# Biodiversity on Ramsey Island

Coastal, Marine and Wildlife Conservation
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BSc Environment, Sustainability and Climate Change

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## 1. Introduction

This report aims to explore the ecological history of Ramsey island and investigate the impact of an invasive species on the native seabird population. Invasive species are a species that is introduced to an environment to which it does not naturally occur, that causes ecological and environmental harm – often with disastrous effects to the native species (National Geographic Society, 2023). Due to them being introduced, the native species have evolved without their presence and commonly lack the defences or adaptations required to compete successfully with the invasive species (Natural History Museum, 2020).

Islands offer unique eco-systems and often contain species that are endemic - found only in that location (Biology Dictionary, 2019). Island biodiversity is highly susceptible to the presence of invasive alien species, almost half of the species that have gone extinct in the past 400 years have been island species (Convention on Biological Diversity, 2014).

The invasive species on Ramsey island will be identified, the impacts on the native species, and the steps taken to eradicate the invasive species.

This will be achieved by examining relevant research literature on island ecosystems and invasive species, and the projects performed on Ramsey island. This will provide insight into the previous and current state of biodiversity on the island, the cause for a reduction in this biodiversity, and what steps were taken to reverse this reduction. This insight will allow critical analysis to determine if the reversal of this trend was successful.

2. **Ramsey Island.**

Ramsey Island, Pembrokeshire, is one of a series of islands located off the coast of South-West Wales (See figure 1). These other islands include Skomer, Skokholm and Grassholm. Ramsey is the fourth largest island in Wales (Thomas & Powell, 2017). It has several conservation designations, being a nature reserve, a Site of Specific Scientific Interest (SSSI), and most importantly, an RSPB reserve (Welsh Government, 2024).

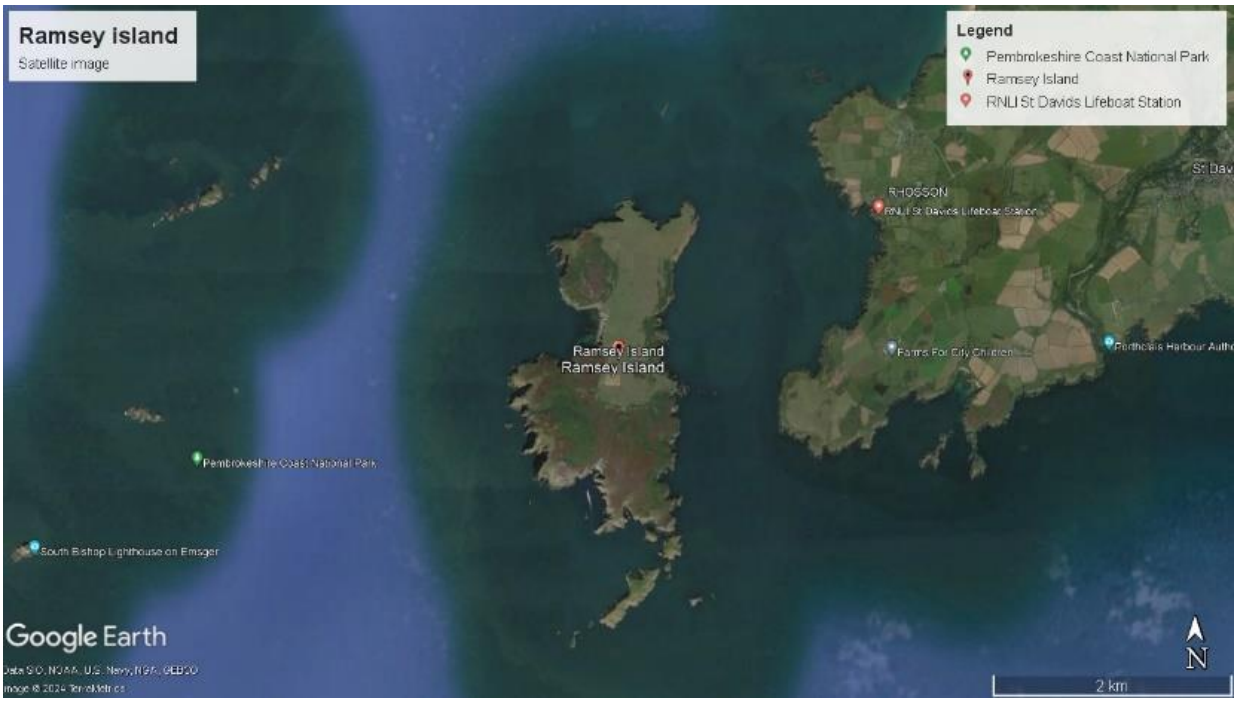


*Figure 1. Satellite image of Ramsey Island. (Google Earth, 2021)*

Ramsey Island is home to a variety of bird species, such as Choughs *(Pyrrhocorax pyrrhocorax),* Common Guillemots *(Uria aalge),* Razorbills *(Alca torda),* Manx Shearwaters *(Puffinus puffinus),* and Northern Wheatears *Oenanthe (oenanthe)* (Mitchell *et al*, 2004).

Ramsey is also an important location for Gray Seals *(Halichoerus grypus)*, that use the caves, sheltered coves, and shingle beaches for birthing pups during the later months of summer. These have become a popular tourist attraction and consideration has been given for commercial boats to circumnavigate the island during these times. Alongside mammals and birds, Ramsey is home to multiple species of plants and lichen, most notably the Golden Hair-Lichen *(Teloschistes flavicans) (*See figure 2) which is classed as a vulnerable species (British Lichen Society, 2024). A wide range of vascular plants inhabit the island, its ponds, coves, and the surrounding cliffs. Providing foraging grounds for moths and butterflies, of which seventy-five species of moth and eighteen species of butterfly have been recorded (Bullock & Cadbury, 2006).

*Figure 2. Golden Hair Lichen (The Isles of Scilly Wildlife Trust, n.d.)*

**2.1 The history of Ramsey Island**

Ramsey island has not always been an island flourishing with biodiversity. The island shows the existence of human settlement dating back to the Bronze Age, 4,500 years ago (Coflein, 2021). A number of significant archaeological sites have been discovered here, dating back to the 9th century (Bluestone Resorts Ltd, 2024). For six hundred years, from the 13th century up until the 1960's, the Bishops of St Davids owned Ramsey Island. They used this land to graze cows and sheep, and for the purpose of growing corn and other crops

(Pembrokeshire Coast National Park, 2023). Due to these grazing and farming practices, the island had limited undisturbed habitat available for seabirds and other wildlife. These practices most likely contributed to the introduction of the species responsible for the diminished seabird population.

**3. The cause of suppressed biodiversity.**

Prior to the turn of the millennium, Ramsey island was considerably less biodiverse in comparison to the other Pembrokeshire islands. A count of Puffins (See figure 3) on Skomer island, in March 2023, found 42,513 puffins inhabiting the island (The Wildlife Trust of South and West Wales, 2023). Where as to date, there is no evidence of breeding or nesting pairs of Puffins on the island.

On Skokholm island there were an estimated 63,564 breeding pairs of Manx shearwaters, and 316,065 breeding pairs on Skomer island. Identified in the Seabirds Count 2015–2020 census that was coordinated by the Joint Nature Conservation Committee (Perrins et al., 2019).

Upon taking over management of the island in 1992, RSPB staff identified brown rats as the cause of the reduced burrow nesting seabird population (Morgan, 2016). Manx shearwater, Chough, Storm petrels and Puffins are all species of birds that burrow to nest (British Trust for Ornithology, 2023). Brown rats (See figure 4) are able to enter these burrows and predate defenceless eggs and vulnerable chicks, with such success that once thriving bird populations became almost non-existent on the island. Predation of eggs and small chicks would naturally occur in the wild, but this introduced invasive species had no natural predators on the island and the rats went uncompleted to disastrous effect (Morgan, 2011).

*Figure 3: Puffin in a burrow (Walker, 2023)*

Brown rats (Rattus norvegicus), live in burrows that form loose colonies. They are omnivorous and will consume almost anything dependent on their environment. Alongside occupying potential nesting sites, these rats would pose a serious risk to any unhatched eggs and young chicks that are unable to escape. Able to breed as young as 3 – 4 months old and having up to 5 litters a year, left uncontrolled and with nothing to predate them, a rat population can increase dramatically within a short period of time (The Mammal Society, n.d.).

*Figure 4: Brown rat (Kendall, 2024)*

Having evolved and inhabited the island without the presence of brown rats, the burrowing seabird population declined severely due to the introduction of this invasive species.

**3. Eradication of invasive species**

Introduced to an island ecosystem, invasive species have been identified as the most important factor to biodiversity loss. Whether this introduction is accidental or intentional, control or eradication of the invasive population is essential to restoring the islands natural ecosystem and providing opportunities for the sea bird population to recover (Courchamp et al., 2003). It is not known how these rats were introduced to the island, but it is thought that they were introduced via shipwreck more than 200 years ago (Morgan, 2011).

A rat eradication project took place on Ramsey between 1999 and 2000, performed by RSPB staff and Wildlife Management International Limited (WMIL). Based in Blenheim, New Zealand, WMIL are experienced in invasive species eradication and control. It was decided that ground-based protective bait stations would be used (See figure 5), containing a rodenticide cereal block, to reduce the risk to non-target species during this poisoning operation. This operation ran for two months from 11th of January to 10th of March 2000, with a total of 1,260 stations placed on the main island and surrounding stacks (Bell *et al*,. 2019).

*Figure 5: Example of the bait stations used on Ramsey island (Wildlife Management International, 2024).*

Following this bait station operation, monitoring stations were set up across the island to determine the success of the eradication project. These were established from the 1st of March to 15th of March 2000. The monitoring stations used ink pads that would show paw prints from any rats passing over them. They also used wax candles, chew sticks, and chocolate blocks, which would show teeth marks from rodents chewing on them. These were checked daily to identify if any rats remained in the areas of the monitoring stations. As detailed in the report '*The recovery of seabird populations on Ramsey Island, Pembrokeshire, Wales, following the 1999/2000 rat eradication'* (Bell *et al*,. 2019), after day 41 no further bait was being taken from the bait stations, and monitoring for rat presence continued for a further 2 years following the baiting operation. No further sightings or sign of rats was detected, and Ramsey island was declared rat-free in March 2002.

### 3.1 Success of the eradication

Having successfully eradicated rats on Ramsey island, work could begin to help restore bird populations to a level of which they could be considered thriving. Manx shearwater, a seabird that nests in burrows on the island, appeared to have suffered tremendously due to the introduction of brown rats on the island. Prior to the eradication of the brown rats, breeding pair numbers were substantially lower in 1998 than they were by 2016 (Morgan, 2016). The table below shows the significant improve to the number of breeding pairs before and after the eradication of the rats.

Table showing the number of breeding pairs of Manx shearwaters before and after the eradication of rats on Ramsey island.

| Year | Breeding pairs (Manx shearwaters) |
|---|---|
| 1998 (before eradication) | 897 |
| 2007 | 2,387 |
| 2012 | 3,835 |
| 2016 | 4,796 |

For the Manx shearwaters, the eradication of brown rats on Ramsey island has made a substantial improvement to their numbers and productivity. Proving that invasive brown rats were having a considerable impact on these burrowing seabirds and their nesting habits. It is widely recognised that invasive rats are major contributors to the extinction seabirds, particularly those inhabiting islands (Jones et al., 2008).

Storm petrels have started returning to the island to nest, but unfortunately, puffins are yet to return to the island for breeding. To date, puffins are still not nesting on the island and the RSPB is using decoy puffins in an attempt to lure the birds to the island (First Nature, 2024). Although found on nearby islands in abundance, puffins are not yet returning to Ramsey island to nest or breed (Voyages of Discovery, 2024).

**4. The future of Ramsey island**

With successful eradication of rats from the island, it is vital to the seabird populations that they are not accidentally reintroduced and allowed to re-establish themselves. A key step to this is improved biosecurity and taking precautions with visitors and boats traversing to the island. Cooperation with communities, local authorities and tourist operators is vital to preventing accidental or mistaken transfer of rats to the island again. Education of the importance for the protection of these habitats is crucial to ensuring the safety and survival of these isolated habitats.

Ramsey island is now designated as a National Nature Reserve (NNR), Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and the coastline surrounding the island forms part of the Pembrokeshire Marine Special Area of Conservation (SAC) and is a part of the Pembrokeshire Coast National Park. The island itself also contains two sites of Geological Conservation Review (GCR) (First Nature, 2024). These designations provide protection to the island through UK legislation, meaning the area is closely monitored and any changes or developments to the island require strict management and consideration before being approved (Natural England, 2023).

Continued and ongoing monitoring of Ramsey island and the surrounding coastal marine environment is vital to ensuring the growth of current species and enabling the return of seabirds, such as the puffin, in the future.

**5. Conclusion**

Ramsey is the fourth largest island in Wales and has several important conservation designations. It is home to a variety of seabird species, plants and lichens. It is also an important location for Gray seals during the breeding season and provides habitat for a large quantity of butterfly and moth species.

The island has had human settlements and activity taking place there since the Bronze age, with significant archaeological discovery found on the island. From the 13$^{th}$ century until the 1960's, Ramsey was used to farm crops and graze livestock. Agricultural practices and the transport of goods to and from the island played a part in the reduction of the islands biodiversity.

In comparison to other Pembrokeshire islands, Ramsey was considerably less biodiverse prior to the change in ownership. In 1992 RSPB took ownership of the island and identified the cause of the reduction of seabird species populations. This was confirmed to be brown rats.

As invasive species have been recognised as the foremost factor to biodiversity loss in island ecosystems, control or eradication of the brown rats was a priority for restoring Ramsey islands biodiversity to a state similar to that of its neighbouring island.

A rat eradication project took place on Ramsey between 1999 and 2000, by Wildlife Management International, that utilised ground-based bait stations. Following the operation of baiting and poisoning, monitoring took place to confirm if the project was successful. No sightings or signs of brown rats were detected during the monitoring phase of the project and Ramsey island was successfully declared rat-free in March 2002.

Having successfully eradicated the rats, Manx shearwater numbers showed considerable signs of improvement. In 1998 prior to the eradication, there were only 897 breeding pairs recorded. After the eradication, the number of breeding pairs improved with every census. There were 4,796 breeding pairs recorded by 2016, a five-fold improvement in the number of breeding pairs. Storm petrels, another species of seabird that burrows to nest, are now also returning to the island to breed.

This proves that invasive brown rats were having a considerable impact on this species of burrowing seabird and can reflect the overall impact of these rats were having on the other species of native burrowing seabird populations.

Despite this success, Puffins are still not nesting on Ramsey island or returning there to breed. The RSPB is currently undertaking actions to rectify this, using decoy puffins in an attempt to lure them to the island.

With Ramsey island having numerous conservation designations, UK legislation is assisting to protect the island and its wildlife through monitoring practices and guidance for conservation efforts. This has enabled cooperation with local communities and provides the tourism industry with strict guidelines to follow for visitors and wildlife watching activities.

Continued management, conservation projects and ongoing monitoring of Ramsey will allow the species now inhabiting the island to recover from their population decline. Where necessary, work is taking place to restore the biodiversity that has been lost over the centuries of human inhabitation on the island and from the introduction of an invasive species.

[2,407 words]

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