
**Aldabra Research Station**

# Research Officer's Annual Report

**2009**

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## 1.0: Summary

2009 was the first year since 2007 that there was a single Research Officer for the entire year. This is in contrast to 2008 which saw 3 research officers within 12 months. This continuity provided some stability within the research department and in many ways enabled the monitoring to be conducted in a regular and undisturbed way throughout the 12 months. This is also evidenced in the monthly reports which provide detailed updates and analysis of the monitoring being conducted. It also enabled some changes and improvements to a number of the monitoring programmes. Despite this as always it was often difficult trying to keep the monitoring programmes on track with staff changes, staffing levels and other logistical constraints. This, as always, included the influence of boat and engine problems and the heightened tourist activity on the atoll at the start of the year.

During 2009 meteorological data (temperature and rainfall) was collected at the research station on a daily basis and monthly rainfall totals were collected for all rain gauges around the atoll (Figure 1). Monitoring of turtle emergences and activity around the atoll again, as in other years, made up a considerable proportion of the time spent undertaking monitoring activities on the atoll. This included emergence counts for nesting green and hawksbill turtles, tagging of nesting green turtles, emergences of nesting hawksbill turtles, and juvenile green and hawksbill turtles in the lagoon. Daily counts of emergences on Settlement Beach were conducted on all bar one day of 2009 and assessments of beach accessibility were also undertaken along Settlement Beach twice each month as part of the turtle monitoring conducted on the atoll.

Monthly data was collected for all the tortoise transects and land bird point counts in various locations around the atoll (Figure 1). Twelve transects are monitored for tortoises and seven of these are also used for the land bird point counts with the number of points on each ranging from four to nine. Monitoring of birds on the atoll is not restricted to the land birds and counts of the number and species of waders are also carried out. These were primarily completed along Settlement Beach on Picard at least twice every month with counts also being conducted along the coast from Dune Jean-Louis to Dune D'Messe when possible once a month.

Monitoring of the red-tailed tropicbirds nesting on the islets on the inside of the lagoon adjacent to Picard continued with a more systematic approach being developed, providing a more comprehensive picture of the timing and size of breeding activity on the islets.

Vegetation phenology monitoring along the Back Path went through some more changes and development in 2009 resulting in a much more scientific and rigorous programme. The same transect along the Back Path on Picard as well as the additional transect along the coastal path continued to be monitored for coconut crabs. The frequency of this monitoring was reduced to once a month but continues to provide a detailed picture of the abundance and size structure of the population on Picard.

While the majority of monitoring programmes on the atoll concentrate on the terrestrial environment a number of marine monitoring programmes were continued in 2009. The transect first established by the AMP opposite the settlement at the research station was monitored for butterfly fish species presence and abundance on numerous occasions throughout the year and data on fish catches was collected following all subsistence fishing. Observations of whales, dolphins and dugongs were also recorded and provide valuable information on the species frequently sighted around the atoll as well as the seasonality of particular species.

2009 was another busy year on Aldabra in terms of monitoring activities and also visitors. An increase in tourist activity following on from 2008 saw the first quarter of the year pass with days busy with tour groups and cruise ships. This time of year also saw a number of research visits to the atoll including some work by the Cambridge Coastal Research Unit (CCRU) and the GIS Section of the Department of Environment on the habitat mapping of the lagoon and vegetation of the atoll. The following report provides a summary of the data collected in the numerous monitoring activities around the atoll while also providing some basic analysis of this data.

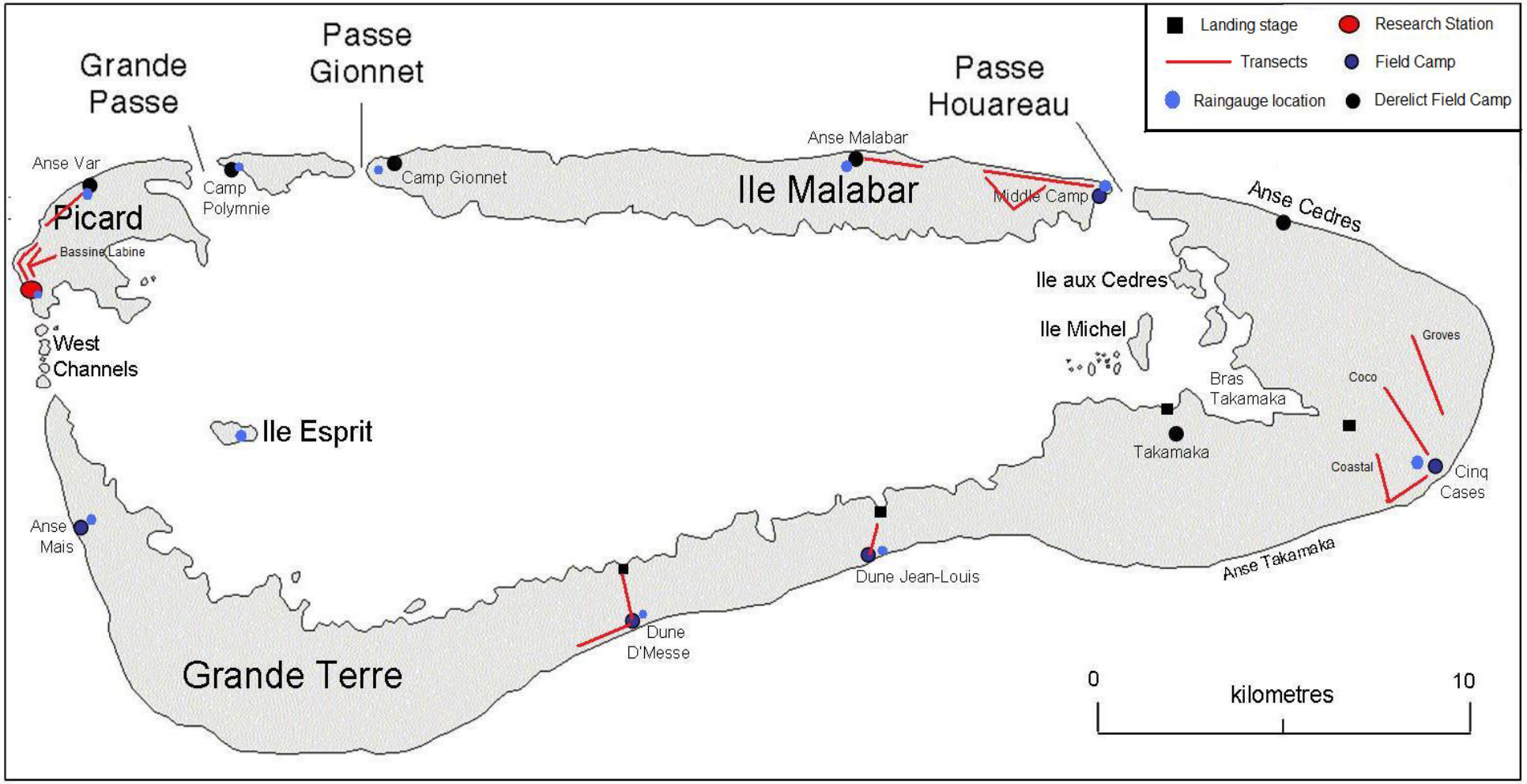


**Figure 1:** Map of Aldabra Atoll with camps and locations of monitoring transect/activities.

## 2.0: Climate

Temperature readings and rainfall totals for the previous 24 hours are taken from the Stevenson screen at the station every day at 8:00 am. The temperature readings include dry and wet bulb temperature at the time of reading and the maximum and minimum temperatures for the previous 24 hours. Mean monthly temperatures were calculated based on these daily readings and are provided in Table 1. The most informative of these readings is the maximum daily temperature which gives an indication of the warmest temperature experienced at the station. For this reason the maximum temperature recorded throughout each month is also included Table 1. Any overall increase in temperatures at the station will be reflected in an increase in the maximum temperature recorded each day as well as the overall mean maximum temperature. Any comparison between maximum temperatures is relatively meaningless over short temporal periods and so both of these parameters have been included for both 2007 and 2008 to provide a comparison in any trends as far as the hottest months of the year.

In 2009 December recorded the highest maximum daily temperature (35.6$^{o}$C) followed by January and February which recorded a maximum daily temperature of only 0.6$^{o}$C lower than December (Table 1). December also recorded one of the highest mean maximum temperatures, only 0.1$^{o}$C lower than March which recorded the highest mean daily maximum. This is in contrast to 2008 during which the months of January, February and March all recorded the highest mean maximum temperature. It is also in contrast to 2007 which recorded January, February and March as having the lowest mean maximum temperature.

**Table 1:** Mean monthly temperatures for 2009, 2008 and 2007, Picard weather station. NA's indicate months where data was not available due to equipment error or lack of readings.

| **2009** | **Jan** | **Feb** | **Mar** | **April** | **May** | **June** | **July** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dry bulb | 29.2 | 28.7 | 18.7 | 19.4 | 18.2 | 17.8 | 15.8 | 16.2 | 16.8 | 18.7 | 19.6 | 20.1 |
| Wet bulb | 26.8 | 26.6 | 26.5 | 27.0 | 26.5 | 25.6 | 24.1 | 24.0 | 24.4 | 25.6 | 27.0 | 28.2 |
| Daily max | 32.1 | 31.9 | 33.3 | 33.0 | 31.6 | 29.7 | 28.2 | 28.7 | 29.6 | 29.6 | 33.0 | 33.2 |
| Daily min | 23.7 | 24.4 | 23.5 | 19.7 | 15.0 | 14.5 | 15.6 | 15.6 | 16.3 | 19.4 | 15.5 | NA |
| Max daily maximum | 35.0 | 35.0 | 34.5 | 34.5 | 33.0 | 31.5 | 31.2 | 30.0 | 30.6 | 31.0 | 34.0 | 35.6 |
| **2008** | | | | | | | | | | | | |
| Daily max | 35.5 | 35.5 | 35.5 | 32.8 | 31.5 | 29.5 | 28.6 | 28.5 | 29.6 | 30.6 | NA | 33.2 |
| Max daily maximum | 35.8 | 35.5 | 35.5 | 35.5 | 31.6 | 33.0 | 33.0 | 29.5 | 30.6 | 32.1 | NA | 34.8 |
| **2007** | | | | | | | | | | | | |
| Daily max | 33 | 33.2 | 33.6 | 35.1 | 35.2 | 35.4 | 35.3 | 35.4 | 35.4 | 35.4 | 35.4 | 35.5 |
| Max daily maximum | 33.1 | 33.5 | 34.8 | 35.5 | 35.5 | 35.5 | 35.4 | 35.4 | 35.4 | 35.5 | 35.5 | 35.5 |

During 2009 work was begun on the compilation and checking of all climate records collected on the atoll. This was done under a funded CC DARE project and included compilation of historic records on both temperature and rainfall. The resulting report was completed in 2010 and will be included in the annual report for that year. Summary results for a number of the temperature readings collected at the station are shown in Figure 2. The figure shows the variability in recent years in a number of the readings. However, this is most likely due to instrument and reader error rather than being an accurate reflection of real changes in the temperatures. Interestingly while the maximum temperatures recorded in recent years have remained high and are considerably higher than historical records the mean maximum temperature has dropped over recent years although remains higher than the historical readings indicating a possible general increase in maximum temperatures (Figure 2).

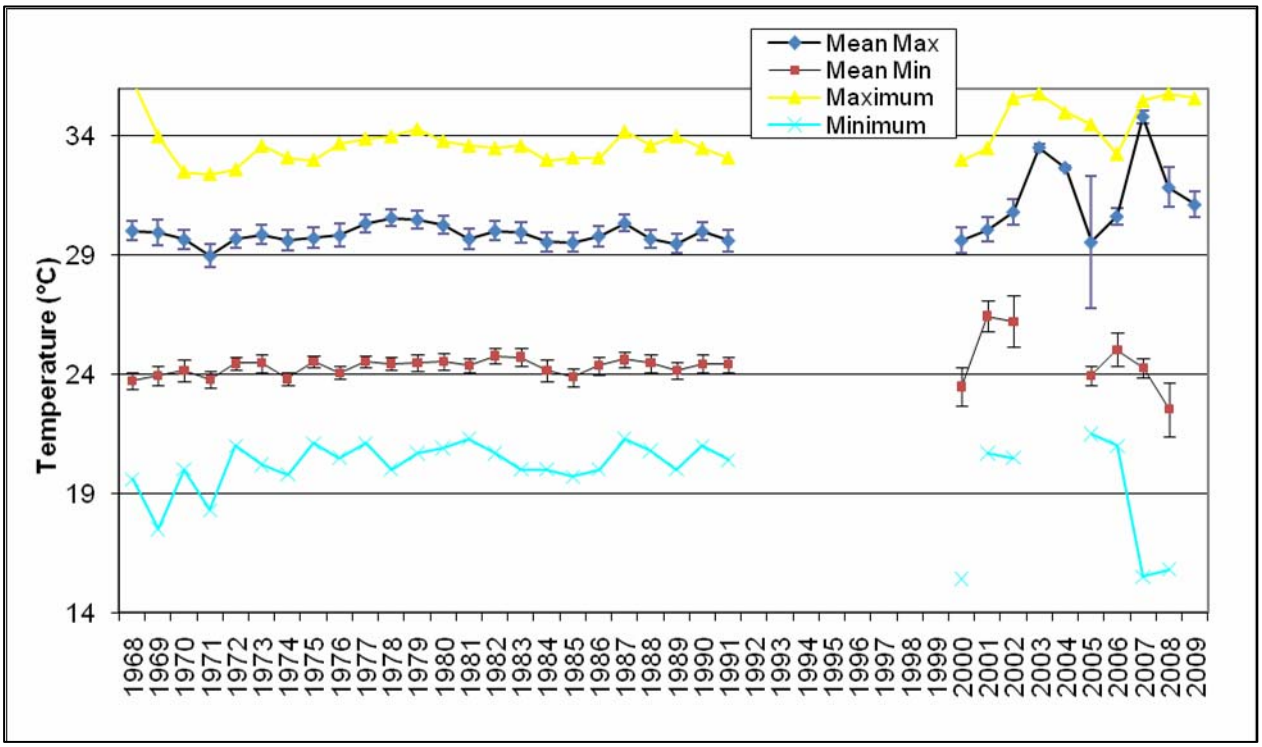


**Figure 2:** Temperature readings taken at the Research Station 1968–2009 (± SE). No data are available from 1992–1999.

In addition to the temperature readings daily rainfall data is also collected at the Research Station. Figure 3 shows the total monthly rainfall for each month of 2009 as well as the mean maximum temperature collected each day. March and December were the wettest months of 2009 with the highest total monthly rainfall. These two months also experienced the highest mean maximum temperature. In contrast to the high rainfall recorded both March and December, October recorded the lowest rainfall for the year with no rain recorded at the station in this month.

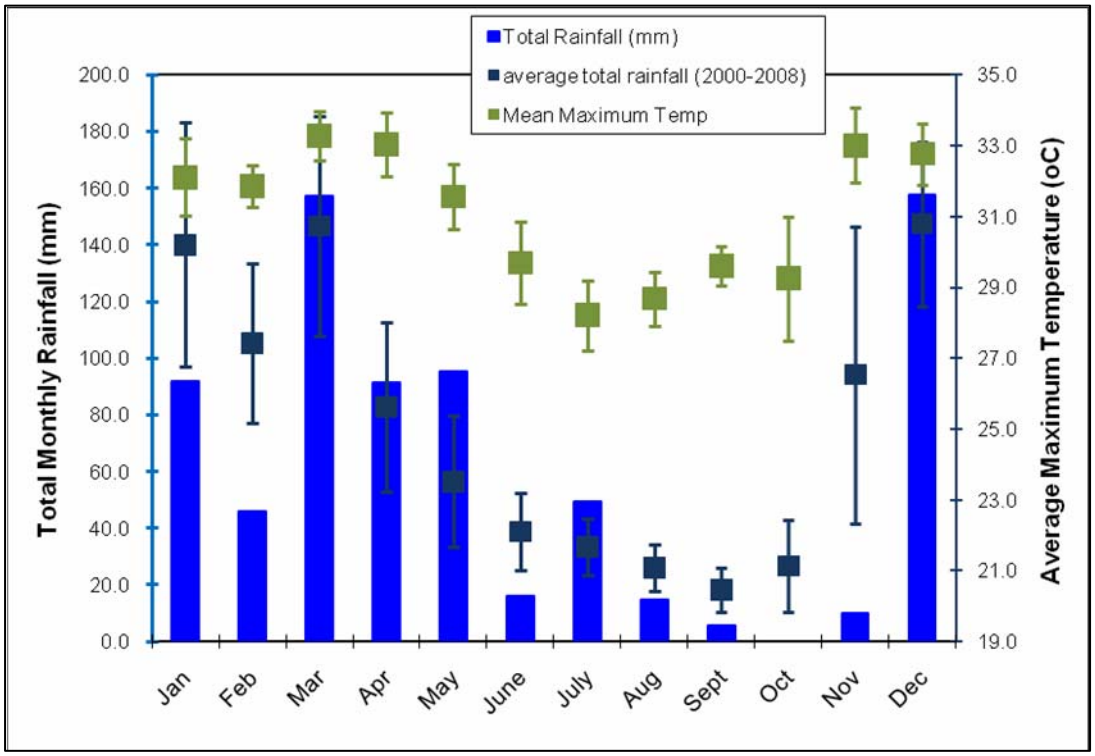


**Figure 3:** Total monthly rainfall and average maximum temperature for Picard, Aldabra (± SE).

Rainfall totals vary considerably around the atoll and there is no obvious or consistent pattern in the amount of rainfall that falls each month across the 12 locations where rainfall is recorded. Table 2 shows the rainfall totals measured at each of the outer rainguage stations throughout the year. The area around the Cinq Cases field hut recorded the highest rainfall with the gauge at the Grove recording a total of 1058.5 mm and the gauge at the hut recording only slightly less than this with an annual total of 1018 mm. The other location recording high rainfall was at Bassine Labine which is close to the research station.

**Table 2:** Total monthly rainfall for rainguage stations around the atoll in 2009

| Location | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cinq Cases Hut | 222 | 85 | 173 | 233 | 227 | 12 | 26 | 18 | 0 | 0 | 10 | 12 | 1018 |
| Cinq Cases Groves | 223 | 76 | 142 | 220 | 265 | 12 | 42.5 | 33 | 10 | 0 | 15 | 20 | 1058.5 |
| Dune Jean Louis | 128 | 190* | 190* | 207 | 75 | 12 | 17.5 | 5 | 7 | 4 | 28 | 8 | 491.5 |
| Dune D'Messe | 73 | 140* | 140* | 163 | 115 | 24 | 37 | 10 | 0 | 10 | 15 | 20 | 467 |
| Anse Mais | 126 | 100 | 112 | 180 | 185 | 35 | 47 | 28 | 7 | 3 | 0 | 76 | 899 |
| Anse Var | 89 | 60 | 150 | 180 | 150 | 15 | 40 | 0 | 0 | 2 | 47 | 65 | 798 |
| Bassin Lebine | 222 | 92 | 123 | 266 | 127 | 21 | 25 | 8 | 2 | 3 | 25 | 118 | 1032 |
| Gionnet | 178 | 125 | 131 | 132 | 168 | 20 | 28 | 29 | 7 | 5 | 40 | 65 | 928 |
| Polymnie | 200 | 162 | 160 | 164 | 141 | 23 | 27 | 27 | 0 | 13 | 35 | 345 | 1297 |
| Anse Malabar | 217 | 175 | 123* | 123* | 160 | 12 | 30 | 12.5 | 8 | 7 | 10 | 25 | 656.5 |
| Middle Camp | 52 | 90 | 67 | 183 | 204 | 15 | 30 | 5 | 7 | 0 | 15 | 27 | 695 |
| Ile Esprit | 235 | 154 | 180 | 133 | 162 | 15 | 27 | 15 | 0 | 0 | 2 | 75 | 998 |
| Average all locations | 164 | 112 | 138 | 187 | 165 | 18 | 31 | 16 | 4 | 4 | 20 | 71 | |

Figure 4 shows the annual rainfall totals recorded at the 12 outer rainguage stations and Research Station locations during 2001-2009. It shows the variability in the amounts recorded across this period as well as across the atoll and highlights the large amount of rainfall recorded in 2006 (see also Aldabra climate report 2010 by Duhec, Doak and Balderson).

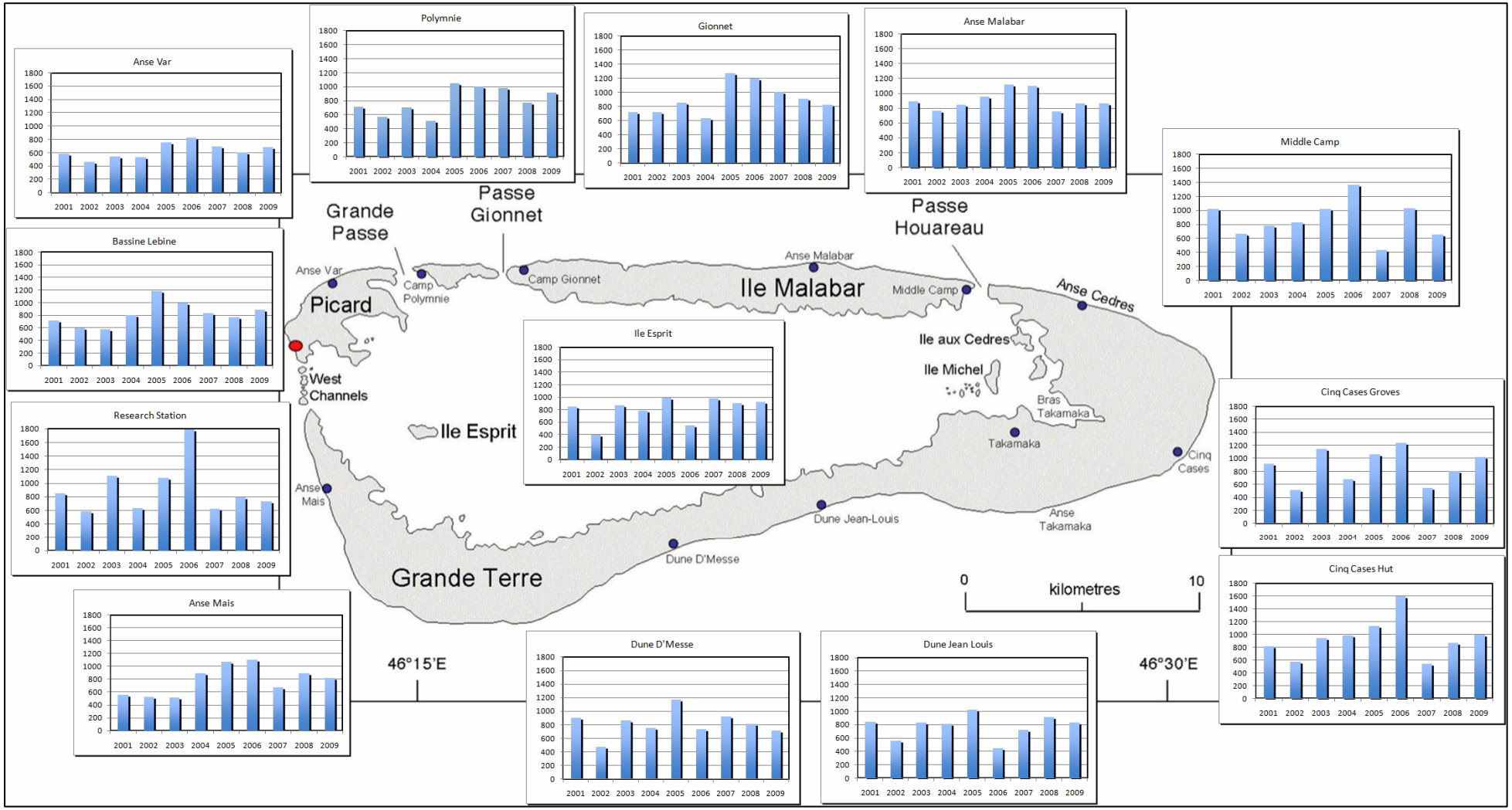


**Figure 4:** Annual rainfall totals for 2001–2009 for the rain gauge locations around the atoll.

## 3.0: Vegetation Monitoring

Monitoring of vegetation phenology on Picard has been in various stages of development in recent years. In 2008 this particular component of the monitoring programme underwent a number of revisions but was returned to the original methodology in late 2008 due to the complex nature of the system proposed by RO Gavin Hellström. Review of the methods being used continued in 2009 and during the visit by Dr. Christopher Kaiser-Bunbury in March 2009 it was possible for an experienced researcher to accompany rangers Alex Underwood and David Boodna on the monitoring and work with them to provide suggestions for improvement with this particular monitoring activity.

Comments from Christopher on the vegetation phenology monitoring following the visit are as follows:

“During my time on Aldabra I accompanied two rangers, Alex Underwood and David Boodna, on the weekly (or 2-weekly) plant phenology survey. The phenology transect runs along the back path where three individuals of each of the 34 plant species included in the survey are permanently marked. The current phenology survey, established by the last RO Gavin Hellström and Cathy Avierinos records complex data on the intensity of flowering, fruiting and leaf growth as well as the presence of pollinators, insect and rat damage, drought effects and fungus infestation. While the scope of the data collected is appropriate for such a monitoring programme, the quality and quantity of the data collected requires revision. For example, the number of three individuals per species is insufficient for any statistical analysis of the data and, thus, no sound conclusions about the phenology of a species can drawn from the data currently collected. Furthermore, the categorisation of flowering, fruiting and leaf budding is overly complicated and fairly subjective, as is the assessment of the intensity of these stages. This has resulted in the recording of different categories and intensities for exactly the same conditions on the plant.

To improve the statistical power and the quality of the data while maintaining compatibility with previous monitoring schemes, I recommend the following modifications:

1. The monitoring categories should be simplified without loss of crucial information. Four levels of intensity (none, few, some, many) should be recorded for the following stages:
   **Leaf budding** – (i) no leaves, branches bare; (ii) leaf buds; (iii) young leaves; (iv) mature leaves; (v) dry leaves
   **Flowering** – (vi) flower buds; (vii) fresh/full flowers
   **Fruiting** – (viii) young fruits; (ix) developing fruits; and (x) mature fruits.

2. The number of individuals per tree species should be increased to N = 6. This can be easily done along the existing transect. Note the importance of stratifying the target plants along the entire transect to avoid spatial dependencies (which is not done in the existing set up). This number of replicates ensures statistical soundness and a solid basis for further research projects which rely on baseline data on plant phenology on Aldabra. It may be that for rare plant species, six individuals do not occur along the transect and for these species, individuals not on the transect should be located and incorporated into the survey.

3. Previously, the datasheets were organised as one datasheet per species which meant that 32 sheets needed to be taken into the field on every monitoring trip on one clipboard. This led to the sheets being disorganised, extra time spent trying to sort them and locate the correct sheet, and more potential for damaged or lost sheets and may be why the monitoring took as long as two days of work. A new data collection sheet has therefore been designed to increase the efficiency of the monitoring. Species names and individual number are listed in the left hand column according to the sequence in which they occur when walking along the transect. Arranging the data in such a manner ensures that no individual can be omitted since they must be recorded in order. It also reduces the number of data sheets required for the monitoring and facilitates the recording of the data. I

anticipate that all individuals can be sampled within one day following the new data sheet, even with the additional three individuals recommended for each species in the sample.

4. All rangers and trainee rangers should be trained in the new monitoring techniques to maintain high flexibility and to ensure continuity of the monitoring. Data should be recorded every 2 weeks which should be sufficient to account for rapid changes in phenology.

5. As there is no written (electronic) record documenting the reasons behind or describing the methodology and the data collection, I strongly urge the preparation of a manual with clear instructions on the surveying methodology. The manual may include information on the plant species surveyed (and perhaps photographs) so that it can be used for training purposes. This is fairly urgent as the protocol as it stands is known by only one ranger and not contained in any document but it needs to accompany and include the other changes outlined above. I would be willing to assist in the preparation of such a document.

The aforementioned modifications will increase the objectivity of the data collection and the efficiency of the phenology survey so that all rangers on Aldabra can be trained in plant identification and phenology monitoring skills. Most importantly, it will produce a high quality data set which can be used to answer ecological questions on the community level (e.g. pollination network, seed dispersal research) and more specific biological questions on the species level. For example, phenology data can be accurately related to rainfall data collected on Picard or to landbird or fruitbat abundance."

After the visit and report by Chris additional specimens of all monitored species were added and modifications made to the datasheet used during the monitoring to facilitate the collection of meaningful data in a way that maximises the amount of information recorded in the time available. It also enabled the data to be collected more quickly, so data could be collected at more regular intervals while not impacting on other monitoring activities carried out on the atoll. Six specimens of each monitored species are now included in the monitoring as standard. A detailed protocol was drawn up by Christopher and checked and approved by staff and this is now in use on Aldabra. Table 3 shows the species included in the monitoring each month since the introduction of the new monitoring methods in June. It also shows the number of individuals included in the monitoring at the time of the last monitoring event of each month. Any individuals that die are replaced with a different individual.

Table 3 also indicates the number of monitoring events that were undertaken each month (N). It is standard for the transect to be completed at least twice each month but depending on the number of days and other activities monitoring may also be undertaken more than this. July, September and November all contained three monitoring events while the other months contained the minimum of two.

Each phenology variable is recorded according to a numbering system which is an estimate of the proportion of total possible leaves/flowers/fruit in each category. This system for recording the condition of each variable on each specimen is as follows; 0: none, 1: starting/few (1-25%), 2: medium/some (26-75%), and 3: full/many (76-100%).

As such an increase in the average value recorded for a particular variable for an individual species indicates an increase in the percentage of specimens displaying the specific parameter. Table 4 shows the average values for each species for each of the variables recorded in terms of leaves and flowers / fruit. This average value has been calculated across all individuals of a species and also across all of the monitoring events within each month. Given the difficulty in choosing a single species to represent the trend in the phenology of the vegetation these average values were plotted to show the trends (Figure 5 (leaves) and Figure 6 (Flowers / Fruit). The Y axis on the figures is used to spread the lines representing each species as plotting all of them would result in many lines overlapping. As such the Y axis does not represent specific values relevant to the phenology of the plants.

Figure 5 clearly shows the synchronous nature of leaf development across all species and when compared to the rainfall recorded on Picard shows that species develop leaves soon after the first rainfall of the season in late November / early December. At this time the percentage of each specimen that is recorded with no leaves reaches a peak (in November, Figure 5 a) before dramatically decreasing. As the percentage of each individual specimen with no leaves drops in December the percentage of each individual that is covered with buds or fresh leaves increases (Figure 5 b).

Figure 6 shows the same pattern in terms of the phenology of flowers and fruits with species clearly showing the development of flowers after the first rains in November / December and the subsequent shift from buds to full flowers and then on to developing fruits and mature fruits. Continued collection of this data over an entire 12 month period will provide substantial detail on the continued shifts and changes in phenology for monitored species.

**Table 3:** Plant species and number of individuals included in the vegetation phenology monitoring along back path during 2009 (N = number of monitoring events each month).

| **Species** | | **June** | **July** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** |
|---|---|---|---|---|---|---|---|---|
| | **N** | **1** | **3** | **2** | **3** | **2** | **3** | **2** |
| *Acalypha claoxloides* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Allophylus aldabricus* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Apodytes dimidiate* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Azima tetracantha* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Canthium bibracteatum* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Capparis cartilaginea* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Cassipourea lanceolata* (rare) | | 4 | 4 | 4 | 6 | 6 | 6 | 6 |
| *Clerodendrum glabrum var. minutiflorum* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Dracaena reflexa* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Erythroxylum platycladum* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Euphorbia pyrifolia* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Flacourtia indica* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Gagnebina commersoniana* var *aldabrensis* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Grewia picta* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Jasminium elegans* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Lomatophyllum aldabrense* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Maytenus senegalensis* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Mystroxylon aethiopicum* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Obetia radula* (rare) | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Ochna ciliata* | | 6 | 6 | 5 | 6 | 6 | 6 | 6 |
| *Pandanus tectorius* | | 4 | 4 | 6 | 6 | 6 | 6 | 6 |
| *Pemphis acidula* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Pleurostelma cermuum* | | 3 | 3 | 6 | 6 | 6 | 6 | 6 |
| *Polysphaeria multiflora* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Premna serratifolia* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Scutia myrtina* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Sideroxylon inerme* subsp. *cryptophlebium* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Solanum aldabrense* | | 5 | 5 | 5 | 6 | 6 | 6 | 6 |
| *Tarenna supra-axillaris* (rare) | | 5 | 5 | 5 | 6 | 6 | 6 | 6 |
| *Terminalia boivinii* | | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| *Tournefortia argentea* | | 3 | 3 | 6 | 6 | 6 | 6 | 6 |
| *Trianolepsis africana* subsp. *hildebrandtii* | | 3 | 3 | 6 | 6 | 6 | 6 | 6 |
| *Tricalysia ovalifolia* | | 3 | 3 | 6 | 6 | 6 | 6 | 6 |

**Table 4:** Phenology variables and monthly mean values for each species monitored along the back path.

| Species | June | | | | | | | | | July | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Leaves | | | | Flowers / Fruit | | | | | Leaves | | | | Flowers / Fruit | | | | |
| | No. | buds | mature | dry | buds | full | young | dev. | mature | No. | buds | mature | dry | buds | full | young | dev. | mature |
| *Acalypha claoxloides* | 0.8 | 1.0 | 2.3 | 0.5 | 0.7 | 0.7 | 0.7 | 0.0 | 0.3 | 1.5 | 0.9 | 2.6 | 1.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 |
| *Allophylus aldabricus* | 1.0 | 0.3 | 3.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 0.6 | 2.3 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Apodytes dimidiate* | 1.0 | 0.8 | 3.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.9 | 1.3 | 3.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Azima tetracantha* | 1.0 | 1.0 | 2.8 | 0.8 | 0.2 | 0.0 | 0.2 | 0.2 | 0.2 | 1.0 | 1.3 | 2.8 | 0.8 | 0.2 | 0.0 | 0.2 | 0.1 | 0.3 |
| *Canthium bibracteatum* | 0.8 | 1.0 | 3.0 | 0.7 | 0.3 | 0.2 | 0.3 | 0.0 | 0.0 | 1.3 | 1.7 | 2.4 | 0.9 | 0.7 | 0.0 | 0.1 | 0.0 | 0.1 |
| *Capparis cartilaginea* | 1.3 | 1.2 | 2.5 | 0.5 | 1.2 | 0.3 | 0.2 | 0.5 | 0.3 | 1.1 | 1.6 | 2.7 | 0.7 | 1.8 | 0.8 | 1.1 | 0.6 | 0.4 |
| *Cassipourea lanceolata* (rare) | 0.8 | 1.0 | 3.0 | 0.8 | 0.8 | 0.0 | 0.5 | 0.8 | 0.8 | 0.7 | 0.7 | 3.0 | 0.8 | 0.5 | 0.0 | 0.3 | 0.3 | 0.2 |
| *Clerodendrum glabrum var. minutiflorum* | 1.7 | 0.5 | 2.0 | 0.7 | 0.8 | 0.3 | 0.2 | 0.2 | 0.2 | 2.4 | 0.1 | 1.5 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Dracaena reflexa* | 0.5 | 1.0 | 3.0 | 0.8 | 0.0 | 0.2 | 0.3 | 0.5 | 0.5 | 0.7 | 1.8 | 2.8 | 1.1 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 |
| *Erythroxylum platycladum* | 1.0 | 0.0 | 3.0 | 1.0 | 0.3 | 0.2 | 0.3 | 0.5 | 0.3 | 1.4 | 0.1 | 2.8 | 1.1 | 0.2 | 0.1 | 0.3 | 0.3 | 0.1 |
| *Euphorbia pyrifolia* | 1.3 | 1.3 | 2.5 | 1.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 0.8 | 1.6 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Flacourtia indica* | 1.3 | 0.7 | 2.3 | 0.7 | 0.2 | 0.5 | 0.3 | 0.3 | 0.3 | 1.6 | 1.1 | 2.1 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| *Gagnebina commersoniana var aldabrensis* | 1.0 | 0.8 | 2.7 | 0.8 | 0.8 | 0.7 | 0.7 | 1.0 | 0.8 | 2.2 | 0.3 | 1.7 | 1.1 | 0.0 | 0.0 | 0.2 | 0.6 | 1.1 |
| *Grewia picta* | 1.0 | 0.7 | 2.5 | 0.7 | 0.0 | 0.0 | 0.0 | 0.5 | 0.2 | 1.7 | 0.4 | 1.9 | 0.9 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| *Jasminium elegans* | 1.0 | 1.0 | 2.8 | 0.7 | 0.7 | 1.0 | 1.2 | 1.2 | 0.8 | 1.2 | 1.1 | 2.6 | 0.9 | 1.7 | 1.1 | 1.4 | 1.1 | 0.6 |
| *Lomatophyllum aldabrense* | 0.0 | 1.0 | 2.8 | 1.5 | 0.2 | 0.2 | 0.0 | 0.0 | 0.2 | 0.1 | 1.1 | 2.7 | 1.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Maytenus senegalensis* | 1.2 | 1.0 | 2.8 | 0.7 | 1.5 | 1.3 | 1.3 | 1.2 | 0.8 | 1.2 | 0.7 | 2.9 | 0.7 | 2.1 | 1.9 | 1.5 | 1.2 | 0.9 |
| *Mystroxylon aethiopicum* | 0.8 | 0.5 | 2.8 | 0.7 | 1.0 | 1.0 | 0.5 | 0.8 | 0.5 | 0.9 | 0.8 | 2.9 | 1.1 | 1.6 | 1.3 | 1.2 | 1.2 | 0.8 |
| *Obetia radula* (rare) | 1.0 | 1.0 | 2.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | 0.6 | 0.8 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Ochna ciliata* | 0.3 | 0.7 | 3.0 | 0.8 | 0.2 | 0.5 | 0.2 | 0.2 | 0.2 | 1.1 | 0.8 | 2.7 | 1.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.2 |
| *Pandanus tectorius* | 0.0 | 1.0 | 2.8 | 2.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.3 | 2.5 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| *Pemphis acidula* | 1.2 | 1.2 | 3.0 | 1.0 | 0.5 | 0.7 | 0.3 | 0.5 | 0.7 | 1.4 | 1.3 | 2.8 | 1.0 | 1.1 | 0.8 | 0.9 | 1.0 | 0.9 |
| *Pleurostelma cermuum* | 1.3 | 1.0 | 3.0 | 0.7 | 1.3 | 1.3 | 1.0 | 0.7 | 0.7 | 1.4 | 1.1 | 2.2 | 0.8 | 1.0 | 0.6 | 0.1 | 0.1 | 0.1 |
| *Polysphaeria multiflora* | 1.3 | 1.0 | 2.5 | 0.5 | 0.8 | 0.6 | 0.8 | 1.7 | 1.2 | 1.2 | 0.4 | 2.8 | 0.9 | 0.3 | 0.2 | 0.6 | 1.2 | 1.1 |
| *Premna serratifolia* | 1.2 | 0.5 | 2.8 | 0.8 | 0.8 | 1.0 | 0.7 | 1.5 | 1.5 | 1.6 | 0.9 | 2.2 | 0.8 | 1.2 | 1.2 | 1.2 | 1.0 | 0.9 |
| *Scutia myrtina* | 1.2 | 1.2 | 2.7 | 0.7 | 0.2 | 0.2 | 0.0 | 0.3 | 0.2 | 1.3 | 0.9 | 2.8 | 1.0 | 0.1 | 0.0 | 0.2 | 0.1 | 0.1 |
| *Sideroxylon inerme subsp. cryptophlebium* | 1.0 | 0.7 | 3.0 | 1.0 | 0.0 | 0.3 | 0.2 | 0.5 | 0.7 | 1.3 | 0.8 | 2.9 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| *Solanum aldabrense* | 0.4 | 0.8 | 2.6 | 0.0 | 0.2 | 0.4 | 0.4 | 0.2 | 0.6 | 0.1 | 1.1 | 2.9 | 0.5 | 0.5 | 0.2 | 0.1 | 0.1 | 0.4 |
| *Tarenna supra-axillaris* (rare) | 1.0 | 0.8 | 3.0 | 0.8 | 1.0 | 0.8 | 0.6 | 1.4 | 0.6 | 0.9 | 0.8 | 3.0 | 1.0 | 1.3 | 0.1 | 0.5 | 1.2 | 1.0 |
| *Terminalia boivinii* | 0.8 | 0.7 | 2.8 | 0.3 | 0.2 | 0.3 | 0.3 | 0.5 | 0.3 | 1.2 | 0.6 | 2.6 | 1.0 | 0.1 | 0.0 | 0.4 | 0.8 | 0.2 |
| *Tournefortia argentea* | 0.3 | 1.0 | 3.0 | 1.3 | 1.0 | 0.7 | 1.0 | 2.0 | 0.3 | 0.4 | 1.8 | 3.0 | 1.1 | 1.1 | 0.7 | 1.8 | 1.7 | 1.1 |
| *Trianolepsis africana* subsp. *hildebrandtii* | 1.3 | 0.7 | 2.7 | 1.0 | 0.3 | 0.3 | 0.3 | 0.0 | 0.0 | 1.8 | 0.9 | 1.9 | 0.9 | 0.1 | 0.0 | 0.1 | 0.2 | 0.1 |
| *Tricalysia ovalifolia* | 0.7 | 1.0 | 3.0 | 0.3 | 0.7 | 0.0 | 0.0 | 0.3 | 0.7 | 1.0 | 1.3 | 3.0 | 0.8 | 1.2 | 0.1 | 0.0 | 0.1 | 0.3 |

Table 4: continued

| Species | August | | | | | | | | | September | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Leaves | | | Flowers / Fruit | | | | | | Leaves | | | Flowers / Fruit | | | | |
| | No. | buds | mature | dry | buds | full | young | dev. | mature | No. | buds | mature | dry | buds | full | young | dev. | mature |
| *Acalypha claoxloides* | 1.4 | 0.8 | 2.4 | 0.9 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 1.9 | 0.4 | 1.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| *Allophylus aldabricus* | 1.9 | 0.7 | 1.8 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 | 0.6 | 0.8 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Apodytes dimidiate* | 0.9 | 0.7 | 3.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.9 | 2.8 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Azima tetracantha* | 1.0 | 1.6 | 2.8 | 1.0 | 0.8 | 0.2 | 0.3 | 0.1 | 0.1 | 1.1 | 1.0 | 2.8 | 1.0 | 1.1 | 0.9 | 0.8 | 0.7 | 0.5 |
| *Canthium bibracteatum* | 1.1 | 1.0 | 2.8 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.1 | 1.0 | 2.7 | 1.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Capparis cartilaginea* | 1.2 | 1.3 | 2.8 | 0.9 | 0.9 | 0.8 | 0.6 | 0.4 | 0.2 | 1.1 | 1.6 | 2.8 | 0.9 | 1.6 | 1.1 | 1.2 | 0.9 | 0.5 |
| *Cassipourea lanceolata* (rare) | 0.8 | 0.8 | 3.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.8 | 0.4 | 2.5 | 0.8 | 0.5 | 0.1 | 0.0 | 0.0 | 0.0 |
| *Clerodendrum glabrum var. minutiflorum* | 2.6 | 0.0 | 1.2 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 | 0.1 | 0.4 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Dracaena reflexa* | 0.5 | 1.7 | 2.9 | 1.0 | 0.5 | 0.0 | 0.1 | 0.0 | 0.0 | 0.8 | 1.3 | 3.0 | 0.9 | 0.8 | 0.4 | 0.2 | 0.2 | 0.2 |
| *Erythroxylum platycladum* | 1.3 | 0.4 | 2.7 | 1.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 2.5 | 0.0 | 1.1 | 1.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 |
| *Euphorbia pyrifolia* | 2.8 | 0.3 | 1.0 | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.8 | 0.7 | 0.3 | 0.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Flacourtia indica* | 1.8 | 1.4 | 2.1 | 1.2 | 0.2 | 0.1 | 0.0 | 0.0 | 0.1 | 1.8 | 0.8 | 1.4 | 1.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 |
| *Gagnebina commersoniana var aldabrensis* | 2.7 | 0.7 | 0.8 | 0.9 | 0.0 | 0.0 | 0.1 | 0.2 | 0.8 | 1.9 | 0.7 | 0.6 | 0.4 | 0.2 | 0.1 | 0.1 | 0.1 | 0.4 |
| *Grewia picta* | 1.8 | 0.8 | 1.5 | 0.9 | 0.2 | 0.0 | 0.1 | 0.1 | 0.0 | 2.6 | 0.3 | 0.8 | 0.8 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| *Jasminium elegans* | 1.3 | 0.8 | 2.6 | 1.0 | 0.7 | 0.3 | 0.6 | 0.5 | 0.3 | 1.3 | 0.9 | 2.5 | 0.9 | 0.3 | 0.1 | 0.3 | 0.2 | 0.1 |
| *Lomatophyllum aldabrense* | 0.0 | 0.9 | 2.9 | 1.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.4 | 1.1 | 2.9 | 1.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 |
| *Maytenus senegalensis* | 1.1 | 0.4 | 3.0 | 1.0 | 2.5 | 2.3 | 1.5 | 1.3 | 0.5 | 1.1 | 0.8 | 2.7 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.5 |
| *Mystroxylon aethiopicum* | 0.8 | 0.7 | 2.8 | 1.0 | 1.5 | 1.0 | 0.8 | 0.4 | 0.3 | 0.9 | 0.8 | 3.0 | 1.0 | 1.1 | 0.9 | 0.7 | 0.7 | 0.6 |
| *Obetia radula* (rare) | 2.8 | 0.8 | 0.3 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.5 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Ochna ciliata* | 1.3 | 0.6 | 2.5 | 1.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 1.4 | 0.5 | 2.2 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| *Pandanus tectorius* | 0.0 | 0.7 | 2.5 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.4 | 0.8 | 2.8 | 1.7 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| *Pemphis acidula* | 1.2 | 1.3 | 2.9 | 1.1 | 1.5 | 1.7 | 1.6 | 1.8 | 1.7 | 1.4 | 0.9 | 2.9 | 1.1 | 0.9 | 1.2 | 0.9 | 1.0 | 0.6 |
| *Pleurostelma cermuum* | 1.2 | 1.2 | 2.4 | 1.0 | 0.9 | 0.6 | 0.0 | 0.1 | 0.1 | 1.1 | 0.9 | 1.8 | 0.8 | 1.1 | 1.0 | 0.4 | 0.3 | 0.0 |
| *Polysphaeria multiflora* | 1.3 | 0.5 | 2.5 | 0.8 | 0.1 | 0.1 | 0.3 | 0.8 | 0.8 | 1.1 | 0.5 | 2.8 | 1.2 | 0.1 | 0.1 | 0.1 | 0.4 | 0.4 |
| *Premna serratifolia* | 2.0 | 0.9 | 2.1 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 2.0 | 1.1 | 1.4 | 0.9 | 0.8 | 0.6 | 0.6 | 0.6 | 0.8 |
| *Scutia myrtina* | 1.3 | 0.8 | 2.7 | 0.9 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 0.6 | 2.4 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Sideroxylon inerme subsp. cryptophlebium* | 1.0 | 0.8 | 3.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.6 | 3.0 | 1.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Solanum aldabrense* | 0.1 | 0.9 | 2.3 | 1.0 | 0.3 | 0.3 | 0.1 | 0.0 | 0.0 | 0.8 | 0.9 | 2.2 | 0.7 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| *Tarenna supra-axillaris* (rare) | 1.0 | 0.6 | 2.8 | 1.0 | 1.7 | 0.1 | 0.9 | 1.1 | 1.0 | 1.1 | 0.6 | 2.9 | 1.1 | 1.1 | 0.1 | 0.2 | 0.2 | 0.4 |
| *Terminalia boivinii* | 1.4 | 0.0 | 2.4 | 1.0 | 0.0 | 0.1 | 0.3 | 0.7 | 0.1 | 1.7 | 0.1 | 1.8 | 1.1 | 0.0 | 0.0 | 0.2 | 0.2 | 0.0 |
| *Tournefortia argentea* | 0.7 | 1.3 | 2.8 | 0.9 | 0.9 | 0.7 | 0.7 | 1.0 | 0.9 | 0.8 | 1.4 | 2.5 | 0.9 | 1.1 | 0.9 | 0.7 | 0.6 | 0.6 |
| *Trianolepsis africana* subsp. *hildebrandtii* | 1.8 | 0.6 | 1.9 | 0.9 | 0.2 | 0.2 | 0.2 | 0.3 | 0.1 | 2.3 | 0.3 | 1.1 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Tricalysia ovalifolia* | 0.8 | 0.8 | 2.7 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 0.6 | 2.7 | 0.9 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |

Table 4: continued

| Species | October | | | | | | | | | November | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Leaves | | | Flowers / Fruit | | | | | | Leaves | | | Flowers / Fruit | | | | |
| | No. | buds | mature | dry | buds | full | young | dev. | mature | No. | buds | mature | dry | buds | full | young | dev. | mature |
| *Acalypha claoxloides* | 2.4 | 0.3 | 0.6 | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 0.3 | 0.7 | 0.3 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| *Allophylus aldabricus* | 2.8 | 0.4 | 0.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.1 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Apodytes dimidiate* | 1.1 | 0.2 | 2.6 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 0.3 | 2.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Azima tetracantha* | 1.1 | 0.1 | 2.9 | 0.9 | 0.3 | 0.2 | 0.5 | 0.8 | 0.5 | 1.0 | 0.4 | 2.6 | 1.1 | 0.1 | 0.1 | 0.2 | 0.5 | 0.2 |
| *Canthium bibracteatum* | 1.2 | 0.3 | 2.9 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.1 | 0.6 | 2.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Capparis cartilaginea* | 1.0 | 1.1 | 2.9 | 0.8 | 1.2 | 1.0 | 1.2 | 1.0 | 0.3 | 1.2 | 1.0 | 2.8 | 1.0 | 0.7 | 0.5 | 0.6 | 0.5 | 0.5 |
| *Cassipourea lanceolata* (rare) | 0.8 | 0.8 | 2.9 | 1.1 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.1 | 2.6 | 1.1 | 0.4 | 0.1 | 0.2 | 0.2 | 0.2 |
| *Clerodendrum glabrum var. minutiflorum* | 3.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.9 | 0.0 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Dracaena reflexa* | 1.0 | 1.4 | 2.8 | 1.0 | 0.1 | 0.0 | 0.1 | 0.3 | 0.4 | 1.1 | 1.1 | 2.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 |
| *Erythroxylum platycladum* | 3.0 | 0.1 | 0.2 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.1 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Euphorbia pyrifolia* | 2.8 | 0.4 | 0.4 | 0.3 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.9 | 0.0 | 0.0 | 2.4 | 0.4 | 0.3 | 0.1 | 0.1 |
| *Flacourtia indica* | 1.9 | 0.6 | 1.6 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 0.4 | 1.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Gagnebina commersoniana var aldabrensis* | 2.5 | 0.8 | 0.6 | 0.3 | 0.3 | 0.3 | 0.0 | 0.0 | 0.4 | 2.6 | 0.5 | 0.6 | 0.6 | 0.3 | 0.3 | 0.1 | 0.1 | 0.2 |
| *Grewia picta* | 2.7 | 0.1 | 0.6 | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Jasminium elegans* | 1.3 | 0.4 | 2.4 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.3 | 0.4 | 2.6 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Lomatophyllum aldabrense* | 0.1 | 0.9 | 2.1 | 1.3 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.3 | 0.9 | 2.2 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Maytenus senegalensis* | 1.2 | 0.3 | 2.8 | 0.8 | 0.0 | 0.0 | 0.1 | 0.2 | 0.3 | 1.1 | 0.3 | 2.4 | 0.9 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| *Mystroxylon aethiopicum* | 1.0 | 0.2 | 3.0 | 0.7 | 0.5 | 0.3 | 0.4 | 0.6 | 0.3 | 1.0 | 0.6 | 2.9 | 1.0 | 0.2 | 0.2 | 0.4 | 0.3 | 0.1 |
| *Obetia radula* (rare) | 3.0 | 0.3 | 0.0 | 0.1 | 1.3 | 0.8 | 0.2 | 0.0 | 0.0 | 3.0 | 0.1 | 0.1 | 0.0 | 1.2 | 0.8 | 0.4 | 0.3 | 0.2 |
| *Ochna ciliata* | 1.6 | 0.2 | 2.1 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.3 | 1.4 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Pandanus tectorius* | 0.0 | 1.0 | 2.3 | 1.5 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.7 | 1.2 | 2.6 | 1.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| *Pemphis acidula* | 1.4 | 1.6 | 2.6 | 1.1 | 1.0 | 0.9 | 1.1 | 1.4 | 0.8 | 1.2 | 1.3 | 2.9 | 1.0 | 0.9 | 0.9 | 1.3 | 1.3 | 0.8 |
| *Pleurostelma cermuum* | 1.5 | 0.9 | 1.9 | 1.0 | 1.1 | 1.2 | 0.4 | 0.1 | 0.0 | 1.2 | 1.4 | 1.7 | 0.9 | 1.2 | 0.8 | 0.4 | 0.4 | 0.2 |
| *Polysphaeria multiflora* | 1.1 | 0.1 | 2.5 | 1.4 | 0.0 | 0.0 | 0.0 | 0.3 | 0.3 | 1.4 | 0.2 | 2.1 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| *Premna serratifolia* | 2.1 | 0.6 | 1.3 | 0.4 | 0.8 | 0.8 | 0.7 | 0.5 | 0.3 | 2.2 | 0.5 | 0.9 | 0.6 | 0.5 | 0.3 | 0.4 | 0.2 | 0.3 |
| *Scutia myrtina* | 1.5 | 0.3 | 2.3 | 1.0 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 1.5 | 0.1 | 1.9 | 1.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Sideroxylon inerme subsp. cryptophlebium* | 0.9 | 0.2 | 3.0 | 1.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.3 | 2.8 | 1.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Solanum aldabrense* | 0.8 | 0.8 | 2.2 | 0.7 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 1.4 | 0.4 | 1.6 | 0.7 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |
| *Tarenna supra-axillaris* (rare) | 1.2 | 0.1 | 2.8 | 1.1 | 0.3 | 0.0 | 0.0 | 0.1 | 0.4 | 1.2 | 0.4 | 2.3 | 0.9 | 0.7 | 0.1 | 0.1 | 0.0 | 0.1 |
| *Terminalia boivinii* | 2.3 | 0.0 | 1.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 2.4 | 0.0 | 0.9 | 0.7 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| *Tournefortia argentea* | 1.1 | 1.5 | 2.5 | 0.9 | 1.0 | 1.2 | 0.8 | 0.9 | 0.8 | 1.3 | 1.2 | 2.3 | 1.0 | 0.8 | 0.8 | 1.0 | 1.2 | 0.9 |
| *Trianolepsis africana* subsp. *hildebrandtii* | 2.8 | 0.3 | 0.3 | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| *Tricalysia ovalifolia* | 1.1 | 0.2 | 2.4 | 1.1 | 0.2 | 0.1 | 0.2 | 0.4 | 0.3 | 1.1 | 0.4 | 3.7 | 1.0 | 0.1 | 0.0 | 0.1 | 0.2 | 0.2 |

Table 4: continued

| Species | December | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Leaves | | | | Flowers / Fruit | | | | |
| | No. | buds | mature | dry | buds | full | young | dev. | mature |
| *Acalypha claoxloides* | 1.2 | 1.8 | 1.7 | 0.3 | 0.5 | 0.3 | 0.8 | 0.3 | 0.0 |
| *Allophylus aldabricus* | 1.3 | 2.4 | 1.0 | 0.3 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Apodytes dimidiate* | 1.4 | 1.5 | 1.7 | 0.9 | 0.3 | 0.3 | 0.1 | 0.1 | 0.0 |
| *Azima tetracantha* | 1.2 | 0.3 | 2.5 | 1.0 | 0.0 | 0.0 | 0.3 | 0.3 | 0.2 |
| *Canthium bibracteatum* | 1.2 | 1.3 | 2.1 | 0.9 | 1.7 | 0.8 | 0.3 | 0.0 | 0.0 |
| *Capparis cartilaginea* | 1.2 | 0.3 | 2.8 | 1.0 | 0.4 | 0.3 | 0.2 | 0.2 | 0.1 |
| *Cassipourea lanceolata* (rare) | 0.4 | 1.3 | 2.8 | 0.6 | 1.5 | 0.2 | 1.0 | 0.3 | 0.2 |
| *Clerodendrum glabrum var. minutiflorum* | 2.2 | 1.3 | 0.8 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Dracaena reflexa* | 1.1 | 1.6 | 1.9 | 1.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.3 |
| *Erythroxylum platycladum* | 1.6 | 2.1 | 1.5 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| *Euphorbia pyrifolia* | 0.8 | 1.9 | 1.7 | 0.3 | 0.6 | 0.8 | 0.7 | 0.8 | 0.1 |
| *Flacourtia indica* | 1.3 | 1.5 | 1.8 | 0.5 | 0.7 | 0.4 | 0.2 | 0.3 | 0.2 |
| *Gagnebina commersoniana var aldabrensis* | 1.9 | 1.3 | 1.5 | 0.5 | 0.3 | 0.2 | 0.0 | 0.0 | 0.1 |
| *Grewia picta* | 1.5 | 1.4 | 0.9 | 0.5 | 0.6 | 0.2 | 0.0 | 0.0 | 0.0 |
| *Jasminium elegans* | 1.5 | 0.8 | 2.2 | 0.8 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| *Lomatophyllum aldabrense* | 0.0 | 1.0 | 2.3 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Maytenus senegalensis* | 1.6 | 0.8 | 2.5 | 1.0 | 0.5 | 0.3 | 0.0 | 0.1 | 0.2 |
| *Mystroxylon aethiopicum* | 1.0 | 1.1 | 2.7 | 1.1 | 0.7 | 0.4 | 0.3 | 0.3 | 0.3 |
| *Obetia radula* (rare) | 0.8 | 1.5 | 0.9 | 0.2 | 2.3 | 1.2 | 0.4 | 0.2 | 0.0 |
| *Ochna ciliata* | 1.9 | 1.0 | 1.5 | 0.9 | 1.1 | 0.4 | 0.3 | 0.2 | 0.1 |
| *Pandanus tectorius* | 0.0 | 1.8 | 1.9 | 1.1 | 0.0 | 0.0 | 0.2 | 0.2 | 0.0 |
| *Pemphis acidula* | 1.8 | 2.0 | 2.7 | 1.1 | 0.9 | 1.2 | 1.2 | 1.6 | 1.0 |
| *Pleurostelma cermuum* | 1.0 | 1.0 | 2.1 | 0.9 | 1.4 | 0.9 | 0.3 | 0.1 | 0.0 |
| *Polysphaeria multiflora* | 1.6 | 1.1 | 2.1 | 1.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 |
| *Premna serratifolia* | 1.7 | 1.3 | 1.8 | 0.6 | 1.0 | 0.6 | 0.0 | 0.2 | 0.1 |
| *Scutia myrtina* | 1.3 | 1.3 | 2.0 | 0.9 | 0.3 | 0.0 | 0.0 | 0.1 | 0.0 |
| *Sideroxylon inerme subsp. cryptophlebium* | 1.3 | 0.9 | 2.6 | 1.0 | 1.9 | 0.5 | 0.1 | 0.0 | 0.0 |
| *Solanum aldabrense* | 1.3 | 1.3 | 1.5 | 0.5 | 0.1 | 0.0 | 0.1 | 0.3 | 0.0 |
| *Tarenna supra-axillaris* (rare) | 1.3 | 0.9 | 2.4 | 0.9 | 1.3 | 0.1 | 0.0 | 0.0 | 0.1 |
| *Terminalia boivinii* | 1.3 | 2.0 | 1.7 | 0.5 | 0.9 | 0.2 | 0.1 | 0.0 | 0.0 |
| *Tournefortia argentea* | 1.0 | 1.1 | 2.6 | 1.0 | 0.1 | 0.0 | 0.5 | 0.8 | 0.0 |
| *Trianolepsis africana* subsp. *hildebrandtii* | 2.2 | 1.2 | 0.4 | 0.1 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 |
| *Tricalysia ovalifolia* | 1.4 | 1.0 | 2.3 | 1.0 | 1.0 | 0.5 | 0.1 | 0.1 | 0.1 |

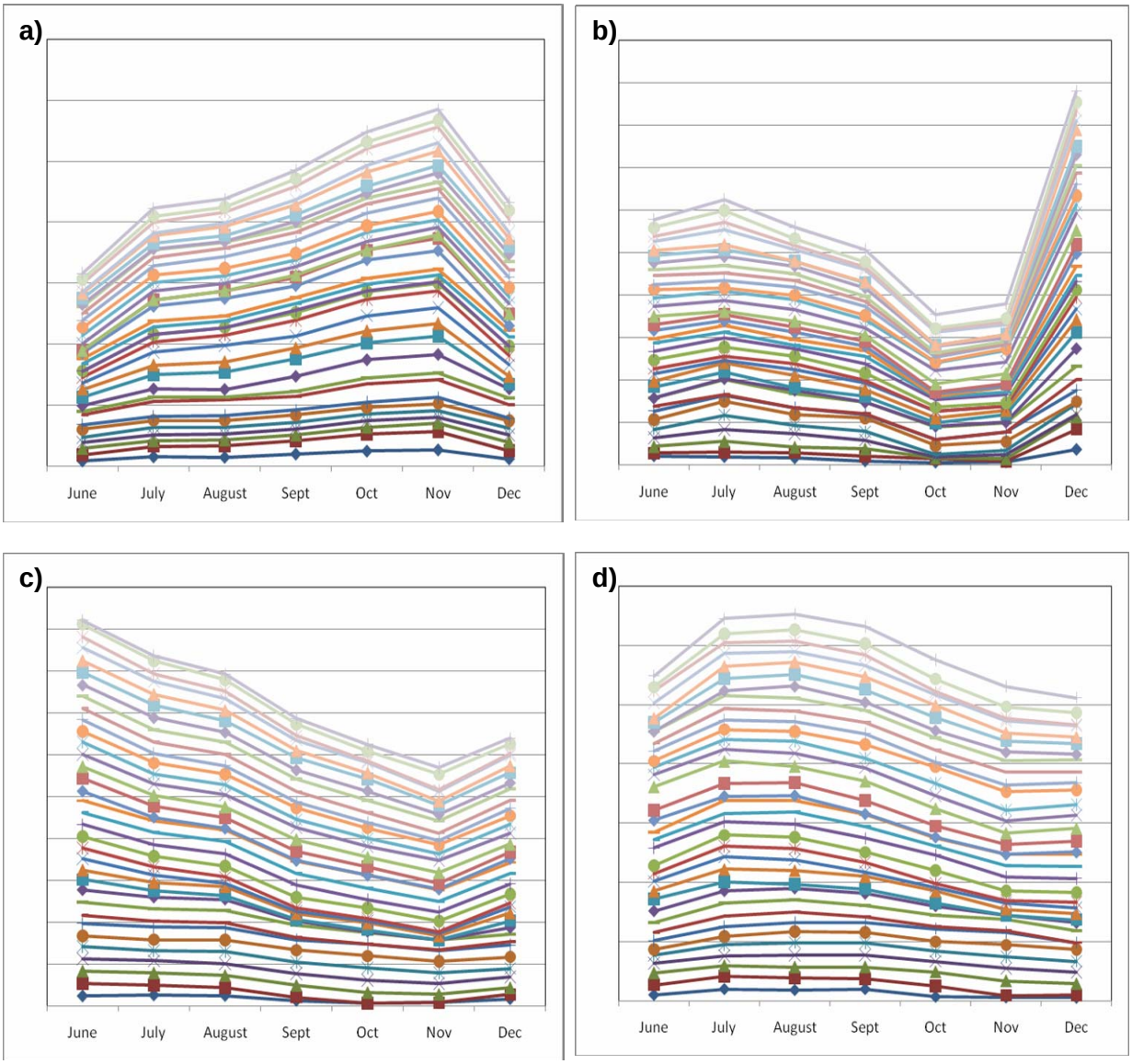


**Figure 5:** Vegetation phenology for leaves on monitored species along the backpath from June – December 2009. a) no leaves, b) buds / young leaves, c) mature leaves and d) dry leaves. No values are specified on the Y-axis as in this case this is not an absolute measure of the phenology but an indication of the trend based on the average figures from Table 4. Each line represents a single species.

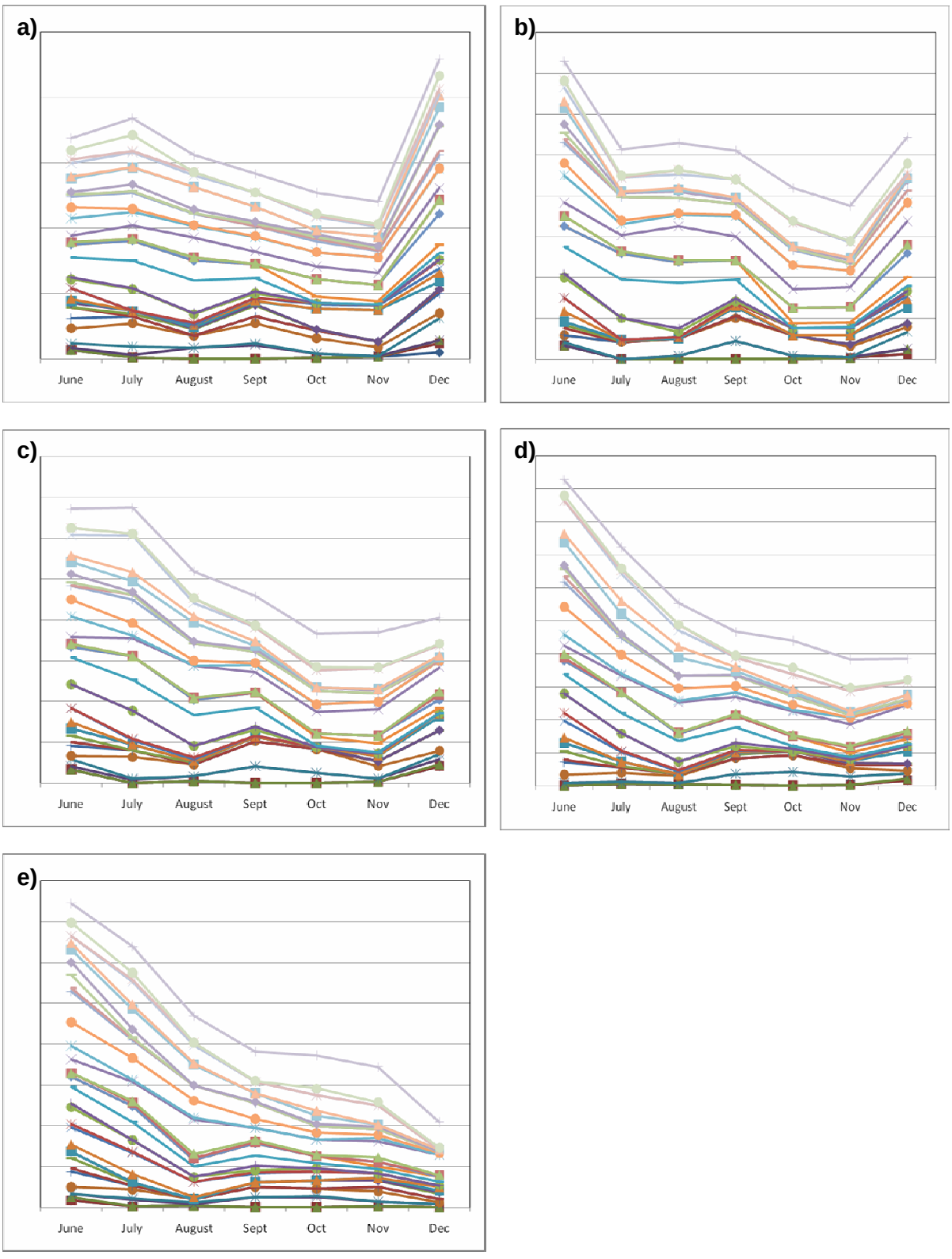


**Figure 6:** Vegetation phenology for flowers and fruits on monitored species along the Back Path from June–December 2009. a) flower buds, b) full / fresh flowers, c) young fruits, d) developing fruits and e) mature fruits. No values are specified on the Y-axis as in this case this is not an absolute measure of the phenology but an indication of the trend based on the average figures from Table 4. Each line represents a single species.

## 4.0: Turtle Monitoring

As with 2008 a comprehensive analysis of the turtle monitoring data collected on the atoll is not provided here as it is usually undertaken by Jeanne Mortimer. Jeanne is currently in the process of a detailed analysis of the considerable amount of data collected on the turtles at Aldabra. This analysis will include the most up to date data from 2009 which was provided to Jeanne in both hard and soft copy. As such detailed analysis has not been undertaken here and the results presented are a summary of the large amounts of data collected.

### 4.1: Track counts along external beaches (Green turtles)

Track counts were conducted along Settlement Beach every day apart from one in 2009, producing what is to date the most complete set of daily track counts for any year since the commencement of turtle monitoring. On each of these occasions the number of emergences was recorded with tracks being placed into one of three categories, very fresh (VF), half moon (HM) and emergence stopped by obstacle (ESBO). In addition beginning in 2009 staff recorded whether emergences appeared to have resulted in a successful nesting attempt. This provides additional information for the estimate of the nesting population of green turtles as the inclusion of emergences which were not successful nesting attempts in any calculation of nesting population may lead to an over estimate. While successful nesting can only be confirmed if each nest is dug up and eggs confirmed a number of signs indicate a likely successful nesting attempt.

Settlement Beach is divided into four zones where emergences are recorded. Zone 4 recorded the largest number of emergences in 2009 in all three categories of track recorded; 1073, 88 and 282 very fresh, half moon and emergence stopped by obstacle respectively (Table 5). While this zone is by far the most visited zone of the beach throughout the year, it is also the zone with the largest number of emergences that were stopped by obstacles, 282, which is a higher number than the very fresh emergences recorded in Zone 1. While Zone 1 recorded the lowest number of emergences (123) only 0.15% of these were prevented by obstacles.

**Table 5:** Turtle tracks observed on Settlement Beach, Picard

| | | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 1 | VF | 24 | 21 | 27 | 5 | 12 | 6 | 5 | 5 | 4 | 4 | 3 | 2 | 118 |
| | HM | 2 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 7 |
| | ESBO | 4 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 8 |
| Zone 2 | VF | 75 | 113 | 169 | 109 | 77 | 60 | 46 | 40 | 35 | 35 | 31 | 11 | 801 |
| | HM | 7 | 3 | 12 | 2 | 8 | 2 | 4 | 2 | 0 | 2 | 0 | 0 | 42 |
| | ESBO | 10 | 2 | 3 | 1 | 2 | 1 | 2 | 2 | 12 | 0 | 2 | 0 | 37 |
| Zone 3 | VF | 56 | 105 | 160 | 134 | 103 | 61 | 34 | 23 | 38 | 36 | 18 | 25 | 793 |
| | HM | 12 | 6 | 13 | 8 | 16 | 6 | 2 | 0 | 2 | 1 | 1 | 2 | 69 |
| | ESBO | 20 | 15 | 12 | 11 | 13 | 6 | 3 | 3 | 6 | 4 | 5 | 1 | 99 |
| Zone 4 | VF | 68 | 161 | 242 | 185 | 142 | 63 | 36 | 48 | 40 | 34 | 33 | 21 | 1073 |
| | HM | 8 | 9 | 23 | 12 | 12 | 5 | 2 | 9 | 1 | 2 | 2 | 3 | 88 |
| | ESBO | 25 | 19 | 48 | 42 | 49 | 19 | 13 | 12 | 21 | 16 | 16 | 2 | 282 |
| Total | | 311 | 455 | 711 | 509 | 436 | 230 | 148 | 145 | 161 | 134 | 111 | 67 | 3418 |

Tracks recorded as very fresh are those that have involved some level of digging in attempts to lay eggs. This category includes no differentiation between the emergences that have successfully laid a clutch of eggs and those that have involved digging of a body pit with no eggs being laid. Figure 7 shows the average number of very fresh emergences recorded along the length of settlement beach for each month of 2009. Emergence data for Settlement Beach in previous years has shown that the seasonality related to nesting activity of green turtles is dynamic with the peak in nesting activity varying slightly from year to year. In 2009 the peak in emergence activity on Settlement Beach occurred in March with the numbers decreasing from this month until the lowest number of emergences recorded in December (Figure 7 and 8). This pattern is shown in the total number of emergences, mean number of VF emergences (Figure 7) as well as in the mean number of very fresh emergences for each zone along Settlement Beach (Figure 8).

In 2008 the peak in emergence activity was in April although there was a great deal of variation in the number of emergences each day as is expected with some reliance on the time and size of the high tide. While the peak in emergences was recorded in April there was very little difference between the average numbers of emergences recorded from March through to June (see RO Annual Report 2008). In 2007 the peak in activity was in March which was followed by an incremental decline until September and December with the lowest average number of emergences. In 2006 the peak in emergence activity was in May. As can be seen in Figure 8 it is the number of emergences in Zone 4 which drives the position of the peak emergence time as the peak in emergences in the other zones, while still placed in April are not as marked as the peak seen in zone 4.

In April 2009 staff began recording the number of VF emergences that appeared to have resulted in successful nesting attempts as well as those that did not. Figure 9 shows the relatively high percentage of VF emergences that do not result in successful nesting but, by definition, include digging of some sort or an attempt to construct a nest. In April, one of the busiest times for emergences along Settlement Beach (Figure 7) more than 50 % of the VF emergences did not result in a successful nesting attempt. Other months also showed a relatively high percentage of emergences not resulting in nesting, however, this percentage decreased as did the number of emergences as they year progressed.

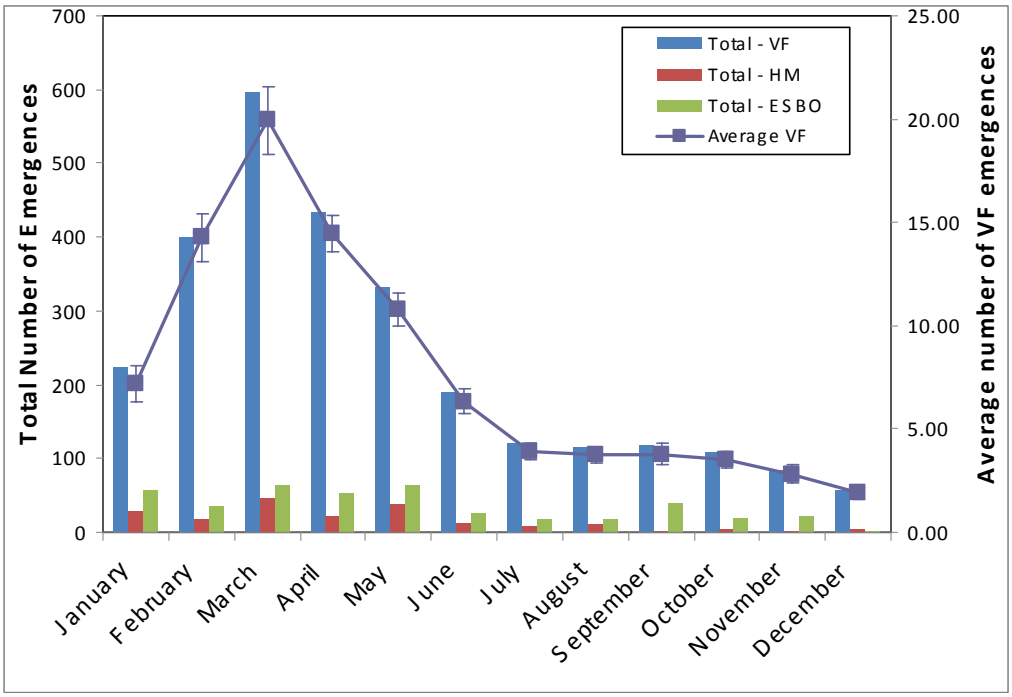


**Figure 7:** Monthly trends in turtle emergences in 2009 on Settlement Beach.

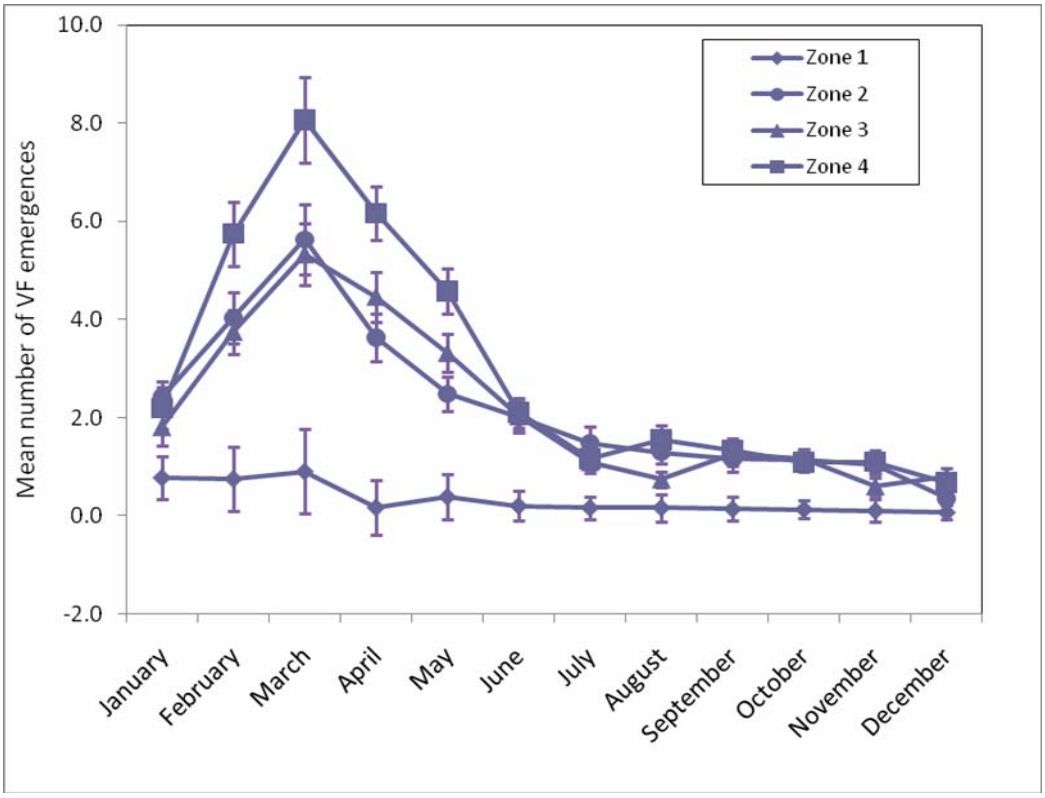


**Figure 8:** Monthly trends in each zone for Very Fresh emergences on Settlement Beach

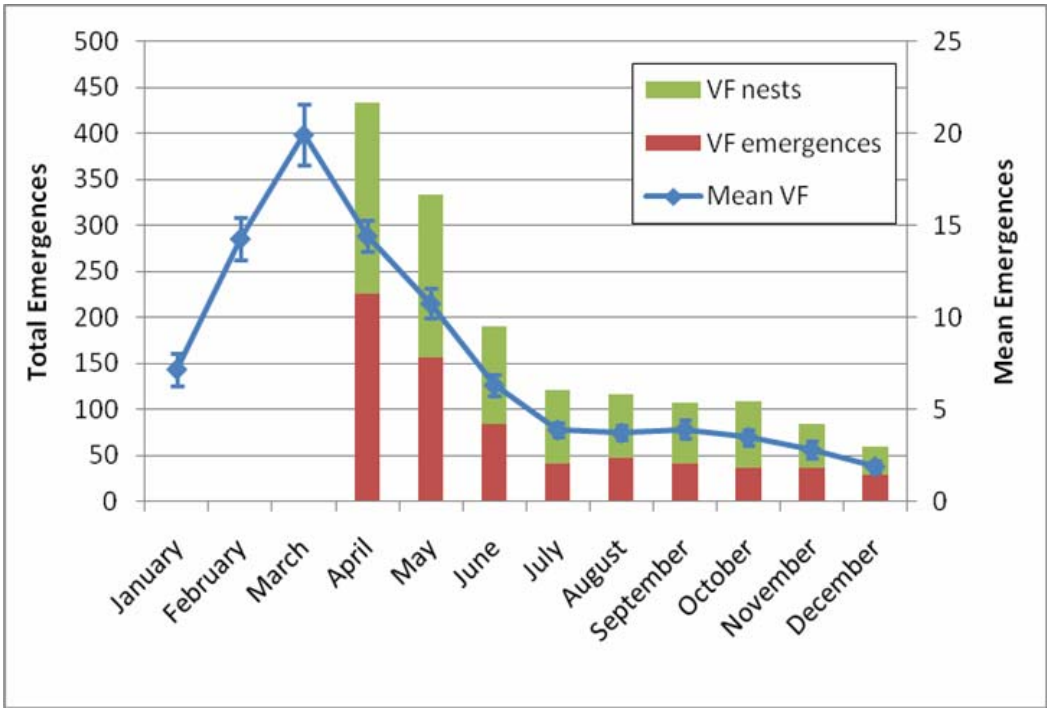


**Figure 9:** Monthly Very Fresh Emergences, percentage of nests and mean emergences along Settlement Beach.

Other beaches around the atoll were also checked for emergences and tracks counted on a regular basis. In each of the location groups (West Grande Terre, Cinq Cases, Dune Jean-Louis, Dune D'Messe, Northern Beaches and Anse Var) turtle track counts were conducted at least monthly. The only exceptions to this being the Dune D'Messe, Dune Jean-Louis and North beaches in March due to boat availability issues and weather.

While overall numbers of emergences are lower on the other beaches, trends in the number of emergences are similar to that seen on Settlement Beach (Table 6). It should be noted that only the data for Very Fresh emergences is presented and in the case of West Grande Terre beaches counts are frequently done more than once but the numbers presented are totals for each month.

**Table 6:** Total monthly number of turtle tracks observed for all beaches around the Atoll.

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Settlement | 223 | 400 | 598 | 433 | 334 | 190 | 121 | 116 | 117 | 109 | 85 | 59 |
| West Grande Terre[1] | 15 | 53 | 38 | 95 | 93 | 41 | 77 | 122 | 72 | 34 | 48 | 34 |
| Dune D'Messe[2] | 3 | 4 | NC | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 2 |
| Dune J-L[3] | 8 | 14 | NC | 8 | 18 | 18 | 15 | 15 | 3 | 5 | 7 | 3 |
| Cinq Cases[4] | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 3 | 0 | 0 | 1 |
| North[5] | 4 | 0 | NC | 6 | 13 | 11 | 23 | 5 | 9 | 5 | 12 | 2 |
| Anse Var[6] | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

[1] Beaches included in count – 2,3,4,5,6,7,8,9,10,11,12,13,14,15,15.5,16,17,17.5,18,19,20,21. FF tracks not recorded.
[2] Beaches included in count – 23, 24, 25, 26, 27, 28.
[3] Beaches included in count – 29, 30, 31, 32, 33, 34, 35, 36. FF only recorded on 29, 30, 31.
[4] Beaches included in count – 37, 38, 38.5, 39. FF not recorded.
[5] Beaches included in count – 40, 41, 42, 43, 43.5, 44, 45, 46, 51, 55. FF only recorded on 40, 41, 42, 43. Anse Var included
[6] Beaches included in count – 55 only. Anse Var counted in North beach counts as well as in its own count.

## 4.2: Track counts along lagoon beaches (Hawksbill turtles)

Hawksbill turtles on Aldabra nest only on the inner lagoon beaches. Breeding activity is primarily restricted to the period between September and March and during this time attempts are made to check these beaches once a month. This is dependent on staffing levels and boat availability and as a result checks of inner lagoon beaches were not possible for a number of the months in 2009. Track counts were not conducted in January, February, March, or September due to shortages in staff and also issues with boats.

Track counts on the inner lagoon beaches for hawksbill emergences were conducted In October, November and December. On a number of these counts a number of beaches could not be properly surveyed on the same day, especially with a number of beaches in the eastern part of the lagoon and others in the west. In addition on a number of occasions there was not sufficient sand or beach for emergence of nesting adults. In October one VF track was recorded while in November there were 3 and December 5.

## 4.3: Tagging of Turtles

Tagging of turtles was carried out on a number of beaches around the atoll during specific tagging activities on Settlement Beach or opportunistically during other monitoring at other beaches around the atoll. Juvenile turtles were tagged during turtle "rodeo" activities in the lagoon.
A total of 117 green turtles were encountered with tags during 2009. Of these 46 were newly tagged in 2009. The nature of this data base and activity means that tagged turtles that were encountered at other times are not necessarily entered in to the database. So no accurate information on the percentage of individuals encountered on the atoll with tags is available.

In 2009 in water tagging activities were conducted every month from May onwards. Prior to this limited staff and boats prevented monthly in water tagging from being conducted. When juvenile turtles are caught they are weighed, measured and tagged if they have not already been tagged. In 12 tagging events 47 individuals were encountered with 30 of them being green turtles and the remaining 17 hawksbill turtles. Eighty seven percent of the green turtles caught were newly tagged and 24% of the hawksbills were also newly tagged.

**Table 7:** Number of turtles newly tagged or with tags replaced or added in 2009.

| | Encountered | Newly Tagged | Tag replaced and/or added |
|---|---|---|---|
| Green turtles | | | |
| Nesting | 117 | 46 | 12 |
| In-water | 30 | 26 | 0 |
| Total | 147 | 72 | 12 |
| Hawksbill turtles | | | |
| In-water | 17 | 13 | 4 |
| Total | 17 | 13 | 4 |

## 5.0: Aldabra Tortoise Monitoring Programme

Detailed monthly monitoring, including the size, sex and abundance along designated transects, for the giant tortoises has been collected since 1998 on Aldabra. There are 12 transects located around the atoll (Figure 1) and while in total this covers only a very small percentage of the area of the atoll it provides information on the status of the population and covers the major habitat types found on all 4 main islands that make up the atoll. While the relatively small percentage of area covered has been criticised in the past logistical constraints render increasing the number and thus area covered by such transects impractical and the 12 transects currently monitored provide an indication of population status and trends (Figure 10). Figure 10 shows the abundance at each location since 1996 when data was first collected and clearly shows the locations that have consistently recorded the highest number of individuals.

Transects are monitored, when possible, on a monthly basis providing valuable information on the population size, structure and distribution of this species around the atoll. It also allows for annual and monthly variations in these parameters to be investigated with the continued monitoring adding to a valuable long term programme focused on this species. Figure 11 shows the trends at each transect for each month in terms of the number of individuals encountered along the transect. All 12 transects were monitored each month with the only exceptions being the Cinq Cases Coastal transect in February and Dune D'Messe, Dune Jean Louis and Malabar in March. It shows clearly that Cinq Cases Coco transect consistently records the highest number of individuals along with Dune D'Messe Coastal transect.

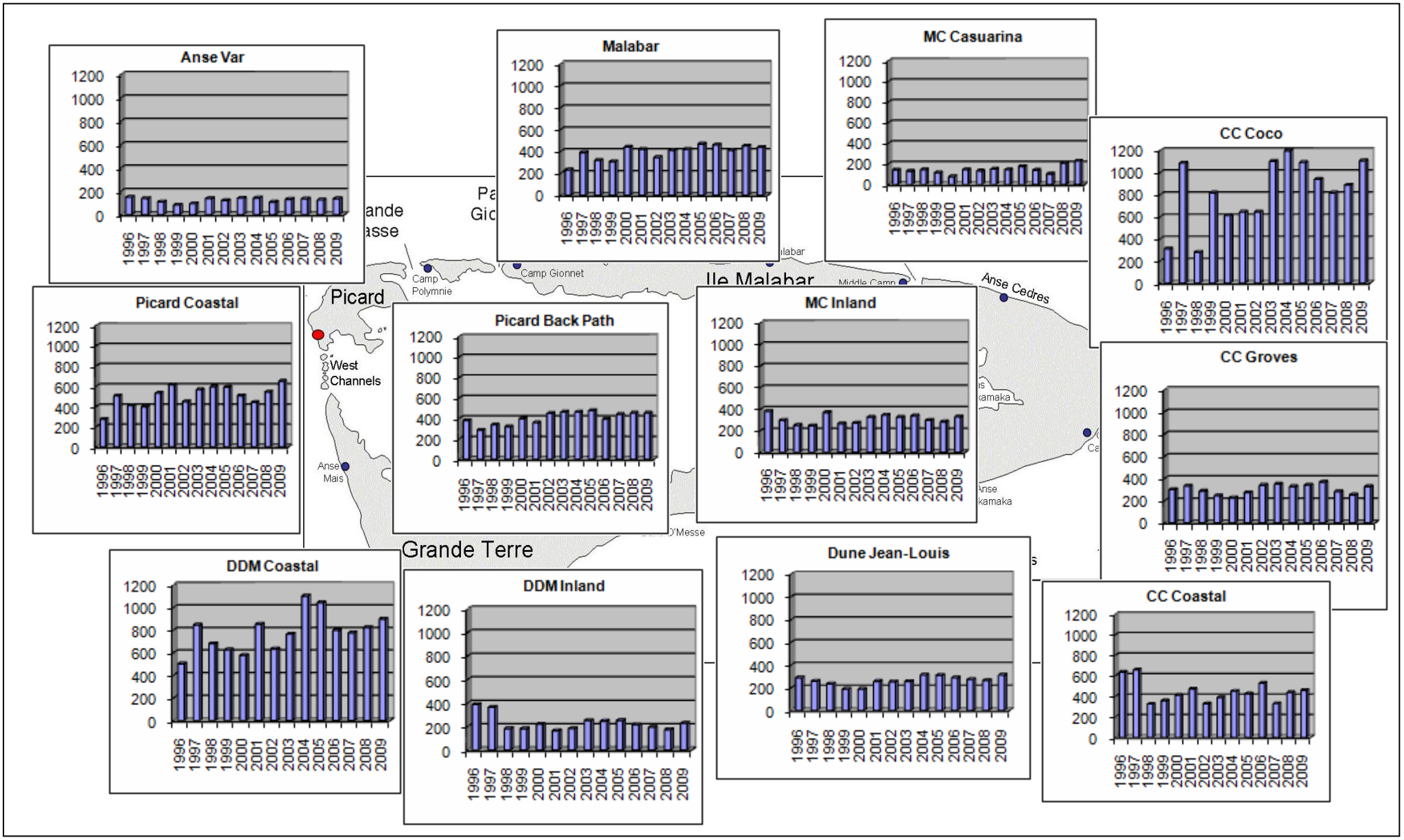


**Figure 10:** Annual total abundance for giant tortoise transects from 1996–2009.

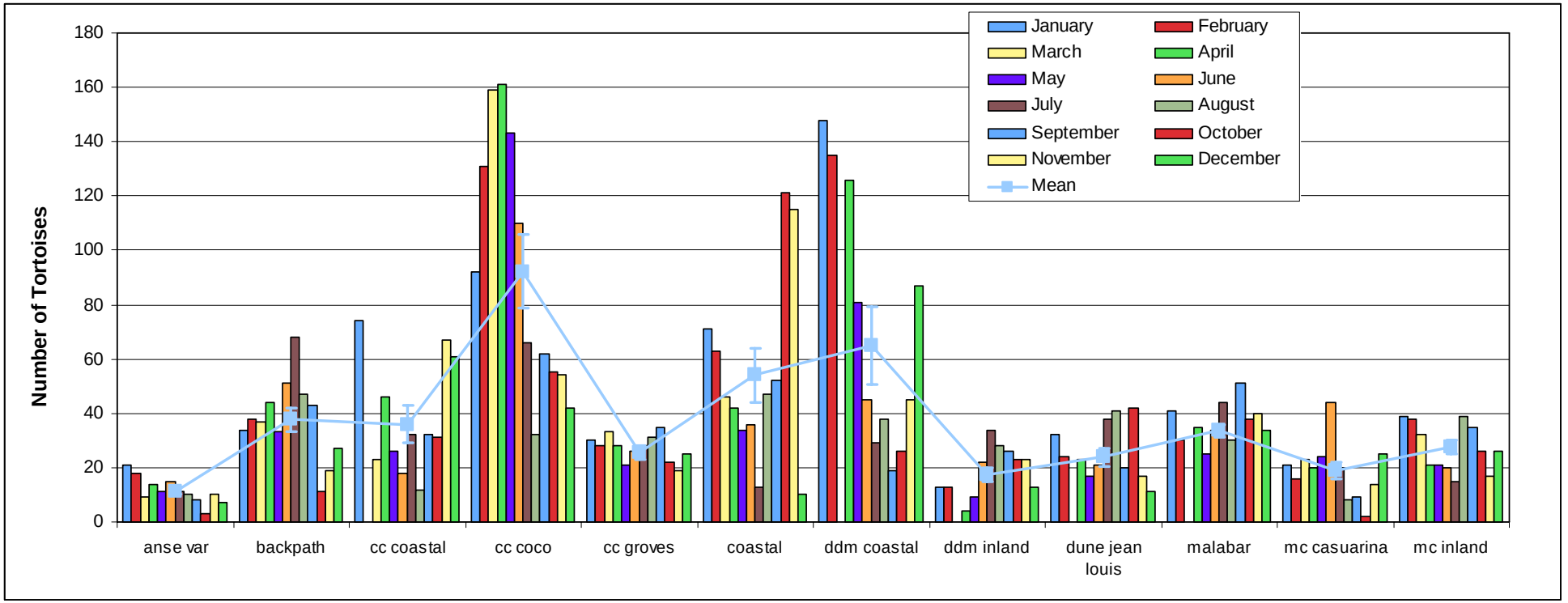


**Figure 11:** Monthly abundance of tortoises and mean annual abundance along all 12 monitoring transects in 2009.

Results presented below are summary results from the four main areas of the atoll where transects are located; Picard (3 transects), Cinq Cases (3 transects), Malabar (3 transects) and Grande Terre (3 transects). Each figure shows the monthly totals for each transect as well as the mean size for the individuals encountered.

**Picard**

Tortoise monitoring was conducted on Picard for all three transects once each month. Anse Var consistently recorded the lowest number of tortoises along the transect and individuals in this part of Picard are on average smaller than those detected on the other two transects, Coastal and Back Path (Figure 12). While the coastal transect often records a higher number of individuals it should be noted that the width of this transect is 20 m (10 m on each side of the transect) while for all other tortoise monitoring transects on Aldabra the width is 10 m (5 m on each side of the transect). This will not only influence the number of individuals recorded but also the mean size as the increased sample size will influence the calculation of the mean and any variation around this.

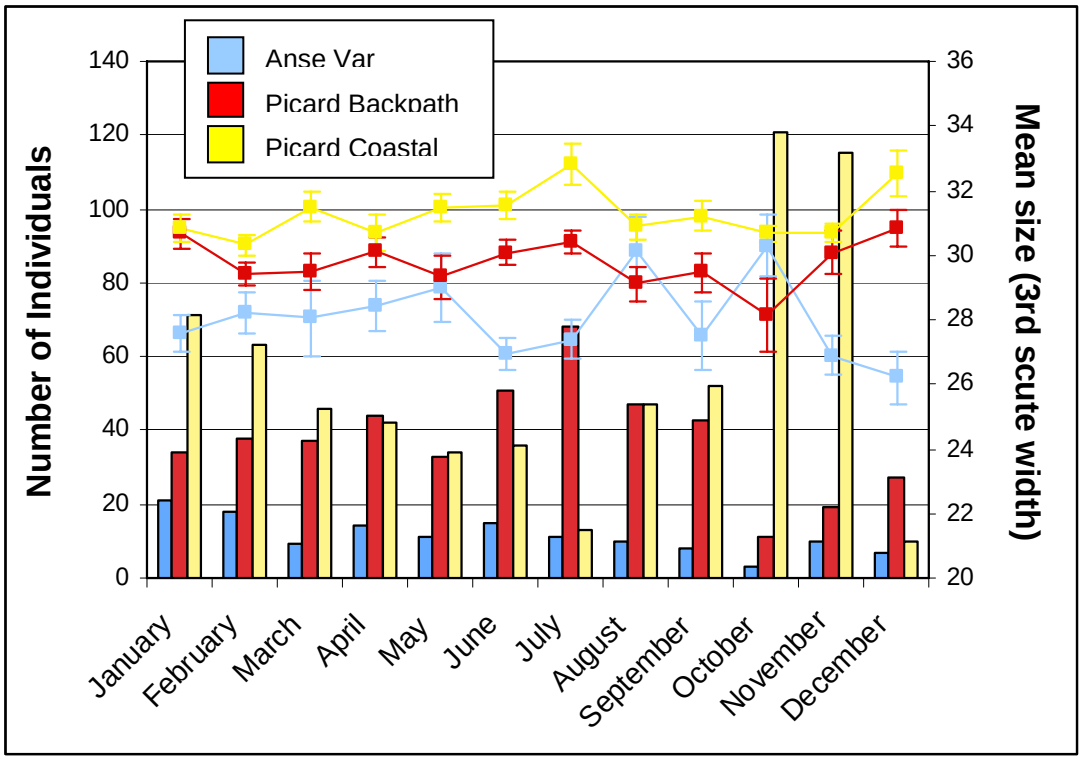


**Figure 12:** Number of individuals (columns) and mean size (line, ± SE) as determined by the width of the third scute for the three giant tortoise transects monitored at Picard.

Interestingly an analysis of the relationship between the number of individuals recorded on the Back Path and the Coastal Path shows a direct relationship between the two with the number recorded on the Back Path increasing when there is a decrease in the number of individuals recorded on the Coastal Path (Figure 13). This direct relationship in numbers appears to be related to rainfall as soon after showers of rain the numbers detected on the Coastal Path would drop as individuals appear to be moving inland on to the champignon where the water pools and is available for drinking.

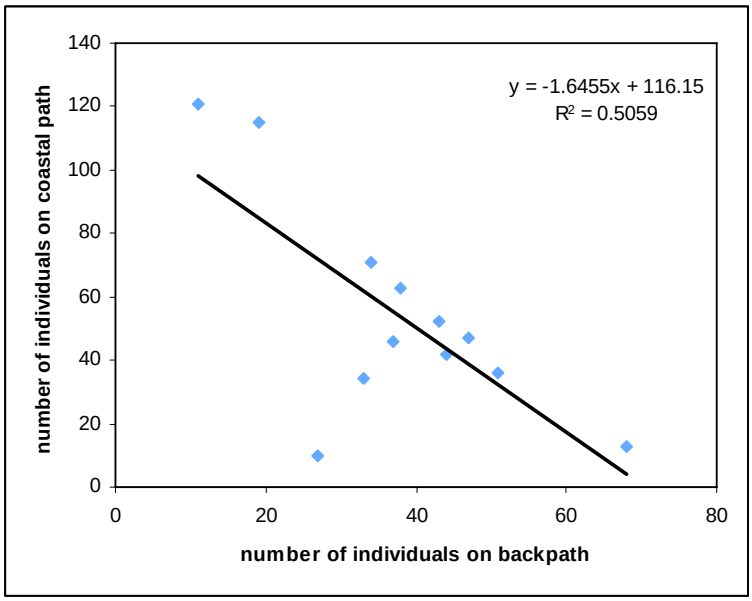


**Figure 13:** Relationship between the number of giant tortoises recorded on the Back Path and Coastal Path on Picard.

**Malabar**

Tortoise monitoring was completed at the three transects on Malabar each month of 2009 apart from the transect at Malabar in March (Figure 12). The coastal transect at Middle Camp consistently records the lowest number of individuals of all three transects while the transect at Malabar camp records the highest number of individuals and individuals with the highest mean size. Despite the Malabar transect recoding the highest number of animals, these numbers were mostly below the numbers recorded on Picard and the mean size was also smaller than those recorded on any of the three transects on Picard. The mean size of individuals on Malabar show greater variation, particularly on the MC Inland transect.

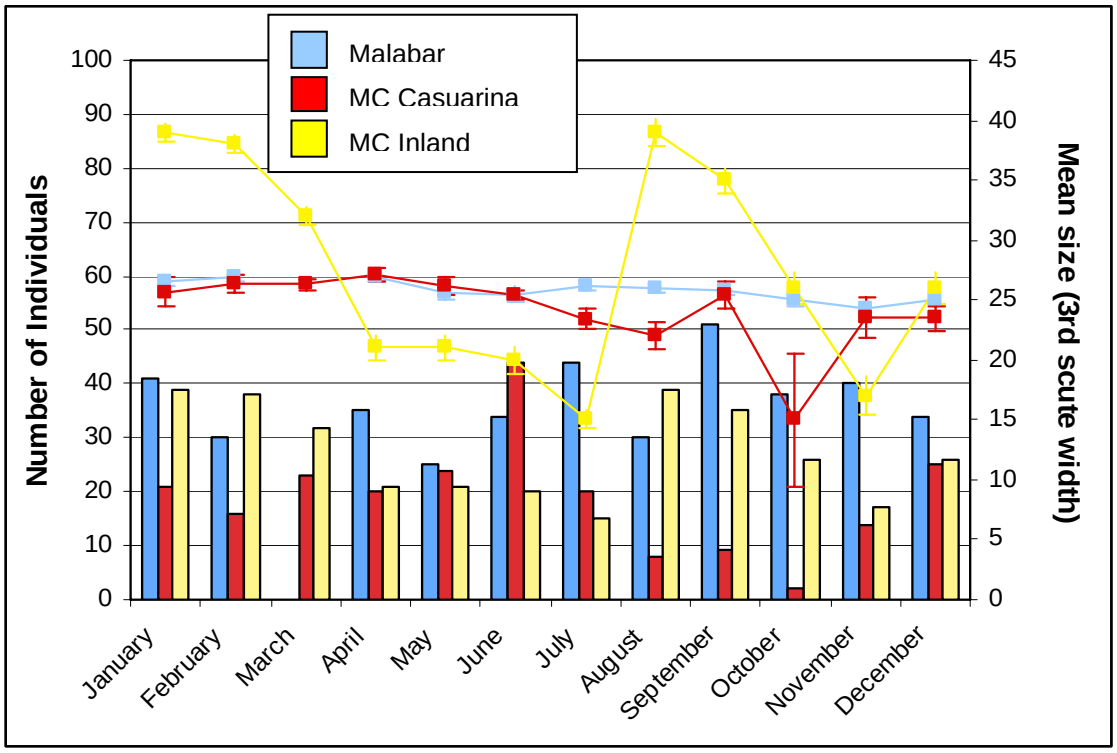


**Figure 14:** Number of individuals (columns) and mean size (line, ± SE) as determined by the width of the third scute for the three giant tortoise transects monitored on Malabar.

**Grand Terre – Cinq Cases, Dune Jean Louis, Dune D'Messe**

Historically monitoring of the giant tortoise population on Aldabra has shown that the area around Cinq Cases on Grande Terre has the highest number of individuals and these tend to be of a smaller size than in many of the other areas of the atoll. The data collected on all transects on Grande Terre during 2009 showed the same trends with the transect at Cinq Cases Coco and Dune D'Messe Coastal consistently recording the largest numbers of individuals (Figure 15 and Figure 16). All 6 transects on Grande Terre recorded individuals of a much smaller size than those recorded on the transects on Picard and also Malabar. Individuals on the Cinq Cases Groves transect tended to be the smallest of any transect with many of these individuals falling under the size threshold used for confidently determining the sex of individuals (20 cm). In 2009 staff started to record the sex for the individuals of any size if they felt confident in determining it to obtain estimates of the sex ratios of the local populations in these areas.

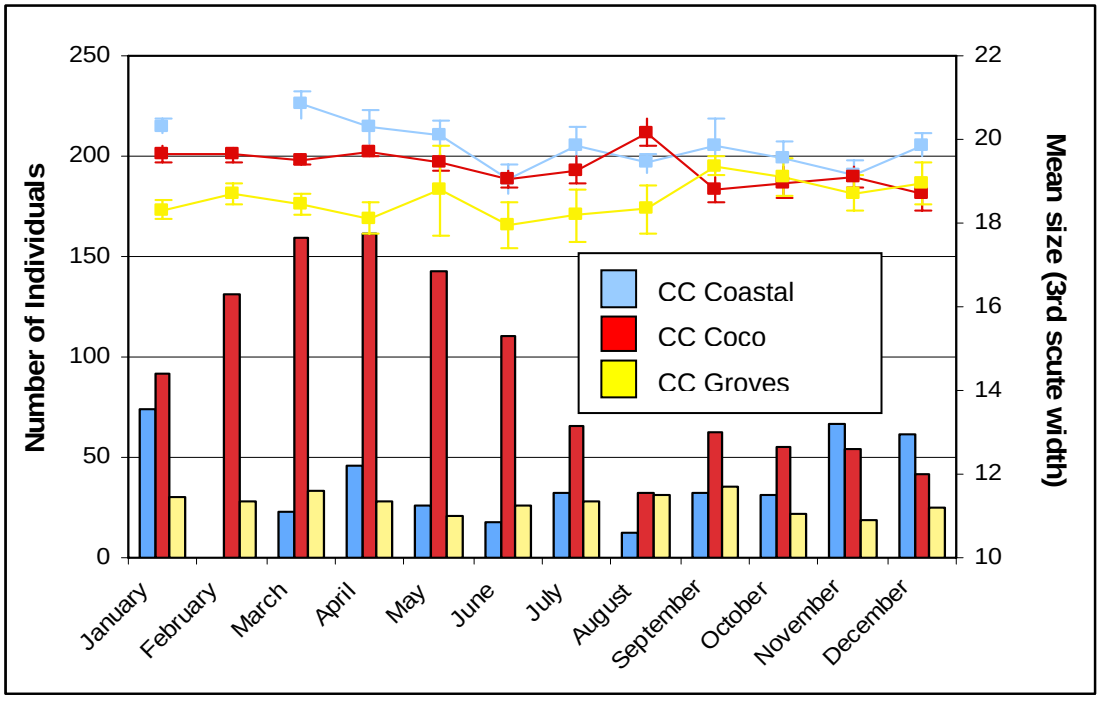


**Figure 15:** Number of individuals (columns) and mean size (line, ± SE) as determined by the width of the third scute for the three giant tortoise transects monitored on Grande Terre, Cinq Cases.

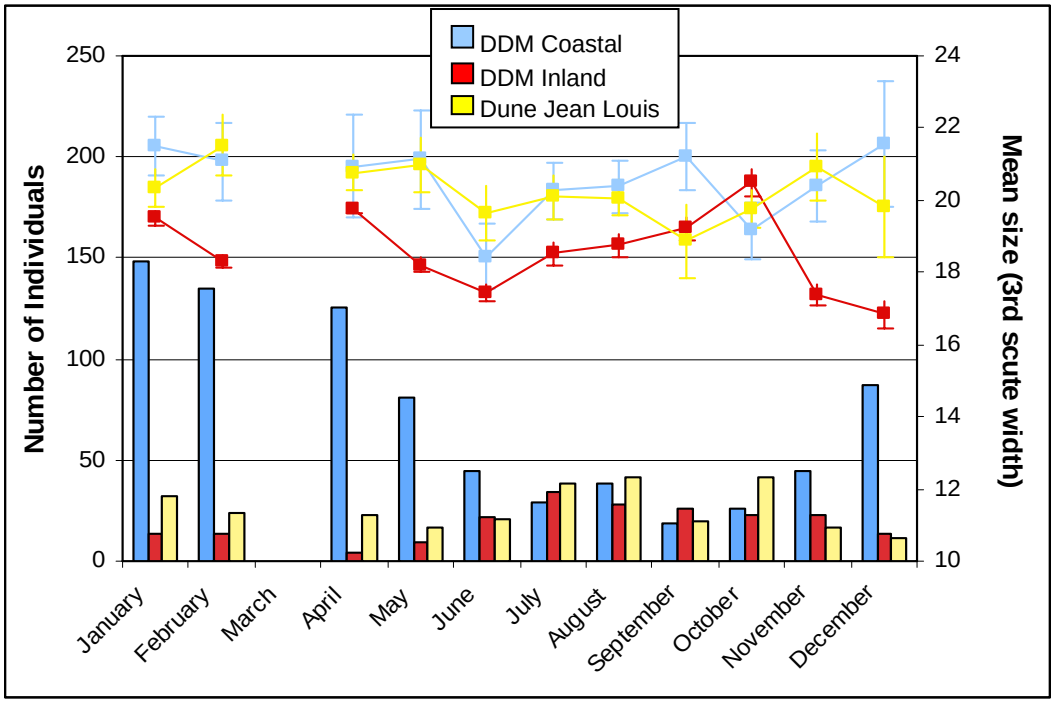


**Figure 16:** Number of individuals (columns) and mean size (line, ± SE) as determined by the width of the third scute for the three giant tortoise transects monitored on Grande Terre, Dune Jean Louis and Dune D'Messe.

## 6.0: Bird Monitoring

There are a number of different monitoring activities undertaken on Aldabra to monitor the bird populations. This includes monitoring focussing on landbirds, waders and a number of the seabird species on the atoll.

### 6.1: Landbirds

The landbird monitoring involves seven of the tortoise transects located around the atoll (Figure 17). Along each of these transects point counts are conducted (counts of birds seen or heard over 4 minutes within a 25m radius of a specific point along the transect). The number of points monitored ranges from four to nine depending on the location of the transect. The monitoring of landbird abundance around the atoll at these seven transects has been undertaken since 2002 and continues to provide valuable information, particularly in regards to the abundance of passerines.

The total number of birds recorded across all point counts on all transects is shown in Figure 17. It is important to note that this figure does not account for differences in abundance between transects or between points along the same transect but shows the total number of individuals recorded throughout the year. Displayed on a logarithmic scale it clearly shows that the most abundant species was the Souimanga sunbird with the Malagasy turtle-dove the second most abundant species recorded. The sunbird was the most abundant species across all transect locations. While the Malagasy nightjar was not recorded on any of the transects, most likely due to the methods used and the low detection probability of this species during diurnal surveys. Detectability and the suitability of the methods used for many of the species remains an issue and this monitoring should not be used as an indication of population size, distribution or abundance for many of the species included.

Figure 18 shows the mean annual total number of birds recorded on the landbird transects from 2002 to 2008. It also shows the total number recorded for each species in 2009 on the same transects. The numbers recorded for 2008 are extremely similar to the average total number recorded for the previous 5 years with the only apparent differences being in the number of Comoro blue pigeon, Magagascar coucal and Madagascar kestrel with slightly lower numbers

recorded in 2009 than the average for the previous years. Despite these decreases the total numbers recorded for 2009 fall within the variation in numbers for the previous 5 years. Standard errors were calculated for these totals but are not obvious on all of the species on the graph due to the logarithmic scale used to plot the number of birds recorded.

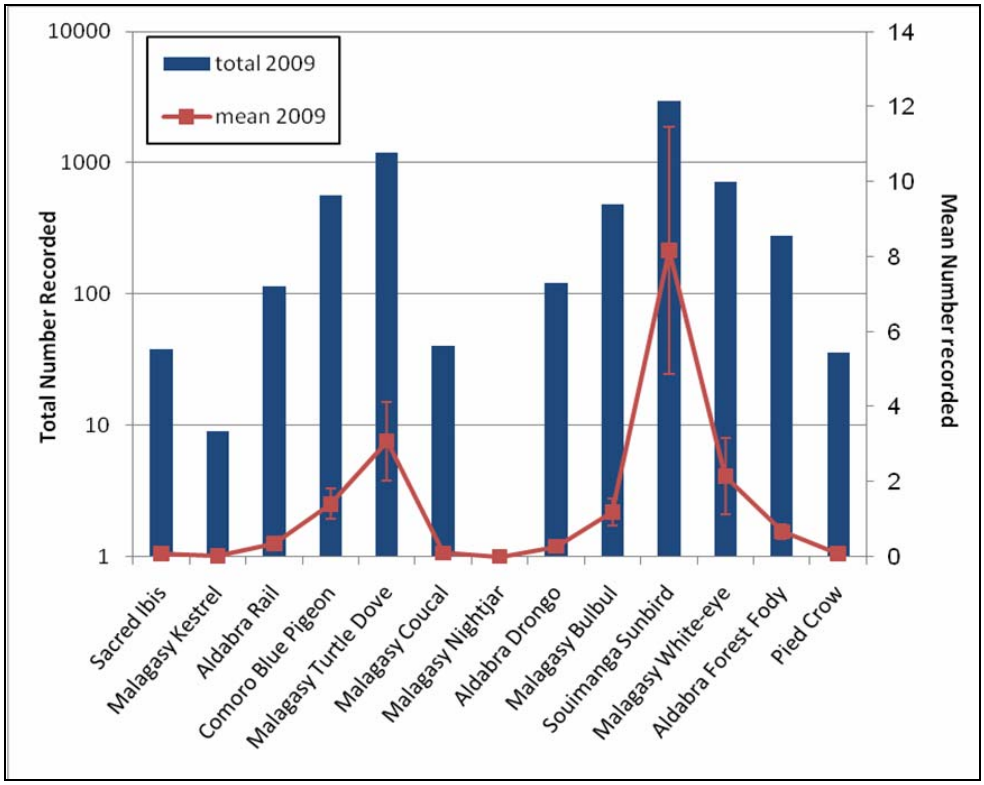


**Figure 17:** Total number and monthly mean number (± SE) of birds recorded across all point counts on all transects for 2009.

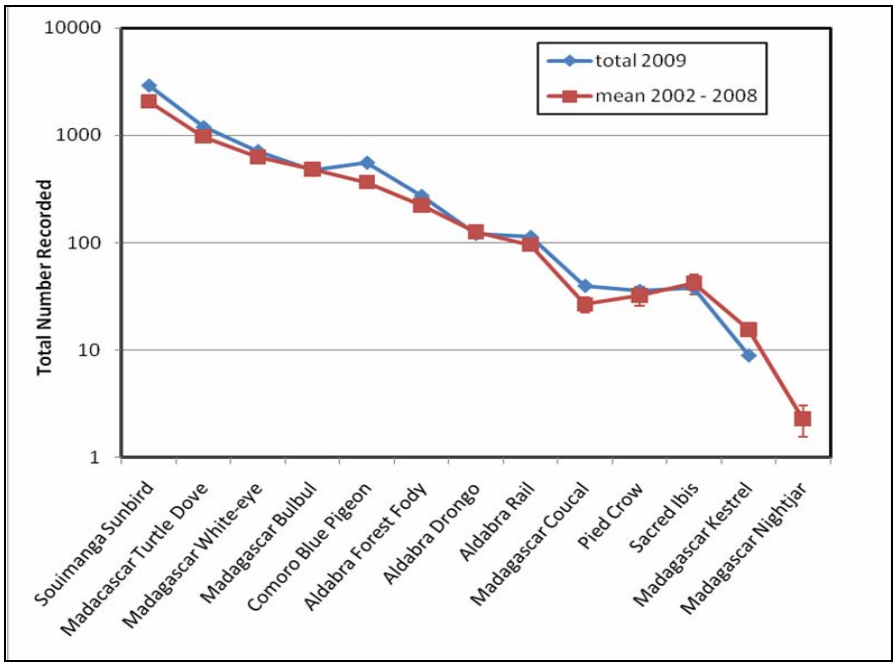


**Figure 18:** Mean annual total number of birds recorded on the landbird transects during 2002–2008 (± SE) and total number recorded for each species in 2009 on the same transects.

**Rail Monitoring**

Regular monitoring of the rail populations on the individual islands of Aldabra was not undertaken in 2009. The current monitoring of the rail population on Picard is restricted to sightings and counts of individuals recorded during the monthly landbird monitoring. The data gathered on the landbird point counts on Picard show very little variation in the total number of birds recorded throughout the year. While the numbers for 2009 are higher than the previous year they are slightly lower than the number recorded in 2006 (Table 8) but indicate a steady increase since 2007.

**Table 8:** Yearly total for Aldabra rails recorded on land bird transects.

| | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | ***2009*** |
|---|---|---|---|---|---|---|---|---|
| TOTAL | 74 | 67 | 112 | 103 | 127 | 98 | 104 | *114* |

Monthly totals for the last three years (Table 9) show similar trends in the number of birds detected each month. Any trends evident in the monthly numbers and abundance may indicate post breeding increases in the population. These could then be used in conjunction with previous surveys to provide an indication of the most appropriate timing for targeted surveys of the rail populations, as suggested in the previous annual report and following the methods of Huxley.

**Table 9:** Total number of rails recorded on landbird transects each month.

| **TOTAL** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **June** | **July** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 3 | 8 | 4 | 4 | 10 | 4 | 1 | 0 | 1 | 2 | 2 | 0 |
| 2008 | 7 | 8 | 8 | 10 | 11 | 9 | 15 | 13 | 7 | 5 | 4 | 7 |
| 2007 | 11 | 13 | 10 | 20 | 11 | 3 | 3 | 8 | 4 | 1 | 9 | 5 |

As mentioned above in 2009 there was no targeted or specific monitoring of the rail population undertaken. However, during the regular monthly landbird monitoring the number of individuals seen is recorded (see above). Accurate monitoring of the species requires the use of calls and should be focused during the breeding season. During regular monthly monitoring on the Back Path on Picard in January an adult rail was observed with a metal ring on the left leg (Figure 19). This rail must therefore have been a minimum of 9 years old.


**Figure 19:** Adult rail with metal ring on left leg, observed along Picard Back Path.

## 6.2: Madagascar Pond Heron

The Madagascar pond heron project started in late 2008 with the arrival of volunteer Jen Stockdale. This species may be the most endangered species on the atoll and is thought to breed on Aldabra from November to April. As a result of observations recorded during Jen's time on Aldabra it was recommended that this species be monitored across the atoll, particularly on the monthly trips to the Cinq Cases area to increase the information available on this species on Aldabra.

Standard methods involving regular searches of key pools were added to the activities conducted during monthly monitoring visits to Cinq Cases. Staff recorded all sightings in a set format including habitat details as well as location and activity at time of sighting. All sightings in other parts of the atoll were recorded in the same way. The objective of the monitoring is to get a better idea of which areas of Aldabra are being used by the species and when, while also providing a better idea of the seasonality and breeding of this species on the atoll and changes in breeding plumage. When possible, photos of the individuals seen are also taken (Figure 20).

It is unknown if some individuals of this species remain on Aldabra all year round as the sightings collated from event cards do not yet show an obvious pattern in timing of the sightings. This also opens the possibility of breeding occurring at any time during the year on Aldabra. The fact that individuals in non-breeding plumage were still being sighted as late as June may indicate a small but permanent population of this species on the atoll (Table 10).

The majority of observations made involved only single individuals and only one of the records includes a bird in breeding plumage (Table 10). GPS points taken when birds were recorded were subsequently mapped (Figure 21). This map does not indicate the number of birds seen at each location and includes sighting records to April 2010.

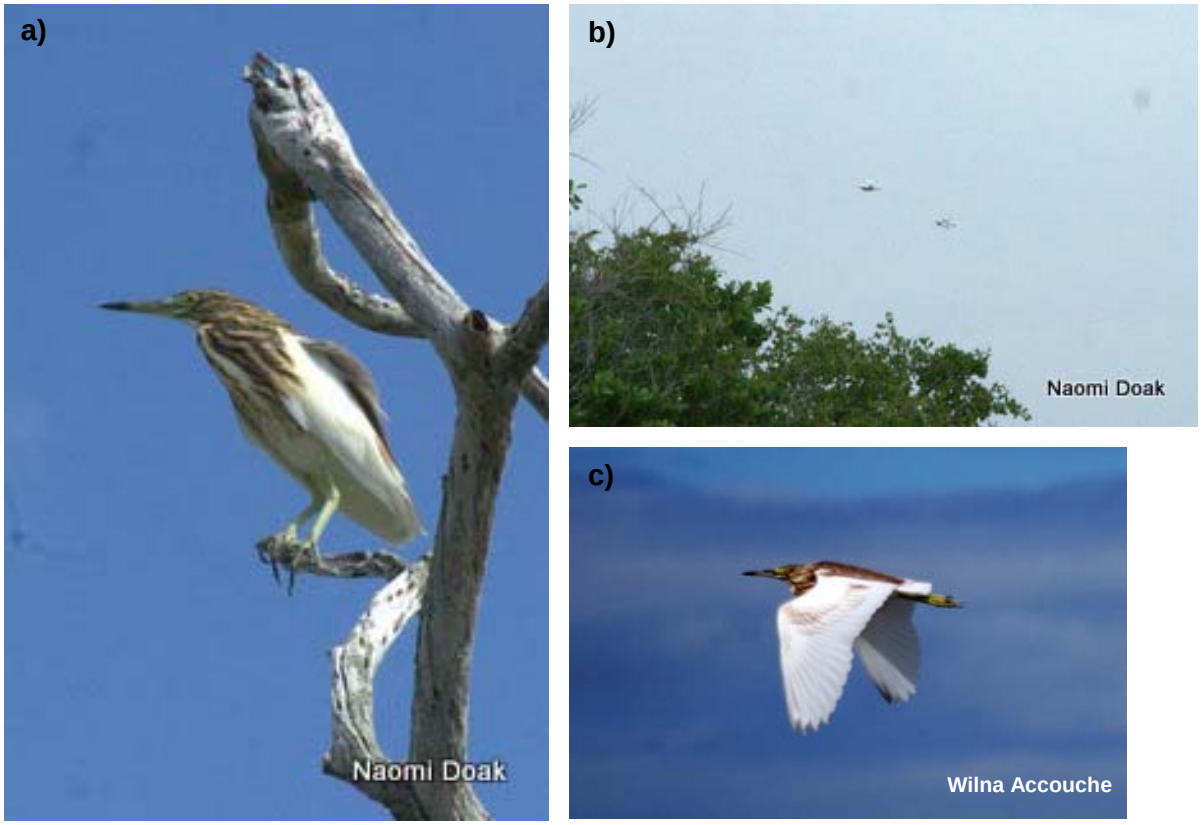


**Figure 20:** Madagascar pond herons recorded in the Cinq Cases area (all in non-breeding plumage).

**Table 10:** Summary of Madagascar pond heron sightings in 2009 following the project by J. Stockdale (whose sightings are listed in her volunteer report).

| Date | Area | # | Plumage | Activity | Habitat |
|---|---|---|---|---|---|
| 21/06 | Cinq Cases | 2 | Non-breeding | Resting | Pool |
| 21/06 | Cinq Cases | 1 | Non-breeding | Resting | Pool |
| 22/06 | Cinq Cases – Groves | 1 | Non-breeding | Resting | Pool |
| 22/06 | Cinq Cases – Groves | 1 | Non-breeding | Resting | Pool |
| 24/06 | Cinq Cases | 1 | Non-breeding | Resting | Pool |
| 24/06 | Cinq Cases – Coco | 1 | Non-breeding | Resting | Pool |
| 25/06 | Cinq Cases Groves | 1 | Non-breeding | Resting | Pool |
| 25/06 | Cinq Cases Groves | 3 | Non-breeding | Resting | Pool |
| 26/06 | Cinq Cases | 1 | Non-breeding | Resting | Pool |
| 26/06 | Cinq Cases | 2 | Non-breeding | Resting | Pool |
| 20/07 | Cinq cases | 1 | Non-breeding | Flying, calling | Open vegetation |
| 21/07 | Bassin Flamant | 2 | Non-breeding | Flying | Pool |
| 21/07 | Cinq cases | 2 | Non-breeding | Flying | Pool |
| 21/07 | Cinq cases | 1 | Non-breeding | Flying | Pool |
| 21/07 | Anse Cedres | 2 | Non-breeding | Flying | Beach fringe vegetation |
| 22/07 | Cinq cases | 1 | Non-breeding | Flying | Pool |
| 23/07 | Cinq cases | 1 | Non-breeding | Resting | Pool |
| 23/07 | Cinq cases | 1 | Non-breeding | Flying | Pool |
| 27/07 | Anse dans Galets | 1 | Non-breeding | Flying | Open vegetation |
| 22/08 | Cinq cases | 1 | Non-breeding | In flight | Pool |
| 22/08 | Cinq cases | 1 | Non-breeding | In flight | Pool |
| 23/08 | Cinq cases | 1 | Non-breeding | In flight | Pool |
| 23/08 | Cinq cases | 1 | Non-breeding | Resting | Bassin Fregate Pool |
| 26/08 | Middle Beach | 1 | Non-breeding | In flight | Beach vegetation |
| 27/08 | Anse Des Cocos | 1 | Non-breeding | In flight | Beach vegetation |
| 12/09 | Anse Cedres - Passe Hoareau area | 1 | Non-breeding | Disturbed | Open vegetation |
| 14/09 | Anse Cedres- Grove area | 1 | Non-breeding | Disturbed | Pandanus-dominated vegetation |
| 21/10 | Anse Cedre- Passe Houareau | 1 | Non-breeding | In flight | forest vegetation |
| 22/10 | Cinq Cases | 1 | Non-breeding | Resting | open area shrub |
| 22/10 | Bassin Fregate (Grove) | 1 | Non-breeding | In flight | Pool |
| 18/11 | Cinq Cases Grove | 1 | Non-breeding | In flight | Pool |
| 18/11 | Cinq Cases Landing Stage | 4 | Breeding | Disturbed | Pool |

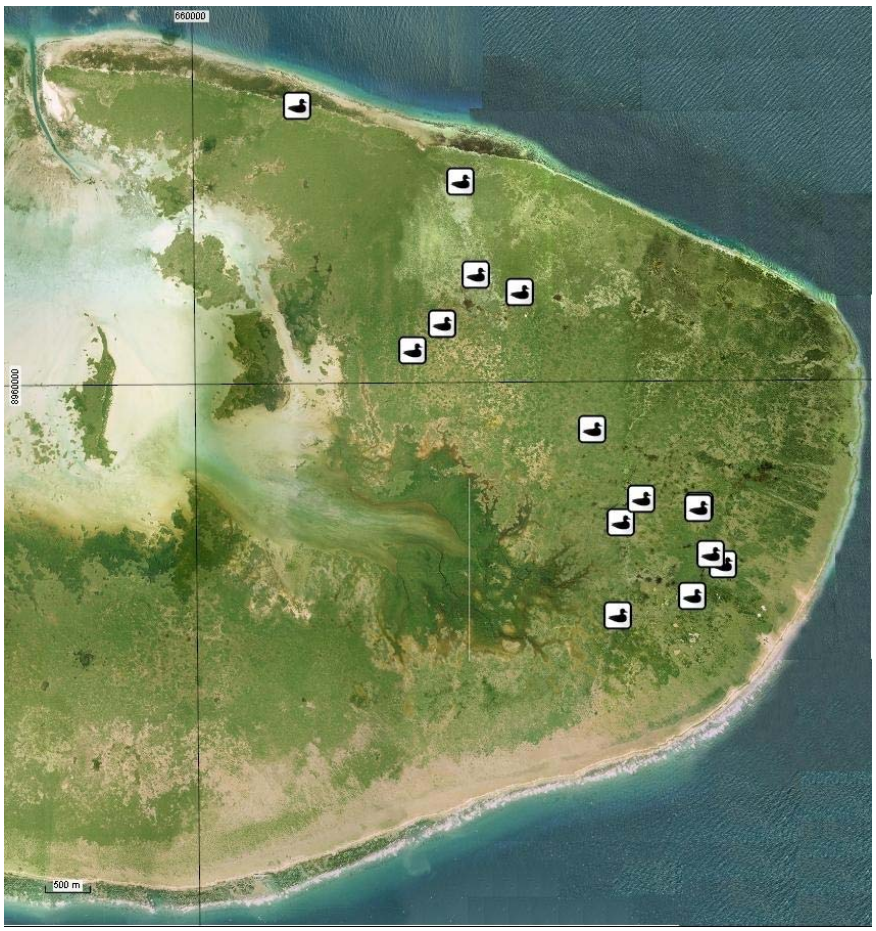


**Figure 21:** Map of locations with sightings of at least one Madagascar pond heron recorded.

## 6.3: Flamingos

There is currently no ongoing, dedicated monitoring program for the flamingos on Aldabra. However, in conjunction with the data sheet for recording the number of Madagascar pond herons staff are also now encouraged to record details of flamingo sightings. Records of sightings have been recorded in past annual reports but these appear to be more a compilation of opportunistic sightings and recordings combined with reports from a couple of dedicated trips to the pool near Takamaka where breeding had previously been recorded. No detailed regular reports of sightings were available during 2010. However, opportunistic sightings were recorded. For example during the June monitoring trip to Cinq Cases a GPS location, approximate number of birds and photos were possible. The flamingos seen during this trip were easily flushed and in general these birds appear quite flighty making close approaches and photos difficult.

During the June monitoring and associated activities flamingos were sighted on six occasions at a number of different pools and ranging in number from two to approximately 26 individuals. Repeated observations of individuals at a number of pools indicates that they may be frequently used by flamingos for feeding although no obvious signs of abundant suitable algae was noted. On 25$^{th}$ June during the walk from Cinq Cases to Anse Cedres flamingos were heard at one pool on the right hand side of the path and approximately 26 individuals were counted feeding within the shallows (Figure 22).


**Figure 22:** Stand of flamingos in pool at Groves transect and after taking flight (June 2009).

## 6.4: Wader counts

Counts of the wading birds along Settlement Beach are made at least twice a month on Aldabra as well as being recorded on the walk from Dune Jean-Louis and Dune D'Messe and at Dune Patates when possible. The number of individuals recorded throughout the year is shown in Table 11.

**Table 11:** Wader species and number of individuals seen off Settlement Beach.

| Species | Annual Total |
|---|---|
| Black-naped tern | 39 |
| Caspian tern | 46 |
| Cattle egret | 2 |
| Common greenshank | 69 |
| Common ringed plover | 4 |
| Common sandpiper | 18 |
| Crab plover | 1063 |
| Dimorphic egret | 1822 |
| Fairy tern | 44 |
| Greater crested-tern | 153 |
| Greater sand plover | 98 |
| Green-backed heron | 289 |
| Grey heron | 216 |
| Grey plover | 95 |
| Lesser crested-tern | 55 |
| Lesser sand plover | 65 |
| Ruddy turnstone | 1714 |
| Sanderling | 273 |
| Whimbrel | 121 |
| Wood sandpiper | 1 |
| Brown noddy | 4 |
| Bar-tailed godwit | 147 |
| Curlew sandpiper | 57 |
| Terek sandpiper | 3 |

The large number of factors that influence the abundance of waders makes analysis of trends and changes in numbers difficult and increases the number of independent counts required. Height and time of tide, temperature and other weather variables as well as season and time of year are all likely to have a significant impact on the number of birds recorded. Given the size of the atoll and the high mobility of the species monitored the influence of these factors in other areas of the atoll is also likely to impact the numbers recorded at other monitored sites. The total number of each species recorded during monitoring along Settlement Beach is shown in Table 11. The most abundant species was dimorphic egrets, closely followed by ruddy turnstones.

Figure 23 shows the species composition and relative abundance of species recorded along Settlement Beach throughout the year. As in previous years, dimorphic egrets, ruddy turnstones and crab plovers made up the majority of the individuals recorded along Settlement Beach; 29, 27 and 17% respectively. All other species recorded during the monitoring represented less than 5% of the relative abundance with the highest being green backed herons which constituted 5%.

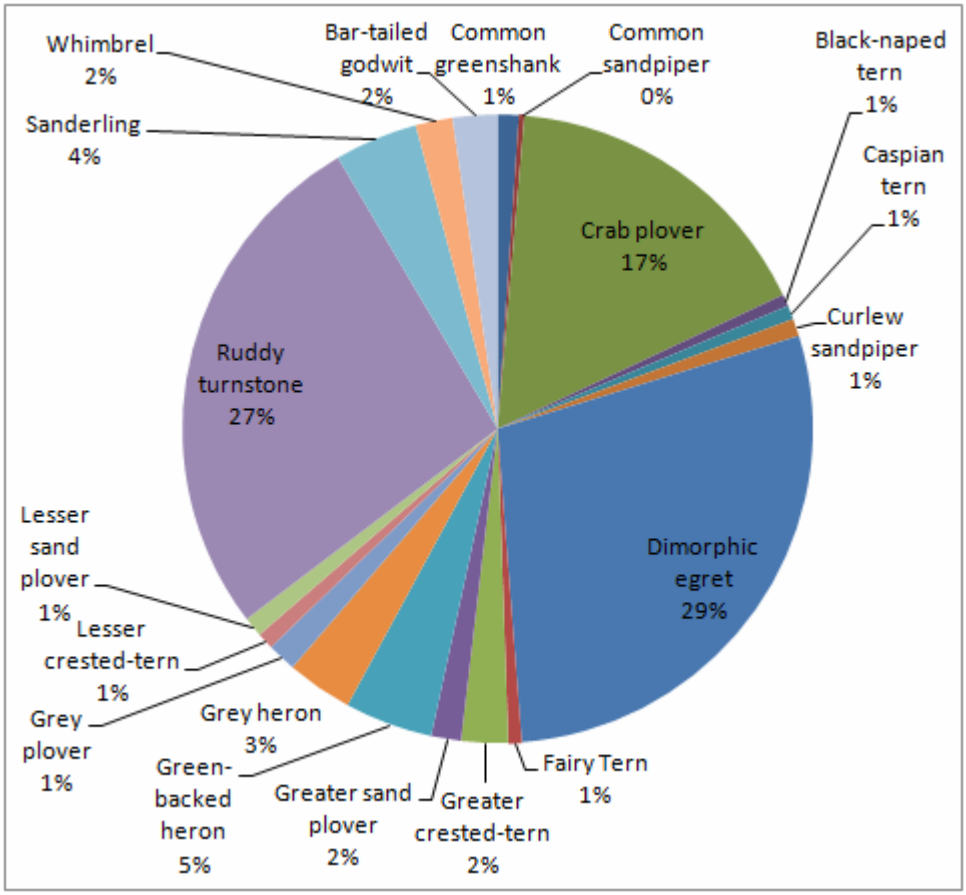


**Figure 23:** Species composition and relative abundance of wading species recorded along Settlement Beach in 2009.

## 6.5: Seabirds

*Red-tailed Tropicbird (*Phaethon rubricauda*) monitoring*

The peak in red-tailed tropicbird breeding is from December to March. Monitoring of red-tailed tropicbirds on the islets in the lagoon continued on a weekly basis throughout the year. A summary of the results collected during the monitoring is shown in Table 12.

All nests monitored are numbered with laminated cards showing nest number, cable tied to a location adjacent to the nest site and their status noted on a weekly basis. Numbers are assigned to each new nest in the order of discovery and not individual to a particular islet. No numbers are

used twice within the same season. The size of the islets and density of nests does not allow for accurate GPS locations on all nests given the error involved with handheld GPS locations (up to 10m). Efforts are put in to improve this monitoring with thorough searches of the islets made when walking the islets and re-design of the monitoring form to include additional information.

There were a number of nests throughout the year which failed at both egg and chick stage (Table 11). It is difficult to know for sure, unless a dead chick is found, how many nests failed at the chick stage but a reliable indication can be gained by the stage of the chick at last confirmed sighting. All nests identified as failing at the chick stage had previously contained a C1 (small downy) chick, with insufficient time for these chicks to have fledged if not seen again it is reasonable to assume the chick has been predated (or died and scavenged).

While there were a large number of nest sites observed a large number of nests were empty of both adults and chicks and so were not considered active. Observations of these nest sites continue for a number of weeks before the label is removed and the nest declared abandoned as failed nesting attempts may be followed by another attempt in the same nest site.

**Table 12:** Number (%) and stage of tropicbird nests on La Gigi Islets (excluding outcomes of nests active at the end of December).

| | **Number of nests** | |
|---|---|---|
| | **Red-tailed** | **White-tailed** |
| Number of new nests found in 2009[1] | 53 | 19 |
| Number of nests failed at egg stage[2] | 25 (47.2%) | 15 (78.9%) |
| Number of nests reaching chick stage | 10 | 2 |
| Number of nests failed at chick stage[3] | 1 (1.9%) | 1 (5.3%) |
| Number of nests fledged | 2 (3.8%) | 1 (5.3%) |

[1]Nests that have egg, chick or adult sitting in the nest
[2]Includes eggs that are missing, infertile, embryo death or depredated
[3]Includes chicks that disappear (before fledging age), and chicks that are depredated, starved or dehydrated

It should be noted that nests still active at the end of December are not included in the above table. Nests that were identified by the presence of an adult but in which no egg was ever produced are also only included in the count of new nests. In addition a number of nest sites were re-used by birds although unless banding of individuals is undertaken it is not possible to know if these were the same adults re-using a site after either a failed attempt or a fledging.

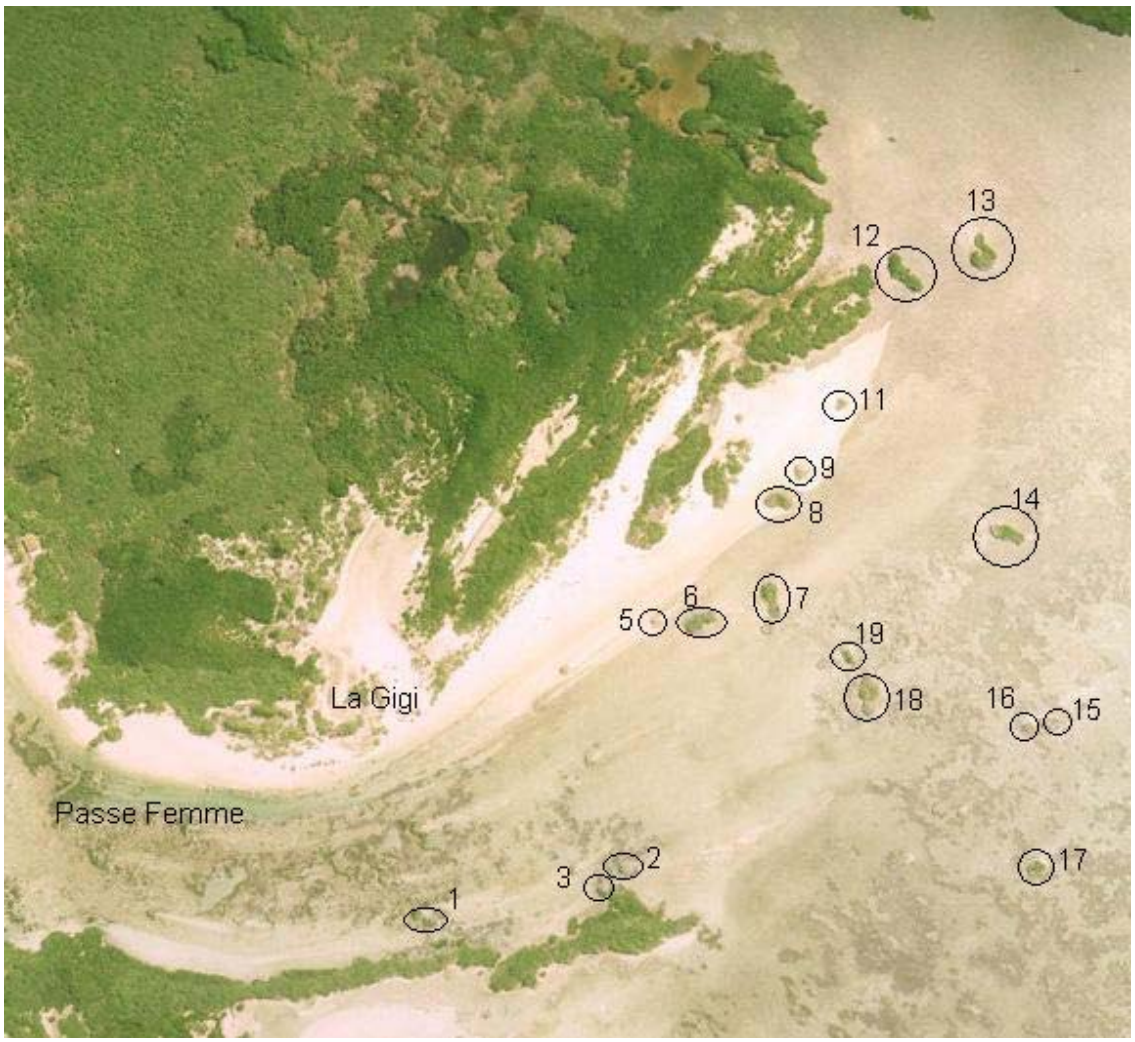


**Figure 24:** Map of the La Gigi area including numbered islets where monitoring of red-tailed tropicbirds is carried out.

*Caspian Terns*

In 2009 Caspian terns were first recorded in the sightings during counts of waders along Settlement Beach in March at low tide heights when exposed sand bars were evident and birds were often observed sitting on these along with both greater and lesser crested terns. While not listed by the IUCN and considered a species of least concern with possible increases in number by BirdLife International, Aldabra is the only known breeding site for this species in Seychelles and the only known oceanic breeding site in the world. Previous estimates of population size or number of breeding pairs for the atoll have included counts of 12 in July 1986 with 30 birds recorded in May 1972 being the highest of a limited number of counts. Current estimates, prior to 2009, are 6–10 breeding pairs. Monitoring specifically targeting this species remains difficult due to logistical and staff capacity restrictions but observations on the species were recorded and details noted throughout 2009. Details of the sightings are included in individual monthly reports.

Locations noted as previously being used as breeding sites by this species include Champignon des Os, Esprit, Ile Michel, Sylvestre and La Gigi with Ile Moustique appearing to be a favoured site, supporting a number of breeding pairs. While a complete census of the population was not possible observations were recorded with numerous pairs observed in the area around Ile Moustique (6-7 pairs) and breeding confirmed at Anse Grand Posche and Anse Polymnie.

One adult pair was recorded at the site of the old hut at Anse Polymnie and on June 26$^{th}$ during checking of the rain gauge at this location a nest was located containing two small chicks (Figure 25 a).


**Figure 25:** Caspian tern chicks recorded at a) Anse Polymnie and b) eggs recorded on Picard at La Gigi.

## 7.0: Subsistence Fishing

As allowed in the regulations of the atoll and the World Heritage Property, Aldabra Station staff members are permitted to fish in order to provide subsistence fish for consumption of residents. Detailed information on the catches during these trips is recorded including the amount of time spent fishing (bottom and trawling), number of lines deployed, location and details of fish caught (species, weight, length). This information can then be used to calculate an index of the catch per unit effort which serves as an index of fish abundance. During 2008 it was noticed that many of the details recorded during fishing trips were either incomplete or incorrect. For example the number of people fishing or number of lines was being recorded on the data sheets as the number of people onboard which is not necessarily the same thing. This has been clarified on the data sheets with the number of lines now recorded separately to the names of staff on board. This will allow a more accurate calculation of statistics such as Catch Per Unit Effort (CPUE).

While CPUE (catch per unit effort) can be used as an indication of changes in abundance the linear relationship between the measure of effort and catch can break down for numerous reasons. Changes in staff and the diligence in recording parameters such as number of lines and time spent fishing is one reason CPUE can be difficult to present. The other parameter difficult to measure is the area were fishing is being conducted, particularly for trawling which requires the boat to be moving with lines trailing behind to catch open water species.

Table 13 provides a summary of the main statistics gathered on all fish caught, including the species, total number and total weight. Details are provided for fish caught during bottom fishing and also during trawling when lured lines are let out behind the boat which is driven slowly for pelagic species such as tuna. The majority of fish caught are groupers and snappers, which combined make up over 53% of the catch (Table 13). Of pelagic species the majority of the catch is made up of giant trevally with the second most common species caught being bonito which makes up over 11% of the catch (based on weight) despite the number of individuals being the highest in terms of trawling species.

Figure 26 shows the variation in the weight of fish caught throughout the year. While informative in terms of catch per month this is also dependant on the number of people present at the station as well as weather and sea conditions. The CPUE of each month shows that October, November and December were the three most productive months in terms of the amount of fish caught for the time and number of people fishing (Figure 27). However, this will also depend on the location of fishing activity, weather conditions and potentially time of year or season.

**Table 13:** Details of fishing trips conducted throughout 2009.

| Species | | Total number of fish | Total weight of fish | Mean weight per fish | Percentage of total catch |
|---|---|---|---|---|---|
| **Bottom Fishing** | | | | | |
| **Emporers** | | | | | |
| Redgill emperor | *Lethrinus rubrioperculatus* | 12 | 6.5 | 0.54 | 0.31 |
| Yellowlip emperor | *L. xanthochilus* | 1 | 2.1 | 2.10 | 0.10 |
| Longface emperor | *L. Olivaceus* | 2 | 3.2 | 1.60 | 0.15 |
| Smalltooth emperor | *L. microdon* | 1 | 0.7 | 0.70 | 0.03 |
| Spangled emperor | *L. nebulosus* | 88 | 194.1 | 2.21 | 9.32 |
| Snubnose emperor | *L. borbonicus* | 1 | 1 | 1.00 | 0.05 |
| **Groupers** | | | | | |
| Saddleback grouper | *Plectropomus laevis* | 1 | 4.2 | 4.20 | 0.20 |
| Moontail seabass | *Variola louti* | 230 | 419.55 | 1.82 | 20.14 |
| Blacktip grouper | *Epinephelus fasciatus* | 19 | 5.25 | 0.28 | 0.25 |
| Redmouth grouper | *Aethaloperca rogaa* | 2 | 13.8 | 6.90 | 0.66 |
| Marbled coral grouper | *P. punctatus* | 5 | 43 | 8.60 | 2.06 |
| Brown marbled grouper | *E. fuscoguttatus* | 1 | 0.3 | 0.30 | 0.01 |
| Surge grouper | *E. polyphekadion* | 44 | 69.9 | 1.59 | 3.36 |
| White blotched grouper | *E. multinotatus* | 92 | 184.6 | 2.01 | 8.86 |
| Snubnose grouper | *E. macrospilos* | 16 | 16.7 | 1.04 | 0.80 |
| Potato grouper | *E. tukula* | 5 | 108.7 | 21.74 | 5.22 |
| Coral hind | *Cephalopholis miniata* | 8 | 23.3 | 2.91 | 1.12 |
| **Triggerfish** | | | | | |
| Bridled triggerfish | *Sufflamen fraenatus* | 5 | 5.3 | 1.06 | 0.25 |
| **Snappers** | | | | | |
| Scribbled snapper | Lutjanus rivulatus | 4 | 17.3 | 4.33 | 0.83 |
| Humpback snapper | *Lutjanus gibbus* | 5 | 3.7 | 0.74 | 0.18 |
| Twinspot snapper | *Lutjanus bohar* | 299 | 685.65 | 2.29 | 32.91 |
| | | | | | |
| **Trawling** | | | | | |
| Green jobfish | *Aprion virescenes* | 13 | 38.9 | 2.99 | 1.87 |
| Smalltooth jobfish | *Aphareus furca* | 1 | 4.9 | 4.90 | 0.24 |
| Rainbow runner | *Elagatis bipinnulata* | 10 | 21.9 | 2.19 | 1.05 |
| Giant trevally | *Caranx ignobilis* | 52 | 352.7 | 6.78 | 16.93 |
| Bluefin trevally | *Caranx melampygus* | 10 | 33.1 | 3.31 | 1.59 |
| **Tunas** | | | | | |
| Bonito | *Euthynnus affinis* | 66.5 | 233 | 3.50 | 11.18 |
| Wahoo | *Acanthocybium solandri* | 5 | 72.5 | 14.50 | 3.48 |
| Dogtooth tuna | *Gymnosarda unicolor* | 4 | 46.4 | 11.60 | 2.23 |
| Yellowfin tuna | *Thunnus albacares* | 16 | 160.3 | 10.02 | 7.69 |
| **Barracudas** | | | | | |
| Pickhandle barracuda | *Sphyraena jello* | 1 | 1.9 | 1.90 | 0.09 |
| Great barracuda | *Sphyraena barracuda* | 3 | 20 | 6.67 | 0.96 |

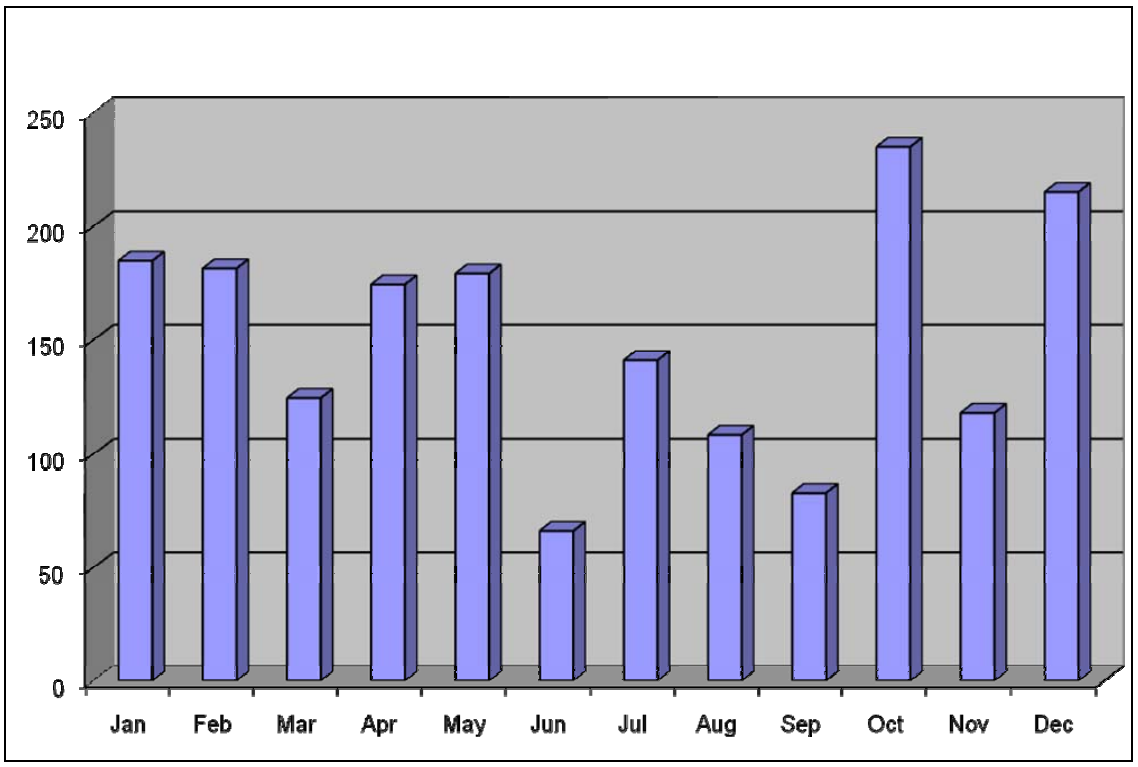


**Figure 26:** Total weight of bottom fish caught each month in 2009

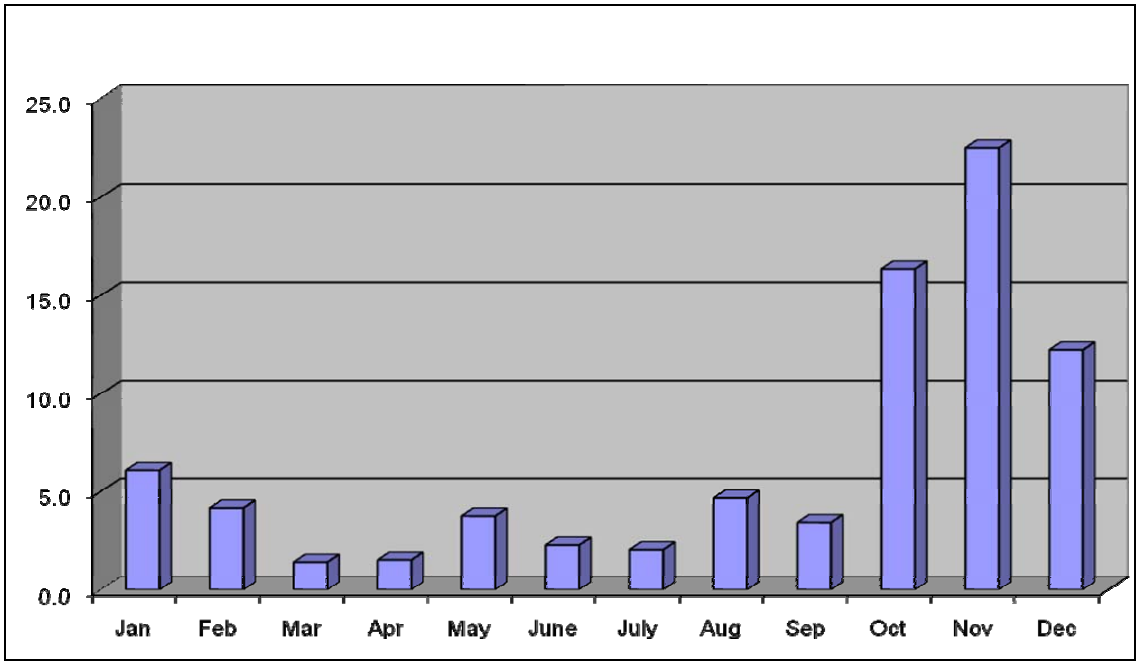


**Figure 27:** CPUE of bottom fish caught each month in 2009

Figure 28 shows the weight of trawled fish caught each month in 2009. When compared to the weight of bottom fish caught each month this paints a picture of the prevailing weather conditions which in turn effect the fishing method used. In general when large amounts of bottom fish are caught the amount of trawled fish is relatively low. March and May both show high levels of trawled fish while these months are some of the lower catch for bottom fish. June, July and August were relatively low catches for both methods, primarily due to the rough sea conditions and the difficulty for either fishing method (Figure 26 and 28). These are also the months with some of the lowest CPUE (Figure 27).

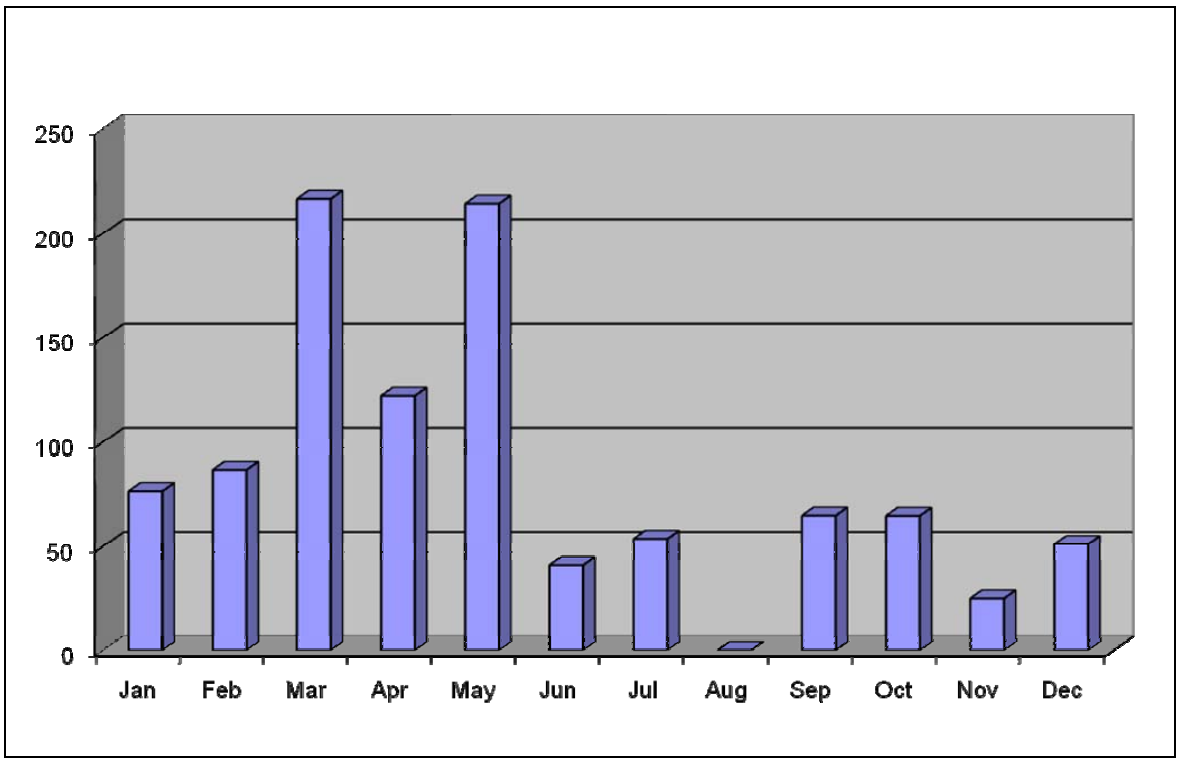


**Figure 28:** Total weight of trawled fish caught each month in 2009.

## 8.0: Butterflyfish Monitoring

Monitoring of the species diversity and abundance of species of Chaetodonitds along a transect previously established by the Aldabra Marine Programme (AMP) was conducted each month during 2009. A number of changes and improvements were made to the monitoring if butterflyfish abundance in late 2008 including the introduction of a standardised data sheet for recording of the species and number of individuals. To improve the accuracy of the monitoring and train staff, a test of identification skills (using all species) for all staff partaking in this monitoring was also introduced. The test must be passed with a mark of at least 90%? before the staff member can actively contribute to this monitoring. Staff have the option to retake the test if they fail. In May 2009 a second transect line was found approximately 100m north of the previous one and this was added to the monitoring. This second transect is along the same depth profile and covers similar habitat to the first but is far enough away to make the transects independent.

Summary data for this monitoring in 2009 are presented in Table 14. The data included in the table are the mean number of individuals recorded on either transect each month. Only data from May onwards are included in this mean as this was the month when both transects were monitored and prior to this monitoring was only conducted on Transect 1. In addition the mean shown is calculated for each species only based on the months in which it was detected on the individual transect and does not include the 0 values of the months when particular species were not recorded. Seven species recorded on transect 1 were observed in each month from May onwards; *C. falcula, C. guttatissimus, C. kleinii, C. lunula, C. meyeri, H. zoster, F. flavissimus.* Only two species were recorded in each month on transect 2*; C. guttatissimus* and F. *flavissimus.*

While the abundance of the species recorded are relatively similar on both transects a number of species show a higher abundance along transect 1. Despite this there were a number of species that were recorded on transect 2 but not on transect 1 (Table 14).

**Table 14**: Species and abundance of butterfly fish recorded on the monitoring transect.

| Species | Common Name | transect 1 | transect 2 |
|---|---|---|---|
| *C. auriga* | threadfin | 3.1 | 3.6 |
| *C. bennetti* | Bennett's | 1.3 | 1.4 |
| *C. falcula* | saddleback | 8.4 | 1.7 |
| *C. guttatissimus* | spotted | 4.1 | 3.5 |
| *C. kleinii* | Kleins | 1.9 | 1.5 |
| *C. lineolatus* | lined | | 2.0 |
| *C. lunula* | racoon | 4.9 | 4.6 |
| *C. melannotus* | blackbacked | 4.3 | 2.4 |
| *C. meyeri* | maypole | 1.9 | 2.3 |
| *C. trifascialis* | chevron | 2.0 | 3.0 |
| *C. trifasciatus* | purple | 3.7 | 3.8 |
| *C. unimaculatus* | teardrop | | 1.0 |
| *C. xanthocephalus* | yellowhead | 2.0 | 1.5 |
| *C. zanzibariensis* | Zanzibar | | 1.0 |
| *F. flavissimus* | long-nosed | 3.5 | 5.3 |
| *H. acuminatus* | reef | | 2.0 |
| *H. diphreutes* | schooling | 6.0 | 7.0 |
| *H. monoceros* | masked | 2.0 | 1.7 |
| *H. zoster* | black pyramid | 4.5 | 1.5 |

Dives in other areas of the atoll provided an opportunity to identify and note other species of Chaetodontids that were not recorded on either transect or only recorded infrequently. Two such species included *Chaetodon bennetti*, Bennett's butterflyfish (Figure 29 a), which has been recorded along the monitoring transect and *C. madagascariensis*, Madagascar butterflyfish (Figure 29 b), which is noted in the monitoring records as being uncommon in the area and has not previously been recorded on the transect.

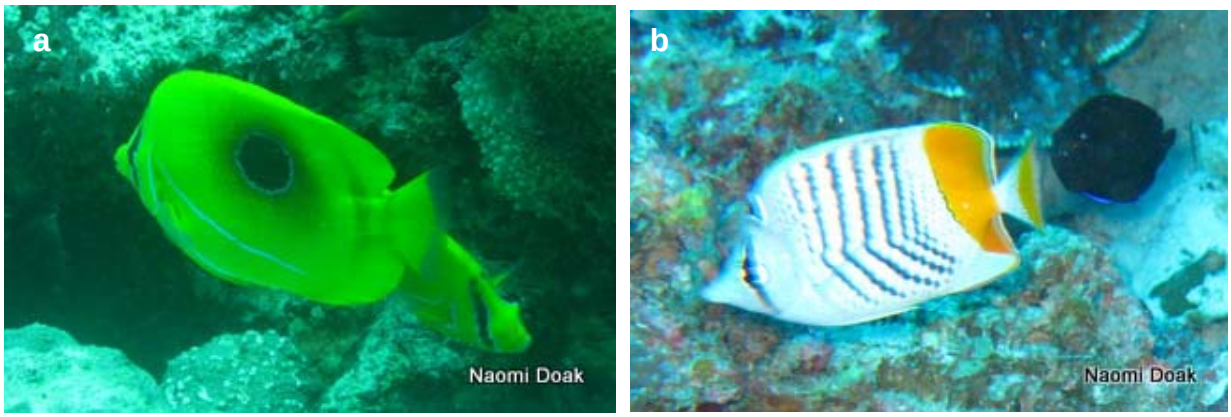


**Figure 29:** *Chaetodon bennetti* (a) and *C. madagascariensis* (b).

## 9.0: Robber Crabs

Robber crab monitoring was first instigated in October 2006 with an increase in the effort invested in this monitoring commencing in March 2007 by the then RO Pierre Pistorius to gather detailed information on the movements of individuals and the distribution of the population along the back

path and coastal transects. This monitoring has continued on a regular basis since then. The aim of the current monitoring is to provide information on seasonal and size related activity patterns as well as population density. Previous as well as ongoing monthly analysis of the data throughout 2009 has continued to reveal that despite the large variance associated with monthly means which is often related to the variation in the number of counts per month there is a seasonal pattern in the abundance and size distribution of robber crabs. It has also shown no long term change in the mean number of individuals recorded.

As in previous years a larger number of robber crabs were recorded along the Back Path on Picard than along the Coastal Path (Figure 30 and Figure 31). However, this is likely to be affected by the difference in length of the two transects with the coastal transect finishing at point 12 along the path and as a result this transect being of a shorter length. There is no obvious difference in the size distribution of individuals along both transects. However, there is a smaller difference between the size of males and females on the Coastal Path than that evident on the Back Path. In addition during months in which very few individuals were recorded on either transect (e.g. November) those individuals that were recorded tended to be very large males (Figure 30 and Figure 31).

The data collected in 2009 showed a similar pattern to that evident in previous years with a peak in abundance recorded in the first 6 months of the year, specifically around February, March and April with numbers then declining to lows in abundance from September (Figure 30). The mean thoracic length (which serves as a reliable index of weight) shows that the males recorded along the Back Path were again consistently larger than females with the largest males being recorded in the months with the fewest individuals recorded.

Along the Coastal Path, as with the Back Path, male robber crabs were consistently larger than females, as expected. However, the difference between the observed males and females was generally much smaller with males observed being consistently smaller than those recorded along the back path. Females along the Coastal Path showed no significant difference in size although females on this path were slightly larger than those on the Back Path (Figure 30 and Figure 31) which is consistent with results from the analysis in 2008.

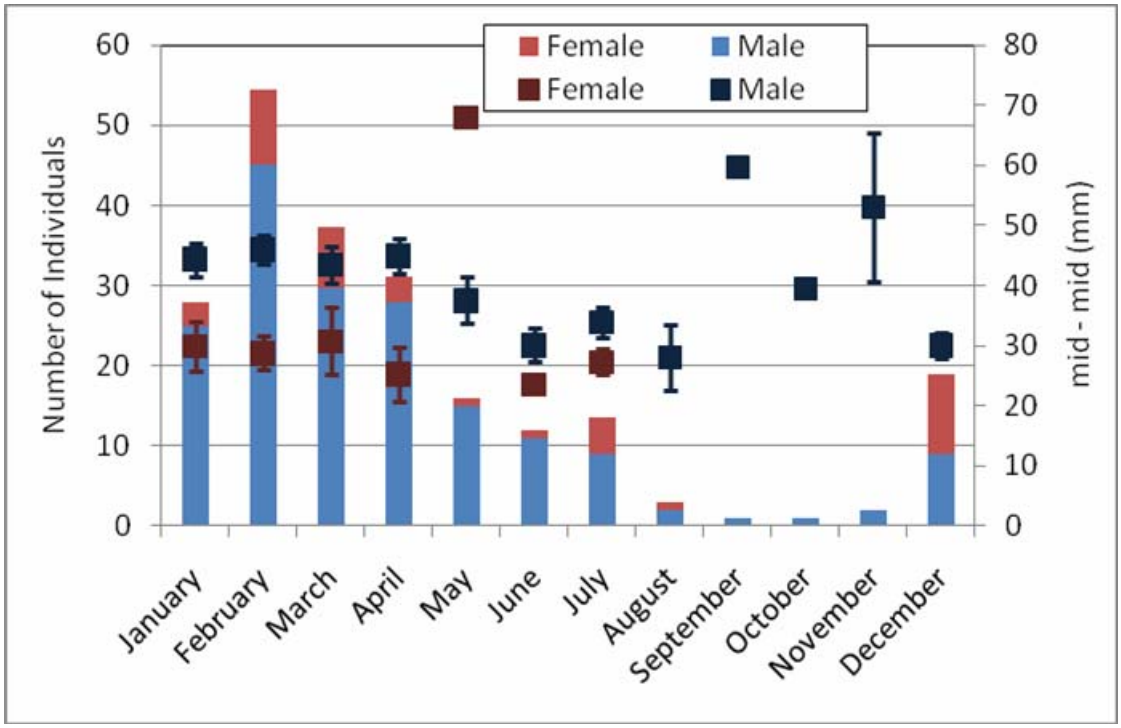


**Figure 30:** Mean abundance (bars) and size (± SE) of robber crabs recorded along the Back Path each month in 2009.

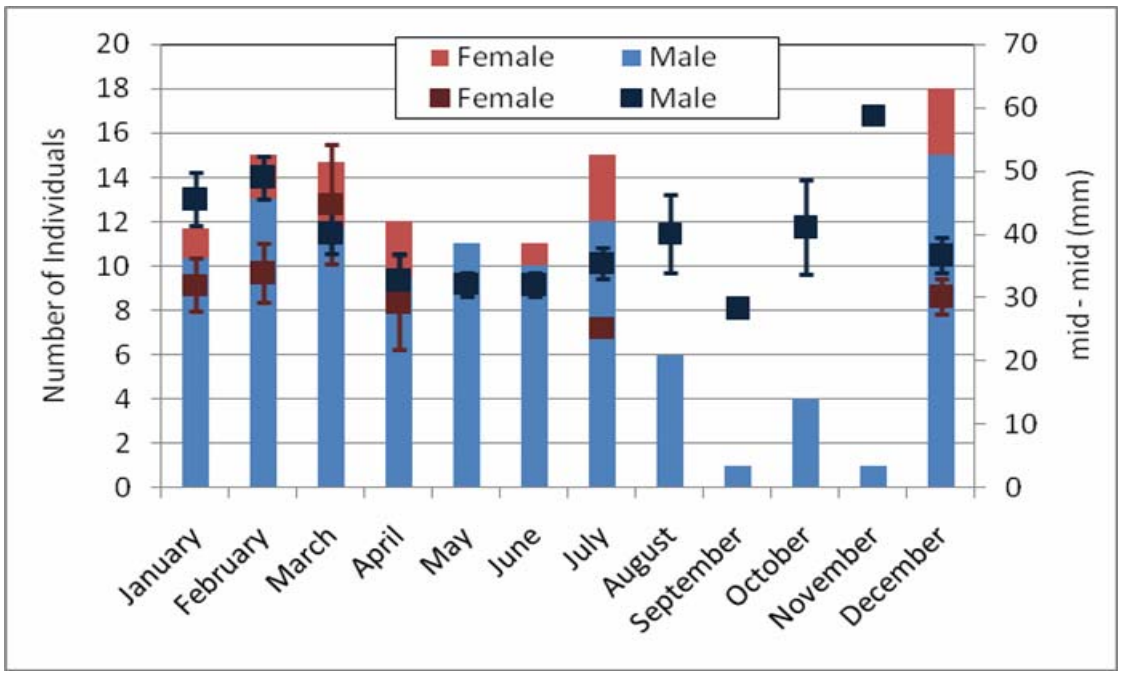


**Figure 31:** Mean abundance (bars) and size (± SE) of robber crabs recorded along the Coastal Path each month in 2009.

## 10.0: Marine Mammals

### 10.1: Dugongs

No targeted dugong surveys were conducted during 2009. A lack of appropriate boats and motors currently restricts any targeted searches in suitable habitat. However, it was a considerably productive year for sightings of this species. The fieldwork being conducted by the CCRU research team and the amount of time spent in the lagoon as a result of the habitat mapping project provided a perfect opportunity for opportunistic sightings.

On Friday 30th January, during one of the trips conducted by the CCRU GIS research group in the lagoon to validate habitat classifications for the mapping project, they saw a single adult dugong. They were able to obtain underwater video footage and above water photographs to confirm the identification (Figure 32 a). The individual was sighted in relatively shallow water on the south-east side of Ile Esprit and the footage obtained is the first underwater footage of this species on Aldabra.

During a transfer between locations in the lagoon on 15th February, two staff members; Skipper, Jude Brice and Volunteer Jennifer Stockdale, spotted two separate individuals. The first individual (Figure 32 b, approximately 2m in length) was seen at 8:55 am in approximately 2 metres of water. This particular individual was followed and filmed on a small digital camera for 2 minutes. The second individual was seen as soon as the first had moved out of sight and was smaller than the first (approximately 1.5m in length). Of particular importance the first of these two individuals has a distinctive white mark on the dorsal surface just behind the head. This was captured in the video and makes the individual distinguishable enabling identification.

June 10th saw another sighting of an adult dugong in the lagoon. Research staff were conducting turtle rodeo activities near Ile Moustique at 8:15 am when they spotted the adult dugong in approximately 2m of water approximately 350 m from Ile Esprit. Efforts to approach closer to the animal to enable photos and further information were rewarded with a very close encounter when the animal surfaced directly alongside the boat. Photos (Figure 32 c and d) and observations by staff confirm the animal has a very similar white scar to the individual recorded earlier in the year by Jude Brice and Jennifer Stockdale.

The sighting of the individual by the CCRU team and the other sightings later in the year led to the compilation of sighting records and the drafting of a paper for submission focussing on the dugong sightings and habitat mapping of the lagoon. A previous publication of marine mammal sightings included some details of dugong sightings, however numerous errors were detected and inconsistencies with historical sightings. The title and abstract of this paper are included below as well as a summary of the sightings of dugongs compiled for the paper (Table 15). The manuscript was in draft form at the end of 2009 and is due to be finished and submitted in 2010.

**Lagoon Habitat Mapping and Observations of Dugong (*Dugong dugon*) at Aldabra Atoll, Seychelles, Western Indian Ocean.**
Annelise Hagan, Sarah M. Hamylton and Naomi Doak

Abstract
Until recently, it was thought that dugongs in the Seychelles had gone extinct. However, since 2001 a collection of sightings has renewed interest in dugongs at Aldabra Atoll, a World Heritage Site in the Seychelles, western Indian Ocean. This paper documents the results of several extensive searches of Aldabra Research Station library records and consolidates numerous reports of recent dugong sightings. The locations of sightings (2001-2009) are plotted onto a high resolution benthic habitat map of the Aldabra lagoon, created in January 2009. A spatial cluster detection procedure is applied to point records of sightings to reveal a statistically significant cluster of sightings in the northwest of the lagoon, at Bras Monsieur Clairemont. This suggests a mutual co-existence of dugongs and seagrass beds, favoured as a primary food source, in the vicinity of the channels connecting the 226 km$^2$ lagoon to the open ocean.




**Figure 32:** Dugongs sighted in the lagoon in 2009.

**Table 15:** Summary of dugong sightings at Aldabra Atoll since 2001.

| Date | Site of Observation | Number of individuals | Comments |
|---|---|---|---|
| 02/08/01 | Bras Monsieur Clairemont | 1 | Observed in shallow water, near mangroves; individual 2.5 - 3 m in length |
| 03/08/01 | Bras Monsieur Clairemont | 1 | Observed in shallow water, near mangroves; individual 2.5 - 3 m in length |
| 01/10/01 | Bras Monsieur Clairemont | 2 | 2 adults swimming together; observed in shallow water, near mangroves; individuals 2.5 - 3 m in length |
| 12/10/01 | Bras Monsieur Clairemont | 1 | Observed in shallow water, near mangroves; individual 2.5 - 3 m in length |
| 11/11/01 | Bras Monsieur Clairemont | 1 | None |
| 03/02 | Bras Monsieur Clairemont | 2 | Seen from FIB, swimming near mangroves at Bras Monsieur Clairemont in shallow water; during falling spring tide |
| 04/02 | Bras Monsieur Clairemont | 1 | Adult with distinctive white spot on dorsum |
| 20/05/03 | Bras Monsieur Clairemont | 1 | Adult |
| 10/03 | Unrecorded | 1 | Adult sighted from FIB. Location unrecorded |
| 24/10/03 | North of Ile Esprit | 1 | Sub-adult |
| 25/10/03 | North of Ile Esprit | 1 | Sub-adult |
| 25/10/03 | Bras Monsieur Clairemont | 1 | Adult |
| 14/12/03 | Bras Monsieur Clairemont | 1 | Sub-adult |
| 16/12/03 | North of Ile Esprit | 1 | Adult |
| 16/04/05 | North of Ile Esprit | 1 | Adult sighted from Flying Inflatable Boat (FIB), apparently resting in clear water. Neap tide 2.3 m |
| 11/05/05 | Between Dune D'Messe and Ile Esprit | 1 | Adult between Dune D'Messe and Ile Esprit. Moving in a NW direction towards Ile Esprit. Tide ~2.8 m |
| 23/07/05 | Lagoon centre | 4 | 1 adult, 2 sub-adults, 1 juvenile |
| 27/07/05 | Close to Dune D'Messe landing stage | 1 | Medium sized adult (possibly sub-adult) moving in direction of Ile Esprit. Close to lagoon shore feeding on seagrass (high tide) |
| 27/07/05 | North of Ile Esprit | 1 | Adult |
| 25/08/05 | 200 m north of Ile Esprit | 1 | Adult, very evasive. Water murky, about 2 m deep |
| 15/06/06 | Dune D'Messe area | 1 | Individual sighted between research station and Dune D'Messe, individual surfaced and moved in an easterly direction |
| 28/07/06 | Dune D'Messe area | 1 | One adult appeared to be feeding on seagrass bed and surfaced for air |
| 10/01/07 | Close to Dune D'Messe | 1 | One individual surfaced very briefly in murky water |
| 04/02/07 | Bras Monsieur Clairemont | 1 | One large individual observed very briefly |
| 02/08/08 | Bras Monsieur Clairemont | 1 | One individual sighted in vicinity of Bras Monsieur Clairemont |
| 30/01/09 | Near Ile Esprit | 1 | One adult observed swimming NW close to Ile Esprit |
| 15/02/09 | Between Ile Esprit and research station | 2 | First individual approx 2 m in length. Second appeared as soon as first disappeared, approx 1.5 m in length |
| 10/06/09 | Close to Ile Moustique | 1 | Adult |

## 10.2: Whales and dolphins

Throughout 2009 there were sightings of pods of spinner dolphins around the atoll. This is perhaps the most numerous marine mammal species around Aldabra and the species that is observed most frequently. In addition to numerous sightings of spinner dolphins staff on board a visiting vessel, The National Geographic Explorer, provided details of two sightings of beaked whales. On Friday 20th March prior to arrival at the atoll two individuals were sighted approximately 2 miles south west of Grande Terre in 1,200 m of water at the GPS location 09°30.9'S 46°13.7'E. Following this sighting on 21st March a single individual was sighted at 12:45 at 9°22.6'S 46°10.6'E.

In June staff sighted a pod of short-finned pilot whales off Settlement Reef (Figure 33). As with the pods of spinner dolphins observed around the atoll in June, the pilot whales appeared to contain a number of calves. Widespread and abundant throughout tropical and warm temperate waters the short-finned pilot whale has been recorded in waters around Aldabra numerous times previously.

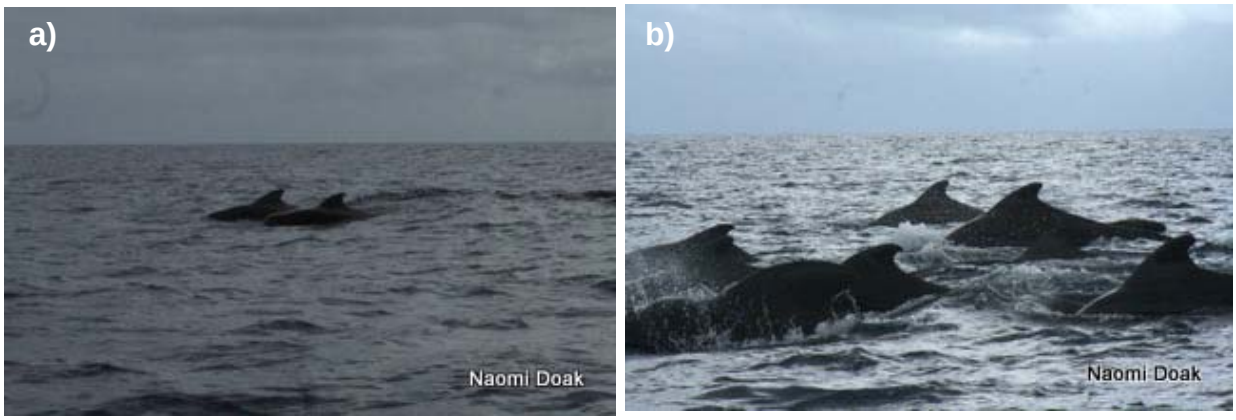


**Figure 33:** Pod of short-finned pilot whales, *Globicephala macrorhynchus*.

June also saw the first sighting of humpback whales off the atoll for 2009, with two individuals recorded late in the month. Sightings became more frequent during July with numerous groups seen off Settlement Reef and during trips around the atoll. Many of these were identified as what appears to be an adult female with a small calf. Staff made efforts to record details of the sightings although this will remain difficult until a systematic monitoring protocol is introduced as often they may be multiple sightings by different staff of the same group, especially directly off the station. Photos were taken when possible although these were opportunistic as there were no dedicated monitoring trips and suitable shots of tale flukes were difficult to obtain (Figure 34). Throughout the whale season numerous discussions over email were held in regards to a detailed methodology and database for recording any photos taken and notes on sightings but no details were provided and no methods agreed on. A workshop on this was held in the Maldives in 2009 and staff were to receive advice from both David Rowat and Michel Vely on the design of recording sheets based on this meeting and discussions on the data base but no information was received.


**Figure 34:** Photos of humpback whales sighted around the atoll during 2009.

## 11.0: Goat Eradication Project

Activities for the GEP continued in 2009 with a summary of the specific monitoring activities provided in Table 16. A lack of suitably qualified staff hampered monitoring at the start of the year, however a dedicated effort to provide training soon solved this issue. It also became apparent in 2009 that the collars on the Judas goats would need to be changed as signals were lost from a number (five) of them and the goats became increasingly difficult to locate.

The GEP was first conducted in early January and no other tracking has been again until March. In February two Judas goats were sighted close to Anse Cedres by research staff conducting the Pond Heron project. However, they could not identify their respective collars. Activities for the GEP were resumed in March with the return of Senior Ranger Alex Underwood. A 4 day trip to Cinq Cases was conducted beginning on the 13$^{th}$ of March with the main aim being to locate as many of the Judas goats as possible. Judas Goat 10 was located and sighted in a small herd of goats which also contained Judas goats 1, 9 and 12. No non-Judas goats were sighted with this group. Unfortunately during this particular GEP field trip Judas goats 7 and 8 were not located or sighted.

GEP activities were undertaken at two locations during April. Staff, accompanied by a number of SPDF personal made an extended trip to Dune Jean-Louis in efforts to locate and remove the single female goat that has been sighted in this area on several occasions and after consultation with the office and staff it was decided that the GEP activities in the Cinq Cases area would also be conducted for an extended length of time. This was primarily as a response to the urgency in locating all Judas goats with concern for the battery life of the current collars. It was also felt that

the current presence of the SPDF personnel on the island provides an opportunity for an increased focus on the eradication of the remaining non-Judas goats.

GEP activities were again undertaken at two localities in May. In an effort to locate and remove the single female sighted near Dune Jean-Louis on previous occasions efforts were again made in this region. May GEP activities in the Cinq Cases area were restricted to three days due to tide heights and access to the landing stage.

Following on from previous efforts to locate the Judas goats in 2009 and to ensure all radio-tracking equipment was working June saw an extended visit to the Cinq Cases region by three staff members from the Research Department; RO Naomi Doak, Ranger David Boodna and Ranger Israel Labrosse. July saw some positive results with staff successfully shooting an adult female non-Judas goat on the 10th and in addition to this it is believed that they may have also been able to shoot a kid that was seen with the same group of adults although this could not be confirmed as it disappeared into the pemphis with the adults and no carcass could be located.

Activities associated with the Goat monitoring and eradication project continued throughout August. A trip was scheduled from the 4th to the 7th August but the sea conditions were too rough and a safe landing was not possible at Anse Cedres and staff returned to the station. Staff departed from the station for Middle camp on 8th August to then proceed on to the Takamaka region from the landing stage on the inside of the lagoon in an attempt to locate any goats or obtain signals from the other Judas goats that had not been located in the Anse Cedres area.

GEP monitoring activities in September revealed that all 6 Judas goats were frequenting the Anse Cedres area. While no non-Judas goats were seen with them it was noted that only J10 on frequency 148.501 was still emitting a signal. October saw 1 dedicated trip for goat eradication project activities which was conducted in the Anse Cedres area while staff on monthly monitoring programs at Cinq Cases carried out tracking in the area. October also saw efforts to recruit an experienced wildlife darting expert to assist in replacement of the radio collars on the Judas goats.

Tom Smith, who has broad experience in hunting and darting animals in Canada, was recruited by SIF to come to Aldabra to dart and change all collars on the Judas goats commencing in November. A dedicated trip to Anse Cedres was scheduled to coincide with Tom's arrival and this was on the 25th November as the plane from Mahé was delayed pending necessary authorisations and equipment.

This first trip to Anse Cedres by Tom and research staff was primarily to familiarise Tom with the site and to plan necessary activities in the context of the project. J10 was sighted on this trip. November also saw the finalising of the construction of the field hut at Anse Cedres. Throughout November goat monitoring activities continued in other areas of Grande Terre and the last individual sighted in the Dune Jean-Louis area was shot on the December monitoring trip to Dune Jean-Louis.

All other specific goat eradication project activities in December were concentrated in the Anse Cedres area with 4 trips to this location undertaken by Tom Smith, David Boodna and Israel Labrosse. Given that J10 was the only individual Judas goat fitted with a collar emitting a signal, activities focussed on this goat which was tracked and observed with another black male Judas goat. J10 was successfully darted and had its collar changed on the 9th December. J10 also had a coloured ear tag applied to enable identification in the field. No concrete evidence of the other goats was observed in the area. Tom also conducted a number of training sessions for rangers to equip them with the necessary skills and knowledge to track, dart, and place collars on the other Judas goats.

As mentioned in the November report, the female goat sighted previously in the Dune Jean-Louis area was shot on the 3rd December. At the end of 2009, all goats remaining on Grande Terre appeared to be concentrated around the Anse Cedres area and efforts to locate and re-collar the remaining Judas goats and eradicate any non-Judas goats sighted will continue in 2010.

**Table 16:** Activities and observations during goat eradication activities in 2009.

| Date | Location | Staff | Observation |
|---|---|---|---|
| 4/01 | Dune Jean Louis | AU, DB | attempts to find female at DJL, no goats sighted |
| 5/01 | Dune Jean Louis | AU, DB | attempts to find female at DJL, no goats sighted |
| 7/01 | Cinq Cases | AU, DB | J8 with four other JG, unable to identify them |
| 8/01 | Cinq Cases | AU, DB | J8 with four other JG, unable to identify them |
| 9/01 | Cinq Cases | AU, DB | J8 sighted with J10, J7, J12, J9, no non-JG accompanying; J1 not seen |
| Feb | - | JS, SD ? | no GEP conducted but 2 JG sighted close to Anse Cedras b y research staff working on MPH; no ID possible |
| 13/03 | Cinq Cases | AU, SD | J10 seen with J12, J9 and J1. No non-JG sighted with them. J7 and J8 not seen |
| 6/04 | Dune Jean Louis | AU, DB, SD, 2 SPDF | Female goat sighted 100 metres behind DJL, 2 shots fired but missed |
| 7/04 | Dune Jean Louis | AU, DB, SD, 2 SPDF | female goat sighted. 1 round fired but goat disappeared into thick pemphis |
| 11/04 | Cinq Cases | AU, DB, 2 SPDF | scanning for J12, weak signal from Ance Cedras. |
| 12/04 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 13/04 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 14/04 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 15/04 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 16/04 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 6/05 | Dune Jean Louis | AU, DB | attempts to find female at DJL, no goats sighted |
| 7/05 | Dune Jean Louis | AU, DB | attempts to find female at DJL, no goats sighted |
| 24/05 | Cinq Cases | AU, DB, 2 SPDF | strong signal from J9 |
| 24/05 | Cinq Cases | AU, DB, 2 SPDF | weak signal from J9, J8, J12. |
| 25/05 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 26/05 | Cinq Cases | AU, DB, 2 SPDF | No signal obtained |
| 22/06 | Anse Cedras | ND, DB, IL | Signal from J10 and J8, approx 1.5 km from Anse Cedras |
| 23/06 | Anse Cedras | ND, DB, IL | Signal from J10 along the coast from Anse Cedras towards Passe Houreau |
| 24/06 | Cinq Cases | ND, DB, IL | No signal obtained |
| 25/06 | Anse Cedras | ND, DB, IL | Signal from J10 and J8, approx 1.5 km from Anse Cedras |
| 6/07 | Dune Jean-Louis | IL, DB | No goats or trace of goats |
| 7/07 | Dune Jean-Louis | IL, DB | No goats or trace of goats |
| 9/07 | Anse Cedras | IL, DB, US, WA | Signal from 501 |
| 10/07 | Anse Cedras | IL, DB, US, WA | 3 NJ goats with J12, shot one adult female and possibly one kid |
| 20/07 | Anse Cedres | IL, DB | Tracking 2km inland from trail and outwards toward coast |
| 21/07 | Anse Cedres | IL, DB | Tracking, strong signal obtained from J10 in beach area |
| 21/07 | Anse Cedres | IL, DB | 2 goats seen through vegetation, unable to confirm IDs |

| | | | |
|---|---|---|---|
| 22/07 | Grove trail | IL, DB | Fairly fresh goat dropping |
| 23/07 | Cinq Cases - Takamaka | IL, DB, US, WA | No signals or sign of goats |
| 4/08 | Anse Cedras | IL, DB, US, WA | Could not land at Anse Cedras due to sea conditions, staff returned to station |
| 8/08 | Takamaka | IL, DB, US, WA | Via landing stage from Middle Camp, no signals |
| 10/08 | Dune Jean-Louis | IL, WA | No goats or trace of goats |
| 11/08 | Dune Jean-Louis | IL, WA | No goats or trace of goats |
| 21/08 | Takamaka | IL, WA | No goats or trace of goats |
| 22/08 | Cinq Cases | IL, US | No signal or trace, mostly in Coco area |
| 23/08 | Anse Cedras (via Grove) | IL, US, WA, LS | Very strong signal from 501 but no sighting, some droppings along Grove transect, returned along coast some fairly fresh droppings |
| 10/9 | Anse Cedres | IL, DB | Tracking conducted, No signal obtained |
| 11/9 | Anse Cedres | IL, DB | Droppings were observed at GPS position 0663094 8961558 |
| 12/9 | Anse Cedres-Passe Hoareau | IL, DB | Droppings of kid and adult observed at GPS position 0660978 8963078 |
| 13/9 | Anse Cedres-Pointe Hodoul | IL, DB | Signal obtained from 148.501 at GPS point 0665052 8961706, All 6 Judas goats seen together |
| 20/10 | Anse Cedres-Cinq cases | DB, WA | Fresh droppings on the coast, Three Judas goats seen J10, J8 and unknown. Only J10 emitting signal |
| 21/10 | Anse Cedres - Passe Hoareau | DB, WA | Fairly fresh droppings of kid and several adults next to coastline |
| 22/10 | Cinq cases area | US, AD, SD | Tracking on Coco transect towards Grove, BasSin Fregat area up to Pointe Hodoul - no signals obtained |
| 22/10 | Anse Cedres-Groove area | DB, WA | Strong signal in Anse Cedres area from J10, no signal in Groove area |
| 3/11 | Dune Jean-Louis | US,SD | Fairly fresh droppings on trail at point no.10 on transect, (1 heap only indicating presence of adult goat) |
| 18/11 | Grove and Anse Cedres areas | WA,US | Weak signal obtained at Pt.30 in Grove, fairly strong signal at pt. MP0 in a NW direction, no signal in Anse Cedres area |
| 26/11 | Anse Cedres area | TS, DB, SD, IL | Located J-10 approx. 2.5 km from camp. |
| 27/11 | Anse Cedres – Cinq Cases | TS, DB, SD, IL | Hiked to Cinq Cases, signal from J-10 in same location. |
| 28/11 | Cinq Cases – Anse Cedres | TS, DB, SD, IL | Hiked back to Anse Cedras, No signals received |
| 29/11 | Anse Cedres | TS, DB, SD, IL | Sighted J-10 and 1 other Judas goat. No ID possible on second Judas goat. |
| 03/12 | Dune Jean-Louis | IL,SB,US | The female goat was observed behind beach 32 grazing on vegetation and was successfully shot. |
| 02/12 | Anse Cedres | TS, DB | Bush too thick for shot |
| 07/12 | Anse Cedres | TS,DB | Swirling wind and scent gave us away before close enough for shot |
| 09/12 | Anse Cedres | TS,DB | Replaced collar on J-10 |
| 16/12 | Anse Cedres | TS,DB | GPS in camp, within 6 m of goats but dart transmitter problems |
| 17/12 | Anse Cedres area | TS,DB | Bad timing; J-10 was just in the exact spot to see us |
| 21/12 | Anse Cedres area | TS,DB | Only saw 1 goat; not J-10 as no eartag, but J-10 close |
| 21/12 | Anse Cedres area | TS,DB | Learning telemetry and thought goats in front instead of behind |
| 22/12 | Anse Cedres area | TS,DB | No GPS taken |

# 12.0: Departmental Issues

## 12.1: 2009 Staff

One of the most notably points in terms of staffing on the atoll in 2008 was the changes in staffing in the position of Research Officer. This was not the case in 2009 with the position filled by one person for the entire year. In addition other staffing posts within the research department also saw a greater deal of stability and continuity with fewer staff changes and many staff remaining with SIF and on the atoll for the majority of the year (Table 17). The role of Assistant Research Officer was filled by two people throughout the year with Ian Valmont filling this position at the start of the year. However, Ian left the atoll in mid-January. The post then remained vacant for a considerable amount of time until the arrival of Wilna Accouche in June.

Despite the continuity in staff on the atoll in 2009 considerable times of the year saw the research department operating with minimal staff and very few people to assist with the completion of monitoring activities. As noted in previous annual reports the demands on staff within the research department shifts dramatically between the seasons and with high levels of visitor numbers early in the year this became more apparent.

Unfortunately April 1st arrived with the news that our friends aboard the Indian Ocean Explorer had been hijacked by Somali Pirates in the waters around Aldabra and were on their way to Somalia. The increased pirate activity in Seychelles waters and indeed so close to Aldabra meant some big adjustments and the arrival of the supply boat in early April bought with it an armed response team and security detail and the start of the deployment of soldiers on the atoll. This also meant a stop to any tourist activities in the region and as a result the number of visitors decreased dramatically with only two vessels visiting the atoll between April and December.

**Table 17:** Name, position and engagement of research staff at the Aldabra Research Station.

| Name | Post | Engagement |
|---|---|---|
| Naomi Doak | Research Officer | January – December |
| Ian Valmont | Assistant Research Officer | January 2009 (Departed Jan 16th) |
| Wilna Accouche | Assistant Research Officer | July – December |
| Alex Underwood | Senior Ranger | January – June |
| Uzice Samedi | Senior Ranger | July – December |
| David Boodna | Ranger | January – December |
| Stan Denis | Trainee Ranger / Ranger | January – December |
| Israel Labrosse | Ranger | April (arrived April 14th) – December |
| Richard Jeanne | Ranger | November – December |
| Malik Maiche | Trainee Ranger | November – December |
| Jennifer Stockdale | Volunteer | January – April (Departed April 4th) |
| Rebecca Scott | Volunteer | January – February (Departed Feb 23rd) |
| Bernard Coetze | Volunteer | January 2009 (Departed Jan 8th) |
| Aurélie Duhec | Volunteer | September – December |
| Sam Balderson | Volunteer | November – December |
| Christina Quanz | Masters Student | January 2009 (Departed Jan 8th) |

## 12.2: Ranger Projects

No ranger projects were undertaken in 2009.

## 12.3: Volunteer Projects

2009 saw the continuation of a number of volunteer projects that commenced in 2009. Both Jen Stockdale and Rebecca Scott were on the atoll for the first part of 2009 and continued to conduct research work on specific projects.

While Bernard Coetzee left Aldabra in January 2009 the work he had started on the nomination of Aldabra as a RAMSAR wetland site was continued by Head Office. Following completion and submission of the nomination file, Aldabra was successfully nominated as a RAMSAR site in December 2009.

In 2008 Rebecca Scott commenced a project investigating the influence of tides and habitat diversity within the Aldabra lagoon on sea turtle foraging stocks in November 2008. The aim of the project was to determine the influence of tides and habitat characteristics on the foraging stock composition and behaviour of sea turtles within the Aldabra lagoon. Baseline information was to be collected to gain insights into the health of both foraging and nesting turtles and hatching success on key nesting beaches around the atoll.

The initial project proposed by Becky included:

- Investigation into how tides and habitat characteristics govern the abundance and movements of adult and juvenile green and hawksbill sea turtles within the lagoon.
- Collect baseline information on the health of sea turtles foraging and nesting in Aldabra.
- Collect baseline information on hatching success and how accurately this can be determined to facilitate any future work on this topic.

**Rebecca Scott. 2009. Investigation into the abundance, behaviour and stock composition of Aldabra's foraging sea turtles.**

**Abstract:**
The abundance of turtles that forage within the Aldabra lagoon presents an ideal opportunity to study the stock composition and behaviour of turtles present in this tidal dominated atoll ecosystem. By conducting snorkelling transects at a range of tidal heights detailed observations of turtles encountered were made to gain insights into the abundance, behaviour and stock composition of turtles within the Aldabra lagoon. Results reveal a highly significant effect of tides on sea turtle foraging populations and an extreme bias towards adult male green turtles in the foraging stock present. Biotelemetry studies are proposed as priority areas of research to further understanding of the movements of different species, size and sex classes of Aldabra's sea turtles.

Also commenced in 2008 was a project by Jennifer Stockdale investigating the "Population status and breeding ecology of the Madagascar pond heron *Ardeola idae* on Aldabra Atoll." This project commenced in November 2008 and continued in 2009. The full reference for this with the abstract is as follows:

**Stockdale J. 2009. The Madagascar Pond Heron *Ardeola idae* on Aldabra Atoll: A preliminary study.**

**Abstract**: The Madagascar Pond Heron, *Ardeola idae*, is listed as endangered with an estimated total population of 6000 birds; which is declining due to habitat destruction and degradation particularly at its main breeding sites in Madagascar. Given the species' rapid decline a study was

undertaken to determine the habitat requirements and preferences on Aldabra atoll. Aldabra is the world's largest raised coral atoll and a Seychelles UNESCO World Heritage Site; which may constitute a population stronghold and important breeding site.

Eight targeted surveys, based on previous recorded sightings compiled from the last 30 years, were carried out, on foot and by boat, to locate the Madagascar Pond Heron (MPH). Information was recorded on the number of birds seen and their breeding status, location and habitat characteristics. Overall, 59 MPH were sighted. This is a conservative count and includes repeat sightings across the field season. MPH were recorded in 8 different areas and, apart from 7 sightings, all observations were recorded in the east of the Atoll. Initial observations suggest a significant link between the shrub *Thespesia populneoides,* shallow bodies of water and the presence of MPH.

The project faced several constraints during the first field season. Therefore it has now been extended from the originally proposed two field seasons into a longer term project. A distribution map of the species on Aldabra has had a sound start with this project. This will become more comprehensive with further sightings and monitoring. Overall we hope that by continuing to contribute to the knowledge base of the MPH we can improve the current conservation status of this endangered species.

## 12.4: Visiting Scientists

The 2008 annual report saw an increase in the size of the section related to researchers and scientists visiting the atoll. It also saw a renewed effort to ensure that reports from groups conducting research expeditions to Aldabra are submitted both to the SIF office on Mahé and copies also sent to Aldabra for future reference. Unfortunately this did not result in any additional reports from research activities in 2008 and efforts to obtain reports from some of the 2008 research trips will need to continue. This effort has continued in 2009 with increased detail on activities of visiting researchers included here in the report. Where reports are available from Mahé or Aldabra has been noted and these are available on request. Copies are not included here due to the size of the annual report and the additional research reports.

Details of groups that visited the atoll for research purposes and summaries of the purpose of their visit are included below.

*CCRU Habitat Mapping and GIS Project*

January 15th saw the arrival of the Cambridge Coastal Research Unit (CCRU) to begin validation work on the Aldabra mapping project. Quickbird satellite imagery was obtained for this project and the fieldwork to be conducted on the atoll was to validate the habitat classes identified by this imagery. In conjunction to the two researchers from CCRU, Sarah Hamylton and Annelise Hagan, a local team of researchers also came to conduct mapping and validation of the terrestrial vegetation, Justin Prosper (GIS Department of MENRT), Lindsay Chong Seng (SIF), Christina Quanz (University of Halle) and Christian Fleischer (local volunteer). The local team focused on resurveying the terrestrial vegetation as per the report by David Bourne, *Aldabra Revisited*, which describes in detail methods and location of transects while also conducting important ground truthing of the vegetation to look at changes using the Quickbird imagery. The lagoon ground truthing by the CCRU was assisted by Joshua Adeline providing logistical support with boat operations.

Support was provided to this group from the Research department in terms of transfers around the atoll as well as assistance in plant surveys from the Island Manager, Marc Jean-Baptiste, who had experience in this. The visits by both groups were extremely successful and both teams of researchers completed all the work they had planned. A report on the fieldwork was provided by the CCRU team (Table 18) although no similar report is yet available from the vegetation survey.

Fieldwork was conducted in January and continued in February to support the development of habitat maps of the Atoll from the QuickBird satellite imagery. The major fieldwork components undertaken by CCRU were:

- Quantitative coral community assessment using video transect techniques;
- Local recording of lagoon floor habitats;
- Collection of field reflection spectra of targets of interest, including various species of seagrasses and macroalgae, sand and corals;
- Differential GPS surveys of benchmarks in and around Aldabra Research Station;
- Levelling of height differences between benchmarks in and around Aldabra Research Station, and;
- Tidal measurements throughout the fieldwork period.

A report of the work conducted by the CCRU has been provided to SIF and is available on request. In addition, the research from the lagoon mapping is being used in at least one publication in collaboration with SIF staff (see dugong section: 10.1)

**Table 18:** Summary of data collected during Aldabra Expedition 16th Jan – 11th Feb 2009**.**

| Work Component | Description | Data collected |
|---|---|---|
| 1 | Number of underwater video transects | 5 (area for each = 30 x 0.8m) |
| 2 | Number of ground referencing points | 487 |
| 2 | Ground referencing video footage / photographs | >2GB |
| 3 | Number of spectral signatures collected | 200 |
| 4 | Number of differential positioning survey points | 1948 |
| 5 | Number of benchmark heights surveyed | 4 |
| 5 | Number of height points levelled | 154 |
| 6 | Duration of tidal data collected | 24 days |
| 6 | Number of tidal data points logged | 56616 |

## 12.5: Visiting Vessels

2008 saw a significant number of tourist vessels visiting the atoll and the total number of visitors was much greater than in previous years. In total almost 1700 visitors came to Aldabra in 2008 with a number of vessels having repeat trips to the region. This trend continued from the end of 2008 into the first few months of 2009 (Table 19). In addition to the increased number of larger cruise vessels the year also started with a number of visits by smaller charter yachts.

The continued political unrest in Madagascar meant that there were a number of changes to cruise vessel itineraries and an increase in the expected number of visits to the Atoll. Cruise ship Island Sky visited the atoll twice in February. Both of these visits were unexpected and due to changes in cruise itineraries. The number of clients on board was around 70 for each visit and the vessel was stationed at Aldabra for 2 days in both instances.

Cruise vessel Le Ponant visited the atoll 3 times during February with each visit being for 2 days. These visits were scheduled in the information received in late December 2008 and involved 2 French groups and one visit by Zegrahm Expeditions. These visits involved 56, 51 and 30 clients respectively. Activities undertaken by these groups included station tours, snorkelling at Passe Dubois, off Settlement Reef and in the main channel, diving and visits to the frigatebird colony . The extent and involvement of staff in these activities varied according to the number of clients on board (station tours with large numbers are difficult and unsatisfactory for staff and clients), the time of arrival of the vessel (activities are dependent on tide), specific interest of clients (Zegrahm groups are generally more interested in the animals and have more specific questions and request at least one presentation by the RO, French groups prefer to sit on the beach and are not overly interested in the other highlights on the atoll) and the presence of experienced cruise directors and guides on board (Zegrahm has staff who have been here with a diverse knowledge of the animals

here, Island Sky has large groups of people with perhaps one experienced, knowledgeable guide or staff member on board).

During February there was also a visit by the Charter Yacht Moana with five people on board. These guests came ashore for a station tour and also went snorkelling and diving around Picard.

July also saw a single boat visit the atoll. This time of year is usually a very quiet month in terms of visitors with the south east monsoon upon us and the rougher and unpredictable sea conditions that come with it. There was a single visit in July by a yacht with two guests on board. The visit experienced a number of difficulties and highlighted the need to consider timing of visits for clients. Despite previous visits by the captain of the yacht during the south east there was an obvious lack of understanding in terms of the weather and sea conditions at the time of the visit with repeated insistence by the captain that the yacht would moor inside the lagoon. In addition to the demands of clients and their reluctance to accept the restrictions placed on their activities by the sea conditions on arrival at the station there was an incident between the yacht and *Zegret*, the small fibreglass boat used at the station. *Zegret* had been placed on the mooring buoy to facilitate the return of staff to the station after a necessary trip to Assumption to deliver the Island Manager to a flight to Mahé. Despite clear and repeated instructions from the RO for the captain not to moor on the buoy because *Zegret* was already there the captain attempted to approach the buoy and moor to it. In the process it appears the yacht ran over the line from *Zegret* to the buoy thus pushing *Zegret* under the water and causing it to be inundated. *Zegret* was eventually salvaged and the engine was checked and washed and appears to be functioning well.

From 23rd to 24th of November, the pleasure yacht 'Senses' visited Aldabra. It was originally planned and approved that Senses arrive on the 22nd November but the passengers were delayed and they arrived in the morning of the 23rd. Furthermore, on the 24th, we received an alert of a tropical storm in the region most precisely at Farquhar. To this effect, the boat opted to depart before the arrival of the bad weather.

Clients from the yacht were accompanied on tour of the Settlement and Research station which involved the six guests on 'Senses' and a small number of crew from the yacht. In addition clients went on a lagoon cruise from the station to Bras Anse Grand Poche where a small number of frigate birds are currently nesting. This location was used for the viewing of frigate birds as the tide was not appropriate for the usual cruise through Passe Gionnet. The passengers were also accompanied on snorkelling at Passe Dubois.

**Table 19:** Vessels visiting Aldabra research Station.

| Date or arrival | Date of departure | Vessel |
|---|---|---|
| 5/01/2009 | 8/01/2009 | Tere-moana |
| 31/1/2009 | 1/01/2009 | ISLAND SKY |
| | | |
| 1/02/2009 | 1/02/2009 | LE PONANT |
| 13/02/2009 | 14/02/2009 | LE PONANT |
| 16/02/2009 | 16/02/2009 | Moana |
| 16/02/2009 | 17/02/2009 | ISLAND SKY |
| 22/02/2009 | 23/02/2009 | LE PONANT |
| 28/02/2009 | 29/2/2009 | ISLAND SKY |
| | | |
| 3/03/2009 | 6/03/2009 | IOE |
| 5/03/2009 | 6/03/2009 | LE PONANT |
| 15/03/2009 | 16/03/2009 | LE PONANT |
| 15/03/2009 | 16/03/2009 | ISLAND SKY |
| 20/03/2009 | 21/03/2009 | NATIONAL GEOGRAPHIC EXPLORER |
| 27/03/2009 | | Seabird |
| 30/03/2009 | | HEBRIDEAN SPIRIT |
| | | |

| | | |
|---|---|---|
| 1/04/2009 | 2/04/2009 | NATIONAL GEOGRAPHIC EXPLORER |
| 6/04/2009 | | Seabird |
| 10/04/2009 | | Seabird |
| 13/04/2009 | 14/04/2009 | NATIONAL GEOGRAPHIC EXPLORER |
| 17/04/2009 | | Seabird |
| | | |
| July visit | I cant find the dates | Yacht |
| | | |
| 23/11/2009 | 24/11/2009 | Senses - Yacht |

**Austrian Ambassador**
March saw a visit by the Austrian Honorary consul after a specific and particular request was made by him to visit Aldabra and spend some time diving there. The ambassador and his two companions on the trip were accommodated on the atoll. The ambassador was particularly demanding on staff time and resources and was rude and abusive to staff from both the atoll and those visiting at the time from the Mahé office. While his position as honorary consul earns some degree of respect he showed very little respect to staff as well as the visitor regulations and logistical constraints involved with activities on the atoll. Due to reports and communications between the office and the atoll it was subsequently decided that the Ambassador would not be allowed to visit the atoll again and this was communicated to his office.

**Japanese Group**
The end of March 2009 saw a visit that had been some time in planning and which had taken considerable time to arrange for staff, both on the atoll and also in the Mahé office. The visit by the Japanese group was a result of a tour agent pursuing the option of accommodating small groups on the atoll after tour staff had visited on cruise ships. Activities included guided tours and boat cruises as well as snorkelling lessons and guided snorkelling. This group was also particularly demanding as the level of access and service provided to the group was expected to be of a similar standard to that provided by cruise ships despite it being made clear to the agent that there were serious concerns and issues with boat support for numerous activities requested. However, the visit was in other ways a success and I believe the clients enjoyed their time on the atoll.

Unfortunately the second group scheduled to arrive in April had to be cancelled as early in the month during the time the first group was present at the station we received news that the Indian Ocean Explorer, which had just made a trip from Aldabra to Assumption to return guests for a flight to Mahé had been captured by pirates. As a result SY Seabird which was also in the area at the time, Enterprise II which had delivered supplies to the atoll and Ocean Adventurer, the large catamaran which had been providing boat support to the Japanese Group met at Aldabra and travelled back to Mahé in convoy with soldiers on board. After this incident all tourist boat traffic was cancelled and no more visitors were received on the atoll. Details of the armed unit from the Seychelles Defence Force which arrived to provide a presence on the atoll was included above in the staff section of the report.

## 12.6: Poaching reports

During 2009 there were very few patrols around the atoll during the year to check for poaching. This was mainly due to issues in regards to the boats and staff levels but also due to the busy schedule of monitoring activities. Checks for vessels and activity around the atoll were conducted during other activities around the atoll including transport of staff to the monitoring camps. No reports of vessels or poaching activities were made during these trips.

## 12.7: Logistics / Incident reports

2009 saw the long awaited construction of a dedicated dive area adjacent to the boat shed (under the ReCoMaP project). Previously located at the back of the wet lab on the research building this area included the dive compressor and drying area for all dive equipment (Figure 35 a). This facility

was relocated to an extension to the boat shed with a dedicated location for the compressor, including additional plumbing to enable a supply of fresh water for washing equipment and for use during the filling of tanks (Figure 35 b). The island mechanic made extensions to the exhaust mechanism on the compressor to ensure that the air intake is away from fumes and exhaust while the compressor is under cover and now also much easier to access in order to start. In addition a new room was built to enable safe and secure storage of all dive gear including BCD's, regulators and snorkel equipment. The new location makes re-fuelling of the compressor as well as access to boats easier and more suitable.

**Figure 35:** New dive area adjacent to the boatshed with dedicated area for the compressor and filling of tanks and a lockable area for storage of dive equipment.

### 12.8 Status and activities of Funded Projects

**1. Ensuring the universal value of an MPA and World Heritage Site: Strengthening management, infrastructure, training and research on Aldabra Atoll**
Funded by ReCoMaP (May 2009–December 2010)
This project is well underwayat the end of 2009 and activities on Aldabra in 2009 towards completion of this project include:

- Two field camps renovated (Anse Cedres and Anse Mais)
- New dive gear purchased
- New dive centre established
- Training of two staff (SD and IL) in Open Water diving PADI certification
- Training of skipper in 60nm licence including fire training
- Four GPS units purchased and all research staff trained in their use

**2. Introduction of an Environment Management System to improve the sustainability of operations at the Aldabra Research Station**
Funded by COI (November 2008–March 2010)
Part of this project was conducted by MSc student Christina Quanz from December 2008-January 2009. Activities under the project include:

- Full evaluation and costing of the energy consumption per year on Aldabra.
- Assessment of which items/appliances/practices are the most energetically costly (computers, air-conditioning units, cooling units and lighting were identified as the highest energy consuming devices at the Research Station).
- Full inventory of all energy-using equipment and appliances on the atoll.
- Major energy-wasting practices identified as 24-h air-conditioning and computers, poor locations of fridges, and inefficient lighting.

- Realistic strategies to reduce energy wastage identified and implemented (e.g. reduce # units and length of air-conditioning time, replace all lighting with energy saving bulbs, turn off most computers overnight, develop new generator system).
- Implementation of these strategies has begun and is predicted to reduce energy consumption by 36% and save equivalent cost to SIF.
- Following these results, an Environmental Management Protocol to improve energy efficiency has been developed and implemented across all three SIF-managed sites.
- Large fuel tanks researched and sourced to limit use of small fuel barrels and improve safety conditions for staff and the environment.

**3. Adaptation by increasing climate monitoring and climate change assessment in the Seychelles**

Funded by CC DARE (November 2009–September 2010)

This project only started at the end of 2009 and will continue into 2010. The following activities have been completed so far:

- Start of climate data compilation
- Research into and liaison with SNMS about Automatic Weather Station for Aldabra

**Acknowledgements**

As this is the final annual report I will write as Research Officer I would like to take this opportunity to thank the funding agencies of the above mentioned projects for their support and contribution to research and improved conditions on Aldabra. In particular I would like to thank ReCoMap, COI/WWF, CC DARE for funding large projects, UNESCO International Assistance fund for contributing to Al-Khadra and marine monitoring, the Environment Trust Fund Seychelles and Cambridge Coastal Research Unit for supporting the remote-sensing work and the British Ornithologists' Union for supporting the Madagascar pond-heron work.

I would also like to thank the researchers who assisted on these projects as well as previous work reported in the 2008 annual report.

I would particularly like to take the opportunity to express my thanks to Frauke and Nancy for their continued and unwavering support during my time as Research Officer. None of the monitoring work would be possible without the assistance and help of the many staff and volunteers I worked with during my time on Aldabra and I would also like to thank them for their continued efforts to keep up the long term monitoring.

I consider myself extremely privileged to have had the opportunity to live and work on Aldabra and I only hope that I was able to contribute as much as I gained from my time there.