MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Appendix to Ornithological assessment clarification data (REP5-035) - Explanatory note to support SNCB and Applicant workbooks

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Image of an offshore wind farm

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Glossary

Term	Meaning
Applicant	Morgan Offshore Wind Limited.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Morgan Array Area	The area within which the wind turbines, foundations, inter-array cables, interconnector cables, scour protection, cable protection and offshore substation platforms (OSPs) forming part of the Morgan Offshore Wind Project: Generation Assets will be located.
Morgan Offshore Wind Project: Generation Assets	This is the name given to the Morgan Generation Assets project as a whole (includes all infrastructure and activities associated with the project construction, operations and maintenance, and decommissioning).
The Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.

Acronyms

Acronym	Description
CEA	Cumulative Effects Assessment
CGR	Counterfactual of Growth Rate
CPS	Counterfactual of Population Size
CRM	Collision risk model
HRA	Habitats Regulations Assessment
MERP	Marine Ecosystems Research Programme
SeaMaST	Seabird Mapping and Sensitivity Tool
SPA	Special Protection Areas

Units

Unit	Description
Km	Kilometres
km^2	Kilometres squared
M	Metres
Rpm	Revolutions per minute
°	Degrees
%	Percentage

1   EXPLANATORY NOTE TO SUPPORT SNCB AND APPLICANT WORKBOOKS

1.1   Introduction

1.1.1.1   This note provides explanatory information to support the workbooks submitted by the Applicant at Deadline 5, reflecting the position of the Statutory Nature Conservation Bodies (SNCBs) (Annex 16.1 to Ornithological assessment clarification data English sites (REP5-032), Annex 16.2 to Ornithological assessment clarification data Welsh sites (AS-013) and Annex 16.3 to Ornithological assessment clarification data offshore sites (REP5-034)) and of the Applicant (Annex 16.4 to Ornithological assessment clarification data (REP5-035) - Applicant's parameters (English sites) S_D6_37.2 and Annex 16.5 to Ornithological assessment clarification data (REP5-035) - Applicant's parameters (Welsh sites) S_D6_37.3). This includes additional detail that cannot be included in the aforementioned workbooks including the apportioning values applied to cumulative impacts for other projects, the process undertaken to identify those species for which PVA was required and the associated PVA input logs.

1.1.1.2   This includes the sources of information used to populate the workbooks as well as the additional information required to support the assessments undertaken in the workbooks.

1.2   Information sources

1.2.1.1   The information used to parameterise the workbooks is provided in Table 1.1. The clarification data submitted at Deadline 6 (S_D6_37.2 and S_D6_37.3) present comparable information to that provided in this explanatory note together with additional information that was requested from the SNCBs. Some of the information provided at Deadline 6 was incorporated into the workbooks submitted at Deadline 5.

Table 1.1:   Data sources incorporated into the workbooks.

Source	Examination Library reference	Information included in workbook(s)
Volume 4, Annex 5.2: Offshore ornithology displacement technical report	APP-054	Displacement estimates calculated applying the upper and lower displacement and mortality rates advocated by the SNCBs.
Volume 4, Annex 5.3: Offshore ornithology collision risk modelling technical report	APP-055	Collision risk estimates calculated using parameters advocated by the SNCBs.
Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note	REP1-010	Quantified impact estimates for projects considered qualitatively in the application.
Annex 4.7 to Response to Hearing Action Point 15: Apportioning Sensitivity Analysis	REP1-012	Apportioning values calculated using data from the Seabirds Count (Burnell *et al.,* 2023).
Inclusion of Awel y Môr in Cumulative Assessments – Clarification note	REP3-018	Updated impact estimates for the Awel ŷ Mor offshore wind farm.
Review of Cumulative Effects Assessment and In-Combination Assessment: Offshore ornithology	REP3-019	Updated impact estimates for the Morecambe Offshore Windfarm: Generation Assets.

Source	Examination Library reference	Information included in workbook(s)
Kittiwake apportioning clarification note	REP3-020	SNCB recommended approach for the apportioning of kittiwake for relevant SPAs.
Additional PVA Modelling for Great Black-Backed Gull Cumulative Assessment	REP5-031	PVA modelling for great black-backed gull using parameters recommended by Natural England.
Additional PVA Modelling for Guillemot Cumulative Assessment	S_D6_37.2	PVA modelling for guillemot using parameters recommended by Natural England.
Assessment of Gannet at the Grassholm SPA	S_D6_37.3	Assessment of gannet at the Grassholm SPA to provide additional information for NRW

1.3 Supporting information

1.3.1 Gap-filling for additional projects

Overview

1.3.1.1 The Barrow offshore wind farm, North Hoyle offshore wind farm and Rhyl Flats offshore wind farm were initially discounted from consideration in the cumulative and in-combination assessments for the Morgan Generation Assets presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) and HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), due to the operational life span of these projects. The Applicant has since incorporated the Barrow offshore wind farm, North Hoyle offshore wind farm and Rhyl Flats offshore wind farm projects into the cumulative and in-combination assessments required for the Morgan Generation Assets, as presented in the following sections and in the accompanying workbooks (S_D6_37.2 and S_D6_37.3).

Methodology

1.3.1.2 The methodology applied to calculate abundance estimates and impact estimates for the Barrow, North Hoyle and Rhyl Flats offshore wind farms is consistent with that applied for the original gap-fill projects considered in Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010).

1.3.1.3 Project-specific abundances were unavailable for all three projects and therefore alternative sources were required in order to estimate abundance metrics. The source used for each project is identified in Table 1.2.

Table 1.2: Summary of data sources used to calculate density data for relevant projects.

Project	Species of relevance	Seasons of relevance	Data source
Barrow Offshore Wind Farm, North Hoyle Offshore Wind Farm and Rhyl	All (except great black-backed gull and lesser black-backed gull)	All	Marine Ecosystems Research Programme (MERP) data have been used for all relevant species and all seasons.
	Lesser black-backed gull	All	Collision risk estimates for lesser black-backed gull were taken from DONG Energy (2014)

Project	Species of relevance	Seasons of relevance	Data source
Flats Offshore Wind Farm	Great black-backed gull	All	Seabird Mapping and Sensitivity Tool (SeaMaST) data have been used for great black-backed gull.

1.3.1.4   The monthly densities, as used in collision risk modelling (CRM) for each project, calculated using the MERP dataset for kittiwake, herring gull and gannet and the SeaMaST dataset for great black-backed gull are provided in Table 1.3. Those densities calculated using the MERP dataset were corrected to remove sitting birds using the same proportions applied in Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010). The derivation of densities was not required for lesser black-backed gull as collision risk estimates are available from DONG Energy (2014).

Table 1.3: Densities (birds per km²) of kittiwake, great black-backed gull, herring gull and gannet at the Barrow, North Hoyle and Rhyl Flats offshore wind farms.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Barrow Offshore Wind Farm												
Kittiwake	0.46	0.47	0.31	0.19	0.18	0.16	0.14	0.40	0.13	0.22	0.37	0.43
Great black-backed gull	0.05	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.05	0.05	0.05
Herring gull	0.25	0.28	1.01	1.44	1.38	1.30	1.21	0.66	0.11	0.13	0.17	0.21
Gannet	0.06	0.06	0.07	0.09	0.10	0.12	0.14	0.16	0.16	0.12	0.08	0.07
North Hoyle Offshore Wind Farm												
Kittiwake	0.43	0.44	0.30	0.19	0.18	0.16	0.14	0.36	0.13	0.20	0.33	0.40
Great black-backed gull	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Herring gull	0.23	0.26	0.25	0.23	0.19	0.15	0.12	0.10	0.11	0.13	0.16	0.20
Gannet	0.06	0.06	0.07	0.09	0.10	0.12	0.14	0.15	0.15	0.11	0.08	0.07
Rhyl Flats Offshore Wind Farm												
Kittiwake	0.42	0.44	0.32	0.22	0.20	0.17	0.15	0.14	0.21	0.32	0.36	0.39
Great black-backed gull	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Herring gull	0.24	0.26	0.26	0.23	0.19	0.15	0.12	0.10	0.11	0.13	0.16	0.20
Gannet	0.06	0.06	0.07	0.09	0.10	0.12	0.14	0.16	0.16	0.12	0.08	0.07

1.3.1.5 The wind farm and turbine parameters used to parameterise CRMs for each project are provided in Table 1.4.

Table 1.4:   Wind farm parameters used within the CRMs for the historical projects gap-filling.

Project	Number of turbines	Turbine capacity (MW)	Hub height (m from HAT)	Rotor radius (m)	Rotor speed (rpm)	Maximum blade width (m)	Blade pitch (°)	Proportion of time operational (%)	Tidal offset (m)	Latitude (decimal degrees)	Width (km)
Barrow	30	3	71	45	16.1	3.5	6	94	4	54.0	4.72
North Hoyle	30	2	63	40	16.7	3.5	15	94	4	53.4	4.69
Rhyl Flats	25	3.6	76	53.5	13.5	4.2	15	94	4	53.2	9.442

1.3.2 In-combination calculations for English, Welsh and offshore SPAs

1.3.2.1 At Deadline 5, the Applicant submitted Annex 16.1 to Ornithological assessment clarification data English sites (REP5-032), Annex 16.2 to Ornithological assessment clarification data Welsh sites (AS-013) and Annex 16.3 to Ornithological assessment clarification data offshore sites (REP5-034), which quantified the predicted in-combination impact on the following SPA qualifying features:

- Herring gull at the Morecambe Bay and Duddon Estuary SPA/Morecambe Bay Ramsar

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

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

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

- Manx shearwater at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

- Manx shearwater at the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

1.3.2.2 This section provides the detailed calculations underpinning the values for each project included in Annex 16.1 to Ornithological assessment clarification data English sites (REP5-032), Annex 16.2 to Ornithological assessment clarification data Welsh sites (AS-013) and Annex 16.3 to Ornithological assessment clarification data offshore sites (REP5-034).

1.3.2.3 For comparable information relating to great black-backed gull at the Isles of Scilly SPA/Isles of Scilly Ramsar please see Additional PVA Modelling for Great Black-Backed Gull Cumulative Assessment (REP5-031). For gannet at the Grassholm SPA please see S_D6_37.3. Information for these species has been provided in separate clarification notes to provide additional information requested by the SNCBs.

1.3.2.4 For all other qualifying features of relevant SPAs screened into HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) the predicted impact did not surpass the thresholds defined in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and therefore consideration of in-combination impacts was not required as the contribution of the Morgan Generation Assets to any existing impact was considered to be immaterial.

Herring gull at the Morecambe Bay and Duddon Estuary SPA/Morecambe Bay Ramsar

Table 1.5: **In-combination collision risk total for herring gull at the Morecambe Bay and Duddon Estuary SPA/Morecambe Bay Ramsar.**

Notes

[a] Assumed to be the same as Walney Extension

[b] Assumed to be the same as Burbo Bank Extension

Values are rounded to one decimal place whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values		Seasonal apportioned collision values (99.39% avoidance rate)		Seasonal apportioned collision values (99.52% avoidance rate)	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	0.062	0.016	0.1	0.0	0.1	0.0
Barrow	0.411[a]	0.016	5.9	0.0	4.6	0.0
Burbo Bank	0.060[b]	0.016	0.1	0.0	0.1	0.0
Burbo Bank Extension	0.060	0.016	1.0	0.2	0.8	0.2
Erebus	No connectivity	0.016	-	0.0		0.0
Gwynt y Môr	0.060[b]	0.016	1.3	0.3	1.0	0.2
Llŷr 1	No connectivity	0.016	-	0.0	-	0.0
Mona Offshore Wind Project	0.110	0.016	0.0	0.0	0.0	0.0
Morecambe Offshore Windfarm: Generation Assets	0.154	0.016	0.0	0.0	0.2	0.0
Morgan Generation Assets	0.054	0.016	0.1	0.1	0.1	0.1
North Hoyle	0.060[b]	0.016	0.1	0.0	0.1	0.0
Ormonde	0.411[a]	0.016	0.0	0.0	0.0	0.0

Project	Seasonal apportioning values		Seasonal apportioned collision values (99.39% avoidance rate)		Seasonal apportioned collision values (99.52% avoidance rate)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Rhyl Flats	0.060[b]	0.016	0.3	0.0	0.2	0.0
Robin Rigg	0.060[b]	0.016	0.4	0.1	0.3	0.0
Twinhub	No connectivity	0.016	-	0.2	-	0.2
Walney 1&2	0.411[a]	0.016	8.2	0.2	6.4	0.1
Walney 3 + 4	0.411	0.016	17.0	0.4	13.3	0.3
West of Duddon Sands	0.411[a]	0.016	13.5	0.1	10.6	0.1
White Cross	No connectivity	0.016	-	0.0	-	0.0
Annual total			**49.9**		**39.5**	

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

Table 1.6:   In-combination collision risk total for kittiwake at the Skomer, Skokholm and Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA.

Notes

[a] Assumed to be the same as the Morgan Generation Assets

[b] Assumed to be the same as Awel y Môr

[c] Assumed to be the same as Llŷr 1

Values are rounded to one decimal place whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate)			Seasonal apportioned collision values (99.79% avoidance rate)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr	0.004	0.001	0.002	0.1	0.0	0.0	0.0	0.0	0.0
Barrow	0.003[a]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Burbo Bank	0.004[b]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Burbo Bank Extension	0.004[b]	0.001	0.002	0.1	0.0	0.0	0.0	0.0	0.0
Erebus	0.817	0.001	0.002	1.0	0.0	0.0	0.3	0.0	0.0
Gwynt y Môr	0.004[b]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Llŷr 1	0.636	0.001	0.002	0.1	0.0	0.0	0.0	0.0	0.0
Mona Offshore Wind Project	0.002	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Morecambe Offshore Windfarm: Generation Assets	0.003	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate)			Seasonal apportioned collision values (99.79% avoidance rate)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Morgan Generation Assets	0.003	0.001	0.002	0.1	0.0	0.0	0.0	0.0	0.0
North Hoyle	0.004[b]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Ormonde	0.003[a]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Rampion	No connectivity	0.001	0.002	-	0.0	0.0		0.0	0.0
Rampion 2	No connectivity	0.001	0.002	-	0.0	0.0		0.0	0.0
Rhyl Flats	0.004[b]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Robin Rigg	No connectivity	0.001	0.002	-	0.0	0.0		0.0	0.0
Twinhub	0.636[c]	0.001	0.002	0.9	0.0	0.0	0.3	0.0	0.0
Walney 1&2	0.003[a]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
Walney 3 + 4	0.003[a]	0.001	0.002	0.1	0.1	0.1	0.0	0.0	0.0
West of Duddon Sands	0.003[a]	0.001	0.002	0.0	0.0	0.0	0.0	0.0	0.0
West of Orkney	No connectivity	0.001	0.002	-	0.0	0.0		0.0	0.0
White Cross	0.636[c]	0.001	0.002	0.1	0.0	0.0	0.0	0.0	0.0
Annual total				3.3			1.0		

Table 1.7: **Cumulative abundance for kittiwake at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA for projects considered in-combination in relation to disturbance and displacement from projects.**

Notes

[a] Assumed to be the same as the Morgan Generation Assets

[b] Assumed to be the same as Awel y Môr

[c] Assumed to be the same as Erebus

Values are rounded to whole numbers whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**
Awel y Môr	0.004	0.001	0.002	2	0	1
Barrow	0.003[a]	0.001	0.002	0	0	0
Burbo Bank	0.004[b]	0.001	0.002	0	0	0
Burbo Bank Extension	0.004[b]	0.001	0.002	5	0	0
Erebus	0.817	0.001	0.002	2	3	1
Gwynt y Môr	0.004[b]	0.001	0.002	0	0	0
Llŷr 1	0.636	0.001	0.002	56	3	0
Mona Offshore Wind Project	0.002	0.001	0.002	1	1	2
Morecambe Offshore Windfarm: Generation Assets	0.003	0.001	0.002	6	2	1
Morgan Generation Assets	0.003	0.001	0.002	2	2	2
North Hoyle	0.004[b]	0.001	0.002	0	0	0

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**
Ormonde	0.003[a]	0.001	0.002	0	0	0
Rampion	No connectivity	0.001	0.002	-	1	1
Rampion 2	No connectivity	0.001	0.002	-	0	1
Rhyl Flats	0.004[b]	0.001	0.002	0	0	0
Robin Rigg	No connectivity	0.001	0.002	-	0	0
Twinhub	0.817[c]	0.001	0.002	8	0	0
Walney 1&2	0.003[a]	0.001	0.002	0	0	0
Walney 3 + 4	0.003[a]	0.001	0.002	1	1	1
West of Duddon Sands	0.003[a]	0.001	0.002	2	0	0
West of Orkney	No connectivity	0.001	0.002	0	1	3
White Cross	0.817[c]	0.001	0.002	31	0	1
Annual total				**144.1**		

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

Table 1.8: **Cumulative abundance for guillemot at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA for projects considered in-combination in relation to disturbance and displacement from projects.**

Notes

[a] Assumed to be the same as Erebus

Values are rounded to whole numbers whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.026	-	75
Barrow	No connectivity	0.026	-	2
Burbo Bank	No connectivity	0.026	-	2
Burbo Bank Extension	No connectivity	0.026	-	40
Erebus	0.754	0.026	5,279	730
Gwynt y Môr	No connectivity	0.026	-	5
Llŷr 1	0.487	0.026	987	335
Mona Offshore Wind Project	No connectivity	0.026	-	97
Morecambe Offshore Windfarm: Generation Assets	No connectivity	0.026	-	214
Morgan Generation Assets	No connectivity	0.026	-	98
North Hoyle	No connectivity	0.026	-	2
Ormonde	No connectivity	0.026	-	1
Rhyl Flats	No connectivity	0.026	-	2
Robin Rigg	No connectivity	0.026	-	2
Twinhub	No connectivity	0.026	-	6
Walney 1&2	No connectivity	0.026	-	6

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Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	Non-breeding	Breeding	Non-breeding
Walney 3 + 4	No connectivity	0.026	-	50
West of Duddon Sands	No connectivity	0.026	-	4
West of Orkney	No connectivity	0.026	-	113
White Cross	0.754[a]	0.026	2,491	27
Annual total			**10,567.4**	

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

Table 1.9: **Cumulative abundance for razorbill at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA for projects considered in-combination in relation to disturbance and displacement from projects.**

Notes

[a] Assumed to be the same as Erebus

Values are rounded to whole numbers whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values				Seasonal abundance values			
	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding
Awel y Môr	No connectivity	0.019	0.011	0.019	-	1	2	7
Barrow	No connectivity	0.019	0.011	0.019	-	0	0	0
Burbo Bank	No connectivity	0.019	0.011	0.019	-	0	0	0
Burbo Bank Extension	No connectivity	0.019	0.011	0.019	-	0	0	0
Erebus	0.892	0.019	0.011	0.019	173	33	11	17
Gwynt y Môr	No connectivity	0.019	0.011	0.019	-	0	0	1
Llŷr 1	0.639	0.019	0.011	0.019	13	37	5	5
Mona Offshore Wind Project	No connectivity	0.019	0.011	0.019	-	2	4	37
Morecambe Offshore Windfarm: Generation Assets	No connectivity	0.019	0.011	0.019	-	13	7	7
Morgan Generation Assets	No connectivity	0.019	0.011	0.019	-	5	12	6
North Hoyle	No connectivity	0.019	0.011	0.019	-	0	0	0
Ormonde	No connectivity	0.019	0.011	0.019	-	0	0	0
Rhyl Flats	No connectivity	0.019	0.011	0.019	-	0	0	0

Project	Seasonal apportioning values				Seasonal abundance values			
	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding
Robin Rigg	No connectivity	0.019	0.011	0.019	-	0	0	0
Twinhub	No connectivity	0.019	0.011	0.019	-	0	1	0
Walney 1&2	No connectivity	0.019	0.011	0.019	-	0	0	1
Walney 3 + 4	No connectivity	0.019	0.011	0.019	-	17	32	2
West of Duddon Sands	No connectivity	0.019	0.011	0.019	-	0	2	1
West of Orkney	No connectivity	0.019	0.011	0.019	-	2	0	1
White Cross	0.892[a]	0.019	0.011	0.019	36	1	4	7
Annual total							510.8	

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

Table 1.10: Cumulative abundance for Manx shearwater at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Notes

[a] Assumed to be the same as the Morgan Generation Assets

[b] Assumed to be the same as Awel y Môr

*Values are rounded to whole numbers whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr	0.375	0.443	0.443	10	95	78
Barrow	0.638[a]	0.443	0.443	0	0	0
Burbo Bank	0.375[b]	0.443	0.443	1	0	0
Burbo Bank Extension	0.375[b]	0.443	0.443	166	1	0
Erebus	0.995	0.443	0.443	1,532	247	8
Gwynt y Môr	0.375[b]	0.443	0.443	5	2	0
Llŷr 1	0.983	0.443	0.443	3,376	12	561
Mona Offshore Wind Project	0.750	0.443	0.443	936	81	1
Morecambe Offshore Windfarm: Generation Assets	0.765	0.443	0.443	3601	1,173	716
Morgan Generation Assets	0.638	0.443	0.443	800	403	0
North Hoyle	0.375[b]	0.443	0.443	0	0	0
Ormonde	0.638[a]	0.443	0.443	638	0	0
Rampion	0.000	0.443	0.443	0	0	0

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Rampion 2	0.000	0.443	0.443	0	0	0
Rhyl Flats	0.375[b]	0.443	0.443	0	1	0
Robin Rigg	0.638[a]	0.443	0.443	88	0	0
Twinhub	0.603	0.443	0.443	766	1	0
Walney 1&2	0.638[a]	0.443	0.443	9	2	0
Walney 3 + 4	0.638[a]	0.443	0.443	375	144	1
West of Duddon Sands	0.638[a]	0.443	0.443	347	1	0
West of Orkney	0.000	0.443	0.443	0	1	0
White Cross	0.940	0.443	0.443	11,398	10	15
Annual total				**27,604.8***		

Manx shearwater at the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA

Table 1.11: Cumulative abundance for Manx shearwater at the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA for projects considered in-combination in relation to disturbance and displacement from projects.

[a] Assumed to be the same as the Morgan Generation Assets

[b] Assumed to be the same as Awel y Môr

[c] Assumed to be the same as Erebus

*Values are rounded to whole numbers whereas all calculations have been undertaken using exact values (i.e. with all decimal places)

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr	0.125	0.020	0.020	3	4	4
Barrow	0.090[a]	0.020	0.020	0	0	0
Burbo Bank	0.125[b]	0.020	0.020	0	0	0
Burbo Bank Extension	0.125[b]	0.020	0.020	55	0	0
Erebus	0.003	0.020	0.020	5	11	0
Gwynt y Môr	0.125[b]	0.020	0.020	2	0	0
Llŷr 1	0.003[c]	0.020	0.020	10	1	26
Mona Offshore Wind Project	0.113	0.020	0.020	142	4	0
Morecambe Offshore Windfarm: Generation Assets	0.086	0.020	0.020	406	54	33
Morgan Generation Assets	0.090	0.020	0.020	113	19	0
North Hoyle	0.125[b]	0.020	0.020	0	0	0
Ormonde	0.090[a]	0.020	0.020	90	0	0
Rampion	0.000	0.020	0.020	0	0	0
Rampion 2	0.000	0.020	0.020	0	0	0

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Rhyl Flats	0.125[b]	0.020	0.020	1	0	0
Robin Rigg	0.090[a]	0.020	0.020	12	0	0
Twinhub	0.003[c]	0.020	0.020	4	0	0
Walney 1&2	0.090[a]	0.020	0.020	1	0	0
Walney 3 + 4	0.090[a]	0.020	0.020	53	7	0
West of Duddon Sands	0.090[a]	0.020	0.020	49	0	0
West of Orkney	0.000	0.020	0.020	0	0	0
White Cross	0.003[c]	0.020	0.020	36	0	1
Annual total				**1,147.8***		

1.3.3 Population Viability Analysis for Welsh SPAs

Designated sites and qualifying features for consideration

1.3.3.1 The in-combination impact magnitudes predicted for a number of features of Welsh SPAs in the workbook presenting the SNCB position (Annex 16.2 to Ornithological assessment clarification data Welsh sites (AS-013)) surpassed the 1% threshold used to identify where further consideration of impacts is required. As a result, PVA modelling was undertaken to support further assessment. PVA modelling was undertaken for the following features:

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

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

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

- Manx shearwater at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

- Manx shearwater at the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

Impacts

1.3.3.2 The impacts and associated decreases in adult survival incorporated into the PVAs for each qualifying feature are provided in Table 1.12.

Table 1.12: In-combination totals and associated impact input parameters for PVA modelling.

Note

[a] Whilst the impact associated with the Morgan Generation Assets does not surpass the 0.05% threshold of baseline mortality used as a criteria for consideration from an in-combination basis, PVA has been conducted to inform the SNCB assessments.

SPA	Species of relevance	Impact	Impact scenario	PVA scenario name	Impact magnitude (no. of birds)	Decrease in adult survival
Skomer, Skokholm and Seas off Pembrokeshire /Sgomer, Sgogwm a Moroedd Penfro SPA	Kittiwake	Collision + displacement	70% displacement 10% mortality SNCB parameters for CRM	KI_Skomer_70_10	13.4	0.004450967
			30% displacement 1% mortality SNCB parameters for CRM	KI_Skomer_30_1	3.7	0.001240813
	Guillemot	Displacement	70% displacement 10% mortality	GU_Skomer_70_10	739.7	0.017025333
			30% displacement 1% mortality	GU_Skomer_30_1	31.7[a]	0.000729657
	Razorbill	Displacement	70% displacement 10% mortality	RA_Skomer_70_10	35.8	0.001750496
			30% displacement 1% mortality	RA_Skomer_30_1	1.5[a]	0.000075021
	Manx shearwater	Displacement	70% displacement 10% mortality	MX_Skomer_70_10	1932.3	0.002122714

SPA	Species of relevance	Impact	Impact scenario	PVA scenario name	Impact magnitude (no. of birds)	Decrease in adult survival
			30% displacement 1% mortality	MX_Skomer_30_1	82.8[a]	0.000090973
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA	Manx shearwater	Displacement	70% displacement 10% mortality	MX_Aberdaron_70_10	80.3	0.000088261
			30% displacement 1% mortality	MX_Aberdaron _30_1	3.4[a]	0.000003783

Outputs

1.3.3.3   PVA outputs for each qualifying feature are provided in the following tables (Table 1.13-Table 1.17).

Table 1.13:   PVA outputs for kittiwake at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Notes:

CGR = Counterfactual of Growth Rate

CPS = Counterfactual of Population Size

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	2,892	-0.5	0.995	0.783	1.160	-	-
2030	KI_Skomer_70_10	2,880	-1.0	0.990	0.779	1.154	0.995	0.995
2030	KI_Skomer_30_1	2,889	-0.6	0.994	0.780	1.158	0.999	0.999
2065	Baseline (unimpacted)	1,676	-42.5	0.985	0.961	1.005	-	-
2065	KI_Skomer_70_10	1,385	-52.7	0.979	0.957	1.000	0.995	0.823
2065	KI_Skomer_30_1	1,589	-45.3	0.983	0.960	1.004	0.999	0.948

Table 1.14: **PVA outputs for guillemot at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.**

Notes:

CGR = Counterfactual of Growth Rate

CPS = Counterfactual of Population Size

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	44,086	1.9	1.019	0.897	1.125	-	-
2030	GU_Skomer_70_10	43,288	0.1	1.001	0.878	1.105	0.982	0.982
2030	GU_Skomer_30_1	44,042	1.8	1.018	0.896	1.123	0.999	0.999
2065	Baseline (unimpacted)	79,737	84.0	1.017	1.002	1.030	-	-
2065	GU_Skomer_70_10	39,754	-8.2	0.998	0.983	1.011	0.981	0.499
2065	GU_Skomer_30_1	77,355	78.7	1.016	1.002	1.030	0.999	0.971

Table 1.15:   PVA outputs for razorbill at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Notes:

CGR = Counterfactual of Growth Rate

CPS = Counterfactual of Population Size

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	15,319	1.3	1.013	0.834	1.150	-	-
2030	RA_Skomer_70_10	15,299	1.2	1.012	0.832	1.148	0.998	0.998
2030	RA_Skomer_30_1	15,322	1.3	1.013	0.833	1.149	1.000	1.000
2065	Baseline (unimpacted)	17,325	14.8	1.004	0.985	1.022	-	-
2065	RA_Skomer_70_10	16,133	6.5	1.002	0.983	1.020	0.998	0.931
2065	RA_Skomer_30_1	17,263	14.2	1.004	0.985	1.021	1.000	0.997

Table 1.16: PVA outputs for Manx shearwater at the Skomer, Skokholm and Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Notes:

CGR = Counterfactual of Growth Rate

CPS = Counterfactual of Population Size

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	1,033,392	2.6	1.026	0.805	1.165	-	-
2030	MX_Skomer_70_10	1,030,906	2.3	1.023	0.802	1.163	0.998	0.997
2030	MX_Skomer_30_1	1,032,688	2.6	1.026	0.805	1.166	1.000	1.000
2065	Baseline (unimpacted)	1,502,390	48.0	1.011	0.991	1.03	-	-
2065	MX_Skomer_70_10	1,376,776	35.7	1.009	0.988	1.027	0.998	0.916
2065	MX_Skomer_30_1	1,497,555	47.6	1.011	0.99	1.03	1.000	0.996

Table 1.17:   PVA outputs for Manx shearwater at the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

Notes:

CGR = Counterfactual of Growth Rate

CPS = Counterfactual of Population Size

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	46,922	2.6	1.026	0.804	1.166	-	-
2030	MX_Aberdaron_70_10	46,947	2.6	1.026	0.803	1.165	1.000	1.000
2030	MX_Aberdaron _30_1	46,901	2.6	1.026	0.806	1.165	1.000	1.000
2065	Baseline (unimpacted)	68,296	47.9	1.011	0.991	1.030	-	-
2065	MX_Aberdaron _70_10	67,936	47.4	1.011	0.990	1.030	1.000	0.996
2065	MX_Aberdaron _30_1	68,321	48.1	1.011	0.991	1.030	1.000	1.000

1.4   References

Burnell, D., Perkins, A.J., Newton, S.F., Bolton, M., Tierney, T.D. and Dunn, T.E. (2023) Seabird Count. Barcelona: Lynx Nature Books.

DONG Energy (2014) Walney Extension Offshore Wind Farm. Offshore Ornithology. Clarification Note: Lesser Black-backed Gull In-combination Collision Risk Assessment and SPA Apportioning. DONG Energy.

Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment. [Online]. Available at: https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-advice-on-cumulative-effects-assessment (Accessed February 2025).

Appendix A: PVA input logs

A.1   Kittiwake at the Skomer, Skokholm and Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA

A.1.1   Set up

The log file was created on: 2025-01-10 17:11:09 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

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

A.1.2   Basic information

This run had reference name "Kittiwake_Skomer_SNCB".
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.3   Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: Skomer (1978-2007). Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.3.1   Population 1

Initial population values: Initial population 3144 in 2024

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

Adult survival rate: mean: 0.837 , sd: 0.082

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 1e-06 , DD: NA

Age class 1 to 2 - mean: 0.837 , sd: 0.082 , DD: NA

Age class 2 to 3 - mean: 0.837 , sd: 0.082 , DD: NA

Age class 3 to 4 - mean: 0.837 , sd: 0.082 , DD: NA

A.1.4 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

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

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

A.1.5 Impact on Demographic Rates

A.1.5.1 Scenario A - Name: KI_Skomer_70_10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004450967 , se: NA

A.1.5.2 Scenario B - Name: KI_Skomer_30_1

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001240813 , se: NA

A.1.6 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2   Guillemot at the Skomer, Skokholm and Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA

A.2.1   Set up

The log file was created on: 2025-01-10 17:19:21 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

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

A.2.2   Basic information

This run had reference name "Guillemot_Skomer_SNCB".
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.3   Baseline demographic rates

Species chosen to set initial values: Common Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: Skomer (1985-2011). Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.3.1   Population 1

Initial population values: Initial population 39923 in 2024

Productivity rate per pair: mean: 0.5826832 , sd: 0.1894517

Adult survival rate: mean: 0.93 , sd: 0.043

Immatures survival rates:

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

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

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

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

Age class 4 to 5 - mean: 0.93 , sd: 0.043 , DD: NA

Age class 5 to 6 - mean: 0.93 , sd: 0.043 , DD: NA

A.2.4   Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

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

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

A.2.5   Impact on Demographic Rates

A.2.5.1   Scenario A - Name: GU_Skomer_70_10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.01702533 , se: NA

A.2.5.2   Scenario B - Name: GU_Skomer_30_1

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000729657 , se: NA

A.2.6   Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.3 Razorbill at the Skomer, Skokholm and Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA

A.3.1 Set up

The log file was created on: 2025-01-10 17:37:51 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

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

A.3.2 Basic information

This run had reference name "Razorbill_Skomer_SNCB".
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.3.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: . Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.3.3.1 Population 1

Initial population values: Initial population 14846 in 2024

Productivity rate per pair: mean: 0.4965345 , sd: 0.1721675

Adult survival rate: mean: 0.895 , sd: 0.064

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 1e-05 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 1e-05 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.064 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.064 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.064 , DD: NA

A.3.4 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

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

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

A.3.5 Impact on Demographic Rates

A.3.5.1 Scenario A - Name: RA_Skomer_70_10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001750496 , se: NA

A.3.5.2 Scenario B - Name: RA_Skomer_30_1

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 7.5021e-05 , se: NA

A.3.6 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.4 Manx shearwater at the Skomer, Skokholm and Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA

A.4.1 Set up

The log file was created on: 2025-01-10 15:54:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

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

A.4.2 Basic information

This run had reference name "MX_Skomer_SNCB".
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.4.3 Baseline demographic rates

Species chosen to set initial values: .
Region type to use for breeding success data: .
Available colony-specific survival rate: . Sector to use within breeding success region: .
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.4.3.1 Population 1

Initial population values: Initial population 910312 in 2018

Productivity rate per pair: mean: 0.6 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.08

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.08 , DD: NA

A.4.4   Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

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

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

A.4.5   Impact on Demographic Rates

A.4.5.1   Scenario A - Name: MX_Skomer_70_10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.002122714, se: NA

A.4.5.2   Scenario B - Name: MX_Skomer_30_1

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 9.0973e-05, se: NA

A.4.6   Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5 Manx shearwater at the Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA

A.5.1 Set up

The log file was created on: 2025-01-10 16:07:45 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

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

A.5.2 Basic information

This run had reference name "MX_Aberdaron_SNCB".
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.3 Baseline demographic rates

Species chosen to set initial values: .
Region type to use for breeding success data: .
Available colony-specific survival rate: . Sector to use within breeding success region: .
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.3.1 Population 1

Initial population values: Initial population 41350 in 2018

Productivity rate per pair: mean: 0.6 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.08

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.08 , DD: NA

A.5.4   Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

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

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

A.5.5   Impact on Demographic Rates

A.5.5.1   Scenario A - Name: MX_Aberdaron_70_10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 8.8261e-05 , se: NA

A.5.5.2   Scenario B - Name: MX_Aberdaron_30_1

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 3.783e-06 , se: NA

A.5.6   Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA