The Ecological History of Ynys Dewi/Ramsey Island

Coastal, Marine & Wildlife Conservation

ACNA5001

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Table of Contents

1. Introduction **2**
2. About Ramsey Island **2**
3. Situating Ramsey Island **4**
4. Ramsey Island Biodiversity Losses and Restoration **5**
4.1 Rats and Island Ecosystems 5
4.2 On Ramsey Island 6
5. Effects of the Rat Eradication **7**
6. Ramsey Island and the Future **8**
6.1 The Wales Wide Approach 8
6.2 Ramsey's Plans 8
6.3 Vulnerable Islands 8
7. Conclusion **9**
8. Reference List **9**

1. Introduction

Islands have long been identified as unique and important ecosystems in environmental and ecological studies, from over 90% of Madagascar's flora and fauna (see figure 1) being endemic (Antonelli *et al,* 2022), to the Galápagos Islands being instrumental in Charles Darwin's development of the theory of evolution (Galápagos Island Trust, n.d). Despite the fact that less than 5% of the terrestrial area worldwide consists of islands, more than 20% of both terrestrial plants and vertebrates are located on them. However, islands are also at high risk from climate change and species extinction (Courchamp, 2014).

Figure 1: Brown mouse lemur *(Microcebus rufus),* only found on Madagascar (Lee, 2023)

As well as having extremely high levels of biodiversity, islands have also been described as 'paradigmatic' examples of the interactions between humans and the environment, leading to both positive and negative outcomes for ecosystems. Unique topography and ecology shape the communities that live on and near islands, and cultural knowledge is suggested to be an underutilised resource in conservation efforts (Kueffer & Kinney, 2017). Standing in contrast to this, however, are the lasting environmental damages caused by colonisation of many island nations by Europeans from the 15th century onwards, which frequently destroyed traditional, sustainable methods of interacting with the environment (Wallmen et al, 2017). This history still influences the environmental practices of many island nations today (Manglou, 2022).

2. About Ramsey Island

Turning now to the primary subject of this report, Ramsey Island (see figure 2), a small island located off the coast of Pembrokeshire, about one kilometre from St. David's Head at the northern end of St. Brides Bay (Bluestone Resorts, 2023). It is owned and managed by the Royal Society for the Protection of Birds (RSPB) as a nature reserve, with cliffs and maritime heathlands providing habitat for a variety of seabirds such as chough *(Pyrrhocorax pyrrhocorax),* and is uninhabited by humans apart from two RSPB staff who reside there year round (RSPB, n.d). As well as being habitat for endangered or rare seabirds, rare plants are found in maritime healthland pools on the island, such as floating water plantain *(Luronium latans)* (Countryside Council for Wales, 2008).

Despite being mostly uninhabited today, the island has a long history of human-environment interactions, with surveys finding remains of settlement thought to date to the Bronze Age, around 4,500 years old (Coflein, 2021). In the 13th century, the island was owned by the Bishops of St. David, and cows and sheep were farmed there up to the 1960s (Pembrokeshire Coast National Park, 2023a).

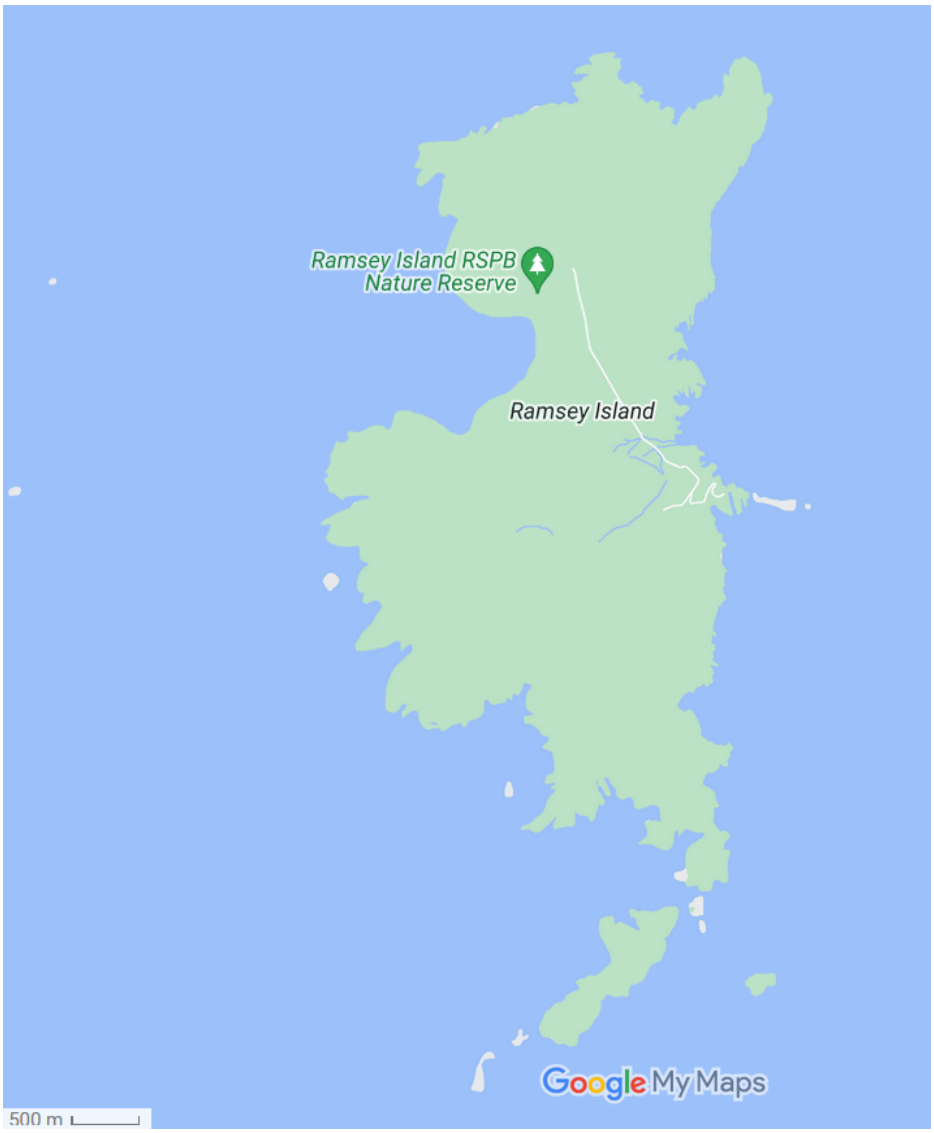

Figure 2: Ynys Dewi/Ramsey Island (Google My Maps, 2023a).

While Ramsey Island is currently owned and managed by the RSPB, it also falls under the territory of the Parc Cenedlaethol Arfordir Penfro/Pembrokeshire Coast National Park (PCNP). This is one of the three national parks in Wales, with Eryri National Park being the first to be designated in 1951, followed by the PCNP in 1952, and lastly the Bannau Brycheiniog National Park in 1957. In England and Wales, the goals of national parks as set out by law are to promote public enjoyment and understanding of the area, while at the same time conserving natural beauty, cultural significance and wildlife (National Parks UK, 2023).

The PCNP also highlights in their management goals their responsibility towards communities that live within the area designated as the national park, with an aim to encourage social and economic wellbeing (Pembrokeshire National Park, 2023b). The RSPB, in their statement of

governance, include public education about nature as one of their primary goals, and describe how their intentions are to conserve nature for the specific purpose of benefit to the public (RSPB, 2023). Both of the organisations involved in the running of Ramsey Island have social and community aims listed as priorities for their operation alongside ecological goals, which is important because of how community involvement is regularly identified as a vital part of creating long lasting, sustainable conservation areas (Ancrenaz *et al,* 2007, and Raycraft, 2019), especially in the context of local communities often being excluded from island management, as discussed in the introduction.

3. Situating Ramsey Island

Ramsey Island is not the only island that is part of the PNCP (see figure 3).

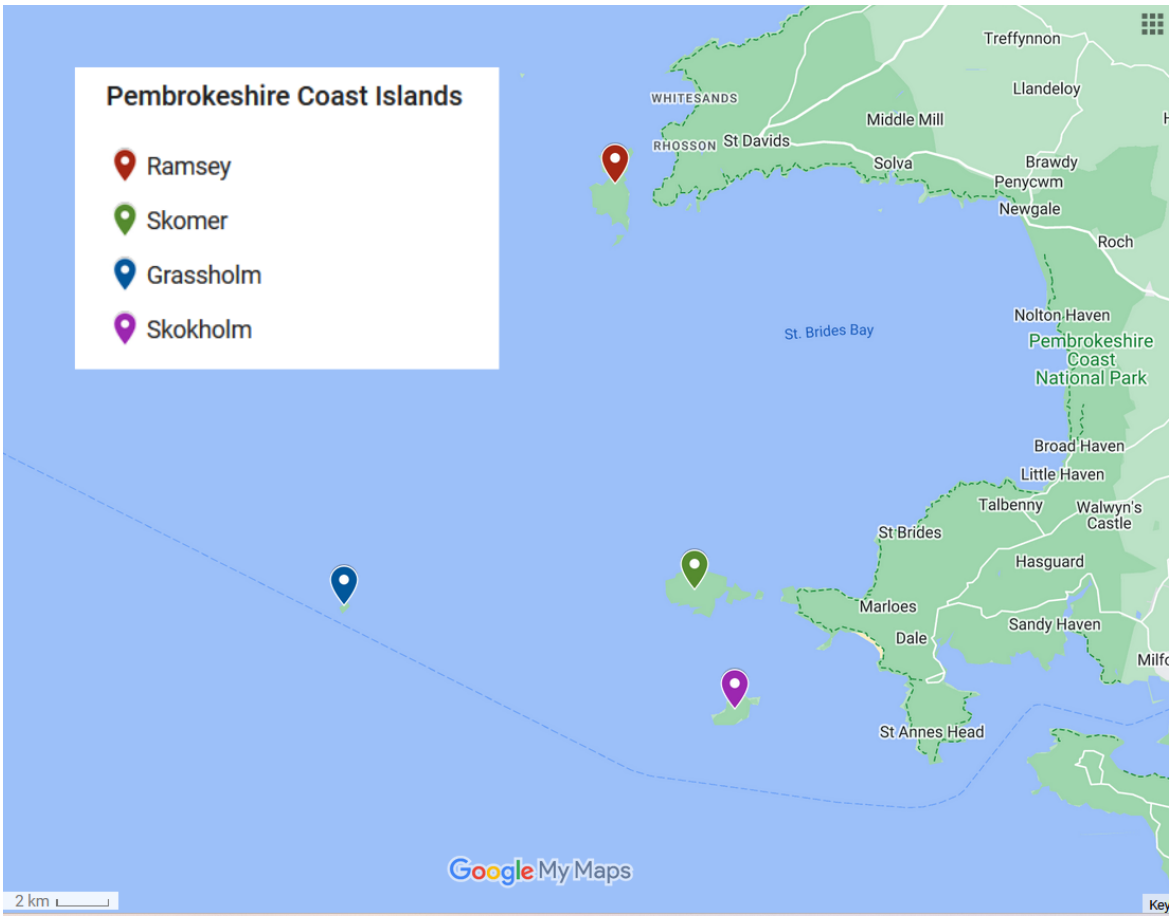

Figure 3: Pembrokeshire Islands (Google My Maps, 2023b).

As a site of international importance for many seabirds, Skomer Island is perhaps the most well known of the islands in this area. With the largest colony of Manx shearwaters *(Puffinus puffinus)* in the world, the island is also home to puffins *(Fratercula artica),* guillemots *(Uria*

aalge), and the endemic Skomer vole (*Clethrionomys glareolus skomerensis)* (Wildlife Trust of South and West Wales, n.d.a). It is also noted that despite the presence of the Skomer vole, rabbits and shrews, there are no rats on Skomer Island. In 2022, 255 grey seal pups *(Halichoerus grypus)* were born on the island, demonstrating the importance of the area to the species (Buche & Blockley, 2022).

Skokholm, although smaller than Skomer, is also known for seabirds, including puffin*,* Manx shearwater (Wildlife Trust of South and West Wales, n.d.b) and storm petrel *(Hydrobates pelagicus)* (Wood et al, 2022). Grassholm Island is home to the 3rd largest colony of gannets *(Morus bassanus)* in the UK (Visit Pembrokeshire, 2023).

In summary, despite the biodiversity of its neighbouring islands, and coming under management strategies with conservation focuses, Ramsey Island itself has a complex ecological history, especially compared to nearby islands. To this day, puffins do not reside on Ramsey, and many of the seabirds that are found there today have returned within the last 15-20 years (Voyages of Discovery, 2023). In the section following, this history will be explored in more depth.

4. Ramsey Island Biodiversity Losses and Restoration

There are a few key sources that provide insights into the history of Ramsey Island, and one of these is the series of blogs written by Ramsey Island staff on the RSPB website. Greg Morgan, who was the resident warden of Ramsey Island for eighteen years and current site manager, describes the cause of the wildlife losses on Ramsey as he sees it - rats, presumed to be introduced via shipwrecks on the island in the 1800s (Morgan, 2011).

4.1 Rats and Island Ecosystems

Rats are a factor often closely associated with biodiversity loss in island habitats (Moors *et al,* 2010 & Micheletti *et al*, 2020) and there is evidence to suggest that people have been aware of this relationship since as early as the 1940s, if not earlier (Atkinson, 1977). The black rat *(Rattus rattus)*, brown rat (*R. norvegicus*) and Pacific rat *(R. exulans)* are three of the primary species identified in the literature as frequently becoming invasive, and the house mouse *(Mus musculus)* can also become an issue (see figure 4). Smaller seabirds that nest in burrows or on the ground have been shown to be particularly vulnerable to predation by invasive rats (Jones *et al*, 2008, Ratcliffe *et al*, 2009), but endemic island

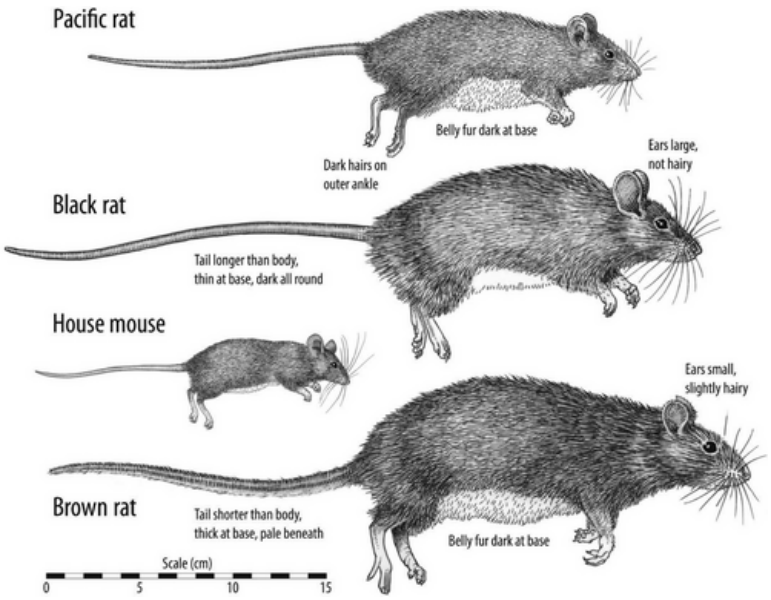

Figure 4: The four main rodent species to become invasive (Innes et al, 2023)

rodents are also vulnerable to being out-competed by invasive rodent species (Amori & Clout, 2003).

In addition to damaging population numbers of rare seabirds, it has been shown that when invasive rat populations are present, the ways nutrients move through the ecosystem can be greatly altered, as there are fewer birds returning from feeding at sea to deposit guano on land, which effects the whole ecosystem (Benkwitt et al, 2021).

4.2 On Ramsey Island

As the literature has demonstrated, invasive rat species are capable of harming populations of seabirds, by predating on them directly or altering the island habitat they require. One of the first successful recorded rat eradications to be carried out in the UK took place on Ynys Aberteifi/Cardigan Island in the 1960s, where the brown rat was causing topsoil erosion and damage to bird populations. Following the eradication, birds such as the razorbill *(Alca torda)* began to nest on the island again (The Wildlife Trust of South and West Wales, n.d.c). This case is not unlike Ramsey Island, which was also affected by invasive brown rat populations.

The rat eradication project on Ramsey was undertaken over the 1999-2000 period, and was the first rat eradication programme that the company Wildlife Management International had undertaken in the UK, as they are based in Aotearoa/New Zealand (Wildlife Management International Limited, 2016). It was carried out using ground-based bait stations, made from lengths of pipe (see figure 5), placed at regular intervals depending on the species targeted. As brown rats were the target on Ramsey, bait stations were placed at distances between every 25m x 25m and 100m x 100m, with a denser placing around higher risk locations such as existing bird nesting sites, and then baited with cereal blocks containing 'Neosorexa', an anticoagulant containing difenacoum made by Sorex LTD, a pest control company (Bell, 2019a).

Figure 5: An example of the rodent bait stations used (Bell, 2019b).

Another of the key sources that is highly informative about the Ramsey rat eradication is the paper written about the process in 2019 (Bell & Bell *et al).* Here, it is described how in addition to the bait stations, monitoring stations were also set up immediately after baiting had taken place, containing wax blocks which would show rodent teeth marks, and ink pads that would show footprints, and these were checked daily. After 41 days, no more bait was taken and there were no signs of rats appearing in the monitoring stations. However, it is noted that some corvids (*Corvus* spp.) were able to access the poisoned bait at first, and several bird deaths were recorded until the bait station sizes were increased. This paper also notes the fact that the

rabbit population on Ramsey Island may continue to affect Manx shearwater distribution even after rat eradication, but does not expand further on this point. Ramsey was declared officially rat free in 2002.

5. Effects of the Rat Eradication

Today, it has been over 2 decades since the rat eradication was completed. Population surveys of Manx shearwater are carried out on the island every 5 years, and the most recent one was completed in 2022. It found that there were over 6,000 breeding pairs of shearwaters present on the island, which is significantly higher than the roughly 800 breeding pairs recorded in 1998, pre rat eradication (Bird Guides, 2022). Surveys are carried out using playback, where bird calls are played in each of the given survey squares and responses back are measured, and while this is a common method for surveying bird populations (Clewley et al, 2016), the accuracy has been questioned in more recent studies (Orlando et al, 2021), and knowledge gaps about the behaviours, distributions, and population numbers of bird species such as the Manx shearwater have also been identified (Baker et al, 2022). However, Manx shearwater numbers have been steadily increasing in the years since the eradication, and birds that were ringed as fledglings on the island have been recorded returning as mature adults to breed (Morgan, 2016).

Despite the success of the Manx shearwaters, puffins have not returned to the island since the rat eradication. It is also important to keep in mind that rats are not the only invasive mammal that can impact an island ecosystem, rabbits, amongst others, also can become invasive (Courchamp, 2001 & Duerwald, 2018). It does not appear that the potential effects of rabbits on seabird populations on Ramsey have been studied. Armstrong (1982) describes rabbits as having been ‘exterminated’ from Ramsey by rats, but more recently a volunteer blogging about their visit to the island notes a large rabbit population (Ramsey, 2022). This area would benefit from further study.

Overall, however, it appears that the rat eradication has succeeded in its goal of restoring seabird populations to Ramsey Island. In Aotearoa/New Zealand, where many islands have suffered from invasive rat populations and eradications carried out, the need for thorough, consistent biosecurity is highlighted, and the adoption of new techniques to improve the biosecurity currently in place is also recommended to ensure the long term success of rat eradications (Russell et al, 2008).

6. Ramsey Island and the Future

6.1 The Wales Wide Approach

In Wales, the Wellbeing of Future Generations (Wales) Act 2015 identifies seven wellbeing goals (see figure 7), and outlines the need for public bodies, such as national park authorities, to participate in sustainable development (Llywodraeth Cymru/Welsh Government, 2021). In addition to this, resilience is emphasised as a goal of national parks in Wales specifically, both in practices undertaken and in communities formed, as a response to the worsening effects of the climate crisis, especially biodiversity loss (Llywodraeth Cymru/Welsh Government, 2018). The PCNP identifies focus areas in their management plan for 2020-2024 under this legislation, aiming to manage light pollution, restoring hedgerows and monitoring plant pathogens on their site (PCNP, 2019).

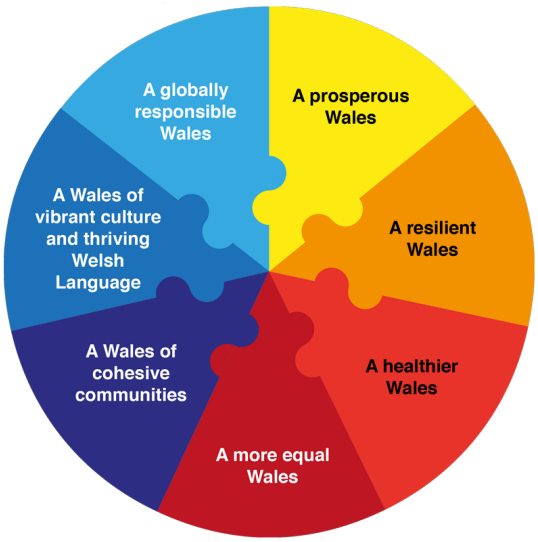

Figure 7: Wellbeing goals (WCVA, 2023)

6.2 Ramsey's Plans

On Ramsey Island, biosecurity methods have been passive monitoring, with ink, wax and camera traps to detect any invasive species, especially rats. However, in the past few years, they have been working on an active form of biosecurity, which is using specially trained dogs to sniff out rats, stoats or other target animals (Biosecurity for Life, 2021). In 2022, a small fishing vessel ran aground on nearby Skomer, and a full incursion response had to be undertaken (Newman *et al,* 2022), and Jinx, the conservation detection dog being trained on Ramsey (see figure 8) was brought in as part of this response (Morgan, 2023).

Figure 8: Jinx (Morris, 2023)

6.3 Vulnerable Islands

While the PCNP's management plan discusses preventing biodiversity loss in general terms, there does not appear to be specific information available to the public regarding Ramsey Island's plans for climate change mitigation. However, the rising sea levels, changing temperatures and unusual weather patterns caused by climate change leave islands uniquely vulnerable, and increased erosion of sea cliffs due to these factors could be particularly

damaging on Ramsey, as many of the seabirds nest in the tall cliffs (Veron *et al,* 2019). Many islands take adaptive actions, but without documentation of what was done and the effects it has had so far, it can be hard to plan effectively (Klock & Nunn, 2019).

The Pacific Islands are an instance of islands that are highly vulnerable to climate change, where the work of local leaders and community members is often disregarded, leading to the islands being described as lacking options for adaptation. However, local community members have a strong understanding of their environment, and push for both local change and global policy change (Mcleod *et al,* 2019), an example which could be followed by the community around Ramsey Island. To be most effective, climate change adaptation and mitigation efforts need to be just and equitable, focusing on sustainable and consistent processes (Johnson & Wilkinson, 2020, Loach, 2023)

7. Conclusion

Island ecosystems frequently play important roles in human understandings of the environment, and have been sites of both conflict and conservation efforts throughout the years. In the past, the ecological status of Ramsey Island has been different from neighbouring islands, and the literature investigated in this report concludes that this is because of the presence of invasive brown rats on Ramsey, whereas the other islands nearby have not had this issue. Nonetheless, there are gaps in the research, especially about the impact that other invasive mammals may have, and the behaviour and habitat requirements of seabirds. The rat eradication programme carried out in 1999/2000 was successful meaning that Ramsey Island has been rat free since 2002, and many seabirds such as the Manx shearwater have been increasing in population on the island since that time. Adaptive actions will need to be taken against the effects of the climate crisis, however, and despite differences between islands globally, there is useful information available about continued community involvement and mitigation documentation for Ramsey Island to take in the future.

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