

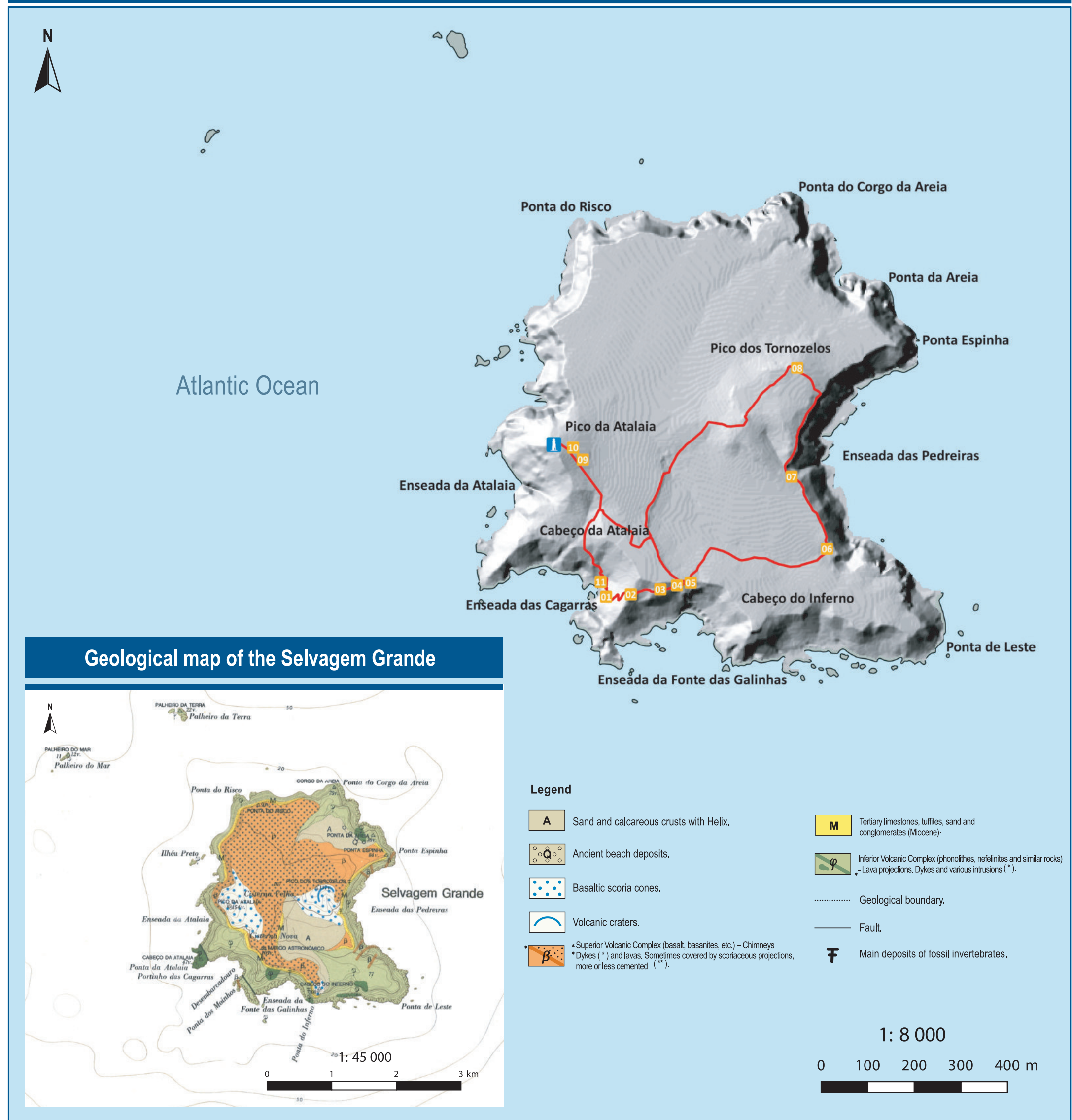
# Selvagem Grande

## Guide to the Natural and Cultural Heritage of Selvagens Island

Please note

- The visit to the Selvagem Grande is only possible with prior authorization from the Institute of Forests and Nature Conservation (IFCN).
- The visitor is the sole responsible for the visit.
- During the visit, due precautions should be taken, taking into account terrain and weather conditions and other hazards.
- Appropriate footwear and clothing should be worn for the course (in uneven ground).
- The user must respect the natural heritage keeping it intact.
- The impact of your actions should be minimal, and must stay always within the path.

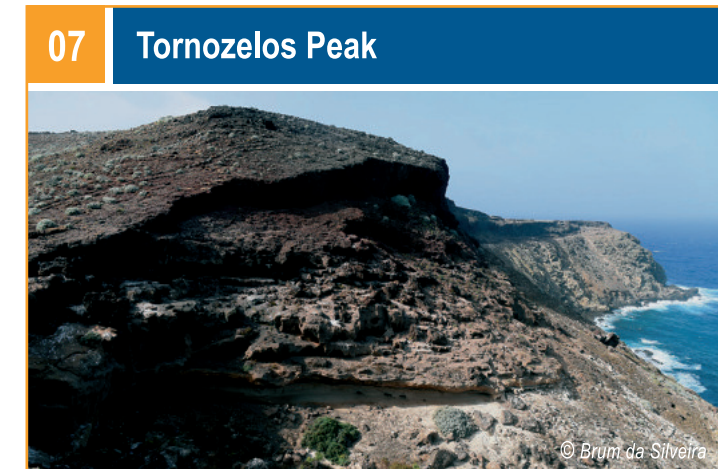
# Guide to the Natural and Cultural Heritage of Selvagem Grande



**06 Wave-Cut Surface**

The Enseada das Pedreiras cliff is a privileged vantage point for observing the geological sequence of Selvagem Grande. At the base, between 0-75 m, rises the Inferior Volcanic Complex (IVC) (see site 4). Above this formation, one can observe an almost horizontal wave-cut surface that formed during a period of volcanic dormancy, between 24-12 Ma, that led to the complete or almost complete erosion of the proto-island, by the sea. On this abrasion surface, in a marine environment, light-coloured calcareous sediments, between 1 and 3 m thick, were deposited (see site 3). On top of those sediments lay the 3.4 Ma lava flows that form the Superior Volcanic Complex (see site 5). The presence of structures formed underwater at this altitude is evidence of the island uplift to its current position.

Captain Kidd's Furna is in this cove. Its name is a reference to the famous pirate, William Kidd, although there is no evidence that he set foot on these islands.



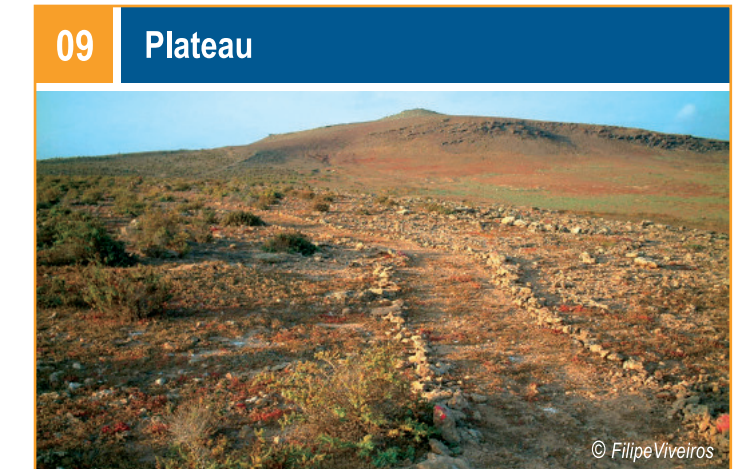
**07 Tornozeiros Peak**

This 3.4 Ma, 136 m high cone is formed by pyroclasts from the Superior Volcanic Complex, and in here one can observe part of the crater rim that opens towards the south-east. On the top, there are two basalt outcrops rich in olivine phenocrysts. Several basalt rocks here have cavities filled with minerals like chalcodony.



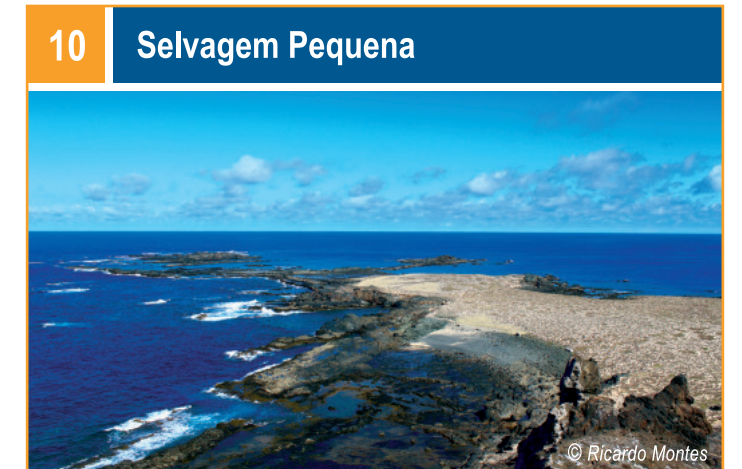
**08 Chão dos Caracóis**

On the north-eastern part of the Selvagem Grande plateau, between Ponta do Corgo da Areia and Ponta Espinha, there is a vast white-coloured area where, at close range, one can observe several fossilised and sub-fossilised snail shells of the *Theba macandrewiana* species, an endemism that still exists today. There are millions of shells, either loose or stuck to the sandy sediments from the Quaternary period that cover the Superior Volcanic Complex. Those numbers are an indicator that, in the past, this species was much more abundant on the island than it is now, due to a wetter climate.



**09 Plateau**

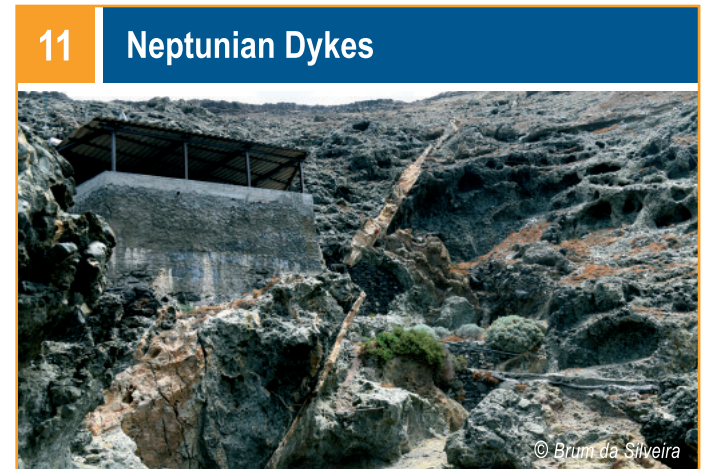
The top of Selvagem Grande consists of a sub-horizontal plateau that resulted from the formation of the Superior Volcanic Complex, which covered a large part of the island. There were, at least, three major eruptive sources: the volcanic cones of Atalaia (Pico da Atalaia), Tornozeiros (Pico dos Tornozeiros) and Inferno (Cabeço do Inferno), the latter already eroded. A lava flow ran from Inferno to the NW, towards the "astronomical landmark", and was subsequently covered with a basaltic flow coming from the opposite direction, expelled by the Atalaia cone. The flows from the Tornozeiros cone slid to the NE, towards Ponta Espinha. To the NW, the lava reached the flows from the Atalaia cone. This overlap of fluid lava flows filled surface irregularities, forming the flat relief observed today at the top of the island.



**10 Selvagem Pequena**

The top of Atalaia peak is a privileged spot for observing Selvagem Pequena and its islets, about 20 km to the south west. In geological terms, this group is connected to Selvagem Grande by the -500 m depth line. There one can find the oldest known rocks of the Selvagens, which are around 29 Ma old. The Miocene carbonated sediments and Superior Volcanic Complex seen on Selvagem Grande are non-existent on this island and it is not known whether they were formed and subsequently eroded or not formed at all in there. Like Selvagem Grande, it is also covered with Quaternary sedimentary deposits.

From here, one can also see Teide peak on a clear day. Located around 220 km to the south, on the island of Tenerife, Canary Islands, it is one of the largest volcanoes in the world.



**11 Neptunian Dykes**

The "Neptunian dykes" of Selvagem Grande are a rare example of geodiversity. They were formed when fractures were filled with non-consolidated sediments and calcareous sands that were subsequently cemented by carbonated fluids. Contrary to volcanic dykes that are formed by the magma rising and cooling inside fissures, neptunian dykes result from those fractures being filled with sediments due to the influence of gravity.

**Geological evolution**

The Selvagens Islands are comprised of two shield volcanoes rising 4000 metres above the seafloor and joining together at the depth of -500 m:

1. Formation of the submarine volcanic edifice;
2. Emergence of Selvagem Grande and Selvagem Pequena islands, more than 29 million years ago (Ma);
3. Phonolite intrusions during the latter stage of the shield volcanoes, that form the Inferior Volcanic Complex (IVC). Dating indicates an age of about 29 Ma on Selvagem Pequena and 26-24 on Selvagem Grande;
4. Between 24-12 Ma, there was a pause in volcanic activity accompanied by a high erosive rate. An abrasion platform containing calcareous deposits, visible on Selvagem Grande, is formed. Formation of "calcareous or neptunian dykes", when carbonate sediments occupied existent fissures and cracks;
5. Between 12-8 Ma, volcanic activity started again on Selvagem Grande, which is evident from the different dykes that cross the calcareous sediments and the IVC. Subaerial structures associated with these eruptions were already eroded;
6. Between 8-3.4 Ma, there was another pause in volcanic activity. Deposition, in Selvagem Grande, of a conglomerate that resulted from the erosion of the IVC, in a submarine/intertidal setting;
7. 3.4 Ma ago, a new phase of volcanic activity gives rise to the Superior Volcanic Complex (SVC) on Selvagem Grande (does not occur in Selvagem Pequena). The first eruptions were submarine, followed by subaerial ones. Alternating effusive and explosive eruptions that formed the Atalaia, Tornozeiros and Cabeço do Inferno peaks;
8. Deposition of sedimentary formations during the Quaternary, evident in both Selvagem Grande and Selvagem Pequena. Littoral sediments can be found at the base of the formations while calcareous organogenic sands containing terrestrial gastropod fossils are found at the top. Uplift of the islands by at least, 50 meters.

**01 Basaltic Dyke**

This basaltic dyke, like several others here, was formed when the magma solidified inside a fissure. It crosses the Inferior Volcanic Complex (IVC), making it younger than it. This dyke does not intersect the Miocene carbonated sediments, and so, it is older than them.

**02 Prismatic Disjunction**

In the Enseada das Galinhas, there is a prismatic disjunction in phonolitic rocks of the Inferior Volcanic Complex. Despite being considerably weathered, its characteristic columnar structure is still preserved.

These columns or prisms are a result of the contraction of the lava as it cooled. As the lava solidifies, it breaks to relieve the inside pressure, forming a polygonal pattern. Although many of the columns have six sides, there are also some with four, five, seven or eight. Their degree of perfection depends on the thickness and composition of the lava and its cooling rate.

**03 Miocene sedimentary sandstone deposits**

Around the island perimeter, at an altitude of 75-90 m and overlapping the rocks of the Inferior Volcanic Complex (IVC), there are sedimentary deposits of a white/yellowish colour with a variable thickness of 1-3 m. They consist of fossils, well calibrated IVC sediments and carbonate cement. They were deposited in a marine environment on a wave-cut platform formed by the erosion of the proto-island during a period of volcanic dormancy, between 23 and 13 Ma ago, during the Miocene.

**04 Cabeço do Inferno**

This 107 m high peak is formed by basaltic flows from an already-eroded volcanic cone that belonged to the Superior Volcanic Complex (SVC), and it lays on top of the Inferior Volcanic Complex (IVC). On the cliff, a wave-cut surface can be seen separating the lighter-coloured IVC from the darker-coloured SVC.

The deeply weathered IVC, aged between 27 and 24 Ma, forms the bulk of the island and is visible in all cliffs up to 70-90 m high. It is mainly formed by nephelinites and phonolites, often rich in phenocrysts, that alternate, at some points, with subaerial volcanic breccias and tuffs, which indicates a succession of effusive and explosive volcanic eruptions. It is crossed by a dense dyke network (see site 1), which plays an important role in supporting and protecting the surrounding rocks. It is here that we can find the 138.5 m long Furna do Inferno, which is the largest cave in the Selvagens Islands.

**05 Basaltic flows in the Superior Volcanic Complex and Atalaia Peak**

From this point, one can see basaltic flows with prismatic disjunction from the Superior Volcanic Complex (SVC). These columns or prisms are a result of the contraction of the lava as it cooled. As the lava solidifies, it breaks to relieve the inside pressure, forming a polygonal pattern.

Around 3.4 Ma ago, the SVC covered the former eroded island structure with a thin volcanic sequence. It is characterised by incoherent volcanic tuffs and lapilli at the base and lava flows at the top. The first eruptions were submarine and became subaerial, as evidenced by the reddish scoria and lapilli. Explosive activity alternated or was contemporary with effusive activity.

The Atalaia Peak (Pico da Atalaia), the highest point on Selvagem Grande, is one of the volcanoes of the SVC. It is a 163 m high loosely cemented pyroclasts and scoria cone. Preto Islet, to the west, is the result of a lava flow that ran into the sea from this volcanic cone.

**Information**

Location area (km <sup>2</sup> )	2.4
Perimeter (km)	10.2
Maximum altitude (m)	163
Maximum length (m)	1850
Maximum width (m)	1530

**Useful contact information**

Emergency number	112
Institute of Forestry and Nature Conservation	291 740 060
Regional Secretariat for Environment and Natural Resources	291 220 200



## Protection status



The Selvagens Islands, located around 300 km south-east of Madeira Island, mark the southernmost point of Portugal.

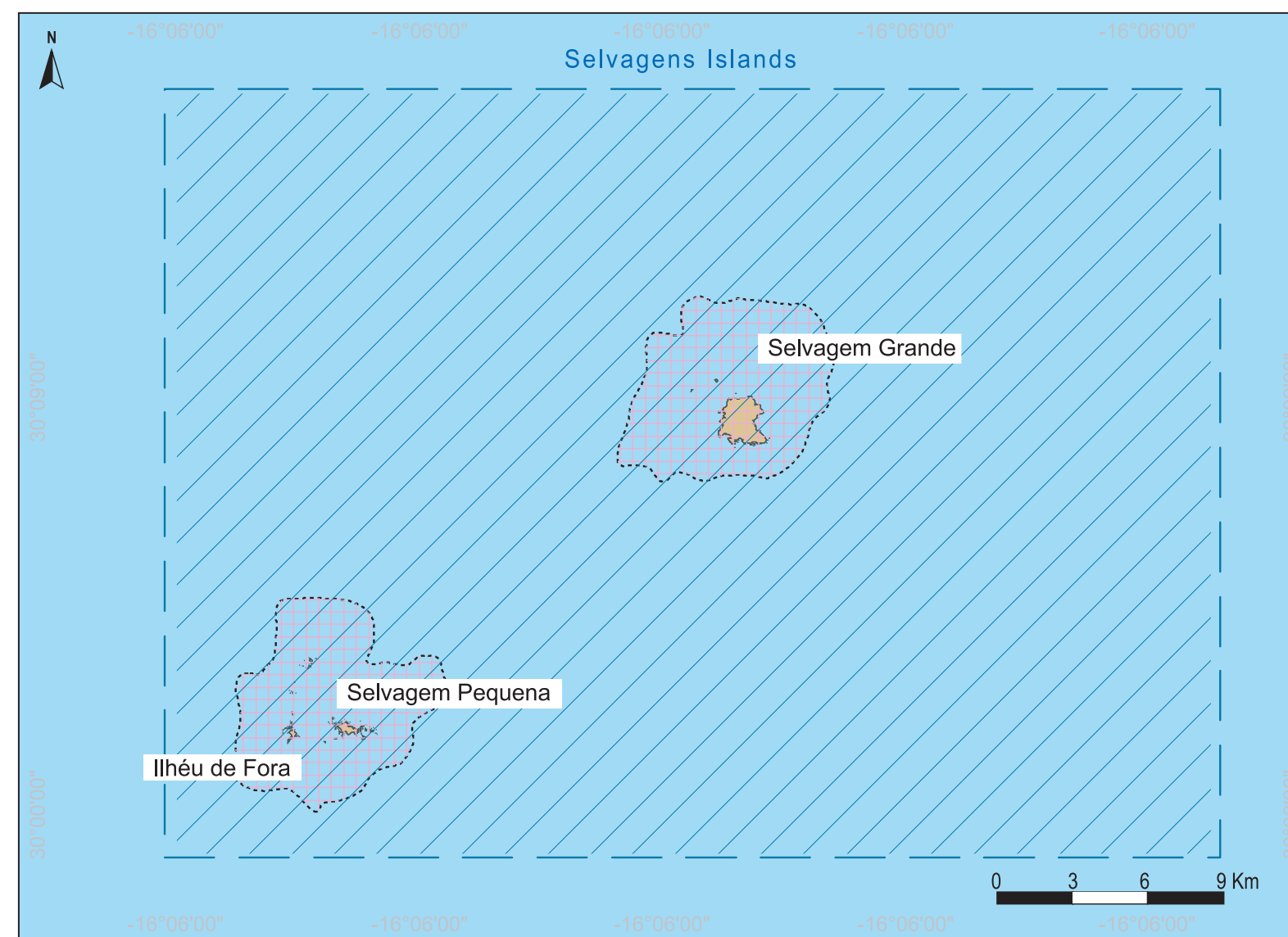
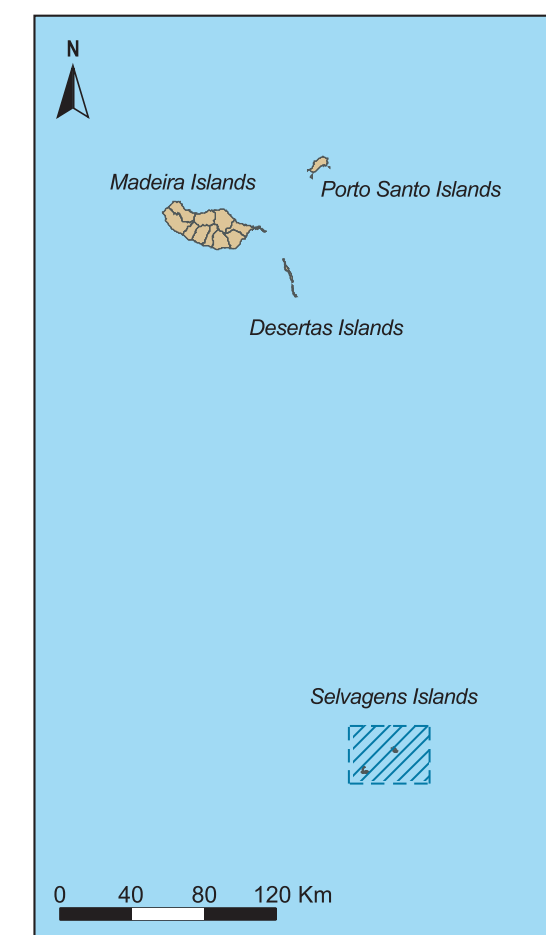
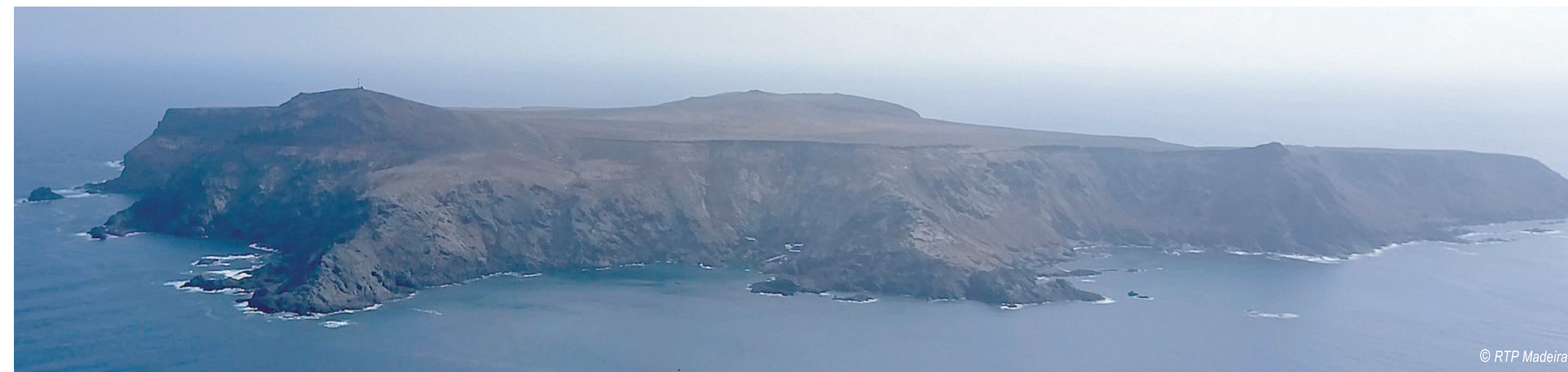
The Natural Reserve of the Selvagens Islands, created in 1971, was the first one in Portugal. It has an area of 95 km<sup>2</sup>, including all islands and islets, and is delimited by the 200 m depth line. The Reserve has been granted an European Diploma for Protected Areas by the Council of Europe since 1992, as a recognition of the great interest of their Natural Heritage, as well as the conservation work performed there.

Two areas comprising the Natura 2000 Network are also delimited: one Special Area of Conservation (SAC), classified under the Habitats Directive, which has an area overlapping the Reserve, and a 1.245 m<sup>2</sup> Special Protection Area (SPA), classified under the Bird Directive, which embraces the Reserve and the SAC, as well as a large marine area that provides protection to a depth of -3.000 m.

They are also classified as an Important Birds and Biodiversity Area (IBA) by *Birdlife International* in recognition of their importance for the conservation of regional seabirds on a global scale.

In 2018, the islands were presented with the GLORES award in the Gold category, becoming a part of the "Global Ocean Refuge System - GLORES", in recognition of the strong protection of the area, its marine biodiversity and the efficacy of the efforts made to know and protect it.

They have been on the Tentative List of Portugal for inclusion as part of UNESCO World Heritage since 2004.



Selvagens Islands Natural Reserve  
 Rede Natura 2000 network  
 Land Area



## Flora and Vegetation

The vegetation of the Selvagens Islands is strongly influenced by the dryness of their subtropical maritime climate, where average annual precipitation is lower than 200 mm. The habitats of interest, like cliffs with endemic flora of the Macaronesian coast and Thermo-Mediterranean pre-desert scrubs are in an excellent state of conservation. Terrestrial flora is characterised by premature growth, a predominance of xerophytic characteristics, succulence, less chloroplasts and the psammophilic or halophilic characteristics of some species.

Of the reported 105 taxa (species and subspecies) of vascular plants, 7 are exclusive to the Selvagens Islands, which makes them the area of the Macaronesian region with the highest endemism rate per unit area. These include *Argyranthemum thalassophilum* (Estreleira), *Monanthes lowei*, *Lobularia canariensis* subsp. *rosula-venti*, *Asparagus nesiotus* subsp. *nesiotus*, and *Euphorbia anachoreta*, the latter only found on Fora islet. Bryoflora includes 16 taxa and is essentially terricolous, being dominated by mosses well adapted to the semi-desertic conditions, like *Riccia atlantica*, endemic to the archipelago of Madeira. 25 taxa of lichens are also reported, amongst which is *Urzela* (*Roccella canariensis*), which grows on the cliffs and was often used to dye fabric with a violet colour.

The Selvagens Islands have the lowest exotic plant taxa (17) in the Madeira region, and they exist only on Selvagem Grande, where important work is being carried out to restore its habitats and species. Selvagem Pequena and Fora islet have no exotic taxa and their ecosystems remain unchanged.

After the successful eradication of rabbits and house mice from Selvagem Grande, the Selvagens became the only invasive mammal-free islands of Macaronesia and the North Atlantic. The restriction of terrestrial vertebrates to their original composition has enabled the scientific study of a type of insular ecosystem that was the most common worldwide before human migration to those lands. As the ecological succession occurs and the island returns to its pristine condition, studies have been developed that will be very useful for the description of the baseline of island communities, for later comparison with other islands whose ecosystems are very degraded due to invasion of mammals and human activity.



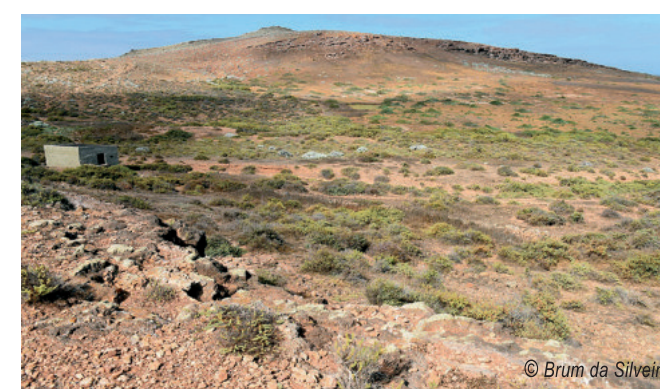
**Lobularia canariensis ssp. rosula-venti.**  
Herbaceous plant, perennial, up to 10 cm high, commonly found on rocks and sandy soil, at an altitude of 0 to 150 m.



**Monanthes lowei**  
Small herbaceous plant, perennial and succulent, frequently found in cracks in rocks, mainly those facing north.



**Urzela (Roccella canariensis)**  
Lichen commonly used in the past in the production of violet pigment to dye fabrics.



**Plateau vegetation**  
Xerophyte vegetation on the plateau of Selvagem Grande. It is characterised by plants tolerant to the dryness and saltiness of the sea air.

## Terrestrial Fauna

There are around 219 taxa (species and subspecies) of terrestrial invertebrates on the Selvagens Islands, of which arthropods represent the highest number (92%). Around 44 taxa (39 species and 7 subspecies) are unique. However, this number is surely underestimated. There are at least 8 mollusc taxa on the Selvagens Islands, amongst which is one endemic species – *Theba macandrewiana*.

There is usually a very small number of terrestrial vertebrate taxa in island ecosystems, with a considerable proportion of endemisms. This general pattern is also applicable to the Selvagens Islands. Here, there are 10 terrestrial vertebrates, whose only two reptiles, the Selvagem Gecko (*Tarentola bischoffi*) and Lizard (*Teira dugesii selvagensis*), are exclusive. Land vertebrate fauna is characterised by the absence of native mammals.

A passerine bird nests in the Selvagens, the Berthelot's pipit (*Anthus berthelotii berthelotii*), which is endemic to these islands and to the Canary Islands. Many other birds visit the Selvagens, occasionally or accidentally, mainly during the Autumn and Spring months.



**Lizard (*Teira dugesii ssp. selvagensis*)**  
A subspecies endemic to the Selvagens Islands. It is present on all islands. It is small in size, diurnal and omnivorous, explores all available resources, from plant matter to animal remains, and is known for its scavenging habits. As a result of its diet, it is a key species of the ecosystem as pollinator and seed disperser.



**Selvagem Gecko (*Tarentola bischoffi*)**  
10,000 individuals of this endemic species are estimated to be present on Selvagem Grande, Selvagem Pequena and Fora Islet. Insectivorous, active at dawn and during the night, frequently found in areas containing soda plants. They mate in Spring, between April and July. They can be found on Selvagem Grande from sea level, along the cliffs, where there are only a few, to the central plateau, where they settle in abundance.



**Snail (*Theba macandrewiana*)**  
A species endemic to the Selvagens Islands. The presence of fossils of millions of snail shells in Chão dos Caracóis indicates a more humid climate in the past, when they were more abundant.

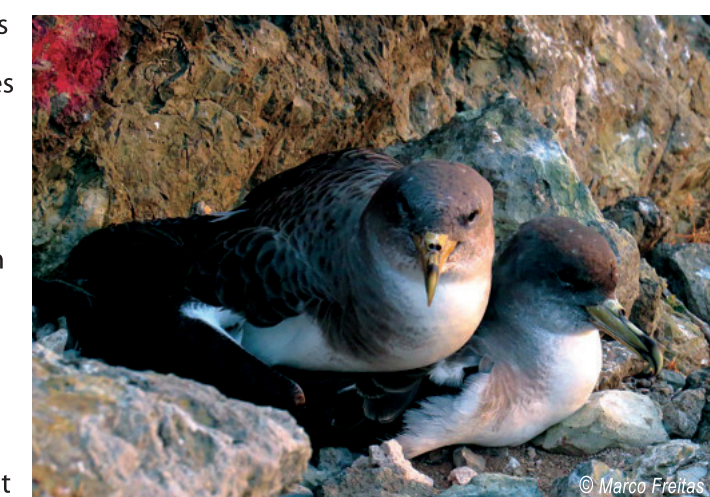


**Berthelot's pipit (*Anthus berthelotii berthelotii*)**  
A bird that can be found all year round on the Selvagens Islands and whose subspecies is the same as that found in the Canary Islands but not in the rest of the archipelago of Madeira. It is around 14 cm long and is characterised by its behaviour, as it runs across the ground, with little vegetation, or undergrowth, along a vast altitudinal gradient. It is more abundant on the plateau and less on the cliffs.

## Marine birds

The Selvagens Islands are one of the major mating areas for marine birds from Macaronesia and the North Atlantic. Nesting marine birds are composed of 8 species belonging to 4 families: Cory's shearwater (*Calonectris borealis*), the white-faced storm petrel (*Pelagodroma marina*), the Bulwer's petrel (*Bulweria bulwerii*), the band-rumped storm petrel (*Hydrobates castro*), the Barolo shearwater (*Puffinus lherminieri baroli*), the yellow-legged gull (*Larus michahellis*), the common tern (*Sterna hirundo*) and the roseate tern (*Sterna dougalli*).

The colony of Cory's shearwaters is the densest in the whole world with over 30,000 mating pairs. However, the colony of white-faced storm petrels is the most numerous on the Selvagens Islands, with a total of over 80,000 pairs. The Bulwer's petrel, band-rumped storm petrel and Barolo shearwater are other marine birds that nest in abundance in here, all of which are protected.



**Cory's shearwater (*Calonectris borealis*)**  
An emblematic species of the Selvagens Islands that has a broad distribution in the Atlantic. It is the largest marine bird of the archipelago, up to 56 cm long and with a 126 cm wing span.

On the Selvagens Islands, free from disruption and predators, Cory's shearwater nests on the ground in the low vegetation, in rock cavities and under large stones. Every year they return to the same nest where they mated for the first time and their partner is almost always the same. Offspring are born in July and in October/November they leave their nests and head out to sea. Adults return the following year, but youngsters stay in the high seas and only return to land 3 to 4 years later. They only nest, on average, when they are 9 years' old.

GPS receivers indicate that most Cory's shearwaters from the Selvagens Islands find their food on the Moroccan coast during breeding time, around 400 kilometres away. They mainly feed on small pelagic fish (scad, mackerel, garfish, etc.).



**White-faced storm petrel (*Pelagodroma marina hypoleuca*)**  
The breeding populations in the North Atlantic settle in the Selvagens Islands and the remainder in the Canary Islands.

They have a very peculiar flight in which they appear to bounce from side to side over the sea surface. They feed essentially on planktonic crustaceans, small fish and other small surface plankton. They make their nests on sandy ground, normally in very dense colonies. They visit the colony only at night during mating season, which takes place between January and August.

## Human Occupation

The Selvagens Islands were discovered by the Portuguese in the 15th century (1438). However, there are earlier accounts of these islands. They were owned by several private entities over the years, but they remained registered in the parish of Sé, municipality of Funchal, until they fell under the administration of the Madeira Autonomous Region in 1971.

There are remnants of their occupancy, since the 16th century, on Selvagem Grande, such as stone walls, a furnace for soda extracted from the soda plant (*Mesembryanthemum crystallinum* and *M. nodiflorum*) and a cistern and respective channels. The stone walls, built by settlers from the Minho and Algarve regions, helped to protect the crops. The existence of a water source, nowadays called Furna da Água, has led to attempts to store and transport it, evidenced by the various ceramic fragments found nearby.

The owners obtained a good source of income collecting natural plants, fishing and hunting. However, the most profitable activity in the history of the Selvagens Islands was the capture of Cory's Shearwater ("Cagarrá"), a pelagic sea bird that nests in these islands. These activities continued until the Reserve was created in 1971. Since then, the Reserve has been dedicated to the conservation and restoration of the ecosystem.



**Stone wall**



**Ancient cistern**



**Old water transport channel from the cistern**

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