Monitoring for rats on the uninhabited island, St Helen's Winter 2016/17

Isles of Scilly Seabird Recovery Project
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Photos Amy King, Lydia Titterton, Holly Paget-Brown
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Introduction
The purpose of this report is to present relevant information on brown rats (*Rattus Norvegicus*) on the uninhabited island of St Helen's, 'Isles of Scilly over a six month winter period. This information may be useful in preparing for wider-scale rat removal work.

The work has been carried out by Isles of Scilly Seabird Recovery Project staff and volunteers during winter 2016/17.

For further details on previous baiting and monitoring on the uninhabited islands, as carried out by Isles of Scilly Wildlife Trust (IoSWT) as per 'Isles of Scilly Seabird Strategy 2013 – 2018', please see Appendix 1.

Objectives
1. To identify any brown rats with the L20 gene (indicating bait resistance) on St Helen's.
2. To identify the natural feeding preferences and behaviours of brown rats on St Helen's.
3. To identify any preferences to monitoring wax of brown rats on St Helen's.
4. To record the behaviour of brown rats around trapping and monitoring stations to determine whether they are neophobic (wary of new objects in their environment).
5. To identify if mice are present on St Helen's.
6. To record any other relevant information on brown rats on St Helen's to aid a possible future rat removal project.

Summary
1. Over a period of 6 months (September 2016 to March 2017) 15 visits were made to St Helen's with 12 rats trapped in total and none were positive for the L20 resistance gene.
2. Stomach content analysis confirmed their main diet during this winter period was invertebrates and vegetation, particularly *pittosprum crassifolium* and Hottentot fig (*carpobrotus edulis*).
3. Their preferred flavour of wax was peanut butter, there least preferred was aniseed. They preferred freshly flavoured wax, compared to wax flavoured over two years ago.
4. The rats are neophobic (wary of new objects) and are more likely to enter traps located within natural vegetation tunnels than within the Protecta Boxes or wooden tunnels.
5. The presence of mice was confirmed via teeth marks in the monitoring wax, but none were caught, filmed or seen, so the species (wood mouse or house mouse) is unconfirmed.
6. The rat population is currently concentrated on Dibley Point, an area on the east coast of St Helen's where the main Manx shearwater colony breeds in summer.

Methods

Objective 1 – DNA analysis for bait resistance gene
T Rex snap traps were used to collect specimens for DNA and resistance testing. Project Manager Jaclyn Pearson, Project Officer Lydia Titterton, Project Assistant Holly Paget-Brown, previous WMIL staff and volunteers Alex Cropper and Amy King, and RSPB staff Stuart Taylor set up a grid of 40 traps on 19th September 2016. All following trips were completed by the Project Officer and Project Assistant.

The traps were set up in two lines of 20 (A and B) to cover the coastline and central path over St Helen's. The location of each station was GIS recorded. (Fig. 1). The location of the traps were

selected on the basis of how much rat-sign (runs, burrows, droppings) was in the immediate area. The traps were set in three different settings, Protecta boxes: wooden tunnels: and under natural vegetation. Following best practice methodology from the 'Biosecurity Plan for St Agnes and Gugh 2014 Wildlife Management International Ltd (WMIL)', the traps were baited with peanut butter and were checked within 24 hours of being set to minimise the risk of trapping non-target species.

Figure 1 – map showing location of snap traps and trail cameras.

The tails of the trapped rats were then removed, stored to prevent contamination and sent to the University of Reading for resistance analysis. The Project Officer and Project Assistant were trained in necropsy and storage techniques by the Project Manager and WMIL's Lead Ecologist Biz Bell. The protocols for collection and prevention of contamination are found in the 'Biosecurity Plan for St Agnes and Gugh 2014 Wildlife Management International Ltd (WMIL)'.During necropsy, they also recorded gender, weight and body length.

Objective 2 - Feeding Behaviour

On each visit, the islands were searched for droppings and these were analysed on site to identify dietary contents. During necropsy, the stomach contents were analysed. The Project Officer and Project Assistant were trained in stomach content analysis by the Project Manager and WMIL's Lead Ecologist Biz Bell, and received refresher training in January 2016 to identify winter diet. The rat bodies were disposed according to Council Isles of Scilly protocol (non toxic animal material).

Two trail cameras were used to record 'preference to monitoring tools' and could also collect any footage of other feeding behaviour.

Objective 3 - Preference for Monitoring Tools

Non toxic monitoring tools are used to identify the presence of rats. Flavoured wax is attractive to foraging rats due to their strong appealing smell, when nibbled the wax retains the rats teeth marks so their presence can be identified. The preferred flavour of wax by rats can vary between islands.

The wax blocks were made by the Project Officer and Project Assistant after receiving training from from WMIL Lead Ecologist Biz Bell in January 2016, and from WMIL's previous staff member Alex Cropper in September 2016. Details on how to make the monitoring wax are held in the 'Biosecurity Plan for St Agnes and Gugh 2014'.

Five flavours used were chocolate, aniseed, vanilla, fish and peanut butter. These were selected as per conversations with WMIL's Lead Ecologist Biz Bell from trials elsewhere in the world.

The attractiveness of chocolate wax to rats when either freshly made and therefore with a strong odour (new chocolate wax) or made over two years ago and kept in storage, so potentially having a weaker odour (old chocolate wax), were compared. This was done through a comparison of ow long it took for rats to chew and eat the flavoured wax. This would enable us to understand whether the wax which is stored and being used on St Agnes, should be replaced before a two year period to remain attractive to rats.

Originally 40 blocks of wax were spaced evenly around the coastline, however we found that this was not effective as we couldn't guarantee how long the wax would be left unchecked between trips by which time some of the wax was gone. The methodology was changed in January, setting out all six flavours in a row (wax buffet) in front of trail cameras to monitor rat feeding behaviour on the wax. The preference to each flavoured wax was recorded by the number of days which it took rats to sniff, chew or completely eat the wax. Camera one was set up for five days, and camera two for seven days in January. See Figure 2 for the set up.

Figure 2 – Camera set up to record feeding behaviour of rats on the flavoured wax (photo Holly Paget Brown).

Objective 4 – evidence of neophobia in brown rats

The traps were set in Protecta boxes, wooden tunnels and under natural cover vegetation. Neophobia would be confirmed by rats not being caught in the Protecta boxes or wooden tunnels, but instead being caught in the natural vegetation tunnels.
Trail cameras (Figure 2) set up for 'preference for monitoring tools' could also collect footage of neophobia behaviour around these stations.

Objective 5 – Presence of mice

Any evidence of mice teeth marks in the wax, footage on trail cameras, trapped or seen mice were recorded. Project Officer and Project Assistant were trained on Tresco, February 2016 by RSPB Seabird Recovery Officer Karen Varnham to identify house and wood mice and their teeth marks.

Objective 6 – other relevant information on brown rats

Anything deemed relevant was written in field notebooks and reported back to the Project Manager.

Results

Over a period of 6 months (September 2016 to March 2017) 15 visits were made to St Helen's

Date	Personnel
19/09/2016	Jaclyn Pearson, Lydia Titterton, Holly Paget-Brown, Alex Cropper, Amy King, Stuart Taylor
30/11/2016	Lydia Titterton, Holly Paget-Brown
01/12/2016	Lydia Titterton, Holly Paget-Brown
04/01/2016	Lydia Titterton, Holly Paget-Brown
05/01/2016	Lydia Titterton, Holly Paget-Brown
06/01/2016	Lydia Titterton, Holly Paget-Brown
17/01/2016	Lydia Titterton, Holly Paget-Brown
18/01/2016	Lydia Titterton, Holly Paget-Brown
15/02/2016	Lydia Titterton, Holly Paget-Brown
16/02/2016	Lydia Titterton, Holly Paget-Brown
20/02/2016	Lydia Titterton, Holly Paget-Brown
21/02/2016	Lydia Titterton, IOSSRP Volunteer (and boat skipper) John Peacock
08/03/0216	Lydia Titterton, Holly Paget-Brown
09/03/2016	Lydia Titterton, Holly Paget-Brown

Table 1 – Dates and personnel on visits

Objective 1 - DNA analysis for bait resistance gene

In total 12 rats were caught and all were reported negative for the L20 resistance gene by laboratory researchers Dave Rymer and Emily Coen, University of Reading.

Figure 3 – location of where rats were trapped.

Objective 2 - Feeding Behaviour

Analysis of stomach contents

The main diet of brown rats on St Helen's is vegetation which could be analysed further to *pittosprum crassifolium* and hottentot fig (*carpobrotus edulis*) due to their seeds and green waxy composition. Insects formed a large part of their diet, and could be identified to the level of spiders, woodlice and worms. Some plastic was found in their stomachs, which was not plastic from the bait stations and most likely was beach litter (Table 2 and Figure 4).

Trap Type	Trap	Collection Date	L20	Stomach Contents	Sex	Age	Weight (g)	Total Length (cm)	Tail Length (cm)
Snap trap in vegetation	A6	01/12/2016	No	Pittosporum seeds	F	Adult	280	22	17cm
Snap trap in vegetation	A8	05/01/2017	No	Unidentifiable plant matter and Pittosporum seeds	F	Adult	210	36	17cm
Snap trap in vegetation	A9	05/01/2017	No	Unidentifiable plant matter and Pittosporum seeds	M	Adult	220	36	15cm
Wooden Tunnel	B17	05/01/2017	No	Unidentifiable plant matter, Pittosporum seeds and Hottentot fig leaves	F	Adolescent	145	33	15cm
Protecta Box	B10	06/01/2017	No	Unidentifiable plant matter, Woodlouse	M	Adult	270	40	14cm
Snap trap in vegetation	A6	06/01/2017	No	Unidentifiable plant matter, Spiders, Plastic	M	Adult	300	39	13cm
Snap trap in vegetation	A8	18/01/2017	No	Hottentot fig leaves, Plastic, Worm	F	Adult	175	32	14cm
Snap trap in vegetation	A9	18/01/2017	No	Unidentifiable plant matter	F	Adult	230	35	16cm
Protecta Box	B10	16/02/2017	No	Unidentifiable plant matter	M	Adult	230	29	11cm
Snap trap in vegetation	B1	21/02/2017	No	Unidentifiable plant matter	F	Adult	310	41	18cm
Snap trap in vegetation	A6	21/02/2017	No	Unidentifiable plant matter	F	Adult	240	39	17cm

Table 2 – Details of rats caught.

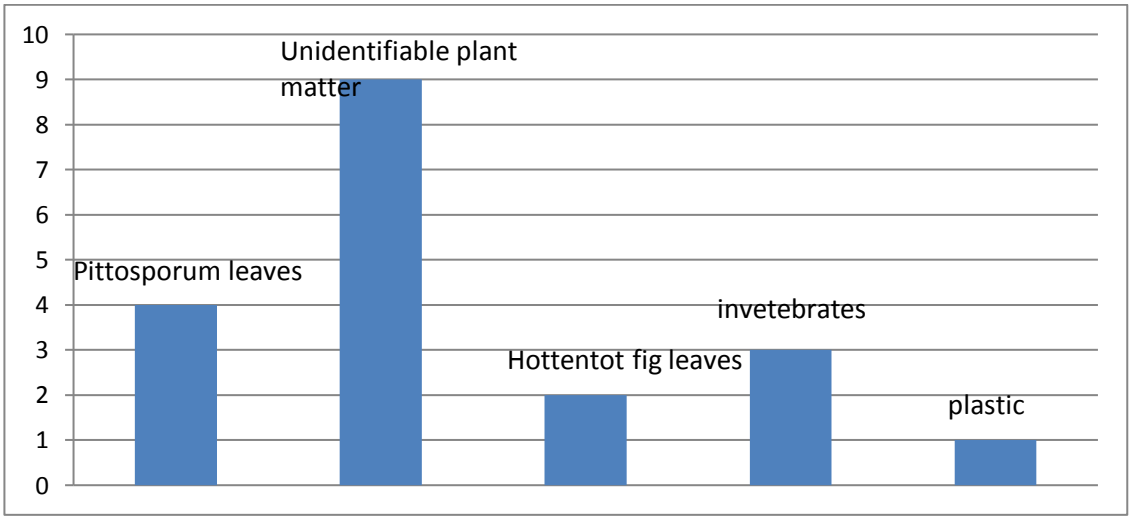

Figure 4. No. of rats in which these items were found in their stomachs.

Analysis of dropping contents

In total the contents of 74 rat droppings were analysed. The results of dropping analysis matched those of stomach contents analysis, with vegetation and insects being identified as their main food source .

Food source	No. of 74 droppings containing food source
Plant matter	72
Pittosporum seeds	58
Hottentot leaves	42
Invertebrates (most likely woodlouse and spiders)	32
Plastic	1

Table 3. Details of content of rat droppings

Analysis of footage on trail cameras

There was no footage of rats eating anything other than the monitoring wax.

Objective 3 - Preference for Monitoring Tools

Two trail cameras enabled us to view back footage of the preference of wax flavours which the rats sniffed, chewed or ate over five days 21/02/2017 to 25/02/2017 for camera 1, and seven days 21/02/2017 to 27/02/2017 for camera 2. The following tables (Table 4 and Table 5) show the results. The rats preferred peanut butter, followed by vanilla, fish, chocolate and the least preferred was aniseed.

When comparing whether rats prefer the newly flavoured wax to older favoured wax (made two years previously), they chose the new chocolate wax which smelt stronger of chocolate, over the older chocolate wax.

		Old chocolate	Vanilla	Aniseed	Fish	New chocolate	Peanut
		Camera 1					
21/02/2017	Day 1	S	E			S	E
22/02/2017	Day 2	S	C		S		C
23/02/2017	Day 3	S		S	C	C	
24/02/2017	Day 4	E		S			
25/02/2017	Day 5	C					
		Camera 2					
21/02/2017	Day 1						
22/02/2017	Day 2		E		E	E	C
23/02/2017	Day 3	E	C		C	E	
24/02/2017	Day 4	E				C	
25/02/2017	Day 5	C					
26/02/2017	Day 6			E			
27/02/2017	Day 7			C			

Table 4 – No. of days for each flavour of wax to be sniffed (S), eaten (E) and completely eaten (C)

Wax	Days Taken to be Completely Eaten		
	Camera 1	Camera 2	Average
Peanut	2	2	2
Vanilla	2	3	2.5
Fish	3	3	3
Chocolate New	3	4	3.5
Chocolate Old	5	5	5
Aniseed	Not touched	7	7 and not touched

Table 5 – No. of days for each flavour of wax to be completely eaten.

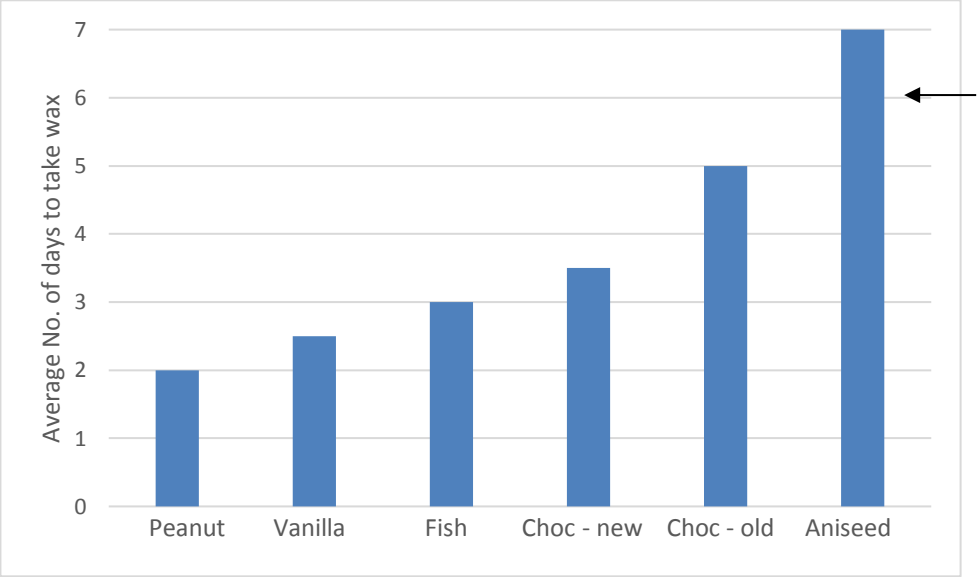

Figure 5 - No. of days for each flavour of wax to be completely eaten by rats.

Figure 5. Photo (Holly Paget Brown) of the wax buffet in front of camera, aniseed (second from left) not taken.

Objective 4 – Evidence of neophobia in brown rats

Table 6 shows the most ratss on St Helen's were trapped in traps laid in natural vegetation confirming the rats are neophobic, wary of new objects in their environment.

Type of bait station	No. of rats caught in trap in this station
Protecta box	2
Wooden box	2
Natural vegetation	10

Table 6 – No. of the 14 rats trapped in each type of station.

Objective 5 – Presence of mice

Mouse teeth marks were found in some of the monitoring wax (fish, aniseed and chocolate wax).

Objective 6 – other relevant information on brown rats

The main area where rats were recorded through: trapping: teeth marks on wax: droppings: other 'rat sign' (runs, burrows, footprints), was on the east side of the island at Dibley Point. Here the habitat is characterised by a large growth of Hottentot fig, but also this area has the largest concentration of Manx shearwater burrows. There was no evidence of seabird material (feathers or bone) found in stomach contents or droppings but burrow-nesting seabirds had migrated away for winter. There is though evidence of predation of the Manx shearwaters in summer by rats, see 'Seabird Monitoring and Research Project Technical Report 2016 and 2017 by Dr Vickie Heaney'. There is worldwide evidence of eggs and chicks of burrow nesting seabirds forming a large part of the diet of rats in spring and summer.

If rats are swimming between islands to feed and nest, this is the nearest point to Tean, so is naturally an area to be recolonised.

Discussion

Objective 1 - To identify any brown rats with the L20 gene (indicating bait resistance) on St Helen's.
The sample size of rat tails for DNA analysis (n=12) was deemed by the University of Reading to be a good sample size to be confident that the brown rats on St Helen's during the winter 2016/17 did not have the L20 bait resistance gene.

Objective 2 - To identify the natural feeding preferences and behaviours of brown rats on St Helen's.
The rats on St Helen's main food source in winter is vegetation, particularly the two plants *pittosprum crassifolium* and Hottentot fig.

Objective 3 - To identify any preferences to monitoring wax of brown rats on St Helen's.
Brown rats on St Helen's have a preference for peanut butter flavoured wax, so this is the best monitoring tool for use on the St Helen'd island group. Fresh monitoring wax with a stronger smell has a better uptake by rats compared to old wax.

Objective 4 - To record the behaviour of brown rats around trapping and monitoring stations to determine whether they are neophobic (wary of new objects in their environment).
The rats on St Helen's are neophobic.

Objective 5 - To identify if mice are present on St Helen's.
Mice are present on St Helen's, but it is unconfirmed if they are house mice or wood mice, or both species are present.

Objective 6 - To record any other relevant information on brown rats on St Helen's to aid a possible future rat removal project.
It is likely that the rats are feeding on the Manx shearwater eggs and chicks as the highest concentration of rats is where the main nesting colony of Manx shearwaters is located.

Recommendations for future rat removal work.

1. It is known that rats do move between islands, so further analysis of the resistance gene needs to be carried out on the other inhabited and uninhabited islands (excluding St Mary's) to be confident.
2. Peanut butter should be used in any future operation on St Helen's and nearby islands to monitor rat populations and territories.
3. Monitoring wax should be stored in airtight containers and replaced after a year so that it is fresh with a stronger smell in order to be attractive to rats.
4. In the future in order to remove rats, islands need to become 'rat-removal ready' - reducing the amount of alternative food and rat harbouring material available so that the rats are more likely to eat the bait. As the rats on St Helen's main food source was the two plants *pittosprum crassifolium* and Hottentot fig, management of these species prior to a rat removal operation should be considered. These are both invasive, none-native species which are known to have negative implication on the natural flora and fauna. Any management must also be considered in relation to impacting any other protected species, for example any negative impacts on removing the Hottentot fig from around the Manx shearwater burrows.

Also as plastics were found in stomach contents, beach cleans prior to removal are recommended.

5. As the rats on St Helen's are neophobic, baiting tunnels would need to be set out in a grid (with no traps inside) on the islands a minimum of six weeks prior to a baiting operation, so the rats can get used to them in their environment and consider them to be part of their natural foraging terrain. The longer the period these tunnels could be left out, the more likely rats will be less wary of them when they contain bait, and the more likely they will be to take the bait quickly.
6. The species of mice needs to be confirmed through use of longworth traps. Mice are known to have detrimental effects on some seabirds, so if consultation with local communities, landowners and partners confirmed mice should be removed, a baiting grid of 25m would be required. Please refer to 'Biosecurity plan St Agnes and Gugh 2014, WMIL' for best practice methodology on mice removal.
7. A future rat removal project across all islands (excluding St Mary's) would ensure the colonies of Manx shearwaters on the St Helen's group are protected and chicks would survive. Storm petrel may also return to breed recruiting from the breeding colony on nearby Round Island.

Acknowledgements

The team would like to thank; IoSWT for research access to St Helen's and ongoing support; St Agnes Boating for getting us on and off the island; Alan Buckle, David Rymer and Emily Coen, University of Reading for analysing our samples; and all of our off-island volunteers for helping us collect a wide range of data and keeping St Agnes rat-free.

Appendices

Appendix 1.

Summary of Action D1 -Carry out long-term monitoring for rats on the Uninhabited Islands 2013 to 2016

Status: - Complete

Background and rationale prior to IOSSRP: Since the mid 1990's the Isles of Scilly Wildlife Trust has been tasked with the management of the uninhabited islands for seabirds, through clearance of brown rats. An annual programme of work across up to 21 islands has been undertaken with the aim of improving the prospects of breeding seabirds within the SPA – and specifically to seek to increase numbers of breeding seabirds and improve their productivity.

More recently, the work was funded by Natural England through the Wildlife Enhancement Scheme which became part of IOSSRP between October 2013 to March 2016.

Year 1 Activities October 2013 – March 2014

Responsible for action: IoSWT CEO Sarah Mason

Field Lead: IoWST rangers

Progress and deliverables summarised

IOSWT Chief Executive Sarah Mason inherited reports from the previous IOSWT Manager suggesting these islands were rat-free prior to this projects start date (2012) as summarised in the table below.

Action	Location	Priority level	Status
Assess, Monitor and maintain rate free			
	Western Rocks	1	Confirmed rat free.
	Norrard Rocks	1	Confirmed rat free.
	Round Island	1	Confirmed rat free.
	Men a vaur	1	Confirmed rat free.
Clear, monitor and take further action if re-invasion			
	Annet	1	Completed and confirmed rat free. Control measures in place.
	Samson	2	Completed. Control measures in place.
	St Helen's Group	2	Completed. Control measures in place
Monitor and take further action if re-invasion			
	Gweal	2/3	Completed. Considered rat free. Control measures in place. Hugely susceptible to incursions from Bryher.
	Eastern Isles	3	Completed. Considered rat free. Control measures in place.

(From The Isles of Scilly Seabird Strategy 2009-2013)

In winter 2013/2014, Sarah Mason reported that the islands categorised as '**Clear, monitor and take further action if re-invasion'** and '**Monitor and take further action if re-invasion'** were in fact *not* rat-free and the planned monitoring work became re-invasion bating work and baiting work which was labour intensive and there were not enough resources this which was not envisaged.

Recommendations for next year's winter activities 2014/15

Based on the reports **'Review of management of seabird colonies on uninhabited islands', by IoSWT CEO Sarah Mason 2014** and '**Action Plan for rat incursion response on the uninhabited islands' by WMIL**.

1) Prioritise monitoring resources to the islands which have the highest populations of burrow nesting seabirds (data from 'Monitoring of seabird' by Vickie Heaney).
2) Maintain current effort of monitoring on Annet and St Helens group with a minimum of 8 visits during this winter using monitoring methods recommended by WMIL (chocolate wax in plastic bait tubes) and monitor throughout the year to gather data on incursions.
3) If required, maintain winter control of rats using Contrac™ (bromadiolone) using a baiting grid and ensure visits occur every 2 weeks. All bait will be removed by the end of March 2015
4) No rat baiting will take place this year on Samson or the Eastern Isles, however monitoring may take place if time and weather conditions allow.
5) Review this position again in October 2015

Year 2 Activities October 2014 – March 2015

Responsible for action: IoSWT CEO Sarah Mason

Field Lead: IoWST Rangers and IoSWT Access and Engagement Officer

Please see report **'Uninhabited islands rat control report 2014 15 IOSWT'** Isles of Scilly Access and Engagement Officer.

Progress and deliverables summarised

- St Helen's group (Tean, St Helen's, Northwethel, Round Island, Peashopper, Crow, Foreman's and Round Island) were prioritised as the only islands to be monitored and baited this winter. No monitoring or baiting was carried out on the other uninhabited islands, instead all permanent baiting tunnels were removed from these islands.

- On the first visit in November rat sign was found on St Helen's, Tean and Northwethel,so baiting grids were deployed.
- Foremans, Peashopper, and Round island did not show any rat sign on the monitoring stations.
- A new position at the Trust (Access and Engagement Officer) worked part time in partnership with IOSSRP from January to March 2015 to lead the baiting field work on St Helens, Tean and Northwethal and report findings. On each of these islands, coastal and inland transects were plotted and bait stations were put out roughly every 50 metres (depending on terrain). Bait stations followed best practice methodology from the St Agnes and Gugh rat removal (see IOSSRP Technical Report for the rat removal phase on St Agnes and Gugh (Biz et al 2014). At the side of each station was a wire of three flavoured wax blocks to detect 'fussy rats'.
- During each visit to these islands, the amount of take (the percentage of the original block missing, showing how much had been ingested) on both the bait and the wax blocks was

recorded, as well as which species had left signs on wax or bait. These amounts were then entered into a spreadsheet in order to monitor changes in bait and wax take.

- In January it soon became clear that the bait and wax taking behaviours of the rats on each island differed significantly. On Tean bait take peaked early on, after which there was a very small but constant amount of bait take across the island.
- On St Helen's there was little to no response to the bait for the first half of the programme, and no response to peanut butter on the bait. The huge increase in bait take corresponds to the method of putting peanut butter on both the bait and the entrances to the baiting tunnels, although it also corresponds to the theory of rats using non-natural food sources later in winter, in this case mid-February. For this reason we cannot be certain which factor caused the increase in bait take.
- The Northwethel baiting programme began with positive bait take results, with over half of the first batch of bait being consumed. However, this dropped off after time. In early February, the results from putting the preferred food source of the Northwethel rat population, wax, into the tubes proved to be effective and increased bait take once more. When the bait was collected in at the end of the season, there had been no bait take over the last two weeks of March
- At the end of March (the baiting programme) there was no further rat-sign on Tean, and the rats may have all been removed, rats were still present on St Helens and Northwethal.

Recommendations for winter activities 2015/16

- Further prioritise resources to St Helen's, Tean and Northwethel, do not carry out monitoring on Foreman's Peashopper and Crow, as they were rat-free this winter.
- Deliver all baiting trips (approx 9) between January and March, as opposed to October to March, as the rats are more likely to take the bait from January.
- Use peanut butter and lard to entice the rats to the stations.

Year 3 Activities October 2015 – March 2016

Responsible for action: IoSWT Sarah Mason

Field Lead: IoSWT Head Ranger Darren Mason and supplementary field work and report by WMIL's Biz Bell

Please see report Isles of Scilly Wildlife Trust, **'Uninhabited islands rat control 2015/16 report IOSWT'** by Darren Mason.

Progress and deliverables summarised

- St Helen's, Tean and Northwethel were prioritised ,the smaller islands of Foreman's Peashopper and Crow were not monitored this year due to allocation of resources to these higher priority larger islands. The results of the 2015 SPA seabird monitoring survey, carried out earlier this year by IOSSRP and completed in September 2015, recorded 30 pairs of Manx Shearwater on St Helens, thus reiterating the priority of rat-removal here.
- All baiting trips were carried out between January and March.
- Nine baiting visits were made in total; two to set up and remove the bait stations.
- The same coastal and inland transects from 2014/15 were used, set out at approximately 50m, with the exception of Tean, where the small outcrops to the west and the western coastal areas of the main island were not baited. This allowed resource to be focussed on the

central and eastern areas of Tean where the main bait take was recorded during the 2014/15 programme.

- Two blocks of bait were placed in each monitoring station on all 3 islands with peanut butter spread on the blocks and at the entrance to each station to encourage them inside.
- From WMIL's report (below) in January it was found that the rats on Tean preferred aniseed wax, so this was used during February on Tean and Northwethal to lure the rats to the stations and increased take.
- On each visit the number of blocks put out, the % of blocks taken, species teeth marks on bait or wax, rat droppings, burrows and footprints were recorded.
- On Tean, the peak in rat signs and bait take occurred very early on in the 2015 Programme. After this peak, the remainder of the programme recorded a steady, almost parallel decrease in both measurements over the remaining period.
- On Northwethal and St Helen's the overall bait take throughout the whole monitoring and baiting period shows an overall increase, with the rats being wary of the baiting tunnels to start (neophobia).Both islands lie closest to the inhabited islands of St Martins and Tresco respectively, where food outlets are very close to the shores of Tean and Northwethel (Karma Hotel and Ruin Beach Cafe). These rats may be travelling from these St Martins or Tresco and these individuals may be particularly neophobic, having become more wary of baiting boxes deployed regularly by staff at these eateries.
- Rats may also come from Tresco in February as a result of the orgnaised pheasant shoots from Tresco Estate ceasing in February, and the corn hoppers being stopped.Rats may search for other food sources and swim to Tean or St Helens, and again may have moreneophoc behaviour as result of being more wary of baiting boxes deployed by Tresco gamekeepers.
- Alongside the rats being 'fussy' over certain lures (see WMILs report below) on different islands, and being neophobic of baiting stations, the rats may also not be sedentary on any particular island, but instead move between islands during this winter period. It has often been thought that rats return to these uninhabited islands from nearby Tresco, St Martins during low tides, by moving across connecting low water land bridges. During this monitoring and baiting programme the lowest tides occurred during the weeks beginning 8th February 2016 and the 7th March at 0.4m and 0.2m respectively. These tides corresponded with visits 2 and 5 on St Helens and visits 3 and 6 on Tean and Northwethel. From the results there is an increase in rat sign and bait take on St Helens and Northwethel in particular, either on those visits or the visit (week) following the largest tides. The increase is more pronounced during visit 5 and 6 respectively on the lowest tides (0.2m) during March 2016. Also on reviewing the dates of the lowest tides during the same period in the winter of 2014/15 (weeks beginning 19th January 2015 and 16th February 2015, 0.4m and 0.2m respectively) the results from St Helens and Northwethel show a similar trend with large increases in bait take (compared to previous weeks), particularly on the visit occurring on or immediately after the week with the largest tides. These results strongly suggest that movement between the islands do occur, particularly when tidal ranges are at their largest when there is the distinct possibility of being able to cross with minimal swimming and using sandbars to make the journey.
- The islands still had bait take and 'rat sign' by the time the winter operation completed by the end of March 2015 as seabirds returned.

Please see report 'WMIL Results from the visit to Tean and St Helen's, Isles of Scilly 2016' by Biz Bell and Alex Cropper

- Monitoring visits carried out by IOSSRP and WMIL on Tean and St Helen's in January and February 2016 (during the period when WMIL were on Scilly carrying out the 'final check phase' on St Agnes, for Senior Ecologist, Biz Bell could then offer any advice on operations).
- A range of monitoring tools was placed over both islands including flavoured wax, tracking tunnels, a trail camera and traps (in lockable commercial trap boxes) on 19 January 2016.
- All of the monitoring tools and traps were collected on 4 February 2016. No rats were trapped, although one fresh carcass was recovered on the surface from the baiting operation. Another rat was also found on Tean during the second check by IOSWT personnel on 11 February 2016. These rats were retained and dissected and then safely disposed .
- On both islands there was rat sign on flavoured wax only; more on aniseed wax on Tean and more on peanut wax on St Helen's .Traps and tracking tunnels did not show any rat activity on either island. Scilly shrew active was recorded on chocolate wax and aniseed wax on St Helen's and only on tracking tunnels on Tean . Footage of rats and rat activity was recorded on the trail camera established on St Helens.

Recommendations;

- Karen Lunan, LIFE NEEMO Monitor, visited the project in May 2015, and IOSWT Chief Executive Sarah Mason recommended rat behaviour, resistance testing and monitoring work in the final winter of the project, in replacement of baiting, which is very likely to fail again.
- Sarah Mason explained that IOSWT will not be carrying out this final winter of work as Natural England WES 'wildlife enhancement scheme' funding for the uninhabited islands baiting work has now come to an end in March 2016. Although it was planned that budget from the project would replace WES for this work, IOSWT feel that they do not have the necessary skill set or capacity to carry out the monitoring work. They do though suggest it should be carried out by project staff members that have the skills and they will provide access permission for a field team to carry out this work.
- At the steering group meeting 21st April 2016, Sarah Mason raised the concern of the uninhabited island work, due to the preliminary results of 2015/16 winter baiting work, the group also agreed that monitoring work should replace the baiting work.
- To further understand how the rats can best be removed in the future, IOSSRP personnel will complete further surveys of which monitoring tools the rats have a preference for on each island, carry out further rat-behaviour work, and bait resistance testing through DNA analysis.
- Bait resistance testing will involve using snap traps to collect rats, so that samples of DNA can be tested for bait resistance at the University of Reading.
- From the report **'Suggested activities for summer on uninhabited islands'** WMIL, it was recommended that a team to camp on these islands for 5 – 7 days to use snap traps (set out at dusk and deployed at dawn). The boating contractor (St Agnes boating) will not operate between 8pm and 8am (other boating contractors may consider these trips, but at a high cost and their boating timetables are dependent on other contracts, so they are unable to commit to uninhabited island work programmes)
- IOSWT manage the uninhabited islands and are unable to give permission to camp as these islands have closed access to camping all year round. Therefore the risk of trapping non-target species or having a potential impact on visitors and dogs visiting these islands on summer evenings is too high, and the work should be carried out instead when the boating contractor can drop a field team off at dawn and dusk in the winter months (7-9am and 4-6pm).
- A report would then be produced in May 2017, and with this information, further informed decisions can then be made by the 'seabird technical group' and land owners IOSWT, as how to best remove these rats in the future thereby protecting seabirds.