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MONA OFFSHORE WIND PROJECT

Volume 6, Annex 5.7: Offshore Ornithology Assessment of Pen y Gogarth/Great Orme's Head SSSI Technical Report

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Image of an offshore wind farm

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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
BDMPS	Biologically Defined Minimum Population Scales
CEA	Cumulative effects assessment
DCO	Development Consent Order
EPP	Evidence Plan Process
EWG	Expert Working Group
LCI	Lower confidence interval
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 ASSESSMENT OF PEN Y GOGARTH/GREAT ORME'S HEAD SITE OF SPECIAL SCIENTIFIC INTEREST TECHNICAL REPORT

1.1 Introduction

1.1.1 Background

1.1.1.1 This technical report presents the predicted impacts on the Pen y Gogarth/Great Orme's Head Site of Special Scientific Interest (SSSI) and has given regard to advice received from Natural Resources Wales (Advisory) (NRW (A)) during the examination of the Development Consent Order (DCO) application for the Mona Offshore Wind Project. This technical note utilises information from other reports, including Volume 6, Annex 5.2: Offshore Ornithology Displacement Technical Report (Document Reference F6.5.2 F03), Volume 6, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (Document Reference F6.5.3 F03) and Volume 6 Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03).

1.1.1.2 NRW (A) provided advice on the need to undertake an assessment of the ornithological features of Pen y Gogarth/Great Orme's Head SSSI during the Evidence Plan Process (EPP) (detailed in Technical Engagement Plan Appendices – Part 1 (A to E) (Document Reference E4.1 F01)), during the Mona examination as part of their Relevant Representations, Written Representations at Deadline 1, Deadline 2 submission and their Deadline 3 submission.

1.1.1.3 An assessment of common guillemot during the breeding season only was presented within Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F01) at application; however, NRW (A), requested (via NRW's Relevant Representations) that an annual assessment was presented for black-legged kittiwake, common guillemot and razorbill as a stand-alone document. Therefore, an initial version of this technical report (Offshore Ornithology Assessment of Pen y Gogarth/Great Orme's Head SSSI (Document Reference S_D1_25 F01)) was submitted at Deadline 1 and took account of advice received via the EPP and NRW's Relevant Representations.

1.1.1.4 A second version of this technical report (Offshore Ornithology Assessment of Pen y Gogarth & Great Orme's Head SSSI (Document Reference S_D1_25 F02) was submitted at Deadline 4 to reflect further guidance from NRW (A) received at Deadlines 2 and 3.

1.1.1.5 Table 1-1 provides a summary of NRW (A)'s comments received to date and the Applicant's response where relevant to Pen y Gogarth/Great Orme's Head SSSI.

1.1.1.6 NRW (A) confirmed via the Mona and NRW (A) Offshore Statement of Common Ground (SoCG) (Document Reference S_D1_13 F01) at Deadline 6 that 'a significant adverse effect' can be ruled out for the guillemot and razorbill features of the SSSI' from the Mona Project alone and cumulatively (NRW.OO.24 and NRW.OO.26). However, NRW (A) concluded a moderate adverse impact on black-legged kittiwake from both the Mona Offshore Wind Project alone and cumulative (NRW.OO.25 and NRW.OO.28) although it was recognised that the Applicant has provided proportionate mitigation for black-legged kittiwake. Consequently, this has been assigned a status of 'not agreed - not material' within the SoCG. In light of this, there has been no additional amendment to this technical report between the version submitted at

Deadline 4 (Document Reference S_D1_25 F02) and this version submitted at Deadline 7.

1.1.1.7 This Offshore Ornithology Assessment of Pen y Gogarth/Great Orme's Head SSSI Technical Report has been submitted into examination at Deadline 7 as an annex to the Environmental Statement and supersedes earlier versions of this note (Document Reference S_D1_25 F01 and F02). It is also included in Schedule 15 of the Draft Development Consent Order (DCO) (Document Reference C1 F08) as a document to be certified by the Secretary of State in the event the DCO is granted.

Table 1-1: Summary of NRW (A)'s key comments on the assessment for the Pen y Gogarth/Great Orme's Head SSSI.

Source	Relevant Comment	Applicant's Response
NRW (A)'s Relevant Representation	2.1.2 Impacts to Sites of Special Scientific Interest (SSSIs) Reference is made to an assessment of operational displacement from the project alone to the guillemot feature of the Pen y Gogarth / Great Orme's Head SSSI in the Offshore Ornithology Chapter (Document Reference F2.5 F01). However, we consider the assessment is unclear, and appears to be based on breeding season impacts only. Impacts to SSSI colony features should be apportioned to the colony in the non-breeding season as well, and the annual impact assessed against baseline mortality of the colony (calculated using the colony size in adults and the adult mortality rate). As the Mona project is located within foraging range of the guillemot, razorbill and kittiwake features of the Pen-y-Gogarth / Great Orme's Head Site SSSI, we again advise that detailed quantitative assessments of the potential impacts of the Mona project on all three of these features should be undertaken. The Applicant could consider following the approach taken by the applicant in the Awel-yMôr DCO (see Deadline 3a assessment REP3a-019)	Within Volume 6, Annex 5.5: Offshore apportioning technical report (Document Reference F6.5.5 F03), the breeding season apportioning on common guillemot, razorbill, and black-legged kittiwake is presented in Table 1.8, Table 1.11, and Table 1.17, respectively. The increase in baseline mortality for razorbill and black-legged kittiwake did not indicate that PVA was required, but the Applicant acknowledges that this calculation was not presented explicitly. The non-breeding season was not considered in Volume 2, Chapter 5: Offshore ornithology (Document Reference F2.5 F04) due to the size of the populations at the Pen-y-Gogarth/Great Orme's Head Site SSSI versus the BDMPS. With an adult breeding population of 3,578 birds at Pen-y-Gogarth/Great Orme's Head Site SSSI and a proportion of adults in UK western waters in the non-breeding season of 0.9 (taken from Skomer and Skokholm SPA (Furness, 2015)), the proportion of SSSI birds in the BDMPS (Adult UK Western waters of 656,156) is below 1%. For clarity, the Applicant recognises the value of presenting a specific document on the impact on the Pen-y-Gogarth/Great Orme's Head Site SSSI year-round. This was provided into examination at Deadline 1 (Document Reference S_D1_25 F01) and an update provided at Deadline 4 (Document Reference S_D1_25 F02), which has subsequently been included as an Annex (this document) to Volume 2, Chapter 5: Offshore ornithology (Document Reference F2.5 F04) submitted at Deadline 7.
NRW (A)'s Written Representation	NRW (A) advises that a detailed assessment of the potential impacts of the project on the breeding seabird features of Pen-y-Gogarth / Great Orme's Head Site of Special Scientific Interest (SSSI) (guillemots, razorbills and kittiwakes) should be undertaken, as currently this has not been done sufficiently to assess effects on these features. We advise that the effects of displacement on auks and collision risk mortality of kittiwakes should be further assessed.	As outlined in the Applicant's Response to Relevant Representations, the Applicant submitted an Offshore Ornithology Assessment of Pen y Gogarth/Great Orme's Head SSSI (Document Reference S_D1_25 F01) note at Deadline 1. This document provided an annual assessment of the impact of the Mona Offshore Wind Project alone on black-legged kittiwake, razorbill and common guillemot from Pen y Gogarth/Great Orme's Head SSSI as requested by NRW in their Relevant Representation and Written Representation. This was subsequently updated at Deadline 4 (Document Reference S_D1_25 F02) and has been included as an Annex (this document) to Volume 2, Chapter 5: Offshore ornithology (Document Reference F2.5 F04) submitted at Deadline 7.
NRW (A)'s Deadline 2 Submission	2. Comments on Offshore Ornithology Assessment of Pen y Gogarth / Great Orme's Head SSSI (Document Reference F6.5.7)	The Applicant notes NRW (A)'s comments and, in response to the points raised, submitted a revised Offshore Ornithology Assessment

Source	Relevant Comment	Applicant's Response
	2.1 Key Comments We welcome that the Applicant has now submitted a detailed quantitative assessment of impacts of the Mona project alone on the kittiwake, guillemot and razorbill features of the Pen y Gogarth / Great Orme's Head SSSI. This was advised to be undertaken by NRW (A) in both our Relevant Representation, and with further detail on this request provided in our Written Representation at Deadline 1. The Applicant's assessment document was submitted ahead of submission of our Written Representation and hence produced before the further detail in Document Reference S_D1_25 F02 was available. As a result, there are some aspects of the assessment approach that we have concerns/queries regarding, or that we would not agree with/advise are undertaken.	of Pen y Gogarth/Great Orme's Head SSSI note at Deadline 4 (Document Reference S_D1_25 F02) to address, where required, the matters raised by NRW (A) on the version submitted at Deadline 1 (Document Reference S_D1_25 F02). The revisions to the assessment did not altered the conclusions drawn. The Applicant has also provided this document at Deadline 7 as an Annex to Volume 2, Chapter 5: Offshore ornithology (Document Reference S_D1_25 F02).
NRW (A)'s Deadline 3 Submission	We welcome the Applicant's submitted detailed quantitative assessment of impacts of the Mona project alone on the kittiwake, guillemot and razorbill features of the Pen y Gogarth / Great Orme's Head Site of Special Scientific Interest (SSSI) (Document Reference S_D1_25 F02). NRW (A) provided a response on this at Deadline 2, where we noted some aspects of the assessment approach that we have concerns / queries regarding, or that we do not agree with / advise are undertaken.	The Applicant notes NRW (A)'s comments and confirms that following submission of the Offshore Ornithology Assessment of Pen y Gogarth/Great Orme's Head Site of Special Scientific Interest (SSSI) (Document Reference S_D1_25 F01) at Deadline 1 and NRW (A)'s comments received at Deadline 2 and Deadline 3, the Applicant submitted an updated assessment for the Pen Pen y Gogarth / Great Orme's Head SSSI (Document Reference S_D1_25 F02) at Deadline 4 to address the comments made. The Applicant confirms that additional clarity was provided in relation to the following points: • The methods for calculating non-breeding season age-class apportioning (Table 1-2); • The foraging range table was updated at Deadline 2 (see Table 1.7 of HRA Stage 1 Screening Report (Document Reference E1.4 F03)). The changes did not alter the breeding season apportioning undertaken for common guillemot or razorbill. • The collision impact for black-legged kittiwake was updated in line with the full breeding season (March to August) as presented in Table 5.13 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference S_D1_25 F02); • The full range of SNCB advised displacement and mortality rates was considered for common guillemot and razorbill; however, displacement impacts on black-legged kittiwake were no longer included, in line with NRW (A)'s guidance. The removal of displacement did not amend the conclusions for the Mona Offshore Wind Project alone assessment (section 1.3.1). • An updated CEA for offshore wind projects with known impacts was provided. The projects included within the CEA were the

Source	Relevant Comment	Applicant's Response
		same as those presented in Section 5.8 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference S_D1_25 F02).
Virtual meeting on the 18 October 2024	NRW requested that, as part of the note, the following two items are included: • Visual presentation of the PVA outputs; • A matrix table showing the percentage increase in baseline mortality using the range of potential displacement impacts; and • Confirmation that their interim advice (alongside Natural England) has been followed for the survival rate of immature razorbill.	The Applicant has presented a visual PVA chart of each of the species for both the alone and cumulative assessments. The Applicant has also added the matrix table for razorbill and guillemot for the Mona Offshore Wind Project alone. No matrix table has been presented for the cumulative impact due to all displacement ranges (30-70% displacement and 1-10% mortality), indicating an increase of >1% in baseline mortality. The Applicant can also confirm that the interim advice (*NE and NRW interim advice regarding demographic rates, EIA scale mortality rates and reference populations for use in offshore wind impact assessments*; Natural England and NRW, 2024) has been followed in this report in regard to the immature survival rate for razorbill as requested by NRW.
Virtual meeting on the 29 October 2024	NRW requested the following: • that the gap-filled projects are included within the cumulative assessment for the three species considering within this assessment. • that all projects with no site-specific age class apportioning should be considered adults during the breeding season. • that if there was no site apportioning value for projects considered the cumulative assessment that a proxy can be used. If a proxy is used that it's source is specifically stated.	The Applicant has updated the CEA to include the gap-filled projects. A detailed methodology on the calculation of the gap-filled project's impacts was submitted into Examination at Deadline 4 (Offshore Ornithology Cumulative Effects Assessment and In-combination Gap-filling Historical Projects Technical Note (Document Reference S_D3_12 F02) and has subsequently been included as an appendix to Volume 2, Chapter 5: Offshore ornithology (Document Reference F2.5 F04) at Deadline 7. The Applicant notes that the SNCBs have published no formal guidance on quantifying the impacts of 'gap-filled' projects; however, the Applicant considers that it has taken a robust approach, in consultation with the SNCBs, which aligns with the advice received. The Applicant does not consider that assuming all birds within the breeding season are adults would be a true representation of the risk and has continued to use the stable-age structure from Furness (2015) within the cumulative assessment. The Applicant notes that the SCNBs requested the inclusion of stable-age structures as part of the regional population for EIA scale impacts during the breeding season as part of the EPP. The Applicant considers using the age-class structures when considering 17 projects over a wide spatial scale as a robust assessment of the risk. Furness (2015) sets out how the ratios used are a precautionary estimate due to seabird species life history. Including 100% of birds as adults in the breeding season would lead to unrealistic and overly precautionary impacts that would give little confidence in the assessment. The inclusions of a proportion of birds being adults has been utilised for multiple other consented offshore wind projects and the Crown Estate's Plan Level

Source	Relevant Comment	Applicant's Response
		HRAs, therefore the inclusion of stable-age structures has precedent. Finally, the Applicant can confirm that proxy sites were used for the site apportioning if an apportioning value was not available from the site-specific documentation (e.g. for the gap-filled projects). The source of the proxy apportioning value is presented above each of the cumulative tables for the three species assessed.
Section 1.1.2 of NRW (A)'s Deadline 5 Submission	We welcome the additional work undertaken by the Applicant in the updated Pen y Gogarth / Great Orme's Head Special Site of Scientific Interest (SSSI) Assessment (Document Reference S_D1_12 F02). We are content with the approaches taken for the assessment of the predicted impacts from the project alone. Whilst we consider that the cumulative totals presented in (Document Reference S_D1_12 F02) are likely to be underestimates, we can agree that the project alone and cumulatively with other plans and projects is unlikely to have a significant adverse effect (i.e. not greater than minor adverse) for the guillemot and razorbill features of the SSSI. However, the kittiwake colony of the SSSI is decreasing, but not at a rate that has been seen at other UK kittiwake colonies. Based on this, and that the Applicant's PVAs suggest that the population would remain stable due to the project alone impact and that the population would decline due to the cumulative impact, we consider that the predicted cumulative collision impacts as presented, which are likely to be underestimated, have the potential to give rise to a moderate adverse impact As noted, the predicted level of cumulative impacts, which includes consideration of the gap filled historical projects, to the kittiwake feature of the Pen y Gogarth / Great Orme's Head SSSI are at level of concern. In the case of the Mona OWF project, we recognise and welcome the commitment already made to raise turbine draught height to 30m above Mean Sea Level (Environmental Statement - Volume 6, Annex 5.3: Offshore ornithology collision risk modelling technical report Table 1.5, Document Reference F6.5.3). Therefore, we are content that the Applicant has provided proportionate mitigation for kittiwake at this site.	The Applicant welcomes NRW (A)'s comments, which are also repeated within the Mona and NRW (A) Offshore SoCG (S_D1_12 F03). The Applicant notes NRW (A)'s conclusion of no significant impact on common guillemot and razorbill from the Mona Offshore Wind Project alone, and for common guillemot and razorbill cumulatively (see NRW.OO.24 of Mona and NRW (A) Offshore SoCG (S_D1_12 F03)). However, NRW (A) conclude a significant impact on black-legged kittiwake alone and cumulatively (see NRW.OO.25 of Mona and NRW (A) Offshore SoCG (S_D1_12 F03)). The Applicant does not agree with NRW (A)'s assessment conclusion but as NRW (A) have stated that the Applicant's mitigation is proportionate the Applicant, therefore, considers this matter closed.

1.2 Method of assessment

1.2.1.1 The impact and assessment for black-legged kittiwake, razorbill and common guillemot from Pen y Gogarth/Great Orme's Head SSSI from the Mona Offshore Wind Project presented in this clarification note have used the same methodology as presented within Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). As advised by NRW in their Relevant Representation (detailed in Table 1-1), the Applicant has reviewed the approach adopted by Awel y Môr to assess its impact on the Pen y Gogarth/Great Orme's Head SSSI (RWE, 2022) and does not consider it to be appropriate to present a PVA without first assessing whether this level of assessment is necessary (i.e. the project is predicted to result in a sufficient increase in baseline mortality to warrant further assessment). Therefore, in accordance with the assessment methodology presented in Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04), the Applicant has first assessed if the predicted impact of the Mona Offshore Wind Project alone and/or cumulatively would surpass the threshold for requiring further assessment using PVA (i.e. >1% increase in baseline mortality), before undertaking a PVA.

1.2.1.2 The impacts presented within Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04) are supported by the technical reports, specifically Volume 6, Annex 5.2: Offshore Ornithology Displacement Technical Report (Document Reference F6.5.2 F03), Volume 6, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (Document Reference F6.5.3 F03) and Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03).

1.2.1.3 During the breeding season the Pen y Gogarth/Great Orme's Head SSSI was included within Volume 6, Annex 5.4: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03) for black-legged kittiwake, common guillemot and razorbill. Specifically, 15.6% of black-legged kittiwake, 15.6% of common guillemot and 21.1% of razorbill recorded within the Mona Offshore Wind Project during the breeding season are likely to originate from the Pen y Gogarth/Great Orme's Head SSSI. The calculations of these percentages are presented in Table 1.17, Table 1.8 and Table 1.11 of Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03), respectively.

1.2.1.4 During the breeding season, 100% of birds are considered to be adults for both common guillemot and razorbill, and 95.2% for black-legged kittiwake as presented in Table 1.4 of Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03). NRW stated agreement with this approach within NRW's Deadline 2 Submission.

1.2.1.5 During the non-breeding season, the apportioning calculations were taken from Furness (2015). Furness (2015) defined Biologically Defined Minimum Population Scales (BDMPS) populations during the non-breeding season for most seabird species within the UK. The report (Furness, 2015) and subsequent BDMPS populations focused on Special Protection Areas (SPAs) with SSSIs cumulatively presented within a single 'colony' called "West coast UK non-SPA populations" for each species. As no individual SSSIs were reported in Furness (2015) the impact during the non-breeding season on SSSIs was not quantified within Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). This included the Pen y Gogarth/Great Orme's Head SSSI.

1.2.1.6 The species-specific calculation of non-breeding season impact on the Pen y Gogarth/Great Orme's Head SSSI is presented within Table 1-2.

1.2.1.7 The proportion of adults from Pen y Gogarth/Great Orme's Head SSSI within the BDMPS during the non-breeding bioseason has used the values assigned to Rathlin Island SPA within the Appendix tables of Furness (2015) as this is the closest colony with suitable data. NRW stated agreement with using Rathlin Island SPA as a proxy within NRW's Deadline 2 Submission.

1.2.1.8 When calculating the proportion of the non-breeding population, which could have originated from Pen y Gogarth/Great Orme's Head SSSI, the population estimate from 2000 was used (Seabird Monitoring Programme, 2024). This data was chosen as Furness (2015) used the 2000 population estimates to determine the population estimate of "West coast UK non-SPA populations". The apportioning in Furness (2015) uses historical count data but is still the recommended resource (Parker *et al*., 2022).

Table 1-2: Species-specific calculation of non-breeding season apportioning for features of the Pen y Gogarth/Great Orme's Head SSSI.

Species	Bioseason	Population at Pen y Gogarth/Great Orme's Head SSSI (breeding adults from 2000)	Proportion of adults from Pen y Gogarth/Great Orme's Head SSSI within the BDMPS	Number of adult birds from Pen y Gogarth/Great Orme's Head SSSI within the BDMPS	Total adult population of the BDMPS	Proportion of adult population of the BDMPS from Pen y Gogarth/Great Orme's Head SSSI (adult birds)
Black-legged kittiwake	Spring migration	2,294	0.8	1,835	375,111	0.0049
	Autumn migration		0.6	1,376	498,970	0.0028
Common guillemot	Non-breeding	2,026	1.0	2,026	656,156	0.0031
Razorbill	Migration seasons (spring and autumn)	302	0.98	296	316,928	0.0009
	Winter		0.4	121	179,183	0.0007

1.3 Species assessments

1.3.1 Black-legged kittiwake

Project alone assessment

1.3.1.1 The apportioned annual collision impact from the Mona Offshore Wind Project alone is presented in Table 1-3 for black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI. The un-apportioned impact of the Mona Offshore Wind Project is presented in Table 1-3 (and Table 5.38 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)). The CRM was undertaken using the stochastic CRM via the shiny app (Caneco, 2022) using the species-group avoidance rate of 0.9928. The collision impacts are rounded to two decimal places and therefore the combined impact when summing the numbers presented in the tables may not equal the number presented in the 'total' row due to this rounding.

1.3.1.2 During the spring migration bioseason, the estimated impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI was 0.04 birds (0.01 to 0.08 birds), which could increase the baseline mortality by 0.02% (0.01% to 0.05%) (Table 1-3). The impacts presented are mean collision estimates with lower 95% confidence intervals (LCI) and upper 95% confidence intervals (UCI) presented in brackets.

1.3.1.3 During the breeding bioseason, the estimated impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI was 2.31 birds (0.84 to 4.70 birds), which could increase the baseline mortality by 1.40% (0.51% to 2.85%) (Table 1-3).

1.3.1.4 During the autumn migration bioseason, the estimated impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI was 0.02 birds (0.01 to 0.05 birds), which could increase the baseline mortality by 0.01% (0.00% to 0.03%) (Table 1-3).

1.3.1.5 When considering the annual impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI, the predicted collision impact is 2.37 birds (0.87 to 4.83) which equates to an estimated 1.44% (0.53% to 2.93%) increase in baseline mortality. Considering the latest population estimate of 564 apparently occupied nests (1,128 adult birds) in 2023 (Seabird Monitoring Programme, 2024) and the baseline mortality rate of 0.146, the baseline mortality could be 165 birds.

Table 1-3: Predicted impact of collisions from Mona Offshore Wind Project on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI

Bioseason	Un-apportioned impact - mean collisions (LCI and UCI)	Apportioning percentage	Percentage of adult type birds from DAS	Apportioned impact on Pen y Gogarth/Great Orme's Head SSSI	Percentage increase in baseline mortality (165 birds)
Spring migration (January and February)	8.74 (3.09 to 18.15)	0.49%	92.01%	0.04 (0.01 to 0.08)	0.02% (0.01% to 0.05%)
Breeding (March to August)	15.52 (5.68 to 31.60)	15.6%	95.36%	2.31 (0.84 to 4.70)	1.40% (0.51% to 2.85%)
Autumn migration (September to December)	8.41 (2.96 to 17.53)	0.28%	92.01%	0.02 (0.01 to 0.05)	0.01% (0.00% to 0.03%)

Bioseason	Un-apportioned impact - mean collisions (LCI and UCI)	Apportioning percentage	Percentage of adult type birds from DAS	Apportioned impact on Pen y Gogarth/Great Orme's Head SSSI	Percentage increase in baseline mortality (165 birds)
Annual	32.67 (11.73 to 67.27)	N/A	N/A	2.37 (0.87 to 4.83)	1.44% (0.53% to 2.93%)

1.3.1.6 The predicted increase in baseline mortality from the Mona Offshore Project alone is predicted to be >1% and, therefore warrants further investigation via PVA. The summary outputs of the project alone PVA are presented in Table 1-4. When considering the mean collision impacts, the PVA predicted a stable population (median growth rate 1.000) and is therefore neither increasing or decreasing in size. The counterfactual of the growth rate is close to 1 (0.998) and, therefore, within natural variation of the growth rate. When the UCI of collision impacts are assumed in the PVA, there is predicted to be a small annual decline in the population (median growth rate of 0.998). However, as set out above, the other scenarios (e.g. LCI and mean scenarios) do not indicate a decline in growth rate for the black-legged kittiwake population and as such, the risk of a decline in the population is low (i.e. only in the UCI scenario). A visual representation of the Mona Offshore Wind Project alone impact scenarios, baseline scenario and the UCI and LCI is shown in Figure 1.1.

1.3.1.7 Given that all but the most conservative scenario (i.e. UCI) indicate stable population after 35 years (in 2065), this would be considered a negligible to low magnitude impact. Following the EIA methodology (set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)) black-legged kittiwake is deemed to be of high vulnerability, low recoverability and medium value. The sensitivity of the receptor is therefore, considered to be high.

1.3.1.8 Overall, as the sensitivity of black-legged kittiwake is high and the magnitude of impact is considered negligible to low, this could lead to a potential minor significant impact to black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI from the project alone. Therefore, as the predicted impact is of minor significant impact, this is considered non-significant.

Table 1-4: PVA outputs for the annual impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI from the Mona Offshore Wind Project alone

Year	Impact scenario	Simulated population size (adult birds)	Median population change since 2023 (%)	Median growth rate	2.5 percentile of simulated growth rate	97.5 percentile of simulated growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	Baseline	1,156	1.34%	1.013	0.810	1.165	-	-
2030	Mean impact (2.37 birds)	1,153	1.15%	1.012	0.806	1.162	0.998	0.997
2030	UCI impact (4.83 birds)	1,151	0.71%	1.007	0.804	1.159	0.995	0.995
2065	Baseline	1,272	10.65%	1.003	0.981	1.023	-	-
2065	Mean impact (2.37 birds)	1,164	1.52%	1.000	0.978	1.020	0.998	0.914
2065	UCI impact (4.83 birds)	1,060	-7.61%	0.998	0.976	1.018	0.995	0.833

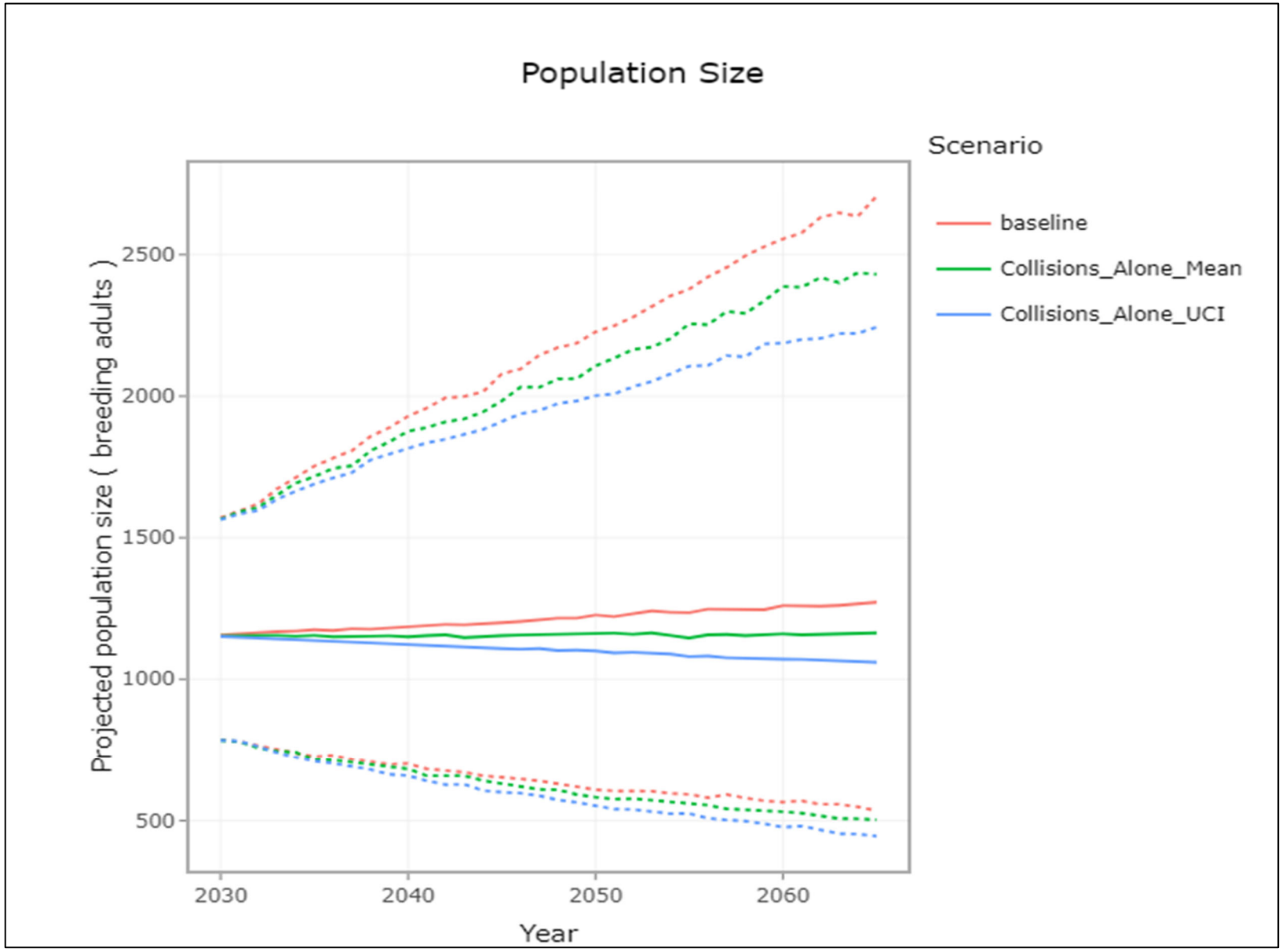

Figure 1.1: PVA output chart showing the black-legged kittiwake population size under the baseline and collision scenarios from the Project alone. Dashed lines present the LCI and UCI of the population size

Cumulative assessment

1.3.1.9 As set out in Table 1-1 NRW specifically requested a cumulative assessment of the potential impact to black-legged kittiwake from the Pen y Gogarth/Great Orme's Head SSSI.

1.3.1.10 Table 1-5 provides project by project un-apportioned and apportioned impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI. The projects included in this assessment are the same as those presented in Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). As the predicted cumulative impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI increases baseline mortality of >1%, further investigation via a PVA has been undertaken. The summary output of the PVA is presented in Table 1-6.

Table 1-5: Apportioned predicted impact on adult black-legged kittiwake from the Pen y Gogarth/Great Orme's Head SSSI as a result of the Mona Offshore Wind Project acting cumulatively.

a – the apportioning value during the breeding season has used that of Morecambe Offshore Wind Generation Assets, specifically 0.0609.

b – the apportioning value during the breeding season was taken from project specific documentation

c - the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.53.

d – the project only presented an annual impact, for precaution the annual impact is considered to occur in the breeding season

e – the plans/projects included within this cumulative assessment cover a large spatial area, and therefore, it is considered necessary to apply a correction factor to account for the number of adult birds within the whole area. All projects have used the proportion of adults/immatures within the Appendix tables of from Furness (2015) for age-class apportioning which is 53.2% of birds are adults during the breeding season, 54.33% of birds are adults in the spring migration and 54.74% are adults in the autumn migration.

Project	Un-apportioned impact (all age-classes)			Apportioning value			Apportioned collision values (species-group avoidance rate 99.28) – adult birds[e]			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	15.3	11.66	8.29	0.0049	0.53[b]	0.0028	0.04	3.29	0.01	3.34
Burbo Bank Extension Offshore Wind Farm	N/A	23.04[d]	N/A	0.0049	0.0609[a]	0.0028	N/A	0.75	N/A	0.75
Erebus Floating Wind Demo	12.51	0.5	24.64	0.0049	No connectivity	0.0028	0.03	No connectivity	0.04	0.07
TwinHub (Wave Hub Floating Wind Farm)	N/A	9.78[d]	N/A	0.0049	No connectivity	0.0028	N/A	No connectivity	N/A	0.00
Mona Offshore Wind Project	8.74	15.52	8.41	0.0049	0.156[b]	0.0028	0.01	1.29	0.01	1.32
Morecambe Offshore Windfarm Generation Assets	5.34	15.03	11.63	0.0049	0.0609[a]	0.0028	0.01	0.49	0.02	0.52
Morgan Offshore Wind Project Generation Assets	13.18	5	21.63	0.0049	0.07[b]	0.0028	0.03	0.19	0.03	0.25
Ormonde Wind Farm	N/A	3.27[d]	N/A	0.0049	0.0609[a]	0.0028	N/A	0.11	N/A	0.11
Rampion Offshore Wind Farm	41.76	70.56	15.84	0.0049	No connectivity	0.0028	0.11	No connectivity	0.02	0.14
Rampion 2 Offshore Wind Farm	17	1	10	0.0049	No connectivity	0.0028	0.04	No connectivity	0.01	0.06
Walney (3 & 4) Extension Offshore Wind Farm	15.19	18.79	86.4	0.0049	0.0609[a]	0.0028	0.04	0.61	0.13	0.78
West of Orkney Windfarm	20.99	17.06	16.44	0.0049	No connectivity	0.0028	0.05	No connectivity	0.02	0.08
White Cross Offshore Windfarm	9.26	3.7	1.85	0.0049	No connectivity	0.0028	0.02	No connectivity	0.00	0.03
Gap-filled projects										
Burbo Bank	0.54	0.84	0.84	0.0049	0.0609[a]	0.0028	0.00	0.03	0.00	0.03

Project	Un-apportioned impact (all age-classes)			Apportioning value			Apportioned collision values (species-group avoidance rate 99.28) – adult birds[e]			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Gwynt y Môr Offshore Wind Farm	0.84	1.45	1.33	0.0049	0.53[c]	0.0028	0.00	0.41	0.00	0.41
Robin Rigg	0.74	1.33	1.27	0.0049	0.0609[a]	0.0028	0.00	0.04	0.00	0.05
Rhyl Flats Offshore Wind Farm	0.75	1.34	1.18	0.0049	0.53[c]	0.0028	0.00	0.38	0.00	0.38
Walney 1	1.16	1.81	1.87	0.0049	0.0609[a]	0.0028	0.00	0.06	0.00	0.06
Walney 2	0.56	3.26	0.71	0.0049	0.0609[a]	0.0028	0.00	0.11	0.00	0.11
West of Duddon Sands Offshore Wind Farm	2.59	3.99	4.16	0.0049	0.0609[a]	0.0028	0.01	0.13	0.01	0.14
Combined impact	**166.45**	**208.87**	**967.13**	**N/A**	**N/A**	**N/A**	**0.44**	**7.86**	**0.33**	**8.64**
									Increase in baseline mortality	**5.23%**

Table 1-6: PVA outputs for the annual cumulative impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI

Year	Impact scenario	Median adult population size	Population change (%) since 2023	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	Baseline	1,156	2.5%	1.014	0.806	1.166	-	-
2030	Impact (8.64 birds)	1,144	1.4%	1.005	0.798	1.152	0.991	0.990
2065	Baseline	1,270	12.6%	1.003	0.981	1.023	-	-
2065	Impact (8.64 birds)	914	-18.6%	0.994	0.972	1.014	0.991	0.720

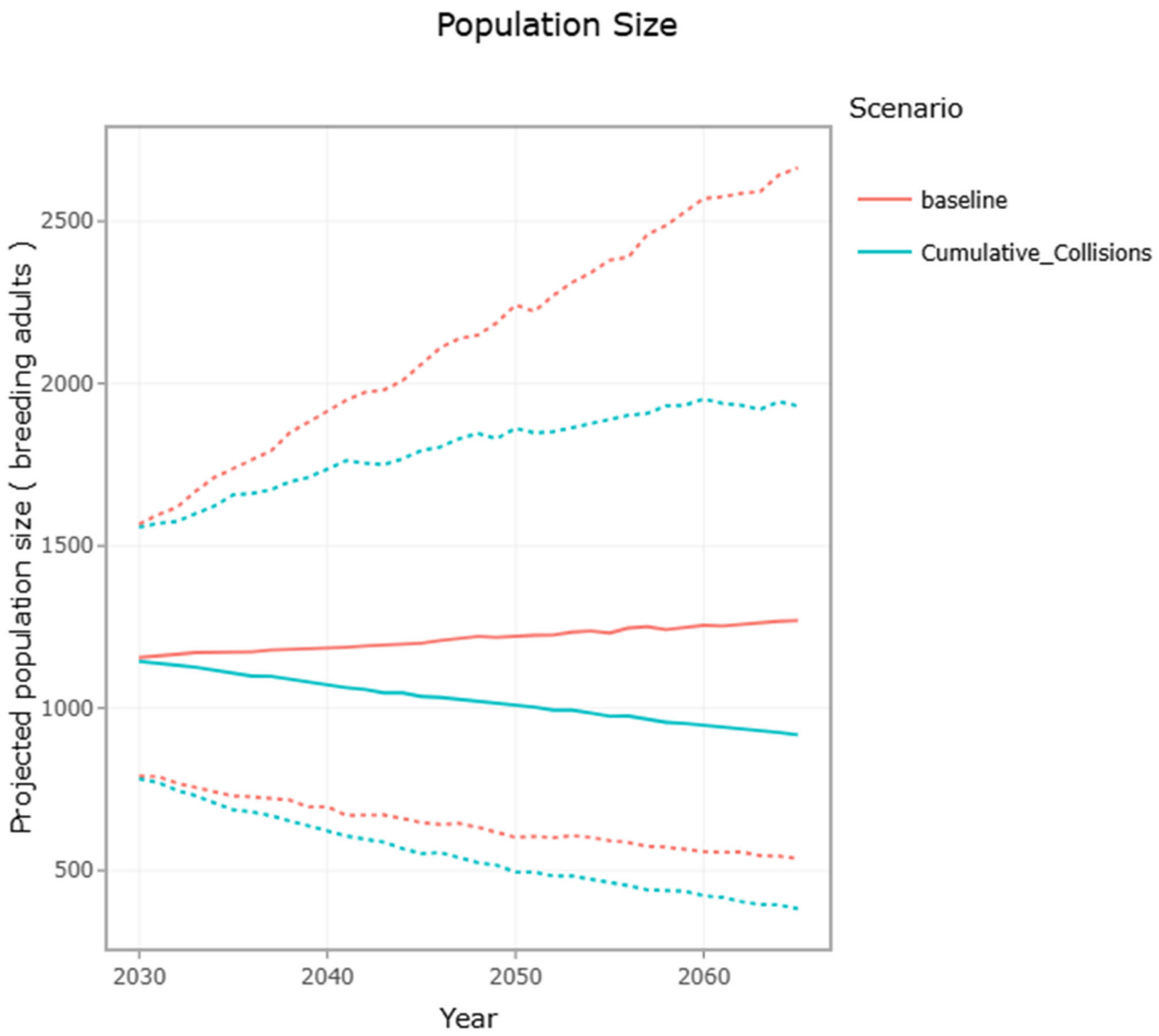

Figure 1.2: PVA output chart showing the black-legged kittiwake population size under the baseline and cumulative collision scenario. Dashed lines present the LCI and UCI of the population size

1.3.1.11 The annual impact on black-legged kittiwake from the Mona Offshore Wind Project cumulatively with other projects is predicted to be 8.64 birds. When considering the latest population estimate of 564 apparently occupied nests (1,128 adult birds) in 2023 and the baseline mortality rate of 0.146, the baseline mortality at this SSSI can be estimated at 165 birds. Based on this assumption, the additional impact of up to 8.64 birds annually would result in an increase in the baseline mortality of 5.23% (Table 1-5).

1.3.1.12 The cumulative PVA for black-legged kittiwake at Pen y Gogarth/Great Orme SSSI indicated that predicted collisions may reduce the unimpacted baseline population growth rate by 0.9% (i.e. 0.991 counterfactual of population growth rate; Table 1-6). Although this change in the growth rate is very small (i.e. 1%), there is a risk that under the cumulative impact scenario, the population could decline in size (due to a 0.994 annual growth rate). Figure 1.2 presents a visual representation of the predicted growth under the baseline and impacted scenarios, and this demonstrates the variability inherent in PVA modelling, where both baseline and impacted scenarios result in increasing and declining populations when considering the LCI and UCI shown as the dashed lines on Figure 1.2 (depending on the input parameters, assumptions etc.). This also highlights the sensitivity of the PVA tool, where even very small changes in a population growth rate (0.9%) can suggest a declining population (especially for small colonies with stable populations under baseline scenarios).

1.3.1.13 It should also be noted that the cumulative impacts would not persist for the entire 35-year modelled period, with existing offshore wind farms likely to be decommissioned (or subject to further applications for repowering that would require additional assessment) and, therefore, no longer presenting a collision risk to black-legged kittiwake. The PVA does not account for a reduced impact as the years progress, and therefore, there is an innate overestimation of the potential risk.

1.3.1.14 Recent population data has shown that the population of black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI has increased in size over the latest colony counts (2013 to 2021; Figure 1.3; Seabird Monitoring Programme, 2014), however, the counts within 2022 and 2023 are likely to be impacted by highly pathogenic avian influenza (HPAI), which was prevalent during the 2022 and 2023 breeding seasons (Tremlett *et* al., 2024). Within Figure 1.3 the last 13 years are presented which is the average lifespan of black-legged kittiwake (BTO, 2024).

1.3.1.15 This increase in the population (between 2010 and 2021) of black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI (Figure 1.3) should be considered in light of the introduction of thirteen offshore windfarms and their associated potential impacts. Figure 1.3 provides the cumulative capacity of these offshore wind farms (measured in MW) within theoretical connectivity to the Pen y Gogarth/Great Orme's Head SSSI during the breeding and non-breeding seasons which includes North Hoyle (operational since 2003), Barrow (operational since 2006), Burbo Bank (operational since 2007), Rhyl Flats (operational since 2009), Walney 1 (operational since 2011), Walney 2 (operational since 2012), Ormonde (operational since 2012), West of Duddon Sands (operational since 2014), Gwynt y Môr (operational since 2015), Burbo Bank Extension (operational since 2017), Rampion 1 (operation since 2018) and Walney Extension (operational since 2018). As set out in Table 1-5, impacts from a number of these wind farms have already been accounted for within the PVA, which emphasises the precautionary nature of the CEA, i.e. project impacts are considered in the impact assessment, while also being accounted for within the latest colony counts and productivity rates used within the PVA input parameters (e.g. impacts on this colony from Burbo Bank will have been occurring since 2011). This also demonstrates that the increase in installed capacity of offshore wind in the Irish Sea

over the last 20 years has not shown empirical effects on the Pen y Gogarth/Great Orme's Head SSSI colony (beyond natural variability).

1.3.1.16 The recent population size increase set out above (pre-HPAI) should be noted alongside the long-term (37-year) decrease in colony size since 1986 (Seabird Monitoring Programme, 2024)). This decline is mirrored at the national (Wales) and British level (Burnell *et al*, 2024). The only national population of black-legged kittiwake which have recorded a long-term increase is in Northern Ireland (Burnell *et al*, 2024), with a 33% increase since 2000 (when the latest UK and Ireland-wide seabird census took place). There is proven connectivity between colonies in north Wales (Puffin Island) and Northern Ireland, so interannual variation in nesting location may occur (BTO, 2024).

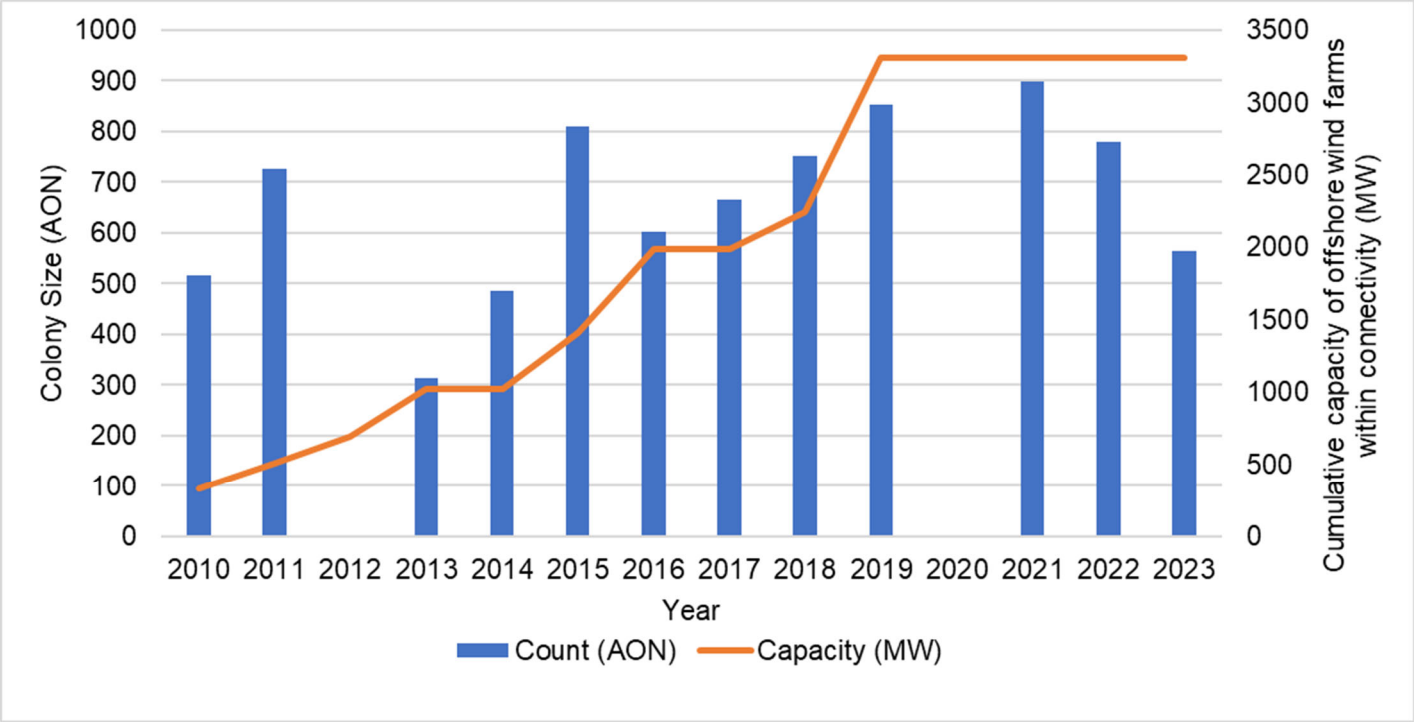

Figure 1.3: Recent (2010 to 2023) colony counts of black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI (blue bars) alongside the generation capacity of the cumulative offshore wind farms (orange line)

1.3.1.17 The evidence presented and the PVA outputs indicate the potential for a small decline (change in the growth rate of <1%) in the black-legged kittiwake population from Pen y Gogarth/Great Orme's Head SSSI under the cumulative impact scenario. However, as noted above, there is a high degree of conservatism within the CEA, with predicted cumulative impacts likely to be overestimated (or already accounted for within the PVA inputs), leading to an overestimation of risk through the modelled period. In addition, the small change in the predicted growth rate (i.e. <1%) even in this conservative cumulative scenario, combined with the high level of variability in PVA outputs (when considering the LCI and UCI), suggests that the actual risk of a decrease in growth rate (and therefore a population decline) due to cumulative effects of collision is low and it is likely that any effects will be within the range of natural variability. As such, the impact is predicted to be of low magnitude.

1.3.1.18 Following the EIA methodology (set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)), black-legged kittiwake is deemed to be

of high vulnerability, low recoverability and medium value. The sensitivity of the receptor is, therefore, considered to be high.

1.3.1.19 Overall, and following the EIA methodology set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04), as the sensitivity of black-legged kittiwake is high and the magnitude of impact is considered low, this could lead to a potential minor significant impact on black-legged kittiwake from Pen y Gogarth/Great Orme's Head SSSI.

1.3.2 Common guillemot

Project alone assessment

1.3.2.1 The apportioned annual displacement impact from the Mona Offshore Wind Project alone is presented in Table 1-7 for common guillemot from Pen y Gogarth/Great Orme's Head SSSI. As requested by NRW (and the JNCC) for precaution, 100% of birds are considered adults for the project alone assessment; this will, therefore, present an overestimation of the risks on common guillemot from Pen y Gogarth/Great Orme's Head SSSI. The un-apportioned impact of the Mona Offshore Wind Project is presented in Table 1-7 (and Table 5.30 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)). The predicted impacts from displacement are presented considering 50% displacement and 1% mortality and the range using 30-70% displacement and 1-10% mortality, as advised by NRW (see Table 1-1). The displacement impacts are rounded to two decimal places, and therefore, the combined impact when summing the numbers presented in the tables may not equal the number presented in the 'total' row due to this rounding.

1.3.2.2 During the breeding bioseason, the estimated impact was 3.29 (1.97 to 46.08) common guillemot from Pen y Gogarth/Great Orme's Head SSSI, which could increase the baseline mortality by 1.51% (0.91% to 21.12%; Table 1-7).

1.3.2.3 During the non-breeding bioseason the estimated impact was 0.06 (0.03 to 0.82) common guillemot from Pen y Gogarth/Great Orme's Head SSSI, which could increase the baseline mortality by 0.03% (0.02% to 0.37%; Table 1-7).

1.3.2.4 When considering the annual impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI, the predicted displacement impact is 3.35 (2.01 to 46.90), which equates to an estimated 1.54% (0.95% to 21.49%; Table 1-7) increase in baseline mortality.

1.3.2.5 The red text within Table 1-8, is when the percentage increase in baseline mortality is >1% and therefore a PVA would be required.

1.3.2.6 Table 1-8The red text within Table 1-8, is when the percentage increase in baseline mortality is >1% and therefore a PVA would be required. Table 1-8 presents the matrix table of the increase in baseline mortality, with red text used where >1% is predicted.

1.3.2.7 The predicted increase in baseline mortality from the Mona Offshore Project alone is >1%; therefore, a PVA is required. The summary outputs of the project alone PVA for common guillemot from Pen y Gogarth/Great Orme's Head SSSI is presented in Table 1-9.

1.3.2.8 A visual representation of the Mona Offshore Wind Project alone impact scenarios and baseline scenario is shown in Figure 1.4.

Table 1-7: Predicted impact of displacement from Mona Offshore Wind Project alone on common guillemot from Pen y Gogarth/Great Orme's Head SSSI

Bioseason	Un-apportioned impact when considering 50% displacement and 1% mortality (30-70% displacement and 1-10% mortality)	Apportioning percentage	Percentage of birds considered to be adults	Apportioned impact on Pen y Gogarth/Great Orme's Head SSSI	Percentage increase in baseline mortality (218 birds)
Breeding (March to July)	21 (13 to 295)	15.6%	100%	3.29 (1.97 to 46.08)	1.51% (0.91% to 21.12%)
Non-breeding (August to February)	19 (11 to 263)	0.31%	100%	0.06 (0.03 to 0.82)	0.03% (0.02% to 0.37%)
Annual	40 (24 to 558)	N/A	N/A	**3.35 (2.01 to 46.90)**	**1.54% (0.92% to 21.49%)**

1.3.2.9 The red text within Table 1-8, is when the percentage increase in baseline mortality is >1% and therefore a PVA would be required.

Table 1-8: Matrix table showing the percentage increase in baseline mortality for the range of potential annual impacts from displacement on common guillemot from Pen y Gogarth/Great Orme's Head SSSI from the project alone

		Percentage mortality					
		1%	2%	3%	4%	5%	10%
Percentage displacement	30%	0.92%	1.84%	2.76%	3.68%	4.61%	9.21%
	40%	1.23%	2.46%	3.68%	4.91%	6.14%	12.28%
	50%	1.54%	3.07%	4.61%	6.14%	7.68%	15.35%
	60%	1.84%	3.68%	5.53%	7.37%	9.21%	18.42%
	70%	2.15%	4.30%	6.45%	8.60%	10.75%	21.49%

Table 1-9: PVA outputs for the annual impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI from the Mona Offshore Wind Project alone

Year	Impact scenario	Median adult population size	Population change (%) since 2023	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	Baseline	4,250	2.80%	1.028	0.951	1.095	-	-

Year	Impact scenario	Median adult population size	Population change (%) since 2023	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	30% displacement and 1% mortality (2.06 birds)	4,247	2.75%	1.028	0.951	1.096	0.999	0.999
2030	50% displacement and 1% mortality (3.33 birds)	4,245	2.72%	1.027	0.950	1.095	0.999	0.999
2030	70% displacement and 10% mortality (46.84 birds)	4,190	1.30%	1.013	0.937	1.081	0.986	0.986
2065	Baseline	10,412	152.61%	1.026	1.017	1.035	-	-
2065	30% displacement and 1% mortality (2.06 birds)	10,176	146.58%	1.025	1.016	1.034	0.999	0.978
2065	50% displacement and 1% mortality (3.33 birds)	10,019	143.10%	1.025	1.016	1.033	0.999	0.963
2065	70% displacement and 10% mortality (46.84 birds)	6,129	48.50%	1.011	1.002	1.020	0.985	0.589

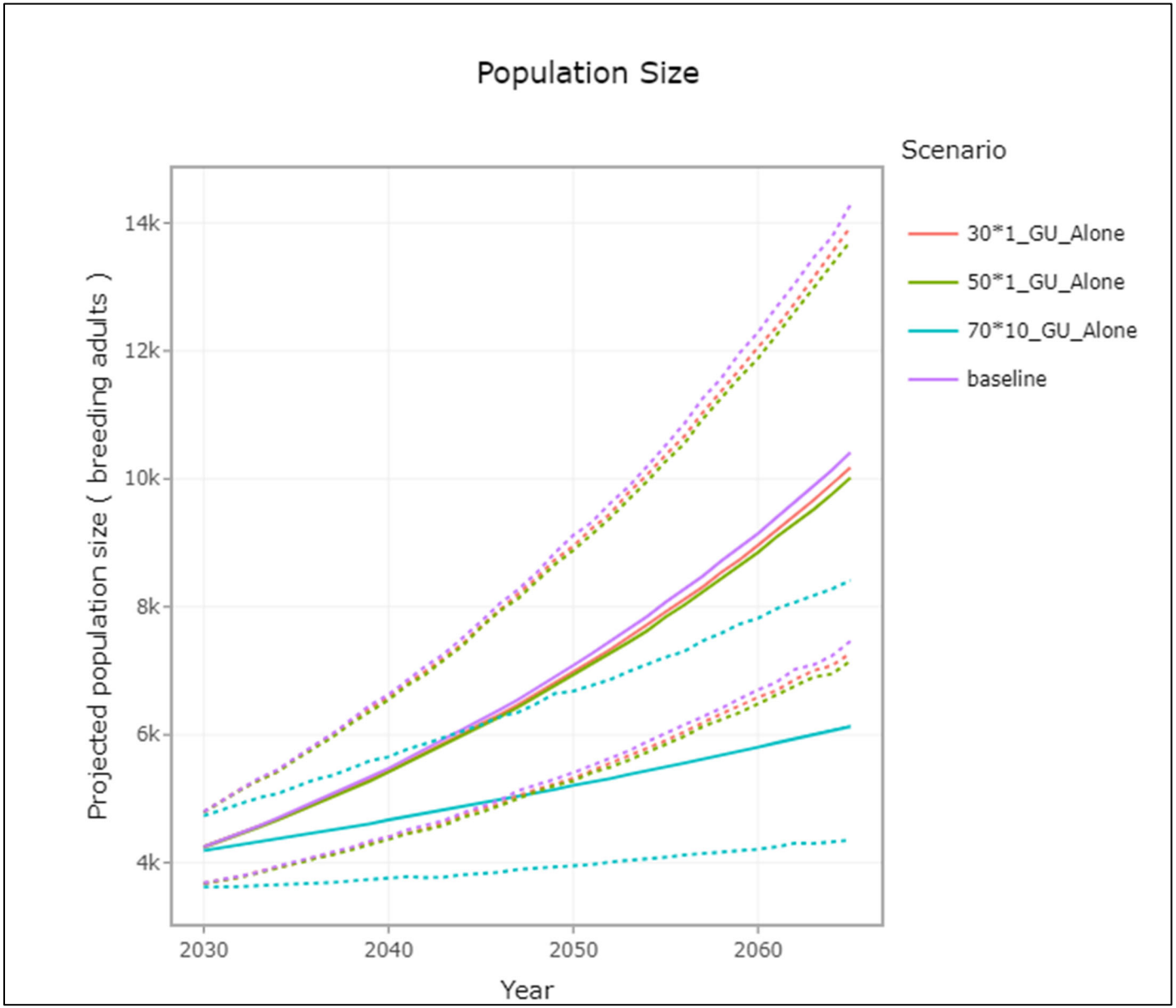

Figure 1.4: PVA output chart showing the common guillemot population size under the baseline and three displacement scenarios from the Project alone. Dashed lines present the LCI and UCI of the population size

1.3.2.10 The PVA for common guillemot from Pen y Gogarth/Great Orme SSSI indicated that when considering the worst-case impact scenario of 70% displacement and 10% mortality would reduce the unimpacted baseline population growth rate by 0.015. When assessing the 50% displacement and 1% mortality scenario, the PVA predicted a growth rate reduction of 0.1% compared to the baseline (counterfactual of median growth rate of 0.999). In all scenarios modelled (displacement rate 30%-70%, mortality rate 1%-10%), a positive population growth rate was sustained indicating that the population is predicted to be growing and is predicted to be 48.75% to 146.54% larger than the current size after 35 years (2065) (Figure 1.4).

1.3.2.11 The population of common guillemot from Pen y Gogarth/Great Orme's Head SSSI has been increasing in size consistently since 2000 (average annual growth rate of 1.043 between 2000 and 2023, JNCC, 2024). This empirical annual average growth rate is higher than predicted by the PVA. Given that the PVA is predicting a continuation of the increasing population, the predicted impact can be considered to be of negligible to low magnitude.

1.3.2.12 Following the EIA methodology (set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)), common guillemot is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is, therefore, considered to be medium. Overall, as the sensitivity of common guillemot is medium and the magnitude of impact is considered negligible to low, this could lead to a potential minor significant impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI from the project alone. Therefore, as the predicted impact is of minor significant impact, this is considered non-significant.

Cumulative assessment

1.3.2.13 As set out in Table 1-1 NRW specifically requested a cumulative assessment of the potential impact on common guillemot from the Pen y Gogarth/Great Orme's Head SSSI.

1.3.2.14 Table 1-10 provides project by project un-apportioned, and apportioned impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI. The projects included in this assessment are the same as those presented in Section 5.9 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). As the predicted cumulative impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI increased baseline mortality by >1%, a PVA was undertaken. The summary output presented in Table 1-11.

Table 1-10: Apportioned predicted impact on adult common guillemot from the Pen y Gogarth/Great Orme's Head SSSI as a result of the Mona Offshore Wind Project acting cumulatively.

a – the apportioning value during the breeding season has used that of Morgan Offshore Wind Generation Assets, specifically 0.02.

b – the apportioning value during the breeding season was taken from project specific documentation

c – the plans/projects included within this cumulative assessment cover a large spatial area and therefore, it is considered necessary to apply a correction factor to account for the number of adult birds within the whole area. All projects have used the proportion of adults/immatures within the Appendix tables of from Furness (2015) for age-class apportioning, which is 57.5% of birds are adults during the breeding season, 57.6% of birds are adults in the non-breeding season.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.365.

Plan or project	Abundance estimate		Apportioning value		Apportioned adult mortalities from displacement when considering 50% displacement and 1% mortality (30-70% displacement and 1-10% mortality)[c]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	1,569	2,919	0.365[b]	0.0031	1.67 (1.00 to 23.40)	1.65 (0.99 to 23.04)	0.03 (0.02 to 0.36)
Burbo Bank Extension Offshore Wind Farm	1,000	1,561	0.02[a]	0.0031	0.07 (0.04 to 1.00)	0.06 (0.03 to 0.80)	0.01 (0.01 to 0.19)
Erebus Floating Wind Demo	7,001	28,338	No connectivity	0.0031	0.25 (0.15 to 3.53)	No connectivity	0.25 (0.15 to 3.53)
Mona Offshore Wind Project	4,220	3,756	0.156[b]	0.0031	1.93 (1.16 to 26.95)	1.89 (1.14 to 26.48)	0.03 (0.02 to 0.47)
Morecambe Offshore Windfarm Generation Assets	4,050	7,647	0.02[a]	0.0031	0.30 (0.18 to 4.21)	0.23 (0.14 to 3.26)	0.07 (0.04 to 0.95)
Morgan Offshore Wind Project Generation Assets	4,893	4,101	0.02[b]	0.0031	0.32 (0.19 to 4.45)	0.28 (0.17 to 3.94)	0.04 (0.02 to 0.51)
Ormonde Wind Farm	912	39	0.02[a]	0.0031	0.05 (0.00 to 0.74)	0.05 (0.03 to 0.73)	0.00 (0.00 to 0.00)
TwinHub (Wave Hub Floating Wind Farm)	39	217	No connectivity	0.0031	0.00 (0.00 to 0.03)	No connectivity	0.00 (0.00 to 0.03)
Walney (3 & 4) Extension Offshore Wind Farm	4,169	1,927	0.02[a]	0.0031	0.26 (0.15 to 3.59)	0.24 (0.14 to 3.35)	0.02 (0.01 to 0.24)
West of Duddon Sands Offshore Wind Farm	1,321	166	0.02[a]	0.0031	0.08 (0.00 to 1.08)	0.08 (0.05 to 1.06)	0.00 (0.00 to 0.02)

Plan or project	Abundance estimate		Apportioning value		Apportioned adult mortalities from displacement when considering 50% displacement and 1% mortality (30-70% displacement and 1-10% mortality)[c]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding
West of Orkney Windfarm	4,861	4,275	No connectivity	0.0031	0.04 (0.02 to 0.53)	No connectivity	0.04 (0.02 to 0.53)
White Cross Offshore Windfarm	3,304	1,059	No connectivity	0.0031	0.01 (0.01 to 0.13)	No connectivity	0.01 (0.01 to 0.13)
Gap-filled projects							
Burbo Bank	41	58	0.02[a]	0.0031	0.00 (0.00 to 0.04)	0.00 (0.00 to 0.03)	0.00 (0.00 to 0.01)
Gwynt y Môr Offshore Wind Farm	149	205	0.365[d]	0.0031	0.16 (0.09 to 2.21)	0.16 (0.09 to 2.19)	0.00 (0.00 to 0.03)
Rhyl Flats Offshore Wind Farm	49	68	0.365[d]	0.0031	0.05 (0.03 to 0.73)	0.05 (0.03 to 0.72)	0.00 (0.00 to 0.01)
Robin Rigg	138	88	No connectivity	0.0031	0.00 (0.00 to 0.01)	No connectivity	0.00 (0.00 to 0.01)
Walney 1 & 2	161	227	0.02[a]	0.0031	0.01 (0.01 to 0.16)	0.01 (0.01 to 0.13)	0.00 (0.00 to 0.03)
Combined impact	N/A	N/A	N/A	N/A	5.20 (3.12 to 72.82)	4.70 (2.82 to 65.74)	0.51 (0.30 to 7.08)
Annual increase in baseline mortality					2.38% (1.43% to 33.38%)		

Table 1-11: PVA outputs for the annual cumulative impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI

Year	Impact scenario	Median adult population size	Population change (%) since 2023	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	Baseline	4,914	37.34%	1.051	0.967	1.125		
2030	30% displacement and 1% mortality (3.12 birds)	4,909	37.20%	1.050	0.966	1.124	0.999	0.999
2030	50% displacement and 1% mortality (5.20 birds)	4,909	37.19%	1.050	0.966	1.124	0.998	0.999
2030	70% displacement and 10% mortality (72.82 birds)	4,807	34.33%	1.029	0.946	1.102	0.978	0.978
2065	Baseline	26,550	642.03%	1.050	1.040	1.058		
2065	30% displacement and 1% mortality (3.12 birds)	25,606	615.65%	1.048	1.039	1.057	0.999	0.966
2065	50% displacement and 1% mortality (5.20 birds)	24,987	598.34%	1.048	1.038	1.057	0.998	0.943
2065	70% displacement and 10% mortality (72.82 birds)	11,554	222.92%	1.026	1.016	1.034	0.977	0.435

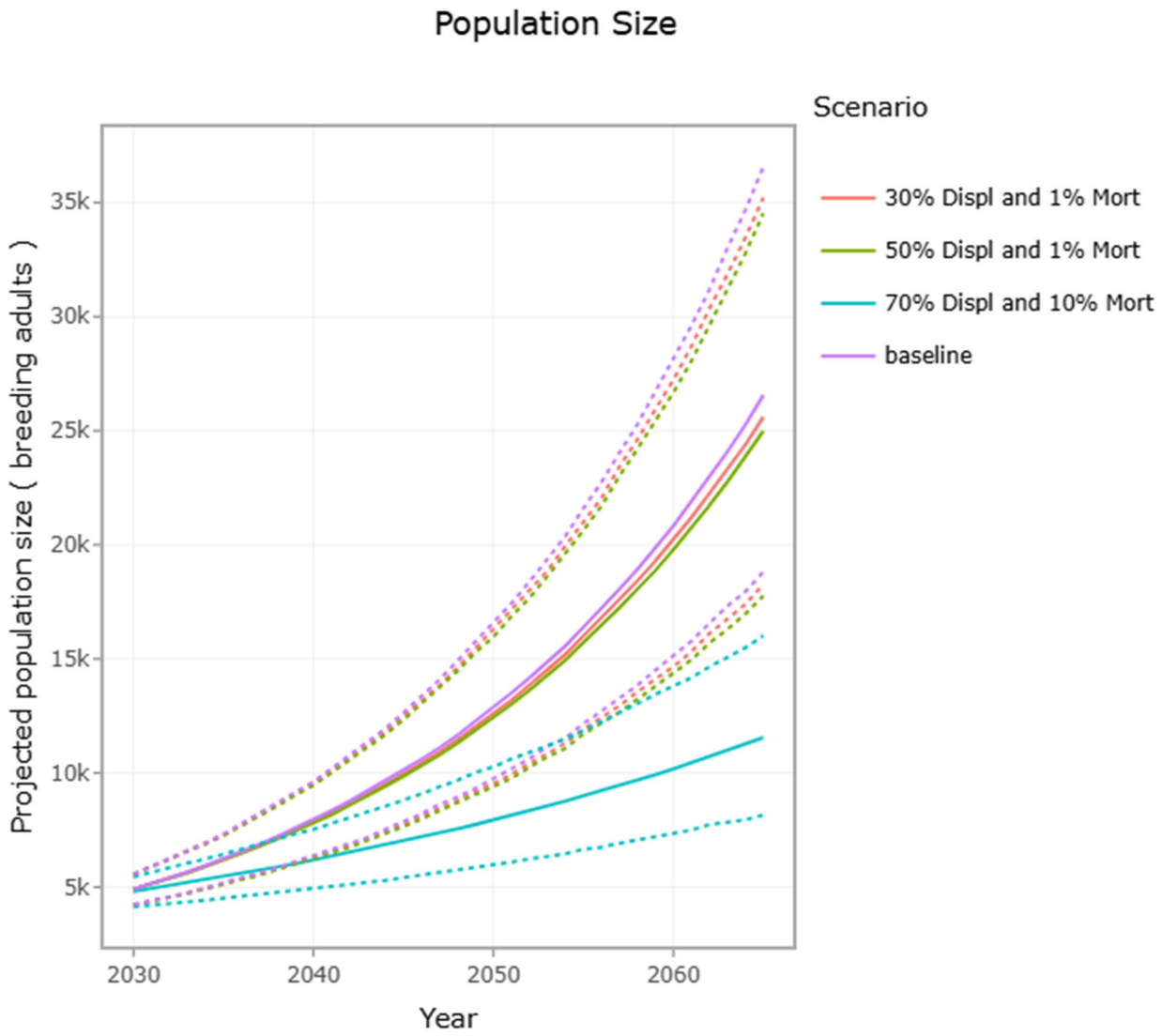

Figure 1.5: PVA output chart showing the common guillemot population size under the baseline and three displacement scenarios from the cumulative impact. Dashed lines present the LCI and UCI of the population size

1.3.2.15 The annual impact on common guillemot from the Mona Offshore Wind Project alongside other projects is predicted to be 5.20 (3.12 to 72.82) adult birds (Table 1-10). Considering the latest population estimate of 2,670 individuals, which equates to 3,578 adult birds in 2023 and the baseline mortality rate of 0.061, the baseline mortality could be 218 birds annually. The additional impact of up to 5.20 (3.12 to 72.81) adult birds annually could increase the baseline mortality by 2.38% (1.43% to 33.38%).

1.3.2.16 Given the predicted cumulative impact is >1% increase in baseline mortality, a PVA was undertaken for common guillemot from Pen y Gogarth/Great Orme's Head SSSI (Table 1-11).

1.3.2.17 The cumulative PVA for common guillemot from Pen y Gogarth/Great Orme SSSI indicated that when considering worst-case scenario of 70% displacement and 10% mortality could reduce the unimpacted baseline population growth rate by 0.023 (Table 1-11). When considering a 50% displacement and 1% mortality scenario the PVA predicted a growth rate reduction of 0.002. In all scenarios modelled (displacement rate 30% to 70%, mortality rate 1% to 10%), a positive population growth rate was sustained, indicating that the population is predicted to increase in size and will be 222.92% to 615.65% larger than the current (2023) size after 35 years (Figure 1.5).

1.3.2.18 The population of common guillemot from Pen y Gogarth/Great Orme's Head SSSI has been increasing in size consistently since 2000 (average annual growth rate of 1.043 between 2000 and 2023, JNCC, 2024). This annual average growth rate is higher than predicted by the PVA. Given that the PVA predicts a continuation of the increasing population the impact can be considered to be of negligible to low magnitude.

1.3.2.19 Following the EIA methodology (set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)), common guillemot is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium. Overall, as the sensitivity of common guillemot is medium and the magnitude of impact is considered negligible to low, this could lead to a potential minor significant impact on common guillemot from Pen y Gogarth/Great Orme's Head SSSI from the project alone. Therefore, as the predicted impact is of minor significant impact, this is considered non-significant.

1.3.3 Razorbill

Project alone assessment

1.3.3.1 The apportioned annual displacement impact from the Mona Offshore Wind Project alone is presented in Table 1-12 for razorbill from Pen y Gogarth/Great Orme's Head SSSI. As requested by NRW (and the JNCC) for precaution, 100% of birds are considered adults for the project alone assessment; this will, therefore, present an overestimation of the risks on razorbill from Pen y Gogarth/Great Orme's Head SSSI. The un-apportioned impact of the Mona Offshore Wind Project is presented in Table 5.31 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). The displacement impacts are rounded to two decimal places and therefore the combined impact when summing the numbers presented in the tables may not equal the number presented in the 'total' row due to this rounding.

1.3.3.2 During the spring migration bioseason, the estimated impact was 0.01 (0.01 to 0.12) razorbill from Pen y Gogarth/Great Orme's Head SSSI, which could increase the baseline mortality by 0.02% (0.01% to 0.23%; Table 1-12).

1.3.3.3 During the breeding bioseason, the estimated impact was 0.09 (0.05 to 1.22) razorbill from Pen y Gogarth/Great Orme's Head SSSI, which could increase the baseline mortality by 0.17% (0.10% to 2.36%; Table 1-12).

1.3.3.4 During the autumn migration bioseason, the estimated impact was 0.00 (0.00 to 0.01) razorbill from Pen y Gogarth/Great Orme's Head SSSI, which could increase the baseline mortality by 0.00% (0.00% to 0.01%; Table 1-12).

1.3.3.5 During the non-breeding bioseason the estimated impact was 0.00 (0.00 to 0.02) razorbill from Pen y Gogarth/Great Orme's Head SSSI, which could increase the baseline mortality by 0.00% (0.00% to 0.04%; Table 1-12).

1.3.3.6 When considering the annual impact on razorbill from Pen y Gogarth/Great Orme's Head SSSI, the predicted collision impact is 0.10 (0.06 to 1.37) birds, which equates to an estimated 0.19% (0.11% to 2.64%; Table 1-12) increase in baseline mortality.

1.3.3.7 Table 1-13 presents the matrix table of the increase in baseline mortality, with red text used where >1% is predicted.

1.3.3.8 The increase in baseline mortality from the Mona Offshore Project alone is >1% when considering the worst-case scenario advised by the SNCBs (70% displacement and 10% mortality); therefore, a PVA is required. The summary outputs of the project alone PVA is presented in Table 1-14. A visual representation of the Mona Offshore Wind Project alone impact scenarios and baseline scenario is shown in Figure 1.6.

Table 1-12: Predicted impact of displacement from Mona Offshore Wind Project on razorbill from Pen y Gogarth/Great Orme's Head SSSI

Bioseason	Un-apportioned impact when considering 50% displacement and 1% mortality (30-70% displacement and 1-10% mortality)	Apportioning percentage	Percentage of birds considered to be adults	Apportioned impact on Pen y Gogarth/Great Orme's Head SSSI	Percentage increase in baseline mortality (52 birds)
Spring migration (January to March)	10 (6 to 135)	0.09%	100%	0.01 (0.01 to 0.12)	0.02% (0.01% to 0.23%)
Breeding (April to July)	0 (0 to 6)	21.1%	100%	0.09 (0.05 to 1.22)	0.17% (0.10% to 2.36%)
Autumn migration (August to October)	0 (0 to 6)	0.09%	100%	0.00 (0.00 to 0.01)	0.00% (0.00% to 0.01%)
Non-breeding (November to December)	2 (1 to 29)	0.07%	100%	0.00 (0.00 to 0.02)	0.00% (0.00% to 0.04%)
Annual	13 (8 to 176)	N/A	N/A	0.10 (0.06 to 1.37)	0.19% (0.11% to 2.64%)

Table 1-13: Matrix table showing the percentage increase in baseline mortality for the range of potential annual impacts from displacement on razorbill from Pen y Gogarth/Great Orme's Head SSSI from the project alone

		Percentage mortality					
		1%	2%	3%	4%	5%	10%
Percentage displacement	30%	0.11%	0.23%	0.34%	0.45%	0.57%	1.13%
	40%	0.15%	0.30%	0.45%	0.60%	0.75%	1.51%
	50%	0.19%	0.38%	0.57%	0.75%	0.94%	1.88%
	60%	0.23%	0.45%	0.68%	0.90%	1.13%	2.26%
	70%	0.26%	0.53%	0.79%	1.05%	1.32%	2.64%

Table 1-14: PVA outputs for the annual impact on razorbill from Pen y Gogarth/Great Orme's Head SSSI from the project alone

Year	Impact scenario	Simulated population size (adult birds)	Median population change since 2023 (%)	Median growth rate	2.5 percentile of simulated growth rate	97.5 percentile of simulated growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	Baseline	531	2.22%	1.022	0.835	1.134	-	-
2030	30% displacement and 1% mortality (0.06 birds)	531	2.22%	1.022	0.830	1.132	1.000	1.000
2030	50% displacement and 1% mortality (0.10 birds)	531	2.26%	1.023	0.829	1.132	1.000	1.001
2030	70% displacement and 10% mortality (1.37 birds)	530	1.92%	1.019	0.830	1.127	0.997	0.998
2065	Baseline	726	39.34%	1.009	0.991	1.026	-	
2065	30% displacement and 1% mortality (0.06 birds)	728	39.27%	1.009	0.991	1.026	1.000	1.001
2065	50% displacement and 1% mortality (0.10 birds)	724	38.61%	1.009	0.991	1.026	1.000	1.001
2065	70% displacement and 10% mortality (1.37 birds)	652	24.36%	1.006	0.987	1.023	0.997	0.899

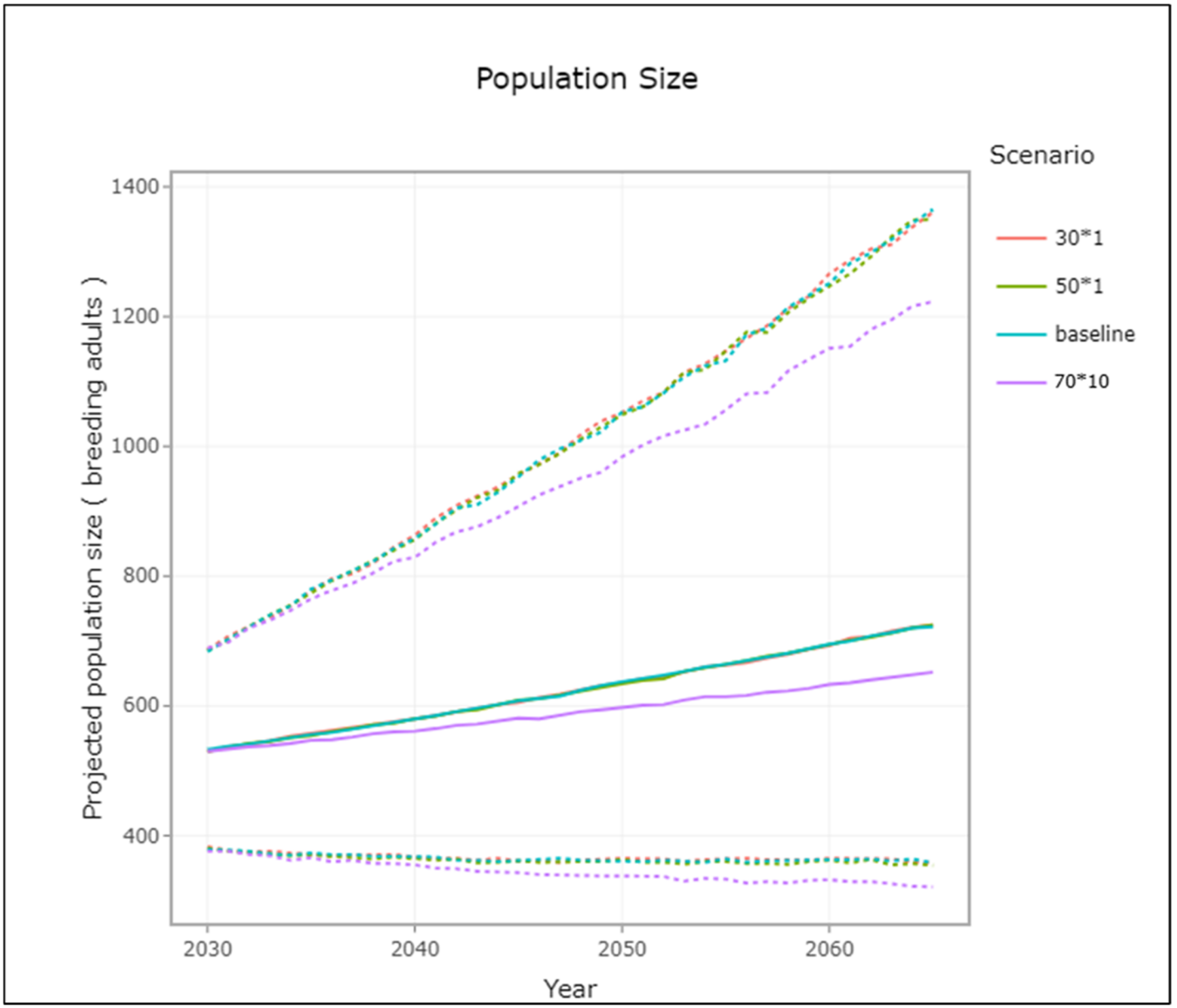

Figure 1.6: PVA output chart showing the razorbill population size under the baseline and three displacement scenarios from the Project alone. Dashed lines present the LCI and UCI of the population size

1.3.3.9 The PVA for razorbill at Pen y Gogarth/Great Orme SSSI revealed that the worst-case scenario of 70% displacement and 10% mortality would reduce the unimpacted baseline population growth rate by 0.003 (Table 1-14). When considering 50% displacement and 1% mortality, there would be no change to the growth rate. In all scenarios modelled (displacement rate 30%-70%, mortality rate 1%-10%), a positive population growth rate was sustained indicating that the population is predicted to be growing and would be 24.36% to 39.27% larger than the current size after 35 years (2065).

1.3.3.10 The population of razorbill from Pen y Gogarth/Great Orme's Head SSSI has been increasing in size consistently since 2000 (average annual growth rate of 1.036 between 2000 and 2023, JNCC, 2024). This annual average growth rate is higher than predicted by the PVA. Therefore, even if the worst-case displacement and mortality scenario were to occur (70% displacement and 10% mortality), the population should continue to increase. This empirical annual average growth rate is higher than predicted by the PVA. Given the PVA predicts a continuation of the increasing population the impact can be considered to be of negligible to low magnitude.

1.3.3.11 Following the EIA methodology (set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)), razorbill is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is, therefore, considered to be medium. Overall, as the sensitivity of razorbill is medium and the magnitude of impact is considered negligible to low, this could lead to a potential minor significant impact to razorbill from Pen y Gogarth/Great Orme's Head SSSI from the project alone. Therefore, as the predicted impact is of minor significant impact, this is considered non-significant.

Cumulative assessment

1.3.3.12 As set out in Table 1-1 NRW specifically requested a cumulative assessment of the potential impact to razorbill from the Pen y Gogarth/Great Orme's Head SSSI.

1.3.3.13 Table 1-15 provides project by project un-apportioned, and apportioned impact on razorbill from Pen y Gogarth/Great Orme's Head SSSI. The projects included within this assessment are the same as those presented in Section 5.9 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). As the predicted cumulative impact on razorbill from Pen y Gogarth/Great Orme's Head SSSI increased baseline mortality of >1%, a PVA was undertaken. The summary output presented in Table 1-16 and visual presentation within Figure 1.7.

Table 1-15: Apportioned predicted impact on adult razorbill from the Pen y Gogarth/Great Orme's Head SSSI as a result of the Mona Offshore Wind Project acting cumulatively.

a – the apportioning value during the breeding season has used that of Morecame Offshore Wind Generation Assets, specifically 0.1211.

b – the apportioning value during the breeding season was taken from project specific documentation

c - the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.399.

d – the plans/projects included within this cumulative assessment cover a large spatial area and therefore it is considering necessary to apply a correction factor to account for the number of adult birds within the whole area. All projects have used the proportion of adults/immatures within the Appendix tables of from Furness (2015) for age-class apportioning which is 57.1% of birds are adults during the breeding season, 52.22% of birds are adults during migration periods (pre-breeding and post-breeding) and 52.48% of birds are adults in the non-breeding season.

Plan or project	Abundance estimate				Apportioning value				Apportioned adult moralities from displacement when considering 50% displacement and 1% mortality (30-70% displacement and 1-10% mortality)[d]				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding
Awel y Môr Offshore Wind Farm	336	140	66	150	0.0009	0.399[b]	0.0009	0.0007	0.16 (0.10 to 2.25)	0.00 (0.00 to 0.01)	0.16 (0.10 to 2.23)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Burbo Bank Extension	-	64	-	29	0.0009	0.1211[a]	0.0009	0.0007	0.02 (0.01 to 0.31)	0.00 (0.00 to 0.00)	0.02 (0.01 to 0.31)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Erebus Floating Wind Demo	896	194	1,708	1,069	0.0009	No connectivity	0.0009	0.0007	0.01 (0.00 to 0.11)	0.00 (0.00 to 0.03)	No connectivity	0.00 (0.00 to 0.06)	0.00 (0.00 to 0.03)
Mona Offshore Wind Project	1,924	83	91	421	0.0009	0.211[b]	0.0009	0.0007	0.06 (0.03 to 0.78)	0.00 (0.00 to 0.07)	0.05 (0.03 to 0.70)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.01)
Morecambe Offshore Windfarm Generation Assets	389	222	674	596	0.0009	0.1211[b]	0.0009	0.0007	0.08 (0.05 to 1.13)	0.00 (0.00 to 0.01)	0.08 (0.05 to 1.08)	0.00 (0.00 to 0.02)	0.00 (0.00 to 0.02)
Morgan Offshore Wind Project Generation Assets	166	120	103	233	0.0009	0.04[b]	0.0009	0.0007	0.01 (0.01 to 0.21)	0.00 (0.00 to 0.01)	0.01 (0.01 to 0.19)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.01)
TwinHub (Wave Hub Floating Wind Farm)	-	12	-	53	0.0009	No connectivity	0.0009	0.0007	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)	No connectivity	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Walney (3 & 4) Extension Offshore Wind Farm	-	76	874	3,066	0.0009	0.1211[a]	0.0009	0.0007	0.03 (0.02 to 0.48)	0.00 (0.00 to 0.00)	0.03 (0.02 to 0.37)	0.00 (0.00 to 0.03)	0.01 (0.00 to 0.08)
West of Duddon Sands Offshore Wind Farm	-	-	-	202	0.0009	0.1211[a]	0.0009	0.0007	0.00 (0.00 to 0.01)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.01)
West of Orkney Windfarm	97	70	144	15	0.0009	No connectivity	0.0009	0.0007	0.00 (0.00 to 0.01)	0.00 (0.00 to 0.00)	No connectivity	0.00 (0.00 to 0.01)	0.00 (0.00 to 0.00)
White Cross Offshore Windfarm	345	40	40	361	0.0009	No connectivity	0.0009	0.0007	0.00 (0.00 to 0.02)	0.00 (0.00 to 0.01)	No connectivity	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.01)
Gap-fill projects													
Burbo Bank	10	3	6	9	0.0009	0.1211[a]	0.0009	10	0.00 (0.00 to 0.02)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.01)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Gwynt y Môr Offshore Wind Farm	39	12	22	32	0.0009	0.399[c]	0.0009	39	0.01 (0.01 to 0.19)	0.00 (0.00 to 0.00)	0.01 (0.01 to 0.19)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Ormonde Offshore Wind Farm	10	174	6	8	0.0009	0.1211[a]	0.0009	10	0.06 (0.04 to 0.84)	0.00 (0.00 to 0.00)	0.06 (0.04 to 0.84)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Robin Rigg	15	63	11	14	0.0009	No connectivity	0.0009	15	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)	No connectivity	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Rhyl Flats Offshore Wind Farm	12	4	7	10	0.0009	0.399[c]	0.0009	12	0.00 (0.00 to 0.06)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.06)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Walney 1 and 2	40	12	25	34	0.0009	0.1211[a]	0.0009	40	0.00 (0.00 to 0.06)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.06)	0.00 (0.00 to 0.00)	0.00 (0.00 to 0.00)
Combined impact									0.46 (0.27 to 6.48)	0.01 (0.01 to 0.14)	0.43 (0.26 to 6.05)	0.01 (0.00 to 0.12)	0.01 (0.00 to 0.16)
Increase in baseline mortality									0.89% (0.52% to 12.46%)	0.02% (0.01% to 0.27%)	0.83% (0.50% to 11.63%)	0.02% (0.00% to 0.24%)	0.02% (0.01% to 0.31%)

Table 1-16: PVA outputs for the annual cumulative impact on razorbill from Pen y Gogarth/Great Orme's Head SSSI

Year	Impact scenario	Median adult population size	Population change (%) since 2023	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median counterfactual of growth rate	Median counterfactual of population size
2030	Baseline	533	12.80%	1.022	0.833	1.134	-	-
2030	30*1 (0.27 birds)	530	12.30%	1.023	0.833	1.132	1.000	1.000
2030	50*1 (0.46 birds)	531	12.50%	1.020	0.831	1.131	0.999	0.999
2030	70*10 (6.48 birds)	523	10.89%	1.008	0.819	1.118	0.986	0.985
2065	Baseline	722	51.01%	1.009	0.991	1.026	-	-
2065	30*1 (0.27 birds)	713	49.19%	1.009	0.990	1.025	0.999	0.981
2065	50*1 (0.46 birds)	701	46.77%	1.008	0.990	1.025	0.999	0.965
2065	70*10 (6.48 birds)	424	-9.07%	0.994	0.975	1.011	0.985	0.584

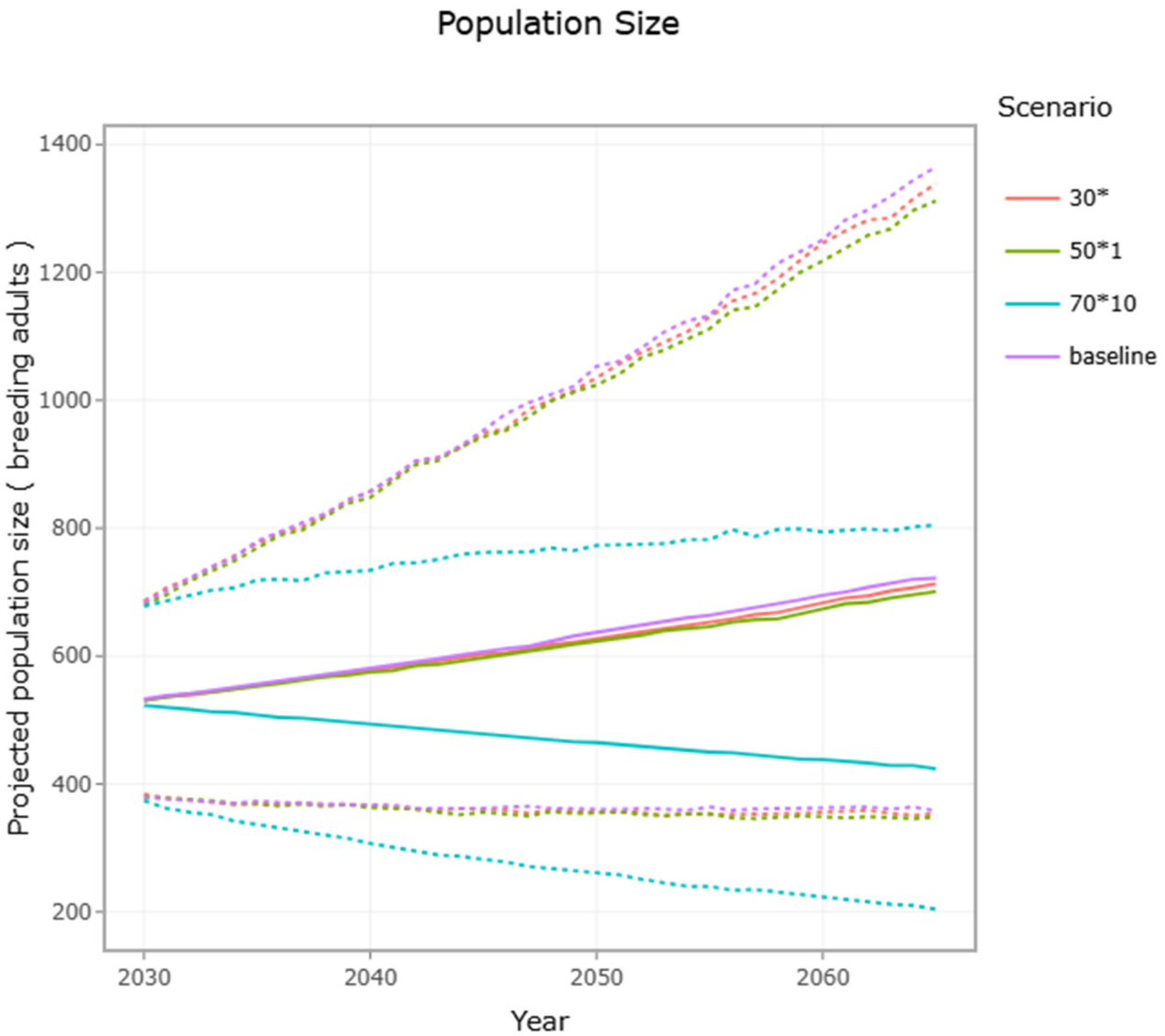

Figure 1.7: PVA output chart showing the razorbill population size under the baseline and three displacement scenarios from the cumulative impact. Dashed lines present the LCI and UCI of the population size.

1.3.3.14 The annual impact on razorbill from the Mona Offshore Wind Project alongside other projects is predicted to be 0.46 (0.27 to 6.48) adult birds (Table 1-15). When considering the latest population estimate of 370 individuals, which equates to 496 adult birds in 2023 and the baseline mortality rate of 0.105, the baseline mortality could be 52 birds. The additional impact of up to 0.46 (0.27 to 6.48) adult birds annually, could increase the baseline mortality by 0.89% (0.52% to 12.46%).

1.3.3.15 The cumulative PVA for razorbill at Pen y Gogarth/Great Orme SSSI revealed that the most extreme scenario of 70% displacement and 10% mortality would reduce the unimpacted baseline population growth rate by 0.014 (Table 1-16). The more likely scenario of 50% displacement and 1% mortality would result in a growth rate reduction of 0.001. In two of the three scenarios modelled (displacement rate 30% to 50% and mortality rate 1%), a positive population growth rate was sustained, indicating that the population is predicted to be growing and will be 46.8% to 49.1% larger than the current size after 35 years. When considering the worst-case scenario, a negative growth rate is predicted after 35 years (median growth of 0.994).

1.3.3.16 The population of razorbill from Pen y Gogarth/Great Orme's Head SSSI has been increasing in size consistently since 2000 (average annual growth rate of 1.036 between 2000 and 2023, JNCC, 2024). This annual average growth rate is higher than predicted by the PVA, and therefore, even if the worst-case estimate of displacement and mortality scenario were to occur (70% displacement and 10% mortality), the population should continue to increase. This empirical annual average growth rate is higher than predicted by the PVA. Given that the PVA predicts a continuation of the increasing population, the impact can be considered to be of negligible to low magnitude.

1.3.3.17 Following the EIA methodology (set out in section 5.4 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04)), razorbill is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is, therefore, considered to be medium. Overall, as the sensitivity of razorbill is medium and the magnitude of the cumulative impact is considered negligible to low, this could lead to a potential minor significant impact to razorbill from Pen y Gogarth/Great Orme's Head SSSI from the project alone. Therefore, as the predicted impact is of minor significant impact, this is considered non-significant.

1.4 Conclusions

1.4.1.1 Following NRW's request within their Relevant Representation, an annual assessment of black-legged kittiwake, common guillemot, and razorbill from the Pen y Gogarth/Great Orme's Head SSSI has been provided in this document and submitted at Deadline 7 as an Annex to the Environmental Statement.

1.4.1.2 The annual impact assessment of the Mona Offshore Wind Project alone and cumulatively indicate that razorbill and common guillemot from Pen y Gogarth/Great Orme's Head SSSI are predicted to continue to grow in line with the empirical evidence from colony monitoring counts.

1.4.1.3 The annual impact assessment of the Mona Offshore Wind Project alone and cumulatively indicate that black-legged kittiwake population from Pen y Gogarth/Great Orme's Head SSSI is predicted to decline in line with the empirical evidence from colony monitoring counts. The additional impact of up to 9.68 birds changes the annual median growth rate by up to 1.0%, which is considered a minor non-significant impact.

1.5 References

DESNZ, 2023. Awel Y Môr Habitats Regulations Assessment

Natural England and NRW (2024). NE and NRW interim advice regarding demographic rates, EIA scale mortality rates and reference populations for use in offshore wind impact assessments

RWE, 2022. Awel Y Môr Offshore Wind Farm. Marine Ornithology Great Orme Assessment (Clean). Document reference: 3a.19

RWE, 2023. Awel Y Môr Offshore Wind Farm. Report 5.2: Report to Inform Appropriate Assessment. Deadline 8. Document reference: 8.40

Appendix A: PVA Inputs

A.1 Black-legged kittiwake – Mona Offshore Wind Project alone

A.1.1 Set up

The log file was created on: 2024-10-10 10:09:12 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 Basic information

This run had reference name “Kittiwake_GOH_Alone”.
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 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: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 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.1.3.1 Population 1

Initial population values: Initial population 1128 in 2023

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.1.4 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.1.5 Impact on Demographic Rates

A.1.5.1 Scenario A - Name: Collisions_Alone_Mean

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00210093, se: NA

A.1.5.2 Scenario B - Name: Collisions_Alone_UCI

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00428191, se: NA

A.1.6 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.2 Black-legged kittiwake – Cumulative Impact

A.2.1 Set up

The log file was created on: 2024-10-08 10:08:08 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.2.2 Basic information

This run had reference name “Kittiwake_GOH_Cumulative”.
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.2.3 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: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 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.2.3.1 Population 1

Initial population values: Initial population 1128 in 2023

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.2.4 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.2.5 Impact on Demographic Rates

A.2.5.1 Scenario A - Name: Cumulative Collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.008582562, se: NA

A.2.6 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.3 Common guillemot – Mona Offshore Wind Project alone

A.3.1 Set up

The log file was created on: 2024-10-22 13:39:49 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.3.2 Basic information

This run had reference name “Guillemot_GOH_Alone”.
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.3.3 Baseline demographic rates

Species chosen to set initial values: 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.
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.3.3.1 Population 1

Initial population values: Initial population 3578 in 2023

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.3.4 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.3.5 Impact on Demographic Rates

A.3.5.1 Scenario A - Name: 30*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00056174, se: NA

A.3.5.2 Scenario B - Name: 50*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00093623, se: NA

A.3.5.3 Scenario C - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.01310717, se: NA

A.3.6 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.4 Common guillemot – Cumulative impact

A.4.1 Set up

The log file was created on: 2024-10-22 14:39:49 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.4.2 Basic information

This run had reference name “Guillemot_GOH_Cumulative”.
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.4.3 Baseline demographic rates

Species chosen to set initial values: 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.

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.4.3.1 Population 1

Initial population values: Initial population 3578 in 2023

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.4.4 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.4.5 Impact on Demographic Rates

A.4.5.1 Scenario A - Name: 30*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000872108, se: NA

A.4.5.2 Scenario B - Name: 50*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001453513, se: NA

A.4.5.3 Scenario C - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.020349183, se: NA

A.4.6 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.5 Razorbill – Mona Offshore Wind Project alone

A.5.1 Set up

The log file was created on: 2024-10-11 13:33:31 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.5.2 Basic information

This run had reference name “Razorbill_GOH_Alone”.
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.5.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
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.

A.5.3.1 Population 1

Initial population values: Initial population 496 in 2023

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.4 Impacts

Number of impact scenarios: 4.

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.5.5 Impact on Demographic Rates

A.5.5.1 Scenario A - Name: 30*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0001187 , se: NA

A.5.5.2 Scenario B - Name: 50*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0001978 , se: NA

A.5.5.3 Scenario C - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0027691 , se: NA

A.5.6 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.6 Razorbill – Cumulative impact

A.6.1 Set up

The log file was created on: 2024-10-08 07:55:53 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.6.2 Basic information

This run had reference name “Razorbill_GOH_Cumulative”.
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.6.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
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.

A.6.3.1 Population 1

Initial population values: Initial population 496 in 2023

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.6.4 Impacts

Number of impact scenarios: 4.

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.6.5 Impact on Demographic Rates

A.6.5.1 Scenario A - Name: 30*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000546989, se: NA

A.6.5.2 Scenario B - Name: 50*1

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000932787, se: NA

A.6.5.3 Scenario C - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.013059012, se: NA

A.6.6 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