Rampion 2 WIND FARM

Rampion 2 Wind Farm

Category 6: Environmental Statement

Volume 4, Appendix 12.6 Great black-backed gull cumulative assessment and PVA

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1. Introduction

1.1 Background

1.1.1 As presented within Natural England's Relevant Representations **[REP3-080]** the following queries were raised in relation to the EIA cumulative collision risk assessment for great black-backed gull (*Larus marinus*):

- *"Natural England advises that the impacts from the Project alone and cumulatively with other projects should be assessed using the South-west UK and Channel non-breeding BDMPS population of 17,742 individuals as the reference population."*
- "*We also reiterate that the cumulative assessment presented contained numerous data gaps and therefore cannot be considered to be comprehensive."*

1.1.2 As presented within this report, in order to comply with Natural England's request, the Project has undertaken a revised alone and cumulative assessment for great black-backed gull, the results of which are presented within this report. This is inclusive of Population Viability Analysis (PVA) where any level of predicted impact exceeded a 1% increase in baseline mortality.

2. Methodology

2.1 Biological seasons

2.1.1 The biological seasons considered in this report are consistent with those outlined in Furness (2015), as recommended in the latest guidance (SNCB, 2024). The bio-seasons for great black-backed gull are as follows:

- Breeding season – March to August
- Non-breeding season – September to February

2.2 EIA Scale Reference Populations

2.2.1 Predicted impacts from projects are assessed against biologically defined minimum population scales (BDMPS). The BDMPS for great black-backed gull are split into two separate regions for the western waters of the UK for assessment as defined in Furness (2015) and Natural England and Natural Resource Wales (NRW) interim guidance on demographics (SNCBs, 2024). These regions are defined as:

- UK southwest and Channel BDMPS
  - With a breeding season population size of 13,424 individuals.
  - With a non-breeding season population size of 17,742 individuals, which is also used to inform annual assessments.
- UK west of Scotland waters BDMPS
  - With a breeding season population size of 28,119 individuals.
  - With a non-breeding season population size of 34,380 individuals, which is also used to inform annual assessments.

2.2.2 These two regions are presented in Figure 14.8 of Furness (2015), with the dividing line for the two regions being between the west Cumbrian coastline out to the Isle of Man. Rampion 2 is situated at the southeasterly edge of the UK southwest and Channel BDMPS and so assessment against this population is recommended by Natural England **[REP3-080]**. However, the projects contributing to the cumulative assessment lie at the northern edge of the UK southwest and Channel BDMPS, which means great black-backed gull recorded for those projects are likely to have connectivity to either of the western waters BDMPS regions. For this reason, this report presents cumulative assessments for both the UK southwest and Channel BDMPS as well as for the two western waters BDMPS combined (total population size of 52,122 individuals for annual assessments).

2.3 Cumulative assessments

2.3.1 The criteria for identification of projects for inclusion within the cumulative assessments is described within the Environmental Impact Assessment. The

Project has used the latest predicted impacts for projects included within the cumulative assessments presented at the time of drafting this submission, as informed from the latest documents submitted to the Planning Inspectorate. Further detail of where project predicted impact values were derived is set out in **Section 2.4**. Developments within the same region are currently at varying stages of the planning process, with the final proposed project designs for some at the assessment and reporting stage, while others may not actually be taken forward or completed to their full maximum capacities. To incorporate this uncertainty, developments have been categorised into different tiers dependent on project status as described in **Table 2.1**.

Table 2.1 Description of Tiers of other developments.

Tier	Sub-tier	Description
Tier 1	Tier 1a	Project in operation
	Tier 1b	Project under construction
	Tier 1c	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented
	Tier 1d	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined
Tier 2	N/A	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted
Tier 3	Tier 3a	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted
	Tier 3b	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited
	Tier 3c	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward

2.4 Updates since ES Chapter submission

2.4.1 Since the submission of the Environmental Statement (ES) (Document reference 6.2) there have been updates for several projects as well as additional projects submitted. The changes to the cumulative assessment for Rampion 2 since the ES submission are:

- Inclusion of White Cross (APEM, 2024), Arklow Bank Phase 2 (SSER, 2024), Oriel (RPS, 2024a) and NISA (Ove Arup & Partners Ireland Limited, 2024);

- Updated values for Morecambe (Royal HaskoningDHV, 2024), Mona (RPS, 2024b) and Morgan (NIRAS, 2024) projects as provided within the individual project ES chapters; and
- Updated values for Erebus, Awel y Mor, Rampion 1, Burbo Bank Extension and Walney Extension based on reanalysis undertaken by White Cross OWF (APEM, 2024) in order to account for Natural England's latest interim guidance for collision risk modelling (Natural England, 2023).

2.4.2 A note of consideration is made here on the impact values for Twin Hub floating demonstration project. The Project is unaware of Twin Hub publicly available impact values, although recent projects (Mona, Morecambe and Morgan) have provided values for this project within their cumulative assessments. The value assigned to Twin Hub is a predicted impact value of up to 15.6 great black-backed gull mortalities per annum (Royal Haskoning DHV, 2024), which appears unrealistically high for a demonstration project that is made up of a single turbine, and for this reason the confidence in this impact value is low. Therefore, in this assessment this value for Twin Hub has not been included, with discussion on data deficient projects further explained below.

Incorporation of latest collision risk guidance

2.4.3 The relative ES Chapters and annexes for Erebus, Awel y Mor, Rampion 1, Burbo Bank Extension, Walney Extension and White Cross provide collision risk impact values that do not incorporate the interim guidance for collision risk modelling produced by Natural England (2023). Because of this, full remodelling of predicted collision risk impacts was completed by White Cross OWF for Awel Y Mor, Rampion 1, Burbo Bank Extension and Walney Extension as presented within their cumulative gap analysis report (APEM, 2024). For Erebus, due to uncertainty in deriving the input data used to inform collision risk modelling, updated collision risk estimates were based on correction factor calculations undertaken by Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects presented within the CRM Updates Technical Note (Royal HaskoningDHV, 2023). Updated values for these projects have been incorporated in the cumulative assessment for great black-backed gull presented in **Section 3**.

Historic projects in the western waters

2.4.4 The cumulative assessment for great black-backed gull within the Environmental Impact Assessment is considered by Natural England to contain data gaps, due to some projects within the Western Waters not having quantifiable predicted impact values. This refers to a total of 11 projects which due to their age, quantification of collision risk was not a requirement to inform EIA assessments. White Cross OWF have recently calculated predicted collision risk estimates for these 11 projects based on guidance provided to them by Natural England as detailed within their cumulative gap analysis report (APEM, 2024). Updated cumulative assessments presented within this report have therefore been considered with and without these approximate impact values, due to uncertainty regarding Natural England's opinion of such approximate values. It should be noted that the Project does not consider these approximate impact values necessary for incorporation. This is because these older projects have been operational for nine to 21 years

depending on the project. Given the age of operation any such impact from these projects would already be accounted for within the baseline population assessed against, therefore the inclusion of quantifiable numbers for these older projects poses an issue of double counting of impacts.

3. Rampion 2 Alone Impacts

3.1.1 The monthly estimated mortality from collision for great black-backed gull are presented in **Table 3.1**.

Table 3.1 Great black-backed gull project alone collision risk estimates

Season	Collision mortalities	BDMPS population (individuals)	Baseline mortality (individuals)	Increase in Baseline mortality (%)
Breeding	6.3	13,424	1,302	0.48%
Non-breeding	13.6	17,742	1,721	0.79%
Annual	19.8	17,742	1,721	1.15%

3.1.2 During breeding season, six (6.3) great black-backed gulls are expected to be subject to mortality per annum. During the breeding season, the total regional baseline population is predicted to be 13,424 great black-backed gulls (**Table 3.1**). When the average baseline mortality of 0.097 is applied (as recommended by Natural England and NRW (SNCBs, 2024), the natural predicted mortality for the breeding season is 1,302 individuals per annum. The addition of six predicted additional mortalities per annum due to collision would increase baseline mortality by 0.48%.

3.1.3 This level of impact is considered to be of negligible magnitude during the breeding season, as it represents no discernible difference to the baseline conditions due to the very small number of estimated collisions.

3.1.4 During the non-breeding season, 14 (13.6) great black-backed gulls may be subject to collision mortality per annum. During the non-breeding season, the total regional baseline population is predicted to be 17,742 great black-backed gulls (**Table 3.1**). When the average baseline mortality rate of 0.097 is applied, the natural predicted mortality for the non-breeding season is 1,721 individuals per annum. The addition of 14 predicted additional mortalities per annum due to collision would increase baseline mortality rate by 0.79%.

3.1.5 This level of impact is considered to be of negligible magnitude during the non-breeding season, as it represents no discernible difference to the baseline conditions due to the very small number of estimated collisions.

3.1.6 Annually, 20 (19.8) great black-backed gulls may be subject to collision mortality. The annual baseline population for great black-backed gull in this region is 17,742 individuals and when the average baseline mortality rate of 0.097 is applied, the natural predicted mortality is 1,721 individuals per annum. The addition of 20 predicted additional mortalities per annum due to collision would increase baseline mortality rate by 1.15%.

3.1.7 As the level of additionally mortality per annum exceeds a 1% increase in baseline mortality annually, further consideration of this level of impact has been undertaken through PVA, the results of which are presented within **Section 5**.

4. Cumulative Impacts

4.1 Cumulative impacts without historic projects

4.1.1 The cumulative tables below (**Table 4.1** and **Table 4.2**) provide values from all consented and planned projects following the methods described in **Section 2,** excluding the inclusion of approximate impact values for older projects calculated by White Cross OWF (APEM, 2024). Projects where quantifiable numbers are not available to inform assessments are denoted with a dash (-). Totals are provided for the following scenarios:

- All consented projects excluding Rampion 2;
- Rampion 2 plus consented projects; and
- Rampion 2 plus all projects.

Table 4.1 Great black-backed gull cumulative collision risk estimates for projects within UK southwest and Channel BDMPS

Development	Breeding	Non-breeding	Annual	Tier
Arklow	-	-	0.0	1a
Barrow	-	-	0.0	1a
Burbo Bank	-	-	0.0	1a
Burbo Bank Extension	5.4	12.8	18.2	1a
Gwynt y Môr	-	-	0.0	1a
North Hoyle	-	-	0.0	1a
Ormonde	-	-	0.0	1a
Rampion I	3.4	16.6	20.0	1a
Rhyl Flats	-	-	0.0	1a
Robin Rigg	-	-	0.0	1a
Walney Phase 1	-	-	0.0	1a
Walney Phase 2	-	-	0.0	1a
Walney Extension	6.9	25.7	32.6	1a

Development	Breeding	Non-breeding	Annual	Tier
West of Duddon Sands	-	-	0.0	1a
TwinHub	-	-	0.0	1c
AyM	5.9	0.8	6.7	1c
Erebus	0.0	0.7	0.7	1c
Total (Consented)	**21.6**	**56.6**	**78.2**	
Rampion II	6.3	13.6	19.8	1d
Total consented + Rampion 2	**27.9**	**70.2**	**98.0**	
White Cross	0.9	0.0	0.9	1d
Morecambe OWF	0.7	1.1	1.8	1d
Morgan Offshore Windfarm	1.1	4.6	5.7	1d
Mona OWF	1.6	3.2	4.8	1d
Arklow Phase 2	0.0	1.8	1.8	1d
NISA	10.1	16.2	26.3	1d
Oriel	15.7	50.2	65.9	1d
Mooir Vannin	-	-	0.0	3b
LLYR Projects	-	-	0.0	3c
Total all projects (including Rampion 2)	**58.0**	**147.3**	**205.2**	

Table 4.2 Great black-backed gull cumulative collision risk estimates for projects within both the UK southwest and Channel BDMPS and UK west Scotland waters BDMPS

Development	Breeding	Non-breeding	Annual	Tier
Arklow	-	-	0.0	1a
Barrow	-	-	0.0	1a

Development	Breeding	Non-breeding	Annual	Tier
Burbo Bank	-	-	0.0	1a
Burbo Bank Extension	5.4	12.8	18.2	1a
Gwynt y Môr	-	-	0.0	1a
North Hoyle	-	-	0.0	1a
Ormonde	-	-	0.0	1a
Rampion I	3.4	16.6	20.0	1a
Rhyl Flats	-	-	0.0	1a
Robin Rigg	-	-	0.0	1a
Walney Phase 1	-	-	0.0	1a
Walney Phase 2	-	-	0.0	1a
Walney Extension	6.9	25.7	32.6	1a
West of Duddon Sands	-	-	0.0	1a
TwinHub	-	-	0.0	1c
AyM	5.9	0.8	6.7	1c
Erebus	0.0	0.7	0.7	1c
Total (Consented)	**21.6**	**56.6**	**78.2**	
Rampion II	6.3	13.6	19.8	1d
Total consented + Rampion 2	**27.9**	**70.2**	**98.0**	
White Cross	0.9	0.0	0.9	1d
West of Orkney	0.1	6.0	6.1	1d

Development	Breeding	Non-breeding	Annual	Tier
Morecambe OWF	0.7	1.1	1.8	1d
Morgan Offshore Windfarm	1.1	4.6	5.7	1d
Mona OWF	1.6	3.2	4.8	1d
Arklow Phase 2	0.0	1.8	1.8	1d
NISA	10.1	16.2	26.3	1d
Oriel	15.7	50.2	65.9	1d
Mooir Vannin	-	-	0.0	3b
LLYR Projects	-	-	0.0	3c
Total all projects (including Rampion 2)	**58.1**	**153.3**	**211.3**	

Table 4.3 Great black-backed gull cumulative impact assessment

Bio-season	Projects included within seasonal totals	BDMPS scenario and population size (individuals)	Baseline mortality (individuals per annum)	Estimated number of great black-backed gulls subject to mortality (individuals per annum)	Increase in baseline mortality (%)
Breeding	Consented (including Rampion 2)	Southwest and Channel (13,424)	1,301	27.9	2.14%
	Consented (excluding Rampion 2)			21.6	1.66%
	All projects (including Rampion 2)			58.0	4.46%
	Consented (including Rampion 2)	Combined BDMPS (41,543)	4,026	27.9	0.69%
	Consented (excluding Rampion 2)			21.6	0.54%
	All projects (including Rampion 2)			58.1	1.44%
Non-breeding	Consented (including Rampion 2)	Southwest and Channel (17,742)	1,719	70.2	4.08%
	Consented (excluding Rampion 2)			56.6	3.29%
	All projects (including Rampion 2)			147.3	8.57%

Bio-season	Projects included within seasonal totals	BDMPS scenario and population size (individuals)	Baseline mortality (individuals per annum)	Estimated number of great black-backed gulls subject to mortality (individuals per annum)	Increase in baseline mortality (%)
	Consented (including Rampion 2)			70.2	1.39%
	Consented (excluding Rampion 2)	Combined BDMPS (52,122)	5,051	56.6	1.12%
	All projects (including Rampion 2)			153.3	3.04%
Annual	Consented (including Rampion 2)			98.0	5.70%
	Consented (excluding Rampion 2)	Southwest and Channel (17,742)	1,719	78.2	4.55%
	All projects (including Rampion 2)			205.2	11.94%
	Consented (including Rampion 2)			98.0	1.94%
	Consented (excluding Rampion 2)	Combined BDMPS (52,122)	5,051	78.2	1.55%
	All projects (including Rampion 2)			211.3	4.19%

4.1.2 The annual estimated cumulative number of great black-backed gulls subject to mortality due to collision from all projects including Rampion 2 is 205 (205.2) individuals for the approach considering the UK southwest and Channel BDMPS only (**Table 4.3**). This differs to the estimated cumulative number when considering the combined BDMPS regions, with an annual total from all projects of 211 (211.3) individuals (**Table 4.3**).

4.1.3 Using the UK South-west and Channel BDMPS population of 17,742 as a proxy for total BDMPS population across the year, the natural baseline mortality is 1,719 individuals per annum (based on an EIA mortality rate of 0.097, as recommended by Natural England and NRW (SNCBs, 2024)). The addition of 205 predicted mortalities per annum, would increase baseline mortality by 11.94%.

4.1.4 Considering the combined BDMPS approach, the total population is 52,122 individuals, with a natural baseline mortality of 5,051 individuals per annum (based on an EIA mortality rate of 0.097). The addition of 211 mortalities per annum, would increase the baseline mortality by 4.19%.

4.1.5 For both BDMPS scenarios, this level of potential cumulative impact annually exceeds the 1% baseline mortality increase threshold, therefore further investigation of the level of potential impact is considered within **Section 5** through PVA.

4.2 Cumulative impacts with historic projects

4.2.1 The cumulative tables below (**Table 4.4** and **Table 4.5**) provide values from all consented and planned projects following the methods described in **Section 2,** excluding the inclusion of approximate impact values for older projects calculated by White Cross OWF (APEM,2024). Projects where quantifiable numbers are not available to inform assessments are denoted with a dash (-). Totals are provided for the following scenarios:

- All consented projects excluding Rampion 2;
- Rampion 2 plus consented projects; and
- Rampion 2 plus all projects.

Table 4.4 Great black-backed gull cumulative collision risk estimates for projects within UK southwest and Channel BDMPS incorporating historic project values

Development	Breeding	Non-breeding	Annual	Tier
Arklow	0.3	0.1	0.4	1a
Barrow	0.8	2.8	3.6	1a
Burbo Bank	1.8	4.2	6.0	1a
Burbo Bank Extension	5.4	12.8	18.2	1a

Development	Breeding	Non-breeding	Annual	Tier
Gwynt y Môr	10.6	1.4	12.0	1a
North Hoyle	1.4	0.2	1.6	1a
Ormonde	0.9	3.4	4.3	1a
Rampion I	3.4	16.6	20.0	1a
Rhyl Flats	1.3	0.2	1.5	1a
Robin Rigg	1.5	5.6	7.1	1a
Walney Phase 1	1.7	6.3	8.0	1a
Walney Phase 2	1.7	6.3	8.0	1a
Walney Extension	6.9	25.7	32.6	1a
West of Duddon Sands	4.8	17.8	22.6	1a
TwinHub	-	-	0.0	1c
AyM	5.9	0.8	6.7	1c
Erebus	0.0	0.7	0.7	1c
Total (Consented)	**48.4**	**104.9**	**153.3**	
Rampion II	6.3	13.6	19.8	1d
Total consented + Rampion 2	**54.7**	**118.5**	**173.2**	
White Cross	0.9	0.0	0.9	1d
Morecambe OWF	0.7	1.1	1.8	1d
Morgan Offshore Windfarm	1.1	4.6	5.7	1d
Mona OWF	1.6	3.2	4.8	1d

Development	Breeding	Non-breeding	Annual	Tier
Arklow Phase 2	0.0	1.8	1.8	1d
NISA	10.1	16.2	26.3	1d
Oriel	15.7	50.2	65.9	1d
Mooir Vannin	-	-	-	3b
LLYR Projects	-	-	-	3c
Total all projects (including Rampion 2)	**84.8**	**195.6**	**280.4**	

Table 4.5 Great black-backed gull cumulative collision risk estimates for projects within both the UK southwest and Channel BDMPS and UK west Scotland waters BDMPS incorporating historic project values

Development	Breeding	Non-breeding	Annual	Tier
Arklow	0.3	0.1	0.4	1a
Barrow	0.8	2.8	3.6	1a
Burbo Bank	1.8	4.2	6.0	1a
Burbo Bank Extension	5.4	12.8	18.2	1a
Gwynt y Môr	10.6	1.4	12.0	1a
North Hoyle	1.4	0.2	1.6	1a
Ormonde	0.9	3.4	4.3	1a
Rampion I	3.4	16.6	20.0	1a
Rhyl Flats	1.3	0.2	1.5	1a
Robin Rigg	1.5	5.6	7.1	1a
Walney Phase 1	1.7	6.3	8.0	1a
Walney Phase 2	1.7	6.3	8.0	1a

Development	Breeding	Non-breeding	Annual	Tier
Walney Extension	6.9	25.7	32.6	1a
West of Duddon Sands	4.8	17.8	22.6	1a
TwinHub	-	-	0.0	1c
AyM	5.9	0.8	6.7	1c
Erebus	0.0	0.7	0.7	1c
Total (Consented)	**48.4**	**104.9**	**153.3**	
Rampion II	6.3	13.6	19.8	1d
Total consented + Rampion 2	**54.7**	**118.5**	**173.2**	
White Cross	0.9	0.0	0.9	1d
West of Orkney	0.1	6.0	6.1	1d
Morecambe OWF	0.7	1.1	1.8	1d
Morgan Offshore Windfarm	1.1	4.6	5.7	1d
Mona OWF	1.6	3.2	4.8	1d
Arklow Phase 2	0.0	1.8	1.8	1d
NISA	10.1	16.2	26.3	1d
Oriel	15.7	50.2	65.9	1d
Mooir Vannin	-	-	-	3b
LLYR Projects	-	-	-	3c
Total all projects (including Rampion 2)	**84.9**	**201.6**	**286.5**	

Table 4.6 Great black-backed gull cumulative impact assessment (including historic projects)

Bio-season	Projects included within seasonal totals	BDMPS scenario and population size (individuals)	Baseline mortality (individuals per annum)	Estimated number of great black-backed gulls subject to mortality (individuals per annum)	Increase in baseline mortality (%)
Breeding	Consented (including Rampion 2)	Southwest and Channel (13,424)	1,301	54.7	4.20%
	Consented (excluding Rampion 2)			48.4	3.72%
	All projects (including Rampion 2)			84.8	6.52%
	Consented (including Rampion 2)	Combined BDMPS (41,543)	4,026	54.7	1.36%
	Consented (excluding Rampion 2)			48.4	1.20%
	All projects (including Rampion 2)			84.9	2.12%
Non-breeding	Consented (including Rampion 2)	Southwest and Channel (17,742)	1,719	118.5	6.89%
	Consented (excluding Rampion 2)			104.9	6.10%
	All projects (including Rampion 2)			195.6	11.38%

Bio-season	Projects included within seasonal totals	BDMPS scenario and population size (individuals)	Baseline mortality (individuals per annum)	Estimated number of great black-backed gulls subject to mortality (individuals per annum)	Increase in baseline mortality (%)
	Consented (including Rampion 2)			118.5	2.35%
	Consented (excluding Rampion 2)	Combined BDMPS (52,122)	5,051	104.9	2.08%
	All projects (including Rampion 2)			201.6	3.99%
Annual	Consented (including Rampion 2)			173.2	10.07%
	Consented (excluding Rampion 2)	Southwest and Channel (17,742)	1,719	153.3	8.92%
	All projects (including Rampion 2)			280.4	16.31%
	Consented (including Rampion 2)			173.2	3.429%
	Consented (excluding Rampion 2)	Combined BDMPS (52,122)	5,051	153.3	3.036%
	All projects (including Rampion 2)			286.5	5.67%

4.2.2 When including the historic projects that were previously data deficient, the annual estimated cumulative number of great black-backed gulls subject to mortality due to collision from all projects including Rampion 2 is 280 (280.4) individuals per annum for the approach considering the UK southwest and Channel BDMPS only (**Table 4.6**). This differs to the estimated cumulative number when considering the combined BDMPS regions, with an annual total from all projects of 287 (286.5) individuals per annum (**Table 4.6**). Using the UK South-west and Channel BDMPS population of 17,742 as a proxy for total BDMPS population across the year, the natural baseline mortality is 1,719 individuals (based on an EIA mortality rate of 0.097 as recommended by Natural England and NRW (SNCBs, 2024)). The addition of 280 predicted mortalities per annum from cumulative collisions, would increase baseline mortality by 16.31%. Considering the combined BDMPS approach, the total population is 52,122 individuals, with a natural baseline mortality of 5,051 individuals per annum (based on an EIA mortality rate of 0.097). The addition of 287 predicted mortalities from cumulative collisions, would increase the baseline mortality by 5.67%. For both BDMPS scenarios, this level of potential cumulative impact annually exceeds the 1% baseline mortality increase threshold, therefore further investigation of the level of potential impact is considered within **Section 5** through PVA.

5. Population Viability Analysis (PVA)

5.1.1 PVA was conducted where cumulative impacts presented in **Section 3** exceeded a 1% increase in baseline mortality at the relevant BDMPS population scale. An overview of the PVA methodology is described below.

Modelling approach

5.1.2 PVA was undertaken using the Seabird PVA Tool developed by Natural England (Searle et al., 2019). The Seabird PVA Tool was accessed via the 'Shiny App' interface, which is a user-friendly graphical user interface accessible via a standard web-browser that uses the nepva R package to perform the modelling and analysis. The advantages of using an online platform for modelling and analysis purposes are that users are not required to use any R code, users are not required to install or maintain R, and updates to the model are made directly to the server. The tool is capable of assessing any type of impact in terms of change to demographic parameters, or as a cull or harvest of a fixed size per year (Searle et al., 2019).

5.1.3 All PVA models were undertaken using the 'Simulation' run type, which is used to simulate population trajectories based on the specified demographic parameters, initial population sizes and scenarios the user inputs into the model.

5.1.4 The Seabird PVA Tool uses a Leslie matrix to construct a PVA model (Caswell, 2000) based on the parameters provided by the user. Users can specify whether they wish the model to include demographic stochasticity, environmental stochasticity, density dependence, density independence or whether they want the model to run an entirely deterministic model.

5.1.5 A deterministic model translates the demographic parameters provided into point estimates with no confidence values due to no variability (i.e, standard deviation/error) in parameter values. Due to the lack of variability (stochasticity), a deterministic model will produce the same result every time the simulation is run. In situations where little is known about how the population size has varied, or how the scale of impact may vary, running a deterministic model might provide a more candid assessment of the population and how it may be impacted.

5.1.6 A stochastic model produces probabilistic outputs to account for the impact of environmental and demographic stochasticity. Environmental stochasticity describes the effects random variation in factors such as weather can have on a population and is modelled by the incorporation of randomly generated values for the probability of survival from one-time step to the next. Demographic stochasticity refers to the effect of random variation in population structure on demographic rates and is modelled by generating random numbers of surviving individuals for any given survival probability. Demographic stochasticity can usually be ignored for populations greater than 100 individuals, however including demographic stochasticity will not cause any penalty when simulating larger populations (WWT Consulting, 2012).

5.1.7 All PVA modelling in this report was undertaken with environmental and demographic stochasticity. To ensure robust results, all simulations were set to run 5,000 times. All models were run for a 30-year time span (2030 to 2060), representing the likely lifespan of the Project.

5.1.8 The Seabird PVA tool is able to utilise a "burn-in" parameter. The use of "burn-in" allows the model to run for a set number of years which are removed from the outputs. These dropped modelled years are likely more variable in their estimates of population numbers due to potential initial population structure instability (i.e, an imbalance of immature-matures). After several years, the modelled structure will become stable and it's at this point where it is appropriate to take outputs from, informed by the internal model parameterisation developed during the burn-in period. The burn-in parameter value used for each species followed the guidance of 10 years.

5.1.9 Demographic processes such as growth, survival, productivity and recruitment are density-dependent, as their rates change in relation to the number of individuals in a population. Density dependence can be described as being either compensatory or depensatory (Begon et al., 2005). Compensation is characterised by demographic changes that cause a stabilising effect on a populations long-term average. Depensation acts to further decrease the rate of population growth in declining populations and can delay the rate of recovery. This is typically exhibited in populations that have been significantly depleted in size and is caused by a reduction in the benefits associated with conspecific presence.

5.1.10 Density dependence is self-evident in the natural environment, as without density dependence, populations would grow exponentially. For seabird populations, the mechanisms as to how this operates are largely uncertain and highly variable between species and regions. If density dependence is mis-specified in an assessment, the modelled predictions may be unreliable. Therefore, it is more typical to use density independent models for seabird assessments, despite the lack of biologically realistic density dependence. As such, density independent models lack any means by which a population can recover once it has been reduced beyond a certain point, they are therefore appropriate for impact assessment purposes on the grounds of precaution (i.e., another source of precaution in the assessment process) (Ridge et al. 2019).

Demographic rates

5.1.11 The Shiny App offers the users the choice of using pre-set demographic parameters or the ability to enter custom values. The pre-set demographic values are available for a total of 15 different species. The values are derived from previously reported national or colony specific demographic parameters sourced from the Joint Nature Conservation Committee (JNCC) Seabird Monitoring Programme (SMP, 2024), divided into eight regional classifications (further information on the eight regional classifications can be found in Mobbs et al., (2020) for breeding success data or Horswill and Robinson, (2015) for survival rate). **Table 5.1** summarises the species-specific values for great black-backed gull.

5.1.12 After reviewing the pre-formulated productivity rates within the tool for the eight regional classifications, due to the age of the data (productivity data spanning over

50 years in some instances) feeding into the productivity rates, none of the pre-formulated values for productivity were representative of the populations assessed within this report. The national productivity values presented within Horswill and Robinson (2015) were instead used for assessment, due to providing a more representative productivity rate of the populations assessed.

5.1.13 Natural England and NRW have provided updated interim advice on the reference populations and demographic rates that should be used at EIA level assessments (SNCBs, 2024). For great black-backed gull the initial population size input into all PVAs for the UK south-west and Channel BDMPS were taken from the updated guidance that provides values based on Furness (2015). PVAs using a combined BDMPS population were also modelled, summing the population values for the UK south-west and Channel BDMPS and the UK West of Scotland waters BDMPS.

5.1.14 The survival rates for great black-backed gull presented in Horswill and Robinson (2015) are limited and are based on a relatively old study by Glutz von Blotzheim & Bauer (1982). Due to the limited amount of data available for great black-backed gull, Horswill and Robinson (2015) recommended using the survival rates of other large gull species when conducting population modelling for great black-backed gull. The latest interim guidance reflects this, using herring gull data to calculate the weighted mean for great black-backed gull (SNCB, 2024). Therefore, the survival rates for great black-backed gull used for the PVA are based on adult and juvenile rates for herring gull as presented in Horswill & Robinson (2015).

5.1.15 For age at first breeding and maximum brood size per pair parameters, the pre-formulated values within the tool were used.

Table 5.1 BDMPS population demographic parameters for great black-backed gull

BDMPS scenario	Productivity rate + SD**	BDMPS population size (all individuals) *	Mean adult survival rate + SD**	Mean immature age class 0 – 1 survival rate + SD	Mean immature age class 1 – 2 survival rate + SD	Mean immature age class 2 – 3 survival rate + SD	Mean immature age class 3 – 4 survival rate + SD	Mean immature age class 4 – 5 survival rate + SD	Mean immature age class 5 – 6 survival rate + SD
UK south-west and Channel	1.139 ± 0.533	17,742	0.834 ± 0.034	0.798 ± 0.092	0.834 ± 0.034	0.834 ± 0.034	0.834 ± 0.034	0.834 ± 0.034	0.834 ± 0.034
UK south-west and Channel and UK west of Scotland waters combined	1.139 ± 0.533	52,122	0.834 ± 0.034	0.798 ± 0.092	0.834 ± 0.034	0.834 ± 0.034	0.834 ± 0.034	0.834 ± 0.034	0.834 ± 0.034

*Table note: *Values taken from SNCB (2024); **Values taken from Horswill & Robinson (2015). All immature survival rates are taken from Horswill & Robinson (2015)*

PVA results

5.1.16 The outputs of the Seabird PVA Tool are set out in **Table 5.2** for the project alone and **Table 5.3, Table 5.4, Table 5.5** and **Table 5.6** for the project cumulatively. The metrics used to summarise the PVA results are based on the median of the ratio of impacted to unimpacted counterfactual of population growth rate and the median counterfactual of population size.

5.1.17 Although both the counterfactual of population size and population growth rate are presented within this report, the Project considers that only the counterfactual of population growth rate should be used for interpreting the predicted impacts. This is because the counterfactual of population growth rate can be compared against known population trends and is relatively insensitive to the baseline rate of growth and direction. Whereas, the counterfactual of population size will predict very large differences in comparison to the baseline population size, especially when density dependent factors allowing for population recovery of preventing exponential growth are not considered within the PVA, as is the case with these assessments.

Table 5.2 PVA results using Seabird PVA Tool for the project alone impacts on great black-backed gulls in the UK Southwest channel BDMPS

Season	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
Annual	19.8	0.999 (0.001)	0.960 (0.027)	0.1%	4.0%

Table 5.3 PVA results using Seabird PVA Tool for cumulative displacement impacts on great black-backed gulls in the UK Southwest channel BDMPS

Projects	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
Consented (including Rampion 2)	98.0	0.993 (0.001)	0.814 (0.023)	0.7%	18.6%

Projects	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
Consented (excluding Rampion 2)	78.2	0.995 (0.001)	0.847 (0.024)	0.5%	15.3%
All projects (including Rampion 2)	205.2	0.986 (0.001)	0.646 (0.019)	1.4%	35.4%

Table 5.4 PVA results using Seabird PVA Tool for cumulative displacement impacts on great black-backed gulls for the combined BDMPS of southwest and Channel and west of Scotland waters.

Projects	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
Consented (including Rampion 2)	98.0	0.998 (<0.001)	0.932 (0.015)	0.2%	6.8%
Consented (excluding Rampion 2)	78.2	0.998 (<0.001)	0.946 (0.015)	0.2%	5.4%
All projects (including Rampion 2)	211.3	0.995 (<0.001)	0.858 (0.014)	0.5%	14.2%

Table 5.5 PVA results using Seabird PVA Tool for cumulative displacement impacts on great black-backed gulls in the UK Southwest channel BDMPS including historic projects

Projects	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
Consented (including Rampion 2)	173.2	0.988 (0.001)	0.691 (0.020)	1.2%	30.9%
Consented (excluding Rampion 2)	153.3	0.990 (0.001)	0.724 (0.021)	1.0%	27.6%
All projects (including Rampion 2)	280.4	0.981 (0.001)	0.551 (0.016)	1.9%	44.9%

Table 5.6 PVA results using Seabird PVA Tool for cumulative displacement impacts on great black-backed gulls for the combined BDMPS of southwest and Channel and west of Scotland waters including historic projects

Projects	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
Consented (including Rampion 2)	173.2	0.996 (<0.001)	0.884 (0.015)	0.4%	11.6%
Consented (excluding Rampion 2)	153.3	0.997 (<0.001)	0.897 (0.015)	0.3%	13.3%

Projects	Additional mortality (individuals)	Density independent counterfactual metric (after 30 years)		Predicted reduction in growth rate per annum after 30 years	Predicted reduction in population size after 30 years
		Median growth rate (SD)	Median population size (SD)		
All projects (including Rampion 2)	286.5	0.993 (<0.001)	0.814 (0.014)	0.7%	18.6%

5.1.18 Great black-backed gulls in the UK have seen a decline in recent years (Burnell et al, 2023) (**Table 5.7**), though this is predominately skewed by the significant decline noted within the Scottish population (63% in the last 15- 20 years; Burnell et al., 2023) which makes up the majority of the UK population. Although significant steps have already been made by to curb this decline, through removal of great black-backed gull from general licencing and updated guidance for gull licensing in Scotland, which aims to reduce the number of licences that are issued to control gulls in towns and cities each breeding season (NatureScot, 2024). Additionally, the recent ban on sandeel trawling within the UK has the potential to increase prey species for great black-backed gull such as puffin (Lopez et al., 2023a), further adding to potential curbing of population decline.

5.1.19 Historic counts indicated high populations of the species, with birds taking advantage of waste treatment sites and fish discards to forage food, which is suggested as being a possible cause of the great black-backed gull population seeing significant inflation in the early 20th century (Reeves & Furness, 2002). With the change in industry standards for these two practices, the availability of easy food sources has reduced, and thus leading to the declines observed in the great black-backed gull populations within the UK (Reeves & Furness, 2002). However, it has been suggested that rather than the great black-backed gull population being in decline, it is likely stabilising to 'normal' levels with the absence of the human mediated food source (Burnell et al, 2023). Although not at the same rate as other large gull species such as herring gull (*Larus argentatus*) and lesser black-backed gull (*Larus fuscus*), great black-backed gulls do appear to be shifting to nesting in urban environments which may further aid in explanation of some declines seen in natural populations (Calladine et al, 2006; Burnell et al, 2023).

5.1.20 In contrast to the UK population trend, the Southwest and Channel BDMPs region is expected to be stable to favourable condition given the recent positive regional growth trends for Wales (49% increase in the last 15- 20 years), Northern Ireland (507% increase in the last 15- 20 years) and republic of Ireland (28% increase in the last 15- 20 years) combined with the overall stable population trend for England (3% decrease in the last 15- 20 years) (Burnell et al., 2023) (**Table 5.7**). It

is worth noting that within this timeframe 10 OWF developments have been operational for over 10 years and four have been operational for five to 10 years without any apparent significant impact on the population growth trend as seen by the stable to increasing population growth noted. Additionally, any effects from these 14 OWFs are considered to already be part of the population baseline.

Table 5.7 Historic census counts for breeding great black-backed gulls in the UK (Burnell *et al*, 2023)

Great black-backed gull breeding numbers (Apparently Occupied Nests)	Operation Seafarer (1969-1970)	Seabird Colony Register (1985-1988)	Seabird 2000 (1998-2002)	Seabirds Count (2015-2021)
UK	18,771	17,415	16,814	8,021
% change since previous census (UK)	N/A	-7%	-3%	-52%
Wales	905	289	434	648
% change since previous census (Wales)	N/A	-68%	+50%	+49%
Northern Ireland	240	277	74	449
% change since previous census (Northern Ireland)	N/A	+15%	-73%	+507%
Republic of Ireland	3,166	2,921	2,212	2,825
% change since previous census (Republic of Ireland)	N/A	-8%	-24%	+28%
England	1,676	1,534	1,562	1,520
% change since previous census (England)	N/A	-9%	+2%	-3%

5.1.21 As previously discussed within the **Great black-backed gull Assessment Sensitivity Report [REP1-038]** the values presented within the cumulative assessments use the parameters recommended by Natural England. These parameters provide the worse-case and by using all of Natural England's recommended parameters, multiple layers of precaution may have been built into the models run for the various projects. This provides significant uncertainty as to the realism of the level of effect from collision risk on great black-backed gulls (and other seabirds) with the inclusion of a single alternative collision input parameters changing the impact prediction by up to ~86% annually.

5.1.22 The original developer of the CRM model (Band ,2012) specifically states they 'do not recommend worse case assumptions at each stage as this provides overly

pessimistic results'. It is likely that the cumulative and alone assessment for great back-backed gull within this report may overestimate the actual collision mortality occurring.

5.1.23 Given the levels of precaution highlighted in assessments, combined with the relevant regional stability of populations summarised in **Table 5.7**, conclusions on impact significance for the varying assessment approaches is provided in **Table 5.8**. Overall, the Project remains of the position that under all scenarios assessed, significance of such an effect is not significant in EIA terms. These conclusions conform with the Project's original assessment conclusion within the **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).

Table 5.8 Summary of Assessment conclusions for great black-backed gull.

BDMPS Region	Projects included	Assessment conclusion	Comment
UK Southwest channel	Rampion 2 Alone	Not significant in EIA terms	When considering the level of precaution in assessment combined with the negligible decrease (0.1%) predicted in growth rate per annum in contrast to the stability and resilience of great black-backed gulls in this region (**Table 5.7**) it can be concluded with confidence that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
	Consented (including Rampion 2), excluding historic projects	Not significant in EIA terms	When considering that 14 of the consented OWF developments have been operational for a significant period of time within the region combined with the stable population trend over that time period (**Table 5.7**), combined with the overall decrease in growth rate per annum predicted as being less than 1% per annum, it can be concluded with confidence that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
	Consented (including Rampion 2), including historic projects	Not significant in EIA terms	As previously noted, the project considers the inclusion of quantitative impact values for historic projects inappropriate due to such impacts already being a part of the population

BDMPS Region	Projects included	Assessment conclusion	Comment
			baseline condition given the age that these projects have been in operation. Additionally as summarised in **Table 5.7**, the regional populations which make up the UK Southwest channel BDMPS are considered in stable condition with significant growth recorded in between the two most recent Britain and Ireland censuses (Burnell et al, 2023), despite majority of the OWFs included within the cumulative assessment being Operational during the time period. It can therefore be concluded with confidence that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
	All projects (including Rampion 2), excluding historic projects	Not significant in EIA terms	When considering all Projects the decrease in growth rate per annum is predicted at 1.4% per annum which even when considering the stability of the regional populations (**Table 5.7**) may have the potential to lead to a significant effect. However, as previously noted the assessment for great black-backed presented contains a considerable amount of precaution. Because of this the likelihood of such a level of effect occurring is considered highly unlikely and inconsistent with current population trends. It can therefore be concluded that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and**

BDMPS Region	Projects included	Assessment conclusion	Comment
			Intertidal Ornithology, Volume 2 **[APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
	All projects (including Rampion 2), including historic projects	Not significant in EIA terms	When considering all Projects the decrease in growth rate per annum is predicted at 1.9% per annum which even when considering the stability of the regional populations (**Table 5.7**) may have the potential to lead to a significant effect. However, as previously noted the assessment for great black-backed presented contains a considerable amount of precaution and also contains a significant amount of double counting of impacts, due to the age of projects within the region. Because of this the likelihood of such a level of effect occurring is considered highly unlikely and inconsistent with current population trends. It can therefore be concluded that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
Combined BDMPS	Consented (including Rampion 2), excluding historic projects	Not significant in EIA terms	When considering the level of precaution in assessment combined with the minor decrease (0.2%) predicted in growth rate per annum, it can be concluded with confidence that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).

BDMPS Region	Projects included	Assessment conclusion	Comment
	Consented (including Rampion 2), including historic projects	Not significant in EIA terms	As previously noted, the project considers the inclusion of quantitative impact values for historic projects inappropriate due to such impacts already being a part of the population baseline condition, given the age that these projects have been in operation. Therefore, given the level of double counting of impacts within assessment combined with the minor decrease (0.4%) predicted in growth rate per annum, it can be concluded with confidence that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
	All projects (including Rampion 2), excluding historic projects	Not significant in EIA terms	Considering the level of precaution in assessment combined with the minor decrease (0.5%) predicted in growth rate per annum, it can be concluded with confidence that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).
	All projects (including Rampion 2), including historic projects	Not significant in EIA terms	As previously noted, the project considers the inclusion of quantitative impact values for historic projects inappropriate due to such impacts already being a part of the population baseline condition, given the age that these projects have been in operation. When considering all Projects the decrease in growth rate per annum is predicted at 0.7% per annum which may have the potential to lead to a significant

BDMPS Region	Projects included	Assessment conclusion	Comment
			effect. However, as previously noted the assessment for great black-backed presented contains a considerable amount of precaution and also contains a significant amount of double counting of impacts, due to the age of projects within the region. Because of this the likelihood of such a level of effect occurring is considered highly unlikely and inconsistent with current population trends for the majority of the regional components. It can therefore be concluded that the significance of such an effect is not significant in EIA terms. This conclusion conforms with the Project's original assessment conclusion within **Chapter 12: Offshore and Intertidal Ornithology, Volume 2 [APP-053] (Document reference 6.2.12)** (updated at Deadline 6).

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Appendix 1 – PVA run logs

Great black-backed gull PVA log – Project alone

Population Viability Analysis Parameter log

Set up

The log file was created on: 2024-07-18 11:10:20 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"

Basic information

This run had reference name “Rampion 2_GBBG_Project alone”.

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 1234.

Years for burn-in: 10.

Case study selected: None.

Baseline demographic rates

Species chosen to set initial values: Great Black-Backed Gull.

Region type to use for breeding success data: Global.

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

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 3 per pair.

Number of subpopulations: 1.

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

Units for initial population size: all.individuals

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

Population 1

Initial population values: Initial population 17742 in 2015

Productivity rate per pair: mean: 1.139 , sd: 0.533

Adult survival rate: mean: 0.834 , sd: 0.034

Immatures survival rates:

Age class 0 to 1 - mean: 0.798 , sd: 0.092 , DD: NA

Age class 1 to 2 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 2 to 3 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 3 to 4 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 4 to 5 - mean: 0.834 , sd: 0.034 , DD: NA

Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

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

Years in which impacts are assumed to begin and end: 2030 to 2060

Impact on Demographic Rates

Scenario A - Name: Annual

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0011 , se: NA

Output:

First year to include in outputs: 2030

Final year to include in outputs: 2060

How should outputs be produced, in terms of ages?: whole.population

Target population size to use in calculating impact metrics: NA

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

Great black-backed gull PVA log – UK southwest and Channel BDMPS

Population Viability Analysis Parameter log

Set up

The log file was created on: 2024-07-16 10:11:55 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"

Basic information

This run had reference name “GBBG_Rampion 2_ UK Southwest and Channel”.

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: 1234.

Years for burn-in: 10.

Case study selected: None.

Baseline demographic rates

Species chosen to set initial values: Great Black-Backed Gull.

Region type to use for breeding success data: Global.

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

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 3 per pair.

Number of subpopulations: 1.

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

Units for initial population size: all.individuals

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

Population 1

Initial population values: Initial population 17742 in 2015

Productivity rate per pair: mean: 1.139 , sd: 0.533

Adult survival rate: mean: 0.834 , sd: 0.034

Immatures survival rates:

Age class 0 to 1 - mean: 0.798 , sd: 0.092 , DD: NA

Age class 1 to 2 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 2 to 3 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 3 to 4 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 4 to 5 - mean: 0.834 , sd: 0.034 , DD: NA

Impacts

Number of impact scenarios: 6.

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 2060

Impact on Demographic Rates

Scenario A - Name: R2 plus consented (without historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0055 , se: NA

Scenario B - Name: consented excluding R2 (without historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0044 , se: NA

Scenario C - Name: All projects (without historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0116 , se: NA

Scenario D - Name: R2 plus consented (with historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0098 , se: NA

Scenario E - Name: consented excluding R2 (with historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0086 , se: NA

Scenario F - Name: All projects (with historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0158 , se: NA

Output:

First year to include in outputs: 2030

Final year to include in outputs: 2060

How should outputs be produced, in terms of ages?: whole.population

Target population size to use in calculating impact metrics: NA

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

Great black-backed gull PVA log – combined ‘western waters’ BDMPS

Population Viability Analysis Parameter log

Set up

The log file was created on: 2024-07-16 10:27:03 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"

Basic information

This run had reference name “GBBG_Rampion 2_ combined BDMPS”.

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: 1234.

Years for burn-in: 10.

Case study selected: None.

Baseline demographic rates

Species chosen to set initial values: Great Black-Backed Gull.

Region type to use for breeding success data: Global.

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

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 3 per pair.

Number of subpopulations: 1.

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

Units for initial population size: all.individuals

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

Population 1

Initial population values: Initial population 52122 in 2015

Productivity rate per pair: mean: 1.139 , sd: 0.533

Adult survival rate: mean: 0.834 , sd: 0.034

Immatures survival rates:

Age class 0 to 1 - mean: 0.798 , sd: 0.092 , DD: NA

Age class 1 to 2 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 2 to 3 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 3 to 4 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 4 to 5 - mean: 0.834 , sd: 0.034 , DD: NA

Impacts

Number of impact scenarios: 6.

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 2060

Impact on Demographic Rates

Scenario A - Name: R2 plus consented (without historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0019 , se: NA

Scenario B - Name: consented excluding R2 (without historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0015 , se: NA

Scenario C - Name: All projects (without historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0041 , se: NA

Scenario D - Name: R2 plus consented (with historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0033 , se: NA

Scenario E - Name: consented excluding R2 (with historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0029 , se: NA

Scenario F - Name: All projects (with historic)

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0055 , se: NA

Output:

First year to include in outputs: 2030

Final year to include in outputs: 2060

How should outputs be produced, in terms of ages?: whole.population

Target population size to use in calculating impact metrics: NA

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