The loggerhead sea turtle (*Caretta caretta*) on Sal Island, Cape Verde: nesting activity and beach surveillance in 2009

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Surveys for *Caretta caretta* nesting activities were performed during the nesting seasons from the middle of June to end of October 2009 on Sal Island, Cape Verde. A total of 3628 activities were registered: 1071 nests, 2466 turtle tracks and 91 dead turtles. On nesting beaches still used by locals to catch female turtles for their meat, nightly patrols from 9 pm to 5 am resulted in a significant reduction in turtle mortality in comparison to non patrolled beaches. On beaches regularly patrolled, an increment of nests per km was also observed which allows us to conclude that the presence of trained Rangers does not disturb the turtles or interrupt the nesting process.

Key words: mortality, poachers, population, patrols, rangers, tracks

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INTRODUCTION

Cape Verde harbours one of the world's largest nesting aggregations of loggerhead sea turtles (Monzón-Argüello et al. 2007) which means that protection of nesting habitats in these islands is of critical concern for marine turtle populations worldwide. However, we have not been able to find reliable published data on number of nests. Of the five species reported to be observed in Capeverdian waters, the loggerhead, *Caretta caretta*; the green turtle, *Chelonia mydas*; the leatherback, *Dermochelys coriacea*; the hawksbill, *Eretmochelys imbricata*; and the Olive Ridley, *Lepidochelys olivacea* (Merino et al. 2008 in review), only the loggerhead still nests regularly on all the islands of Cape Verde. According to Monzón-Argüello et al. (2007), the majority of nesting activity occurs in the islands of Boavista, Sal, Santa Luzia and Maio.

Marine turtles are considered endangered species and have been protected since 2002 by national laws. All activities that harm these animals in any way are considered criminal and can lead to penalties including prison sentences. Despite this, poachers still go to nesting beaches to kill females that come ashore to lay their eggs. To diminish the marine turtle killing on land, military personnel working for Sal City Hall have patrolled some beaches on Sal each year since 2001. However, the number of loggerhead nests and other activities connected with turtles, have not been recorded consistently over the years. Since 2008, biologists and volunteers from the Non Governmental Organization SOS Tartarugas increased the survey effort on the southern, southwestern and southeastern beaches with the aim of dissuading poachers. In that year, an intensive program to register all the data related to the nesting activity of loggerhead turtles began

as well. Here we present this data, based on the information collected in the nesting season in 2009 (and 2008 for comparison) in an area of about 12 km of sandy beaches.

MATERIAL AND METHODS

Data of all turtle activities (tracks, nests, false crawls, dead animals and dragging tracks from killed turtles) were recorded by a group of permanent volunteers during the nesting season of 2009, from 12 June to 30 of October, on beaches in the southern part of Sal Island, Cape Verde (Fig. 1).

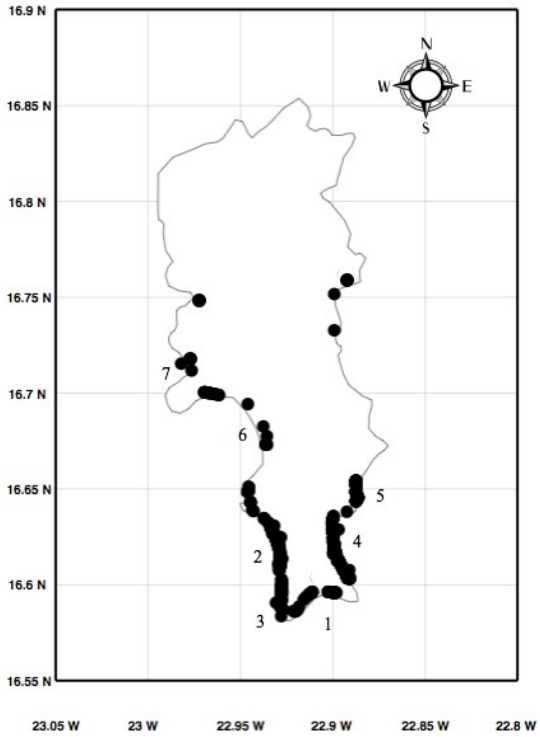

Fig. 1. Locations of all loggerhead turtle activities registered during the 2009 nesting season in Sal island, Cape Verde (1. Santa Maria, 2. Algodoeiro, 3. Ponta Preta, 4. Costa da Fragata, 5. Serra Negra, 6. Murdeira and 7. Monte Leão).

Night-time beach patrols were undertaken regularly from 9 pm to 5 am during that period, in shifts of 4 hours with 2 to 3 persons, equipped with red filtered head lamps and radios for communication. Each of these groups began their patrol on foot on several sections of the beaches in a way that the groups would overlap each other. When sighting a turtle, in order to diminish the risk of disturbing nesting, the patrollers would stop at a safe distance and sit in the dark until the female started to lay the eggs or returned to the sea. After recording the data in a notebook, the track was erased with a specific mark in the sand to avoid being counted twice. Every morning an extra patrol was made from 6 to 9 am on a quad bike, covering all the beaches and recording any activity not registered the previous night. The exact geographical position of the activities was recorded using 6 GPS *Garmin ETREX*. Monthly surveys were also conducted by a 4x4 pick-up van in on all beaches around the island in order to register the activities in beaches without surveillance.

RESULTS

A total of 3628 activities for loggerhead sea turtles were registered on Sal island during the 2009 nesting season (Table 1): 1071 were nests, 2466 were turtle tracks and 91 were dead turtles (recorded either as cadavers or as drag marks left by turtles turned upside down and dragged away by poachers). The first activity, a False Crawl U-turn (FCU), was registered 19 of June during morning patrol in Algodoeiro beach (southwest) and the last, on night patrol 23 October, a nest in Costa da Fragata (southeast). The mortality registered (Table 1) was mainly due to human activities: the highest number of turtles was killed in areas with difficult access (as on the beaches on the north coast) or in areas where patrols were not conducted regularly (Serra Negra and Monte Leão). Algodoeiro was the patrolled beach with the highest number of turtles killed. Reasons for these could be associated with the beach characteristics: *i)* a vast open area that allows poachers to watch the movements of the patrollers and to avoid them and *ii*) nearer to settlements where turtles have been use traditionally as a food resource (turtle meat is still highly appreciated by capeverdians).

Table 1. Summary of all activities registered during the 2009 nesting season on Sal Island beaches.

	Tracks		Nests		Mortality		Situation
Beaches (coast locations)	total	per km	Total	per km	total	per km	Status
Santa Maria (South)	101	27	56	15	0	0	protected
Algodoeiro (Southwest)	786	262	317	106	17	6	protected
Ponta Preta (Southwest)	161	94	47	27	0	0	protected
Costa da Fragata (Southeast)	609	154	387	98	6	2	protected
Serra Negra (Southeast)	581	533	200	183	13	12	unprotected
Murdeira (West)	21	23	6	7	1	1	unprotected
Monte Leão (West)	96	109	32	36	11	13	unprotected
Other beaches (North)	202	91	26	12	43	19	unprotected
total	2557	146	1071	61	91	5	-

Data shows that the areas most frequently used by female turtles on Sal Island are Algodoeiro and Costa da Fragata (Table 1; Figure 1). Of the unprotected beaches, Serra Negra had the highest number of activities with a total of 533 tracks and 98 nests per km, followed by Monte Leão with 109 tracks and 36 nests per km. Numbers of turtle mortality show that both areas are also commonly used by poachers, who usually try to hide the carapaces behind the bushes or by burying them in the sand. Beaches in the north have the highest mortality rates. Regarding nesting density, results confirm that Costa Fragata and Algodoeiro were the preferred areas for turtles to lay their eggs accounting for more than 60% of all nests on the island. Surprisingly, the northern beaches contribute only 4% of all nests on Sal, more than in Murdeira. This is a rocky region with one large bay and smaller ones flanked with very small beaches and locally described as being very important for the nesting turtles. It is the only marine protected area in Cape Verde islands but according to our data, Murdeira only presented about 1% of all turtle nests on Sal.

Table 2. Numbers of female tracks registered during the nesting seasons 2008 and 2009; *unpublished data provided by J. Cozens (SOS Tartarugas).

Month	2008*	2009
June	90	48
July	505	1099
August	451	1520
September	210	617
October	24	78
Total	1280	3362

In comparison with the previous year (Table 2), 2009 had three times more turtle activities registered. The first nesting month (June) was the only exception indicating that the season for nesting started later but had more registered activities during a longer period of time. By July the registered activities were already double compared to the year before and in August registered activities were three times higher. The comparison between the two years also allows us to observe that in 2008, July was the month with more activities, while in 2009 it was August. The number of nests registered for 2008 was 346 (Cozens 2009).

DISCUSSION

The overall results demonstrate that constant protection of nesting beaches is of critical concern for Sal's marine turtle population since turtle killings are seen to decrease, on average, from 11 per km in unprotected areas to 2 per km on patrolled beaches. These results also indicate that a regular presence of Rangers on the nesting beaches has an effect of dissuading the hunters to kill female turtles. On the other hand, several times in wide open extensions of beaches as in Algodoeiro, turtles were hunted in areas between two groups of patrols which led us to believe that poachers observe the Rangers movements and try to take a turtle when a chance presents itself. The methods of poachers have been observed to change with the presence of volunteers: before SOS Tartarugas patrolled regularly, turtles were

dragged on their backs a short distance from the water, killed immediately and the meat taken, leaving the carapace on the spot. Nowadays the turtles are dragged for longer distances, and left on their backs in hidden places far from the water mark (where the patrols are made) until they find the opportunity to kill them. Several turtles were rescued when Rangers recognizing the drag mark, followed the trail and found the female, upside down. More than once the Rangers detected poachers hidden near the turtle. This indicates that surveillance alone may not be enough to stop the killings. This is particularly true on beaches in the north with very difficult access. Therefore it is of critical importance to mobilize the local community to protect turtles, which might result in the reduction of unnatural mortality. Costa da Fragata and Algodoeiro, the areas where the patrol effort was higher, accounted for more than 60% of all nests. These results can be considered as good indicators that the presence of highly trained Rangers on the nesting beaches does not disturb the turtles and allows them to nest successfully in contrast to areas where poachers and other human activity (such as in Santa Maria with loud music from bars and nightclubs, bright lights in front line developments and great construction sites), have a negative influence on the nesting activities.

Serra Negra and Monte Leão are two areas where protection is not as complete due to poor access. The 24 dead turtles found (more than 25% of total mortality) and the high number of activities per km at these locations shows that they are very important for turtles and should be protected.

Although two years of data is not sufficient to estimate the nesting population on Sal Island the comparison of the overall activities during the same period in two consecutive years allowed us to understand that, as it is described for Florida beaches by Witherington et al. (2009), the number of nests varies annually and that 2009 could have been a "maximum peak year". If we compare the overall numbers, results show that in areas with similar number of activities (e.g. Costa da Fragata and Serra Negra or Ponta Preta and Monte Leão) the number of nests increases and the mortality diminishes in patrolled beaches. According to a NOAA report (2010), in the Eastern Atlantic, the Cape Verde islands support an intermediate-sized loggerhead nesting assemblage. It seems that from our data in Sal Island the turtle nesting has increased from 2008 (346) to 2009 (1071). Although, the number of nests in 2008 might be too low as some nests might have been overlooked, we can conclude that an increase in nesting has occurred, which is encouraging when some of the world's loggerhead nesting is decreasing (Hawkes et al. 2005; Margaritoulis 2005; Witherington et al. 2009). For instance in Florida, on the coast that hosts between 80–90% of the world's loggerhead nesting activity, the nesting declined by 37% between 1989 and 2007 and by 49% between 1998 and 2007 (Witherington et al. 2009). Our results suggest that the constant surveillance of the most important beaches for nesting turtles can be of great importance not only for the recovery of the Capeverdian population but also have a meaningful impact for the marine turtle populations worldwide in years to come.

CONCLUSIONS

Surveillance actions in the most important beaches for nesting turtles in Sal Island resulted in the increase of nests and decrease of mortality by poachers proving that these actions can have a positive contribution to stop the decline that these marine populations face nowadays. Combined efforts should be made by NGOs, Sal City Hall, the population and the Government Environment Department in order to protect the Sal beaches in the future, especially those with difficult access, like Serra Negra and Monte Leão.

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