

MONA OFFSHORE WIND PROJECT

Offshore ornithology additional supporting in-combination assessment information in line with SNCB advice

Deadline: 5

Application Reference: EN010137

Document Reference: S_D5_23

Document Number: MOCNS-J3303-RPS-10461

3 December 2024

F01



Image of an offshore wind farm

MONA OFFSHORE WIND PROJECT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
F01	Submission to Deadline 5	RPS	Mona Offshore Wind Ltd.	Mona Offshore Wind Ltd.	3 Dec 2024

Prepared by:

RPS

Prepared for:

Mona Offshore Wind Ltd.

Contents

1	OFFSHORE ORNITHOLOGY ADDITIONAL SUPPORTING IN-COMBINATION ASSESSMENT INFORMATION IN LINE WITH SNCB ADVICE	6
1.1	Summary	6
1.2	Introduction	6
1.3	Applicant's Position.....	8
1.4	Information to support assessment	9
1.4.1	Updated populations	9
1.4.2	Site-specific age-class data	10
1.5	In-combination assessments	11
1.5.2	Black-legged kittiwake assessment considering displacement and collisions (as requested by the JNCC).....	13
1.5.3	Black-legged kittiwake assessment considering collisions (as requested by NRW (A))	17
1.5.4	Common guillemot	19
1.5.5	Manx shearwater	21
1.5.6	Northern gannet	24
1.5.7	Razorbill	25
1.6	Population Viability Analysis.....	28
1.6.2	Black-legged kittiwake.....	30
1.6.3	Common guillemot	34
1.6.4	Manx shearwater	36
1.6.5	Northern gannet	40
1.6.6	Razorbill	42
1.7	Conclusions	44
1.8	References	45

Tables

Table 1.1:	Populations used within this technical note (Seabird Monitoring Programme).....	10
Table 1.2:	Site-specific age-class data during the breeding season.....	11
Table 1.3:	In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering 30-70% displacement and 1-10% mortality.	13
Table 1.4:	In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering 30% displacement and 3% mortality.....	15
Table 1.5:	Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%)......	16
Table 1.6:	In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering collisions only.	17
Table 1.7:	In-combination assessment for common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA.	19
Table 1.8:	Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).	21
Table 1.9:	In-combination assessment for Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.	21
Table 1.10:	Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA (red text indicates >1%).	22

MONA OFFSHORE WIND PROJECT

Table 1.11: In-combination assessment for Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.	23
Table 1.12: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).	24
Table 1.13: In-combination assessment for northern gannet from the Grassholm SPA.	24
Table 1.14: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Grassholm SPA (red text indicates >1%).	25
Table 1.15: In-combination assessment for razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.	26
Table 1.16: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).	27
Table 1.17: Summary of colony sites where apportioned in-combination impacts result in an increase in baseline mortality of >1%.	29
Table 1.18: PVA outputs for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.	31
Table 1.19: PVA outputs for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro.	34
Table 1.20: PVA outputs for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.	36
Table 1.21: PVA outputs for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.	38
Table 1.22: PVA outputs for northern gannet from Grassholm SPA.	40
Table 1.23: PVA outputs for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.	42

Figures

Figure 1.1: PVA output graph for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% lower confidence interval (LCI) and upper confidence intervals (UCI)).	32
Figure 1.2: Colony count monitoring of black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.	33
Figure 1.3: PVA output graph for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% LCI and UCI).	35
Figure 1.4: PVA output graph for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA (dashed lines represent the 95% LCI and UCI).	37
Figure 1.5: PVA output graph for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% LCI and UCI).	39
Figure 1.6: PVA output graph for northern gannet from Grassholm SPA (dashed lines represent the 95% LCI and UCI)	41
Figure 1.7: PVA output graph for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% LCI and UCI).	43

Appendices

APPENDIX A: PVA MODELLING PARAMETERS	46
A.1.1 PVA input parameters for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	46
A.1.1.1 Set up	46
A.1.1.2 Basic information	46
A.1.1.3 Baseline demographic rates	46
A.1.1.4 Population 1	47
A.1.1.5 Impacts	47
A.1.1.6 Impact on Demographic Rates	47
A.1.1.7 Output:	48
A.1.2 PVA input parameters for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	48
A.1.2.1 Set up	48
A.1.2.2 Basic information	48
A.1.2.3 Baseline demographic rates	48
A.1.2.4 Population 1	49
A.1.2.5 Impacts	49
A.1.2.6 Impact on Demographic Rates	49
A.1.2.7 Output:	50
A.1.3 PVA input parameters for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	50
A.1.3.1 Set up	50
A.1.3.2 Basic information	50
A.1.3.3 Baseline demographic rates	50
A.1.3.4 Population 1	51
A.1.3.5 Impacts	51
A.1.3.6 Impact on Demographic Rates	51
A.1.3.7 Output:	51
A.1.4 PVA input parameters for for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.	52
A.1.4.1 Set up	52
A.1.4.2 Basic information	52
A.1.4.3 Baseline demographic rates	52
A.1.4.4 Population 1	53
A.1.4.5 Impacts	53
A.1.4.6 Impact on Demographic Rates	53
A.1.4.7 Output:	53
A.1.5 PVA input parameters for northern gannet from Grassholm SPA	54
A.1.5.1 Set up	54
A.1.5.2 Basic information	54
A.1.5.3 Baseline demographic rates	54
A.1.5.4 Population 1	55
A.1.5.5 Impacts	55
A.1.5.6 Impact on Demographic Rates	55
A.1.5.7 Output:	55

MONA OFFSHORE WIND PROJECT

Glossary

Term	Meaning
Applicant	Mona Offshore Wind Limited.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Mona Offshore Wind Project	The Mona Offshore Wind Project is comprised of both the generation assets, offshore and onshore transmission assets, and associated activities.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects.

Acronyms

Acronym	Description
AEoSI	
BDMPS	Biologically Defined Minimum Population Scales
CGR	Counterfactual of growth rate
CPS	Counterfactual of population size.
EIA	Environmental Impact Assessment
ExA	Examining Authority
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
LCI	Lower confidence interval
NRW(A)	Natural Resources Wales (Advisory)
NRW	Natural Resources Wales
PVA	Population Viability Analysis
SNCB	Statutory Nature Conservation Body
SPAs	Special Protection Areas
SSSI	Site of Special Scientific Interest
UCI	Upper confidence interval
UK	United Kingdom

Units

Unit	Description
%	Percentage
km ²	Square kilometres
km	Kilometres
m	Metres

1 OFFSHORE ORNITHOLOGY ADDITIONAL SUPPORTING IN-COMBINATION ASSESSMENT INFORMATION IN LINE WITH SNCB ADVICE

1.1 Summary

- 1.1.1.1 Natural Resources Wales (Advisory) and the Joint Nature Conservation Committee (JNCC) agree that an adverse effect on site integrity (AEoSI) from the Mona Offshore Wind Project alone can be ruled out for the relevant European sites and qualifying features. Following Deadline 4, NRW (A) and the JNCC requested that further supplementary information be provided for the in-combination assessment. The request was to use updated age-class proportions, the incorporation of relevant LIÿr 1 Floating Offshore Wind Farm estimated impacts and the updated impacts from the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Wind Farm: Generation Assets applications. The request was made in relation to three specific SPAs in order for the Statutory Nature Conservation Bodies (SNCBs) to be able to determine their position on AEoSI for the Mona Offshore Wind Project in-combination with other projects and plans.
- 1.1.1.2 The Applicant maintains that the scenario of 50% displacement and 1% mortality for auk species, black-legged kittiwake and Manx shearwater presented in the application documents is both robust and precautionary for the purposes of the assessment. It is the Applicant's position that the additional assessments presented within this document hyperinflate the potential impacts and do not use the 'best-scientific' evidence on the age-class structures and displacement rates. However, the information in this note has been provided in order to give the SNCBs confidence in the Applicant's in-combination assessment conclusions.
- 1.1.1.3 With consideration of the additional information provided in this note, the Applicant's conclusion remains as presented within the application, which is that AEoSI from the Mona Offshore Wind Project in-combination with other projects and plans can be ruled out beyond reasonable scientific doubt.

1.2 Introduction

- 1.2.1.1 Following representations from Natural Resources Wales (Advisory) (NRW (A)) and the Joint Nature Conservation Committee (JNCC) in the Mona Offshore Wind Project Examination, the Applicant provided the Offshore ornithology supporting information in line with SNCB advice (REP4-030) note at Deadline 4. This supporting information note sought to provide supplementary assessment information in accordance with the Statutory Nature Conservation Bodies (SNCBs) advice to provide confidence that the Applicant's Environmental Impact Assessment (see Volume 2, Chapter 5: Offshore ornithology (REP4-007)) and Habitats Regulations Assessment (HRA) (see HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas (SPAs) and Ramsar sites Assessments (REP2-010)) conclusions are robust. With respect to HRA, this information was also provided to enable the SNCBs to reach a view on whether an Adverse Effect on Site Integrity (AEoSI) from the Mona Offshore Wind Project, in-combination with other plans or projects, can be ruled out beyond reasonable scientific doubt for European sites and qualifying offshore ornithological features.
- 1.2.1.2 It should be noted that the Applicant, NRW (A), and JNCC agree that AEoSI from the Mona Offshore Wind Project alone can be ruled out for the relevant European sites

MONA OFFSHORE WIND PROJECT

and qualifying features (see paragraph 3 of NRW's Comments on Submissions received at Deadline 3 (REP4-105) and the Applicant understands the JNCC will be confirming this position in its Deadline 5 submissions).

- 1.2.1.3 With respect to the Applicant's in-combination assessments, NRW (A) and the JNCC requested that further supplementary information be provided into Examination to include the following:
- updated age-class proportions within the in-combination assessments to use site-specific age-class data where available and where there was no site-specific age-class data that all birds should be presumed adults;
 - incorporation of the Llŷr 1 Floating Offshore Wind Farm following publication of the application reports (Llŷr 1 Floating Offshore Wind Farm, 2024a and 2024b); and
 - updated abundance and collision estimates for the Morgan Offshore Wind Project: Generation Assets (hereafter referred to as the Morgan Generation Assets) and Morecambe Offshore Wind Farm: Generation Assets (hereafter referred to as the Morecambe Generation Assets) from the numbers presented at Preliminary Environmental Impact Report (PIER) to those within the Environmental Statements (Morecambe Generation Assets, 2024a and 2024b; Morgan Generation Assets, 2024a).
- 1.2.1.4 This information was requested with respect to the following three SPAs and qualifying features:
- Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA - black-legged kittiwake, common guillemot, razorbill and Manx Shearwater;
 - Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA – Manx Shearwater; and
 - Grassholm SPA – Northern gannet.
- 1.2.1.5 The approach taken to try to resolve concerns raised by stakeholders in relation to in-combination effects should also be considered in the context of the contribution that the Mona Offshore Wind Project makes to these in-combination effects. In the case of the SPAs where there are residual concerns, the Applicant's position is that any effects on these SPA features from the Mona Offshore Wind Project do not materially contribute to the in-combination effect (e.g. see the HRA Stage 2 Information to Support an Appropriate Assessment Part Three: SPAs and Ramsar sites Assessments (REP2-10) which demonstrates that all predicted impacts from the Mona Offshore Wind Project on these SPAs are <0.05% baseline mortalities (when considering the Applicant's identified assessment scenario), with a large proportion of the impact on these SPA features arising from other projects in the Irish and Celtic Seas.
- 1.2.1.6 NRW (A) and the JNCC confirmed in a meeting on 22 November that no further information was required for any other sites and qualifying features. Thus, as per the request in the Examining Authority's Report on the Implications for European Sites (RIES), the Applicant anticipates the SNCBs to confirm their position on AEOSI (in-combination) with respect to these at Deadline 5.
- 1.2.1.7 To enable NRW (A) and the JNCC to determine their position on AEOSI (in-combination) for those sites and features outlined in paragraph 1.2.1.4, the Applicant has provided the information requested by the SNCBs in this note. This is notwithstanding the Applicant's position outlined in Section 1.3 below.

MONA OFFSHORE WIND PROJECT

1.2.1.8 The Applicant understands that NRW (A) and the JNCC will submit an update to the Examining Authority following review of the Applicant's Deadline 5 submissions to confirm its position on AEOsI (in-combination) for those sites and features outlined in paragraph 1.2.1.4 as soon as possible and the Applicant anticipates this being no later than Deadline 6.

1.3 Applicant's Position

1.3.1.1 The Applicant maintains that the scenario of 50% displacement and 1% mortality for auk species, black-legged kittiwake and Manx shearwater presented in the application documents is both robust and precautionary for the purposes of the assessment. The Applicant does not consider that the most conservative scenarios advised by the SNCBs and presented within this (i.e. 70% displacement and 10% mortality rate) are a realistic worst-case scenario as this level of impact has not been evidenced at previous offshore wind projects (Dierschke *et al.*, 2016; APEM, 2022; MacArthur Green, 2023). Available evidence suggests that the upper ranges of displacement and mortality rates (e.g. 70% displacement and 10% mortality for auk species, Manx shearwater and black-legged kittiwake) may be excessively precautionary (e.g. MacArthur Green, 2023; APEM, 2022; Peschko *et al.*, 2020; Vanermen *et al.*, 2016; Vanerman *et al.*, 2023; Leopold *et al.*, 2013; Dierschke *et al.*, 2016). The use of both the highest levels of displacement and the highest levels of mortality results in unrealistic outputs that are not supported by the available evidence.

1.3.1.2 The Applicant notes that in their written representations, both the JNCC and NRW (A) have stated (see NRW's written representation REP1-056 and the JNCC's written representation REP1-066) that they would not base their consideration of impact solely on the worst-case assessment scenario but would consider the predicted impacts for the full range of advised assessment scenarios.

1.3.1.3 The JNCC was the only SNCB involved in the Expert Working Groups for the Mona Offshore Wind Project that requested the Applicant provide a displacement assessment for black-legged kittiwake. Both NRW(A) and Natural England have stated there is insufficient evidence to undertake a displacement assessment for black-legged kittiwake (See D3.1 of Technical Engagement Plan Appendices - Part 1 (A to E) APP-042). As such, displacement assessments have not been undertaken for the vast majority of previously consented projects in English and Welsh waters. The Applicant notes NatureScot's (NatureScot, 2023) advice to Scottish offshore wind projects that displacement assessments ought to be undertaken for black-legged kittiwake.

1.3.1.4 As requested by the JNCC (see the JNCC's written representation (REP1-066)), a displacement assessment for black-legged kittiwake is included in this technical note and considers 70% displacement and 10% mortality. The evidence that JNCC presented in support of its advice to consider 30-70% displacement and 1-10% mortality to be considered (specifically, Peschko *et al.*, 2020; Vanermen *et al.*, 2016; Leopold *et al.*, 2013 within D.3.14 of Technical Engagement Plan Appendices - Part 1 (A to E) (APP-042)) does not, in the Applicant's view, support the displacement and mortality rates suggested, with very high variability around the impacts (even some positive effects). Furthermore, the Applicant wishes to highlight that NatureScot advises an assessment based on 30% displacement and 1-3% mortality for Scottish offshore wind projects (NatureScot, 2023), which is considerably lower than the worst-case scenario requested by the JNCC.

1.3.1.5 The assessment for black-legged kittiwake that the Applicant has undertaken for the application is based on 50% displacement and 1% mortality see HRA Stage 2

MONA OFFSHORE WIND PROJECT

Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010). The Applicant also presented a displacement assessment for black-legged kittiwake based on 70% displacement and 10% mortality in the Offshore ornithology supporting information in line with SNCB advice (REP4-031) submitted at Deadline 4. However, PVAs were only undertaken where predicted impacts exceeded a 1% increase in baseline mortality when considering 30% displacement and 3% mortality, in line with the upper range of NatureScot's guidance (NatureScot, 2023). A PVA was not undertaken for the 70% displacement and 10% mortality scenario (as advised by the JNCC) as the Applicant does not consider there to be sufficient empirical evidence to support PVA based on this scenario.

- 1.3.1.6 The level of assessment for black-legged kittiwake presented in the Offshore ornithology supporting information in line with SNCB advice (REP4-031) submitted at Deadline 4 far exceeds the requirements of Natural England and NRW (given that it includes a displacement assessment for this species which as outlined in paragraph 1.3.1.3 above, NRW (A) and Natural England does not request for offshore wind farm projects) and is at the upper bounds of what would be considered scientifically robust by NatureScot. The Applicant considers the information provided in the Offshore ornithology supporting information in line with SNCB advice (REP4-031) submitted at Deadline 4 to be sufficient to allow the SNCBs to reach a conclusion on AEOsI beyond scientific doubt. It is the Applicant's position that providing PVAs for 70% displacement and 10% mortality is not scientifically credible and should not be used to inform a conclusion of AEOsI. During a meeting with the JNCC on 22 November 2024, the JNCC confirmed that PVAs for 70% displacement and 10% mortality where predicted impacts were over 1% increase in baseline mortality were required in order to come to a position on AEOsI therefore this has been provided in this technical note to allow the JNCC to confirm their view on AEOsI.
- 1.3.1.7 The Applicant would also like to highlight that the approach suggested by NRW (A) and JNCC to assume that all birds recorded during the site-specific surveys for all projects within the in-combination assessments are adult birds (where no age-class data exists from the site-specific surveys) is over-precautionary and considered to be biologically unrealistic given that populations will always include a material proportion of immature birds. This approach requires the Applicant re-calculate the impacts from other consented offshore wind projects included in the in-combination assessment from what was included in their applications to assume that all birds are 100% adults (where there is no site-specific age-class data). It is therefore the Applicant's position that the assessments presented within this document hyperinflate the potential impacts and do not use the 'best-scientific' evidence on the age-class structures and displacement rates.

1.4 Information to support assessment

1.4.1 Updated populations

- 1.4.1.1 The apportioning values for each of the SPAs considered in this technical note are taken from Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022). The apportioning values were generated using the latest population estimates at the time of production (October 2023) for the breeding season and used the populations within Furness (2015) during the non-breeding season.
- 1.4.1.2 The Welsh sites are regularly monitored, with counts undertaken in 2024, which are publicly available for several of the species/sites presented in this technical note. As such, the Applicant has updated the breeding season populations to the latest

MONA OFFSHORE WIND PROJECT

population estimate (counts undertaken in 2024). These latest estimates have been used when calculating the increase in baseline mortality and for the starting population within population viability analysis (PVA). The populations used within this document are presented in Table 1.1 and were taken from the Seabird Monitoring Programme's online portal in November 2024. Manx shearwater are not as regularly monitored as other seabird species and no more recent breeding population data are available, therefore there is no change to the population estimate from those presented in the application.

Table 1.1: Populations used within this technical note (Seabird Monitoring Programme)

Site	Species	Population (adult birds)	Year of count
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA	Black-legged kittiwake	3,144	2024
	Common guillemot	39,923	2024
	Manx shearwater	910,312	2018; Seabird Count (mean)
	Razorbill	14,846	2024
Grassholm SPA	Northern gannet	38,398	2024
Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA	Manx shearwater	41,350	2018; Seabird Count

1.4.2 Site-specific age-class data

- 1.4.2.1 For the purpose of this note, and in line with SNCB advice, the Applicant has taken into account site-specific age-class data for other projects considered within the in-combination assessments during the breeding season where this is available. Where site-specific age-class data is unavailable, the applicant has assumed that 100% of birds are adults during the breeding season. Of the species requested to be considered in this technical note, only black-legged kittiwake and northern gannet can be aged via their plumage during baseline surveys.
- 1.4.2.2 Age-class proportion information was available for six of the 17 projects considered within the in-combination assessment, these are Awel y Môr Offshore Wind Farm, Erebus Floating Wind Farm, Llŷr 1 Floating Offshore Wind Farm, Mona Offshore Wind Project, Morecambe Generation Assets and Morgan Generation Assets. For the remaining 11 projects, 100% of birds have been assumed adults during the breeding season. The Applicant does not consider that these numbers illustrate the true scale of the impacts as, in reality, a proportion of the birds within a population will be immatures thus, the predicted impacts are overestimated.
- 1.4.2.3 A breakdown of age-class data for black-legged kittiwake and northern gannet for the six projects outlined above is detailed in Table 1.2.

MONA OFFSHORE WIND PROJECT

Table 1.2: Site-specific age-class data during the breeding season.

Project	Percentage of birds considered adult		Document and reference
	Black-legged kittiwake	Northern gannet	
Awel y Môr Offshore Wind Farm	Unavailable	93.5%	Report 5.2: Report to Inform Appropriate Assessment (Awel y Môr, 2022)
Erebus Floating Wind Farm	100% (only two birds were recorded)	99.0%	Technical Appendix 11.1 – Baseline Data (Erebus, 2021a)
Llŷr 1 Floating Offshore Wind Farm	77.39%	95.99%	Volume 6: Appendix 22A – Marine Ornithology Baseline (Llŷr 1 Floating Offshore Wind Farm, 2024)
Mona Offshore Wind Project	95.36%	93.58%	Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022)
Morecambe Generation Assets	96.5%	73.3%	Appendix 12.2 Aerial Survey Two Year Report March 2021 to February 2023 (Morecambe Generation Assets, 2024a)
Morgan Generation Assets	84.11%	94.94%	Volume 4, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Morgan Generation Assets, 2024a)

1.5 In-combination assessments

1.5.1.1 As outlined in Section 1.1, NRW (A) and JNCC have requested further supplementary information be provided for the following sites and qualifying features in order to enable them to confirm their position on AEoSI (in-combination):

- Black-legged kittiwake from:
 - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
- Common guillemot from:
 - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
- Northern gannet from:
 - Grassholm SPA
- Manx shearwater from:
 - Aberdaron Coast and Bardsey Island SPA /Glannau Aberdaron ac Ynys Enlli/
 - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
- Razorbill from:
 - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.1.2 Within the in-combination assessments the Applicant has presented the gap-filled projects as part of the in-combination totals. The full method for how gap-filling was done and for which sites, species and seasons gap-filling was undertaken for, please

MONA OFFSHORE WIND PROJECT

see Offshore Ornithology Cumulative Effects Assessment and In-combination Gap-filling Historical Projects Technical Note (REP4-028).

1.5.2 Black-legged kittiwake assessment considering displacement and collisions (as requested by the JNCC)

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.2.1 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (see Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) for the Mona Offshore Wind Project alone assessments), an in-combination assessment is presented within Table 1.3 (assuming 30% displacement and 1% mortality to 70% displacement and 10% mortality) and Table 1.4 (assuming 30% displacement and 3% mortality). Table 1.3 and Table 1.4 replicate Table 1-35 and Table 1-36 of Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030), respectively but with the inclusion of the Llŷr 1 Floating Offshore Wind Farm and using the predicted abundance and collision estimates for Morecambe Generation Assets and Morgan Generation Assets from the projects Environmental Statements.

1.5.2.2 Table 1.5 provides a matrix table showing the percentage increase in baseline mortality for the full range of displacement (30-70%) and mortality (1-10%) rates as advised by the JNCC. Table 1.5 also includes the predicted collision impacts.

Table 1.3: In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used (see Table 1.2) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Generation Assets, specifically 0.002.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.004.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.687.

f – the collisions predicted from TwinHub is presented annually, for precaution, 100% of the impact is predicted to occur in the breeding season.

g – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds ^{a)}			Un-apportioned collision impacts (adult birds ^{a)} ^g			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.14	11.66	4.41	0.0045	0.004 ^b	0.0025	0.00 to 0.05	0.00 to 0.02	0.00 to 0.01	0.04	0.05	0.01	0.04 to 0.09	0.05 to 0.07	0.01 to 0.02	0.10 to 0.18
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0045	0.004 ^d	0.0025	0.00 to 0.01	0.01 to 0.20	0.00 to 0.00	0.00	0.09	0.00	0.00 to 0.01	0.10 to 0.29	0.00 to 0.00	0.10 to 0.30
Erebus Floating Wind Project	1,099	2	278	6.66	0.5	13.11	0.0045	0.817 ^b	0.0025	0.01 to 0.35	0.00 to 0.11	0.00 to 0.05	0.03	0.41	0.03	0.05 to 0.38	0.41 to 0.52	0.04 to 0.08	0.49 to 0.98
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72 ^f	0.00	0.0045	0.687 ^e	0.0025	0.00 to 0.01	0.01 to 0.18	0.00 to 0.02	0.00	6.18	0.00	0.00 to 0.01	6.19 to 6.36	0.00 to 0.02	6.19 to 6.39
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.4	0.85	11.28	0.0045	0.687 ^b	0.0025	0.00 to 0.04	0.13 to 3.03	0.01 to 0.19	0.01	0.54	0.03	0.01 to 0.04	0.67 to 3.57	0.04 to 0.21	0.71 to 3.83
Mona Offshore Wind Project	312	692	307	4.65	14.80	4.47	0.0045	0.002 ^b	0.0025	0.00 to 0.10	0.00 to 0.10	0.00 to 0.05	0.02	0.03	0.01	0.03 to 0.12	0.03 to 0.13	0.01 to 0.07	0.07 to 0.31
Morecambe Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0045	0.003 ^b	0.0025	0.00 to 0.01	0.02 to 0.35	0.01 to 0.16	0.00	0.05	0.01	0.00 to 0.01	0.06 to 0.40	0.02 to 0.18	0.09 to 0.59
Morgan Generation Assets	430	425	630	7.39	6.81	10.07	0.0045	0.002 ^b	0.0025	0.01 to 0.14	0.00 to 0.06	0.00 to 0.11	0.03	0.01	0.03	0.04 to 0.17	0.02 to 0.07	0.03 to 0.14	0.09 to 0.38
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0045	0.002 ^c	0.0025	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Rampion Offshore Wind Farm	451	1,059	122	22.22	70.56	8.43	0.0045	No connectivity	0.0025	0.01 to 0.14	-	0.00 to 0.02	0.10	-	0.02	0.11 to 0.24	-	0.02 to 0.04	0.13 to 0.29
Rampion 2 Offshore Wind Farm	155	5	53	9.04	1	5.32	0.0045	No connectivity	0.0025	0.00 to 0.05	-	0.00 to 0.01	0.04	-	0.01	0.04 to 0.09	-	0.01 to 0.02	0.06 to 0.11

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned abundances (adult birds ^{a)})			Un-apportioned collision impacts (adult birds ^{a)} ^g			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.08	18.79	45.96	0.0045	0.002 ^c	0.0025	0.01 to 0.25	0.00 to 0.04	0.00 to 0.11	0.04	0.04	0.12	0.05 to 0.29	0.04 to 0.08	0.12 to 0.22	0.21 to 0.60
West of Orkney Windfarm	661	690	437	11.17	17.06	8.75	0.0045	No connectivity	0.0025	0.01 to 0.21	-	0.00 to 0.08	0.05	-	0.02	0.06 to 0.26	-	0.03 to 0.10	0.09 to 0.36
White Cross Offshore Windfarm	379	44	94	4.93	3.7	0.98	0.0045	0.687 ^e	0.0025	0.01 to 0.12	0.08 to 1.96	0.00 to 0.02	0.02	2.35	0.00	0.03 to 0.14	2.44 to 4.31	0.00 to 0.02	2.47 to 4.47
Gap-filled projects																			
Burbo Bank	12	14	11	0.29	0.84	0.45	0.0045	0.004 ^d	0.0025	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.02
Gwynt y Môr Offshore Wind Farm	39	51	36	0.45	1.45	0.71	0.0045	0.004 ^d	0.0025	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.02	0.00 to 0.01	0.01 to 0.04
Robin Rigg	16	21	15	0.39	1.33	0.68	0.0045	0.002 ^c	0.0025	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.02
Rhyl Flats Offshore Wind Farm	12	16	11	0.40	1.34	0.63	0.0045	0.004 ^d	0.0025	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Walney 1 - abundances are 1+2 combined	51	63	47	0.62	1.81	0.99	0.0045	0.002 ^c	0.0025	0.00 to 0.02	0.00 to 0.01	0.00 to 0.01	0.00	0.00	0.00	0.00 to 0.02	0.00 to 0.01	0.00 to 0.01	0.01 to 0.04
Walney 2	N/A	N/A	N/A	0.30	3.26	0.45	0.0045	0.002 ^c	0.0025	N/A	N/A	N/A	0.00	0.01	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.01 to 0.01
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0045	0.002 ^c	0.0025	0.00 to 0.01	0.00 to 0.06	0.00 to 0.01	0.01	0.01	0.01	0.01 to 0.02	0.01 to 0.07	0.01 to 0.01	0.02 to 0.10
Total predicted impact (adult birds)										0.07 to 1.52	0.26 to 6.16	0.04 to 0.85	0.40	9.79	0.32	0.47 to 1.93	10.06 to 15.96	0.35 to 1.17	10.88 to 19.05
Increase in baseline mortality (%) (baseline mortality of 459)										0.01% to 0.33%	0.06% to 1.34%	0.01% to 0.19%	0.09%	2.13%	0.07%	0.10% to 0.42%	2.19% to 3.48%	0.08% to 0.25%	2.37% to 4.15%

1.5.2.3 Whilst the Applicant has undertaken a PVA on the maximum displacement (70%) and mortality rates (10%) advised by JNCC, it does not consider this to be a scientifically robust assessment scenario for black-legged kittiwake and therefore advises caution when interpreting these results. An alternative approach has been provided in Table 1.4 which uses 30% displacement and 3% mortality in line with the upper range of NatureScot guidance (NatureScot, 2023). As outlined in Section 1.3, it is the Applicant position that presenting a PVA based on 70% displacement and 10% mortality and 100% of birds being adult is not scientifically credible and should not be used to inform a conclusion of AEOsI.

MONA OFFSHORE WIND PROJECT

Table 1.4: In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering 30% displacement and 3% mortality.

a – During the breeding season site-specific age-class values have been used (see Table 1.2) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.002.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.004.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.687.

f – the collisions predicted from TwinHub is presented annually, for precaution, 100% of the impact is predicted to occur in the breeding season.

g – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds ^a)			Un-apportioned collision impacts (adult birds ^a) ^g			Apportioning values			Apportioned displacement impact values (30% displacement and 3%)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.14	11.66	4.41	0.0045	0.004 ^b	0.0025	0.01	0.00	0.00	0.01	0.05	0.01	0.04	0.05	0.01	0.11
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0045	0.004 ^d	0.0025	0.00	0.03	0.00	0.00	0.09	0.00	0.00	0.12	0.00	0.12
Erebus Floating Wind Project	1,099	2	278	6.66	0.5	13.11	0.0045	0.817 ^b	0.0025	0.04	0.01	0.01	0.00	0.41	0.03	0.08	0.42	0.04	0.54
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72 ^f	0.00	0.0045	0.687 ^e	0.0025	0.00	0.02	0.00	0.00	6.18	0.00	0.00	6.20	0.00	6.21
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.4	0.85	11.28	0.0045	0.687 ^b	0.0025	0.00	0.39	0.02	0.00	0.54	0.03	0.01	0.93	0.05	0.99
Mona Offshore Wind Project	312	692	307	4.65	14.80	4.47	0.0045	0.002 ^b	0.0025	0.01	0.01	0.01	0.01	0.03	0.01	0.03	0.04	0.02	0.09
Morecambe Offshore Windfarm Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0045	0.003 ^b	0.0025	0.00	0.05	0.02	0.00	0.05	0.01	0.00	0.09	0.03	0.13
Morgan Offshore Wind Project Generation Assets	430	425	630	7.39	6.81	10.07	0.0045	0.002 ^b	0.0025	0.02	0.01	0.01	0.02	0.01	0.03	0.05	0.02	0.04	0.11
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0045	0.002 ^c	0.0025	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01
Rampion Offshore Wind Farm	451	1,059	122	22.22	70.56	8.43	0.0045	No connectivity	0.0025	0.02	-	0.00	0.02	-	0.02	0.12	-	0.02	0.14
Rampion 2 Offshore Wind Farm	155	5	53	9.04	1	5.32	0.0045	No connectivity	0.0025	0.01	-	0.00	0.01	-	0.01	0.05	-	0.01	0.06
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.08	18.79	45.96	0.0045	0.002 ^c	0.0025	0.03	0.01	0.01	0.03	0.04	0.12	0.07	0.04	0.13	0.24
West of Orkney Windfarm	661	690	437	11.17	17.06	8.75	0.0045	No connectivity	0.0025	0.03	-	0.01	0.03	-	0.02	0.08	-	0.03	0.11
White Cross Offshore Windfarm	379	44	94	4.93	3.7	0.98	0.0045	0.687 ^e	0.0025	0.02	0.25	0.00	0.02	2.35	0.00	0.04	2.61	0.00	2.65
Gap-filled projects																			
Burbo Bank	12	14	11	0.29	0.84	0.45	0.0045	0.004 ^d	0.0025	0.00	0.00	0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.02
Gwynt y Môr Offshore Wind Farm	39	51	36	0.45	1.45	0.71	0.0045	0.004 ^d	0.0025	0.00	0.00	0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.02	0.00 to 0.01	0.01 to 0.04

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned abundances (adult birds ^a)			Un-apportioned collision impacts (adult birds ^a) ^g			Apportioning values			Apportioned displacement impact values (30% displacement and 3%)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Robin Rigg	16	21	15	0.39	1.33	0.68	0.0045	0.002 ^c	0.0025	0.00	0.00	0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.02
Rhyl Flats Offshore Wind Farm	12	16	11	0.40	1.34	0.63	0.0045	0.004 ^d	0.0025	0.00	0.00	0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Walney 1 - abundances are 1+2 combined	51	63	47	0.62	1.81	0.99	0.0045	0.002 ^c	0.0025	0.00	0.00	0.00	0.00	0.00	0.00	0.00 to 0.02	0.00 to 0.01	0.00 to 0.01	0.01 to 0.04
Walney 2	NA	NA	NA	0.30	3.26	0.45	0.0045	0.002 ^c	0.0025	NA	NA	NA	0.00	0.01	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.01 to 0.01
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0045	0.002 ^c	0.0025	0.00	0.01	0.00	0.01	0.02	0.01	0.01 to 0.02	0.01 to 0.07	0.01 to 0.01	0.02 to 0.10
Total predicted impact (adult birds)										0.20	0.79	0.11	0.40	9.79	0.32	0.60	10.59	0.43	11.61
Increase in baseline mortality (%) (baseline mortality of 459)										0.04%	0.17%	0.02%	0.09%	2.13%	0.07%	0.13%	2.31%	0.09%	2.53%

Table 1.5: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Black-legged kittiwake (Annual)		Mortality rate (%)					
		1%	2%	3%	4%	5%	10%
Displacement rate (%)	30%	2.37%	2.45%	2.53%	2.60%	2.68%	3.08%
	40%	2.39%	2.50%	2.60%	2.71%	2.81%	3.34%
	50%	2.42%	2.55%	2.68%	2.81%	2.95%	3.60%
	60%	2.45%	2.60%	2.76%	2.92%	3.08%	3.86%
	70%	2.47%	2.66%	2.84%	3.02%	3.21%	4.15%

1.5.2.4 As the predicted impact on black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality, the impact is further investigated by a PVA (see section 1.6.2) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.5.3 Black-legged kittiwake assessment considering collisions (as requested by NRW (A))

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.3.1 The predicted collision impact from the Mona Offshore Wind Project alone is predicted to result in an increase in the baseline mortality of 0.01% of black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, therefore following the method set out in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010) an in-combination assessment would **not be required** as the predicted contribution from the Mona Offshore Wind Project is <0.05% increase in baseline mortality. This approach to undertaking an in-combination assessment was deemed acceptable for this application by NRW (A) (NRW (A)'s Relevant Representations (RR-033)). However, at the meeting on 22 November 2024, NRW (A) specifically asked for this assessment to be presented following the requested updates (as detailed in section 1.2). An in-combination assessment is therefore presented within Table 1.6. This information has been provided for NRW (A) as they do not require a displacement assessment for black-legged kittiwake.

Table 1.6: In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering collisions only.

a – During the breeding season site-specific age-class values have been used (see Table 1.2) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.002.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.004.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.687.

f – the collisions predicted from TwinHub is presented annually, for precaution, 100% of the impact is predicted to occur in the breeding season.

g – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned collision impacts (adult birds ^a) ^g			Apportioning values			Apportioned collision values (species-group avoidance rate 99.28)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	8.14	11.66	4.41	0.0045	0.004 ^b	0.0025	0.04	0.05	0.01	0.10
Burbo Bank Extension Offshore Wind Farm	0.00	23.04	0.00	0.0045	0.004 ^d	0.0025	0.00	0.09	0.00	0.09
Erebus Floating Wind Project	6.66	0.5	13.11	0.0045	0.817 ^b	0.0025	0.03	0.41	0.03	0.47
TwinHub (Wave Hub Floating Wind Farm)	0.00	9.72 ^f	0.00	0.0045	0.687 ^e	0.0025	0.00	6.18	0.00	6.18
Llŷr 1 Floating Offshore Wind Farm	1.4	0.85	11.28	0.0045	0.687 ^b	0.0025	0.01	0.54	0.03	0.57
Mona Offshore Wind Project	4.65	14.80	4.47	0.0045	0.002 ^b	0.0025	0.02	0.03	0.01	0.06
Morecambe Offshore Windfarm Generation Assets	0.34	16.32	4.65	0.0045	0.003 ^b	0.0025	0.00	0.05	0.01	0.06
Morgan Offshore Wind Project Generation Assets	7.39	6.81	10.07	0.0045	0.002 ^b	0.0025	0.03	0.01	0.03	0.07
Ormonde Wind Farm	0.00	3.27	0.00	0.0045	0.002 ^c	0.0025	0.00	0.01	0.00	0.01
Rampion Offshore Wind Farm	22.22	70.56	8.43	0.0045	No connectivity	0.0025	0.10	-	0.02	0.12
Rampion 2 Offshore Wind Farm	9.04	1	5.32	0.0045	No connectivity	0.0025	0.04	-	0.01	0.06
Walney (3 and 4) Extension Offshore Wind Farm	8.08	18.79	45.96	0.0045	0.002 ^c	0.0025	0.04	0.04	0.12	0.19
West of Orkney Windfarm	11.17	17.06	8.75	0.0045	No connectivity	0.0025	0.05	-	0.02	0.07
White Cross Offshore Windfarm	4.93	3.7	0.98	0.0045	0.687 ^e	0.0025	0.02	2.35	0.00	2.38

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned collision impacts (adult birds ^a) ^g			Apportioning values			Apportioned collision values (species-group avoidance rate 99.28)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Gap-filled projects										
Burbo Bank	0.29	0.84	0.45	0.0045	0.004 ^d	0.0025	0.00	0.00	0.00	0.01
Gwynt y Môr Offshore Wind Farm	0.45	1.45	0.71	0.0045	0.004 ^d	0.0025	0.00	0.01	0.00	0.01
Robin Rigg	0.39	1.33	0.68	0.0045	0.002 ^c	0.0025	0.00	0.00	0.00	0.01
Rhyl Flats Offshore Wind Farm	0.40	1.34	0.63	0.0045	0.004 ^d	0.0025	0.00	0.01	0.00	0.01
Walney 1 - abundances are 1+2 combined	0.62	1.81	0.99	0.0045	0.002 ^c	0.0025	0.00	0.00	0.00	0.01
Walney 2	0.30	3.26	0.45	0.0045	0.002 ^c	0.0025	0.00	0.01	0.00	0.01
West of Duddon Sands Offshore Wind Farm	1.41	3.99	2.28	0.0045	0.002 ^c	0.0025	0.01	0.01	0.01	0.02
Total predicted impact (adult birds)							0.40	9.79	0.32	10.51
Increase in baseline mortality (%) (baseline mortality of 459)							0.09%	2.13%	0.07%	2.29%

1.5.3.1 As the predicted impact on black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.2) to determine whether AEOsI can be ruled out beyond reasonable scientific doubt.

1.5.4 Common guillemot

Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.4.1 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (see Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) for the Mona Offshore Wind Project alone assessments), an in-combination assessment is presented within Table 1.7 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality). Table 1.7 replicates Table 1-49 of Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) but with the inclusion of the Llŷr 1 Floating Offshore Wind Farm project and using the predicted abundance and estimates for Morecambe Generation Assets and Morgan Generation Assets from the projects Environmental Statements.

1.5.4.2 Table 1.8 provides a matrix table showing the percentage increase in baseline mortality for the full range of JNCC and NRW (A) advised displacement (30-70%) and mortality (1-10%) rates.

Table 1.7: In-combination assessment for common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.487.

Project	Un-apportioned abundances (adult birds)		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0447	0.22 to 5.26	-	0.22 to 5.26	1.05	-	1.05
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0447	0.12 to 2.81	-	0.12 to 2.81	0.56	-	0.56
Erebus Floating Wind Project	7,001	16,322	0.754 ^b	0.0447	18.03 to 420.58	15.84 to 369.51	2.19 to 51.07	52.69	42.47	10.21
Llŷr 1 Floating Offshore Wind Farm	2,026	7,493	0.487 ^b	0.0447	3.96 to 92.51	2.96 to 69.07	1.00 to 23.44	18.50	13.81	4.69
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0447	0.29 to 6.77	-	0.29 to 6.77	1.35	-	1.35
Morecambe Offshore Windfarm Generation Assets	No connectivity	4,789	No connectivity	0.0447	0.64 to 14.99	-	0.64 to 14.99	3.00	-	3.00
Morgan Offshore Wind Project Generation Assets	No connectivity	2,203	No connectivity	0.0447	0.30 to 6.89	-	0.30 to 6.89	1.38	-	1.38
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0447	0.02 to 0.39	-	0.02 to 0.39	0.08	-	0.08
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0447	0.15 to 3.47	-	0.15 to 3.47	0.69	-	0.69
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0447	0.33 to 7.70	-	0.33 to 7.70	1.54	-	1.54
White Cross Offshore Windfarm	3,304	610	0.487 ^c	0.0447	4.91 to 114.54	4.83 to 112.63	0.08 to 1.91	22.91	22.53	0.38
Gap-filled projects										
Burbo Bank	No connectivity	33	No connectivity	0.0447	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Gwynt Y Môr	No connectivity	118	No connectivity	0.0447	0.02 to 0.37	-	0.02 to 0.37	0.07	-	0.07
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0447	0.00 to 0.07	-	0.00 to 0.07	0.01	-	0.01
Robin Rigg	No connectivity	51	No connectivity	0.0447	0.01 to 0.16	-	0.01 to 0.16	0.03	-	0.03
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0447	0.01 to 0.12	-	0.01 to 0.12	0.02	-	0.02
Walney 1 & 2	No connectivity	131	No connectivity	0.0447	0.02 to 0.41	-	0.02 to 0.41	0.08	-	0.08
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0447	0.01 to 0.30	-	0.01 to 0.30	0.06	-	0.06
Total predicted impact (adult birds)					29.03 to 677.46	23.62 to 551.21	5.41 to 126.25	135.49	110.24	25.25

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned abundances (adult birds)		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Increase in baseline mortality (%) (baseline mortality of 2,435)					1.19% to 27.82%	0.97% to 22.63%	0.22% to 5.18%	5.56%	4.53%	1.04%

Table 1.8: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Common guillemot (Annual)		Mortality rate (%)						
		1%	2%	3%	4%	5%	10%	
Displacement rate (%)	30%	1.19%	2.38%	3.58%	4.77%	5.96%	11.92%	
	40%	1.59%	3.18%	4.77%	6.36%	7.95%	15.90%	
	50%	1.99%	3.97%	5.96%	7.95%	9.94%	19.87%	
	60%	2.38%	4.77%	7.15%	9.54%	11.92%	23.84%	
	70%	2.78%	5.56%	8.35%	11.13%	13.91%	27.82%	

1.5.4.3 As the predicted impact on common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.3) to determine whether AEOsI can be ruled out beyond reasonable scientific doubt.

1.5.5 Manx shearwater

Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA

1.5.5.1 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in Manx shearwater baseline mortality from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA (see Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) for the Mona Offshore Wind Project alone assessments), an in-combination assessment is presented within Table 1.9 (30-70% displacement and 1-10% mortality). Table 1.9 replicates Table 1-51 of Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) but with the inclusion of the Llŷr 1 Floating Offshore Wind Farm project and using the predicted abundance estimates for Morecambe Generation Assets and Morgan Generation Assets from the projects Environmental Statements.

1.5.5.2 Table 1.10 provides a matrix table showing the percentage increase in baseline mortality for the full range of JNCC and NRW (A) advised displacement (30-70%) and mortality (1-10%) rates.

Table 1.9: In-combination assessment for Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

a – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

b – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.0421.

c – the apportioning value during the breeding season has used that of Erebus, specifically 0.003.

d – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.085.

e – During the breeding season age-class proportion are not able to be calculated due to the inability to age Manx shearwater on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which is 62.77% of birds are adults in the pre-breeding and post-breeding periods.

Project	Un-apportioned abundances (adult birds) ^e			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	111	26	134	0.00326	0.0421 ^a	0.00326	0.00 to 0.03	0.00 to 0.08	0.00 to 0.03	0.01 to 0.13
Burbo Bank Extension Offshore Wind Farm	0	444	1	0.00326	0.0421 ^b	0.00326	0.00 to 0.00	0.06 to 1.31	0.00 to 0.00	0.06 to 1.31
Erebus Floating Wind Project	11	1,540	350	0.00326	0.003 ^a	0.00326	0.00 to 0.00	0.01 to 0.32	0.00 to 0.08	0.02 to 0.41
TwinHub (Wave Hub Floating Wind Farm)	0	1,270	2	0.00326	0.003 ^c	0.00326	0.00 to 0.00	0.01 to 0.27	0.00 to 0.00	0.01 to 0.27
Llŷr 1 Floating Offshore Wind Farm	795	3,434	17	0.00326	0.003 ^a	0.00326	0.01 to 0.18	0.03 to 0.72	0.00 to 0.00	0.04 to 0.91
Mona Offshore Wind Project	2	1,249	10	0.00326	0.1134 ^a	0.00326	0.00 to 0.00	0.42 to 9.91	0.00 to 0.00	0.43 to 9.92
Morecambe Offshore Windfarm Generation Assets	1,015	4,705	1,635	0.00326	0.0863 ^a	0.00326	0.00 to 0.00	1.96 to 45.77	0.00 to 0.00	1.96 to 45.77
Morgan Offshore Wind Project Generation Assets	0	1,254	572	0.00326	0.085 ^a	0.00326	0.00 to 0.01	0.32 to 7.46	0.00 to 0.07	0.33 to 7.59
Ormonde Wind Farm	0	1,001	1	0.00326	0.085 ^d	0.00326	0.00 to 0.00	0.26 to 5.96	0.00 to 0.00	0.26 to 5.96
Rampion Offshore Wind Farm	0	33	0	0.00326	No connectivity	0.00326	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Rampion 2 Offshore Wind Farm	0	0	0	0.00326	No connectivity	0.00326	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Walney (3 and 4) Extension Offshore Wind Farm	0	588	203	0.00326	0.085 ^d	0.00326	0.00 to 0.00	0.15 to 3.50	0.00 to 0.05	0.15 to 3.55
West of Duddon Sands Offshore Wind Farm	1	544	2	0.00326	0.085 ^d	0.00326	0.00 to 0.00	0.14 to 3.24	0.00 to 0.00	0.14 to 3.24
West of Orkney Windfarm	0	8	2	0.00326	No connectivity	0.00326	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
White Cross Offshore Windfarm	7,611	33	14	0.00326	0.0028 ^a	0.00326	0.07 to 1.74	0.00 to 0.01	0.00 to 0.00	0.07 to 1.75
Gap-filled projects										
Burbo Bank Offshore Wind Farm	0	2	1	0.00326	0.0421 ^b	0.00326	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned abundances (adult birds) °			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Gwynt y Môr Offshore Wind Farm	1	13	2	0.00326	0.0421 ^b	0.00326	0.00 to 0.00	0.00 to 0.04	0.00 to 0.00	0.00 to 0.02
Robin Rigg	0	3	1	0.00326	0.085 ^d	0.00326	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00 to 0.01
Rhyl Flats	0	4	1	0.00326	0.0421 ^b	0.00326	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.01
Walney 1 & 2	1	14	3	0.00326	0.085 ^d	0.00326	0.00 to 0.00	0.00 to 0.08	0.00 to 0.00	0.00 to 0.05
Total predicted impact (adult birds)							0.08 to 1.95	3.37 to 78.70	0.01 to 0.30	3.47 to 80.88
Increase in baseline mortality (%) (baseline mortality of 5,376)							0.00% to 0.04%	0.06% to 1.46%	0.00% to 0.01%	0.06% to 1.51%

Table 1.10: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA (red text indicates >1%).

Manx shearwater (Annual)		Mortality rate (%)					
		1%	2%	3%	4%	5%	10%
Displacement rate (%)	30%	0.06%	0.13%	0.19%	0.26%	0.32%	0.65%
	40%	0.09%	0.17%	0.26%	0.34%	0.43%	0.86%
	50%	0.11%	0.22%	0.32%	0.43%	0.54%	1.08%
	60%	0.13%	0.26%	0.39%	0.52%	0.65%	1.29%
	70%	0.15%	0.30%	0.45%	0.60%	0.75%	1.51%

1.5.5.3 As the predicted impact on Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.5.4 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in Manx shearwater baseline mortality from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (see Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) for the Mona Offshore Wind Project alone assessments), an in-combination assessment is presented within Table 1.11 (30-70% displacement and 1-10% mortality). Table 1.11 replicates Table 1-53 of Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) but with the inclusion of the Llŷr 1 Floating Offshore Wind Farm project and using the predicted abundance estimates for Morecambe Generation Assets and Morgan Generation Assets from the projects Environmental Statements.

1.5.5.5 Table 1.12 provides a matrix table showing the percentage increase in baseline mortality for the full range of JNCC and NRW (A) advised displacement (30-70%) and mortality (1-10%) rates.

Table 1.11: In-combination assessment for Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

a – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

b – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.4436.

c – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.983.

d – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.752.

e – During the breeding season age-class proportion are not able to be calculated due to the inability to age Manx shearwater on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which is 62.77% of birds are adults in the pre-breeding and post-breeding periods.

Project	Un-apportioned abundances (adult birds) ^a			Apportioning values			Apportioned displacement impact values (30-70% displacement 1-10% mortality)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	111	26	134	0.7054	0.4436 ^a	0.7054	0.24 to 5.49	0.03 to 0.81	0.28 to 6.63	0.55 to 12.93
Burbo Bank Extension Offshore Wind Farm	0	444	1	0.7054	0.4436 ^b	0.7054	0.00 to 0.00	0.59 to 13.79	0.00 to 0.03	0.59 to 13.82
Erebus Floating Wind Project	11	1,540	350	0.7054	0.995 ^a	0.7054	0.02 to 0.56	4.60 to 107.26	0.74 to 17.26	5.36 to 125.08
TwinHub (Wave Hub Floating Wind Farm)	0	1,270	2	0.7054	0.983 ^c	0.7054	0.00 to 0.00	3.79 to 87.39	0.00 to 0.09	3.79 to 87.48
Llŷr 1 Floating Offshore Wind Farm	795	3,434	17	0.7054	0.983 ^a	0.7054	1.68 to 39.27	10.13 to 236.29	0.04 to 0.84	11.85 to 276.40
Mona Offshore Wind Project	2	1,249	10	0.7054	0.7497 ^a	0.7054	0.00 to 0.09	2.81 to 65.55	0.02 to 0.50	2.83 to 66.14
Morecambe Offshore Windfarm Generation Assets	1,015	4,705	1,635	0.7054	0.7654 ^a	0.7054	0.00 to 0.00	10.80 to 252.08	0.01 to 0.19	16.41 to 382.94
Morgan Offshore Wind Project Generation Assets	0	1,254	572	0.7054	0.752 ^a	0.7054	0.08 to 1.83	2.83 to 66.01	0.62 to 14.47	4.04 to 94.25
Ormonde Wind Farm	0	1,001	1	0.7054	0.752 ^d	0.7054	0.00 to 0.00	2.26 to 52.69	0.00 to 0.03	2.26 to 52.72
Rampion Offshore Wind Farm	0	33	0	0.7054	No connectivity	0.7054	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Rampion 2 Offshore Wind Farm	0	0	0	0.7054	No connectivity	0.7054	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Walney (3 and 4) Extension Offshore Wind Farm	0	588	203	0.7054	0.752 ^d	0.7054	0.00 to 0.00	1.33 to 30.95	0.43 to 10.04	1.76 to 40.99
West of Duddon Sands Offshore Wind Farm	1	544	2	0.7054	0.752 ^d	0.7054	0.00 to 0.03	1.23 to 28.64	0.00 to 0.09	1.23 to 28.76
West of Orkney Windfarm	0	8	2	0.7054	No connectivity	0.7054	0.00 to 0.00	-	0.00 to 0.09	0.00 to 0.09
White Cross Offshore Windfarm	7,611	33	14	0.7054	0.6032 ^a	0.7054	16.11 to 375.84	0.06 to 1.39	0.03 to 0.68	16.20 to 377.92
Gap-filled projects										
Burbo Bank Offshore Wind Farm	0	2	1	0.001	0.0059 ^b	0.001	0.00 to 0.00	0.00 to 0.06	0.00 to 0.03	0.00 to 0.09
Gwynt y Môr Offshore Wind Farm	1	13	2	0.001	0.0059 ^b	0.001	0.00 to 0.03	0.02 to 0.40	0.00 to 0.09	0.02 to 0.53
Robin Rigg	0	3	1	0.001	0.752 ^d	0.001	0.00 to 0.00	0.01 to 0.16	0.00 to 0.03	0.01 to 0.19
Rhyl Flats	0	4	1	0.001	0.0059 ^b	0.001	0.00 to 0.00	0.01 to 0.12	0.00 to 0.03	0.01 to 0.16
Walney 1 & 2	1	14	3	0.001	0.752 ^d	0.001	0.00 to 0.03	0.03 to 0.74	0.01 to 0.12	0.04 to 0.89
Total predicted impact (adult birds)							20.21 to 471.46	40.47 to 944.34	6.24 to 145.58	66.92 to 1,561.38
Increase in baseline mortality (%) (baseline mortality of 118,341)							0.02% to 0.40%	0.03% to 0.80%	0.01% to 0.12%	0.06% to 1.32%

Table 1.12: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Manx shearwater (Annual)		Mortality rate (%)						
		1%	2%	3%	4%	5%	10%	
Displacement rate (%)	30%	0.06%	0.11%	0.17%	0.23%	0.28%	0.57%	
	40%	0.08%	0.15%	0.23%	0.30%	0.38%	0.75%	
	50%	0.09%	0.19%	0.28%	0.38%	0.47%	0.94%	
	60%	0.11%	0.23%	0.34%	0.45%	0.57%	1.13%	
	70%	0.13%	0.26%	0.40%	0.53%	0.66%	1.32%	

1.5.5.6 As the predicted impact on Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.3) to determine whether AEOsI can be ruled out beyond reasonable scientific doubt.

1.5.6 Northern gannet

Grassholm SPA

1.5.6.1 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in northern gannet baseline mortality from Grassholm SPA (see Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) for the Mona Offshore Wind Project alone assessments), an in-combination assessment is presented within Table 1.13 (60-80% displacement and 1-10% mortality and species-group avoidance rate). Table 1.13 replicates Table 1-55 of Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) but with the inclusion of the Llŷr 1 Floating Offshore Wind Farm project and using the predicted abundance and collisions estimates for Morecambe Generation Assets and Morgan Generation Assets from the projects Environmental Statements.

1.5.6.2 Table 1.14 provides a matrix table showing the percentage increase in baseline mortality for the full range of JNCC and NRW (A) advised displacement (60-80) and mortality (1-10%) rates.

1.5.6.3 Table 1.14 also includes the predicted collision impacts.

Table 1.13: In-combination assessment for northern gannet from the Grassholm SPA.

a – During the breeding season site-specific age-class values have been used (see Table 1.2) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 59.16% of birds are adults in the pre-breeding period and 58.25% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.258.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.367.

e – the apportioning value during the breeding seas has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.969.

f – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds ^{a)}			Un-apportioned collision impacts (adult birds ^{a)} ^f			Apportioning values			Apportioned displacement impact values (60-80% displacement and 10% mortality)			Apportioned collision (species-group avoidance rate 0.9928)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	0	307	117	0.00	10.17	1.40	0.2007	0.367 ^b	0.2471	0.00 to 0.00	0.68 to 9.00	0.17 to 2.31	0.00	3.73	0.36	0.00 to 0.00	4.41 to 12.74	0.54 to 2.68	4.95 to 15.42
Burbo Bank Extension Offshore Wind Farm	15	648	13	0.00	12.44	0.00	0.2007	0.367 ^d	0.2471	0.02 to 0.24	1.43 to 19.03	0.02 to 0.25	0.00	4.56	0.00	0.02 to 0.24	5.99 to 23.59	0.02 to 0.25	6.03 to 24.08
Erebus Floating Wind Project	59	222	195	0.34	3.34	0.34	0.2007	0.995 ^b	0.2471	0.07 to 0.95	1.32 to 17.65	0.29 to 3.85	0.07	3.32	0.09	0.14 to 1.02	4.64 to 20.97	0.38 to 3.93	5.16 to 25.93
TwinHub (Wave Hub Floating Wind Farm)	0	244	89	0.00	26.12	0.00	0.2007	0.969 ^e	0.2471	0.00 to 0.00	1.46 to 18.91	0.13 to 1.76	0.00	25.31	0.00	0.00 to 0.00	27.45 to 44.23	0.13 to 1.76	26.86 to 45.99
Llŷr 1 Floating Offshore Wind Farm	38	236	416	0.18	2.88	0.29	0.2007	0.969 ^b	0.2471	0.05 to 0.62	1.37 to 18.31	0.62 to 8.23	0.04	2.79	0.07	0.08 to 0.65	4.16 to 21.10	0.69 to 8.31	4.93 to 30.05
Mona Offshore Wind Project	17	235	34	0.23	4.43	0.28	0.2007	0.176 ^b	0.2471	0.02 to 0.27	0.25 to 3.31	0.05 to 0.67	0.05	0.78	0.07	0.07 to 0.31	1.03 to 4.09	0.12 to 0.74	1.22 to 5.14
Morecambe Offshore Windfarm Generation Assets	5	397	72	0.00	0.91	0.01	0.2007	0.3141 ^b	0.2471	0.01 to 0.08	0.75 to 9.96	0.11 to 1.43	0.00	0.29	0.00	0.01 to 0.08	1.03 to 10.25	0.11 to 1.43	1.15 to 11.76
Morgan Offshore Wind Project Generation Assets	21	139	38	0.00	1.08	0.12	0.2007	0.258 ^b	0.2471	0.02 to 0.33	0.21 to 2.86	0.06 to 0.75	0.00	0.28	0.03	0.02 to 0.33	0.49 to 3.14	0.08 to 0.78	0.60 to 4.25

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned abundances (adult birds ^{a)})			Un-apportioned collision impacts (adult birds ^{a)} ^f			Apportioning values			Apportioned displacement impact values (60-80% displacement and 10% mortality)			Apportioned collision (species-group avoidance rate 0.9928)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Ormonde Wind Farm	2	199	3	0.00	6.72	0.00	0.2007	0.258 ^c	0.2471	0.00 to 0.03	0.31 to 4.11	0.01 to 0.07	0.00	1.73	0.00	0.00 to 0.03	2.04 to 5.84	0.01 to 0.07	2.05 to 5.94
Walney (3 and 4) Extension Offshore Wind Farm	14	150	151	0.51	16.30	9.15	0.2007	0.258 ^c	0.2471	0.02 to 0.23	0.23 to 3.10	0.22 to 2.98	0.11	4.20	2.38	0.13 to 0.34	4.44 to 7.30	2.61 to 5.37	7.17 to 13.00
West of Duddon Sands Offshore Wind Farm	7	431	10	0.14	1.96	0.18	0.2007	0.258 ^c	0.2471	0.01 to 0.10	0.67 to 8.90	0.02 to 0.21	0.03	0.51	0.05	0.04 to 0.14	1.17 to 9.40	0.06 to 0.25	1.27 to 9.79
West of Orkney Windfarm	35	958	682	1.16	33.80	7.14	0.2007	No connectivity	0.2471	0.04 to 0.56	-	1.01 to 13.48	0.25	-	1.86	0.29 to 0.81	-	2.87 to 15.34	3.16 to 16.15
White Cross Offshore Windfarm	83	239	44	0.00	4.42	0.93	0.2007	0.5208 ^b	0.2471	0.10 to 1.34	0.75 to 9.96	0.07 to 0.88	0.00	2.30	0.24	0.10 to 1.34	3.05 to 12.26	0.31 to 1.12	3.46 to 14.72
Gap-filled projects																			
Burbo Bank	2	6	3	0.03	0.36	0.03	0.2007	0.367 ^d	0.2471	0.00 to 0.03	0.01 to 0.18	0.00 to 0.06	0.01	0.13	0.01	0.01 to 0.04	0.15 to 0.31	0.01 to 0.07	0.17 to 0.41
Gwynt y Môr Offshore Wind Farm	8	27	12	0.56	7.30	0.69	0.2007	0.367 ^d	0.2471	0.01 to 0.12	0.06 to 0.79	0.02 to 0.23	0.12	2.68	0.18	0.13 to 0.24	2.74 to 3.47	0.20 to 0.41	3.06 to 4.13
Robin Rigg	2	11	4	0.05	0.70	0.07	0.2007	0.258 ^c	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.08	0.01	0.18	0.02	0.01 to 0.05	0.20 to 0.41	0.02 to 0.10	0.23 to 0.55
Rhyl Flats Offshore Wind Farm	2	8	3	0.22	1.04	0.10	0.2007	0.367 ^d	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.07	0.05	0.38	0.03	0.05 to 0.09	0.40 to 0.62	0.03 to 0.09	0.48 to 0.80
Walney 1 and 2	9	36	15	0.14	1.91	0.18	0.2007	0.258 ^c	0.2471	0.01 to 0.14	0.06 to 0.74	0.02 to 0.30	0.03	0.49	0.05	0.04 to 0.17	0.55 to 1.24	0.07 to 0.35	0.66 to 1.75
Total predicted impact (adult birds)										0.38 to 5.11	9.56 to 127.42	2.82 to 37.61	0.76	53.69	5.44	1.15 to 5.87	63.25 to 181.11	8.26 to 43.05	72.65 to 230.03
Increase in baseline mortality (%) (baseline mortality of 3,110)										0.01% to 0.16%	0.31% to 4.10%	0.09% to 1.21%	0.02%	1.73%	0.17%	0.04% to 0.19%	2.03% to 5.82%	0.27% to 1.38%	2.34% to 7.40%

Table 1.14: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Grassholm SPA (red text indicates >1%).

Northern gannet (Annual)		Mortality rate (%)					
		1%	2%	3%	4%	5%	10%
Displacement rate (%)	60%	2.34%	2.75%	3.16%	3.57%	3.98%	6.03%
	70%	2.40%	2.88%	3.36%	3.84%	4.32%	6.71%
	80%	2.47%	3.02%	3.57%	4.11%	4.66%	7.40%

1.5.6.4 As the predicted impact on northern gannet from Grassholm SPA is predicted to be >1% increase in baseline mortality, the impact is further investigated by a PVA (see section 1.6.4.2) to determine whether AEOI can be ruled out beyond reasonable scientific doubt.

1.5.7 Razorbill

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.7.1 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (see Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) for the Mona Offshore Wind Project alone assessments), an in-combination assessment is presented within Table 1.15 (70% displacement and 10% mortality and 70% displacement and 2% mortality). Table 1.15 replicates Table 1-62 of Offshore Ornithology Supporting Information in line with SNCB Advice (REP4-030) but with the inclusion of the Llŷr 1 Floating Offshore Wind Farm project and using the predicted abundance and collisions estimates for Morecambe Generation Assets and Morgan Generation Assets from the projects Environmental Statements.

1.5.7.2 Table 1.16 provides a matrix table showing the percentage increase in baseline mortality for the full range of JNCC and NRW (A) advised displacement (30-70%) and mortality (1-10%) rates.

MONA OFFSHORE WIND PROJECT

Table 1.15: In-combination assessment for razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age razorbill on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (REP2-022); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.639.

Project	Un-apportioned abundances (adult birds) ^a				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	No connectivity	34	79	0.0371	No connectivity	0.0371	0.0201	0.02 to 0.46	-	0.00 to 0.09	0.00 to 0.11	0.03 to 0.66	0.09	-	0.02	0.02	0.13
Burbo Bank Extension	0	No connectivity	0	15	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.02	0.00 to 0.02	0.00	-	0.00	0.00	0.00
Erebus Floating Wind Project	468	194	892	561	0.0371	0.892 ^b	0.0371	0.0201	0.05 to 1.22	0.52 to 12.11	0.10 to 2.32	0.03 to 0.79	0.70 to 16.43	0.24	2.42	0.46	0.16	3.29
TwinHub (Wave Hub Floating Wind Farm)	0	12	0	28	0.0371	0.639 ^b	0.0371	0.0201	0.00 to 0.00	0.02 to 0.54	0.00 to 0.00	0.00 to 0.04	0.02 to 0.58	0.00	0.11	0.00	0.01	0.12
Llŷr 1 Floating Offshore Wind Farm	134	21	986	259	0.0371	0.639 ^b	0.0371	0.0201	0.01 to 0.35	0.04 to 0.94	0.11 to 2.56	0.02 to 0.36	0.18 to 4.21	0.07	0.19	0.51	0.07	0.84
Walney (3 and 4) Extension Offshore Wind Farm	0	No connectivity	456	1609	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00	-	0.05 to 1.19	0.10 to 2.26	0.15 to 3.45	0.00	-	0.24	0.45	0.69
West of Duddon Sands Offshore Wind Farm	0	No connectivity	0	106	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00	-	0.00 to 0.00	0.01 to 0.15	0.01 to 0.15	0.00	-	0.00	0.03	0.03
West of Orkney Windfarm	51	No connectivity	75	8	0.0371	No connectivity	0.0371	0.0201	0.01 to 0.13	-	0.01 to 0.20	0.00 to 0.01	0.01 to 0.34	0.03	-	0.04	0.00	0.07
White Cross Offshore Windfarm	180	40	21	189	0.0371	0.639 ^b	0.0371	0.0201	0.02 to 0.47	0.08 to 1.79	0.00 to 0.05	0.01 to 0.27	0.11 to 2.58	0.09	0.36	0.01	0.05	0.52
Morecambe Offshore Windfarm Generation Assets	199	No connectivity	362	342	0.0371	No connectivity	0.0371	0.0201	0.02 to 0.52	-	0.04 to 0.94	0.02 to 0.48	0.08 to 1.94	0.10	-	0.19	0.10	0.39
Morgan Offshore Wind Project Generation Assets	171	No connectivity	133	614	0.0371	No connectivity	0.0371	0.0201	0.01 to 0.44	-	0.01 to 0.34	0.04 to 0.86	0.07 to 1.65	0.09	-	0.07	0.17	0.33
Mona Offshore Wind Project	1,005	No connectivity	48	221	0.0371	No connectivity	0.0371	0.0201	0.11 to 2.61	-	0.01 to 0.12	0.01 to 0.31	0.13 to 3.04	0.52	-	0.02	0.06	0.61
Gap-filled projects																		
Burbo Bank	5	No connectivity	3	5	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Gwynt y Môr Offshore Wind Farm	20	No connectivity	11	17	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.05	-	0.00 to 0.03	0.00 to 0.02	0.00 to 0.11	0.01	-	0.01	0.00	0.02
Ormonde Offshore Wind Farm	5	No connectivity	3	4	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Robin Rigg	8	No connectivity	6	7	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.05	0.00	-	0.00	0.00	0.01
Rhyl Flats Offshore Wind Farm	6	No connectivity	4	5	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Walney 1 and 2	21	No connectivity	13	18	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.05	-	0.00 to 0.03	0.00 to 0.03	0.00 to 0.11	0.01	-	0.01	0.01	0.02
Total predicted impact (adult birds)										0.27 to 6.36	0.66 to 15.38	0.34 to 7.91	0.25 to 5.75	1.52 to 35.40	1.27	3.08	1.58	1.15 7.08
Increase in baseline mortality (%) (baseline mortality of 1,559)										0.02% to 0.41%	0.04% to 0.99%	0.02% to 0.51%	0.02% to 0.37%	0.10% to 2.27%	0.08%	0.24%	0.13%	0.09% 0.56%

MONA OFFSHORE WIND PROJECT

Table 1.16: Matrix table showing the percentage increase in baseline mortality for the range of potential annual in-combination impacts from displacement on razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Razorbill (Annual)		Mortality rate (%)					
		1%	2%	3%	4%	5%	10%
Displacement rate (%)	30%	0.10%	0.19%	0.29%	0.39%	0.49%	0.97%
	40%	0.13%	0.26%	0.39%	0.52%	0.65%	1.30%
	50%	0.16%	0.32%	0.49%	0.65%	0.81%	1.62%
	60%	0.19%	0.39%	0.58%	0.78%	0.97%	1.95%
	70%	0.23%	0.45%	0.68%	0.91%	1.14%	2.27%

1.5.7.3 As the predicted impact on razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality) the impact is further investigated by a PVA (see section 1.6.4.2) to determine whether AEOsI can be ruled out beyond reasonable scientific doubt.

1.6 Population Viability Analysis

- 1.6.1.1 Given the considerations set out in section 1.1.2 of Offshore Ornithology Supporting Information In Line With SNCB Advice (REP4-030) and Section 1.3 of this note, the Applicant considers that the scenarios set out in this section are excessively precautionary, exceed likely effects from even a worst-case scenario and do not represent a realistic scenario due to lack of empirical evidence. Therefore, it is the Applicant's view that these results should be interpreted cautiously and not considered in isolation. The Applicant maintains that the conclusions presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (REP2-010) are accurate and utilise the best scientific evidence available. The Applicant has also provided the SNCBs with the full range of assessment scenarios within Offshore Ornithology Supporting Information In Line With SNCB Advice (REP4-030), this supplementary information provides an even more conservative approach to assessment, as requested by the SNCBs.
- 1.6.1.2 Table 1.17 provides a summary of those sites and species considered in this technical note where the increase in baseline mortality from in-combination impacts was found to exceed 1% when considering the upper displacement and mortality range recommended by the SNCBs.
- 1.6.1.3 A PVA has been undertaken for each SPA and species which exceeds a >1% increase in baseline mortality for the upper displacement and mortality range as advised by the SNCBs. PVAs have also been undertaken for the alternative approach for common guillemot (using 70% displacement rate and 2% mortality rate), where predicted impacts would result in an increase in baseline mortality of >1%. Furthermore, for black-legged kittiwake PVAs have also been undertaken using an alternative approach (using 30% displacement and 3% mortality rate), where predicted impacts would result in an increase in baseline mortality of >1%.
- 1.6.1.4 The full methodology for running the PVA is presented in Volume 6, Annex 5.6: Offshore ornithology Population Viability Analysis Technical Report (REP2-024). All PVAs were run density independently which is in line with best practice (Parker *et al.*, 2022; NatureScot, 2023), and therefore, the counterfactual of growth rate (CGR) is a more useful metric than counterfactual of population size (CPS). Full input parameters are presented in Appendix A:.

MONA OFFSHORE WIND PROJECT
Table 1.17: Summary of colony sites where apportioned in-combination impacts result in an increase in baseline mortality of >1%.

Species	Bio season	Impact	Site	Adult bird mortalities (worst-case)	Increase in baseline mortality(worst-case)	Estimated mortalities when using alternative approach ¹	Percentage increase in baseline mortalities using alternative approach
Common guillemot	Annual	Displacement	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	677.46	27.82%	135.49	5.56%
Razorbill	Annual	Displacement	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	35.40	2.27%	7.08	0.56%
Black-legged kittiwake – JNCC Approach	Annual	Displacement and collisions	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	19.03	4.15%	11.60	2.53%
Black-legged kittiwake – NRW (A) Approach	Annual	Collisions	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	10.51	2.29%		
Manx shearwater	Annual	Displacement	Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.	80.88	1.51%		
			Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	1,561.38	1.32%		
Northern gannet	Annual	Displacement and collisions	Grassholm SPA	230.03	7.40%		

¹ The 'alternative approach' considered for common guillemot, razorbill and black-legged kittiwake using accepted displacement and mortality rates as recently accepted and used by the Secretary of State within the HRAs for Hornsea Two/Three/Four, East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard, Sheringham Shoal and Dudgeon Extension Projects (SEP and DEP). The rates presented for common guillemot and razorbill are 70% displacement and 2% mortality. The rates used for black-legged kittiwake are 30% displacement and 3% mortality which is in line with NatureScot guidance (NatureScot, 2023).

1.6.2 Black-legged kittiwake

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

- 1.6.2.1 Three scenarios were modelled within the PVA for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA. One scenario considered collision impacts only in line with NRW (A) advice. A second scenario considered the combined collision and displacement impact, assuming 70% displacement and 10% mortality in line with the upper scenario as advised by the JNCC, and a third scenario considered the combined collision and displacement impact, assuming 30% displacement and 3% mortality, in line with the upper range of NatureScot guidance (NatureScot, 2023).
- 1.6.2.2 The Applicant wishes to highlight that there is limited evidence suggesting kittiwake displacement and associated mortality is likely to be anywhere near as high at 70% and 10%, respectively. NatureScot advises an assessment based on 30% displacement and 1-3% mortality (NatureScot, 2023). Both NRW(A) and Natural England have stated there is insufficient evidence to undertake a displacement assessment for black-legged kittiwake (as detailed in Technical Engagement Plan Appendices - Part 1 (A to E) (APP-042)).
- 1.6.2.3 Presentation and assessment via PVAs of the predicted displacement impact considering 70% displacement and 10% mortality far exceeds the requirements of Natural England, NRW and NatureScot and in the Applicant's opinion, is beyond the upper bounds of what would be considered scientifically robust. The Applicant considers the information provided in the HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010) and Offshore Ornithology Supporting Information In Line With SNCB Advice (REP4-030) sufficient to allow the SNCBs to reach a conclusion on AEOsI beyond scientific doubt. It is the Applicant's view that assessing an even higher rate of displacement is not scientifically credible and should not be used to inform a conclusion of AEOsI.
- 1.6.2.4 However, the Applicant has provided a PVA for kittiwake using 70% displacement and 10% mortality (see Table 1.18; Figure 1.1) at the JNCC's request.
- 1.6.2.5 For all scenarios assessed, the predicted impact would result in the median growth rate being marginally <1 after 35 years of operation, therefore indicating that the population is predicted to decrease in size under these modelled parameters (Table 1.18; Figure 1.1). The CGR however indicates these three impact scenarios are near to the baseline for the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.4 to 0.7% smaller).

MONA OFFSHORE WIND PROJECT

Table 1.18: PVA outputs for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2024	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	3,211	1.32%	1.013	0.808	1.167	-	-
2030	Impact (collisions only)	3,197	0.84%	1.008	0.807	1.163	0.996	0.996
2030	Impact (30% displacement and 3% mortality plus collisions)	3,195	0.79%	1.008	0.807	1.164	0.995	0.996
2030	Impact (70% displacement and 10% mortality plus collisions)	3,188	0.59%	1.006	0.804	1.157	0.993	0.993
2065	Baseline	3,522	10.86%	1.003	0.981	1.023	-	-
2065	Impact (collisions only)	3,056	-4.23%	0.999	0.977	1.018	0.866	0.996
2065	Impact (30% displacement and 3% mortality plus collisions)	3,019	-5.24%	0.999	0.977	1.018	0.854	0.996
2065	Impact (70% displacement and 10% mortality plus collisions)	2,729	-14.52%	0.996	0.974	1.015	0.771	0.993

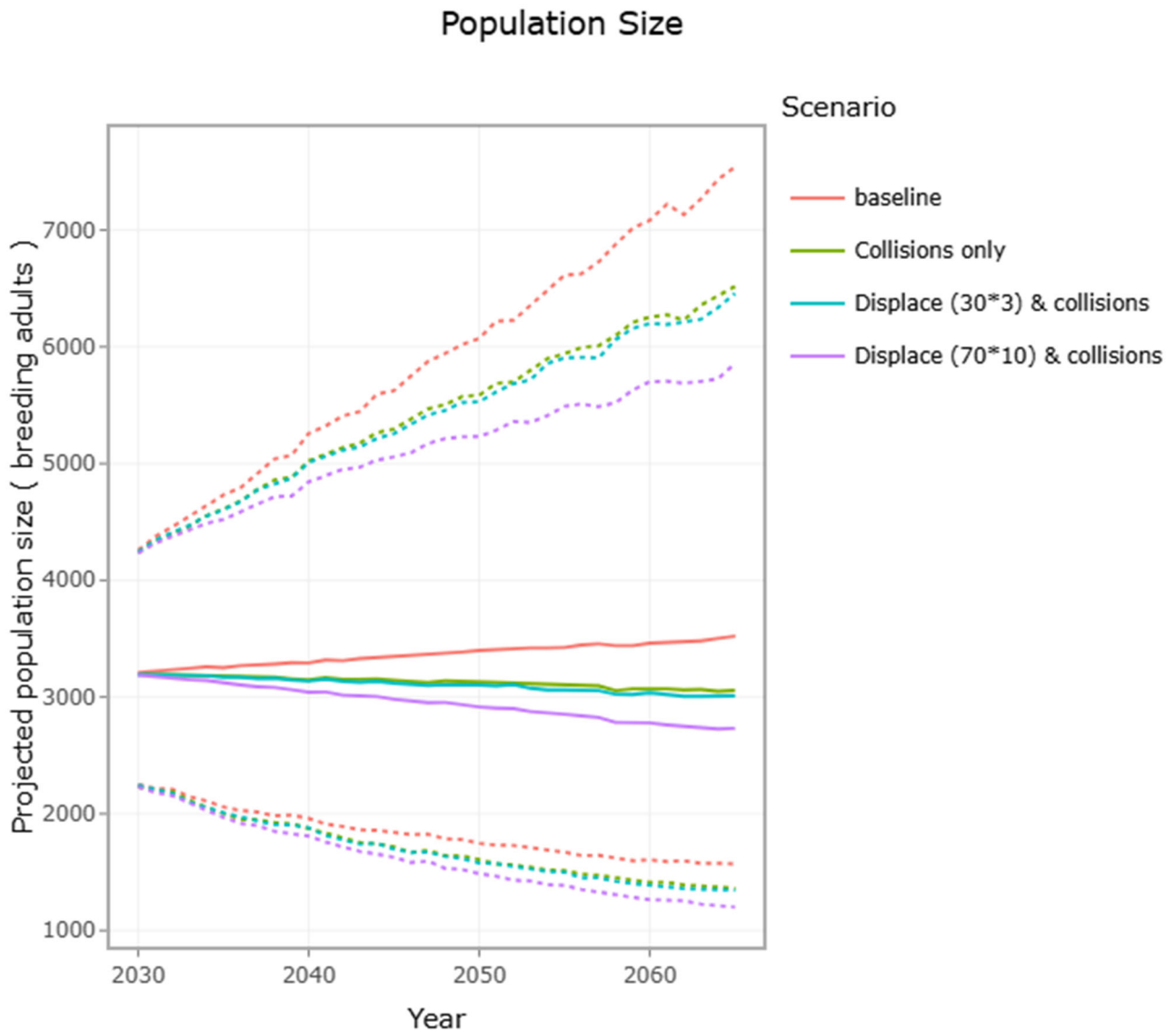


Figure 1.1: PVA output graph for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% lower confidence interval (LCI) and upper confidence intervals (UCI)).

1.6.2.6 The population of black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA has remained stable over the last 14 years of colony monitoring (Figure 1.2; Seabird Monitoring Programme, 2024). This stable population is in light of the predicted annual impact from the projects considered in-combination (Figure 1.2). The average colony count was 2,973 birds \pm 450 (standard deviation) between 2010 and 2024. Therefore, the predicted population after the 35 years of modelling (between 2,733 and 3,057 birds) is within the natural range of the population.

1.6.2.7 It should be noted that as projects are decommissioned the impact would also be removed, however the PVA is unable to take this reduction of impacts into account.

MONA OFFSHORE WIND PROJECT

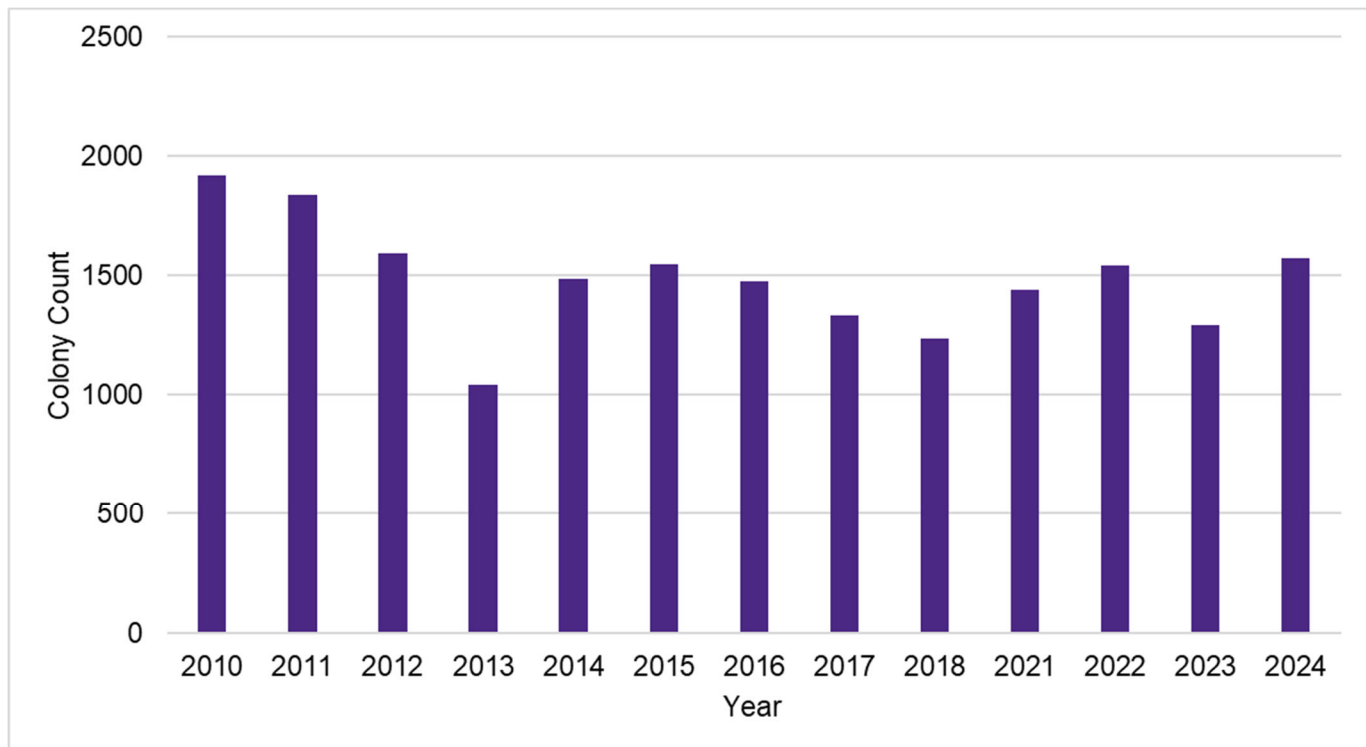


Figure 1.2: Colony count monitoring of black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

1.6.2.8 It should also be noted that tracking data on black-legged kittiwake undertaken from Skomer Island did not record birds foraging over any great distance (Trevail *et al*, 2019 and Trevail, 2019). Within the studies 22 birds were tracked from Skomer Island and were recorded to travel 22.0 ± 2.6 km from the colony (straight line) during the breeding season. Therefore, the connectivity between the Mona Offshore Wind Project and the colony has not been empirically proven and is theoretically linked due to the work of Woodward *et al*. (2019). The review of foraging ranges undertaken by Woodward *et al*. (2019) was published before the work of Trevail *et al*. (2019), and therefore, the tracking study from Skomer was not included in the review undertaken by Woodward *et al*. (2019).

1.6.2.9 The Applicant would like to highlight that the predicted impact of the Mona Offshore Wind Project is 0.31 birds per annum (when considering the combined impact of collisions and displacement (assuming 70% displacement and 10% mortality)), or 10.9 birds over the predicted 35 years of the project which represents just 1.6% of the annual in-combination impact. When considering collision only (in line with NRW (A) advice) Mona Offshore Wind Project’s contribution is 0.06 birds or 0.6% of the annual impact from collisions. 0.06 birds annually would multiple up to 2.1 birds over the 35 years of the project or a collision every 16.6 years.

1.6.2.10 It is important to note that black-legged kittiwake is not a qualifying feature of the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA in its own right (although it has been considered as such for the purpose of assessment), but a component of the breeding seabird assemblage alongside razorbill, common guillemot, Atlantic puffin, lesser black-backed gull, Manx shearwater and European storm petrel. As the results of the PVA undertaken for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicated the population would be within the natural fluctuation of the colony when compared to the long-term (10 year) average. Therefore with or

MONA OFFSHORE WIND PROJECT

without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in combination with other plans and projects for black-legged kittiwake and the seabird assemblage. On coming to this conclusion, the Applicant has considered the sites conservation objectives (Appendix to ExQ1 Q1.10.6 Part B Conservation objectives for SPAs screened in for Likely Significant Effects REP3-068). This conclusion replicates what was previously presented in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010).

1.6.3 Common guillemot

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.6.3.1 Two scenarios were modelled within the PVA for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA. One considered the worst-case scenario of 70% displacement and 10% mortality and a second considered an alternative approach of 70% displacement and 2% mortality, which is the scenario that has recently been accepted and used by the Secretary of State within the HRAs for Hornsea Two/Three/Four, East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard, Sheringham Shoal and Dudgeon Extension Projects.

1.6.3.2 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.19). The CGR also indicates that the impact scenarios are close to the baseline or the non-impacted predicted growth rate when considering the 70% displacement and 2% mortality.

Table 1.19: PVA outputs for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro.

Year	Impact scenario	Median adult population size	Population change (%) since 2024	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	46,113	2.67	1.027	0.952	1.092	-	-
2030	70% and 2%	45,952	2.31	1.023	0.948	1.088	0.996	0.996
2030	70% and 10%	45,274	0.83	1.008	0.934	1.073	0.982	0.982
2065	Baseline	112,672	151.23	1.026	1.017	1.034	-	-
2065	70% and 2%	98,477	119.26	1.022	1.013	1.030	0.872	0.996
2065	70% and 10%	56,720	26.25	1.006	0.998	1.015	0.503	0.981

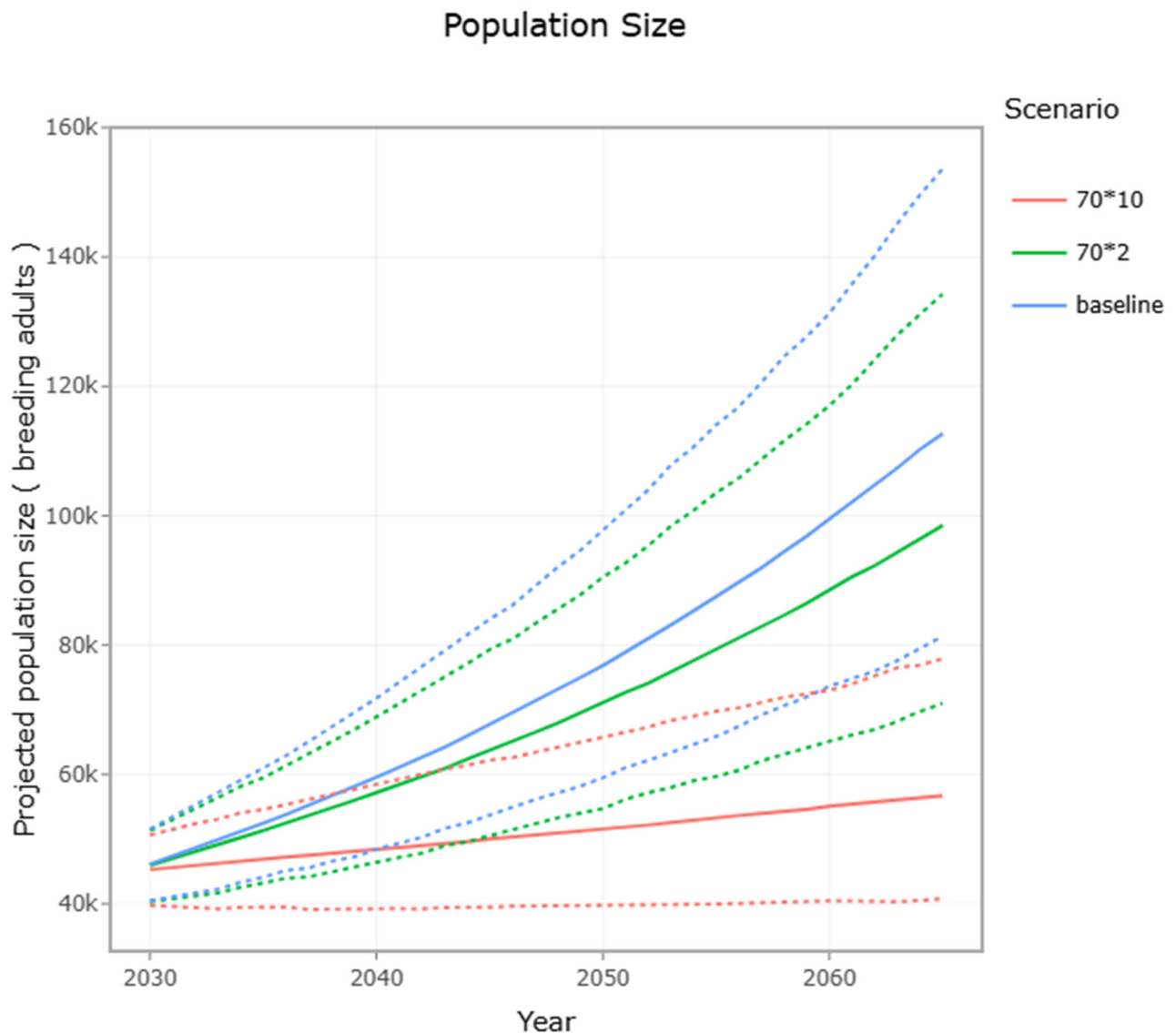


Figure 1.3: PVA output graph for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% LCI and UCI).

1.6.3.3 As the results of the two PVAs undertaken for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEOsI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives (Appendix to ExQ1 Q1.10.6 Part B Conservation objectives for SPAs screened in for Likely Significant Effects S_D3_25.6). This conclusion replicates what was previously presented in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010).

MONA OFFSHORE WIND PROJECT

1.6.4 Manx shearwater

Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

1.6.4.1 One scenario was modelled within the PVA for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA and considered the worst-case scenario of 70% displacement and 10% mortality.

1.6.4.2 The PVA resulted in a predicted impact, which indicates that the median growth rate (and 95% confidence intervals) continues to be >1 and, therefore, indicates that the population is predicted to increase in size under these modelled parameters (Table 1.22; Figure 1.4). The CGR also indicates that the impact scenario is close to the baseline or the non-impacted predicted growth rate.

Table 1.20: PVA outputs for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2018	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	46,941	2.57%	1.026	0.805	1.165	-	-
2030	Impact	46,875	2.33%	1.023	0.802	1.162	0.998	0.998
2065	Baseline	68,204	47.87%	1.011	0.991	1.030	-	-
2065	Impact	63,007	36.61%	1.009	0.988	1.028	0.922	0.998

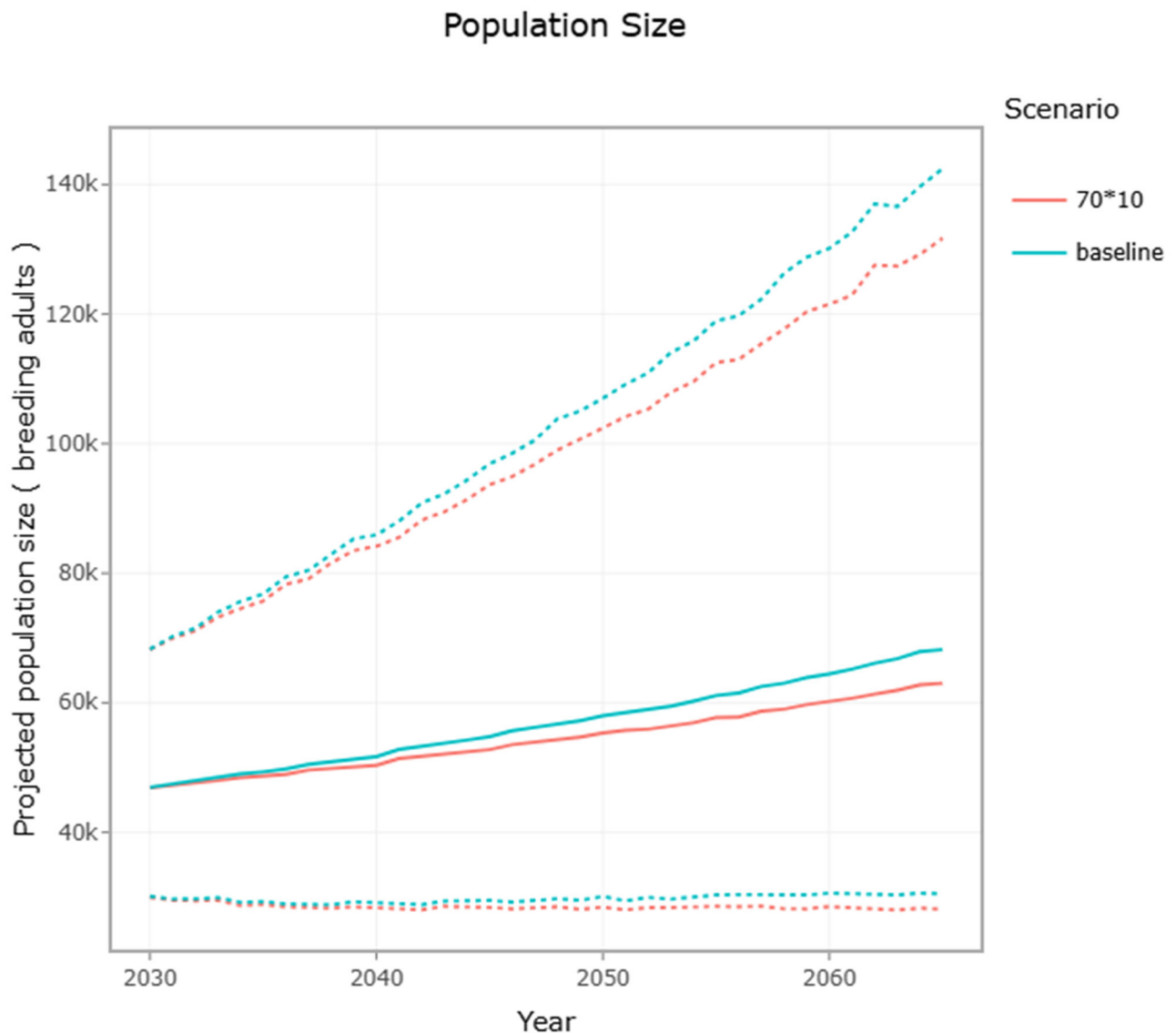


Figure 1.4: PVA output graph for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA (dashed lines represent the 95% LCI and UCI).

1.6.4.3 As the results of the PVA undertaken for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA indicate an increasing population size with and without the predicted impacts, it can be concluded that there is no AEOsI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives (Appendix to ExQ1 Q1.10.6 Part B Conservation objectives for SPAs screened in for Likely Significant Effects S_D3_25.6). This conclusion replicates what was previously presented in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010).

MONA OFFSHORE WIND PROJECT

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.6.4.4 One scenario was modelled within the PVA for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, considering the worst-case scenario of 70% displacement and 10% mortality.

1.6.4.5 The PVA resulted in a predicted impact which indicates that the median growth rate (and 95% confidence intervals) continues to be >1 and, therefore, indicates that the population is predicted to increase in size under these modelled parameters (Table 1.22; Figure 1.5). The CGR also indicates the impact scenario is close to the baseline or the non-impacted predicted growth rate.

Table 1.21: PVA outputs for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2018	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	1,033,107	2.58	1.026	0.805	1.166	-	-
2030	Impact	1,031,386	2.37	1.024	0.803	1.163	0.998	0.998
2065	Baseline	1,503,796	48.05	1.011	0.991	1.030	-	-
2065	Impact	1,399,169	37.90	1.009	0.989	1.028	0.931	0.998

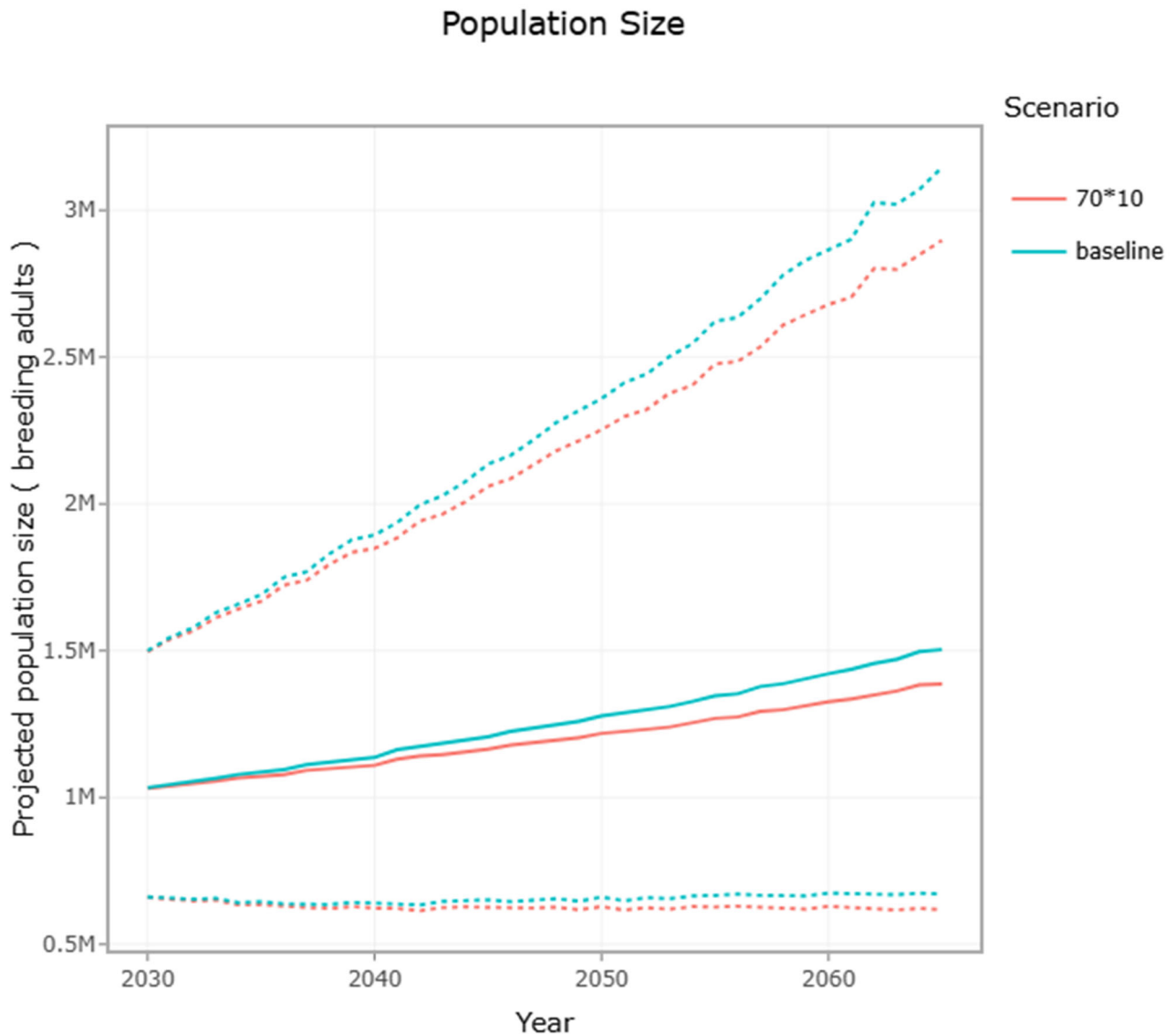


Figure 1.5: PVA output graph for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (dashed lines represent the 95% LCI and UCI).

1.6.4.6 As the results of the PVA undertaken for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicate an increasing population size with and without the predicted impacts it can be concluded that there is no AEOsI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives (Appendix to ExQ1 Q1.10.6 Part B Conservation objectives for SPAs screened in for Likely Significant Effects S_D3_25.6). This conclusion replicates what was previously presented in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010).

MONA OFFSHORE WIND PROJECT

1.6.5 Northern gannet

Grassholm SPA

1.6.5.1 One scenario was modelled within the PVA for northern gannet from Grassholm SPA, considering the worst-case scenario of 80% displacement and 10% mortality and collisions when using the species-group avoidance rate.

1.6.5.2 The PVA resulted in a predicted impact which indicates that median growth rate (and 95% confidence intervals) continues to be >1 and therefore indicate that the population is predicted to increase in size under these modelled parameters (Table 1.22; Figure 1.6). The CGR also indicates the impact scenario is close to the baseline or the non-impacted predicted growth rate.

Table 1.22: PVA outputs for northern gannet from Grassholm SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2024	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	41,325	1.87	1.019	0.914	1.085	-	-
2030	Impact	41,068	1.20	1.012	0.907	1.078	0.994	0.993
2065	Baseline	63,310	55.44	1.012	1.001	1.023	-	-
2065	Impact	49,018	20.60	1.005	0.994	1.016	0.775	0.993

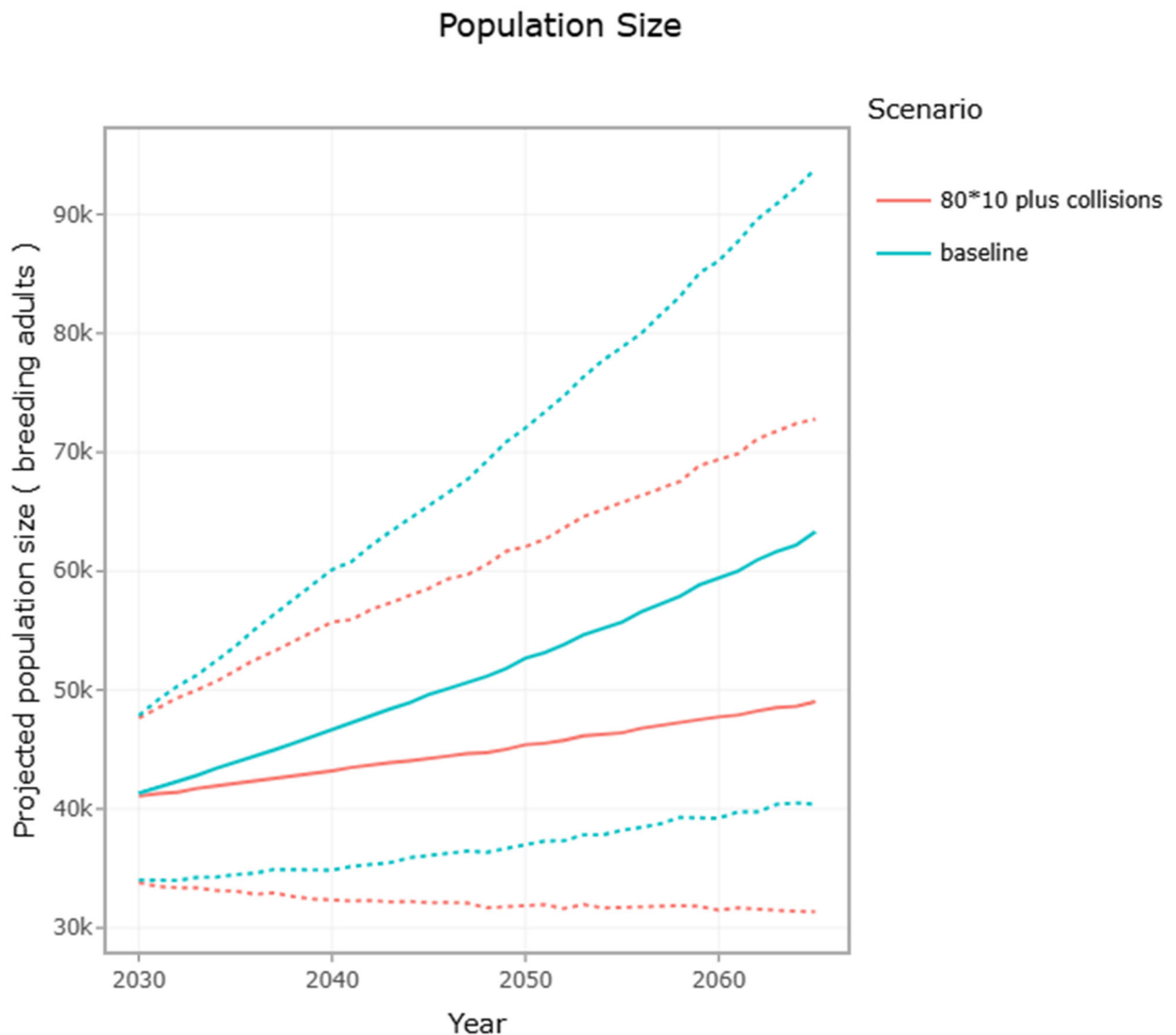


Figure 1.6: PVA output graph for northern gannet from Grassholm SPA (dashed lines represent the 95% LCI and UCI)

1.6.5.3 As the results of the PVA undertaken for northern gannet from Grassholm SPA indicate an increasing population size with and without the predicted impacts, it can be concluded that there is no AEOsI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives (Appendix to ExQ1 Q1.10.6 Part B Conservation objectives for SPAs screened in for Likely Significant Effects S_D3_25.6). This conclusion replicates what was previously presented in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010).

1.6.6 Razorbill

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.6.6.1 One scenario was modelled within the PVA for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and, therefore, not requiring a PVA (Parker *et al.*, 2023).

1.6.6.2 For the modelled scenario, the predicted impact would result in the median growth rate continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.23; Figure 1.7). The CGR also indicates that the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.23: PVA outputs for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2024	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	15,779	2.23%	1.022	0.839	1.126	-	-
2030	Impact	15,731	1.98%	1.020	0.837	1.124	0.998	0.997
2065	Baseline	21,582	39.04%	1.009	0.992	1.026	-	-
2065	Impact	19,563	26.32%	1.007	0.989	1.023	0.907	0.997

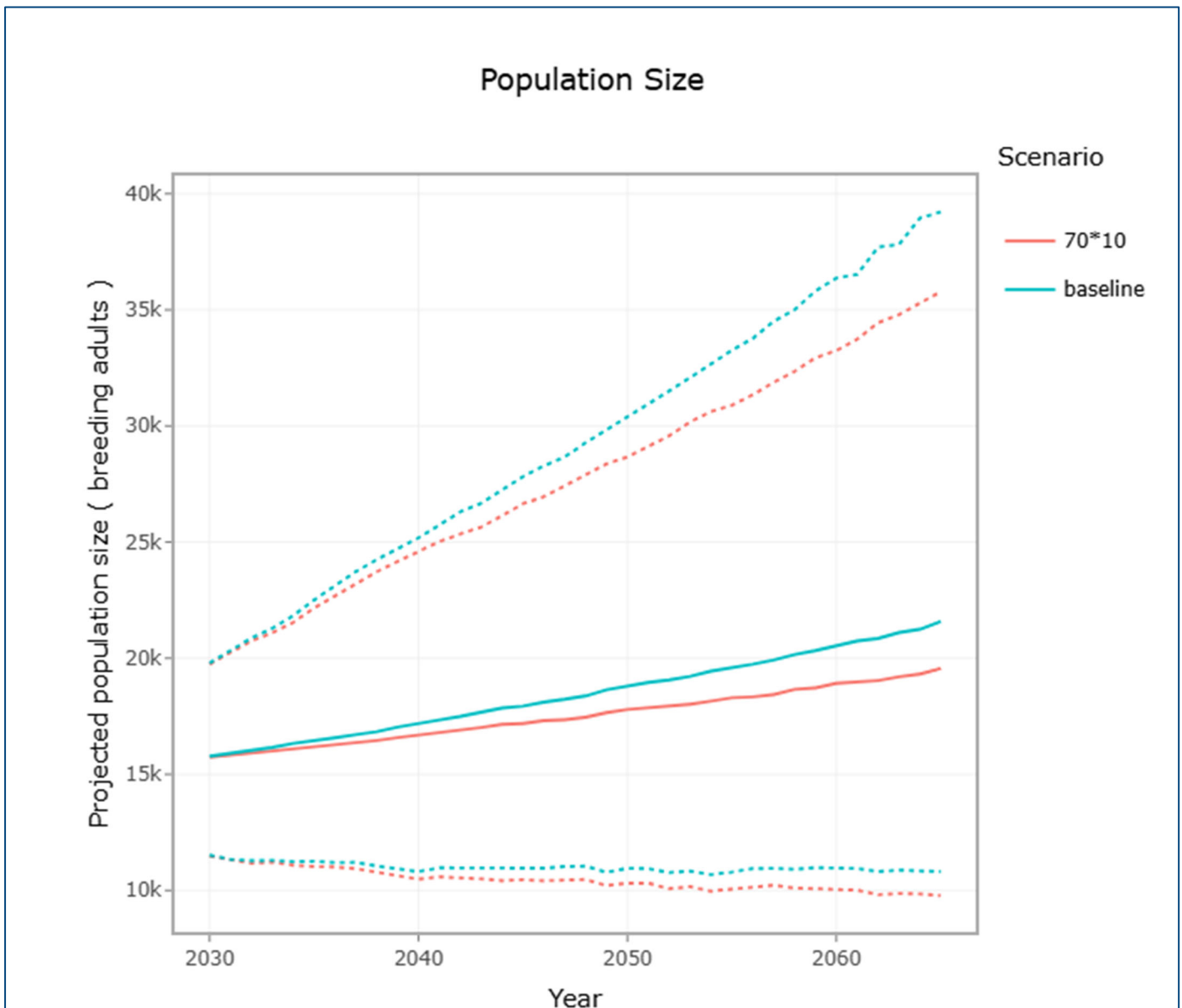


Figure 1.7: PVA output graph for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA(dashed lines represent the 95% LCI and UCI).

1.6.6.3

As the results of the PVA undertaken for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives (Appendix to ExQ1 Q1.10.6 Part B Conservation objectives for SPAs screened in for Likely Significant Effects S_D3_25.6). This conclusion replicates what was previously presented in HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (REP2-010).

1.7 Conclusions

- 1.7.1.1 The Examining Authority's Report on the Implications for European Sites (RIES) requested that the Applicant, NRW (A) and the JNCC confirm at Deadline 5 whether an AEOSI from the Mona Offshore Wind Project alone or in-combination with other plans or projects can be ruled out. Whilst the three parties agree that AEOSI from the Mona Offshore Wind Project alone can be ruled out for the relevant European sites and qualifying features, NRW (A) and the JNCC confirmed to the Applicant in a meeting on 22 November 2024 that they remained unable to confirm their position on AEOSI for the in-combination assessment with respect to all relevant sites and qualifying features. This was due to two principal outstanding concerns related to the Applicant's approach to age-class proportions during the breeding season and the consideration of projects which have submitted consent applications since the in-combination assessment for the Mona Offshore Wind Project was undertaken (namely Morgan Generation Assets, Morecambe Generation Assets and Llŷr 1 Floating Offshore Wind Farm).
- 1.7.1.2 In order to resolve the SNCB's outstanding concerns and enable them to confirm their position with respect to AEOSI (in-combination) as soon as possible within the Examination, the Applicant has sought to provide the further supplementary assessment information requested, which is outlined in this note.
- 1.7.1.3 As set out in section 1.3, the Applicant considers that the use of both the highest levels of displacement and the highest levels of mortality results in unrealistic outputs that are not supported by the available evidence. In addition, the approach suggested by NRW (A) and JNCC to assume that all unaged birds recorded during the site-specific surveys for all cumulative projects are adult birds is over-precautionary and considered to be biologically unrealistic given that populations will always include a material proportion of immature birds. Therefore, the Applicant's position is that the assessments presented within this document hyperinflate the potential impacts and do not use the 'best-scientific' evidence on the age-class structures and displacement rates.
- 1.7.1.4 Notwithstanding this, for all species and sites assessed within this note, the Applicant's conclusion remains as presented within the application (HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments REP2-010) and the Offshore ornithology supporting information in line with SNCB advice (REP4-030) which is that AEOSI from the Mona Offshore Wind Project in-combination with other projects and plans can be ruled out beyond reasonable scientific doubt.

1.8 References

- Awel y Môr (2022). Report 5.2: Report to Inform Appropriate Assessment
- Erebus (2021a). Technical Appendix 11.1 – Baseline Data
- Erebus (2021b). Volume 3, Appendix 8.3. Habitat Regulations Assessment: Report to Inform Appropriate Assessment.
- Llŷr 1 Floating Offshore Wind Farm (2024a). Volume 6: Appendix 22A – Marine Ornithology Baseline
- Llŷr 1 Floating Offshore Wind Farm (2024b). Volume 6: Appendix 22B – Marine Ornithology Colony Apportioning
- Morecambe Generation Assets (2024a) Appendix 12.2 Aerial Survey Two Year Report March 2021 to February 2023
- Morecambe Generation Assets (2024b) Volume 5 - Appendix 12.1 - Offshore Ornithology Technical Report
- Morgan Generation Assets (2024a). Volume 4, Annex 5.5: Offshore Ornithology Apportioning Technical Report
- Morgan Generation Assets (2024b). Kittiwake Apportioning Clarification Note
- NatureScot (2018). Interim Guidance on apportioning impacts from marine renewable developments to breeding seabird populations in SPAs. Available at: <https://www.nature.scot/doc/interim-guidance-apportioning-impacts-marine-renewable-developments-breeding-seabird-populations>
- Trevail, A. (2019). Environmental drivers of variability in population and individual foraging strategies. PhD Thesis University of Liverpool.
- Trevail, A. M., Green, J. A., Sharples, J., Polton, J. A., Arnould, J. P., & Patrick, S. C. (2019). Environmental heterogeneity amplifies behavioural response to a temporal cycle. *Oikos*, 128(4), 517-528.

Appendix A: PVA modelling parameters

A.1.1 PVA input parameters for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

A.1.1.1 Set up

The log file was created on: 2024-11-26 15:54:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

##	Package	Version
## popbio	"popbio"	"2.4.4"
## shiny	"shiny"	"1.1.0"
## shinyjs	"shinyjs"	"1.0"
## shinydashboard	"shinydashboard"	"0.7.1"
## shinyWidgets	"shinyWidgets"	"0.4.5"
## DT	"DT"	"0.5"
## plotly	"plotly"	"4.8.0"
## rmarkdown	"rmarkdown"	"1.10"
## dplyr	"dplyr"	"0.7.6"
## tidyr	"tidyr"	"0.8.1"

A.1.1.2 Basic information

This run had reference name "Skomer_KI_In-comb_100Adult".

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.1.1.3 Baseline demographic rates

Species chosen to set initial values: Black-legged kittiwake.

Region type to use for breeding success data: Global.

Available colony-specific survival rate: National. Sector to use within breeding success region: Global.

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

MONA OFFSHORE WIND PROJECT

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

A.1.1.4 Population 1

Initial population values: Initial population 3144 in 2024

Productivity rate per pair: mean: 0.619 , sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077, DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077 , DD: NA

A.1.1.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.1.6 Impact on Demographic Rates

Scenario A - Name: Collisions only

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.003342102, se: NA

Scenario B - Name: Displacement (30*3) and collisions

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0036924306, se: NA

Scenario C - Name: Displacement (70*10) and collisions

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0060593684, se: NA

MONA OFFSHORE WIND PROJECT

A.1.1.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.2 PVA input parameters for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

A.1.2.1 Set up

The log file was created on: 2024-11-26 10:18:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

##	Package	Version
## popbio	"popbio"	"2.4.4"
## shiny	"shiny"	"1.1.0"
## shinyjs	"shinyjs"	"1.0"
## shinydashboard	"shinydashboard"	"0.7.1"
## shinyWidgets	"shinyWidgets"	"0.4.5"
## DT	"DT"	"0.5"
## plotly	"plotly"	"4.8.0"
## rmarkdown	"rmarkdown"	"1.10"
## dplyr	"dplyr"	"0.7.6"
## tidyr	"tidyr"	"0.8.1"

A.1.2.2 Basic information

This run had reference name "Skomer_GU_In-comb_100Adult".

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.1.2.3 Baseline demographic rates

Species chosen to set initial values: Common guillemot.

Region type to use for breeding success data: Global.

Available colony-specific survival rate: National. Sector to use within breeding success region: Global.

Age at first breeding: 6.

MONA OFFSHORE WIND PROJECT

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

A.1.2.4 Population 1

Initial population values: Initial population 39923 in 2024

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058, DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152, DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098, DD: NA

Age class 3 to 4 - mean: 0.938, sd: 0.107, DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.1.2.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.2.6 Impact on Demographic Rates

Scenario A - Name: 70*10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.016969141, se: NA

Scenario B - Name: 70*2

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.003393828, se: NA

MONA OFFSHORE WIND PROJECT

A.1.2.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.3 PVA input parameters for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

A.1.3.1 Set up

The log file was created on: 2024-11-25 14:05:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

##	Package	Version
## popbio	"popbio"	"2.4.4"
## shiny	"shiny"	"1.1.0"
## shinyjs	"shinyjs"	"1.0"
## shinydashboard	"shinydashboard"	"0.7.1"
## shinyWidgets	"shinyWidgets"	"0.4.5"
## DT	"DT"	"0.5"
## plotly	"plotly"	"4.8.0"
## rmarkdown	"rmarkdown"	"1.10"
## dplyr	"dplyr"	"0.7.6"
## tidyr	"tidyr"	"0.8.1"

A.1.3.2 Basic information

This run had reference name "Skomer_MX_In-comb_100Adult".

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.1.3.3 Baseline demographic rates

Species chosen to set initial values: None.

Region type to use for breeding success data: None.

Available colony-specific survival rate: National. Sector to use within breeding success region: None.

Age at first breeding: 5.

MONA OFFSHORE WIND PROJECT

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

A.1.3.4 Population 1

Initial population values: Initial population 910312 in 2018

Productivity rate per pair: mean: 0.600 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.080

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.080 , DD: NA

A.1.3.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.3.6 Impact on Demographic Rates

Scenario A - Name: 70*10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0017152122 , se: NA

A.1.3.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.4 PVA input parameters for for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

A.1.4.1 Set up

The log file was created on: 2024-11-26 10:05:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

##	Package	Version
## popbio	"popbio"	"2.4.4"
## shiny	"shiny"	"1.1.0"
## shinyjs	"shinyjs"	"1.0"
## shinydashboard	"shinydashboard"	"0.7.1"
## shinyWidgets	"shinyWidgets"	"0.4.5"
## DT	"DT"	"0.5"
## plotly	"plotly"	"4.8.0"
## rmarkdown	"rmarkdown"	"1.10"
## dplyr	"dplyr"	"0.7.6"
## tidyr	"tidyr"	"0.8.1"

A.1.4.2 Basic information

This run had reference name "Bardsey_MX_In-comb_100Adult".

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.1.4.3 Baseline demographic rates

Species chosen to set initial values: None.

Region type to use for breeding success data: None.

Available colony-specific survival rate: National. Sector to use within breeding success region: None.

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

MONA OFFSHORE WIND PROJECT

A.1.4.4 Population 1

Initial population values: Initial population 41350 in 2018

Productivity rate per pair: mean: 0.600 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.080

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.080 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.080 , DD: NA

A.1.4.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.4.6 Impact on Demographic Rates

Scenario A - Name: 70*10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0019576191 , se: NA

A.1.4.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.5 PVA input parameters for northern gannet from Grassholm SPA

A.1.5.1 Set up

The log file was created on: 2024-11-26 10:05:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

##	Package	Version
## popbio	"popbio"	"2.4.4"
## shiny	"shiny"	"1.1.0"
## shinyjs	"shinyjs"	"1.0"
## shinydashboard	"shinydashboard"	"0.7.1"
## shinyWidgets	"shinyWidgets"	"0.4.5"
## DT	"DT"	"0.5"
## plotly	"plotly"	"4.8.0"
## rmarkdown	"rmarkdown"	"1.10"
## dplyr	"dplyr"	"0.7.6"
## tidyr	"tidyr"	"0.8.1"

A.1.5.2 Basic information

This run had reference name "Grassholm_GX_In-comb_100Adult".

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.1.5.3 Baseline demographic rates

Species chosen to set initial values: Northern gannet.

Region type to use for breeding success data: Global.

Available colony-specific survival rate: National. Sector to use within breeding success region: Global.

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

MONA OFFSHORE WIND PROJECT

A.1.5.4 Population 1

Initial population values: Initial population 38398 in 2024

Productivity rate per pair: mean: 0.766 , sd: 0.051

Adult survival rate: mean: 0.919 , sd: 0.042

Immatures survival rates:

Age class 0 to 1 - mean: 0.424 , sd: 0.045 , DD: NA

Age class 1 to 2 - mean: 0.829 , sd: 0.026, DD: NA

Age class 2 to 3 - mean: 0.891 , sd: 0.019, DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.019, DD: NA

Age class 4 to 5 - mean: 0.919 , sd: 0.042 , DD: NA

A.1.5.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.5.6 Impact on Demographic Rates

Scenario A - Name: 80*10 plus collisions

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00599075 , se: NA

A.1.5.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA