two months time with no interference, allowing it to find other goats if any present. There was therefore no GEP done during **April** and **May**.

- In **June** a GEP trip was done with the aim to track J8, to establish if it was still alive and if it was in the presence of other goats (necessarily non-Judas associates). The team received a signal from J8 north of Big Pool, but did not see the goat. Without sight of J8 the team could not confirm whether there were any NJ goats associated with it.

- The aim for the **July** 2012 GEP trip was again to track J8 and to check any associations with NJ goats. It was decided not to cull the goat yet, even if it was observed alone. The team did not receive any signal from J8, and thus the goat could not be found. The lack of signal might have been caused by the following possibilities: (i) the equipment did not function properly, (ii) J8 has died, (iii) J8 has moved out of the area that was searched by the team or (iv) the battery has stopped working. In consult with HO it was decided that during the next search, if J8 would be found to have no association with other goats (observation of minimum 15 minutes) the team would be allowed to shoot it so that the GEP chapter can be closed.

- The aim of the **August** expedition was to finish the GEP era by culling J8. On the first two days J8 was seen and photographed (Figure 52), and some shots were taken but missed.

Figure 52. J8, the last remaining goat of Aldabra (*photographs by Richard Baxter*)

On August the 3rd, the team found J8 in an open area north of Coco2 (coordinates 0665530-895278; Figure 53). At 17:00pm it was shot by Ranger Andy Gouffé (Figure 54) and after removing the intestines it was carried back to the hut. The following day it was transported back to the Station where it was further prepared for preservation.

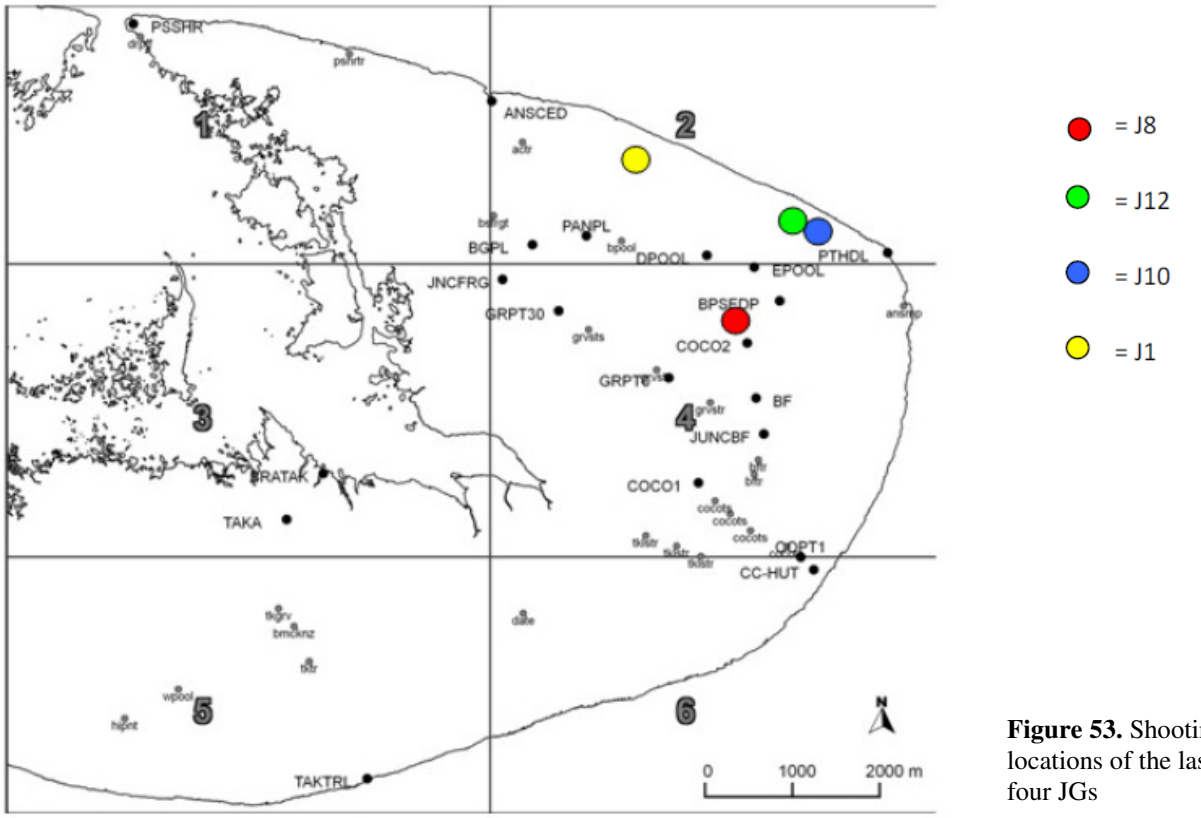


Figure 53. Shooting locations of the last four JGs

Figure 54. After being shot, J8 was carried back by the GEP team to the Cinq Cases hut (*photographs by Curtis Baker & Michel Malbrook*)

The background and significance of this accomplishment was well phrased by our CEO Frauke Fleischer-Dogley: 'The team has managed to return Aldabra largely to its conditions before man interfered, an accomplishment that many places in the world will never be able to return to. This success is based on teamwork at different levels over years, if not decades, which involved different nations and resources. The combination of expertise, technical skills, logistical support and tireless efforts were all equally important for this achievement. Surely a cross section of humanity has served humanity and preserved an exceptional place. It is pleasing that many Seychellois have been involved at different times and at different levels, be it as support staff, team leader or hunter have shown their dedication up to the last call.'

7.2. Invasive birds at Takamaka

Unfortunately the end of one eradication project coincided with the beginning of another. During the February GEP expedition, Senior Ranger Stan Denis and external IAS consultant Darryl Birch reported a sighting of a small group of birds which could possibly be Madagascar fodies (MF). A photo of one of the suspected MFs was examined by senior SIF staff and sent to Adrian Skerrett and was confirmed to be an Aldabra fody (AF). However, other suspicious individuals were not photographed and therefore a quick follow-up was needed.

MFs are introduced on Assumption, and they form a threat for the AF population in terms of resource competition, potential disease transmission and possible interbreeding which could eventually lead to the loss of the Aldabra species (due to hybridisation). Takamaka is the area most proximate to Assumption, and MFs that have flown / blown over are likely to arrive here first.

A summary of findings / activities over 2012 is given below. A total of fourteen Madagascar fodies were culled in 2012 (six were caught with mistnets and eight birds were shot), and by the end of the year the Madagascar fody population was estimated to hold approximately 150-200 birds. For more detailed information see the overview report entitled 'Report Takamaka Invasive Bird Project - 2012 overview' and the fileserver folder Monitoring\Birds\Takamaka - MAD FODY & RWB.

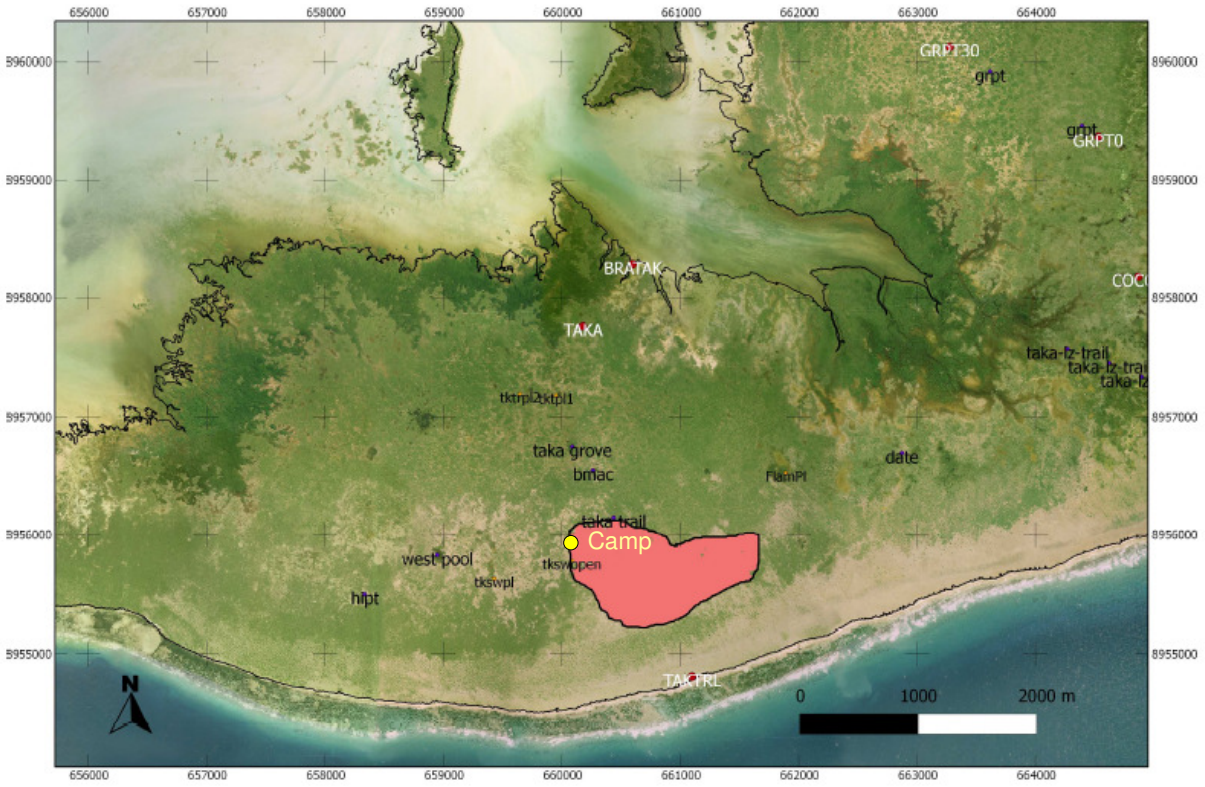


Figure 55. Takamaka region with in pink the large flat platin area where most Madagascar fodies were seen, and the location of the tent camp.

- In **early March** a trip to Takamaka was organized to search for and catch MFs. Sighting of six suspected MF males and two females was reported, of which one individual was confirmed by Adrian Skerrett to be a MF. During the expedition the sightings were scattered over a big area ranging from Flamingo nesting pool to the Takamaka Grove. No suspicious fodies were caught. It seemed like the open flat platin area (Figure 55) is their favoured habitat (i.e., most birds were encountered there), but in addition two suspicious males were heard singing in more dense vegetation. The first estimate after this expedition ranged from 10 (conservative) to 30 birds.

Halfway March, another expedition was conducted with as aim to gain more information about the numbers of individuals/territories present and their spatial distribution. The team carried out observations of MF / AFs by means of transects and again they tried to catch fodies with mistnets (Figure 56). They camped at a sites just south-west of the large open platin area (Figure 55). After the second excursion the estimate of the MF population was adjusted to at least 35 territories, based on the transects (westward track: six territories, eastward track: ten territories and southward track: five territories), and separate sightings.

Figure 56. Mistnets and Takamaka camp site.

It was during this expedition that the team observed a red-whiskered bulbul (RWB) in the area as well (Figure 57). This is another introduced bird species that is currently being eradicated from Assumption. It was seen at the west side of the open platin area, nearby the camp site. No other individuals were heard or spotted.

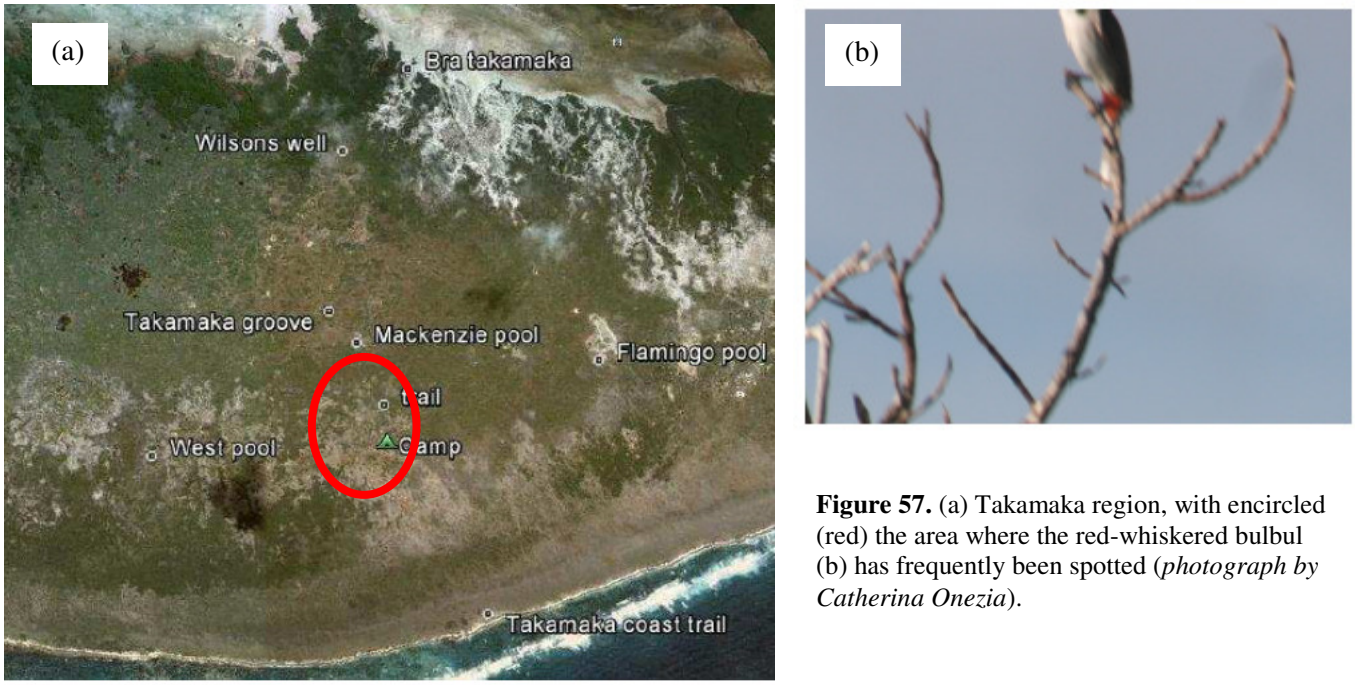


Figure 57. (a) Takamaka region, with encircled (red) the area where the red-whiskered bulbul (b) has frequently been spotted (*photograph by Catherina Onezia*).

- In **early April** a third follow up trip to the Takamaka region of Grande Terre was conducted. A team of five conducted the expedition: two team members carried out the point counts; one worked the mist-nets and two conducted mobile monitoring and shooting. More specifically, they: (1) set up a 250m2 GPS based monitoring grid across the core 'invasion' area and conduct standardized interval point counts at each accessible point; (2) aimed to catch Madagascar fodies with mistnets. Four MFs were caught, dissected and brought back to Station; (3) aimed to shoot (Darryl Birch as shooter) MFs as field samples and for further analysis in the lab. Four MFs and one AF were shot and the bodies retrieved.

As it had become apparent that Takamaka indeed housed an established population of invasive birds, it was discussed how to approach this challenge in terms of logistics. Takamaka is one of the areas furthest away from the Station and most difficult to reach (i.e., via the lagoon, the Takamaka landing stage is only reachable during spring tides, and via the outside the Takamaka beach is very small surrounded by champignon, and therefore reachable only in very calm conditions). The camp site is located on about 45 minutes walk from the Takamaka lagoon landing stage (Figure 55, 56), right at the western edge of the MF-preferred open platin area. As the transport of supplies, especially water, is the biggest setback during the SE season (when transport via the outside of the atoll is not possible), it was decided that a rainwater catchment would be extremely useful. When the sea would calm down in the NW season, a (semi-)permanent hut should be built to house a permanent eradication team.

- In the beginning of **June**, a team of four went to Takamaka to build a rain water catchment on the camp site. Materials were transported in two walks and the device was proven successful as 300L of fresh clean rainwater was collected by the beginning of July.

- In early **July** a point count was conducted by a team of four staff. The same 250m² GPS grid as in April was used. As the timing of the count was outside the breeding period, the birds were very quiet and cryptic, thus difficult to observe (probably resulting in an underestimation of the population estimate). As males were not in their breeding plumage anymore, the MFs and AFs were difficult to distinguish. It was therefore advised to repeat the count in the breeding season. Also, due to time constraints and, more important, inaccessibility (thick pemphis vegetation), a number of points could not be reached.

- Early **September** a team of three staff went to Takamaka to catch the red-whiskered bulbul(s). Until then it was not clear whether it was one individual or more, but afterwards it was confirmed that it was only one bulbul. So far, all sightings included only one bulbul. The last few months the bird had been seen in the same area within the Takamaka region (Figure 57). Furthermore, observations were done to assess in what extent the breeding season of the Madagascar fodies had started. It was attempted to catch the RWB with mistnets. For this sake, an audio playback of singing RWBs (recorded on Assumption) was played next to the net to attract the bird. The playback mainly attracted Aldabra bulbuls and sunbirds, but the RWB was not coming close to the nets. Once the RWB was spotted at a distance of about 50m of the net, possibly attracted by the playback, but at that same moment a group of nine Aldabra bulbuls flew into the mistnet where the playback was played, thereby ruining the chances of catching the RWB. It flew off and afterwards it was not seen close anymore to the nets. Staff managed to take a photograph that showed part of the bird, which is the very first photo on which the red-whiskered bulbul on Aldabra is recognizable (Figure 57). It was discussed with HO whether it would be wise to try to shoot the red-whiskered bulbul by use of the air rifle, but the chance to disturb it after a missed shot with a short-range weapon by a non-expert was deemed too big.

- The camp of early **October** had as aim to catch RWB and any MFs using mist nets combined with playback of RWB sounds. The RWB was seen and heard in the same area as the previous visits and nest were set up. The playback did not attract the bird or was not loud/ clear enough to hear. No displaying MF males were seen or heard. The mistnetting did result in the capture of 29 birds in total but no RWB or Madagascar fodies were caught. Caught birds were measured, ringed and blood samples were taken.

When the calm NW season started, the priority for the Takamaka project is to build the hut, so that food, water and materials can be stored and permanent staff presence can be organized. The materials transported via the outside (the trail from the lagoon landing stage has many bends and is over quite rough terrain) on a day that the sea is calm enough to land on the outside beach.

- In **November and December**, in the calm NW season, two expeditions were conducted to build the wooden / iron sheet six-person hut at the Takamaka camp site (Figure 58). A team consisting of four logistics staff (three during the 2nd expedition) and Martijn van Dinther managed to complete the hut. Materials were offloaded at the Takamaka beach, and from there they were carried inland by foot, a walk of about 30 minutes one-way which had to be repeated for many times.

Figure 58. Transport of materials, building and usage of the Takamaka hut, baptized as 'Hut 42'.

Mid **December** the newly built Takamaka hut was used for the first time. A team of four staff conducted a survey on the number of MF and AF using the point count method and tried to catch MF using mist nets. The point count team managed to count 68 points, trying to cover an area as large as possible extending to West Pool and Flamingo Pool, Takamaka Grove and coast. Unlike in April, no MFs (but AFs) were found at the more inland vegetated locations (towards West Pool and Flamingo Pool, and along the trail towards the landing stage north of Bra McKenzie), but they were present on the open platin area nearby the hut and the coastal strip. Both MF and AF were in the stage of nest building and the team destroyed some MF nests. No eggs were found yet. The mistnetting team managed to catch one male and one female MF.

In the mean time a special Takamaka eradication team of six local and international ISTOs (Invasive Species Technical Officers) was recruited with as mission to eradicate the MFs and RWB while permanently staying on Takamaka. The team would start the project from mid January 2013 onwards.

7.3. Rats

7.3.1. Rat DNA study

Since September 2010 rat tail samples have been collected to assess the origin, population structures and connectivity among the rat populations on Aldabra (which are present on all major islands). Rats were trapped and sampled opportunistically during camping trips. In 2012 two samples were collected at Middle Camp and three at Takamaka, resulting in the totals given in Table 18.

Table 18. Rat DNA samples collected on field camps.

Location	Total number of samples
Picard	32
Middle Camp	23
Malabar	3
Cinq Cases	2
Dune Jean-Louis	1
Dune d'Messe	3
Anse Mais	2
Takamaka	3
Total	**69**

7.3.2. Preparations for rat eradication feasibility project

As part of his GEF (and later IAS) Project, Martijn van Dinther carried out preparations for the rat eradication feasibility project that is planned to start off in the beginning of 2013. His work consisted of two main projects:

(1) The removal of rats from several tropic bird islets at La Gigi and monitor the nesting success of tropic birds. A repeat of the 2011 chew block experiment was done on the islets were rat presence was confirmed last time. This re-assessment was needed as a presence confirmation before any rats would be removed as part of the experiment. In the beginning of May a single chew block was placed on each of the islets LG13, 12, 8, 7, 6. As there were no suspicions of rat activity on islets LG1, 2, 14, 15, 16, 17 and 18, these were left out of the investigation. The chew blocks were hung on a branch of available bushes between 0.6 – 1.0 meters above the ground and reachable for rats. Rat activity was found on LG13, 12, 7 and 6, but not on LG8. The latter was a surprise, as rat presence was found last year on LG8. As the analyses of the tropicbird data showed that there was nearly no difference in nest success on islet with / without rats (see section 5.2.7. Tropicbirds), and as more vegetation research was needed to check comparability of the islets, the experiment was put on hold.

(2) The second project to obtain an abundance measure for the number of rats present on the different islands of Aldabra by use of the mark-recapture method in trapping grids.

Bait trials

To trial which bait was preferred by the rats, a set-up was made near the Backpath with six Sherman-traps and a camera trap. Traps were baited with oats-peanut butter-mix, cereal and roasted coconut (two of each and placed apart). It was also studied whether any of the baits attracted non-target species as rails, coconut crabs, hermit crabs or tortoises. Unfortunately the camera traps did not pick up anything during three consecutive night trails without bait. Testing the camera on the RO house porch (which is regularly visited by rails, coconut crabs and presumably also rats during the night and early morning) gave the same results. As the camera is triggered by body heat it was thought that the ambient (back-ground) temperature here in the tropics is too high to pick up any animals. It is one of the problems the manufacturer warns about when camera use in the tropics. Another problem was damage to the traps caused by coconut crabs (Figure 59).

Figure 59. Severely damage to rat trap, caused by coconut crabs.

Trapping grids

Rat densities are expected to vary between habitats and islands of Aldabra. It was planned to conduct a total of three trapping sessions on six locations with three similar habitats (1. Picard mixed scrub; 2. Picard Pemphis scrub; 3. Malabar mixed scrub; 4. Malabar Pemphis scrub; 5. Grand Terre (DDM) Pemphis scrub and 6. Grand Terre (CC) mixed scrub). The timing would be end of wet season (May-July), end of dry season (September-November) and middle of the wet season January-March.

In July, a first trapping grid site was selected on the trail to Bassin Lebine which mainly consists of dense mixed scrub with some smaller clearings in between. Using GIS a trapping grid was placed on a map of the area with the grid lines running North-South. On these lines every 20 meters a trapping station was placed. However, due to the vegetation density and the wish to keep damage to a minimum, creating a straight line turned out to be impossible. Next to this, the GPS has an accuracy of only ~4-5 meter which made finding the trapping station spot very difficult. In August the grid was, apart from the last three points on several transect lines, finished. The creation was slow due to the large pocket of dense Pemphis in the grid. In September, two trapping grids on Picard were finished; one of 10x10m in mixed scrub and one of 7x7m in casuarina (coastal) woodland. All points were marked with red/white plastic (but this needed replacing) by something more suitable as the plastic is already deteriorating.

In the last half of 2012 it was difficult to plan in the rat work, due to low research staffing and as other projects were prioritized (GEP, Takamaka bird eradication). In November it was decided to postpone further work on rat abundance until the expected arrival of Grant Harper (external consultant and Project Leader of rat eradication feasibility study) in January 2013.

For information about the rat work see the following documents:

- Monthly GEF / IAS reports Martijn van Dinther
- Protocol for monitoring abundance of *Rattus rattus* on Aldabra Atoll (Martijn van Dinther, June 2012): \\ALDABRASERVER\fileserver\Monitoring\Eradication\Rats\Rat studies Martijn van Dinther 2011-2012\Protocols\ Rat abundance proposal_FINAL_Jun12

7.4. Cats

During the July Takamaka fody point count, a nest with two kittens was found in a champignon hole at Takamaka (Figure 60). It was found because the mother was coming out of the hole, running away. It is surprising to find the cats reproducing in the middle of the dry season. The two kittens were culled by hitting them on the head which killed them instantly.

Figure 60. The two kittens that were found and culled at Takamaka (*photographs by Catherina Onezia*)

7.5. Control of invasive vegetation

7.5.1. Sisal (*Agave Sisalana*)

Removal of invasive alien species (IAS) is one of the primary requirements for island restoration, and aligns with requirements set by the IUCN for management of nature reserves and UNESCO World Heritage sites of which Aldabra is one. Sisal (*Agave sisalana*) is a known IAS that occurs on Aldabra Atoll. The 2011 Annual ASC report entails an extensive summary of the background and monitoring history of sisal on Aldabra.

Nowadays sisal still occurs on Back path Picard, Ile Michel and Anse Polymnie (Table 19, Figure 61).

Table 19. Current sisal patches on Aldabra with their characteristics and their locations.

Location	Nr of adult plants	Surface area	GPS	Point on map	Monitoring done
Back Path Picard	2-3	ca. 20x20m	0632407E 8961442N	A	Checked each month for flowering, new plants removed
Anse Polymnie (Fig. 58c)	30-40, but removed in	ca. 10x5m	0637263E 8963684N	B	Checked each month for flowering, new plants removed
Ile Michel (Fig. 58a, b)	100-150	ca. 70x30m	0659065E 8960245N	C	Checked regularly for flowering

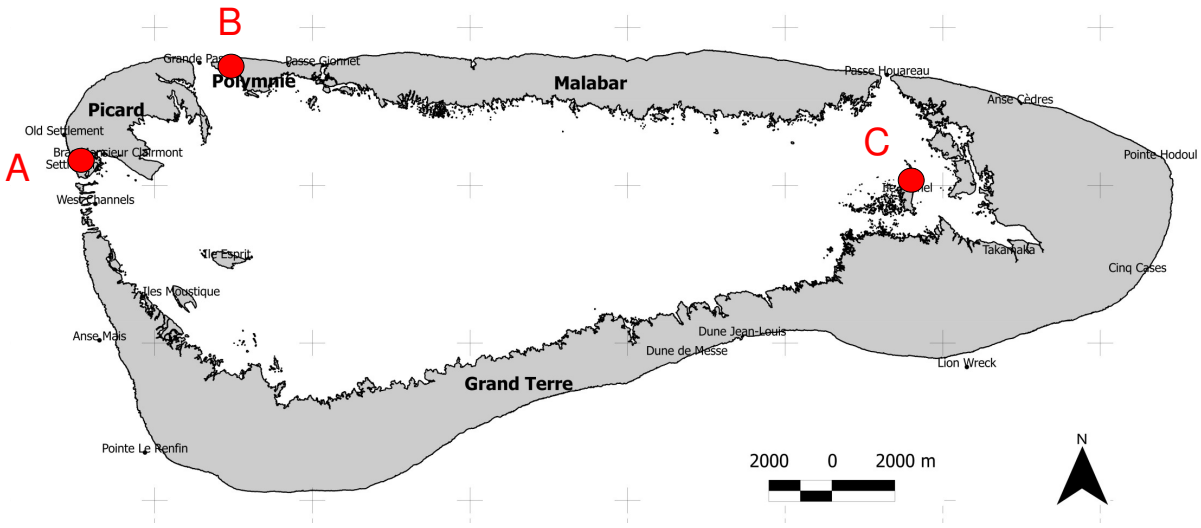


Figure 61. Current distribution of Sisal patches on Aldabra.

Below a summary is given of the 2012 activities per site.

Picard Back Path: Only two or three big plants remain (mostly to check their phenological patterns). Monthly visits to this patch are conducted during phenology monitoring to ensure that new plants are removed and the few remaining adult plants are not given a chance to produce new flowering stems. Like in the previous few years, no flowering stems were found in 2012. However, some little plants were re-growing and these were removed and destroyed.

Ile Michel: Ile Michel is visited as often as possible when staff are camping at Middle Camp or during transports to Cinq Cases. On these visits, photos of the site are reported in the RO monthly reports. No action is taken as the site is too big and needs large-scale clearing which is planned for 2013 as part of the EC eradication project. During all recent visits recent flowering stems were found.

Anse Polymnie: The Polymnie patch was rediscovered in February 2012, a site that consisted of 30-40 adult plants. During a check-up in August a flower stem was discovered (no flowers yet). Upon communication with HO, it was decided to remove the flower stem and if possible the plants. During a dedicated trip in the end of August the plants were removed. In total, 186 small plants (among which 20 bulbils from an old flower stem), 85 medium-sized plants and 35 large plants (including the one with the flower stem) were removed (Figure 62). Only two medium-sized plants were left as they were, as they were growing in champignon rocks. Ideally these should be treated with herbicide to keep them from re-growing. The large plants were left uprooted at the site for later collection and the small and medium-sized plants were taken to Station in guni bags. There they were left to dry on iron sheets in the concrete enclosure around the big fuel tanks (Figure 62). When they were dry enough the plant remains were burnt without problems. The Polymnie patch is now empty (apart from the two large plants growing on the rocks), but needs regular shovelling to remove roots and prevent young plants from sprouting. A permanent solution must be found to keep the site clear.

Figure 62. Uprooting the sisal on Polymnie, the plants that were taken to Station were left to dry in the fuel tank enclosures and burnt when dry enough (*photographs by Martijn van Dinther and Joel Souyave*).

7.6. Biosecurity during transports

7.6.1. Supply boat beaching

In February 2012 the supply boat (Enterprise II) was beaching instead of being moored outside the reef (Figure 63), and therefore a number of precautionary measures were taken to avoid the threat of rats and mice coming on shore and exotic species being introduced via the supplies (many building materials were brought for the powerhouse construction). There were four SIF staff members on board of Enterprise to ensure biosecurity measures before beaching.

Figure 63. Enterprise II beaching in front of the last staff house at Settlement Beach.

The following measures were discussed and taken:
1) Biosecurity starts at the earliest possible stage. Staff on Mahe should make sure as far as possible that nothing is being carried in packaging or in the containers. It is important to keep in mind that it is not only rats and mice to look out for but also potentially even greater threats like yellow crazy ants, fourmi nwanr (white-footed ant), other inverts/insects, reptiles (snakes, geckos) etc.
2) Staff present on the ship should do a full check of the boat before departure and all staff on the ship should be vigilant and carry out searches on board.
3) Trapping on the ship; eight traps are placed on different locations on the ship and in containers. They should be placed along edges in areas rats/mice likely to run/hide, dark areas, cupboards etc. Good baits are dried salted fish, peanut butter and oat mix, lumps of sweet potato etc. Materials were sprayed regularly with anti-insect spray (DOOM).
4) On Aldabra, staff is briefed before unloading about the importance to look out for invasives.
5) When unloading everyone was instructed to keep an eye out for any animals coming off the ship and dispose of them immediately if possible. Construction equipment is notorious for carrying invertebrates, especially crazy ants.
6) One person on Aldabra should be assigned as temporary Biosecurity officer to check the unloaded gear (e.g., spraying with insect spray).

7) Traps are set around the beaching area (bearing in mind that anything mammalian getting off the boat will immediately and quickly try to head for cover and vegetation. Traps were located a bit further back next to objects that they might head for, logs, roots etc). If staff see anything running off, they should try to identify it, see where it goes and focus trapping on that area.

No signs of the above-mentioned invasives were found, other than a few black small ants that were successfully killed with insect spray. It was discussed that a fixed protocol should be made for similar events in which the supply boat is beaching.

7.5.2. Carry-over of fagot (phagode) seeds from Assumption to Aldabra

Another threat is formed by the invasive plant 'fagot' (*Tribulus terrestris*, also known as goathead or devil's thorn; Figure 64) that grows on Assumption, particularly at the airstrip area. Fagot is a ground-covering creeper with spiny seeds that easily get attached to footwear. Therefore chances are high that fagot seeds are carried over via footwear from Assumption to Aldabra. It is thus very important to ask ALL visitors / staff that arrive via Assumption to have their shoes checked by either the ASC / IM / Biosecurity Officer (other grass seeds should also be removed) first thing upon arrival on Aldabra. The seeds should be disposed in a closed jar with the normal trash that is shipped to Mahé. All Aldabra staff should be aware of this risk and check their own footwear after arrival from Assumption. For the ASC / IM it is important to brief all new staff as well.

Figure 64. Fagot (*Tribulus terrestris*) flower and seeds.

8. MISCELLANEOUS

8.1. Protocols

The following protocols have been finalized:

- Coconut crab monitoring
- Tropicbird monitoring
- Tortoise monitoring
- Wader monitoring
- Landbird monitoring

The opportunistic sightings protocol is in a nearly finished stage.
These protocols, together with the climate, marine mammals and phenology protocols, will be compiled into one field guide that can be used by the research team as a reference and for training of new staff.

Catherina Onezia has been working on a catalogue with photos of the different fruiting and flowering parts. It is in the final stage, only some photos of particular fruits / flowers need to be added. Chris Kaiser-Bunbury has provided advice and suggested to include a photo of the whole tree as well, which also needs to be added.

8.2. Assistance with EC Bird Eradication Project on Assumption

Like last year, some of the Aldabra research staff (Janske van de Crommenacker in April and October / November and Curtis Baker in October / November) visited Assumption Island to assist with the EC eradication project of introduced bird species. Assumption Island used to host similar land bird species to Aldabra. All but one of these species have been wiped out in the last century through exploitation of the island, habitat destruction and the introduction of cats and rats. Of Assumption's original breeding land birds (including rails, sunbirds, coucals, turtle-doves, fodies, bulbuls), only the sunbird remains. Mauritian staff working on the guano mining activities on Assumption introduced several bird species from Mauritius to the island in the mid-1970s. Of these, the red-whiskered bulbul and Madagascar fody have established populations and exploded in numbers since then.

Assumption is only 27 km from Aldabra at its closest point and scientists and conservation practitioners have warned for over 30 years (Benson & Penny 1971; Prŷs-Jones *et al*. 1981; Roberts 1988) that the introduced bird species would reach Aldabra and threaten its birds if no action is taken. Eradication was therefore long recommended but in practice difficult and expensive to implement. To protect Aldabra, the Seychelles Islands Foundation launched a programme in October 2011 to research and eradicate the introduced birds from Assumption under a broader EU-funded project focusing on invasive alien species.

The activity began with censuses of all land birds on Assumption, alongside plant surveys, trials and ecological research. The initial population estimates (December 2011) for red-whiskered bulbuls and Madagascar fodies on Assumption were 3000–6000 and 1200–2200 birds, respectively (conducted by Jannie Fries Linnebjerg, see Assumption project reports). After the first phase in 2012 which consisted of capturing of the birds mainly by mist nets, culling and dissection. In the period September until December, just before the onset of breeding and in the resource-wise most challenging period for the birds (at the end of the dry season), a large team effort was planned to intensively strike the birds when most vulnerable.

During the second half of this large team effort, a follow-up population census (Figure 65) was conducted by Terence Mahoune and Janske van de Crommenacker.

During the analysis of the second census (conducted by Jannie Fries Linnebjerg), the initial 2011 results were adjusted to a more realistic estimate. During the first estimate the RWB were probably overestimated and the fodies were certainly underestimated. For example, in 2012 more fodies have been caught than originally estimated to be present.

Adjusted results from 2011 census:
RWB: *n* counted = 4032, range: 3486-4665 individuals (rounded up: 3500-4700 individuals)
Fody: *n* counted = 3017, range: 1967-4625 individuals (rounded up: 2000-4600 individuals)

Results of 2012 census:
RWB: *n* counted = 1719, range: 1422-2077 individuals (rounded up: 1400-2100 individuals)
Fody: *n* counted = 510, range: 282-922 individuals (rounded up: 300-900 individuals)

The results imply that both species have declined with at least half of the population size, which means that the eradication efforts are paying off. It is hoped that numbers in 2013 will have declined again in a large extent.

Figure 65. Assumption point count grid and the census team in action.

8.2. Staff training

Throughout the year, various presentations and training courses were given to (and in some cases provided by) Aldabra staff (Table 20). In addition, a number of posters were made by staff members (with assistance of the ASC), which will be formatted, printed as banner and during the AGM (February 2013). Aldabra staff wrote the text and selected the photos, and the design was made by a professional designer on Mahé. The text set-up was a good training for summarizing scientific information for a broad audience. The following subjects were chosen:
- GEP (Andy)
- *Madagascar Pond Heron (Catherina) – normal print, not as banner*
- *Black-tip reef sharks (Michel) – normal print, not as banner*
- Turtle monitoring and satellite tagging (Martijn)
- ZARP (Rich)
- EMS project (Christina)
- Frigatebirds (Nancy)
- Invasive alien species (Nancy)

Table 20. Presentations and training given to (and provided by) Aldabra staff.

Date	Training / presentation	Participants	Given by	Notes
March 27th	Presentation about RSPB job on Islay Nature Reserve, Scotland	All staff	Michal Šúr	
May 15th	Presentation about Assumption EC bird eradication project	All staff	Janske van de Crommenacker	
May 25th	Presentation about Round Island conservation work	All staff	Rich Baxter	
May 28th	Butterfly fish transect training	Research staff	Philip Haupt	Background information and practice of species recognition
May 29th and 31st	Mistnet mending training	Catherina Onezia, Curtis Baker	Janske van de Crommenacker	
May 30th	Landbird monitoring distance estimation training	Research staff	Catheina Onezia	Practice in estimating 25m distance for point counts. Staff was usually only off by a few meters (mostly <25m).
June 12th	Paleontology excursion to Bassin Cabris	Christina Quanz, Catherina Onezia, Curtis Baker, Janske van de Crommenacker	Dennis Hansen	
June 12th	Presentation about tortoise food experiment and general Aldabra	All staff	Dennis Hansen	

	impressions			
July 16th	Presentation about rat abundance study	All staff	Martijn van Dinther	
July 30th	GEP telemetry and dart training	Research staff	Andy Gouffé	
Oct 11th	Presentation ASC Annual report 2011	All staff	Janske van de Crommenacker	
Dec 17th	Presentation about Reef Mapping Project	All staff	Rebecca Klaus & Philip Haupt	

9. CONCLUDING REMARKS

2012 was a year that was marked by some hugely important milestones. We succeeded in fulfilling a long-wished goal: the switch from fuel-driven generators to solar energy, thereby reducing CO_2 emissions and contributing to a greener future. The impressive dedication of EMS Project Officer Christina Quanz played a huge role in this major achievement. Another huge milestone was the culling of the last goat on Aldabra by Ranger Andy Gouffé, after more than a century of goat presence on the atoll and after a long and challenging battle between various SIF staff and the goats. Unfortunately the accomplishment of this eradication coincided with the beginning of another: the Madagascar fody population and single red-whiskered bulbul found on Takamaka. The birds are assumed to come from neighbouring Assumption Island, where both species are being eradicated. Fortuitously, early detection on Aldabra has enabled rapid response and control efforts to begin which are SIF's new challenges. The eradication team on Assumption managed to significantly bring down the population sizes of both species, which is promising as being one of the first large-scale bird eradications. The satellite tagged turtles did provide valuable data on their migration routes, but unfortunately transmission was aborted too early. By the end of 2012 the marine work on Aldabra was re-initiated with a successful reef mapping project and hopefully a follow-up in the development of a marine bio-indicator programme.

2013 will be a year in which invasive species management again will play a key role in the research work plan. The bird eradication programmes at Takamaka and Assumption will be among SIF's most important activities, and in addition the two-year rat & cat eradication feasibility study will be started off with the arrival of expert Dr. Grant Harper. The invasive species projects may at times compromise the routine long-term monitoring programmes. Some of the latter will be reviewed this year in terms of scientific value and the need for collection of more data. Furthermore, a follow-up on the Reef Mapping Project is planned and the ZARP project will be continued.

As Aldabra community we can be very proud of all the important accomplishments of last year, which can be described as a year in which history was written. Like always the efforts of all team members within research, together the continuous support of the Island Manager, Skipper and logistics department made up the ingredients for this success. Like always the continuous support and guidance of SIF Head Office made it possible to make these developments happen. On my behalf I hope that we can keep going on in these good spirits, thereby not taking anything for granted but appreciate the value that each team member adds to the total.

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