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West of Orkney Windfarm

Offshore Ornithology Additional Information

Appendix 8 - HRA: PVA at SPA population scales for Project alone and in-combination impacts

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1 INTRODUCTION

1.1 Project summary

1. Offshore Wind Power Limited (OWPL) ('the Applicant') is proposing the development of the West of Orkney Windfarm ('the Project'), an Offshore Wind Farm (OWF), located at least 23 kilometres (km) from the north coast of Scotland and 28 km from the west coast of Hoy, Orkney (**Figure 1-1**).

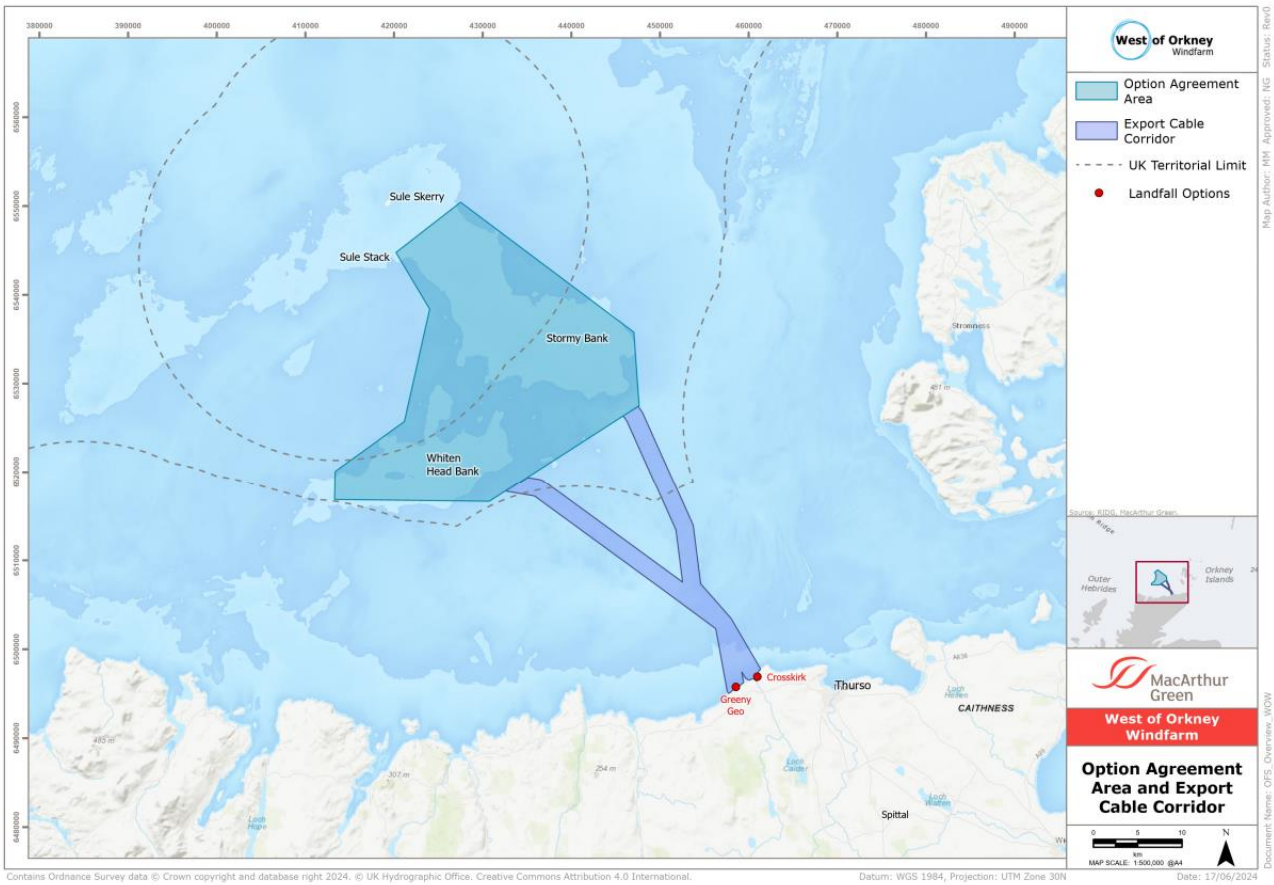

Figure 1-1. Map showing location of the West of Orkney Windfarm Option Agreement Area (OAA) and Export Cable Corridor (ECC) which together, comprise the Offshore Project Area.

2. The Offshore Project will comprise up to 125 wind turbine generators (WTGs) with fixed-bottom foundations and up to five Offshore Substation Platforms (OSPs). The area within which the WTGs, OSPs and associated infrastructure will be located is the Option Agreement Area (OAA). The OAA covers an area of 657 km^2. The export cables will be located within the Export Cable Corridor (ECC), with landfall options at Greeny Geo and/or Crosskirk in Caithness (**Figure 1-1**). The OAA and ECC together comprise the offshore Project area.

3. The Applicant submitted an application for consent under Section 36 of the Electricity Act 1989 and Marine Licences under Part 4 of the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 to Scottish Ministers in September 2023 for the offshore components of the Project seaward of Mean High Water Springs (MHWS).

4. In accordance with relevant EIA Regulations[1], an Offshore Environmental Impact Assessment (EIA) Report was submitted to Marine Directorate – Licensing Operations Team (MD-LOT) as part of the Applicant's consent application (the 'Offshore EIA Report'). A Report to Information Appropriate Assessment (RIAA) was also submitted as part of the Offshore Application to provide the Competent Authority (MD-LOT) with the information required to assist them in undertaking an Appropriate Assessment (AA) for the offshore Project as required under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended), the Conservation of Marine Habitats and Species Regulations 2017 and The Conservation of Habitats and Species Regulations 2017 (as amended) (hereafter referred to as the 'Habitats Regulations').

5. Following the review of the Applicant's application, and upon receipt of representations from consultees, MD-LOT issued a request for Additional Information on offshore ornithology. This report is part of the Ornithology Additional Information (OAI).

1.2 Relationship between the original application and the OAI

6. The Ornithology Additional Information (OAI) (see **Introduction to the Additional Ornithology Information** for structure of OAI and list of all reports) includes:

   - an **Addendum to the Offshore EIA Report** in the form of a revised EIA chapter for Offshore and Intertidal Ornithology. All ornithology information in this report should be read in place of information in the original EIA chapter;
   - an **Addendum to the RIAA**. All ornithology information in this report should be read in place of information in the original RIAA (with the exception of information on pre-application consultation);
   - a set of nine technical appendices. This **Appendix 8 – HRA: PVA at SPA population scales for Project alone and in-combination impacts** is one of the nine technical appendices. These reports entirely replace the original Supporting Study 12: Offshore Ornithology Technical Supporting Study.

7. NatureScot's pre- and post-application Project-specific advice and online guidance notes[2] were followed throughout the OAI. To demonstrate this, reference to NatureScot's guidance and advice is made throughout the OAI, either in the text or in separate text boxes.

[1] *The relevant EIA Regulations include the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and the Marine Works (Environmental Impact Assessment) Regulations 2007.*

[2] *Guidance Note 1: Guidance to support Offshore Wind Applications: Marine Ornithology - Overview | NatureScot*

1.3 Purpose of this Report

8. Collision and displacement mortality were estimated for the Project (see **Appendix 3 - EIA and HRA: Collision Risk Modelling Technical Report** and **Appendix 4 - EIA and HRA: Displacement Technical Report** for details). These impacts were then apportioned to Special Protection Areas (SPAs), as described in **Appendix 5 - HRA: Apportioning Technical Report**. The **Appendix 6 - HRA: Calculation of mortalities and change in survival rate at SPA population scales for Project alone and in-combination impacts** then describes how the apportioning weightings were used to calculate Project alone and in-combination mortality for each SPA population. Finally, the consequences of this additional mortality on each SPA population was assessed using Population Viability Analysis (PVA) methods, as described in this report. A summary of methods and key results are presented in the **Addendum to the RIAA**, with mortalities and population response to that mortality considered in detail for each SPA, as well as a conclusion on the potential for that mortality to affect the site's Conservation Objectives, i.e. to cause an adverse effect on site integrity.

9. This report describes methods and parameters used in undertaking PVA. It also provides the full results obtained from PVAs. For each run of the PVA, complete tables of all input values are provided, together with the outputs which are presented in both tabulated and graphical form.

10. This report uses the estimated changes in survival for seabird features of SPAs arising from impacts from the Project alone and in-combination with other OWFs. Mortalities and change in annual adult survival rate for SPA populations are presented in **Appendix 6 - HRA: Calculation of mortalities and change in survival rate at SPA population scales for Project alone and in-combination impacts.**

2 METHODS

11. A key part of HRA impact assessment is to understand how SPA populations might respond to predicted mortality arising from OWF developments. It is this population response to predicted OWF mortality that determines whether a proposed plan or project could adversely affect integrity of an SPA.

12. NatureScot Guidance Note 11[3] provides recommendations on how to quantify population response to OWF mortality, using PVA.

2.1 Threshold for determining whether a PVA is required

NatureScot Guidance Note 11:

The impacts of collision and distributional responses, such as displacement, will need to be considered in the context of relevant SPA breeding colonies particularly where the assessed effects exceed a change to the adult annual survival rate of 0.02 percentage point change. For example, if a survival rate was estimated at 80% and this decreased to 79.98% when including the impacts of apportioned collision or distributional responses, a PVA should be undertaken. Where apportioned impacts are large and / or the SPA populations are small, it is likely that population models will be required to establish whether or not there could be long-term impacts on population viability.

NatureScot Consultation Meeting 21 May 2024:

Thresholds for PVA
Use a 2 step process:
1. Does the project alone result in an estimated increase in baseline annual mortality >= 0.02%?
a. If no (i.e. <0.02%) then PVA for project alone is not required.
b. If yes, then PVA required for project alone.
2. Do cumulative impacts result in an estimated increase in baseline annual mortality >= 0.02%?
a. If no (i.e. <0.02%), then no cumulative PVA is required;
b. If yes (i.e. >=0.02%) & project alone mortality >0.2 birds per annum, then cumulative PVA is required; but if project alone mortality <0.2 birds per annum, then cumulative PVA is not required.

13. A PVA was only required where predicted mortality and predicted change to baseline adult survival rate was sufficiently large.

2.1.1 PVAs for HRA

14. Following NatureScot Guidance Note 11, a PVA was run for SPA populations for which decrease in annual adult survival rate was greater than or equal to 0.02% (percentage point change).

[3] Guidance Note 11: Guidance to support Offshore Wind Applications: Marine Ornithology - Recommendations for Seabird Population Viability Analysis (PVA) | NatureScot.

15. Following more recent NatureScot advice in a consultation meeting (21 May 2024), a PVA was run when the Project mortality, in-combination with other OWFs mortality, resulted in impacts that caused a decrease in adult annual survival rate equal to or greater than 0.02% and the estimated Project mortality was equal to or greater than 0.2 birds per annum.

16. When an in-combination PVA was required, estimated Project alone impacts were included as additional scenarios, irrespective of whether the Project alone impacts exceeded the PVA threshold or not. These Project alone scenarios were included, for context, to assist with understanding the Project contribution to the in-combination impacts, e.g. by comparing PVA metrics for the Project alone impacts with in-combination metrics.

17. **Table 2-1** shows which features of an SPA required a PVA to be undertaken. For all other SPAs that were screened in, mortality and/or decrease in annual adult survival rate was sufficiently small that a PVA was not required. See **Appendix 6 - HRA: Calculation of mortalities and change in survival rate at SPA population scales for Project alone and in-combination impacts** for mortality and change in adult survival rate for each SPA and feature.

Table 2-1. SPAs and species for which a PVA has been run for the Project impacts, alone and in-combination. 'X' indicates that a PVA was run. 'WoW' = West of Orkney Windfarm impacts alone; 'in-comb' = West of Orkney Windfarm impacts in-combination with other OWFs.

SPA	Kittiwake		Gannet		Great black-backed gull		Guillemot		Razorbill		Puffin	
	WoW	In-comb	WoW	In-comb	WoW	In-comb	WoW	In-comb	WoW	In-comb	WoW	In-comb
Buchan Ness to Collieston Coast SPA		X										
Calf of Eday SPA					X			X				
Cape Wrath SPA	X	X						X		X		
Copinsay SPA					X			X				
East Caithness Cliffs SPA		X			X			X		X		
Fair Isle SPA				X				X				X
Farne Islands		X										X
Flamborough and Filey Coast		X		X								
Forth Islands		X		X							X	X
Foula SPA												X
Fowlsheugh SPA		X										
Handa SPA		X						X		X		
Hermaness, Saxa Vord and Valla Field SPA				X								X
Hoy SPA	X	X			X			X				
Marwick Head SPA	X	X						X				
North Caithness Cliffs SPA	X	X						X		X		
Noss SPA				X								
Rousay SPA	X	X						X				
St Abb's Head to Fast Castle		X										
St Kilda SPA				X								
Sule Skerry and Sule Stack			X	X			X	X			X	X

SPA	Kittiwake		Gannet		Great black-backed gull		Guillemot		Razorbill		Puffin	
	WoW	In-comb	WoW	In-comb	WoW	In-comb	WoW	In-comb	WoW	In-comb	WoW	In-comb
Troup, Pennan and Lion's Head		X										
West Westray SPA	X	X					X	X				

2.2 Population modelling

2.2.1 Type of model

NatureScot Guidance Note 11:

The Natural England (NE) PVA tool (Searle et al. 2019) should be used to undertake Population Viability Analyses. This uses a Leslie Matrix Model, which is an age-structured model, populated by life-history parameters to estimate population size over a set time period.

18. PVA is an approach to assessing projected future changes to population size and growth rate, using numerical population models. Typically, PVA is used to compare various metrics of a population, such as size or growth rate, under a range of conditions, e.g. to compare population size projected into the future under current (baseline population) conditions with predicted population size in the presence of additional OWF mortality (impacted population; Searle *et al.* 2019).

19. The NE-commissioned PVA tool (Searle *et al.* 2019), (the 'NE PVA tool') was used for this assessment, as recommended in NatureScot Guidance Note 11. The NE PVA tool is a version of a matrix model (Caswell, 1989). This model is written using the R programming language (R Core Team, 2023) and can be used either from within R or via an online interface[4]. Owing to the large number of models that were required for the Project assessment (48 for SPAs and 15 for EIA and Cumulative Impact Assessment (CIA)), the former option was used. The most recently available version of the R scripts (Version 4.15, 19 February 2020) was used for this analysis[5].

2.2.2 Time periods

NatureScot Guidance Note 11:

We request that the modelling of impacts is undertaken over two or three time periods:

25 years (and the intended lease period if different)
50 years

20. NatureScot Guidance Note 11 advises presenting outputs from 25 and 50 year projects as well as the intended period of operation, which for the Project, was 35 years. Tabulated outputs are provided at three time points from the simulated projections, after 25, 35 and 50 years. On 4 June 2024, in a consultation meeting, NatureScot confirmed that a 60 year project was not required, despite this being the period of seabed lease for the Project.

[4] http://ec2-34-243-66-127.eu-west-1.compute.amazonaws.com/shiny/seabirds/PVATool_Nov2022/R/.
[5] https://github.com/naturalengland/Seabird_PVA_Tool/releases/latest.

21. It is recommended that an initial 'burn-in' period of at least five years is included in a model simulation to allow aspects such as age distributions to equilibrate prior to the simulated period of interest (Searle *et al.* 2019). However, for SPA-species with small population sizes, this was found to be not possible as the models would fail to complete the burn-in phase. In these cases, it was necessary to omit the burn-in phase. However, this is not considered likely to have had a material effect on the results obtained.

22. Projections were run from a starting year of 2027 to an end year of 2077. Collision and displacement impacts were applied from the starting year for 35 years, i.e. to 2062 (as agreed with NatureScot in a consultation meeting on 4 June 2024).

23. The Project is intending to be operational for a period of 30 years. However, PVAs were run with impacts on populations for a period of 35 years, to account for WTGs starting to rotate at first power, prior to the full OWF becoming operational. Additionally, displacement effects could start to occur when WTGs are first installed, i.e. prior to the OWF being fully operational and could continue to displace birds (assuming no habitation) after the Project ceases operation, prior to full decommissioning.

2.2.3 Starting population size

NatureScot Guidance Note 11:

The most up to date population data (i.e. most will be available within the SMP database) should be used to determine the baseline populations. This should be undertaken at the designated site level, e.g. at the SPA level for HRA.

24. Starting population size was taken from the most recent seabirds census, Seabirds Count (Burnell *et al.* 2023). These counts were undertaken during 2015-2021, which are contemporary with the period over which digital aerial surveys of the offshore Project were conducted (July 2020 to September 2022). For some colonies, more recent counts were undertaken during the 2023 breeding season, to ascertain the extent to which populations have declined following highly pathogenic avian influenza (HPAI) mortality (Tremlett *et al.* 2024). These more recent counts were not used in PVA as:

- Estimated mortality for the Project is calculated from digital aerial survey density and abundance estimates, i.e. mortality estimates are based on information from 2020-2022. Using contemporary population counts (i.e. colony counts obtained from approximately the same time as when the digital aerial surveys were undertaken) gives a more relevant assessment of population response to those impacts;
- The outputs from PVAs used in impact assessments are robust to uncertainty in population size (Cook & Robinson, 2016). PVA metrics are counterfactuals, showing relative change in population size or growth rate in the presence of impacts, compared to no impacts. Both these scenarios are run with the same starting population size, no matter whether it is a population size from Burnell *et al.* (2023) or Tremlett *et al.* (2024).

This means that using starting population sizes estimated by Tremlett *et al.* (2024) would make very little difference to PVA outputs.

25. Starting population size is presented for each PVA in **Table 2-2.** These are from the Seabirds Count census[6] (Burnell *et al.* 2023), revised version (13 December 2023). Counts were adjusted to the number of individual breeding adults, using the following methods:

- Gannet, kittiwake, great skua, great black-backed gull, fulmar: Apparently Occupied Nest (AON), Apparently Occupied Territory (AOT) or Apparently Occupied Site (AOS) * 2 = individuals;
- Guillemot and razorbill: Individuals (IND) * 0.67 to give the estimated number of pairs, then * 2 = individuals;
- Puffin AOB * 2 = individuals.

26. This gave an estimated number of breeding adults for each SPA population.

Table 2-2. SPA population sizes for each species and SPA for which a PVA was run. SPA population size was taken from Seabirds Count (Burnell *et al.* 2023) but with counts converted to individual breeding adults. These SPA population sizes were used as starting population size in PVAs.

SPA	SPA population size (individual breeding adults)
Kittiwake	
Buchan Ness to Collieston Coast SPA	22,590
Cape Wrath SPA	7,244
East Caithness Cliffs SPA	48,958
Farne Islands	8,804
Flamborough and Filey Coast	91,008
Forth Islands	9,084
Fowlsheugh SPA	28,078
Handa SPA	7,498
Hoy SPA	532
Marwick Head SPA	1,812
North Caithness Cliffs SPA	11,142
Rousay SPA	660
St Abb's Head to Fast Castle	10,300
Troup, Pennan and Lion's Head	21,232
West Westray SPA	5,510
Gannet	
Fair Isle	9,942
Flamborough and Filey Coast	26,784
Forth Islands	150,518
Hermaness, Saxa Vord and Valla Field	59,124
Noss	27,530
St Kilda	120,580

[6] Seabirds Count | JNCC - Adviser to Government on Nature Conservation.

SPA	SPA population size (individual breeding adults)
Sule Skerry and Sule Stack	18,130
Great black-backed gull	
Calf of Eday SPA	116
Copinsay SPA	134
East Caithness Cliffs SPA	532
Hoy SPA	64
Guillemot	
Calf of Eday	4,681
Cape Wrath	51,066
Copinsay	24,762
East Caithness Cliffs	199,966
Fair Isle	24,515
Handa	73,250
Hoy	12,390
Marwick Head	16,060
North Caithness Cliffs	52,123
Rousay	7,921
Sule Skerry and Sule Stack	12,060
West Westray	38,454
Razorbill	
Cape Wrath SPA	4,350
East Caithness Cliffs SPA	4,0373
Handa SPA	10,997
North Caithness Cliffs SPA	4,796
Puffin	
Coquet Island SPA	50,058
Fair Isle	13,332
Farne Islands	87,504
Forth Islands	85,846
Foula	8,468
Hermaness, Saxa Vord and Valla Field	28,750
Sule Skerry and Sule Stack	95,484

2.2.4 Demographic rates

NatureScot Guidance Note 11:

We recommend the use of Horswill and Robinson (2015) for species demographic data for use within population modelling. The input values used should be reported, and justification should be provided if any different values occur, for example, if site specific data are available.

27. As agreed with NatureScot on 25 June 2024, the demographic rates used for each species were those built into the online PVA, with productivity selected as *Region: Country* and *Sector: Scotland* and survival as *National*. These rates were derived from Horswill and Robinson (2015), and in some instances that source was used to supplement the rates (e.g. for kittiwake adult survival the standard deviation in Horswill and Robinson (2015), 0.051, was used in preference to the value in the online PVA of 0.077 as the latter appears to be erroneous use of the immature value; use of Horswill and Robinson (2015) as the most reliable source of demographic rates was agreed with NatureScot in a consultation meeting on the 25 June 2024).

28. All demographic rates used in each PVA are presented in the input tables below, as requested in NatureScot Guidance Note 11. Demographic rates are summarised below in **Table 2-3**.

Table 2-3. Demographic rates used in PVAs. No PVAs were run for fulmar or great skua and so demographic rates are not presented for these species

Species	Kittiwake	Gannet	Great black-backed gull	Guillemot	Razorbill	Puffin
Age at first breeding	4	5	5	6	5	5
Productivity rate per pair - mean	0.586	0.679	0.930	0.501	0.440	0.415
Productivity rate per pair – SD	0.370	0.092	0.432	0.208	0.188	0.212
Adult survival rate – Mean	0.854	0.919	0.93	0.94	0.895	0.907
Adult survival rate - SD	0.051	0.042	0.1	0.025	0.067	0.083
Immatures survival rates 0 to 1 mean	0.790	0.424	0.93	0.560	0.63	0.709
Immatures survival rates 0 to 1 SD	0.077	0.045	0.1	0.058	0.067	0.108
Immatures survival rates 1 to 2 mean	0.854	0.829	0.93	0.792	0.63	0.709
Immatures survival rates 1 to 2 SD	0.077	0.026	0.1	0.152	0.067	0.108
Immatures survival rates 2 to 3 mean	0.854	0.891	0.93	0.917	0.895	0.709
Immatures survival rates 2 to 3 SD	0.077	0.019	0.1	0.098	0.067	0.108
Immatures survival rates 3 to 4 mean	0.854	0.895	0.93	0.938	0.895	0.76
Immatures survival rates 3 to 4 SD	0.077	0.019	0.1	0.107	0.067	0.093
Immatures survival rates 4 to 5 mean	-	0.919	0.93	0.94	0.895	0.805
Immatures survival rates 4 to 5 SD	-	0.042	0.1	0.025	0.067	0.083
Immatures survival rates 5 to 6 mean	-	-	-	0.94	-	-

Species	Kittiwake	Gannet	Great black-backed gull	Guillemot	Razorbill	Puffin
Immatures survival rates 5 to 6 SD	-	-	-	0.025	-	-

2.2.5 Stochasticity and density dependence

29. The PVAs were run as stochastic models that incorporate environmental and demographic variability in the input parameters, with 1,000 simulations for each model scenario. A matched runs approach was used where impacted populations had the same stochastic variation as unimpacted (baseline) populations for each individual simulation run.

30. No density dependent regulation was applied to these simulations. NatureScot confirmed, by email (dated 9 July 2024) that they were content with use of a density-independent model. This means that average demographic rates remain the same irrespective of population growth or decline, in contrast with the natural processes of resource constraint which prevents unlimited (i.e. exponential) growth and also tends to buffer populations against declines, through reduced competition and consequent increase in survival and/or productivity.

31. The results for each species-SPA combination included the complete set of input parameters to permit model validation if required (but it should be noted that the random seed specified relates to the R version of the PVA functions and use of this value with the online version will not result in identical outputs).

2.2.6 PVA metrics to be presented

NatureScot Guidance Note 11:

We advise the two ratio metrics that compare impacted and un-impacted populations should be applied in both EIA and HRA. The two metrics that should be used are generally termed 'Counterfactual (ratio) of final population size' and 'Counterfactual (ratio) of population growth-rate'.

In addition to the ratio metrics, other metrics, e.g. predicted final population size, can be supplied for context, and output graphs of PVA runs should be supplied where possible.

32. The counterfactuals of population growth rate (C-PGR, the average annual rate of change over the projected period) and population size (C-PS) and the 50th quantiles for unimpacted

and impacted populations[7] are provided for each PVA scenario run, at 25, 35 and 50 year projections.

33. As requested in NatureScot Guidance Note 11, a plot for each model run is also provided which presents all of the different scenarios on the same plot to allow a straightforward comparison of impacted population trajectories with baseline trajectories, as well as Project alone with in-combination comparisons.

34. The C-PGR and C-PS are provided as the median, mean, standard deviation and 95% confidence intervals. Although the two counterfactual measures may appear to be equally informative with respect to understanding the population consequences of impacts, which one is more appropriate depends on whether density dependent regulation has been included. Consideration of the properties of density dependent and density independent population projections illustrates why this is: a population regulated by density dependent feedback will maintain itself around an equilibrium level. Since there is no long-term growth or decline for such a population, when an impact is applied the population growth rate will only change in the short term, following which the population will once again settle at a new, lower, equilibrium size. Hence the change in growth rate (i.e. C-PGR) is of limited value for understanding the effect of an impact. In contrast, the change in population size (C-PS) provides useful information on how much smaller the population will be in the presence of the impact. When a population is simulated without regulation (i.e. density independent), the population will grow or decline exponentially. The baseline and impacted predictions will both change in this manner but the difference between the two will increase with duration as the baseline population grows more rapidly. Hence, the time point when the differences are considered is critical to the C-PS value obtained and how this is interpreted. However, the average growth rate of a density independent population is constant and therefore, a comparison of the baseline and impacted growth rates is insensitive to the duration over which the comparison is made. Thus, for density independent PVA, as presented here, the C-PGR is the more robust and reliable metric to use. However, following NatureScot Guidance Note 11, C-PS is also presented for each PVA scenario.

2.3 PVA Scenarios

35. PVA scenarios were developed to take into account the following:

- Kittiwake and gannet have both collision and displacement impact pathways;
- Guillemot, razorbill and puffin have only displacement impact pathways; and
- Great black-backed gull have only collision pathways.

36. Two estimates of collision mortality were generated, one under a Worst Case Scenario (WCS) and the other under a Most Likely Scenario (MLS) (see **Appendix 3 - EIA and HRA: Collision Risk Modelling Technical Report** for more details). For each scenario, the number of WTGs did not change, but size of WTG increased under the WCS, compared to the MLS. Due to the number of WTGs not changing, collision mortality estimates under both scenarios were very

[7] *the quantile from the unimpacted population that matched the 50% quantile for the impacted population and the quantile from the impacted population that match the 50% quantile for the unimpacted population, respectively.*

similar. Once these impacts have immature and sabbatical birds removed and are then apportioned to SPAs, the differences between MLS and WCS are very small, <1 bird for each species. See **Table 2-3** in **Appendix 6 - HRA: Calculation of mortalities and change in survival rate at SPA population scales for Project alone and in-combination impacts** as well as **Appendix 3 - EIA and HRA: Collision Risk Modelling Technical Report** for more information. The Applicant decided to present PVA outputs based on only WCS collision mortality due to the MLS and WCS predicted collisions being so similar. PVA outputs would not be substantially different under the two scenarios, meaning that conclusions on adverse effect on site integrity for a site would not change. Consequently, only a single mortality rate (WCS) was used to model collision impacts in the PVAs.

37. Two estimates of displacement mortality were generated. NatureScot advise that, due to there being uncertainty around the proportion of birds that may die as a consequence of being displaced, two rates for mortality of displaced birds should be assessed (see NatureScot Guidance Note 8[8]). The estimated annual low and high impact displacement mortality were assessed in PVAs, as two separate scenarios. See **Appendix 4 - EIA and HRA: Displacement Technical Report** for more details.

38. NatureScot requested (consultation meeting, 11 June 2024) that the in-combination assessment present two scenarios, one including Berwick Bank Wind Farm ('Berwick Bank') impacts and the other excluding Berwick Bank impacts. These two scenarios were included in PVAs and are presented.

39. Consequently, Project alone and in-combination impacts were modelled using a single collision scenario (WCS) and two displacement scenarios (high and low displacement mortality). Additionally, two scenarios were used for in-combination, one with Berwick Bank impacts included and one with Berwick Bank impacts excluded. Details of the PVA scenarios run for each species are provided below.

40. Six PVA scenarios were modelled for kittiwake and gannet:

- Project alone, WCS collisions, plus low displacement impacts;
- Project alone, WCS collisions, plus high displacement impacts;
- In-combination, WCS collisions, plus low displacement impacts, without Berwick Bank;
- In-combination, WCS collisions, plus high displacement impacts, without Berwick Bank;
- In-combination, WCS collisions, plus low displacement impacts, with Berwick Bank; and
- In-combination, WCS collisions, plus high displacement impacts with Berwick Bank.

41. Six PVA scenarios were modelled for guillemot, razorbill and puffin (although for guillemot there is no connectivity between the Project and SPAs impacted by Berwick Bank so only one set of in-combination values was modelled for guillemot):

[8] *Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds | NatureScot.*

- Project alone, low displacement impact;
- Project alone, high displacement impact;
- In-combination, low displacement impact, without Berwick Bank;
- In-combination, high displacement impact, without Berwick Bank;
- In-combination, low displacement impact, with Berwick Bank; and
- In-combination, high displacement impact, with Berwick Bank.

42. Three PVA scenarios were modelled for great black-backed gull:

- Project alone, WCS collisions;
- In-combination, WCS collisions, without Berwick Bank; and
- In-combination, WCS collisions, with Berwick Bank.

3 RESULTS

3.1 PVAs run for SPA populations

43. The inputs to each SPA qualifying feature PVA and outputs from the PVA are presented below, by SPA and species. Outputs were also presented in the **Addendum to the RIAA** and were used to inform a conclusion on whether the Project, alone or in-combination with other OWFs, could have an adverse effect on site integrity.

44. For each species, an input and an output table, along with a plot of population size over time, are presented. All tables follow the same structure. The input and output tables for the kittiwake population at Buchan Ness to Collieston Coast SPA are used as an example to explain information presented in the tables for each PVA (**Table 3-1** and **Table 3-2**). An input and an output table are presented, with red text explaining what the information is in each part of the tables.

Table 3-1. Example input table to explain information presented for each PVA. Explanation is given in red text.

Baseline parameters	Settings	Impact parameters	Values
Reference name – species and SPA name	Kittiwake at Buchan Ness to Collieston Coast SPA	Number of scenarios of impact – see PVA Scenarios section above	6
Type – a simulation model run	Simulation	Are impacts applied separately to each subpopulation – no sub populations were included	FALSE
Case studies – not a case study example run	None	Are impacts specified separately for immatures – no, immatures have the same mortality rate as adults in the PVA	FALSE
Model to use for environmental stochasticity – type of distribution from which values are selected	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence – model is density independent	No density dependence	Should random seeds be matched for impact scenarios – this ensures matched runs	TRUE
Include demographic stochasticity in model – model includes demographic stochasticity	TRUE	Impacts are specified as – the relative change in population size and growth rate	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed – number used to create the same set of parameter values selected from the stochastic distributions	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name – West of Orkney Windfarm alone, with Collision mortality (CRM) and low displacement impacts	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean – assumes no impacts to productivity, only to survival	0
Age at first breeding	4	Scenario A Impact on adult survival rate – change to adult survival rate due to collision and displacement impacts	4.767399e-05
Is there an upper constraint on productivity in the model – stochastic variation in brood size is capped at 2 chicks per pair	TRUE	Scenario A Impact on immature survival rate mean – immature survival is impacted to the same extent as adult survival	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name - West of Orkney Windfarm alone, with Collision mortality (CRM) and high displacement impacts	WoW alone CRM+High
Number of subpopulations – no sub populations are considered	1	Scenario B Impact on productivity rate per pair mean – assumes no impacts to productivity, only to survival	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate – change to adult survival rate due to collision and displacement impacts	6.09692677584866 46E-5

Baseline parameters	Settings	Impact parameters	Values
Are baseline demographic rates specified separately for immatures – adult survival rate is different to immature survival rate	TRUE	Scenario B Impact on immature survival rate mean immature survival is impacted to the same extent as adult survival	-
Initial population size – starting population size, which is the number of breeding adults in that SPA population	22590	Scenario C name West of Orkney Windfarm in-combination but excluding Berwick Bank impacts, with Collision mortality (CRM) and low displacement impacts	Incomb CRM+Low ex. BB
Year – value is set to 2023 for all populations despite the population being counted in different years	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	2.88104386685087E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name West of Orkney Windfarm in-combination but excluding Berwick Bank impacts, with Collision mortality (CRM) and high displacement impacts	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	3.7758368806398617E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name West of Orkney Windfarm in-combination including Berwick Bank impacts, with Collision mortality (CRM) and low displacement impacts	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	3.7501976492127181E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.854	Scenario F name West of Orkney Windfarm in-combination including Berwick Bank impacts, with Collision mortality (CRM) and high displacement impacts	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean adults start breeding at 4 years old so move to the adult age class	-	Scenario F Impact on adult survival rate	4.6449906630017107E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean adults start breeding at 4 years old so move to the adult age class	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-2. Example output table (from kittiwakes at Buchan Ness to Collieston Coast SPA) to explain information presented for each PVA. Explanation is given in text boxes.

Total annual collision and displacement mortality at that SPA population (from WoW alone, or in-combination including/excluding Berwick Bank impacts)

Decrease in adult survival rate in presence of collision and displacement mortality, compared with baseline survival rate

Counterfactual of population growth rate (median, mean standard deviation, lower and upper 95% confidence interval

Counterfactual of population size (median, mean standard deviation, lower and upper 95% confidence interval

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	1.1	0.00004767399	25	0.9999	0.9999	0.0007	0.9985	1.0012	0.9987	0.9985	0.0185	0.9630	1.0337	49.9	50.1
WoW alone CRM+High	1.4	0.00006096927	25	0.9999	0.9999	0.0007	0.9986	1.0012	0.9982	0.9985	0.0182	0.9617	1.0337	49.9	50.4
Incomb CRM+Low ex. BB	65.1	0.00288104387	25	0.9966	0.9966	0.0007	0.9951	0.9979	0.9154	0.9153	0.0175	0.8803	0.9508	40.1	59.4
Incomb CRM+High ex. BB	85.3	0.00377583688	25	0.9955	0.9955	0.0007	0.9941	0.9968	0.8907	0.8901	0.0163	0.8581	0.9223	37.6	62.2
Incomb CRM+Low inc. BB	84.7	0.00375019765	25	0.9956	0.9956	0.0007	0.9942	0.9969	0.8920	0.8917	0.0165	0.8596	0.9232	37.6	62.0
Incomb CRM+High inc. BB	104.9	0.00464499066	25	0.9945	0.9945	0.0007	0.9931	0.9959	0.8668	0.8664	0.0164	0.8335	0.8980	34.4	65.0
WoW alone CRM+Low	1.1	0.00004767399	35	1.0000	1.0000	0.0006	0.9988	1.0012	0.9984	0.9989	0.0217	0.9572	1.0437	49.6	50.8
WoW alone CRM+High	1.4	0.00006096927	35	0.9999	0.9999	0.0006	0.9987	1.0010	0.9978	0.9977	0.0214	0.9543	1.0406	49.2	50.7
Incomb CRM+Low ex. BB	65.1	0.00288104387	35	0.9966	0.9966	0.0006	0.9954	0.9978	0.8848	0.8846	0.0198	0.8448	0.9246	40.1	60.7
Incomb CRM+High ex. BB	85.3	0.00377583688	35	0.9955	0.9955	0.0006	0.9943	0.9967	0.8514	0.8514	0.0183	0.8116	0.8892	36.7	63.8
Incomb CRM+Low inc. BB	84.7	0.00375019765	35	0.9956	0.9956	0.0006	0.9943	0.9967	0.8535	0.8533	0.0188	0.8132	0.8883	36.6	63.1
[illegible]	4.9	0.00464499066	35	0.9945	0.9945	0.0006	0.9933	0.9957	0.8200	0.8203	0.0182	0.7856	0.8593	33.9	66.2
[illegible]	1.1	0.00004767399	50	1.0000	1.0000	0.0005	0.9989	1.0010	0.9979	0.9987	0.0263	0.9472	1.0521	50.0	49.9
[illegible]	1.4	0.00006096927	50	0.9999	0.9999	0.0005	0.9989	1.0009	0.9967	0.9973	0.0256	0.9455	1.0483	49.9	50.2
[illegible]	5.1	0.00288104387	50	0.9976	0.9976	0.0005	0.9965	0.9987	0.8841	0.8844	0.0247	0.8378	0.9365	40.3	59.2
[illegible]	5.3	0.00377583688	50	0.9969	0.9969	0.0005	0.9958	0.9978	0.8521	0.8518	0.0224	0.8072	0.8977	37.2	62.0
[illegible]	4.7	0.00375019765	50	0.9969	0.9969	0.0005	0.9957	0.9979	0.8531	0.8529	0.0239	0.8019	0.8983	37.9	61.5
[illegible]	4.9	0.00464499066	50	0.9961	0.9961	0.0005	0.9951	0.9972	0.8196	0.8200	0.0231	0.7767	0.8698	34.4	64.7

See PVA Scenarios above for more information.

WoW alone: only West of Orkney impacts

CRM: collision mortality included

Low: low displacement mortality scenario

High: high displacement mortality scenario

ex. BB: In-combination impacts but excluding Berwick Bank

inc. BB: In-combination impacts but including Berwick Bank

Year since start of PVA projection

50% quantiles of impacted and unimpacted populations

3.1.1 Kittiwake

3.1.1.1 Buchan Ness to Collieston Coast SPA

Table 3-3. PVA Inputs: Kittiwake at Buchan Ness to Collieston Coast SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Buchan Ness to Collieston Coast SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	4.767535e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	6.0971092557718844E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	22590	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	2.4164996072670942E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	2.9679593738356192E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	3.4668650550084799E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	4.3722605604052346E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-4. PVA Outputs: Kittiwake at Buchan Ness to Collieston Coast SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	1.1	0.00004767535	25	0.9999	0.9999	0.0007	0.9985	1.0012	0.9987	0.9985	0.0185	0.9630	1.0337	49.9	50.1
WoW alone CRM+High	1.4	0.00006097109	25	0.9999	0.9999	0.0007	0.9984	1.0012	0.9979	0.9978	0.0179	0.9616	1.0327	49.9	50.1
Incomb CRM+Low ex. BB	54.6	0.00241649961	25	0.9971	0.9971	0.0007	0.9958	0.9985	0.9288	0.9285	0.0173	0.8954	0.9625	41.3	58.1
Incomb CRM+High ex. BB	67.0	0.00296795937	25	0.9965	0.9965	0.0007	0.9951	0.9979	0.9129	0.9128	0.0171	0.8771	0.9462	39.1	59.6
Incomb CRM+Low inc. BB	78.3	0.00346686506	25	0.9959	0.9959	0.0007	0.9945	0.9972	0.8989	0.8989	0.0166	0.8670	0.9319	37.7	61.4
Incomb CRM+High inc. BB	98.8	0.00437226056	25	0.9948	0.9948	0.0007	0.9934	0.9962	0.8724	0.8733	0.0170	0.8405	0.9075	34.5	64.3
WoW alone CRM+Low	1.1	0.00004767535	35	1.0000	1.0000	0.0006	0.9988	1.0012	0.9984	0.9989	0.0217	0.9572	1.0437	49.6	50.8
WoW alone CRM+High	1.4	0.00006097109	35	0.9999	0.9999	0.0006	0.9988	1.0010	0.9967	0.9969	0.0215	0.9549	1.0404	49.3	50.8
Incomb CRM+Low ex. BB	54.6	0.00241649961	35	0.9971	0.9971	0.0006	0.9960	0.9983	0.9023	0.9026	0.0192	0.8640	0.9441	41.5	59.1
Incomb CRM+High ex. BB	67.0	0.00296795937	35	0.9965	0.9965	0.0006	0.9953	0.9977	0.8823	0.8817	0.0193	0.8423	0.9213	39.6	60.9
Incomb CRM+Low inc. BB	78.3	0.00346686506	35	0.9959	0.9959	0.0006	0.9948	0.9971	0.8629	0.8631	0.0191	0.8265	0.9010	37.1	62.6
Incomb CRM+High inc. BB	98.8	0.00437226056	35	0.9948	0.9948	0.0006	0.9935	0.9959	0.8291	0.8292	0.0185	0.7915	0.8665	34.4	65.5
WoW alone CRM+Low	1.1	0.00004767535	50	1.0000	1.0000	0.0005	0.9989	1.0009	0.9976	0.9983	0.0267	0.9455	1.0522	49.9	50.1
WoW alone CRM+High	1.4	0.00006097109	50	0.9999	0.9999	0.0005	0.9989	1.0009	0.9955	0.9963	0.0263	0.9449	1.0491	49.9	50.1
Incomb CRM+Low ex. BB	54.6	0.00241649961	50	0.9980	0.9980	0.0005	0.9970	0.9989	0.9021	0.9021	0.0239	0.8569	0.9482	41.3	57.9
Incomb CRM+High ex. BB	67.0	0.00296795937	50	0.9975	0.9975	0.0005	0.9965	0.9985	0.8816	0.8814	0.0243	0.8328	0.9279	39.6	59.2
Incomb CRM+Low inc. BB	78.3	0.00346686506	50	0.9971	0.9971	0.0005	0.9961	0.9982	0.8621	0.8628	0.0231	0.8176	0.9120	38.8	61.0
Incomb CRM+High inc. BB	98.8	0.00437226056	50	0.9963	0.9963	0.0005	0.9953	0.9973	0.8285	0.8288	0.0232	0.7845	0.8731	35.4	64.0

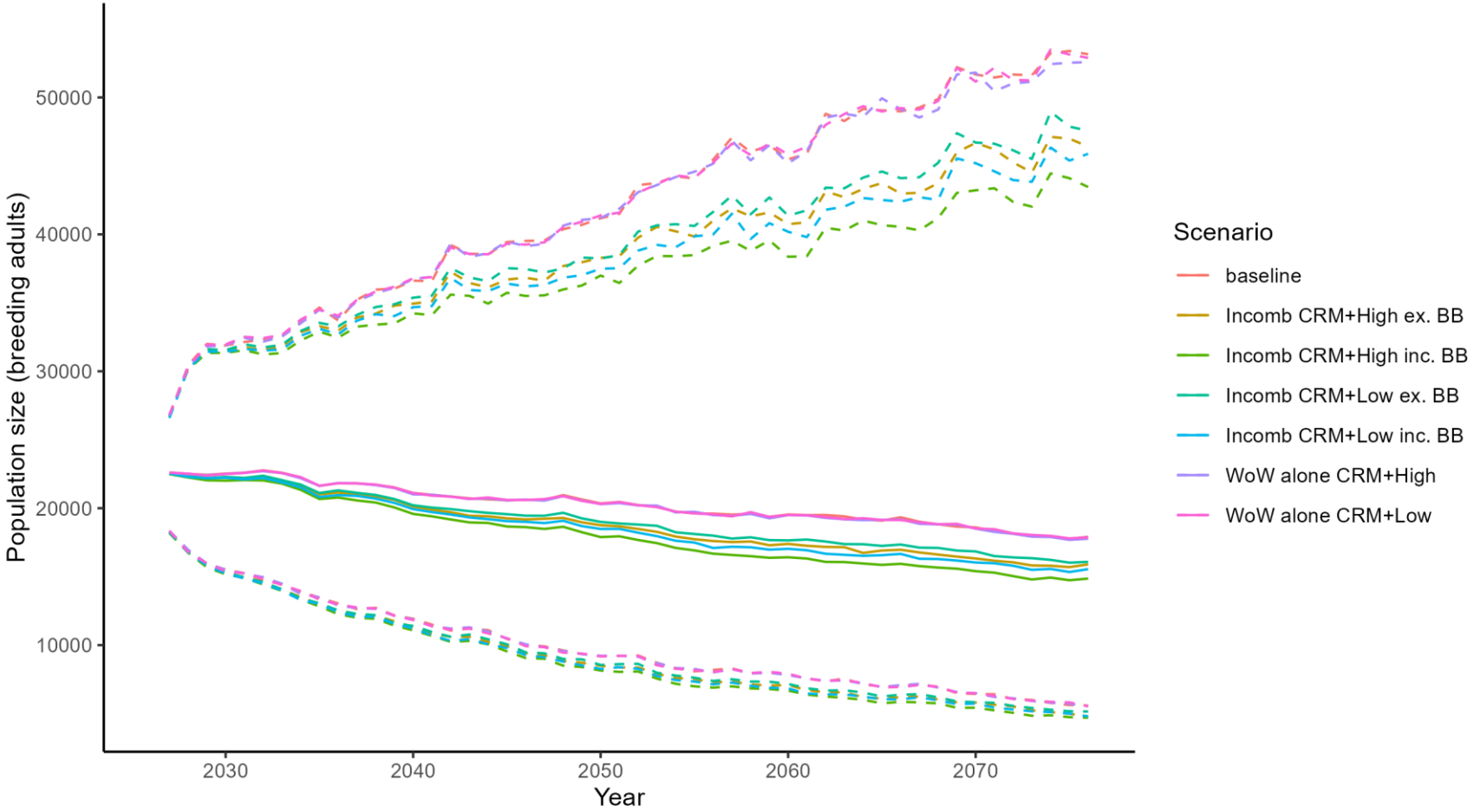

Figure 3-1. Kittiwake at Buchan Ness to Collieston Coast SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank. Inc BB are in-combination impacts including Berwick Bank. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.2 *Cape Wrath SPA*

Table 3-5. PVA Inputs: Kittiwake at Cape Wrath SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Cape Wrath SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.0003404688
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	4.5460421280081777E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	7244	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	4.7307857823414274E-4
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	6.1803712239457559E-4
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	4.8546307037093531E-4
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	6.3650273730542131E-4
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-6. PVA Outputs: Kittiwake at Cape Wrath SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	2.5	0.0003404688	25	0.9996	0.9996	0.0012	0.9973	1.0021	0.9885	0.9892	0.0324	0.9301	1.0620	49.0	51.4
WoW alone CRM+High	3.3	0.0004546042	25	0.9995	0.9995	0.0012	0.9972	1.0018	0.9858	0.9874	0.0323	0.9250	1.0532	49.0	50.9
Incomb CRM+Low ex. BB	3.4	0.0004730786	25	0.9994	0.9994	0.0012	0.9971	1.0020	0.9850	0.9854	0.0324	0.9263	1.0551	49.2	51.0
Incomb CRM+High ex. BB	4.5	0.0006180371	25	0.9993	0.9993	0.0012	0.9971	1.0016	0.9809	0.9822	0.0305	0.9273	1.0438	47.5	52.3
Incomb CRM+Low inc. BB	3.5	0.0004854631	25	0.9994	0.9994	0.0013	0.9968	1.0020	0.9853	0.9856	0.0338	0.9186	1.0548	49.0	51.0
Incomb CRM+High inc. BB	4.6	0.0006365027	25	0.9992	0.9993	0.0012	0.9968	1.0017	0.9788	0.9812	0.0328	0.9145	1.0446	47.9	51.8
WoW alone CRM+Low	2.5	0.0003404688	35	0.9996	0.9996	0.0010	0.9975	1.0016	0.9844	0.9861	0.0385	0.9141	1.0650	48.5	50.9
WoW alone CRM+High	3.3	0.0004546042	35	0.9995	0.9995	0.0011	0.9975	1.0016	0.9807	0.9812	0.0385	0.9071	1.0582	48.5	51.3
Incomb CRM+Low ex. BB	3.4	0.0004730786	35	0.9994	0.9994	0.0010	0.9975	1.0016	0.9781	0.9794	0.0378	0.9099	1.0590	48.8	51.7
Incomb CRM+High ex. BB	4.5	0.0006180371	35	0.9993	0.9993	0.0010	0.9973	1.0013	0.9741	0.9749	0.0364	0.9021	1.0512	48.4	51.6
Incomb CRM+Low inc. BB	3.5	0.0004854631	35	0.9994	0.9994	0.0011	0.9974	1.0015	0.9786	0.9802	0.0388	0.9056	1.0597	48.5	51.0
Incomb CRM+High inc. BB	4.6	0.0006365027	35	0.9992	0.9992	0.0010	0.9972	1.0013	0.9722	0.9733	0.0376	0.9027	1.0456	48.5	52.0
WoW alone CRM+Low	2.5	0.0003404688	50	0.9997	0.9997	0.0009	0.9980	1.0017	0.9835	0.9857	0.0471	0.8969	1.0863	47.7	51.3
WoW alone CRM+High	3.3	0.0004546042	50	0.9996	0.9996	0.0009	0.9978	1.0014	0.9790	0.9809	0.0460	0.8922	1.0745	48.7	51.6
Incomb CRM+Low ex. BB	3.4	0.0004730786	50	0.9995	0.9996	0.0009	0.9979	1.0014	0.9759	0.9785	0.0459	0.8953	1.0770	47.6	51.5
Incomb CRM+High ex. BB	4.5	0.0006180371	50	0.9995	0.9995	0.0009	0.9978	1.0013	0.9724	0.9752	0.0453	0.8898	1.0714	47.3	52.5
Incomb CRM+Low inc. BB	3.5	0.0004854631	50	0.9996	0.9996	0.0009	0.9978	1.0014	0.9799	0.9801	0.0473	0.8904	1.0749	49.5	50.7
Incomb CRM+High inc. BB	4.6	0.0006365027	50	0.9995	0.9995	0.0009	0.9977	1.0011	0.9717	0.9728	0.0453	0.8868	1.0588	47.6	51.9

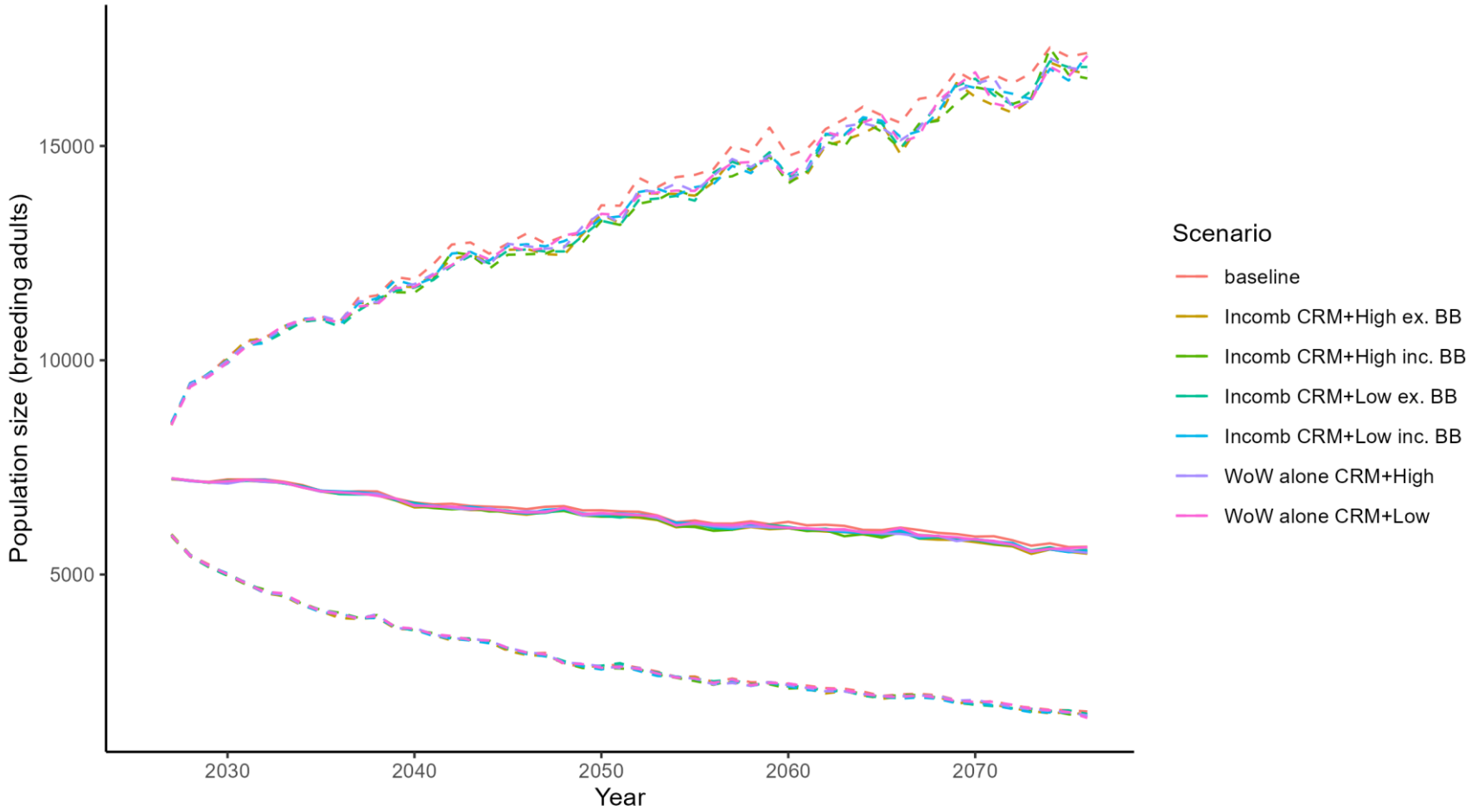

Figure 3-2. Kittiwake at Cape Wrath SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.3 *East Caithness Cliffs SPA*

Table 3-7. PVA Inputs: Kittiwake at East Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at East Caithness Cliffs SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.0001054982
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	1.3688227495536773E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	48958	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	3.9822144578848312E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	4.6887327025594092E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	4.547456806350149E-3

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	5.5026811747865426E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-8. PVA Outputs: Kittiwake at East Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	5.2	0.0001054982	25	0.9999	0.9999	0.0005	0.9989	1.0008	0.9975	0.9972	0.0126	0.9720	1.0201	49.7	50.5
WoW alone CRM+High	6.7	0.0001368823	25	0.9999	0.9999	0.0005	0.9989	1.0007	0.9963	0.9965	0.0121	0.9723	1.0184	49.7	51.0
Incomb CRM+Low ex. BB	195.0	0.0039822145	25	0.9953	0.9953	0.0005	0.9944	0.9963	0.8849	0.8851	0.0113	0.8635	0.9074	36.5	63.0
Incomb CRM+High ex. BB	229.6	0.0046887327	25	0.9945	0.9945	0.0005	0.9935	0.9954	0.8663	0.8662	0.0112	0.8436	0.8887	34.5	65.2
Incomb CRM+Low inc. BB	222.6	0.0045474568	25	0.9947	0.9946	0.0005	0.9937	0.9956	0.8701	0.8697	0.0113	0.8477	0.8927	34.7	64.8
Incomb CRM+High inc. BB	269.4	0.0055026812	25	0.9935	0.9935	0.0005	0.9926	0.9945	0.8442	0.8444	0.0111	0.8239	0.8660	33.1	67.5
WoW alone CRM+Low	5.2	0.0001054982	35	0.9999	0.9999	0.0004	0.9991	1.0007	0.9969	0.9965	0.0147	0.9685	1.0244	49.5	50.5
WoW alone CRM+High	6.7	0.0001368823	35	0.9999	0.9999	0.0004	0.9990	1.0006	0.9956	0.9956	0.0145	0.9660	1.0241	49.4	50.4
Incomb CRM+Low ex. BB	195.0	0.0039822145	35	0.9953	0.9953	0.0004	0.9945	0.9961	0.8446	0.8447	0.0130	0.8191	0.8710	36.3	63.7
Incomb CRM+High ex. BB	229.6	0.0046887327	35	0.9945	0.9945	0.0004	0.9936	0.9953	0.8197	0.8199	0.0127	0.7944	0.8460	34.5	65.8
Incomb CRM+Low inc. BB	222.6	0.0045474568	35	0.9946	0.9947	0.0004	0.9938	0.9955	0.8242	0.8244	0.0129	0.7994	0.8519	34.5	65.1
Incomb CRM+High inc. BB	269.4	0.0055026812	35	0.9935	0.9935	0.0004	0.9926	0.9944	0.7916	0.7912	0.0126	0.7665	0.8162	31.2	68.0
WoW alone CRM+Low	5.2	0.0001054982	50	1.0000	0.9999	0.0003	0.9993	1.0006	0.9977	0.9971	0.0176	0.9625	1.0303	49.8	50.1
WoW alone CRM+High	6.7	0.0001368823	50	0.9999	0.9999	0.0003	0.9992	1.0006	0.9957	0.9958	0.0177	0.9603	1.0331	49.3	50.3
Incomb CRM+Low ex. BB	195.0	0.0039822145	50	0.9967	0.9967	0.0004	0.9960	0.9974	0.8450	0.8449	0.0157	0.8134	0.8752	37.3	62.6
Incomb CRM+High ex. BB	229.6	0.0046887327	50	0.9961	0.9961	0.0004	0.9954	0.9968	0.8200	0.8199	0.0151	0.7898	0.8497	35.1	64.5

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
Incomb CRM+Low inc. BB	222.6	0.0045474568	50	0.9962	0.9962	0.0004	0.9955	0.9970	0.8239	0.8249	0.0156	0.7924	0.8580	35.5	64.0
Incomb CRM+High inc. BB	269.4	0.0055026812	50	0.9954	0.9954	0.0004	0.9946	0.9962	0.7918	0.7914	0.0150	0.7601	0.8215	33.0	67.0

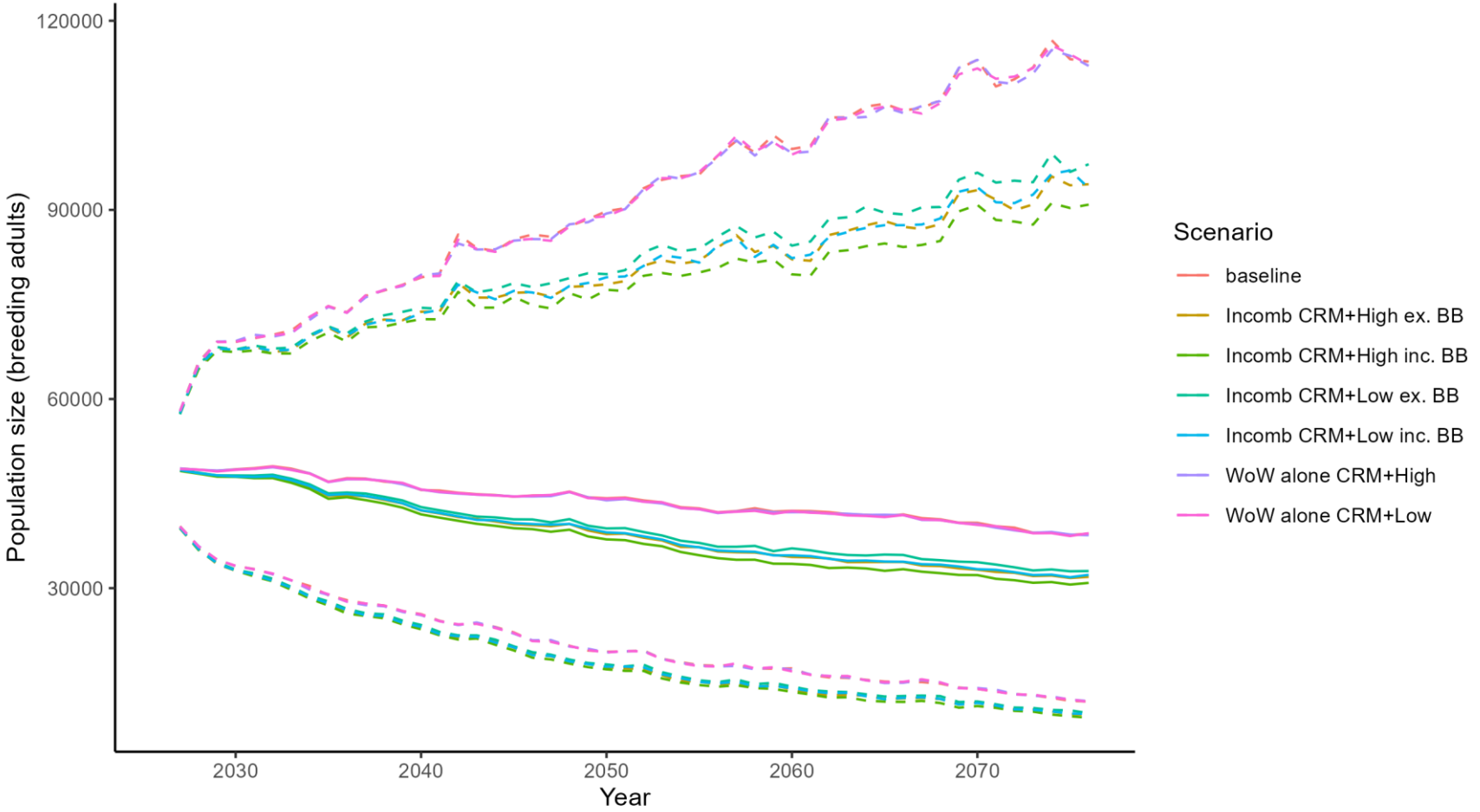

Figure 3-3. Kittiwake at East Caithness Cliffs SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.4 *Farne Islands SPA*

Table 3-9. PVA Inputs: Kittiwake at Farne Islands SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Farne Islands SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	2.969095e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	3.7750628905058249E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	8804	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	1.9273053322671307E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	2.0683357442443078E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	5.7859829608167181E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	7.0449376357759833E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-10. PVA Outputs: Kittiwake at Farne Islands SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.3	0.00002969095	25	1.0000	1.0000	0.0011	0.9978	1.0023	0.9992	0.9998	0.0299	0.9467	1.0637	50.3	49.8
WoW alone CRM+High	0.3	0.00003775063	25	0.9999	0.9999	0.0011	0.9978	1.0022	0.9978	0.9987	0.0287	0.9441	1.0616	49.5	50.7
Incomb CRM+Low ex. BB	17.0	0.00192730533	25	0.9978	0.9978	0.0011	0.9955	1.0000	0.9431	0.9438	0.0289	0.8885	1.0002	43.3	56.0
Incomb CRM+High ex. BB	18.2	0.00206833574	25	0.9975	0.9976	0.0011	0.9954	0.9998	0.9392	0.9393	0.0280	0.8842	0.9982	42.6	56.9
Incomb CRM+Low inc. BB	50.9	0.00578598296	25	0.9932	0.9932	0.0012	0.9908	0.9955	0.8373	0.8368	0.0264	0.7866	0.8897	34.1	69.3
Incomb CRM+High inc. BB	62.0	0.00704493764	25	0.9917	0.9917	0.0011	0.9895	0.9939	0.8044	0.8050	0.0243	0.7605	0.8545	30.2	72.0
WoW alone CRM+Low	0.3	0.00002969095	35	1.0000	1.0000	0.0009	0.9981	1.0018	0.9980	0.9993	0.0349	0.9350	1.0712	49.7	50.1
WoW alone CRM+High	0.3	0.00003775063	35	0.9999	0.9999	0.0009	0.9981	1.0018	0.9958	0.9965	0.0336	0.9303	1.0659	49.3	50.4
Incomb CRM+Low ex. BB	17.0	0.00192730533	35	0.9977	0.9977	0.0010	0.9958	0.9998	0.9196	0.9214	0.0336	0.8593	0.9901	43.3	56.3
Incomb CRM+High ex. BB	18.2	0.00206833574	35	0.9975	0.9975	0.0010	0.9957	0.9995	0.9156	0.9154	0.0318	0.8581	0.9786	43.2	56.7
Incomb CRM+Low inc. BB	50.9	0.00578598296	35	0.9931	0.9931	0.0010	0.9912	0.9950	0.7793	0.7803	0.0284	0.7264	0.8371	29.6	69.8
Incomb CRM+High inc. BB	62.0	0.00704493764	35	0.9917	0.9916	0.0010	0.9895	0.9937	0.7392	0.7397	0.0275	0.6857	0.7964	25.4	73.5
WoW alone CRM+Low	0.3	0.00002969095	50	0.9999	1.0000	0.0008	0.9983	1.0015	0.9965	0.9987	0.0418	0.9162	1.0837	50.0	50.0
WoW alone CRM+High	0.3	0.00003775063	50	0.9999	0.9999	0.0008	0.9983	1.0016	0.9956	0.9963	0.0416	0.9141	1.0873	49.7	50.2
Incomb CRM+Low ex. BB	17.0	0.00192730533	50	0.9984	0.9984	0.0009	0.9966	1.0002	0.9203	0.9212	0.0422	0.8409	1.0078	43.4	55.9
Incomb CRM+High ex. BB	18.2	0.00206833574	50	0.9983	0.9982	0.0009	0.9966	0.9998	0.9147	0.9151	0.0398	0.8375	0.9951	43.1	56.4
Incomb CRM+Low inc. BB	50.9	0.00578598296	50	0.9951	0.9951	0.0009	0.9933	0.9968	0.7795	0.7799	0.0350	0.7056	0.8497	31.1	68.2
Incomb CRM+High inc. BB	62.0	0.00704493764	50	0.9941	0.9941	0.0009	0.9924	0.9958	0.7387	0.7393	0.0339	0.6759	0.8068	28.3	71.6

Figure 3-4. Kittiwake at Farne Islands SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.5 *Flamborough and Filey Coast SPA*

Table 3-11. PVA Inputs: Kittiwake at Flamborough and Filey Coast SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Flamborough and Filey Coast	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	3.138136e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	3.9899898328573657E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	91008	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	4.1972158285552494E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	4.2737361109966079E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	4.6041583138914316E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	4.83972663626785E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-12. PVA Outputs: Kittiwake at Flamborough and Filey Coast SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	2.9	0.00003138136	25	1.0000	1.0000	0.0003	0.9993	1.0007	0.9995	0.9994	0.0089	0.9823	1.0183	50.0	50.0
WoW alone CRM+High	3.6	0.00003989990	25	1.0000	1.0000	0.0003	0.9992	1.0006	0.9992	0.9991	0.0092	0.9802	1.0172	50.1	49.9
Incomb CRM+Low ex. BB	382.0	0.00419721583	25	0.9951	0.9950	0.0004	0.9943	0.9957	0.8787	0.8786	0.0082	0.8616	0.8942	35.8	63.6
Incomb CRM+High ex. BB	388.9	0.00427373611	25	0.9950	0.9950	0.0004	0.9942	0.9956	0.8771	0.8770	0.0082	0.8604	0.8930	35.7	63.7
Incomb CRM+Low inc. BB	419.0	0.00460415831	25	0.9946	0.9946	0.0004	0.9939	0.9953	0.8677	0.8678	0.0081	0.8524	0.8838	34.2	64.7
Incomb CRM+High inc. BB	440.5	0.00483972664	25	0.9943	0.9943	0.0003	0.9936	0.9950	0.8615	0.8615	0.0081	0.8451	0.8776	34.0	65.4
WoW alone CRM+Low	2.9	0.00003138136	35	1.0000	1.0000	0.0003	0.9995	1.0005	0.9988	0.9991	0.0102	0.9795	1.0195	50.4	49.9
WoW alone CRM+High	3.6	0.00003989990	35	1.0000	1.0000	0.0003	0.9994	1.0005	0.9984	0.9987	0.0110	0.9778	1.0204	49.9	50.2
Incomb CRM+Low ex. BB	382.0	0.00419721583	35	0.9951	0.9950	0.0003	0.9944	0.9956	0.8364	0.8362	0.0095	0.8170	0.8549	35.7	64.4
Incomb CRM+High ex. BB	388.9	0.00427373611	35	0.9950	0.9950	0.0003	0.9943	0.9956	0.8338	0.8338	0.0092	0.8156	0.8517	35.3	64.4
Incomb CRM+Low inc. BB	419.0	0.00460415831	35	0.9946	0.9946	0.0003	0.9940	0.9952	0.8213	0.8218	0.0092	0.8037	0.8405	34.4	65.4
Incomb CRM+High inc. BB	440.5	0.00483972664	35	0.9943	0.9943	0.0003	0.9937	0.9949	0.8138	0.8136	0.0095	0.7946	0.8321	33.5	66.3
WoW alone CRM+Low	2.9	0.00003138136	50	1.0000	1.0000	0.0002	0.9995	1.0004	0.9993	0.9993	0.0126	0.9735	1.0230	49.9	50.1
WoW alone CRM+High	3.6	0.00003989990	50	1.0000	1.0000	0.0003	0.9995	1.0004	0.9990	0.9987	0.0135	0.9724	1.0246	49.9	50.1
Incomb CRM+Low ex. BB	382.0	0.00419721583	50	0.9965	0.9965	0.0003	0.9960	0.9970	0.8369	0.8365	0.0117	0.8148	0.8592	36.3	63.2
Incomb CRM+High ex. BB	388.9	0.00427373611	50	0.9964	0.9964	0.0003	0.9959	0.9970	0.8334	0.8339	0.0113	0.8113	0.8560	36.0	63.3
Incomb CRM+Low inc. BB	419.0	0.00460415831	50	0.9962	0.9962	0.0003	0.9956	0.9967	0.8215	0.8216	0.0110	0.8010	0.8437	35.1	64.4
Incomb CRM+High inc. BB	440.5	0.00483972664	50	0.9960	0.9960	0.0003	0.9954	0.9965	0.8131	0.8135	0.0113	0.7909	0.8344	34.5	65.1

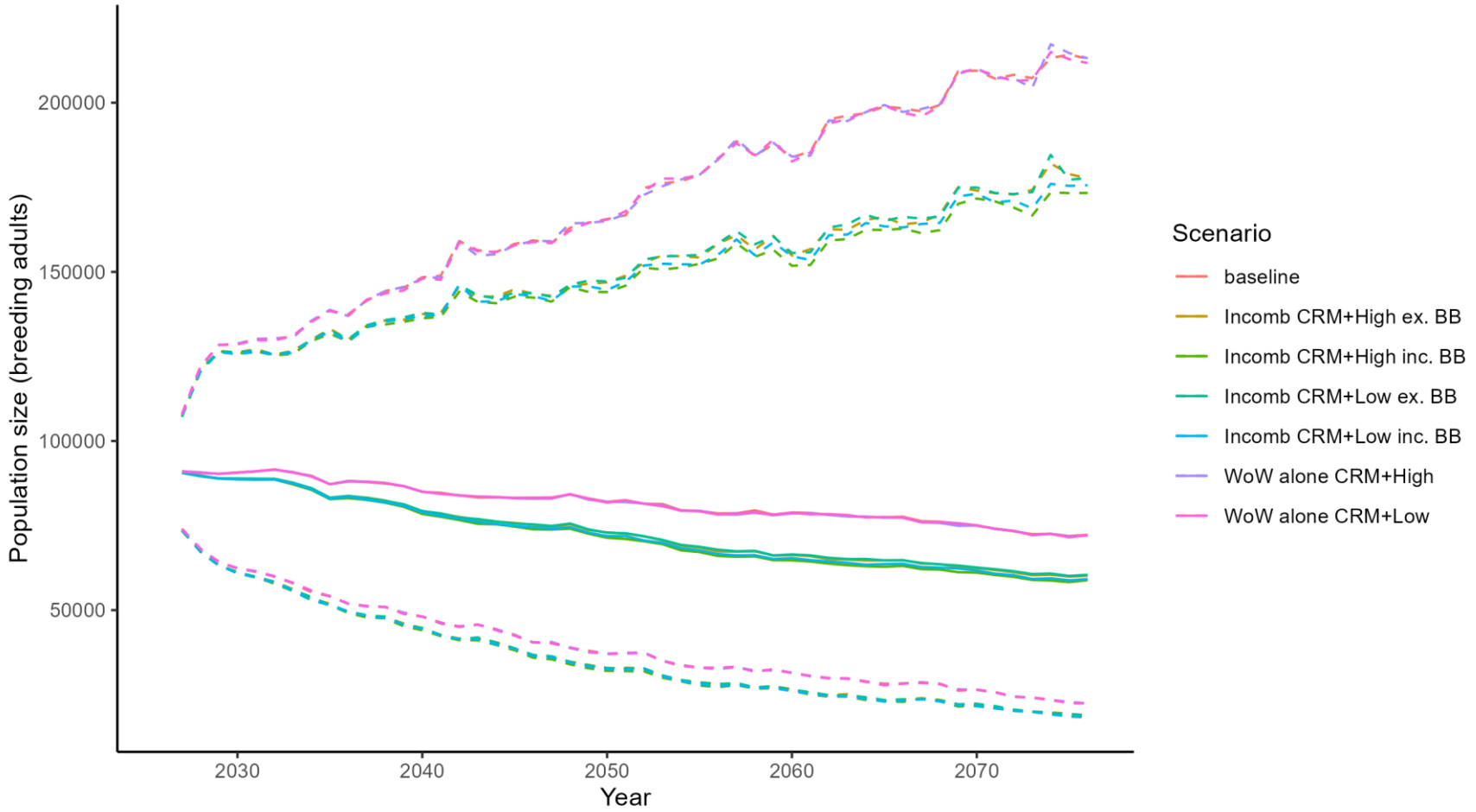

Figure 3-5. Kittiwake at Flamborough and Filey Coast SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.6 *Forth Islands SPA*

Table 3-13. PVA Inputs: Kittiwake at Forth Islands SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Forth Islands SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	2.872189e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	3.6698870087386437E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	9084	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	2.6240847389549793E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	3.5838630141584544E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	5.4005632003042555E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	7.17135496865739E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-14. PVA Outputs: Kittiwake at Forth Islands SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.3	0.00002872189	25	1.0001	1.0000	0.0011	0.9978	1.0021	1.0021	1.0016	0.0287	0.9454	1.0593	50.5	49.7
WoW alone CRM+High	0.3	0.00003669887	25	1.0000	1.0000	0.0011	0.9979	1.0023	1.0003	1.0010	0.0299	0.9443	1.0652	50.7	49.3
Incomb CRM+Low ex. BB	23.8	0.00262408474	25	0.9970	0.9969	0.0011	0.9948	0.9989	0.9237	0.9235	0.0261	0.8719	0.9752	41.1	58.9
Incomb CRM+High ex. BB	32.6	0.00358386301	25	0.9958	0.9958	0.0011	0.9937	0.9980	0.8970	0.8971	0.0265	0.8482	0.9526	38.2	61.3
Incomb CRM+Low inc. BB	49.1	0.00540056320	25	0.9937	0.9937	0.0011	0.9915	0.9958	0.8473	0.8478	0.0254	0.8014	0.8986	33.0	67.5
Incomb CRM+High inc. BB	65.1	0.00717135497	25	0.9916	0.9916	0.0011	0.9893	0.9936	0.8023	0.8027	0.0236	0.7532	0.8481	29.5	71.8
WoW alone CRM+Low	0.3	0.00002872189	35	1.0000	1.0000	0.0009	0.9983	1.0019	1.0011	1.0019	0.0344	0.9366	1.0695	50.0	50.1
WoW alone CRM+High	0.3	0.00003669887	35	1.0000	1.0000	0.0010	0.9981	1.0018	1.0004	1.0011	0.0347	0.9358	1.0696	50.5	49.6
Incomb CRM+Low ex. BB	23.8	0.00262408474	35	0.9969	0.9969	0.0009	0.9950	0.9987	0.8936	0.8947	0.0299	0.8356	0.9524	40.8	58.7
Incomb CRM+High ex. BB	32.6	0.00358386301	35	0.9958	0.9958	0.0010	0.9938	0.9977	0.8593	0.8594	0.0315	0.7976	0.9222	37.4	62.1
Incomb CRM+Low inc. BB	49.1	0.00540056320	35	0.9937	0.9937	0.0010	0.9917	0.9957	0.7955	0.7961	0.0290	0.7389	0.8547	31.1	67.2
Incomb CRM+High inc. BB	65.1	0.00717135497	35	0.9916	0.9916	0.0010	0.9895	0.9933	0.7375	0.7376	0.0259	0.6868	0.7867	25.6	73.0
WoW alone CRM+Low	0.3	0.00002872189	50	1.0000	1.0000	0.0008	0.9984	1.0017	1.0012	1.0016	0.0425	0.9237	1.0908	50.1	49.9
WoW alone CRM+High	0.3	0.00003669887	50	1.0000	1.0000	0.0008	0.9985	1.0016	1.0005	1.0016	0.0406	0.9254	1.0852	50.2	49.9
Incomb CRM+Low ex. BB	23.8	0.00262408474	50	0.9978	0.9978	0.0008	0.9962	0.9995	0.8928	0.8944	0.0361	0.8232	0.9714	41.0	59.0
Incomb CRM+High ex. BB	32.6	0.00358386301	50	0.9970	0.9970	0.0008	0.9953	0.9986	0.8582	0.8588	0.0378	0.7868	0.9321	38.2	61.1
Incomb CRM+Low inc. BB	49.1	0.00540056320	50	0.9955	0.9955	0.0009	0.9938	0.9971	0.7970	0.7961	0.0358	0.7253	0.8652	32.7	66.4
Incomb CRM+High inc. BB	65.1	0.00717135497	50	0.9940	0.9940	0.0008	0.9925	0.9956	0.7357	0.7376	0.0322	0.6793	0.8017	28.6	71.4

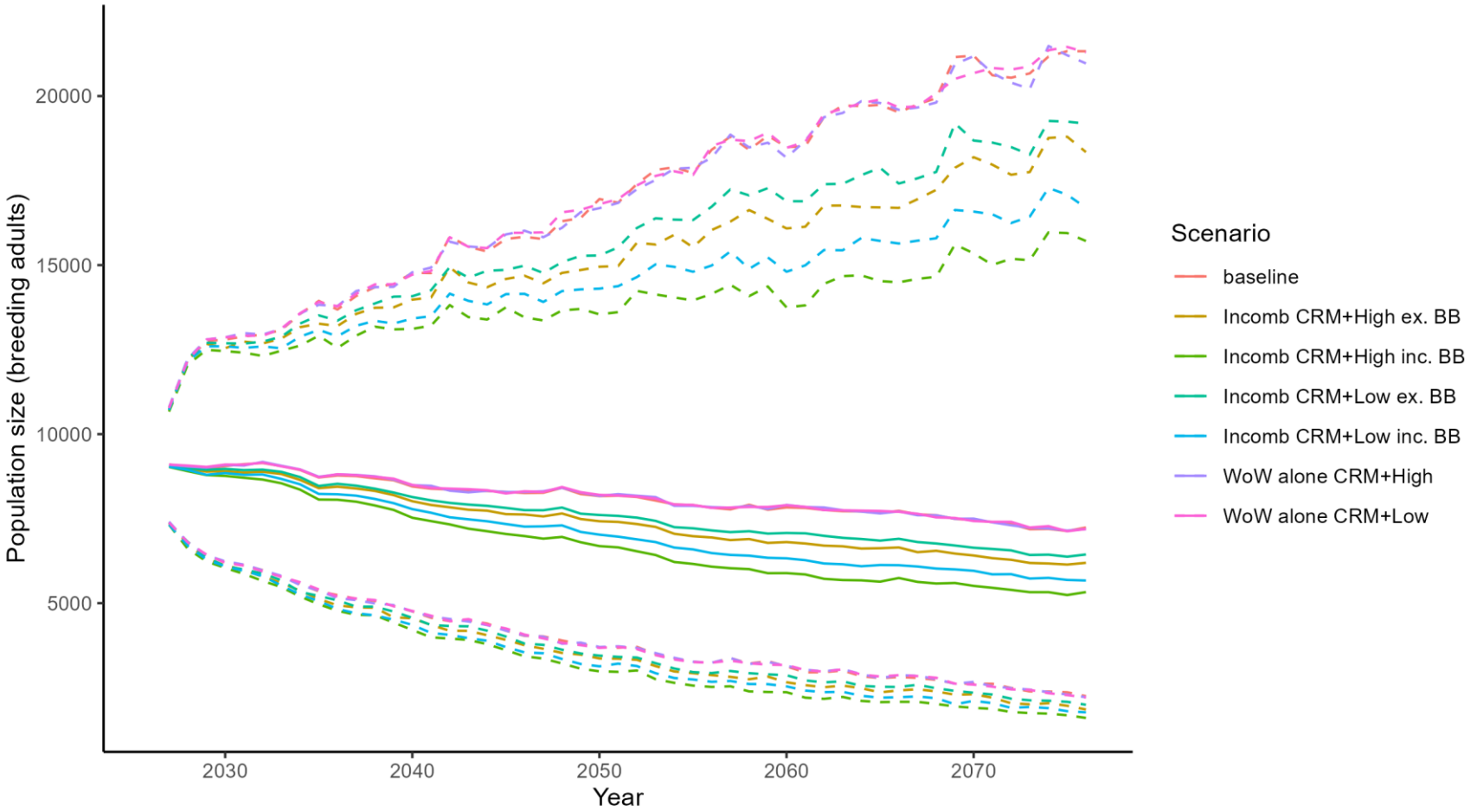

Figure 3-6. Kittiwake at Forth Islands SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.7 *Fowlsheugh SPA*

Table 3-15. PVA Inputs: Kittiwake at Fowlsheugh SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Fowlsheugh SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	2.942788e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	3.7684228613499476E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	28078	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	2.5497437736729804E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	3.1226556302977391E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	4.9250224690479084E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	6.1962456617186577E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-16. PVA Outputs: Kittiwake at Fowlsheugh SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.8	0.00002942788	25	1.0000	1.0000	0.0006	0.9987	1.0012	0.9997	0.9996	0.0172	0.9650	1.0344	50.2	49.8
WoW alone CRM+High	1.1	0.00003768423	25	0.9999	0.9999	0.0006	0.9987	1.0012	0.9983	0.9988	0.0172	0.9650	1.0323	49.7	50.2
Incomb CRM+Low ex. BB	71.6	0.00254974377	25	0.9970	0.9970	0.0006	0.9958	0.9982	0.9246	0.9247	0.0156	0.8943	0.9575	40.7	58.0
Incomb CRM+High ex. BB	87.7	0.00312265563	25	0.9963	0.9963	0.0006	0.9950	0.9975	0.9080	0.9079	0.0152	0.8778	0.9375	39.0	60.4
Incomb CRM+Low inc. BB	138.3	0.00492502247	25	0.9942	0.9941	0.0006	0.9929	0.9954	0.8596	0.8588	0.0147	0.8292	0.8864	34.0	65.5
Incomb CRM+High inc. BB	174.0	0.00619624566	25	0.9927	0.9926	0.0006	0.9914	0.9939	0.8250	0.8254	0.0142	0.7981	0.8541	31.3	69.7
WoW alone CRM+Low	0.8	0.00002942788	35	1.0000	1.0000	0.0005	0.9988	1.0010	1.0002	0.9993	0.0202	0.9589	1.0363	49.9	50.1
WoW alone CRM+High	1.1	0.00003768423	35	0.9999	1.0000	0.0005	0.9989	1.0010	0.9985	0.9984	0.0198	0.9602	1.0403	50.0	49.9
Incomb CRM+Low ex. BB	71.6	0.00254974377	35	0.9970	0.9970	0.0006	0.9959	0.9981	0.8979	0.8973	0.0183	0.8611	0.9331	41.0	59.1
Incomb CRM+High ex. BB	87.7	0.00312265563	35	0.9963	0.9963	0.0005	0.9952	0.9974	0.8754	0.8753	0.0170	0.8411	0.9079	38.3	60.9
Incomb CRM+Low inc. BB	138.3	0.00492502247	35	0.9942	0.9942	0.0006	0.9931	0.9953	0.8111	0.8110	0.0166	0.7774	0.8445	32.9	66.3
Incomb CRM+High inc. BB	174.0	0.00619624566	35	0.9927	0.9927	0.0006	0.9916	0.9938	0.7673	0.7671	0.0157	0.7360	0.7989	28.7	70.5
WoW alone CRM+Low	0.8	0.00002942788	50	1.0000	1.0000	0.0005	0.9991	1.0009	0.9999	0.9992	0.0239	0.9543	1.0460	50.1	50.0
WoW alone CRM+High	1.1	0.00003768423	50	1.0000	1.0000	0.0005	0.9990	1.0008	0.9976	0.9985	0.0239	0.9518	1.0454	50.1	49.9
Incomb CRM+Low ex. BB	71.6	0.00254974377	50	0.9979	0.9979	0.0005	0.9969	0.9988	0.8975	0.8973	0.0216	0.8539	0.9402	40.6	57.4
Incomb CRM+High ex. BB	87.7	0.00312265563	50	0.9974	0.9974	0.0005	0.9964	0.9983	0.8759	0.8754	0.0210	0.8335	0.9141	39.5	59.4
Incomb CRM+Low inc. BB	138.3	0.00492502247	50	0.9959	0.9959	0.0005	0.9950	0.9968	0.8106	0.8111	0.0199	0.7729	0.8497	33.8	64.2
Incomb CRM+High inc. BB	174.0	0.00619624566	50	0.9948	0.9948	0.0005	0.9938	0.9958	0.7677	0.7670	0.0194	0.7263	0.8048	30.8	69.0

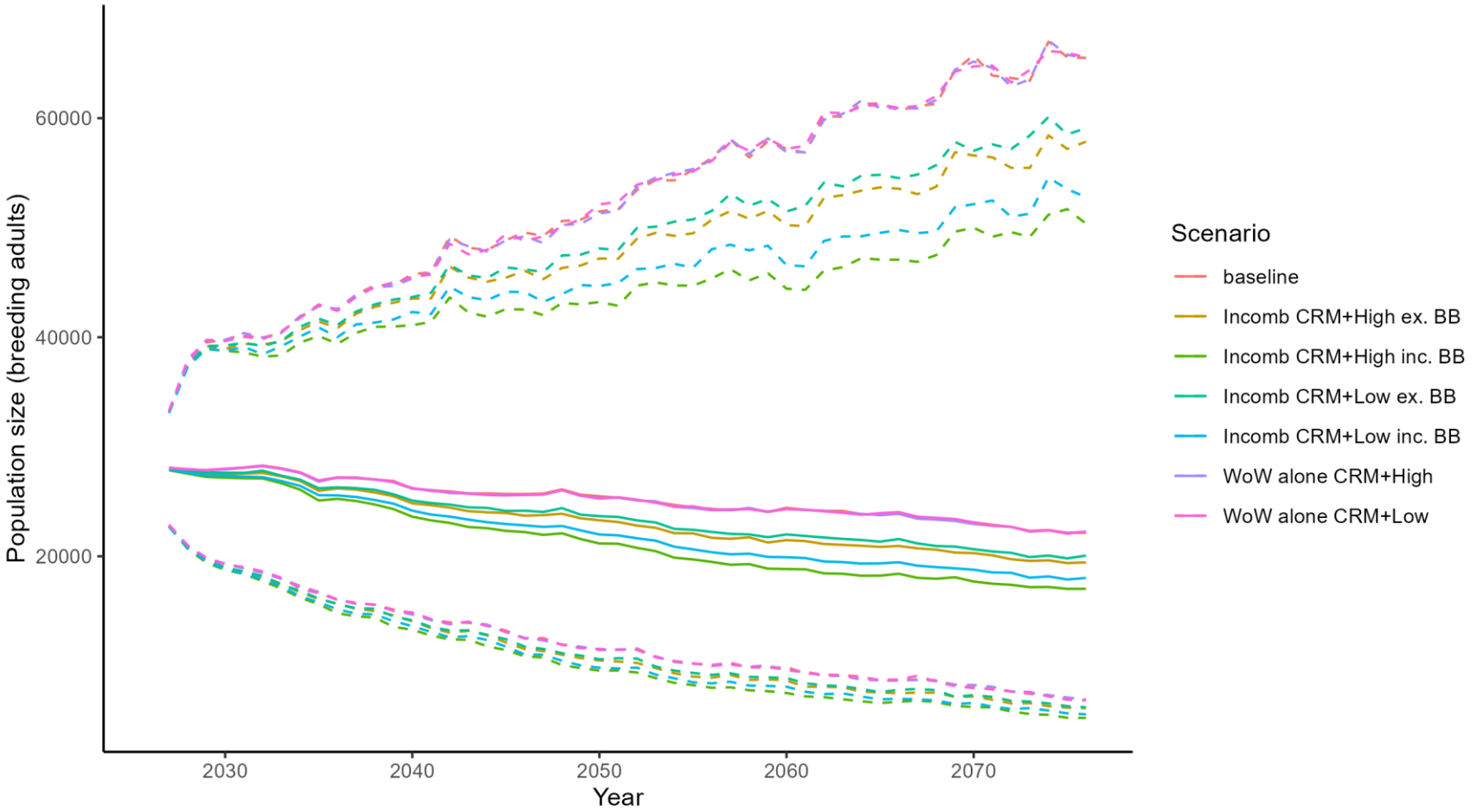

Figure 3-7. Kittiwake at Fowlsheugh SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.8 Handa SPA

Table 3-17. PVA Inputs: Kittiwake at Handa SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kitiiwake at Handa SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	6.733928e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	8.9916100993706126E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	7498	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	1.4043588604589451E-4
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	1.8801559673824785E-4
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	2.1473032716775835E-4
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	2.834618687062752E-4
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-18. PVA Outputs: Kittiwake at Handa SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.5	0.00006733928	25	1.0000	1.0000	0.0013	0.9973	1.0024	0.9996	0.9995	0.0336	0.9329	1.0601	50.2	49.7
WoW alone CRM+High	0.7	0.00008991610	25	0.9999	0.9999	0.0012	0.9976	1.0022	0.9972	0.9976	0.0311	0.9380	1.0563	50.4	49.7
Incomb CRM+Low ex. BB	1.1	0.00014043589	25	0.9998	0.9998	0.0012	0.9974	1.0022	0.9957	0.9955	0.0312	0.9315	1.0586	50.3	49.6
Incomb CRM+High ex. BB	1.4	0.00018801560	25	0.9998	0.9998	0.0012	0.9975	1.0022	0.9949	0.9957	0.0314	0.9364	1.0571	49.7	50.3
Incomb CRM+Low inc. BB	1.6	0.00021473033	25	0.9997	0.9997	0.0012	0.9974	1.0022	0.9922	0.9931	0.0324	0.9298	1.0635	49.8	50.3
Incomb CRM+High inc. BB	2.1	0.00028346187	25	0.9996	0.9997	0.0012	0.9975	1.0019	0.9906	0.9915	0.0311	0.9325	1.0516	49.8	50.7
WoW alone CRM+Low	0.5	0.00006733928	35	0.9999	1.0000	0.0011	0.9978	1.0023	0.9983	0.9996	0.0399	0.9227	1.0793	49.7	50.6
WoW alone CRM+High	0.7	0.00008991610	35	0.9999	0.9999	0.0010	0.9979	1.0020	0.9967	0.9976	0.0369	0.9249	1.0705	49.2	50.7
Incomb CRM+Low ex. BB	1.1	0.00014043589	35	0.9998	0.9999	0.0010	0.9979	1.0019	0.9947	0.9955	0.0369	0.9260	1.0693	48.8	51.2
Incomb CRM+High ex. BB	1.4	0.00018801560	35	0.9998	0.9998	0.0010	0.9979	1.0018	0.9936	0.9953	0.0372	0.9271	1.0723	49.0	50.7
Incomb CRM+Low inc. BB	1.6	0.00021473033	35	0.9998	0.9998	0.0010	0.9978	1.0018	0.9894	0.9919	0.0383	0.9176	1.0701	49.4	50.6
Incomb CRM+High inc. BB	2.1	0.00028346187	35	0.9997	0.9997	0.0010	0.9976	1.0017	0.9883	0.9889	0.0366	0.9198	1.0614	48.2	51.6
WoW alone CRM+Low	0.5	0.00006733928	50	0.9999	1.0000	0.0009	0.9981	1.0019	0.9982	0.9997	0.0473	0.9102	1.0982	49.8	50.1
WoW alone CRM+High	0.7	0.00008991610	50	0.9999	0.9999	0.0009	0.9983	1.0016	0.9966	0.9971	0.0439	0.9163	1.0863	50.0	50.0
Incomb CRM+Low ex. BB	1.1	0.00014043589	50	0.9999	0.9999	0.0009	0.9982	1.0016	0.9927	0.9953	0.0444	0.9128	1.0834	49.4	50.4
Incomb CRM+High ex. BB	1.4	0.00018801560	50	0.9999	0.9999	0.0009	0.9981	1.0015	0.9933	0.9953	0.0439	0.9097	1.0827	50.1	49.8
Incomb CRM+Low inc. BB	1.6	0.00021473033	50	0.9998	0.9998	0.0009	0.9981	1.0017	0.9912	0.9926	0.0466	0.9053	1.0942	48.4	51.0
Incomb CRM+High inc. BB	2.1	0.00028346187	50	0.9998	0.9998	0.0009	0.9980	1.0014	0.9894	0.9895	0.0438	0.9048	1.0809	49.2	50.8

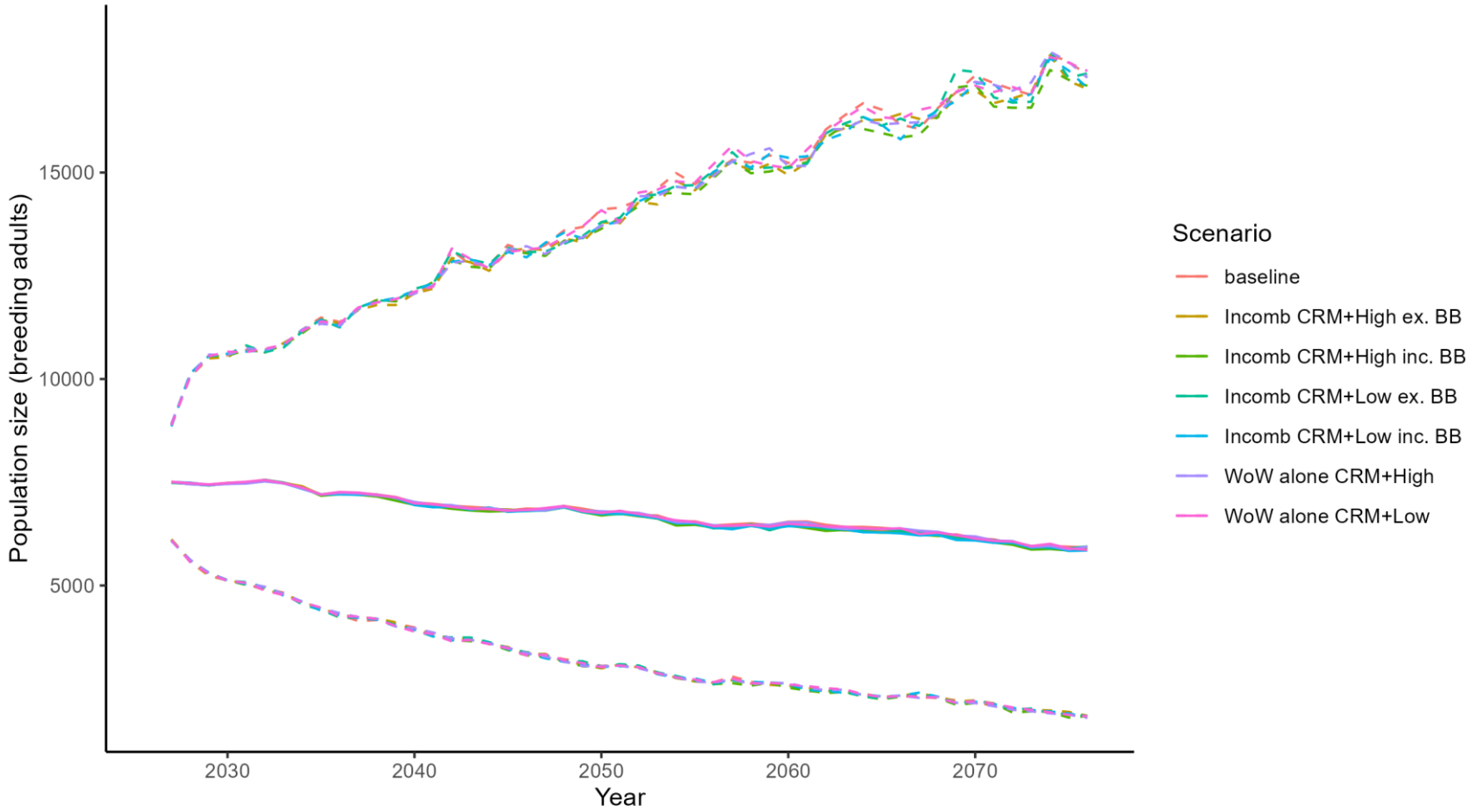

Figure 3-8. Kittiwake at Handa SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.9 *Hoy SPA*

Table 3-19. PVA Inputs: Kittiwake at Hoy SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Hoy SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.0004233359
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	5.617622103658101E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	532	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	2.5575760875138618E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	2.872955546366325E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	3.0288776059183122E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	3.5580454512316828E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-20. PVA Outputs: Kittiwake at Hoy SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.2	0.0004233359	25	0.9996	0.9995	0.0048	0.9900	1.0085	0.9873	0.9931	0.1261	0.7658	1.2416	49.8	50.4
WoW alone CRM+High	0.3	0.0005617622	25	0.9990	0.9991	0.0046	0.9901	1.0083	0.9734	0.9839	0.1208	0.7570	1.2458	49.1	50.6
Incomb CRM+Low ex. BB	1.4	0.0025575761	25	0.9969	0.9971	0.0046	0.9881	1.0064	0.9239	0.9331	0.1163	0.7234	1.1947	42.4	56.3
Incomb CRM+High ex. BB	1.5	0.0028729555	25	0.9965	0.9965	0.0046	0.9873	1.0058	0.9144	0.9190	0.1171	0.7084	1.1576	40.3	58.9
Incomb CRM+Low inc. BB	1.6	0.0030288776	25	0.9964	0.9964	0.0044	0.9877	1.0048	0.9092	0.9167	0.1088	0.7290	1.1450	41.2	59.1
Incomb CRM+High inc. BB	1.9	0.0035580455	25	0.9958	0.9958	0.0046	0.9874	1.0050	0.8975	0.9034	0.1121	0.7037	1.1412	38.5	60.2
WoW alone CRM+Low	0.2	0.0004233359	35	0.9995	0.9995	0.0041	0.9913	1.0078	0.9813	0.9924	0.1490	0.7285	1.3176	48.6	52.5
WoW alone CRM+High	0.3	0.0005617622	35	0.9992	0.9991	0.0039	0.9916	1.0066	0.9663	0.9787	0.1421	0.7376	1.2675	48.2	53.0
Incomb CRM+Low ex. BB	1.4	0.0025575761	35	0.9969	0.9970	0.0040	0.9891	1.0047	0.8953	0.9052	0.1337	0.6752	1.1802	41.2	60.3
Incomb CRM+High ex. BB	1.5	0.0028729555	35	0.9965	0.9965	0.0039	0.9887	1.0042	0.8821	0.8919	0.1305	0.6660	1.1689	41.0	60.4
Incomb CRM+Low inc. BB	1.6	0.0030288776	35	0.9964	0.9963	0.0038	0.9888	1.0037	0.8741	0.8836	0.1250	0.6594	1.1495	40.6	60.5
Incomb CRM+High inc. BB	1.9	0.0035580455	35	0.9956	0.9958	0.0040	0.9883	1.0039	0.8545	0.8677	0.1311	0.6468	1.1557	37.8	62.5
WoW alone CRM+Low	0.2	0.0004233359	50	0.9998	0.9997	0.0035	0.9934	1.0066	0.9828	1.0001	0.1833	0.7098	1.3933	49.5	50.8
WoW alone CRM+High	0.3	0.0005617622	50	0.9994	0.9993	0.0034	0.9921	1.0062	0.9630	0.9812	0.1768	0.6590	1.3738	48.3	51.9
Incomb CRM+Low ex. BB	1.4	0.0025575761	50	0.9979	0.9979	0.0035	0.9908	1.0048	0.8964	0.9096	0.1666	0.6152	1.2960	41.7	59.0
Incomb CRM+High ex. BB	1.5	0.0028729555	50	0.9976	0.9976	0.0035	0.9906	1.0048	0.8850	0.8972	0.1665	0.6072	1.2611	40.6	59.5
Incomb CRM+Low inc. BB	1.6	0.0030288776	50	0.9973	0.9973	0.0034	0.9906	1.0041	0.8733	0.8859	0.1560	0.6192	1.2456	39.7	60.4
Incomb CRM+High inc. BB	1.9	0.0035580455	50	0.9971	0.9970	0.0036	0.9897	1.0037	0.8624	0.8727	0.1672	0.5795	1.2147	39.5	61.4

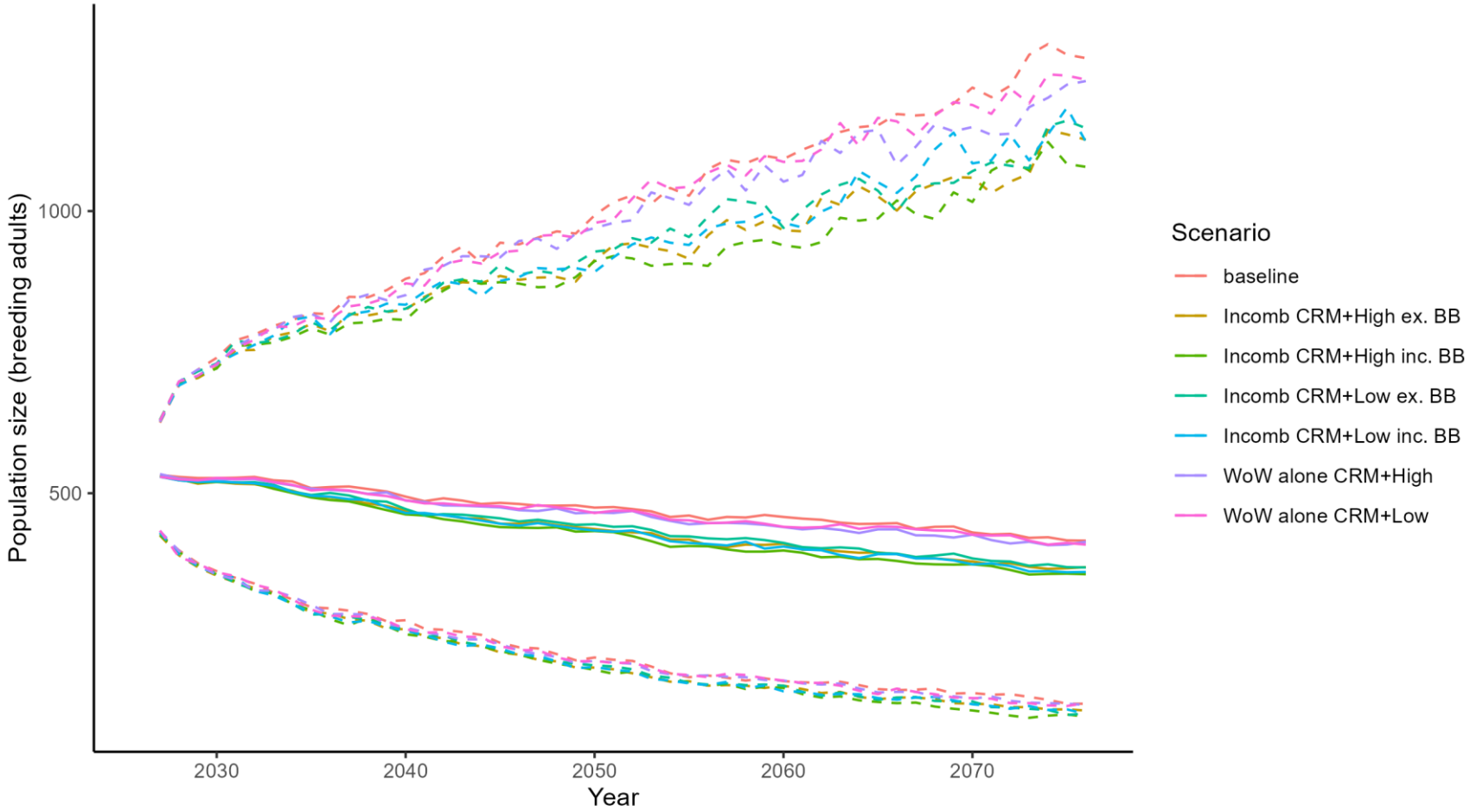

Figure 3-9. Kittiwake at Hoy SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.10 Marwick Head SPA

Table 3-21. PVA Inputs: Kittiwake at Marwick Head SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Marwick Head SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.0001925776
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	2.5578783077106598E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	1812	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	1.0405420885049525E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	1.1778137466609973E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	1.1916012023607462E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	1.403046997602938E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-22. PVA Outputs: Kittiwake at Marwick Head SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.3	0.0001925776	25	0.9996	0.9997	0.0026	0.9948	1.0048	0.9915	0.9948	0.0682	0.8708	1.1380	50.0	50.0
WoW alone CRM+High	0.5	0.0002557878	25	0.9997	0.9997	0.0025	0.9949	1.0050	0.9925	0.9953	0.0665	0.8683	1.1255	48.8	50.9
Incomb CRM+Low ex. BB	1.9	0.0010405421	25	0.9986	0.9987	0.0025	0.9942	1.0037	0.9693	0.9710	0.0647	0.8513	1.1034	46.5	52.8
Incomb CRM+High ex. BB	2.1	0.0011778137	25	0.9986	0.9986	0.0025	0.9939	1.0032	0.9651	0.9669	0.0637	0.8514	1.0897	46.8	52.8
Incomb CRM+Low inc. BB	2.2	0.0011916012	25	0.9985	0.9985	0.0025	0.9936	1.0036	0.9636	0.9650	0.0652	0.8388	1.0901	46.1	53.0
Incomb CRM+High inc. BB	2.5	0.0014030470	25	0.9983	0.9982	0.0025	0.9933	1.0033	0.9598	0.9578	0.0640	0.8391	1.0857	45.4	54.5
WoW alone CRM+Low	0.3	0.0001925776	35	0.9997	0.9997	0.0021	0.9954	1.0041	0.9910	0.9922	0.0771	0.8462	1.1576	48.9	51.3
WoW alone CRM+High	0.5	0.0002557878	35	0.9997	0.9997	0.0020	0.9958	1.0039	0.9893	0.9935	0.0748	0.8583	1.1539	49.2	50.8
Incomb CRM+Low ex. BB	1.9	0.0010405421	35	0.9988	0.9988	0.0021	0.9948	1.0027	0.9592	0.9601	0.0736	0.8225	1.1077	47.3	52.9
Incomb CRM+High ex. BB	2.1	0.0011778137	35	0.9987	0.9986	0.0021	0.9944	1.0029	0.9516	0.9539	0.0740	0.8188	1.1132	46.5	53.3
Incomb CRM+Low inc. BB	2.2	0.0011916012	35	0.9985	0.9985	0.0021	0.9943	1.0030	0.9508	0.9516	0.0748	0.8190	1.1136	46.2	54.3
Incomb CRM+High inc. BB	2.5	0.0014030470	35	0.9984	0.9983	0.0021	0.9938	1.0021	0.9413	0.9428	0.0735	0.7927	1.0868	45.7	54.1
WoW alone CRM+Low	0.3	0.0001925776	50	0.9997	0.9997	0.0018	0.9961	1.0033	0.9852	0.9893	0.0928	0.8240	1.1752	48.8	51.6
WoW alone CRM+High	0.5	0.0002557878	50	0.9997	0.9997	0.0018	0.9963	1.0033	0.9857	0.9912	0.0907	0.8271	1.1846	50.0	50.1
Incomb CRM+Low ex. BB	1.9	0.0010405421	50	0.9990	0.9991	0.0018	0.9957	1.0025	0.9522	0.9586	0.0878	0.7983	1.1394	45.8	53.1
Incomb CRM+High ex. BB	2.1	0.0011778137	50	0.9990	0.9989	0.0018	0.9955	1.0022	0.9477	0.9504	0.0875	0.7950	1.1258	46.1	53.3
Incomb CRM+Low inc. BB	2.2	0.0011916012	50	0.9989	0.9989	0.0018	0.9955	1.0024	0.9475	0.9514	0.0896	0.7917	1.1440	46.4	53.2
Incomb CRM+High inc. BB	2.5	0.0014030470	50	0.9987	0.9987	0.0018	0.9950	1.0022	0.9349	0.9396	0.0871	0.7737	1.1267	45.2	54.0

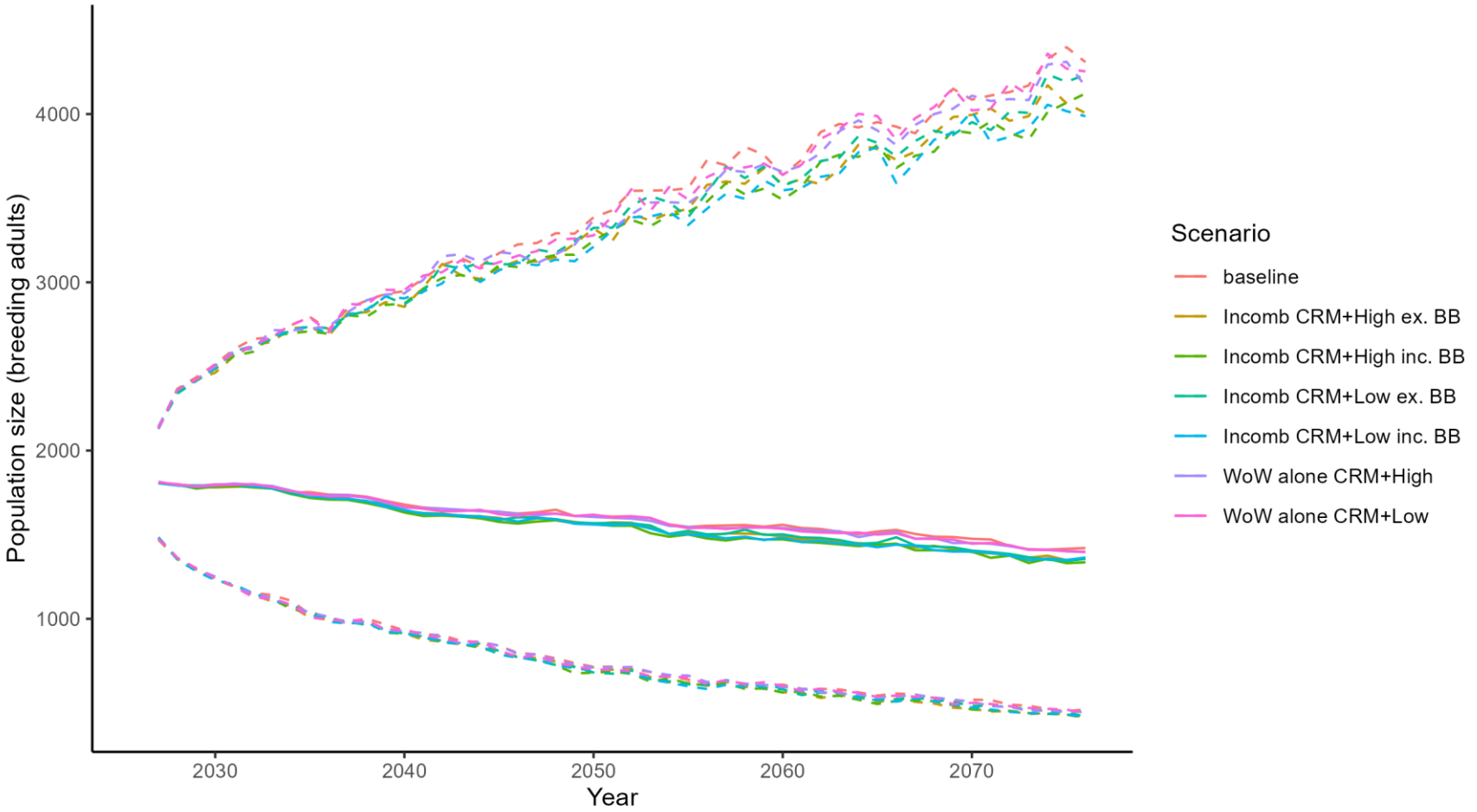

Figure 3-10. Kittiwake at Marwick Head SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.11 *North Caithness Cliffs SPA*

Table 3-23. PVA Inputs: Kittiwake at North Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at North Caithness Cliffs SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.000369314
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	4.8881025913410643E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	11142	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	3.4078988421626186E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	3.9249152420515864E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	3.9823407224151321E-3

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	4.7600881600220824E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-24. PVA Outputs: Kittiwake at North Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	4.1	0.0003693140	25	0.9996	0.9996	0.0010	0.9977	1.0015	0.9879	0.9890	0.0261	0.9396	1.0400	47.9	52.0
WoW alone CRM+High	5.4	0.0004888103	25	0.9994	0.9994	0.0010	0.9975	1.0014	0.9857	0.9854	0.0263	0.9350	1.0380	47.8	52.6
Incomb CRM+Low ex. BB	38.0	0.0034078988	25	0.9960	0.9960	0.0010	0.9941	0.9979	0.9023	0.9025	0.0232	0.8562	0.9497	38.4	61.9
Incomb CRM+High ex. BB	43.7	0.0039249152	25	0.9954	0.9954	0.0009	0.9936	0.9973	0.8866	0.8869	0.0226	0.8434	0.9357	37.2	63.2
Incomb CRM+Low inc. BB	44.4	0.0039823407	25	0.9953	0.9953	0.0010	0.9933	0.9973	0.8844	0.8852	0.0240	0.8384	0.9337	37.0	63.6
Incomb CRM+High inc. BB	53.0	0.0047600882	25	0.9944	0.9944	0.0010	0.9925	0.9962	0.8636	0.8645	0.0224	0.8203	0.9076	34.6	65.5
WoW alone CRM+Low	4.1	0.0003693140	35	0.9996	0.9996	0.0008	0.9979	1.0011	0.9849	0.9842	0.0297	0.9228	1.0416	48.6	51.0
WoW alone CRM+High	5.4	0.0004888103	35	0.9994	0.9994	0.0009	0.9977	1.0011	0.9800	0.9793	0.0315	0.9160	1.0414	48.6	51.4
Incomb CRM+Low ex. BB	38.0	0.0034078988	35	0.9960	0.9960	0.0008	0.9944	0.9977	0.8653	0.8659	0.0266	0.8157	0.9211	37.8	61.7
Incomb CRM+High ex. BB	43.7	0.0039249152	35	0.9954	0.9954	0.0008	0.9937	0.9970	0.8471	0.8471	0.0263	0.7986	0.8995	36.6	63.5
Incomb CRM+Low inc. BB	44.4	0.0039823407	35	0.9953	0.9953	0.0009	0.9937	0.9971	0.8440	0.8445	0.0269	0.7952	0.9015	36.6	63.3
Incomb CRM+High inc. BB	53.0	0.0047600882	35	0.9944	0.9944	0.0008	0.9926	0.9960	0.8157	0.8161	0.0254	0.7651	0.8660	34.0	66.0
WoW alone CRM+Low	4.1	0.0003693140	50	0.9997	0.9997	0.0007	0.9982	1.0011	0.9843	0.9844	0.0371	0.9091	1.0583	48.5	51.8
WoW alone CRM+High	5.4	0.0004888103	50	0.9996	0.9996	0.0007	0.9981	1.0010	0.9787	0.9797	0.0379	0.9052	1.0518	48.2	51.8
Incomb CRM+Low ex. BB	38.0	0.0034078988	50	0.9972	0.9972	0.0007	0.9957	0.9987	0.8657	0.8672	0.0326	0.8036	0.9315	38.6	60.6
Incomb CRM+High ex. BB	43.7	0.0039249152	50	0.9967	0.9968	0.0007	0.9953	0.9984	0.8463	0.8475	0.0328	0.7862	0.9207	36.3	62.7

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
Incomb CRM+Low inc. BB	44.4	0.0039823407	50	0.9967	0.9967	0.0007	0.9953	0.9982	0.8436	0.8455	0.0330	0.7874	0.9146	36.6	63.3
Incomb CRM+High inc. BB	53.0	0.0047600882	50	0.9960	0.9960	0.0007	0.9946	0.9976	0.8148	0.8164	0.0320	0.7577	0.8833	34.9	64.8

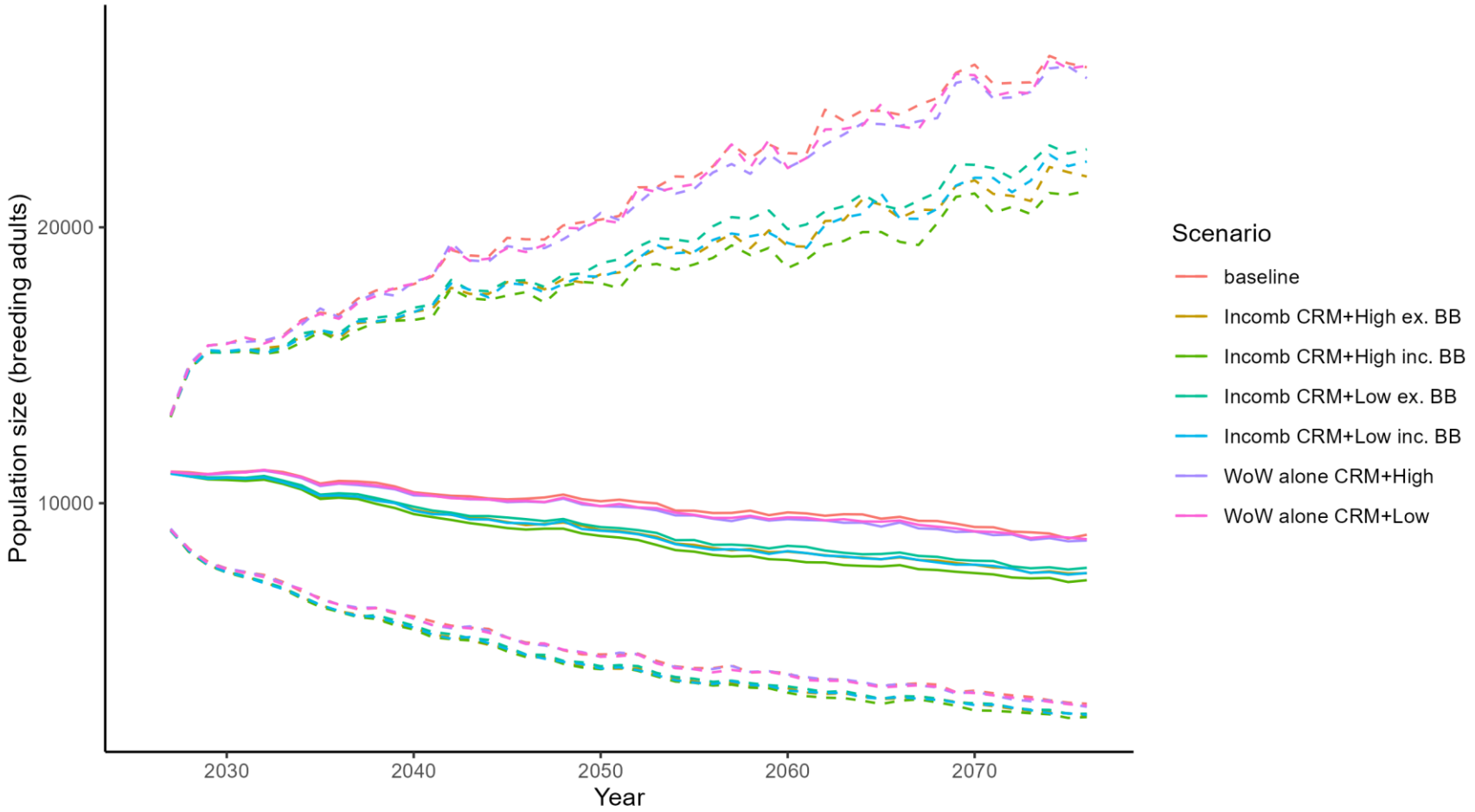

Figure 3-11. Kittiwake at North Caithness Cliffs SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.12 *Rousay SPA*

Table 3-25. PVA Inputs: Kittiwake at Rousay SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Rousay SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.000285
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	3.6738416616455299E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	660	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	7.3409999999999994E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	7.8443197896214713E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	8.7309999999999992E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	9.9180850731990424E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-26. PVA Outputs: Kittiwake at Rousay SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.2	0.0002850000	25	0.9996	0.9997	0.0039	0.9922	1.0072	0.9833	0.9961	0.1051	0.8160	1.2243	48.9	50.7
WoW alone CRM+High	0.2	0.0003673842	25	0.9992	0.9994	0.0040	0.9918	1.0075	0.9830	0.9916	0.1060	0.8004	1.2298	49.0	50.3
Incomb CRM+Low ex. BB	4.8	0.0073410000	25	0.9913	0.9913	0.0040	0.9830	0.9990	0.7977	0.7996	0.0870	0.6381	0.9806	29.6	73.0
Incomb CRM+High ex. BB	5.2	0.0078443198	25	0.9906	0.9906	0.0040	0.9824	0.9987	0.7819	0.7864	0.0833	0.6333	0.9614	28.8	74.6
Incomb CRM+Low inc. BB	5.8	0.0087310000	25	0.9894	0.9896	0.0041	0.9816	0.9976	0.7606	0.7671	0.0855	0.6140	0.9500	26.2	75.3
Incomb CRM+High inc. BB	6.5	0.0099180851	25	0.9883	0.9882	0.0041	0.9800	0.9964	0.7359	0.7385	0.0824	0.5869	0.9034	24.2	78.9
WoW alone CRM+Low	0.2	0.0002850000	35	0.9996	0.9996	0.0034	0.9930	1.0066	0.9828	0.9934	0.1271	0.7747	1.2943	48.9	51.0
WoW alone CRM+High	0.2	0.0003673842	35	0.9992	0.9994	0.0035	0.9927	1.0061	0.9744	0.9855	0.1258	0.7652	1.2472	49.3	51.3
Incomb CRM+Low ex. BB	4.8	0.0073410000	35	0.9911	0.9912	0.0036	0.9841	0.9986	0.7267	0.7333	0.0966	0.5514	0.9392	24.5	74.7
Incomb CRM+High ex. BB	5.2	0.0078443198	35	0.9906	0.9906	0.0034	0.9841	0.9973	0.7099	0.7163	0.0917	0.5560	0.9066	23.7	75.5
Incomb CRM+Low inc. BB	5.8	0.0087310000	35	0.9896	0.9896	0.0036	0.9827	0.9966	0.6883	0.6936	0.0922	0.5237	0.8982	21.7	77.9
Incomb CRM+High inc. BB	6.5	0.0099180851	35	0.9883	0.9882	0.0037	0.9809	0.9950	0.6537	0.6564	0.0891	0.4971	0.8372	18.6	80.9
WoW alone CRM+Low	0.2	0.0002850000	50	0.9997	0.9997	0.0031	0.9941	1.0057	0.9826	0.9983	0.1604	0.7266	1.3504	49.5	50.9
WoW alone CRM+High	0.2	0.0003673842	50	0.9995	0.9995	0.0030	0.9938	1.0056	0.9760	0.9897	0.1576	0.7245	1.3392	48.9	51.3
Incomb CRM+Low ex. BB	4.8	0.0073410000	50	0.9937	0.9937	0.0030	0.9878	0.9999	0.7271	0.7315	0.1164	0.5211	1.0000	29.5	71.7
Incomb CRM+High ex. BB	5.2	0.0078443198	50	0.9931	0.9932	0.0032	0.9868	0.9994	0.7052	0.7146	0.1199	0.5093	0.9669	28.5	71.9
Incomb CRM+Low inc. BB	5.8	0.0087310000	50	0.9927	0.9926	0.0032	0.9864	0.9984	0.6895	0.6961	0.1144	0.4924	0.9377	25.1	74.2
Incomb CRM+High inc. BB	6.5	0.0099180851	50	0.9916	0.9916	0.0032	0.9851	0.9981	0.6521	0.6584	0.1094	0.4660	0.9019	22.7	75.9

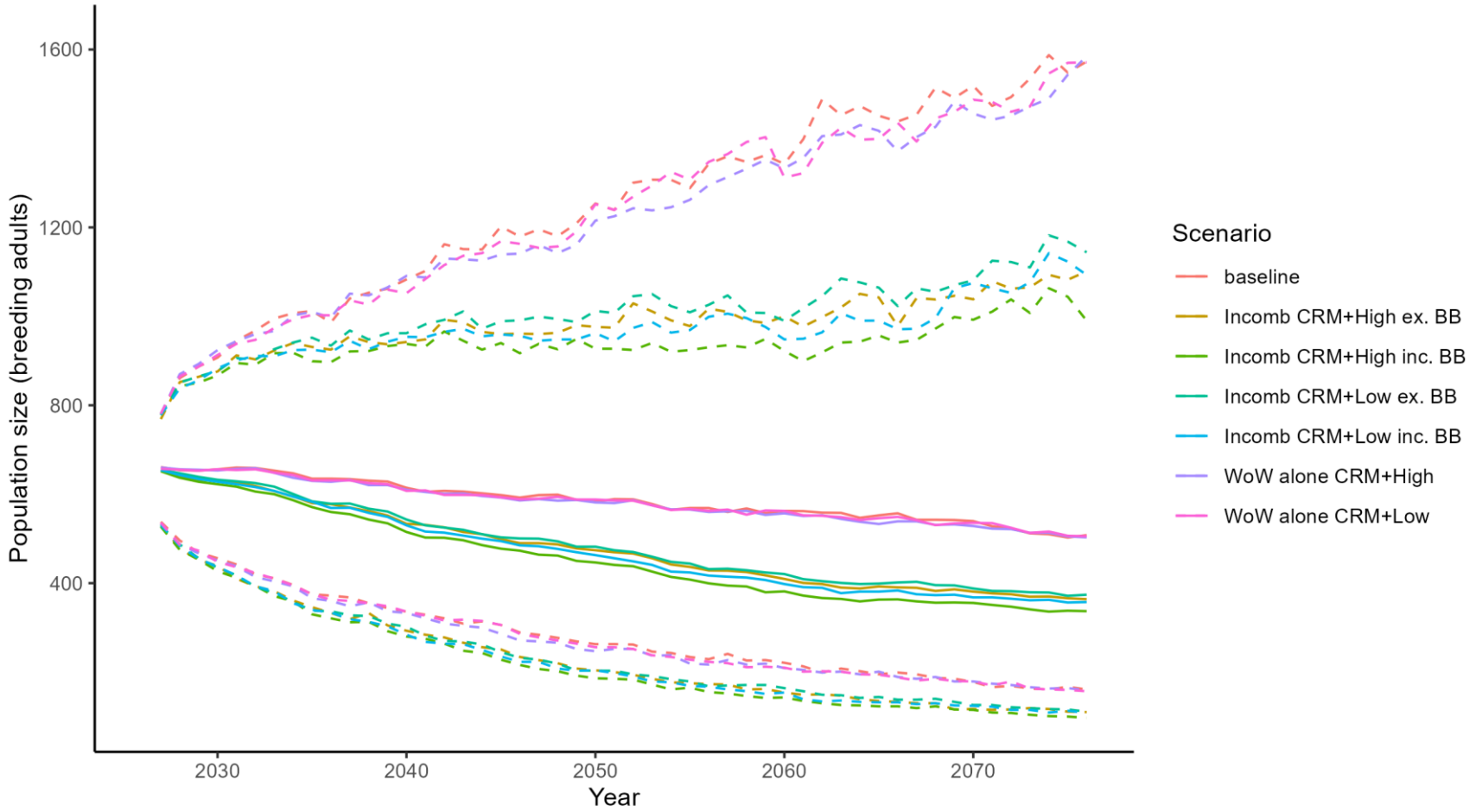

Figure 3-12. Kittiwake at Rousay SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.13 *St Abb's Head to Fast Castle SPA*

Table 3-27. PVA Inputs: KI St Abb's Head to Fast Castle SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at St Abb's Head to Fast Castle SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	2.508371e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	3.1892746927157459E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	10300	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	1.6416269290132335E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	1.9286567961104416E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	6.6068259508549531E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	8.3132449613168829E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-28. PVA Outputs: Kittiwake at St Abb's Head to Fast Castle SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.3	0.00002508371	25	1.0000	1.0000	0.0010	0.9979	1.0020	1.0000	1.0001	0.0279	0.9458	1.0526	49.9	50.2
WoW alone CRM+High	0.3	0.00003189275	25	1.0000	1.0000	0.0010	0.9980	1.0021	0.9999	0.9998	0.0280	0.9488	1.0572	49.3	50.6
Incomb CRM+Low ex. BB	16.9	0.00164162693	25	0.9981	0.9981	0.0011	0.9959	1.0001	0.9525	0.9521	0.0272	0.8996	1.0061	44.0	55.7
Incomb CRM+High ex. BB	19.9	0.00192865680	25	0.9977	0.9977	0.0010	0.9958	0.9997	0.9416	0.9429	0.0265	0.8954	0.9949	42.6	57.5
Incomb CRM+Low inc. BB	68.1	0.00660682595	25	0.9922	0.9922	0.0011	0.9900	0.9945	0.8157	0.8160	0.0247	0.7706	0.8668	30.6	72.1
Incomb CRM+High inc. BB	85.6	0.00831324496	25	0.9901	0.9902	0.0011	0.9879	0.9923	0.7723	0.7741	0.0232	0.7271	0.8213	26.6	75.9
WoW alone CRM+Low	0.3	0.00002508371	35	1.0000	1.0000	0.0009	0.9982	1.0017	0.9992	0.9998	0.0332	0.9370	1.0604	50.2	49.9
WoW alone CRM+High	0.3	0.00003189275	35	1.0000	1.0000	0.0009	0.9982	1.0017	0.9988	0.9989	0.0318	0.9347	1.0634	49.5	50.4
Incomb CRM+Low ex. BB	16.9	0.00164162693	35	0.9981	0.9981	0.0009	0.9962	0.9998	0.9332	0.9337	0.0310	0.8732	0.9956	44.6	56.1
Incomb CRM+High ex. BB	19.9	0.00192865680	35	0.9977	0.9977	0.0009	0.9961	0.9994	0.9215	0.9218	0.0306	0.8640	0.9806	43.0	56.5
Incomb CRM+Low inc. BB	68.1	0.00660682595	35	0.9922	0.9922	0.0010	0.9903	0.9940	0.7548	0.7549	0.0271	0.7025	0.8085	27.3	71.4
Incomb CRM+High inc. BB	85.6	0.00831324496	35	0.9902	0.9902	0.0010	0.9883	0.9921	0.7017	0.7015	0.0249	0.6531	0.7539	22.0	77.0
WoW alone CRM+Low	0.3	0.00002508371	50	1.0000	1.0000	0.0008	0.9983	1.0016	0.9993	0.9995	0.0403	0.9187	1.0826	49.6	50.1
WoW alone CRM+High	0.3	0.00003189275	50	1.0000	1.0000	0.0008	0.9984	1.0015	0.9984	0.9994	0.0399	0.9205	1.0779	50.0	50.1
Incomb CRM+Low ex. BB	16.9	0.00164162693	50	0.9986	0.9986	0.0007	0.9972	1.0001	0.9324	0.9338	0.0364	0.8643	1.0076	45.0	55.2
Incomb CRM+High ex. BB	19.9	0.00192865680	50	0.9984	0.9984	0.0008	0.9969	0.9999	0.9218	0.9215	0.0360	0.8545	0.9955	43.4	56.7
Incomb CRM+Low inc. BB	68.1	0.00660682595	50	0.9945	0.9945	0.0008	0.9928	0.9961	0.7542	0.7545	0.0329	0.6887	0.8194	30.1	70.2
Incomb CRM+High inc. BB	85.6	0.00831324496	50	0.9930	0.9930	0.0008	0.9914	0.9948	0.7002	0.7012	0.0305	0.6419	0.7695	26.7	74.0

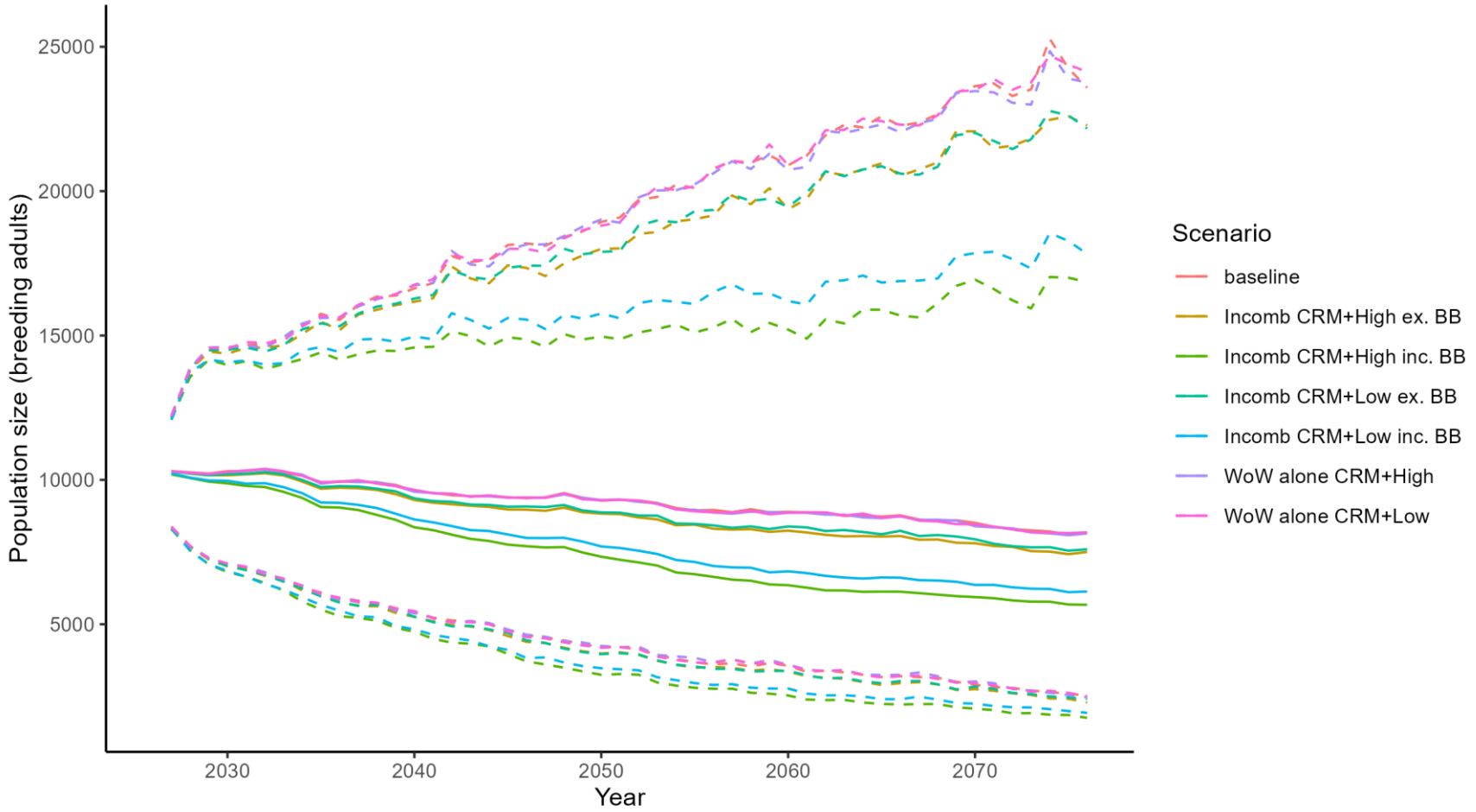

Figure 3-13. Kittiwake at St Abb's Head to Fast Castle SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.14 *Troup, Pennan and Lion's Head SPA*

Table 3-29. PVA Inputs: KI Troup, Pennan and Lion's Head SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at Troup, Pennan and Lion's Head SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	5.987424e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	7.655098348775997E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	21232	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	2.2232136696548623E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	2.430646301318781E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	2.8725535023358339E-3

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	3.3384210132864868E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-30. PVA Outputs: KI Troup, Pennan and Lion's Head SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	1.3	0.00005987424	25	1.0000	1.0000	0.0007	0.9986	1.0013	0.9990	0.9993	0.0186	0.9649	1.0361	49.3	50.9
WoW alone CRM+High	1.6	0.00007655098	25	1.0000	0.9999	0.0007	0.9986	1.0013	0.9986	0.9990	0.0191	0.9647	1.0366	49.7	50.6
Incomb CRM+Low ex. BB	47.2	0.00222321367	25	0.9974	0.9974	0.0007	0.9959	0.9988	0.9346	0.9345	0.0180	0.8989	0.9706	41.5	58.0
Incomb CRM+High ex. BB	51.6	0.00243064630	25	0.9971	0.9971	0.0007	0.9957	0.9986	0.9283	0.9287	0.0179	0.8944	0.9643	41.2	58.5
Incomb CRM+Low inc. BB	61.0	0.00287255350	25	0.9966	0.9966	0.0007	0.9952	0.9981	0.9154	0.9156	0.0175	0.8829	0.9498	40.0	60.4
Incomb CRM+High inc. BB	70.9	0.00333842101	25	0.9961	0.9961	0.0007	0.9946	0.9975	0.9025	0.9027	0.0176	0.8669	0.9364	38.5	61.3
WoW alone CRM+Low	1.3	0.00005987424	35	0.9999	0.9999	0.0006	0.9988	1.0012	0.9976	0.9985	0.0221	0.9561	1.0456	50.2	49.8
WoW alone CRM+High	1.6	0.00007655098	35	0.9999	0.9999	0.0006	0.9987	1.0011	0.9980	0.9984	0.0217	0.9558	1.0431	50.5	49.7
Incomb CRM+Low ex. BB	47.2	0.00222321367	35	0.9974	0.9974	0.0006	0.9961	0.9987	0.9096	0.9098	0.0211	0.8682	0.9542	41.7	58.0
Incomb CRM+High ex. BB	51.6	0.00243064630	35	0.9971	0.9971	0.0006	0.9958	0.9984	0.9022	0.9022	0.0211	0.8621	0.9452	41.1	58.6
Incomb CRM+Low inc. BB	61.0	0.00287255350	35	0.9966	0.9966	0.0006	0.9954	0.9979	0.8852	0.8853	0.0199	0.8466	0.9239	39.0	60.1
Incomb CRM+High inc. BB	70.9	0.00333842101	35	0.9960	0.9961	0.0006	0.9948	0.9973	0.8666	0.8677	0.0200	0.8285	0.9074	38.0	62.0
WoW alone CRM+Low	1.3	0.00005987424	50	1.0000	1.0000	0.0005	0.9989	1.0010	0.9979	0.9994	0.0270	0.9482	1.0522	50.2	49.9
WoW alone CRM+High	1.6	0.00007655098	50	0.9999	1.0000	0.0005	0.9990	1.0010	0.9985	0.9993	0.0264	0.9459	1.0539	50.2	49.9
Incomb CRM+Low ex. BB	47.2	0.00222321367	50	0.9982	0.9982	0.0005	0.9971	0.9992	0.9112	0.9110	0.0255	0.8601	0.9613	42.0	57.3
Incomb CRM+High ex. BB	51.6	0.00243064630	50	0.9980	0.9980	0.0005	0.9969	0.9990	0.9036	0.9038	0.0249	0.8568	0.9565	41.4	57.3

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
Incomb CRM+Low inc. BB	61.0	0.00287255350	50	0.9976	0.9976	0.0005	0.9966	0.9987	0.8857	0.8860	0.0239	0.8407	0.9362	40.0	58.7
Incomb CRM+High inc. BB	70.9	0.00333842101	50	0.9972	0.9972	0.0005	0.9961	0.9983	0.8682	0.8682	0.0241	0.8205	0.9170	38.6	60.1

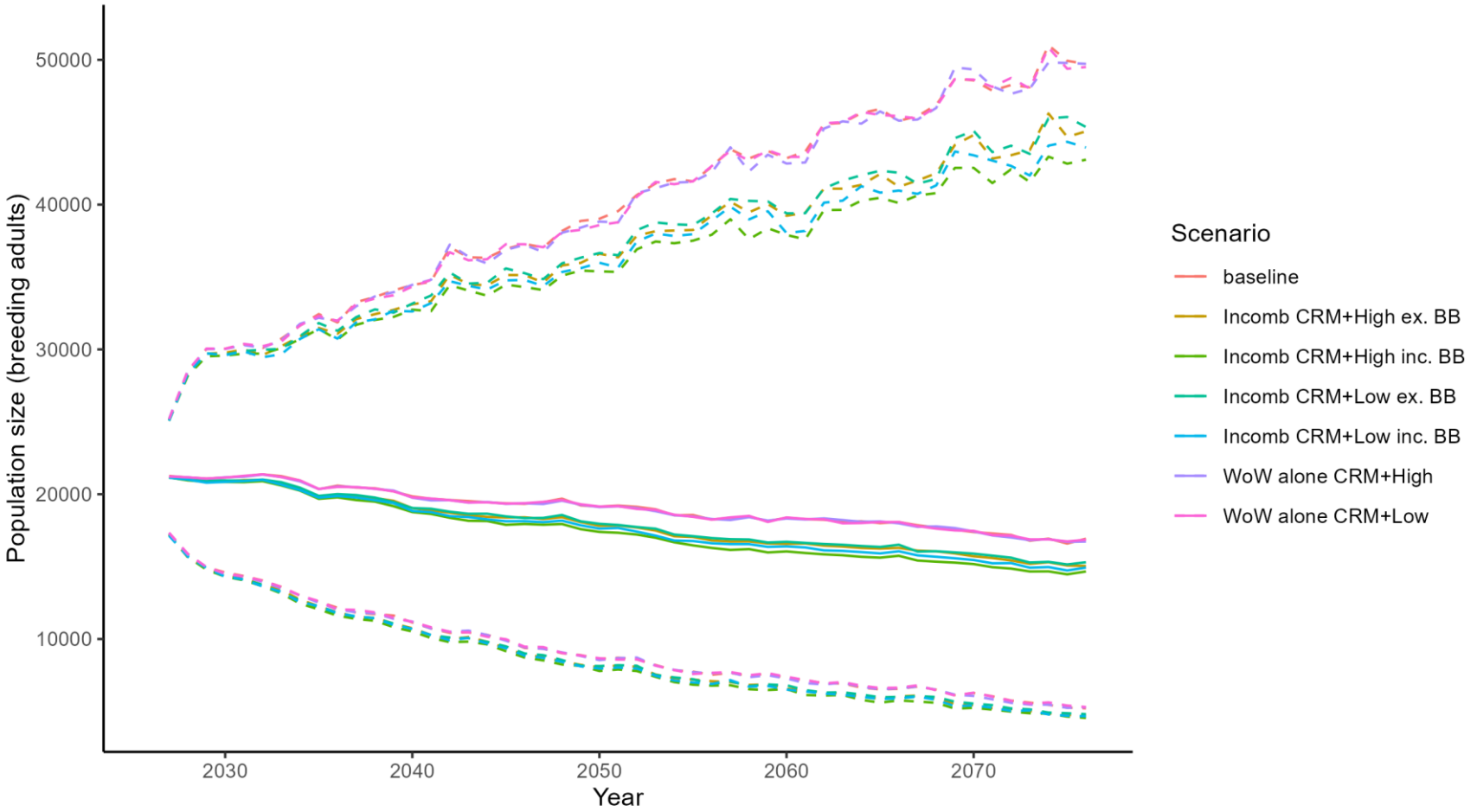

Figure 3-14. Kittiwake at Troup, Pennan and Lion's Head SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.1.15 *West Westray SPA*

Table 3-31. PVA Inputs: Kittiwake at West Westray SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Kittiwake at West Westray SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Black-legged kittiwake	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	4	Scenario A Impact on adult survival rate	0.0002284603
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	2	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	2.9447450219570925E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	5510	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5860126	Scenario C Impact on adult survival rate	6.0118392790516765E-3
Productivity rate per pair standard deviation	0.3704002	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.854	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.051	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.79	Scenario D Impact on adult survival rate	6.4170111251494492E-3
Immatures survival rates 0 to 1 standard deviation	0.077	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.854	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.077	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.854	Scenario E Impact on adult survival rate	7.1503444245414674E-3
Immatures survival rates 2 to 3 standard deviation	0.077	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.854	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.077	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	-	Scenario F Impact on adult survival rate	8.1145532898518665E-3
Immatures survival rates 4 to 5 standard deviation	-	Scenario F Impact on immature survival rate mean	-
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-32. PVA Outputs: Kittiwake at West Westray SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	1.3	0.0002284603	25	0.9997	0.9997	0.0014	0.9971	1.0026	0.9928	0.9937	0.0376	0.9203	1.0723	49.3	51.2
WoW alone CRM+High	1.6	0.0002944745	25	0.9997	0.9997	0.0014	0.9969	1.0028	0.9920	0.9934	0.0384	0.9214	1.0777	49.3	51.0
Incomb CRM+Low ex. BB	33.1	0.0060118393	25	0.9929	0.9929	0.0015	0.9898	0.9959	0.8296	0.8309	0.0337	0.7624	0.9011	32.3	70.1
Incomb CRM+High ex. BB	35.4	0.0064170111	25	0.9925	0.9925	0.0014	0.9896	0.9954	0.8205	0.8218	0.0325	0.7593	0.8903	31.2	70.7
Incomb CRM+Low inc. BB	39.4	0.0071503444	25	0.9916	0.9916	0.0014	0.9888	0.9944	0.8017	0.8035	0.0306	0.7480	0.8657	29.9	72.4
Incomb CRM+High inc. BB	44.7	0.0081145533	25	0.9905	0.9905	0.0014	0.9876	0.9933	0.7800	0.7801	0.0299	0.7217	0.8412	27.1	75.6
WoW alone CRM+Low	1.3	0.0002284603	35	0.9997	0.9997	0.0012	0.9975	1.0022	0.9894	0.9914	0.0434	0.9074	1.0846	48.2	51.5
WoW alone CRM+High	1.6	0.0002944745	35	0.9997	0.9997	0.0012	0.9973	1.0021	0.9880	0.9904	0.0452	0.9073	1.0839	48.3	51.5
Incomb CRM+Low ex. BB	33.1	0.0060118393	35	0.9929	0.9929	0.0013	0.9902	0.9954	0.7718	0.7736	0.0375	0.6993	0.8502	29.3	70.4
Incomb CRM+High ex. BB	35.4	0.0064170111	35	0.9924	0.9925	0.0013	0.9899	0.9950	0.7607	0.7621	0.0358	0.6957	0.8391	28.1	71.2
Incomb CRM+Low inc. BB	39.4	0.0071503444	35	0.9917	0.9916	0.0013	0.9891	0.9941	0.7390	0.7387	0.0349	0.6730	0.8063	26.5	73.3
Incomb CRM+High inc. BB	44.7	0.0081145533	35	0.9904	0.9905	0.0013	0.9880	0.9929	0.7079	0.7086	0.0333	0.6467	0.7734	22.8	77.2
WoW alone CRM+Low	1.3	0.0002284603	50	0.9999	0.9999	0.0010	0.9979	1.0019	0.9959	0.9949	0.0525	0.8957	1.1026	50.5	49.8
WoW alone CRM+High	1.6	0.0002944745	50	0.9999	0.9998	0.0010	0.9979	1.0018	0.9923	0.9931	0.0530	0.8947	1.0950	49.7	50.4
Incomb CRM+Low ex. BB	33.1	0.0060118393	50	0.9950	0.9950	0.0011	0.9927	0.9972	0.7730	0.7746	0.0451	0.6900	0.8692	31.2	67.4
Incomb CRM+High ex. BB	35.4	0.0064170111	50	0.9947	0.9947	0.0011	0.9926	0.9969	0.7621	0.7635	0.0432	0.6846	0.8545	31.0	69.0
Incomb CRM+Low inc. BB	39.4	0.0071503444	50	0.9941	0.9941	0.0011	0.9919	0.9962	0.7391	0.7406	0.0424	0.6576	0.8275	28.8	71.5
Incomb CRM+High inc. BB	44.7	0.0081145533	50	0.9933	0.9933	0.0011	0.9911	0.9954	0.7078	0.7092	0.0399	0.6325	0.7911	27.2	72.6

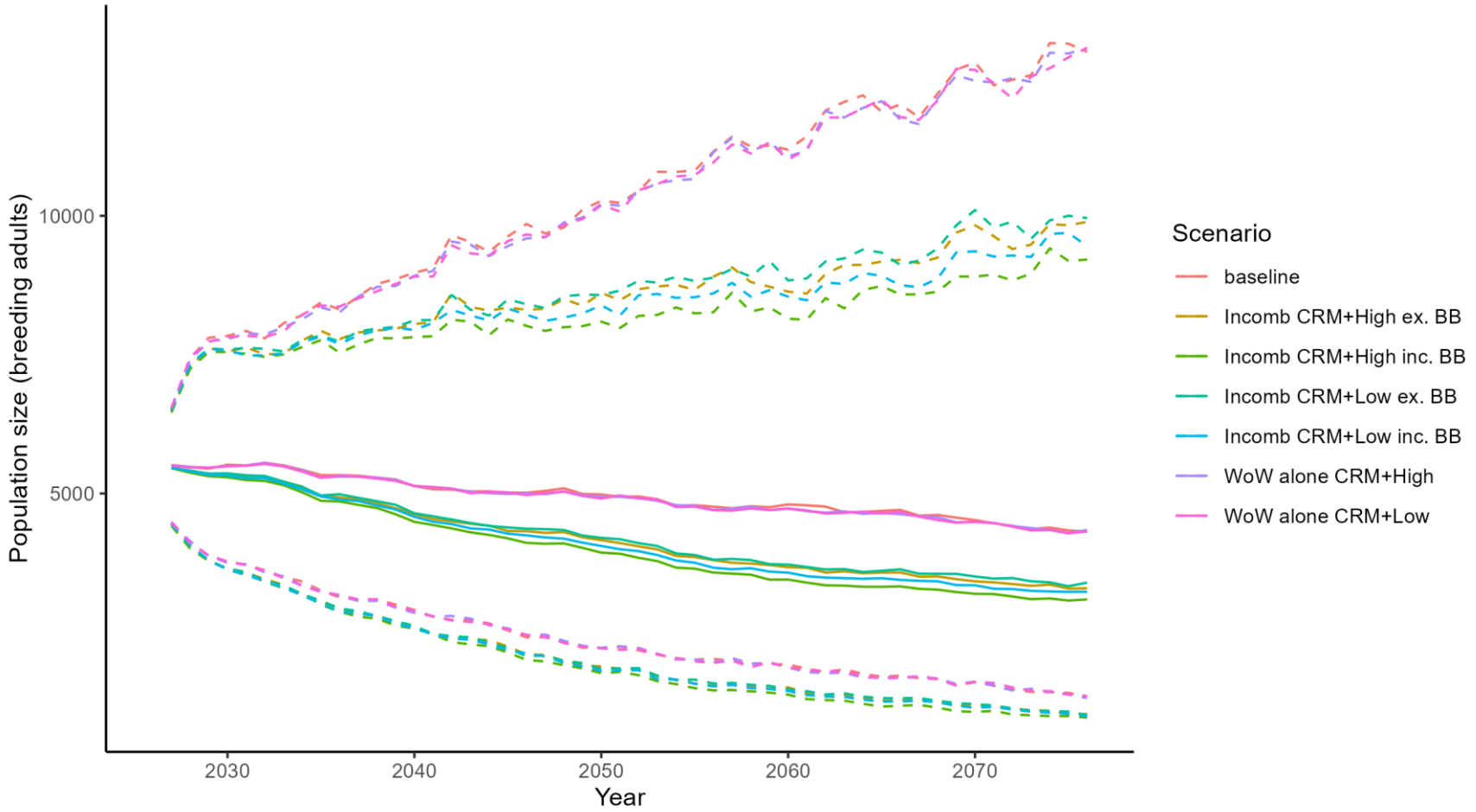

Figure 3-15. Kittiwake at West Westray SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2 Gannet

3.1.2.1 *Fair Isle SPA*

Table 3-33. PVA Inputs: Gannet at Fair Isle SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at Fair Isle SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	3.04129e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	6.1263549115400881E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	9942	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	2.2461584347938835E-3
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	3.0314915295808816E-3
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	2.2878583073556143E-3

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	3.073191402142612E-3
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-34. PVA Outputs: Gannet at Fair Isle SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.3	0.00003041290	25	1.0000	1.0000	0.0008	0.9984	1.0017	1.0000	1.0001	0.0222	0.9568	1.0438	49.2	51.1
WoW alone CRM+High	0.6	0.00006126355	25	0.9999	0.9999	0.0008	0.9983	1.0015	0.9986	0.9984	0.0216	0.9549	1.0395	48.5	50.8
Incomb CRM+Low ex. BB	22.3	0.00224615843	25	0.9974	0.9974	0.0008	0.9959	0.9990	0.9343	0.9346	0.0203	0.8976	0.9751	34.4	65.4
Incomb CRM+High ex. BB	30.1	0.00303149153	25	0.9965	0.9965	0.0008	0.9949	0.9980	0.9118	0.9123	0.0199	0.8740	0.9511	29.3	70.4
Incomb CRM+Low inc. BB	22.7	0.00228785831	25	0.9974	0.9974	0.0008	0.9959	0.9989	0.9347	0.9341	0.0198	0.8955	0.9730	34.4	64.9
Incomb CRM+High inc. BB	30.6	0.00307319140	25	0.9964	0.9964	0.0008	0.9947	0.9979	0.9114	0.9112	0.0203	0.8672	0.9509	29.2	70.2
WoW alone CRM+Low	0.3	0.00003041290	35	1.0000	1.0000	0.0007	0.9987	1.0014	0.9989	1.0005	0.0251	0.9534	1.0503	49.4	50.4
WoW alone CRM+High	0.6	0.00006126355	35	0.9999	0.9999	0.0007	0.9986	1.0013	0.9970	0.9984	0.0252	0.9482	1.0496	49.4	50.5
Incomb CRM+Low ex. BB	22.3	0.00224615843	35	0.9974	0.9974	0.0007	0.9961	0.9988	0.9093	0.9105	0.0232	0.8692	0.9589	32.7	66.6
Incomb CRM+High ex. BB	30.1	0.00303149153	35	0.9964	0.9965	0.0007	0.9952	0.9978	0.8804	0.8806	0.0223	0.8413	0.9268	26.1	71.5
Incomb CRM+Low inc. BB	22.7	0.00228785831	35	0.9974	0.9973	0.0007	0.9961	0.9987	0.9089	0.9091	0.0223	0.8678	0.9540	31.9	66.6
Incomb CRM+High inc. BB	30.6	0.00307319140	35	0.9964	0.9964	0.0007	0.9951	0.9976	0.8783	0.8788	0.0223	0.8341	0.9236	26.2	72.1
WoW alone CRM+Low	0.3	0.00003041290	50	1.0000	1.0000	0.0006	0.9989	1.0011	0.9994	0.9998	0.0295	0.9407	1.0602	49.8	50.5
WoW alone CRM+High	0.6	0.00006126355	50	0.9999	1.0000	0.0005	0.9988	1.0011	0.9972	0.9985	0.0288	0.9434	1.0555	49.4	50.4
Incomb CRM+Low ex. BB	22.3	0.00224615843	50	0.9981	0.9981	0.0006	0.9970	0.9993	0.9081	0.9094	0.0275	0.8577	0.9669	34.7	65.5
Incomb CRM+High ex. BB	30.1	0.00303149153	50	0.9975	0.9975	0.0005	0.9965	0.9986	0.8781	0.8793	0.0256	0.8328	0.9318	30.4	69.7

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
Incomb CRM+Low inc. BB	22.7	0.00228785831	50	0.9981	0.9981	0.0005	0.9970	0.9992	0.9067	0.9076	0.0256	0.8600	0.9581	34.7	65.6
Incomb CRM+High inc. BB	30.6	0.00307319140	50	0.9974	0.9974	0.0006	0.9963	0.9985	0.8771	0.8777	0.0260	0.8297	0.9302	30.3	70.2

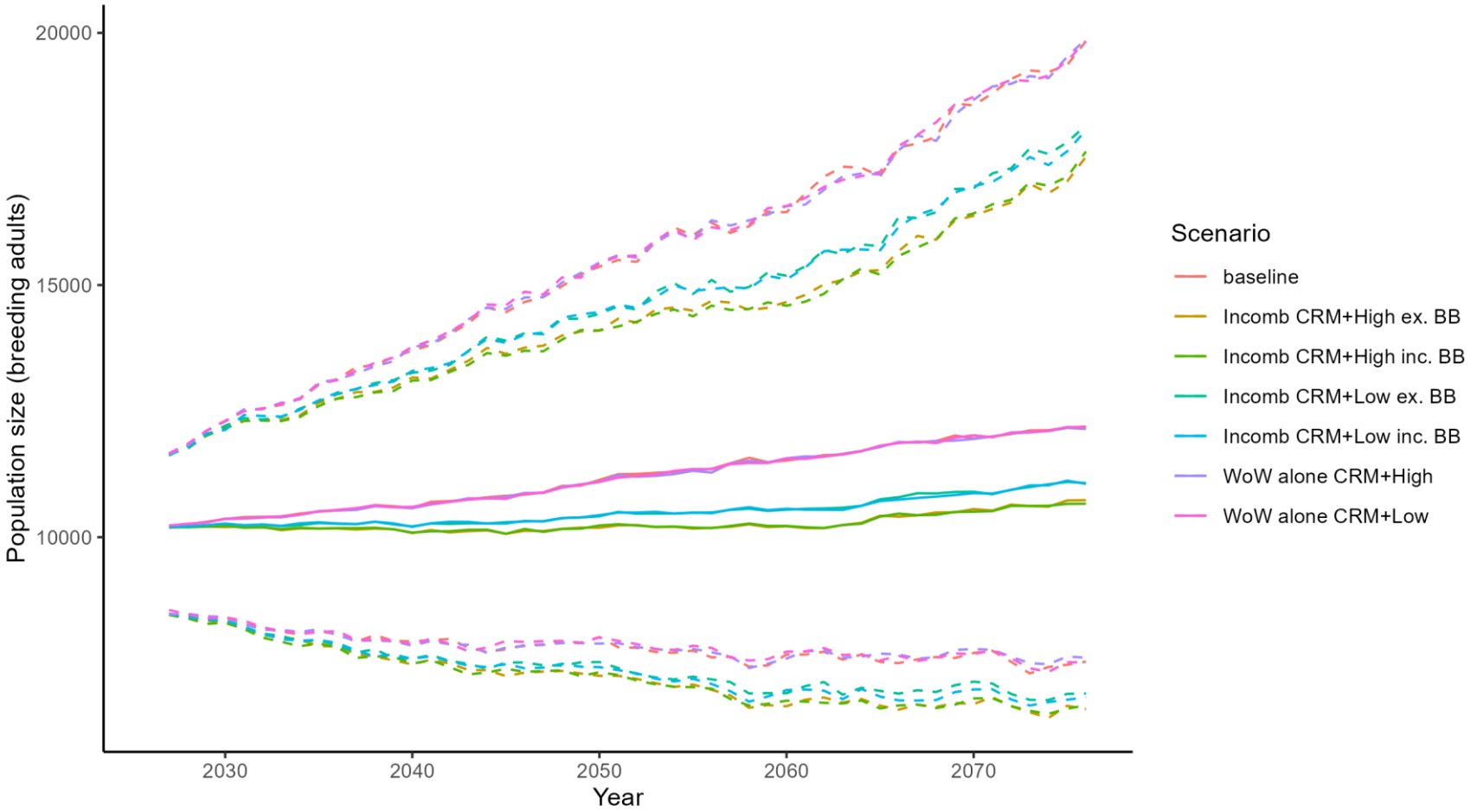

Figure 3-16. Gannet at Fair Isle SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2.2 *Flamborough and Filey Coast SPA*

Table 3-35. PVA Inputs: Gannet at Flamborough and Filey Coast SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at Flamborough and Filey Coast SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	3.818383e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	7.7396632719783782E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	26784	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	7.6452339220098187E-3
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	1.0083184579707315E-2
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	7.7235009775232701E-3
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	1.016145163522077E-2
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-36. PVA Outputs: Gannet at Flamborough and Filey Coast SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	1.0	0.00003818383	25	1.0000	0.9999	0.0005	0.9990	1.0009	0.9983	0.9982	0.0132	0.9726	1.0243	49.4	50.9
WoW alone CRM+High	2.1	0.00007739663	25	0.9999	0.9999	0.0005	0.9989	1.0009	0.9970	0.9973	0.0131	0.9719	1.0240	49.3	50.7
Incomb CRM+Low ex. BB	204.8	0.00764523392	25	0.9910	0.9910	0.0005	0.9901	0.9920	0.7912	0.7913	0.0105	0.7701	0.8118	9.7	91.7
Incomb CRM+High ex. BB	270.1	0.01008318458	25	0.9882	0.9882	0.0005	0.9871	0.9892	0.7344	0.7341	0.0104	0.7140	0.7550	4.4	96.8
Incomb CRM+Low inc. BB	206.9	0.00772350098	25	0.9910	0.9910	0.0005	0.9900	0.9919	0.7894	0.7898	0.0107	0.7703	0.8117	9.6	92.4
Incomb CRM+High inc. BB	272.2	0.01016145164	25	0.9881	0.9881	0.0005	0.9869	0.9891	0.7328	0.7323	0.0104	0.7119	0.7522	4.4	97.0
WoW alone CRM+Low	1.0	0.00003818383	35	1.0000	1.0000	0.0004	0.9991	1.0007	0.9983	0.9981	0.0150	0.9697	1.0276	49.1	50.4
WoW alone CRM+High	2.1	0.00007739663	35	0.9999	0.9999	0.0004	0.9991	1.0008	0.9962	0.9964	0.0152	0.9694	1.0291	48.9	51.0
Incomb CRM+Low ex. BB	204.8	0.00764523392	35	0.9910	0.9910	0.0004	0.9901	0.9919	0.7231	0.7228	0.0116	0.6990	0.7452	6.2	94.2
Incomb CRM+High ex. BB	270.1	0.01008318458	35	0.9882	0.9882	0.0004	0.9873	0.9890	0.6510	0.6512	0.0108	0.6298	0.6720	2.0	98.5
Incomb CRM+Low inc. BB	206.9	0.00772350098	35	0.9909	0.9909	0.0004	0.9901	0.9917	0.7208	0.7206	0.0114	0.6981	0.7420	6.2	94.7
Incomb CRM+High inc. BB	272.2	0.01016145164	35	0.9881	0.9881	0.0005	0.9871	0.9889	0.6495	0.6494	0.0108	0.6280	0.6700	2.0	98.5
WoW alone CRM+Low	1.0	0.00003818383	50	1.0000	1.0000	0.0003	0.9992	1.0006	0.9981	0.9978	0.0180	0.9606	1.0337	49.4	50.3
WoW alone CRM+High	2.1	0.00007739663	50	0.9999	0.9999	0.0003	0.9993	1.0007	0.9960	0.9964	0.0180	0.9629	1.0342	49.6	50.6
Incomb CRM+Low ex. BB	204.8	0.00764523392	50	0.9936	0.9936	0.0004	0.9929	0.9943	0.7215	0.7209	0.0134	0.6947	0.7466	9.0	90.6
Incomb CRM+High ex. BB	270.1	0.01008318458	50	0.9916	0.9916	0.0004	0.9908	0.9923	0.6494	0.6494	0.0123	0.6245	0.6730	4.5	95.6
Incomb CRM+Low inc. BB	206.9	0.00772350098	50	0.9936	0.9935	0.0004	0.9928	0.9942	0.7190	0.7189	0.0133	0.6921	0.7445	8.9	91.4
Incomb CRM+High inc. BB	272.2	0.01016145164	50	0.9915	0.9915	0.0004	0.9908	0.9922	0.6477	0.6472	0.0125	0.6223	0.6707	4.4	95.8

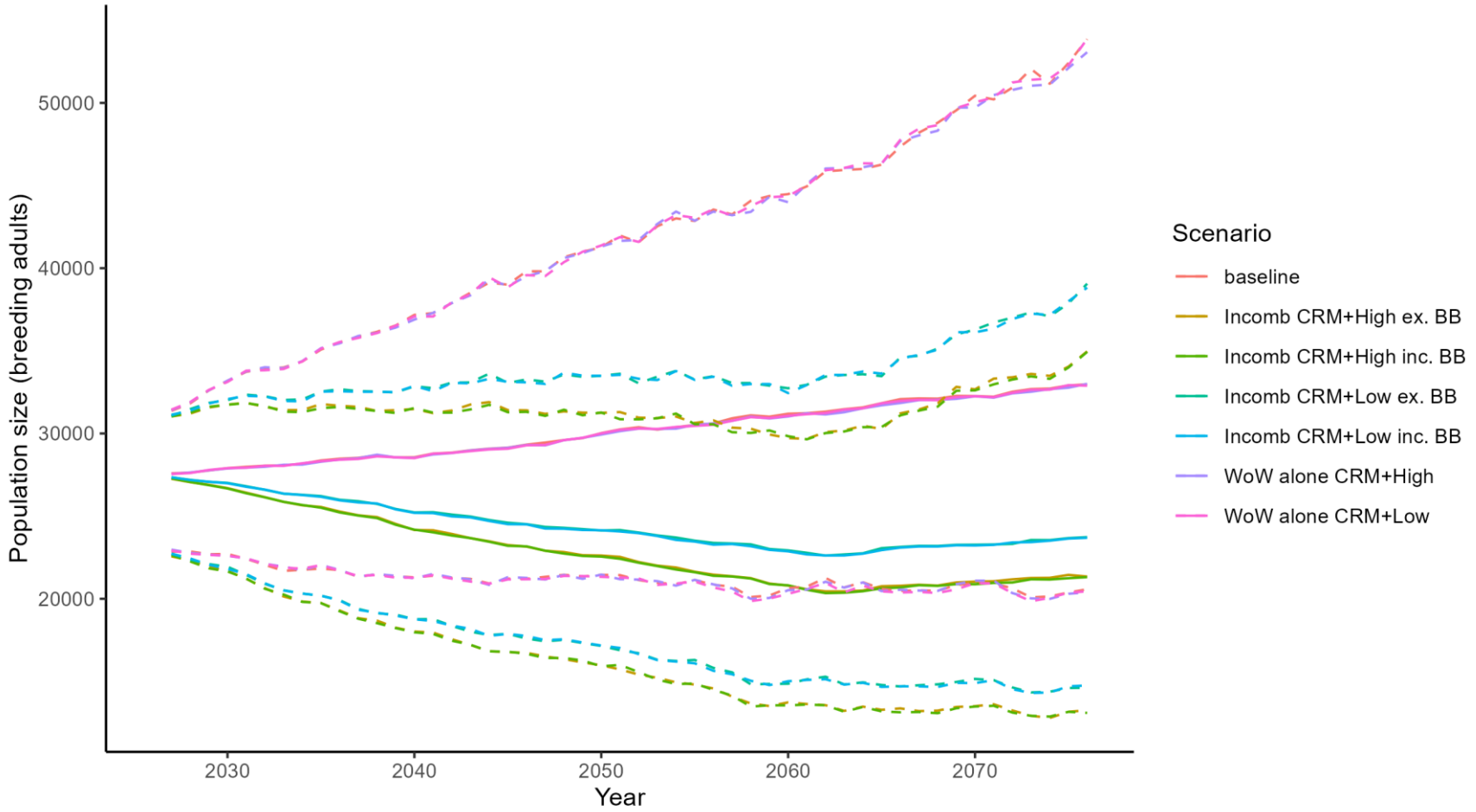

Figure 3-17. Gannet at Flamborough and Filey Coast SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2.3 *Forth Islands SPA*

Table 3-37. PVA Inputs: Gannet at Forth Islands SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at Forth Islands SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	3.40821e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	6.9082516244949093E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	150518	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	4.1652590551776664E-3
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	5.7238100955683616E-3
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	4.7248535682786405E-3
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	6.2834046086693348E-3
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-38. PVA Outputs: Gannet at Forth Islands SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	5.1	0.00003408210	25	1.0000	1.0000	0.0002	0.9996	1.0004	0.9989	0.9990	0.0054	0.9881	1.0093	49.8	50.0
WoW alone CRM+High	10.4	0.00006908252	25	0.9999	0.9999	0.0002	0.9995	1.0003	0.9978	0.9979	0.0054	0.9880	1.0090	49.3	50.6
Incomb CRM+Low ex. BB	626.9	0.00416525906	25	0.9951	0.9951	0.0002	0.9947	0.9956	0.8808	0.8808	0.0051	0.8713	0.8909	23.8	77.6
Incomb CRM+High ex. BB	861.5	0.00572381010	25	0.9933	0.9933	0.0002	0.9928	0.9937	0.8398	0.8395	0.0049	0.8298	0.8484	17.9	85.0
Incomb CRM+Low inc. BB	711.2	0.00472485357	25	0.9945	0.9945	0.0002	0.9940	0.9949	0.8662	0.8659	0.0050	0.8556	0.8752	21.3	80.7
Incomb CRM+High inc. BB	945.8	0.00628340461	25	0.9926	0.9926	0.0002	0.9922	0.9931	0.8255	0.8254	0.0050	0.8159	0.8353	15.8	87.1
WoW alone CRM+Low	5.1	0.00003408210	35	1.0000	1.0000	0.0002	0.9996	1.0003	0.9987	0.9986	0.0061	0.9871	1.0111	49.4	50.5
WoW alone CRM+High	10.4	0.00006908252	35	0.9999	0.9999	0.0002	0.9996	1.0003	0.9971	0.9971	0.0063	0.9850	1.0095	49.3	50.7
Incomb CRM+Low ex. BB	626.9	0.00416525906	35	0.9951	0.9951	0.0002	0.9948	0.9955	0.8384	0.8383	0.0057	0.8273	0.8493	19.0	79.0
Incomb CRM+High ex. BB	861.5	0.00572381010	35	0.9933	0.9933	0.0002	0.9929	0.9936	0.7848	0.7844	0.0054	0.7741	0.7941	12.3	89.1
Incomb CRM+Low inc. BB	711.2	0.00472485357	35	0.9944	0.9945	0.0002	0.9941	0.9948	0.8187	0.8186	0.0055	0.8079	0.8290	17.0	82.9
Incomb CRM+High inc. BB	945.8	0.00628340461	35	0.9926	0.9926	0.0002	0.9923	0.9930	0.7661	0.7660	0.0053	0.7555	0.7765	10.4	90.7
WoW alone CRM+Low	5.1	0.00003408210	50	1.0000	1.0000	0.0001	0.9997	1.0003	0.9987	0.9987	0.0071	0.9843	1.0125	49.7	50.3
WoW alone CRM+High	10.4	0.00006908252	50	0.9999	0.9999	0.0001	0.9997	1.0002	0.9969	0.9973	0.0075	0.9828	1.0126	49.1	51.0
Incomb CRM+Low ex. BB	626.9	0.00416525906	50	0.9965	0.9965	0.0002	0.9962	0.9968	0.8376	0.8374	0.0066	0.8241	0.8498	23.8	78.7
Incomb CRM+High ex. BB	861.5	0.00572381010	50	0.9952	0.9952	0.0002	0.9949	0.9955	0.7835	0.7832	0.0061	0.7707	0.7948	16.2	83.5
Incomb CRM+Low inc. BB	711.2	0.00472485357	50	0.9961	0.9961	0.0002	0.9958	0.9963	0.8177	0.8176	0.0064	0.8050	0.8299	20.8	80.4
Incomb CRM+High inc. BB	945.8	0.00628340461	50	0.9947	0.9948	0.0002	0.9945	0.9951	0.7646	0.7647	0.0061	0.7528	0.7773	13.8	85.6

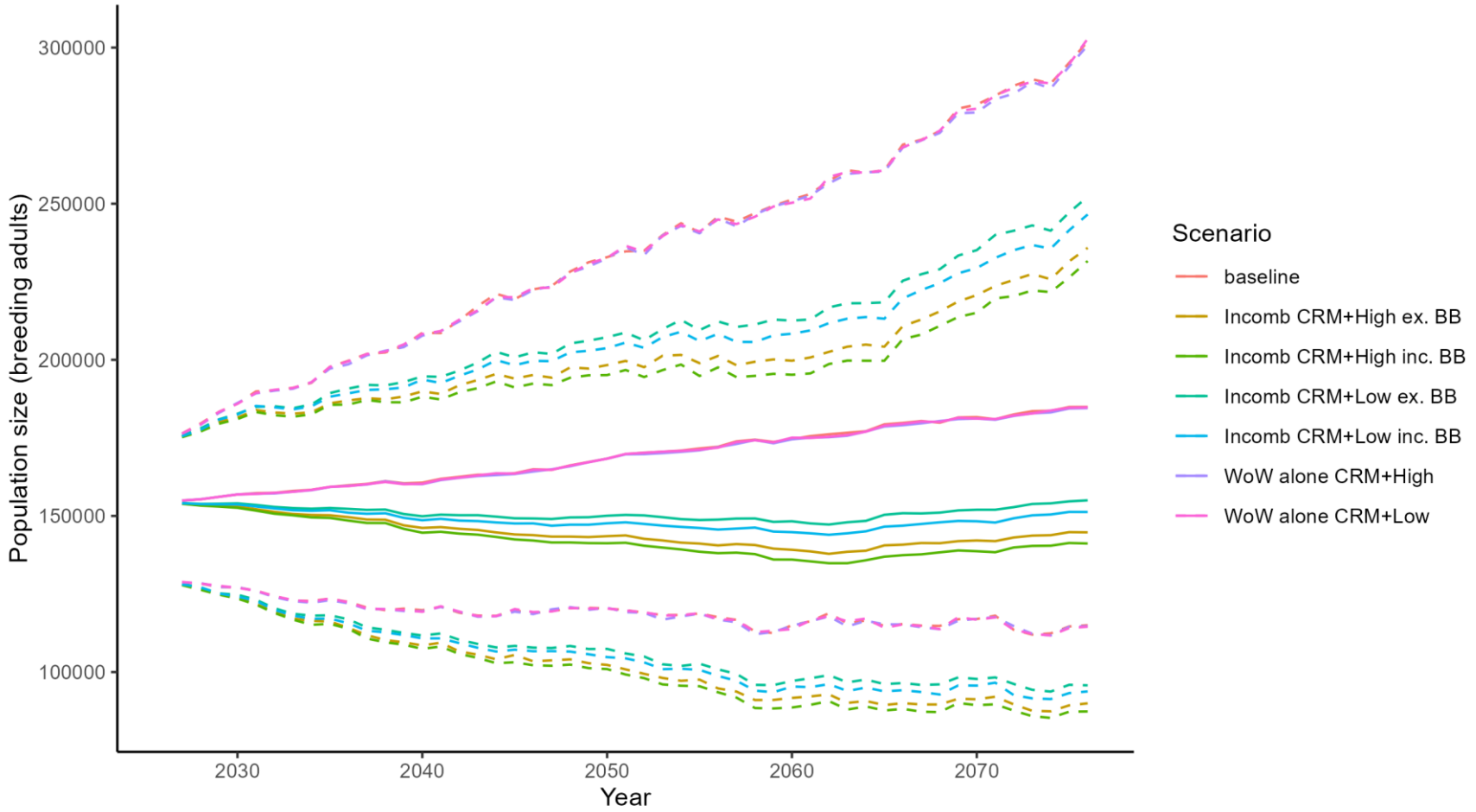

Figure 3-18. Gannet at Forth Islands SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2.4 *Hermaness, Saxa Vord and Valla Field SPA*

Table 3-39. PVA Inputs: Gannet at Hermaness, Saxa Vord and Valla Field SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at Hermaness, Saxa Vord and Valla Field SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	3.173843e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	6.3934004808518277E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	59124	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	2.0262433417346146E-3
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	2.7619777406416189E-3
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	2.063872546927522E-3
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	2.7996069458345266E-3
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-40. PVA Outputs: Gannet at Hermaness, Saxa Vord and Valla Field SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	1.9	0.00003173843	25	1.0000	1.0000	0.0003	0.9993	1.0006	0.9987	0.9989	0.0087	0.9826	1.0158	49.1	50.9
WoW alone CRM+High	3.8	0.00006393400	25	0.9999	0.9999	0.0003	0.9993	1.0005	0.9980	0.9981	0.0084	0.9821	1.0143	49.2	51.0
Incomb CRM+Low ex. BB	119.8	0.00202624334	25	0.9976	0.9976	0.0003	0.9970	0.9983	0.9400	0.9401	0.0084	0.9238	0.9558	36.9	64.4
Incomb CRM+High ex. BB	163.3	0.00276197774	25	0.9968	0.9968	0.0003	0.9961	0.9975	0.9196	0.9197	0.0084	0.9040	0.9358	32.0	69.4
Incomb CRM+Low inc. BB	122.0	0.00206387255	25	0.9976	0.9976	0.0003	0.9970	0.9983	0.9389	0.9392	0.0082	0.9227	0.9556	36.7	64.0
Incomb CRM+High inc. BB	165.5	0.00279960695	25	0.9967	0.9967	0.0003	0.9961	0.9974	0.9184	0.9183	0.0080	0.9020	0.9339	31.3	69.2
WoW alone CRM+Low	1.9	0.00003173843	35	1.0000	1.0000	0.0003	0.9994	1.0005	0.9985	0.9987	0.0101	0.9793	1.0181	49.6	50.7
WoW alone CRM+High	3.8	0.00006393400	35	0.9999	0.9999	0.0003	0.9994	1.0005	0.9971	0.9972	0.0098	0.9784	1.0169	49.7	50.1
Incomb CRM+Low ex. BB	119.8	0.00202624334	35	0.9976	0.9976	0.0003	0.9971	0.9982	0.9180	0.9180	0.0096	0.8998	0.9359	32.8	64.7
Incomb CRM+High ex. BB	163.3	0.00276197774	35	0.9968	0.9968	0.0003	0.9962	0.9974	0.8902	0.8902	0.0093	0.8722	0.9090	28.4	70.1
Incomb CRM+Low inc. BB	122.0	0.00206387255	35	0.9976	0.9976	0.0003	0.9970	0.9981	0.9167	0.9167	0.0094	0.8984	0.9343	33.2	64.5
Incomb CRM+High inc. BB	165.5	0.00279960695	35	0.9967	0.9967	0.0003	0.9961	0.9972	0.8887	0.8884	0.0090	0.8700	0.9056	28.0	70.0
WoW alone CRM+Low	1.9	0.00003173843	50	1.0000	1.0000	0.0002	0.9995	1.0004	0.9985	0.9986	0.0114	0.9761	1.0214	49.9	50.4
WoW alone CRM+High	3.8	0.00006393400	50	0.9999	0.9999	0.0002	0.9995	1.0004	0.9970	0.9973	0.0114	0.9740	1.0191	49.2	50.7
Incomb CRM+Low ex. BB	119.8	0.00202624334	50	0.9983	0.9983	0.0002	0.9979	0.9987	0.9175	0.9173	0.0111	0.8952	0.9380	36.6	63.9
Incomb CRM+High ex. BB	163.3	0.00276197774	50	0.9977	0.9977	0.0002	0.9973	0.9981	0.8893	0.8893	0.0106	0.8683	0.9099	32.1	68.8
Incomb CRM+Low inc. BB	122.0	0.00206387255	50	0.9983	0.9983	0.0002	0.9978	0.9987	0.9159	0.9160	0.0109	0.8952	0.9368	36.2	64.1
Incomb CRM+High inc. BB	165.5	0.00279960695	50	0.9977	0.9977	0.0002	0.9972	0.9981	0.8877	0.8875	0.0105	0.8656	0.9083	31.1	69.1

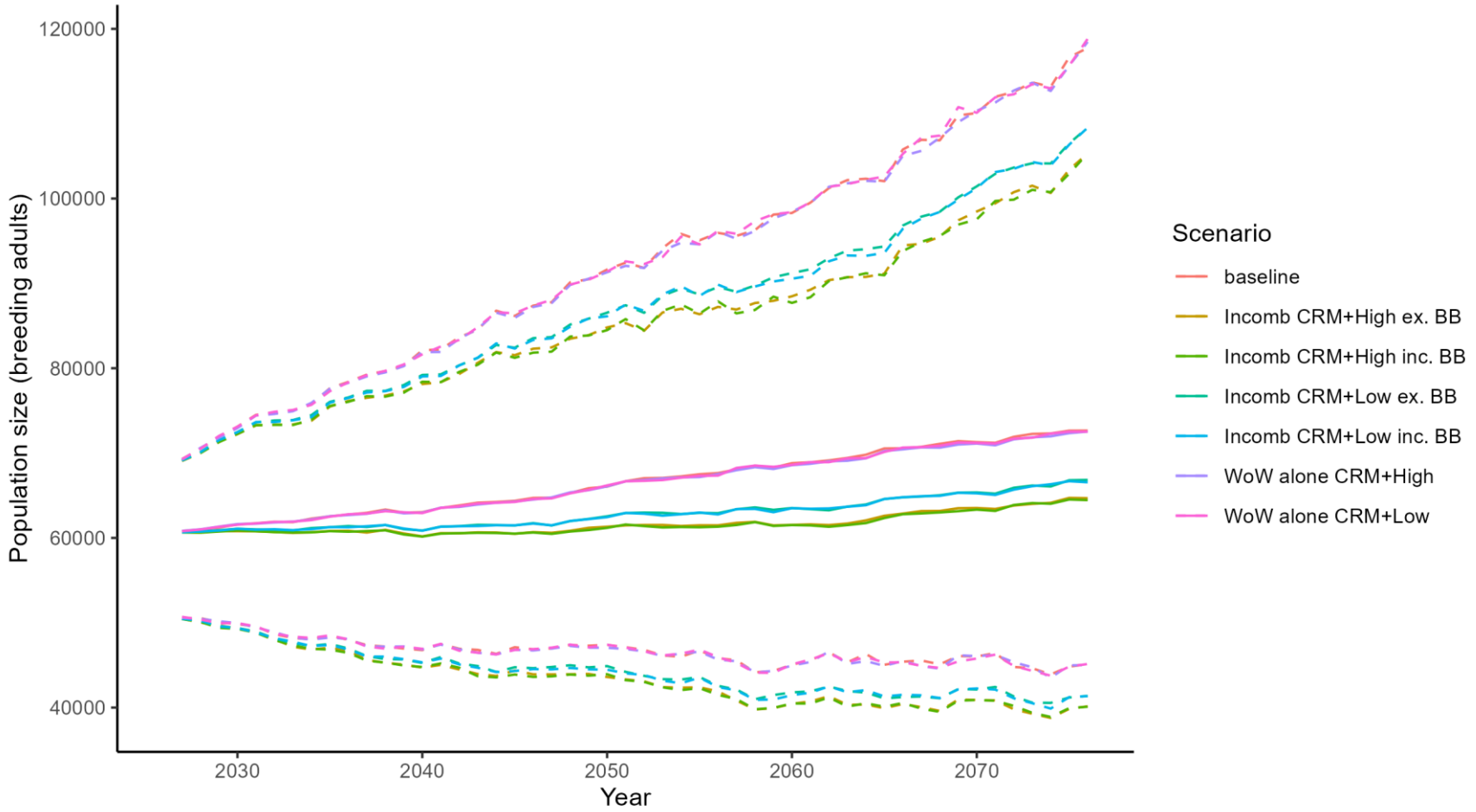

Figure 3-19. Gannet at Hermaness, Saxa Vord and Valla Field SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2.5 *Noss SPA*

Table 3-41. PVA Inputs: Gannet at Noss SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at Noss SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	2.733717e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	5.5068001551262477E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	27530	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	1.8260838095374356E-3
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	2.4823245242436599E-3
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	1.8609750627882906E-3
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	2.5172157774945147E-3
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-42. PVA Outputs: Gannet at Noss SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.8	0.00002733717	25	1.0000	1.0000	0.0005	0.9991	1.0009	0.9994	0.9995	0.0124	0.9754	1.0243	50.2	49.7
WoW alone CRM+High	1.5	0.00005506800	25	1.0000	1.0000	0.0005	0.9990	1.0008	0.9989	0.9987	0.0126	0.9735	1.0233	49.9	50.1
Incomb CRM+Low ex. BB	50.3	0.00182608381	25	0.9979	0.9979	0.0005	0.9970	0.9988	0.9462	0.9463	0.0120	0.9225	0.9688	37.9	62.3
Incomb CRM+High ex. BB	68.3	0.00248232452	25	0.9971	0.9971	0.0005	0.9962	0.9980	0.9265	0.9269	0.0117	0.9053	0.9488	33.2	66.4
Incomb CRM+Low inc. BB	51.2	0.00186097506	25	0.9978	0.9978	0.0005	0.9969	0.9988	0.9452	0.9451	0.0125	0.9209	0.9696	37.4	61.7
Incomb CRM+High inc. BB	69.3	0.00251721578	25	0.9971	0.9970	0.0005	0.9961	0.9979	0.9259	0.9258	0.0118	0.9013	0.9476	33.2	66.8
WoW alone CRM+Low	0.8	0.00002733717	35	1.0000	1.0000	0.0004	0.9992	1.0007	0.9991	0.9992	0.0143	0.9718	1.0264	49.1	50.5
WoW alone CRM+High	1.5	0.00005506800	35	0.9999	0.9999	0.0004	0.9991	1.0008	0.9976	0.9979	0.0145	0.9691	1.0271	49.1	50.6
Incomb CRM+Low ex. BB	50.3	0.00182608381	35	0.9979	0.9979	0.0004	0.9971	0.9986	0.9254	0.9258	0.0135	0.8994	0.9523	35.1	63.4
Incomb CRM+High ex. BB	68.3	0.00248232452	35	0.9971	0.9971	0.0004	0.9963	0.9978	0.8999	0.8998	0.0135	0.8745	0.9262	30.3	68.2
Incomb CRM+Low inc. BB	51.2	0.00186097506	35	0.9978	0.9978	0.0004	0.9970	0.9987	0.9246	0.9244	0.0143	0.8962	0.9527	34.6	63.4
Incomb CRM+High inc. BB	69.3	0.00251721578	35	0.9971	0.9970	0.0004	0.9963	0.9979	0.8987	0.8987	0.0135	0.8734	0.9252	29.9	68.1
WoW alone CRM+Low	0.8	0.00002733717	50	1.0000	1.0000	0.0003	0.9993	1.0006	0.9991	0.9991	0.0167	0.9647	1.0329	49.1	51.0
WoW alone CRM+High	1.5	0.00005506800	50	1.0000	1.0000	0.0003	0.9993	1.0006	0.9979	0.9978	0.0171	0.9642	1.0332	49.5	50.8
Incomb CRM+Low ex. BB	50.3	0.00182608381	50	0.9985	0.9985	0.0003	0.9978	0.9992	0.9248	0.9251	0.0158	0.8954	0.9572	37.3	62.8
Incomb CRM+High ex. BB	68.3	0.00248232452	50	0.9979	0.9979	0.0003	0.9973	0.9986	0.8982	0.8991	0.0156	0.8682	0.9297	33.0	67.4
Incomb CRM+Low inc. BB	51.2	0.00186097506	50	0.9985	0.9984	0.0003	0.9978	0.9991	0.9241	0.9237	0.0165	0.8910	0.9544	37.2	63.5
Incomb CRM+High inc. BB	69.3	0.00251721578	50	0.9979	0.9979	0.0003	0.9972	0.9985	0.8974	0.8978	0.0157	0.8664	0.9282	32.3	68.0

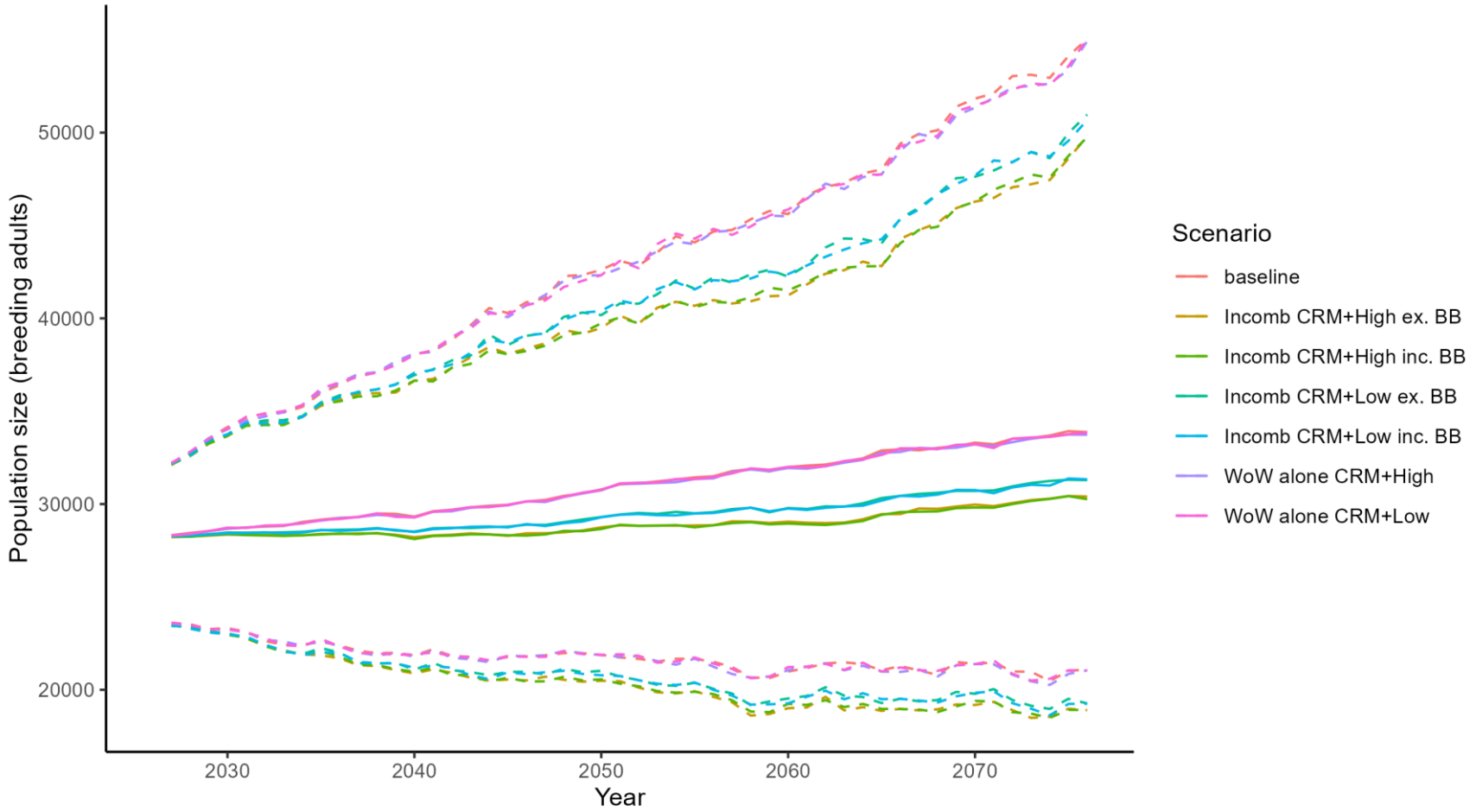

Figure 3-20. Gannet at Noss SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2.6 St Kilda SPA

Table 3-43. PVA Inputs: Gannet at St Kilda SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at St Kilda SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	3.809366e-06
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	7.9601691283672594E-6
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	120580	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	2.7773313146525563E-4
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	3.8400952445650019E-4
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	2.87894920044933E-4
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	3.9417131303617756E-4
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-44. PVA Outputs: Gannet at St Kilda SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	0.5	0.000003809366	25	1.0000	1.0000	0.0002	0.9995	1.0004	0.9996	0.9997	0.0061	0.9880	1.0117	49.9	50.0
WoW alone CRM+High	1.0	0.000007960169	25	1.0000	1.0000	0.0002	0.9995	1.0004	0.9995	0.9995	0.0060	0.9875	1.0116	50.3	49.8
Incomb CRM+Low ex. BB	33.5	0.000277733131	25	0.9997	0.9997	0.0002	0.9992	1.0001	0.9916	0.9914	0.0060	0.9788	1.0033	47.9	51.8
Incomb CRM+High ex. BB	46.3	0.000384009524	25	0.9996	0.9995	0.0002	0.9991	1.0000	0.9885	0.9883	0.0063	0.9759	1.0015	47.1	53.2
Incomb CRM+Low inc. BB	34.7	0.000287894920	25	0.9997	0.9997	0.0002	0.9992	1.0001	0.9912	0.9914	0.0058	0.9807	1.0028	48.1	51.9
Incomb CRM+High inc. BB	47.5	0.000394171313	25	0.9995	0.9995	0.0002	0.9991	1.0000	0.9880	0.9879	0.0060	0.9758	0.9996	47.2	53.4
WoW alone CRM+Low	0.5	0.000003809366	35	1.0000	1.0000	0.0002	0.9996	1.0004	0.9995	0.9996	0.0070	0.9862	1.0131	50.1	49.7
WoW alone CRM+High	1.0	0.000007960169	35	1.0000	1.0000	0.0002	0.9996	1.0004	0.9994	0.9993	0.0070	0.9856	1.0138	50.0	49.9
Incomb CRM+Low ex. BB	33.5	0.000277733131	35	0.9997	0.9997	0.0002	0.9993	1.0001	0.9881	0.9881	0.0068	0.9753	1.0017	47.9	51.8
Incomb CRM+High ex. BB	46.3	0.000384009524	35	0.9995	0.9995	0.0002	0.9992	0.9999	0.9839	0.9838	0.0072	0.9706	0.9989	46.4	53.1
Incomb CRM+Low inc. BB	34.7	0.000287894920	35	0.9997	0.9997	0.0002	0.9993	1.0000	0.9877	0.9879	0.0068	0.9750	1.0019	48.3	52.4
Incomb CRM+High inc. BB	47.5	0.000394171313	35	0.9995	0.9995	0.0002	0.9992	0.9999	0.9830	0.9832	0.0069	0.9699	0.9975	46.8	52.7
WoW alone CRM+Low	0.5	0.000003809366	50	1.0000	1.0000	0.0002	0.9997	1.0003	0.9995	0.9994	0.0078	0.9837	1.0137	50.0	50.0
WoW alone CRM+High	1.0	0.000007960169	50	1.0000	1.0000	0.0001	0.9997	1.0003	0.9990	0.9992	0.0077	0.9844	1.0151	50.4	49.8
Incomb CRM+Low ex. BB	33.5	0.000277733131	50	0.9998	0.9998	0.0002	0.9995	1.0001	0.9879	0.9879	0.0077	0.9730	1.0032	48.0	52.4
Incomb CRM+High ex. BB	46.3	0.000384009524	50	0.9997	0.9997	0.0002	0.9994	1.0000	0.9835	0.9836	0.0080	0.9677	0.9988	48.0	53.4
Incomb CRM+Low inc. BB	34.7	0.000287894920	50	0.9998	0.9998	0.0001	0.9995	1.0001	0.9876	0.9877	0.0076	0.9738	1.0027	48.0	52.5
Incomb CRM+High inc. BB	47.5	0.000394171313	50	0.9997	0.9997	0.0002	0.9994	1.0000	0.9828	0.9830	0.0077	0.9683	0.9978	46.9	53.7

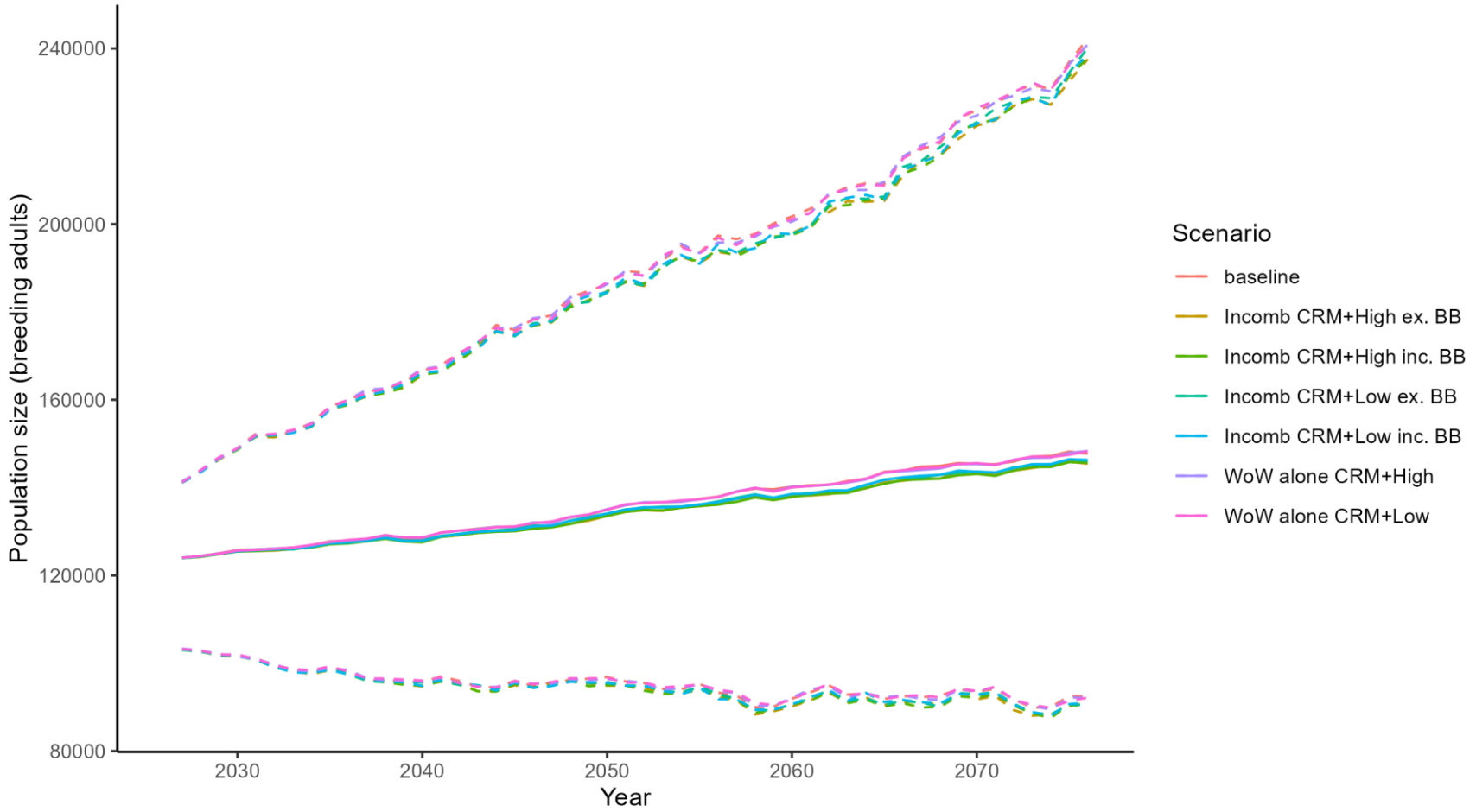

Figure 3-21. Gannet at St Kilda SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.2.7 *Sule Skerry and Sule Stack SPA*

Table 3-45. PVA Inputs: Gannet at Sule Skerry and Sule Stack SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Gannet at Sule Skerry and Sule Stack SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone CRM+Low
Species	Northern gannet	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	0.001128273
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	1.4559887620027843E-3
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	18130	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.6798639	Scenario C Impact on adult survival rate	1.7956107358937645E-3
Productivity rate per pair standard deviation	0.0920597	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.919	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.042	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.424	Scenario D Impact on adult survival rate	2.3245840726405032E-3
Immatures survival rates 0 to 1 standard deviation	0.045	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.829	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.026	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.891	Scenario E Impact on adult survival rate	1.8089929471422307E-3
Immatures survival rates 2 to 3 standard deviation	0.019	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb CRM+High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.019	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.919000000000	Scenario F Impact on adult survival rate	2.3379662838889695E-3
Immatures survival rates 4 to 5 standard deviation	4.200000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-46. PVA Outputs: Gannet at Sule Skerry and Sule Stack SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM+Low	20.5	0.001128273	25	0.9987	0.9987	0.0006	0.9975	0.9999	0.9675	0.9670	0.0156	0.9367	0.9975	41.8	58.8
WoW alone CRM+High	26.4	0.001455989	25	0.9983	0.9983	0.0006	0.9971	0.9994	0.9571	0.9568	0.0151	0.9266	0.9865	39.3	60.4
Incomb CRM+Low ex. BB	32.6	0.001795611	25	0.9979	0.9979	0.0006	0.9967	0.9990	0.9479	0.9477	0.0152	0.9175	0.9771	38.6	61.9
Incomb CRM+High ex. BB	42.1	0.002324584	25	0.9973	0.9973	0.0006	0.9961	0.9984	0.9329	0.9324	0.0148	0.9017	0.9620	34.6	65.5
Incomb CRM+Low inc. BB	32.8	0.001808993	25	0.9979	0.9979	0.0006	0.9968	0.9990	0.9473	0.9471	0.0151	0.9188	0.9773	38.2	63.0
Incomb CRM+High inc. BB	42.4	0.002337966	25	0.9973	0.9973	0.0006	0.9961	0.9985	0.9315	0.9319	0.0148	0.9027	0.9605	35.0	66.0
WoW alone CRM+Low	20.5	0.001128273	35	0.9987	0.9987	0.0005	0.9977	0.9997	0.9544	0.9547	0.0176	0.9216	0.9906	40.1	60.1
WoW alone CRM+High	26.4	0.001455989	35	0.9983	0.9983	0.0005	0.9973	0.9992	0.9400	0.9405	0.0172	0.9061	0.9734	37.0	62.2
Incomb CRM+Low ex. BB	32.6	0.001795611	35	0.9979	0.9979	0.0005	0.9969	0.9989	0.9278	0.9282	0.0172	0.8926	0.9614	35.7	63.4
Incomb CRM+High ex. BB	42.1	0.002324584	35	0.9973	0.9973	0.0005	0.9963	0.9982	0.9085	0.9078	0.0165	0.8743	0.9391	31.8	67.6
Incomb CRM+Low inc. BB	32.8	0.001808993	35	0.9979	0.9979	0.0005	0.9969	0.9989	0.9269	0.9274	0.0171	0.8959	0.9608	35.7	63.9
Incomb CRM+High inc. BB	42.4	0.002337966	35	0.9973	0.9973	0.0005	0.9963	0.9982	0.9063	0.9065	0.0163	0.8748	0.9401	31.5	67.0
WoW alone CRM+Low	20.5	0.001128273	50	0.9991	0.9991	0.0004	0.9983	0.9999	0.9540	0.9542	0.0203	0.9158	0.9937	42.0	58.5
WoW alone CRM+High	26.4	0.001455989	50	0.9988	0.9988	0.0004	0.9980	0.9996	0.9400	0.9397	0.0202	0.8994	0.9800	39.3	61.3
Incomb CRM+Low ex. BB	32.6	0.001795611	50	0.9985	0.9985	0.0004	0.9977	0.9993	0.9277	0.9278	0.0195	0.8898	0.9643	37.7	62.4
Incomb CRM+High ex. BB	42.1	0.002324584	50	0.9981	0.9981	0.0004	0.9973	0.9989	0.9082	0.9074	0.0193	0.8693	0.9454	34.5	65.5
Incomb CRM+Low inc. BB	32.8	0.001808993	50	0.9985	0.9985	0.0004	0.9977	0.9993	0.9279	0.9274	0.0197	0.8884	0.9662	37.7	62.1
Incomb CRM+High inc. BB	42.4	0.002337966	50	0.9981	0.9981	0.0004	0.9973	0.9988	0.9054	0.9058	0.0190	0.8692	0.9429	34.2	65.3

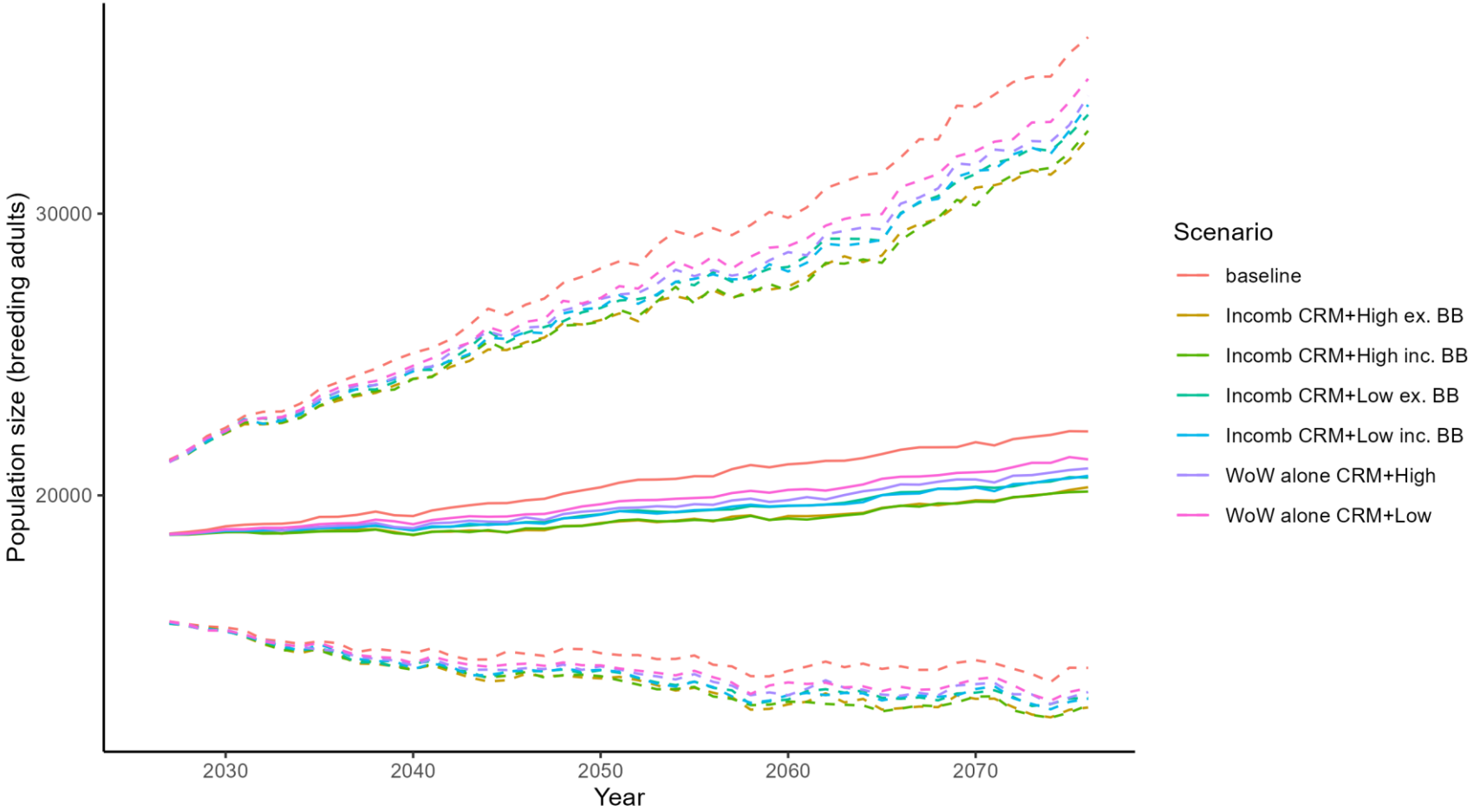

Figure 3-22. Gannet at Sule Skerry and Sule Stack SPA. CRM + High = collision mortality plus high displacement impact scenario. WOW = West of Orkney Windfarm. CRM + Low = collision mortality plus low displacement impact scenario. Ex BB are in-combination impacts excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.3 Great black-backed gull

3.1.3.1 Calf of Eday SPA

Table 3-47. PVA Inputs: Great black-backed gull at Calf of Eday SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Great black-backed gull at Calf of Eday SPA	Number of scenarios of impact	1
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM
Species	Great black-backed gull	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	0.0007139509
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	3	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	-
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	116	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.9302198	Scenario C Impact on adult survival rate	-
Productivity rate per pair standard deviation	0.4328549	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.93	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.1	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.93	Scenario D Impact on adult survival rate	-
Immatures survival rates 0 to 1 standard deviation	0.1	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.93	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.1	Scenario E Impact on productivity rate per pair mean	0

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 mean	0.93	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.1	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.93	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.1	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.93	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	0.1	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-48. PVA Outputs: Great black-backed gull at Calf of Eday SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM	0.1	0.0007139509	25	0.9992	0.9992	0.0030	0.9933	1.0054	0.9754	0.9812	0.0807	0.8390	1.1557	48.8	51.8
WoW alone CRM	0.1	0.0007139509	35	0.9992	0.9992	0.0022	0.9946	1.0038	0.9669	0.9738	0.0810	0.8312	1.1471	48.5	51.8
WoW alone CRM	0.1	0.0007139509	50	0.9995	0.9994	0.0015	0.9963	1.0026	0.9675	0.9738	0.0811	0.8313	1.1470	48.5	51.6

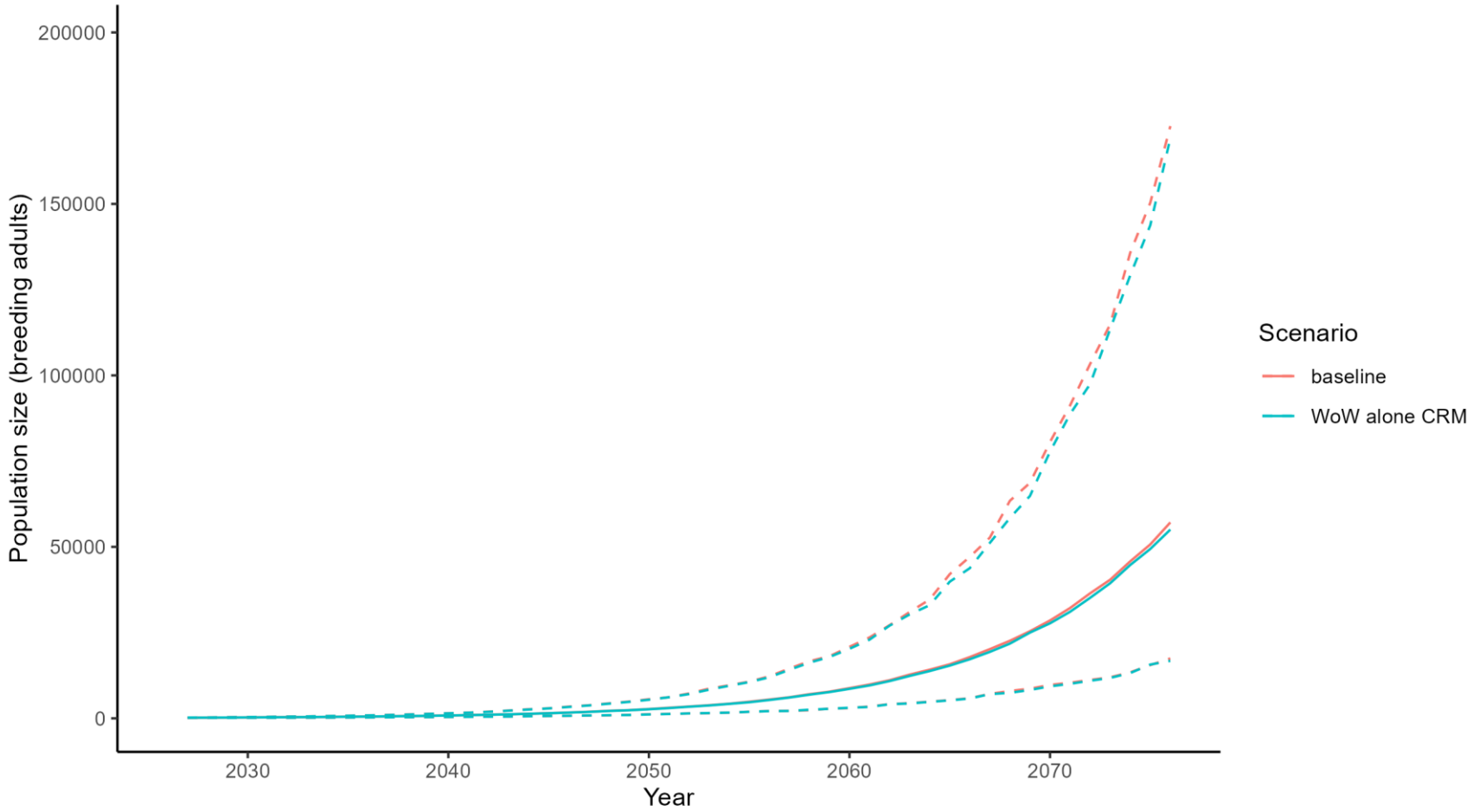

Figure 3-23. Great black-backed gull Calf of Eday SPA. WOW = West of Orkney Windfarm. CRM = collision mortality.

3.1.3.2 *Copinsay SPA*

Table 3-49. PVA Inputs: Great black-backed gull at Copinsay SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Great black-backed gull at Copinsay SPA	Number of scenarios of impact	1
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM
Species	Great black-backed gull	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	0.0005501637
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	3	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	-
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	134	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.9302198	Scenario C Impact on adult survival rate	-
Productivity rate per pair standard deviation	0.4328549	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.93	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.1	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.93	Scenario D Impact on adult survival rate	-
Immatures survival rates 0 to 1 standard deviation	0.1	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.93	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.1	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.93	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.1	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.93	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.1	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.93	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	0.1	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-50. PVA Outputs: Great black-backed gull at Copinsay SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM	0.1	0.0005501637	25	0.9993	0.9993	0.0028	0.9935	1.0052	0.9854	0.9892	0.0771	0.8446	1.1473	48.2	51.5
WoW alone CRM	0.1	0.0005501637	35	0.9994	0.9994	0.0020	0.9954	1.0034	0.9824	0.9837	0.0765	0.8477	1.1449	48.2	51.6
WoW alone CRM	0.1	0.0005501637	50	0.9996	0.9995	0.0014	0.9967	1.0025	0.9809	0.9835	0.0767	0.8429	1.1441	47.5	52.0

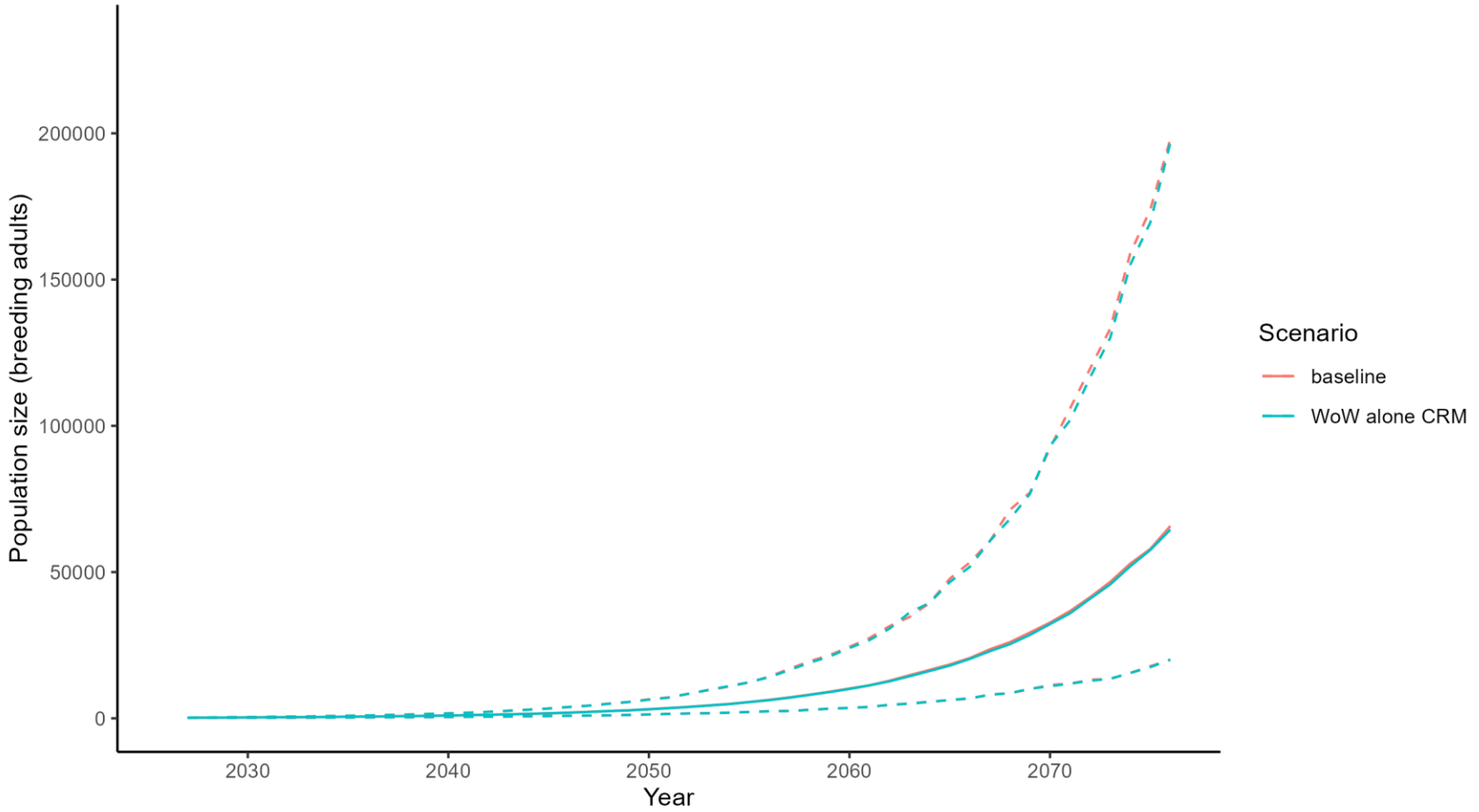

Figure 3-24. Great black-backed gull at Copinsay SPA. WOW = West of Orkney Windfarm. CRM = collision mortality.

3.1.3.3 *East Caithness Cliffs SPA*

Table 3-51. PVA Inputs: Great black-backed gull at East Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Great black-backed gull at East Caithness Cliffs SPA	Number of scenarios of impact	1
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM
Species	Great black-	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	0.0002831385
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	3	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	-
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	532	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.9302198	Scenario C Impact on adult survival rate	-
Productivity rate per pair standard deviation	0.4328549	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.93	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.1	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.93	Scenario D Impact on adult survival rate	-
Immatures survival rates 0 to 1 standard deviation	0.1	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.93	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.1	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.93	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.1	Scenario E Impact on immature survival rate mean	
Immatures survival rates 3 to 4 mean	0.93	Scenario F name	

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.1	Scenario F Impact on productivity rate per pair mean	
Immatures survival rates 4 to 5 mean	0.93	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	0.1	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-52. PVA Outputs: Great black-backed gull at East Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM	0.2	0.0002831385	25	0.9997	0.9997	0.0014	0.9971	1.0025	0.9937	0.9938	0.0388	0.9216	1.0718	50.0	50.0
WoW alone CRM	0.2	0.0002831385	35	0.9997	0.9997	0.0010	0.9977	1.0017	0.9904	0.9904	0.0389	0.9178	1.0686	48.8	50.8
WoW alone CRM	0.2	0.0002831385	50	0.9998	0.9998	0.0007	0.9984	1.0012	0.9901	0.9904	0.0392	0.9190	1.0721	49.9	50.5

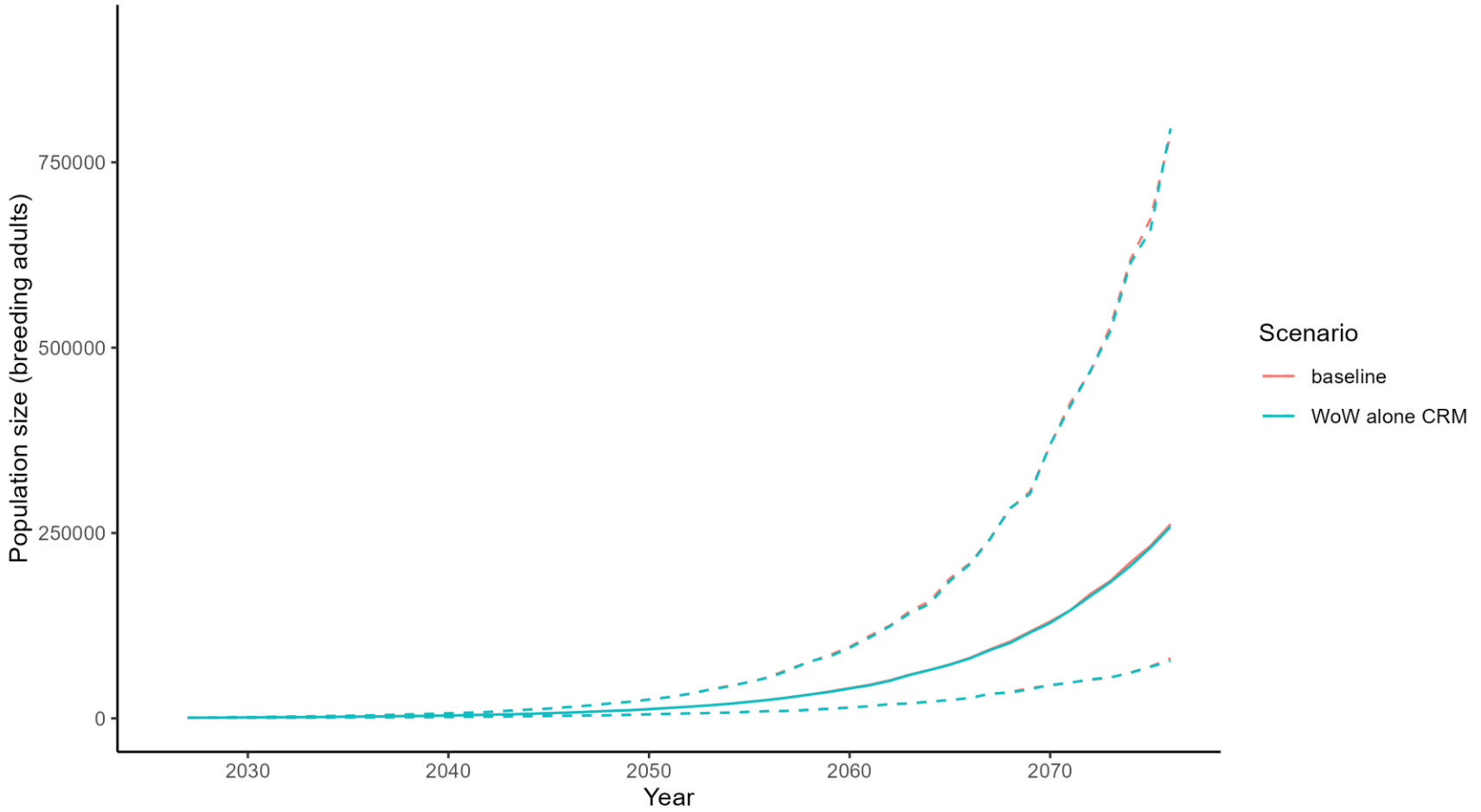

Figure 3-25. Great black-backed gull at East Caithness Cliffs SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. CRM = collision mortality. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.3.4 *Hoy SPA*

Table 3-53. PVA Inputs: Great black-backed gull at Hoy SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Great black-backed gull at Hoy SPA	Number of scenarios of impact	1
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone CRM
Species	Great black-backed gull	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	0.001613343
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	3	Scenario B name	WoW alone CRM+High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	-
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	64	Scenario C name	Incomb CRM+Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.9302198	Scenario C Impact on adult survival rate	-
Productivity rate per pair standard deviation	0.4328549	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.93	Scenario D name	Incomb CRM+High ex. BB
Adult survival rate standard deviation	0.1	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.93	Scenario D Impact on adult survival rate	-
Immatures survival rates 0 to 1 standard deviation	0.1	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.93	Scenario E name	Incomb CRM+Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.1	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.93	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.1	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.93	Scenario F name	Incomb CRM+High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.1	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.93	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	0.1	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-54. PVA Outputs: Great black-backed gull at Hoy SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone CRM	0.1	0.001613343	25	0.9981	0.9982	0.0042	0.9901	1.0064	0.9545	0.9582	0.1089	0.7641	1.1984	45.4	55.0
WoW alone CRM	0.1	0.001613343	35	0.9982	0.9982	0.0031	0.9923	1.0043	0.9366	0.9420	0.1087	0.7509	1.1856	44.5	56.3
WoW alone CRM	0.1	0.001613343	50	0.9987	0.9987	0.0022	0.9945	1.0031	0.9374	0.9422	0.1085	0.7501	1.1864	45.9	53.0

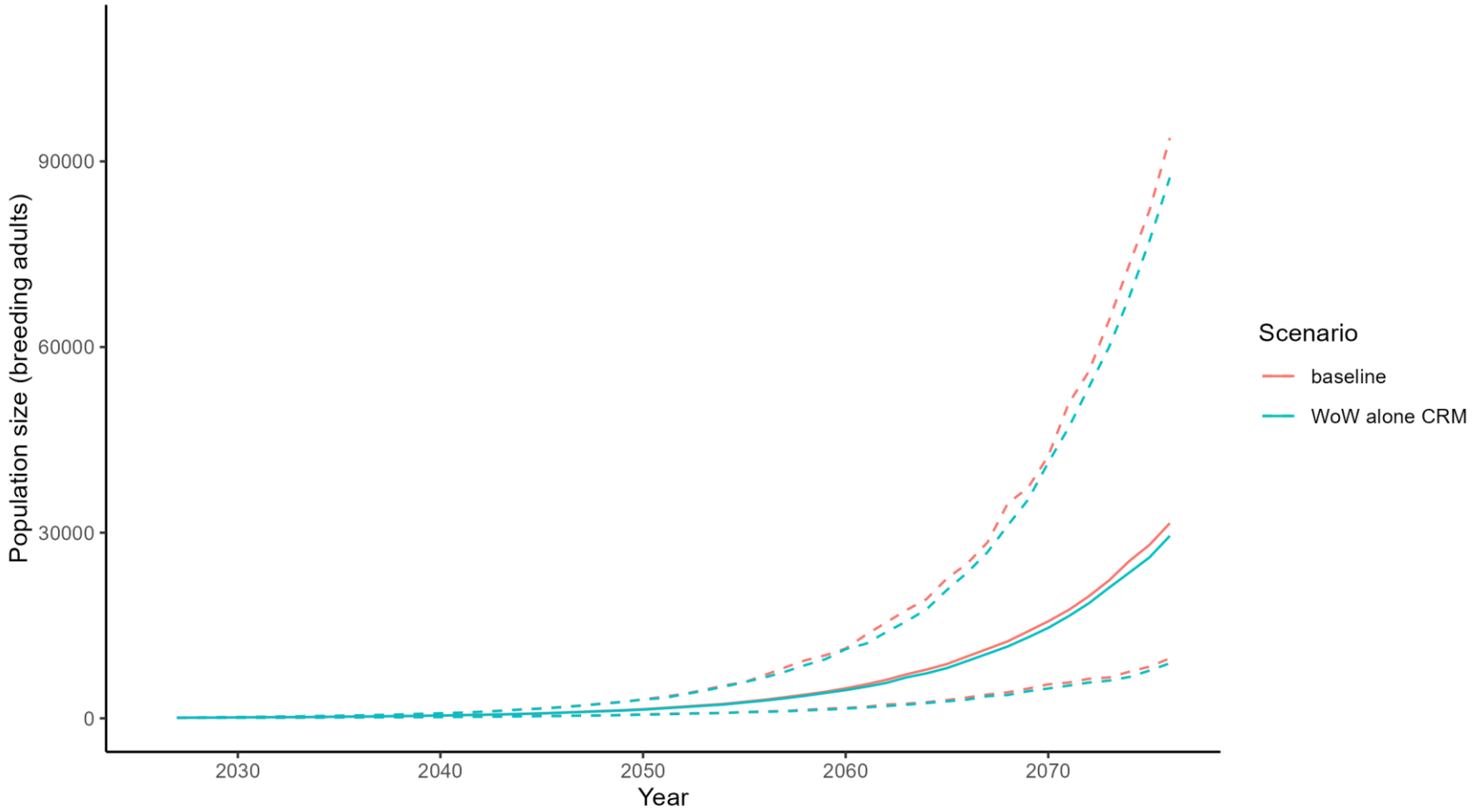

Figure 3-26. Great black-backed gull at Hoy SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. CRM = collision mortality. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4 Guillemot

3.1.4.1 *Calf of Eday SPA*

Table 3-55. PVA Inputs: Guillemot at Calf of Eday SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Calf of Eday SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.8e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	4681	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	4.3499999999999995E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.243E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-56. PVA Outputs: Guillemot at Calf of Eday SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.1	0.000028	25	1.0000	1.0000	0.0009	0.9981	1.0017	0.9982	0.9989	0.0246	0.9503	1.0457	48.4	50.6
WoW alone High	0.4	0.000085	25	0.9999	0.9999	0.0009	0.9981	1.0017	0.9962	0.9973	0.0242	0.9499	1.0455	48.1	51.1
Incomb Low	2.0	0.000435	25	0.9995	0.9995	0.0009	0.9977	1.0014	0.9876	0.9870	0.0243	0.9404	1.0380	47.4	53.3
Incomb High	5.8	0.001243	25	0.9986	0.9986	0.0009	0.9968	1.0004	0.9647	0.9641	0.0240	0.9170	1.0123	42.3	59.4
WoW alone Low	0.1	0.000028	35	1.0000	0.9999	0.0007	0.9985	1.0014	0.9979	0.9982	0.0273	0.9441	1.0530	50.5	49.6
WoW alone High	0.4	0.000085	35	0.9999	0.9999	0.0008	0.9985	1.0014	0.9952	0.9965	0.0276	0.9453	1.0521	49.3	50.5
Incomb Low	2.0	0.000435	35	0.9995	0.9995	0.0007	0.9980	1.0011	0.9821	0.9824	0.0273	0.9294	1.0377	46.5	52.3
Incomb High	5.8	0.001243	35	0.9986	0.9986	0.0008	0.9971	1.0002	0.9511	0.9515	0.0265	0.9024	1.0052	39.7	59.0
WoW alone Low	0.1	0.000028	50	1.0000	1.0000	0.0006	0.9989	1.0011	0.9985	0.9984	0.0300	0.9408	1.0592	49.5	50.3
WoW alone High	0.4	0.000085	50	0.9999	0.9999	0.0006	0.9988	1.0012	0.9960	0.9966	0.0299	0.9426	1.0576	49.5	50.7
Incomb Low	2.0	0.000435	50	0.9997	0.9997	0.0006	0.9985	1.0008	0.9834	0.9831	0.0301	0.9248	1.0451	47.0	52.6
Incomb High	5.8	0.001243	50	0.9990	0.9990	0.0006	0.9979	1.0002	0.9505	0.9515	0.0296	0.8925	1.0112	41.4	58.3

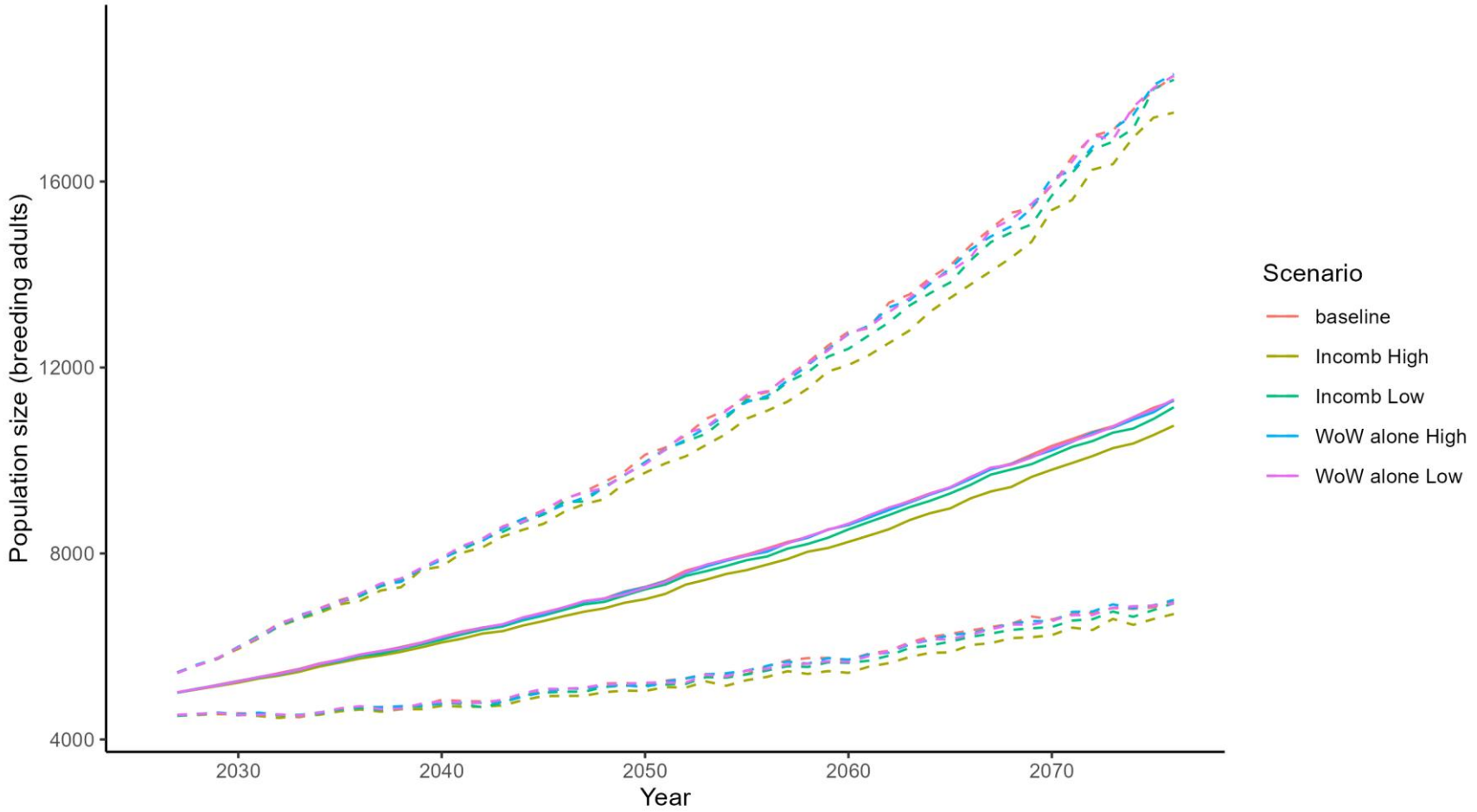

Figure 3-27. Guillemot at Calf of Eday SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.2 *Cape Wrath SPA*

Table 3-57. PVA Inputs: Guillemot at Cape Wrath SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Cape Wrath SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.9e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.6000000000000003E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	51066	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	3.5799999999999997E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.072E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-58. PVA Outputs: Guillemot at Cape Wrath SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	1.5	0.000029	25	1.0000	1.0000	0.0003	0.9995	1.0006	0.9993	0.9995	0.0075	0.9854	1.0153	49.9	50.1
WoW alone High	4.4	0.000086	25	0.9999	0.9999	0.0003	0.9994	1.0005	0.9978	0.9978	0.0072	0.9838	1.0120	49.7	50.5
Incomb Low	18.3	0.000358	25	0.9996	0.9996	0.0003	0.9991	1.0001	0.9901	0.9902	0.0071	0.9760	1.0033	48.2	52.3
Incomb High	54.7	0.001072	25	0.9988	0.9988	0.0003	0.9983	0.9993	0.9697	0.9698	0.0068	0.9564	0.9828	43.6	56.9
WoW alone Low	1.5	0.000029	35	1.0000	1.0000	0.0002	0.9995	1.0004	0.9988	0.9991	0.0085	0.9826	1.0160	49.7	50.1
WoW alone High	4.4	0.000086	35	0.9999	0.9999	0.0002	0.9995	1.0003	0.9969	0.9968	0.0082	0.9801	1.0127	49.7	51.2
Incomb Low	18.3	0.000358	35	0.9996	0.9996	0.0002	0.9992	1.0000	0.9861	0.9861	0.0078	0.9707	1.0016	47.7	53.4
Incomb High	54.7	0.001072	35	0.9988	0.9988	0.0002	0.9984	0.9992	0.9582	0.9583	0.0077	0.9432	0.9729	42.5	58.7
WoW alone Low	1.5	0.000029	50	1.0000	1.0000	0.0002	0.9996	1.0004	0.9991	0.9992	0.0093	0.9810	1.0179	49.9	50.1
WoW alone High	4.4	0.000086	50	0.9999	0.9999	0.0002	0.9996	1.0003	0.9970	0.9969	0.0090	0.9791	1.0144	49.9	50.2
Incomb Low	18.3	0.000358	50	0.9997	0.9997	0.0002	0.9994	1.0001	0.9860	0.9862	0.0087	0.9700	1.0038	48.4	51.9
Incomb High	54.7	0.001072	50	0.9992	0.9992	0.0002	0.9988	0.9995	0.9578	0.9581	0.0087	0.9421	0.9750	42.5	56.9

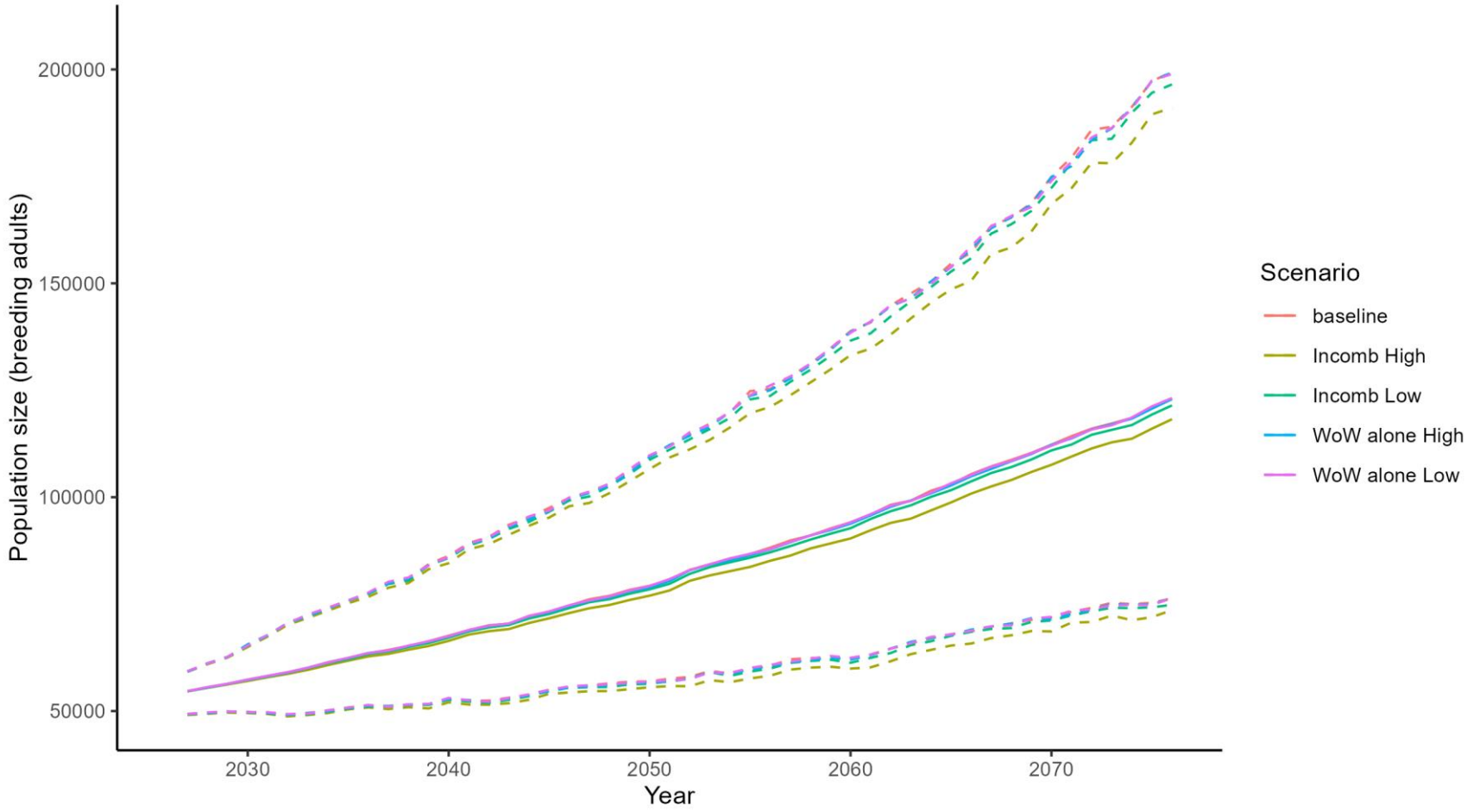

Figure 3-28. Guillemot at Cape Wrath SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.3 *Copinsay SPA*

Table 3-59. PVA Inputs: Guillemot at Copinsay SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Copinsay SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.8e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	24762	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	1.189E-3
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	3.2640000000000004E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-60. PVA Outputs: Guillemot at Copinsay SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.7	0.000028	25	1.0000	1.0000	0.0004	0.9992	1.0007	0.9994	0.9994	0.0100	0.9783	1.0195	49.7	50.5
WoW alone High	2.1	0.000085	25	0.9999	0.9999	0.0004	0.9991	1.0007	0.9973	0.9977	0.0106	0.9769	1.0182	49.0	50.4
Incomb Low	29.4	0.001189	25	0.9987	0.9987	0.0004	0.9979	0.9994	0.9665	0.9665	0.0099	0.9473	0.9849	43.2	57.4
Incomb High	80.8	0.003264	25	0.9964	0.9964	0.0004	0.9956	0.9972	0.9102	0.9103	0.0097	0.8913	0.9293	29.6	70.3
WoW alone Low	0.7	0.000028	35	1.0000	1.0000	0.0003	0.9994	1.0005	0.9990	0.9990	0.0114	0.9777	1.0204	49.8	50.6
WoW alone High	2.1	0.000085	35	0.9999	0.9999	0.0003	0.9993	1.0006	0.9968	0.9969	0.0121	0.9731	1.0196	49.8	51.4
Incomb Low	29.4	0.001189	35	0.9987	0.9987	0.0003	0.9981	0.9993	0.9541	0.9542	0.0111	0.9327	0.9754	41.2	59.2
Incomb High	80.8	0.003264	35	0.9964	0.9964	0.0003	0.9957	0.9970	0.8774	0.8776	0.0106	0.8559	0.8984	25.5	74.1
WoW alone Low	0.7	0.000028	50	1.0000	1.0000	0.0003	0.9995	1.0005	0.9984	0.9992	0.0129	0.9735	1.0239	49.6	50.6
WoW alone High	2.1	0.000085	50	0.9999	0.9999	0.0002	0.9995	1.0004	0.9974	0.9971	0.0131	0.9714	1.0223	49.0	50.9
Incomb Low	29.4	0.001189	50	0.9991	0.9991	0.0003	0.9986	0.9996	0.9537	0.9540	0.0125	0.9304	0.9776	41.0	58.1
Incomb High	80.8	0.003264	50	0.9974	0.9974	0.0003	0.9969	0.9979	0.8765	0.8771	0.0117	0.8548	0.9006	28.8	71.6

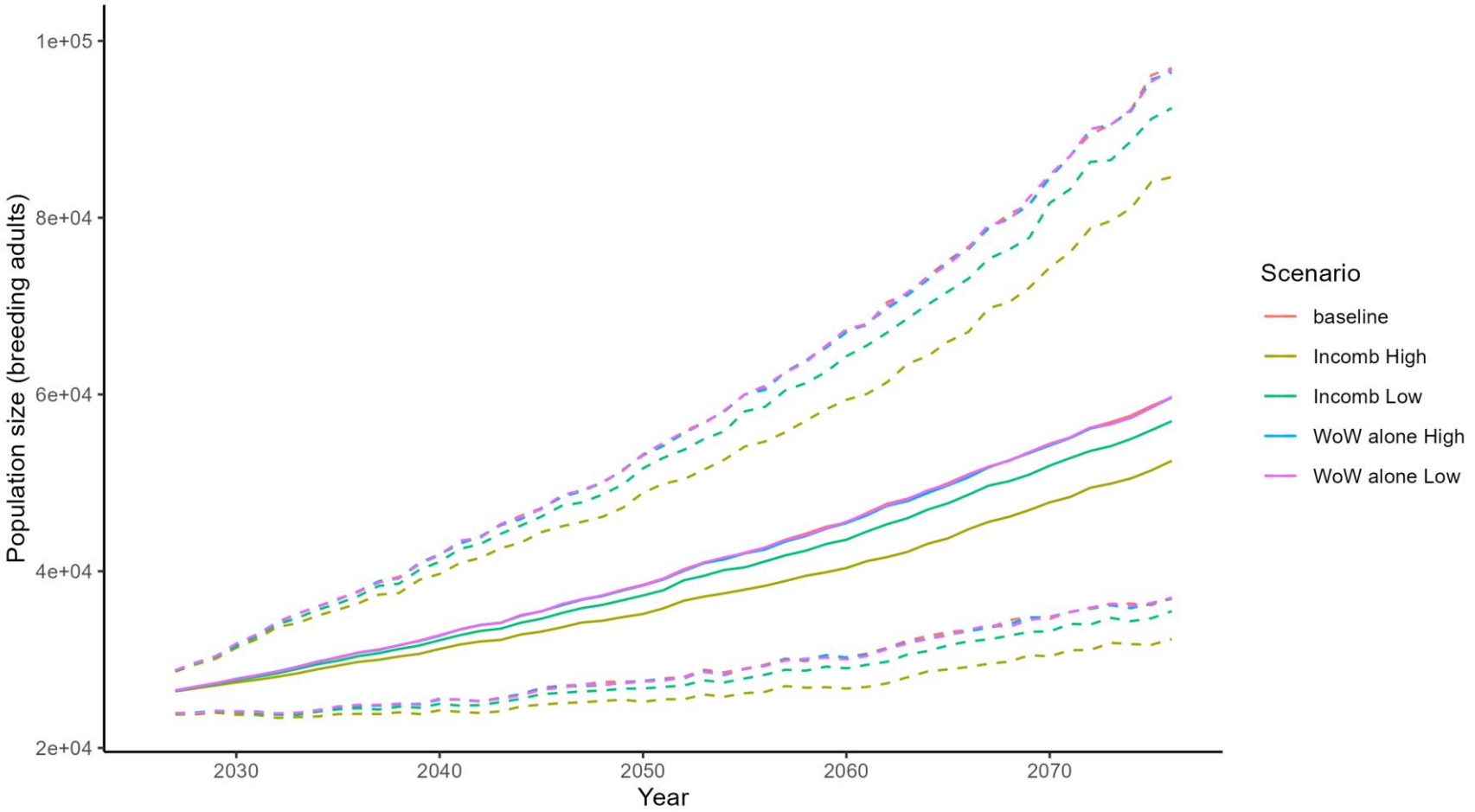

Figure 3-29. Guillemot at Copinsay SPA.

Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.4 *East Caithness Cliffs SPA*

Table 3-61. PVA Inputs: Guillemot at East Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at East Caithness Cliffs SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.8e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	199966	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	3.3139999999999997E-3
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	7.1380000000000002E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-62. PVA Outputs: Guillemot at East Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	5.6	0.000028	25	1.0000	1.0000	0.0001	0.9997	1.0002	0.9992	0.9992	0.0036	0.9923	1.0062	49.9	50.1
WoW alone High	17.0	0.000085	25	0.9999	0.9999	0.0001	0.9996	1.0002	0.9977	0.9977	0.0037	0.9906	1.0053	49.4	50.8
Incomb Low	662.7	0.003314	25	0.9963	0.9963	0.0001	0.9960	0.9966	0.9089	0.9089	0.0035	0.9022	0.9155	29.3	70.4
Incomb High	1,427.4	0.007138	25	0.9921	0.9921	0.0002	0.9918	0.9924	0.8134	0.8133	0.0033	0.8066	0.8200	12.1	88.6
WoW alone Low	5.6	0.000028	35	1.0000	1.0000	0.0001	0.9998	1.0002	0.9989	0.9989	0.0042	0.9913	1.0070	49.9	50.2
WoW alone High	17.0	0.000085	35	0.9999	0.9999	0.0001	0.9997	1.0001	0.9967	0.9968	0.0042	0.9887	1.0051	49.6	50.5
Incomb Low	662.7	0.003314	35	0.9963	0.9963	0.0001	0.9961	0.9966	0.8758	0.8758	0.0037	0.8687	0.8832	25.8	74.0
Incomb High	1,427.4	0.007138	35	0.9921	0.9921	0.0001	0.9918	0.9923	0.7509	0.7508	0.0035	0.7442	0.7574	8.2	92.0
WoW alone Low	5.6	0.000028	50	1.0000	1.0000	0.0001	0.9998	1.0002	0.9989	0.9990	0.0046	0.9901	1.0083	49.6	50.2
WoW alone High	17.0	0.000085	50	0.9999	0.9999	0.0001	0.9998	1.0001	0.9968	0.9968	0.0047	0.9872	1.0060	48.9	50.6
Incomb Low	662.7	0.003314	50	0.9974	0.9974	0.0001	0.9972	0.9976	0.8753	0.8753	0.0043	0.8672	0.8836	28.5	70.8
Incomb High	1,427.4	0.007138	50	0.9944	0.9944	0.0001	0.9942	0.9946	0.7498	0.7497	0.0038	0.7422	0.7571	11.4	87.3

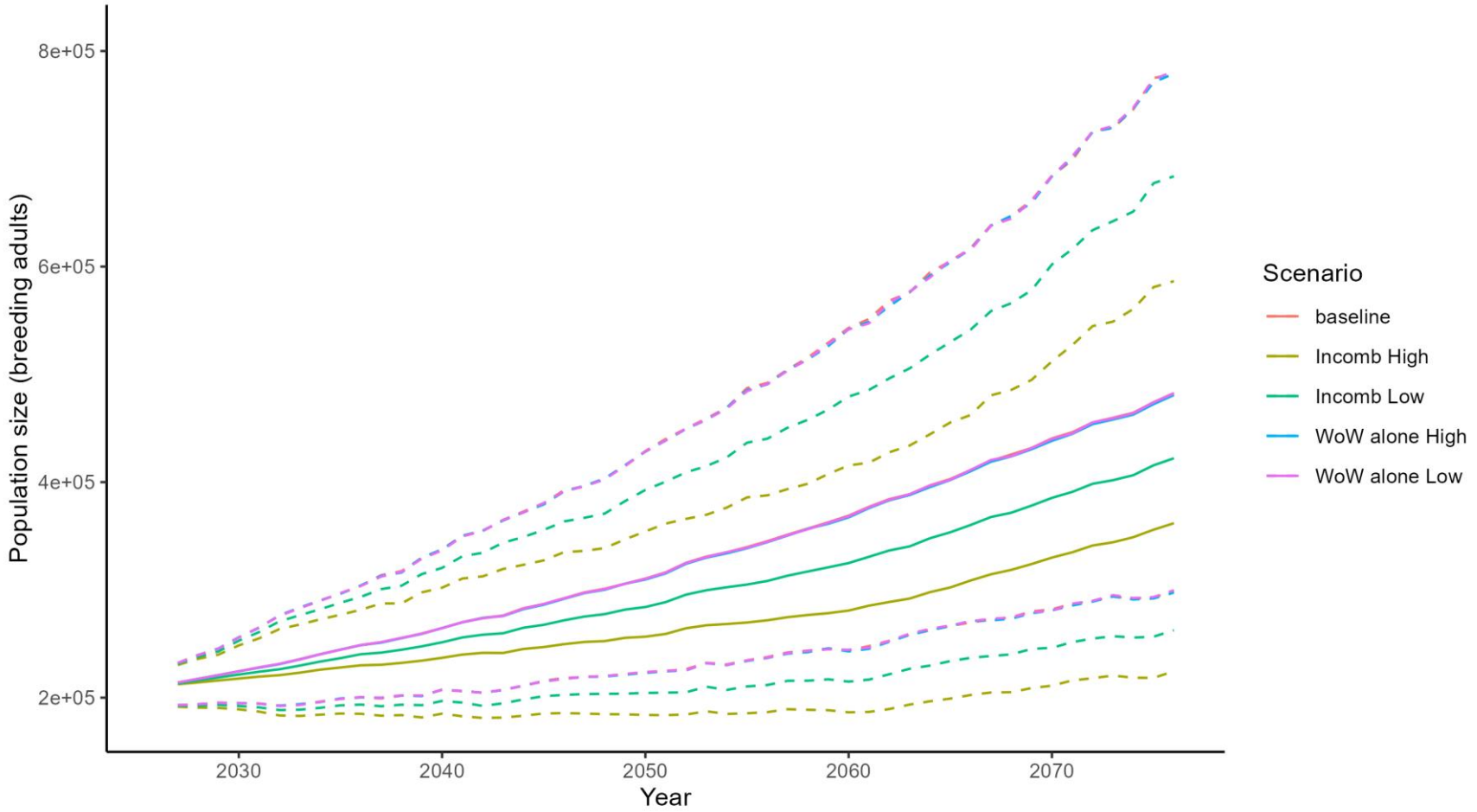

Figure 3-30. Guillemot at East Caithness Cliffs SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.5 *Fair Isle SPA*

Table 3-63. PVA Inputs: Guillemot at Fair Isle SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Fair Isle SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	No
Case studies	None	Are impacts specified separately for immatures	No
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	No
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	Yes
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.8e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	24515	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.502	Scenario C Impact on adult survival rate	1.0800000000000001E-4
Productivity rate per pair standard deviation	0.208	Scenario C Impact on immature survival rate mean	
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	3.01E-4
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-64. PVA Outputs: Guillemot at Fair Isle SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.7	0.000028	25	1.0000	1.0000	0.0004	0.9992	1.0008	0.9999	0.9997	0.0104	0.9793	1.0206	50.4	49.6
WoW alone High	2.1	0.000085	25	0.9999	0.9999	0.0004	0.9992	1.0007	0.9974	0.9978	0.0105	0.9778	1.0188	49.3	50.7
Incomb Low	2.6	0.000108	25	0.9999	0.9999	0.0004	0.9992	1.0006	0.9969	0.9974	0.0104	0.9768	1.0180	49.2	50.4
Incomb High	7.4	0.000301	25	0.9997	0.9997	0.0004	0.9989	1.0004	0.9916	0.9918	0.0101	0.9723	1.0113	48.8	52.1
WoW alone Low	0.7	0.000028	35	1.0000	1.0000	0.0003	0.9994	1.0006	0.9991	0.9993	0.0118	0.9762	1.0222	49.6	50.4
WoW alone High	2.1	0.000085	35	0.9999	0.9999	0.0003	0.9993	1.0005	0.9963	0.9968	0.0118	0.9754	1.0194	49.6	50.7
Incomb Low	2.6	0.000108	35	0.9999	0.9999	0.0003	0.9993	1.0005	0.9958	0.9962	0.0114	0.9744	1.0196	49.5	50.7
Incomb High	7.4	0.000301	35	0.9997	0.9997	0.0003	0.9991	1.0003	0.9881	0.9883	0.0115	0.9662	1.0109	48.6	52.4
WoW alone Low	0.7	0.000028	50	1.0000	1.0000	0.0003	0.9995	1.0005	0.9991	0.9992	0.0133	0.9743	1.0275	50.0	50.1
WoW alone High	2.1	0.000085	50	0.9999	0.9999	0.0002	0.9995	1.0004	0.9965	0.9968	0.0130	0.9728	1.0234	49.9	50.1
Incomb Low	2.6	0.000108	50	0.9999	0.9999	0.0002	0.9995	1.0004	0.9958	0.9961	0.0127	0.9714	1.0221	50.0	50.1
Incomb High	7.4	0.000301	50	0.9998	0.9998	0.0002	0.9993	1.0003	0.9879	0.9885	0.0128	0.9635	1.0153	48.0	51.1

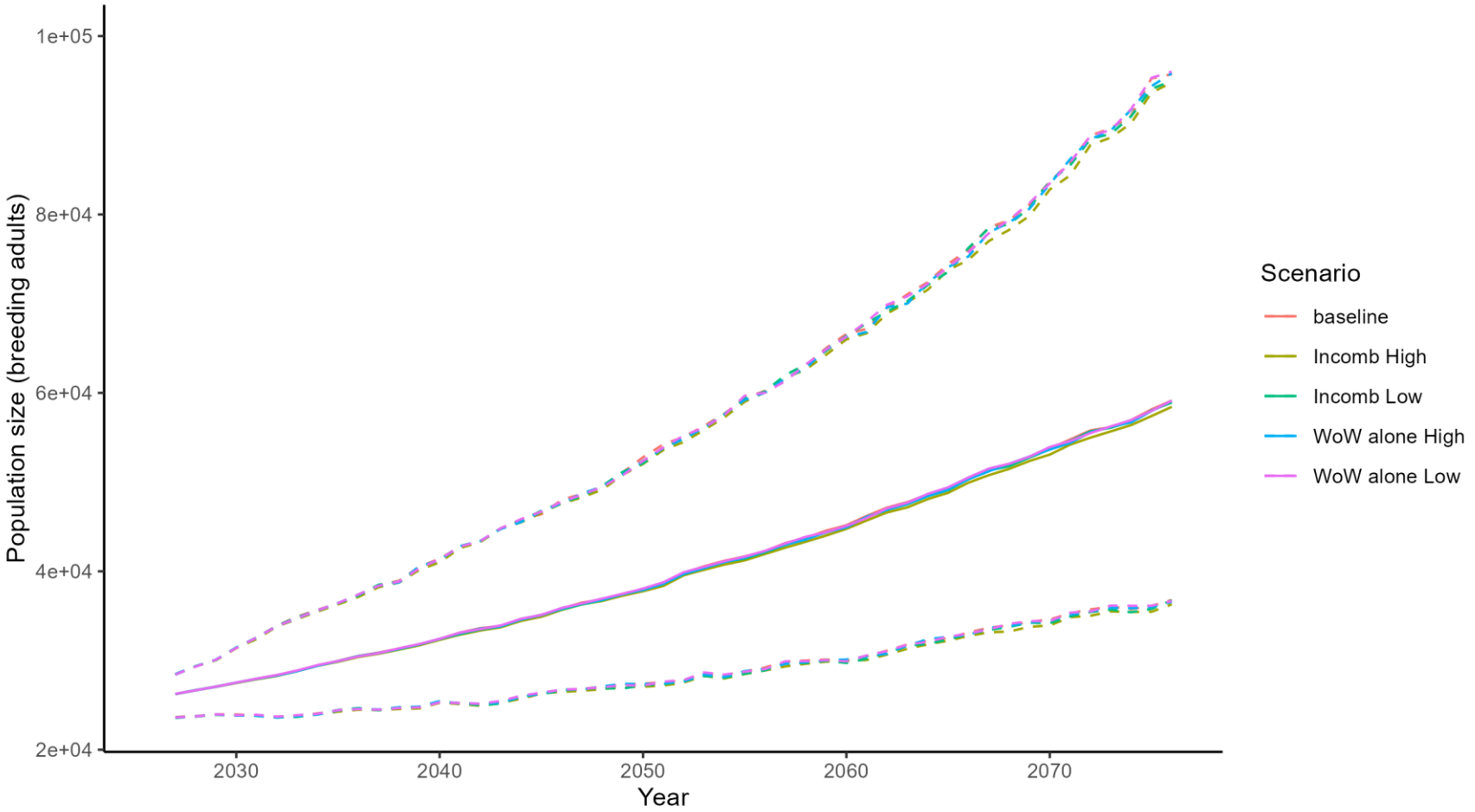

Figure 3-31. Guillemot at Fair Isle SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.6 *Handa SPA*

Table 3-65. PVA Inputs: Guillemot at Handa SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Handa SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.9e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	73250	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	3.57E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.0689999999999999E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-66. PVA Outputs: Guillemot at Handa SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	2.1	0.000029	25	1.0000	1.0000	0.0002	0.9995	1.0004	0.9992	0.9992	0.0063	0.9869	1.0106	49.9	50.3
WoW alone High	6.2	0.000085	25	0.9999	0.9999	0.0002	0.9995	1.0003	0.9974	0.9975	0.0060	0.9863	1.0097	49.6	50.5
Incomb Low	26.2	0.000357	25	0.9996	0.9996	0.0002	0.9992	1.0001	0.9897	0.9897	0.0062	0.9777	1.0020	48.1	52.1
Incomb High	78.3	0.001069	25	0.9988	0.9988	0.0002	0.9983	0.9993	0.9695	0.9697	0.0059	0.9581	0.9812	43.6	56.7
WoW alone Low	2.1	0.000029	35	1.0000	1.0000	0.0002	0.9996	1.0003	0.9990	0.9988	0.0069	0.9857	1.0119	49.8	50.3
WoW alone High	6.2	0.000085	35	0.9999	0.9999	0.0002	0.9995	1.0003	0.9970	0.9967	0.0068	0.9836	1.0095	49.6	50.6
Incomb Low	26.2	0.000357	35	0.9996	0.9996	0.0002	0.9993	1.0000	0.9858	0.9858	0.0065	0.9733	0.9987	47.8	53.1
Incomb High	78.3	0.001069	35	0.9988	0.9988	0.0002	0.9985	0.9992	0.9580	0.9581	0.0063	0.9456	0.9700	42.3	58.3
WoW alone Low	2.1	0.000029	50	1.0000	1.0000	0.0001	0.9997	1.0003	0.9990	0.9989	0.0077	0.9845	1.0134	50.0	50.0
WoW alone High	6.2	0.000085	50	0.9999	0.9999	0.0001	0.9997	1.0002	0.9969	0.9969	0.0075	0.9830	1.0120	49.9	50.2
Incomb Low	26.2	0.000357	50	0.9997	0.9997	0.0001	0.9994	1.0000	0.9858	0.9857	0.0073	0.9713	1.0002	47.3	51.9
Incomb High	78.3	0.001069	50	0.9992	0.9992	0.0001	0.9989	0.9994	0.9579	0.9579	0.0071	0.9434	0.9710	41.9	56.7

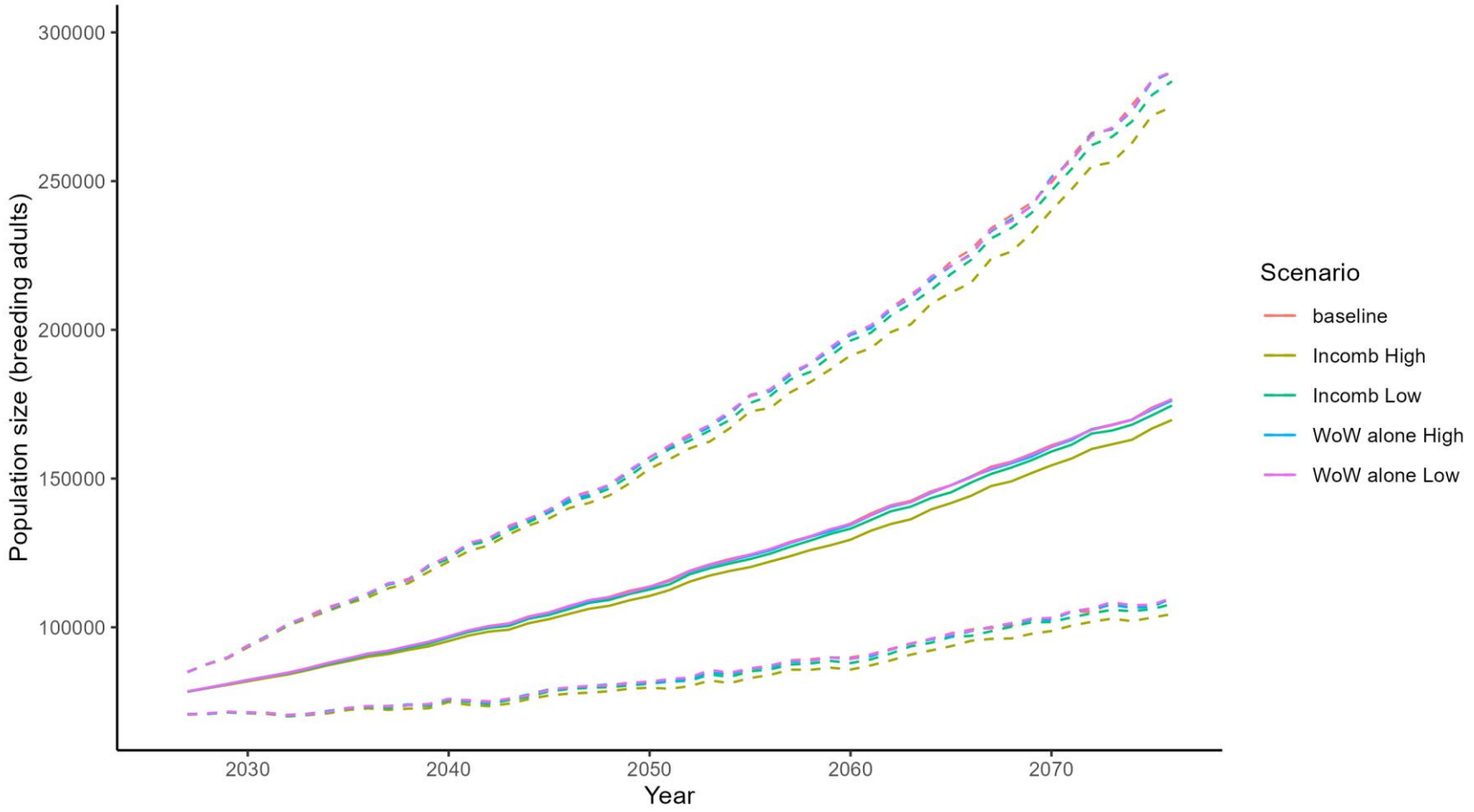

Figure 3-32. Guillemot at Handa SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.7 *Hoy SPA*

Table 3-67. PVA Inputs: Guillemot at Hoy SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Hoy SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.9e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.6000000000000003E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	12390	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	5.3199999999999992E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.4039999999999999E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-68. PVA Outputs: Guillemot at Hoy SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.4	0.000029	25	1.0000	1.0000	0.0005	0.9989	1.0010	0.9994	0.9991	0.0148	0.9691	1.0287	49.5	50.4
WoW alone High	1.1	0.000086	25	0.9999	0.9999	0.0005	0.9989	1.0010	0.9969	0.9972	0.0147	0.9695	1.0269	49.4	50.5
Incomb Low	6.6	0.000532	25	0.9994	0.9994	0.0005	0.9983	1.0005	0.9848	0.9846	0.0148	0.9548	1.0147	46.3	52.9
Incomb High	17.4	0.001404	25	0.9984	0.9984	0.0005	0.9974	0.9995	0.9597	0.9598	0.0143	0.9319	0.9885	42.0	59.5
WoW alone Low	0.4	0.000029	35	0.9999	1.0000	0.0004	0.9991	1.0008	0.9985	0.9985	0.0165	0.9662	1.0321	49.7	50.2
WoW alone High	1.1	0.000086	35	0.9999	0.9999	0.0004	0.9990	1.0008	0.9961	0.9964	0.0162	0.9663	1.0303	49.4	50.8
Incomb Low	6.6	0.000532	35	0.9994	0.9994	0.0004	0.9985	1.0003	0.9786	0.9787	0.0163	0.9474	1.0101	46.2	54.2
Incomb High	17.4	0.001404	35	0.9984	0.9984	0.0005	0.9975	0.9993	0.9444	0.9445	0.0158	0.9126	0.9749	39.7	60.5
WoW alone Low	0.4	0.000029	50	1.0000	1.0000	0.0004	0.9993	1.0006	0.9980	0.9983	0.0184	0.9628	1.0357	49.6	50.7
WoW alone High	1.1	0.000086	50	0.9999	0.9999	0.0003	0.9993	1.0006	0.9961	0.9964	0.0182	0.9600	1.0318	49.3	51.0
Incomb Low	6.6	0.000532	50	0.9996	0.9996	0.0004	0.9989	1.0003	0.9784	0.9786	0.0188	0.9429	1.0166	45.5	53.7
Incomb High	17.4	0.001404	50	0.9989	0.9989	0.0004	0.9982	0.9996	0.9441	0.9444	0.0177	0.9110	0.9793	40.6	58.8

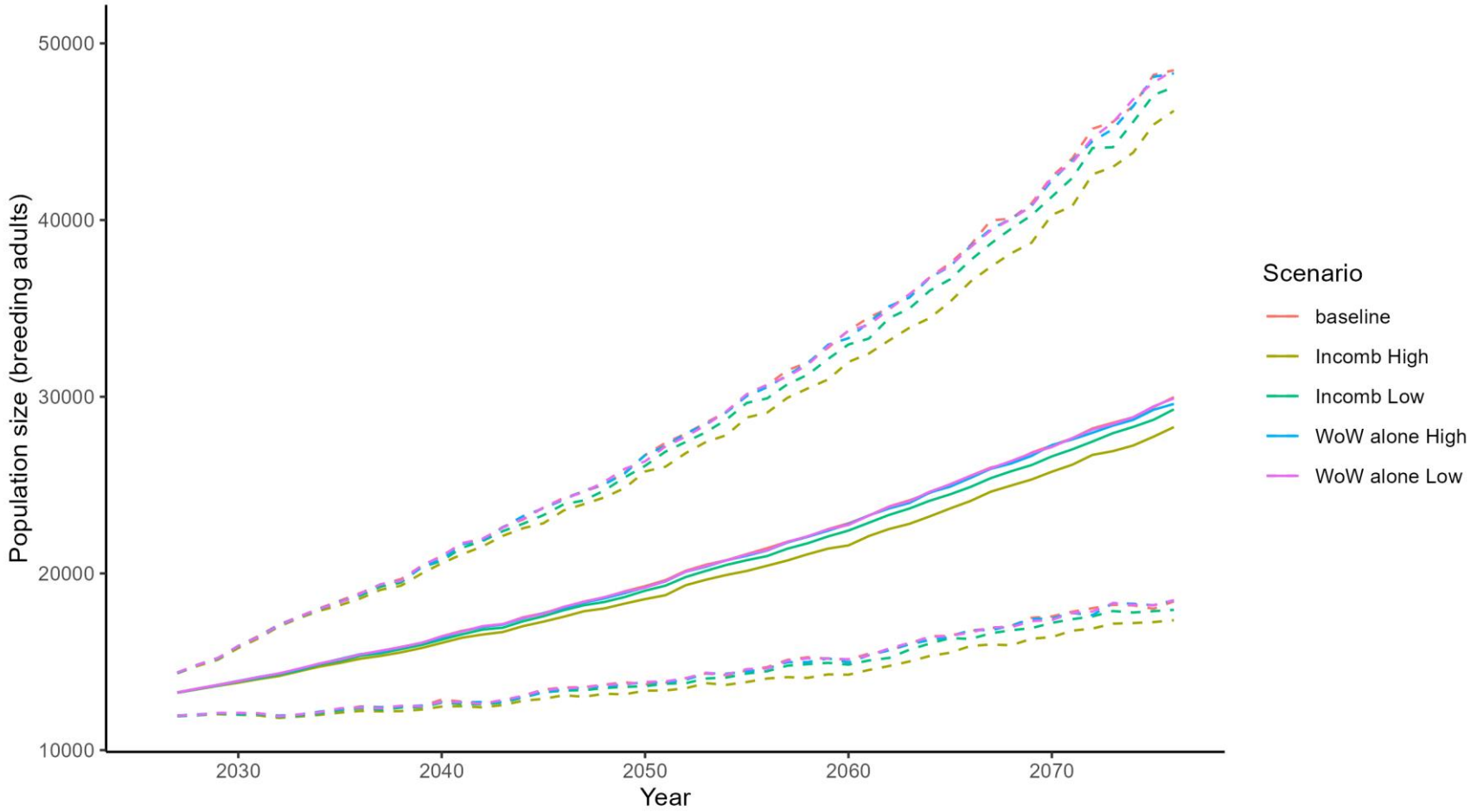

Figure 3-33. Guillemot at Hoy SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.8 Marwick Head SPA

Table 3-69. PVA Inputs: Guillemot at Marwick Head SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Marwick Head SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.9e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.6000000000000003E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	16060	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	4.4299999999999998E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.256E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-70. SPA Outputs: Guillemot at Marwick Head PSA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.5	0.000029	25	1.0000	1.0000	0.0005	0.9990	1.0009	0.9993	0.9996	0.0129	0.9737	1.0250	49.5	50.5
WoW alone High	1.4	0.000086	25	1.0000	0.9999	0.0005	0.9990	1.0009	0.9985	0.9985	0.0128	0.9733	1.0239	49.5	51.0
Incomb Low	7.1	0.000443	25	0.9995	0.9995	0.0005	0.9985	1.0005	0.9881	0.9880	0.0128	0.9624	1.0145	47.8	52.6
Incomb High	20.2	0.001256	25	0.9986	0.9986	0.0005	0.9977	0.9996	0.9657	0.9654	0.0125	0.9417	0.9904	42.8	57.6
WoW alone Low	0.5	0.000029	35	1.0000	1.0000	0.0004	0.9992	1.0007	0.9989	0.9993	0.0145	0.9711	1.0283	49.5	50.6
WoW alone High	1.4	0.000086	35	0.9999	0.9999	0.0004	0.9992	1.0007	0.9978	0.9976	0.0145	0.9697	1.0265	49.2	51.1
Incomb Low	7.1	0.000443	35	0.9995	0.9995	0.0004	0.9987	1.0003	0.9830	0.9830	0.0141	0.9545	1.0101	47.6	53.7
Incomb High	20.2	0.001256	35	0.9986	0.9986	0.0004	0.9979	0.9993	0.9521	0.9519	0.0137	0.9262	0.9789	41.4	59.7
WoW alone Low	0.5	0.000029	50	1.0000	1.0000	0.0003	0.9994	1.0006	0.9989	0.9996	0.0160	0.9677	1.0314	49.8	50.2
WoW alone High	1.4	0.000086	50	1.0000	1.0000	0.0003	0.9994	1.0006	0.9983	0.9982	0.0161	0.9667	1.0294	49.5	50.4
Incomb Low	7.1	0.000443	50	0.9997	0.9997	0.0003	0.9990	1.0003	0.9824	0.9835	0.0159	0.9524	1.0153	46.7	52.5
Incomb High	20.2	0.001256	50	0.9990	0.9990	0.0003	0.9984	0.9997	0.9525	0.9522	0.0156	0.9225	0.9834	41.1	58.2

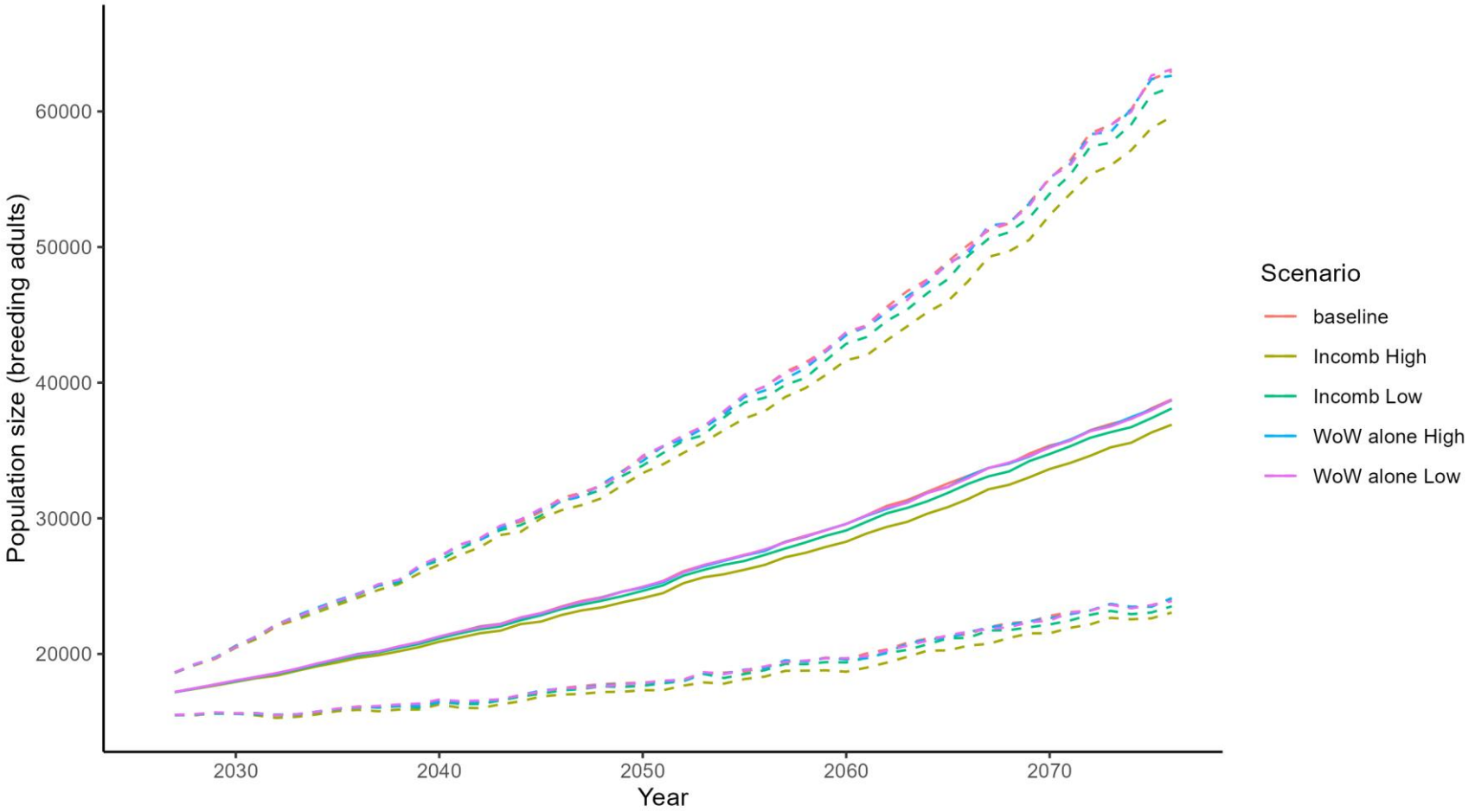

Figure 3-34. Guillemot at Marwick Head SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.9 *North Caithness Cliffs SPA*

Table 3-71. PVA Inputs: Guillemot at North Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at North Caithness Cliffs SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.9e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.6000000000000003E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	52123	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	1.774E-3
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	4.5650000000000005E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-72. PVA Outputs: Guillemot at North Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	1.5	0.000029	25	1.0000	1.0000	0.0003	0.9995	1.0004	0.9991	0.9989	0.0068	0.9858	1.0120	50.0	50.1
WoW alone High	4.5	0.000086	25	0.9999	0.9999	0.0003	0.9994	1.0004	0.9975	0.9975	0.0071	0.9841	1.0113	49.2	51.0
Incomb Low	92.5	0.001774	25	0.9980	0.9980	0.0003	0.9976	0.9985	0.9501	0.9502	0.0067	0.9380	0.9630	39.7	62.4
Incomb High	237.9	0.004565	25	0.9949	0.9949	0.0003	0.9944	0.9954	0.8767	0.8764	0.0062	0.8644	0.8887	23.1	77.7
WoW alone Low	1.5	0.000029	35	1.0000	1.0000	0.0002	0.9995	1.0003	0.9987	0.9984	0.0077	0.9829	1.0133	49.9	50.3
WoW alone High	4.5	0.000086	35	0.9999	0.9999	0.0002	0.9995	1.0003	0.9967	0.9967	0.0080	0.9815	1.0129	49.7	50.6
Incomb Low	92.5	0.001774	35	0.9980	0.9980	0.0002	0.9976	0.9984	0.9315	0.9316	0.0072	0.9186	0.9449	36.5	63.3
Incomb High	237.9	0.004565	35	0.9949	0.9949	0.0002	0.9945	0.9954	0.8329	0.8329	0.0069	0.8196	0.8460	17.9	82.1
WoW alone Low	1.5	0.000029	50	1.0000	1.0000	0.0002	0.9996	1.0003	0.9984	0.9983	0.0086	0.9812	1.0147	49.5	50.4
WoW alone High	4.5	0.000086	50	0.9999	0.9999	0.0002	0.9996	1.0003	0.9970	0.9967	0.0089	0.9792	1.0142	49.7	50.3
Incomb Low	92.5	0.001774	50	0.9986	0.9986	0.0002	0.9983	0.9989	0.9309	0.9311	0.0082	0.9160	0.9480	38.4	60.5
Incomb High	237.9	0.004565	50	0.9964	0.9964	0.0002	0.9961	0.9967	0.8318	0.8320	0.0077	0.8171	0.8465	22.1	78.3

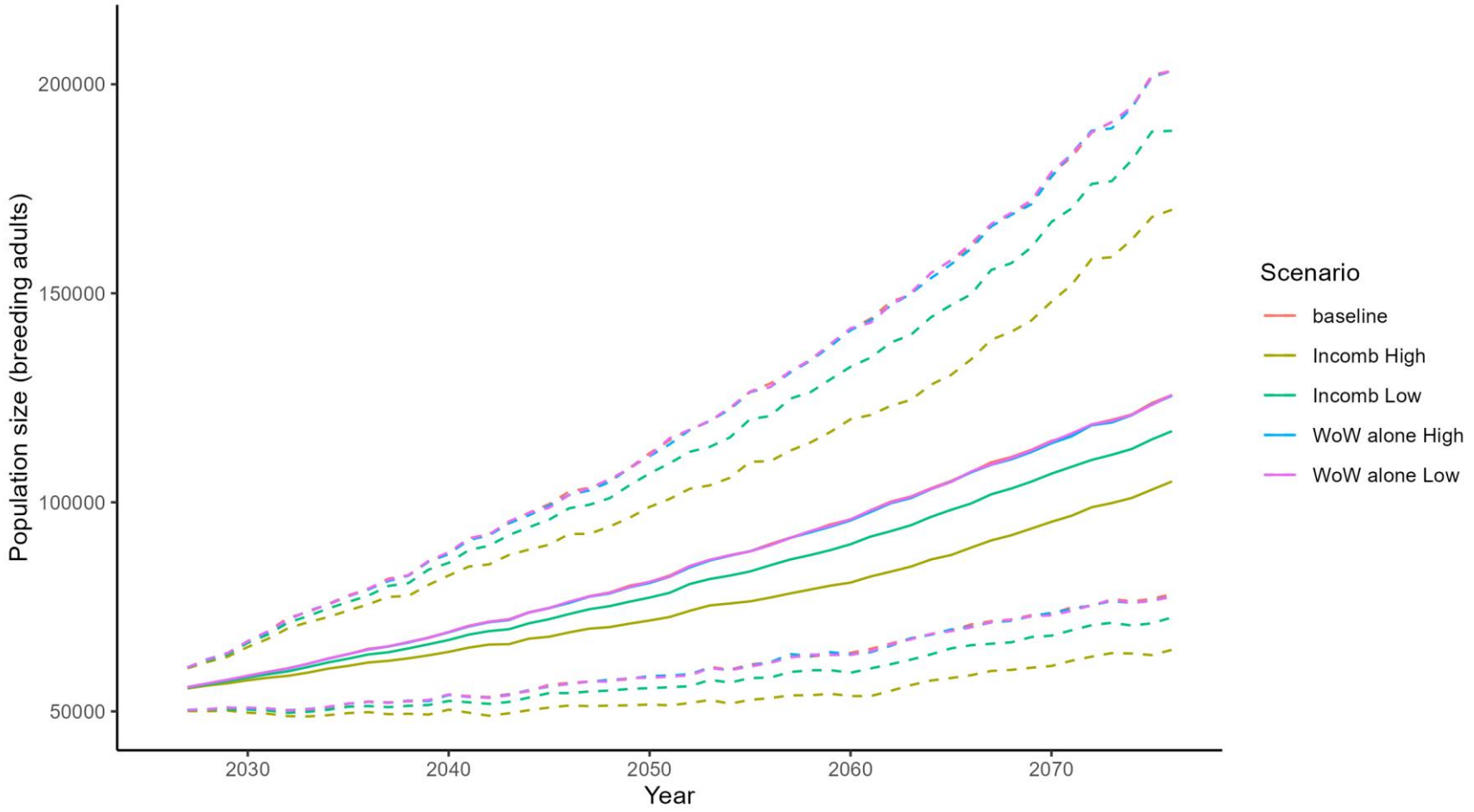

Figure 3-35. Guillemot at North Caithness Cliffs SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.10 Rousay SPA

Table 3-73. PVA Inputs: Guillemot at Rousay SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Rousay SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.9e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	7921	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	4.4099999999999999E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.253E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-74. PVA Outputs: Guillemot at Rousay PVA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.2	0.000029	25	1.0000	1.0000	0.0007	0.9987	1.0013	0.9991	0.9998	0.0184	0.9644	1.0365	50.5	49.6
WoW alone High	0.7	0.000085	25	0.9999	0.9999	0.0007	0.9985	1.0012	0.9978	0.9974	0.0188	0.9601	1.0333	49.2	50.7
Incomb Low	3.5	0.000441	25	0.9995	0.9995	0.0007	0.9982	1.0008	0.9872	0.9874	0.0188	0.9509	1.0260	47.5	52.9
Incomb High	9.9	0.001253	25	0.9986	0.9986	0.0007	0.9973	1.0000	0.9651	0.9650	0.0177	0.9307	1.0016	42.8	57.4
WoW alone Low	0.2	0.000029	35	1.0000	1.0000	0.0006	0.9989	1.0010	0.9997	0.9996	0.0208	0.9599	1.0390	50.0	50.0
WoW alone High	0.7	0.000085	35	0.9999	0.9999	0.0006	0.9987	1.0010	0.9961	0.9962	0.0212	0.9539	1.0377	49.4	50.4
Incomb Low	3.5	0.000441	35	0.9995	0.9995	0.0006	0.9984	1.0006	0.9830	0.9826	0.0210	0.9428	1.0251	47.7	52.1
Incomb High	9.9	0.001253	35	0.9986	0.9986	0.0006	0.9975	0.9997	0.9519	0.9516	0.0200	0.9135	0.9915	40.9	58.8
WoW alone Low	0.2	0.000029	50	1.0000	1.0000	0.0004	0.9992	1.0008	0.9994	0.9999	0.0229	0.9576	1.0452	50.5	49.7
WoW alone High	0.7	0.000085	50	0.9999	0.9999	0.0005	0.9990	1.0008	0.9965	0.9966	0.0237	0.9502	1.0423	49.1	50.4
Incomb Low	3.5	0.000441	50	0.9997	0.9997	0.0005	0.9987	1.0005	0.9828	0.9833	0.0233	0.9393	1.0291	47.5	51.7
Incomb High	9.9	0.001253	50	0.9990	0.9990	0.0004	0.9981	0.9999	0.9522	0.9520	0.0220	0.9090	0.9952	41.0	58.1

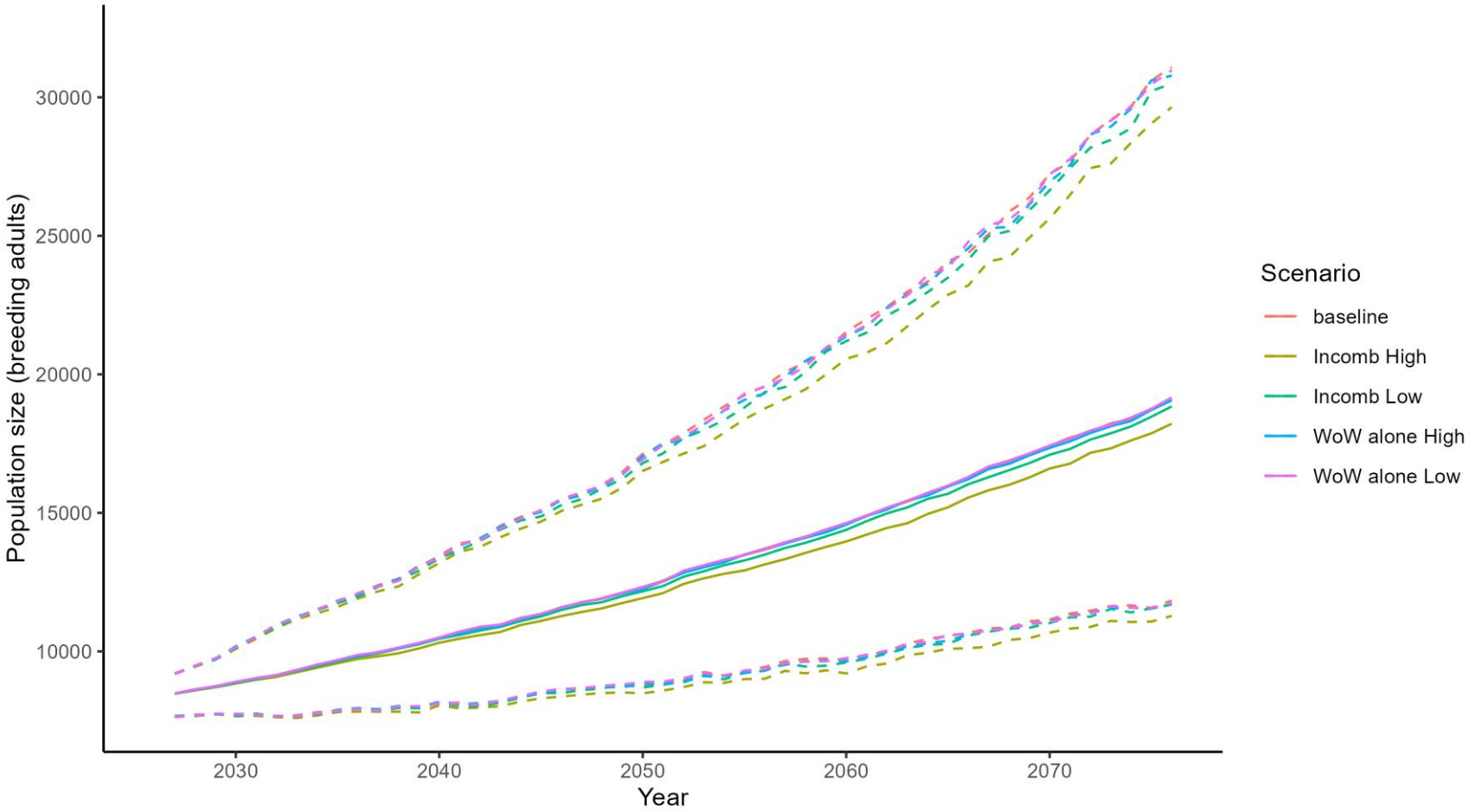

Figure 3-36. Guillemot at Rousay SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.11 *Sule Skerry and Sule Stack SPA*

Table 3-75. PVA Inputs: Guillemot at Sule Skerry and Sule Stack SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at Sule Skerry and Sule Stack SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	0.006334
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	1.0595E-2
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	12060	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	6.7169999999999999E-3
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.1669000000000001E-2
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-76. PVA Outputs: Guillemot at Sule Skerry and Sule Stack SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	76.4	0.006334	25	0.9930	0.9930	0.0006	0.9918	0.9942	0.8320	0.8330	0.0132	0.8068	0.8603	15.6	85.0
WoW alone High	127.8	0.010595	25	0.9883	0.9883	0.0006	0.9871	0.9894	0.7360	0.7359	0.0117	0.7119	0.7600	4.1	97.1
Incomb Low	81.0	0.006717	25	0.9926	0.9926	0.0006	0.9914	0.9937	0.8242	0.8237	0.0126	0.7988	0.8473	13.3	86.8
Incomb High	140.7	0.011669	25	0.9871	0.9871	0.0006	0.9858	0.9882	0.7132	0.7131	0.0113	0.6895	0.7355	3.1	98.2
WoW alone Low	76.4	0.006334	35	0.9930	0.9930	0.0005	0.9920	0.9939	0.7765	0.7761	0.0138	0.7507	0.8025	10.0	88.7
WoW alone High	127.8	0.010595	35	0.9883	0.9882	0.0005	0.9873	0.9891	0.6536	0.6534	0.0118	0.6312	0.6764	2.3	98.5
Incomb Low	81.0	0.006717	35	0.9926	0.9925	0.0005	0.9916	0.9934	0.7647	0.7641	0.0135	0.7369	0.7897	8.6	90.6
Incomb High	140.7	0.011669	35	0.9870	0.9871	0.0005	0.9860	0.9880	0.6254	0.6257	0.0114	0.6015	0.6478	1.5	99.4
WoW alone Low	76.4	0.006334	50	0.9950	0.9950	0.0004	0.9942	0.9958	0.7749	0.7750	0.0156	0.7431	0.8044	14.2	84.9
WoW alone High	127.8	0.010595	50	0.9916	0.9916	0.0004	0.9909	0.9924	0.6523	0.6520	0.0134	0.6263	0.6774	4.7	94.9
Incomb Low	81.0	0.006717	50	0.9947	0.9947	0.0004	0.9939	0.9954	0.7631	0.7629	0.0152	0.7327	0.7903	13.2	86.3
Incomb High	140.7	0.011669	50	0.9908	0.9908	0.0004	0.9900	0.9916	0.6239	0.6242	0.0132	0.5987	0.6504	3.0	96.4

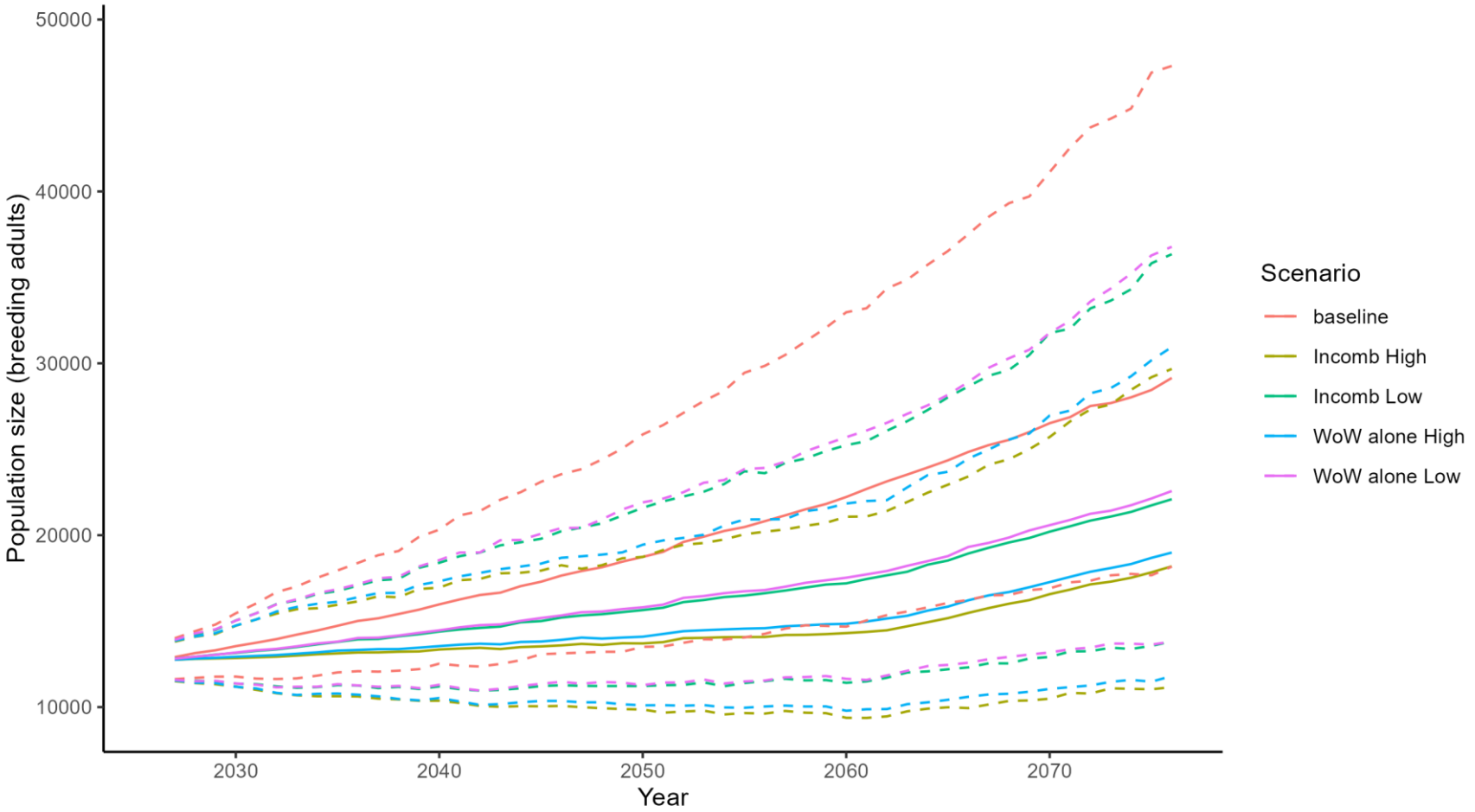

Figure 3-37. Guillemot at Sule Skerry and Sule Stack SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.4.12 *West Westray SPA*

Table 3-77. PVA Inputs: Guillemot ay West Westray SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Guillemot at West Westray SPA	Number of scenarios of impact	4
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	0	Scenario A name	WoW alone Low
Species	Common guillemot	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	6	Scenario A Impact on adult survival rate	2.8e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.5000000000000006E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	38454	Scenario C name	Incomb Low
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.5017244	Scenario C Impact on adult survival rate	3.9800000000000002E-4
Productivity rate per pair standard deviation	0.2080057	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.94	Scenario D name	Incomb High
Adult survival rate standard deviation	0.025	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.56	Scenario D Impact on adult survival rate	1.1819999999999999E-3
Immatures survival rates 0 to 1 standard deviation	0.058	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.792	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.152	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.917	Scenario E Impact on adult survival rate	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 2 to 3 standard deviation	0.098	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.938	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.107	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.94	Scenario F Impact on adult survival rate	-
Immatures survival rates 4 to 5 standard deviation	2.500000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	0.94		
Immatures survival rates 5 to 6 standard deviation	2.500000000000		
Units for output	Breeding.adults		

Table 3-78. PVA Outputs: Guillemot at West Westray SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	1.1	0.000028	25	1.0000	1.0000	0.0003	0.9994	1.0006	0.9994	0.9991	0.0085	0.9819	1.0153	48.6	51.0
WoW alone High	3.3	0.000085	25	0.9999	0.9999	0.0003	0.9993	1.0005	0.9982	0.9977	0.0085	0.9811	1.0147	49.5	50.6
Incomb Low	15.3	0.000398	25	0.9996	0.9995	0.0003	0.9989	1.0002	0.9883	0.9883	0.0085	0.9712	1.0039	47.6	52.7
Incomb High	45.5	0.001182	25	0.9987	0.9987	0.0003	0.9981	0.9993	0.9664	0.9664	0.0085	0.9499	0.9828	42.8	58.2
WoW alone Low	1.1	0.000028	35	1.0000	1.0000	0.0003	0.9995	1.0005	0.9987	0.9987	0.0095	0.9797	1.0178	50.1	50.0
WoW alone High	3.3	0.000085	35	0.9999	0.9999	0.0003	0.9994	1.0004	0.9970	0.9967	0.0095	0.9778	1.0150	49.3	50.6
Incomb Low	15.3	0.000398	35	0.9996	0.9995	0.0003	0.9991	1.0000	0.9839	0.9838	0.0093	0.9660	1.0013	47.4	53.3
Incomb High	45.5	0.001182	35	0.9987	0.9987	0.0003	0.9982	0.9992	0.9536	0.9536	0.0093	0.9353	0.9723	41.3	58.9
WoW alone Low	1.1	0.000028	50	1.0000	1.0000	0.0002	0.9996	1.0004	0.9985	0.9988	0.0103	0.9798	1.0195	49.8	50.5
WoW alone High	3.3	0.000085	50	0.9999	0.9999	0.0002	0.9996	1.0003	0.9967	0.9968	0.0106	0.9769	1.0178	49.0	51.2
Incomb Low	15.3	0.000398	50	0.9997	0.9997	0.0002	0.9993	1.0001	0.9840	0.9839	0.0101	0.9648	1.0040	47.1	52.8
Incomb High	45.5	0.001182	50	0.9991	0.9991	0.0002	0.9987	0.9995	0.9532	0.9534	0.0103	0.9339	0.9735	41.9	57.9

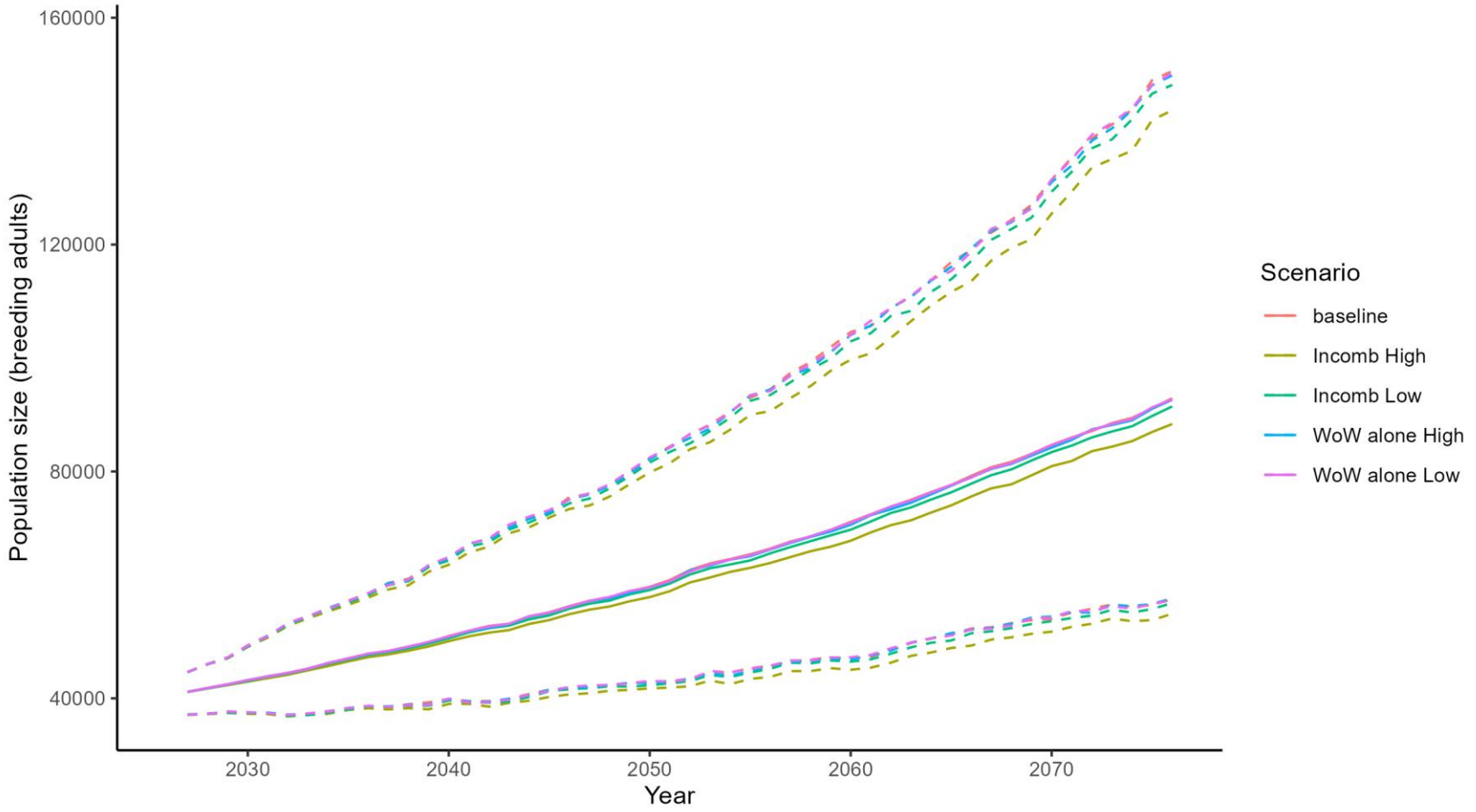

Figure 3-38. Guillemot at West Westray SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.5 Razorbill

3.1.5.1 Cape Wrath SPA

Table 3-79. PVA Inputs: Razorbill at Cape Wrath SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Razorbill at Cape Wrath SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Razorbill	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	8.676104e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	1.1572467987651218E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	4350	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4401746	Scenario C Impact on adult survival rate	2.0221976604488544E-4
Productivity rate per pair standard deviation	0.1886934	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.895	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.067	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.63	Scenario D Impact on adult survival rate	4.2607531670692137E-4
Immatures survival rates 0 to 1 standard deviation	0.067	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.63	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.067	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.895	Scenario E Impact on adult survival rate	2.0891869807020908E-4
Immatures survival rates 2 to 3 standard deviation	0.067	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.067	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.895000000000	Scenario F Impact on adult survival rate	4.466116838558801E-4
Immatures survival rates 4 to 5 standard deviation	6.700000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-80. PVA Outputs: Razorbill at Cape Wrath SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.4	0.00008676104	25	0.9998	0.9999	0.0019	0.9960	1.0036	0.9965	0.9975	0.0494	0.9032	1.0963	50.1	49.8
WoW alone High	0.5	0.00011572468	25	0.9998	0.9999	0.0019	0.9961	1.0038	0.9948	0.9974	0.0509	0.9048	1.1011	50.3	49.9
Incomb Low ex. BB	0.9	0.00020221977	25	0.9997	0.9997	0.0019	0.9960	1.0034	0.9921	0.9944	0.0495	0.8984	1.0914	49.8	50.4
Incomb High ex. BB	1.9	0.00042607532	25	0.9996	0.9996	0.0018	0.9961	1.0031	0.9901	0.9894	0.0466	0.9013	1.0810	48.3	52.1
Incomb Low inc. BB	0.9	0.00020891870	25	0.9998	0.9998	0.0019	0.9961	1.0035	0.9940	0.9952	0.0495	0.9028	1.0907	49.9	50.3
Incomb High inc. BB	1.9	0.00044661168	25	0.9994	0.9994	0.0018	0.9959	1.0030	0.9831	0.9862	0.0480	0.8937	1.0835	49.2	52.0
WoW alone Low	0.4	0.00008676104	35	0.9998	0.9999	0.0018	0.9962	1.0036	0.9953	0.9974	0.0661	0.8762	1.1469	49.4	50.5
WoW alone High	0.5	0.00011572468	35	0.9997	0.9998	0.0018	0.9963	1.0036	0.9885	0.9956	0.0657	0.8757	1.1342	48.7	51.6
Incomb Low ex. BB	0.9	0.00020221977	35	0.9997	0.9997	0.0018	0.9962	1.0035	0.9917	0.9928	0.0644	0.8717	1.1318	48.8	51.1
Incomb High ex. BB	1.9	0.00042607532	35	0.9995	0.9995	0.0018	0.9959	1.0033	0.9827	0.9850	0.0654	0.8651	1.1257	48.5	53.0
Incomb Low inc. BB	0.9	0.00020891870	35	0.9997	0.9998	0.0018	0.9961	1.0034	0.9898	0.9935	0.0661	0.8681	1.1270	48.3	51.6
Incomb High inc. BB	1.9	0.00044661168	35	0.9995	0.9994	0.0018	0.9959	1.0029	0.9813	0.9822	0.0634	0.8628	1.1110	46.8	53.4
WoW alone Low	0.4	0.00008676104	50	0.9999	0.9999	0.0018	0.9964	1.0037	0.9914	0.9997	0.0954	0.8317	1.1955	49.9	50.2
WoW alone High	0.5	0.00011572468	50	0.9999	0.9999	0.0018	0.9966	1.0036	0.9906	0.9967	0.0928	0.8341	1.1977	49.4	51.8
Incomb Low ex. BB	0.9	0.00020221977	50	0.9998	0.9998	0.0018	0.9965	1.0035	0.9895	0.9953	0.0922	0.8313	1.1866	48.6	52.1
Incomb High ex. BB	1.9	0.00042607532	50	0.9997	0.9996	0.0019	0.9958	1.0034	0.9824	0.9859	0.0956	0.8103	1.1852	48.2	52.2
Incomb Low inc. BB	0.9	0.00020891870	50	0.9997	0.9998	0.0018	0.9964	1.0035	0.9849	0.9932	0.0925	0.8277	1.1935	49.4	50.9
Incomb High inc. BB	1.9	0.00044661168	50	0.9996	0.9996	0.0018	0.9962	1.0031	0.9778	0.9838	0.0913	0.8249	1.1713	48.2	52.1

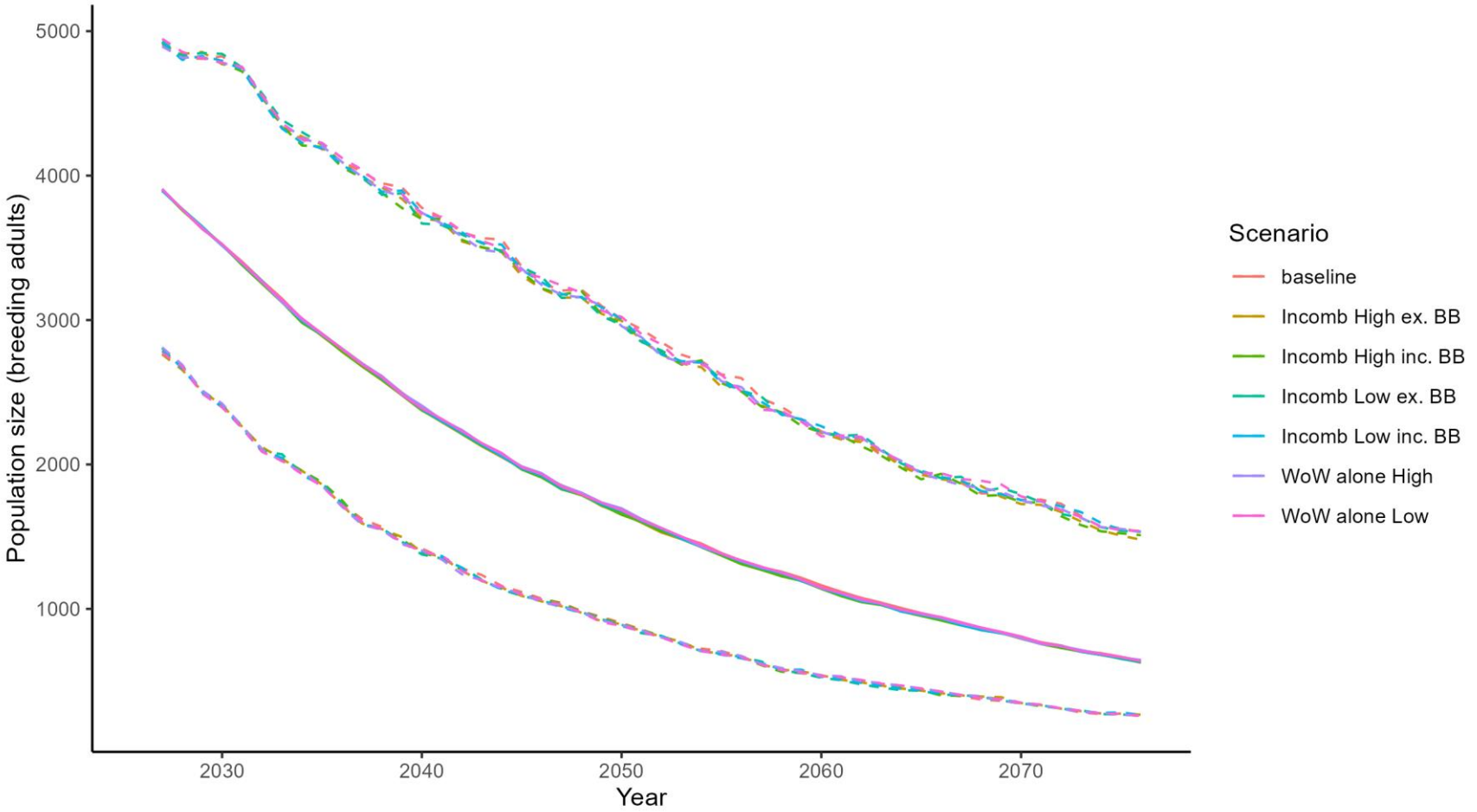

Figure 3-39. Razorbill at Cape Wrath SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.5.2 *East Caithness Cliffs SPA*

Table 3-81. PVA Inputs: Razorbill at East Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Razorbill at East Caithness Cliffs SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Razorbill	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	1.460777e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	2.0871981372705509E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	40373	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4401746	Scenario C Impact on adult survival rate	1.9308262954708664E-3
Productivity rate per pair standard deviation	0.1886934	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.895	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.067	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.63	Scenario D Impact on adult survival rate	4.0259755519140477E-3
Immatures survival rates 0 to 1 standard deviation	0.067	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.63	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.067	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.895	Scenario E Impact on adult survival rate	2.0401532254400697E-3
Immatures survival rates 2 to 3 standard deviation	0.067	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.067	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.895000000000	Scenario F Impact on adult survival rate	4.3548060658212089E-3
Immatures survival rates 4 to 5 standard deviation	6.700000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-82. PVA Outputs: Razorbill at East Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.6	0.00001460777	25	1.0000	1.0000	0.0006	0.9987	1.0012	0.9993	0.9990	0.0161	0.9675	1.0305	50.1	49.9
WoW alone High	0.8	0.00002087198	25	1.0000	1.0000	0.0006	0.9987	1.0013	0.9999	0.9997	0.0171	0.9658	1.0344	49.5	50.7
Incomb Low ex. BB	78.0	0.00193082630	25	0.9977	0.9978	0.0006	0.9965	0.9990	0.9430	0.9433	0.0158	0.9122	0.9731	42.3	56.1
Incomb High ex. BB	162.5	0.00402597555	25	0.9953	0.9953	0.0006	0.9940	0.9964	0.8843	0.8842	0.0149	0.8561	0.9123	33.8	65.7
Incomb Low inc. BB	82.4	0.00204015323	25	0.9976	0.9976	0.0006	0.9964	0.9988	0.9397	0.9400	0.0154	0.9102	0.9707	41.5	57.1
Incomb High inc. BB	175.8	0.00435480607	25	0.9949	0.9949	0.0007	0.9936	0.9962	0.8763	0.8759	0.0153	0.8470	0.9051	32.7	66.7
WoW alone Low	0.6	0.00001460777	35	1.0000	1.0000	0.0006	0.9988	1.0011	0.9986	0.9990	0.0209	0.9596	1.0405	50.5	49.3
WoW alone High	0.8	0.00002087198	35	1.0000	1.0000	0.0006	0.9988	1.0011	0.9991	0.9993	0.0215	0.9571	1.0437	49.9	50.1
Incomb Low ex. BB	78.0	0.00193082630	35	0.9978	0.9978	0.0006	0.9966	0.9989	0.9217	0.9226	0.0203	0.8854	0.9624	40.4	57.9
Incomb High ex. BB	162.5	0.00402597555	35	0.9953	0.9953	0.0006	0.9941	0.9965	0.8432	0.8432	0.0186	0.8065	0.8802	31.1	65.4
Incomb Low inc. BB	82.4	0.00204015323	35	0.9976	0.9976	0.0006	0.9964	0.9988	0.9174	0.9176	0.0199	0.8782	0.9576	39.9	58.0
Incomb High inc. BB	175.8	0.00435480607	35	0.9949	0.9949	0.0006	0.9937	0.9961	0.8318	0.8317	0.0182	0.7960	0.8691	29.5	66.9
WoW alone Low	0.6	0.00001460777	50	1.0000	1.0000	0.0006	0.9988	1.0011	0.9997	0.9993	0.0296	0.9407	1.0582	50.3	50.0
WoW alone High	0.8	0.00002087198	50	1.0000	1.0000	0.0006	0.9987	1.0011	0.9993	0.9987	0.0302	0.9352	1.0590	49.9	50.1
Incomb Low ex. BB	78.0	0.00193082630	50	0.9984	0.9984	0.0006	0.9972	0.9996	0.9211	0.9219	0.0277	0.8678	0.9800	40.9	57.5
Incomb High ex. BB	162.5	0.00402597555	50	0.9967	0.9967	0.0006	0.9954	0.9978	0.8428	0.8432	0.0260	0.7895	0.8930	33.0	64.0
Incomb Low inc. BB	82.4	0.00204015323	50	0.9983	0.9983	0.0006	0.9971	0.9995	0.9174	0.9170	0.0282	0.8621	0.9736	40.7	57.1
Incomb High inc. BB	175.8	0.00435480607	50	0.9964	0.9964	0.0006	0.9951	0.9975	0.8312	0.8309	0.0256	0.7790	0.8819	31.5	65.1

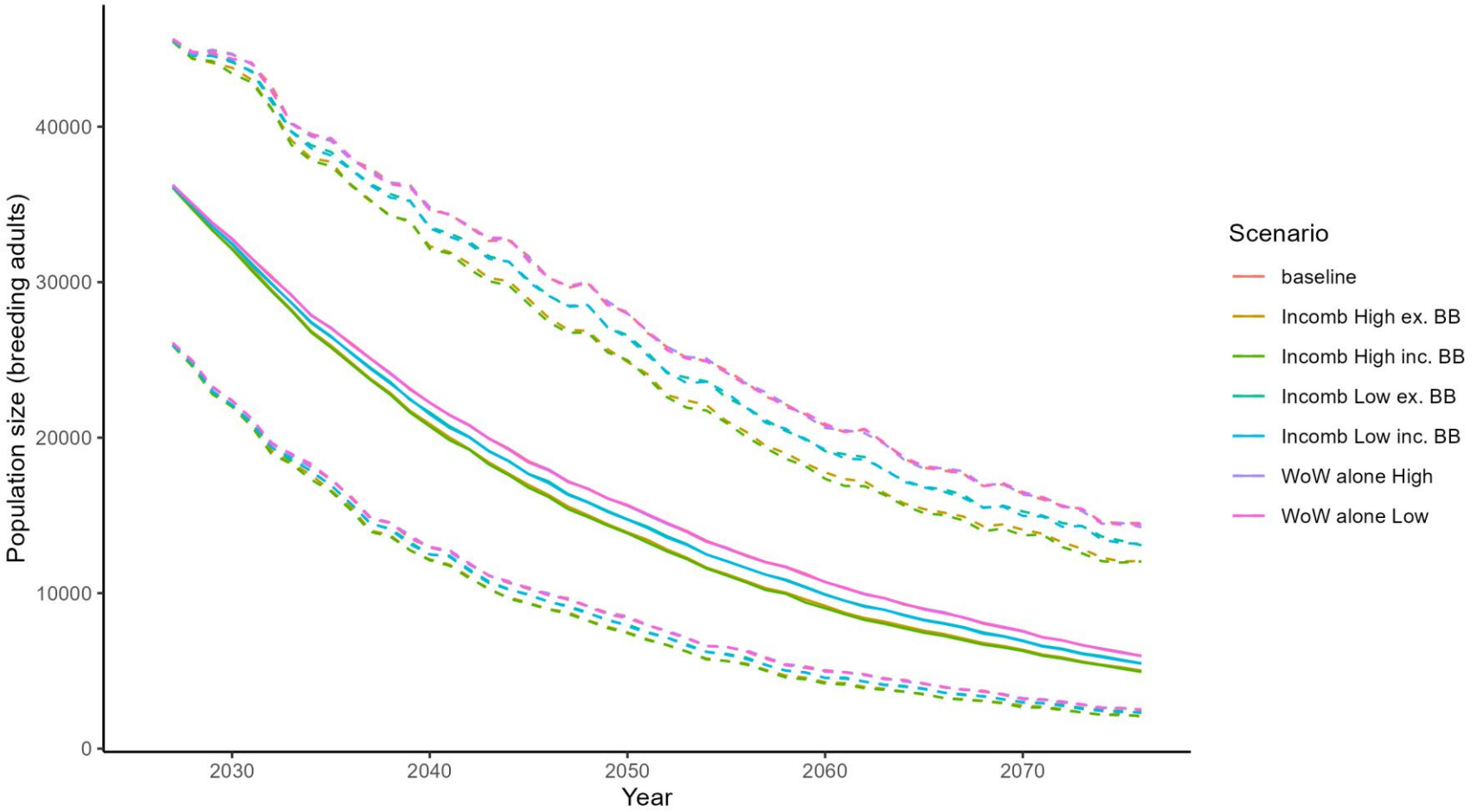

Figure 3-40. Razorbill at East Caithness Cliffs SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.5.3 *Handa SPA*

Table 3-83. PVA Inputs: Razorbill at Handa SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Razorbill at Handa SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Razorbill	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	1.886145e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	2.5190915872555037E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	10997	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4401746	Scenario C Impact on adult survival rate	1.170386858186383E-4
Productivity rate per pair standard deviation	0.1886934	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.895	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.067	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.63	Scenario D Impact on adult survival rate	3.0388698459092036E-4
Immatures survival rates 0 to 1 standard deviation	0.067	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.63	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.067	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.895	Scenario E Impact on adult survival rate	1.2358645999521913E-4
Immatures survival rates 2 to 3 standard deviation	0.067	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.067	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.895000000000	Scenario F Impact on adult survival rate	3.2395995950549092E-4
Immatures survival rates 4 to 5 standard deviation	6.700000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-84. PVA Outputs: Razorbill at Handa SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.2	0.00001886145	25	1.0000	1.0000	0.0012	0.9976	1.0024	1.0012	1.0011	0.0318	0.9412	1.0664	49.4	50.4
WoW alone High	0.3	0.00002519092	25	1.0000	1.0000	0.0012	0.9977	1.0024	1.0000	1.0007	0.0310	0.9436	1.0640	49.4	50.8
Incomb Low ex. BB	1.3	0.00011703869	25	0.9999	0.9999	0.0012	0.9975	1.0023	0.9971	0.9982	0.0326	0.9324	1.0625	49.4	50.7
Incomb High ex. BB	3.3	0.00030388698	25	0.9997	0.9997	0.0012	0.9974	1.0019	0.9913	0.9921	0.0306	0.9345	1.0511	48.5	51.5
Incomb Low inc. BB	1.4	0.00012358646	25	0.9999	0.9999	0.0012	0.9976	1.0023	0.9954	0.9971	0.0318	0.9400	1.0626	49.0	50.6
Incomb High inc. BB	3.6	0.00032395996	25	0.9996	0.9996	0.0011	0.9973	1.0020	0.9895	0.9909	0.0301	0.9325	1.0532	48.3	51.0
WoW alone Low	0.2	0.00001886145	35	1.0000	1.0000	0.0012	0.9977	1.0023	0.9980	1.0007	0.0423	0.9214	1.0879	50.4	49.4
WoW alone High	0.3	0.00002519092	35	0.9999	1.0000	0.0011	0.9979	1.0023	0.9979	1.0001	0.0413	0.9267	1.0889	50.3	49.2
Incomb Low ex. BB	1.3	0.00011703869	35	0.9998	0.9999	0.0012	0.9976	1.0023	0.9945	0.9970	0.0428	0.9190	1.0884	49.9	50.2
Incomb High ex. BB	3.3	0.00030388698	35	0.9996	0.9997	0.0011	0.9974	1.0017	0.9868	0.9882	0.0394	0.9114	1.0642	48.1	50.8
Incomb Low inc. BB	1.4	0.00012358646	35	0.9998	0.9999	0.0011	0.9977	1.0022	0.9930	0.9959	0.0416	0.9186	1.0842	49.8	50.8
Incomb High inc. BB	3.6	0.00032395996	35	0.9997	0.9996	0.0011	0.9974	1.0018	0.9877	0.9880	0.0393	0.9115	1.0680	48.1	51.9
WoW alone Low	0.2	0.00001886145	50	1.0000	1.0000	0.0011	0.9977	1.0024	0.9985	1.0026	0.0581	0.8933	1.1243	49.3	50.2
WoW alone High	0.3	0.00002519092	50	0.9999	0.9999	0.0012	0.9977	1.0024	0.9950	0.9993	0.0601	0.8927	1.1325	50.8	49.4
Incomb Low ex. BB	1.3	0.00011703869	50	0.9999	0.9999	0.0012	0.9976	1.0022	0.9977	0.9985	0.0595	0.8860	1.1191	50.2	50.0
Incomb High ex. BB	3.3	0.00030388698	50	0.9997	0.9997	0.0011	0.9976	1.0019	0.9848	0.9884	0.0558	0.8856	1.1032	48.8	50.9
Incomb Low inc. BB	1.4	0.00012358646	50	0.9999	0.9999	0.0011	0.9977	1.0023	0.9929	0.9961	0.0590	0.8867	1.1212	50.5	49.7
Incomb High inc. BB	3.6	0.00032395996	50	0.9997	0.9997	0.0011	0.9974	1.0021	0.9862	0.9877	0.0578	0.8776	1.1095	48.8	51.1

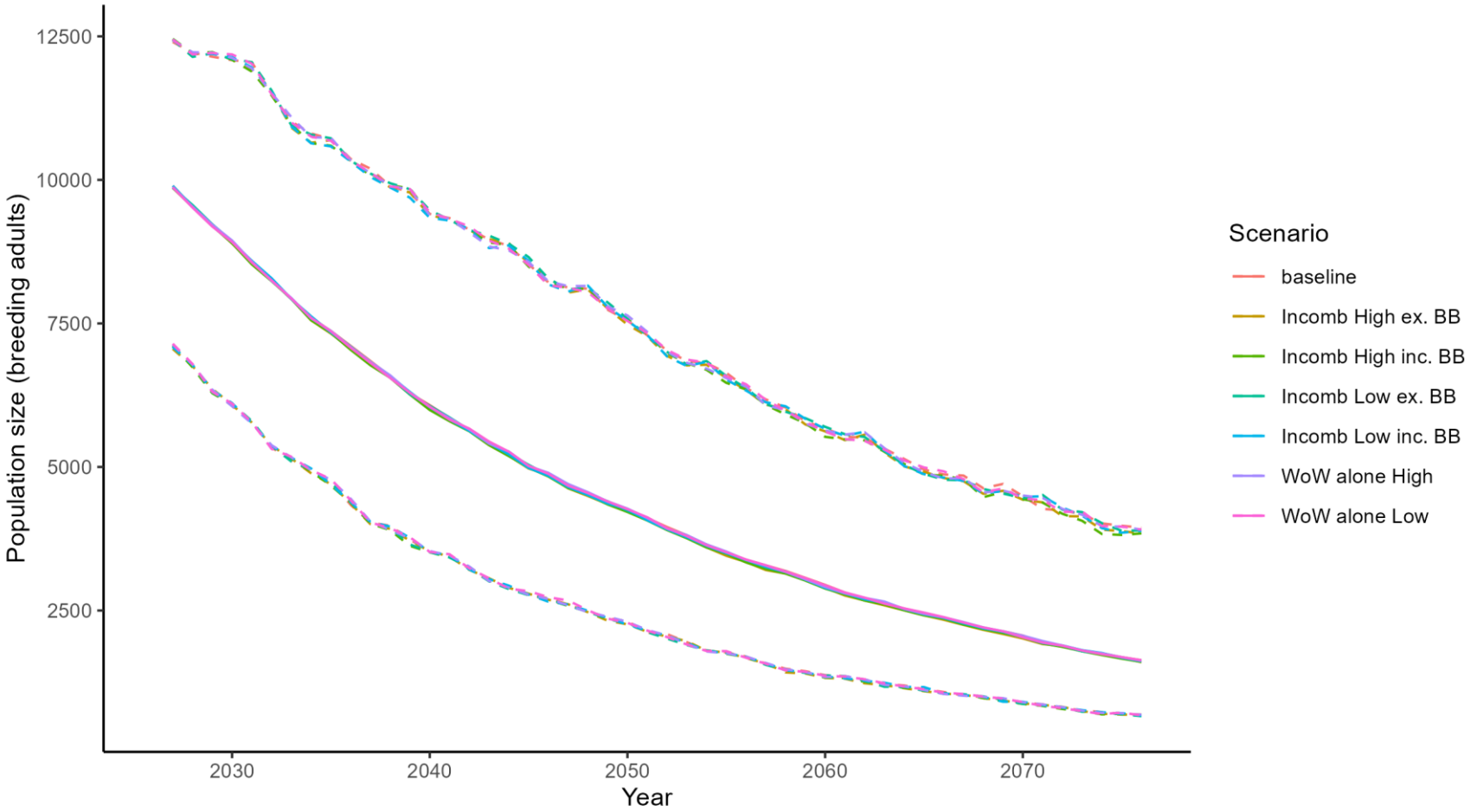

Figure 3-41. Razorbill at Handa SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.5.4 *North Caithness Cliffs SPA*

Table 3-85. PVA Inputs: Razorbill at North Caithness Cliffs SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Razorbill at North Caithness Cliffs SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Razorbill	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	7.455285e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	1.0092100515844483E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	4796	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4401746	Scenario C Impact on adult survival rate	1.2172586429612818E-3
Productivity rate per pair standard deviation	0.1886934	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.895	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.067	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.63	Scenario D Impact on adult survival rate	2.9793249036215636E-3
Immatures survival rates 0 to 1 standard deviation	0.067	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.63	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.067	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.895	Scenario E Impact on adult survival rate	1.3365562186046043E-3
Immatures survival rates 2 to 3 standard deviation	0.067	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.895	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.067	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.895000000000	Scenario F Impact on adult survival rate	3.3381904669516488E-3
Immatures survival rates 4 to 5 standard deviation	6.700000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-86. PVA Outputs: Razorbill at North Caithness Cliffs SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.4	0.00007455285	25	0.9998	0.9999	0.0018	0.9966	1.0035	0.9950	0.9980	0.0474	0.9142	1.1005	48.8	51.3
WoW alone High	0.5	0.00010092101	25	0.9997	0.9998	0.0018	0.9965	1.0033	0.9931	0.9962	0.0493	0.9058	1.0979	48.5	51.9
Incomb Low ex. BB	5.8	0.00121725864	25	0.9986	0.9986	0.0018	0.9952	1.0021	0.9632	0.9640	0.0453	0.8822	1.0524	45.6	55.6
Incomb High ex. BB	14.3	0.00297932490	25	0.9964	0.9965	0.0018	0.9929	1.0002	0.9122	0.9126	0.0450	0.8321	1.0078	37.8	61.3
Incomb Low inc. BB	6.4	0.00133655622	25	0.9984	0.9984	0.0018	0.9948	1.0021	0.9594	0.9600	0.0456	0.8753	1.0561	44.9	55.7
Incomb High inc. BB	16.0	0.00333819047	25	0.9960	0.9961	0.0019	0.9926	0.9999	0.9018	0.9049	0.0448	0.8223	0.9979	37.1	63.2
WoW alone Low	0.4	0.00007455285	35	0.9999	0.9999	0.0017	0.9967	1.0033	0.9983	0.9995	0.0628	0.8878	1.1267	49.3	50.6
WoW alone High	0.5	0.00010092101	35	0.9999	0.9999	0.0017	0.9965	1.0035	0.9944	0.9973	0.0634	0.8788	1.1306	48.7	50.7
Incomb Low ex. BB	5.8	0.00121725864	35	0.9986	0.9986	0.0018	0.9950	1.0019	0.9488	0.9511	0.0611	0.8361	1.0760	44.1	55.5
Incomb High ex. BB	14.3	0.00297932490	35	0.9965	0.9965	0.0017	0.9931	1.0000	0.8826	0.8831	0.0565	0.7778	1.0013	36.5	62.5
Incomb Low inc. BB	6.4	0.00133655622	35	0.9984	0.9985	0.0017	0.9952	1.0018	0.9469	0.9484	0.0583	0.8423	1.0659	42.7	55.3
Incomb High inc. BB	16.0	0.00333819047	35	0.9961	0.9961	0.0018	0.9928	0.9997	0.8685	0.8725	0.0566	0.7683	0.9954	35.5	63.4
WoW alone Low	0.4	0.00007455285	50	0.9999	0.9999	0.0017	0.9966	1.0032	0.9939	1.0009	0.0890	0.8407	1.1891	50.3	49.4
WoW alone High	0.5	0.00010092101	50	0.9999	0.9999	0.0018	0.9966	1.0036	0.9927	0.9998	0.0929	0.8413	1.2032	49.6	50.5
Incomb Low ex. BB	5.8	0.00121725864	50	0.9990	0.9990	0.0019	0.9953	1.0028	0.9521	0.9554	0.0908	0.7855	1.1545	44.9	54.0
Incomb High ex. BB	14.3	0.00297932490	50	0.9976	0.9976	0.0018	0.9940	1.0012	0.8841	0.8873	0.0860	0.7322	1.0670	38.0	60.8
Incomb Low inc. BB	6.4	0.00133655622	50	0.9988	0.9989	0.0018	0.9956	1.0027	0.9416	0.9489	0.0864	0.7939	1.1505	44.7	54.8
Incomb High inc. BB	16.0	0.00333819047	50	0.9972	0.9972	0.0018	0.9939	1.0008	0.8640	0.8729	0.0822	0.7318	1.0465	36.7	61.5

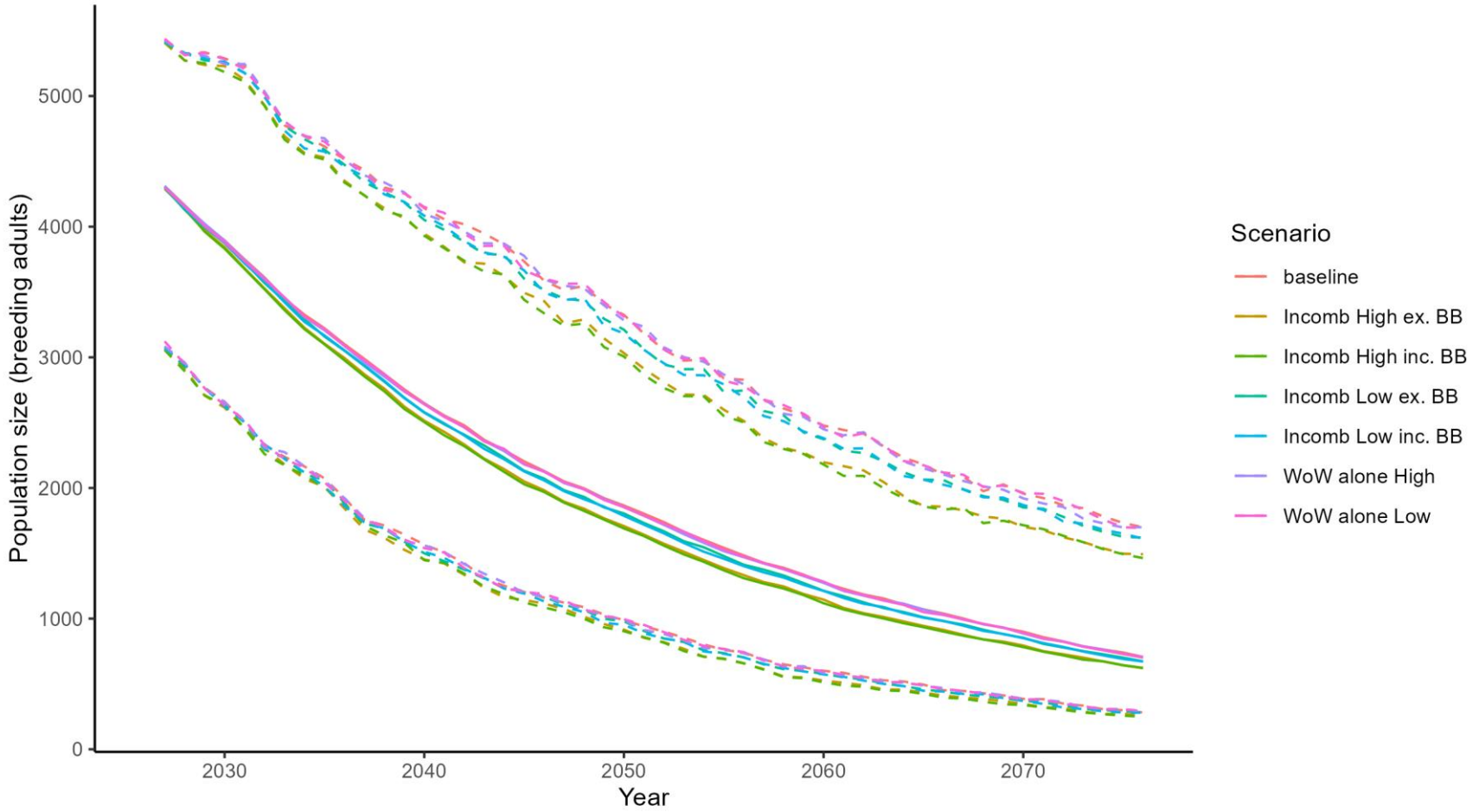

Figure 3-42. Razorbill at North Caithness Cliffs SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6 Puffin

3.1.6.1 Coquet Island SPA

Table 3-87. PVA Inputs: Puffin at Coquet Island SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Coquet Island SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	1.362408e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	4.0872232179166339E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	50058	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	4.2686323210245757E-4
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	9.3121082030416815E-4
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	5.6850719296735032E-4
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	1.2429089124078589E-3
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-88. PVA Outputs: Puffin at Coquet Island SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.7	0.00001362408	25	1.0000	1.0000	0.0006	0.9988	1.0011	0.9992	0.9994	0.0156	0.9690	1.0306	49.7	50.3
WoW alone High	2.0	0.00004087223	25	0.9999	0.9999	0.0006	0.9988	1.0011	0.9985	0.9984	0.0161	0.9669	1.0304	49.1	50.8
Incomb Low ex. BB	21.4	0.00042686323	25	0.9995	0.9995	0.0006	0.9984	1.0008	0.9869	0.9873	0.0158	0.9557	1.0196	48.2	51.6
Incomb High ex. BB	46.6	0.00093121082	25	0.9989	0.9989	0.0006	0.9977	1.0001	0.9723	0.9719	0.0159	0.9407	1.0033	47.3	52.7
Incomb Low inc. BB	28.5	0.00056850719	25	0.9993	0.9993	0.0006	0.9982	1.0005	0.9826	0.9827	0.0157	0.9522	1.0141	47.7	51.5
Incomb High inc. BB	62.2	0.00124290891	25	0.9985	0.9985	0.0006	0.9973	0.9997	0.9628	0.9625	0.0153	0.9316	0.9939	46.4	53.8
WoW alone Low	0.7	0.00001362408	35	1.0000	1.0000	0.0006	0.9988	1.0012	0.9997	0.9997	0.0215	0.9578	1.0438	49.6	50.1
WoW alone High	2.0	0.00004087223	35	0.9999	0.9999	0.0006	0.9988	1.0011	0.9984	0.9984	0.0218	0.9556	1.0425	49.4	50.4
Incomb Low ex. BB	21.4	0.00042686323	35	0.9995	0.9995	0.0006	0.9984	1.0007	0.9829	0.9836	0.0213	0.9438	1.0264	48.5	52.1
Incomb High ex. BB	46.6	0.00093121082	35	0.9989	0.9989	0.0006	0.9977	1.0001	0.9619	0.9624	0.0213	0.9195	1.0059	46.1	53.0
Incomb Low inc. BB	28.5	0.00056850719	35	0.9993	0.9994	0.0006	0.9981	1.0006	0.9768	0.9771	0.0219	0.9338	1.0208	47.9	51.9
Incomb High inc. BB	62.2	0.00124290891	35	0.9986	0.9986	0.0006	0.9974	0.9997	0.9492	0.9494	0.0205	0.9082	0.9905	45.1	53.8
WoW alone Low	0.7	0.00001362408	50	1.0000	1.0000	0.0006	0.9987	1.0012	0.9975	0.9989	0.0326	0.9363	1.0677	50.3	49.6
WoW alone High	2.0	0.00004087223	50	0.9999	1.0000	0.0006	0.9987	1.0011	0.9981	0.9982	0.0324	0.9368	1.0597	49.9	50.1
Incomb Low ex. BB	21.4	0.00042686323	50	0.9997	0.9997	0.0006	0.9984	1.0009	0.9824	0.9836	0.0310	0.9202	1.0488	49.0	50.5
Incomb High ex. BB	46.6	0.00093121082	50	0.9992	0.9992	0.0006	0.9979	1.0005	0.9623	0.9617	0.0307	0.8995	1.0264	47.2	52.4
Incomb Low inc. BB	28.5	0.00056850719	50	0.9995	0.9995	0.0006	0.9983	1.0009	0.9759	0.9766	0.0319	0.9166	1.0441	48.2	51.5
Incomb High inc. BB	62.2	0.00124290891	50	0.9990	0.9990	0.0006	0.9977	1.0003	0.9493	0.9499	0.0314	0.8860	1.0160	47.3	53.4

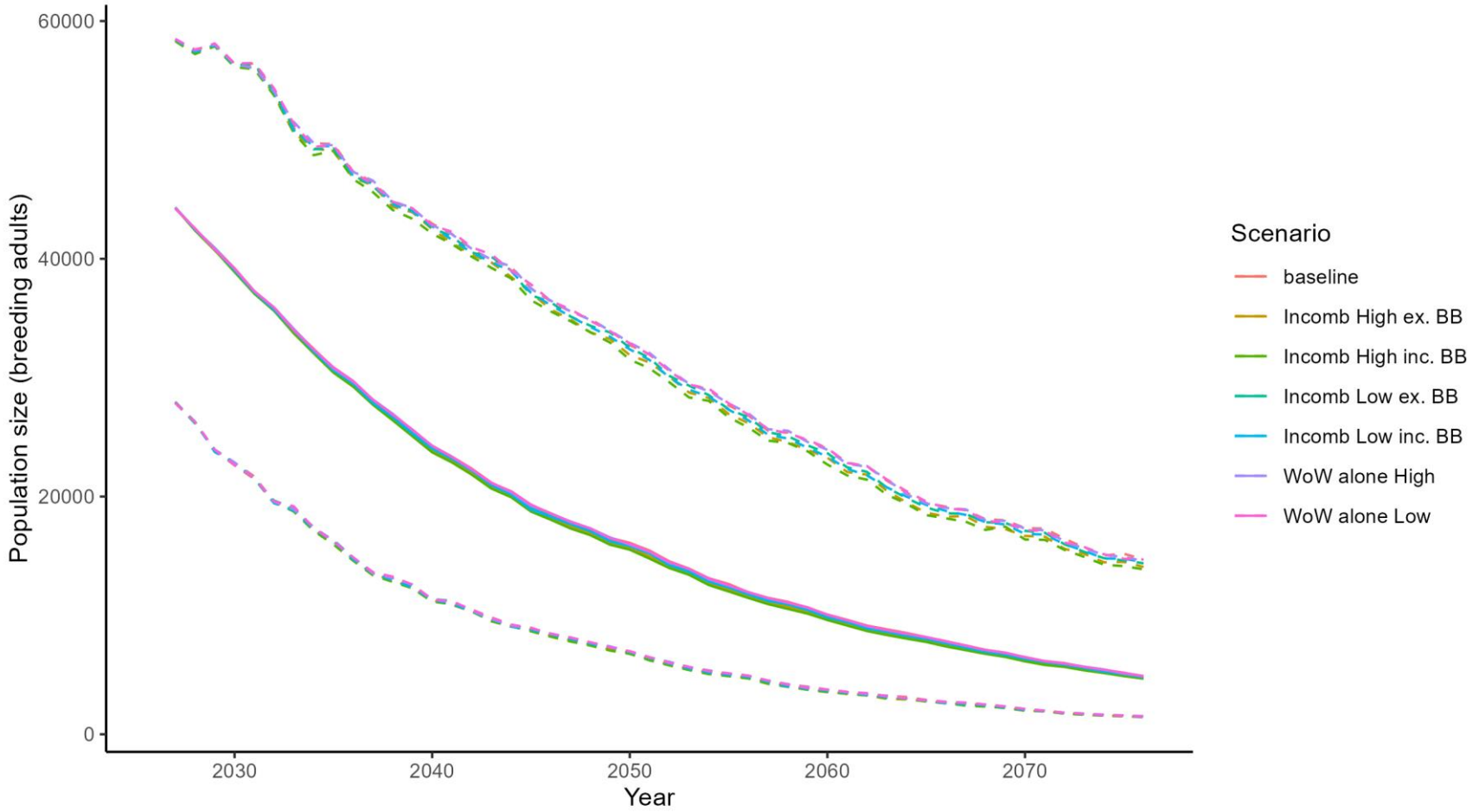

Figure 3-43. Puffin at Coquet Island SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6.2 *Fair Isle SPA*

Table 3-89. PVA Inputs: Puffin at Fair Isle SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Fair Isle SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	1.3e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	3.9930378507677335E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	13332	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	3.2599999999999996E-4
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	7.575697799457017E-4
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	3.8100000000000005E-4
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	9.2380294149954764E-4
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-90. PVA Outputs: Puffin at Fair Isle SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.2	0.00001300000	25	1.0001	1.0000	0.0011	0.9978	1.0022	1.0009	1.0013	0.0295	0.9430	1.0608	50.4	49.8
WoW alone High	0.5	0.00003993038	25	1.0000	1.0000	0.0011	0.9978	1.0023	0.9996	1.0006	0.0302	0.9424	1.0623	50.3	49.8
Incomb Low ex. BB	4.3	0.00032600000	25	0.9996	0.9996	0.0012	0.9974	1.0019	0.9899	0.9906	0.0302	0.9310	1.0518	48.6	51.0
Incomb High ex. BB	10.1	0.00075756978	25	0.9991	0.9991	0.0012	0.9969	1.0014	0.9776	0.9781	0.0299	0.9193	1.0357	47.4	52.2
Incomb Low inc. BB	5.1	0.00038100000	25	0.9996	0.9996	0.0012	0.9974	1.0019	0.9900	0.9907	0.0301	0.9347	1.0499	48.1	50.9
Incomb High inc. BB	12.3	0.00092380294	25	0.9990	0.9990	0.0011	0.9968	1.0013	0.9741	0.9754	0.0293	0.9191	1.0369	46.6	52.2
WoW alone Low	0.2	0.00001300000	35	1.0001	1.0000	0.0012	0.9977	1.0022	1.0020	1.0015	0.0418	0.9214	1.0833	50.3	49.7
WoW alone High	0.5	0.00003993038	35	1.0000	1.0000	0.0011	0.9978	1.0023	0.9997	1.0007	0.0408	0.9233	1.0866	49.7	50.3
Incomb Low ex. BB	4.3	0.00032600000	35	0.9996	0.9996	0.0011	0.9974	1.0018	0.9877	0.9877	0.0396	0.9094	1.0657	49.0	51.3
Incomb High ex. BB	10.1	0.00075756978	35	0.9991	0.9991	0.0011	0.9969	1.0013	0.9703	0.9697	0.0404	0.8942	1.0473	48.4	51.9
Incomb Low inc. BB	5.1	0.00038100000	35	0.9996	0.9996	0.0011	0.9973	1.0018	0.9859	0.9867	0.0404	0.9115	1.0690	48.4	51.7
Incomb High inc. BB	12.3	0.00092380294	35	0.9990	0.9990	0.0011	0.9970	1.0012	0.9632	0.9652	0.0387	0.8956	1.0465	47.4	52.9
WoW alone Low	0.2	0.00001300000	50	1.0000	1.0000	0.0012	0.9976	1.0026	1.0011	1.0041	0.0638	0.8825	1.1395	50.1	49.8
WoW alone High	0.5	0.00003993038	50	1.0000	1.0000	0.0012	0.9974	1.0025	1.0000	1.0023	0.0628	0.8763	1.1387	50.6	48.8
Incomb Low ex. BB	4.3	0.00032600000	50	0.9997	0.9998	0.0012	0.9973	1.0022	0.9869	0.9896	0.0619	0.8694	1.1228	49.3	51.1
Incomb High ex. BB	10.1	0.00075756978	50	0.9994	0.9994	0.0012	0.9970	1.0018	0.9708	0.9714	0.0597	0.8585	1.0962	48.7	51.5
Incomb Low inc. BB	5.1	0.00038100000	50	0.9998	0.9997	0.0012	0.9974	1.0020	0.9890	0.9882	0.0593	0.8733	1.1048	49.4	50.4
Incomb High inc. BB	12.3	0.00092380294	50	0.9993	0.9993	0.0012	0.9970	1.0018	0.9626	0.9669	0.0601	0.8582	1.0955	48.5	51.7

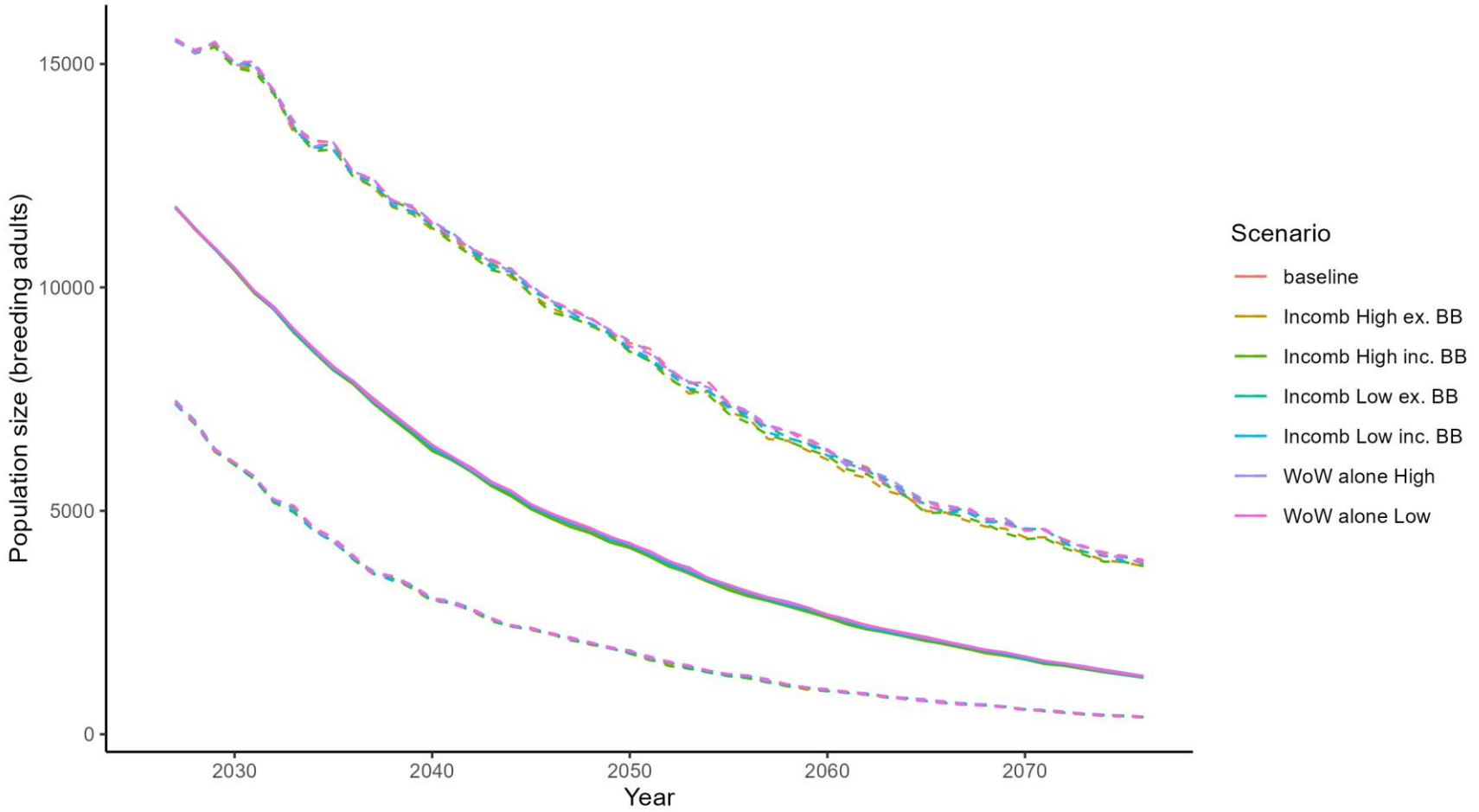

Figure 3-44. Puffin at Fair Isle SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6.3 *Farne Islands SPA*

Table 3-91. PVA Inputs: Puffin at Farne Islands SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Farne Islands SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	2.523155e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	7.5694660784998859E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	87504	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	5.1472800205606105E-4
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	1.2648940979024931E-3
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	8.6834769665233976E-4
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	1.9943161099673372E-3
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-92. PVA Outputs: Puffin at Farne Islands SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	2.2	0.00002523155	25	0.9999	1.0000	0.0004	0.9991	1.0009	0.9986	0.9991	0.0120	0.9757	1.0237	49.8	50.0
WoW alone High	6.6	0.00007569466	25	0.9999	0.9999	0.0004	0.9990	1.0008	0.9973	0.9974	0.0118	0.9737	1.0206	49.8	50.2
Incomb Low ex. BB	45.0	0.00051472800	25	0.9994	0.9994	0.0005	0.9985	1.0003	0.9841	0.9844	0.0119	0.9606	1.0086	48.3	51.3
Incomb High ex. BB	110.7	0.00126489410	25	0.9985	0.9985	0.0005	0.9976	0.9994	0.9622	0.9619	0.0120	0.9396	0.9858	45.6	53.7
Incomb Low inc. BB	76.0	0.00086834770	25	0.9990	0.9990	0.0004	0.9981	0.9999	0.9740	0.9738	0.0116	0.9505	0.9972	47.2	52.6
Incomb High inc. BB	174.5	0.00199431611	25	0.9977	0.9977	0.0005	0.9968	0.9986	0.9415	0.9413	0.0116	0.9174	0.9627	44.2	55.4
WoW alone Low	2.2	0.00002523155	35	1.0000	1.0000	0.0004	0.9991	1.0008	0.9984	0.9987	0.0159	0.9676	1.0316	50.5	49.5
WoW alone High	6.6	0.00007569466	35	0.9999	0.9999	0.0004	0.9991	1.0008	0.9959	0.9967	0.0156	0.9669	1.0292	49.6	50.5
Incomb Low ex. BB	45.0	0.00051472800	35	0.9994	0.9994	0.0005	0.9985	1.0003	0.9783	0.9786	0.0162	0.9487	1.0113	48.5	51.7
Incomb High ex. BB	110.7	0.00126489410	35	0.9985	0.9985	0.0004	0.9976	0.9994	0.9481	0.9480	0.0152	0.9186	0.9793	44.6	53.3
Incomb Low inc. BB	76.0	0.00086834770	35	0.9990	0.9990	0.0004	0.9981	0.9999	0.9637	0.9641	0.0156	0.9344	0.9960	46.3	52.5
Incomb High inc. BB	174.5	0.00199431611	35	0.9977	0.9977	0.0005	0.9968	0.9986	0.9190	0.9195	0.0155	0.8894	0.9505	42.2	55.2
WoW alone Low	2.2	0.00002523155	50	1.0000	1.0000	0.0005	0.9990	1.0009	0.9977	0.9977	0.0240	0.9512	1.0478	49.9	50.1
WoW alone High	6.6	0.00007569466	50	0.9999	0.9999	0.0004	0.9990	1.0008	0.9959	0.9963	0.0226	0.9531	1.0416	49.9	50.1
Incomb Low ex. BB	45.0	0.00051472800	50	0.9996	0.9996	0.0005	0.9987	1.0005	0.9783	0.9790	0.0236	0.9330	1.0265	48.7	51.6
Incomb High ex. BB	110.7	0.00126489410	50	0.9989	0.9990	0.0005	0.9980	0.9999	0.9473	0.9484	0.0226	0.9036	0.9941	45.5	53.5
Incomb Low inc. BB	76.0	0.00086834770	50	0.9993	0.9993	0.0005	0.9984	1.0002	0.9622	0.9639	0.0229	0.9217	1.0141	47.1	52.7
Incomb High inc. BB	174.5	0.00199431611	50	0.9984	0.9984	0.0005	0.9974	0.9993	0.9199	0.9194	0.0228	0.8743	0.9639	43.2	55.9

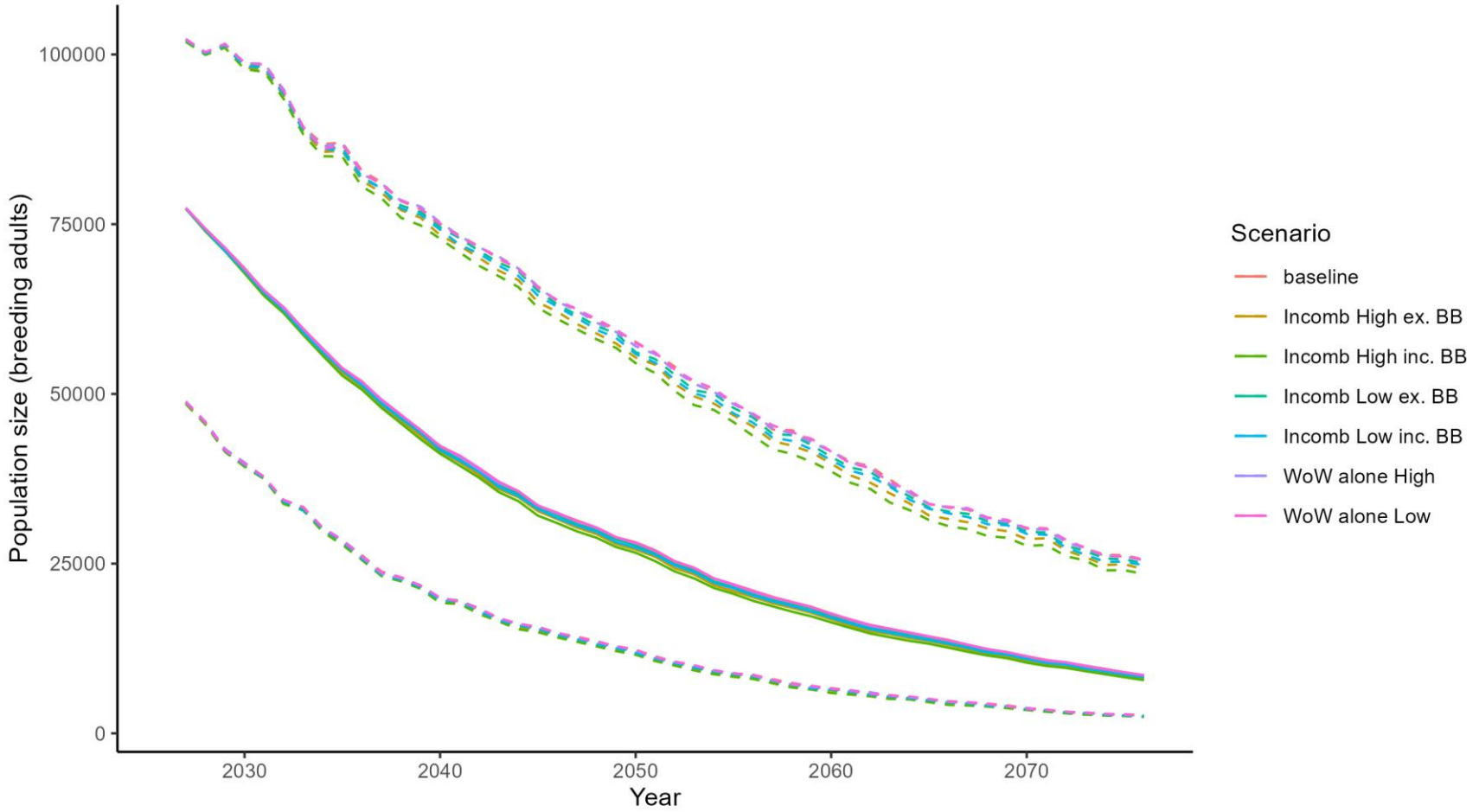

Figure 3-45. Puffin at Farne Islands SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6.4 *Forth Islands SPA*

Table 3-93. PVA Inputs: Puffin at Forth Islands SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Forth Islands SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	4.005082e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	1.2015245625956916E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	85846	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	1.6663666529113483E-3
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	3.4233437082016858E-3
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	2.0137444363363586E-3
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	4.2246216331202754E-3
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-94. PVA Outputs: Puffin at Forth Islands SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	3.4	0.00004005082	25	1.0000	0.9999	0.0005	0.9990	1.0008	0.9987	0.9986	0.0120	0.9736	1.0216	50.0	49.9
WoW alone High	10.3	0.00012015246	25	0.9999	0.9999	0.0004	0.9990	1.0007	0.9961	0.9964	0.0118	0.9737	1.0185	49.8	50.3
Incomb Low ex. BB	143.1	0.00166636665	25	0.9981	0.9981	0.0005	0.9972	0.9989	0.9510	0.9508	0.0114	0.9273	0.9735	44.8	54.7
Incomb High ex. BB	293.9	0.00342334371	25	0.9960	0.9960	0.0005	0.9951	0.9969	0.9016	0.9015	0.0109	0.8814	0.9243	40.3	59.1
Incomb Low inc. BB	172.9	0.00201374444	25	0.9977	0.9976	0.0005	0.9967	0.9985	0.9405	0.9405	0.0115	0.9171	0.9641	44.0	55.3
Incomb High inc. BB	362.7	0.00422462163	25	0.9951	0.9951	0.0005	0.9941	0.9960	0.8801	0.8799	0.0111	0.8578	0.9018	38.3	61.3
WoW alone Low	3.4	0.00004005082	35	1.0000	1.0000	0.0005	0.9990	1.0009	0.9984	0.9984	0.0166	0.9662	1.0314	50.2	49.4
WoW alone High	10.3	0.00012015246	35	0.9999	0.9999	0.0005	0.9989	1.0008	0.9954	0.9954	0.0165	0.9620	1.0272	49.7	50.1
Incomb Low ex. BB	143.1	0.00166636665	35	0.9981	0.9981	0.0005	0.9972	0.9989	0.9327	0.9323	0.0154	0.9016	0.9628	43.2	54.4
Incomb High ex. BB	293.9	0.00342334371	35	0.9960	0.9960	0.0005	0.9951	0.9969	0.8664	0.8664	0.0145	0.8375	0.8952	37.0	59.7
Incomb Low inc. BB	172.9	0.00201374444	35	0.9976	0.9976	0.0004	0.9968	0.9986	0.9187	0.9189	0.0151	0.8898	0.9488	41.0	55.5
Incomb High inc. BB	362.7	0.00422462163	35	0.9951	0.9951	0.0005	0.9941	0.9960	0.8378	0.8374	0.0146	0.8063	0.8654	35.1	62.2
WoW alone Low	3.4	0.00004005082	50	0.9999	0.9999	0.0005	0.9990	1.0009	0.9968	0.9973	0.0244	0.9497	1.0473	49.4	50.2
WoW alone High	10.3	0.00012015246	50	0.9999	0.9999	0.0005	0.9989	1.0008	0.9943	0.9940	0.0244	0.9431	1.0426	49.0	50.4
Incomb Low ex. BB	143.1	0.00166636665	50	0.9986	0.9986	0.0005	0.9977	0.9995	0.9302	0.9312	0.0228	0.8867	0.9767	44.1	54.1
Incomb High ex. BB	293.9	0.00342334371	50	0.9972	0.9971	0.0005	0.9961	0.9981	0.8653	0.8648	0.0218	0.8190	0.9078	39.4	59.3
Incomb Low inc. BB	172.9	0.00201374444	50	0.9983	0.9983	0.0005	0.9974	0.9994	0.9179	0.9185	0.0232	0.8762	0.9703	42.4	55.1
Incomb High inc. BB	362.7	0.00422462163	50	0.9965	0.9965	0.0005	0.9954	0.9974	0.8358	0.8363	0.0221	0.7922	0.8792	36.7	61.9

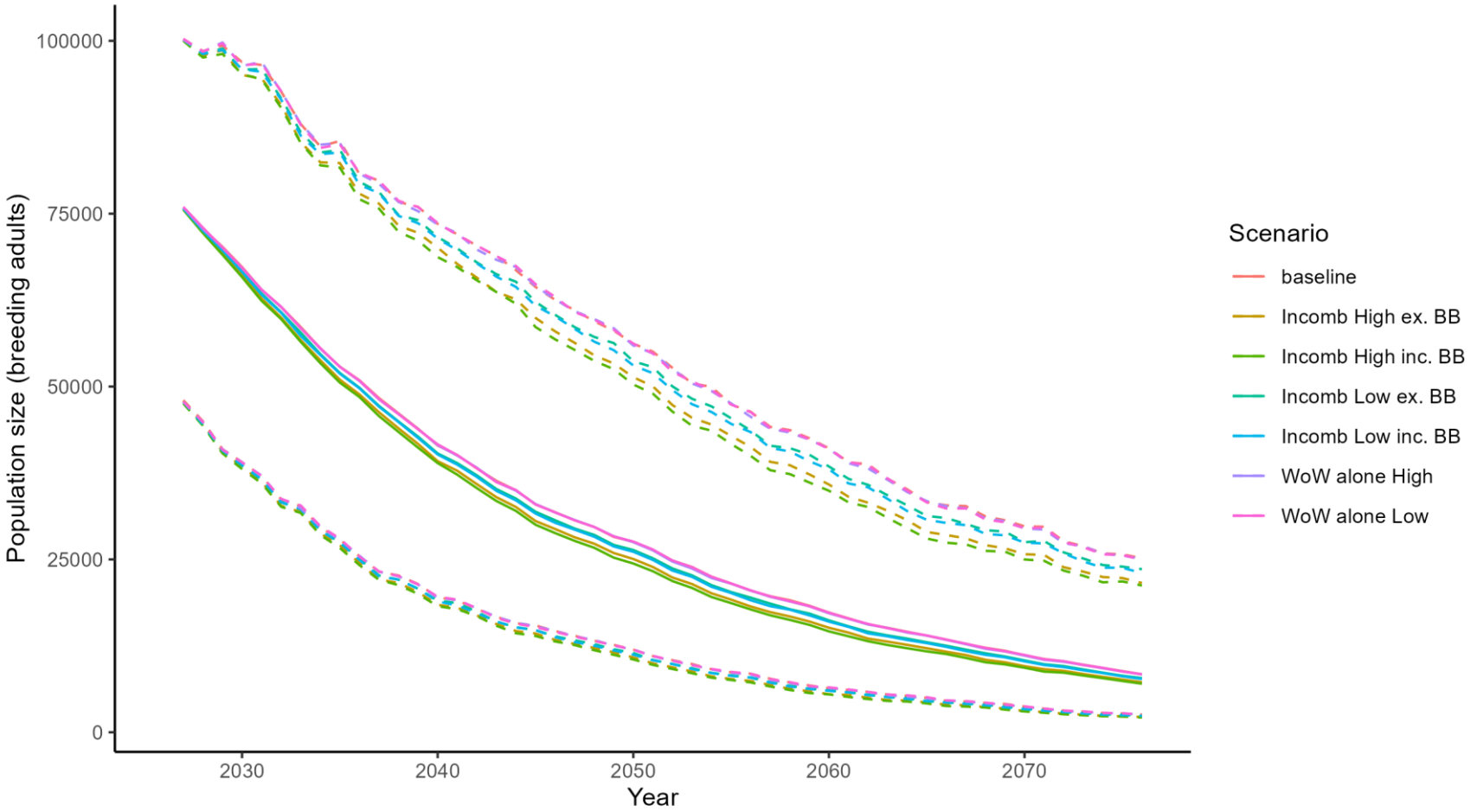

Figure 3-46. Puffin at Forth Islands SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6.5 *Foula SPA*

Table 3-95. PVA Inputs: Puffin at Foula SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Foula SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	4.40402e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	breeding.adults	Scenario B Impact on adult survival rate	1.3212037466963318E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	8468	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	6.0976634137776143E-4
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	1.7266937731986883E-3
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	7.9311010607048646E-4
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	2.2767250672768632E-3
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	breeding.adults		

Table 3-96. PVA Outputs: Puffin at Foula SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.4	0.0000440402	25	0.9999	0.9999	0.0015	0.9971	1.0028	0.9982	0.9980	0.0389	0.9242	1.0754	50.0	50.0
WoW alone High	1.1	0.0001321204	25	0.9999	0.9999	0.0015	0.9969	1.0027	0.9971	0.9975	0.0389	0.9206	1.0736	50.0	49.8
Incomb Low ex. BB	5.2	0.0006097663	25	0.9993	0.9993	0.0015	0.9963	1.0021	0.9832	0.9825	0.0382	0.9095	1.0605	49.2	51.3
Incomb High ex. BB	14.6	0.0017266938	25	0.9980	0.9980	0.0014	0.9951	1.0007	0.9494	0.9502	0.0360	0.8809	1.0219	45.6	55.9
Incomb Low inc. BB	6.7	0.0007931101	25	0.9991	0.9991	0.0014	0.9963	1.0018	0.9771	0.9778	0.0368	0.9066	1.0491	47.6	51.8
Incomb High inc. BB	19.3	0.0022767251	25	0.9974	0.9973	0.0014	0.9945	1.0000	0.9343	0.9340	0.0349	0.8678	1.0012	43.4	56.1
WoW alone Low	0.4	0.0000440402	35	0.9999	0.9999	0.0015	0.9972	1.0029	0.9949	0.9979	0.0534	0.9049	1.1116	50.1	49.8
WoW alone High	1.1	0.0001321204	35	0.9999	0.9998	0.0014	0.9970	1.0026	0.9950	0.9960	0.0498	0.8992	1.0967	50.0	50.0
Incomb Low ex. BB	5.2	0.0006097663	35	0.9993	0.9993	0.0014	0.9964	1.0021	0.9764	0.9765	0.0517	0.8748	1.0831	48.4	51.4
Incomb High ex. BB	14.6	0.0017266938	35	0.9980	0.9980	0.0014	0.9951	1.0007	0.9308	0.9325	0.0472	0.8427	1.0297	43.3	55.1
Incomb Low inc. BB	6.7	0.0007931101	35	0.9991	0.9991	0.0014	0.9965	1.0019	0.9689	0.9704	0.0480	0.8803	1.0708	46.9	52.5
Incomb High inc. BB	19.3	0.0022767251	35	0.9973	0.9973	0.0015	0.9945	1.0002	0.9077	0.9092	0.0487	0.8179	1.0059	41.1	56.9
WoW alone Low	0.4	0.0000440402	50	1.0000	1.0000	0.0015	0.9970	1.0029	0.9988	1.0005	0.0791	0.8552	1.1633	49.8	50.4
WoW alone High	1.1	0.0001321204	50	1.0000	1.0000	0.0015	0.9968	1.0031	0.9980	1.0007	0.0772	0.8500	1.1686	51.0	49.1
Incomb Low ex. BB	5.2	0.0006097663	50	0.9995	0.9995	0.0015	0.9965	1.0026	0.9740	0.9783	0.0778	0.8374	1.1389	48.7	51.2
Incomb High ex. BB	14.6	0.0017266938	50	0.9986	0.9986	0.0015	0.9957	1.0018	0.9321	0.9359	0.0720	0.8008	1.0927	45.8	54.5
Incomb Low inc. BB	6.7	0.0007931101	50	0.9994	0.9994	0.0015	0.9965	1.0023	0.9676	0.9736	0.0739	0.8361	1.1319	48.5	51.1
Incomb High inc. BB	19.3	0.0022767251	50	0.9982	0.9982	0.0015	0.9952	1.0012	0.9113	0.9139	0.0705	0.7791	1.0561	44.7	55.4

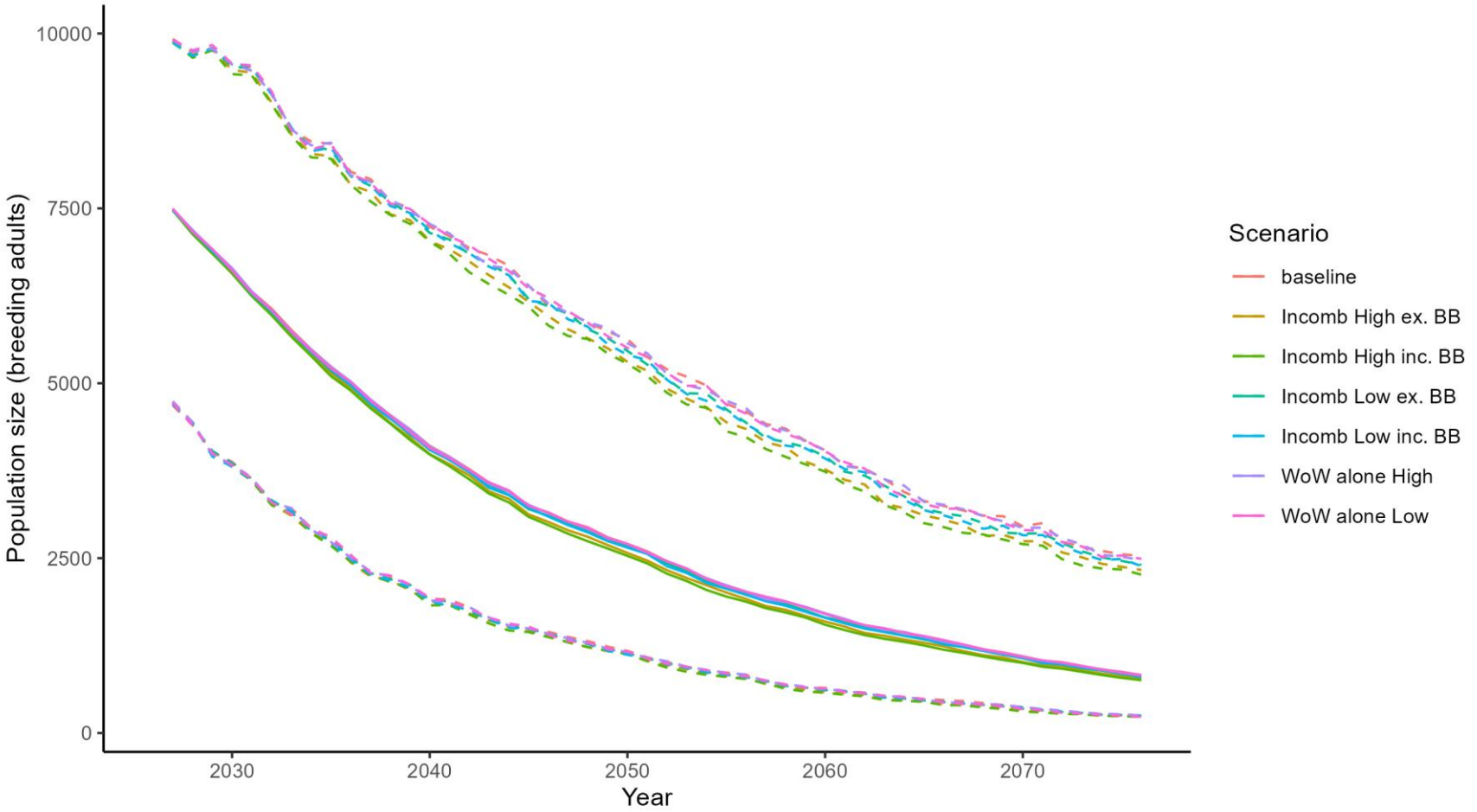

Figure 3-47. Puffin at Foula SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6.6 Hermaness, Saxa Vord and Valla Field SPA

Table 3-97. PVA Inputs: Puffin at Hermaness, Saxa Vord and Valla Field SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Hermaness, Saxa Vord and Valla Field SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	1.364091e-05
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	4.0922633496603833E-5
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	28750	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	1.6669463575428071E-4
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	4.9786692835774844E-4
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	2.2348304748951423E-4
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	6.6823216356344908E-4
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-98. PVA Outputs: Puffin at Hermaness, Saxa Vord and Valla Field SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	0.4	0.00001364091	25	1.0000	1.0000	0.0008	0.9983	1.0015	1.0003	0.9998	0.0213	0.9575	1.0401	49.6	50.4
WoW alone High	1.2	0.00004092263	25	1.0000	1.0000	0.0008	0.9983	1.0014	0.9992	0.9986	0.0203	0.9572	1.0367	49.6	50.4
Incomb Low ex. BB	4.8	0.00016669464	25	0.9998	0.9998	0.0008	0.9982	1.0014	0.9944	0.9950	0.0206	0.9541	1.0372	49.3	50.8
Incomb High ex. BB	14.3	0.00049786693	25	0.9994	0.9994	0.0008	0.9978	1.0010	0.9843	0.9846	0.0207	0.9445	1.0262	48.0	51.3
Incomb Low inc. BB	6.4	0.00022348305	25	0.9997	0.9997	0.0008	0.9981	1.0013	0.9928	0.9929	0.0220	0.9500	1.0355	49.1	50.8
Incomb High inc. BB	19.2	0.00066823216	25	0.9992	0.9992	0.0008	0.9975	1.0007	0.9796	0.9794	0.0207	0.9394	1.0201	47.9	51.8
WoW alone Low	0.4	0.00001364091	35	1.0000	1.0000	0.0008	0.9984	1.0016	1.0000	1.0004	0.0290	0.9457	1.0601	49.7	50.4
WoW alone High	1.2	0.00004092263	35	1.0000	0.9999	0.0008	0.9984	1.0014	0.9980	0.9980	0.0275	0.9439	1.0534	49.7	50.1
Incomb Low ex. BB	4.8	0.00016669464	35	0.9998	0.9998	0.0008	0.9983	1.0012	0.9928	0.9923	0.0271	0.9390	1.0445	49.5	50.4
Incomb High ex. BB	14.3	0.00049786693	35	0.9994	0.9994	0.0008	0.9980	1.0010	0.9796	0.9797	0.0276	0.9305	1.0356	47.6	52.3
Incomb Low inc. BB	6.4	0.00022348305	35	0.9997	0.9997	0.0008	0.9983	1.0013	0.9909	0.9904	0.0278	0.9380	1.0466	49.4	51.0
Incomb High inc. BB	19.2	0.00066823216	35	0.9992	0.9992	0.0008	0.9976	1.0006	0.9728	0.9719	0.0280	0.9193	1.0235	48.2	52.2
WoW alone Low	0.4	0.00001364091	50	1.0000	1.0000	0.0008	0.9984	1.0017	1.0000	1.0021	0.0428	0.9225	1.0899	49.6	50.5
WoW alone High	1.2	0.00004092263	50	1.0000	1.0000	0.0008	0.9985	1.0016	0.9985	1.0001	0.0425	0.9216	1.0860	49.7	50.1
Incomb Low ex. BB	4.8	0.00016669464	50	0.9998	0.9998	0.0009	0.9982	1.0016	0.9916	0.9926	0.0433	0.9094	1.0846	49.0	51.2
Incomb High ex. BB	14.3	0.00049786693	50	0.9996	0.9996	0.0008	0.9980	1.0013	0.9782	0.9797	0.0407	0.9027	1.0646	48.6	52.3
Incomb Low inc. BB	6.4	0.00022348305	50	0.9998	0.9998	0.0008	0.9983	1.0014	0.9888	0.9894	0.0408	0.9167	1.0731	48.5	50.8
Incomb High inc. BB	19.2	0.00066823216	50	0.9995	0.9995	0.0008	0.9978	1.0011	0.9735	0.9734	0.0412	0.8916	1.0597	47.6	52.1

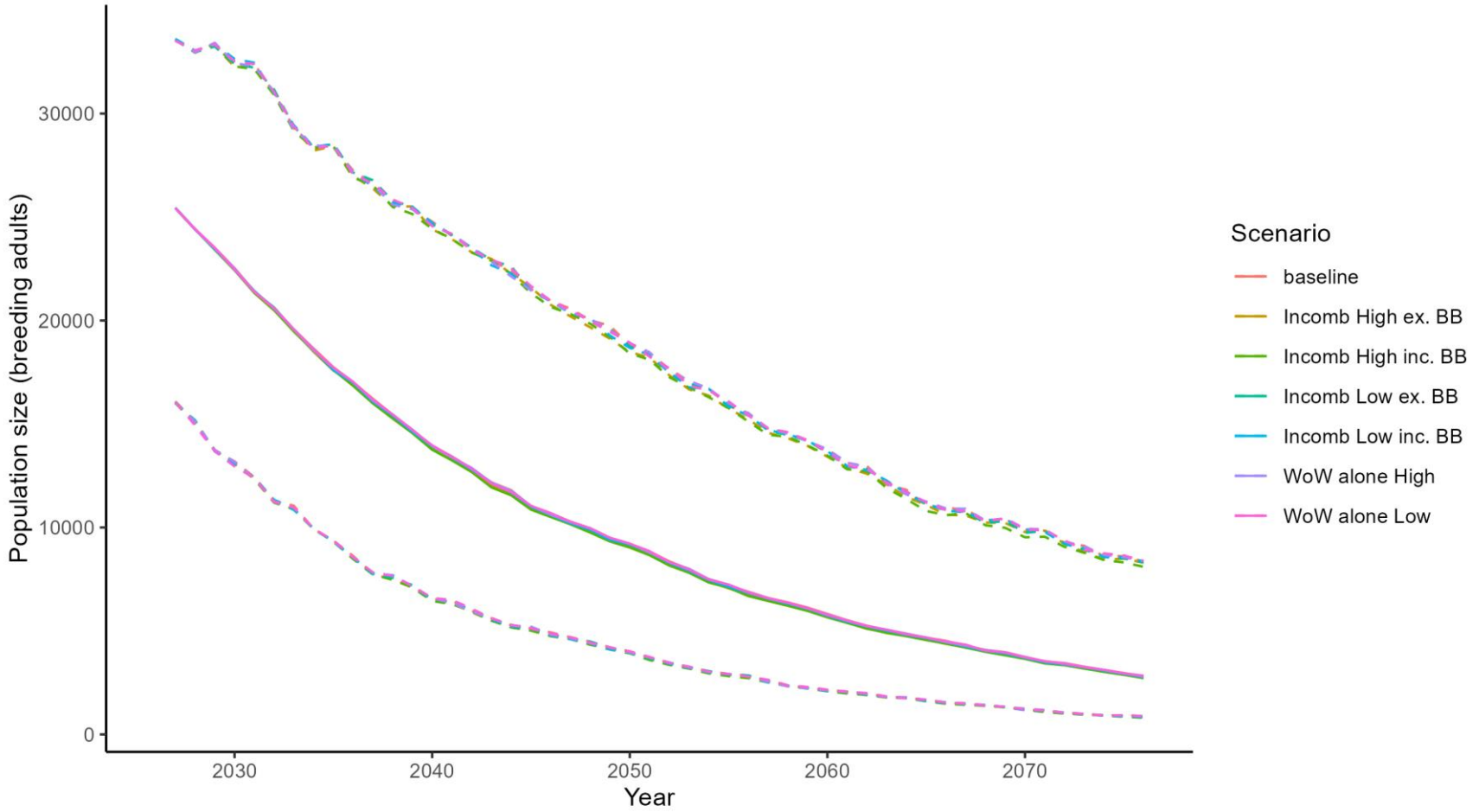

Figure 3-48. Puffin at Hermaness, Saxa Vord and Valla Field SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

3.1.6.7 *Sule Skerry and Sule Stack SPA*

Table 3-99. PVA Inputs: Puffin at Sule Skerry and Sule Stack SPA

Baseline parameters	Settings	Impact parameters	Values
Reference name	Puffin at Sule Skerry and Sule Stack SPA	Number of scenarios of impact	6
Type	Simulation	Are impacts applied separately to each subpopulation	FALSE
Case studies	None	Are impacts specified separately for immatures	FALSE
Model to use for environmental stochasticity	Beta/Gamma	Are standard errors of impacts available	FALSE
Choose model for density dependence	No density dependence	Should random seeds be matched for impact scenarios	TRUE
Include demographic stochasticity in model	TRUE	Impacts are specified as	Relative
Number of simulations	1000	Years in which impacts are assumed to begin	2027
Random seed	1971	Years in which impacts are assumed to end	2062
Years for burn in	5	Scenario A name	WoW alone Low
Species	Atlantic puffin	Scenario A Impact on productivity rate per pair mean	0
Age at first breeding	5	Scenario A Impact on adult survival rate	0.0005084074
Is there an upper constraint on productivity in the model	TRUE	Scenario A Impact on immature survival rate mean	-
Maximum brood size per pair chicks will be constrained to be no greater than	1	Scenario B name	WoW alone High
Number of subpopulations	1	Scenario B Impact on productivity rate per pair mean	0
Units for initial population size	Breeding.adults	Scenario B Impact on adult survival rate	8.4743746304047558E-4
Are baseline demographic rates specified separately for immatures	TRUE	Scenario B Impact on immature survival rate mean	-
Initial population size	95484	Scenario C name	Incomb Low ex. BB
Year	2023	Scenario C Impact on productivity rate per pair mean	0
Productivity rate per pair mean	0.4154966	Scenario C Impact on adult survival rate	5.0917123527811664E-4
Productivity rate per pair standard deviation	0.2120927	Scenario C Impact on immature survival rate mean	-
Adult survival rate Mean	0.907	Scenario D name	Incomb High ex. BB
Adult survival rate standard deviation	0.083	Scenario D Impact on productivity rate per pair mean	0
Immatures survival rates 0 to 1 mean	0.709	Scenario D Impact on adult survival rate	8.4972890897266147E-4
Immatures survival rates 0 to 1 standard deviation	0.108	Scenario D Impact on immature survival rate mean	-
Immatures survival rates 1 to 2 mean	0.709	Scenario E name	Incomb Low inc. BB
Immatures survival rates 1 to 2 standard deviation	0.108	Scenario E Impact on productivity rate per pair mean	0
Immatures survival rates 2 to 3 mean	0.709	Scenario E Impact on adult survival rate	5.0945775060159265E-4
Immatures survival rates 2 to 3 standard deviation	0.108	Scenario E Impact on immature survival rate mean	-
Immatures survival rates 3 to 4 mean	0.76	Scenario F name	Incomb High inc. BB

Baseline parameters	Settings	Impact parameters	Values
Immatures survival rates 3 to 4 standard deviation	0.093	Scenario F Impact on productivity rate per pair mean	0
Immatures survival rates 4 to 5 mean	0.805000000000	Scenario F Impact on adult survival rate	8.5058845494308938E-4
Immatures survival rates 4 to 5 standard deviation	8.300000000000	Scenario F Impact on immature survival rate mean	
Immatures survival rates 5 to 6 mean	-		
Immatures survival rates 5 to 6 standard deviation	-		
Units for output	Breeding.adults		

Table 3-100. PVA Outputs: Puffin at Sule Skerry and Sule Stack SPA

Scenario	Mortality	Increase in mortality rate	Year	C-PGR					C-PS					50% Quantiles	
				Med.	Mean	SD	LCI	UCI	Med.	Mean	SD	LCI	UCI	Q-UNIMP-50%	Q-IMP-50%
WoW alone Low	48.5	0.0005084074	25	0.9994	0.9994	0.0004	0.9985	1.0004	0.9849	0.9849	0.0113	0.9630	1.0080	48.8	51.3
WoW alone High	80.9	0.0008474375	25	0.9990	0.9990	0.0004	0.9981	0.9998	0.9745	0.9745	0.0112	0.9528	0.9969	47.1	52.1
Incomb Low ex. BB	48.6	0.0005091712	25	0.9994	0.9994	0.0004	0.9985	1.0002	0.9852	0.9848	0.0115	0.9620	1.0073	48.6	51.4
Incomb High ex. BB	81.1	0.0008497289	25	0.9990	0.9990	0.0004	0.9982	0.9999	0.9751	0.9747	0.0113	0.9528	0.9977	47.2	52.1
Incomb Low inc. BB	48.6	0.0005094578	25	0.9994	0.9994	0.0004	0.9986	1.0003	0.9846	0.9847	0.0113	0.9622	1.0084	48.1	51.4
Incomb High inc. BB	81.2	0.0008505885	25	0.9990	0.9990	0.0004	0.9981	0.9999	0.9749	0.9749	0.0114	0.9507	0.9976	47.0	52.2
WoW alone Low	48.5	0.0005084074	35	0.9994	0.9994	0.0004	0.9986	1.0003	0.9792	0.9792	0.0152	0.9489	1.0085	48.0	51.7
WoW alone High	80.9	0.0008474375	35	0.9990	0.9990	0.0004	0.9982	0.9999	0.9645	0.9650	0.0148	0.9385	0.9958	46.5	52.2
Incomb Low ex. BB	48.6	0.0005091712	35	0.9994	0.9994	0.0004	0.9986	1.0002	0.9788	0.9787	0.0153	0.9504	1.0100	48.1	51.4
Incomb High ex. BB	81.1	0.0008497289	35	0.9990	0.9990	0.0004	0.9981	0.9998	0.9651	0.9649	0.0150	0.9355	0.9941	46.5	52.4
Incomb Low inc. BB	48.6	0.0005094578	35	0.9994	0.9994	0.0004	0.9986	1.0003	0.9791	0.9789	0.0156	0.9488	1.0103	48.3	51.9
Incomb High inc. BB	81.2	0.0008505885	35	0.9990	0.9990	0.0004	0.9982	0.9998	0.9657	0.9653	0.0148	0.9339	0.9951	46.3	52.4
WoW alone Low	48.5	0.0005084074	50	0.9996	0.9996	0.0004	0.9987	1.0005	0.9784	0.9793	0.0225	0.9373	1.0237	48.4	52.0
WoW alone High	80.9	0.0008474375	50	0.9993	0.9993	0.0005	0.9984	1.0002	0.9645	0.9655	0.0226	0.9237	1.0083	47.6	52.7
Incomb Low ex. BB	48.6	0.0005091712	50	0.9996	0.9996	0.0005	0.9987	1.0005	0.9777	0.9788	0.0234	0.9324	1.0281	48.0	51.8
Incomb High ex. BB	81.1	0.0008497289	50	0.9993	0.9993	0.0005	0.9983	1.0002	0.9637	0.9645	0.0231	0.9167	1.0119	47.2	52.3
Incomb Low inc. BB	48.6	0.0005094578	50	0.9996	0.9996	0.0005	0.9987	1.0005	0.9778	0.9792	0.0234	0.9323	1.0262	48.0	51.5
Incomb High inc. BB	81.2	0.0008505885	50	0.9993	0.9993	0.0005	0.9984	1.0002	0.9650	0.9650	0.0222	0.9226	1.0119	47.6	52.5

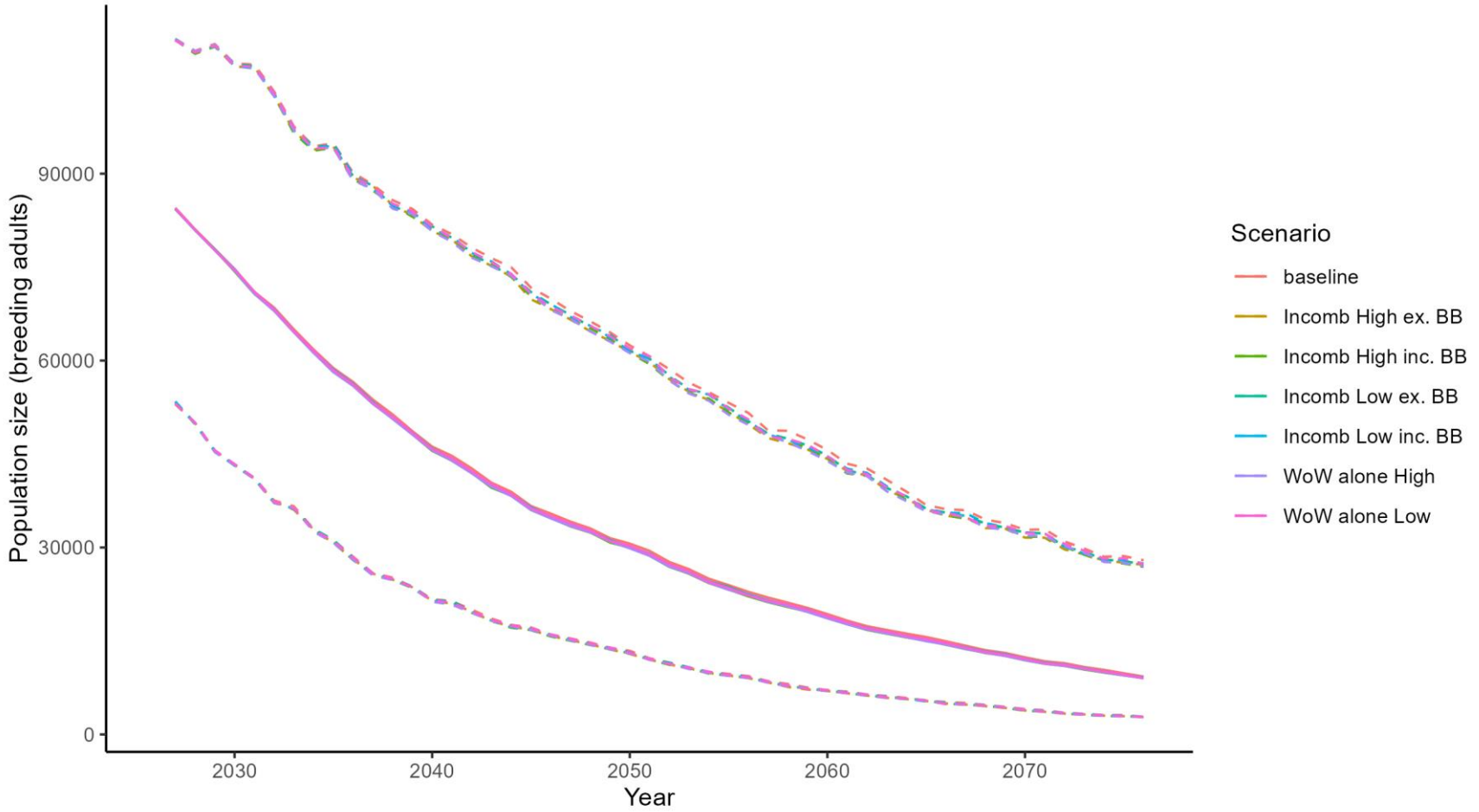

Figure 3-49. Puffin at Sule Skerry and Sule Stack SPA. Baseline = unimpacted population. WOW = West of Orkney Windfarm. Incomb High = high displacement impact scenario for Project alone and In-combination impacts. Incomb Low = low displacement impact scenario for Project alone and In-combination impacts. Ex BB are in-combination impacted excluding Berwick Bank OWF. Inc BB are in-combination impacts including Berwick Bank OWF. WOW alone High = high displacement impact scenario for Project alone. WOW alone Low = low displacement impact scenario for Project alone. Some trajectories are obscured in the plot due to being very similar to other trajectories.

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