

## **Nesting activity of the loggerhead sea turtle *Caretta caretta* (Linnaeus, 1758) on Maio, Cape Verde Islands**

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Key words: Loggerhead turtle, *Caretta caretta*, Maio, Cape Verde

### ABSTRACT

Loggerhead sea turtles *Caretta caretta* may now be the only species of marine turtle nesting on the island of Maio, Cape Verde Islands. Threats to loggerhead turtles include hunting of females on land and males and females in the water, poaching of nests and, increasingly, light pollution and other disturbances related to tourism development. Length and remoteness of the beaches on Maio lead to limited monitoring and data collection. Although it is believed that Maio has one of the largest nesting populations of loggerheads in the Cape Verde Islands, very little information exists regarding the nesting beaches and the population of nesting females. During July 2009, a four day survey of the island was carried out in order to obtain insight as to the status of nesting loggerheads on Maio. The census showed that compared to the island of Sal the number of turtles nesting on Maio was higher at 19.64% more nests and 39.9% more tracks during the same period. It is recommended that in order to determine the true size of the Maio nesting population a full census should be undertaken over several seasons.

### RESUMO

É provável que as tartarugas-comuns (*Caretta caretta*) sejam actualmente a única espécie de tartarugas marinhas a nidificar na ilha do Maio, Cabo Verde. Algumas das principais ameaças à tartaruga comum incluem a caça de fêmeas em terra e de fêmeas e machos no mar, o roubo dos ovos, bem como, de forma crescente, a poluição luminosa e outras perturbações relacionadas com o desenvolvimento turístico. A extensão e localização remota das praias da ilha do Maio têm contribuído para uma monitorização e recolha de dados limitada. Apesar de se suspeitar que o Maio possui uma das maiores populações nidificantes de tartarugas-comuns em Cabo Verde, a informação sobre as praias onde a nidificação ocorre e sobre a população de fêmeas é escassa. Em Julho de 2009, foi efectuado um estudo de quatro dias sobre o estado dos ninhos na ilha. O recenseamento demonstrou que, em comparação com a ilha do Sal durante o mesmo período, o número de ninhos era superior em 19.64% e o número de rastros em 39.9%. Recomenda-se que sejam conduzidos recenseamentos sistemáticos ao longo de várias estações para determinar o tamanho real da população nidificante no Maio.

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## INTRODUCTION

The Capeverdean island of Maio is located south of Boavista and east of Santiago (Fig. 1), and although there is no published data to support the theory, it is believed to have one of the most significant sized nesting populations of loggerhead turtles in the archipelago. There is also only a limited amount of information about the total number of nesting turtles in all the Cape Verde islands. In the past, like elsewhere in Cape Verde, other species such as hawksbill *Eretmochelys imbricata* and green *Chelonia mydas* turtles may have nested on Maio, but possibly due to excessive hunting and poaching of nests, today only loggerheads remain (cf. López-Jurado *et al.* 2000, Loureiro & Torrão 2008).

Aside from the killing of nesting females, a problem seen across the whole of Cape Verde (Araújo 2009), Maio also has a

high incidence of egg poaching and hunting of male turtles for the penis (which is often mixed with the local spirit, grogue, and sold as an aphrodisiac). Another concern is the amount of development for tourism, which is responsible for the increase of degradation in nesting beaches and habitat loss (Taylor & Cozens 2010).

Illegal removal of sand for construction is also a problem on Maio as it is on many other islands in Cape Verde. Removing sand from prime nesting beaches causes females to find other, possibly less suitable, locations to nest (Witherington & Martin 1986). Laws exist, such as Article 206 of the Cape Verde Constitution, which are designed to prevent sand removal as well as promote the protection of the environment. Unfortunately these laws are not usually implemented.



Fig. 1. Map of the Cape Verde Islands

One of the biggest concerns for Maio's nesting population is the limited knowledge of the life cycle and endangered status of turtles amongst the people of Maio. In Cape Verde, there seems to be a general lack of awareness of both the importance of turtles and the need to protect them (Marco *et al.* 2010). In 2008, only 44 nests were identified in São Vicente island and 11 in Santo Antão, compared to 382 in Maio, indicating the significance of the island within Cape Verde (Araújo 2009).

The Câmara Municipal (City Hall) of Maio, together with the Direcção Geral do Ambiente (Department for the Environment) mounts a turtle protection campaign each year, which encompasses outreach activity and beach patrols on foot during the night by local guards. Patrols consist of the collection of data such as number of nests, tracks and

dead turtles, but are primarily performed to deter hunting of the females for meat. These local guards live in coastal communities and have received training to undertake the patrols, although standards of data collection are not uniform and the suitability of beaches has not been assessed, for example quality of sand or likelihood of inundation.

The aim of this study was to gain a better understanding of the quality and accessibility of Maio's nesting beaches, as well as allowing further understanding of nesting abundance by assessing a few days activity over the peak season. Prior to the survey, the key beaches were reported to be in the southeastern part of the island as well as in Morro (southwest), Praia Rotcha (Vila de Maio) and Santana (northwest) (data Câmara Municipal do Maio).

## METHODS

The non-governmental organization SOS Tartarugas visited Maio from 15 July to 5 August 2009 with the objective of undertaking a full survey of sea turtle nesting beaches and to assist with outreach activities. The island survey was conducted between 17 and 21 July in conjunction with the Câmara Municipal do Maio, other local organizations and individual citizens (see Acknowledgements).

Every stretch of sandy beach was walked during daylight (see Appendix 1) and the following data were recorded:

- Name of beach,
- Beach length and GPS coordinates,
- Observations on beach conditions,
- Presence of turtle nests,

- Presence of false crawls,
- Signs of human nest robbery,
- Presence of dead turtles.

Beaches were assessed for nesting suitability taking into account factors such as quality of sand, width, slope, likelihood of flooding, presence of vegetation and amount of litter or degradation caused by litter (visually assessed). Data were analyzed to determine the most prolific nesting beaches. Data were simultaneously collected on both Sal and Maio during the morning of the same days by various members of SOS Tartarugas personnel using the same methodology to record nests and tracks. All visible activities were recorded.

## RESULTS

A total of 353 activities were recorded on Maio island during the census: 286 tracks and 67 nests (23%). Fig. 2 compares data for nests on Maio for the same period (17–21 July 2009) on Sal island. Maio recorded a higher number of loggerheads nesting, with 19.64% more nests and 39.9% more tracks than Sal

during this period. The highest number of nests was seen at Santana Beach ( $n = 34$ ), while the highest number of tracks was found at Djampaja Beach ( $n = 62$ ) (Fig. 3). The highest nesting density was seen on Praia de Farol (a rate of one nest per 37 m).

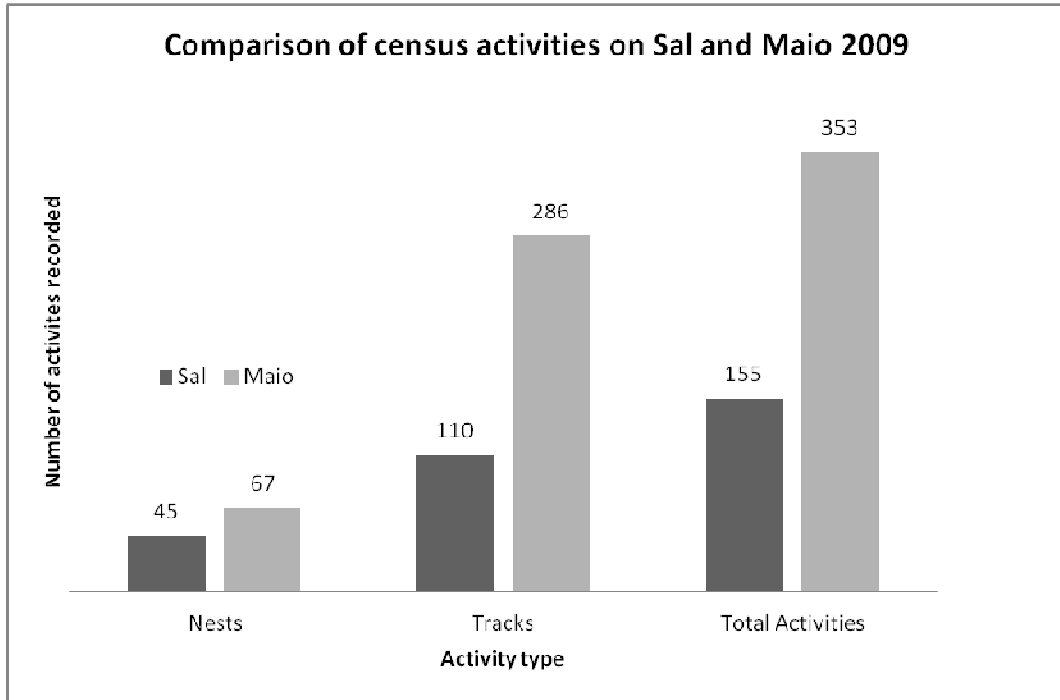


Fig. 2. Comparison of activities on Sal and Maio between 17 and 21 July 2009.

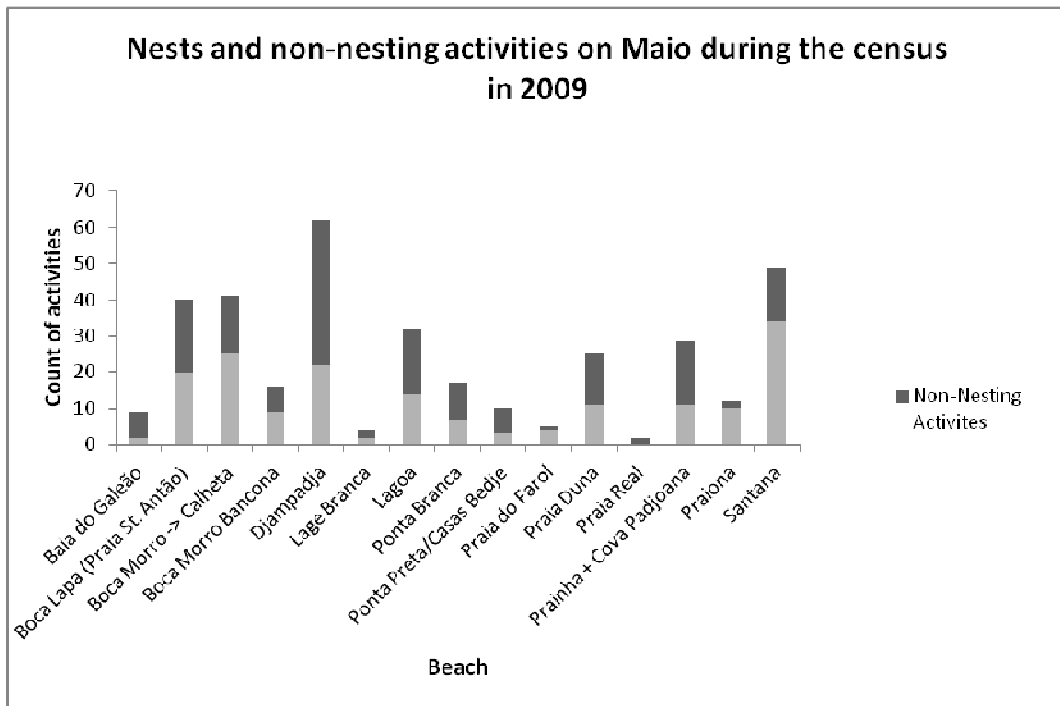


Fig. 3. Nests and non-nesting activities on Maio during the census in 2009.

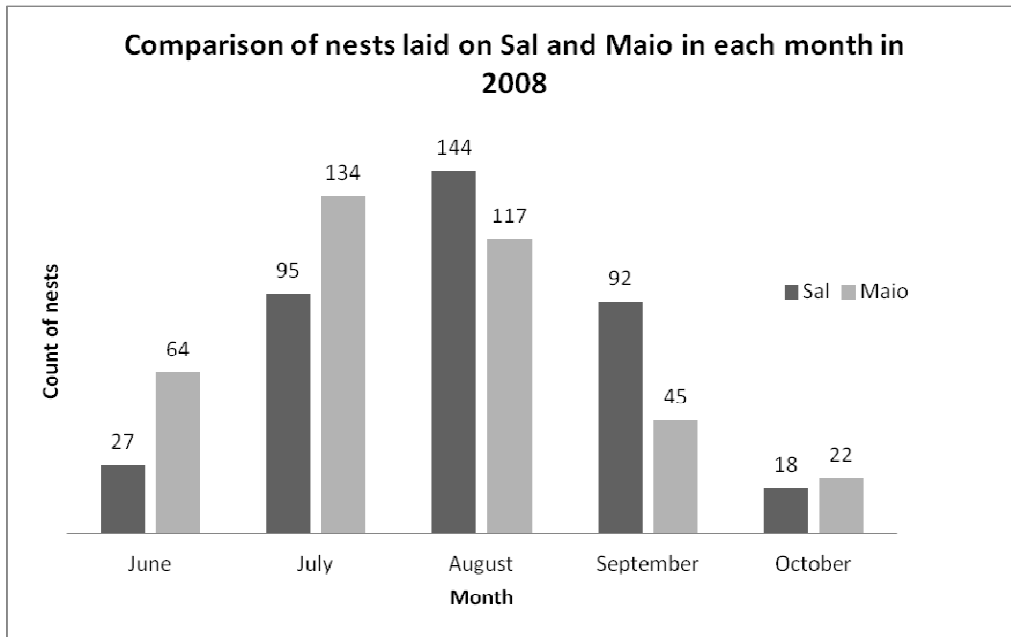


Fig. 4. Comparison of nests laid on Sal and Maio during June-October 2008.

Data collected on Maio by the Câmara Municipal in 2008 show a similar trend as in 2009, with Maio having higher numbers of tracks and nests (Fig. 4). August and September were an exception, with a higher number of activities on Sal compared to Maio, but this could be due to a decrease in

monitoring activity on Maio at this time. Due to differences in data collection methods between islands and between individuals on Maio, comparison of data collected on Maio in 2008 with those of Sal can only be used as an indicator to activity level difference.

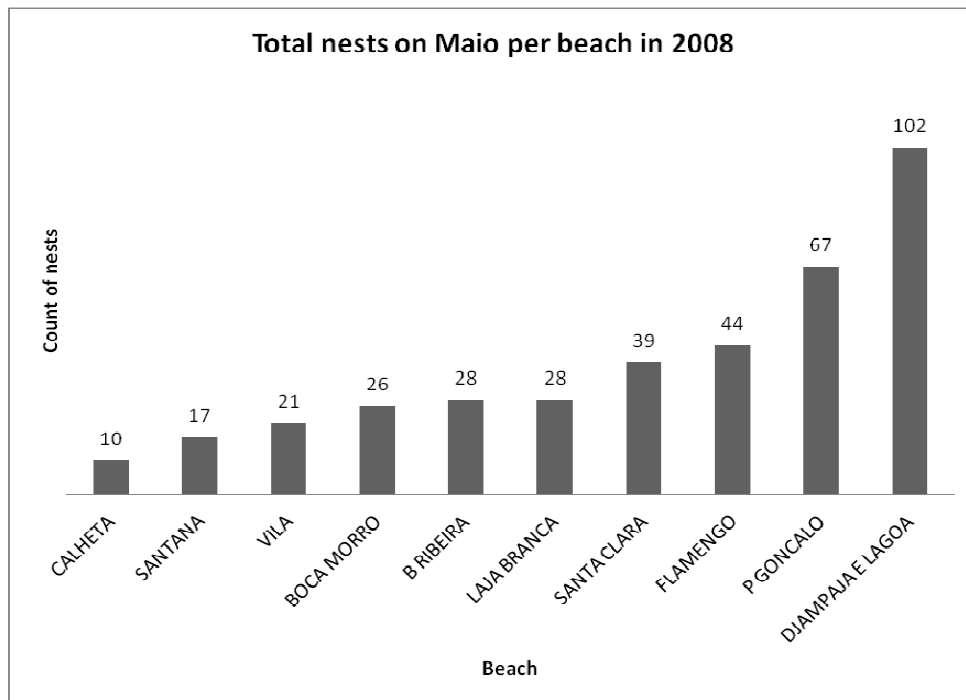


Fig. 5. Nests on Maio per beach in 2008.

Fig. 5 shows nest counts in 2008 at the different beaches (data Betty Silva, Câmara Municipal do Maio). During the 2009 census, three dead turtles, 32 stolen nests, three

depredated nests and three inundated nests were recorded. Similar information from previous years is not available for comparison.

## DISCUSSION

The 2009 census gives a small insight as to how important Maio may be to turtle conservation in Cape Verde. The survey highlighted the difficulty in performing the census with a single team and limited transportation because many beaches were remote and difficult to access. Some beaches do not have official names or have several names, which sometimes makes it hard to clearly identify individual beaches. In addition to this, long stretches of coastline had in the past been identified as one beach, thereby increasing the difficulty of distinguishing at which specific areas nests had previously been recorded. However, Maio showed a significantly higher number of nests compared to Sal and over double the number of activities during the same period.

Tracks seen during the census were more concentrated in the southeastern area, which consists of many small beaches with difficult access, although generally nesting was seen to be dispersed across the island. On the southwestern coast there were also many tracks, but the beaches were easier to access. The survey demonstrated that nesting habitat is suitable on the southeastern beaches, possibly due to them being wide enough to limit flooding and therefore limiting the risk of nest inundation. Hunting of nesting females however, seems to be greater here than on the west coast despite the problems with access. This is believed to be due to the remoteness of the beaches. More nests were observed to be stolen from the west coast, which may be related to these beaches being closer to villages. Southern and southwestern beaches experience relatively high levels of inundation.

Guards monitoring beaches in Maio are community based, which is a positive factor in engaging the local population in conservation activities. However, guards have different levels of general knowledge, basic training and experience. Therefore, due to these differences, it is possible that data collected prior to the 2009 census may not be very

accurate. It was also observed that some guards have long stretches of beach to patrol and this may hinder their ability to patrol effectively. Lack of equipment or suitable footwear to carry out patrols is another issue faced by the guards – it can be difficult to reach some beaches after heavy rains.

There are some inconsistencies with the data collection. For example, in 2008 Djampadja and Lagoa were counted as one beach as it was controlled by only one guard, but in 2009 these beaches were surveyed separately. In addition, in 2008 a lower number of nests were recorded on Maio in August than in July, which may point to errors in data collection since the peak nesting period in Cabo Verde is usually in August (Araújo 2009), although daily, monthly and yearly changes in the number of nests laid do occur. Even though patrols in 2009 were being carried out and data were collected according to standardized methods, the overall quality of these data varied. To increase the quality of data collecting, guards need more training, help and monitoring to ensure data are collected to a better standard. We suggest an island wide protocol to be created, ensuring the same methodology for basic data collection. This would also allow for fair and better comparisons between islands.

Although we know Maio to be an important nesting ground for loggerhead turtles (Araújo 2009), only limited studies have been undertaken to analyse the population size and insufficient protection has been given to nesting turtles. To understand the true significance of Maio for nesting loggerheads in Cape Verde, extensive monitoring should be conducted over several seasons to determine nesting activities and nests per season. Unlike the islands of Sal and Boavista, Maio is as yet not much affected by mass-tourism. Whilst this remains the case, a complete seasonal survey should be undertaken to further assess the current nesting habitat and implement a protection plan for the nesting beaches.

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## REFERENCES

- Araújo, S., 2009. Relatório da campanha nacional para a conservação das tartarugas marinhas em Cabo Verde 2008. Unpublished report, Ministério do Ambiente, Desenvolvimento Rural e Recursos Marinhos, Direcção Geral do Ambiente, Praia. 16 pp.
- López-Jurado, L.F., I. Cabrera, D. Cejudo, C. Évora & P. Alfama, 2000. Distribution of marine turtles in the archipelago of Cape Verde, western Africa. Pp. 245-247 in: Proceedings of the 19th Annual Symposium on Sea Turtle Biology and Conservation, 2-6 March 1999, South Padre Island, Texas. NOAA Technical Memorandum NOAA-SEFSC-443.
- Loureiro, N. de S. & M.M.F. Torrão, 2008. Homens e tartarugas marinhas. Seis séculos de história e histórias nas ilhas de Cabo Verde. Anais de História de Além-Mar 9: 37-78.
- Marco, A., E. Abella, O. López, N. Varo, S. Martins, P. Sanz & L.F. López-Jurado, 2010. Massive capture of nesting females is severely threatening the caboverdian loggerhead population. Pp. 93-94 in: Proceedings of the 28th Annual Symposium on Sea Turtle Biology and Conservation, 22-26 January 2008, Loreto, Baja California Sur, Mexico. NOAA Technical Memorandum NOAA-NMFS-602.
- Taylor, H. & J. Cozens, 2010. The effects of tourism, beachfront development and increased light pollution on nesting loggerhead turtles *Caretta caretta* (Linnaeus, 1758) on Sal, Cape Verde Islands. *Zoologia Caboverdiana* 1: 100-111.
- Witherington, B.E. & R.E. Martin, 1986. Understanding, assessing and resolving light-pollution problems on sea turtle nesting beaches. FMRI Technical Report TR-2. Florida Department of Environmental Protection. 73 pp.

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Appendix 1. Position and length of beaches prospected during the sea turtle survey on the island of Maio, Cape Verde Islands, 17-21 July 2009. Positions were determined with a Garmin Etrek handheld device.

Ponta Preta & Casas Velhas  
Start - 15° 07.410/23° 12.363  
End - 15° 06.991/23° 10.465  
Length ca. 3.5 km

Djampadja (DJ1 - DJ2 - DJ3)  
DJ1 Start - 15° 06.991/23° 10.465  
DJ2 Start - 15° 06.840/23° 09.672  
DJ3 Start - 15° 06.857/23° 09.214  
Length ca. 2.3 km

Lagoa  
Start - 15° 07.192/23° 08.823  
End - 15° 07.499/23° 08.110

Praia Marco da Areia Branca  
Start - 15° 07.676/23° 08.085  
End - 15° 07.781/23° 08.002  
Length ca. 3.4km

Ribeira Dom João  
RJ1 Start - 15° 08.145/23° 07.416  
End - 15° 08.159/23° 07.226  
RJ2 Start - 15° 08.148/23° 07.201  
End - 15° 08.143/23° 07.170

Ribeira Funda Baixo  
Start - 15° 08.404/23° 06.817  
End - 15° 08.316/23° 06.900

Ribeira Funda Riba  
Start - 15° 08.632/23° 06.525  
End - 15° 08.715/23° 06.477

Praia Flamengos  
Start - 15° 09.566/23° 05.825  
End - 15° 09.836/23° 05.518  
Length ca. 4.4 km

Ponta Flamengo -> Ribeira Baía  
Length ca. 2.5 km

Ribeira Baía  
Start - 15° 11.183/23° 05.641  
End - 15° 11.083/23° 05.586  
Length ca. 1.4km

Praia Sta Clara  
Start - 15° 11.936/23° 05.558  
End - 15° 12.716/23° 05.684  
Length ca. 1.5 km

Praia Guarda  
Start - 15° 13.526/23° 05.695  
End - 15° 13.635/23° 05.731  
Sta Clara -> Praia Guarda  
Length ca. 1.7 km

Boca Ribeira  
Start - 15° 14.679/23° 05.916  
End - 15° 14.521/23° 05.892

Praia Guarda -> Boca Ribeira  
Length ca. 1.7 km

Prainha/Praiona/Boca Lapa  
Boca Ribeira -> Prainha  
Length ca. 1.3 km

Prainha  
Start - 15° 15.366/23° 06.108  
End - 15° 15.223/23° 06.037

Praiona  
Start - 15° 15.962/23° 06.332  
End - 15° 15.161/23° 06.349

Boca Lapa  
Start - 15° 16.780/23° 06.098  
End - 15° 16.546/23° 06.367

Praiona -> Boca Lapa  
Length ca. 1.1 km

Laje Branca  
Start - 15° 18.563/23° 08.492  
End - 15° 18.595/23° 08.623

Boca Lapa -> Laje Branca  
Length ca. 5.5 km

Baia do Galeão  
Start - 15° 18.843/23° 09.143  
Ends - 15° 18.241/23° 09.595

Laje Branca -> Baía do Galeão  
Length ca. 1.9 km

Praia Real  
Start - 15° 19.261/23° 09.853  
End - 15° 19.315/23° 23° 10.482



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Praia Farol

Start – 15° 19.877/23° 10.794

End – 15° 19.823/23° 10.317

Ponta Branca Bay 1 (Porto Cais)

Start – 15° 18.721/23° 11.679

End – 15° 18.729/23° 10.584

Ponta Branca Bay 2 (Porto Cais)

Start – 15° 18.629/23° 11.360

End – 15° 18.904/23° 11.957

Praia Real -> Ponta Branca

Length ca. 5.5 km

Baía de Santana

Start – 15° 17.479/23° 12.009

End – 15° 16.471/23° 13.522

Praia Duna

Start – 15° 16.302/23° 13.527

End – 15° 15.820/23° 13.793

Praia Duna -> Santana

Length ca. 4.4 km

Calheta

Start – 15° 13.398/23° 13.040

End – 15° 15.820/23° 13.793

Praia Duna -> Calheta

Length ca. 4.7 km

Boca Morro/Bancona

Start – 15° 10.450/23° 13.923

End – 15° 11.208/23° 13.700

Calheta -> Boca Morro

Length ca. 5.7 km

Boca Morro -> Bancona

Length ca. 3.3 km

Bancona/Vila

Bancona -> Vila

Length ca. 1.9 km