

# MARINE TURTLE MONITORING AT THE PONTA DO OURO PARTIAL MARINE RESERVE: 2019-2020



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**Cover Photographs:** Female loggerhead at the POPMR (Photo: Raquel Fernandes);

**Back cover** - RMPPO rangers measuring the first nesting loggerhead of the 2019/20 season (Photo: POPMR).

*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 organizations that contributed to the elaboration of this report.*

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### Context

The coastal Matutuíne and Kanyaka districts have landscapes with specific and exceptional aesthetic, ecological and cultural attributes, which are protected by the Maputo Special Reserve, Ponta do Ouro Marine Reserve and Inhaca Island reserves, namely Yingwani Forest Reserve, Nyakeni Forest Reserve and Portuguese Island Reserve. To enhance the integrated management of landscapes within the area, the Council of Ministers approved the establishment of the Maputo Environmental Protection Area, in December 2019 (Decree 103/2019, of 31 December; Figure 9). Efforts are also being made to nominate the Ponta do Ouro – Inhaca Island coastal strip as a UNESCO World Heritage Site.

The Ponta do Ouro Partial Marine Reserve (RMPPPO) is considered a nesting hotspot for loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*) turtles in Mozambique, from which more than 80% of the nests of these species are reported.

Monitoring of marine turtles started at Inhaca and Portuguese islands during the 1988/89 nesting season of 1988/89 by the *Estação de Biologia Marítima da Inhaca* (EBMI - Maritime Biology Station of Inhaca Island). In 1994, a marine turtle monitoring and tagging program was initiated between Ponta Malongane and Ponta Dobela, a stretch of about 30 km. This program was led by Mr. Pierre Lombard, and had the support of the Mozambican Government and technical support from Dr. George Hughes, who at the time supervised the turtle monitoring program in Kwazulu-Natal, South Africa, run by Ezemvelo Wildlife. Since 2007, with the support of several organizations such as the *Associação para Investigação Costeira e Marinha* (AICM - Association for Coastal and Marine Research) and *Centro Terra Viva* (CTV), the monitoring program started to cover the area between Ponta do Ouro and Santa Maria. The program was based on local monitors and benefited from a strong involvement of other stakeholders, especially tourism operators.

### Objectives

The marine turtle monitoring, tagging and conservation program aims at collecting information to assess the conservation status of marine turtles within the POPMR, as a proxy to the wider southern Mozambique area. More specifically it aims to:

- (1) Assess monitoring effort per site;
- (2) Determine number of tracks and nests by species;
- (3) Assess coastal threats (eg. nests lost by anthropogenic causes, flooding, erosion, among other causes);
- (4) Monitor turtle mortality;
- (5) Estimate the nesting population of female turtles, as well as study other biological traits, based on data from titanium tagged and recaptured turtles.

## MONITORING EFFORT DURING THE 2019/20 SEASON

Currently, monitoring occurs along the east coast of the POPMR. The monitoring is carried out on foot, by 45 community monitors on nine beach sections between Ponta do Ouro and Santa Maria, covering a total of 90 km of beach. The nesting season runs from October to March (Table 2; Figure 6).

To maintain consistency within the database and previous reports, data were organized in the following sections: 1) Ponta do Ouro to Ponta Malongane; 2) Ponta Malongane to Ponta Dobela; 3) Ponta Dobela to Ponta Mucombo and 4) Ponta Mucombo to Santa Maria. The program is currently using the national standardized monitoring protocol.

Table 1. Monitoring effort per monitoring area during the 2019/20 season. (PF - Patrols on foot; PB - Patrols by bicycle and PC – Patrols by car). \*Not added to the total of beach extension.

Monitoring Areas	Type of patrol	Nr of monitors & rangers	Distance per section (km)	Total distance patrolled (km)	Period	Nr of days patrolled
P. Mucombo - Santa Maria	PF	20	20	≈3640	01Oct19 – 31Mar20	182
P. Chemucane - Mucombo	PF	3	11	≈2002	01Oct19 – 31Mar20	182
P. Milibangalala - Chemucane	PF	3	12	≈2184	01Oct19 – 31Mar20	182
P. Dobela - P. Milibangalala	PF	3	7	≈1274	01Oct19 – 31Mar20	182
Monte Mutondo – P. Dobela	PF	3	10	≈1820	01Oct19 – 31Mar20	182
P. Techobanine – Mutondo	PF	3	10	≈1820	01Oct19 – 31Mar20	182
P. Maderjanine - Techobanine	PF	3	6	≈1092	01Oct19 – 31Mar20	182
P. Malongane - Maderjanine	PF	3	6	≈1092	01Oct19 – 31Mar20	182
P. Malongane – Mutondo	PC	1	32*	≈1024	06Dec19 – 06Jan20	32
P. Ouro – Malongane	PF	3	8	≈1456	01Oct19 – 31Mar20	182
<b>Total</b>		45	90	≈17404		



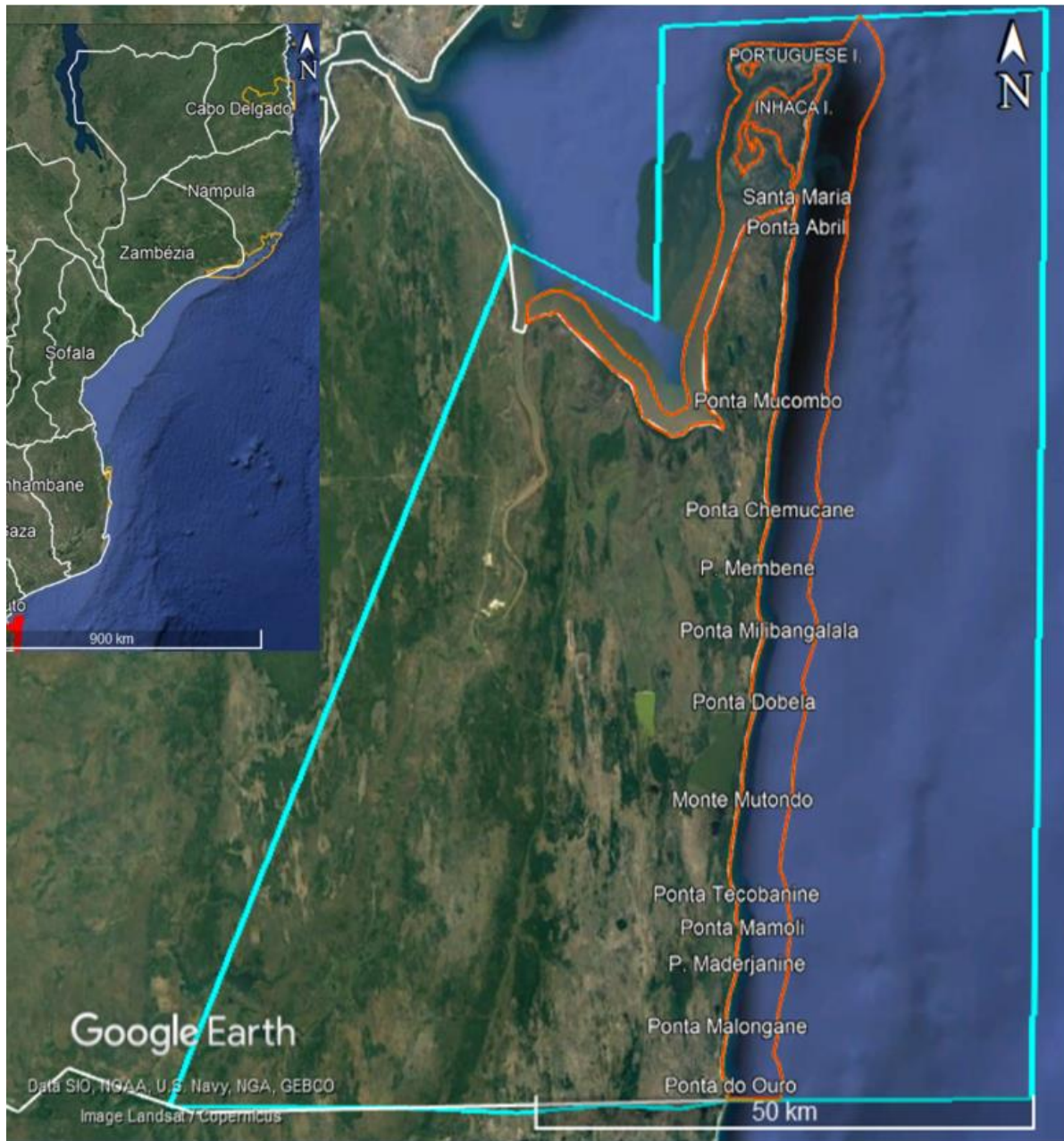


Figure 1. Ponta do Ouro Partial Marine Reserve with main reference sites for marine turtle monitoring (Adapted from Google Earth).

## MONITORING RESULTS

A total of 1 923 tracks and 775 nests were reported at the POPMR, during the 2019-20 season. Loggerheads were the most common species with 1 885 tracks (98.0%) and 747 nests (96.4%; Tables 3 and 4).

A high number of unconfirmed nests (1126 tracks; representing 59.7% of the total tracks) are reported for loggerheads, and only 12 were classified as a non-nesting emergence (Table 5). Different results were found for leatherbacks, with nine unconfirmed nests (23.7% of the total tracks) and only one non-nesting emergence.

Table 2. Marine turtle tracks per species and per area.

Monitoring area	Loggerhead	Leatherback	Total
Ponta Mucombo – Santa Maria	271	16	287
Ponta Dobela – Ponta Mucombo	545	2	547
Ponta Malongane - Ponta Dobela	1 031	19	1 050
Ponta do Ouro – Ponta Malongane	38	1	39
<b>Total</b>	<b>1 885</b>	<b>38</b>	<b>1 923</b>

Table 3. Number of confirmed nests laid per species.

Monitoring area	Loggerhead	Leatherback	Total
Ponta Mucombo – Santa Maria	135	16	151
Ponta Dobela – Ponta Mucombo	128		128
Ponta Malongane - Ponta Dobela	473	12	485
Ponta do Ouro – Ponta Malongane	11		11
<b>Total</b>	<b>747</b>	<b>28</b>	<b>775</b>

Table 4. Number of non-nesting emergences (NN) and unconfirmed nests (UN) laid per species during the 2019/20 season.

Monitoring area	Loggerhead		Leatherback		Total
	NN	UN	NN	UN	
Ponta Mucombo – Santa Maria		136			136
Ponta Dobela – Ponta Mucombo	6	411	1	1	419
Ponta Malongane - Ponta Dobela	6	552		7	565
Ponta do Ouro – Ponta Malongane		27			27
<b>Total</b>	<b>12</b>	<b>1 126</b>	<b>1</b>	<b>9</b>	<b>1 148</b>

## Tagging and Recaptures

A total of 196 loggerhead females were handled during the nesting season. Of these, 128 were tagged for the first time at the POPMR (Table 16); 68 individuals tagged in previous nesting seasons, were recaptured (Table 17), including 33 turtles with South African tags (Table 18). Tagged loggerhead turtles tracks (244 tracks) represent only 12.9% of the total recorded tracks for this species.



A total of four leatherback females were handled, with two being tagged for the first time (Table 5) and two recaptured (Table 6). Tagged leatherback turtles tracks (5 tracks) represent only 13.2% of the total recorded tracks for this species. A detailed list of tags codes applied and recaptured in 2019/20 per species is shown in Table 7.

Table 5. Number of marine turtles tagged for the first time during the 2019/2020 season. Note that the application of new tags to replace old tags was not counted.

Monitoring Area	<i>C. caretta</i>	<i>D. coriacea</i>
P. Mucombo - Santa Maria	9	-
P. Dobela – P. Mucombo	20	-
P. Malongane – P. Dobela	94	2
P. Ouro – P. Malongane	5	-
<b>Total</b>	<b>128</b>	<b>2</b>

Table 6. Number of marine turtles recaptured in the 2019/2020 season. Note that this table includes only the tags that were first applied on other nesting seasons or from other areas outside the monitoring area. \* =The total of individuals recaptured at POPMR is not the sum of the numbers reported per each section, as an individual (same tag number) may be spotted in different beach sections. The POPMR total refers to the number of individuals recaptured with tags that were applied in previous nesting seasons or different areas, for example, from South Africa.

Monitoring Area	<i>C. caretta</i>	<i>D. coriacea</i>
P. Mucombo – Santa Maria	1	-
P. Dobela – P. Mucombo	1	-
P. Malongane – P. Dobela	65	2
P. do Ouro – P. Malongane	3	-
<b>POPMR*</b>	<b>68*</b>	<b>2</b>

Table 7. Series of tags applied and recaptured in the 2019/2020 season.

<p><b>Applied:</b> MZ2130, MZ2213, MZ2568-MZ2570, MZ2573, MZ2579, MZ2580 - MZ2583, MZ2588, MZ2589, MZ2591, MZ2593, MZ2618 - MZ2622, MZ2758, MZ2774, MZ2776 - MZ2778, MZ2780 - MZ2786, MZ2788, MZ2790-MZ2793, MZ2800 - MZ2807 - MZ2809 - MZ2825, MZ2830 - MZ2832, MZ2851 - MZ2861, MZ2951-MZ2953 - MZ2975, MZ2980, MZ2988, MZ2990 and MZ3026 -MZ3050.</p> <p>The tags MZ2777, MZ2808, MZ2984, MZ2989, MZ2991 and MZ3013 were applied on turtles with scars on the fin suggesting they were tagged before, and therefore, not counted as new tags on table 16, MZ2952 and MZ2808 were applied in a turtle with a loose old tag MZ1920 (tagged during 2014/15 nesting season at Ponta Malongane – Ponta Dobela section).</p>
<p><b>Recaptured</b></p> <p><b>loggerheads:</b> MZ1390, MZ1441, MZ1512, MZ1617, MZ1665, MZ1726, MZ1754, MZ1878, MZ1882, MZ1920/MZ2808, MZ1931 MZ1947, MZ1969, , MZ2211, MZ2265, MZ2298, MZ2334, MZ2343, MZ2438, MZ2453, MZ2460, MZ2466, MZ2467, MZ2524, MZ258, MZ2599, MZ2777, MZ2984, MZ2989, MZ3013, MZ636, MZ911, MZ912, MZ945 and MZ961.</p> <p><b>leatherback:</b> MZ1980 and MZ2991.</p>

**Foreign tags recaptured:**



**loggerheads:** KEL0025, NN308, PP051, ZA0019C, ZA0234B, ZA0559B, ZA0770A, ZA0835B, ZA0848B, ZA0938E, ZA0998E, ZA1050B, ZA1050E, ZA1330B, ZA1481E, ZA1500A, ZA1703C, ZA1801/MZ1916, ZA559B, ZAA055B, ZACA435, ZACC482, ZAO848B, ZAO961B, ZAO998E, ZASS399, ZAT789, ZATT085, ZAVV688, ZAXX494, ZAXX831, ZAXX832 and ZAYY832.

**Leatherbacks:** none.

**Threats**

A total of three juvenile and adult marine turtle mortalities were reported at the Ponta do Ouro Partial Marine Reserve during the 2021/20 season (Table 8).

Table 8. Reported marine turtle threats by anthropogenic (AC) or not identified (NI) causes that have culminated with turtle mortality, per area and species; CCL – curved carapace length; CCW – curved carapace width.

Description	Photo evidence
Green juvenile turtle crushed found at Ponta do Ouro (26° 50.710'; 32° 53.473') (1 July 2019)	 <p>Photo credits: POPMR</p>
Green juvenile (43 cm CCL) found dead at the beach (11 August 2019)	<p>No photo available Whitnesed by Vicente Matsimbe</p>
Adult female loggerhead (80 cm CCL and 65 CCW) found dead at the beach OF Ponta Dobela. Turtle was transported by the Reserve to Ponta do Ouro for post mortem examination. Dolphin Encountours Research Center conducted a necropsy and found hundreds of developing eggs. no plastics in the stomach and no signs of visible parasite/worm infections in her main organs. The discoloration (purple/grey coloring) and bleeding around the bite sites suggests that the turtle was alive while the shark was biting her and that the injuries sustained by the shark are the cause of death. (6 December 2019)	 <p>Photo Credits: Dolphin Encountours Research Center</p>

## Leatherback turtles

Leatherback tracks at the POPMR were first sighted on 11 November 2019 and the last track on 23 January, without clear, obvious peaks. The first nest was also recorded 11 November 2019; the last nest occurred on 6 January 2020 (Figure 2; Table 9).

Leatherbacks seems to have a cyclical variation along the years (Figure 3 and Figure 4). However, the percentage of observed turtles with tags, related to the total number of tracks, seems to be decreasing since 2017/18 and this might be a result of a reduction in the tagging effort and/or reduced monitoring effort (Figure 5).

Table 9. Leatherback turtle (*Dermochelys coriacea*): number of confirmed nests laid per area and month, during the 2019/20 season.

Monitoring area	Oct	Nov	Dec	Jan	Feb	Mar
Ponta Mucombo – Santa Maria		9	6	1		
Ponta Dobela – Ponta Mucombo						
Ponta Malongane – Ponta Dobela		1	6	5		
Ponta do Ouro – Ponta Malongane						
<b>Total</b>		<b>10</b>	<b>12</b>	<b>6</b>		

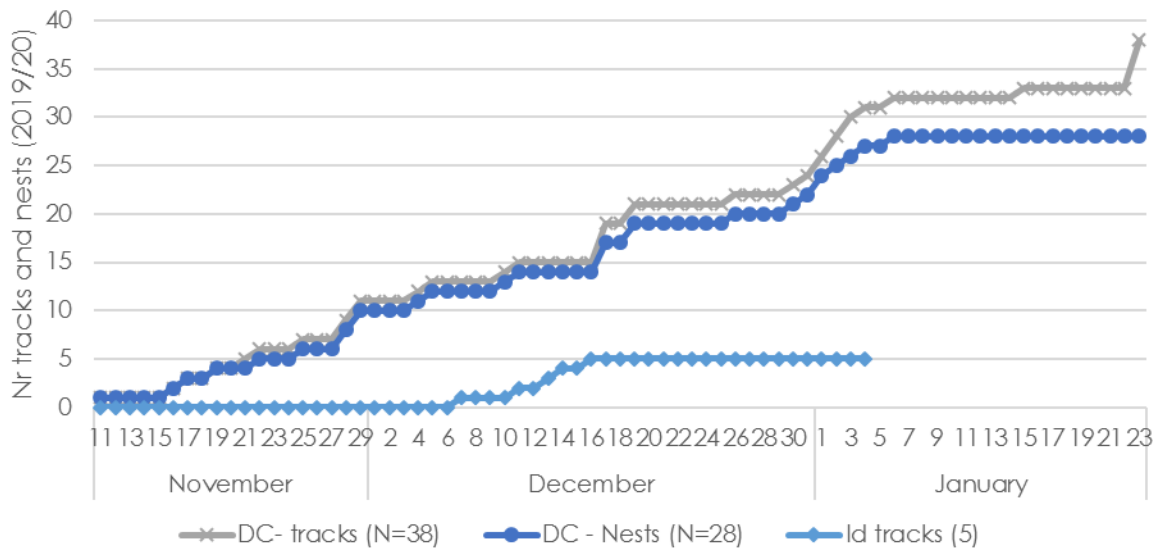


Figure 2. Cumulative analysis of tracks, nests and observed leatherback turtles with tags at Ponta do Ouro Partial Marine Reserve.

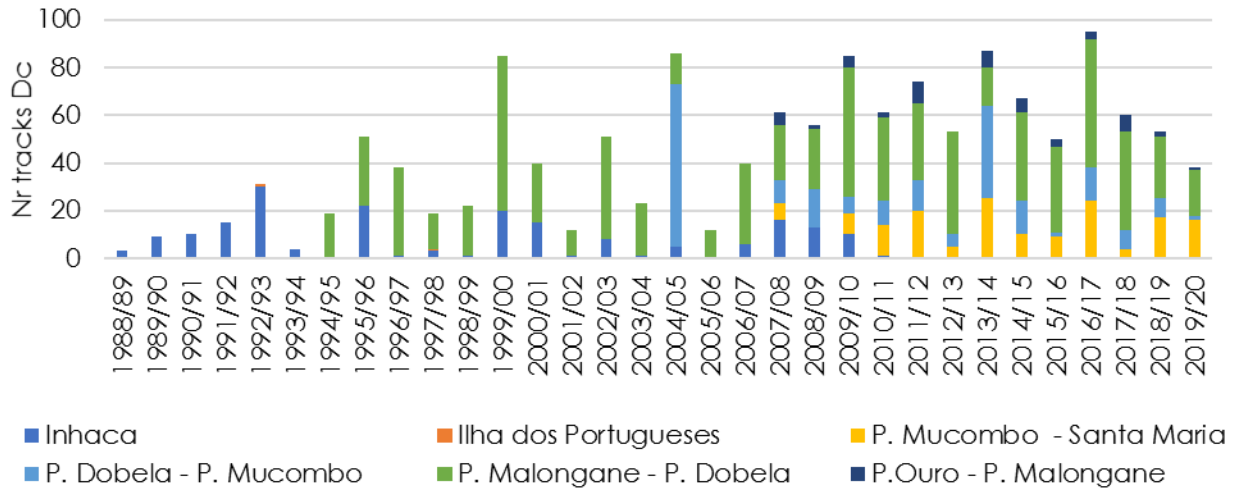


Figure 3. Historical data of leatherback tracks at Ponta do Ouro Partial Marine Reserve (Note that data from Inhaca is not reported since the 2009/10 nesting season).

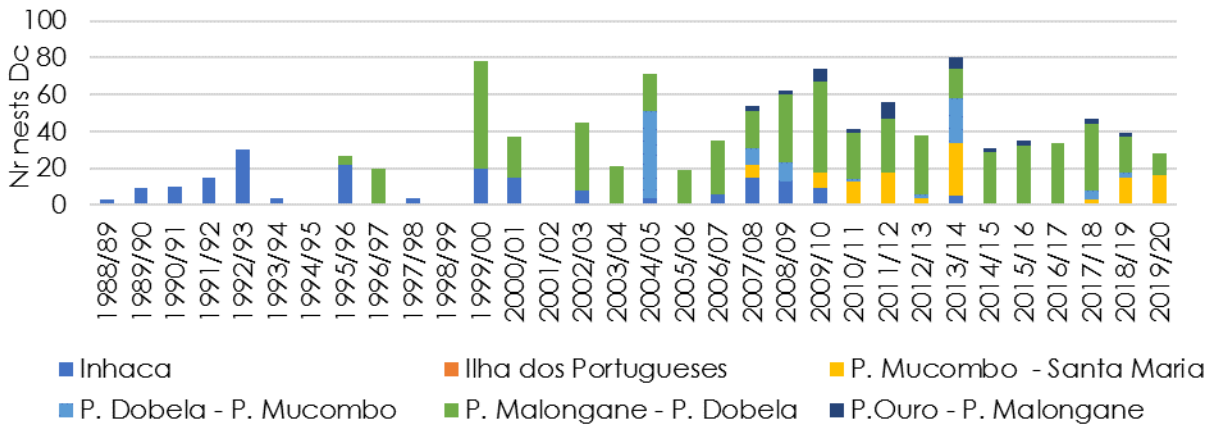


Figure 4. Historical data of leatherback nesting at the Ponta do Ouro Partial Marine Reserve (Note that data from Inhaca is not reported since 2009/10 nesting season and data for some years are missing).

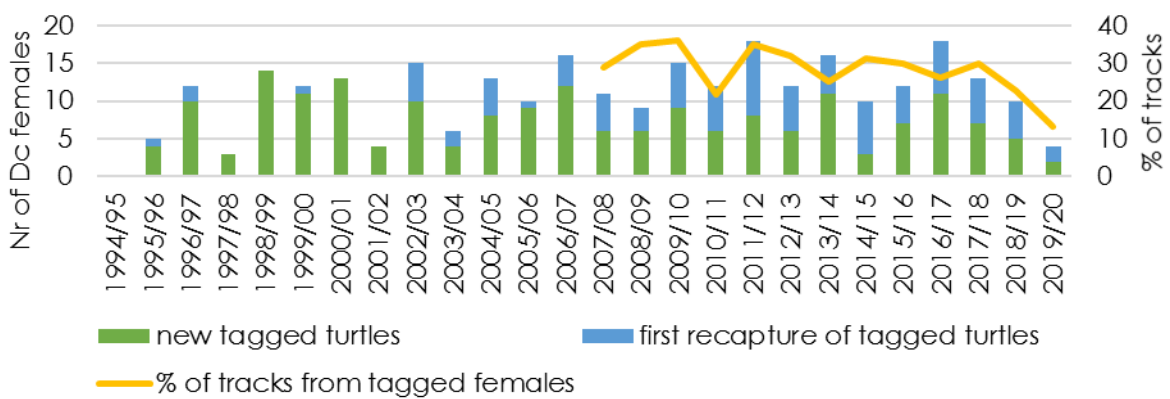


Figure 5. Historical data of identified leatherback turtles at Ponta do Ouro Partial Marine Reserve. Percentage of tracks from tagged females refers to the relation between female tagged turtles (including with foreign tags) and the total number of tags.

## Loggerhead turtles

Loggerhead tracks were first sighted on 14 October 2019 and the last track on 25 February 2020, with a peak nesting activity (735 tracks, 39.0%) in December (Table 10). Whereas the first confirmed nest was sighted on 16 October 2019 and the last on 22 February 2020, with highest nesting activity also in December (357 confirmed nests, 47.8% of total nests; Figure 6).

The nesting population of loggerheads increased until the 2011/12 season (Figure 7 and Figure 8), as a result of an increase of the spatio-temporal monitoring effort. However, as reported for leatherbacks the percentage of observed turtles with tags, related to the total number of tracks, seem to be decreasing since 2017/18 and this might be a result of a reduction in the tagging effort and/or reduced monitoring effort (Figure 9).

Table 10. Loggerhead turtles: number of confirmed nests laid per area and month, during the 2019/20 season.

Monitoring area	Oct	Nov	Dec	Jan	Feb	Mar
P. Mucombo – Santa Maria	1	43	59	32		
P. Dobela – P. Mucombo	2	48	35	38	5	
P. Malongane – P. Dobela	2	63	257	147	4	
P. do Ouro – P. Malongane		4	6	1		
<b>Total</b>	<b>5</b>	<b>158</b>	<b>357</b>	<b>218</b>	<b>9</b>	

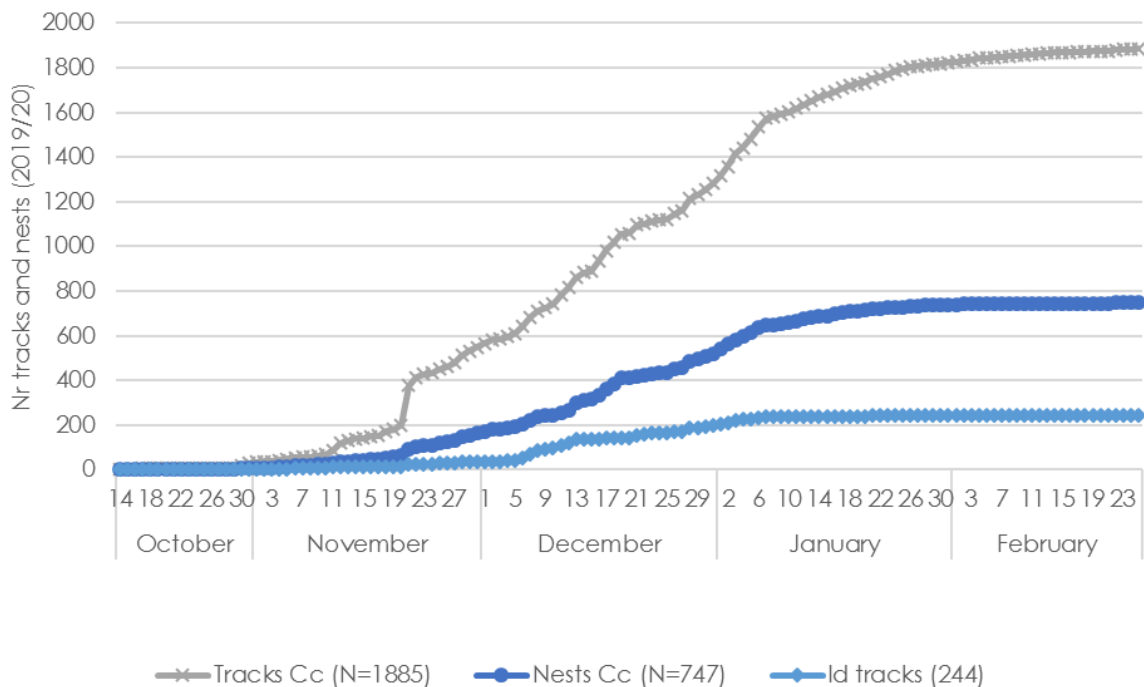


Figure 6. Cumulative analysis of tracks, nests and observed loggerhead (*Caretta caretta*) turtles with tags at Ponta do Ouro Partial Marine Reserve.

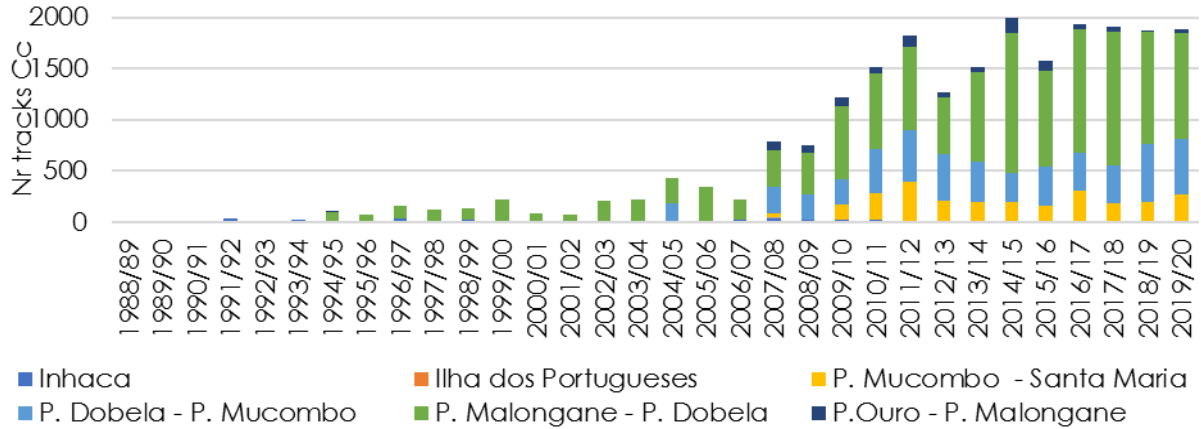


Figure 7. Historical data of loggerhead tracks at Ponta do Ouro Partial Marine Reserve (Note that data from Inhaca is not reported since 2009/10 nesting season).

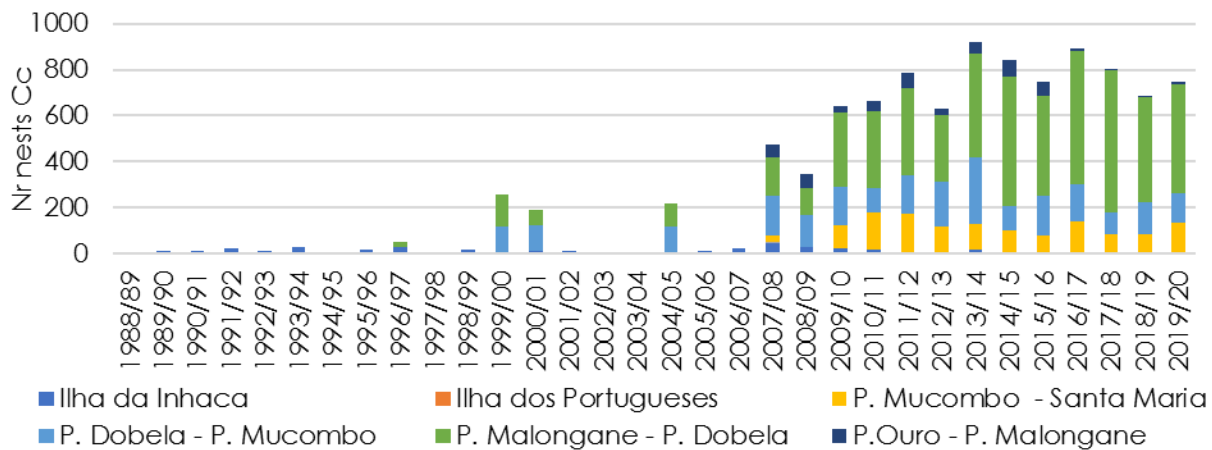


Figure 8. Historical data of loggerhead nests at Ponta do Ouro Partial Marine Reserve (Note that there is a gap of information until 2007/08 season and data from Inhaca is not reported since 2009/10 nesting season).

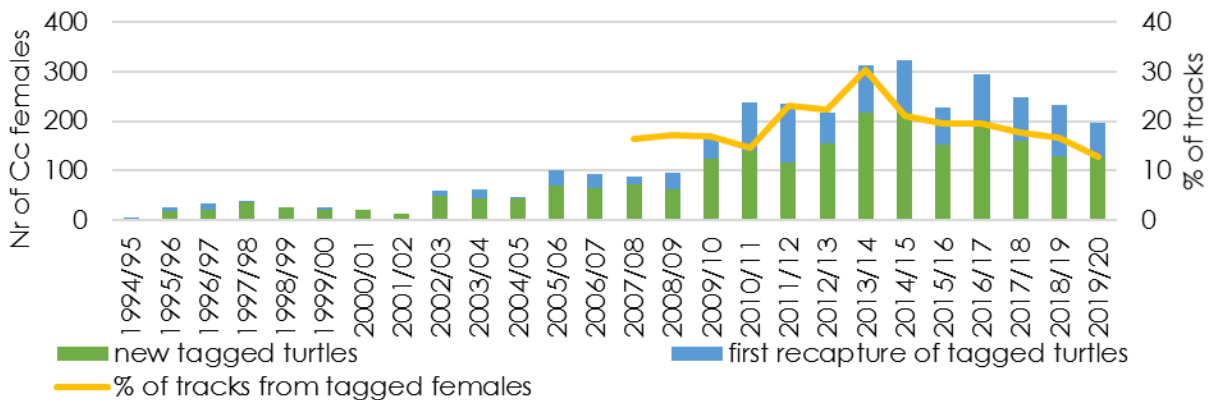


Figure 9. Historical data of identified loggerhead turtles at Ponta do Ouro Partial Marine Reserve. Percentage of tracks from tagged females refers to the relation between female tagged turtles (including with foreign tags) and the total number of tags.

## Hatching success

The following data on number of eggs and hatchlings (Table 10) should be considered preliminary and requires additional information and analysis for interpretation. However, it is considered important to reinforce that nest monitoring, which requires the exhumation of the nests, should only be performed after the incubation period. Most protocols state that exhumation can be made within 24 or 48 hours after the first emergence or 70 days after the nesting date in case no emerged was observed (eg. Carrasco & Chacón, 2017).

A review of the literature indicated that loggerhead eggs per nest range from 23 to 198 (Van Buskirk & Crowder, 1994) and some of the lower values are probably the result of counting eggs in clutches that were the remainder of disturbed nesting attempts (Limpus, 1995 cited by Miller *et al.*, 2003). However, some may be real, albeit from females that were not functioning properly (Miller *et al.*, 2003). Some of the higher values may result from counting eggs from overlapping nests (Miller *et al.*, 2003).

Table 10. Loggerhead turtles: exhumated nests from Ponta Malongane to Ponta Chemucane, during the 2019/20 season. HS=estimated hatching success. Note that fully destroyed nests were not included in the table. \* = Nests with information on number of eggs laid and unhatched eggs; \*\* = Nests with information on live and dead hatchlings.

	Nests*	Eggs Laid	Unhatched Eggs	HS (%)	Nests**	Alive Hatchlings	Dead Hatchlings
<b>Total</b>	28	1709	88	94,9	27	1363	204
<b>Average per nest (SD); range</b>	-	61±31 (10-99)	3±7 (0 – 30)	-	-	50±33 (7-96)	8±4 (2-14)

## RECOMMENDATIONS

The following activities are proposed:

1. Annual refresh course for the marine turtle monitors. The course should be conducted at the beginning of the nesting season (late September/early October) and at the end of the nesting season. The last refreshment would be useful if monitoring of hatching success is considered a priority.
2. Initiate a nest temperature monitoring program using temperature loggers (ibuttons), as well as beach profile monitoring.



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