



Wideawake Fairs  
Management Plan  
2023-2028



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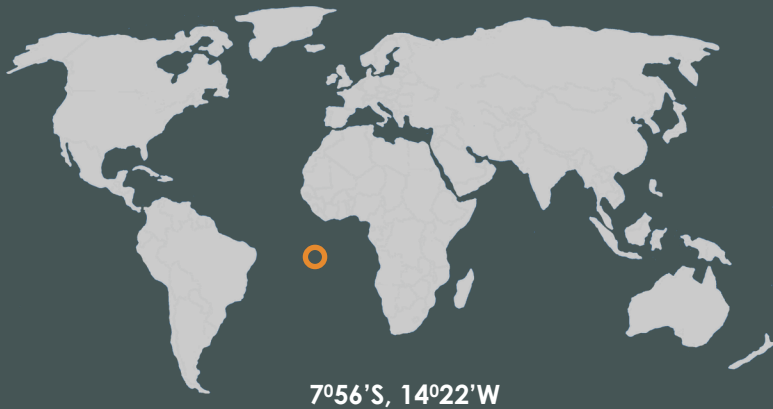
Introduction

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# Introduction

## Ascension Island

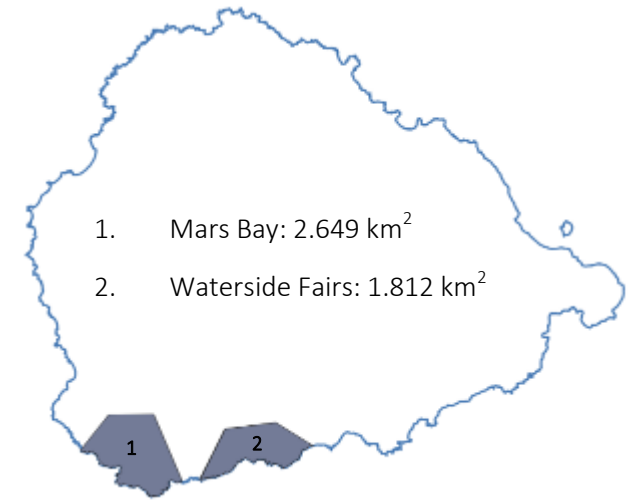
Ascension Island is a remote overseas territory of the United Kingdom (UKOT) located at the centre of the Atlantic Ocean. Ascension is a young volcanic island 97km<sup>2</sup> in size, lying 1504km from the coast of Africa and 2232km from Brazil.



Though small, Ascension supports globally-important biodiversity including 67 endemic species found nowhere else in the world. It is a nesting site for over half a million seabirds and the second largest turtle rookery in the Atlantic.

Protecting biodiversity is one of the Ascension Island Government (AIG)'s strategic objectives and a commitment under the Convention on Biological Diversity. The island's Protected Areas are central to meeting this commitment and achieving Target 3 of the post-2020 Global Biodiversity Framework. All of the Protected Areas have legal status and are underpinned by management plans. This plan covers the two reserves found in the Wideawake Fairs in the southwest corner of Ascension Island.

The Wideawake Fairs is an area traditionally used by nesting sooty terns (*Onychoprion fuscatus*) known locally as 'Wideawake terns'. Within the Wideawake Fairs are two Nature Reserves (NRs) divided by a rough lava flow. The reserves are found within close proximity to the island's only airport— the Wideawake Airfield. All wildlife protected areas on Ascension Island are managed by the Ascension Island Government Conservation and Fisheries Directorate (AIGCFD).



The Wideawake NRs are made of a number of basalt lava flows that extend along the southern coast of the island. A number of effusive and passive eruptions from nearby scoria cones have created a range of lava types in the reserves from the rough a'ā lava found in the Mars Bay NR to the smooth, ropey pāhoehoe lava found on the Waterside NR.

The Mars Bay NR and Waterside NR were designated in 2014 under the National Protected Areas Ordinance, 2003. The reserves are home to thousands of individual nesting seabirds, predominately sooty terns. The Mars Bay area is also a stronghold for the Critically Endangered Ascension spurge (*Euphorbia organoides*). Endemic to Ascension Island, Mars Bay hosts around 80% of the plant's entire global population. Within the Mars Bay NR is Shelly Beach with unique anchialine pools. These are home to endemic shrimps, corals and other marine invertebrates. Small rocky beaches and coastal lava flows within the NRs support scaly crickets of the genus *Discophallus* that is endemic to Ascension.

The Wideawake Fairs were identified as an Important Bird Area (IBA) by the Royal Society for the Protection of Birds (RSPB) in 2006 (Rowlands et al. 2006). This was a global initiative to identify, protect and manage a network of sites, which are important for the long-term viability of naturally occurring bird populations.





## Mars Bay NR

The Mars Bay Nature Reserve covers a number of habitats described below that support a range of important biodiversity.

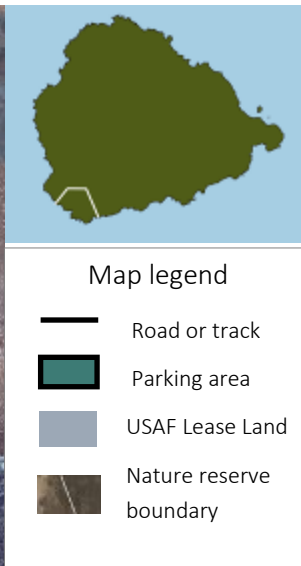
**Lava flows:** These are home to sooty terns that nest here in internationally-important numbers. It is estimated that 250,000 pairs of sooty terns nest across the Wideawake Fairs. Lava flows close to the coast also provide perfect habitat for the endemic scaly crickets. The flat gravel areas at the top of the reserve are important habitat for the Critically Endangered Ascension spurge (*Euphorbia organoides*) plant.

**Shell beach:** In the east of the reserve is Shelly Beach. It can be accessed on foot through a rough track, crossing one of the youngest lava flows on the island. Shelly Beach is a popular hiking location with a white beach created entirely by shells and eroded rhodolith pieces. This combination creates an unusual beach surface, unlike others on Ascension and is the main attraction to reserve visitors.

**Anchialine pools:** 100m inland at Shelly Beach is a series of saltwater, land-locked pools. They are home to a variety of unique wildlife found nowhere else in the world including the small endemic shrimps *Typhlatya rogersi* and *Procaris ascensionis*.

**Coastline:** The coastline of the reserve at sea-level is populated with small rock pools, favourable habitat for moray eels (*Muraenidae*), octopus (*Octopus vulgaris*) and other inshore marine life. These pools are popular with local fishers.

The Mars Bay NR is accessed via a dirt track leading off from Gannet Road, past the airport. The track is well worn and is only suitable for 4WD vehicles. At the end of the track there are information boards including one stating that vehicles are not permitted beyond this point. There is adequate space to park several vehicles.



## Waterside Fairs NR

The Waterside Fairs NR covers a large area of lava flow identified as an important habitat for nesting sooty terns. The coastal edge varies in height from 35m cliffs to sea-level and provides habitat for a range of wildlife.

**Lava flows:** The lava flows of the Waterside NR are important for sooty terns, which nest here over a 9-10 month period each year. Individual sooty terns use both the Mars Bay and Waterside Fairs NRs, moving between the two reserves in subsequent years to nest.

**Coastline:** The western coastline of the Waterside Fairs NR features steep seaward facing cliffs. Yellow-billed tropicbirds (*Phaethon lepturus*) and red-billed tropicbirds (*Phaethon aethereus*) nest on the cliff ledges here. Their aerial breeding displays can be easily viewed from the dirt track access to the reserve.

The eastern coastline of the Waterside Fairs NR slopes down to sea-level and has a number of large rock pools brimming with sub-littoral species. The pools are covered with growths of coralline algae, encrusting sponges and corals. They provide a safe haven for juvenile fishes such as scissortail sergeants (*Abudefduf sexfasciatus*) and spotted moray (*Gymnothorax moringa*). Rocky beaches along the coast and lava flows behind them support the endemic scaly crickets.

The Waterside Fairs NR can be accessed via the dirt track leading off from Gannet Road, south of Command Hill. This access road is well maintained by the USAF, but it is not recommended for vehicles that are not 4WD. It is a comfortable track to hike, however, made up of compacted gravel. At the end of the dirt track is an information board, which illustrates the bird life that may be seen on the reserve.





# Strategic and Operational Objectives



**Conserve** the seabirds nesting on the Mars Bay and Waterside Fairs Nature Reserves. This includes a regionally-important population of nesting sooty terns (*Onychoprion fuscatus*) as well as brown noddies (*Anous stolidus*) and tropicbirds (*Phaethon spp.*).

- The size of the seabird populations in the Wideawake Fairs NRs are maintained or increased.



**Protect and conserve** the critically endangered Ascension spurge (*Euphorbia organoides*).

- The population of the Ascension spurge is maintained or increased.



**Safeguard** the anchialine pools at Shelly Beach– home to endemic shrimp *Typhlatya rogersi*, *Procaris ascensionis* and other unique marine invertebrates.

- No decrease in the biodiversity of the anchialine pools.
- Specific threats to the delicate anchialine pool ecology are identified and addressed.



**Conserve** Ascension's endemic invertebrates including *Discophallus* scaly crickets and pseudoscorpions.

- Scaly crickets extend their range into suitable inland habitat following the control of invasive, non-native crickets.

**Facilitate** natural ecosystem functions and processes within the reserve.

- No non-native shrubs present within the NRs.
- Non-native predators are controlled to a level they have no significant impact on the seabird, Ascension spurge or scaly cricket populations.



**Encourage** recreational use of the Nature Reserves- compatible with conservation objectives- to promote the health and wellbeing of people of Ascension.

- There is a high level of awareness about the importance of the Wideawake Fairs NRs for seabirds, Ascension spurge and scaly crickets.
- The Wideawake Fairs NRs are a source of pride for Ascension islanders.





Natural features of the Nature Reserves

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## Species of Mars Bay/Waterside Fairs Nature Reserves

### Sooty tern (*Onychoprion fuscatus*)

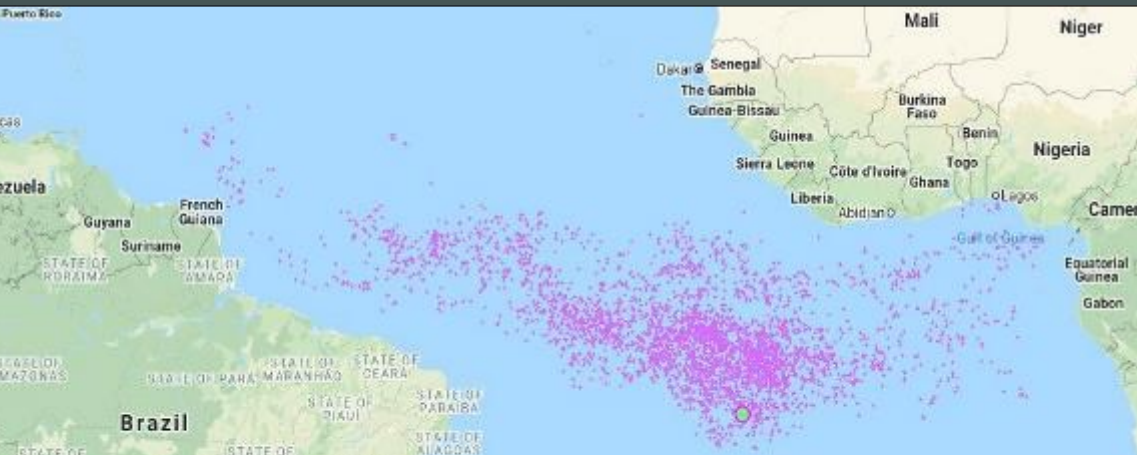
Length: 43-45cm, Wingspan: 86-94cm. Least concern.

This species is widespread throughout tropical oceans. An estimated population of 250,000 pairs nest on Ascension Island across Mars Bay and the Waterside Fairs Nature Reserves making Ascension the largest sooty tern rookery in the Atlantic.

The sooty tern does not breed until its sixth-eighth year; the longest period to maturation for any member of the *Laridae* family. It lays a single egg in a scrape or shallow nest bowl in the ground. Both parents take turns to incubate the egg for 28-30 days and the chick will fledge at around 8 weeks old.

Highly gregarious, sooty terns often associate with other seabirds over shoaling fish. It swoops over the sea and snatches prey from the surface, mainly feeding on flying fish and small squid.

Largely pelagic, sooty terns are frequently encountered many miles from landfall. Recent GPS tracking of sooty terns has shown a wide dispersal of adult and juvenile birds across the tropical Atlantic once the terns leave Ascension. The image below shows GPS points generated by 100 individuals (50 adults, 50 juveniles) over a 6 week period after leaving the island.



### **Brown noddy (*Anous stolidus*)**

Length: 40-45, Wingspan: 79-86cm. Least concern.

Brown noddies can be found across the tropics worldwide. They nest in small loose colonies across Mars Bay NR on elevated cliffs, with an estimated population of 100-150 pairs. The species potentially navigates long distances but its precise dispersal throughout world range is poorly known. The brown noddy creates a platform nest of shingle and lays a single egg. Incubation is performed by both parents for 35-38 days. Adult noddies often forage close to the colony, feeding the young frequently. Brown noddy chicks grow quickly, reaching the weight of the adult bird after only three weeks. The chick fledges at six weeks, however is supported by the adults for several more weeks.



**Brown noddy**

### **Red-billed tropicbird (*Phaethon aethereus*)**

Length: 46-50cm, Wingspan: 99-106cm. Least concern (global population declining).

Widespread throughout tropical oceans, the red-billed tropicbird can be found nesting on offshore stacks and in suitable habitat around the Ascension coastline. Also known as the “boatswain bird” due to the similarity of its shrill call to a boatswain’s whistle. A small population of <50 pairs nest across the Wideawake Fairs. Aggressive at the nesting site, this species may oust other seabirds for nesting habitat. The red-billed tropicbird is monogamous and faithful to the nest site. They lay a single egg on inaccessible ledges or in crevices. The chick fledges after 80 days and receives no additional parental care once leaving the nest.



**Red-billed tropicbird**

### **Yellow-billed tropicbird (*Phaethon lepturus*)**

Length: 38-40cm, Wingspan: 89-96cm. Least concern.

This species can be found across the tropical oceans. It is the smallest, most common and most widely distributed of the three *Phaethon* species. This species is approximately twice as abundant as its larger relative on Ascension Island where it nests on offshore stacks and inaccessible cliffs around the coastline. Less than 50 pairs nest around the coastal edges of the Wideawake Fairs. The yellow-billed tropicbird lays a single egg in a scrape on the ground, incubating for 42-44 days. The chick fledges after 70-85 days. This species can breed several times per year if nesting attempts are unsuccessful, depending on weather and availability of nesting habitat. The yellow-billed tropicbird disperses widely across the ocean outside of the breeding season. They feed primarily on fish and squid, which they catch by surface plunging; this species is a poor swimmer.



**Yellow-billed tropicbird**



## Species of Mars Bay/Waterside Fairs Nature Reserves

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### Ascension spurge (*Euphorbia organoides*)

This perennial, dwarf shrub forms low hemispherical domes up to 1m in diameter and 40cm high. Endemic to Ascension, this species is classified by the IUCN as Critically Endangered. The Ascension spurge has reddish, dichotomously branched stems with oval, olive green leaves and creamish-white flowers. Flowers are monoecious (possesses both male and female parts) and are insect pollinated.

The number of Ascension spurge plants varies annually though in the last 5 years, the Mars Bay area has supported around 80% of the world population. The majority of these plants are found at South Gannet, Round and Cotar Hills on the boundary of the Nature Reserve, although a small population thrives within the NR itself.

The Ascension spurge survives on the arid plains of Mars Bay as the plants can lay dormant in a seed bank for up to many years (5+) while it waits for adequate rainfall, rapidly germinating in favourable conditions.

Seed dispersal is predominantly via wind, but water may be an important dispersal agent following heavy deluges. Populations that survive longer drought periods are often found in small crevices and gullies where evapotranspiration rates are lower and have increased water availability compared to exposed sites.

The Ascension spurge was once widespread in the low lying areas of the island, but it is estimated that changes in distribution have led to a 50% reduction in the areas occupied. The majority of plants are around Mars Bay, but other populations are scattered across the island. There is evidence of genetic divergence between east and west coast populations, potentially linked to a dispersal barrier to seeds and pollinators caused by the prevailing south-easterly trade winds. The closest relative is believed to be *E. trinervia* which is native to coastal regions of tropical West Africa. Native associates include *Aristida ascensionis* (grass), *Cyperus appendiculatus* (sedge) and *Portulaca oleracea* (purslane).





## Species of Mars Bay/Waterside Fairs Nature Reserves

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### Ascension scaly crickets (*Discophallus* spp.)

The *Discophallus* genus of scaly crickets (family: Mogoplistidae) are endemic to Ascension Island and likely arrived via rafting (Ashmole & Ashmole 2000; Gorochov 2009). There are five sister species, of which three use the lava habitat of the Mars Bay and Waterside Fairs NRs: *D. ascension*, *D. myrtleae* and *D. pallidus*. These three species are similar in size (around 12-15mm in body length) and appearance, and all are covered in minute translucent scales.

None of these three *Discophallus* species have been Red List assessed, although all meet the International Union for Conservation of Nature (IUCN) criteria for Critically Endangered given their limited distributions and that much of their suitable habitat has been degraded by non-native plants and invertebrates. Recent research has highlighted that *Discophallus* distribution and abundance may be limited by competition with closely-related non-native crickets.

Although *Discophallus* breeding behavior has never been observed, it is likely that they lay their eggs on sand or between rocks in the lava flows. The Ascension scaly crickets are generalist scavengers and it is thought that the decomposing fish and crab carcasses on the NR coastlines form important food sources for these species.

### Ascension-endemic pseudoscorpions (Order: Pseudoscorpiones)

The Waterside Fairs NR is home to Ascension's renowned pseudoscorpions, which are notably large in comparison to pseudoscorpions worldwide. Ascension's pseudoscorpion species are thought to have reached the island via phoresy, that is the process of "hitchhiking" on larger organisms (likely seabirds).

It is thought that pseudoscorpion species would naturally occupy large areas of the Ascension mainland but introduced species have greatly reduced their populations. They are likely to be active nocturnal predators of invertebrates on the bird guano. Nothing is known of the population status of pseudoscorpions on Ascension or their main threats.



Ascension scaly cricket



Ascension pseudoscorpion



## Habitats of Mars Bay/Waterside Fairs Nature Reserves

### Anchialine Pools

Covering approximately 280m<sup>2</sup>

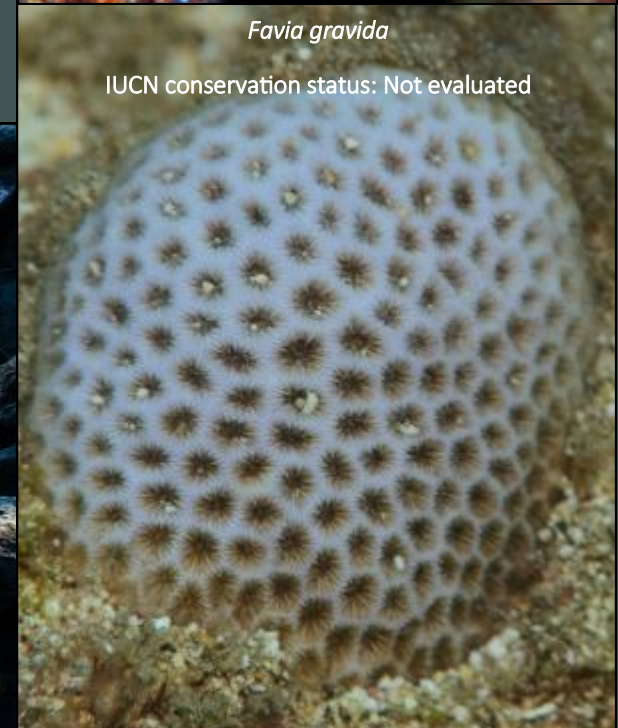
The Mars Bay NR is home to several anchialine pools at Shelly Beach on the eastern side of the nature reserve. These are landlocked, saline bodies of water with a permanent, subterranean connection to the ocean but no surface contact. The limited connectivity to the sea has promoted the evolution of a number of endemic species within the pools. Characteristic members of the anchialine pools are the caridean shrimps *Typhlatya rogersi* and *Procaris ascensionis*, which grow to less than 20mm. The pools are also home to three endemic amphipods (*Melita spp.*, *Maera spp.* and *Elasmopus spp.*) found either exclusively or predominantly in this anchialine system.

The westernmost cluster consists of 3-4 pools, the largest of which measures 6m in diameter. These 'marl pools' have a deep, soft, sedimentary bottom. A second, larger cluster of around 10 pools lies 125m to the south east ranging in size from less than a metre to 7m in diameter. These 'coral pools' have predominantly rocky substrates lined with fragments of an unusual free-living form of coral, *Favia gravida*. The pools are separated from the ocean by a ridge of shell and rhodolith pieces rising approximately 2-6m above sea level. The height of the ridge line varies depending on the distribution of substrate caused by oceanic swell. There is no surface connection with the ocean, but the pools are clearly under tidal influence. The most landward pools are completely dry at low tide and water chemistry and temperature are broadly comparable with seawater, suggesting frequent mixing through subterranean passages.



*Procaris ascensionis* (<20mm)

IUCN conservation status: Not evaluated



*Favia gravida*

IUCN conservation status: Not evaluated





## Habitats of Mars Bay/Waterside Fairs Nature Reserves

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### Rocky shoreline/Rock Pools

The southern side of the Mars Bay and Waterside NR have a rocky shoreline and are home to a number of rock pools. The pools range in size and provide a safe haven for inshore marine species.

Several fish species can be found in these rock pools, most noticeably black triggerfish (*Melichthys niger*), sergeant majors (*Abudefduf saxatilis*) and other damselfish. Juvenile eels can be found hiding between the rocks, waiting for the opportune moment to feed.

The common octopus (*Octopus vulgaris*) weaves throughout the rock pools of Mars Bay and Waterside. These rock pools provide a haven for juvenile octopus, which camouflage well in the rocks and crevices, feeding on unsuspecting crabs and fish.

Sally lightfoot crabs (*Grapsus grapsus*) are numerous around the coastlines of the nature reserves. Scavenging on sooty tern eggs, dead marine life or grazing on algae, the rock pools of the nature reserves provide a fantastic habitat for these brightly coloured crustaceans. Rock oysters (*Saccostrea cucullate*) cling to the shoreline and are abundant throughout the reserves, particularly at Shelly Beach. This species is tolerant of a wide range of temperatures and salinities so can thrive in



*Common octopus*

IUCN conservation status: Least concern



*Sally Lightfoot crab*

IUCN conservation status: Not evaluated



*Spotted moray eel*

IUCN conservation status: Not evaluated





Historical and recreational use of reserves

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# Historical use of the Wideawake Fairs

## Gills observatory

In 1877 Sir David Gill (1843-1914) visited Ascension Island in an attempt to measure the astronomical unit– the distance between the Earth and the Sun. Original observations were made in Georgetown, however, Gill and his wife Isobel found the evenings were too cloudy as they were downwind of clouds emanating from Green Mountain. Isobel trekked for several miles over lava fields searching for locations less affected by cloud. She eventually travelled to the south west of the island and found a suitable location for their observations.

Delicate observational equipment was transported by sea to a small clear beach in an area later named Mars Bay (after the expedition). The couple spent several months camped at the bay making observations. The remains of the camp including paths are still visible (page 15). In 1878, Isobel Gill published an account of the trip titled: Six Months in Ascension: An unscientific account of a scientific expedition.

Sir Gill's solar parallax observations with a heliometer and his calculations of distances to the nearer stars are a testimony to his outstanding work- his value was within 0.2% of the modern accepted value. Sir David Gill published his results in 1881 titled: A determination of the solar parallax from observations of Mars made at the Island of Ascension.



## Wideawake Airfield

Although not strictly a part of the Wideawake Nature Reserves, the Wideawake Airfield has greatly impacted the creation of the reserves and even now impacts the species found there.

US Army engineers were sent to Ascension in March 1942 and within four months established the airfield. In the first two years of operation, the Wideawake Airfield handled over 5,000 planes. It was noted that the main difficulty in maintaining the airfield was:

*“hundreds of thousands of wideawakes [sooty terns] stubbornly nesting on the handy, open runways. No matter how often they were shooed off, back they came”.*

Dr James Chapin, associate curator of the American Museum of Natural History, made a special trip to Ascension and recommended that eggs were destroyed until the birds gave up and nested elsewhere. He wrote:

*“Some 40,000 or 45,000 eggs were accordingly broken in the bottom of the valley, close to the far end of the runway; and after ten days scarcely a bird would be seen alighting in that area. In 1943, when laying began in mid-May, it was reported that some 23,000 eggs were collected by our Quartermasters men, and many others by the residents of the island. But there were times when hundreds of dead terns were noted by other visitors; some shooting evidently went on.”*

Far left: Centenary stamp illustrating the Gill Observatory

Left: Scottish astronomer Sir David Gill (1843-1914)

Right: Photograph taken in 1940s before the installation of the Wideawake Airfield showing the density of nesting sooty terns (photographer unknown).





## Recreational use of the reserves

Mars Bay and Waterside Fairs NRs are a haven for wildlife and provide many unique experiences for geologists, naturalists, artists and photographers. Reserve visitors can surround themselves in the raw landscape of this volcanic island and appreciate nature in its simplest form.

A Cultural Ecosystem Services report on Ascension Island (Canelas *et al.* 2019) found that the Wideawake Fairs are greatly appreciated by islanders. The reserves were described as:

*“a striking landmark on the island, with all the birds and history”*

*“you go down there and the birds come to you, you get a close encounter with wildlife”*

*“despite being secluded [Shelly Beach] hides its brine pond with endemic shrimp, in some sort of primordial soup...more should be made of this unique wonder”*



Reserve visitors enjoying the anchialine pools at Shelly Beach

## Hiking

Ascension Island has 42 designated walks spread across the island with hikers seeking a stamp found in a letterbox at the end of each walk as a reward. Hikers follow guidance provided through the Letterbox Walks book, last updated in 2020.

### Shelly Beach Letterbox Walk

Mars Bay reserve visitors are advised to park clear of the Ascension spurge restoration site, which is visibly fenced off. The hike to Shelly Beach follows the western edge of the rough lava flow towards the sea. A loose path then cuts through the lava flow to Shelly Beach with painted cairns and stakes showing the route. On occasion, sooty terns nest on the path across the lava flow to Shelly Beach. Eggs and small chicks are well camouflaged against the lava and when necessary the path has been closed by the Administrator under section 10 of the National Protected Areas Regulations 2014, to protect the nesting birds.



The route to Shelly Beach passes nesting sooty terns, which may swoop and create a fuss around hikers particularly when they are chick rearing. The local hash hiking group organises several hikes to this letterbox outside the breeding season, maintaining the guides through the lava flow and often performing a litter pick on the beach too.

### Water's Edge Letterbox Walk

The route of the Water's Edge Letterbox Walk follows the dirt track along the edge of the airfield towards the Waterside Fairs NR. This track is well maintained by USAF and is therefore deemed less demanding and one of the more family friendly Letterbox Walks. It is possible to drive the track with an off-road vehicle and the letterbox is a mere 20m from the end of the road. This recommended walk, therefore does not encourage thorough exploration of the reserve, however many visitors will explore the rock pools along the coast. The location of the letterbox provides excellent views of seabirds, which feed offshore, and good views of the nesting sooty terns.










Threats to the Nature Reserves

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## Threats to the Wideawake Fairs Nature Reserves

There are a range of threats to the health of the Wideawake Nature Reserves and to the achievement of the strategic objectives set out in this management plan. These threats are coded using a traffic light system to reflect the severity of the threat.

-  **High:** Major effect on the health of the ecosystem/species of the reserves
-  **Medium:** Some effect on the health of the ecosystem/species of the reserves
-  **Low:** Minimum effect on the health of the ecosystem/species of the reserves



Mexican thorn growing in dense thickets on the Mars Bay NR

## Invasive flora

A number of Invasive Non-Native Species (INNS) can be found encroaching onto the Wideawake Fairs NR. INNS out-compete native wildlife for resources such as water, nutrients and available habitat and can also introduce diseases and support other INNS, further exacerbating the threat to native flora and fauna.

Mexican thorn is the main concern on the Mars Bay reserve. On the Waterside Fairs NR, Mexican thorn grows in abundance alongside tree tobacco (*Nicotiana glauca*), black lantana (*Lantana spp.*) and prickly pear (*Opuntia spp.*). These shrubs provide food and shelter for rodents and non-native ants, which increases the local populations that may predate seabirds and damage the Ascension spurge.

### Mexican Thorn

Mexican thorn (*Neltuma juliflora*) is identified as a major threat in Ascension's National Biodiversity Strategy and Action Plan. The pressing need to control thorn is highlighted in a specific Species Action Plan for Mexican thorn, reflecting its widespread impacts on species, habitats and landscapes.

Mexican thorn is a dryland specialist, growing in arid low-lying lava and ash plains across the island. They have extensive lateral root systems (up to 30m) allowing them to survive prolonged drought by accessing the water table. Mexican thorn can be found on both the Mars Bay (right) and Waterside Fairs NRs.

### Tree tobacco

Hundreds of tree tobacco plants can be found growing in the Waterside Fairs NR. Tree tobacco grows rapidly and can produce viable seed within only a few years. Tree tobacco thrives on the Waterside Fairs NR as it prefers well drained soil in full sun. It can grow up to 6m in height. First introduced as an ornamental, the seeds are carried long distances by moving waterflows. Tree tobacco follows the valleys of the Waterside Fairs NR where water flows during heavy rain allowing this species to spread quickly across the reserve.

# Threats to the Wideawake Nature Reserves



## Introduced Fauna

A number of non-native animal species have been introduced to Ascension that are detrimental to the wildlife found on the Wideawake NRs.

### Rodents:

Rodents were introduced via passing ships, sometime before 1701. Black rats (*Rattus rattus*) and house mice (*Mus musculus*) can be found throughout the island. These highly adaptable species forage on fruit, seeds, plants and will predate small animals and eggs. Rodents have a high fecundity and short generation times allowing populations to grow rapidly in favourable conditions.

The seabirds on Ascension have not evolved alongside rodents. Consequently the birds do not react to the presence of rodents with an anti-predatory response. Remote camera trap footage shows rats and mice freely walking through the sooty tern colonies with the birds unreactive. Many abandoned eggs show signs of rodent predation with evident teeth marks. Chicks which are unable to fly are particularly vulnerable to rodent predation.

Rodents are a real threat to the Ascension Spurge. Alongside rabbits (*Oryctolagus cuniculus*) they graze on the spurge, which is already struggling in marginal conditions. The impact of rodents on native invertebrates including *Discophallus* scaly crickets is unquantified on Ascension. However, other studies have shown they can greatly reduce island invertebrate populations through predation or reducing food availability.

Left: Rat feeding on a sooty tern egg.

Right: Cat predation on sooty terns at Mars Bay (Phillip Ashmole, 1990)



### Common myna bird (*Acridotheres tristis*)

Myna birds were introduced to control insect populations on Ascension, particularly cattle ticks when the farm was active on Green Mountain. Myna birds breed throughout the year and the airhead hosts a healthy population of this species. Myna birds have a varied diet and are an opportunistic feeder. On Ascension they can be seen feeding on sooty tern eggs at Mars Bay. There is currently no evidence to suggest that they scare adult sooty terns to actively predate nests, they may simply be scavenging abandoned eggs. When myna birds are present in tern colonies, the terns do not express anti-predator behaviour.

### Domestic cat (*Felis catus*)

Cats were introduced to Ascension in 1815 to control the rodent population. Feral cats preyed on the nesting seabirds too, decimating some populations and greatly reducing the sooty tern population on the Wideawake Fairs.

A successful feral cat eradication was undertaken in 2002-2004 by the RSPB. This removed a significant source of predation for Ascension's seabirds. Several pet cats remain on island, however, all have to be registered through AIG. Each cat is de-sexed and monitored regularly to ensure it remains with the owner. Advice is given to prevent the cat turning feral. If a cat goes missing, AIGCFD may assist to recapture the animal and return it to the owner.

### Non-native invertebrates

A number of non-native invertebrate species can be found across the Wideawake NRs, which are detrimental to the Ascension spurge and scaly crickets. Ants, farm aphids, mealybugs, scale and whiteflies, which damage the Ascension spurge. Ants are also likely to directly predate native invertebrates. Other non-native invertebrates such as the tropical house cricket, *Grylodes sigillatus*, reduces and displaces *Discophallus* populations through resource competition.



## Threats to the Wideawake Nature Reserves

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### Climate Change

The global climate is changing at an unprecedented rate due to the increased levels of carbon dioxide in the atmosphere produced by the burning of fossil fuels. The following changes are predicted for Ascension by the end of the 21st century:

- Air temperatures will rise by between 0.7 And 2.4°C depending on global CO<sub>2</sub> emission reductions (Intergovernmental Panel on Climate Change)
- The ocean will become warmer and more acidic with temperatures increasing by between 0.6 And 1.4 °C and pH decreasing by between 0.006 and 0.11 depending on global CO<sub>2</sub> emission reductions.
- Sea levels will rise by between 0.3 and 0.6m (Intergovernmental Panel on Climate Change).
- Storm events and high swells will become more frequent and more severe

This will have a profound effect on Ascension's biodiversity if species are unable to evolve quickly enough to cope with the changing conditions.

#### Impacts of climate change on anchialine pools:

The isolation of the anchialine pools has allowed a unique ecosystem to evolve. If sea level rise and increased storm events result in frequent inundation of the pools, then these ecosystems are like to be lost due to the introduction of new species and changes in the chemical and physical conditions of the pools.

Increases in annual rainfall or temperature as a result of climate change may also change the salinity and water temperature of the pools. There is no knowledge about the physiological tolerances of the endemic species found in the pools. It is possible that they are able to adapt rapidly to changing conditions because of the tidal nature of their habitat. However, if they are unable to evolve quickly enough to respond to these changes, then species extinction could occur.

#### Impacts of climate change on seabirds:

Rising sea levels, rising sea temperatures and shifts in oceanic currents will greatly disrupt marine ecosystem and make prey items increasingly difficult for seabirds to find. During the nesting period when seabirds are tied to the island, travelling increased distances for food will not be energy efficient, resulting in population decline as adults fail to nest successfully.

Increased offshore storms makes feeding more difficult for seabirds that surface feed because the increased turbidity makes viewing prey more difficult. If storms and swells increase, cliffs are likely to be damaged, potentially reducing or increasing the availability of habitat for cliff nesting species such as tropicbirds.

Periods of heavy rainfall will result in temporary water-flows through the reserve, washing out seabird nests. Chicks are particularly vulnerable to heavy rains with downy feathers becoming waterlogged, causing hypothermia and eventually death. Heavy rains cause a boom in raingrass (*Enneapogon cenchroides*), which provides a food source for rodents, creating a population boom and an increase in predation pressures on seabird eggs and chicks.

#### Impacts of climate change on Ascension spurge:

The impact of climate change on the Ascension spurge could be complex and difficult to predict. Ascension spurge evolved on the low arid environments of Ascension and requires rain to stimulate seed germination. The seeds are viable for approximately five to ten years, but climate change could result in prolonged drought conditions that exceed this period. Even small reductions in the frequency or quantity of rainfall could have significant impacts on spurge populations already growing in marginal environments and facing other threats such as non-native pests.

Conversely, climate change may increase the frequency of storms and rainfall. The Ascension spurge undergoes a cyclical boom following heavy winter rains (normally every 5 years). An increase in annual rainfall as a result of climate change may allow this species to thrive, allowing seed dispersal to other suitable habitat.

## Threats to the Wideawake Nature Reserves



### Disturbance

It is important to balance the benefits of people experiencing and valuing wildlife with potential negative impacts on wildlife from human presence. Note that dogs are not permitted on the reserves.

Human presence can alarm incubating seabirds, causing them to leave the nest. At best this is wasted energy, at worst they may abandon the nesting attempt. Time spent off the egg exposes the egg to harmful UV rays and it is possible the developing embryo may overheat during disturbance periods.



Unattended eggs and chicks are well-camouflaged against the lava (see left), making them susceptible to trampling, predation or the weather. Disturbance causes chicks to scatter and they can become lost, unable to find the original nesting site and therefore are unable to be fed by the parent bird.

When necessary, access to the reserve or parts of the reserve may be restricted by the Administrator under section 10 of the National Protected Areas Regulations, 2014, to protect the nesting birds.

Reserve visitors may trample, drive or park vehicles on mature spurge plants if they stray off the beaten tracks. Another threat to the Ascension spurge is infrastructure development in surrounding areas, which can disturb plants and their seed bank. Several populations occur in loose, unstable scree slopes which render them vulnerable to landslides created by nearby works.

Entry to the anchialine pools would cause serious disturbance to the unique aquatic life found here. Chemicals found in sunscreen or other products have been well documented to alter the composition of the marine environment. This would be intensified in this small aquatic environment. Movement of rocks to gain better views of the animals that reside here can have serious consequences. Many of the endemic wildlife found within the pools are incredibly small and are likely to be hurt or even killed by misplaced rocks.



Reserve visitors at Mars Bay



## Threats to the Wideawake Nature Reserves

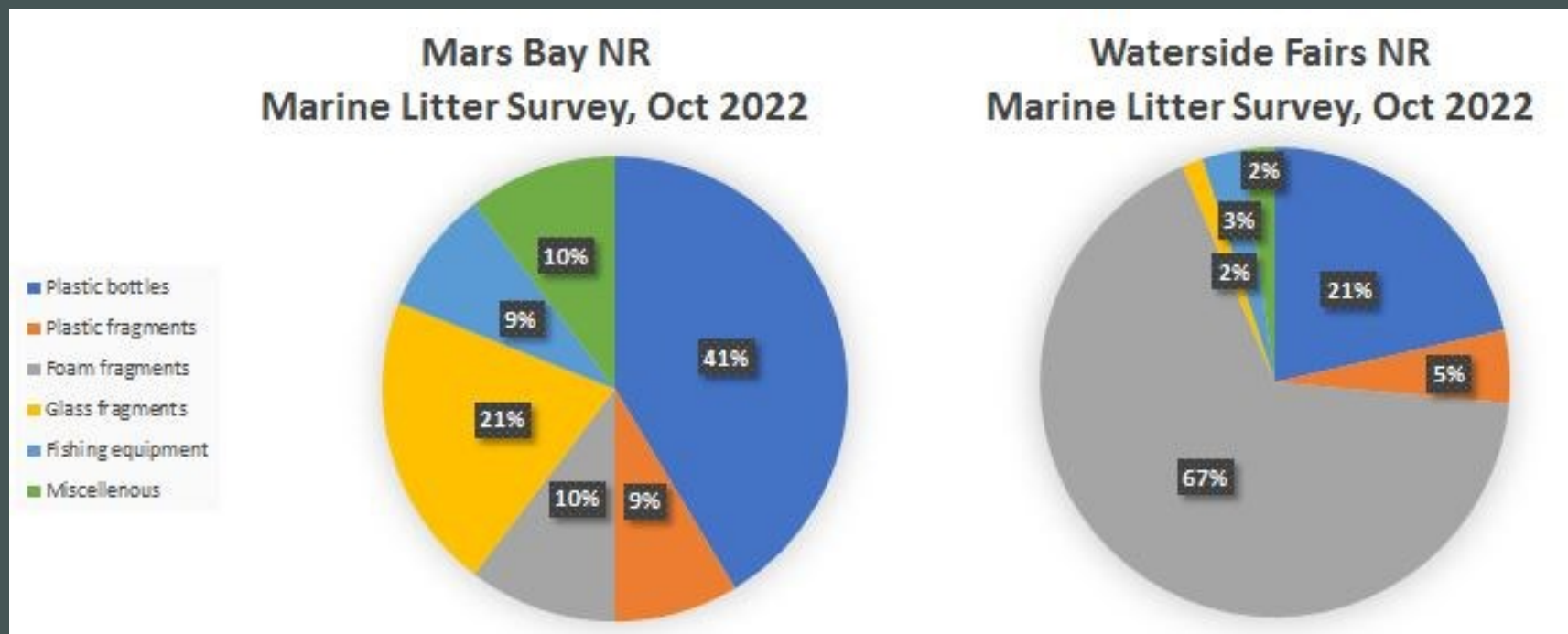
### Litter

There is a legacy of litter on the Mars Bay NR as it was previously a refuse site and used for military target practice. The remains of old fire trucks, large chunks of rusty metal and bullet shells litter the reserve. Broken glass bottles can be found scattered throughout the Mars Bay NR, left behind before the area was designated as a Nature Reserve.

Left untreated, litter can smother suitable habitat for nesting seabirds or the Ascension spurge. If litter enters the anchialine pools, it has the potential to block the connective tunnels to the sea, changing this unique environment and the aquatic life that resides here. Chemical breakdown of litter can cause changes in the anchialine pool environment or alter the soil composition on the reserve, affecting the suitability of the site for spurge.

Oceanic currents wash driftwood, plastic and other waste onto the shores of the NRs where it accumulates. An analysis of litter on Shelly Beach in 2022 showed that half of the litter was formed of plastic bottles and other plastic pieces. On the Waterside Fairs NR, several bays in the western edge of the Reserve are hotspots for litter washed up by currents (page 18). This mainly consisted of foam fragments, which are likely buoys broken up in the surf or sun. These bays were also prone to other discarded fishing equipment such as rope or netting. Much of this equipment is not used locally suggesting it originates from large-scale fishing vessels, which are not permitted within 200nm of the island.

It is well documented that seabirds are vulnerable to ingesting plastic found within the marine environment, mistaking plastic for food items, which can be fatal. Even small plastic fragments can have long-term impacts, scarring the digestive tract, which leaves the bird more vulnerable to illness.





Legislation

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# Legislation and Policy

The designation and management of Nature Reserves is an important part of Ascension's approach to protecting its biodiversity and meeting its commitments under international agreements and strategies.

## International agreements and strategies

The [Convention on Biological Diversity \(CBD\)](#) has been extended to Ascension and provides the overarching context for biodiversity protection on the island. Target 3 of the CBD Post-2020 Global Biodiversity Framework reads:

*Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories.*

The need for well-managed area-based protection is also a foundation of the [UK Overseas Territories Biodiversity Strategy](#) and fulfills Ascension's obligations to protect habitats and species under the [Ascension Environmental Charter](#) signed in 2001. Mars Bay and Waterside Fairs Nature Reserves form part of a network of ten protected areas on Ascension. Local legislation provides the legal basis for the establishment and management of the Nature Reserves.

## Ascension protected areas legislation

The [National Protected Areas Ordinance, 2003](#) provides the Governor with powers to designate Nature Reserves 'primarily for the purpose of maintaining a proper balance in the natural ecology of the area.' It also limits the type of development that can be permitted within a Nature Reserve and allows the restriction of activities that could be harmful to a Nature Reserve. The Ordinance also provides powers to introduce regulations to protect Nature Reserves and to appoint Reserve Wardens to enforce these regulations.

Mars Bay and Waterside Fairs NRs were designated under the [Natural Protected Areas Order, 2014](#). Their boundaries are shown on page 6 and 7.

The [National Protected Areas Regulations, 2014](#), prohibit a list of potentially harmful activities on the Nature Reserves without prior permission from the Administrator or Reserve Warden (see overleaf). They also provide powers for the Administrator to close all or part of a nature reserve for the purposes of management, wildlife protection or public safety.

## Other relevant Ascension legislation

Under the [Wildlife Protection Ordinance, 2013](#), it is an offence to willfully take, kill, trade or molest any of 40 species listed in the ordinance. The following species found within the Wideawake Fairs Nature Reserves are protected by this ordinance: sooty tern (*Onychoprion fuscatus*), brown noddy (*Anous stolidus*), yellow-billed tropicbird (*Phaethon lepturus*), red-billed tropicbird (*Phaethon aethurus*), Procaris Shrimps (*Procaris ascensionis*), Typhlatya Shrimps (*Typhlatya rogersi*), and Ascension spurge (*Euphorbia origanoides*).

The [Biosecurity Ordinance, 2020](#) introduced import control measures and powers to inspect and treat cargo, vessels and aircraft arriving on Ascension with the aim of reducing the likelihood of introducing new non-native species to the island.

The [Ascension Island Marine Protected Area](#) was designated in 2019 under the National Protected Areas Ordinance. The MPA covers 100% of Ascension's Exclusive Economic Zone (EEZ), an area of over 445,000km<sup>2</sup>. Within the MPA, large-scale commercial fishing and mineral extraction is prohibited. The MPA protects the food source for the seabirds nesting on the Wideawake Fairs NRs.

## The National Protected Areas Regulations

All or any of the following are prohibited within Mars Bay and Waterside Fairs Nature Reserves if done without the prior permission of the Administrator or Reserve Warden:

- any development;
- the improving or altering of any existing structure;
- the removal of sand, soil or rock;
- the intentional or reckless disturbance to, or damage or injury to, any protected species;
- the dumping of refuse, chemicals, abandoned vehicles, scrap metal, mining spoils, toxic or other wastes, bilges, oil and other petroleum products, pesticides and other items harmful to animals or plants, or unsightly items;
- the driving or riding of motor vehicles other than on public roads as defined in the Road Traffic Ordinance, 1984 or in a signed parking zone;
- parking a vehicle, except in a signed parking zone;
- the making of fires without a permit other than in a portable stove or grill, or in designated fire pits;
- playing any musical instrument, radio, sound system, television or other item which produces or reproduces music, to the annoyance of other persons;
- the use or possession by any person, other than a Warden acting in the course of his or her duties, of any type of firearm, air gun, cross bow, bow and arrow or slingshot;
- Allowing any dogs or cats within the reserve;
- Taking any animal or plant from the Mars Bay NR anchialine ponds;
- Entry into, swimming or bathing in the Mars Bay NR anchialine ponds.

## Implementation policy

The restrictions are designed to prevent activities that might harm the natural features of the Nature Reserves or reduce people's enjoyment of the areas. There is a presumption against these activities taking place in the Nature Reserves, but the Administrator and Reserve Warden have discretion to permit them on a case by case basis. When deciding whether to permit an activity, the Administrator or Reserve Warden must consult the Director of Conservation and will consider the following:

- Whether an activity is consistent with the objectives of this management plan. The onus will be on the person proposing the activity to demonstrate that it will not conflict with the objectives. Activities that would have a significant negative impact on the Nature Reserve objectives will not be permitted.
- Whether the activity will have a significant and/or long-term impact on the natural features of the Nature Reserves. Activities that would have a significant or long-term impact on the natural features of the Nature Reserve will not be permitted. Decisions of this nature must be referred to the Administrator and cannot be made by a Reserve Warden.
- Whether the activity is necessary for the island's military mission or critical functions. Such activities can be permitted if all other alternatives have been exhausted and all available mitigations have been put in place. Decisions of this nature must be referred to the Administrator and cannot be made by a Reserve Warden.
- Where there is doubt or lack of evidence about an activity's impact, the precautionary principle will be applied and the activity will not be permitted.
- Restrictions on public access to the Nature Reserves will only be authorised by the Administrator where it is necessary to prevent the risk of significant disturbance or trampling of the natural features or where there is a risk to public safety. Restrictions will be in place for the shortest time period and over the minimum area possible.

## Enforcement

Education and awareness raising are the preferred methods to ensure compliance, and proportionate enforcement action will only be taken when this approach has been exhausted. The maximum penalty for an offence under the National Protected Areas Ordinance or Regulations is a fine of £20,000 or imprisonment for 12 months. All warranted Reserve Wardens, Fishery Protection Officers and Police Officers are able to take enforcement action.





Action Plan

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# Action plan

The following section describes a number of actions to be achieved in the next five years. Actions are prioritised (High, Medium or Low) according to the positive changes they will make to the reserves. Actions are arranged according to the threats which they address. Each is numbered for identification with clear targets and suggested timeframes to measure success.

## 1. Clearance of invasive flora

**Proposed:** Removal of all invasive plant species from Mars Bay and Waterside Fairs NRs plus 200m buffer zone.

**Purpose:** Protect the NR and relevant species from the threats of invasive species.

**Outcome:** No invasive plant species remain on the Nature Reserves or in surrounding buffer zones.



	Description	Target	Priority
1a	Monitor the Mars Bay NR for new recruits of Mexican thorn. Visit previously marked trees to check for regrowth. Where necessary, cut and treat with herbicide mix.	100% of NR checked every 3 months. All regrowth treated.	HIGH PRIORITY Every quarter
1b	Removal of all Mexican thorn, <i>Nicotiana</i> and other invasive plant species from Waterside Fairs NR using best practice mechanical and chemical methods.	No invasive plant species within Waterside Fairs NR by Year 5	HIGH PRIORITY Completed by Year 4
1c	Removal of all Mexican thorn in 200m buffer zone around Mars Bay NR boundary using best practice mechanical and chemical methods.	No Mexican thorn plants within Mars Bay NR 200m buffer by Year 5	LOW PRIORITY Year 2
1d	Removal of all Mexican thorn, <i>Nicotiana</i> and other invasive species in a 200m buffer zone around Waterside Fairs NR boundary using best practice mechanical and chemical methods.	No invasive plants species within Mars Bay NR 200m buffer by Year 5	LOW PRIORITY Year 5



## 2. Predator control

**Proposed:** Control the rodent (black rat and house mouse) populations on the Wideawake NRs. Manage domestic cats on island to prevent individuals from turning feral. Manage rabbits so they are unable to graze on Ascension spurge.

**Purpose:** Protect the Ascension spurge and nesting seabirds from non-native predators.

**Outcome:** No rodent or rabbit grazing on the Ascension spurge or predation on seabird eggs/chicks. No seabirds killed by cats.



	Description	Target	Priority
1	Remove invasive plant species in NRs and surrounding buffer zones, which harbour local rodent populations (see action point 1 for details).	No invasive plant species within NRs and 200m buffer by Year 5	HIGH PRIORITY
			Completed by Year 5
2a	Maintain a working register of domestic cats on island. Any domestic cats which become feral should be caught and rehabilitated where possible. All cats on island neutered or spayed. AIGCFD work closely with cat owners to minimise the likelihood of cats straying, providing advice and support. Cat owners should be well informed about the Dog and Cat Ordinance, Cap A10 to ensure they are familiar with their legal responsibilities of being a cat owner.	No domestic cats go feral. No feline predation on native wildlife.	HIGH PRIORITY
			Ongoing
2b	Set a network of rodent bait stations around the key seabird colonies on both NRs, only bait in areas where the sooty terns are nesting.	100 rodent bait stations in situ	HIGH PRIORITY
			Year 1
2c	Rodent bait boxes filled fortnightly to reduce local rodent populations. Use a range of bait types (minimum 100g of each bait) to prevent the evolution of resistant in the local population.	No signs of rodent predation on sooty terns during nesting	HIGH PRIORITY
			Ongoing
2d	If high predation/grazing on seabirds and/or spurge is observed, increase the number of baited boxes around these areas and fill weekly or more frequently if necessary. Additional bait may be hand strewn around the NRs– particularly around Ascension spurge and seabird nesting sites.	No signs of rodent predation on sooty terns during nesting. No signs of rodent grazing on spurge	HIGH PRIORITY
			When required
2f	Rabbit proof fencing installed around mature spurge plants to protect from grazing. Regular maintenance of the fence is required.	No evidence of rabbit grazing on protected Ascension spurge plants	HIGH PRIORITY
			Year 1

### 3. Conservation of the Ascension spurge

**Proposed:** Protect and maintain population of Ascension spurge on Mars Bay NR.

**Purpose:** Protect the native flora of the NRs from the impacts cause by invasive non-native species and climate change.

**Outcome:** Healthy, self-sustaining population of Ascension spurge at Mars Bay.



	Description	Targets	Priority
3a	Protect and maintain wild population of Ascension spurge providing irrigation and shade to individuals. Resume restoration work in this site to prevent extinction of the Mars Bay population. Additionally this area can act as a contingency translocation site for wild spurge plants growing on roadsides in areas adjacent to the reserve in the event of planned construction or roadworks.	Self sustaining wild population of Ascension spurge in the Mars Bay NR	HIGH PRIORITY
			Ongoing
3b	Control the pest invertebrates found on Ascension spurge .This involves examining individual plants and treating with a species specific insecticide. Individual pests may be carefully removed and killed on site. During periods of high mealy bug infestation, station ant bait traps strategically around the Ascension spurge sites.	No plant death caused by invertebrates	HIGH PRIORITY
			Ongoing
3c	Maintain a viable stock of cultivated plants at Kew and on Ascension Island. Each nursery should hold 200 plants, 50 specimens from each sub-population. These will provide a potential source for restoration work.	50 Mars Bay spurge plants held in a nursery on Ascension Island. 50 Mars Bay plants at Kew Gardens, London	HIGH PRIORITY
			Ongoing
3d	Maintain a viable, ex-situ seed bank at Kew’s Millennium Seed Bank and on Ascension Island. Collect, clean, dry and bank seed from all wild Ascension spurge populations.	Viable seed bank of Mars Bay spurge kept on island and at Kew Gardens	HIGH PRIORITY
			Ongoing
3e	In collaboration with Kew gardens, produce a propagation document to develop cultivation techniques for the Ascension spurge.	Propagation document produced by end of Year 1	HIGH PRIORITY
			Year 1
3f	Draft a memorandum of understanding with the USAF to mitigate damage during future groundwork in <i>E. origanoides</i> habitat.	MoU created by end of Year 3	HIGH PRIORTIY
			Year 3
3g	Ensure all island organisations are familiar with and adhere to strict biosecurity control measures. All importations should be suitably cleaned and treated to prevent entry of non-native flora and fauna. All non-native species should be destroyed on entry to the island to prevent colonisation.	No new established populations of non-native species	HIGH PRIORITY
			Ongoing



## 4. Public engagement

**Proposed:** Organise public engagement events for school children and islanders.

**Purpose:** Encourage recreational use of the nature reserves. Educate islanders about the importance of the NRs and the species found there.

**Outcome:** Higher engagement between islanders and the Wideawake NRs.



	Description	Target	Priority
4a	Guided walk to Shelly Beach with conservation staff.	Minimum of 10 people engaged	HIGH PRIORITY
			Annually
4b	Litter pick organized on the Mars Bay Nature Reserve to remove legacy refuse.	Minimum of 10 people engaged	HIGH PRIORITY
			Annually
4c	Field trip for Two Boats School children to NRs. Classroom lesson about local seabirds.	Minimum of 2 year groups engaged.	MEDIUM PRIORITY
			Annually
4d	Volunteer opportunities with AIGCFD within NRs. This is open to islanders as well as RAF volunteer days.	Minimum of 20 people engaged.	MEDIUM PRIORITY
			Annually
4e	Improved signage on the reserves. Removal of old Ascension Heritage Society signs that are showing signs of wear.	New signage erected in reserve	MEDIUM PRIORITY
			Year 1
4f	Create videos, posters, islander articles and social media posts regarding the reserves and the wildlife found there.	Minimum of 10 items on social media regarding Wideawake NRs	HIGH PRIORITY
			Annually

## 5. Reduce disturbance

**Proposed:** Reduce the impact of human disturbance on the wildlife of the Wideawake NRs.

**Purpose:** Protect the wildlife of the Wideawake NRs and allow these species to thrive.

**Outcome:** No signs of human disturbance on the wildlife.



	Description	Target	Priority
5a.	During periods when sooty terns are nesting, monitor the Shelly Beach access path. If birds nest on the Shelly Beach path or in areas which make it difficult for members of the public to walk around, an application to close parts of the NR may be made to the Administrator.  The path and/or other areas of the NR may be closed by the Administrator under section 10 of the National Protected Areas Regulations 2014 to protect the nesting birds. Closures may be temporary until such times that it is safe to re-open to the public. A public notice will be issued and displayed	No eggs or small chicks recorded as trampled or damaged by disturbance.	HIGH PRIORITY
			Annually
5b	Designated parking areas and tracks clearly marked on the NR.	Designated parking site and tracks in place by Year 1. No Ascension spurge damaged by vehicles.	HIGH PRIORITY
			Year 1
5c	Clearly mark walking routes throughout the reserve to reduce visitors becoming lost and walking through nesting seabirds unnecessarily. Encouragement to follow the route in the Letterbox hiking book to reach desired locations.	No signs of disturbance to seabirds (e.g. areas of abandonment).	HIGH PRIORITY
			Ongoing
5d	Develop wildlife watching guidelines for visitors to the protected areas to minimise disturbance.	Wildlife watching guidelines created and distributed. Guidelines made available on government website for visitors to the area.	HIGH PRIORITY
			Year 1





Monitoring and research

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## Monitoring and research

To assess the success of the Nature Reserves and the species found there, monitoring will take place. This monitoring will ensure that management actions set in this document are accomplished and that they make a positive contribution towards environmental protection through achieving the Management Plan objectives (page 8).

Monitoring will be assessed in two approaches:

1. **Monitoring Management Plan actions** - Have management actions been completed and outputs achieved?
2. **Performance Monitoring** —are the Management Plan objectives being achieved?

Separating these types of monitoring will allow a distinction to be drawn between a) missing objectives because actions were not carried out properly or b) actions were completed, but were insufficient to achieve the objectives. This will guide future management responses, determining if more effort is required to deliver planned actions or if new actions need to be established. These will be reviewed annually by AIGCFD .

Each monitoring action in the proceeding pages is linked to the Management Plan objectives using the objective icons. A brief description of what is monitored , methodology and target is provided. Monitoring will be delivered by the AIGCFD alongside volunteers and external partners.

Research effort will be targeted to fill the knowledge gaps identified on the right. Priority has been given to research that will help to inform and improve wildlife and reserve management.

## Current knowledge gaps

There are a number of knowledge gaps which limit the effectiveness of current management. Research will focus on collecting baseline data or developing methods to allow effective ongoing monitoring.

### Seabirds:

- Sooty tern population size and trends
- Productivity of sooty terns
- Population size and trends of other seabird species nesting on the NRs
- Distribution and foraging locations of sooty terns outside of nesting period
- Factors determining productivity and population size of seabirds
- Impacts of rodents or Myna birds on seabird population
- Predicted impacts of climate change on seabird productivity and survival

### Ascension spurge:

- Adaptability to climate change
- Seed bank viability
- Life history responses under different environmental conditions






### Endemic and native invertebrates:

- Breeding behaviour
- Microhabitat and resource requirements
- Competitive interactions with non-native invertebrates
- Predation by non-native rodents
- Taxonomy of *Discophallus* crickets and Ascension pseudoscorpions

### Anchialine pools:




- Biodiversity of the anchialine pools
- Pool hydrology and connectivity
- Specific threats faced by the anchialine pool ecosystem






	Monitoring	Details		Objective
A	Monitor the distribution of nesting sooty tern populations.	Record locations of nesting sooty terns on a map with a population estimate of sub-colonies. Convert this into QGIS maps.		<ul style="list-style-type: none"> <li>Uncover trends in the use of the NRs spatially and through time.</li> <li>Identify areas preferred by nesting terns. Determine what makes these areas more suitable.</li> </ul>
B	Monitor changes in prey composition and trophic position of sooty terns.	Collect regurgitate samples and a minimum of 20 breast feather samples from adult and juvenile sooty terns for stable isotope analysis.		<ul style="list-style-type: none"> <li>Determine if sooty tern diet changes over time and investigate potential causes of this.</li> </ul>
C	Monitor the seabird populations of the Wideawake NRs	Annual population census of brown noddies and tropicbirds nesting on the nature reserves.		<ul style="list-style-type: none"> <li>Establish a baseline population for noddies and tropicbirds in the NR.</li> <li>Annual census will determine trends in the population.</li> </ul>
D	Monitor the wild Ascension spurge population.	Carry out bi-annual census— once in the warm and once in the wet season to determine annual trends.— recording the location of mature and seedling plants.		<ul style="list-style-type: none"> <li>Understand trends in the size and distribution of the wild Ascension spurge population.</li> </ul>
E	Monitor soil moisture levels.	Record the soil moisture levels at a range of depths from surface roots down to tap root (2m). Loggers deployed in areas which are irrigated regularly and in areas which are not watered. Loggers also deployed at other island locations as potential Ascension spurge restoration sites. This is part of the legacy from DPLUS113 project.		<ul style="list-style-type: none"> <li>Determine the appropriateness of the NR for a long-term sustainable Ascension spurge population.</li> <li>Look for alternative locations on island which may be more suitable for the Ascension spurge to thrive.</li> </ul>

	Research	Details	Objective	
A	Determine the population size of the sooty terns nesting on the NRs.	Trial effectiveness of remote cameras to monitor nesting seabirds. Joint project with the University of Oxford (DPLUS1020)		<ul style="list-style-type: none"> <li>Establish a baseline population size for sooty terns.</li> <li>Determine if remote cameras may be used for productivity monitoring of sooty terns.</li> </ul>
B	Methods for control the invasive flora of the NRs.	Trial and establish best-practice methods to control Mexican thorn- DARWIN Plus project DPLUS134.		<ul style="list-style-type: none"> <li>Best-practice methods used for future control of invasive flora.</li> </ul>
C	Determine the impacts of pollution on the seabirds of the NRs	Dissection of freshly dead seabirds to collect stomachs for plastic analysis as part of DPLUS176 Analyse breast feather of sooty terns for mercury contamination in collaboration with researchers at the University of La Rochelle.		<ul style="list-style-type: none"> <li>Determine the main items of pollution which seabirds ingest.</li> <li>Reduce litter found in reserves and in surrounding MPA by identifying items and reducing them at the source.</li> </ul>
D	Determine the dispersal of sooty terns outside of the breeding season.	Track sooty terns using satellite tags.		<ul style="list-style-type: none"> <li>Understand the spatial use of the Atlantic Ocean by sooty terns to ensure these species are protected in all aspects of their life cycle.</li> </ul>
E	Estimate rodent population on the NRs	Establish baseline population for rodents and create an effective programme to monitor the population and the success of bait control. Quantify direct predation pressures on seabirds.		<ul style="list-style-type: none"> <li>Control local rodent population to ensure they are not having an impact on seabird productivity.</li> </ul>
F	Assess impact of myna birds on seabird populations	Quantify myna bird predation on sooty tern eggs using remote cameras. Create an effective control programme for Myna birds.		<ul style="list-style-type: none"> <li>If Myna birds are reducing seabird productivity, this invasive species can be controlled in the local area to reduce impact.</li> </ul>
G	Predict the impact of climate change on the Ascension spurge.	Use data from DPLUS113 to make recommendations for potential mitigation measures to protect this species and to create self-sustaining wild populations.		<ul style="list-style-type: none"> <li>Determine the appropriateness of the NR for a long-term sustainable Ascension spurge population.</li> <li>Look for alternative locations on island which may be more suitable for the Ascension spurge to thrive.</li> </ul>
H	Assess the potential of bio-controls.	Experimentation of breeding ladybirds for bio-control in nurseries and on wild populations of Ascension spurge.		<ul style="list-style-type: none"> <li>Reduce pest invertebrates on Ascension spurge by using bio control which may be more effective and less damaging to individual plants.</li> </ul>



	Research	Details		Objective
I	Assess the potential of biocontrol agents.	Risk assess potential biocontrol agents for Mexican thorn (DARWIN plus project DPLUS134) and other invasive species- .		<ul style="list-style-type: none"> <li>Control Mexican thorn around NRs to reduce impact on seabirds and Ascension spurge as described in this Management Plan.</li> </ul>
J	Determine the environmental conditions of the anchialine pools	Measure temperature, pH, conductivity and dissolved oxygen levels in the pools.		<ul style="list-style-type: none"> <li>Predict future climate change problems for the pools and the unique marine species residing there.</li> </ul>
K	Baseline survey of invertebrates in the NRs	Survey all invertebrates in the NRs to produce a comprehensive list of those in the NRs through DARWIN Plus project DPLUS135. Highlight endemic species or species of conservation value and the highest priority non-native invertebrates.		<ul style="list-style-type: none"> <li>Determine if non-native invertebrates affect seabird productivity.</li> <li>Understand the potential impacts of non-native invertebrates on the Ascension spurge population.</li> <li>Understand the potential impacts of non-native invertebrates on endemic and native invertebrates.</li> </ul>
L	Assess the conservation status of the invertebrates found in the anchialine pools.	Identify and taxonomically describe all the invertebrates in the anchialine pools and establish relative population trends for these species.  Undertake topographical and hydrological surveys of the anchialine pools to establish connectivity and vulnerability to climate change impacts.		<ul style="list-style-type: none"> <li>Conduct threat assessment for each of the five endemic invertebrate species and incorporate findings into IUCN Red List assessments.</li> <li>Establish methods to combat impact of climate change on the pools, after identifying specific pathways of ecosystem degradation.</li> </ul>
M	Identify breeding behavior and resource/microclimate requirements of <i>Discophallus</i> crickets	Lab-based trials on captive crickets to identify breeding substrate materials, potential important food resources, and potential impacts of climate change.		<ul style="list-style-type: none"> <li>Inform the preservation of breeding materials within the NRs, which may include driftwood.</li> <li>Inform the preservation of food resources within the NRs, which may include fish carcasses to be protected from scavenging rodents.</li> <li>Determine likely <i>Discophallus</i> population trends under climate change and assess potential mitigation options.</li> <li>Red List assess described pseudoscorpion and scaly cricket endemic species.</li> <li>Determine if conservation measures are required to maintain endemic and native invertebrate species.</li> </ul>

	Research	Details	Objective	
N	Identify competitive and predatory threats to <i>Discophallus</i> crickets.	Field-based trials on crickets to identify negative competitive interactions for food resources with non-native animals species, and quantify predation rates by non-native rodents using surrogate insects.		<ul style="list-style-type: none"> <li>• Inform future targeted non-native species management to reduce threats and increase <i>Discophallus</i> density.</li> <li>• Inform placement of rodent bait boxes to sites of maximum</li> </ul>
O	Pseudoscorpion taxonomy	Taxonomic description and DNA barcoding of Ascension's pseudoscorpion species		<ul style="list-style-type: none"> <li>• Genetic barcoding of all species to confirm distinctness to pseudoscorpions found elsewhere.</li> </ul>
P	Tolerance range of inshore marine species	Physiological experiments to establish vulnerability to climate change.		<ul style="list-style-type: none"> <li>• Results used in conjunction with ecosystem modelling of climate change scenarios on Ascensions inshore habitat.</li> <li>• Species identified as vulnerable used as future indicator species to monitor climate change impacts.</li> </ul>



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