Hornsea Project Four: Derogation Information

PINS Document Reference: B2.6.1
APFP Regulation: 5(2)(q)

Volume B2, Annex 6.1: Compensation measures of the FFC SPA: Compensation Criteria

Prepared GoBe Consultants Limited. September, 2021
Checked Sarah Randall, Orsted. September, 2021
Accepted Francesca De Vita Orsted. September, 2021
Approved Julian Carolan, Orsted. September, 2021

Doc. No: B2.6.1
Version: [A]

Table of Contents

Annexes

Annex/Appendices Number	Heading
A	Rating of compensation criteria.
B	Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: Kittiwake
C	Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: Guillemot and Razorbill.
D	Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: Gannet.

List of Tables

Glossary

Term	Definition
Commitment	A term used interchangeably with mitigation and enhancement measures. The purpose of Commitments is to reduce and/or eliminate Likely Significant Effects (LSEs), in EIA terms. Primary (Design) or Tertiary (Inherent) are both embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, Preliminary Environmental Information Report (PEIR) or ES). Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are acceptable.
Compensation / Compensatory Measures	If an Adverse Effect on the Integrity on a Designated Site is determined during the Secretary of State's Appropriate Assessment, Compensatory Measures for the impacted site (and relevant features) will be required. The term compensatory measures is not defined in the Habitats Regulations. Compensatory measures are however, considered to comprise those measures which are independent of the project, including any associated mitigation measures, and are intended to offset the negative effects of the plan or project so that the overall ecological coherence of the national site network is maintained.
Cumulative effects	The combined effect of Hornsea Four in combination with the effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with Hornsea Project Four.
Design Envelope	A description of the range of possible elements that make up the Hornsea Project Four design options under consideration, as set out in detail in the project description. This envelope is used to define Hornsea Project Four for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.
Habitats Regulations	The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017
Hornsea Project Four Offshore Wind Farm	The term covers all elements of the project (i.e. both the offshore and onshore). Hornsea Four infrastructure will include offshore generating stations (wind turbines), electrical export cables to landfall, and

	connection to the electricity transmission network. Hereafter referred to as Hornsea Four.
Landfall	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) tide and the Transition Joint Bay (TJB) inclusive of all construction works, including the offshore and onshore ECC, intertidal working area and landfall compound. Where the offshore cables come ashore east of Fraisthorpe.
Maximum Design Scenario (MDS)	The maximum design parameters of each Hornsea Four asset (both on and offshore) considered to be a worst case for any given assessment.
Mitigation	A term used interchangeably with Commitment(s) by Hornsea Four. Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, or PEIR or ES).
National Grid Electricity Transmission (NGET) substation	The grid connection location for Hornsea Four.
Onshore export cables	Cables connecting the landfall first to the onshore substation and then on to the NGET substation at Creyke Beck.
Onshore substation (OnSS)	Comprises a compound containing the electrical components for transforming the power supplied from Hornsea Project Four to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid. If a HVDC system is used the OnSS will also house equipment to convert the power from HVDC to HVAC.
Order Limits	The limits within which Hornsea Project Four (the 'authorised project) may be carried out.
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).
Planning Inspectorate (PINS)	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Trenchless Techniques	Also referred to as trenchless crossing techniques or trenchless methods. These techniques include Hydraulic Directional Drilling (HDD), thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.

Acronyms

Term	Definition
CBRA	Cable Burial Risk Assessment
DCO	Development Consent Order
DBCB	Dogger Bank Creyke Beck
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
FFC	Flamborough and Filey Coast
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
JNCC	Joint Nature Conservation Committee
MBES	Multi-Beam Echo Sounder
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MPA	Marine Protected Area
NE	Natural England
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
PSA	Particle Size Analysis
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SPA	Special Protection Area
SSS	Side-Scan Sonar
TCE	The Crown Estate
UKHO	UK Hydrographic Office

1 Background

1.1.1.1 Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network. Detailed information on the project design can be found in **Volume A1, Chapter 1: Project Description**, with detailed information on the site selection process and consideration of alternatives described in **Volume A1, Chapter 3: Site Selection and Consideration of Alternatives**.

1.1.1.2 The Applicant is submitting an application for a DCO to the Planning Inspectorate (PINS), supported by a range of plans and documents including an ES which sets out the results of the EIA. The Applicant is also submitting a Report to Inform Appropriate Assessment (RIAA) (**B2.2: Report to Inform Appropriate Assessment**) which sets out the information necessary for the competent authority to undertake a Habitats Regulations Assessment (HRA) to determine if there is any Adverse Effect on Integrity (AEoI) on the national site network.

1.1.1.3 In light of the conclusions of the RIAA which will support the DCO application, Hornsea Four's position is that no AEoI on the FFC SPA will arise from Hornsea Four alone or in-combination with other plans and projects (**B2.2: Report to Inform Appropriate Assessment**). Nevertheless, in light of the Secretary of State's clear direction in his decision letter for Hornsea Three, Hornsea Four's DCO application will be accompanied by a derogation case (including compensatory measures) which will be provided on a "without prejudice" basis i.e., the derogation case will be provided without prejudice to Hornsea Four's conclusion that no AEoI will arise.

1.1.1.4 In spring 2020, the Applicant commenced a process to identify and ultimately select what compensation measures to include in the without prejudice derogation case. Initially a long-list of potential options were drawn up. The draft long-list was presented to stakeholders at a workshop on 24th June 2020. Following this a short-listing exercise was undertaken to evaluate selected compensation measures in more detail and to decide which measures to undertake further work on. The results of this short-listing exercise were presented in a series of tables and were presented to stakeholders in autumn 2020 (see **B2.9: Record of Consultation**).

1.1.1.5 The purpose of this document is to present the results of the short-listing exercise and specifically to demonstrate the methodology and rationale used to select the proposed compensation measures.

1.1.1.6 The scope of this document covers compensation measures for kittiwake, *Rissa trydactyla,* large auks (common guillemot – hereafter guillemot, *Uria aalge,* and razorbill, *Alca torda*), and gannet, *Morus bassanus,* regarding the Flamborough and Filey Coast Special Protection Area (FFC SPA). It has been developed in support of Hornsea Four in the instance that the Secretary of State does not agree with the conclusions of the Applicant's Report to Inform

Appropriate Assessment (RIAA) in relation to the impact on kittiwake, large auks and gannet from the operation of the proposed wind farm.

2 Methods

2.1.1.1 To evaluate the potential compensation measures in a robust and transparent manner, each of the options were evaluated against a set of criteria. The criteria are described in full in Table 4 of Appendix A, with a summary provided below[1]:

- Targeted - The compensatory measures must address the issue specifically;
- Effective – The compensatory measures must be feasible in reinstating the ecological conditions needed to ensure the overall coherence of the national site network;
- Technical feasibility – The technical feasibility of the measure taking into account requirements of the ecological features to be reinstated;
- Extent of compensation – The extent required for the compensatory measures to be effective is directly related to the quantitative and qualitative aspects inherent to the elements of integrity;
- Location of compensation - Compensatory measures should be located in areas where they will be most effective in maintaining the overall coherence of the National Site Network (note general agreement to be as close to the impacted site as feasibly possible);
- Timing of compensation – The timing of the compensation is difficult to specify and should be adapted using a case-by-case approach, and;
- Long-term implementation – The compensatory measures require a legal and financial basis for long-term implementation as well as for the protection, monitoring and maintenance of the site/species.

2.1.1.2 Each compensation method identified was scored on a scale of 1 to 5 (with 5 being the maximum score for meeting the criteria) for the 7 criteria identified above (targeted, effective, technical feasibility, extent of compensation, location of compensation, timing of compensation, and long-term implementation). A description of the criteria ratings is within **Table 4** of Appendix A.

2.1.1.3 An overall score of all the criteria was then calculated (highest score = 35). In depth analyses and scoring of each compensation method are available in the Appendices:

- Appendix B: Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: kittiwake.
  - **Table 5** – description of measures
  - **Table 6** – rating of measure according to criteria
- Appendix C: Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: guillemot and razorbill.
  - **Table 7** – description of measures
  -

[1] Guidance criteria was built upon Defra Compensatory Measures guidance: Best practice guidance for developing compensatory measures in relation to Marine Protected Areas (defra.gov.uk)

- Table 8 – rating of measure according to criteria

- Appendix D: Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: gannet.
  - Table 9– description of measures
  - Table 10– rating of measure according to criteria

3 Conclusions

3.1.1.1 The total scores of compensation options for kittiwake, large auks (guillemot and razorbill) gannet are summarised within the tables below.

3.1.1.2 The most promising (highest scoring) options for compensation of kittiwakes were identified as:

- Habitat creation (onshore) (25/35);
- Incentives/ disincentives for certain activities (change the sandeel quota) (24/35);
- Habitat creation (offshore) (22/35); and
- Species recovery (rat eradication and/ or control) (22/35).

3.1.1.3 The most promising (highest scoring) options for compensation of guillemot and razorbill were:

- Reduction of other threats and pressures (bycatch reduction) (26/35);
- Species recovery (rat eradication and/ or control) (23/35);
- Incentives/ disincentives for certain activities (change the sandeel quota) (23/35); and
- Incentives/ disincentives for certain activities (sandeel and sprat fishery exclusion zone) (20/35).

3.1.1.4 The most promising (highest scoring) options for compensation of gannet were:

- Habitat restoration or improvement (removal of hazardous objects at Bass Rock) (27/35);
- Reduction of other threats and pressures (reduction in entanglement in salmon aquaculture netting) (26/35);
- Reduction of other threats and pressures (removal of plastics/fishing debris incorporated into gannet nests) (26/35);
- Reduction of other threats and pressures (bycatch reduction) (25/35); and
- Habitat creation (offshore) (24/35).

Table 1: The total score of compensation options for kittiwake (designated the Flamborough and Filey Coast Special Protection Area).

Measure	Compensation Option	Overall Score
Habitat creation	i: Construction of ONSHORE artificial structures to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	25
	ii: Construction of OFFSHORE artificial structures to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	22
	iii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	19
Reserve creation	i: Designation of new marine SPA in important offshore foraging location.	18
Species recovery	i: Eradication and/ or control of American mink from an island important to/used by kittiwake using trapping or poisoning techniques.	21
	ii: Eradication and/ or control of feral cat from an island important to/used by kittiwake using trapping/ lethal technique.	19
	iii: Eradication and/ or control of rat (brown rat and or black rat (and house mouse) from an island colony using trapping or poisoning techniques.	22
	iv: Exclusion of foxes from a colony using anti-predator fencing	21
	v: Exclusion of great skua from a buffer zone around a kittiwake colony	17
4. Incentives/ disincentives for certain activities	i: Management of recreational pressure at the FFC SPA (or another SPA)	20
	ii: Sandeel fishery exclusion zone	21
	iii: Sandeel fisheries exclusion zone within the Hornsea Project Four array area	20
	iv: Purchase of a sandeel fishery quota	16
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management	24

NOTE: The overall score is calculated by rating the following criteria: targeted, effective, technical feasibility, extent of compensation, location of compensation, timing of compensation, and long-term implementation (see Appendix B for scoring per criteria). The highest scores indicate the optimal compensation options (highlighted in green, yellow, and orange).

Table 2: The total score of compensation options for guillemot and razorbill (designated the Flamborough and Filey Coast Special Protection Area).

Measure	Compensation Option	Overall Score
1. Species recovery	i: Eradication and/ or control of rats from an island colony of guillemot and razorbill using rodent traps or poisoned bait.	23
2. Habitat creation	i: Encourage establishment of a new colony in an area close to heightened prey availability using models and call playback.	15
	ii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	19
3. Incentives/ disincentives for certain activities	i: Sandeel and sprat fishery exclusion zone.	20
	ii: Sandeel and sprat fisheries exclusion zone within the Hornsea Project Four array area.	18
	iii: Purchase of a sandeel and sprat fishery quota	16
	iv: Sandeel and sprat fisheries exclusion in wintering areas.	19
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management	23
4. Reserve creation	i: Designation of new marine SPA at important offshore foraging location.	18
5. Reduction of other threats and pressures	i: Reduce bycatch.	26

NOTE: The overall score is calculated by rating the following criteria: targeted, effective, technical feasibility, extent of compensation, location of compensation, timing of compensation, and long-term implementation (see Appendix B for scoring per criteria). The highest scores indicate the optimal compensation options (highlighted in green, yellow, and orange).

Table 3: The total score of compensation options for gannet (designated the Flamborough and Filey Coast Special Protection Area).

Measure	Compensation Option	Overall Score
1.Incentives/ disincentives for certain activities	i: End legal harvest of approximately 2000 gannet chicks at Sula Sgeir each year.	24
2.Habitat Creation	i: Encourage more rapid expansion of small colonies with use of models and playback of calls.	21
	ii: Construction of ONSHORE artificial structures to encourage a new gannet colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	25
	iii: Construction or repurposing of OFFSHORE artificial structures to encourage a new gannet colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	24
	iv: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	19
3. Reserve creation	i: Designation of new marine SPA at important offshore foraging location away from OWF.	18
4. Habitat restoration or improvement	i: Removal of hazardous objects at Bass Rock colony to reduce bird strike and entrapment.	27
5. Reduction of other threats and pressures	i: Reduce gannet bycatch.	25
	ii: Reduction in entanglement of gannets in salmon aquaculture netting	26

Measure	Compensation Option	Overall Score
	iii: Management of recreational pressure at the FFC SPA.	17
	iv: Management of visitor pressure at Bass Rock.	24
	v: Removal of plastics/fishing debris incorporated into gannet nests	26

NOTE: The overall score is calculated by rating the following criteria: targeted, effective, technical feasibility, extent of compensation, location of compensation, timing of compensation, and long-term implementation (see Appendix B for scoring per criteria). The highest scores indicate the optimal compensation options (highlighted in green, yellow, and orange).

4 Summary

4.1.1.1 Despite the options of many different compensation measures, they vary in feasibility. The Applicant therefore took forward the following compensation measures for inclusion in the derogation case, as a result of the short-listing process combined with stakeholder feedback on the potential measures:

- Kittiwake:
  1. Onshore artificial structures (25 overall score);
  2. Offshore artificial structures (22 overall score); and
  3. Habitat creation – seagrass restoration (19 overall score).

- Guillemot and razorbill
  1. Bycatch reduction (26 overall score);
  2. Predator eradication and/ or control (23 overall score); and
  3. Habitat creation - seagrass restoration (19 overall score).

- Gannet
  1. Onshore artificial structures (25 overall score);
  2. Offshore artificial structures (24 overall score);
  3. Habitat creation – seagrass restoration (19 overall score); and
  4. Bycatch reduction (25 overall score).

4.1.1.2 Note that the short-listing process has been updated since original conception to include new evidence and stakeholder feedback. This was discussed with stakeholders during compensation workshops for Hornsea Four (see **B2.9: Record of Consultation**). As in February 2021, Hornsea Four decided to no longer pursue compensation options in Scotland and therefore no Scottish based measures were progressed past this short-listing exercise, for all options and all species. This decision was made by the Project based on a lack of support from Scottish government stakeholders. As a result, options such as aquaculture netting entanglement for gannet and works at Bass Rock and the advancement of predator eradication at some of the largest UK guillemot colonies have been temporarily removed from the short-listing process. If circumstances were to present the potential for opportunities to be explored in Scotland, the short-listing process may be revisited.

4.1.1.3 A number of the measures proposed under the heading "Incentives/ disincentives for certain activities" relate to the management of prey resource (such as creation of fishery exclusion zones or purchase sandeel and/or spray quotas). As described in **B2.6 Compensation measures for FFC SPA: Overview,** there remains significant challenge at a project level as to proportionate measures that can be applied to deliver meaningful compensation on this theme.

4.1.1.4 All measures identified within the prey resource report (**B2.6.2 Compensation measures for FFC SPA: Prey Resource Evidence)** have high level of technical difficulty and most have a measure of political challenge associated with them. All measures, apart from a commercial agreement, would need significant support from Defra, MMO, JNCC, Natural England and in some cases the Danish Government, as well as significant engagement and interaction with

the Danish sandeel fishing industry.

4.1.1.5 Given the findings of the report (**B2.6.2 Compensation measures for FFC SPA: Prey Resource Evidence**), the Applicant advocate the need for a science-led and ecosystem-based assessment of predicted mortality to understand the predation rate needed to feed into the maximum sustainable yield calculation. Therefore, a government-led approach to sustainable management of forage fish fisheries seems the only feasible proposition for long-term measure addressing prey availability.

Appendix A : Rating of compensation critera.

Table 4: Rating of compensation criteria for species and habitats. 5 = the most preferred compensation.

Criteria	Description	Rating (species) - if applicable	Rating (habitats)
Targeted	The compensatory measures must address these issues specifically, so that the elements of integrity contributing to the overall coherence of the National Site network are compensated for in the long term. Thus, these measures should be the most appropriate to the type of impact predicted and should be focused on objectives and targets clearly addressing the Natura 2000 elements affected. They must clearly refer to the structural and functional aspects of the site integrity, and the related types of habitats and species populations that are affected. This entails that the compensatory measures must necessarily consist of ecological measures and. any secondary or indirect measure that might be proposed to enhance the performance of the core compensatory measures must have a clear relationship to the objectives and targets of the compensatory measures themselves	5= Direct "in kind" compensation with direct benefits to the targeted species and directly related to the affected site's COs 4 = Direct benefits to the targeted species, not specific to the affected site's COs 3 = Some benefits to the targeted species AND/OR direct benefits to the seabird assemblage 2 = Limited benefits to the targeted species AND/OR some benefits to the seabird assemblage 1 = Limited benefits to the seabird assemblage	5= Direct "in kind" compensation with direct benefits to the qualifying features and directly related to the CO's 4= Indirect benefits to sub features and/or qualifying features, habitat/species linkages and functions 3= Direct benefits to other features within the Network with an overall benefit in biodiversity terms 2= Some benefit to other features within the Network with some benefit in biodiversity terms 1= limited benefit to any features with limited biodiversity benefits
Effective	Compensatory measures must be feasible and operational in reinstating the ecological conditions needed to ensure the overall coherence of the National Site network. The estimated timescale and any maintenance action required to enhance performance should be understood and/or foreseen right from the start before the measures are rolled out. This must be based on the best scientific knowledge available, together with specific investigations for the precise location where the compensatory measures will be implemented. Measures for which there is no reasonable guarantee of success should not be considered under Article 6(4), and the likely success of the compensation scheme should influence the final approval of the plan or project in line with the prevention principle. In addition, when it comes to deciding between different possibilities for compensation, the most effective options, with the greatest chances of success, must be chosen. The programme of compensatory measures needs to include detailed monitoring during implementation to ensure effectiveness in the long term.	5= Considerable evidence to demonstrate with best scientific evidence that the measure is effective with multiple examples from elsewhere 4= Fair amount of evidence that measure is effective but with few examples from elsewhere 3= Some evidence available to demonstrate effectiveness but with limited examples 2= Some literature and research to demonstrate measures may be effective but with little to no examples/evidence from elsewhere 1= No literature or evidence to demonstrate effectiveness	5= Considerable evidence to demonstrate with best scientific evidence that the measure is effective with multiple examples from elsewhere 4= Fair amount of evidence that measure is effective but with few examples from elsewhere 3= Some evidence available to demonstrate effectiveness but with limited examples 2= Some literature and research to demonstrate measures may be effective but with little to no examples/evidence from elsewhere 1= No literature or evidence to demonstrate effectiveness
Technical feasibility	According to current knowledge, it is highly unlikely that the ecological structure and function or the related habitats and species populations can be reinstated to the status they had before the damage by a plan or project. To overcome the intrinsic difficulties standing in the way of full success for the ecological conditions, the design of compensatory measures must: (1) follow scientific criteria and evaluation in accordance with best scientific knowledge, and (2) take into account the specific requirements of the ecological features to be reinstated (e.g., exposure, existing threats and other conditions critical to the success of reinstatement). The aspects critical to technical feasibility will determine the suitability of the location of compensatory measures (spatial feasibility), the appropriate timing and their required extent. In addition, the choice of particular measures and their design must follow the existing guidance for each particular practice, i.e. habitat creation, habitat restoration, population reinforcement, species reintroduction, or any other measure considered in the compensatory programme	5= Technical delivery of measure is well evidenced and achievable without any substantial challenges and there is certainty in the outcomes 4= Technical delivery is evidenced but some challenges with delivery and some uncertainty in the outcomes 3= There is some evidence of delivery and some uncertainty regarding outcomes 2= little to no evidence of delivery and considerable uncertainty in outcomes 1= No evidence of delivery and considerable uncertainty in outcomes	5= Technical delivery of measure is well evidenced and achievable without any substantial challenges and there is certainty in the outcomes 4= Technical delivery is evidenced but some challenges with delivery and some uncertainty in the outcomes 3= There is some evidence of delivery and some uncertainty regarding outcomes 2= little to no evidence of delivery and considerable uncertainty in outcomes 1= No evidence of delivery and considerable uncertainty in outcomes
Extent of compensation	The extent required for the compensatory measures to be effective is directly related to the quantitative and qualitative aspects inherent to the elements of integrity (i.e. including structure and functionality and their role in the overall coherence of the National Site network) likely to be impaired and to the estimated effectiveness of the measures. Consequently, compensation ratios are best set on a case-by-case basis and must be initially determined in the light of the information from the Article 6(3) appropriate assessment and ensure ecological functionality. The ratios may then be redefined according to the results observed when monitoring the effectiveness, and the final decision on the proportion of compensation must be justified. There is wide acknowledgement that ratios should be generally well above 1:1. Thus, compensation ratios of 1:1 or below should only be considered when it is shown that with such an extent the measures will be fully effective in reinstating structure and functionality within a short period of time (e.g. without compromising the	5= Measure provides direct benefit to species with a high level of effectiveness and feasibility so lower ratios can be expected 4= Measure provides direct benefit to species but there are unknowns regarding effectiveness and a lack of confidence in technical feasibility so high ratios (over delivery) can be expected 3= Measure provides some benefit to species or assemblage features, over delivery will be required with supporting calculations on "biodiversity value" to understand compensation extent 2= Measure provides limited benefit to target species,	5= Effectiveness rating is 5 and measure will ensure reinstatement of structure and functionality of impacted receptor, ratios of 1:1 and 2:1 maybe more acceptable 4= effectiveness rating is 4, 2:1 ratio would be accepted 3= effectiveness rating is 3, given evidence level 3:1 ratio is expected 2= effectiveness rating is 2, given low level of evidence, over delivery at 4:1 ratio 1= effectiveness rating is 1, no evidence of measure working, over delivery at 5:1

Criteria	Description	Rating (species) - if applicable	Rating (habitats)
	preservation of the habitats or the populations of key species likely to be affected by the plan or project nor their conservation objectives).	over delivery and calculations to support biodiversity value will be required to understand compensation extent 1= Measure provides no benefit to target species and over delivery and calculations to support be biodiversity value with be required to understand compensation extent.	
Location of compensation	Compensatory measures should be located in areas where they will be most effective in maintaining the overall coherence of the National Site network. This entails a set of pre- conditions that any compensatory measure should meet: • The area selected for compensation must be within the same biogeographical region (for sites designated under the Habitats Directive) or within the same range, migration route or wintering area for bird species (i.e., sites designated under the Birds Directive) in the Member State concerned. Furthermore, the area should provide functions comparable to those which had justified selecting the original site, particularly regarding adequate geographical distribution. • The area selected for compensation must have - or must be able to develop - the specific features attached to the ecological structure and functions, and required by the habitats and species populations. This relates to qualitative aspects like the uniqueness of the assets impaired and requires that local ecological conditions be taken into account. • Compensatory measures must not jeopardize the preservation of the integrity of and contribute to the overall coherence of the network. When carried out on existing network site(s), the measures must be consistent with the conservation objectives of the site(s) and go above the conservation measures established under Article 6(1). Management plans will be a useful reference to steer sensible compensation measures. In addition, there is general agreement that the local conditions necessary to reinstate the ecological assets at stake are found as close as possible to the area affected by the plan or project. Therefore, locating compensation within or near the site concerned where suitable conditions for the measures to be successful seems the most preferred option. However, this is not always possible and a range of priorities should therefore be applied when searching locations that meet the requirements of the Habitats Directive: 1) Compensation within the site, provided the necessary elements to ensure ecological coherence and network functionality exist within the site. 2) Compensation outside the site concerned, but within a common topographical or landscape unit, provided the same contribution to the ecological structure and/or network function is feasible. The new location can be in another designated site or a non-designated location. In the latter case	5 = Measure can with certainty benefit birds at the same Natura 2000 site (within, adjacent to, within usual foraging range of) 4 = Measure can be utilised by affected species from the affected Natura 2000 site 3 = Measure can be reached by the same species from a designated SPA 2 = Measure can be reached by the species and is within the UK portion of the biogeographic region 1 = Measure can be reached by the species and is located within the biogeographic region	5= Measure is located within the same Natura 2000 site or similar site 4= Measure is located within another Natura 200 site with similar conditions 3 = Measure is located outside of the network but within an area with very similar conditions 2= Measure is located in an area with conditions dissimilar to the site (likely that the measure will score lower on target criteria) 1= Measure is located in an area with no similarities to the site
Timing of compensation	Timing the compensatory measures calls for a case-by-case approach. The schedule adopted must provide continuity in the ecological processes essential for maintaining the structure and functions that contribute to the overall coherence of the National Site network. This requires a tight coordination between the implementation of the plan or project and the implementation of the compensatory measures, and relies on issues such as the time required for habitats to develop and/or for species populations to recover or establish in a given area. In addition, other factors and processes must also be considered: • A site must not be irreversibly affected before compensation is in place. • The result of compensation should be operational at the time the damage occurs on the site concerned. Under certain circumstances where this cannot be fully achieved, overcompensation would be required for the interim losses. • Time lags might only be admissible when it is ascertained that they would not compromise the objective of 'no net losses' to the overall coherence of the National Site network. • Time lags must not be permitted, for example, if they lead to population losses for any species protected on the site under Annex II to the Habitats Directive or Annex I to the Birds Directive; priority	5= Agreed certainty that measures will be functioning before impact occurs with timeframe <2 years 4= Some certainty that measures will be functioning prior to impact occurring < 3 years 3= Some certainty that measures will be functioning prior to impact occurring <5 years but would likely assume a higher compensation ratio to allow for uncertainty 2= Little to no certainty that measures will be functioning <10 years and would definitely assume a higher compensation ratio to allow for uncertainty 1= no certainty within 10 year timeframe and perhaps poorly evidenced and as such acceptance of higher ratio required	5= Agreed certainty that measures will be functioning before impact occurs with timeframe <2 years 4= Some certainty that measures will be functioning prior to impact occurring < 3 years 3= Some certainty that measures will be functioning prior to impact occurring <5 years but would likely assume a higher compensation ratio to allow for uncertainty 2= Little to no certainty that measures will be functioning <10 years and would definitely assume a higher compensation ratio to allow for uncertainty 1= no certainty within 10 year time frame and perhaps poorly evidenced and as such acceptance of higher ratio required

Criteria	Description	Rating (species) - if applicable	Rating (habitats)
	species listed in Annex II to the Habitats Directive merit special attention It may be possible to scale down in time compensatory measures, depending whether the significant negative effects are expected to arise in the short, medium or long term. Specific measures to outweigh interim losses that would occur until the conservation objectives are met may be advisable. All technical, legal or financial provisions needed to implement the compensatory measures must be completed before the plan or project implementation starts, so as to prevent any unforeseen delays that may hinder the effectiveness of the measures.		
Long term implementation	Compensatory measures require that a sound legal and financial basis for long-term implementation and for the protection, monitoring and maintenance of the sites be secured before impacts on habitats and/or species occur. This could involve: • Providing for temporary protection, even if the SCI/SPA status is only granted later. Applying binding enforcement tools at the national level to ensure the full implementation and effectiveness of compensation (e.g. linked to the EIA Directive, if applicable, or to the Environmental Liability Directive; or linking the plan or project approval to the robustness of the relevant provisions for implementing compensatory measures). • Applying the necessary legal means in case land or rights purchase is deemed essential for the effective implementation of the measures in line with good practice (e.g. standard procedures for compulsory purchase on grounds of nature conservation). • Establishing monitoring programmes to ensure that the compensatory measures reach their objective and are maintained over the longer term, and if not, that corrective measures are taken to address this, including objectives, responsible bodies and resource needs, indicators, and requirements for reporting to the Commission. This could be best performed by independent bodies specifically set up for the	5= There is a high level of confidence in the security of the measure and in the long term implementation 4= Measure is legislatively permissible with some level of confidence in securability and long term implementation 3= There are a number of uncertainties regarding the securability of the measure and if long term implementation is feasible 2= The is a lot of uncertainty regarding the security of the measure and long term implementation 1= The measure cannot be legally secured and there is no certainty in the long term implementation	5= There is a high level of confidence in the security of the measure and in the long term implementation 4= Measure is legislatively permissible with some level of confidence in securability and long term implementation 3= There are a number of uncertainties regarding the securability of the measure and if long term implementation is feasible 2= The is a lot of uncertainty regarding the security of the measure and long term implementation 1= The measure cannot be legally secured and there is no certainty in the long term implementation

Appendix B : Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: Kittiwake.

Table 5: Description of measures for short-listing criteria of kittiwake compensation measures.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
1. Habitat creation	i: Construction of ONSHORE artificial structures to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	Yes – If the structure is in a suitable area i.e., onshore and close to foraging grounds.	A: Yes and supported by the RSPB. SM/D: Identification of suitable location for an artificial structure to be constructed which will attract kittiwake.	Kittiwake are known to use artificial nest sites where there is a shortage of natural nesting habitat (e.g., Lowestoft pier (Brown and Grice 2005) and buildings along the River Tyne (Coulson 2011)).	Construction of artificial nest sites could be achieved before OWF operation. Colonisation would be expected to occur naturally within 3-4 years. Potential to shorten this by using playback of kittiwake calls and models (Jones *et al.* 2011).	Risk of not attracting enough kittiwake to establish a colony. *et al*	Monitor use of artificial nesting habitat and productivity. Potential to partner with SNCB, RSPB or TWT depending on location.
	ii: Construction or repurposing of OFFSHORE artificial structures to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	Yes – If the structure is in a suitable area i.e., offshore and close to foraging grounds.	A: Yes, and supported by the RSPB. SM/D: Identification of suitable location for an artificial structure to be constructed which will attract kittiwake.	Kittiwake are known to use artificial nest sites where there is a shortage of natural nesting habitat (e.g. Lowestoft pier (Brown and Grice 2005) and buildings along the River Tyne (Coulson 2011)). Evidence from aerial and boat based surveys undertaken on behalf of the Applicant in 2021 have recorded that kittiwake do nest on offshore oil and gas platform.	Construction of artificial nest sites could be achieved before OWF operation. Colonisation would be expected to occur naturally within 3-4 years for a new structure or potentially immediately for a repurposed structure. Potential to shorten this by using playback of kittiwake calls and models (Jones *et al.* 2011).	Risk of not attracting enough kittiwake to establish a colony. *et al*	Monitor use of artificial nesting habitat and productivity. Potential to partner with SNCB, RSPB or TWT depending on location.
	iii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	Yes - in theory, but may need more evidence on scale required and location	A: Yes SM/D: mechanism for delivery requires further consideration.	It is well evidenced that the key cause of kittiwake population decline and reduced productivity at colonies throughout the UK is due to reduced prey availability (Daunt *et al.* (2008), Frederiksen *et al.* (2004)). Creation of new seabed habitat for key prey within foraging range of SPA would in theory increase prey availability. However, further work required to determine if evidence exists of this having been successfully undertaken elsewhere. Will need to quantify benefits of habitat	1 year or more to identify key foraging locations (i.e., those highlighted in Cleasby *et al.* (2020)) and initiate planning process. Uncertainty over length of time for seabed habitat to be colonised and subsequently increase prey availability. Further consideration required.	Habitat may attract increased fisheries effort if not undertaken in conjunction with fisheries management. May benefit predatory fish and seabirds other than the target species	Monitor prey usage, availability and use by seabirds and productivity at colony. Potential to partner with SNCB or/and RSPB depending on location.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
				to prey (e.g., seagrass as a nursery ground) and then demonstrate links to seabirds			
2. Reserve creation	i: Designation of new marine SPA in important offshore foraging location.	Yes – in theory, depending on Governments willingness	A: Yes SM/D: Identify a suitable location which obtains the prerequisites for SPA designation. Will require support from various stakeholders	Previous examples include the Irish Sea Front SPA and Northumberland Marine SPA which were designated to support foraging seabirds away from breeding colonies.	1 year or more to identify key foraging locations (i:e., those highlighted in Cleasby *et al.* (2020)) and initiate planning process which may take at least 2 years.	Prey hotspots may shift over time and move beyond the boundary of a new SPA. Additional management measures via the EIFCA and MMO to control the fishery would be required in partnership with designation. Measure will require the designation and management of a large area of significant sandeel habitat to ensure increased stock is available. Would need to go through public consultation and be supported by Defra.	Monitor prey availability and use of the new SPA by seabirds and productivity at the FFC colony. Potential to partner with SNCB or/and RSPB depending on location.
3. Species recovery	i: Eradication and/ or control of American mink from an island important to/used by kittiwake using trapping or poisoning techniques.	Yes	A: Yes SM/D: Locate colony island which supports specific predator and undertake eradication programme to remove and/ or control.	Kittiwake productivity at St Abb's Head colony was halved during the 2001 breeding season when compared to the previous breeding season, likely as a result of American mink predation on kittiwake chicks (Mavor *et al.* 2002). Reports also exist from the 1999 breeding season (Furness *et al.* 2013).	<3 years due to the need for site identification, ground truthing (understanding the level of infestation), deployment of traps/ poisoned bait (or other method tbc). Duration of eradication process will depend on size of island and population size of target eradication and/ or control species.	Biosecurity – potential for island to be recolonised by species from nearby areas (natural or human induced). Potential challenge associated with working across administrative boundaries. Eradication and/ or control of an animal may be an emotive subject and generate negative publicity.	Monitor effectiveness of eradication and/ or control method and productivity at island. Potential to partner with SNCB, RSPB, or TWT depending on location.
	ii: Eradication and/ or control of feral cat from an island important to/used by kittiwake using trapping/ lethal technique.	Yes	Acceptability at a local level will be challenging due to potential for pet cats to be impacted. SM/D: Identify a colony impacted by feral cat and undertake trapping or legal methods to remove pressure.	Limited evidence for kittiwake although Thompson *et al.* (1999) reported that kittiwake depredation by cats was the cause of very low productivity at the Isles of Scilly, where the species is part of the seabird assemblage of the SPA.	<3 years due to the need for site identification, ground truthing (understanding the level of population), deployment of traps/ lethal measures (or other method such as anti-predator fencing). Duration of eradication and/ or control process will depend on size of island and population size of target eradication and/ or control species.	Biosecurity – potential for island to be recolonised by species from nearby areas (natural or human induced). Eradication and/ or control of an animal (particularly this species) may be an emotive subject and generate negative publicity. Potential challenge associated with working across administrative boundaries.	Monitor effectiveness of eradication and/ or control method and productivity at island. Potential to partner with SNCB, RSPB, or TWT depending on location.
	iii: Eradication and/ or control of rat (brown rat and or black rat (and house mouse) from an	Yes	A: Yes SM/D: Locate colony	Limited evidence although Walsh *et al.* (1995) reported that brown rat predation at	<3 years due to the need for site identification, ground truthing (understanding the	Biosecurity – potential for island to be recolonised by species from nearby areas	Monitor effectiveness of eradication and/ or control method and

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
	island colony using trapping or poisoning techniques.		island which supports specific predator and undertake eradication programme to remove and/ or control them.	the Isles of Scilly archipelago was the cause of reduced kittiwake productivity.	level of infestation), deployment of traps/ poisoned bait (or other method tbc). Duration of eradication and/ or control process will depend on size of island and population size of target eradication and/ or control species.	(natural or human induced). Eradication and/ or control of an animal may be an emotive subject and therefore generate a negative image. Potential challenge associated with working across administrative boundaries.	productivity at island. Potential to partner with SNCB, RSPB, or TWT depending on location.
	iv: Exclusion of foxes from a colony using anti-predator fencing	Yes	A: Potentially yes. SM/D: Establish suitable location based on ground nesting species and evidence of predation from ground predators. Erect specialist fencing around colony.	Foxes are a factor reducing kittiwake productivity at some highly accessible colonies (JNCC Annual Reports on Seabird Numbers and Breeding Success) including Lowestoft pier.	<2 years to erect anti-predator fencing. Must be in-situ prior to breeding season and ensure no foxes are within the predator free zone.	Unintended consequences to wildlife could arise as may limit the movement of other non-target species. Limited number of suitable locations due to the accessibility to colonies required by foxes. Additionality for existing SPAs could be questionable as anti-predator fencing may already be in-situ.	Monitor effectiveness of exclusion method and productivity at FFC colony. Potential to partner with SNCB, RSPB, or TWT depending on location.
	v: Exclusion of great skua from a buffer zone around a kittiwake colony	Yes	A: No - Great skua are a protected species and a designated feature of multiple SPAs.	Multiple Scottish kittiwake colonies are affected by great skua depredations (Votier *et al.* 2004 & 2008).	<2 years to locate small, non-SPA population of great skua in proximity to kittiwake colony and discourage breeding or remove birds from site.	Great skua are a protected species and a designated feature of multiple SPAs. Controlling species at SPAs is inappropriate and unlike to gain support from SNCBs and NGOs.	Monitor effectiveness of exclusion method and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.
4. Incentives/ disincentives for certain activities	i: Management of recreational pressure at the FFC SPA (or another SPA)	Yes	A: No - Recreational pressures are already managed at FFC SPA (and likely other colonies). Unlikely to provide additionality.	Limited evidence of recreational pressures impacting kittiwake productivity.	<2 years to determine where measure could be implemented and action management.	Social and stakeholder support should be considered if there is potential to limit access to a site.	Monitor effectiveness of management method and productivity at colony. Potential to partner with SNCB and RSPB.
	ii: Sandeel fishery exclusion zone	Yes - (previously through Common Fisheries Policy	A: Feasible if delivered by government – see comment in limitations column. SM/D: The Fisheries Act 2020 provides the framework for UK fishing policy. Any exclusions will be subject to consultation and approval by MMO and enforcement by the	It is well evidenced that the key cause of kittiwake population decline and reduced productivity at colonies throughout the UK is due to reduced prey availability, with overfishing of sandeel (which kittiwake are heavily reliant on during the breeding season) being a key factor (Daunt *et al.* 2008, Frederiksen *et al.* 2004). Excluding commercial fishing of this species may increase	Uncertainty relating to possibility and timescales at this stage.	Measure would be reliant on government power to exclude fishery. Excluding a fishery in one area could displace fishing effort to other regions to achieve the same quota. Compensating the fishery could cost a significant amount over the lifetime of the project. Exclusion of a fishery from an SPA could be considered a management measure and, therefore, would not provide	Monitor effectiveness of exclusion zone on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
			government and therefore may not meet the criteria "ability to secure".	prey availability to kittiwake and therefore increase productivity (Daunt *et al.* 2008, Frederiksen *et al.* 2004).		additionality. This is particularly the case where fisheries pressures are listed as a contributor to species decline across the UK SPA network. However, for an SPA where this action is not being taken or taken in a reasonable timeframe it could provide additionality (this is referred to as the "but for" test); it would also be acceptable outside an SPA.	
	iii: Sandeel fisheries exclusion zone within the Hornsea Project Four array area	Yes - (previously through Common Fisheries Policy).	A: Feasible if delivered by government – see comment in limitations column. SM/D: The Fisheries Act 2020 provides the framework for UK fishing policy. Any exclusions will be subject to consultation and approval by MMO and enforcement by the government and therefore may not meet the criteria "ability to secure". Potential for other options to secure measure, including securing an exclusion zone around each turbine to prevent fishing or pay fishery to stay out of array.	As above	Measure could be actioned during the operational phase of the project and is therefore dependant on project timescales.	Potential for exclusion to displace fishing effort to likely another FFC SPA kittiwake foraging area. Potential attraction of birds to array, because of fisheries exclusion, and therefore increased collision risk. Potential for a small impact based on the low existing fishing intensity in HOW04. Payment to fishermen to not fish in array could cost a significant amount over the lifetime of the project (greater cost than available to a singular developer).	Monitor effectiveness of exclusion zone on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.
	iv: Purchase of a sandeel fishery quota	Yes	A: Potentially – see comment in limitations column. SM/D: The Fisheries Act 2020 provides the framework for UK fishing policy. Any	It is well evidenced that the key cause of kittiwake population decline at colonies throughout the UK is due to reduced prey availability, with overfishing of sandeel (which kittiwake are heavily reliant on during	Under the current quota regulations, the purchase of quota by an offshore developer is not a viable proposal.	Under the current quota regulations, the purchase of quota by an offshore developer is not a viable proposal. Exclusion of fisheries from area for SPA impacts is considered a management measure, and therefore is not	Monitor effectiveness of reduced take on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
			quota changes will be subject to consultation and approval by MMO and enforcement by the Government.	the breeding season) being a key factor (Daunt *et al.* 2008, Frederiksen *et al.* 2004). Excluding commercial fisheries of this species may increase prey availability to kittiwake and therefore increase productivity (Daunt *et al.* 2008, Frederiksen *et al.* 2004).		in addition to normal management measures (does not meet the additionality test). This is particularly the case where fisheries pressures are listed as a contributor to species decline across the UK SPA network	
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management	Yes	A: Potentially – see comment in limitations column. SM/D: The Fisheries Act 2020 provides the framework for UK fishing policy. Any quota changes will be subject to consultation and approval by MMO and enforcement by the Government.	As above	Measure could be actioned during the operational phase of the project and is therefore dependant on project timescales. However, would require planning to coincide with quota review period.	Lack of political agreement or drive to undertake measure or agreement by ICES scientists.	Monitor effectiveness of reduced take on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.

Table 6: Rating of compensation measures for kittiwake according to criteria (Scoring benchmarks in Table 4).

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
1. Habitat creation	i: Construction of ONSHORE artificial structures to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	4 Direct benefits to kittiwake but not specific to FFC SPA CO's.	4 Reasonable amount of evidence that the measure is effective with some examples. Strong evidence that kittiwake are limited by nesting structures in the southern North Sea. Numerous examples of artificial nesting structures being used by kittiwake. Smaller colonies away from large colonies (such as FFC SPA) are likely to have higher breeding success due to weaker density dependant competition for food resources. There is no guarantee that kittiwake will use the new structure for nesting.	4 Technical delivery is evidenced but some challenges with delivery and some uncertainty associated with the outcomes. However, onshore structure is well evidenced with numerus examples.	4 Measure provides direct benefit to kittiwake (nest sites, access to prey, predator free) but some unknowns exist in relation to effectiveness (i.e., whether kittiwake will choose platform and if prey availability is enough to ensure breeding success). Kittiwake are colonial nesters although initial colonisation of new structure is likely to be slow. The extent of compensation could relate to the size of the structure and therefore the potential number of nest locations.	3 Measure is away from FFC SPA but is accessible from FFC SPA and within the species biogeographic region.	3 Onshore likely to be deliverable in short time frame (within 3 to 5 years) and therefore before anticipated impact.	3 There are a number of uncertainties regarding the securability of the measure and if long term implementation is feasible. Consideration will need to be given to maintenance requirements. Structures are not likely to be long term and may require replacement.	25	Multiple examples exist of onshore kittiwake nesting structures. Measure is likely to be successful and be delivered in relatively short time frame.
	ii: Construction or repurposing of OFFSHORE artificial structures to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	4 Direct benefits to kittiwake but not specific to FFC SPA CO's.	3 Reasonable amount of evidence that the measure is effective with some examples. Strong evidence that kittiwake are limited by nesting structures in the southern North Sea. Numerous examples of artificial nesting structures being used by kittiwake. Smaller colonies away from large colonies (such as FFC SPA) are likely to have higher	3 Technical delivery is evidenced for onshore/ near shore structures however some challenges with delivery and some uncertainty associated with the outcomes for offshore structure. Project likely to be feasible if an appropriate offshore structure (such as a oil platform) can be acquired, and suitable nesting structure	4 Measure provides direct benefit to kittiwake (nest sites, access to prey, predator free) but some unknowns exist in relation to effectiveness (i.e. whether kittiwake will choose platform and if prey availability is high enough to ensure breeding success). However, there are some good examples of where kittiwakes	3 Measure is away from FFC SPA but is accessible from FFC SPA and within the species biogeographic region.	2 Dependant on procurement of offshore structure. Offshore structure may require a longer timeframe (if new structure rather than repurposed) than onshore but may still be achievable prior to anticipated impact.	3 There are a number of uncertainties regarding the securability of the measure and if long term implementation is feasible. Consideration will need to be given to maintenance requirements.	22	Offshore structure specifically for nesting kittiwake is a new concept, but based on evidence is likely to be successful on a much larger scale than onshore structure, due to the size of platforms and location in relation to prey. Reduced certainty of delivery prior to impact occurring if at new structure. However this would not apply for existing colony.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
			breeding success due to weaker density dependant competition for food resources. There is no guarantee that kittiwake will use the new structure for nesting. Potential for larger colony to exist offshore and to be in closer proximity to prey resources.	installed. The construction of an offshore structure would likely be a new concept, however evidence does exist of kittiwake nesting on operation oil and gas platforms in North Sea.	nest successfully in high numbers on offshore structures in the North Sea.Kittiwake are colonial nesters although initial colonisation of new structure is likely to between 3 to 4 years. The extent of compensation could relate to the size of the structure and therefore the potential number of nest locations.					
	iii. Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	3 The focus is on seabed habitat creation which will have some benefit to kittiwake and other seabirds.	2 Limited evidence to suggest measure would be effective in increasing kittiwake breeding success. Without quota restrictions, a spatial closure will be less effective.	3 Little to no evidence of delivery and considerable uncertainty relating to outcomes. Sandeel (the main prey) require sandy substrate to live and spawn which are dynamic and shift location over time. Measure would also require fisheries management to prevent/ control fishing of new habitat (see fisheries measures). Inshore nursery grounds (eg seagrass) may offer a more viable alternative option	3 Potential for measure to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding kittiwake.	4 Measure can be reached by kittiwake from FFC SPA.	2 Little to no certainty measure will be functioning within 10 years due to the uncertainty around prey species recruitment of new seabed habitat. Also consideration of political uncertainty with regards to securing measure.	2 There is a significant amount of uncertainty surrounding the security of the measure and the long term implementation.	19	Uncertainty surrounding the feasibility of such a measure in relation to providing increased prey availability.
2. Reserve creation	i: Designation of new marine SPA in important offshore foraging location.	3 New marine SPA is likely to deliver some benefits to kittiwake along with other seabird features of assemblage if	2 Limited evidence to suggests measure would be effective in increasing kittiwake breeding success. Without quota	1 Considerable uncertainty relating to outcomes. Stakeholders maintain the view that areas which are	3 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a	4 Measure can be reached by kittiwake from FFC SPA.	2 Potential that measure could be functioning prior to impact (< 5 years) although consultation period	3 Measure is legislatively permissible but uncertainties remain with regard to securabillity.	18	Stakeholders maintain the view that all candidate SPAs have been recognised.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
		focused on foraging data.	restrictions/ management, a spatial closure will be less effective.	candidates for designation are already identified and designated. Unlikely push for new marine SPA designation would be accepted.	large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding kittiwake. SPA designation does not directly relate to prey availability.		and decision of previous SPAs may have taken longer.			
3. Species recovery	i: Eradication and/ or control of American mink from an island important to/used by kittiwake using trapping or poisoning techniques.	3 Measure will be undertaken following feasibility study to ascertain predation pressure on kittiwake. Will not be undertaken at FFC SPA.	2 Some evidence is available for this species in relation to predation pressure. No evidence exists in relation to removal of mink at kittiwake colony or subsequent monitoring. However, considerable evidence base exists for predator eradication and/ or control from seabird colonies in general.	4 Ground predator removal is well evidenced at UK seabird colonies and even more so, globally.	3 Measure will provide direct benefit to kittiwake (and wider seabird assemblage) where pressure is present at colony. Calculations will be required to understand the extent of measure. Multiple colonies with pressure can be targeted to increase extent.	3 Predation pressure for this species has not been identified as an impact at FFC SPA. Measure will be undertaken at colony within foraging range of an SPA where kittiwake is present. Measure will be within the biogeographic region for species.	3 Measure will require a feasibility study to ascertain the presence of pressure. This will require gathering local knowledge and potential site visits along with surveys. Eradication and/ or control scheme may also take at least 3 years. Poenitentia for measure to be <5 years.	3 Measure will also include biosecurity protocols where required to ensure colony will remain predator free.	21	Measure depends on feasibility study to locate candidate colony. Removal of mink is well evidenced at seabird colonies generally.
	ii: Eradication and/ or control of feral cat from an island important to/used by kittiwake using trapping/ lethal technique.	3 Measure will be undertaken following feasibility study to ascertain predation pressure on kittiwake. Will not be undertaken at FFC SPA.	2 Some evidence is available for this species in relation to predation pressure. Limited evidence exists in relation to removal of feral cat at kittiwake colony or subsequent monitoring (Isles of Scilly). However, considerable evidence base exists for predator eradication and/ or control from seabird colonies in general.	3 Ground predator removal is well evidenced at UK seabird colonies and even more so, globally. Potential issues associated with target predator and public image.	2 Measure will provide direct benefit to kittiwake (and wider seabird assemblage) where pressure is present at colony. Calculations will be required to understand the extent of measure. Multiple colonies with pressure can be targeted to increase extent.	3 Predation pressure for this species has not been identified as an impact at FFC SPA. Measure will be undertaken at colony within foraging range of an SPA where kittiwake is present. Measure will be within the biogeographic region for species.	3 Measure will require a feasibility study to ascertain the presence of pressure. This will require gathering local knowledge and potential site visits along with surveys. Eradication and/ or control scheme may also take at least 3 years. Poenitentia for measure to be <5 years.	3 Measure will also include biosecurity protocols where required to ensure colony will remain predator free.	19	Measure depends on feasibility study to locate candidate colony. Removal of feral cat is less well evidenced at seabird colonies than other predators.
	iii: Eradication and/ or control of rat (brown rat and or black rat (and house	3	2	4	3	3	3	4	22	Measure depends on feasibility study to locate candidate

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
	mouse) from an island colony using trapping or poisoning techniques.	Measure will be undertaken following feasibility study to ascertain predation pressure on kittiwake. Will not be undertaken at FFC SPA.	Some evidence is available for this species in relation to predation pressure. Considerable evidence base exists for predator eradication and/ or control from seabird colonies in general.	Ground predator removal is well evidenced at UK seabird colonies and even more so, globally.	Measure will provide direct benefit to kittiwake (and wider seabird assemblage) where pressure is present at colony. Calculations will be required to understand the extent of measure. Multiple colonies with pressure can be targeted to increase extent.	Predation pressure for this species has not been identified as an impact at FFC SPA. Measure will be undertaken at colony within foraging range of an SPA where kittiwake is present. Measure will be within the biogeographic region for species.	Measure will require a feasibility study to ascertain the presence of pressure. This will require gathering local knowledge and potential site visits along with surveys. Eradication and/ or control scheme may also take at least 3 years. Poenitentia for measure to be <5 years.	Measure will also include biosecurity protocols where required to ensure colony will remain predator free.		colony. Removal of mouse/rat is well evidenced at seabird colonies generally.
	iv: Exclusion of foxes from a colony using anti-predator fencing	3 Measure will be undertaken following feasibility study to ascertain predation pressure on kittiwake. Will not be undertaken at FFC SPA.	2 Some evidence is available for this species in relation to predation pressure. Considerable evidence base exists for predator eradication and/ or control from seabird colonies in general.	4 Anti-predator fencing is well evidenced at bird colonies.	2 Measure will provide direct benefit to kittiwake (and wider seabird assemblage) where pressure is present at colony. Calculations will be required to understand the extent of measure. Multiple colonies with pressure can be targeted to increase extent.	3 Predation pressure for this species has not been identified as an impact at FFC SPA. Measure will be undertaken at colony within foraging range of an SPA where kittiwake is present. Measure will be within the biogeographic region for species.	4 Measure will require a feasibility study to ascertain the presence of pressure. This will require gathering local knowledge and potential site visits along with surveys. Erection of anti-predator fencing will be a relatively quick component of measure.	3 Measure will also include biosecurity protocols where required to ensure colony will remain predator free. Fence maintenance/ replacement are also likely to be needed.	21	Measure depends on feasibility study to locate candidate colony. Measure can be undertaken rapidly.
	v: Exclusion of great skua from a buffer zone around a kittiwake colony	3 Measure will be undertaken following feasibility study to ascertain predation pressure on kittiwake. Will not be undertaken at FFC SPA.	2 Limited evidence to suggests measure would be effective.	2 There is little to no evidence of delivery and considerable uncertainty in outcomes. Great skua are a protected species and a component of some SPAs. If pursued, measure would need to be at great skua territory away from SPA. Option unlikely to be supported by stakeholders.	2 Measure will provide direct benefit to kittiwake (and wider seabird assemblage) where pressure is present at colony. Calculations will be required to understand the extent of measure. Multiple colonies with pressure can be targeted to increase extent.	2 Predation pressure for this species has not been identified as an impact at FFC SPA. Measure will be undertaken at colony within foraging range of an SPA where kittiwake is present. Measure will be within the biogeographic region for species.	4 Measure will require a feasibility study to ascertain the presence of pressure. This will require gathering local knowledge and potential site visits along with surveys. Territory removal scheme would be short following identification.	2 Significant uncertainty regarding the securability of measure and the long-term implementation.	17	Significant uncertainty regarding the securability of such measure.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
4. Incentives/ disincentives for certain activities	i: Management of recreational pressure at the FFC SPA (or another SPA)	4 Focus would be on SPAs where visitor pressure is a know influencing factor for kittiwake. Would relate to Cos at FFC SPA.	1 Indication from site managers at FFC SPA suggest absence of issue at FFC SPA. Management of recreation pressures at other SPAs should be a component of site management. Kittiwake normally nest of mid-sections of shear cliffs and are unlikely to be impacted by visitor present at SPAs.	3 Technical delivery is evidenced but some challenges with delivery and some uncertainty associated with the outcomes. Management of recreational pressures is well evidenced in other species of animal. Feasibility would be dependant on the location of SPA and access.	2 Measure likely to only provide a very limited benefit to kittiwake at FFC SPA.	2 Unlikely to be a factor at FFC SPA and therefore would only be possible at other SPA within biogeographical region. Measure would need to be significant in extent in order to compensate for impact.	4 Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	4 High degree of confidence that measure can be secured in the long term.	20	Low likelihood of relevance to SPA populations.
	ii: Sandeel fishery exclusion zone	4 Anticipated direct benefit to kittiwake due to sandeel being key prey species and the significant area of exclusion zone.	2 Prey availability is a key limiting factor in kittiwake breeding success. Excluding fisheries from a large area may increase prey availability. Fisheries pressure may however increase outside exclusion zone. Climate change is also a limiting factor related to prey availability.	3 Fisheries exclusions have been undertaken in Scotland and are proposed at the Dogger Bank SAC (inc others). Only relevant bodies such as IFCAs and MMO have powers to implement closed areas to fishing in UK waters. There is currently no legal mechanism to allow a developer to implement fisheries closures. Developers would only be able to prevent fishing from taking place in a given area through the establishment of contractual arrangements with fishermen. This would not result in the area being closed to fishing per se, but simply in access being prohibited, upon	3 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding kittiwake.	4 The measure can be utilised by kittiwake from FFC SPA.	3 Some certainty that measure could be functioning prior to impact (< 5 years) (if based on compensation scheme for fisheries).	2 There is a high degree of uncertainty regarding the security of the measure and long term implementation.	21	Measure would benefit kittiwake at FFC SPA to some degree due the scale of exclusion zone.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
				agreement, for a selected number of fishermen. This would have high costs as fishermen would have to be compensated.						
	iii: Sandeel fisheries exclusion zone within the Hornsea Project Four array area	4 Anticipated direct benefit to kittiwake due to sandeel being key prey species and the large area of exclusion zone.	2 Prey availability is a key limiting factor in kittiwake breeding success. Excluding fisheries from a large area may increase prey availability. Fisheries pressure may however increase outside exclusion zone. Climate change is also a limiting factor related to prey availability.	3 Fisheries exclusions have been undertaken in Scotland and are proposed at the Dogger Bank SAC. Only relevant bodies such as IFCAs and MMO have powers to implement closed areas to fishing in UK waters. There is currently no legal mechanism to allow a developer to implement fisheries closures. Developers would only be able to prevent fishing from taking place in a given area through the establishment of contractual arrangements with fishermen. This would not result in the area being closed to fishing per se, but simply in access being prohibited, upon agreement, for a selected number of fishermen. This would have high costs as fishermen would have to be compensated.	3 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding kittiwake.	3 Measure can be reached by kittiwake from FFC SPA.	3 Some certainty that measure could be functioning within 10 years but uncertainty due to political landscape	2 There is a high degree of uncertainty regarding the security of the measure and long term implementation. Consideration will need to be given to potential political issues or barriers.	20	Measure would benefit kittiwake at FFC SPA to some degree although consideration should be given to the scale of exclusion area.
	iv: Purchase of a sandeel fishery quota	4 Anticipated direct benefit to kittiwake	3 Limited literature or evidence exists which demonstrates	1 No evidence of delivery and considerable	2 Measure may provide limited benefit to kittiwake. Measure	3 Measure within biogeographic region for kittiwake. A	1 Some certainty that measure could be	2 There is a high degree of uncertainty regarding the security	16	Great uncertainty around feasibility of measure however acknowledgement of potential benefit

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
		due to sandeel being key prey species.	effectiveness. The purchase of quota may reduce the overall fishing pressure on a specific fish stock as it would likely result in a reduction in overall landings. However, as fishing quotas are allocated at large geographical scales, the purchase of quota would not guarantee that specific grounds would not be fished. Climate change is also a limiting factor related to prey availability.	uncertainty in outcomes. The purchase of quota by an offshore developer is unlikely to be a viable proposal under the current quota regulations. Different quota rules apply in different countries. In most cases quota cannot be acquired or traded by non-fishing organisations and there are restrictions with regards to the amount of quota that a single organisation can hold.	would require calculations in relation to prey biomass and the requirements of breeding kittiwake.	reduction in quota may reduce the overall effort of a fishing fleet for a specific quota species, however, it would not guarantee that specific grounds (i.e. ground of importance as feeding areas to SPA features).	functioning within 10 years.	of the measure and long term implementation. Quotas are variable year to year and must be returned after 3 years if not used.		to species as a result of quota purchase.
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management	4 Anticipated direct benefit to kittiwake due to sandeel being key prey species.	4 Prey availability is a key limiting factor in kittiwake breeding success. The reduction of quota would reduce the overall fishing pressure on a specific fish stock which is a vital component of kittiwake diet. An ICES led initiative could cover an extensive area, increasing the chances of benefits to FFC SPA seabird populations. Climate change is also a limiting factor related to prey availability.	2 Requires Government led initiative and collaboration with multiple parties.	5 Sufficient change in quota would likely provide benefit to kittiwake. Scale likely to be large and therefore compensate a significant margin above numbers of birds potentially impacted by Project. Measure would require calculations in relation to prey biomass and the requirements of breeding kittiwakes.	4 Measure highly likely to be within foraging range of kittiwake from FFC SPA if undertaken within this region of the North Sea. A reduction in quota will reduce the overall fishing effort for a key prey species.	2 Some certainty that measure could be functioning prior to impact (< 5 years).	3 There are some uncertainties associated with the long-term implementation of this measure. However, due to it being led by ICES the measure is likely to be more robust than the year to year (or other short term) leasing or purchasing of sandeel quota.	24	Some uncertainty around feasibility of measure however acknowledgement of potential benefit to species as a result of an ICES led quota change.

Appendix C : Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: Guillemot and Razorbill.

Table 7: Description of measures for short-listing criteria of guillemot and razorbill compensation measures.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
1. Species recovery	i: Eradication and/ or control of rats from an island colony of guillemot and razorbill using rodent traps or poisoned bait.	Yes	A: Potentially yes. SM/D: Locate seabird colony island which supports rats and undertake eradication programme to remove and/ or them.	Limited evidence although Mavor *et al.* (2004) reported that brown rat depredation of guillemot and razorbill eggs on Canna resulted in loss of eggs and re-distribution of nesting birds at the colony.	<3 years due to the need for site identification, ground truthing (understanding the level of infestation), deployment of traps/ poisoned bait (or other method tbc). Duration of eradication and/ or control process will depend on size of island and population size of target eradication and/ or control species.	Biosecurity – potential for island to be recolonised by species from nearby areas (natural or human induced). Potential challenge associated with working across administrative boundaries	Monitor effectiveness of eradication and/ or control method and productivity at island. Potential to partner with SNCB, RSPB, or TWT depending on location.
2. Habitat creation	i: Encourage establishment of a new colony in an area close to heightened prey availability using models and call playback.	Yes	A: Yes SM/ D: Site suitability – ensuring new colony is in a suitable area i.e. preferably offshore and close to foraging grounds.	Reducing the distance guillemot and razorbill need to travel in order to reach key foraging habitat may increase productivity. Birds would also be able to exploit prey resources more efficiently where nesting numbers at colony are smaller and therefore levels of resource competition are reduced (Furness *et al.* 2013).	Measure could be initiated before OWF operation. However, species may be reluctant to establish new colony rapidly, even with the use of playback of guillemot and razorbill calls and models (Jones *et al.* 2011).	Risk of not attracting enough birds to establish a colony. Evidence of similar projects failing at high cost exists (Jones and Kress 2011).	Monitor establishment of new colony and productivity. Potential to partner with SNCB, RSPB, or TWT depending on location.
	ii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	Yes - in theory, but may need more evidence on scale required and location	A: Yes – Although the mechanism for delivery would require consideration.	It is well evidenced that the key cause of guillemot and razorbill population decline and reduced productivity at colonies throughout the UK is due to reduced prey availability (Daunt *et al.* 2008). Creation of new seabed habitat for key prey within foraging range of SPA would in theory increase prey availability. However, further work required to determine if evidence exists of this having been successfully undertaken elsewhere. Will need to quantify benefits of habitat to prey (e.g., seagrass as a nursery ground) and then demonstrate links to seabirds	1 year or more to identify key foraging locations and initiate planning process which may take at least 2 years.	Habitat may attract increased fisheries effort if not undertaken in conjunction with fisheries management. May benefit predatory fish and seabirds other than the target species	Monitor prey usage, availability and use by seabirds and productivity at colony. Potential to partner with SNCB or/and RSPB depending on location.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
3. Incentives/ disincentives for certain activities	i: Sandeel and sprat fishery exclusion zone.	Yes - (previously through Common Fisheries Policy) - Exclusion of fisheries from area for SPA impacts is considered a management measure, and therefore is not in addition to normal management measures (does not meet the additionality test). This is particularly the case where fisheries pressures are listed as a contributor to species decline across the UK SPA network.	A: Feasible if delivered by government – see comment in limitations column. SM/D: Common Fishery Policy will be replaced with new powers under the proposed Fisheries Bill executed by the MMO. Any exclusions will be subject to consultation and approval by MMO and enforcement by the government and therefore may not meet the criteria "ability to secure".	It is well evidenced that auk productivity throughout the UK is influenced by prey availability, with overfishing of sandeel and sprat (which auk are heavily reliant on) being a key factor in reducing prey (Mitchell *et al.*. (2004), JNCC. (2020)). Excluding commercial fisheries of these species may increase prey availability to guillemot and razorbill and therefore increase productivity (e.g. Daunt *et al.* (2008), Frederiksen *et al.* (2004)).	Uncertainty relating to possibility and timescales at this stage.	Measure would be reliant on government power to exclude fisheries. Excluding fisheries in one area could just displace fishing effort to other regions to achieve the same quota. Compensating fisheries could cost a significant amount over the lifetime of the project	Monitor effectiveness of exclusion zone on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.
	ii: Sandeel and sprat fisheries exclusion zone within the Hornsea Project Four array area.	Yes - (previously through Common Fisheries Policy) - Exclusion of fisheries from area for SPA impacts is considered a management measure, and therefore is not in addition to normal management measures (does not meet the additionality test). This is particularly the case where fisheries pressures are listed as a contributor to species decline across the UK SPA network.	A: Feasible if delivered by government – see comment in limitations column.SM/D:. Fisheries Act 2020 provides the framework for UK fishing policy. Any exclusions will be subject to consultation and approval by MMO and enforcement by the government and therefore may not meet the criteria "ability to secure". Potential for other options to secure measure, including securing an exclusion zone around each turbine to prevent fishing or pay fisheries to stay out of array.	It is well evidenced that auk productivity throughout the UK is influenced by prey availability, with overfishing of sandeel and sprat (which auk are heavily reliant on) being a key factor in reducing prey (Mitchell *et al.*. (2004), JNCC. (2020)). Excluding commercial fisheries of these species may increase prey availability to guillemot and razorbill and therefore increase productivity (e.g. Daunt *et al.* (2008), Frederiksen *et al.* (2004)).	Measure could be actioned during the operational phase of the project and is therefore dependant on project timescales.	Potential for exclusion to displace fishing effort to likely another FFC SPA auk foraging area. Potential for a small impact based on the low existing fishing intensity in HOW04. Displacement of auks from array area may limit impact. However, prey may 'spill' into surround waters. Payment of fisheries to not fish in array would cost a significant amount over the lifetime of the project (greater cost than available to a singular developer).	Monitor effectiveness of exclusion zone on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.
	iii: Purchase of a sandeel and sprat fishery quota	Yes	A: Potentially – see comment in limitations column. SM/D: Fisheries Act 2020 provides the framework for UK fishing policy. Any exclusions will be subject	It is well evidenced that auk productivity throughout the UK is influenced by prey availability, with overfishing of sandeel and sprat (which auk are heavily reliant on) being a key factor in reducing prey (Mitchell *et al.*. (2004), JNCC. (2020)). Excluding	Under the current quota regulations, the purchase of quota by an offshore developer is not a viable proposal.	Under the current quota regulations, the purchase of quota by an offshore developer is not a viable proposal. (greater cost than available to a singular developer).	Monitor effectiveness of reduced take on prey availability and productivity at colony. Potential to partner with

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
			to consultation and approval by MMO and enforcement by the government and therefore may not meet the criteria "ability to secure".	commercial fisheries of these species may increase prey availability to guillemot and razorbill and therefore increase productivity (e.g. Daunt *et al.* (2008), Frederiksen *et al.* (2004)).			SNCB, RSPB, or TWT depending on location.
	iv: Sandeel and sprat fisheries exclusion in wintering areas.	Yes	A: Feasible if delivered by government – see comment in limitations column. SM/D: Fisheries Act 2020 provides the framework for UK fishing policy.. Any exclusions will be subject to consultation and approval by MMO and enforcement by the government and therefore may not meet the criteria "ability to secure".	Winter is likely a critical season in determining guillemot and razorbill survival, with 'wrecks' of birds having been recorded (e.g. Harris & Wanless 1996). Increasing the amount of prey available to these species at key UK wintering locations may reduce mortality linked to prey availability (Furness *et al.* 2013)	Time required for analysis of important wintering zone in which to apply. Uncertainty relating to possibility and timescales at this stage.	Measure would be reliant on government power to exclude fisheries. Compensation of fisheries would come at a significant cost to the Project during the operational lifetime of the OWF although the duration of measure may not need to be in line with project lifetime.	Monitor effectiveness of reduced take on prey availability and species over-winter survival rates. Potential to partner with SNCB, RSPB, or TWT depending on location.
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management	Yes	A: Yes SM/D: Fisheries Act 2020 provides the framework for UK fishing policy.. Any exclusions will be subject to consultation and approval by MMO and enforcement by the government and therefore may not meet the criteria "ability to secure".	It is well evidenced that the key cause of auk population decline at colonies throughout the UK is due to reduced prey availability, with overfishing of sandeel (which auks are heavily reliant on during the breeding season) being a key factor (Daunt *et al.* 2008, Frederiksen *et al.* 2004). Excluding commercial fisheries of this species may increase prey availability to auks and therefore increase productivity (Daunt *et al.* 2008, Frederiksen *et al.* 2004).	Measure could be actioned during the operational phase of the project and is therefore dependant on project timescales. However, would require planning in conjunction with quota review period.	Lack of political agreement or drive to undertake measure or agreement by ICES scientists	Monitor effectiveness of reduced take on prey availability and productivity at colony. Potential to partner with SNCB, RSPB, or TWT depending on location.
4. Reserve creation	i: Designation of new marine SPA at important offshore foraging location.	Yes - in theory, depending on Governments willingness	A: Yes SM/D: Identify a suitable location which obtains the prerequisites for SPA designation. Will require support from various stakeholders.	Previous examples include the Irish Sea Front SPA and Northumberland Marine SPA which were designated to support foraging seabirds away from breeding colonies.	1 year or more to identify key foraging locations (i.e. those highlighted in Cleasby *et al.* (2020)) and initiate planning process which may take at least 2 years.	Prey hotspots may shift over time and move beyond the boundary of a new SPA. Proposal for SPA may not be accepted by SNCBs and other associated stakeholders. Additional management measures via EIFCA and MMO to control fishery would be required to act in partnership with	Monitor prey availability and habitat use by seabirds at new SPA and productivity at nearby colony. Potential to partner with SNCB or/ and RSPB

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
						designation. Designation would need to go through public consultation and be supported by Defra.	depending on location.
5. Reduction of other threats and pressures	i: Reduce bycatch.	Yes	A: Yes. SM/D: Encourage more sustainable fishing practices and/or provide new fishing technology to fisheries which reduces risk of bycatch.	ICES (2013) and Bradbury *et al.* 2017 identified Guillemot & Razorbill as species known to be caught or sensitive to Bycatch in European and UK waters. Žydelis (2013) also highlighted Guillemot & Razorbill as most concern for bycatch within gillnet fisheries in northern Europe. However, limited monitoring of seabird bycatch has been done in European waters. Implementing measures to prevent bycatch (such as high visibility netting and a code of conduct) would reduce this pressure. Successful delivery of such measures has been evidenced for Auks (Filey Bay).	<2 years to determine where measure could be implemented and action management.	Lack of monitoring seabird data on bycatch. Would require the establishment of collaborative partnerships with the fishing industry and potentially other bodies such as the Environment Agency. Potential challenge if there is a need to work across administrative boundaries but easier to implement within the UK.	Monitor effectiveness of management methods in reducing mortality. Potential to partner with SNCB, RSPB and other NGOs.

Table 8: Rating of compensation measures for guillemot and razorbill according to criteria (Scoring benchmarks in Table 4).

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
1. Species recovery	i: Eradication and/ or control of rats from UK island colony of guillemot and razorbill using rodent traps or poisoned bait.	3 Measure will be undertaken following feasibility study to ascertain predation pressure on auks. Will not be undertaken at FFC SPA.	3 Some evidence is available for this species in relation to predation pressure. Considerable evidence base exists for predator eradication and/ or control from seabird colonies in general.	4 Ground predator removal is well evidenced at UK seabird colonies and even more so, globally.	3 Measure will provide direct benefit to auks (and wider seabird assemblage) where pressure is present at colony. Calculations will be required to understand the extent of measure. Multiple colonies with pressure can be targeted to increase extent.	3 Predation pressure for this species has not been identified as an impact at FFC SPA. Measure will be undertaken outside of any Natura 2000 site (due to additionality to site management). Measure will be undertaken at colony within foraging range of an SPA where auks is present. Measure will be within UK and therefore within biogeographic region for species.	3 Measure will require a feasibility study to ascertain the presence of pressure. This will require gathering local knowledge and potential site visits along with surveys. Eradication and/ or control scheme may also take at least 3 years. Poenitentia for measure to be <5 years.	4 Measure will also include biosecurity protocols where required to ensure colony will remain predator free.	23	Measure depends on feasibility study to locate candidate colony. Removal of ground predators is well evidenced at seabird colonies generally.
2. Habitat creation	i: Encourage establishment of a new colony in an area close to heightened prey availability using models and call playback.	4 Some direct benefits to the targeted species and the seabird assemblage.	2 Some evidence available to demonstrate effectiveness but with limited examples. Most examples relate to encouraging recolonisation at colony where predators have been removed. Auks are likely to already inhabit suitable nesting habitat. Examples relate Reducing the distance guillemot and razorbill need to travel in order to reach key foraging habitat may increase productivity. Birds would also be able to exploit prey resources more efficiently where	2 Technical delivery is evidenced with some limited examples. Examples suggest colony recolonisation is suitable for methods following removal of predators. New colony would require the specific habitat requirements of each species.	2 Measure provides limited benefit to species. Considerations will be required in order to understand the scale of measure.	2 Measure is away from FFC SPA but is accessible from FFC SPA and within the species biogeographic region.	1 Examples suggest measure can take a significant amount of time (i.e. puffin colony on US east coast took 35 years to reach 100 pairs).	2 There are a significant number of uncertainties regarding the securability of the measure and if long term implementation is feasible. Consideration will need to be given to maintenance requirements. Structures are not likely to be long term and may require replacement.	15	Limited evidence to support measure with potential for considerable time scales.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
			nesting numbers at colony are smaller and therefore levels of resource competition are reduced (Furness *et al.* 2013).							
	ii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks	3 The focus is on seabed habitat creation protection to protect key species of prey availability	2 Limited evidence to suggest measure would be effective in increasing auks breeding success without changes to quota as well.	3 Little to no evidence of delivery and considerable uncertainty relating to outcomes. Sandeel (the main prey) require sandy substrate to live and spawn which are dynamic and shift location over time. Measure would also require fisheries management to prevent/ control fishing of new habitat (see fisheries measures). Inshore nursery grounds (eg seagrass) may offer a more viable alternative option	3 Potential for measure to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding auks.	4 Measure can be reached by auks from FFC SPA.	2 Little to no certainty measure will be functioning within 10 years due to the uncertainty around prey species recruitment of new seabed habitat.	2 There is a significant amount of uncertainty surrounding the security of the measure and the long-term implementation.	19	Uncertainty surrounding the feasibility of such a measure in relation to providing increased prey availability.
3. Incentives/ disincentives for certain activities	i: Sandeel and sprat fishery exclusion zone.	4 Anticipated direct benefit to auks due to sandeel being key prey species and the significant area of exclusion zone.	2 Prey availability is a key limiting factor in auk breeding success. Excluding fisheries from a large area may increase prey availability. Fisheries pressure may however increase outside exclusion zone. Climate change is also a limiting factor related to prey availability.	3 Fisheries exclusions have been undertaken in Scotland and are proposed at the Dogger Bank SAC (Inc. others). Only relevant bodies such as IFCAs and MMO have powers to implement closed areas to fishing in UK waters. There is currently no legal mechanism to allow a developer to implement fisheries	3 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding auks.	3 The measure can be utilised by auks from FFC SPA.	3 Some certainty that measure could be functioning prior to impact (< 5 years) (if based on compensation scheme for fisheries).	2 There is a high degree of uncertainty regarding the security of the measure and long term implementation.	20	Measure would benefit auks at FFC SPA to some degree due the scale of exclusion zone. Sprat does not support important fishery in area and is therefore not father considered by the measure.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
				closures. Developers would only be able to prevent fishing from taking place in a given area through the establishment of contractual arrangements with fishermen. This would not result in the area being closed to fishing per se, but simply in access being prohibited, upon agreement, for a selected number of fishermen. This would have high costs as fishermen would have to be compensated.						
	ii: Sandeel and sprat fisheries exclusion zone within the Hornsea Project Four array area.	4 Anticipated direct benefit to auks due to sandeel being key prey species and the large area of exclusion zone.	2 Prey availability is a key limiting factor in auks breeding success. Excluding fisheries from an area may increase prey availability, however it is anticipated a significant are would be required to be effective. Auks are likely to be displaced from array area and buffer to a lesser degree and would therefore only benefit from spill over to areas outside of array or if birds habituate and enter array. Fisheries pressure may however increase outside exclusion zone. Climate change is also a limiting factor	2 Fisheries exclusions have been undertaken in Scotland and are proposed at the Dogger Bank SAC. Only relevant bodies such as IFCAs and MMO have powers to implement closed areas to fishing in UK waters. There is currently no legal mechanism to allow a developer to implement fisheries closures. Developers would only be able to prevent fishing from taking place in a given area through the establishment of contractual arrangements with fishermen. This would not result in the area being closed to fishing	2 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding auks.	3 Measure can be reached by auks from FFC SPA.	3 Some certainty that measure could be functioning prior to impact (< 5 years) (if based on compensation scheme for fisheries).	2 There is a high degree of uncertainty regarding the security of the measure and long-term implementation.	18	Measure would benefit auks at FFC SPA to some degree although consideration should be given to the scale of exclusion area. Sprat does not support important fishery in area and is therefore not father considered by the measure.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
			related to prey availability.	per se, but simply in access being prohibited, upon agreement, for a selected number of fishermen. This would have high costs as fishermen would have to be compensated.						
	iii: Purchase of a sandeel and sprat fishery quota	4 Anticipated direct benefit to auks due to sandeel being key prey species.	3 Some literature or evidence known to exist which demonstrates effectiveness. The purchase of quota may reduce the overall fishing pressure on a specific fish stock as it would likely result in a reduction in overall landings. However, as fishing quotas are allocated at large geographical scales, the purchase of quota would not guarantee that specific grounds would not be fished.	1 No evidence of delivery and considerable uncertainty in outcomes. The purchase of quota by an offshore developer is unlikely to be a viable proposal under the current quota regulations. Different quota rules apply in different countries. In most cases quota cannot be acquired or traded by non-fishing organisations and there are restrictions with regards to the amount of quota that a single organisation can hold.	2 Measure may provide limited benefit to auks. Measure would require calculations in relation to prey biomass and the requirements of breeding auks.	3 Measure within biogeographic region for auks. A reduction in quota may reduce the overall effort of a fishing fleet for a specific quota species, however, it would not guarantee that specific grounds (i.e., ground of importance as feeding areas to SPA features).	2 Some certainty that measure could be functioning within 10 years.	1 There is a high degree of uncertainty regarding the security of the measure and long-term implementation. Quotas are variable year to year and must be returned after 3 years if not used.	16	Great uncertainty around feasibility of measure. However, acknowledgement of potential benefit to species as a result of quota purchase. Sprat does not support important fishery in area.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
	iv: Sandeel and sprat fisheries exclusion in wintering areas.	4 Anticipated direct benefit to auks due to sprat (and sandeel to a lesser extent) being key prey species during the winter.	3 Prey availability is a key limiting factor in auks overwinter survival with 'wrecks' due to food shortages known to occur. Excluding fisheries of key prey from a large area may increase prey availability during this period. Fisheries pressure may however increase outside exclusion zone. Climate change is also a limiting factor related to prey availability.	3 Limited evidence of sprat fisheries exclusions. Only relevant bodies such as IFCAs and MMO have powers to implement closed areas to fishing in UK waters. There is currently no legal mechanism to allow a developer to implement fisheries closures. Developers would only be able to prevent fishing from taking place in a given area through the establishment of contractual arrangements with fishermen. This would not result in the area being closed to fishing per se, but simply in access being prohibited, upon agreement, for a selected number of fishermen. This would have high costs as fishermen would have to be compensated. Sprat distribution during the winter is likely to be outside the 200 km buffer of FFC SPA and within the core wintering areas of auks.	2 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding auks.	2 Measure would likely be reached by auks during the wintering period (particularly in the southern North Sea).	3 Some certainty that measure could be functioning within 10 years.	2 There is a high degree of uncertainty regarding the security of the measure and long-term implementation.	19	Measure would benefit auks at FFC SPA to some degree if exclusion zone was large enough and focused on the species key wintering areas. Sandeel are less likely to be important prey component during winter and are therefore not father considered by this measure.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management	4 Anticipated direct benefit to auks due to sandeel being key prey species.	4 Prey availability is a key limiting factor in auk breeding success. The reduction of quota would reduce the overall fishing pressure on a specific fish stocks which is a vital component of guillemot and razorbill diet. An ICES led initiative could cover an extensive area, increasing the chances of benefits to FFC SPA seabird populations. Climate change is also a limiting factor related to prey availability.	2 Requires Government led initiative and collaboration with multiple parties	5 Sufficient change in quota would likely provide benefit to auk species. Scale likely to be large and therefore compensate a significant margin above numbers of birds potentially impacted by Project. Measure would require calculations in relation to prey biomass and the requirements of breeding auks.	3 Measure highly likely to be within foraging range of guillemot and razorbill from FFC SPA if undertaken within this region of the North Sea. A reduction in quota will reduce the overall fishing effort for a key prey species.	2 Some certainty that measure could be functioning prior to impact (< 5 years).	3 There are some uncertainties associated with the long-term implementation of this measure. However, due to it being led by ICES, the measure is likely to be more robust than the year to year (or other short term) leasing or purchasing of quota.	23	Some uncertainty around feasibility of measure however acknowledgement of potential benefit to species as a result of an ICES led quota change.
4. Reserve creation	i: Designation of new marine SPA at important offshore foraging location.	3 New marine SPA is likely to deliver some benefits to auks along with other seabird features of assemblage if focused on foraging data.	2 Limited evidence to suggests measure would be effective in increasing auks breeding success specifically if the quota was not managed as well.	1 Considerable uncertainty relating to outcomes. Stakeholders maintain the view that areas which are candidates for designation are already identified and designated. Unlikely push for new marine SPA designation would be accepted.	3 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding auks. SPA designation does not directly relate to prey availability.	4 Measure can be reached by auks from FFC SPA.	2 Potential that measure could be functioning prior to impact (< 5 years) although consultation period and decision of previous SPAs may have taken longer.	3 Measure is legislatively permissible but uncertainties remain with regard to securability.	18	Stakeholders maintain the view that all candidate SPAs have been recognised.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long-term Implementation	Overall Score	Notes
5. Reduction of other threats and pressures	i: Reduce bycatch.	4 This measure focuses solely on the target species and will directly benefit species from FFC SPA during non-breeding season. .	3 ICES (2013),Bradbury *et al.* (2017) and Northridge *et al.*, (2020) identified Guillemot & Razorbill as species known to be caught or sensitive to Bycatch in European and UK waters. Žydelis (2013) also highlighted Guillemot & Razorbill as most concern for bycatch within gillnet fisheries in northern Europe. However, limited monitoring of seabird bycatch has been done in European waters. Some evidence that measure is effective for Auk species.	4 Implementing measures to prevent bycatch (such as high visibility netting, above water deterrents and a code of conduct) would reduce this pressure. Successful delivery has been evidenced for Auks (e.g., Filey Bay) but a lack of data on bycatch numbers provides some uncertainty. Trials are being planned for further bycatch reduction techniques by NGOs.	4 Measure will provide direct benefit to auks based on the likely location of targeted measure. However further consideration will need to be given to produce a robust estimate on the likely extent of benefit.	3 Measure will be reached by auks from multiple designated SPAs and will directly benefit species from FFC SPA during non-breeding season.	4 May take some time to implement, particularly if there is a need to work with other regulatory bodies or partners. Focusing on a single and/or smaller scale fishery within the UK may reduce timescales.	4 Measure is legislatively permissible with examples of such a measure being secured successfully.	26	Uncertainty relating to numbers of birds impacted due to lack of seabird bycatch data.

Appendix D : Hornsea Four Derogation work: Criteria for short-listing of compensatory measures: Gannet.

Table 9: Description of measures for short-listing criteria of gannet compensation measures.

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
1.Incentives/ disincentives for certain activities	i: End legal harvest of approximately 2000 gannet chicks at Sula Sgeir each year.	Yes.	A: Potentially – See limitations column. SM/D: To be determined.	Productivity at Sula Sgeir is low compared to the high productivity of gannets breeding at other colonies. This is likely due to the harvest of 2000 gannet chicks per year, and the associated disturbance to other nesting gannet during the harvest. Ending the harvest would likely lead to an increase in productivity to approximately 2000 birds and thus result in more rapid growth of breeding numbers at that colony.	1 or more years due to the likely complex discussions involved with numerous stakeholders and social groups.	Measure may not be acceptable for cultural reasons as gannet harvest is an important part of the local culture in north Lewis (Murray 2008). Temporary cessation of harvesting may be more feasible for a time span to be discussed as appropriate. Potential challenge associated with working across administrative boundaries	Monitor effectiveness of measure on productivity at colony. Potential to partner with SNCB, or RSPB.
2.Habitat creation	i. Encourage more rapid expansion of small colonies with use of models and playback of calls.	Yes.	A: Yes SM/D: Identify a newly established small colony where gannet is not a designated feature and encourage more rapid expansion by enticing prospecting gannets to breed. Using model gannets and call playback will speed up process.	St Abb's Head currently supports a non-designated breeding gannet population which is gradually increasing in size. Encouraging more rapid expansion using models of gannet and playback of calls may increase the productivity of the colony. Birds would also be able to exploit prey resources more efficiently where nesting numbers at a colony are smaller and therefore levels of resource competition are reduced (Furness et al. 2013).	Colony is already established although increasing the rate of colonisation using models and call playback may take at least 2 years.	Gannet may displace other SPA species from nest habitat (such as guillemot). Nesting habitat may be limited for species at the colony. Capacity may be reached under the current colonisation rate without action. Potential challenge associated with working across administrative boundaries.	Monitor growth of colony and productivity. Potential to partner with SNCB, RSPB, or TWT depending on location.
	ii. Construction of ONSHORE artificial structures to encourage a new gannet colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	Yes – If the structure is in a suitable area i.e., onshore and close to foraging grounds.	A: Yes SM/D: Identification of suitable location for an artificial structure to be constructed which will attract gannet.	Gannet are known to use artificial nest sites (e.g. Australasian gannet (Eremorphila (2014) and northern gannet (Lyngs (2015)).	Construction of artificial nest sites could be achieved before OWF operation. Colonisation would be expected to occur naturally within 3-4 years. Potential to shorten this by using playback of calls and models (Jones *et al.* 2011).	Risk of not attracting enough gannet to establish a colony.	Monitor use of artificial nesting habitat and productivity. Potential to partner with SNCB, RSPB or TWT depending on location.
	iii. Construction or repurposing of OFFSHORE artificial structures to encourage a new gannet colony outside of FFC SPA at a location lacking suitable nesting habitat (and	Yes – If the structure is in a suitable area i.e., offshore and close to foraging grounds.	A: Yes, SM/D: Identification of suitable location for an artificial structure to be	Gannet are known to use artificial nest sites (e.g. Australasian gannet (Eremorphila (2014) and northern gannet (Lyngs (2015)).	Construction of artificial nest sites could be achieved before OWF operation. Colonisation would be expected to occur naturally within 3-4 years for a new structure or potentially	Risk of not attracting enough gannet to establish a colony.	Monitor use of artificial nesting habitat and productivity. Potential to partner with SNCB,

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
	preferably near to foraging ground and away from OWFs).		constructed which will attract gannet		immediately for a repurposed structure. Potential to shorten this by using playback of calls and models (Jones *et al.* 2011).		RSPB or TWT depending on location.
	iv. Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks.	Yes - in theory, but may need more evidence on scale required and location.	A: Yes SM/D: mechanism for delivery requires further consideration.	Creation of new seabed habitat for key prey within foraging range of SPA would in theory increase prey availability. However, further work required to determine if evidence exists of this having been successfully undertaken elsewhere. Will need to quantify benefits of habitat to prey (e.g., seagrass as a nursery ground) and then demonstrate links to seabirds.	1 year or more to identify key foraging locations (i.e., those highlighted in Cleasby et al. (2020)) and initiate planning process. Uncertainty over length of time for seabed habitat to be colonised and subsequently increase prey availability. Further consideration required.	Habitat may attract increased fisheries effort if not undertaken in conjunction with fisheries management. May benefit predatory fish and seabirds other than the target species.	Monitor prey usage, availability and use by seabirds and productivity at colony. Potential to partner with SNCB or/and RSPB depending on location.
3. Reserve creation	i. Designation of new marine SPA at important offshore foraging location away from OWF.	Yes.	A: Yes SM/D: Identify a suitable location which obtains the prerequisites for SPA designation. Will require support from various stakeholders.	Designation of a new SPA in an area of important foraging habitat for the species with the potential to reduce fishing pressure. Previous examples include the Irish Sea Front SPA and Northumberland Marine SPA which were designated to support foraging seabirds away from breeding colonies.	1 year or more to identify key foraging locations and initiate designation process which may take a number of years to implement especially given lack of clarity on the process due to Brexit.	Hotspots of prey may shift over time and move beyond the boundary of new SPA. Proposal for SPA may not be accepted by SNCBs and other associated stakeholders. Additional management measures via EIFCA and MMO to control fishery would be required in partnership with designation. Would need to go through public consultation and be supported by Defra. Prey availability is not a limiting factor.	Monitor prey availability and habitat use by seabirds at new SPA and productivity. Potential to partner with SNCB or/ and RSPB depending on location.
4. Habitat restoration or improvement	i. Removal of hazardous objects at Bass Rock colony to reduce bird strike and entrapment.	Yes	A: Yes SM/ D: Contract works at site during the non-breeding season to remove hazardous objects.	Approximately 20 adult gannets die as a result of collision with metal handrail along the clifftop of the colony per year. Approximately 30 fledglings die from being trapped in accumulated mud between the rock and the wall of the derelict lighthouse outbuildings per year. Landscaping work to remove both hazards would prevent further deaths.	1 or more years as it would only be possible to complete these works during October, when no gannet are present at the colony.	Measures will require landowner's permission. Potential challenge associated with working across administrative boundaries.	Monitor effectiveness of management method and productivity at the Bass Rock colony. Potential to partner with SNCB and RSPB.
5. Reduction of other threats and pressures	i. Reduce gannet bycatch.	Yes	A: Potentially yes. SM/D: Encourage more sustainable fishing	ICES (2013), Bradbury *et al.* (2017) and Northridge *et al.*, (2020) identified gannet as a species known to be caught or	<2 years to determine where measure could be implemented and action management.	Lack of monitoring seabird data on bycatch. Would require the establishment of collaborative partnerships with the fishing	Monitor effectiveness of management method in reducing

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
			practices or provide new fishing technology to fisheries which reduces risk of bycatch.	sensitive to Bycatch in European and UK waters. BirdLife International (2009) estimated the Spanish Gran Sol fishery accidentally caught 1,331 gannets per year in 2006/07. Similar fishing practices in other fisheries may be having a similar impact, particularly in regions gannet visit outside of the breeding season. Implementing measures to prevent bycatch (such as line scarers and other deterrents) would reduce this pressure.		industry and potentially other bodies such as the Environment Agency. Potential challenge if there is a need to work across administrative boundaries but easier to implement within the UK.	mortality. Potential to partner with SNCB, RSPB and other NGOs.
	ii. Reduction in entanglement of gannets in salmon aquaculture netting.	Yes	A: Yes SM/D: Identify farm which has recorded mortalities and provide equipment to prevent further deaths.	Gannets are attracted by the presence and activity of fish within salmon pens in coastal aquaculture facilities and may attempt to dive to catch these fish. As a result, they can become entangled in the netting covering these pens. Furness (2019) suggests 60 gannets were killed in 2019 at a single farm. Deterring gannets or coving the pens in fine mesh to reduce visibility of fish and prevent entanglement would reduce this risk.	1 year or more. Measure could be implemented relatively quickly.	Would require cooperation of aquaculture owners. Particular focus on areas of salmon farming (i.e. Scotland) which would require cooperation with SNH. Potentially issue dealing with obtaining agreement of measure across administrative boundaries and the risk of the need to overcompensate due to distance from FFC.	Monitor effectiveness of management method in preventing gannet mortality. Potential to partner with SNCB, RSPB and other NGOs.
	iii. Management of recreational pressure at the FFC SPA.	Yes	No - Recreational pressures are already managed at FFC SPA and therefore option is additive to existing measures undertaken by site managers.	Limited evidence of recreational pressures impacting gannet productivity in the FFC SPA.	<2 years to determine where measure could be implemented and action management.	Social and stakeholder support should be considered if there is potential to limit access to site. Likely that measure is already actioned at SPA in line with site management.	Monitor effectiveness of management method and productivity at colony. Potential to partner with SNCB and RSPB.
	iv. Management of visitor pressure at Bass Rock.	Yes	Yes - Recreational pressures are already managed at SPA. Any measures would need to demonstrate that they are additional to existing management.	Photographic tours to the colony require visitors to step over gannet nests to reach viewing platform which may lead to loss of chicks and eggs through disturbance. Trips are run numerous times per week during	1 or more years as it would only be possible to complete these works during October when no gannet are present at the colony.	Birds may collide with tunnel. Potential challenge associated with working across administrative boundaries.	Monitor effectiveness of management method and productivity at colony. Potential to

Measure	Compensation Option	Feasibility	Acceptability (A)/ securing mechanisms/ delivery (SM/D)	Available evidence	Estimated timeframe for delivery	Limitations, threats and unintended consequences	Monitoring
				the breeding season. Constructing a tunnel from landing site to viewing platform would reduce disturbance to nesting birds and eliminate lost chicks and eggs via this impact.			partner with SNCB and RSPB.
	v. Removal of plastics/fishing debris incorporated into gannet nests	Yes	A. Potentially SM/D - Landings on many colonies occur annually for research/monitoring purposes - additional visits could be supported at these colonies for the purpose of freeing birds from entanglement around fledging time (Late September/October). Would require contract work during non-breeding season to remove debris.	Gannets collect floating material to construct nests, at certain colonies up to 100% of gannet nests contain plastic debris (O'hanlon et al. 2019). These plastics build up year on year as birds add more material to nests. There is evidence that this can cause an increase in mortality at certain colonies. At Grassholm, Wales, 62.85 ± 26.84 (range minima 33–109) birds were entangled each year, totalling 525 individuals over eight years, the majority of which were nestlings (Votier et al. 2011). It has been estimated over 53 birds may be killed per year in Alderney. At Grassholm, RSPB wardens make annual trips to the island to free entangled birds. Removal of debris from nests would be practically challenging but has been attempted in the past at colonies in Alderney.	Annually for additional efforts to free birds from entanglement at colonies. 1 or more years for removal as it would only be possible to complete these works during October, when no gannet are present at the colony.	Removing the plastic from gannet nests will be logistically challenging. The quantities of debris are likely to be very large and they would need to be extracted from an exposed offshore island with poor access.These works would result in the removal of pedestal nests that have been constructed over a number of years, which may have deleterious impacts on the structure and functioning of the colony - though the effects of this are largely unknown. This method does not deal with removal of the source of plastic debris in the marine environment (birds are likely to rebuild nests with more plastic debris) , so would be best completed in conjunction with removal of floating plastic debris from the marine environment.	Monitor effectiveness of management method in reducing mortality. Potential to partner with SNCB, RSPB and other NGOs.

Table 10: Rating of compensation measures for gannet according to criteria (Scoring benchmarks in Table 4).

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long Term Implementation	Overall Score	Notes
1.Incentives/ disincentives for certain activities	i: End legal harvest of approximately 2000 gannet chicks at Sula Sgeir each year.	4 This measure focuses solely on the target species, but not in direct relation to FFC SPA.	4 Ending the harvest of gannet chicks at Sula Sgeir would increase productivity at that colony by at least 2000 chicks per year and would be likely to result in more rapid growth of breeding numbers there.	2 Little or no evidence of delivery. Measure may not be acceptable for cultural reasons as gannet harvest is an important part of the local culture in north Lewis (Murray 2008). Temporary cessation of harvesting may be more feasible for a time span to be discussed as appropriate.	5 Measure would provide direct benefit to gannet at a large scale (2000 birds per annum). Consideration can be given to reducing the scale of harvest instead of ending (completely or long term).	3 Measure is specific to Sula Sgeir SPA but can be reached by gannet from FFC SPA. Likely only relevant to prospecting pre-breeding birds looking for potential breeding location.	4 Likelihood that measure could be functioning prior to impact occurring due to non-physical requirements of measure and only at a single location.	2 Numerous uncertainties regarding the securability of the measure and whether long-term implementation is feasible. That being said, the predicted impact for HOW04 is small and compensation for the lifetime of the project may be achieved by securing the measure for one year.	24	Measure would result in a large increase in productivity at SPA with the addition ion of 2000 birds to population. However, historical cultural reasons may limit feasibility.
2.Habitat Creation	i. Encourage more rapid expansion of small colonies with use of models and playback of calls.	4 This measure focuses solely on the target species, but not in direct relation to FFC SPA.	3 St Abb's Head currently supports a non-designated breeding gannet population which is gradually increasing in size. Potential for reduced resource competition (Furness *et al.* 2013).	3 Encouraging more rapid expansion using models of gannet and playback of calls may increase the productivity of the colony. There is some evidence of delivery and some uncertainty associated with the outcomes.	3 Direct benefit to gannet. Limited SPAs as candidates and unknowns in relation to effectiveness.	3 Measure can be reached by gannet from an SPA. Relevant to prospecting pre-breeding birds looking for alternative breeding colonies.	3 Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	2 There is a lot of uncertainty regarding the security of the measure and long term implementation.	21	Potential for success due to pre existing colony at St Abb's Head. Evidence of successful adaptive management to support measure.
	ii. Construction of ONSHORE artificial structures to encourage a new gannet colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	4 Direct benefits to gannet but not specific to FFC SPA CO's.	4 Evidence of gannet colonising structures even when there is no limitation of natural habitat.	4 The feasibility of establishing new gannet colonies (on artificial structures or in natural habitat) relies heavily on the choice of geographical location, and in particular the vicinity of a large, established gannet colony.	4 Measure provides direct benefit to gannet (nest sites, access to prey, predator free) but some unknowns exist in relation to effectiveness (i.e., whether gannet will choose platform and if prey availability is enough to ensure breeding success).	3 Measure is away from FFC SPA but is accessible from FFC SPA and within the species biogeographic region.	3 Onshore likely to be deliverable in short time frame (within 3 to 5 years) and therefore before anticipated impact.	3 There are a number of uncertainties regarding the securability of the measure and if long term implementation is feasible. Consideration will need to be given to maintenance requirements. Structures are not likely to be long term and may require replacement.	25	Few examples exist of onshore gannet nesting structures.
	iii. Construction or repurposing of OFFSHORE artificial	4	4	4	4	3	2	3	4	Some examples exist of offshore

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long Term Implementation	Overall Score	Notes
	structures to encourage a new gannet colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).	Direct benefits to gannet but not specific to FFC SPA CO's.	Evidence of gannet colonising structures even when there is no limitation of natural habitat.	The feasibility of establishing new gannet colonies (on artificial structures or in natural habitat) relies heavily on the choice of geographical location, and in particular the vicinity of a large, established gannet colony.	Measure provides direct benefit to gannet (nest sites, access to prey, predator free) but some unknowns exist in relation to effectiveness (i.e., whether gannet will choose platform and if prey availability is enough to ensure breeding success).	Measure is away from FFC SPA but is accessible from FFC SPA and within the species biogeographic region.	Dependant on procurement of offshore structure. Offshore structure may require a longer timeframe (if new structure rather than repurposed) than onshore but may still be achievable prior to anticipated impact.	There are a number of uncertainties regarding the securability of the measure and if long term implementation is feasible. Consideration will need to be given to maintenance requirements.		gannet nesting structures.
	iv. Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks.	3 The focus is on seabed habitat creation which will have some benefit to gannet and other seabirds.	2 Limited evidence to suggest measure would be effective in increasing gannet breeding success. Without quota restrictions, a spatial closure will be less effective.	3 Little to no evidence of delivery and considerable uncertainty relating to outcomes. Measure would also require fisheries management to prevent/ control fishing of new habitat (see fisheries measures). Inshore nursery grounds (eg seagrass) may offer a more viable alternative option.	3 Potential for measure to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding gannet.	4 Measure can be reached by gannet from FFC SPA.	2 Little to no certainty measure will be functioning within 10 years due to the uncertainty around prey species recruitment of new seabed habitat. Also consideration of political uncertainty with regards to securing measure.	2 There is a significant amount of uncertainty surrounding the security of the measure and the long term implementation.	19	
3. Reserve creation	i. Designation of new marine SPA at important offshore foraging location away from OWF.	3 New marine SPA is likely to deliver some benefits to gannet along with other seabird features of assemblage if focused on foraging data. SPA would need management teeth to ensure key pressures (i.e., fishing and certain development activities from taking place within the site).	2 Limited evidence to suggests measure would be effective in increasing gannet breeding success.	1 Considerable uncertainty relating to outcomes. Stakeholders maintain the view that areas which are candidates for designation are already identified and designated. Unlikely push for new marine SPA designation would be accepted.	3 This measure would only have potential to result in benefits to the SPA features if it was to be implemented at a large scale. Measure would require calculations in relation to prey biomass and the requirements of breeding gannet. SPA designation does not directly relate to prey availability.	4 Measure would need to be undertaken within foraging range of gannet from FFC SPA.	2 Potential that measure could be functioning prior to impact (< 5 years) although consultation period and decision of previous SPAs may have taken longer.	3 Measure is legislatively permissible, but uncertainties remain with regard to securability.	18	Stakeholders maintain the view that all candidate SPAs have been recognised.
4. Habitat restoration or improvement	i. Removal of hazardous objects at Bass Rock colony to	4	4	4	4	3	4	4	27	Site-specific measure which is

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long Term Implementation	Overall Score	Notes
	reduce bird strike and entrapment.	This measure focuses solely on the target species, but not in direct relation to FFC SPA.	Approximately 50 birds die as a result of collision with metal handrail along the cliff top or die from being trapped in accumulated mud between the rock and the wall of the derelict lighthouse outbuildings per year.	Landscaping work to remove both hazards would prevent further deaths. Work could be undertaken relatively easily by small team using basic tools and materials and within non-breeding season to avoid disturbance to breeding birds.	Measure provides direct benefit to species but there are unknows regarding the effectiveness.	Measure can be reached by the same species from a designated SPA although measure focuses on site specific compensation for species within the same biogeographic population.	Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	Measure is legislatively permissible and works would only be required once to remove hazards.		achievable within short time frame.
5. Reduction of other threats and pressures	i. Reduce bycatch.	4 This measure focuses solely on the target species will directly benefit species from FFC SPA during breeding/ non-breeding seasons.	4 ICES (2013), Bradbury *et al.*, (2017) and Northridge *et al.*, (2020) identified gannet as species known to be caught or sensitive to Bycatch in European and UK waters. BirdLife International (2009) estimated the Spanish Gran Sol fishery accidentally caught 1,331 gannets per year in 2006/07. Similar fishing practices in other fisheries may be having a similar impact, particularly in regions gannet visit outside of the breeding season. Good amount of evidence that measure is	4 Implementing measures to prevent bycatch (such as line scarers and deterrents) would reduce this pressure. Delivery has been evidenced for other species but uncertainty exists for gannet.	4 Measure will provide direct benefit to species at known important foraging locations but there are unknows regarding the effectiveness. BirdLife International (2009) estimated the Spanish Gran Sol fishery accidentally caught 1,331 gannets per year in 2006/07 however further consideration will need to be given to produce a more robust estimate. This would then allow the extent of compensation to be calculated.	3 Measure likely to be reached by gannet (due to significant mean-maximum foraging range) from a designated SPA during the breeding season but further work needed to determine whether the measure is feasible within foraging distance of FFC SPA. Measure will be reached by gannet from FFC SPA during migration.	3 Previous bycatch projects for other species took considerable time to employ. Focusing on a single fishery may reduce timescales but dealing with foreign fishing fleets likely to be time consuming.	3 Measure is legislatively permissible, but uncertainties remain with regard to securability.	25	Considerable uncertainty relating to numbers of birds impacted.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long Term Implementation	Overall Score	Notes
			effective for other species.							
	ii. Reduction in entanglement of gannets in salmon aquaculture netting.	4 This measure focuses solely on the target species, but not in direct relation to FFC SPA.	3 Gannets are attracted to salmon pens in coastal aquaculture facilities and may attempt to dive to catch these fish. As a result, they can become entangled in the netting covering these pens. Furness (2019) suggests 60 gannets were killed in 2019 at a single farm.	4 Deterring gannets or coving the pens in fine mesh to reduce visibility of fish and prevent entanglement would reduce this risk. Limited evidence available with some challenges associated with delivery.	4 Measure has direct benefit to gannet with up to 60 mortalities recorded at a single farm in 2019.	3 Measure can be reached by gannet from FFC SPA but is likely to be most effective near breeding colonies. Salmon aquaculture is mainly based in Scotland.	4 Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	4 Measure is legislatively permissible with some level of confidence in securability and long term implementation.	26	A simple measure which might be applicable to other fish farms and therefore saleable. Unlikely to be relevant to birds at FFC SPA but within biogeographic region.
	iii. Management of recreational pressure at the FFC SPA.	2 Limited benefit to species at FFC SPA.	1 Indication from site managers at FFC SPA suggest absence of issue at FFC SPA.	3 Technical delivery is evidenced but some challenges with delivery and some uncertainty associated with the outcomes. Management of recreational pressures is well evidenced in other species of animal. Feasibility would be dependant on the location of SPA and access.	2 Measure likely to only provide a very limited benefit to gannet at FFC SPA.	1 Unlikely to be a factor at FFC SPA and therefore would only be possible at other SPA within biogeographical region. Measure would need to be significant in extent in order to compensate for impact.	4 Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	4 Some degree of confidence that measure can be secured in the long term.	17	Low likelihood of relevance to FFC SPA population.
	iv. Management of visitor pressure at Bass Rock.	4 This measure focuses solely on the target species, but not in direct relation to FFC SPA.	3 Constructing a tunnel from landing site to viewing platform would reduce disturbance to nesting birds and eliminate lost chicks and eggs via impacts associated with visitors accessing colony.	4 There is some evidence of delivery and some uncertainty associated with the outcomes.	4 Measure provides direct benefit to species but there are unknows regarding the effectiveness.	3 Measure can be reached by the same species from a designated SPA although measure focuses on site specific compensation for species within the same biogeographic population.	4 Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	2 There is a lot of uncertainty regarding the security of the measure and long term implementation. Unlikely to be securable as recreational pressures are already managed at Bass Rock.	24	Site-specific measure which is achievable within short time frame.

Measure	Compensation Option	Targeted	Effective	Technical Feasibility	Extent of Compensation	Location of Compensation	Timing of Compensation	Long Term Implementation	Overall Score	Notes
	v. Removal of plastics/fishing debris incorporated into gannet nests	4 This measure focuses solely on the target species, and could be implemented at FFC SPA (with additional logistical challenges).	3 Removal of debris and increased efforts to free entangled birds could reduce additional mortality	3 There is some evidence of delivery and some uncertainty associated with the outcomes.	4 Measure could have direct benefit to gannet with up to 50 mortalities recorded at colonies with high levels of pollution. Effect of removing long standing nests on birds unknown - if plastic is still in immediate area birds may rebuild nests with more plastics.	4 Measure can be reached by the same species from a designated SPA although measure focuses on site specific compensation (potentially multiple sites) for species within the same biogeographic population.	4 Some certainty that such a measure could be agreed prior to the impact occurring (< 3 years).	4 Some degree of confidence that measure can be secured in the long term.	26	Some uncertainty relating to success of scheme as does not deal with source of marine pollution.

5 References

BirdLife International 2009. European Community Plan of Action (ECPOA) for reducing incidental catch of seabirds in fisheries. BirdLife, Cambridge.

Bradbury, G., Shackshaft, M., Scott-Hayward, L., Rexstad, E., Miller, D. and Edwards, D. 2017. Risk assessment of seabird bycatch in UK waters. Report prepared for the Department for Environment Food and Rural Affairs (Project Code MB0126).

Brown, A. and Grice, P. 2005. Birds in England. T & AD Poyser, London.

Cleasby, I.R., Owen, E., Wilson, L., Wakefield, E.D., O'Connell, P. and Bolton, M., 2020. Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping. Biological Conservation, 241, p.108375.

Coulson, J.C. 2011. The Kittiwake. T & AD Poyser, London.

Daunt, F., Wanless, S., Greenstreet, S.P., Jensen, H., Hamer, K.C. and Harris, M.P., 2008. The impact of the sandeel fishery closure on seabird food consumption, distribution, and productivity in the northwestern North Sea. Canadian journal of fisheries and aquatic sciences, 65(3), pp.362-381.

Eremorphila, 2014. Cape Jaffa Lighthouse. https://eremophila.wordpress.com/2014/01/27/cape-jaffa-lighthouse [Accessed August 2021].

Frederiksen, M., Wanless, S., Harris, M.P., Rothery, P. and Wilson, L.J. 2004. The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. Journal of Applied Ecology 41: 1129-1139.

Furness, R.W., MacArthur, D., Trinder, M. and MacArthur K. 2013. Evidence review to support the identification of potential conservation measures for selected species of seabirds. MacArthur Green, Glasgow.

Furness, R. W. 2019. Scoping ornithological compensation measures for three SPAs. MacArthur Green, Glasgow.

Harris, M. and Wanless, S. 1996. Differential responses of Guillemot *Uria aalge* and Shag *Phalacrocorax aristotelis* to a late winter wreck. Bird Study 43/2:.220-230.

ICES. 2013. Multispecies considerations for the North Sea stocks. ICES Advice 2013, Book 6, section 6.3.1 Copenhagen, Denmark: International Council for the Exploration of the Sea.

Jones, H.P., Towns, D.R., Bodely, T., Miskelly, C., Ellis, J.C., Rauzon, M., Kress, S. and McKown, M. 2011. Recovery and restoration on seabird islands. Pp 317-357 in Mulder, C.P.H., Anderson, W.B., Towns, D.R. and Bellingham, P.J. (eds) Seabird islands: ecology, invasion and restoration. Oxford University Press, Oxford.

Jones, H.P. and Kress, S.W. 2012. A review of the world's active seabird restoration projects. Journal of Wildlife Management 76: 2-9.

JNCC. 2020. Seabird Population Trends and Causes of Change: 1986–2018 Report (https://jncc.gov.uk/our-work/smp-report-1986-2018). Joint Nature Conservation Committee, Peterborough. Updated 10 March 2020.

Lyngs P., 2015. A resident Northern Gannet *Morus bassanus* on Christiansø in the central Baltic Sea. *Seabird* 28.
Mavor, R.A., Parsons, M., Heubeck, M. and Schmitt, S. 2005. Seabird numbers and breeding success in Britain and Ireland, 2004. Peterborough, Joint Nature Conservation Committee. (UK Nature Conservation, No. 29.)

Mitchell, P.I., Newton, S.F., Ratcliffe, N. and Dunn, T.E., 2004. Seabird populations of Britain and Ireland. T. & AD Poyser, London.

Murray, D., 2008. The Guga Hunters. Edinburgh: Birlinn Ltd.

O'Hanlon, N., Bond, A., Lavers, J., Masden, E. and James, N., 2019. Monitoring nest incorporation of anthropogenic debris by Northern Gannets across their range. *Environmental Pollution*, 255: 113152.
Thompson, K.R., Pickerell, G. and Heubeck, M. 1999. Seabird numbers and breeding success in Britain and Ireland, 1998. JNCC. Peterborough. (UK Nature Conservation, No. 23).M.P. Harris & S.

Votier, S.C., Furness, R.W., Bearhop, S., Crane, J.E., Caldow, R.W.G., Catry, P., Ensor, K., Hamer, K.C., Hudson, A.V., Kalmbach, E., Klomp, N.I., Pfeiffer, S., Phillips, R.A., Prieto, I. & Thompson, D.R. 2004. Changes in fisheries discard rates and seabird communities. Nature 427: 727–730

Votier, S.C., Bearhop, S., Fyfe, R. and Furness, R.W. 2008. Temporal and spatial variation in the diet of a marine top predator – links with commercial fisheries. Marine Ecology Progress Series 367: 31 223-232.

Votier, S., Archibald, K., Morgan, G. and Morgan, L., 2011. The use of plastic debris as nesting material by a colonial seabird and associated entanglement mortality. *Marine Pollution Bulletin*, 62/1: 168-172.
Walsh, P.M., Halley, D.J., Harris, M.P., del Nevo, A., Sim, I.M.W. & Tasker, M.L. 1995. Seabird monitoring handbook for Britain and Ireland. JNCC / RSPB / ITE / Seabird Group, Peterborough. ISBN 1 873701 73 X.

Žydelis, R., Small, C. and French, G. 2013, 'The incidental catch of seabirds in gillnet fisheries: A global review', Biological Conservation, 162: 76-88.