



Use of artificial nests to enhance knowledge and survival of an unknown species *P. marina*, in Maio Island, Cabo Verde

# FMB's Report 2019

## Fundação Maio Biodiversidade

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# INTRODUCTION

## Background

Cabo Verde is globally recognized as both a terrestrial and marine biodiversity hotspot, in which the whole archipelago consists of an Important Bird Area (IBA) (MAHOT, 2014), by providing nesting and feeding areas for several seabird species including the white-faced storm petrel (*Pelagodroma marina*) (INIDA, 2007; MAHOT, 2014). In Maio Island there is only one known place where this species nests which is Laje Branca. A small (~0.3ha) and uninhabited islet situated in the north of Maio Island, and it is located within the Natural Park “Parque Natural do Norte da Ilha do Maio - PNNM”, 400 m from the coast (Figures 1 and 2). Laje Branca is also a Restricted Protected Zone due to its conservation importance to the reproduction of this species.

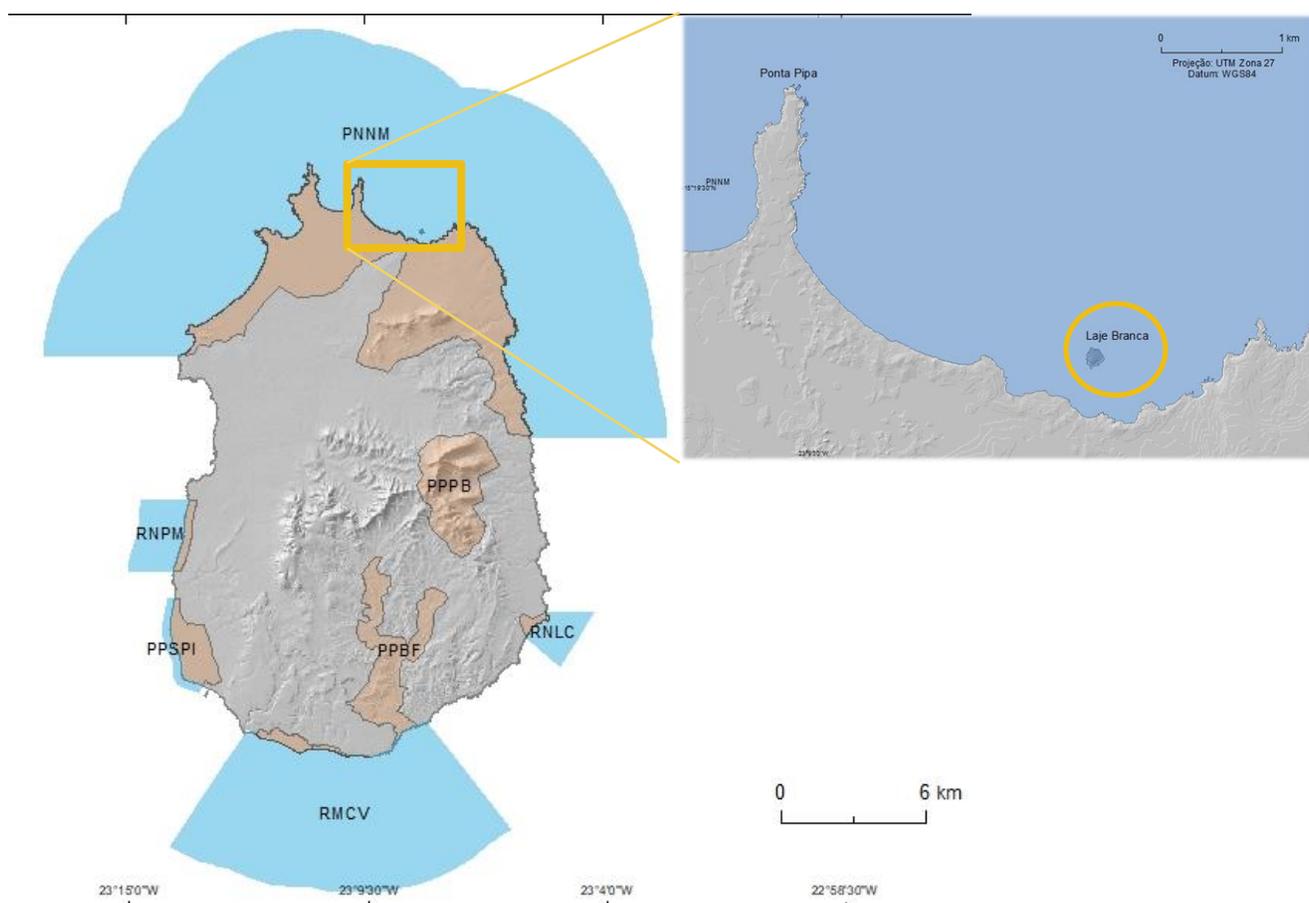


Figure 1. Maio island with the 7 Protected Areas highlighted (blue= marine component, brown= terrestrial component). PPSP= Protected Landscape of Salinas Porto Inglês, RNP= Nature Reserve of Morro's beach, PNNM= Natural Park of the North of Maio, PPPB= Protected Landscape of Mounts Penoso and Branco, RNL= Nature Reserve of Cimidor lagoon, PPBF= Protected Landscape of Barreiro and Figueira, RMCV= Nature Reserve/Marine Reserve of Casas Velhas. Laje Branca islet showed in detail within the Natural Park.



Figure 2. Laje Branca islet seen from above, about 400 m from the coast of the North of Maio. Photography by Enhaut.org

## Previous projects

In 2016, the first monitoring of the white-faced storm petrel was done in the islet with the support of the Seabird Group, co-funded with the DARWIN INITIATIVE. This was first a one-year project which was extended to 2 years. This project was extremely important as it provided the baseline information on this population, including estimates of the population size and some clues of possible threats. It enabled FMB, a local NGO, to monitor these trends over the course of those 2 years. In 2018, the studies carried out at Laje Branca were funded by two main different funders (MAVA Foundation and Arcadia), however we will mention some of the main results in this report to compare them with 2019's results. In 2019, FMB aims to dig deeper and continue learning about this unknown population by increasing the number of artificial nests being monitored, particularly given that this species is included in the Cape Verdian Species Red List and that the Government aims to elaborate an updated Seabird Conservation Action Plan.

# OBJECTIVES

This year several hypotheses were tested in order to better understand the breeding ecology of this species. The idea was to also compare this year's data with that of previous years to obtain better results and more precise conclusions. The aims of this year's work were:

- Determine whether breeding pairs show fidelity to mate fidelity
- Determine whether breeding pairs show nest fidelity
- Continue building up the baseline database with further captures (ringing, collection of morphometric data, collection of blood and feather samples), and refining data, particularly on population size and chick survival rate
- Determine whether the direction of nest opening, wind direction, type of floor and vegetation cover influence nest choice
- Identify which predators are eating: 1) the eggs and 2) the adults
- Carry on community work: talks on the breeding ecology of the *P. marina* in Laje Branca on all 13 communities as well as on schools

# EDUCATIONAL ACTIVITIES

DATE	ACTIVITY	ATENDEES	DESCRIPTION
20/1-11/3/2019	Project presentation in all 13 communities	55	The aim was to present the project to all 13 communities and to bring awareness of the importance of this species to Cape Verde
02/02/2019	World Wetlands Day	33	An interactive presentation was done for primary students with a walk to the Salinas Porto Inglês, the only RAMSAR site in Maio, where a talk on protected areas importance to birds was done. The students also tried birdwatching.
18/3/2019	Workshop on bird biology, behavior and birdwatching for Eco Guides Maio	3	Workshop run during the morning to explain several aspects of bird and birdwatching particularly important for Eco Guides Maio learn and show when birdwatching with tourists.
20/03/2019	World Sparrow Day	70	Activity with school kids celebrated on 21 <sup>st</sup> March, in which a mini gymnastics class was done to have them calm down, followed by several games on species identification differences between the 3 main sparrow species of Cabo Verde and a birdwatching session.
11/05/2019	World Migratory Bird Day	63	Celebrated in the morning with a short video about bird migration to school kids and fun games for kids to "migrate" to other areas whilst pretending to be a specific bird

			species, as well as playing birdwatching in the school, having to identify all birds (papers printed) around the school. In the afternoon, there was a saltmarsh (Salinas do Porto Inglês) clean up to bring awareness of plastic consequences to wildlife - collected 117.5 kg!; followed by a bird watching and count event, and finally a cinema session on animal migration.
22/05/2019	World Biodiversity Day	34	Date celebrated in 3 different parts: 1) photography exhibition in the local high school, 2) interactive explanation on biodiversity with 2 A-level classes, 3) competitive quiz game with those classes, divided into 4 different teams. Winners got a complete school kit.
19/07/2019	Fieldtrip with Eco Guides Maio to the Salinas Porto Inglês to apply what they've learned about birds and bird watching	5	Eco Guides Maio joined FMB's wader survey to the Salinas do Porto Inglês so that they'll learn why monitoring is important, as well as being showed how to distinguish the local bird species and remind on codes of conduct when birdwatching.
21-22/8/2019	Project season results presentation in all 13 communities	302	Project results were done in all communities; however, people only attended the results session in 4 communities. Nevertheless in those communities there were more people actively taking part in the presentations. These people would

make several questions and some even provided some suggestions. This is an improvement from the first year which makes us we believe that people are becoming more interested in conservation topics. On the other hand, in some communities, no one appeared to these presentations even after a second try. We do not know why this happened as the same disclosure was done to all communities.



Figure 3. Project presentation in Cascabulho.



Figure 4. World Wetlands Day - students learning how to birdwatch.



Figure 5. World Wetlands Day - Students attending a presentation on the importance of wetlands.



Figure 6. World Wetlands Day - students together at the end of the field activity. This activity was done in collaboration with our local partners DMAA (Delegation of the Ministry of the Agriculture and the Environment).



Figure 7. World Sparrow Day - students learning how to look out for birds.



Figure 8. World Sparrow Day - students together at the end of the activity.

# METHODOLOGY

Different methodologies were used in order to collect most data possible on the breeding ecology, population estimates, ringing and morphometric data. These methodologies are described below.

## Night Captures

Given the pressure to a small colony, FMB decided to carry out 1-night capture per month during the breeding season. Night captures occurred around new moon when it seems to be higher abundance of animals. The methodology used was the one used by the Natural Park of Fogo and the University of Barcelona that have been using for other seabird studies in Cape Verde. Metal rings provided by University of Barcelona were used for ringing the birds. Data collected included population, locality, date, species, time, sampler name, whether it was a new bird or recapture, whether it had a wind bars, their number and on which feather they occurred; stage of the brood patch, number of ring; the length of tarsus, total bill depth, bill depth at nostril, total head length, wing, culmen (all in millimetres), using rulers to the nearest 1 millimetre for the wing length and Vernier calipers to the nearest 0.1 millimetre for all the other lengths), identification number of feathers collected, weight (grams, using a spring balance) and blood sample (milliliters).

The feathers collected were S8 (secondary) and R6 (retrace) from the right wing, P1 (primary) and S1 (secondary) from the left wing and ~10 breast feathers were additionally collected. Blood samples were taken from the brachial vein using insulin syringes (0.25 ml) and were then transferred to a vial containing ethanol.

If a bird was highly stressed from being captured, no further data collection was done with it and it was promptly released back to the colony. Pregnant females were only ringed and a picture of the brood patch taken - these birds would have priority amongst all others and would be released straight after being ringed.

## Monitoring of Nests

The monitoring of the nests were done to get a better idea of the breeding and chick rearing phases of this species. To compare it, both artificial and natural nests were used. Monitoring of both artificial and natural nests occurred once a week, in which all artificial nests were checked and if a natural nest was found to be occupied it would also be marked and checked from that moment onwards.

### Artificial Nests

50 artificial nests were set up in the islands: 36 were set up in 2 transects that went from the periphery to the center of the islet (18 in the south-north oriented transect and 18 in the west-east transect), and the remaining 14 nests were set up in the periphery of the island. Artificial nests were built similar to those previously done in other islands, particularly Madeira. These were made of wood (20 x 20 x 10 cm) with a hole done in one of the walls where a metal thin exhaust tube (~70 cm long and 9 cm diameter) was attached (see Figures 9 and 10). The nest was dug and set up in places where there were already nests from the previous year during the non-breeding season (beginning of November 2018) to avoid the risk of destroying potential occupied nests.



**Figure 9.** Transporting artificial nests to the islet of Laje Branca.



**Figure 10.** Setting up of new artificial nests in Laje Branca, November 2018, in preparation of 2019's season.

### Natural Nests

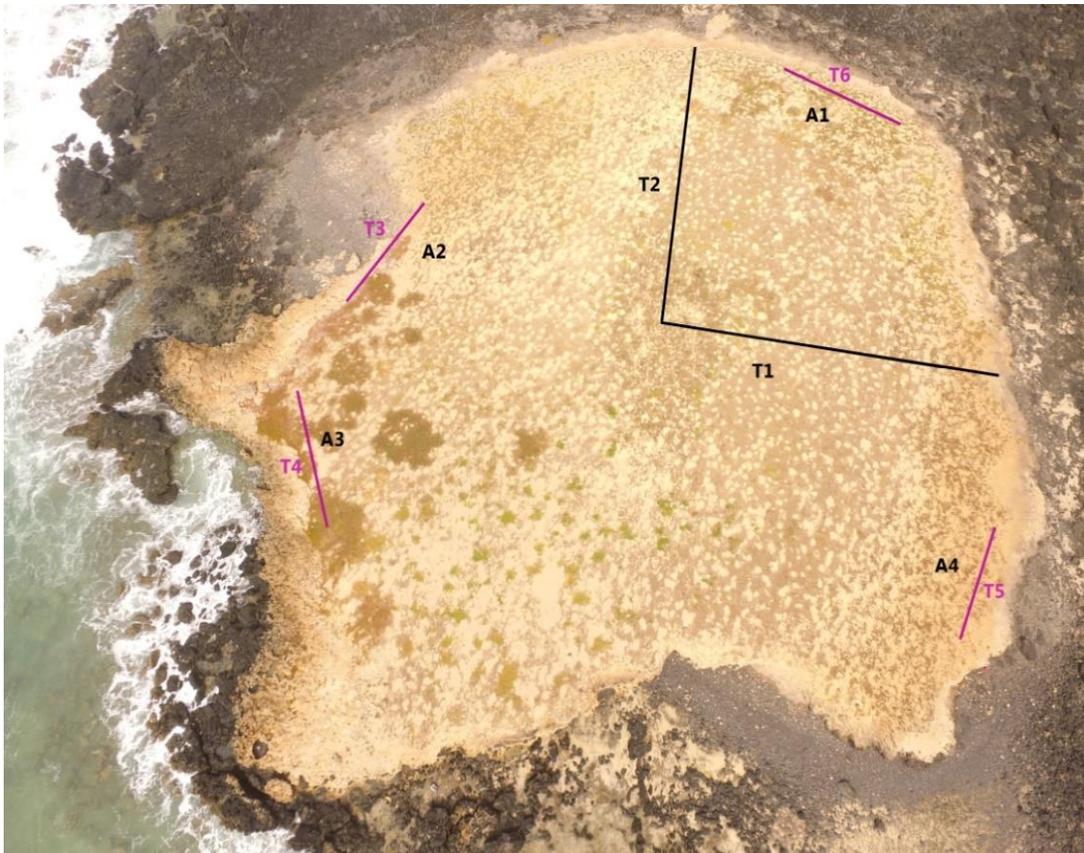
Natural nests within all 6 transects would be marked with a flat stone with the correspondent alphabetic letter if found to be occupied (adult and egg, egg or chick), and be checked from that moment onward.

### Population Estimates

Population estimates was done by using a set of different techniques: 1) checking the proportion of occupancy and density of active burrows vs all burrows found per transect; 2) by doing the same to 4 areas in the periphery where inspected burrows would be counted against the total number of burrows of each of the 4 areas (Figure 11); 3) using the artificial and natural nests; 4) as well as capture/recapture data from night captures.

Once a week, all burrows were counted within the 6 transects to check occupancy and density. A burrow was determined as active (nest) if they contained a new vegetation, sand accumulated outside the burrow, a chick, egg or an adult with an egg. The burrows in the transects were checked with an endoscope that allowed to confirm whether the active burrow

became a nest. However, the burrows in the 4 areas in the periphery were not possible to check with the endoscope without destroying more nests and were classified as active burrows by simply observing and noting if they had sand accumulated outside the burrow (burrows that had been inspected by the petrels). This was checked by cleaning and evening the sand outside the burrows in those 4 areas the day before counting the active burrows. The next day, there would be new sand accumulated from the night activity.



**Figure 11.** Aerial picture of Laje Branca islet showing the estimated positions of transects 1-6 (T1-T6) as well as the 4 areas to estimate occupancy (A1-4).

## Predation

Predation was studied by looking at how many birds were killed per week. Every week the team went to the islet, it would note and collect all dead birds. The team also tried to take pictures of possible predators. In addition, more detection tunnels were used occasionally to check for invasive species (mice) in the islet.

## RESULTS

Night captures of the white-faced storm petrel (*P. marina*) in Laje Branca continued in 2019 which resulted in a total of 147 captured birds, from which 130 were new captures. These numbers are low in comparison to 2018 probably mainly due to the lower in the number of capture events (from 7 in 2018 to 3 in 2019) because of bad weather. In addition, FMB increased the number of artificial nests from 26 (2018) to 50 in the islet to better monitor the breeding success of the species. Comparison of the data between the last 2 breeding seasons (2018 & 2019) showed that ~41% of the animals showed nest fidelity until predation of birds increased highly and jeopardized the analysis. Due to this high level of predation by 2 ravens, several of the hypothesis being tested were not fully achievable and conclusions are not well defined. 26 of the 50 artificial nests were destroyed by the ravens and at least 205 white-faced storm petrels were predated. No natural nest was found occupied in 2019 but this was probably a result of the destruction caused by the ravens (several natural nests were observed to have collapsed). In summary: 37/50 artificial nests were occupied. All occupied artificial nests had eggs. From the 37 eggs only 19 survived predation, however 1 of those chicks was predated after hatching.

### Night Captures

A total of 3-night captures were done in 2019, resulting in a total of 147 birds captured, from which 130 were new captures. See table below for summary of night captures (6/2, 24/4 and 29/5/2019) and of birds ringed from the artificial nests. \* 1 bird recaptured was ringed in 2017 and 7 recaptures were from birds ringed in 2018. \*\* 14 birds recaptured from 2018 and 1 from 2017. 2 birds observed from 2018 in the artificial nests were predated by the ravens.

	06/02/2019	24/04/2019	29/05/2019	Animals ringed from artificial nests	TOTAL
New captures	67	51	12	27	157
Recaptures	13*	2	2	15**	32
Total	80	53	14	42	189



**Figure 12.** Setting up of the mist nets for a night capture of *Pelagodroma marina* in L. Branca islet, April 2019.

## Monitoring of Nests

**A total of 50 artificial nests were monitored throughout the season of which 37 were occupied. No artificial nests were found to be occupied.**

### Artificial Nests

37 out of the 50 artificial nests were occupied by petrels (observed with an adult and egg, or just an egg), which makes 74% of occupancy for 2019: 16 occupied nests in transect 1 (T1), 14 occupied nests in T2 and 7 occupied nests at the periphery of the islet. From the occupied artificial nests, a total of 27 adults were ringed in 2019 or were found ringed from previously years, and 15 chicks were ringed. In addition, 19 eggs hatched and from the 19 chicks, one was found dead.

From the 27 adults of the artificial nests, 12 new animals were ringed in 2019. The remaining 15, 14 were first ringed in 2018 and 1 was ringed in 2017. These recaptures make up ~52% of the total ringed adults in the artificial nests 2019.

The 2 brown-necked ravens (*Corvus ruficollis*) that were observed regularly around the islet destroyed 26 out of the 50 artificial nests.



**Figure 13.** A *P. marina* chick inside an artificial nest, reproductive season 2019.



**Figure 14.** One of the many artificial nests, destroyed by the 2 ravens, February 2019.

## Natural Nests

This year, FMB found no natural nest occupied. We believe it was partly the result of the predation by the ravens and the susceptibility of natural nests to collapse due to the intervention of the ravens.

## Population Estimates

Population has been previously estimated at 648 breeding pairs, 1296 white-faced storm petrels (Gemma Charles, MSc Thesis 2017). So far, FMB has ringed a total of 606 (53 (2017) + 396 (2018) + 157 (2019)) from both night captures and monitoring of artificial nests. If the estimate done by Charles was correct, that means that we have currently ringed ~47% of the population in the last 3 breeding seasons.

## Predation

Predation was found to be mainly done by 2 brown-necked ravens (*Corvus ruficollis*) that were often observed in the islet. It resulted in at least 205 white-faced storm petrels predated by the ravens, although the number of dead birds is likely to be higher.

This was the first time that the team was able to identify the cause of the deaths of *P. marina* after several FMB members directly observed ravens killing the birds during daytime.



**Figure 15.** A dead *P. marina* in Laje Branca islet, January 2019 with brown-necked raven footprints (*Corvus ruficollis*) next to it (inside yellow circle).



**Figure 16.** Dead *P. marina* found in Laje Branca islet in January 2019 with several raven footprints around it.



**Figure 17.** Brown-necked ravens (*Corvus ruficollis*) often seen in L. Branca islet in 2019 season. This was the confirmation that the ravens were killing the white-faced storm petrel. Note one of the ravens with a *P. marina* in its bill, February 2019.

In summary, in relation to the aims, FMB accomplished the following:

- **Determine whether breeding pairs show fidelity to mate fidelity** - FMB observed 3 breeding pairs that went to the same artificial nests than in 2018 and the pairs consisted of the same individuals in the same nest.
- **Determine whether breeding pairs show nest fidelity** - approximately 41% of the birds found in the artificial nests in 2018 returned to the same nests in 2019. This number could potentially be higher, due to the possibility that field technicians consistently missed one individual from a breeding pair on all nest visits (eg.: they were away from the nest or could have been predated)
- **Continue building up the baseline database with further captures (ringing, collection of morphometric data, collection of blood and feather samples)** - data continued to be collected throughout the season
- **Determine whether the direction of nest opening, wind direction, type of floor and vegetation cover influence nest choice** - data analysis will be carried out later in 2020
- **Identify which predators are eating: 1) the eggs and 2) the adults** - predators confirmed for adults - 2 ravens that killed at least 205 petrels of this population. For chicks, FMB tried using a small trap camera in a modified lid however it did not work due to the focus of the camera not working for such close distances. FMB will be looking for smaller spy cameras that could fit in the artificial nests and focus in very short distances
- **Carry on community work: talks on the breeding ecology of the *P. marina* in Laje Branca on all 13 communities as well as on schools** - done to introduce the project to the communities and also to provide the results of 2019 breeding season. In addition, several educational activities were also carried out.

# DISCUSSION

Overall fieldwork went well in 2019. FMB was able to collect further data on the breeding ecology of this species, particularly on duration of each breeding phase, monitor families, chicks and also ring another sample of the population and collect further morphometric data, feathers and blood samples for future analysis.

In addition, this year's data allowed to start a preliminary estimate of nest and partner's fidelity of this species even though the ravens had an impact on this study and therefore data is still not enough to confirm it.

The very high level of predation by 2 ravens resulted in ~16% of the petrel population being killed in one season only. This is of great conservation concern because if it continues over the years, it could mean that the population could become extinct in the next 5.35 years, having in mind 205 birds were killed by only 2 ravens. If the ravens stay around and start to reproduce, the population could become extinct much earlier than that if nothing is to be done.

Ravens have also become a problem for other bird species such as the Kentish plover (*Charadrius alexandrinus*) and the cream-coloured courser (*Cursorius cursor exsul*) in Maio. They are also an issue for other bird breeding species in other islands, such as Boavista. Studies suggest that under favourable conditions such as a rich food source and availability of suitable night roosts, non-breeding ravens may settle in very small areas for a long time (Loretto *et al.* 2015). Given the situation in Laje Branca, FMB is currently looking and testing short term solutions using raven traps (catch and relocate them, Butchko & Small, 1992; Kövér *et al.* 2018) and deterrents (Barker *et al.* 1977; Nicolaus *et al.* 1989; Avery *et al.* 1995). In some places lethal methods are used to control corvid populations (Kövé *et al.*, 2015; Kövé *et al.* 2018), outside their breeding season, however there is controversy in the use of these methods and this is thought to be a short term solution only, as they can quickly recolonize. A long-term solution suggested by Kövé *et al.* 2018 is to improve waste management by working alongside the local Council. FMB will try some of possible solutions whilst also monitoring the raven population of the island.

## NEXT STEPS

- Continue building up the database and knowledge of the white-faced storm petrel in Laje Branca
- Continue to increase the number of ringed individuals of this population
- Continue studying nest and partner fidelities
- Develop a contingency plan for ravens, in case it is needed
- Monitor the raven population in the island (e.g.: identify potential nesting sites)
- Work together with the local Council on the waste situation in the island (e.g.: in the creation of better places to hold the rubbish bins so that they are not thrown to the floor and be opened for animals)

# FINANCIAL STATEMENTS

The funding from the Seabird Group helped contributing towards the whole Laje Branca monitoring project. All the money received was spent and there was additional co-funding of other projects. Note: the co-funded does not include the price of previous bought field material still currently being used.

DESCRIPTION	BUDGET (GBP)	BUDGET (CVE)	SPENT (CVE)	Co-funded by other projects (CVE)
Laje Branca Project	400	49472	49472	22850

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