

ISLES OF SCILLY SEABIRD RECOVERY PROJECT



Summary Report: Improving rodent control on uninhabited islands, assessment of the feasibility of rat removal across the Isles of Scilly archipelago and feasibility of rat removal from St Agnes and Gugh.

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Prepared for:
Isles of Scilly Seabird Recovery Project

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Front pictures: *Top (L)*: Harbour, St Mary's, Isles of Scilly
Top (R): Old Man of Gugh, Isles of Scilly
Bottom (L): Rat teeth marks on Waxtag™, Isles of Scilly
Bottom (M): Rat foot prints on tracking tunnel, Isles of Scilly
Bottom (R): John Tayton (WMIL) setting tracking tunnel, Isles of Scilly

EXECUTIVE SUMMARY

The Isles of Scilly support nationally and internationally important seabird populations. A Seabird Strategy was produced to identify priority actions including protecting and enhancing available habitat for seabirds through rat control and removal. The Isles of Scilly Seabird Recovery Project was developed following a workshop in March 2010 in which key stakeholders within the community helped identify the issues, opportunities and constraints of improving seabird habitat and numbers through the control of rats in the Isles of Scilly. The Isles of Scilly Recovery Project is a partnership of organisations (including RSPB, the Isles of Scilly Wildlife Trust, and Natural England) with the Isles of Scilly Area of Outstanding Natural Beauty acting as facilitators. The partnership commissioned this feasibility study to review current and consider future work to control brown rats that threaten the internationally important seabird colonies in Scilly.

The feasibility study interviewed key stakeholders across the islands; in addition, 55 randomly selected people on St Mary's were also interviewed to obtain information and views. Businesses, properties and land were inspected to assess issues that may affect rat control work. On St Agnes and Gugh all adults were interviewed and trapping monitoring was undertaken to assess species and population densities.

Routine pest control work for rats on Bryher, Treco, St Martin's, St Agnes, Gugh and St Mary's is undertaken by the Council of the Isles of Scilly, Treco Estate and private individuals. The Council of the Isles of Scilly provides rat bait at no charge to all private residents to control rats in and around their homes. Farmers and other tenants (i.e. bulb growers) are responsible for rat control on their land. Rat control on the uninhabited islands (for the protection and enhancement of seabird habitat) has been carried out for over 20 years by local conservation groups and since 1995 by Isles of Scilly Wildlife Trust. Unfortunately the success of this work is limited by the close proximity of rat infested inhabited islands as re-invasions are common. There have been bait station grids established on each uninhabited island which are visited at least once a year. These stations are baited all year. Monitoring for rats occurs between October and March. If rat sign or bait take is recorded on an island, further baiting and monitoring visits are made to that island to remove the rats before the following seabird breeding season. Within the limitations of IOSWT (staff availability and transport issues) and weather, this control work is being done as well as possible. Early rat detection is difficult, but important to ensure rat incursions are identified and dealt with as soon as possible (and at the most appropriate time of year). Using only one method such as bait inside stations reduces the likelihood of early detection, but detection is more likely if a number of monitoring techniques are used and with more frequent visits. Improvements to the current control operations include additional staff (an additional Isles of Scilly Wildlife Trust warden position or a contractor to implement the winter rat control work only), increased transport availability (or use of chartered boats), regular monitoring visits to each island and increased and structured baiting on adjacent inhabited islands, use of wooden boxes in sensitive places to reduce impact on landscape. There was 100% support from those interviewed for the current control work Isles of Scilly Wildlife Trust was undertaking on the uninhabited islands.

From information gathered by interviewing local residents and stakeholder groups, rats cost the inhabited islands between £65-210 per year per household (including purchasing bait, and traps, time, replacing damaged goods and repairing damage), and up to £350 per year per household (depending on the household, particularly farms and growers) due to loss of productivity, contamination of goods and water, damage to crops and eating stock and chicken feed. In addition to physical costs of rats, there is the spread of disease and parasites; there have been two confirmed cases of Weil's Disease in the Isles of Scilly. The control on the uninhabited islands costs at least £12,000 per year (including staff time, boat transport, bait stations, bait and data management). This means rat control, damage, contamination and loss of products costs the Isles of Scilly nearly £200,000 per year.

Due to the connectivity of the uninhabited islands to neighbouring inhabited islands the risk of rats reinvading the islands is high. Additional control on the inhabited islands targeting more locations, particularly the coastal zones, could lower the rat populations on those islands and reduce the reinvasion risk to the uninhabited islands and neighbouring inhabited islands. It would be useful if the Council of the Isles of Scilly rat control took a more structured and regular approach to control on Bryher and St Martin's and that the Tresco Estate also implemented a wider rodent control programme on Tresco. Baiting undertaken in autumn and winter (when rats are more likely to be interested in the bait) is more likely to target rats and reduce the populations more effectively. It would be more cost effective to bait fortnightly (or monthly) from September to March than throughout the year. Interestingly many residents on Bryher and St Martin's recalled that wide-scale baiting for rats used to be undertaken by previous control operators and this kept rat numbers lower than at present. The Council of the Isles of Scilly should also provide snap traps to residents for targeted control of rats at private properties. This would reduce the use of rodenticides over the island and risk to non-target species. Bait blocks should be used rather than grain; blocks last longer in the stations and provide lower risk to non-target species as they remain contained in the stations (as grain can blow out of stations).

At present an archipelago-wide rat removal programme is not possible. St Mary's is not feasible (due to a number of factors including poor waste management, public support, structure of Hugh Town and presence of other predators); Bryher and St Martin's are technically feasible, but the connectivity with Tresco means issues on one island would affect the rat removal programme on the other islands. Tresco is not feasible at present in part due to large-scale bird-hunt operations. The only island that is feasible at present is St Agnes and Gugh. This is due to the isolation from all the other islands; the closest island, St Mary's, is still 1.8 km away (from shore to shore) or 1.3 km (to the nearest stepping stone) from St Agnes and Gugh (across St Mary's Sound), small human population, well-managed waste management and community support.

Even if all the factors affecting a rat-removal programme were addressed on each of the other inhabited islands, a long-term (i.e. multiple year) programme would be required to clear these islands of rats; each island would have to be dealt with in stages and in the case of Tresco, Bryher and St Martin's would have to be a joint project (due to the connectivity). Any rat removal programme on St Mary's would require an extremely long-lead in time as among many factors, waste management is a major issue. Although public support to

remove rats from St Marys was comparatively low (62%), every resident interviewed there thought it was very important to continue to remove rats from the uninhabited islands to protect seabirds. Some (12%) thought that once waste management had improved on St Mary's rat numbers would decrease and there would not be an issue any longer. More (24%) were concerned that the ecosystem balance would change if rats were removed. All wanted some increased level of rat control on St Mary's (especially in cases of severe infestation), but several (42%) thought that total rat removal would not be possible. There were also a number of residents (15%) who believed that rats had a right to live on the Isles of Scilly and that no animal should be killed. Public support for a rat removal programme on St Martin's, Bryher and Tresco was high (93-100%). The residents on St Martin's and Bryher were very keen to remove rats from their islands to reduce overall personal costs as well as impacts on seabirds, ecosystem and the islands as long as the programme was feasible and safe. Nearly all of the Bryher (86%) community and all of the St Martin's community felt it was important to protect and enhance the seabird populations and would like to see seabirds return to their islands. The Bryher and St Martin's communities were very interested in the techniques and procedures in a rat removal programme.

A detailed assessment of feasibility of removing rats from St Agnes and Gugh was completed including trapping and tracking results, density and distribution estimates, identifying difficulties, mitigation requirements and assessing community support. Every adult present during the assessment was interviewed to determine the level of support for the project, to outline the likely techniques and to address any concerns about the proposal. There was unanimous support for the removal of rats from St Agnes and Gugh. Although St Agnes and Gugh has some difficult issues, a well planned, adequately resourced, well executed programme that is fully supported by the local community, and staffed or led by experienced operators, a total rat removal is entirely possible.

Rodent density was estimated using trap and monitoring indexing and surveys across St Agnes and Gugh found 23 rats per hectare (approximately 3100 rats). This density is similar to other inhabited islands around the world and is not excessive. The highest density and distribution of rats on the islands was around the coast. Rats were eating a range of food items including Scilly shrews, blackberries, seeds, heather, invertebrates, limpets, crabs and *Pittosporum*.

The operational plan for the removal of rats from St Agnes and Gugh provides details of the proposed rat removal programme of brown rat (*Rattus norvegicus*) from St Agnes and Gugh and has been prepared to guide the planning and implementation of the programme. The removal operation aims to eradicate all rats from St Agnes and Gugh while minimising any adverse impacts on the environment, non-target species, humans, livestock and pets. The rat removal programme is complicated by the presence of the local community, but because the residents' offered their full support and with a readiness to involve themselves in the project, the removal of rats is achievable. There are significant benefits from removing rats from St Agnes and Gugh including recolonisation of Manx shearwater and storm petrel population, increased Scilly shrew population, increased invertebrate population, recovery of some plant species and stopping damage to crops and properties and better protection of Annet (and the Western Rocks). The costs of rats to St Agnes and Gugh is nearly £425 per

year per household (including purchasing bait, time, replacing damaged goods, productivity loss, contamination and damage to crops and feed. The total costs of rats to residents on St Agnes and Gugh is likely to be between £10,000 and £15,000 per year.

The proposal is for a five-year project with the removal of rats conducted in winter of the third year. Detailed planning and risk assessments, permits and approvals, operational details, continued community consultation, a biosecurity strategy, contracts and monitoring and research programmes would be undertaken in the first two years. The rat-removal operation would occur over winter; from October to March (in a single 180-day operation) in the winter of the third year). Monitoring for surviving rats would continue for two years before a final decision on the success of the rat removal programme could be given. Monitoring of invertebrate, land birds, seabirds and vegetation will continue through these two years as well.

The financial requirement for this rat-removal project on St Agnes and Gugh will depend on delivery method, operators and other factors. A detailed inventory of equipment and manpower has been provided. Funding for the programme has not been secured and will need to be sourced from grants such as the EU Life programme. There are a number of funding options which are being investigated.

It is important to stress that the removal of rats from St Agnes and Gugh could be used as a valuable education tool. The successful removal of rats from St Agnes and Gugh could show the other communities that it is possible to safely remove rats without impacting on the lives and habits of the local residents. Although there are a number of other factors that affect seabird populations, any recovery (of seabirds and other flora and fauna) would show how important it is to have a rat-free island for the biodiversity and health of the ecosystem. This could motivate the other communities to implement changes to enable a rat removal programme to proceed on their islands.

In summary:

1. Rats **are** having an impact on social, economic and conservation factors on the Isles of Scilly; particularly with regards to seabird productivity, public health, public enjoyment, damage to properties, animal health, vegetation growth and crop damage.
2. The Isles of Scilly are internationally important for seabirds. Rats are probably the biggest land-based threat to some seabird species (e.g. storm petrel, Manx shearwater and puffin). The removal of rats from St Agnes and Gugh would provide secure breeding conditions for existing Manx shearwater, release suitable habitat for storm petrel and protect Annet (the most important island in the Special Protected Area for seabirds) from further rat incursions.
3. Rat control, damage, contamination and health issues cost the Isles of Scilly up to £200,000 per year; St Mary's £160,000, Bryher £7,500, St Martin's £12,500, Tresco £5,000 and St Agnes and Gugh £15,000.
4. The present rat control on the uninhabited islands is adequate, but could be improved with increased staffing, increased monitoring, adequate transport and co-operation with residents, other agencies and Council of the Isles of Scilly contractors.

5. A new Isles of Scilly Wildlife Trust warden position (or contract rat control position) should be developed to undertake all rat monitoring (September to April) work on the uninhabited islands and buffer zones on inhabited islands. The responsibilities should be to visit all islands regularly, implement monitoring stations (tracking tunnels and chocolate wax), monitor bait and monitoring stations, data entry and analysis.
6. Monitoring tools (rodent motels, tracking tunnels, chocolate wax etc.) need to be used on the uninhabited islands to aid with rat incursion detection. The use of wooden boxes in sensitive locations will improve aesthetics.
7. Accurate records of re-incursion (i.e. detection location, date) and subsequent action should be maintained. It is important to get a pattern of re-incursion and relate this to tide, month, behaviour, foraging and detection probability.
8. Additional baiting on the inhabited islands could reduce the frequency of rat incursion to the uninhabited islands.
9. Due to a number of factors (including poor waste management, lack of public support and presence of other predators), the removal of rats from St Mary's **is not** currently feasible.
10. Based on random interviews, the proposal to remove rats from St Mary's was not completely supported by the local community. Only 62% of those residents interviewed supported the proposal; others thought it was not achievable or not appropriate as they didn't realise Manx shearwaters were present on St Mary's. In addition 15% of those interviewed considered that rats should not be controlled at all on St Mary's. This makes a removal programme on St Mary's unfeasible.
11. The removal of rats from Bryher, Tresco and St Martin's **is not** feasible without these three islands being targeted together.
12. Based on random interviews, the proposal to remove rats from Bryher, Tresco and St Martin's was supported by the local community.
13. The population estimate for rats on St Agnes and Gugh is 3100 rats, on Bryher is 2500, on Tresco is 7450, on St Martin's is 5100 and on St Mary's is 16350 rats. This is a density of between 20 and 25 rats per hectare depending on the habitat type. Most inhabited islands around the world have rat densities that range between 15 and 50 rats per hectare (depending on habitat). Black rats (*Rattus rattus*) have been recorded historically on the Isles of Scilly (in particular on Samson between 1300 and 1478) but are presumed to have died out in the late 1400s; they were not found as part of this survey. House mice (*Mus musculus*) have been recorded on St Agnes and Gugh in the past but were also not caught during this survey.
14. Rats were recorded eating Scilly shrews, blackberries, seeds, heather, invertebrates, limpets, crabs and *Pittosporum*.
15. The removal of rats from St Agnes and Gugh **is** feasible. However, a number of factors need to be addressed prior to the programme such as reduction in use of poison prior to operation, safety of pets, storage of stock and chicken feed, harvesting and storage of potatoes, compost and general waste disposal and storage.

16. Any rat removal programme undertaken on St Agnes and Gugh should be a ground-based operation using bait stations using difenacoum (Neosorexa[®], a cereal-based wax block) from October to March (approximately 180 days).
17. The entire community on St Agnes and Gugh were supportive of the proposal to remove rats from their island. In addition other off-island communities were supportive of the idea that it was undertaken as a pilot project. The community were willing to implement all requirements to ensure the success of the project such as alternative waste management, potato and animal feed storage systems.
18. Community concerns ranged from pet and children safety, farming issues (being able to grow feed crops as usual), funding and justification of expense. Mitigation and technical information covering these concerns was provided to all households.

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SUMMARY REPORT: ISLES OF SCILLY SEABIRD RECOVERY PROJECT

1 INTRODUCTION

The Isles of Scilly are a nationally and internationally recognised location for seabirds, particularly Manx shearwater (*Puffinus puffinus*) and European storm petrel (*Hydrobates pelagicus*, Lock et al 2006). There are a number of important land areas designated for seabirds as Special Protected Areas (SPA), Sites of Special Scientific Interest (SSSI) and RAMSAR (Lock et al 2009). Seabird populations on the Isles of Scilly have been recognised as a priority for conservation requiring habitat surveys, population monitoring and control of invasive species. A partnership of organisations (Natural England, Isles of Scilly Wildlife Trust, Royal Society for the Protection of Birds (RSPB), and Isles of Scilly Bird Group) produced the Isles of Scilly Seabird Conservation Strategy (2005-8, Lock et al 2006). This document described the national and international status and context of the seabird populations on the Isles of Scilly, identified priority actions including current and future measures to improve the available habitat for seabirds through rat control and removal and outlined an annual work programme to achieve the priority areas of work (Lock et al 2006). A second Isles of Scilly Seabird Conservation Strategy (2009-13) reviewed the first period of seabird research and monitoring on the Isles of Scilly, highlighted the most important issues and set out revised strategic goals for the annual work programme (Lock et al 2009).

One major issue identified by the Isles of Scilly Seabird Conservation Strategy was the need to focus on the opportunity of protecting islands that have historically remained rat-free and provide more suitable habitat for seabirds through the removal of rats. Rat control has been undertaken on all of the uninhabited islands in the Isles of Scilly for over 15 years; particularly on those islands identified as key sites for seabird recolonisation. Unfortunately the success of this work is limited due to the connectivity to the inhabited rat-infested islands. An assessment of the current rat control work undertaken on the uninhabited islands was identified as a priority action to ensure that this work was focusing on the best sites, that best practises were being used and that new and alternative methods were identified that could be used at these locations.

Manx shearwater and storm petrel breed on a number of uninhabited islands (including Annet, Round Island, Western and Norrad Rocks) with Annet being the most important (Lock et al 2006). Manx shearwaters have been recorded on inhabited islands, but are not thought to have successfully bred as no young have been recorded to date (V. Heaney, pers. comm.). Rats are one of the major reasons for this limited distribution. Another issue identified in the Isles of Scilly Seabird Conservation Strategy was the need to investigate into the feasibility of eradicating rats from the archipelago as a whole and more importantly from St Agnes and Gugh with a detailed operational plan to protect Annet from invasion by rats and also provide additional habitat on those islands.

The Isles of Scilly Seabird Recovery Project, involving a partnership of organisations including the Isles of Scilly Area of Outstanding Natural Beauty, Natural England, Isles of Scilly Wildlife Trust and RSPB was established. A workshop involving a large number of stakeholder groups was held in St Mary's in March 2010 to address the issues affecting seabirds on the Isles of Scilly; one major outcome was the requirement to assess the feasibility of removing rats from the Isles of Scilly. The Isles of Scilly Seabird Recovery Project Partnership requested that an assessment of the current rat control work on the uninhabited islands, the feasibility of removing rats from the Isles of Scilly as an archipelago and a detailed feasibility assessment and operational plan for St Agnes and Gugh be undertaken.

Wildlife Management International Limited (WMIL) was contracted to undertake this work for the Isles of Scilly Seabird Recovery Project Partnership.

2 OBJECTIVE

The purpose of this investigation was to:

- Review and assess the efficacy of the current rat control work on uninhabited islands in the Isles of Scilly, review and evaluate new and alternative technologies and make recommendations on future management.
- Assess the feasibility of rat removal across the whole of the archipelago and the potential for inhabited island groups, measures to prevent reinvasion and potential costs, and
- Provide a detailed assessment and costed operational plan for the islands of St Agnes and Gugh.

3 JUSTIFICATION OF ASSESSMENT

The Isles of Scilly support nationally and internationally important populations of seabirds, particularly Manx shearwater and storm petrel (Lock et al 2006). There are a number of designated Special Protected Areas (SPA) and Sites of Special Scientific Interest (SSSI) areas for seabirds on all islands (except St Mary's). Current control on the uninhabited islands assists the action to enhance the habitat for seabirds, but re-incursion of rats is a major problem (Mawer 2009). Investigation into alternative methods that could make this programme more effective is important.

It is crucial that Annet, as the key location for Manx shearwater and storm petrel remains free of rats as Manx shearwater and European storm petrel display significantly diminished productivity in the presence of rats, and the distribution of breeding European storm petrels in the UK is mutually exclusive from the distribution of rats. As such it is important to assess the feasibility of removing rats from St Agnes and Gugh to further protect Annet. St Agnes and Gugh are more isolated from the other islands (separated 1.8 km from the shore of St Mary's by St Mary's Sound, a deep, swift channel of water) which decrease the risk of re-

invasion. It will also give the opportunity for the seabird populations to colonise St Agnes and Gugh.

It was vital to assess the entire island to determine what factors and protocols would have to be changed in order for a rat removal programme to be undertaken. Issues such as waste management, terrain, non-target species and current poison need to be identified and assessed to determine the impact on the success of any rat removal operation. Advances in technology alter the feasibility of rat removal operations and the size and type of islands that can be targeted.

In detail, the reasons for assessing the feasibility of removing rats from one or all of the Isles of Scilly are:

- To protect and enhance the seabird populations present on the islands [under the requirements of SPA designation under the EU Directive 79/409/EEC on the Conservation of Wild Birds to protect bird species and the habitat upon which they depend ('the Birds Directive')].
- To act on the strategic goals of the Isles of Scilly Seabird Conservation Strategy (Lock et al 2006, Lock et al 2009); in particular 4.1.1 (to maintain and enhance the current seabird assemblage) and 4.1.2 (to ensure distribution and population of priority species are at least sustained at 2001 levels).
- As the UK Government is a signatory to the Convention on Biological Diversity (CBD), Article 8(h) requires the control or removal of alien species that threaten ecosystems, habitats or species. The CBD recognise Invasive Alien Species as the second biggest threat to global biodiversity after habitat loss and destruction (www.cbd.int).
- Under the UK Biodiversity Action Plan there needs to be operations to remove rats affecting breeding seabirds on maritime cliff and slope sites identified by Seabird 2000 and other surveys.
- As the UK Government is a signatory to the Bern Convention on European Wildlife and Natural Habitats 1979, Article 11(2b) requires strict control of the introduction of non-native species.
- Under the AONB Strategic Plan, Action BGP6 calls for the support and promotion of the objectives of the Isles of Scilly Seabird Conservation Strategy in order to improve seabird populations and Action BGP7 calls for the protection or restoration of wildlife importance.
- To protect and enhance the regionally, nationally and internationally important populations of seabirds on Annet as well as other uninhabited and inhabited islands.
- To provide additional habitat for Manx shearwater and storm petrel (and other seabird species).
- To aid recovery of Scilly shrew populations
- To aid recovery of native and endemic invertebrate species.
- To aid recovery and regeneration of native and endemic plant species.
- To aid public health and enjoyment of the Isles of Scilly.

4 METHODOLOGY

Wildlife Management International Ltd was contracted to undertake the assessment for the Isles of Scilly Seabird Recovery Project partnership. Elizabeth Bell (Senior Ecologist) visited the Isles of Scilly between 5th and 25th October 2010. A sample of uninhabited islands including Samson, St Helen's and some of the Eastern Isles, were visited with David Mawer (Isles of Scilly Wildlife Trust) on 6th October and 9th October 2010 to observe and assess the present control work that was occurring on these and all the uninhabited islands. Two additional meetings with David Mawer were undertaken. Data and annual reports produced by Isles of Scilly Wildlife Trust on the current control work were reviewed.

A series of interviews (using the standard questionnaire as shown in Appendix 10.1) and meetings with stakeholders and interested parties were undertaken throughout the visit to the Isles of Scilly. A one-day visit was taken to each of the off-islands (Bryher 13/10/10, Tresco 23/10/10 and St Martin's 11/10/10) where interviews and/or drop-in sessions were held to gather information from and opinions of the local residents about the possibility of removing rats from these islands. Fifty-five adults were randomly interviewed on St Mary's to obtain an unbiased view from this island.

St Agnes and Gugh were visited from 16th to 23rd October. John Tayton (WMIL technician) joined Elizabeth to assist with the field aspect of the assessment. Indices of abundance were calculated using traps, tracking tunnels and waxtags®. Public meetings were held on 15th October and 19th October to outline the techniques for rat removal programmes and the assessment work to the community. Face-to face interviews of all adults on the island were conducted to gather information on the islands, answer any concerns about the proposed operation and determine the support for the project. The island was assessed for issues that could affect the success of any rat removal programme.

5 ISLES OF SCILLY

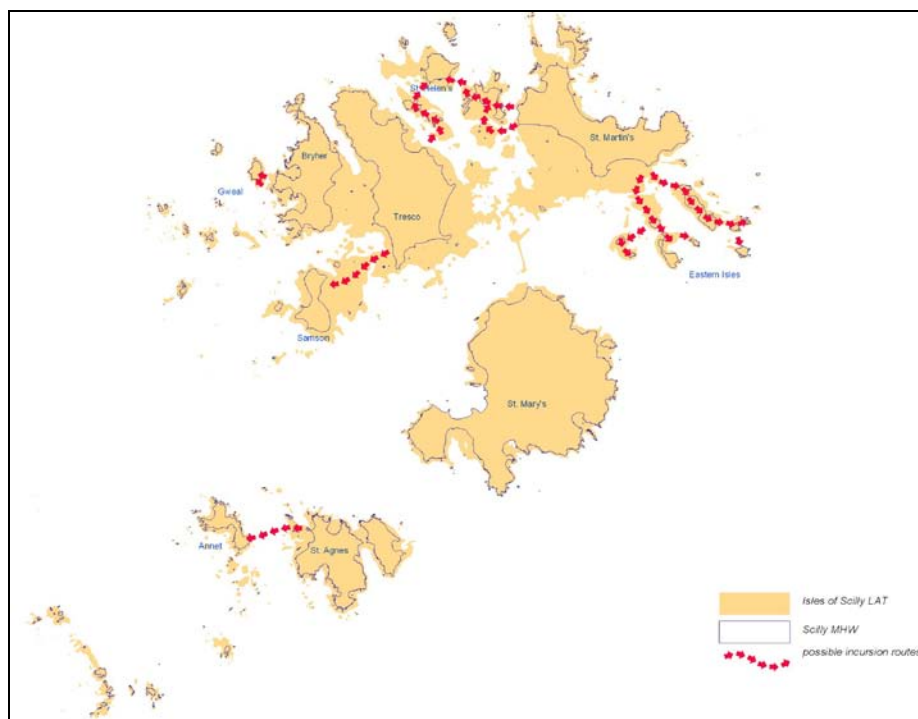
The Isles of Scilly (49°56'N 6°18'W) are a group of rocks and islands located about 45 km southwest of the Cornwall coast (Land's End), England. As an island group, they cover an area of sea approximately 17.5 km by 13 km long and are made up of five inhabited islands and up to 190 uninhabited islets and stacks (1,641 ha, Parslow 2007). The inhabited islands, St Mary's, St Martin's, Tresco, Bryher and St Agnes and Gugh are all low-lying (the highest point on St Mary's is 56 m a.s.l.). The islands lie in a small ring with shallow water in between. Some of them are connected by sandbanks at low tides, particularly at spring tides (Figure 1). Two deeper channels separate St Mary's and Gugh (St Mary's Sound) and St Agnes and Annet (Smith Sound).

The Duchy of Cornwall has owned the title to the Isles of Scilly since 1337. Most of the houses in Hugh Town were sold to resident tenants in 1949. Tresco was leased

from the Duchy to Augustus Smith in 1834 and is currently managed by Robert Dorrien-Smith. Much of the unfarmed land (mostly heathland and coastland) and the uninhabited islands (approximately 1850 ha) are leased to the Isles of Scilly Wildlife Trust.

St Mary's is the largest of the inhabited islands (654 ha) with approximately 1670 residents. Hugh Town is the 'capital' and main administrative point for the archipelago. There are a number of pubs, shops, banks and commercial offices. The passenger ferry, *RMV Scillonian III*, sails from Penzance to the St Mary's quay regularly through summer and into autumn. The ferry does not sail over winter (November to February). Freighter *Gry Maritha* sails from Penzance to St Mary's three days a week year round. A regular fixed wing (Skybus) and helicopter service (British International) fly to St Mary's airport from the mainland several times a day. Much of St Mary's is cultivated with many flower farms in evidence. Apart from the farms, there are several small settlements, coastal habitat, wetland reserves, sandy beaches, rocky outcrops and heathland. There are regular 'tripper boats' between St Mary's and the other 'off-islands' (inhabited islands) and uninhabited islands for residents and visitors. Manx shearwaters have been recorded in burrows on St Mary's attempting to breed.

Figure 1 Connectiveness of uninhabited islands to inhabited islands (and re-invasion potential) between the Isles of Scilly (provided by D. Mawer, IOSWT).



The other four inhabited islands or 'off-islands' are St Martin's, Trecco, Bryher and St Agnes and Gugh. Three (St Martin's, Trecco and Bryher) are almost interconnected at low tide (particularly spring tides). St Agnes and Gugh are separate from all the other islands; specifically by a deep channel (St Mary's Sound) between Gugh and St Mary's.

St Martin's (220 ha, or 240 ha including White Island) is a long narrow island running east to west. There are over 140 residents spread in three settlements (Higher Town, Middle Town and Lower Town). There are a number of bulb growers on the island as well as small farms, a shop, a pub, a vineyard and a bakery. There is a hotel on the island based at Lower Town. Some of the island is cultivated land (for farms and bulbs), but there are large areas of heathland, coastal habitat, dunes, and sandy beaches. St Martin's and White Island are joined by a sand and rock bar at low tide. There are a number of rare invertebrates and plant species recorded on St Martin's. Part of the island is designated as a SPA and RAMSAR site for seabirds (Appendix 10.2).

Tresco (298 ha) is the second largest island in the group. It is famous because of its Abbey Gardens (large botanical gardens) and the whole island is tenanted and managed as one estate by the Dorrien-Smith family. There are approximately 180 residents, all whom work for Tresco Estate or supporting businesses on the island. Tresco has a wide range of habitats owing to its size with a large area of heathland to the north and farmland, woods and garden areas to the south. These are separated by the Great Pool (a large spread of water that almost crosses from one side of the island to the other). There is an area of arable land where the Tresco Estate runs a herd of beef cattle. Bird shoots are undertaken in winter with raising pens and feeding sites located around the island. Tresco is very popular with visitors and has its own heliport serviced directly from Penzance (British Helicopter). With the largest area of woodlands of all the islands, a number of rare butterfly, bird and insect species have been recorded on the island. Part of the island is designated as a SPA and RAMSAR site for seabirds (Appendix 10.2).

Bryher (129 ha) is separated from Tresco by a small channel, but it can be connected via a sand bank at low tide. Bryher has a varied topography with a large headland divided from the main island by a small rocky neck. It is also low-lying, reaching 42 m a.s.l at Shipman Head Down. There are approximately 90 residents. A hotel is found on one end of the island (Hell Bay) as well as a pub, cafe and community hall around the rest of the island. Much of the land is heathland with the arable ground in the centre of the island. There is a large pool at the western end and surrounding heathland, dunes and coastal habitat is home to a number of important and rare plant and invertebrate species. Manx shearwaters are recorded attempting to breed on Bryher. Parts of the island are designated as a SPA and RAMSAR site for seabirds (Appendix 10.2).

St Agnes (105 ha) and Gugh (37 ha) are two separate island that are connected by a rocky and sandy bar at low tide. There are approximately 75 residents, with only 2 living on Gugh. The centre of St Agnes is cultivated farmland surrounded by coastal habitat, heathland, maritime heath, a wooded area and sandy and rocky shores. There is a large pond at the northern end surrounded by flat meadowland; a small rocky offshore stack off the meadow area (Burnt Island) covered in maritime thrift is connected to St Agnes at low tide by a rocky bar. Gugh has regenerating heathland, maritime thrift, marram dunes with small *Pittosporum* wooded areas and rocky

shores as the main habitat. Manx shearwaters are recorded on St Agnes and Gugh attempting to breed. Parts of St Agnes and Gugh are designated as SPA and RAMSAR sites for seabirds (Appendix 10.2).

There are a large number of uninhabited islands ranging in size from 0.05 (Green Island) to 36 ha (Samson). These have a range of habitats (and many are just rock stacks), but usually heathland often dominated by bracken or coastal thrift is the predominant vegetation. Annet is the most important uninhabited island for seabirds as it has always been rat-free (excluding an incursion in 2004, probably from St Agnes) and holds the main populations of Manx shearwaters and European storm petrel. Several of these islands used to be inhabited (including St Helen's, Samson and Tean) with Samson being farmed until 1855.

Although there is archaeological evidence of the Isles of Scilly being visited and inhabited since 8000 BC, cultivation began in earnest in the Bronze (2500 - 700 BC) and Iron Age (700 BC - 400 AD). Since then various Viking, Roman and English Royals have owed, lived and altered the islands. The Isles of Scilly have a large number of archaeological sites, including ruined castles, cist grave and medieval middens. Many are scheduled monuments of national importance. There is a long history of shipwrecks on the Isles of Scilly with over 400 records sites.

Due to the Gulf Stream (North Atlantic Drift) the Isles of Scilly have a maritime climate, with mild winters and pleasantly warm summers (Parslow 2007). Generally temperatures in winter are nearly 5 degrees centigrade higher than on the mainland (Parslow 2007). Frost is rare, but mist and fog can occur at any time.

The Isles of Scilly are nationally and internationally important for seabirds; 20,000 birds from 14 species are recorded on the islands including European storm petrel (*Hydrobates pelagicus*), Manx shearwater (*Puffinus puffinus*) and puffin (*Fratercula arctica*). It has Special Protected Areas (SPA), Sites of Special Scientific Interest (SSSI) and RAMSAR designations for breeding seabird populations. Appendix 10.2 outlines the notified habitats and species for which each site is designated.

Although the Isles of Scilly are renowned for their seabirds, they also have a number of land bird species and the islands are frequently visited by vagrants from Europe and the Americas. Regionally important ground nesting birds including oystercatcher (*Haematopus ostralegus*) and ringed plover (*Charadrius hiaticula*) attempt to breed on both inhabited and uninhabited islands. There are large numbers of blackbirds (*Turdus merula*) and song thrushes (*Turdus philomelos*), but other land birds are in lower number or not present. There are a high number of rare plants that have survived on the Isles of Scilly which have disappeared or have very limited distribution on mainland England. There are a number of mammal species, including wood mouse (*Apodemus sylvaticus*), house mouse (*Mus musculus*), Scilly (lesser white-toothed) Shrew (*Crocidura suaveolens cassiteridium*), brown rat (*Rattus norvegicus*), hedgehog (*Erinaceus europaeus*), rabbit (*Oryctolagus cuniculus*), domestic stock (cattle, *Bovis* and sheep,) and bats (*Pipistrellus*

pipistrellus, *P. pygmaeus*, *Nyctalus noctula*, *Myotis brandtii*, *M. mystacinus* and *Plecotus auritus*).

6 RATS

Rats (*Rattus* sp.) originate from Asia (King 1990, Nowak 1999), but have been transported around the world, usually accidentally on ships (Atkinson 1985, King 1990, Nowak 1999). Rats are now widespread and common throughout the world (including on numerous offshore islands, King 1990). Rats are the major pest to conservation, agriculture, horticulture, forestry and human health in a number of countries, requiring millions of pounds of outlay to control or eradicate them (King 1985, King 1990).

Rats are known to have very detrimental effects on seabird populations, causing local and global extinction of birds on islands throughout the world (Moors and Atkinson 1984, Atkinson 1985). The removal of introduced predators from islands has become one of the most important tools in avian conservation in recent times. It offers the opportunity that with an initial investment, significant long-term benefits are achieved. Rat removal is seen as a prerequisite for the restoration of seabird colonies on islands (Atkinson 1985, Moors et al 1992).

6.1 HISTORY OF RATS (AND OTHER RODENTS) ON THE ISLES OF SCILLY

Black rats (*Rattus rattus*) were historically present on the Isles of Scilly, particularly on Samson, but there have been no recent records (Parslow 2007, Thomas 1985). It is believed that black rats were probably accidentally introduced during medieval times (c. 600 AD) by Mediterranean traders but either died out naturally by the 15th century or were out-competed by brown rats (*R. norvegicus*) after they were accidentally introduced between 1720 and 1728 when several shipwrecks were recorded (Parslow 2007, Thomas 1985).

Brown rats were found on all islands in the Isles of Scilly excluding Annet, the Western and Norrad Rocks, Men-a-vaur and Round Island, but more recently they have been removed from all of the uninhabited islands (D. Mawer, IOSWT, pers. comm.). Many of the uninhabited islands continue to be re-invaded by rats from neighbouring inhabited islands, but control operations are maintained on these sites (D. Mawer, IOSWT, pers. comm.).

Mice are recorded on the Isles of Scilly, but several islands (including St Agnes and Gugh) have had no or limited sightings in more recent years (pers. obs.). This could be related to competition from brown rats which have reduced the numbers or eliminated the populations completely from certain islands. Mice are generally viewed by residents as a nuisance rather than a pest like brown rats, but mice can have significant adverse impacts on certain seabird species (Jones et al 2003, Wanless et al 2007).

In interviews with local communities, many residents (40-79%) have noted that rat numbers have been increasing recently on most of the inhabited islands. This may be a result of poor waste management on some of the islands, reduced control and reduced land management. Numbers do fluctuate naturally, but the number of complaints to Council of the Isles of Scilly does suggest that numbers have increased over recent years.

6.2 BROWN RAT, *Rattus norvegicus*

Although originally from China (and Mongolia), brown rats are now found throughout the world. They are a large rat with a stout body, heavy tail and small ears (King 1990, Novak 1999), growing up to 275 mm in length (and weighing up to 400 g, Cunningham & Moors 1983). Brown rats usually have a grey belly with a brown back, with long black guard hairs.

Males are larger than females, and when mature have a prominent scrotum at the base of the tail. Only mature females have visible nipples (King 1990, Novak 1999). Adult brown rats can weigh up to 450 g (and have been recorded up to 600 g in UK, Perry 1945).

Brown rats have a very acute sense of smell, touch and hearing which are used to communicate with other rats, distinguish features in the habitat and for foraging (King 1990). They are known to be omnivorous and opportunistic feeders, taking advantage of any potential food source (Nowak 1999). Brown rats have been recorded as major predators of birds (both land and sea), invertebrates and native mammals around the world, in many cases causing extinction of the affected species (Atkinson 1985, Imber 1985, King 1990). Food stores, vegetation and crops are also targeted by brown rats as additional food sources and human infrastructure (buildings, electricity etc.) can be seriously damaged by brown rats (King 1990).

Brown rats are strong swimmers and can swim between islands up to 600 m apart (in some cases up to 1 km, King 1990, Russell et al 2005, 2008). They are agile climbers, but usually climb less often than black rats (King 1990). Brown rats are usually associated with water, but can live in a range of habitats from barren ground, coasts and grassland to lush forest and in particular urban areas (King 1990, Nowak 1999).

Brown rats are extensive burrowers and create elaborate tunnels and tracks (King 1990). Food is commonly cached in these burrow systems (King 1990). Droppings are usually deposited in groups (or latrine sites) along the tracks, at feeding sites and on prominent rocks (King 1990).

Small groups of brown rats will live together in colonies and other rats will be aggressively removed from the territory (King 1990). One dominant male will breed with the resident females with younger and juvenile males being evicted at certain ages and/or when the colony reaches higher numbers (Calhoun 1963, King 1990).

Although males travel further and more extensively than females, this may vary depending on habitat quality, food availability, predation pressure and other factors (King 1990, Nowak 1999). Home range can vary from 0.1 ha (in urban areas) to 3 ha or larger (in forested or rural habitats). Again it all depends on food availability and habitat quality (Moors 1985, King 1990).

Brown rats construct nests out of various items including grass, newspaper, cardboard, leaves and feathers (King 1990, Nowak 1999). They breed usually from spring to autumn, but can breed throughout the year in favourable conditions and habitats (King 1990, Nowak 1999). Gestation is up to 24 days and litter size varies from 3 to 10 young (usually 6-8); the average annual production can be up to 40 young per year (King 1990, Nowak 1999). The young are weaned about 28 days old (between 25-40 g) and can be sexually mature at 2 to 3 months old (King 1990, Nowak 1999). Most brown rats live between 12 and 18 months with females having a longer life expectancy than males (Davis 1953, King 1990).

Brown rats are mainly nocturnal, mostly active just after dark and again just before dawn. However this pattern can change depending on habitat, predation pressure, hierarchy, disturbance and food availability (Calhoun 1963, King 1990). Although brown rats actively explore their surroundings, they are known to be very wary of new or strange objects in their home range (i.e. neophobic, King 1990). This behaviour can affect control and removal programmes in cities, farms and on islands.

Brown rats are known transmitters of a number of diseases such as *leptospirosis* (Weil's disease), trichinosis, toxoplasmosis and *salmonellosis* as well as hosting a number of parasites including worms, ticks and fleas (King 1990).

7 ISSUES AND IMPACTS OF RODENTS ON THE ISLES OF SCILLY

In addition to the effects on Scilly wildlife, rats were found to have a significant effect on people's lives, particularly on the off-islands.

The impact of and issues arising from rats on the islands was determined by interviewing interested parties, residents, local government officers and agencies across the islands using the standard questionnaire (Appendix 10.2). There were a total of 154 residents and 20 stakeholder groups interviewed. A summary of the main findings are given in Table 1 and detailed results are shown in Appendix 10.3.

The majority of the interviewees (67-92%) were concerned with the nuisance value of rats and health issues that their presence caused. Many were more concerned in autumn and winter when rats made their ways into their houses and buildings (12-55%). Many had noticed an increase in the number of rats on their island (40-79%) and several mentioned that they were seeing more during the day. A high number (73%) were concerned with the level of predation on seabirds and the Scilly shrew in particular.

Table 1 Summary of main results from the questionnaire interviews in the Isles of Scilly (complete results are listed in Appendix 10.3).

	St Mary's	Bryher	Tresco	St Martin's	St Agnes and Gugh
Number of adults interviewed	55	14	6	17	62
Percentage of adults (of each island community) interviewed	4%	18%	4%	14%	100%
Are seabirds are an important part of the Isles of Scilly?	100% (yes)	100% (yes)	83% (yes)	100% (yes)	98% (yes)
Do you think they should be protected and enhanced?	91% (yes)	86% (yes)	83% (yes)	100% (yes)	98% (yes)
Do you think rats are a problem on your island?	82% (yes)	86% (yes)	67% (yes)	82% (yes)	92% (yes)
Would you support a programme to remove rats from your island if it was found to be feasible?	62% (yes) 7% (maybe)	93% (yes)	83% (yes)	100% (yes)	100% (yes)
Would you support the use of rodenticides?	75% (yes)	100% (yes)	100% (yes)	100% (yes)	100% (yes)
How much you spend privately on controlling rats, repairing damage, rat proofing, etc?	£86 per year per household (average)	£65 per year per household (average)	£150 per year per household (average)	£210 per year per household (average)	£88 per year per household (average)
What is the estimated cost from loss of products caused by contamination (etc.) by rats?	£84 per year per household (average)	£50 per year per household (average)	£50 per year per household (average)	£50 per year per household (average)	£344 per year per household (average)
Can rats enter your buildings?	22% (yes)	93% (yes)	83% (yes)	100% (yes)	88% (yes)
Would you be happy to have bait stations located in buildings on your property?	36% (yes)	86% (yes)	83% (yes)	100% (yes)	94% (yes)
Would you be happy to have bait stations located in the garden?	35% (yes)	100% (yes)	83% (yes)	100% (yes)	98% (yes)
Do you keep any livestock on your property?	5% (yes)	21% (yes)	17% (yes)	36% (yes)	39% (yes)
Would you be happy to provide access to your buildings?	35% (yes)	100% (yes)	100% (yes)	91% (yes)	100% (yes)
Would you be happy to provide access to your gardens?	42% (yes)	100% (yes)	100% (yes)	96% (yes)	100% (yes)
Do you have any pets?	18% (yes)	64% (yes)	17% (yes)	38% (yes)	56% (yes)
Do you own a boat?	10% (yes)	36% (yes)	20% (yes)	55% (yes)	63% (yes)
Would you be happy a bait station on your vessel?	25% (yes)	100% (yes)	100% (yes)	73% (yes)	100% (yes)
Would you be happy to transport food to and between islands in rodent-proof containers?	16% (yes)	14% (yes)	20% (yes)	64% (yes)	80% (yes)
Would you be interested in getting involved in the proposed project?	22%	36% (yes)	20% (yes)	9% (yes)	74% (yes)

There was a high level of concern (83%) regarding health and disease transmission from rats. Many people identified Weil's disease (76%) as a major fear with the number of rats around and their presence in areas of high human use (i.e. beach, parks etc.). There have been two confirmed cases of Weil's Disease in the Isles of Scilly (HPA 2000a, 2000b). Almost as many (71%) were concerned that there was not enough information around regarding the risks and spread of this and other diseases that can be carried by rats.

Most of the general public do not like rats and would like to see them removed from their island (62-100%), although it did depend on which island they lived on. Many (82%) would have like to see a wider control programme undertaken to reduce rat numbers overall. Most (63%) felt the Council of the Isles of Scilly and the Isles of Scilly Wildlife Trust should take responsibility for doing this work.

Many (62-100%) identified that waste management was the primary reason on the island for higher numbers of rats. Many (85%) also thought waste management needed to be dealt with urgently and new and improved protocols were needed to manage and control waste on the Isles of Scilly.

Under UK legislation (Prevention of Damage by Pests Act 1949 and Environmental Protection Act 1990) the Council of the Isles of Scilly are responsible for rodent control in and around private residences. The Environmental Health Department uses a series of bait stations at publicly maintained sites on each of the inhabited islands that are managed by a contracting firm. These stations are baited at least quarterly throughout the year. In addition to this regular programme, all on-demand requests for baiting are undertaken by this firm. Private residents may also do their own thing using bait that is provided free-of-charge from the Council of the Isles of Scilly. The Council of the Isles of Scilly is aware of the issue of increasing rat numbers and is working towards improving waste management and control operations to help reduce overall rat numbers.

Commercial and farming interests have to maintain their own baiting. Many obtain their own bait from Farm Supply Companies and generally maintain their own regimes as and when required. Rats generally were causing problems with livestock and chicken feed stores, hay silage and food crops. In many cases, nearly entire supplies had been lost either to consumption or damage by rats. Many farmers were interested in obtaining further information on managing rats and in ways to reduce their impact. Many were already practicing excellent land management and quarantine (or isolation) measures.

Information on costs of rat control, contamination and damage was obtained from the questionnaires. Most people had few expenses due to the fact that they can receive bait at no charge from the Council of the Isles of Scilly. However at least 35% of residents interviewed (particularly farmers, bulb growers and commercial operators (restaurant, cafes, pubs and shops) undertook and paid for their own rat control. These costs ranged between £65-210 per year per household (including

purchasing bait and traps, staff time, replacing damaged goods and repairing damage) and up to £350 per year per household due to loss of productivity, contamination of goods and water, damage to crops and eating stock and chicken feed. The control on the uninhabited islands costs at least £12,000 per year (including staff time, boat transport, bait stations, bait and data management). This means rat control, damage, contamination and loss of products and crops costs the Isles of Scilly nearly £200,000 per year.

There was general concern about the impacts of rats on seabirds (as well as land birds and mammals). All those interviewed (100% on each island) agreed that the control of rats was very important on the uninhabited islands and felt that this should continue. Most (91%) recognised the importance of safeguarding Annet and other important seabird sites. Many people (57%) raised the issue of plant regeneration and how rats were eating crops, plants and flowers.

Many residents (16-82%) and most of the stakeholder groups (87%) were keen on being trained in rodent detection, biosecurity and control. Many (18-53%) were particularly interested in receiving information on poison type, delivery, safety to people and pets, and persistence.

8 EXECUTIVE SUMMARIES FROM EACH ASPECT OF ASSESSMENT AND FEASIBILITY INVESTIGATION (PARTS 1 to 4)

The following Executive Summaries are taken from each part of the assessment and feasibility investigation. Full details can be found in the full reports.

8.1 PART 1: ASSESSMENT OF CURRENT CONTROL WORK ON UNINHABITED ISLANDS

Rats are having a major impact on the seabird populations on the uninhabited islands in Scilly. In many cases seabird populations cannot establish on these islands due to the presence of rats or they have reduced or nil productivity. Rodent control has been carried out on these islands for over twenty years by local conservation groups and since 1995 by Isles of Scilly Wildlife Trust. Currently all islands are visited annually (whenever possible) to assess their status.

As part of the Seabird Conservation Group, the Isles of Scilly Wildlife Trust are working to protect and enhance the Isles of Scilly for seabirds and want to ensure that the uninhabited islands can be maintained rat free to enable seabird populations to recover. As such this review and assessment of current control work has been undertaken. This report outlines current work, outlines alternative methods and makes recommendations for future work.

The control of rats on the uninhabited islands is the responsibility of the Isles of Scilly Wildlife Trust. Currently this work is undertaken by Dave Mawer with assistance of Isles of Scilly Wildlife Trust volunteers or other personnel. Boat

transport is usually by the Isles of Scilly Wildlife Trust, but in some instances charter boats have been used.

There have been bait station grids established on each uninhabited island that are visited at least twice a year. Bait stations are either plastic tubes or commercial plastic lockable stations. At present cereal-based wax blocks are used. Up to six blocks (in bags of two) are placed in each bait station. The bait is stored in plastic bags to extend bait life and reduce uptake by slugs, snails and invertebrates. Usually monitoring for rats is undertaken between October and March when it is most likely that rats will re-invade the uninhabited islands. If rat sign or bait take is recorded on an island, further baiting and monitoring visits are made to that island to try and ensure that the rats are removed before the following seabird breeding season. Within the limitations of Isles of Scilly Wildlife Trust (staff availability and transport issues) and weather, this work is being done as well as possible. It is important that each island is visited regularly especially if rats are detected. Rat detection is difficult, but is more likely using a combination of techniques and frequent visits. Suggested improvements to the current control operations include additional staff (contracted to implement the winter rat control work only), increased transport availability (or use of chartered boats), regular monitoring visits to each island and increased and structured baiting on adjacent inhabited islands.

Detection of rats is a major issue and the use of bait stations alone may not detect them in time to implement a removal phase. The earlier rats are detected, the quicker and more effectively they can be removed. It is important that alternative monitoring methods (e.g. rodent motels, chocolate wax, etc.) are employed on the uninhabited islands, especially those that are not visited very frequently. The best time for monitoring is mid autumn through to early spring. It is recommended that chocolate wax blocks, tracking tunnels and rodent motels are trialled in all locations to determine attractiveness, longevity and detection probability.

Bait station design needs to be examined. At present plastic tubes are being used, but public opinion is mixed. Many people view them as an eyesore ('appearing like rubbish') and would prefer an alternative. Many of the plastic tube stations are no longer visible on many of the islands as vegetation has grown up and around the stations, but in high-use areas the public do notice them. It is possible that the use of wooden bait stations would be more appealing to the public and they are generally more attractive to rats. Wooden bait stations could be limited to high-use or visible areas as the cost of producing and placing them are high. All stations should be labelled with poison hazard labels. Wooden boxes can be stencilled and engraved.

Due to the connectivity of the uninhabited islands to neighbouring inhabited islands the risk of rats re-invading the islands is high. Wider control on the inhabited islands targeting more locations, particularly the coastal zones, could lower the rat populations on those islands and reduce the re-invasion risk to the uninhabited islands and neighbouring inhabited islands. As such, it would be very useful if the

Council of the Isles of Scilly rat control contractor undertook a more structured and regular control programme on Bryher and St Martin's and that Tresco Estate also implemented a wider rodent control programme on Tresco. A structured baiting programme in high-risk areas (coastal zones) and focused baiting in autumn and winter would be more effective at reducing rodent numbers than baiting all year around. This may require additional funding to implement. Interestingly many residents on Bryher and St Martin's recalled that wide-scale baiting for rats used to be undertaken by a previous rat control operator and this kept rat numbers much lower than at present. Local residents should be advised on ways they can assist with reducing rat numbers on their islands, particularly around their homes and farms.

In addition to more structured baiting on inhabited islands, targeted control at known Manx shearwater locations on these islands (such as Peninnis and Wingletang) would benefit breeding shearwaters by reducing rat numbers in those areas; this control should be undertaken between autumn through spring (until the birds return).

As resources and personnel are limited, the long-term management and control of rats on the uninhabited islands requires co-operation with different agencies and contractors, residents of inhabited islands nearby and interested parties to maximise results for effort.

In summary:

1. Rats are reducing the productivity of seabirds and/or preventing seabirds from establishing on uninhabited and inhabited islands.
2. Present rat control on the uninhabited islands is adequate, but could be improved with the generation of an additional Isles of Scilly Wildlife Trust warden position (or contract winter rat-control position), increased monitoring, adequate transport and co-operation with residents, other agencies and Council of the Isles of Scilly pest control contractors.
3. Advice on bait type (wax blocks) and timing of baiting (autumn and winter) for residents and rat control contractors could improve rat control on the inhabited islands and in turn reduce incursions to the uninhabited islands.
4. A new position in the Isles of Scilly Wildlife Trust (rat control officer for seabird conservation) should be developed to undertake all winter rat monitoring (September to April) work. The tasks should be to visit all islands regularly, introduce monitoring stations (tracking tunnels and chocolate wax) and monitor bait and monitoring stations plus data entry and analysis.
5. Monitoring tools (tracking tunnels, chocolate wax etc.) need to be used on the uninhabited islands to aid with rat incursion and detection.
6. Accurate records of re-incursion (i.e. detection location, date) and subsequent action should be maintained. It is important to get a pattern of re-incursion

and relate this to tide, month, behaviour, foraging and detection probability. This could generate more focus on rat removal on priority islands for seabirds.

7. Plastic tube bait stations should be replaced with wooden box stations whenever possible. However, due to cost (c. £25-50 per station) and installation implications, wooden box stations use could be limited to sensitive locations (e.g. adjacent to access routes and areas of high public use). Introduction of wooden boxes could alter the attitudes of some people to control and/or removal programmes.
8. Additional bait stations along particular stretches of coast on inhabited islands could reduce the frequency of rat incursion to uninhabited islands.
9. Targeted control should be established at known Manx shearwater locations on inhabited islands to benefit shearwater breeding at those sites. Baiting should occur between autumn and spring.
10. Multi-kill traps could be used on uninhabited islands (and in high-risk locations on inhabited islands) to reduce the rat population effectively without significantly increasing work effort.
11. An advocacy and education programme should be run on all inhabited islands to outline the importance of these islands to seabirds, highlighting how people can help with reducing rat numbers on their islands (which will reduce re-incursion events), better waste management (when visiting the uninhabited island and on their islands), and by disturbance (informing about breeding seasons and species present).
12. Public support for the removal of rats from the uninhabited islands was very high with all residents wanting rats controlled or removed totally. Many thought IOSWT needed to visit the uninhabited islands more frequently to ensure rats were kept off.

8.2 PART 2: ASSESSMENT OF THE FEASIBILITY OF REMOVING RATS FROM THE ISLES OF SCILLY ARCHIPELAGO

Successful removal of rats from islands has been undertaken around the world. Those islands have ranged from 1 to 11,200 ha and more recently have had human populations present. Technical aspects of removals depend on the physical and ecological characteristics of the island. The Lundy and Canna rat removal programmes demonstrated how these techniques could be successful on inhabited islands around the UK. However no rat removal operation has targeted an entire archipelago at one time.

The Isles of Scilly Seabird Recovery Project partnership requested an assessment of the possibility of eradicating rats from Scilly to protect and enhance seabirds that breed in the islands. Rats have been preventing seabirds from establishing on a number of uninhabited islands due to their proximity to rat-infested inhabited islands. Rats are also impacting on the livelihood, health, enjoyment and lifestyle of the local community. Many communities had noted more rats recently either on

their islands or on other islands. This report outlines the assessment of each inhabited island and identifies key issues that would need to be resolved before a rat removal programme could be considered.

It was apparent from interviews with members of each community that rats were seriously impacting on the livelihood, health, enjoyment and lifestyle of the local community as well as impacting on biodiversity. Most people (67-92%) thought rats were a problem on their island and would like to see something done about rat levels. This did not necessarily mean support for total rat removal. Many people (63%) felt that the Council of the Isles of Scilly could be doing more to reduce rat numbers by implementing wider-scale control on the off islands as well as St Mary's. The interviews with community members raised a number of concerns regarding a rat removal proposal ranging from safety of pets and children, bait station design, waste management, impacts on the environment and ecosystem balance.

It was interesting that the public totally supported the control of rats on the uninhabited islands, but St Mary's were less interested (62%) in removing rats from that island. Many (35%) felt seabirds could survive on the uninhabited islands without having to have populations on inhabited islands. Many (45%) did not realise seabirds were attempting to nest on these islands.

Control on the inhabited islands appears to have decreased in recent years. Most (82%) residents complained that only four visits per year and reduced number of stations meant that rat numbers had increased in recent years. Many (63%) felt that if better and more widespread control was maintained by the Council of the Isles of Scilly the rat population would remain lower.

The costs of rat control, contamination and damage to communities were obtained from the questionnaires. Most people (65%) had few costs as they could receive bait free from the Council of the Isles of Scilly. However at least 35% of residents interviewed (particularly farmers, bulb growers and commercial operators) undertook and paid for their own rat control. Costs ranged from £65-210 per year (covering purchasing bait and traps, staff time, replacing damaged goods and repairing damage) as well as up to £350 per year due to loss of productivity, contamination of goods and water, damage to crops, eating stock and chicken feed. This means that rat control, damage, contamination and loss of products and crops is costing the Isles of Scilly nearly £200,000 per year.

It is obvious from visiting the islands that an archipelago-wide rat removal programme is not currently possible. At present it is not feasible on St Mary's. Bryher and St Martin's are technically feasible, but connectivity with Tresco and each other means issues on one island would affect the rat removal programme on the other islands and Tresco is not feasible without the agreement of Tresco Estate to temporarily terminate the feeding of game birds during any removal programme.

The only island that is feasible at present is St Agnes with Gugh (and this detailed feasibility assessment is covered in Part 3).

Each island would have to be dealt with in different stages and in the case of Tresco, Bryher and St Martin's this would have to be a joint project (due to connectivity). Any rat removal programme on St Mary's would require an extremely long lead-in time as among many other factors, waste management is a big issue. There have been a number of excellent anti-litter and recycling campaigns on Scilly; future campaigns to improve waste collection, management and processing should make better links where appropriate to the direct benefits to the natural environment such as seabirds.

Although public support to remove rats from St Marys was much lower than elsewhere (62%), every resident interviewed there thought it was very important to remove rats from uninhabited islands to protect seabirds. All wanted some increased level of rat control on St Mary's (especially in cases of severe infestation), but several (42%) thought that total rat removal would not be possible. There was also a number of residents (15%) who believed that rats had a right to live on the Isles of Scilly and that no animal should be killed. Several (24%) were concerned that the ecosystem balance would change if rats were removed. Some (12%) thought that once waste management had improved on St Mary's rat numbers would decrease and there would not be a problem.

Public support for a rat removal programme on St Martin's, Bryher and Tresco was high (93-100%). The residents on St Martin's and Bryher were very keen to remove rats from their islands to reduce overall personal costs as well as impacts on seabirds, the ecosystem and the islands generally as long as the programme was feasible and safe. Nearly all of the Bryher (86%) community and all of the St Martin's community felt it was important to protect and enhance the seabird populations and would like to see seabirds return to their islands. The Bryher and St Martin's communities were very interested in the techniques and procedures in a rat removal programme.

It is important to stress that the removal of rats from St Agnes and Gugh is feasible and this operation could be used as a pilot project. The successful removal of rats from St Agnes and Gugh could show the other communities that it is possible to remove rats safely without impacting on the lives and habits of the local residents. This could then assist the other islands to implement changes to enable a removal programme to proceed there too.

In summary:

1. Rats **are** having an impact in social, economic and conservation factors on all of the inhabited islands of the Isles of Scilly.
2. The removal of rats from St Mary's **is not** currently feasible.

3. Improved waste collection, management and processing needs to be implemented on St Mary's. At present waste management is sub-standard and waste is building up creating a serious health issue.
4. Public support for the removal of rats from St Mary's is lacking; only 62% would support the proposal. Despite this, every resident thought it was very important to remove rats from uninhabited islands to protect seabirds and all wanted an increased level of rat control on St Mary's.
5. Concerns were raised about pet and child safety, farms, environmental contamination, use of poison and animal rights.
6. The removal of rats from Bryher **is not** feasible as a stand-alone project.
7. The removal of rats from Tresco **is not** feasible as a stand-alone project.
8. The removal of rats from St Martin's **is not** feasible as a stand-alone project.
9. The removal of rats from Bryher, Tresco and St Martin's would have to be completed as a joint, co-operative project to be feasible.
10. Community support for the proposed removal of rats from Bryher was 93%, from Tresco was 83% and St Martin's was 100%.
11. The removal of rats from St Agnes and Gugh **is** feasible.
12. The entire community was supportive of the proposal to remove rats from St Agnes and Gugh.
13. The removal of rats from St Agnes and Gugh could be used as a pilot project to show the other communities that it is possible and safe.
14. There was a call for increased and wide-scale control of rats on the inhabited islands by the Council of the Isles of Scilly.
15. An education campaign about litter and ways to reduce rats around homes, farms and businesses should be undertaken on St Mary's.

8.3 PART 3: FEASIBILITY OF REMOVING RATS FROM ST AGNES AND GUGH

Rodents have been successfully eradicated from islands ranging in size from 1 to 11200 ha throughout the world. The delivery method depends on the physical and ecological (specifically the risk to non-target species) characteristics of the island in question. The successful removal of rats from Lundy and Canna demonstrated how these techniques can be utilised on inhabited islands around the UK.

The Isles of Scilly Seabird Recovery Project partnership identified the need to assess the possibility of eradicating rats from St Agnes and Gugh to protect and enhance the islands' seabirds and protect Annet from re-invasion. Rats are having an impact on the biodiversity of St Agnes and Gugh and are also affecting the livelihood, health, enjoyment and lifestyle of the local community. Many in the community had noted more rats recently. This report outlines the assessment on St Agnes and Gugh detailing trapping and tracking results, density and distribution estimates, difficulties, mitigation and community support.

There were 56 rats trapped during the assessment; 32 females and 24 males. A baseline survey of rodent densities across St Agnes and Gugh gave estimates ranging from 0% to 70% rats with a mean of 21.5%. This survey indicated that the islands between them had approximately 23 rats per hectare and a likely total population of 3300 rats. These densities are similar to other inhabited islands around the world and were not excessive. The highest density and distribution of rats on the islands was around the coast. Densities were determined using index trapping, tracking tunnels and Waxtag™ survey methods. Twelve (44%) female rats were either pregnant or lactating which suggests that the rats on St Agnes and Gugh breed all year round. They were eating a range of food items including blackberries, seeds, heather, invertebrates, limpets, crabs and *Pittosporum*. The most frequently noted items were vegetation and seeds (55% of rat stomachs), blackberries (40%), invertebrates (35%), heather (22%) and Scilly shrew (18%) with *Pittosporum* only recorded in 5% of rat stomachs.

It was apparent from community feedback that rats were having an impact on the biodiversity of the island as well as affecting the livelihood, health, enjoyment and lifestyle of the local community. Many had noted more rats recently in certain areas on St Agnes. As far as possible every adult member of the community was interviewed to determine the level of support for the project, to outline the likely techniques and to address any concerns about the proposal. There was unanimous support for the removal of rats from St Agnes and Gugh. Several residents could remember more Manx shearwaters on St Agnes and almost all residents (98%) would be pleased to see them return. There were reports of rats entering houses (76%) and damaging crops (45%) and food (40%). Rats were estimated at costing between £100 and £1000 per year due to purchasing bait, loss of crops, loss of stock feed and damage to property. Residents raised a number of issues and concerns ranging from non-target species safety (particularly pets), educating the children and providing lockable bait stations for homes, on waste and compost, on farming issues (growing crop foods, chickens and stock), on funding, impacts of other species after the removal of rats and the justification of the project. The most important issues that the community felt would affect the success of rat removal programme were waste management (80%), communication (77%), community involvement and support (77%) and adequate funding (86%). Mitigation and technical information to deal with all these issues was provided to all households.

Several residents were very interested in assisting with the project; most with on-island transport and logistical support. Many were interested in training for rodent quarantine and contingency operations.

Although St Agnes and Gugh has some difficult issues, given a well-planned, adequately-resourced, well-executed programme that is fully supported by the local community and staffed or led by experienced operators, total rat removal is entirely possible.

In summary:

1. The mean rat density on St Agnes and Gugh was estimated to be 21.5% (i.e. 22 rats per 100 trap nights); this amounts to 23 rats per hectare giving a total of 3300 rats.
2. Rats were foraging on a variety of food items including shrews, vegetation, heather, limpets, crabs, insects, blackberries and *Pittosporum*.
3. Twelve female rats were pregnant, suggesting breeding all year around.
4. Rats **are** having an impact on social, economic and conservation factors on St Agnes and Gugh; particularly with regards to seabird productivity, public and animal health, vegetation regeneration and crop damage.
5. The removal of rats from St Agnes and Gugh **is** feasible.
6. A number of issues need to be addressed prior to the start of the rat removal programme such as reduction in use of poison prior to operation, safety of pets, storage of stock and chicken feed, harvesting and storage of potatoes, compost and general waste disposal and storage.
7. The entire community was supportive of the proposal to remove rats from St Agnes and Gugh.
8. Community concerns ranged from pet and children safety, farming issues (being able to grow feed crops as usual), funding and justification of expense. Mitigation and technical information covering these concerns was provided to all households.
9. The community was willing to implement alternative waste management, potato and animal feed storage systems before, during and after the rat removal.
10. All residents thought seabirds were important for St Agnes and Gugh and 98% would like to see them return to the island in high numbers.

8.4 PART 4: OPERATIONAL PLAN FOR THE REMOVAL OF RATS FROM ST AGNES AND GUGH

The Isles of Scilly Seabird Recovery Project partnership identified the need to assess the possibility of eradicating rats from St Agnes and Gugh to protect and enhance the islands' seabirds and protect Annet from re-invasion. Rats are having an impact on the biodiversity of St Agnes and Gugh and are also affecting the livelihood, health, enjoyment and lifestyle of the local community. Many in the community had noted more rats recently. An assessment of the islands showed that the removal of rats from St Agnes and Gugh is feasible.

This operational plan provides an overview of the proposed removal of brown rat (*Rattus norvegicus*) from St Agnes and Gugh and has been prepared to guide the planning and implementation of the programme. The rat removal operation aims to eradicate all rats from St Agnes and Gugh while minimising any adverse impacts on the environment, non-target species, humans, livestock and pets. The operation

would occur over winter; from October to March (in a single 180-day baiting operation). The rat removal programme is complicated by the presence of a local community, but with the residents' full support and involvement in the project, the removal of rats is achievable.

There are significant benefits from removing rats from St Agnes and Gugh. At present, rats are preventing Manx shearwater and storm petrel from establishing on the islands, reducing invertebrate numbers, preventing the recovery of some plant species and causing problems to crops, stock and chickens and homes. Removing rats from St Agnes and Gugh would remove the risk of further rat incursions to Annet. The cost of eradication is equivalent to 10 years control; the annual costs of rats to St Agnes and Gugh is approximately £15,000 and the eradication portion of the Seabird Recovery Project is £155,000 (Part 4: Section 21.3). However, given the permanent human population, considerable planning needs to be carried out and a number of risks need to be managed prior to, and during the rat removal programme. These include stock and chicken feed, potato harvest and storage, waste management and compost. They are covered in detail in the operational plan.

All aspects of bait delivery, soil and water interaction and non-target species risk are addressed in this plan. A detailed risk assessment is presented which determines the risks to the environment, humans, livestock and pets. Mitigation measures for these risks are also detailed. A full research and monitoring programme is also presented which details work to be undertaken before, during and after the rat removal operation.

This plan has been prepared using published scientific information, experience from similar rat removal programmes in UK and around the world, consultation with stakeholders and residents and a site assessment. This will need to be updated as the project continues, particularly as the research on the islands' produces results that may affect or influence the rat removal plan, with changes within the community and as new technology around the world advances.

The success of the rat removal programme is dependent on the participation and support of the entire local community. Local residents will be advised on ways that they can assist with reducing rat numbers around their homes and buildings (including removing available habitat and food). A waste storage and disposal plan will have to be developed and an improved regular waste collection regime may have to be implemented during the rat removal programme. It is important that the community maintains an integral role in the planning, preparation and implementation of the rat removal programme to ensure its success. The community was consulted extensively in the preparation of this operational plan. Ongoing consultation and communication to the community (and wider stakeholder groups) during the programme will be essential.

The rat removal programme will involve a number of stages which will occur concurrently over a five-year period. The removal of rats will be conducted in winter, at the start of the third year of the proposal. Tasks to be undertaken during the first two years include: (i) finalise planning and all necessary risk assessments, (ii) obtain required permits and approvals, (iii) update and finalise operational details, (iv) continue community consultation, (v) develop and implement a revised biosecurity strategy, (vi) prepare tenders and contracts and (vii) establish monitoring and research programmes. Tasks in the third year include the rat baiting and monitoring operation and monitoring of flora and fauna species to provide preliminary information on biodiversity benefits. In the fourth and fifth years, monitoring will be continued with a final decision on the success of the rat removal programme to be made two years after the removal phase is conducted. Monitoring of invertebrate, land birds, seabirds and vegetation will continue through these two years as well.

The cost of the programme is estimated to be approximately £300,000 over a five-year period although this requirement will depend on delivery method, the chosen operators and other factors. A detailed inventory of equipment and manpower has been provided. Funding for the programme has not been secured and will need to be sourced from grants such as the EU Life programme. There are a number of funding options which are being investigated.

The proposed rat removal technique has proven to be safe and effective and is supported by previous operations in the UK and around the world. It is an important management tool for the protection and enhancement of seabirds (and biodiversity and island ecosystems). It will also safeguard the seabird populations on Annet.

In summary:

1. Rats **are** having an impact on social, economic and conservation factors on St Agnes and Gugh; particularly with regards to seabird productivity, public and animal health, vegetation regeneration and crop damage.
2. The removal of rats from St Agnes and Gugh is feasible.
3. A number of factors need to be addressed prior to the removal phase such as reduction in use of poison prior to operation, safety of pets, storage of stock and chicken feed, harvesting and storage of potatoes, compost and general waste disposal and storage.
4. The rat removal programme should be a ground-based operation using bait stations.
5. The poison used for this operation should be difenacoum (Neosorex[®]) in cereal-based wax block formulation. Approximately 3 ton of bait will be needed.
6. The rat removal operation would be undertaken from October to March (approximately 180 days), but further work (to implement management and research requirements) would be needed prior to the actual removal phase.

7. The design and implementation of the rat removal programme will include measures to minimise risks to non-target species and contingency plans will be in place to deal with any incidents.
8. Research on the rats, seabirds, land birds, invertebrates and vegetation should be undertaken prior to the removal programme to establish baseline data. Research and monitoring should continue through and after the rat removal operation to assess the effects of removing rats on the islands and ecosystem.
9. The rat removal programme should be directed by an experienced operator with the assistance of local volunteers.
10. Rat control should be maintained on and near all quays on the other islands to reduce the risk of re-invasion (by accidental boat transfer). This would need to be the responsibility of the Council of the Isles of Scilly.
11. Rat control should be maintained along the neighbouring coastline on St Mary's to reduce the risk of re-invasion (by swimming). This would have to be the responsibility of Isles of Scilly Wildlife Trust.

9 REFERENCES

- AONB. 2010. Isles of Scilly Area of Outstanding Natural Beauty Management Strategy 2010-2014.
- Atkinson, I.A.E. 1985. The spread of commensal species of *Rattus* to oceanic islands and their effects on island avifaunas. Pages 35-81 in Moors, P.J. (Ed.). *Conservation of island birds*. ICBP Technical Publication 3.
- Health Protection Agency. 2000a. Communicable Disease Report. Volume 10 (50). PHLS Communicable Disease Surveillance Centre. London.
- Health Protection Agency. 2000b. Communicable Disease Report. Volume 10 (44). PHLS Communicable Disease Surveillance Centre. London.
- Jones, A.G.; Chown, S.L.; Gaston, K.J. 2003. Introduced house mice as a conservation concern on Gough Island. *Biodiversity and Conservation* 12: 2107-2119.
- King, C.M. (Ed.). 1990. *The handbook of New Zealand Mammals*. Oxford University Press. Auckland, New Zealand.
- Lock, L.; Brown, A. Clitherow, J.; Mawer, D.; St Pierre, P. 2006. Isles of Scilly Seabird Conservation Strategy. Report for Isles of Scilly Seabird Conservation Group
- Lock, L.; Brown, A. Clitherow, J.; Mawer, D.; St Pierre, P. 2009. Isles of Scilly Seabird Conservation Strategy. Report for Isles of Scilly Seabird Conservation Group
- Mawer, D. 2009. The control of brown rats (*Rattus norvegicus*) in the Isles of Scilly by Isles of Scilly Seabird Group, Isles of Scilly Wildlife Trust, English Nature and Royal Society for the Protection of Birds. Unpublished internal report for Isles of Scilly Seabird Conservation Group.
- Moors, P.J.; Atkinson, I.A.E. 1984. Predation on seabirds by introduced animals and factors affecting its severity. Pages 667-690 in Croxall, J.P, Evans, P.G.H. and

- Schreiber, R.W. (Eds.). *Status and conservation of the world's seabirds*. ICBP Technical Publication 2.
- Moors, P.J.; Atkinson, I.A.E.; Sherley, G.H. 1992. Reducing the rat threat to island birds. *Bird Conservation International* 2: 93-114.
- Nowak, R.M. 1999. *Walker's Mammals of the world (Volume II)*. John Hopkins University Press. USA.
- Parslow, R. 2007. *The Isles of Scilly*. HarperCollins Publishers, London, UK.
- Perry J.S. 1945. The reproduction of the wild brown rat (*Rattus norvegicus* Erxleben). *Proceedings of the Zoological Society of London* 115: 19-46.
- Wanless, R.M.; Angel, A.; Cuthbert, R.J.; Hilton, G.M.; Ryan, P.G. 2007. Can predation by invasive mice drive seabird extinctions? *Biological Letters* 2007: 1-4.

10 APPENDICES

10.1 THE INTERVIEW QUESTIONNAIRE UNDERTAKEN ON THE ISLES OF SCILLY

WOULD YOU LIKE RAT-FREE ISLES OF SCILLY?

ISLES OF SCILLY SEABIRD RECOVERY PROJECT INTERVIEW QUESTIONNAIRE

The population of seabirds on the Isles of Scilly has declined by 24% between 1983 and 2006. To safeguard the existing populations (particularly the storm petrel and the Manx shearwater) and reverse the overall decline in seabird numbers, a partnership of organisations including RSPB, Isles of Scilly Wildlife Trust (IOSWT), Isles of Scilly Area of Outstanding Natural Beauty (AONB) and Natural England (NE) have commissioned an investigation to review current work protecting the uninhabited islands from rats and identify new opportunities to safeguard and enhance these seabird populations through future work, potentially on inhabited islands. Based upon current information the most feasible islands are St Agnes and Gugh. This assessment is being carried out by Elizabeth Bell from Wildlife Management International Ltd (WMIL).

We are seeking feedback from you to obtain your views, identify issues that need to be addressed and opportunities or support you can provide to help inform our future work. Can you spare approximately 10 minutes of your time and answer some questions? Your name will be entered into a prize draw.

DATE:												
Where do you live?	ST MARY'S		BRYHER		ST MARTIN'S			ST AGNES AND GUGH		TRESKO		
Do you think that seabirds are an important part of the Isles of Scilly?	YES/NO			Why?								
Were you aware that their population was declining?	YES/NO			From where?								
Do you think that their populations should be protected and enhanced?	YES/NO			Why?								
RATS: The presence of rats prevents seabirds such as storm petrel and Manx shearwater from raising young and occupying potentially suitable habitat (rats eat the adults, young and eggs) so we want to find out more about your views on rats and any plans to remove them.												
Have you noticed more rats recently?	YES/NO			Where?								
Do you think rats are a problem on your island?	YES/NO/MAYBE			Where?								
Have rats been a problem for you?	YES/NO			Would you like something done about the rats?						YES/NO		
If yes, where and/or how? (Circle as many as relevant)	DAMAGE TO:		FOOD		CROPS		PROPERTY		ANIMALS			
	HOME		BUSINESS		FARM		BOAT		BEACH			
	ATTACKING ANIMALS		ATTACKING PEOPLE		BITES		FLEAS		OTHER:			
Do you think there would be positive or negative benefits or impacts to any of the following by the removal of rats from the Isles of Scilly? (Please tick relevant column)												
			+	-								

		FISHING			ACCESS			ARCHAEOLOGY		
		OTHER:								
Comments: (List positive or negative affects here)										
RODENT CONTROL: Rats are controlled around the world using a number of methods and rodenticides. Several projects have been on inhabited islands with farms, tourists and pets which successfully and safely removed all rats. Present (and any future) rodenticide use on the Isles of Scilly is restricted to secured bait stations.										
Currently rat control occurs on all the inhabited Isles of Scilly islands. Would you support a programme to remove rats from your island if it was found to be feasible?		YES/NO/MAYBE			If no, or maybe, is there anything we could do to gain your support?					
Rodenticide is already used on the islands to control rats. This currently is the most effective method of removal. Would you support this method?		YES/NO/MAYBE			If no, or maybe, is there anything we could do to gain your support?					
Would you advocate another method?		YES/NO (if yes, which one?)								
Any work would need to be carried between October and March. Would this be a problem?		YES/NO (If yes, why?)								
COSTS OF RODENT CONTROL: We are trying to find out how much rats cost the islands every year. Can you tell us about your costs for rodent control?										
How much you spend privately on controlling rats, repairing any damage, rat proofing your property, etc?										
What is the estimated cost from loss of products caused by contamination, damage or consumption by rats?										
ISSUES FOR OPERATION: A range of issues were identified at a workshop on St Mary's in March 2010 that would need to be addressed for the project to be successful which includes: Waste Management, Public and Animal Health, Access to Private Land, Private Gardens or Farms, Non-Target Species, Project Management, Communication, Community Involvement, Transport, Cargo Movements, Re-Invasion, Livestock, Keeping Chickens, Pets, Terrain, Weather and Adequate Funding. Community support will be vital as many of these would require the involvement of individuals.										
Do you agree with this list, or are there others?		Please list any additional issues:								
Please rank the issues: [From 1 = least important to 5 = most important]		WASTE MANAGEMENT			ANIMAL HEALTH			LIVESTOCK		
		PRIVATE GARDENS OR FARMS			TRANSPORT			PETS		
		PROJECT MANAGEMENT			COMMUNITY INVOLVEMENT			WEATHER		
		CARGO MOVEMENTS			RE-INVASION			TERRAIN		
		ACCESS TO PRIVATE LAND			ADEQUATE FUNDING			NON-TARGET SPECIES		
		PUBLIC HEALTH			COMMUNICATION			KEEPING CHICKENS		
WASTE MANAGEMENT: Ready access to waste makes it difficult to remove rats from islands, so we would like to find out more about how you deal with your waste.										
Do you use the following methods of waste storage and disposal?		Rat-proof dust-bin		Unprotected bin bags		Private burning of waste				
		Rat-proof wheelie bin		Compost heaps		Private dump (home/farm/garden waste)				
		Other (Please state):								
Would you be happy to change this temporarily/permanently if this helped remove food for rats		YES/NO		What type of support would you need?						

PRIVATE PROPERTY: Rats use a variety of debris, buildings, gardens and land because of the provision of shelter and potential food sources they provide, so we would like to ask you some questions about this issue.							
Can/do rats enter your buildings (including out buildings or sheds)?				YES/NO /DON'T KNOW			
Even if you did not consider that rats were present, would you be happy to have rat bait stations located on your property?				BUILDINGS: YES/NO/DEPENDS		GARDENS: YES/NO/DEPENDS	
				OTHER: YES/NO/DEPENDS			
Would there need to be any conditions applied to their presence (Please state)?							
Do you keep any livestock on your property and if so, which is it?		YES/NO	CATTLE	SHEEP	CHICKENS	PONIES	OTHER:
Do you store anything that would be a potential food source for rats on your property and if so, what?		YES/NO	HUMAN FOOD	LIVESTOCK FEED	OTHER:		
ACCESS: On previous projects, teams of volunteers have been used to carry out the work because the work is time-consuming and repetitive. If this were the case, access to private property including buildings/land/gardens may be needed to carry out any project. We would like to find out more about your views on this.							
Would you be happy to provide access?		BUILDINGS			YES/NO/DEPENDS		
		GARDENS			YES/NO/DEPENDS		
		OTHER LAND			YES/NO/DEPENDS		
Would certain conditions need to apply (e.g. foot washes to prevent transfer of bulb diseases)?		YES/NO	If yes, what arrangements would be needed (e.g. self checking)? Please state:				
PETS/FERAL/WILD ANIMALS: Measures will need to be in place to help prevent non-target animals being affected by the work. Additionally the presence of feral animals may reduce the effectiveness of removing rats. We would like to find out more about their presence on the islands to determine whether this would affect the value of removing rats.							
Do you have, or are you aware whether the following animals are present on your land/island?		PET CAT: Number:		FERAL (or semi-wild) CAT		MICE	
		PET DOG: Number:		HEDGEHOG		OTHER (please state):	
TRANSPORT: Rats could potentially reach the islands or be accidentally transported between the islands by boat or plane. We would like to ask some questions about your plane/boat and its use. Options for reducing this risk (such as rodent checks, bait stations, rodent-proof containers, etc.) have been used on a number of international projects.							
Do you own a boat and/or plane and use it for travelling between/to the islands?				PLANE: YES/NO		BOAT: YES/NO	
Do you transport any potential food sources for rats?		FOOD	LIVESTOCK FEED	OTHER (Please state):			
Do you store this on any of the quays/airports?		YES/NO	Where?				
If it was thought that there was a risk of transportation of rats on your vessel, would you be happy to install a bait station?				YES/NO/MAYBE			
MONITORING AND RE-INVASION CONTINGENCY PLANS: If rat removal was achieved there is always the potential issue of re-invasion. Measures would need to be put in place to ensure that any reinvasion is quickly noticed and reacted to accordingly. Rat sightings need to be reported immediately to the project partnership. If a rat (or rat sign) is reported; interviews, site inspections and bait station/monitoring grids will have to be established immediately. A team of trained personnel would be needed to implement this.							
Would you like to be listed as a reporting location (where any rat sighting is reported to you for action)?						YES/NO	
Would you be interested in assisting with any contingency operation?						YES/NO	

Would you like training in rodent detection and identification?	YES/NO		
Would you like to be trained in interview and site inspection procedures and methods?	YES/NO		
Would you want to be involved in long-term monitoring for rodents?	YES/NO		
Would you be happy to check for rodent damage to your own cargo?	YES/NO		
Would you be happy to install and maintain a bait station on your vessel and/or property?	YES/NO		
Would you be happy to transport food to and between islands in rodent-proof containers?	YES/NO		
COMMUNITY SUPPORT: This is fundamental to achieving the success of any project like this. Any project will need to find the resources to carry out the work. This may include funding bids to provide support measures for any of the actions above as the removal programme. We would like to find out more about how people on the islands would like to support this type of project.			
Would you be interested in supporting or getting involved in the project in addition to above?	YES/NO	BECOMING A PARTNER	WRITTEN
	If so, how (circle):	IN-KIND LOGISTICAL SUPPORT	VOLUNTEERING TIME
Please give more details here:		FINANCIAL	OTHER:
We are planning to hold a presentation on the findings of the study to be held on St Agnes in early December. Would you like to be updated on progress during the assessment?	YES/NO	If YES, how? Please state:	
DO YOU HAVE ANY COMMENTS/SUGGESTIONS/ CONCERNS YOU WOULD LIKE ANSWERING?			
Would you like to be entered into the prize draw?	YES/NO		
Would you like more information on the project	YES/NO		
Name			
Contact details			
Thank you for completing the interview. If you would like further information about the Isles of Scilly Seabird Recovery Project, please email Elizabeth at (biz@wmil.co.nz) or Clare Lewis (CLewis@scilly.gov.uk). Please note that additional drop-in sessions will be held during October for people to express their views. The date, time and location of each of these will be advertised.			

10.2 ISLES OF SCILLY NOTIFIED FEATURES FOR SSSI DESIGNATION (PROVIDED BY NATURAL ENGLAND)

Where ■ has SSSI, SPA and RAMSAR designation, ■ has SSSI, SPA, RAMSAR and SAC designation, ■ has SSSI and SAC designation and ■ has SSSI designation

SSSI	Notified habitats	Notified Features (Vascular Plants: *Individually notified & VPA) (Seabirds: *Isolated Colony & Aggregations) (Lichens - Combinations of species)	
<u>St Agnes</u>			
Big Pool & Browarth Point		Vascular Plants:	
		<i>Poa infirma</i>	Early meadow grass
		<i>Trifolium occidentale</i>	Western clover
		<i>Ophioglossum azoricum</i>	Small Adders-tongue
		<i>Trifolium suffocatum</i>	Suffocated clover
		Local Distinctiveness Species:	
		<i>Crambe maritima</i>	Sea Kale
		<i>Raphanus maritimus</i>	Sea raddish
		<i>Chamaemelum nobile</i>	Chamomile
		<i>Spiranthes spiralis</i>	Autumn Lady's-tresses
		<i>Ophioglossum vulgatum</i>	Common Adder's-tongue
Wingletang Down	Heathland H7, H8, H11	Vascular Plants:	
		* <i>Ophioglossum lusitanicum</i>	Least Adder's-tongue
		<i>Ophioglossum azoricum</i>	Small Adder's-tongue
		* <i>Ornithopus pinnatus</i>	Orange Bird's-foot
		<i>Poa infirma</i>	Early meadow grass
		<i>Trifolium occidentale</i>	Western clover
		<i>Asplenium obovatum</i>	Lanceolate Spleenwort
		<i>Rumex rupestris</i>	Shoredock
		<i>Daucus carota</i> subsp. <i>Gummifer</i>	Sea carrot
		Local Distinctiveness Species:	
		<i>Crambe maritima</i>	Sea Kale
		<i>Charadrius hiaticula</i>	Ringed plover
Gugh	Heathland H7, H8, H11	Vascular Plants:	
		* <i>Ornithopus pinnatus</i>	Orange Bird's-foot
		<i>Scrophularia scorodonia</i>	Balm-leaved figwort
		<i>Poa infirma</i>	Early meadow grass
		<i>Ornithopus pinnatus</i>	Orange Bird's-foot
		<i>Ophioglossum azoricum</i>	Small Adder's-tongue
		<i>Trifolium occidentale</i>	Western clover
		Local Distinctiveness Species:	
		<i>Teloschistes flavicans</i>	Golden-hair lichen
<u>Tresco</u>			
Great Pool	Standing waters	Vascular Plants:	
		<i>Allium amp. babingtonii</i>	Babingtons leek
		<i>Scrophularia scorodonia</i>	Balm-leaved figwort
		<i>Oenanthe fistulosa</i>	Tubular water dropwort

SSSI	Notified habitats	Notified Features (Vascular Plants: *Individually notified & VPA) (Seabirds: *Isolated Colony & Aggregations) (Lichens - Combinations of species)
Tresco (continued)		
Great Pool	Standing Waters	Local Distinctiveness Species: <i>Ranunculus baudotii</i> Brackish water crowfoot <i>Myriophyllum alterniflorum</i> Alternate water milfoil <i>Potamogetan pectinatus</i> Fennel pondweed
		Breeding bird assemblage: <i>Cygnus olor</i> Mute swan <i>Anas platyrhynchos</i> Mallard <i>Anas strepera</i> Gadwall <i>Acrocephalus schoenobaenus</i> Sedge warbler <i>Acrocephalus scirpaceus</i> Reed warbler
		Wintering wildfowl: <i>Anas crecca</i> Teal <i>Anas Penelope</i> Wigeon <i>Anas clypeata</i> Shoveler <i>Anas platyrhynchos</i> Mallard <i>Anas strepera</i> Gadwall <i>Aythya farina</i> Pochard <i>Aythya fuligula</i> Tufted duck
Pentle Bay, Merrick and Round Island	Mobile Dune (SD6) Fixed Dune (SD8) Heathland H7, H8, H11	Vascular Plants: <i>*Ornithopus pinnatus</i> Orange Bird's-foot <i>Rumex rupestris</i> Shoredock <i>Allium amp. babingtonii</i> Babingtons leek <i>Scrophularia scorodonia</i> Balm-leaved figwort <i>Trifolium suffocatum</i> Suffocated clover
		Seabirds: <i>Sterna hirundo</i> Common Tern <i>Sterna dougallii</i> Roseate Tern <i>Hydrobates pelagicus</i> Storm Petrel
		Lichens: <i>Heterodermia leucomelos</i> <i>Pseudocyphellari aurata</i> <i>Fossombronina foveolata</i> <i>Lophocolea semiteres</i>
Castle Down	Heathland H7, H8	Geology
		Lichens: <i>Heterodermia leucomela</i> <i>Heterodermia propagulifera</i> <i>Heterodermia obscurata</i> <i>Lobaria pulmonaria</i> <i>Cladonia</i> spp.
St Martin's		
Chapel Down	Heathland H7, H8	Vascular Plants: <i>*Ornithopus pinnatus</i> Orange Bird's-foot
		Geology

SSSI	Notified habitats	Notified Features (Vascular Plants: *Individually notified & VPA) (Seabirds: *Isolated Colony & Aggregations) (Lichens - Combinations of species)	
St Martin's			
Chapel Down	Heathland H7, H8	Seabirds: <i>Rissa tridactyla</i>	Kittiwake
		Local Distinctiveness Species: <i>Ophioglossum azoricum</i> <i>Lotus subuliflorus</i> <i>Anagallis minima</i> <i>Roccella fuciformis</i>	Small Adder's-tongue Hairy birds-foot trefoil Chaffweed Lichen
Plains & Great Bay		Vascular Plants: <i>*Ornithopus pinnatus</i> <i>Daucus carota</i> subsp. <i>Gummifer</i> <i>Trifolium occidentale</i> <i>Ophioglossum azoricum</i> <i>Poa infirma</i>	Orange Bird's-foot Sea carrot Western clover Small Adder's-tongue Early meadow grass
White Island	Heathland H7, H8, H10	Geology	
		Local Distinctiveness Species: <i>Pseudocyphellari aurata</i>	Gilt-edged lichen
Porth Seal		Geology	
St Martin's Sedimentary Shore	Intertidal Sandflats		
Bryher			
Rushy Bay & Heathy Hill		Vascular Plants: <i>*Ornithopus pinnatus</i> <i>*Viola kitaibeliana</i> <i>Ophioglossum azoricum</i> <i>Trifolium occidentale</i>	Orange Bird's-foot Dwarf pansy Small Adder's-tongue Western clover
Pool of Bryher & Popplestone bank.	Saline Coastal Lagoon	Local Distinctiveness Species: <i>Poa infirma</i> <i>Ranunculus baudotii</i> <i>Trifolium occidentale</i> <i>Trifolium suffocatum</i> <i>Lotus subuliflorus</i> <i>Crambe maritima</i> <i>Chamaemelum nobile</i>	Early meadow grass Brackish water crowfoot Western clover Suffocated clover Hairy birds-foot trefoil Sea Kale Chamomile
Shipman Head	Heathland H7, H8	Local Distinctiveness Species: <i>Ornithopus pinnatus</i> <i>Lotus subuliflorus</i> <i>Trifolium occidentale</i>	Orange Bird's-foot Hairy birds-foot trefoil Western clover
St Mary's			
Higher Moors & Porth Hellick Pool		Vascular Plants: <i>Scrophularia scorodonia</i> <i>Spergularia bocconei</i> <i>Lavatera cretica</i> <i>Calystea sepium</i> subsp. <i>Roseata</i>	Balm-leaved figwort Greek sea -spurrey Cretin mallow Hedge Bindweed

SSSI	Notified habitats	Notified Features (Vascular Plants: *Individually notified & VPA) (Seabirds: *Isolated Colony & Aggregations) (Lichens - Combinations of species)
St Mary's (continued)		
Higher Moors & Porth Hellick Pool		Local Distinctiveness Species: <i>Juncus maritimus</i> (var. <i>Atlanticus</i>) Sea rush
Lower Moors	Fen, Marsh & Swamp	Local Distinctiveness Species: <i>Juncus maritimus</i> (var. <i>Atlanticus</i>) Sea rush <i>Calystea sepium</i> subsp. <i>Roseata</i> Hedge Bindweed <i>Potamogeton polygonifolius</i> Bog pondweed
Peninnis	Heathland H7, H8	Geology
		Local Distinctiveness Species: <i>Poa infirma</i> Early meadow grass <i>Trifolium occidentale</i> Western clover <i>Chamaemelum nobile</i> Chamomile <i>Daucus carota</i> subsp. <i>Gummifer</i> Sea carrot <i>Radiola linoides</i> Allseed <i>Asplenium obovatum</i> Lanceolate Spleenwort
PorthLoo		Geology
Watermill Cove		Geology
Uninhabited Islands		
Eastern Isles	Heathland H11a	Vascular Plants: <i>*Ornithopus pinnatus</i> Orange Bird's-foot <i>*Rumex rupestris</i> Shoredock <i>Scrophularia scorodonia</i> Balm-leaved figwort
		Local Distinctiveness Species: <i>Crambe maritima</i> Sea Kale <i>Raphanus maritimus</i> Sea raddish <i>Formica rufibarbis</i> Red barbed ant
Samson		Vascular Plants: <i>*Rumex rupestris</i> Shoredock <i>Scrophularia scorodonia</i> Balm-leaved figwort
		Seabirds: <i>Sterna hirundo</i> Common Tern
		Local Distinctiveness Species: <i>Ornithopus pinnatus</i> Orange Bird's-foot <i>Asplenium obovatum</i> Lanceolate Spleenwort
Tean		Vascular Plants: <i>Scrophularia scorodonia</i> Balm-leaved figwort <i>Polycarpon tetraphyllum</i> Four-leaved allseed <i>*Ornithopus pinnatus</i> Orange Bird's-foot <i>*Viola kitaibeliana</i> Dwarf pansy <i>*Rumex rupestris</i> Shoredock

SSSI	Notified habitats	Notified Features (Vascular Plants: *Individually notified & VPA) (Seabirds: *Isolated Colony & Aggregations) (Lichens - Combinations of species)	
Uninhabited islands (continued)			
St Helen's with Northwethel etc	Heathland H7	Vascular Plants: <i>*Rumex rupestris</i> <i>Scrophularia scorodonia</i>	Shoredock Balm-leaved figwort
		Seabirds: Fulmar Guillemot Razorbill	<i>Fulmarus glacialis</i> <i>Uria aalge</i> <i>Alca torda</i>
		Local Distinctiveness Species: <i>Polycarpon tetraphyllum</i>	Four-leaved allseed
Annet		Vascular Plants: <i>*Rumex rupestris</i>	Shoredock
		Seabirds: <i>Sterna hirundo</i> <i>Larus marinus</i> <i>Larus fuscus</i> <i>Puffinus puffinus</i> <i>Fratercula arctica</i> <i>Hydrobates pelagicus</i>	Common Tern Great black-backed Gull Lesser black-backed Gull Manx Shearwater Puffin Storm Petrel
Norrard Rocks		Seabirds: <i>Larus marinus</i> <i>Larus fuscus</i> <i>Phalacrocorax carbo</i> <i>Phalacrocorax aristotelis</i> <i>Hydrobates pelagicus</i>	Great black-backed Gull Lesser black-backed Gull Cormorant Shag Storm Petrel
		Mammals: <i>Halichoerus grypus</i>	Grey seal
Western Rocks		Seabirds: <i>Larus marinus</i> <i>Larus fuscus</i> <i>Phalacrocorax aristotelis</i> <i>Hydrobates pelagicus</i>	Great black-backed Gull Lesser black-backed Gull Shag Storm Petrel
		Mammals: <i>Halichoerus grypus</i>	Grey seal

10.3 RESULTS OF THE QUESTIONNAIRE

A series of questions were developed to assess the level of community support for a proposed rat removal programme and to determine the aspects and current factors that could affect the success of a removal programme. The results of these are given in the summary table (Table 1) and below in Tables 2 to 4.

Table 2 Results (% of adults interviewed) of the rat removal questionnaire completed in the Isles of Scilly

	St Mary's	Bryher	Tresco	St Martin's	St Agnes and Gugh
Number of adults interviewed	55	14	6	17	62
Percentage of adults (of each island community) interviewed	4%	18%	4%	14%	100%
Do you think that seabirds are an important part of the Isles of Scilly?	100% (yes)	100% (yes)	83% (yes)	100% (yes)	98% (yes)
Were you aware that their populations were declining?	67% (yes)	64% (yes)	33% (yes)	55% (yes)	73% (yes)
Do you think that their populations should be protected and enhanced?	91% (yes)	86% (yes)	83% (yes)	100% (yes)	98% (yes)
Have you noticed more rats recently?	40% (yes)	79% (yes)	50% (yes)	64% (yes)	41% (yes)
Do you think rats are a problem on your island?	82% (yes)	86% (yes)	67% (yes)	82% (yes)	92% (yes)
Have rats been a problem for you? (See Table 3 for details)	38% (yes)	79% (yes)	17% (yes)	73% (yes)	82% (yes)
Would you like something done about the rats?	89% (yes)	86% (yes)	100% (yes)	100% (yes)	100% (yes)
Would you support a programme to remove rats from your island if it was found to be feasible?	62% (yes) 7% (maybe)	93% (yes)	98% (yes)	100% (yes)	100% (yes)
Would you support the use of rodenticides?	75% (yes) 18% (maybe)	100% (yes)	100% (yes)	100% (yes)	100% (yes)
Any work would need to be carried between October and March. Would this be a problem?	5% (yes) 95% (no)	100% (no)	100% (no)	100% (no)	100% (no)
How much you spend privately on controlling rats, repairing damage, rat proofing, etc?	£86 per year per household (average)	£65 per year per household (average)	£150 per year per household (average)	£210 per year per household (average)	£88 per year per household (average)
What is the estimated cost from loss of products caused by contamination (etc.) by rats?	£84 per year per household (average)	£50 per year per household (average)	£50 per year per household (average)	£50 per year per household (average)	£344 per year per household (average)

Do you use a rat-proof dust-bin?	75%	43%	67%	27%	56%
Do you use a rat-proof wheelie bin?	96%	36%	-	27%	-
Do you use unprotected bin bags?	87%	14%	17%	9%	37%
Do you use private burning of waste?	84%	93%	17%	9%	68%
Do you use compost heaps?	84%	79%	67%	-	84%
Do you use a private dump?	87%	29%	-	82%	8%
Would you be happy to change this temporarily or permanently if this helped remove food for rats?	82% (yes) 14% (maybe)	86% (yes) 7% (maybe)	100%	82%	100%
Can/do rats enter your buildings (including out buildings or sheds)?	22% (yes) 52% (maybe)	93% (yes) 7% (maybe)	83% (yes)	100% (yes)	88% (yes)
Even if you did not consider that rats were present, would you be happy to have rat bait stations located in buildings on your property?	36% (yes) 48% (maybe)	86% (yes) 7% (maybe)	83% (yes)	100% (yes)	94% (yes)
Would you be happy to have rat bait stations located in the garden?	35% (yes) 56% (maybe)	100% (yes)	83% (yes)	100% (yes)	98% (yes)
Would there be any conditions to have stations on your property?	85% (yes)	43% (yes)	17% (yes)	27% (yes)	94% (yes)
Do you keep any livestock on your property?	5% (yes)	21% (yes)	17% (yes)	36% (yes)	39% (yes)
Do you store anything that would be a potential food source for rats on your property?	18% (yes)	21% (yes)	17% (yes)	27% (yes)	63% (yes)
Would you be happy to provide access to your buildings?	35% (yes) 27% (depends)	100% (yes)	100% (yes)	91% (yes)	100% (yes)
Would you be happy to provide access to your gardens?	42% (yes) 29% (depends)	100% (yes)	100% (yes)	96% (yes)	100% (yes)
Would any conditions need to be applied?	5% (yes)	43% (yes)	17% (yes)	35% (yes)	31% (yes)
Do you have any pets (cats and/or dogs) present on your land?	18% (yes)	64% (yes)	17% (yes)	38% (yes)	56% (yes)
Do you own a boat and use it for travelling between the islands?	10% (yes)	36% (yes)	20% (yes)	55% (yes)	63% (yes)
Would you like to be listed as a reporting location (where any rat sighting is reported to you for action)?	27% (yes)	14% (yes)	20% (yes)	64% (yes)	64% (yes)
Would you be interested in assisting with any contingency operation?	18% (yes)	21% (yes)	20% (yes)	9% (yes)	53% (yes)
Would you like training in rodent detection and	15% (yes)	14% (yes)	20% (yes)	27% (yes)	35% (yes)

identification?					
Would you like to be trained in interview and site inspection procedures and methods?	16% (yes)	14% (yes)	20% (yes)	45% (yes)	47% (yes)
Would you want to be involved in long-term monitoring for rodents?	16% (yes)	21% (yes)	20% (yes)	55% (yes)	45% (yes)
Would you be happy to check for rodent damage to your own cargo?	20% (yes)	21% (yes)	20% (yes)	64% (yes)	82% (yes)
Would you be happy to install and maintain a bait station on your vessel and/or property?	25% (yes)	100% (yes)	100% (yes)	73% (yes)	100% (yes)
Would you be happy to transport food to and between islands in rodent-proof containers?	16% (yes)	14% (yes)	20% (yes)	64% (yes)	80% (yes)
Would you be interested in supporting or getting involved in the project in addition to above?	22%	36% (yes)	20% (yes)	9% (yes)	74% (yes)

Table 3 Additional results (% of adults interviewed) of the rat removal questionnaire completed in the Isles of Scilly.

Where have rats caused a problem for you?	Damage to food	Damage to crops	Damage to property	Damage to animals	At home	At business	At farm	On boat	At beach	Attacking animals	Attacking people	Bite	Fleas	Health
Bryher	5%	14%	29%	7%	21%	-	-	-	14%	-	-	7%	-	-
St Martin's	11%	36%	9%	9%	12%	27%	45%	-	9%	9%	-	-	-	-
Tresco	25%	-	-	-	17%	-	12%	-	-	-	-	-	-	-
St Mary's	4%	4%	7%	7%	16%	7%	2%	-	2%	4%	-	-	2%	-
St Agnes and Gugh	25%	24%	29%	6%	55%	22%	26%	4%	12%	-	-	-	2%	2%

Table 4 Additional results (% of adults interviewed) of the rat removal questionnaire completed in the Isles of Scilly.

Do you think there would be positive or negative benefits to the following by the removal of rats from the Isles of Scilly?		Seabirds	Community	Economy	Tourism	Agriculture	Fishing	Landbird	Health	Scenery	Biodiversity	Culture/History	Access	Other mammals	Disease reduction	Aesthetics	Land environment	Marine Wildlife	Archaeology
Bryher	Positive	93	79	57	86	43	36	86	57	50	36	43	36	57	71	64	50	50	50
	Negative	7	-	-	-	-	-	-	-	-	14	-	-	7	-	-	-	-	-
	Neutral (no change)	-	-	7	7	7	-	-	7	-	-	7	14	-	7	-	-	7	7
	Don't know or didn't answer	-	21	36	7	50	64	14	36	50	50	50	50	36	21	36	50	43	43
St Martin's	Positive	100	100	82	100	91	73	100	82	91	91	56	64	91	82	91	91	82	82
	Negative	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Neutral (no change)	-	-	18	-	-	27	-	9	-	-	34	27	-	9	-	-	9	9
	Don't know or didn't answer	-	-	-	-	-	-	-	9	9	9	10	9	9	9	9	9	9	9
Tresco	Positive	83	83	83	83	66	67	100	100	66	100	50	50	100	83	67	50	83	67
	Negative	17	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-
	Neutral (no change)	-	17	17	17	17	17	-	-	17	-	33	33	-	17	33	17	17	33
	Don't know or didn't answer	-	-	-	-	-	17	-	-	17	-	17	17	-	-	-	33	-	-
St Mary's	Positive	87	69	69	83	69	29	76	76	47	69	22	29	65	76	55	58	60	35
	Negative	2	2	2	2	4	4	4	2	2	5	4	2	4	-	2	4	4	2
	Neutral (no change)	2	13	13	4	15	38	5	7	29	9	53	49	15	9	27	22	15	38
	Don't know or didn't answer	9	16	16	11	13	29	15	15	22	16	22	20	16	15	16	16	22	25
St Agnes and Gugh	Positive	96	84	59	78	84	24	80	78	37	59	20	37	76	76	41	51	39	39
	Negative	-	2	-	-	-	-	-	-	-	6	2	-	-	-	-	-	-	-
	Neutral (no change)	-	6	18	6	2	41	8	4	33	4	43	27	6	4	33	27	35	25
	Don't know or didn't answer	4	8	23	16	14	35	12	18	30	31	35	36	18	20	26	22	26	36

Table 5 Additional results (% of adults interviewed) of the rat removal questionnaire completed in the Isles of Scilly.

Please rank the issues that could affect the successful outcome of a rat removal project [from 1 = least to 5 = most important]:		Waste management	Private gardens or farms	Project management	Cargo movements	Access to private land	Public Health	Animal Health	Transport	Community involvement	Re-invasion	Adequate funding	Communication	Livestock	Pets	Weather	Terrain	Non-target species	Chickens
Bryher	5	100	57	64	36	71	71	50	29	93	64	93	79	50	64	29	29	36	43
	4	-	21	29	7	14	-	7	14	-	7	-	7	-	14	-	-	7	71
	3	-	7	-	29	-	-	7	14	-	14	-	-	29	14	14	-	14	21
	2	-	7	-	7	-	7	14	21	-	-	-	-	7	-	21	21	21	7
	1	-	-	-	7	7	-	-	-	-	7	-	-	7	-	14	29	-	7
	Not answered	-	7	7	14	7	22	22	22	7	7	7	14	7	7	21	21	21	14
St Martin's	5	100	55	100	36	55	64	55	36	82	73	100	100	64	64	27	27	73	82
	4	-	9	-	9	9	-	9	18	18	27	-	-	9	18	-	-	-	-
	3	-	9	-	18	9	18	27	18	-	-	-	-	18	-	27	27	18	18
	2	-	18	-	9	-	18	9	9	-	-	-	-	9	9	18	18	-	-
	1	-	9	-	27	27	-	-	18	-	-	-	-	-	9	27	27	9	-
Tresco	5	83	50	67	17	50	17	17	-	100	33	67	83	-	20	-	-	-	-
	4	16	17	33	17	-	50	50	-	-	50	33	17	17	50	-	-	50	32
	3	-	17	-	33	50	33	33	17	-	17	-	-	66	30	17	17	50	67
	2	-	16	-	33	-	-	-	67	-	-	-	-	17	-	50	50	-	-
	1	-	-	-	-	-	-	-	16	-	-	-	-	-	-	33	33	-	-
St Mary's	5	62	16	24	18	18	26	29	13	31	49	42	35	36	29	7	9	18	38
	4	2	22	9	13	6	9	12	16	5	5	12	4	5	9	4	2	9	9
	3	-	13	13	13	6	8	11	15	18	-	-	12	9	13	9	11	11	9
	2	-	6	9	15	14	13	2	5	4	2	4	5	2	4	6	8	5	2
	1	2	4	7	4	16	9	6	11	2	6	4	4	6	4	29	25	13	2
	Not answered	34	38	38	38	40	35	40	40	38	40	38	40	42	41	45	45	44	40
St Agnes and Gugh	5	67	25	53	16	31	39	43	6	65	31	75	65	29	33	2	10	22	41
	4	10	20	20	4	12	14	16	6	4	20	4	10	20	12	12	8	8	12
	3	8	24	12	24	12	14	14	22	8	12	2	6	22	22	16	14	18	8
	2	-	10	-	22	10	12	8	18	4	12	-	-	12	14	4	14	18	10
	1	2	4	2	20	20	4	4	31	2	8	4	2	4	4	51	39	18	12
	Not answered	13	17	13	14	15	17	15	17	17	17	15	17	13	15	15	15	16	17