

**MONITORING, TAGGING AND CONSERVATION OF MARINE  
TURTLES IN MOZAMBIQUE: ANNUAL REPORT 2014/15**

**Compiled and Edited by:**

**Raquel S Fernandes, Jess Williams, Joana Trindade & Marcos A M Pereira**



# MONITORING, TAGGING AND CONSERVATION OF MARINE TURTLES IN MOZAMBIQUE: ANNUAL REPORT 2014/15

Compiled and Edited by:

**Raquel S Fernandes<sup>1\*</sup>, Jess Williams<sup>2</sup>, Joana Trindade<sup>3</sup> & Marcos A M Pereira<sup>1</sup>**

<sup>1</sup>Centro Terra Viva – Estudos e Advocacia Ambiental, Maputo

<sup>2</sup>Tartarugas para o amanhã, Tofo – Inhambane

<sup>3</sup>IUCN, Vamizi Island

\* Corresponding author. email: rakelsf.mz@gmail.com

## Suggested Citation:

Fernandes, R. S., J. Williams, J. Trindade & M. A. M. Pereira (2015). Monitoring, tagging and conservation of marine turtles in Mozambique: annual report 2014/15. 21 pp. Maputo, CTV.

## Cover Photographs: ① ② ③ ④

1 – Albino green turtle hatchling found in Vamizi Island (Photo: Joana Trindade)

2 – Female loggerhead turtle emerging to nest at POPMR (Photo: Raquel Fernandes)

3 – Marine turtle carapace, Inhambane (Foto: Jess Williams)

4 – Hawksbill turtle observed feeding at Santa Maria (Photo: Marcos Pereira)

*The opinions, positions and points of view expressed in this document, reflect only those of the authors and do not necessarily reflect those of governmental institutions, private sector or civil society which contributed to the elaboration of this report.*

Maputo, June 2015

## SUMMARY

---

The eighth annual report on monitoring, tagging and conservation of marine turtles in Mozambique presents the monitoring results of the 2014/15 nesting season, ongoing and published studies, as well as priorities for future research and a list of relevant events. This new format reflects the growth and body of work being carried out on marine turtles in Mozambique.

During the 2014/15 season, the monitoring effort covered 112 km of coastline (~4% of the country's coastline), due to a substantial decrease in marine turtle monitoring sites when compared to previous seasons (Fernandes *et al.*, 2014). This is a direct result of funding constraints.

The monitoring took place from September 2014 to March 2015, in the southern part of the country, and from August 2014 to May 2015 in the northern part. Tracks and nests of loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*) turtles were recorded along the stretch of coastline between Ponta do Ouro and Bazaruto Archipelago and green turtles (*Chelonia mydas*) were reported at Vamizi island. Interestingly, not a single hawksbill turtle (*Eretmochelys imbricata*) was reported this season.

A total of 1021 nests were recorded, of which 86% (885 nests) are from the Ponta do Ouro Partial Marine Reserve (POMPR), 13% (132 nests) from Vamizi Island and the remaining are from Inhambane (1%, four nests). Loggerhead turtles were the most abundant nesting species (846 nests), followed by green turtles (144 nests) and leatherback turtles (43 nests).

Titanium flipper tagging only took place at the POPMR. In total 180 marine turtles were tagged, of which 98% were loggerhead turtles. Within the POPMR, 97% of the tagging was done at the Ponta Malongane-Ponta Dobela section.

The various marine turtle conservation programmes continue to struggle (with limited resources, personnel and geographical coverage) to achieve effective conservation outcomes. Marine turtles are globally vulnerable to a number of anthropogenic threats, and in Mozambique, direct harvest is particularly prominent. Anecdotal data on turtle mortalities during the 2014/15 nesting season shows that at least 26 turtles, with six cases attributed to anthropogenic causes (harvesting of nesting female and interaction with fisheries). One of the cases, the intentional killing of a nesting loggerhead turtle at POPMR, was prosecuted.

In general, data on nest loss, either by natural or anthropogenic causes was not collected, except from Vamizi Island, where 14 nests were destroyed by inundation and for Malongane-Dobela section with 161 nests raided by bush pigs.

## ACKNOWLEDGEMENTS

---

The following individuals and institutions deserve a special acknowledgement for their collaboration, material and financial support, data sharing and other kind of support:

- Conservation and Community Project of Vamizi, IUCN, Isabel Marques da Silva and the monitors of Vamizi Island
- All Out Africa and volunteers
- Association of Coastal Conservation Mozambique, Dunas de Dovela, Yara Tibiriçá, Alex Polleau, Thomas;
- Machangulo Group, Mark Strydom and monitors of the Ponta Mucombo and Cabo de Santa Maria areas;
- Pierre, Stephan, Yvone and Werner Lombard;
- Reserva Marinha Parcial da Ponta do Ouro (RMPPPO)
- White Pearl Resort (Ponta Mamoli), Lourenço Paco and monitors of Mamoli and Techobanine;
- Dolphin Encounters, Angie Gullan, Diana Rocha and monitors of Ponta do Ouro;
- Prince Albert II Foundation, Peace Parks Foundation, Petromoc and Toyota.
- Santuário Bravio de Vilanculos, Lda, Scotty Kyle and monitors;

# CONTENTS

---

SUMMARY .....	iii
ACKNOWLEDGEMENTS .....	iv
METHODOLOGY .....	3
MONITORING RESULTS .....	5
1. Tracks .....	5
2. Nests .....	6
3. Mortalities .....	10
4. Tagging and recaptures .....	11
RESEARCH UPDATE .....	12
Recent publications .....	12
On-going studies .....	14
Priority future research .....	16
ENVIRONMENTAL EDUCATION AND AWARENESS .....	17
REFERENCES .....	18
ANNEX 1 Remigration intervals for the recaptured turtles in the season 2014/15 at the POPMR.....	20

## INTRODUCTION

---

Five species of sea turtles have been observed along the Mozambican coast: the leatherback, loggerhead, green, hawksbill and olive ridley turtles (Hughes, 1974; Pereira *et al.*, 2009; 2010). In southern Mozambique, extensive nesting habitats for loggerhead and leatherback turtles range from the Ponta do Ouro Partial Marine Reserve (POPMPR) to the Bazaruto Archipelago National Park (Gove & Magane, 1996; Louro *et al.*, 2006). The green and hawksbill turtles are the predominant species nesting in the northern part of the country and have been observed in the Quirimbas National Park, as well as in the Primeiras and Segundas Islands (Hughes, 1971; Costa, 2007). There is little information on the olive ridley turtle in Mozambique coastal waters and nesting beaches.

Knowledge on the biology and ecology of Mozambique's marine turtle populations is still deficient. Current studies are restricted to only two important nesting grounds: 1) the Ponta do Ouro Partial Marine Reserve (of which Inhaca Island is an integral part); and 2) Vamizi Island. There is a gap in knowledge of Mozambique turtle populations and their status, especially in the central and northern parts of the country. Nel *et al.* (2013) showed an increase in the number of tracks and nests of loggerhead turtles in South Africa, which according to genetics and tag/recapture studies shares the same population with southern Mozambique. Novel findings from recent genetic analysis work completed by Fernandes (2015), demonstrate low nuclear allelic diversity for adult female loggerhead turtles at POPMPR. Despite this lack of diversity, the population still warrants protection as no data is available on gene flow between Indian Ocean populations (eg. between South Africa/Mozambique, Madagascar, Oman and Australia; Fernandes, 2015). The increase in nesting does not seem to be the case for leatherback turtles (Nel *et al.*, 2013) but the causes for this are still unclear.

Only two programs have some consistency in the monitoring effort: the POPMPR and Vamizi. Some non-governmental organizations are occasionally collecting data in Inhambane, mainly in Tofo and Závora (Fernandes *et al.*, 2014; Louro & Fernandes, 2013; Louro *et al.*, 2012). This lack of consistency and continuity warrants an urgent need for technical and financial support to maintain the on-going monitoring and conservation programs, as well as to boost marine turtle

work in other marine protected areas such as the Quirimbas National Park, Primeiras & Segundas Islands Environmental Protected Area, Bazaruto National Park and Pomene National Reserve.

## METHODOLOGY

---

Data collection was made through night patrols, by foot or by car, for nesting females and day patrols for hatchlings (Table 1). Patrols in Závora, Praia de Inharrime, Tofo (Paindane) and Bazaruto Archipelago National Park were not made on a daily basis. Data on eggs and hatchlings are only consistent for Mucombo to Santa Maria section and Vamizi, where the nests were marked. When logistically possible, the number of eggs and hatchlings was recorded to estimate hatching success. Leatherback and loggerhead females were only tagged with titanium tags at the Ponta do Ouro Partial Marine Reserve.

In comparison with the last nesting season, the 2014/15 season saw a reduction in the number of monitoring sites and the total length of beach patrolled, from 137 km (~5 % of the total coastline) to 112 km (~4% of the total coastline; Figure 1). In the southern part of the country, the nesting season lasted from 1<sup>st</sup> September 2014 to 31<sup>st</sup> March 2015, while in the north ran from 1<sup>st</sup> August 2014 to 31<sup>st</sup> May 2015.



Fernandes, 2015



Fernandes, 2015

**Table 1. Methods and period per monitoring area during the 2014/2015 season.**

<b>Area</b>	<b>Method</b>	<b>Distance (km)</b>	<b>Period</b>
Ponta do Ouro - Malongane	Patrol on foot	8	01 Sept 14 – 31 Mar 15
Malongane – Dobela	Patrol by car	32	01 Sept 14 – 31 Mar 15
Dobela – Mucombo	Patrol on foot	30	01 Sept 14 – 31 Mar 15
Mucombo – Sta Maria	Patrol on foot	20	01 Sept 14 – 31 Mar 15
Závora – Praia Manhame	Patrol on foot	10*	01 Oct 13 – 30 Apr 14
Tofo -Paindane	Patrol on foot	*	01 Oct 13 – 30 Apr 14
PNA Bazaruto	Patrol on foot	*	01 Oct 14 – 30 Apr 15
Vamizi	Patrol on foot	12	01 Aug 14 – 31 May 15

\*Occasional patrols



Figure 1. Protected areas in Mozambique (white areas and green text) and marine turtle nesting beaches with data for the 2014/15 season (orange circles). NP – National Park; EPA –Environmental Protected Area; TPZ –Total Protected Zone; NR –National Reserve; PMR –Partial Marine Reserve

It is recognized that this compilation, based on data extracted from the information made available by the different monitoring programmes, might contain gaps and thus it is recommended that readers proceed with caution in any further analyses based on this data.



# MONITORING RESULTS

## 1. Tracks

Table 1.1 Marine turtle tracks per species and per monitoring area (*Cc* - *Caretta caretta*, *Cm* - *Chelonia mydas*, *Dc* - *Dermochelys coriacea*, *Ei* - *Eretmochelys imbricate*, *Lo* - *Lepidochelys olivacea* and NI - not identified).

Area	<i>Cc</i>	<i>Cm</i>	<i>Dc</i>	<i>Ei</i>	<i>Lo</i>	NI	Total
Ponta do Ouro – Malongane	155	-	6	-	-		
Malongane–Dobela	1359	-	37	-	-		
Dobela – Mucombo	289	-	14	-	-		
Mucombo–Sta Maria	194	-	10	-	-		
Závora–Praia Manhame*	2	-	1	-	-		3
Tofo-Paindane*	1	-	-	-	-		1
PNA Bazaruto*						12	12
Vamizi/Rongui	-	144	-	-	-		144
Total	2000	144	68	0	0	12	148

\*Occasional patrols



Green Renaissance, 2012



Green Renaissance, 2012

## 2. Nests

Table 2.1 Number of nests laid per species and per monitoring area (Cc - *Caretta caretta*, Cm - *Chelonia mydas*, Dc - *Dermochelys coriacea*, Ei - *Eretmochelys imbricate*, Lo - *Lepidochelys olivacea* and NI - not identified).

Area	Cc	Cm	Dc	Ei	Lo	NI	Total
Ponta do Ouro - Malongane	72	-	2	-	-	-	74
Malongane–Dobela	565	-	29	-	-	-	594
Dobela–Mucombo	107	-	1	-	-	-	108
Mucombo–Sta Maria	99	-	10	-	-	-	109
Závora–Praia Manhame*	2	-	1	-	-	-	3
Tofo–Paindane*	1	-	-	-	-	-	1
PNA Bazaruto*	-	-	-	-	-	-	0
Vamizi	-	144	-	-	-	-	144
<b>Total</b>	<b>846</b>	<b>144</b>	<b>43</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1033</b>

\*Occasional patrols

Table 2.2 Loggerhead turtle (*Caretta caretta*): number of nests laid per area.

Area	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Ponta do Ouro - Malongane	-	-	15	47	9	1	-
Malongane–Dobela	1	8	154	278	123	1	-
Dobela–Mucombo	-	9	33	39	26	-	-
Mucombo–Sta Maria	-	6	29	45	19	-	-
Tofo-Paindane*	-	-	-	1	-	-	-
<b>Total</b>	<b>1</b>	<b>23</b>	<b>231</b>	<b>409</b>	<b>177</b>	<b>2</b>	<b>0</b>

\*Occasional patrols



Fernandes, 2013



Fernandes, 2013



Fernandes, 2012

Table 2.3 Leatherback turtle (*Dermochelys coriacea*): number of nests laid per area.

Area	Oct	Nov	Dec	Jan	Feb	Mar
Ponta do Ouro - Malongane	-	1	-	-	1	-
Malongane-Dobela	-	7	17	5	-	-
Dobela - Mucombo	-	-	1	-	-	-
Mucombo-Sta Maria	-	2	3	5	-	-
Bilene	-	-	-	-	-	-
Závora-Praia Manhame*	-	-	-	1	-	-
Tofo-Paindame*	-	-	-	-	-	-
<b>Total</b>	<b>0</b>	<b>10</b>	<b>21</b>	<b>10</b>	<b>1</b>	<b>0</b>

\*Occasional patrols

Table 2.4 Green turtle (*Chelonia mydas*): number of nests laid per area

Area	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Vamizi	6	1	5	12	11	3	8	28	32	38
<b>Total</b>	<b>6</b>	<b>1</b>	<b>5</b>	<b>12</b>	<b>11</b>	<b>3</b>	<b>8</b>	<b>28</b>	<b>32</b>	<b>38</b>

Table 2.5 Unidentified species: number of nests laid per area

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PNA Bazaruto*	-	-	-	-	-	-	-	-	-	-	-	12
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12</b>

\*Occasional patrols



Trindade, 2015

Table 2.6 Number of eggs and hatchlings of *C. caretta* per area.

<b>Area</b>	<b>Number</b>	<b>Nests*</b>	<b>Eggs Laid</b>	<b>Unhatched Eggs</b>	<b>Hatchlings</b>	<b>Dead Hatchlings</b>
Ponta do Ouro - Malongane		2	144	2	-	-
Malongane– Dobela		185	17639	1802	4465	428
Dobela - Mucombo		43	3746	1454	616	103
Mucombo–Sta Maria		68	8389	1326	136	68
Závora–Praia Manhame		2	-	-	-	-
Tofo-Paindane		1	84	-	-	-
<b>Total</b>		<b>298</b>	<b>29918</b>	<b>4584</b>	<b>5217</b>	<b>599</b>

\* Number of nests with data on eggs and/or hatchlings

Table 2.7 Number of eggs and hatchlings of *D. coriacea* per area.

<b>Area</b>	<b>Number</b>	<b>Nests*</b>	<b>Eggs Laid</b>	<b>Unhatched Eggs</b>	<b>Hatchlings</b>	<b>Dead Hatchlings</b>
Malongane– Dobela		5	629	138	10	11
Mucombo–Sta Maria		9	1005	131	8	9
Závora–Praia Manhame		1	-	-	-	-
<b>Total</b>		<b>14</b>	<b>1634</b>	<b>269</b>	<b>18</b>	<b>20</b>

\* Number of nests with data on eggs and/or hatchlings

Table 2.8 Number of hatchlings and eggs laid by *C. mydas* per area.

<b>Area</b>	<b>Number</b>	<b>Nests*</b>	<b>Eggs Laid</b>	<b>Unhatched Eggs</b>	<b>Hatchlings</b>	<b>Dead Hatchlings</b>
Vamizi		41	4177	35	64	41

\* Number of nests with data on eggs and/or hatchlings

Table 2.9 Number of nests destroyed by natural and anthropogenic causes per area

Area	<i>Caretta caretta</i>	<i>Dermochelys coriacea</i>	<i>Chelonia mydas</i>	Total	Anthropogenic causes
Malongane - Dobela	Nests raided by bushpigs	Nests raided by bushpigs		161	
Závora–Praia Manhame	1 nest was poached. The other reported nest could not be located for excavation and it is not clear if it was poached or a misidentified false crawl	1 nest was poached.		2	2
Vamizi*			14 nests destroyed by inundation because they were below the high tide mark	14	
Total	1+	1+	14	177	2



Fernandes, 2015

### 3. Mortalities

Table 3.1 Reported adult marine turtle mortality per area (Cc - *Caretta caretta*, Cm - *Chelonia mydas*, Dc - *Dermochelys coriacea*, Ei - *Eretmochelys imbricate*, Lo - *Lepidochelys olivacea* and NI – not identified)

Area	Species/Causes	Total	Anthropogenic causes
Unknown	Three Ei small carapaces were available for sale at the fair – FEIMA in Maputo city (15 <sup>th</sup> February 2015)	3	3
Maputo Bay	One Cc found dead on the beach (7 <sup>th</sup> March 2015). The turtle showed deep cuts resulted from a boat propeller. Although it is not clear if the turtle was dead before the cuts. No titanium tag.	1	
Ponta do Ouro - Malongane	One Cc found dead on the beach (27 <sup>th</sup> October 2014). Poacher identified and penalized	1	1
Malongane – Dobela	One dead Dc was seen on the beach (8th December 2014) caused by natural mortality.	1	
Závora (Praia Manhame)	Two Cm found dead on the beach. Carcass washed up, one whole, other chopped by fishers.	2	1
Tofo -Paindane	Six turtles (1 Cm, 1 Cc - poached- Paindane, 2 Cm Guinjata, 2 Cm Tofo ) found dead on the beach	6	1
North of Inhambane	Travessia Beach lodge (North of Morrumbene) reported the death of twelve turtles (3 Cm, 1 Ei, 3 Cc, 5 NI)	12	
Total		26	6



Fernandes, 2015



Fumo, 2015



Dolphin Care Africa, 2015



## 4. Tagging and recaptures

A total of three leatherback turtles were tagged with the following numbers MZ1822, MZ1830 and MZ914 in Ponta Malongane.

A total of 177 loggerhead turtles were tagged within POPMR with the following tag series:

- MZ250; MZ902- MZ950 (note that this tags are from an old series);
- MZ1152, MZ1390;
- MZ1411; MZ1418-MZ1436; MZ1438-MZ1444;
- MZ1751-MZ1754; MZ1756-MZ1768; MZ1770; MZ1773; MZ1777; MZ1779-MZ1786; MZ1788; MZ1790; MZ1791; MZ1793-MZ1795; MZ1797;
- MZ1800; MZ1802-MZ1805; MZ1808; MZ1810; MZ1811; MZ1813-MZ1816; MZ1818-MZ1820; MZ1822-MZ1825; MZ1827; MZ1828; MZ1830; MZ1832-MZ1835; MZ1837; MZ1839; MZ1841; MZ1844-MZ1850; MZ1852-MZ1854; MZ1856, MZ1858; MZ1860; MZ1862; MZ1863; MZ1866-MZ1869;
- MZ1901-MZ1906; MZ1912; MZ1914-MZ1918; and MZ1920-MZ1925.

Table 4.1 Number of marine turtles tagged by species

Area	<i>C. caretta</i>	<i>D. coriacea</i>
Ponta do Ouro - Malongane	1	
Malongane - Dobela	172	3
Dobela - Mucombo	4	
Total	177	3

Table 4.2 Number of marine turtles recaptured by species (see annex 1)

Area	<i>C. caretta</i>	<i>D. coriacea</i>
Ponta do Ouro - Malongane	4	
Malongane - Dobela	234	18
Dobela - Mucombo	14	1
Mucombo – Sta Maria	7	
Total	259	19



Fernandes, 2015



Green Renaissance, 2012

## RESEARCH UPDATE

---

### Recent publications

- Williams, J. L., Pierce, S. J., Fuentes, M. M. & M. Hamann (2015). Effectiveness of recreational divers for monitoring sea turtle populations. *Endangered Species Research* 26: 209-219.

Open access: <http://www.int-res.com/articles/esr2015/26/n026p209.pdf>

- Fernandes, R. S. (2015) Estrutura da população nidificante de tartarugas cabeçudas (*Caretta caretta*) na Reserva Marinha Parcial da Ponta do Ouro, sul de Moçambique. Tese de Mestrado, Universidade Eduardo Mondlane, 139 pp. Maputo.

Open access: <http://www.ctv.org.mz/wp-content/uploads/2014/04/RF-2015-Estrutura-populacional-CC-RMPPO.pdf>

- Williams, J. (2015) First results of population demographics from citizen science collected photo identified Green and Loggerhead sea turtles from Mozambique. Poster presentation in: Proceedings from the 35<sup>th</sup> International Sea Turtle Symposium, Dalaman, Turkey 19-24<sup>th</sup> April 2015.

The poster can be downloaded from:

[https://www.researchgate.net/profile/Jess\\_Williams3/publications](https://www.researchgate.net/profile/Jess_Williams3/publications)

DOI: 10.13140/RG.2.1.2145.8089

- Pereira, M. A. M., R. S. Fernandes, E. J. S. Videira, C. M. M. Louro & P. M. B. Gonçalves (2014). Celebrating 20 years of marine turtle tagging and monitoring in southern Mozambique. *African Sea Turtle Newsletter*, 2: 31-33.



Open source: <http://www.ctv.org.mz/wp-content/uploads/2014/09/Pereira-et-al-Celebrating-20-years-turtle-conservation-POPMPR.pdf>

- Pereira, M. A. M. (2015). Official celebration of 20 years of monitoring and conservation of marine turtles at the Ponta do Ouro Partial Marine Reserve, Mozambique. African Sea Turtle Newsletter, 3: 39.

Open source: <http://www.ctv.org.mz/wp-content/uploads/2015/03/Je02-285.pdf>

- Dalleau, M, J Bourjea, P Gaspar, L Carassou, S Al Harthi, R Nel, M A M Pereira, R Fernades, B Rakotonirina, C Jean & S Ciccione (2015). International cooperation for increased knowledge and better management of loggerhead populations in the Western Indian Ocean: the Coca-Loca project. Presented at the 35th Annual Symposium on Sea Turtle Biology and Conservation, Turkey, 19-24 April 2015.

Open source: [http://www.ctv.org.mz/wp-content/uploads/2015/04/cocaloca\\_small.pdf](http://www.ctv.org.mz/wp-content/uploads/2015/04/cocaloca_small.pdf)

- Tardy, C., Dalleau, M., Jaquemet, S., Willson, M. S., Al Bulushi, A., Andrew, W., Fernandes, R., Pereira, M., Ciccione, S. & Bourjea, J. (2015) Genetic characterisation & trophic ecology of the loggerhead turtle in the western Indian Ocean. In Séminaire de restitution, Campus du Moufia, Saint Denis, 2 - 5 June 2015.

Open source: [http://www.ctv.org.mz/wp-content/uploads/2014/04/poster\\_Tardy\\_C2015.pdf](http://www.ctv.org.mz/wp-content/uploads/2014/04/poster_Tardy_C2015.pdf)

## On-going studies

- Photo ID database

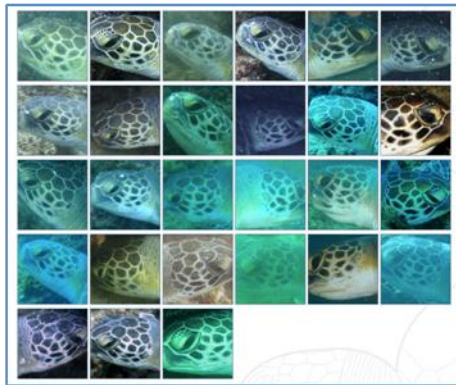
New collaboration with Kelonia/ IFREMER for National photo ID database to run through the TORSOOI system (<http://www.torsooi.com>). Mozambique has now adopted the TORSOOI semi-automated photo identification system, which is rapidly becoming widely adopted across the Western Indian Ocean. A library of photo identification images has been collated for the past 5 years in Inhambane as a pilot project. With the adoption of the TORSOOI system we will now have an increased capacity to identify re-sighted animals, whether they are photographed in water, on nesting beach or through by-catch encounters. The system uses the left and right facial scale patterns of a turtle as unique identifiers for each animal. With a widespread data collection of photo identification shots, site residency, basic population estimates, species composition, habitat preferences and animal movements can be assessed. We would like to encourage regional collaborations for collection of photo identification project (if you would like to contribute to this project contact Jess Williams, project leader in Mozambique: [jess@mozturtles.com](mailto:jess@mozturtles.com)).

- The Vamizi programme is also planning to start a project to tag adult hawksbill turtles with Dalton tags, as well as a photo-ID for the same population, which feeds on the reefs around the island. The goal is to study residency and potential mating grounds.
- Monitoring sand and water temperature
  - The Ponta do Ouro Partial Marine Reserve started the sand temperature data collection using Tinytag probes in 2010, but due to technical difficulties it was impossible to get data from the current nesting season. Financial support required to fix the probe reader and get more probes to cover other nesting beaches.
  - The program in Vamizi Island is planning, if funding is available, to start collecting this information to track changes.

- Monitoring nest success
  - Vamizi and Ponta do Ouro Partial Marine Reserve (Ponta Mucombo to Santa Maria) are monitoring nest success.
  - Erosion is the biggest threat on nesting sea turtles in Vamizi, as it can create high barriers enabling females to climb over, forcing them to nest below the high tide mark. To avoid nests being flooded or eggs being washed away, the programme started a relocation project and training monitors so they can carry on the relocation themselves as they find the nests early in the morning.
  - Erosion is the greatest threat on nesting of sea turtles in Vamizi because it can create major barriers that prevent the escalation of females, forcing them to put their nests below the high tide line. Thus, the program relocation initiated a project nesting and formation monitors so that they can be to perform the replacement of the nests so as to prevent them from being flooded or eggs are dragged.
  
- Genetics and isotopes analysis
  - Two regional level studies on loggerhead populations are currently ongoing.
    1. A study based on the analysis of mitochondrial DNA and isotopes produced from collaboration between POMPR, Environment Society of Oman, Five Oceans Environmental Services CEDTM-Kélonia/ IFREMER, Reunion University and Centro Terra Viva.
    2. A study that aims to analysis geographic structure of mitochondrial and nuclear genes polymorphisms in Indo-Pacific loggerhead turtle populations. This study is an collaboration between Murdoch University (Australia), Metropolitan University (South Africa), Ponta do Ouro Partial Marine Reserve, Centro Terra Viva (Mozambique) and CTM/CIBIO (Portugal).

## Priority future research

- Climate change and vulnerable areas: monitoring nest temperature, sea level rise and coastal erosion;
- Quantifying poaching threats to marine turtles populations;
- Expanding scope of Photo ID library for Mozambique which will allow greater insight into coastal habitat use, site preferences and animal movements along the coast.
- Genetic studies for other marine turtles species populations (eg. Leatherback turtles, hawksbill turtles and green turtles) found in Mozambique. A special interest is to do genetic analysis on green turtles albino hatchlings samples collected in Vamizi.
- Use of the modelling software MARK to study loggerhead population size and dynamics based on tagging and recapture data
- Satellite tagging on green and hawksbill turtles to study their migratory routes;
- Acoustic monitoring
  - The possibility of using acoustic monitoring on the hawksbill, as they spend a lot of time in the waters around Vamizi Island.



Williams, 2015

## ENVIRONMENTAL EDUCATION AND AWARENESS

For the celebration of Marine Turtle World day the following activities took place to promote marine turtle conservation:

- A mini-symposium with presentations on the current knowledge on the conservation status of marine turtle populations and how to increase the collaboration between different sectors such as fisheries, tourism and education was made in Maputo (online access <http://www.ctv.org.mz/wp-content/uploads/2014/04/16-Junho-2014-report-final.pdf>).
- Awareness talks about marine turtle conservation in Triunfo, Costa do Sol and LÍngamo primary schools, Centro Kanimambo and Portuguese School of Mozambique.
- Teach children from the Primary Basic School of Vamizi, on “how to be a turtle monitor”. The children learned about the two species on Vamizi Island, green and hawksbill, and how to find, mark and dig up a nest. They also learned about some of the threats that turtles face worldwide, particularly pollution. The children participated in a beach cleanup in front of the school.



Chemane, 2014



Chemane, 2014

## REFERENCES

---

- Brito, A. (2012). An interview-based assessment of the incidental capture and mortality of sea turtles in Mozambique's Sofala Bank commercial shrimp fishery. *Revista de Investigação Pesqueira*, **30**: 31-56.
- Costa, A. (2007). Status and Management of marine turtles in Quirimbas National park. 12pp. Maputo, Report submitted to PNQ-MITUR.
- Fernandes, R. S., J. Williams, C. M. M. Louro & M. A. M. Pereira (2014). Monitoring, tagging and conservation of marine turtles in Mozambique: annual report 2013/14. 6 pp. Maputo, CTV.
- Fernandes, R. S. (2015) Estrutura da população nidificante de tartarugas cabeçudas (*Caretta caretta*) na Reserva Marinha Parcial da Ponta do Ouro, sul de Moçambique. Tese de Mestrado, Universidade Eduardo Mondlane, 139 pp. Maputo.
- Gove, D. & Magane, S. (1996). The status of sea turtle conservation in Mozambique. In Status of Sea Turtle Conservation in the Western Indian Ocean. In Status of Sea Turtle Conservation in the Western Indian Ocean (eds S.L. Humpfrey & R.V. Salm), pp 89–94. Regional Seas Reports and Studies, No 165. IUCN/UN Environment Programme, Nairobi, Kenya. Hughes, 1971;
- Hughes, G. R. (1974). "The sea turtles of south-east Africa. II The biology of the Tongaland loggerhead turtle *Caretta caretta* L. with comments on the leatherback turtle *Dermochelys coriacea* L. and the green turtle *Chelonia mydas* in the study region. Investigational Report 36." Oceanographic Research Institute, Durban. Louro, C M M, M A M Pereira & A C D Costa (2006). Relatório sobre o estado de conservação das tartarugas marinhas em Moçambique. 42 pp. Xai-Xai, CDS-ZC/MICOA.
- Louro, C. M. M, Videira, E. J. S., Pereira, M. A. M. & R. S. Fernandes (2012) Monitoria, marcação e conservação de tartarugas marinhas em Moçambique: relatório anual 2011/12. Maputo. CTV/AICM

- Louro, C. M. M. & R. S. Fernandes (2013) Monitoria, marcação e conservação de tartarugas marinhas em Moçambique: relatório anual 2012/13. Maputo. CTV
- Nel, R., Punt, A. & Hughes, G. (2013). Are Coastal Protected Areas Always Effective in Achieving Population Recovery for Nesting Sea Turtles? *PLoS One* 8(5): e63525.
- Pereira, M. A. M., Videira, E. J. S. & D. A. Narane (2009). Monitoria, marcação e conservação de tartarugas marinhas em Moçambique: Relatório anual 2008/09. 4pp. Maputo, AICM/GTT.
- Pereira, M. A. M., Videira, E. J. S., Narane, D. A. & Louro, C. M. M. (2010). "Monitoring, tagging and conservation of marine turtles in Mozambique: 2009/10 annual report." AICM/GTT, Maputo.
- Videira, E. J. S., Pereira, M. A. M. Louro, C. M. M. & D. A. Narane (eds.) (2008). Monitoria, marcação e conservação de tartarugas marinhas em Moçambique: dados históricos e relatório anual 2007/08. 85 pp. Maputo, Grupo de Trabalho Tartarugas Marinhas de Moçambique (GTT).
- Videira, E. J. S., Pereira, M. A. M. Narane, D. A. & C. M. M. Louro (2010). Monitoria, marcação e conservação de tartarugas marinhas em Moçambique: Relatório anual 2009/10. 7 pp. Maputo, AICM/GTT.
- Videira, E. J. S., Pereira, M. A. M. & C. M. M. Louro (2011). Monitoria, marcação e conservação de tartarugas marinhas em Mozambique: relatório anual 2010/11. 10 pp. Maputo, AICM/GTT.
- Williams J.L., Pierce S.J., Fuentes M.B.P. & M. Hamann (2015). Effectiveness of recreational divers for monitoring sea turtle populations. *Endangered Species Research* 26: 209-219.

**ANNEX 1 Remigration intervals for the recaptured turtles in the season 2014/15 at the POPMR.**

Tags	2002-03	2003-04	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Total observations	Nr of nesting season
NN172			1		2		1		1			1	6	5
MZ1550										1	1	4	6	3
MZ1564										1	1	4	6	3
MZ1180								1		1		3	5	3
MZ527						1			1			3	5	3
NN539		1					1					3	5	3
MM516	3						1					1	5	3
MZ796							1			3		1	5	3
MZ771							1		2			1	4	3
MO1511		1		1								1	3	3
MZ541						1		1				1	3	3
MZ790							1			1		1	3	3
NN544		1				1						1	3	3
NN545		1								1		1	3	3
MZ1083									2			8	10	2
MZ1003								2				4	6	2
MZ1056									1			3	4	2
MZ1327									1			3	4	2
MZ1560										1		3	4	2
MZ1576										1		3	4	2
MZ978								2				2	4	2
MZ626											3	1	4	2
MZ1543										1		2	3	2
MZ1551										1		2	3	2
MZ1592										1		2	3	2
MZ1810										1		2	3	2
MZ571										1		2	3	2
MZ620								1				2	3	2
MZ767							1					2	3	2
MZ1306										2		1	3	2
MZ1526										2		1	3	2
PP570								2				1	3	2
MZ1060										1		1	2	2
MZ1128									1			1	2	2
MZ1326									1			1	2	2
MZ1512										1		1	2	2
MZ1519										1		1	2	2
MZ1575										1		1	2	2
MZ205											1	1	2	2
MZ259					1							1	2	2
MZ529							1					1	2	2
NN176			1									1	2	2
ZARR268										1		1	2	2



