Morven South Offshore Wind Array Project

Habitats Regulations Appraisal

Volume 3, Annex 2.3: Assessment of Offshore Islands Potentially Suitable for Predator Eradications Report

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1 Introduction

1.1.1.1 Morven North Offshore Wind Array Project (Morven North) and Morven South Offshore Wind Array Project (Morven South) may have predicted impacts on the qualifying features of Special Protection Areas (SPAs) designated for their populations of breeding seabirds, although assessment work is ongoing in this regard. Subject to the outcomes of that assessment work, if the competent authority is unable to objectively conclude that there was no adverse effect on site integrity on one or more SPAs from Morven North or Morven South alone or in-combination with other plans and projects, it will be demonstrated that there are no alternative solutions to Morven North and Morven South and that there are imperative reason of overriding public interest in Morven North and Morven South proceeding, and so it will be necessary to provide any necessary compensation measures to compensate for the contribution from Morven North and Morven South to any finding of adverse effect on site integrity.

1.1.1.2 Among the compensation measures available for seabirds that are qualifying features of SPAs is the eradication of invasive terrestrial predators from islands with seabirds present in the breeding season (Furness et al. 2013, Furness 2021).

1.1.1.3 In this report, available evidence from Stanbury et al. (2017) was used to determine potentially suitable locations for applying predator eradication methods as compensation. Islands where eradication of predators could be used as compensation were assessed based on the species present on each island, the presence of SPAs on those islands, the qualifying features of those SPAs, the presence and number of permanent residents on those islands, and the presence and type of agriculture on those islands. This process ranked the islands previously listed by Stanbury et al. (2017) on the potential effectiveness and feasibility of predator eradications. Higher ranks were applied to islands with rats than other predators (as rat eradication is recognised as feasible in the UK, see Furness et al. 2013 & Furness 2021), islands with suitable seabird species present that are known to respond most strongly to predator eradications, islands with SPAs, islands with smaller human populations and islands without agriculture, or with agriculture not requiring the import of straw or hay (which can raise biosecurity risks). The highest ranked islands had the available seabird population trend data collated, analysed, and presented to aid with understanding the potential recovery that could occur if predators were eradicated.

1.1.1.4 This report will be expanded in the Compensation and Ecological Evidence Report Plan following consultations with key stakeholders. This report was not based on actual predicted impacts from assessment of Morven North and Morven South, but on the species considered most likely to be negatively affected by the presence of rats and positively affected by their removal.

1.1.1.5 The species which may be of relevance to Morven North and Morven South are kittiwake (*Rissa tridactyla)*, guillemot (*Uria aalge)*, razorbill (*Alca torda)*, puffin (*Alca torda)* and gannet (*Morus bassanus)*. While there are varying levels of evidence of the benefit of predator control for seabirds, the presence of seabird species that may be impacted and benefit from predator control has been considered within this report, along with presence of other species which may also benefit from predator control. It is proposed that compensation may be on an equivalent or non like-for-like basis.

2 Methods

2.1 Identification of Potential Locations

2.1.1.1 Stanbury et al. (2017) published a list of the top ranked islands at which eradication of predators would provide a biodiversity benefit. The authors also provided supplementary information on all of the islands that were included in their analyses (i.e. all of the islands in the UK with invasive terrestrial predator's present), not just the top ranked islands. This information was used to identify key factors that were considered important in shortlisting a group of islands with the potential to provide compensation for the impacts to SPA seabird populations from the Morven North and Morven South, once these have been assessed. These factors, and the sources for these, are summarised in Table 2.1.

Table 2.1: Factors Used in Assisting the Shortlisting of Islands for Predator Eradication

Factor	Information Source
The presence of invasive terrestrial predators	Stanbury et al. (2017)
The presence of populations of breeding seabirds that would respond positively to the eradication of invasive terrestrial predators	Seabird Monitoring Programme (SMP) database – all records in the database for each site
The size of the resident human population on the island	Stanbury et al. (2017)
The size of the island	Stanbury et al. (2017)
The presence of, and type of, agriculture on the island	Internet search for each island and aerial images
The presence of an SPA for breeding seabirds on the island	Scotland = SiteLink

2.1.1.2 Each value in these factors was assigned a weight and these were used to create relative ranks for each island for each factor, as described below.

2.1.2 Presence of Predators

2.1.2.1 The invasive terrestrial predators considered were those summarised in the review of suitable compensation measures for seabirds by Furness (2021) as species that could be eradicated from offshore islands as compensation for predicted impacts from offshore wind farms:

- brown rat (*Rattus norvegicus*);
- black rat (*Rattus rattus*);
- feral domestic cat (*Felis catus*);
- American mink (*Neovison vison*).

2.1.2.2 At this initial stage, black rat was removed from the species considered as only two potential sites were apparently available: The Shiant Isles, in the Western Isles, and Herm, in the Channel Islands. Eradication of rats from The Shiant Isles has already been completed so this site is no longer available as a potential compensation location. The island of Herm has already been proposed as a site for compensation for the Hornsea 4 offshore wind farm, so is not available as a compensation solution for Morven North and Morven South.

2.1.2.3 The remaining three species were weighted as follows:

- brown rat = 0.7;
- feral cat = 0.2;
- American mink = 0.1.

2.1.2.4 These ranks were applied as rat eradications from offshore islands provides the most suitable evidence available for recovering seabird populations in the UK (Furness 2021, Furness et al. 2013). Evidence that feral cats negatively affect cliff nesting seabirds or burrow nesting seabirds is relatively weak compared to the evidence of the impacts of brown rats. There is also much stronger evidence for the beneficial effects of the removal of rats from offshore islands in the UK, than the removal of cats. American mink was weighted the lowest, as the available evidence for negative effects of mink on seabirds refers to their predation of eggs, chicks and adults of ground nesting seabirds, particularly gulls and terns. If an island had more than one predator species the score was summed.

2.1.3 Presence of Breeding Seabirds

2.1.3.1 For each island the SMP database was searched and the presence of all seabirds at any time was collated. Each seabird species was assigned a score based on the relative strength of evidence of the benefits of predator eradication from the review by Furness et al. (2013):

- strong evidence of a strong effect = 3;
- weak evidence or a weak effect or colony-specific variation depending on local ecology and habitat = 2.

2.1.3.2 For each island the scores were summed for the seabird species present, thus the islands with the largest number of species with an evidence score were scored most highly.

2.1.4 Size of the Resident Human Population

2.1.4.1 The presence of a human population can affect the biosecurity of island predator eradications and can also create stakeholder objections to eradication, particularly of feral cats. For each island the resident human population from the supplementary information provided by Stanbury et al (2017) was collated to give an inverse score (i.e. smaller populations = higher rank).

2.1.5 Size of Islands

2.1.5.1 Smaller islands will be easier to eradicate predators from than larger islands. For each island the area of the island in hectares (ha) was collated from the supplementary information provided by Stanbury et al (2017). Islands were ranked inversely to their size (i.e. smaller islands = higher rank).

2.1.6 Presence and Type of Agriculture

2.1.6.1 For each island an internet search was undertaken for the presence or absence of agriculture. These were then checked using Google maps aerial images, which also aided determining the type of agriculture present. These were scored as presence (0) and absence (1) of agriculture, so islands with no agriculture were ranked higher than those with agriculture present.

2.1.7 Presence of SPAs for Breeding Seabirds

2.1.7.1 For each island the presence of SPAs designated for their breeding seabirds was determined using two primary sources. In Scotland NatureScot's SiteLink website was used to check for the presence of SPAs on each island in Scotland and the citation was checked to determine if the SPA was designated for breeding seabirds. Similarly, for SPAs in other UK countries, the JNCC website was used to check for the presence of an SPA on each island and what its qualifying features were. Islands with an SPA for any breeding seabirds were scored 1 and islands with no SPAs for breeding seabirds were scored 0.

2.2 Weighted Ranks

2.2.1.1 Factors were not weighted equally but rather favoured those considered to be most important so that the factors that were considered most important in shortlisting islands were used to weight the final rank of each island. The highest weightings were applied equally to the predator score and the seabird presence score, as these are the two most important factors in choosing a suitable location (Table 2.2).

Table 2.2: Weightings Used for Each Factor Used in Ranking Islands

Factor	Weight
Predator presence	0.25
Island size	0.15
Resident human population	0.20
Presence of agriculture	0.10
SPA present	0.05
Seabird species present	0.25

2.2.1.2 The next highest weighting was given to the human population. This was designed to weight islands with no residents or a smaller population, as this creates a simpler approach to predator eradications: it reduces the variety of stakeholder issues that need to be addressed during a predator eradication project and also reduces the risk of accidental re-invasion of terrestrial predators (as human populations are associated with greater levels of transport into an island that can provide a route to re-invasion, particularly for rats).

2.2.1.3 Island size had the fourth highest rank, as the logistics and costs of completing a predator eradication program increase with increasing island size. Larger islands require more monitoring before and after predator controls are applied, often requiring more staff and more equipment and a longer pre-control phase as a result. Larger islands also require more control effect (e.g. more rat poison bait stations) than smaller islands and increases the likelihood of there being refugia for predators that are harder to control.

2.2.1.4 Agriculture was the next weighted factor, with higher weighting for islands without agriculture than those without out. Predator removal is still possible on islands with agriculture as biosecurity measures can be applied to agricultural imports to islands, particularly hay and/or straw for winter feed or bedding. However, these come with higher risks of re-invasion than for islands without agriculture. The type of agriculture present is best assessed on an individual basis within the short list of islands as there is likely to be a wide variety of issues related to the presence of agriculture from island to island.

2.2.1.5 Finally, the presence of an SPA was given the lowest weight, as finding a suitable location has a higher priority than finding that solution within an SPA. Increasing the population of seabirds on an island that is part of a wider meta-population of seabirds, which includes birds within SPAs, increases overall meta-population resilience, which includes birds within SPA populations.

2.2.1.6 For each island the individual factor scores were multiplied by their weights and then summed to provide an overall island score. Islands were then ranked based on their overall score.

2.2.2 Narrative

2.2.2.1 Following the ranking of the islands that could be used to provide compensation, the available information on each factor was carefully considered to create a supporting narrative for each island. This narrative permitted further refinement of each island's suitability and has been used to scope out islands that were considered unlikely to be useful as compensation for Morven North and Morven South.

3 Results

3.1 Presence of Predators

3.1.1.1 The assessment of islands with predators divided the islands into three distinct groups:

1. Islands with both brown rats and feral cats;
2. Islands with only brown rats;
3. Islands with only feral cats.

3.1.1.2 For only one island, Inchmarnock, American mink was also included in the ranking of islands. See Table 3.1 for the results. Islands with larger rank scores are more likely to be suitable than those with smaller rank scores.

Table 3.1: Summary of Islands With Invasive Terrestrial Predators, Island Predator Score and Relative Rank

Island	Brown Rat	Feral Cat	American Mink	Score	Rank
Colonsay and Oronsay	Y	Y	N	0.9	22
Egilsay, Orkney	Y	Y	N	0.9	22
Flotta	Y	Y	N	0.9	22
Gairsay	Y	Y	N	0.9	22
Housay, Out Skerries	Y	Y	N	0.9	22
Hoy	Y	Y	N	0.9	22
Muck	Y	Y	N	0.9	22
Rousay	Y	Y	N	0.9	22
Rum	Y	Y	N	0.9	22
Stronsay	Y	Y	N	0.9	22
Tiree	Y	Y	N	0.9	22
Unst	Y	Y	N	0.9	22
Inchmarnock	Y	N	Y	0.8	21
Boreray, North Uist	Y	N	N	0.7	9
Bruray, Out Skerries	Y	U	N	0.7	9
East Burra, Shetland	Y	U	N	0.7	9
Eigg, Small Isles	Y	U	N	0.7	9
Gighay, Sound of Barra	Y	N	N	0.7	9
Grunay off Bruray, Out Skerries	Y	N	N	0.7	9

Island	Brown Rat	Feral Cat	American Mink	Score	Rank
Guns Island, Northern Ireland	Y	N	N	0.7	9
Hellisay, Sound of Barra	Y	N	N	0.7	9
Sandray, south of Vatersay	Y	N	N	0.7	9
Sheep Island, Northern Ireland	Y	N	N	0.7	9
Taransay, Harris	Y	N	N	0.7	9
Vatersay	Y	U	N	0.7	9
Fair Isle	N	Y	N	0.2	1
Fetlar	N	Y	N	0.2	1
Foula	N	Y	N	0.2	1
North Ronaldsay	N	Y	N	0.2	1
Papa Westray	N	Y	N	0.2	1
South Havra, Shetland	N	Y	N	0.2	1
Westray	N	Y	N	0.2	1
Yell	N	Y	N	0.2	1

3.2 Presence of Breeding Seabirds

3.2.1.1 Across the 33 islands being considered a total of 25 breeding seabird species were identified occurring on one or more islands (Table 3.2). It is important to note that the species that were identified by Furness et al. (2013) as having strong evidence of a strong effect of predator eradication included species that are not likely to trigger the need for compensation for Morven North and Morven South (e.g. species such as Arctic tern (*Sterna paradisaea*), common tern (*Sterna hirundo*) and shag (*Phalacrocorax aristotelis*) could positively benefit from predator eradications but would be unlikely to require compensation). Black guillemot (*Cepphus grylle*) is a species with strong evidence that predator control is beneficial but is not a species that qualified for inclusion in SPA citations (as it was not on Annex I of the Birds Directive, nor is it a migratory species). A further three species with strong evidence, Manx shearwater *(Puffinus puffinus*), storm petrel *Hydrobates pelagicus* and Leach's petrel (*Hydrobates leucorhous*), are unlikely to be strongly impacted by Morven North and Morven South but predator eradication may provide suitable non-like-for-like compensation options. The species with strong evidence, and which are likely to be SPA qualifying features requiring compensation, were razorbill and puffin. In addition, guillemot was classified by Furness et al. (2013) as a species with, "Weak evidence or a weak effect or colony-specific variation depending on local ecology and habitat", so it may benefit from predator eradication, but this may vary by the site chosen. For example, on Lundy the guillemot population increased from around 2,000 to over 10,000 in the 15 years following rat removal (St. Pierre et al. 2023). Both kittiwake and gannet are species that may require compensation. Kittiwake are not typically considered a species for which predator eradication will deliver large population recoveries, however there is evidence of

modest improvements in the status of non-target seabirds following rat removal (e.g. Saunier et al. 2012) and therefore there is scope for compensation for small impacts via this method. This is not the case for gannet, for which rat eradication is unlikely to be a suitable compensation measure. Hence gannet is considered in a separate assessment of potential compensation measures that would be suitable.

Table 3.2: List of Seabirds Recorded in the Seabird Monitoring Programme Database (At Any Time) for Each Island. Y = Yes, Species Present, Blank = No Records in Sectoral Marine Plan Database

Species	Foula	Fair Isle	Westray	Rousay	Colonsay and Oronsay	Unst	Yell	Rum	Papa Westray	Fetlar	Hoy	Flotta	Tiree	Inchmarnock	Stronsay	Gairsay	North Ronaldsay	Muck	Housay, Out Skerries	South Havra, Shetland	Sandray, south of Vatersay	Grunay off Bruray, Out Skerries	Boreray, North Uist	Hellisay, Sound of Barra	Gighay, Sound of Barra	Taransay, Harris	Eigg, Small Isles	Egilsay, Orkney	Bruray, Out Skerries	East Burra, Shetland	Vatersay	Sheep Island, Northern Ireland	Guns Island, Northern Ireland
Arctic Skua (*Stercorarius parasiticus)*	Y	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y		Y	Y	Y			Y													
Arctic tern	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	
Atlantic puffin	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y		Y			Y		Y									Y			Y	
Black guillemot	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Black-headed Gull (*Chroicocephalus ridibundus)*						Y			Y	Y	Y		Y	Y	Y		Y						Y			Y							
Common guillemot	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y		Y			Y	Y								Y					Y	
Common gull (*Larus canus)*	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y		Y			Y	Y	Y		Y		Y	Y		Y		Y
Common tern		Y			Y	Y		Y	Y	Y			Y		Y				Y					Y			Y		Y				
European Storm petrel		Y																		Y			Y										

Species	Foula	Fair Isle	Westray	Rousay	Colonsay and Oronsay	Unst	Yell	Rum	Papa Westray	Fetlar	Hoy	Flotta	Tiree	Inchmarnock	Stronsay	Gairsay	North Ronaldsay	Muck	Housay, Out Skerries	South Havra, Shetland	Sandray, south of Vatersay	Grunay off Bruray, Out Skerries	Boreray, North Uist	Hellisay, Sound of Barra	Gighay, Sound of Barra	Taransay, Harris	Eigg, Small Isles	Egilsay, Orkney	Brurav, Out Skerries	East Burra, Shetland	Vatersay	Sheep Island, Northern Ireland	Guns Island, Northern Ireland
Fulmar (*Fulmarus glacialis*)	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great Black-backed Gull (*Larus marinus*)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y			Y	Y
Great Cormorant (*Phalacrocorax carbo*)					Y										Y		Y																
Great Skua (*Stercorarius skua*)	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y	Y	Y	Y	Y			Y				Y						
Herring Gull (*Larus argentatus*)	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y
Kittiwake	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y		Y			Y	Y	Y												Y	Y
Lesser Black-backed Gull (*Larus fuscus*)	Y	Y	Y		Y	Y	Y	Y		Y			Y	Y	Y	Y		Y		Y			Y		Y		Y	Y	Y			Y	

Species	Foula	Fair Isle	Westray	Rousay	Colonsay and Oronsay	Unst	Yell	Rum	Papa Westray	Fetlar	Hoy	Flotta	Tiree	Inchmarnock	Stronsay	Gairsay	North Ronaldsay	Muck	Housay, Out Skerries	South Havra, Shetland	Sandray, south of Vatersay	Grunay off Bruray, Out Skerries	Boreray, North Uist	Hellisay, Sound of Barra	Gighay, Sound of Barra	Taransay, Harris	Eigg, Small Isles	Egilsay, Orkney	Brurav, Out Skerries	East Burra, Shetland	Vatersay	Sheep Island, Northern Ireland	Guns Island, Northern Ireland
Manx Shearwater	Y							Y			Y			Y													Y						
Northern Gannet	Y	Y	Y			Y																											
Razorbill	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y		Y			Y	Y													Y	
Sandwich tern (*Thalasseus sandvicensis*)									Y								Y																
Shag	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y
Leach's petrel	Y																																
Red-throated diver (*Gavia stellata*)	Y					Y	Y	Y			Y																						
Red-necked phalarope (*Phalaropus lobatus*)										Y																							
Cormorant (*Phalacrocorax carbo*)																																Y	

	Evidence of predator removal benefits (Furness 2021)
	Strong evidence of a strong effect (=score 3)
	Weak evidence or a weak effect or colony-specific variation depending on local ecology and habitat (=score 2)
	No evidence of benefit (=score 0)

3.2.1.2 Islands with large numbers of seabird species and the presence of predators were much more highly scored, and these highlighted islands known to be important for their seabird populations (e.g. Fair Isle, Foula, Rum, etc., see Table 3.3).

Table 3.3: Seabird Presence Score and Relative Rank for Each Island

Island	Score	Rank
Fair Isle	25	31
Foula	25	31
Rum	25	31
Colonsay and Oronsay	22	26
Hoy	22	26
Stronsay	22	26
Tiree	22	26
Unst	22	26
Housay, Out Skerries	19	23
Rousay	19	23
Westray	19	23
Bruray, Out Skerries	17	20
Muck	17	20
Sheep Island, Northern Ireland	17	20
Papa Westray	16	19
South Havra, Shetland	15	18
Boreray, North Uist	14	14
Eigg, Small Isles	14	14
Flotta	14	14
Hellisay, Sound of Barra	14	14
Fetlar	12	13
Grunay off Bruray, Out Skerries	11	10
Taransay, Harris	11	10
Vatersay	11	10
North Ronaldsay	10	9
Sandray, south of Vatersay	9	8
Egilsay, Orkney	8	5
Guns Island, Northern Ireland	8	5
Inchmarnock	8	5
East Burra, Shetland	6	3
Gighay, Sound of Barra	6	3

Island	Score	Rank
Gairsay	5	1
Yell	5	1

3.3 Size of the Resident Human Population

3.3.1.1 The ranking of islands based on their resident human population size ranked islands with no, or very small, populations the most highly (Table 3.4).

Table 3.4: Ranking Scores for Islands Based on their Resident Human Population

Island	Human Population	Rank
Boreray, North Uist	0	24
Gighay, Sound of Barra	0	24
Grunay off Bruray, Out Skerries	0	24
Guns Island, Northern Ireland	0	24
Hellisay, Sound of Barra	0	24
Inchmarnock	0	24
Sandray, south of Vatersay	0	24
Sheep Island, Northern Ireland	0	24
South Havra, Shetland	0	24
Taransay, Harris	0	24
Gairsay	3	23
Rum	22	22
Bruray, Out Skerries	24	21
Egilsay, Orkney	26	20
Muck	27	19
Foula	38	18
Housay, Out Skerries	50	17
Fetlar	61	16
Fair Isle	68	15
North Ronaldsay	72	14
East Burra, Shetland	76	13
Flotta	80	12
Eigg, Small Isles	83	11
Papa Westray	90	9
Vatersay	90	9
Colonsay and Oronsay	132	8

Island	Human Population	Rank
Rousay	216	7
Stronsay	349	6
Hoy	419	5
Westray	588	4
Unst	632	3
Tiree	653	2
Yell	966	1

3.4 Size of the Islands

3.4.1.1 Ranking islands based on their area only resulted in a systematic change in rank as island size increased, so ranked smaller islands more highly (Table 3.5).

Table 3.5: Ranking Scores for Islands Based on their Area (Island Size)

Island	Island Size (ha)	Rank
Sheep Island, Northern Ireland	4	33
Grunay off Bruray, Out Skerries	35	32
Guns Island, Northern Ireland	39	31
Bruray, Out Skerries	62	30
South Havra, Shetland	66	29
Gighay, Sound of Barra	112	28
Hellisay, Sound of Barra	158	27
Housay, Out Skerries	177	26
Boreray, North Uist	259	25
Inchmarnock	266	24
Gairsay	308	23
Sandray, south of Vatersay	456	22
East Burra, Shetland	522	21
Muck	628	20
Egilsay, Orkney	702	19
Fair Isle	798	18
North Ronaldsay	954	17
Papa Westray	985	16
Vatersay	1,044	15
Flotta	1,054	14
Foula	1,317	13

Island	Island Size (ha)	Rank
Taransay, Harris	1,489	12
Eigg, Small Isles	3,183	11
Stronsay	3,724	10
Fetlar	4,110	9
Rousay	4,875	8
Colonsay and Oronsay	5,272	7
Westray	5,408	6
Tiree	8,755	5
Rum	10,937	4
Unst	12,306	3
Hoy	14,892	2
Yell	21,439	1

3.5 Presence and Type of Agriculture

3.5.1.1 Agriculture was only ranked based on presence/absence. Collating this information showed that most islands had agriculture present (25 islands, see Table 3.6). Since the ranking was only based on presence/absence the type of agriculture was more carefully considered at the narrative stage.

Table 3.6: Summary of the Presence (Yes) or Absence (No) of Agriculture and Type of Agriculture on Islands

Island	Agriculture Present?	Agriculture Type
Foula	Yes	Sheep, crofting
Fair Isle	Yes	Sheep, crofting
Westray	Yes	Mixed, crofting
Yell	Yes	Mixed, crofting
Rum	Yes	Livestock (ponies, goats, cattle)
Papa Westray	Yes	Mixed, crofting
Hoy	Yes	Mixed, crofting
Flotta	Yes	Mixed, crofting
Muck	Yes	Mixed, crofting
Housay, Out Skerries	Yes	Crofting
South Havra, Shetland	No	None
Herm, Channel Islands	Yes	Mixed
Fetlar	Yes	Mixed, crofting
Tiree	Yes	Mixed, crofting
Inchmarnock	Yes	Mixed, cattle

Island	Agriculture Present?	Agriculture Type
Stronsay	Yes	Mixed, crofting
Gairsay	Yes	Mixed
North Ronaldsay	Yes	Mixed, crofting
Rousay	Yes	Mixed, crofting
Colonsay and Oronsay	Yes	Mixed, crofting
Unst	Yes	Mixed, crofting
Sandray, south of Vatersay	No	None
Grunay off Bruray, Out Skerries	No	None
Boreray, North Uist	No	None
Hellisay, Sound of Barra	No	None
Gighay, Sound of Barra	No	None
Taransay, Harris	No	None
Eigg, Small Isles	Yes	Crofting
Egilsay, Orkney	Yes	Mixed
Bruray, Out Skerries	Yes	Crofting
East Burra, Shetland	Yes	None
Vatersay	Yes	None
Sheep Island, Northern Ireland	No	None
Guns Island, Northern Ireland	No	None

3.6 Presence of Special Protection Areas for breeding seabirds

3.6.1.1 Similar to assessing agriculture, SPAs were only assessed by presence/absence (Table 3.7). The SPAs were considered best included at the post-shortlisting phase when the final choice of island(s) is made.

Table 3.7: Presence of Special Protection (Yes) on islands and name of Special Protection on Islands, where present

Island	SPA for Breeding Seabirds	SPA Present?
Foula	Foula SPA	Yes
Fair Isle	Fair Isle SPA	Yes
Westray	West Westray SPA	Yes
Yell	None	No
Rum	Rum SPA	Yes
Papa Westray	North Hill and Holm SPA	Yes
Hoy	Hoy SPA	Yes
Flotta	None	No

Island	SPA for Breeding Seabirds	SPA Present?
Muck	None	No
Housay, Out Skerries	None	No
South Havra, Shetland	None	No
Fetlar	Fetlar SPA	Yes
Tiree	None	No
Inchmarnock	None	No
Stronsay	None	No
Gairsay	None	No
North Ronaldsay	None	No
Rousay	Rousay SPA	Yes
Colonsay and Oronsay	North Colonsay & Western Cliffs SPA	Yes
Unst	Hermaness, Saxa Vord & Valla Field SPA	Yes
Sandray, south of Vatersay	None	No
Grunay off Bruray, Out Skerries	None	No
Boreray, North Uist	None	No
Hellisay, Sound of Barra	None	No
Gighay, Sound of Barra	None	No
Taransay, Harris	None	No
Eigg, Small Isles	None	No
Egilsay, Orkney	None	No
Bruray, Out Skerries	None	No
East Burra, Shetland	None	No
Vatersay	None	No
Sheep Island, Northern Ireland	None	No
Guns Island, Northern Ireland	None	No

3.7 Weighted Ranks and Narrative Summary

3.7.1.1 The assessment of the application of the relative weights (Table 2.2) to each of the factors applied to each island resulted in a value being applied to the matrix of factor against island (Table 3.8). These values were summed and used to provide the final rank for each island.

3.7.1.2 The narrative summary collated the information from each factor for each island and then added other relevant information (Table 3.9). These were used to inform more substantive analysis of whether an island was worth short listing for further consideration as a suitable location for compensation measures to be applied.

Table 3.8: Ranks for Each Factor, Relative Weights Applied to Each Island and Final Rank

Island	Predator	Island size	Resident Human Population	Agriculture Present?	SPA Present	Seabird Species Present	Weight	Rank
	0.25	0.15	0.2	0.1	0.05	0.25		
Boreray, North Uist	2.25	3.75	4.8	0.1	0	3.5	14.4	23
Bruray, Out Skerries	2.25	4.5	4.2	0	0	5	15.95	29
Colonsay and Oronsay	5.5	1.05	1.6	0	0.05	6.5	14.7	26
East Burra, Shetland	2.25	3.15	2.6	0	0	0.75	8.75	5
Egilsay, Orkney	5.5	2.85	4	0	0	1.25	13.6	17
Eigg, Small Isles	2.25	1.65	2.2	0	0	3.5	9.6	8
Fair Isle	0.25	2.7	3	0	0.05	7.75	13.75	19
Fetlar	0.25	1.35	3.2	0	0.05	3.25	8.1	4
Flotta	5.5	2.1	2.4	0	0	3.5	13.5	16
Foula	0.25	1.95	3.6	0	0.05	7.75	13.6	18
Gairsay	5.5	3.45	4.6	0	0	0.25	13.8	20
Gighay, Sound of Barra	2.25	4.2	4.8	0.1	0	0.75	12.1	10
Grunay off Bruray, Out Skerries	2.25	4.8	4.8	0.1	0	2.5	14.45	24

Island	Predator	Island size	Resident Human Population	Agriculture Present?	SPA Present	Seabird Species Present	Weight	Rank
	0.25	0.15	0.2	0.1	0.05	0.25		
Guns Island, Northern Ireland	2.25	4.65	4.8	0.1	0	1.25	13.05	12
Hellisay, Sound of Barra	2.25	4.05	4.8	0.1	0	3.5	14.7	26
Housay, Out Skerries	5.5	3.9	3.4	0	0	5.75	18.55	33
Hoy	5.5	0.3	1	0	0.05	6.5	13.35	15
Inchmarnock	5.25	3.6	4.8	0	0	1.25	14.9	28
Muck	5.5	3	3.8	0	0	5	17.3	31
North Ronaldsay	0.25	2.55	2.8	0	0	2.25	7.85	3
Papa Westray	0.25	2.4	1.8	0	0.05	4.75	9.25	7
Rousay	5.5	1.2	1.4	0	0.05	5.75	13.9	21
Rum	5.5	0.6	4.4	0	0.05	7.75	18.3	32
Sandray, south of Vatersay	2.25	3.3	4.8	0.1	0	2	12.45	11
Sheep Island, Northern Ireland	2.25	4.95	4.8	0.1	0	5	17.1	30
South Havra, Shetland	0.25	4.35	4.8	0.1	0	4.5	14	22
Stronsay	5.5	1.5	1.2	0	0	6.5	14.7	25

Island	Predator	Island size	Resident Human Population	Agriculture Present?	SPA Present	Seabird Species Present	Weight	Rank
	0.25	0.15	0.2	0.1	0.05	0.25		
Taransay, Harris	2.25	1.8	4.8	0.1	0	2.5	11.45	9
Tiree	5.5	0.75	0.4	0	0	6.5	13.15	14
Unst	5.5	0.45	0.6	0	0.05	6.5	13.1	13
Vatersay	2.25	2.25	1.8	0	0	2.5	8.8	6
Westray	0.25	0.9	0.8	0	0.05	5.75	7.75	2
Yell	0.25	0.15	0.2	0	0	0.25	0.85	1

Table 3.9: Narrative summary of each factor for each island and the decision on whether to short list each island for further consideration

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
Housay, Out Skerries	33	Brown rats and feral cats present	Four species with high confidence. Includes guillemot, razorbill, and kittiwake.	Moderate human population (50)	Small island (177 ha)	Crofting.	None	Ranked 23rd by Stanbury et al. (2017). Out Skerries might be better considered as a single island. Small archipelago, with connectivity between islands likely.	Yes
Rum	32	Brown rats and feral cats present	Six species with high confidence. Includes guillemot, razorbill, puffin, and Manx shearwater.	Moderate human population (22). Most work for NatureScot.	Very large island (ranked 4th)	Some limited livestock present.	Rum SPA	Ranked 10th by Stanbury et al. (2017). While there is a moderate human population (22), most work for NatureScot. Island owned by NatureScot. High conservation value site. High likelihood of good biosecurity, despite the presence of livestock. Additionality will need to be discussed with NatureScot.	Yes
Muck	31	Brown rats and feral cats present	Five species with high confidence. Includes guillemot,	Moderate human population (27)	Larger island (628 ha)	Mixed farming, crofting and rough grazing.	None	Ranked 22nd by Stanbury et al. (2017). Biosecurity will need to be considered due to the presence of	Yes

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
			razorbill, puffin, and kittiwake.					agriculture. May be some scope for fencing to be considered.	
Sheep Island, Northern Ireland	30	Brown rats present	Five species with high confidence. Includes guillemot, razorbill, and puffin.	No human population.	Very small island (4 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). May be part of an ongoing LIFE project to remove rats.	Yes
Bruray, Out Skerries	29	Brown rats present and feral cats may be present	Five species with high confidence. Includes puffin.	Small human population (24)	Small island (64 ha)	Crofting.	None	Not ranked by Stanbury et al. (2017). Few key species present, so not short listed.	No
Inchmarnock	28	Brown rats and American mink present	Two species with high confidence: Manx shearwater and shag.	No human population.	Small island (266 ha)	There has been farming in the past. Uncertain at present.	None	Ranked (joint) 16th by Stanbury et al. (2017). Relatively few suitable species present. Small island with no human population. Some mixed farming at least in the past. Uncertain at present. Island up for sale in the last few years. Has (or had) a very large gull colony present, but the	Yes

Island	Rank	Narrative Summary							
		Presence of predators	Presence of seabirds	Size of human population	Island size	Presence and type of agriculture	Presence of seabird SPAs	Other Relevant Information	Short List?
								presence of mink may threaten this.	
Colonsay and Oronsay	26	Brown rats and feral cats present	Six species with high confidence. Includes razorbill and puffin.	Moderate human population (132).	Large island (5,272 ha)	Mostly a mix of crofting and rough grazing of sheep. A few farms.	North Colonsay & Western Cliffs SPA	Ranked (joint) 7th by Stanbury et al. (2017). Suitable species present, island size and agriculture may be barrier to eradication and lower biosecurity. May be some scope for fencing to be considered.	Yes
Hellisay, Sound of Barra	26	Brown rats present	Four species with high confidence. Does not include any likely key seabird species.	No human population.	Small island (158 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017).	Yes
Stronsay	25	Brown rats and feral cats present	Six species with high confidence. Includes guillemot, razorbill, puffin, and kittiwake.	Large human population (349)	Large island (3,724 ha)	Mixed farming, crofting, and rough grazing.	None	Ranked (joint) 18th by Stanbury et al. (2017). A lot of mixed agriculture so biosecurity will need to be considered. May be some scope for fencing to be considered.	No

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
Grunay off Bruray, Out Skerries	24	Brown rats present	Three species with high confidence. Does not include any likely key seabird species.	No human population.	Very small island (35 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Small archipelago, with connectivity between islands likely.	No
Boreray, North Uist	23	Brown rats present	Six species with high confidence. Includes Manx shearwater and storm petrel.	No human population.	Small island (259 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Species includes high conservation value Manx shearwater and storm petrel. Only one km from North Uist, so re-invasion by rats would require future ongoing management.	Yes
South Havra, Shetland	22	Feral cats present	Five species with high confidence. Includes puffin, kittiwake and storm petrel.	No human population.	Very small island (66 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Some key species present and storm petrel.	Yes
Rousay	21	Brown rats and feral cats present	Five species with high confidence. Includes guillemot,	Larger human population (216)	Large island (4,875 ha)	Mixed farming, crofting and rough grazing.	Rousay SPA	Ranked (joint) 4th by Stanbury et al. (2017). Biosecurity will need to be considered due to the presence of	Yes

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
			razorbill and puffin.					agriculture. May be some scope for fencing to be considered.	
Gairsay	20	Brown rats and feral cats present	One species with high confidence. No key species included.	Very small human population (3)	Moderate island (305 ha)	Mixed farming.	None	Not ranked by Stanbury et al. (2017). Few key species present.	No
Fair Isle	19	Feral cats present	Seven species with high confidence. Includes guillemot, razorbill, puffin, and storm petrel.	Moderate human population (68).	Moderate island (798 ha)	Crofting.	Fair Isle SPA	Ranked 2nd by Stanbury et al. (2017). Multiple suitable species present. Only feral cats, so more limited response from key species. May be some scope for fencing to be considered.	No
Foula	18	Feral cats present	Seven species with high confidence. Includes guillemot, razorbill, puffin, Manx shearwater, and Leach's petrel.	Moderate human population (38).	Larger island (1,317 ha)	Mostly a mix of crofting and rough grazing of sheep.	Yes	Highest ranked by Stanbury et al. (2017). Only cats and not rats present, so more problematic demonstrating effect. High conservation value. May be better as a predator fencing approach.	No

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
Egilsay, Orkney	17	Feral cats present	Two species with high confidence. No key species present.	Small human population (26)	Moderate island (702 ha)	Mixed farming, crofting and rough grazing.	None	Not ranked by Stanbury et al (2017). No key species present. Important island for ground nesting waders, rather than seabirds (Royal Society for the Protection of Birds (RSPB) reserve on the island). Only feral cats, which may be more difficult to show a benefit. Mixed agriculture present so biosecurity issues likely.	No
Flotta	16	Brown rats and feral cats present	Four species with high confidence. Includes guillemot, razorbill, and puffin.	Moderate human population (80)	Larger island (1054 ha)	Mixed farming, crofting and rough grazing.	None	Ranked 15th by Stanbury et al. (2017). Key auk species present. Presence of large industrial site on the island could create eradication and biosecurity issues.	No
Hoy	15	Brown rats and feral cats present	Six species with high confidence. Includes guillemot, razorbill,	Large human population (419)	Very large island (14,892 ha)	Mixed farming, crofting and rough grazing.	Hoy SPA	Ranked (joint) 14th by Stanbury et al. (2017). Biosecurity will need to be considered due to the presence of agriculture. May be	No

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
			puffin and Manx shearwater.					some scope for fencing to be considered, though some of the highest sea cliffs in the UK.	
Tiree	14	Brown rats and feral cats present	Six species with high confidence. Includes guillemot, razorbill, puffin and kittiwake.	Large human population (653)	Large island (8,755 ha)	Mixed farming, crofting and rough grazing.	None	Ranked (joint) 16th by Stanbury et al. (2017). Large island with a large human population. A lot of mixed agriculture, so biosecurity issues may be challenging.	No
Unst	13	Brown rats and feral cats present	Six species with high confidence. Includes guillemot, razorbill, puffin, and kittiwake.	Very large human population (966)	Very large island (21,439 ha)	Mixed farming, crofting, and rough grazing.	Hermaness, Saxa Vord & Valla Field SPA	Ranked (joint) 7th by Stanbury et al. (2017). Biosecurity will need to be considered due to the presence of agriculture. May be some scope for fencing to be considered.	No
Guns Island, Northern Ireland	12	Brown rats present	Two species with high confidence: black guillemot and shag. No key species present.	No human population.	Very small island (39 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Few key species present.	No

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
Sandray, south of Vatersay	11	Brown rats present	Three species with high confidence: Arctic tern, black guillemot, and shag. No key species present.	No human population.		No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Few key species present.	No
Gighay, Sound of Barra	10	Brown rats present	Two species with high confidence: black guillemot and shag. No key species present.	No human population.	Small island (112 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Few key species present.	No
Taransay, Harris	9	Brown rats present	Two species with high confidence: black guillemot and shag. No key species present.	No human population.	Larger island (1,489 ha)	No agriculture apparent.	None	Not ranked by Stanbury et al. (2017). Few key species present.	No
Eigg, Small Isles	8	Brown rats present, cats may present	Three species with high confidence. Guillemot and Manx	Moderate human population (83)	Large island (3,183 ha)	Mixed farming, crofting, and rough grazing.	None	Not ranked by Stanbury et al (2017). Few key species present, but Manx shearwater present	No

Island	Rank	Narrative Summary							
		Presence of predators	Presence of seabirds	Size of human population	Island size	Presence and type of agriculture	Presence of seabird SPAs	Other Relevant Information	Short List?
			shearwater present.					(good for not like-for-like compensation). Large size island with a moderate human population. Mixed agriculture present so biosecurity will need to be considered. Woodland (including plantations) present, which may hinder eradications.	
Papa Westray	7	Feral cats present	Four species with high confidence. No key species on island.	Moderation human population (90)	Moderate island (985 ha)	Mixed farming, crofting, and rough grazing.	North Hill and Holm SPA	Ranked 11th by Stanbury et al. (2017). Only feral cats, which may be more difficult to show a benefit.	No
Vatersay	6	Brown rats present, cats may present	Three species with high confidence. No key species present. Few seabirds present.	Moderate human population (90)	Large island (1,044 ha)	Crofting and rough grazing.	None	Not ranked by Stanbury et al (2017). No key species present. Causeway to Barra so biosecurity will need to be considered.	No
East Burra, Shetland	5	Brown rats present, cats may present	Two species with high confidence. No key species	Moderate human population (76)	Moderate island (522 ha)	Mixed farming, crofting, and rough grazing.	None	Not ranked by Stanbury et al (2017). No key species present. Mixed agriculture present and	No

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
			present. Few seabirds present.					bridges to other islands so biosecurity will need to be considered. Woodland (including plantations) present, which may hinder eradications.	
Fetlar	4	Feral cats present	Four species with high confidence. Includes guillemot, razorbill, and kittiwake.	No human population.	Large island (4,110 ha)	Mixed farming, crofting, and rough grazing.	Fetlar SPA	Ranked 12th by Stanbury et al. (2017). Relatively few suitable species present. Only feral cats, which may be more difficult to show a benefit.	No
North Ronaldsay	3	Feral cats present	One species with high confidence. No key species present.	Moderate human population (72)	Moderate island (954 ha)	Mixed farming, crofting.	None	Ranked 20th by Stanbury et al. (2017). No key species present. Only feral cats, which may be more difficult to show a benefit.	No
Westray	2	Feral cats present	Five species with high confidence. Includes guillemot, razorbill, puffin and kittiwake.	Large human population (588)	Large island (5,408 ha)	Mixed farming, crofting, and rough grazing.	West Westray SPA	Ranked 3rd by Stanbury et al. (2017). Relatively few suitable seabird species present. Large island with a large human population. Only feral cats, which may be	No

Island	Rank	Narrative Summary							
		Presence of predators	**Presence of seabirds**	**Size of human population**	**Island size**	**Presence and type of agriculture**	**Presence of seabird SPAs**	**Other Relevant Information**	**Short List?**
								more difficult to show a benefit.	
Yell	1	Feral cats present	No species with high confidence. No key species present.	Very large human population (966)	Very large island (21,439 ha)	Mixed farming, crofting, and rough grazing.	None	Ranked 9th by Stanbury. Only feral cats, which may be more difficult to show a benefit. Mixed agriculture present and transport to other islands though Yell, so biosecurity will need to be considered.	No

3.7.1.3 The narrative summary was used to short list 10 islands to be considered for compensation by eradication of invasive terrestrial predators (Table 3.10).

Table 3.10: Short List of Islands with Invasive Terrestrial Predators

Island	Rank
Housay, Out Skerries	33
Rum	32
Muck	31
Sheep Island, Northern Ireland	30
Inchmarnock	28
Colonsay and Oronsay	26
Hellisay, Sound of Barra	26
Boreray, North Uist	23
South Havra, Shetland	22
Rousay	21

4 Discussion and conclusions

4.1.1.1 The ranking method used in this assessment helped to both eliminate islands that were not suitable, as well as help short list potentially suitable locations. The ranking was not used to provide an answer alone but used to help support decision making on which islands to short list.

4.1.1.2 Having identified a short list of 10 islands, each of these islands was considered in more detail below. This helped to further shorten the list of potential locations for predator eradication to islands that would be suitable specifically for Morven North and Morven South and should help refine the islands to be taken forward for discussions with stakeholders.

4.2 Housay, Out Skerries

4.2.1.1 Housay is a small, inhabited island in the Out Skerries archipelago on the eastern side of Shetland. Both brown rats and feral cats are present. Agriculture appears to be mainly crofting and some rough grazing.

4.2.1.2 Most of the available seabird count data that would be needed to demonstrate the potential benefits of predator eradication as a compensation method for Morven North and Morven South are not robust (Table 4.1). Samples sized were small (n=3) for guillemot and very small (n<3) for the other species, except shag (n=6).

4.2.1.3 All species have shown declines across the available data, though there have been significant declines in breeding seabirds since the collapse of the sandeel fishery in the 1990's (Furness & Tasker, 2000).

Table 4.1: Summary of Seabird Monitoring Programme data available for Housay, Out Skerries

Year	Arctic Tern	Black Guillemot	Common Guillemot	Common Tern	Razorbill	Shag
Start year	2000	2000	1986	2018	2001	1986
End year	2018	2017	2021	2018	2021	2021
Samples	2	2	3	1	2	6
Trend	Decline	Decline	Decline	n/a	Decline	Decline

4.2.1.4 The available seabird colony data from Housay, combined with the large-scale negative effects from sandeel stock collapse, and the potential for sandeel stock recovery masking the benefits from predator eradication, could result in difficulties in demonstrating suitable evidence for compensation at this island.

4.2.1.5 At this stage, this island is not recommended as a location for compensation measures for Morven North and Morven South.

4.3 Rum

4.3.1.1 Rum is a relatively large island (compared to others considered in this report) in the Hebrides off the west coast of Scotland. The island is a National Nature Reserve (NNR) and is owned and managed by NatureScot. It is particularly important for its breeding Manx shearwater colony.

4.3.1.2 The available seabird data from the SMP database is a mix of quality. For four species (puffin, Arctic tern, common tern and Manx shearwater) the data appear poor (but see below for Manx shearwater). There are slightly better sample sizes for black guillemot (n=3), razorbill (n=3) and shag (n=4). However, it appears from social media postings by NatureScot (e.g. https://www.nature.scot/doc/rum-nnr-breeding-bird-monitoring-results-2019) that there is likely to be additional seabird breeding abundance data collected and held by NatureScot that are not in the SMP database.

Table 4.2: Summary of Seabird Monitoring Programme Data Available for Rum

Year	Arctic Tern	Atlantic Puffin	Black Guillemot	Common Guillemot	Common Tern	Manx Shearwater	Razorbill	Shag
Start year	2012	1999	1989	2000	2012	2001	1999	1987
End year	2021	1999	2013	2023	2012	2001	2023	2023
Samples	2	1	3	3	1	1	3	4
Trend	Decline	n/a	Increase	Decline	n/a	n/a	Increase	Decline

4.3.1.3 While there is a single estimate of the population size of Manx shearwaters on Rum in the SMP database, which is based on the count of 119,950 occupied burrows (106,730 - 133,550, 95% CL) by Murray et al. (2003). There are no further complete colony counts available for Manx shearwater and the available plot counts (used to estimate productivity) are very small proportions of the overall colony size (<0.01). Therefore, these plot counts are not sufficiently robust as data sources for estimating change in colony size.

4.3.1.4 While NatureScot provided seabird monitoring data, this largely matched the data available from the SMP database. However, some data from NatureScot did not match the data in the SMP database. The 2021 counts of guillemot, razorbill and shag differed, but these did not change the trends concluded in Table 4.2.

4.3.1.5 Rum is an SPA with qualifying features including guillemot and Manx shearwater. Increasing populations of these species through predator eradication would directly increase the UK site network populations and would therefore be direct compensation. However, it is unlikely that Morven North and Morven South will have an adverse effect on any SPA with Manx shearwaters as a qualifying feature. So, any benefit to Manx shearwater would not refer to like-for-like compensation.

4.3.1.6 Published reports have stated that the presence of rats on Rum does limit the breeding success and population size of Manx shearwaters on the island (e.g. Mavor et al. 2005). However, Lambert et al. (2021) noted that both brown rats and wood mice *Apodemus sylvaticus* impacted Manx shearwaters on Rum. These authors suggest that removal of rats alone from Rum would not have the desired benefit to Manx shearwaters and any eradication would need to include wood mice. However, it is logistically much more difficult to remove wood mice and it is also likely to attract negative public opinion, compared with eradication of rats. Eradication of wood mice would likely take longer and cost much more than removal of rats from the island. However, this issue may change the assessment of additionality, as it is less likely that NatureScot could fund removal of both rats and wood mice from the island.

4.3.1.7 NatureScot (email 27 June 2024) noted that the island is large, remote and rugged with rats present across the whole island. It would therefore be relatively expensive and challenging to complete rat eradication across the whole island. Rat eradication on islands the size of Rum has often been conducted by sowing bait from helicopters, however that it not considered appropriate for Rum due to the higher likelihood of secondary poisoning of non-target species (such as eagles). Placing bait

within boxes along trap-lines would reduce those risks, but would require a large team for several months. While NatureScot also noted that, "cliff nesting species tend to nest on inaccessible ledges, which could limit rat impacts" it is important to note that the presence of rats on an island also limits the available nesting habitat for species so eradication of rats can result in spread of the colony into areas that would otherwise be unavailable. This occurred with puffins on the neighbouring island of Canna, where puffins spread from offshore stacks to the main island following eradication of rats (Luxmoore et al. 2019).

4.3.1.8 NatureScot does not control rats in the NNR (which includes the Manx shearwater and the other seabird colonies), though an intervention plan is in place to control rats in the event of a "significant increase in rat activity" or another acute impact (such as Highly Pathogenic Avian Influenza (HPAI)). Rats are currently controlled on some parts of the island though this is very limited (in the village).

4.3.1.9 Rum could be a suitable location for both like-for-like compensation (for guillemot, razorbill and puffin) and non-like-for-like compensation (Manx shearwater) and this location should be explored further with stakeholders.

4.4 Muck

4.4.1.1 Muck is a small island in the Hebridean islands off the west coast of Scotland. It is south of the islands of Rum and Eigg and part of the "Small Isles" group of islands.

4.4.1.2 The SMP database has relatively few breeding seabird counts from Muck, and all data are from 2001. However, there have been declines in all the key species with evidence for response to predator eradication: guillemot, razorbill, and puffin.

Table 4.3: Summary of Seabird Monitoring Programme data available for Muck

Year	Arctic Tern	Atlantic Puffin	Black Guillemot	Common Guillemot	Kittiwake	Razorbill	Shag
Start year	2021	2001	2001	2001	2001	2001	2001
End year	2021	2021	2021	2021	2021	2021	2021
Samples	1	3	2	3	3	3	3
Trend	n/a	Decline	Decline	Decline	Decline	Decline	Decline

4.4.1.3 Muck could be a suitable location for like-for-like compensation for guillemot, razorbill and puffin, with other species (such as shag) providing additional non-like-for-like compensation. Benefits to breeding black guillemot could be included as a net gain benefit.

4.5 Sheep Island, Northern Ireland

4.5.1.1 Sheep Island is a very small island about 500m off the north Antrim coast of Northern Ireland. It is close to the large breeding seabird colonies on Rathlin Island. It is uninhabited with no agriculture. It was confirmed in 2021 that rats were present on the island[1].

[1] https://biosecurityforlife.org.uk/blog/2022-05-20-guest-blog-project-partners-national-trust

4.5.1.2 Breeding seabird data are sparse, with only two counts of puffin, which are only seen in very small numbers. However, the three counts for guillemot and razorbill have a wide temporal spread (1985 to 2021). In general, seabird populations have been healthy in the region, particularly at Rathlin Island. Guillemot numbers have been increasing. These suggest that food availability may not be as limiting a factor as locations on the North Sea coast or the Northern Islands of Scotland. This suggest that eradication of rats from this island would be more likely to show benefits to seabird populations, as they are not being restricted by food supply.

Table 4.4: Summary of Seabird Monitoring Programme data available for Sheep Island, Northern Ireland

Year	Arctic Tern	Atlantic Puffin	Common Guillemot	Kittiwake	Razorbill	Shag
Start year	2021	1985	1985	1985	1985	1985
End year	2021	2021	2021	2021	2021	2021
Samples	1	2	3	3	3	3
Trend	n/a	n/a	Increase	Stable	Decline	Decline

4.5.1.3 It does appear that there are ongoing works to consider rat eradications and biosecurity for Sheep Island. Given the difficulty of accessing the island, it may be logistically very challenging to eradicate rats, or relatively expensive to use a helicopter to deliver poison baits to the island. As a result, there may still be opportunities to fund this work as compensation from the predicted impacts from Morven North and Morven South. Additionality will have to be considered, as a result of the ongoing Biosecurity of LIFE project that includes Sheep Island. However, early discussion with stakeholders may be useful in determining whether this could be a suitable location.

4.6 Inchmarnock

4.6.1.1 Inchmarnock is a moderately small island off the west coast of the Isle of Bute in the Firth of Clyde. The only predator listed by Stanbury et al. (2017) is American mink. Among the species identified by Furness et al. (2013) has having strong evidence of benefit from predator eradication are shag and Manx shearwater (Table 4.5). For both species there is only a single record in the SMP database. The island is an important location for breeding gulls, particularly herring gull. These species are particularly impacted by American mink, but this would only be a non-like-for-like compensation measure.

Table 4.5: Summary of Seabird Monitoring Programme Data available for Inchmarnock, Firth Of Clyde

Year	Shag	Manx Shearwater
Start year	2003	2002
End year	2003	2002
Samples	1	1
Trend	n/a	n/a

4.6.1.2 Given the species of predator and the species of seabirds the island is important for, this island is unlikely to be a preferred location for Morven North and Morven South. It would be a better location for a project with important predicted impacts on large gulls.

4.7 Colonsay and Oronsay

4.7.1.1 Colonsay and Oronsay are a pair of islands off the west coast of Scotland between Islay and Mull. The two islands are connected at low tide, so are best considered as a single location. The islands have large seabird colonies, which includes the North Colonsay and Western Cliffs SPA. Some breeding seabirds have declined, while others have remained approximately stable. There is robust data for most species. The island of Oronsay includes a fairly large Arctic tern and common tern colony in an RSPB reserve.

Table 4.6: Summary of Seabird Monitoring Programme Data Available for Colonsay and Oronsay

Year	Arctic tern	Common tern	Kittiwake	Common guillemot	Black guillemot	Razorbill	Shag
Start year	1996	1996	2000	2000	1999	2000	2000
End year	2018	2022	2018	2018	2021	2018	2023
Samples	22	9	4	3	3	3	18
Trend	Decline	Decline	Decline	Decline	Stable	Stable	Decline

4.7.1.2 The islands are relatively large, with a relatively large human population and mixed agriculture. The habitats on Colonsay include a mix of woodland, including plantation forestry. The combination of these factors would make rat eradication extremely challenging. There are also feral cats present on the island, however there are also likely to be farm cats and pet cats present. As a human population on an island increases the likelihood of the presence of pet, farm and/or feral cats is likely to increase.

4.7.1.3 For the likely scale of predicted impacts from Morven North and Morven South and the scale of the difficulty of compensation measures on Colonsay and Oronsay results in a recommendation that this island is not included in the initial selection exercise for discussion with stakeholders.

4.8 Hellisay, Sound of Barra

4.8.1.1 Hellisay is a small, uninhabited island with no agriculture apparently present. It is one of a group of small islands to the east of the island of Barra at the southern end of the Western Isles. Hellisay is only about 100m from the island of Gighay, to the west. Rat eradication would therefore need to consider whether this would need to include eradication on Gighay too.

4.8.1.2 There are very few data in the SMP database for Hellisay. In addition, the mix of breeding seabirds suggests that this would not provide many opportunities for either like-for-like or non-like-for-like compensation measures.

Table 4.7: Summary of Seabird Monitoring Programme data available for Hellisay, Sound Of Barra

Year	Arctic tern	Black guillemot	Common tern	Shag
Start year	2021	2001	2002	2002
End year	2021	2021	2021	2021
Samples	1	2	2	2
Trend	n/a	Increase	Decline	Decline

4.8.1.3 The lack of seabird data and the mix of species on Hellisay results in a recommendation that this location is not currently considered for compensation measures for predicted impacts from Morven North and Morven South.

4.9 Boreray, North Uist

4.9.1.1 Boreray is a very small island in the shallow waters between North Uist and Harris. It is 1.5 km from North Uist. It has recently been re-inhabited, with a single croft on the island. Though this appears to be a holiday let now.

4.9.1.2 There are few seabird data available in the SMP database, with only a few species with high confidence in their population response to predator eradication (Table 4.8). While this site was partly included due to the apparent presence of storm petrel, the result in the SMP database appears to be a confirmation of the absence of this species. However, there was presumably a good reason for checking and reporting the absence of storm petrels on this island (e.g. an unrecorded possible record of storm petrels in the breeding season).

Table 4.8: Summary of Seabird Monitoring Programme data available for Boreray, North Uist

Year	Arctic Tern	Black Guillemot	Shag
Start year	2002	2001	2018
End year	2021	2001	2021
Samples	3	1	2
Trend	Decline	n/a	Decline

4.9.1.3 Based on the lack of data to support the assessment of benefit from predator eradication and the species present being less likely to be suitable for eradication this location is not currently recommended for further inclusion.

4.10 South Havra, Shetland

4.10.1.1 South Harva is one of the Scalloway Islands off the south-west coast of mainland Shetland. It is uninhabited and has no agriculture present.

4.10.1.2 Several suitable species are present with poor to moderate quality of data from the SMP database (Table 4.9). The mix of species includes puffin and storm petrel. However, storm petrel is included on the basis of a record of five pairs in 2000 on the very small neighbouring island of Little Harvra. Species present have largely declined, except black guillemot and shag. The absence of some species of cliff nesting seabirds (such as common guillemot and razorbill) is somewhat surprising. The sea cliffs around the island appear suitable for guillemots and razorbills, and kittiwakes are present on the island, which often nest in mixed colonies with these auks. It is possible that the absence of these auks is due to the presence of rats on the island.

Table 4.9: Summary of Seabird Monitoring Programme data available for South Havra, Shetland

Year	Arctic Tern	Kittiwake	Atlantic Puffin	Black Guillemot	Shag	Storm Petrel
Start year	1986	1986	1986	1999	1986	2000

Year	Arctic Tern	Kittiwake	Atlantic Puffin	Black Guillemot	Shag	Storm Petrel
End year	2000	2016	2016	2016	2016	2000
Samples	2	16	3	2	8	1
Trend	Decline	Decline	Decline	Increase	Increase	n/a

4.10.1.3 South Harva is a small uninhabited island and may be a useful site to continue to consider and discussed further with stakeholders. It may be difficult to show that the absence of guillemots and razorbills is due to the presence of rats, or other environmental factors.

4.11 Rousay

4.11.1.1 Rousay is a relatively large island (among the islands considered here) with a relatively large human population with a variety of agriculture present. As well as brown rats, there are also feral cats present on the island.

4.11.1.2 The SMP database has relatively few seabird colony counts for each species on the island (Table 4.10). Across the species considered there was a mix of increases and decreases in their population sizes. The mix of species includes the key species likely to be predicted to be impacted by Morven North and Morven South and species with a high confidence of being positively affected by predator eradication.

Table 4.10: Summary of Seabird Monitoring Programme data available for Rousay, Orkney

Year	Arctic Tern	Atlantic Puffin	Black Guillemot	Common Guillemot	Kittiwake	Razorbill	Shag
Start year	1986	1999	2001	1999	1999	1999	1999
End year	2018	2016	2021	2016	2016	2016	2016
Samples	3	2	2	2	2	2	2
Trend	Decline	Increase	Increase	Stable	Decline	Decline	Increase

4.11.1.3 Since one of the species that would need to be controlled is feral cats, and Rousay has one of the larger human populations among the islands considered, it is important to note that there may be difficulties in predator eradication. As discussed above in relation to Colonsay and Oronsay, the presence of a larger human population increases the likelihood of farm cats and pet cats being present, neither of which would be subject to controls.

4.11.1.4 There are several important negative elements to this location (breeding seabird data are sparse, the human population is relatively large, mixed agriculture is present and feral cats would need to be controlled) but also some important positive elements (multiple species with strong evidence of a strong response to predator eradication and species likely to be predicted to be impacted by Morven North and Morven South). As such, this location should be considered further and compared with the other islands.

4.12 Conclusions

4.12.1.1 Through the above discussion the following islands can be scoped out:

- Housay, Out Skerries;
- Inchmarnock;
- Colonsay and Oronsay;
- Hellisay;
- Boreray.

4.12.1.2 The final list of islands that show positive characteristics for compensation measures are:

- Rum;
- Muck;
- Sheep Island;
- South Havra;
- Rousay.

4.12.1.3 The potential to use one of islands as a suitable for predator eradication will be discussed with stakeholders. Key questions for stakeholders are:

- Is the approach taken to short list possible islands suitable?
- Are any of the suggested islands considered unsuitable as a location for compensation measures and if so, why?
- Should any of islands that were not included in the final list be included, and if so, why?
- What evidence for a benefit to seabirds would stakeholders need to see to support predator eradication from any of these islands?
- Can advice be provided on the level of evidence needed to be proportionate to the predicted impact?
- Would predator eradication which benefitted one species as compensation for another species on a non-like-for like basis be supported? How would this need to be demonstrated?

4.12.1.4 This report was discussed at a meeting with NatureScot and Marine Directorate – Licensing Operations Team (MD-LOT) on 6 June 2024 following which it was agreed that the most critical next step was for Morven North and Morven South to estimate the magnitude of predicted impact to each species recorded in the baseline surveys in order to begin the process of island refinement.

5 References

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