



Report Control Plan for Mammals on Barreta Island

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Report of the Action A3 of the project LIFE Ilhas Barreira

SPEA

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Photos

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EXECUTIVE SUMMARY

Location	Ilha da Barreta (327 ha), on Barrier Islands (Ria Formosa Natural Park)
Target species	Feral cats <i>Felis catus</i> , Brown rat <i>Rattus norvegicus</i> , Black rat <i>Rattus rattus</i>
Benefited species	Audouin gull <i>Larus audouinii</i> , Little tern <i>Sternula albifrons</i> , passerines, native reptiles and arthropods
Island Description	Medium-sized sandy island with approx. 327 ha. Fixed coastal dunes with herbaceous vegetation (grey dunes). An island without a resident population (excepting one fisherman), but with the constant human presence of tourists, fishermen and restaurant workers.
Climate	Mediterranean
Methods	<p>For cat control, live traps will be set, on Barreta island, with the support of Animais de Rua. Captured cats will be taken back to the mainland, evaluated by a veterinarian, neutered and released in a cat colony in Faro.</p> <p>Rats will be controlled in areas near Audouin's gull breeding areas and potential entry zones, with 42 <i>Goodnature</i> traps. A toolkit with 10 <i>Goodnature</i> traps will be available for deployment on Little tern breeding areas.</p>
Timeframe	<p>Cat trapping campaigns will be scheduled between March to May and September to November in a 4-day period from 2021 until the end of the project (2023).</p> <p>The installation of <i>Goodnature</i> traps for rat control will begin in February 2022.</p>
Improvements for Conservation and Biodiversity	Improvement of the breeding conditions of seabirds and land birds breeding on the island. Improvement of native vegetation, other native species and sensitive habitat.
Economic Benefits	Ecological improvements may enhance conditions for visitors and increase eco-tourism.

RESUMO EXECUTIVO

Localização	Ilha da Barreta (327 ha), nas Ilhas Barreira (Parque Natural da Ria Formosa)
Espécies-alvo	Gato assilvestrado <i>Felis catus</i> , Ratazana-castanha <i>Rattus norvegicus</i> , Rato-preto <i>Rattus rattus</i>
Espécies beneficiadas	Gaivota-de-audouin <i>Larus audouinii</i> , Chilreta <i>Sternula albifrons</i> , passeriformes, répteis e artrópodes nativos
Descrição da ilha	Ilha de areia de tamanho médio com aproximadamente 327 ha. Dunas costeiras fixas com vegetação herbácea (dunas cinzentas). Ilha sem população residente (exceto um pescador), mas com constante presença humana de turistas, pescadores e trabalhadores do restaurante.
Clima	Mediterrâneo
Métodos	<p>Para o controlo da população de gatos, serão montadas armadilhas, com o apoio da associação Animais de Rua. Os gatos capturados serão levados para o continente, seguidos por um veterinário, castrados, e soltos numa colónia de gatos em Faro.</p> <p>Os ratos serão controlados em áreas próximas às áreas de reprodução das gaivotas-de-audouin e zonas de potencial entrada, com 42 armadilhas Goodnature. Um kit com 10 armadilhas Goodnature estará disponível para implantação nas áreas de reprodução de chilreta.</p>
Calendarização	<p>As campanhas de captura de gatos serão programadas entre janeiro a maio e de setembro a novembro em períodos de 4 dias. Tiveram início em 2021 e durarão até ao final do projeto (2023).</p> <p>A instalação das armadilhas Goodnature para controlo de ratos começará em fevereiro de 2022.</p>
Melhoria para a Conservação e Biodiversidade	Melhoria das condições de nidificação de aves marinhas e de aves terrestres na ilha da Barreta. Melhoria da vegetação nativa, e de outras espécies nativas e habitats sensíveis.
Benefícios Económicos	O restauro ecológico pode melhorar as condições para os visitantes e aumentar o ecoturismo.

1 | Background

Introduced mammals pose serious threats to the survival and breeding success of seabirds (Towns *et.al.* 2011) and land birds (Bonnaud *et al.* 2011), can have a great impact on native vegetation and facilitate the dispersion of invasive plants (Harper & Bunburry, 2015; Wolf *et al.* 2018). For the vulnerable Audouin's gull and Little tern, the presence of cats and rats can cause the abandonment of breeding colonies and increase mortality by predation of eggs and chicks (Gallo-Orsi 2003).

On Barreta Island, rats and cats were known to be present, but their status was mostly unknown until data, on abundance and seasonal fluctuations, were collected at the beginning of this project. We estimated that the population of cats on Barreta island consisted of 7 to 10 adults, widespread throughout the island. Regarding the rodents, we identified the presence of a native species, the Algerian mouse *Mus spretus*, with fluctuations that ranged from 800 to 5000 individuals in the entire island, and two invasive species, the Brown rat *Rattus norvegicus* and the Black rat *Rattus rattus* (Fig. 1). On Barreta Island, the distribution of rats is somewhat localized in specific areas with low abundance levels but enquires to the resident fishermen and visitors reported occasional outbreaks of rats near the harbor and in the lagoon on the west side.

The control of invasive mammals is essential to avoid predation of breeding seabirds, land species and threatened flora. And it will only succeed if rigorous mitigation and specific biosecurity measures are implemented, coupled with awareness campaigns directed to the local community and other users (e.g., tourists).



Figure 1 | Algerian mouse (top left), Brown rat (top-right), and feral cat (bottom) identified on Barreta island.

2 | Methodology

2.1 Pre-control

Before the attempt to control invasive mammals on Barreta Island, a set of methodologies were implemented to identify the species present on the island, their abundance, and the hot spots of cats and rodents' activity. This information is crucial to guarantee the success of control measures.

2.1.1 Cats

Camera-traps

A set of 22 camera-traps was installed on Barreta Island in a 500x500m grid. Cameras were preferably set in passageways used by cats. Cameras were active from January 2020 to February 2021. Memory cards and batteries were replaced once a month, and all images were processed using Timelapse software. A collaboration with Microsoft was set to use their MegaDetector to help with image processing. The use of camera traps proved to be useful to individually identify cats and allowed to obtain an accurate estimate of cats present on the island.

Spotlighting

Spotlighting is a useful tool to survey feral cats, as they became easier to spot through the eye-shine caused by the reflection of the spotlight's beam. One transect covering the entire Barreta Island was sampled every month from February 2020 to February 2021. The transect of 5.49 km long was initiated at sunset or two hours before sunrise, for three consecutive days.

Track counts

To monitor cat footprints, 56 tracking stations placed 100 m apart were marked on Barreta Island. In each station point, a transect of 1x8 m was selected. The presence of cat tracks on the transects was registered during three consecutive days every month from February 2020 to February 2021. To assess the potential of cat entry on Barreta Island, tracking stations were monitored (twice a year) on Ancão Peninsula and Culatra Island. To evaluate the presence of cats on the other Ria Formosa islands (Armona, Tavira and Cabanas), tracking stations were also monitored twice a year.

Occasional sightings

Occasional observations of cats and their tracks and scats were also used to map their distribution on Barreta Island, including enquires to inhabitants, fishermen, and restaurant workers. Cat scats were collected for posterior DNA and diet analysis.

2.1.2 Rodents

Capture-recapture

Two grids of 9×7 traps, spaced 12.5 m, were set on Barreta Island, with one grid located near the restaurant, and the other located near the Audouin's gull colony. In each grid were placed 20 Sherman® traps and 43 Pest-stop® trip-traps, and grids were sampled once a month over one year (From January 2020 to February 2021). Each trapping session included two nights of pre-baiting (where traps were baited but kept blocked) followed by four nights of active trapping. During the summer of 2021, extra sampling was performed around the pier (east side) and in the lagoon (west side), as there was evidence of the presence of rats in these areas.

In 2021, extra sampling was also carried out (twice a year) in the neighbouring islands of Culatra (May and October) and in the Ancão peninsula (April and November). Each captured rodent was marked with a unique numbered earring on the posterior part of the ear, a tissue sample from the ear was collected for DNA analysis, as well as some morphometric data.

Sightings

Occasional observations of rodents, their tracks, scats, and other signs, were also used to map rodents' distribution on Barreta Island. Information was also gathered from enquires to inhabitants, fishermen, and restaurant workers.

2.2 Control

2.2.1 Cats

Cats will be controlled in Barreta Island through a Trap-Neuter-Release (TNR) program, by which cats are trapped, neutered, and then released. To mitigate the impacts of cats on the island's fauna, captured cats will not be returned to Barreta, but relocated to a cat colony in Faro. Live-traps are a humane and safe tool to capture cats without causing significant injuries (Fig. 2) and allow captured non-target animals to be released unharmed. Cat trapping will be carried out in areas where the highest activity has been recorded during the pre-control monitoring, such as near the restaurant, boardwalk, and in the lagoon on the west end of the island (Fig. 3). The location of the traps throughout the campaigns will be adjusted to the activity areas of the remaining cats, through continuous monitoring of cat activity. Before each trapping campaign, lures will be placed in the capture areas so that the cats can get used to being fed. Lures will consist of wet cat food and/or canned fish, but for the trapping sessions, other visual and sound decoys will be tested. Each trapping campaign will last for four days with 2-8 traps set in the field and executed by a group of 2-4 people. During the four days of the campaign, traps will be deployed only during the night and visited early in the morning. Occasional visits to the traps during the night may be justifiable to secure cats' welfare. At least four campaigns per year are planned, depending on the number of cats present on the island. These will be scheduled between January to May and September to November, avoiding the months with harsh weather conditions, and with a large influx of tourists and visitors to the island.

Before each trapping campaign, the veterinary clinic is informed and is prepared to receive cats at any time. Trapped cats will be delivered to the veterinary clinic as soon as possible. Until then, cats will be kept closed in a transportation box in a dark room and fed regularly. After neutering, cats will be reallocated in a cat colony near Praia de Faro. The process of release will have a 3-week habituation stage, in which the cat is kept in a large trap in the colony and fed regularly. This will

allow the cats to get used to feeding places, people, and other cats in the colony. The process of neutering and cat reallocation will be coordinated by Animais de Rua.



Figure 2 | Live-trap (right) used for capturing feral cats, and captured cat (left) on Barreta Island during one of the cat trapping campaigns.



Figure 3 | Map of cat distribution on Barreta Island, based on track counts (grid) and cat sightings during spotlighting transects (black dots)

2.2.2 Rodents

Goodnature traps are auto-reset traps powered by compressed CO₂ gas that work by striking the skull of the rat killing it instantly (Fig. 4). To safeguard the native Algerian mouse *Mus spretus*, Goodnature traps will not be placed in the entire island, but only in areas where the presence of rats (*Rattus* spp.) has been confirmed (Fig. 5), in potential entry zones and near Audouin’s gull colonies. 42 traps will be set up in a line on the areas mentioned above, with an average distance of 100 meters from each other in areas near Audouin’s gull colonies, and placed 50 meters apart in the harbour and in the lagoon (Fig. 6). To minimize the potential effects on the Algerian mouse population, the base of the trap should be installed vertically at a minimal height of 14 cm from the

soil, so that mice can not easily get inside the trap. The CO₂ canisters should be replaced after 24 strikes (and at least once a year if the the maximum number of strikes is not reached), and lures refilled after three months. The installation of *Goodnature* traps for rat control will begin in February 2022 and, the control period will last until December 2022. After deployment, each trap will be checked for the number of trigger events and rodents killed, during the first six days, and after this period, monitoring will take place once a month. The monitoring of 42 traps can be done by two people in eight hours.

Also, a kit with 10 Goodnature traps will be available for quick deployment in breeding areas of Little tern (as these areas tend to vary between years). These traps can be installed at the beginning of the breeding season in critical areas, and removed at the end.

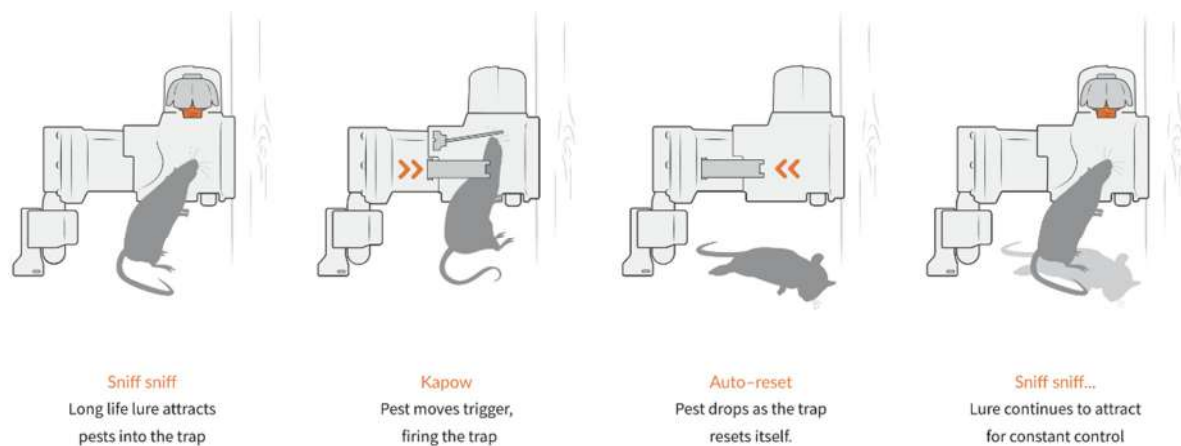


Figure 4 | Mode of operation of the *Goodnature*® A24 self-resetting trap (credits: <https://goodnature.eu/>)



Figure 5 | Map of the distribution of rats (*Rattus* spp.) on Barreta Island, based on occasional sightings, tracks, and scats.



Figure 6 | Location of the Goodnature traps that will be set on Barreta Island.

2.2.3 Materials

Item	Quantity	Costs (€)
Cat traps	5	300
Cat food	960 kg	1,440
Cat transportation box	5	75
Male cat neutering	-	15 (per cat)
Female cat neutering	-	30 (per cat)
Cat registration + microchip	-	28,80 (per cat)
Veterinary services	-	72 (per cat)
Goodnature traps	57	11400
Goodnature CO ₂ canister	280	1400
Goodnature automatic lure pump	150	1725
Metal pole for trap fixation	57	430
Bolts, nuts and washers	500	100
Trap labels	200	100
Cordless drill	1	350
Hammer	1	25
GPS device	2	700

2.3 Monitoring

2.3.1 Cats

Before and after the trapping campaigns it is essential to keep monitoring cat densities and abundance fluctuations to evaluate the degree of success of cat removal. Monitoring will begin after the first control campaign starts and will involve the same methodologies used during the pre-control phase. A spotlighting survey with one transect covering the entire island will be sampled during the

first hours after dusk for three consecutive days. This transect will be developed every month until 50% of the cats are captured, and once every three months after that. Also, track counts will still be performed for three consecutive days until 50% of the cats are captured. After that, occasional line transects covering the entire island will be sampled to search for cat tracks and scats. Camera traps will be set near the lures used to attract cats to the capture sites, and in areas where cat activity is identified. Enquiries with inhabitants and restaurant workers of Barreta Island will be carried out to evaluate the presence of cats.

2.3.2 Rodents

Monitoring of Goodnature traps will start right after the traps are set in the field and will involve recording the number of times that auto-reset traps are triggered and checking around for dead rodents. The traps will be monitored every day during the first six days after deployment. After this period, monitoring and maintenance of traps will take place once a month. Special attention will be given to the eventual death of non-target species, and if detected, measures will be established to mitigate this impact. Wax-blocks near the *Goodnature* traps will be installed for detection of rodents that may avoid the trap.

2.3 Biosecurity measures

To prevent the arrival of new individuals to Barreta Island and maintain the population of rats under control, the 27 Goodnature traps set around the harbour, and near Audouin's gull colonies, will be maintained and frequently monitored.

An emergency kit, containing cat traps and lures, will be set in Olhão (at Parque Natural Ria Formosa headquarter) which can easily and quickly be installed on Barreta Island, in the case of a cat is detected or suspected to be on the Island. Pre-training will be given to nature wardens on how to install and operate the traps.

Awareness campaigns on the risks of unintentional reintroduction and abandonment of mammals on Barreta will be directed to the inhabitants of neighbour islands, visitors, students, and the press.

Further measures will be considered and adjusted depending on the results of the control campaign and will be described on the biosecurity plan.

3 | Timeframe

Cat trapping campaigns are conditioned by several factors. The availability to assemble a qualified team is an important factor for the success of the campaigns, as trapping by inexperienced operators can make animals prone to avoid traps. Also, weather conditions during winter can make it difficult for the team to stay overnight on the island, and during the late spring and summer months, the island is visited by a large number of tourists and visitors, which can condition the success of operations. Cat trapping campaigns will be scheduled between March to May and September to November during four days, depending on the availability of a team, and will be performed during years 2021 and 2022, and until every cat is captured. One month before the start of every campaign, food lures will be installed to attract cats to the capture site. The installation of *Goodnature* traps for rat control will begin in February 2022. After deployment, each trap will be checked for the number of trigger events and rodents killed, during the first six days, and after this period, monitoring will take place once a month until the end of the project.

Action	2021												2022					2023			
	J	F	M	-	S	O	N	D	J	F	M	A	M	J	J	A	S		O	N	D
Preparation																					
- Material acquisition																					
- Team assembly																					
Control																					
- Cat trapping campaigns																					
- Installation of <i>Goodnature</i> traps																					
Monitoring																					
- Monitoring of cat activity																					
- Monthly monitoring of <i>Goodnature</i> traps																					
Confirmation																					
- Biosecurity measures																					

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