Morven South Offshore Wind Array Project

Habitats Regulations Appraisal

Volume 2, Annex 3.2: Report to Inform Appropriate Assessment: Population Viability Analysis

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1 Introduction

1.1 Background

1.1.1.1 Seabirds can be impacted by offshore wind developments in a number of ways, including collision with wind turbine blades resulting in mortality, and displacement from an area due to the presence of wind turbines. These processes affect individuals, but for project alone and the in-combination effects (when the project alone effects are considered alongside any effects from other projects on the same receptor) have the potential to affect the productivity or elevate the baseline mortality of a population. The Habitats Regulations Appraisal (HRA) process allows for evaluating the potential impacts of offshore wind farms on different population scales on protected features of the UK National Site Network and European Sites.

1.1.1.2 One method to estimate the effect that offshore wind projects alone or in-combination may have on a population is through Population Viability Analysis (PVA). PVA provides a robust framework using demographic parameters to predict changes in the population, using statistical population models to forecast future changes over a set period. Comparisons are made between 'baseline' conditions whereby conditions remain unimpacted (i.e. The Morven South Offshore Wind Array Project (hereafter 'Morven South') is not constructed) and under 'scenario' conditions where an impact is applied to a population by the alteration of demographic parameters. Population metrics that are derived from comparisons of 'baseline' and 'impacted' predictions generated by PVAs can then be used to assess the significance of the anticipated additional mortality associated with planned developments. Assessing the acceptability of the impact involves evaluating biological responses alongside statutory, policy, and other relevant considerations. There is no universally defined threshold for what constitutes an 'acceptable' level of impact; rather, determinations will be population-specific and guided by a comprehensive analysis of these factors.

1.2 Aim of report

1.2.1.1 This technical report presents the PVA process conducted for relevant Special Protection Area (SPA) populations (see Section 2.2) in relation to impacts associated with Morven South alone, the Morven programme assessment, and in-combination with other plans and projects.

2 Methodology

2.1 Overview

2.1.1.1 PVA was undertaken using the Seabird PVA Tool developed by Natural England (Searle *et al.*, 2019). This software has a user-friendly interface (in the 'Shiny App' interface) and another series of code tools for direct use. Both are written within the computer software 'R' (R is a free software environment for statistical computing and graphics) and are intended to give the same fundamental calculations. The Seabird PVA Tool was accessed via the Shiny App interface, accessible via a standard web-browser that uses the nepva R package to perform the modelling and analysis. The tool constructs a stochastic Leslie matrix and can assess 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).

2.2 Identification of species and populations for consideration

2.2.1.1 Species are selected for further assessment where the predicted increase in baseline mortality exceeds a 0.02 percentage point increase in the baseline mortality of the relevant regional population. A 0.02 percentage point increase is the level that is regarded as the threshold for undertaking further assessments such as PVA as recommended by NatureScot (2023) for both project alone and in-combination assessments.

2.2.1.2 When applying this threshold as part of the assessments undertaken for Morven South Volume 2, Chapter 3: Report to Inform Appropriate Assessment Part 3 SPA and Ramsar Site Assessment (hereafter referred to as 'RIAA Part 3'), the SPAs and associated qualifying features included in Table 2.1 require PVA modelling.

Table 2.1 Special Protection Areas and associated qualifying features for which population viability analysis is required based on the assessments presented in the Report to Inform Appropriate Assessment Part 3

SPA	Qualifying feature
Project alone	
Buchan Ness to Collieston Coast	Guillemot
Forth Islands	Guillemot
Fowlsheugh	Guillemot
St Abb's Head to Fast Castle	Guillemot
Troup, Pennan and Lion's Head	Guillemot
Morven programme (Scenario 3)	
Buchan Ness to Collieston Coast	Guillemot
Forth Islands	Guillemot
	Razorbill
Fowlsheugh	Guillemot
	Razorbill
	Kittiwake
St Abb's Head to Fast Castle	Guillemot
	Razorbill
Troup, Pennan and Lion's Head	Guillemot

SPA	Qualifying feature
In-combination (Scenario 4)	
Buchan Ness to Collieston Coast	Guillemot
	Kittiwake
Coquet Island	Puffin
East Caithness Cliffs	Razorbill
	Kittiwake
Farne Islands	Puffin
Flamborough and Filey Coast	Razorbill
	Kittiwake
Forth Islands	Guillemot
	Razorbill
	Puffin
	Gannet
Foula	Puffin
Fowlsheugh	Guillemot
	Razorbill
	Kittiwake
Hermaness, Saxa Vord and Valla Field	Puffin
	Gannet
St Abb's Head to Fast Castle	Guillemot
	Razorbill
	Kittiwake
Troup, Pennan and Lion's Heads	Guillemot
	Kittiwake

2.2.1.3 Impacts on other qualifying features of the SPAs included in Table 2.1, and those for which assessments are included in the RIAA Part 3 but not included in Table 2.1, did not exceed the 0.02 percentage point threshold and therefore did not require PVA.

2.3 Modelling approach

2.3.1.1 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.

2.3.1.2 The tool includes an option to switch the model to run as either density independent, or density dependent. 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. 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 necessary 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 (Ridge *et al.*, 2019).

2.3.1.3 Environmental stochasticity, which accounts for the variation arising from environmental changes affecting individuals in the same group (e.g. between-year differences in weather conditions), was incorporated in the models at the level of productivity and survival rates (Beta/Gamma option). For each simulated year, a value for each demographic rate was randomly generated from a probability distribution defined by the mean and standard deviation estimates of that rate for the population under consideration.

2.3.1.4 Demographic stochasticity, which accounts for individual-level variation affecting transition probabilities between age-classes, was included in the models. For large populations, like the ones considered in this analysis, the effects of environmental stochasticity are deemed more important than those associated with demographic stochasticity (Morris and Doak, 2002). However, including demographic stochasticity will not cause any issues when simulating larger populations (WWT Consulting, 2012) and hence has been included.

2.3.1.5 PVA outputs can either be expressed as the counterfactual of population size (CPS) or the counterfactual of population growth rate (CGR). As models within this report have been run using density independence, the CGR is considered more robust and informative, while if the PVA is density dependent then the CPS is more robust and informative. While both CPS and CGR outputs are presented in line with NatureScot's guidance (NatureScot, 2023), the interpretation of results in the RIAA Part 3 focuses on CGR, as it provides a clearer indication of potential long-term population-level effects in the absence of density regulation. This is in line with ecological modelling principles described by White (2016), where it is noted that the interpretation of the CGR is better suited to density-independent models, as it shows how a population responds to external pressures without the added complexity of feedback effects. In contrast, CPS is more appropriate metric when density dependence is explicitly included in the model, as it reflects how population size changes over time in response to natural constraints such as resource limitation and carrying capacity.

2.3.1.6 Additionally, the quantile from the unimpacted population that matched the 50% quantile for the impacted population (U=50%I) and the quantile from the impacted population that matched the 50% quantile for the unimpacted population (I=50%U) have been presented. These quantiles provide a baseline against which the impacted population can be evaluated, aiding in assessing the magnitude of impact and potential consequences.

2.4 Simulation parameterisation

2.4.1.1 All PVA modelling in this technical report was undertaken with environmental and demographic stochasticity. To ensure robust results, all simulations were set to run 5,000 times. This approach (5,000 simulation runs) is regarded as the standard approach and has been utilised in several offshore wind applications such as Hornsea Four Offshore Wind Farm, Awel Y Mor Offshore Wind Farm, Mona and Morgan Offshore Wind Farms, Berwick Bank Offshore Wind Farm and Green Volt Offshore Wind Farm. All models were run for a 35-year time span (the anticipated lifetime of Morven South) with outputs for 50 impacted years also presented for all impact scenarios. A random seed, which is used to initialise a pseudorandom number generator, ensuring a repeatable sequence of "random" numbers within the tool, of '15' was used.

2.4.1.2 The model used included modelling a 'burn in' period for the five years prior to the start of the project operating. Applying a 'burn in' period allows for a stable age structure to form when starting to run the model. Within the PVA model, impacts were set to commence the year the project is anticipated to start operating (2038) and were set to run for the lifetime of the project (35 years) until 2072 providing PVA models run for 35 impacted years.

2.4.1.3 Although impacts are only reported with respect to the adult numbers, impacts within the simulations were also applied proportionally to immature age-classes (based upon the stable age distribution from eigen-decomposition of the Leslie matrix; Searle *et al.*, 2019).

2.4.1.4 Impacted vs unimpacted comparisons were based on a matched runs approach, whereby stochasticity is applied to the population before impacts are applied (i.e. survival and productivity rates simulated at each time step are the same for the unimpacted and impacted populations, before additional impact mortalities are deducted from simulated survivals for the impacted populations). This approach is used as previous analyses demonstrated that stochastic models using a matched runs approach were likely the most precautionary (Cook and Robinson, 2017). Productivity rates were assumed to be unaffected by wind farm effects.

2.5 Model parameterisation

2.5.1 Demographic rates

2.5.1.1 The species demographic rates used in the PVA were those set out within the most recent version of the Seabird PVA Tool (Searle *et al.*, 2019). The survival rates for the species considered were those that Seale *et al.* (2019) derived from the national values presented in Horswill and Robinson (2015), with updated productivity values taken by Seale *et al.* (2019) from the British Trust for Ornithology (BTO) and the Joint Nature Conservation Committee (JNCC) (BTO and JNCC, 2024) (Table 2.2).

2.5.1.2 Survival rates vary depending on age class, with 0 to 1 used to represent birds below the age of one, age class 1 to 2 used to represent birds aged one, age class 2 to 3 representing birds two years of age and so on. Adults are grouped together as survival rates are consistent between adult aged birds regardless of actual age (e.g. seven year olds have the same survival rate as eight year olds and so on) (Table 2.2).

Table 2.2: Species demographic rates used in Population Viability Analysis

Species	Age first breeding (years)	No. of eggs/pair/annum	Metric	Survival rates (per age class)							Productivity
				0-1	1-2	2-3	3-4	4-5	5-6	Adult	
Kittiwake	4	2	Mean	0.790	0.854	0.854	0.854	-	-	0.854	0.619
			Standard deviation	0.001	0.077	0.077	0.077	-	-	0.077	0.121
Guillemot	6	1	Mean	0.560	0.792	0.917	0.938	0.939	0.939	0.939	0.583
			Standard deviation	0.058	0.152	0.098	0.107	0.025	0.025	0.025	0.075
Razorbill	5	1	Mean	0.794	0.794	0.895	0.895	0.895	-	0.895	0.532
			Standard deviation	0.001	0.001	0.067	0.067	0.067	-	0.067	0.084
Puffin	5	1	Mean	0.709	0.709	0.709	0.760	0.805	-	0.907	0.557
			Standard deviation	0.108	0.108	0.108	0.093	0.083	-	0.083	0.115
Gannet	5	1	Mean	0.424	0.829	0.891	0.895	-	-	0.919	0.766
			Standard deviation	0.045	0.026	0.019	0.019	-	-	0.042	0.054

2.5.2 Populations

Special Protection Areas

2.5.2.1 For guillemot, the initial population size inputted into all PVAs used the most recent complete SPA population census values from the Seabird Count surveys undertaken between 2015 and 2021 (Burnell *et al*., 2023) are presented in Table 2.3, converted into estimates of breeding adults (as described in Burnell *et al.* (2023)).

Table 2.3: Special Protection Area populations used for Population Viability Analysis modelling (Burnell *et al*., 2023). (AON = Apparently Occupied Nests, IND = Individuals)

SPA	Feature	Year of Count used in PVA	Population (census unit)	Breeding individuals
Buchan Ness to Collieston Coast	Guillemot	2019	29,433 (IND)	39,440
	Kittiwake	2019	11,295 (AON)	22,590
Coquet Island	Puffin	2019	25,029 (AOB)	50,058
East Caithness Cliffs	Razorbill	2018	30,129 (IND)	44,969
	Kittiwake	2018	24,479 (AON)	48,958
Farne Islands	Puffin	2019	43,752 (AOB)	87,504
Flamborough and Filey Coast	Razorbill	2017	30,227 (IND)	45,116
	Kittiwake	2017	51,535 (AON)	103,070
Forth Islands	Guillemot	2021	26,510 (IND)	35,523
	Razorbill	2019	5,695 (IND)	8,500
	Puffin	2020	42,923 (AOB)	85,846
	Gannet	2014	75,259 (AOS/AON)	150,518
Foula	Puffin	2016	4,234 (AOB)	8,468
Fowlsheugh	Kittiwake	2018	14,039 (AON)	28,078
	Guillemot	2018	69,828 (IND)	93,570
	Razorbill	2018	14,063 (IND)	20,990
Hermaness, Saxa Vord and Valla Field	Puffin	2019	14,375 (AOB)	28,750
	Gannet	2021	29,562 (AOS/AON)	59,124
St Abb's Head to Fast Castle	Guillemot	2018	45,827 (IND)	61,408
	Razorbill	2018	2,935 (IND)	4,381
	Kittiwake	2021	5,150 (AON)	10,300
Troup, Pennan and Lion's Heads	Guillemot	2017	23,801 (IND)	31,893
	Kittiwake	2017	10,616 (AON)	21,232

2.6 Impact scenarios

2.6.1.1 The impact from Morven South both alone and in-combination has been parametrised as a 'relative harvest' (i.e. additional mortality as a result of the impact). Note that for the purposes of the PVA model, specifying a relative harvest means the absolute number of birds that could suffer mortality as a result of the project is proportional to the population size. This is in line with the assessment approach for both collision risk and displacement analysis as described in Volume 3, Annex 11.2: Offshore Ornithology Collision Risk Modelling Report and Volume 3, Annex 11.4: Offshore Ornithology Displacement Modelling Report (Matrix Approach), of the EIA report.

2.6.1.2 Each simulation run within the PVA model was paired with an impact scenario that included additional population-level mortality due to wind turbine collision or displacement effects. This additional mortality was calculated as a proportion of the starting population and applied to the adult age class only. This way, the number of additional mortalities scaled proportionately with changes to the simulated number of breeding adults in the population.

2.6.1.3 For all species, a range of impact levels has been modelled based on the impact values estimated in RIAA Part 3. As explained in Section 2.2, only the impact scenarios that surpassed the 0.02 percentage point threshold have been taken forward to PVA modelling.

2.6.1.4 The impacts for all species used in population modelling are presented in Table 2.4. The impact values used in the PVA assessment for all species are based on the assessments presented in RIAA Part 3. The displacement and collision and displacement combined impacts have either 'SNCB_upper', 'SNCB_lower', or 'Applicant' as the impact scenario. This is due to the various displacement and mortality rates which have been used within the assessment. The displacement and mortality rates used within the assessment for each of the impact scenarios is presented within RIAA Part 3 and Volume 3, Annex 11.4 Offshore Ornithology Displacement Modelling Report (Matrix Approach). The Applicant also presents a different approach for collision estimates (see Volume 3, Annex 11.2: Offshore Ornithology Collision Risk Modelling Report).

2.6.1.5 The PVA graphs for each species and SPA for each impact scenario are presented in Appendix A.

Table 2.4: Impact scenarios modelled for all Special Protection Areas and associated features

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
Project alone					
Buchan Ness to Collieston Coast	Guillemot	Displacement	Displacement SNCB_lower	17.16	0.000435
Forth Islands	Guillemot	Displacement	Displacement SNCB_lower	15.45	0.000435
Fowlsheugh	Guillemot	Displacement	Displacement SNCB_lower	20.94	0.000224
			Displacement SNCB_upper	52.99	0.000566
St Abb's Head to Fast Castle	Guillemot	Displacement	Displacement SNCB_lower	26.7	0.000435
Troup, Pennan and Lion's Heads	Guillemot	Displacement	Displacement SNCB_lower	13.9	0.000435
Morven programme assessment (Scenario 3)					
Buchan Ness to Collieston Coast	Guillemot	Displacement	Displacement SNCB_lower	26.71	0.000677
			Displacement SNCB_upper	71.77	0.001820
			Displacement Applicant	18.77	0.000476
Forth Islands	Guillemot	Displacement	Displacement SNCB_lower	18.41	0.000518
			Displacement SNCB_upper	55.22	0.001554
			Displacement Applicant	15.34	0.000432
	Razorbill	Displacement	Displacement SNCB_upper	2.40	0.000282
Fowlsheugh	Kittiwake	Collision and displacement	Collision and Displacement SNCB_upper	7.47	0.000266
	Guillemot	Displacement	Displacement SNCB_lower	86.27	0.000922
			Displacement SNCB_upper	208.43	0.002228
			Displacement Applicant	48.85	0.000522

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
	Razorbill	Displacement	Displacement SNCB_upper	5.28	0.000252
St Abb's Head to Fast Castle	Guillemot	Displacement	Displacement SNCB_lower	31.82	0.000518
			Displacement SNCB_upper	95.46	0.001554
			Displacement Applicant	26.52	0.000432
	Razorbill	Displacement	Displacement SNCB_upper	1.13	0.000257
Troup, Pennan and Lion's Heads	Guillemot	Displacement	Displacement SNCB_lower	16.53	0.000518
			Displacement SNCB_upper	49.58	0.001554
			Displacement Applicant	13.77	0.000432
In-combination assessment (Scenario 4)					
Buchan Ness to Collieston Coast	Guillemot	Displacement	Displacement SNCB_lower	284.27	0.007208
			Displacement SNCB_upper	600.82	0.015234
			Displacement Applicant	131.89	0.003344
	Kittiwake	Collision and displacement	Collision SNCB	71.10	0.003147
			Collision Applicant	26.77	0.001185
			Displacement SNCB_lower	16.39	0.000725
			Displacement SNCB_upper	49.16	0.002176
			Displacement Applicant	19.29	0.000854
			Collision and Displacement SNCB_lower	87.48	0.003873
			Collision and Displacement SNCB_upper	120.26	0.005323
			Collision and Displacement Applicant	46.07	0.002039
Coquet Island	Puffin	Displacement	Displacement SNCB_lower	30.44	0.000608
			Displacement SNCB_upper	69.55	0.001389

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
			Displacement Applicant	16.30	0.000326
East Caithness Cliffs	Razorbill	Displacement	Displacement SNCB_lower	116.21	0.002584
			Displacement SNCB_upper	257.02	0.005716
			Displacement Applicant	58.67	0.001305
	Kittiwake	Collision and displacement	Collision SNCB	217.23	0.004437
			Collision Applicant	88.09	0.001799
			Displacement SNCB_lower	55.44	0.001132
			Displacement SNCB_upper	166.33	0.003397
			Displacement Applicant	64.63	0.001320
			Collision and Displacement SNCB_lower	272.68	0.005570
			Collision and Displacement SNCB_upper	383.56	0.007835
			Collision and Displacement Applicant	152.72	0.003119
Farne Islands	Puffin	Displacement	Displacement SNCB_lower	70.74	0.000808
			Displacement SNCB_upper	178.80	0.002043
			Displacement Applicant	45.03	0.000515
Flamborough and Filey Coast	Razorbill	Displacement	Displacement SNCB_lower	147.48	0.003269
			Displacement SNCB_upper	296.39	0.006569
			Displacement Applicant	62.05	0.001375
	Kittiwake	Collision and displacement	Collision SNCB	299.52	0.002906
			Collision Applicant	111.88	0.001085
			Displacement SNCB_lower	81.44	0.000790
			Displacement SNCB_upper	244.32	0.002370

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
			Displacement Applicant	95.64	0.000928
			Collision and Displacement SNCB_lower	380.96	0.003696
			Collision and Displacement SNCB_upper	543.84	0.005276
			Collision and Displacement Applicant	207.52	0.002013
Forth Islands	Guillemot	Displacement	Displacement SNCB_lower	260.92	0.007345
			Displacement SNCB_upper	569.69	0.016037
			Displacement Applicant	128.66	0.003622
	Razorbill	Displacement	Displacement SNCB_lower	49.19	0.005787
			Displacement SNCB_upper	95.26	0.011208
			Displacement Applicant	19.20	0.002258
	Puffin	Displacement	Displacement SNCB_lower	235.60	0.002744
			Displacement SNCB_upper	487.52	0.005679
			Displacement Applicant	104.97	0.001223
	Gannet	Collision and displacement	Collision SNCB	320.50	0.002129
			Collision Applicant	180.23	0.001197
			Displacement SNCB_lower	118.34	0.000786
			Displacement SNCB_upper	355.02	0.002359
			Displacement Applicant	151.71	0.001008
			Collision and Displacement SNCB_lower	438.84	0.002916
			Collision and Displacement SNCB_upper	675.52	0.004488

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
			Collision and Displacement Applicant	331.94	0.002205
Foula	Puffin	Displacement	Displacement SNCB_lower	8.83	0.001043
			Displacement SNCB_upper	25.50	0.003011
			Displacement Applicant	6.95	0.000820
Fowlsheugh	Guillemot	Displacement	Displacement SNCB_lower	724.14	0.007739
			Displacement SNCB_upper	1474.64	0.015760
			Displacement Appliant	310.66	0.003320
	Razorbill	Displacement	Displacement SNCB_lower	104.48	0.004978
			Displacement SNCB_upper	191.97	0.009146
			Displacement Applicant	36.45	0.001737
	Kittiwake	Collision and displacement	Collision SNCB	104.56	0.003724
			Collision Applicant	48.48	0.001727
			Displacement SNCB_lower	24.38	0.000868
			Displacement SNCB_upper	73.15	0.002605
			Displacement Applicant	34.99	0.001246
			Collision and Displacement SNCB_lower	128.95	0.004592
			Collision and Displacement SNCB_upper	177.72	0.006329
			Collision and Displacement Applicant	83.47	0.002973
Hermaness, Saxa Vord and Valla Field	Puffin	Displacement	Displacement SNCB_lower	8.51	0.000296
			Displacement SNCB_upper	25.52	0.000888
			Displacement Applicant	7.09	0.000247

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
	Gannet	Collision and displacement	Displacement SNCB_lower	23.80	0.000403
			Displacement SNCB_upper	71.40	0.001208
			Displacement Applicant	24.01	0.000406
			Collision and Displacement SNCB_lower	47.91	0.000810
			Collision and Displacement SNCB_upper	95.50	0.001615
			Collision and Displacement Applicant	43.49	0.000736
St Abb's Head to Fast Castle	Guillemot	Displacement	Displacement SNCB_lower	498.11	0.008112
			Displacement SNCB_upper	1040.32	0.016941
			Displacement Applicant	225.92	0.003679
	Razorbill	Displacement	Displacement SNCB_lower	23.22	0.005300
			Displacement SNCB_upper	44.86	0.010241
			Displacement Applicant	9.02	0.002059
	Kittiwake	Collision and displacement	Collision SNCB	117.24	0.011383
			Collision Applicant	57.82	0.005614
			Collision and Displacement SNCB_lower	134.27	0.013036
			Collision and Displacement SNCB_upper	168.33	0.016342
			Collision and Displacement Applicant	90.54	0.008790
Troup, Pennan and Lion's Heads	Guillemot	Displacement	Displacement SNCB_lower	200.20	0.006277
			Displacement SNCB_upper	424.94	0.013324
			Displacement Applicant	93.64	0.002936

SPA	Feature	Impact	Impact scenario	Total mortality (no. of birds)	Impact on adult survival rate
	Kittiwake	Collision and displacement	Collision SNCB	71.73	0.003378
			Collision Applicant	26.67	0.001256
			Collision and Displacement SNCB_lower	86.91	0.004093
			Collision and Displacement SNCB_upper	117.27	0.005523
			Collision and Displacement Applicant	43.70	0.002058

3 Results

3.1.1.1 The results of the PVA runs for impacts from Morven South alone, the Morven programme assessment and Morven South in-combination with other offshore wind farms on each species outlined in Section 2.2 at the start of the operation and maintenance phase (2038), the expected lifespan of Morven South (35 impacted years) (2072) and 50 impacted years (2087) on relevant SPAs and associated qualifying features are presented in the following sections. The baseline 'unimpacted' scenarios (i.e. assuming no additional mortality other than baseline mortality exists) is also shown for comparison purposes.

3.2 Project alone

3.2.1 Buchan Ness to Collieston Coast Special Protection Area

3.2.1.1 The PVA outputs for impacts from Morven South alone on relevant qualifying features of the Buchan Ness to Collieston Coast SPA are presented in this section.

Guillemot

Table 3.1: Population viability analysis for guillemot at the Buchan Ness to Collieston Coast Special Protection Area for impacts associated with Morven South alone

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	62,856	2.63	1.0263	0.9530	1.0920	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	146,585	139.3	1.025	1.017	1.033	-	-	-	-
	Displacement SNCB_upper	17.2	144,129	135.3	1.025	1.016	1.033	1.000	0.983	46.4	53.92
50 (2087)	Baseline (unimpacted)	-	212,646	248.58	1.0253	1.0182	1.0320	-	-	-	-
	Displacement SNCB_upper	17.2	207,717	239.90	1.0248	1.0177	1.0316	0.9995	0.9763	45.40	54.68

3.2.2 Forth Islands Special Protection Area

3.2.2.1 The PVA outputs for impacts from Morven South alone on relevant qualifying features of the Forth Islands SPA are presented in this section.

Guillemot

Table 3.2: Population viability analysis outputs for guillemot at the Forth Islands Special Protection Area for impacts associated with Morven South alone

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	53,892	2.73	1.0273	0.9490	1.0938	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	125,543	139.25	1.0252	1.0165	1.0335	-	-	-	-
	Displacement SNCB_upper	15.5	123,426	135.26	1.0247	1.0161	1.0330	1.000	0.983	45.82	54.22
50 (2087)	Baseline (unimpacted)	-	182,586	247.72	1.0252	1.0182	1.0323	-	-	-	-
	Displacement SNCB_upper	15.5	177,954	239.41	1.0247	1.0176	1.0318	1.000	0.976	45.40	54.7

3.2.3 Fowlsheugh Special Protection Area

3.2.3.1 The PVA outputs for impacts from Morven South alone on relevant qualifying features of the Fowlsheugh SPA are presented in this section.

Guillemot

Table 3.3: Population viability analysis outputs for guillemot at the Fowlsheugh Special Protection Area for impacts associated with Morven South alone

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	152,431	2.60	1.0260	0.9505	1.0940	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	355,205	139.0	1.025	1.0165	1.0332	-	-	-	-
	Displacement SNCB_lower	20.9	352,020	136.8	1.025	1.0163	1.0329	1.000	0.991	48.5	52.16
	Displacement SNCB_upper	53.0	347,510	133.7	1.025	1.0159	1.0325	0.999	0.978	45.9	55.08
50 (2087)	Baseline (unimpacted)	-	514,403	247.88	1.0252	1.0182	1.0318	-	-	-	-
	Displacement SNCB_lower	20.9	507,925	243.86	1.0250	1.0179	1.0316	0.9997	0.9875	47.62	52.50
	Displacement SNCB_upper	53.0	498,302	237.13	1.0246	1.0175	1.0312	0.9994	0.9691	43.86	56.02

3.2.4 St Abb's Head to Fast Castle Special Protection Area

3.2.4.1 The PVA outputs for impacts from Morven South alone on relevant qualifying features of the St Abb's Head to Fast Castle SPA are presented in this section.

Guillemot

Table 3.4: Population viability analysis outputs for guillemot at the St Abb's Head to Fast Castle Special Protection Area for impacts associated with Morven South alone

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	100,068	2.63	1.0263	0.9497	1.0934	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	232,956	138.69	1.0252	1.0165	1.0331	-	-	-	-
	Displacement SNCB_upper	26.7	229,226	134.82	1.0247	1.0160	1.0327	1.000	0.983	46.86	53.66
50 (2087)	Baseline (unimpacted)	-	337,624	247.97	1.0253	1.0182	1.0318	-	-	-	-
	Displacement SNCB_upper	26.7	329,480	239.85	1.0248	1.0177	1.0314	1.000	0.976	45.24	54.86

3.2.5 Troup, Pennan, and Lion's Heads Special Protection Area

3.2.5.1 The PVA outputs for impacts from Morven South alone on relevant qualifying features of the Troup, Pennan, and Lion's Heads SPA are presented in this section.

Guillemot

Table 3.5: Population viability analysis outputs for guillemot at the Troup, Pennan and Lion's Heads Special Protection Area for impacts associated with Morven South alone

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	53,241	2.67	1.0267	0.9519	1.0941	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	124,364	140.05	1.0253	1.0166	1.0335	-	-	-	-
	Displacement SNCB_upper	13.9	122,128	136.11	1.0249	1.0161	1.0330	1.000	0.983	46.24	53.88
50 (2087)	Baseline (unimpacted)	-	180,168	248.08	1.0253	1.0180	1.0322	-	-	-	-
	Displacement SNCB_upper	13.9	175,655	239.90	1.0248	1.0174	1.0317	1.000	0.976	44.86	54.76

3.3 Morven Programme assessment (Scenario 3)

3.3.1 Buchan Ness to Collieston Coast Special Protection Area

3.3.1.1 The PVA outputs for impacts from Morven Programme alone (Scenario 3) on relevant qualifying features of the Buchan Ness to Collieston Coast SPA are presented in this section.

Guillemot

Table 3.6: Population viability analysis outputs for guillemot at the Buchan Ness to Collieston Coast Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	62,856	2.64	1.0264	0.9539	1.0922	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	146,425	139.14	1.0252	1.0167	1.0335	-	-	-	-
	Displacement SNCB_lower	26.7	142,542	133.17	1.0245	1.0160	1.0327	0.9992	0.9740	43.68	56.38
	Displacement SNCB_upper	71.8	136,288	123.01	1.0232	1.0146	1.0314	0.9980	0.9314	34.14	66.12
	Displacement Applicant	18.8	143,706	134.90	1.0247	1.0162	1.0329	0.9995	0.9814	45.74	54.14
50 (2087)	Baseline (unimpacted)	-	212,723	248.33	1.0253	1.0182	1.0320	-	-	-	-
	Displacement SNCB_lower	26.7	204,871	235.33	1.0245	1.0174	1.0313	0.9992	0.9630	42.36	57.22
	Displacement SNCB_upper	71.8	192,267	214.81	1.0232	1.0161	1.0300	0.9980	0.9031	30.68	70.60
	Displacement Applicant	18.8	207,314	239.22	1.0247	1.0176	1.0315	0.9995	0.9737	44.90	55.12

3.3.2 Forth Islands Special Protection Area

3.3.2.1 The PVA outputs for impacts from Morven Programme alone (Scenario 3) on relevant qualifying features of the Forth Islands SPA are presented in this section.

Guillemot

Table 3.7: Population viability analysis outputs for guillemot at the Forth Islands Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no. of birds)	Impact (no. of birds)	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Median CGR	Median CPS	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	53,919	2.75	1.0275	0.9492	1.0939	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	125,462	139.24	1.0252	1.0165	1.0335	-	-	-	-
	Displacement SNCB_lower	18.4	123,047	134.44	1.0246	1.0159	1.0329	0.9994	0.9800	45.32	54.54
	Displacement SNCB_upper	55.2	118,233	125.13	1.0235	1.0148	1.0317	0.9983	0.9412	36.14	64.26
	Displacement Applicant	15.3	123,438	135.20	1.0247	1.0160	1.0330	0.9995	0.9830	45.96	54.00
50 (2087)	Baseline (unimpacted)	-	182,333	248.03	1.0253	1.0182	1.0323	-	-	-	-
	Displacement SNCB_lower	18.4	176,992	237.71	1.0246	1.0175	1.0317	0.9994	0.9715	44.22	55.50
	Displacement SNCB_upper	55.2	167,107	218.76	1.0235	1.0164	1.0305	0.9983	0.9167	33.08	66.70
	Displacement Applicant	15.3	178,059	239.95	1.0248	1.0178	1.0318	0.9995	0.9760	45.60	54.44

Razorbill

Table 3.8: Population viability analysis outputs for razorbill at the Forth Islands Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	0	5,446	-1.68	0.9832	0.8003	1.1298	-	-	-	-
35 (2072)	Baseline (unimpacted)	0	2,374	-56.96	0.9762	0.9545	0.9959	-	-	-	-
	Displacement SNCB_upper	2.4	2,341	-57.60	0.9758	0.9538	0.9958	0.9996	0.9877	49.08	50.96
50 (2087)	Baseline (unimpacted)	0	1,644	-70.30	0.9760	0.9581	0.9923	-	-	-	-
	Displacement SNCB_upper	2.4	1,615	-70.70	0.9757	0.9578	0.9921	0.9997	0.9837	48.52	51.46

3.3.3 Fowlsheugh Special Protection Area

3.3.3.1 The PVA outputs for impacts from Morven Programme alone (Scenario 3) on relevant qualifying features of the Fowlsheugh SPA are presented in this section.

Kittiwake

Table 3.9: Population viability analysis outputs for kittiwake at the Fowlsheugh Special Protection Area for impacts associated with the Morven Programme

Impacted year (Calendar year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	29,540	1.29	1.0129	0.8112	1.1663	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	31,588	8.33	1.0023	0.9811	1.0231	-	-	-	-
	Collision and Displacement SNCB_upper	7.5	31,192	7.23	1.0020	0.9808	1.0227	0.9997	0.9895	48.88	51.18
50 (2087)	Baseline (unimpacted)	-	32,959	13.02	1.0025	0.9842	1.0198	-	-	-	-
	Collision and Displacement SNCB_upper	7.5	32,400	11.41	1.0022	0.9841	1.0195	0.9997	0.9845	48.60	51.18

Guillemot

Table 3.10: Population viability analysis outputs for guillemot at the Fowlsheugh Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	152,451	2.64	1.0264	0.9503	1.0940	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	354,894	138.83	1.0252	1.0165	1.0332	-	-	-	-
	Displacement SNCB lower	86.3	342,570	130.36	1.0241	1.0155	1.0321	0.9990	0.9645	42.56	58.04
	Displacement SNCB upper	208.4	325,301	118.93	1.0226	1.0140	1.0306	0.9975	0.9165	31.66	68.76
	Displacement Applicant	48.9	347,936	133.95	1.0246	1.0159	1.0325	0.9994	0.9797	46.04	54.44
50 (2087)	Baseline (unimpacted)	-	514,616	248.00	1.0253	1.0182	1.0318	-	-	-	-
	Displacement SNCB lower	86.3	488,453	230.71	1.0242	1.0171	1.0308	0.9990	0.9498	39.94	59.94
	Displacement SNCB upper	208.4	454,011	207.19	1.0227	1.0157	1.0293	0.9975	0.8827	27.04	72.70
	Displacement Applicant	48.9	499,546	238.06	1.0247	1.0176	1.0312	0.9994	0.9712	44.18	55.52

Razorbill

Table 3.11: Population viability analysis outputs for razorbill at the Fowlsheugh Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	13,165	-1.49	0.9851	0.8035	1.1327	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	5,705	-56.91	0.9762	0.9543	0.9958	-	-	-	-
	Displacement SNCB upper	5.3	5,662	-57.47	0.9759	0.9541	0.9954	0.9997	0.9894	49.36	50.72
50 (2087)	Baseline (unimpacted)	-	3,994	-70.38	0.9760	0.9576	0.9925	-	-	-	-
	Displacement SNCB upper	5.3	3,929	-70.77	0.9757	0.9574	0.9922	0.9997	0.9854	48.96	51.22

3.3.4 St Abb's Head to Fast Castle Special Protection Area

3.3.4.1 The PVA outputs for impacts from Morven Programme alone (Scenario 3) on relevant qualifying features of the St Abb's Head to Fast Castle SPA are presented in this section.

Guillemot

Table 3.12: Population viability analysis outputs for guillemot at the St Abb's Head to Fast Castle Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	100,050	2.62	1.0262	0.9510	1.0938	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	232,797	138.92	1.0252	1.0165	1.0332	-	-	-	-
	Displacement SNCB lower	31.8	228,443	134.03	1.0246	1.0159	1.0326	0.9994	0.9801	46.28	54.32
	Displacement SNCB upper	95.5	219,147	124.69	1.0234	1.0148	1.0314	0.9983	0.9409	36.82	63.84
	Displacement Applicant	26.5	229,092	134.81	1.0247	1.0161	1.0327	0.9995	0.9832	46.92	53.84
50 (2087)	Baseline (unimpacted)	-	337,728	248.31	1.0253	1.0182	1.0318	-	-	-	-
	Displacement SNCB lower	31.8	327,757	238.06	1.0247	1.0176	1.0312	0.9994	0.9715	44.28	55.64
	Displacement SNCB upper	95.5	309,373	219.18	1.0235	1.0164	1.0301	0.9983	0.9165	33.18	66.32
	Displacement Applicant	26.5	329,404	239.74	1.0248	1.0177	1.0313	0.9995	0.9759	45.14	54.68

Razorbill

Table 3.13: Population viability analysis outputs for razorbill at the St Abb's Head to Fast Castle Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	2,742	-1.52	0.9848	0.8015	1.1343	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	1,187	-57.05	0.9761	0.9542	0.9959	-	-	-	-
	Displacement SNCB upper	1.1	1,181	-57.63	0.9758	0.9540	0.9957	0.9997	0.9901	49.56	50.56
50 (2087)	Baseline (unimpacted)	-	834	-70.32	0.9760	0.9573	0.9926	-	-	-	-
	Displacement SNCB upper	1.1	818	-70.73	0.9757	0.9572	0.9925	0.9997	0.9869	48.60	51.32

3.3.5 Troup, Pennan and Lion's Head Special Protection Area

3.3.5.1 The PVA outputs for impacts from the Morven Programme alone (Scenario 3) on relevant qualifying features of the Troup, Pennan and Lion's Head SPA are presented in this section.

Guillemot

Table 3.14: Population viability analysis outputs for guillemot at the Troup, Pennan and Lion's Head Special Protection Area for impacts associated with the Morven Programme

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	53,282	2.68	1.0268	0.9517	1.0938	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	124,364	140.10	1.0253	1.0166	1.0335	-	-	-	-
	Displacement SNCB lower	16.5	121,784	135.43	1.0248	1.0160	1.0329	0.9994	0.9801	45.34	54.26
	Displacement SNCB upper	49.6	117,010	125.88	1.0236	1.0148	1.0317	0.9983	0.9412	36.30	63.50
	Displacement Applicant	13.8	122,276	136.18	1.0249	1.0162	1.0330	0.9995	0.9831	46.00	53.40
50 (2087)	Baseline (unimpacted)	-	179,907	248.04	1.0253	1.0180	1.0321	-	-	-	-
	Displacement SNCB lower	16.5	174,613	238.37	1.0247	1.0173	1.0316	0.9994	0.9714	44.04	55.62
	Displacement SNCB upper	49.6	165,041	219.26	1.0235	1.0162	1.0304	0.9983	0.9167	33.04	65.72
	Displacement Applicant	13.8	175,615	239.90	1.0248	1.0174	1.0316	0.9995	0.9762	45.18	54.64

3.4 In-combination assessment (Scenario 4)

3.4.1 Buchan Ness to Collieston Coast Special Protection Area

3.4.1.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Buchan Ness to Collieston Coast SPA are presented in this section.

Kittiwake

Table 3.15: Population viability analysis outputs for kittiwake at the Buchan Ness to Collieston Coast Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	23,725	1.45	1.0145	0.8156	1.1730	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	25,588	9.16	1.0025	0.9813	1.0233	-	-	-	-
	Collision SNCB	71.1	22,403	-4.25	0.9988	0.9776	1.0195	0.9963	0.8778	38.66	61.86
	Collision Applicant	26.8	24,357	4.16	1.0012	0.9799	1.0218	0.9986	0.9522	45.68	54.38
	Displacement SNCB_lower	16.4	24,806	6.03	1.0017	0.9805	1.0224	0.9991	0.9705	47.06	52.92
	Displacement SNCB_upper	49.2	23,424	-0.30	0.9999	0.9786	1.0207	0.9974	0.9140	42.40	58.32
	Displacement Applicant	19.3	24,701	5.52	1.0015	0.9804	1.0222	0.9990	0.9652	46.62	53.28
	Collision and Displacement SNCB_lower	87.5	21,812	-7.04	0.9979	0.9766	1.0187	0.9954	0.8516	36.46	64.32
	Collision and Displacement SNCB_upper	120.3	20,481	-12.42	0.9962	0.9750	1.0169	0.9937	0.8016	31.22	69.68
	Collision and Displacement Applicant	46.1	23,448	0.55	1.0002	0.9788	1.0208	0.9976	0.9189	42.50	58.04

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
50 (2087)	Baseline (unimpacted)	-	26,489	13.89	1.0026	0.9844	1.0197	-	-	-	-
	Collision SNCB	71.1	21,885	-5.46	0.9989	0.9807	1.0161	0.9963	0.8298	35.28	64.50
	Collision Applicant	26.8	24,612	6.06	1.0012	0.9830	1.0183	0.9986	0.9321	44.76	55.88
	Displacement SNCB_lower	16.4	25,303	9.09	1.0017	0.9836	1.0188	0.9991	0.9575	46.66	53.90
	Displacement SNCB_upper	49.2	23,233	0.36	1.0001	0.9820	1.0172	0.9974	0.8794	39.92	60.24
	Displacement Applicant	19.3	25,131	8.29	1.0016	0.9834	1.0189	0.9990	0.9506	46.12	54.16
	Collision and Displacement SNCB_lower	87.5	20,934	-9.53	0.9980	0.9798	1.0153	0.9954	0.7949	32.12	67.12
	Collision and Displacement SNCB_upper	120.3	19,267	-17.00	0.9963	0.9782	1.0136	0.9937	0.7290	26.50	73.56
	Collision and Displacement Applicant	46.1	23,449	0.97	1.0002	0.9820	1.0174	0.9976	0.8858	40.88	59.62

Guillemot

Table 3.16: Population viability analysis outputs for guillemot at the Buchan Ness to Collieston Coast Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	62,856	2.64	1.0264	0.9539	1.0922	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	146,425	139.14	1.0252	1.0167	1.0335	-	-	-	-
	Displacement SNCB_lower	284.3	110,375	80.38	1.0170	1.0085	1.0252	0.9920	0.7539	5.86	94.80
	Displacement SNCB_upper	600.8	80,329	31.36	1.0078	0.9993	1.0161	0.9830	0.5489	0.04	100.00
	Displacement Applicant	131.9	128,444	110.05	1.0214	1.0130	1.0297	0.9963	0.8774	22.94	77.76
50 (2087)	Baseline (unimpacted)	-	212,723	248.33	1.0253	1.0182	1.0320				
	Displacement SNCB_lower	284.3	142,066	132.63	1.0170	1.0099	1.0238	0.9919	0.6675	2.32	98.26
	Displacement SNCB_upper	600.8	90,099	47.60	1.0078	1.0007	1.0146	0.9830	0.4239	0.00	100.00
	Displacement Applicant	131.9	176,283	188.72	1.0214	1.0144	1.0282	0.9963	0.8294	17.80	82.78

3.4.2 Coquet Island Special Protection Area

3.4.2.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Coquet Island SPA are presented in this section.

Puffin

Table 3.17: Population viability analysis outputs for puffin at the Coquet Island Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	29,831	-0.67	0.9933	0.7590	1.1015	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	11,188	-62.80	0.9721	0.9468	0.9944	-	-	-	-
	Displacement SNCB lower	30.4	10,883	-63.60	0.9715	0.9459	0.9937	0.9993	0.9760	48.22	51.86
	Displacement SNCB upper	69.6	10,523	-64.74	0.9707	0.9451	0.9930	0.9984	0.9445	45.68	53.84
	Displacement Applicant	16.3	11,027	-63.23	0.9718	0.9464	0.9940	0.9996	0.9863	49.06	50.94
50 (2087)	Baseline (unimpacted)	-	7,288	-75.68	0.9721	0.9503	0.9910	-	-	-	-
	Displacement SNCB lower	30.4	7,080	-76.54	0.9714	0.9496	0.9901	0.9993	0.9649	48.00	51.96
	Displacement SNCB upper	69.6	6,747	-77.64	0.9705	0.9488	0.9894	0.9984	0.9216	44.56	54.94
	Displacement Applicant	16.3	7,164	-76.24	0.9717	0.9498	0.9906	0.9996	0.9805	48.76	51.00

3.4.3 East Caithness Cliffs Special Protection Area

3.4.3.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the East Caithness Cliffs SPA are presented in this section.

Kittiwake

Table 3.18: Population viability analysis outputs for kittiwake at the East Caithness Cliffs Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	51,552	1.34	1.0134	0.8094	1.1647	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	55,109	8.26	1.0023	0.9810	1.0232	-	-	-	-
	Collision SNCB	217.2	45,779	-9.74	0.9971	0.9757	1.0178	0.9948	0.8316	33.84	65.48
	Collision Applicant	88.1	50,971	0.54	1.0002	0.9789	1.0207	0.9979	0.9281	43.22	56.40
	Displacement SNCB_lower	55.4	52,429	3.19	1.0009	0.9797	1.0217	0.9987	0.9539	45.62	54.28
	Displacement SNCB_upper	166.3	47,778	-6.01	0.9982	0.9771	1.0191	0.9960	0.8685	37.74	62.14
	Displacement Applicant	64.6	52,028	2.55	1.0007	0.9794	1.0216	0.9984	0.9465	44.90	54.86
	Collision and Displacement SNCB_lower	272.7	43,635	-14.25	0.9956	0.9744	1.0166	0.9934	0.7936	30.14	68.96
	Collision and Displacement SNCB_upper	383.6	39,795	-21.86	0.9930	0.9718	1.0138	0.9907	0.7213	23.60	75.52
	Collision and Displacement Applicant	152.7	48,303	-4.75	0.9986	0.9774	1.0194	0.9963	0.8786	38.48	61.10
50 (2087)	Baseline (unimpacted)	-	57,410	13.38	1.0025	0.9844	1.0198	-	-	-	-
	Collision SNCB	217.2	44,220	-12.73	0.9973	0.9792	1.0144	0.9948	0.7684	30.72	69.36
	Collision Applicant	88.1	51,549	1.90	1.0004	0.9825	1.0176	0.9979	0.8990	41.46	57.72
	Displacement SNCB_lower	55.4	53,616	5.95	1.0012	0.9829	1.0185	0.9987	0.9351	44.44	54.92
	Displacement SNCB_upper	166.3	47,002	-7.45	0.9985	0.9804	1.0157	0.9960	0.8176	34.88	64.76
	Displacement Applicant	64.6	53,077	4.44	1.0009	0.9827	1.0182	0.9984	0.9246	43.84	55.64

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
	Collision and Displacement SNCB_lower	272.7	41,331	-18.67	0.9959	0.9778	1.0132	0.9934	0.7189	26.12	73.70
	Collision and Displacement SNCB_upper	383.6	36,077	-28.89	0.9932	0.9752	1.0104	0.9907	0.6275	18.50	82.08
	Collision and Displacement Applicant	152.7	47,772	-5.78	0.9988	0.9808	1.0161	0.9963	0.8315	35.80	63.50

Razorbill

Table 3.19: Population viability analysis outputs for Razorbill at the East Caithness Cliffs Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	28,160	-1.49	0.9851	0.8021	1.1344	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	12,244	-57.06	0.9761	0.9544	0.9960	-	-	-	-
	Displacement SNCB_lower	116.2	11,000	-61.30	0.9732	0.9515	0.9930	0.9970	0.8992	41.08	59.74
	Displacement SNCB_upper	257.0	9,666	-66.10	0.9696	0.9480	0.9893	0.9933	0.7899	31.02	70.20
	Displacement Applicant	58.7	11,589	-59.26	0.9747	0.9528	0.9944	0.9985	0.9475	45.42	54.94
50 (2087)	Baseline (unimpacted)	-	8,545	-70.34	0.9760	0.9578	0.9925	-	-	-	-
	Displacement SNCB_lower	116.2	7,329	-74.49	0.9731	0.9547	0.9896	0.9970	0.8590	38.44	61.96
	Displacement SNCB_upper	257.0	6,100	-78.79	0.9695	0.9511	0.9860	0.9933	0.7138	27.34	74.58
	Displacement Applicant	58.7	7,915	-72.59	0.9744	0.9564	0.9910	0.9985	0.9254	44.16	55.90

3.4.4 Farne Islands Special Protection Area

3.4.4.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Farne Islands SPA are presented in this section.

Puffin

Table 3.20: Population viability analysis outputs for puffin at the Farne Islands Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	52,173	-0.70	0.9930	0.7582	1.1020	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	19,559	-62.71	0.9722	0.9468	0.9944	-	-	-	-
	Displacement SNCB_lower	70.7	18,941	-63.94	0.9713	0.9458	0.9935	0.9991	0.9672	47.94	52.20
	Displacement SNCB_upper	178.8	17,956	-65.71	0.9699	0.9445	0.9922	0.9976	0.9194	44.16	55.64
	Displacement Applicant	45.0	19,147	-63.48	0.9716	0.9463	0.9938	0.9994	0.9791	48.72	51.46
50 (2087)	Baseline (unimpacted)	-	12,764	-75.72	0.9721	0.9502	0.9909	-	-	-	-
	Displacement SNCB_lower	70.7	12,195	-76.88	0.9711	0.9495	0.9901	0.9990	0.9535	47.02	52.74
	Displacement SNCB_upper	178.8	11,322	-78.46	0.9698	0.9480	0.9886	0.9976	0.8867	42.36	57.74
	Displacement Applicant	45.0	12,413	-76.47	0.9715	0.9497	0.9903	0.9994	0.9701	48.22	51.60

3.4.5 Flamborough and Filey Coast Special Protection Area

3.4.5.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Flamborough and Filey Coast SPA are presented in this section.

Kittiwake

Table 3.21: Population viability analysis outputs for kittiwake at the Flamborough and Filey Coast Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	108,179	0.97	1.0097	0.8099	1.1686	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	117,660	8.97	1.0024	0.9812	1.0225	-	-	-	-
	Collision SNCB	299.6	103,862	-3.68	0.9990	0.9776	1.0191	0.9966	0.8833	39.34	61.12
	Collision Applicant	111.9	112,341	3.99	1.0011	0.9798	1.0211	0.9987	0.9546	45.88	54.20
	Displacement SNCB_lower	81.5	113,843	5.36	1.0015	0.9803	1.0215	0.9991	0.9671	47.10	53.10
	Displacement SNCB_upper	244.4	106,297	-1.62	0.9995	0.9785	1.0196	0.9972	0.9035	41.40	58.82
	Displacement Applicant	95.7	113,219	4.78	1.0013	0.9802	1.0214	0.9989	0.9614	46.62	53.72
	Collision and Displacement SNCB_lower	381.1	100,253	-7.20	0.9979	0.9768	1.0181	0.9956	0.8539	36.94	64.04
	Collision and Displacement SNCB_upper	544.1	93,843	-13.27	0.9961	0.9749	1.0162	0.9938	0.7980	31.70	69.08

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
	Collision and Displacement Applicant	207.6	107,858	0.15	1.0000	0.9788	1.0202	0.9976	0.9177	42.58	57.54
50 (2087)	Baseline (unimpacted)	-	121,976	12.96	1.0024	0.9849	1.0195	-	-	-	-
	Collision SNCB	299.5	102,274	-5.12	0.9990	0.9814	1.0160	0.9966	0.8386	36.58	63.42
	Collision Applicant	111.9	114,368	5.81	1.0011	0.9836	1.0183	0.9987	0.9362	45.04	55.10
	Displacement SNCB_lower	81.5	116,085	7.85	1.0015	0.9839	1.0186	0.9991	0.9535	46.26	53.88
	Displacement SNCB_upper	244.4	105,638	-1.88	0.9996	0.9820	1.0167	0.9972	0.8662	39.00	61.00
	Displacement Applicant	95.7	115,249	6.90	1.0013	0.9836	1.0184	0.9989	0.9456	45.60	54.38
	Collision and Displacement SNCB_lower	381.1	97,480	-9.60	0.9980	0.9805	1.0151	0.9956	0.7990	33.28	66.9
	Collision and Displacement SNCB_upper	544.1	88,510	-17.83	0.9962	0.9785	1.0133	0.9938	0.7261	26.82	73.32
	Collision and Displacement Applicant	207.6	108,263	0.25	1.0000	0.9824	1.0170	0.9976	0.8852	41.00	59.26

Razorbill

Table 3.22: Population viability analysis outputs for Razorbill at the Flamborough and Filey Coast Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	27,713	-1.50	0.9850	0.8014	1.1300	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	11,917	-57.22	0.9760	0.9538	0.9962	-	-	-	-
	Displacement SNCB_lower	147.5	10,371	-62.60	0.9723	0.9501	0.9926	0.9962	0.8737	38.82	61.52
	Displacement SNCB_upper	296.4	9,054	-67.41	0.9685	0.9463	0.9887	0.9923	0.7624	28.20	71.30
	Displacement Applicant	62.0	11,218	-59.49	0.9745	0.9523	0.9948	0.9984	0.9448	45.18	54.62
50 (2087)	Baseline (unimpacted)	-	8,254	-70.40	0.9759	0.9576	0.9931	-	-	-	-
	Displacement SNCB_lower	147.5	6,800	-75.57	0.9722	0.9537	0.9892	0.9961	0.8243	35.90	63.62
	Displacement SNCB_upper	296.4	5,577	-79.96	0.9684	0.9501	0.9854	0.9923	0.6786	23.14	75.90
	Displacement Applicant	62.0	7,603	-72.70	0.9744	0.9561	0.9914	0.9984	0.9225	43.94	56.18

3.4.6 Forth Islands Special Protection Area

3.4.6.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Forth Islands SPA are presented in this section.

Guillemot

Table 3.23: Population viability analysis outputs for guillemot at the Forth Islands Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	53,919	2.75	1.0275	0.9492	1.0939	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	125,462	139.24	1.0252	1.0165	1.0335	-	-	-	-
	Displacement SNCB_lower	260.9	94,128	79.42	1.0168	1.0081	1.0251	0.9918	0.7498	5.44	95.92
	Displacement SNCB_upper	569.7	66,674	27.30	1.0069	0.9982	1.0151	0.9821	0.5318	0.02	100.00
	Displacement Applicant	128.7	109,011	107.39	1.0211	1.0124	1.0293	0.9960	0.8679	21.52	80.18
50 (2087)	Baseline (unimpacted)	-	182,333	248.03	1.0253	1.0182	1.0323	-	-	-	-
	Displacement SNCB_lower	260.9	120,622	130.20	1.0168	1.0097	1.0239	0.9918	0.6623	2.00	98.28
	Displacement SNCB_upper	569.7	73,870	40.89	1.0069	0.9998	1.0139	0.9821	0.4050	0.00	100.00
	Displacement Applicant	128.7	148,727	184.29	1.0211	1.0140	1.0281	0.9960	0.8166	16.00	85.22

Razorbill

Table 3.24: Population viability analysis outputs for Razorbill at the Forth Islands Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	5,449	-1.72	0.9828	0.7991	1.1328	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	2,369	-56.88	0.9763	0.9543	0.9960	-	-	-	-
	Displacement SNCB_lower	49.2	1,863	-66.15	0.9695	0.9479	0.9895	0.9932	0.7886	30.64	69.76
	Displacement SNCB_upper	95.3	1,500	-72.90	0.9634	0.9415	0.9831	0.9869	0.6297	16.88	84.98
	Displacement Applicant	19.2	2,155	-60.74	0.9736	0.9518	0.9936	0.9974	0.9120	42.22	57.72
50 (2087)	Baseline (unimpacted)	-	1,652	-70.13	0.9761	0.9580	0.9925	-	-	-	-
	Displacement SNCB_lower	49.2	1,174	-78.83	0.9694	0.9511	0.9858	0.9932	0.7108	26.98	74.82
	Displacement SNCB_upper	95.3	850	-84.65	0.9632	0.9449	0.9796	0.9869	0.5163	10.84	90.20
	Displacement Applicant	19.2	1,440	-73.92	0.9735	0.9555	0.9898	0.9973	0.8756	40.28	60.04

Puffin

Table 3.25: Population viability analysis outputs for puffin at the Forth Islands Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	52,653	0.06	1.0006	0.7554	1.1071	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	19,762	-62.89	0.9721	0.9466	0.9947	-	-	-	-
	Displacement SNCB_lower	235.6	17,640	-66.84	0.9690	0.9434	0.9915	0.9968	0.8932	42.12	58.34
	Displacement SNCB_upper	487.5	15,668	-70.63	0.9656	0.9399	0.9882	0.9933	0.7917	33.86	66.78
	Displacement Applicant	105.0	18,839	-64.68	0.9707	0.9451	0.9933	0.9986	0.9513	46.54	53.54
50 (2087)	Baseline (unimpacted)	-	12,766	-75.86	0.9720	0.9509	0.9913	-	-	-	-
	Displacement SNCB_lower	235.6	10,888	-79.47	0.9688	0.9478	0.9881	0.9968	0.8512	39.16	60.76
	Displacement SNCB_upper	487.5	9,117	-82.80	0.9654	0.9445	0.9849	0.9933	0.7160	28.44	71.22
	Displacement Applicant	105.0	11,919	-77.55	0.9706	0.9496	0.9899	0.9986	0.9308	45.16	55.18

Gannet

Table 3.26: Population viability analysis outputs for Gannet at the Forth Islands Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	201,411	1.85	1.0185	0.9103	1.0847	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	304,843	53.73	1.0124	1.0010	1.0229	-	-	-	-
	Collision SNCB	320.5	279,346	40.76	1.0098	0.9984	1.0204	0.9975	0.9158	36.90	63.46
	Collision Applicant	180.2	290,395	46.32	1.0109	0.9996	1.0216	0.9986	0.9516	42.74	58.02
	Displacement SNCB_lower	118.3	295,381	48.78	1.0114	1.0001	1.0220	0.9991	0.9681	44.88	55.28
	Displacement SNCB_upper	355.0	276,985	39.47	1.0096	0.9982	1.0202	0.9972	0.9070	35.48	64.86
	Displacement Applicant	151.7	292,536	47.56	1.0112	0.9998	1.0217	0.9988	0.9594	43.62	56.78
	Collision and Displacement SNCB_lower	438.8	270,234	36.29	1.0089	0.9976	1.0195	0.9966	0.8864	32.00	68.82
	Collision and DisplacementSNCB_upper	675.5	253,315	27.71	1.0070	0.9956	1.0176	0.9947	0.8306	23.64	78.28
	Collision and Displacement Applicant	331.9	278,798	40.31	1.0097	0.9984	1.0203	0.9974	0.9129	36.68	64.10

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
50 (2087)	Baseline (unimpacted)	-	365,671	84.23	1.0123	1.0026	1.0214	-	-	-	-
	Collision SNCB	320.5	322,612	62.55	1.0098	1.0001	1.0189	0.9975	0.8817	32.46	67.62
	Collision Applicant	180.2	341,042	71.81	1.0109	1.0012	1.0200	0.9986	0.9315	39.98	60.22
	Displacement SNCB_lower	118.3	349,298	76.11	1.0114	1.0017	1.0205	0.9991	0.9546	43.32	56.44
	Displacement SNCB_upper	355.0	317,936	60.31	1.0095	0.9999	1.0186	0.9972	0.8697	30.52	69.40
	Displacement Applicant	151.7	344,888	73.76	1.0111	1.0015	1.0202	0.9988	0.9423	41.62	58.42
	Collision and Displacement SNCB_lower	438.8	307,821	55.21	1.0088	0.9993	1.0179	0.9966	0.8416	27.04	73.04
	Collision and Displacement SNCB_upper	675.5	280,506	41.27	1.0069	0.9973	1.0161	0.9947	0.7666	17.64	83.46
	Collision and Displacement Applicant	331.9	320,908	61.89	1.0097	1.0000	1.0188	0.9974	0.8778	31.64	68.24

3.4.7 Foula Special Protection Area

3.4.7.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Foula SPA are presented in this section.

Puffin

Table 3.27: Population viability analysis outputs for puffin at the Foula Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	4,668	-0.49	0.9951	0.7541	1.1010	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	1,733	-62.77	0.9722	0.9465	0.9942	-	-	-	-
	Displacement SNCB_lower	8.8	1,659	-64.52	0.9708	0.9455	0.9928	0.9988	0.9585	46.72	52.82
	Displacement SNCB_upper	25.5	1,529	-67.12	0.9687	0.9433	0.9906	0.9965	0.8836	40.56	58.82
	Displacement Applicant	6.9	1,675	-64.21	0.9711	0.9457	0.9929	0.9990	0.9660	47.34	52.54
50 (2087)	Baseline (unimpacted)	-	1,130	-75.94	0.9719	0.9507	0.9915	-	-	-	-
	Displacement SNCB_lower	8.8	1,063	-77.42	0.9707	0.9497	0.9902	0.9988	0.9401	46.06	53.88
	Displacement SNCB_upper	25.5	946	-79.86	0.9685	0.9473	0.9879	0.9965	0.8375	39.02	61.48
	Displacement Applicant	6.9	1,084	-77.14	0.9709	0.9498	0.9903	0.9990	0.9524	47.32	52.98

3.4.8 Fowlsheugh Special Protection Area

3.4.8.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Fowlsheugh SPA are presented in this section.

Kittiwake

Table 3.28: Population viability analysis outputs for kittiwake at the Fowlsheugh Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	29,605	1.31	1.0131	0.8086	1.1655	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	31,491	8.23	1.0023	0.9811	1.0231	-	-	-	-
	Collision SNCB	104.6	26,958	-7.15	0.9979	0.9767	1.0186	0.9956	0.8567	36.16	62.78
	Collision Applicant	48.5	29,391	0.60	1.0002	0.9791	1.0211	0.9980	0.9310	43.70	55.88
	Displacement SNCB_lower	24.4	30,375	4.49	1.0013	0.9800	1.0220	0.9990	0.9643	46.72	53.02
	Displacement SNCB_upper	73.2	28,390	-2.94	0.9991	0.9778	1.0199	0.9969	0.8970	40.60	58.54
	Displacement Applicant	35.0	29,982	2.92	1.0008	0.9795	1.0216	0.9985	0.9494	45.66	54.20
	Collision and Displacement SNCB_lower	128.9	26,075	-10.45	0.9969	0.9755	1.0176	0.9946	0.8259	33.14	65.72
	Collision and Displacement SNCB_upper	177.7	24,235	-16.81	0.9948	0.9734	1.0156	0.9925	0.7686	27.68	70.40
	Collision and Displacement Applicant	83.5	27,876	-4.39	0.9987	0.9774	1.0194	0.9965	0.8830	39.14	60.26
50 (2087)	Baseline (unimpacted)	-	32,884	13.31	1.0025	0.9845	1.0197	-	-	-	-
	Collision SNCB	104.6	26,416	-9.33	0.9980	0.9801	1.0153	0.9956	0.8014	33.18	66.08
	Collision Applicant	48.5	29,777	2.24	1.0004	0.9824	1.0178	0.9980	0.9030	41.92	57.22
	Displacement SNCB_lower	24.4	31,318	7.71	1.0015	0.9833	1.0187	0.9990	0.9495	45.72	53.70
	Displacement SNCB_upper	73.2	28,170	-2.95	0.9994	0.9813	1.0167	0.9969	0.8565	37.84	61.22

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
	Displacement Applicant	35.0	30,587	5.39	1.0011	0.9829	1.0183	0.9985	0.9282	43.82	55.04
	Collision and Displacement SNCB_lower	128.9	25,052	-13.77	0.9970	0.9790	1.0143	0.9946	0.7609	29.74	69.80
	Collision and Displacement SNCB_upper	177.7	22,606	-22.31	0.9950	0.9768	1.0122	0.9925	0.6863	23.14	76.28
	Collision and Displacement Applicant	83.5	27,575	-5.17	0.9989	0.9808	1.0162	0.9965	0.8379	36.18	62.78

Guillemot

Table 3.29: Population viability analysis outputs for guillemot at the Fowlsheugh Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	152,451	2.64	1.0264	0.9503	1.0940	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	354,894	138.83	1.0252	1.0165	1.0332	-	-	-	-
	Displacement SNCB_lower	724.1	262,096	76.38	1.0163	1.0077	1.0243	0.9914	0.7382	4.74	96.30
	Displacement SNCB_upper	1,474.6	191,043	28.37	1.0072	0.9985	1.0151	0.9824	0.5375	0.00	99.96
	Displacement Applicant	310.7	311,937	109.83	1.0214	1.0127	1.0294	0.9963	0.8781	24.22	76.70
50 (2087)	Baseline (unimpacted)	-	514,616	248.00	1.0253	1.0182	1.0318	-	-	-	-
	Displacement SNCB_lower	724.1	332,763	125.36	1.0164	1.0093	1.0229	0.9914	0.6478	1.40	98.88
	Displacement SNCB_upper	1,474.6	211,470	43.31	1.0072	1.0001	1.0138	0.9824	0.4113	0.00	100.00
	Displacement Applicant	310.7	426,878	189.05	1.0215	1.0143	1.0280	0.9963	0.8303	17.28	82.38

Razorbill

Table 3.30: Population viability analysis outputs for Razorbill at the Fowlsheugh Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	13,147	-1.55	0.9845	0.8037	1.1338	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	5,706	-57.00	0.9762	0.9544	0.9960	-	-	-	-
	Displacement SNCB_lower	104.5	4,638	-65.11	0.9704	0.9488	0.9902	0.9941	0.8137	32.86	67.60
	Displacement SNCB_upper	192.0	3,895	-70.67	0.9656	0.9440	0.9855	0.9892	0.6854	21.18	79.74
	Displacement Applicant	36.5	5,319	-59.95	0.9742	0.9524	0.9939	0.9979	0.9308	44.38	56.44
50 (2087)	Baseline (unimpacted)	-	3,988	-70.35	0.9760	0.9577	0.9926	-	-	-	-
	Displacement SNCB_lower	104.5	2,963	-77.94	0.9702	0.9520	0.9867	0.9941	0.7444	29.78	71.96
	Displacement SNCB_upper	192.0	2,314	-82.66	0.9656	0.9471	0.9820	0.9892	0.5815	16.46	85.34
	Displacement Applicant	36.5	3,588	-73.23	0.9740	0.9555	0.9905	0.9979	0.9021	42.30	57.64

3.4.9 Hermaness, Saxa Vord and Valla Field Special Protection Area

3.4.9.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Hermaness, Saxa Vord and Valla Field SPA are presented in this section.

Puffin

Table 3.31: Population viability analysis outputs for puffin at the Hermaness, Saxa Vord and Valla Field Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	17,130	-0.70	0.9930	0.7587	1.1016	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	6,438	-62.77	0.9722	0.9468	0.9944	-	-	-	-
	Displacement SNCB_lower	8.5	6,359	-63.27	0.9718	0.9463	0.9943	0.9996	0.9883	49.36	50.86
	Displacement SNCB_upper	25.5	6,205	-64.14	0.9711	0.9455	0.9933	0.9990	0.9644	47.82	52.38
	Displacement Applicant	7.1	6,335	-63.16	0.9719	0.9464	0.9941	0.9997	0.9895	49.12	51.20
50 (2087)	Baseline (unimpacted)	-	4,205	-75.70	0.9721	0.9504	0.9910	-	-	-	-
	Displacement SNCB_lower	8.5	4,133	-76.08	0.9718	0.9501	0.9908	0.9996	0.9825	49.06	51.06
	Displacement SNCB_upper	25.5	3,981	-76.93	0.9711	0.9492	0.9899	0.9989	0.9488	46.62	53.16
	Displacement Applicant	7.1	4,133	-76.06	0.9718	0.9501	0.9906	0.9997	0.9854	49.06	50.90

Gannet

Table 3.32: Population viability analysis outputs for Gannet at the Hermaness, Saxa Vord and Valla Field Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	72,531	1.88	1.0188	0.9124	1.0842	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	109,323	53.17	1.0123	1.0010	1.0228	-	-	-	-
	Displacement SNCB_lower	23.8	107,556	50.67	1.0118	1.0005	1.0224	0.9995	0.9837	47.48	52.38
	Displacement SNCB_upper	71.4	103,937	45.74	1.0108	0.9994	1.0214	0.9986	0.9516	41.88	58.04
	Displacement Applicant	24.0	107,470	50.57	1.0118	1.0005	1.0223	0.9995	0.9834	47.30	52.10
	Collision and Displacement SNCB_lower	47.9	105,815	48.17	1.0113	0.9999	1.0217	0.9990	0.9673	44.94	55.50
	Collision and Displacement SNCB_upper	95.5	102,324	43.19	1.0103	0.9990	1.0209	0.9981	0.9354	38.92	61.24
	Collision and Displacement Applicant	43.5	105,920	48.44	1.0114	1.0001	1.0219	0.9991	0.9700	45.00	54.60
50 (2087)	Baseline (unimpacted)	-	131,405	84.62	1.0123	1.0029	1.0210	-	-	-	-
	Displacement SNCB_lower	23.8	128,532	80.16	1.0118	1.0023	1.0205	0.9995	0.9765	46.58	53.68

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
	Displacement SNCB_upper	71.4	122,468	71.56	1.0109	1.0015	1.0196	0.9986	0.9313	39.20	60.90
	Displacement Applicant	24.0	128,340	80.09	1.0118	1.0024	1.0206	0.9995	0.9764	46.46	53.84
	Collision and Displacement SNCB_lower	47.9	125,470	75.98	1.0114	1.0019	1.0200	0.9990	0.9535	42.94	57.18
	Collision and Displacement SNCB_upper	95.5	119,490	67.80	1.0104	1.0010	1.0190	0.9981	0.9089	35.96	64.30
	Collision and Displacement Applicant	43.5	125,893	76.64	1.0114	1.0019	1.0202	0.9991	0.9573	43.54	56.38

3.4.10 St Abb`s Head to Fast Castle Special Protection Area

3.4.10.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the St Abb`s Head to Fast Castle SPA are presented in this section.

Kittiwake

Table 3.33: Population viability analysis outputs for kittiwake at the St Abb`s Head to Fast Castle Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	10,717	1.07	1.0107	0.8123	1.1716	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	11,660	9.61	1.0026	0.9810	1.0233	-	-	-	-
	Collision SNCB	117.2	7,236	-31.90	0.9891	0.9671	1.0098	0.9865	0.6217	14.70	86.00
	Collision Applicant	57.8	9,285	-12.90	0.9961	0.9743	1.0165	0.9934	0.7922	30.58	69.48
	Collision and Displacement SNCB_lower	134.3	6,766	-36.35	0.9872	0.9656	1.0077	0.9846	0.5801	11.76	88.62
	Collision and Displacement SNCB_upper	168.3	5,879	-44.61	0.9833	0.9614	1.0040	0.9806	0.5043	6.80	93.88
	Collision and Displacement Applicant	90.5	8,092	-23.87	0.9922	0.9704	1.0127	0.9896	0.6939	21.12	79.42
50 (2087)	Baseline (unimpacted)	-	12,028	13.72	1.0026	0.9842	1.0196	-	-	-	-
	Collision SNCB	117.2	6,107	-42.38	0.9890	0.9707	1.0061	0.9865	0.5070	9.06	91.28
	Collision Applicant	57.8	8,597	-18.65	0.9959	0.9777	1.0131	0.9934	0.7165	24.86	74.78
	Collision and Displacement SNCB_lower	134.3	5,548	-47.95	0.9870	0.9688	1.0044	0.9846	0.4595	6.50	93.88
	Collision and Displacement SNCB_upper	168.3	4,534	-57.38	0.9831	0.9649	1.0003	0.9807	0.3764	2.86	97.48
	Collision and Displacement Applicant	90.5	7,147	-32.62	0.9921	0.9737	1.0092	0.9896	0.5929	14.66	85.16

Guillemot

Table 3.34: Population viability analysis outputs for guillemot at the St Abb`s Head to Fast Castle Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	100,050	2.62	1.0262	0.9510	1.0938	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	232,797	138.92	1.0252	1.0165	1.0332	-	-	-	-
	Displacement SNCB_lower	498.1	169,649	73.71	1.0159	1.0073	1.0239	0.9910	0.7276	4.16	96.90
	Displacement SNCB_upper	1,040.3	119,442	22.48	1.0058	0.9971	1.0138	0.9811	0.5129	0.00	99.98
	Displacement Applicant	225.9	201,804	106.97	1.0210	1.0123	1.0290	0.9959	0.8660	21.54	79.20
50 (2087)	Baseline (unimpacted)	-	337,728	248.31	1.0253	1.0182	1.0318	-	-	-	-
	Displacement SNCB_lower	498.1	214,360	120.62	1.0160	1.0089	1.0225	0.9909	0.6343	1.28	99.24
	Displacement SNCB_upper	1,040.3	129,724	33.78	1.0058	0.9988	1.0124	0.9811	0.3846	0.00	100.00
	Displacement Applicant	225.9	274,744	183.13	1.0210	1.0140	1.0276	0.9959	0.8139	15.08	84.74

Razorbill

Table 3.35: Population viability analysis outputs for Razorbill at the St Abb`s Head to Fast Castle Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	2,739	-1.60	0.9840	0.8054	1.1323	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	1,188	-57.14	0.9761	0.9540	0.9959	-	-	-	-
	Displacement SNCB_lower	23.2	956	-65.50	0.9701	0.9480	0.9900	0.9938	0.8017	31.86	68.88
	Displacement SNCB_upper	44.9	778	-71.96	0.9643	0.9423	0.9841	0.9879	0.6536	18.64	81.98
	Displacement Applicant	9.0	1,094	-60.62	0.9737	0.9517	0.9936	0.9976	0.9187	43.18	57.10
50 (2087)	Baseline (unimpacted)	-	834	-70.25	0.9760	0.9572	0.9927	-	-	-	-
	Displacement SNCB_lower	23.2	607	-78.36	0.9699	0.9515	0.9864	0.9938	0.7308	28.78	73.44
	Displacement SNCB_upper	44.9	454	-83.86	0.9642	0.9455	0.9809	0.9879	0.5446	14.16	88.06
	Displacement Applicant	9.0	738	-73.72	0.9736	0.9549	0.9903	0.9976	0.8870	41.22	59.60

3.4.11 Troup, Pennan and Lion's Heads Special Protection Area

3.4.11.1 The PVA outputs for impacts from Morven South in-combination with other plans and projects (Scenario 4) on relevant qualifying features of the Troup, Pennan and Lion's Heads SPA are presented in this section.

Kittiwake

Table 3.36: Population viability analysis outputs for kittiwake at the Troup, Pennan and Lion's Heads Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	22,251	0.99	1.0099	0.8081	1.1682	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	24,166	8.75	1.0024	0.9809	1.0231	-	-	-	-
	Collision SNCB	71.7	21,008	-5.22	0.9985	0.9768	1.0189	0.9960	0.8690	37.84	62.36
	Collision Applicant	26.7	22,903	3.69	1.0010	0.9793	1.0214	0.9985	0.9496	45.16	54.90
	Collision and Displacement SNCB_lower	86.9	20,399	-8.15	0.9976	0.9759	1.0182	0.9952	0.8435	35.48	64.84
	Collision and Displacement SNCB_upper	117.3	19,211	-13.41	0.9959	0.9742	1.0165	0.9935	0.7943	30.68	69.18
	Collision and Displacement Applicant	43.7	22,216	0.22	1.0001	0.9783	1.0206	0.9976	0.9177	42.54	58.02
50 (2087)	Baseline (unimpacted)	-	25,042	12.93	1.0024	0.9845	1.0195	-	-	-	-
	Collision SNCB	71.7	20,438	-7.63	0.9984	0.9806	1.0158	0.9960	0.8182	34.72	65.28
	Collision Applicant	26.7	23,211	4.55	1.0009	0.9830	1.0181	0.9985	0.9281	44.22	55.90
	Collision and Displacement SNCB_lower	86.9	19,594	-11.54	0.9976	0.9795	1.0148	0.9952	0.7847	31.48	68.00

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
	Collision and Displacement SNCB_upper	117.3	18,013	-18.81	0.9958	0.9780	1.0132	0.9935	0.7203	25.82	74.12
	Collision and Displacement Applicant	43.7	22,145	-0.30	0.9999	0.9820	1.0173	0.9976	0.8848	40.42	59.34

Guillemot

Table 3.37: Population viability analysis outputs for Guillemot at the Troup, Pennan and Lion's Heads Special Protection Area for impacts associated with Morven South In-combination with Other Plans and Projects

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
1 (2038)	Baseline (unimpacted)	-	53,282	2.68	1.0268	0.9517	1.0938	-	-	-	-
35 (2072)	Baseline (unimpacted)	-	124,364	140.10	1.0253	1.0166	1.0335	-	-	-	-
	Displacement SNCB_lower	200.2	97,212	87.77	1.0182	1.0094	1.0263	0.9930	0.7821	8.64	91.82
	Displacement SNCB_upper	424.9	73,663	42.23	1.0101	1.0013	1.0182	0.9851	0.5922	0.26	99.86
	Displacement Applicant	93.6	110,776	114.06	1.0220	1.0132	1.0301	0.9967	0.8916	25.10	74.02

Impacted year (Year)	Impact scenario	Impact (no. of birds)	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	Quantile U=50 %I	Quantile I=50 %U
50 (2087)	Baseline (unimpacted)	-	179,907	248.04	1.0253	1.0180	1.0321	-	-	-	-
	Displacement SNCB_lower	200.2	126,591	144.81	1.0181	1.0108	1.0249	0.9930	0.7036	4.26	95.84
	Displacement SNCB_upper	424.9	84,926	64.40	1.0100	1.0028	1.0169	0.9851	0.4725	0.02	100.00
	Displacement Applicant	93.6	152,629	195.32	1.0219	1.0146	1.0287	0.9967	0.8485	20.40	78.90

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Appendix A Population Viability Analysis graphs

A.1 Morven South alone

A.1.1 Buchan Ness to Collieston Coast Special Protection Area

Guillemot

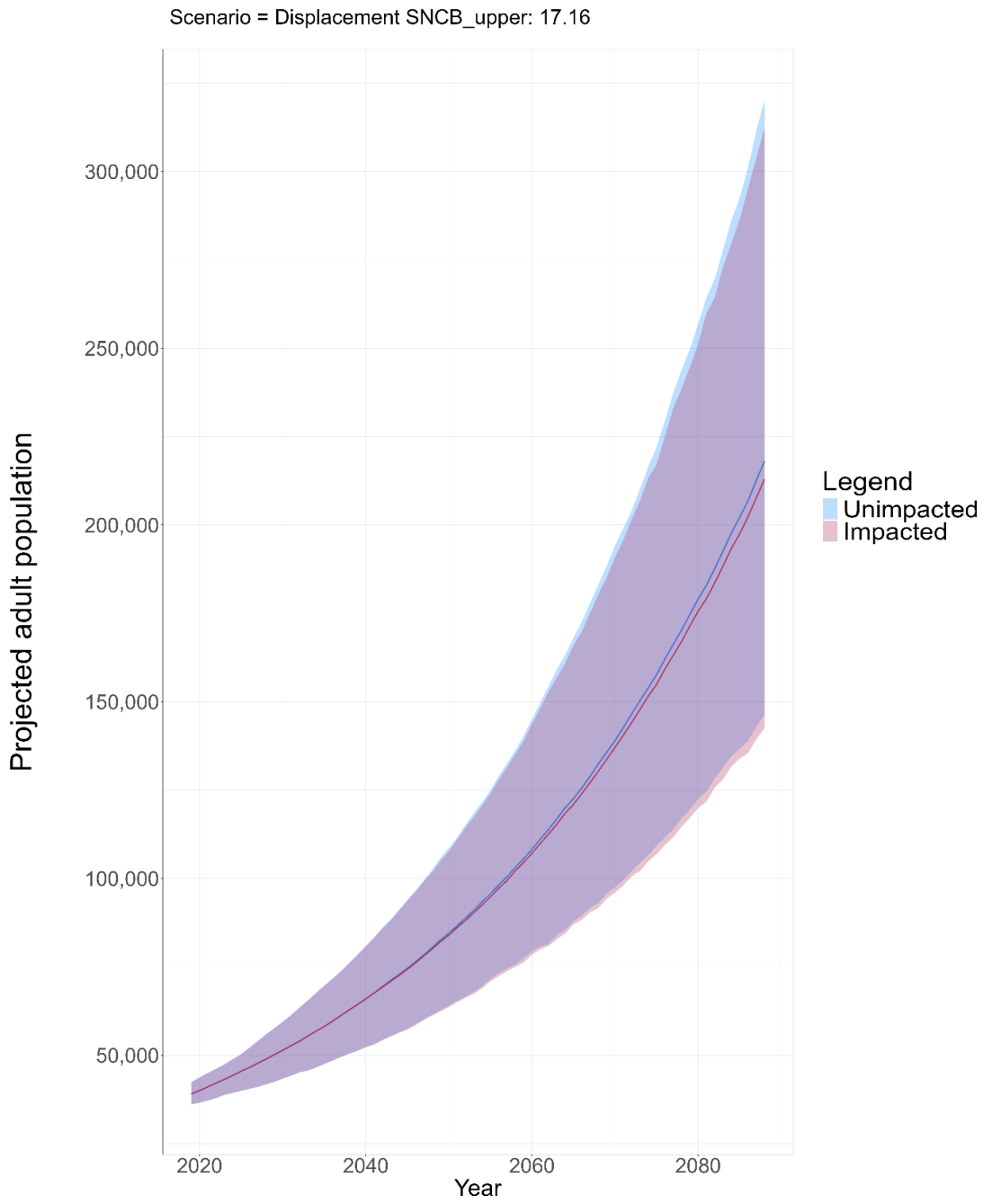

Figure A. 1: Guillemot population projection over 35 years at the Buchan Ness to Collieston Coast Special Protection Area from project alone impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

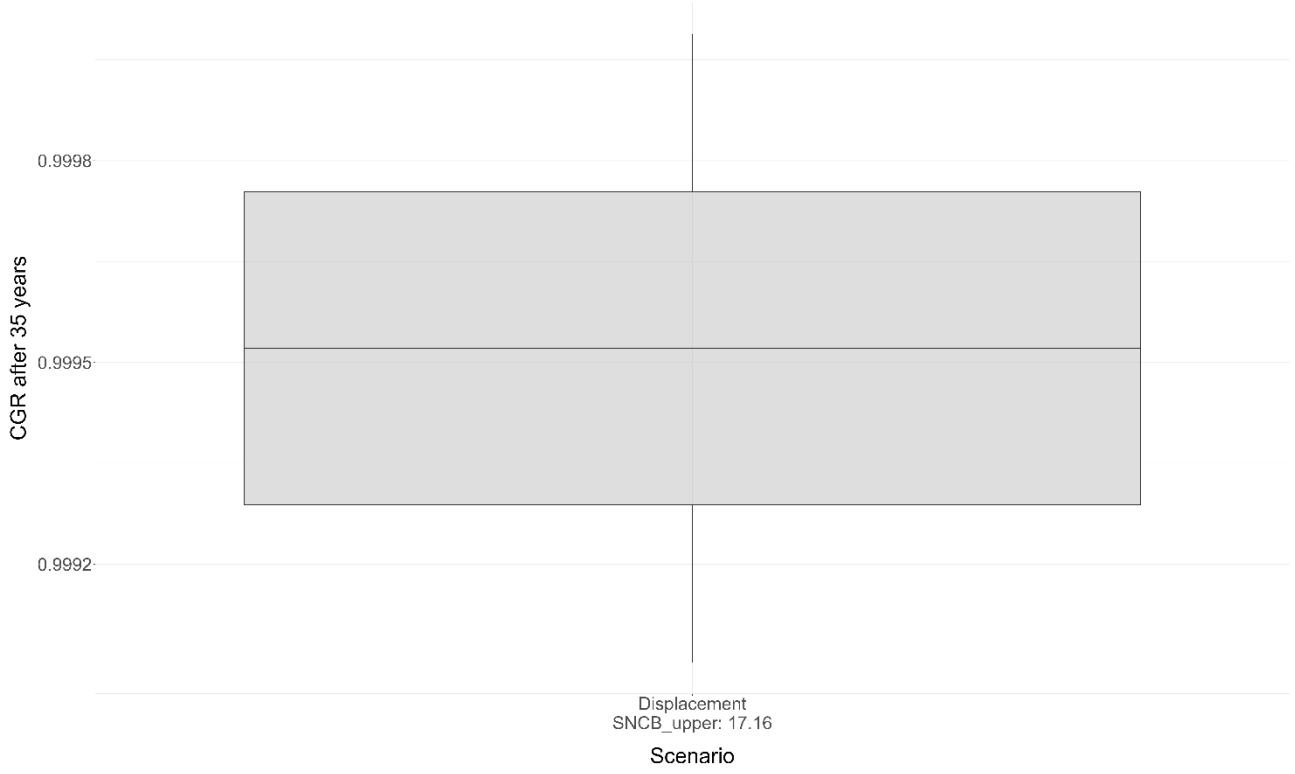

Figure A. 2: Counterfactual of Growth Rates after 35 years for the guillemot population at the Buchan Ness and Collison Coast Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

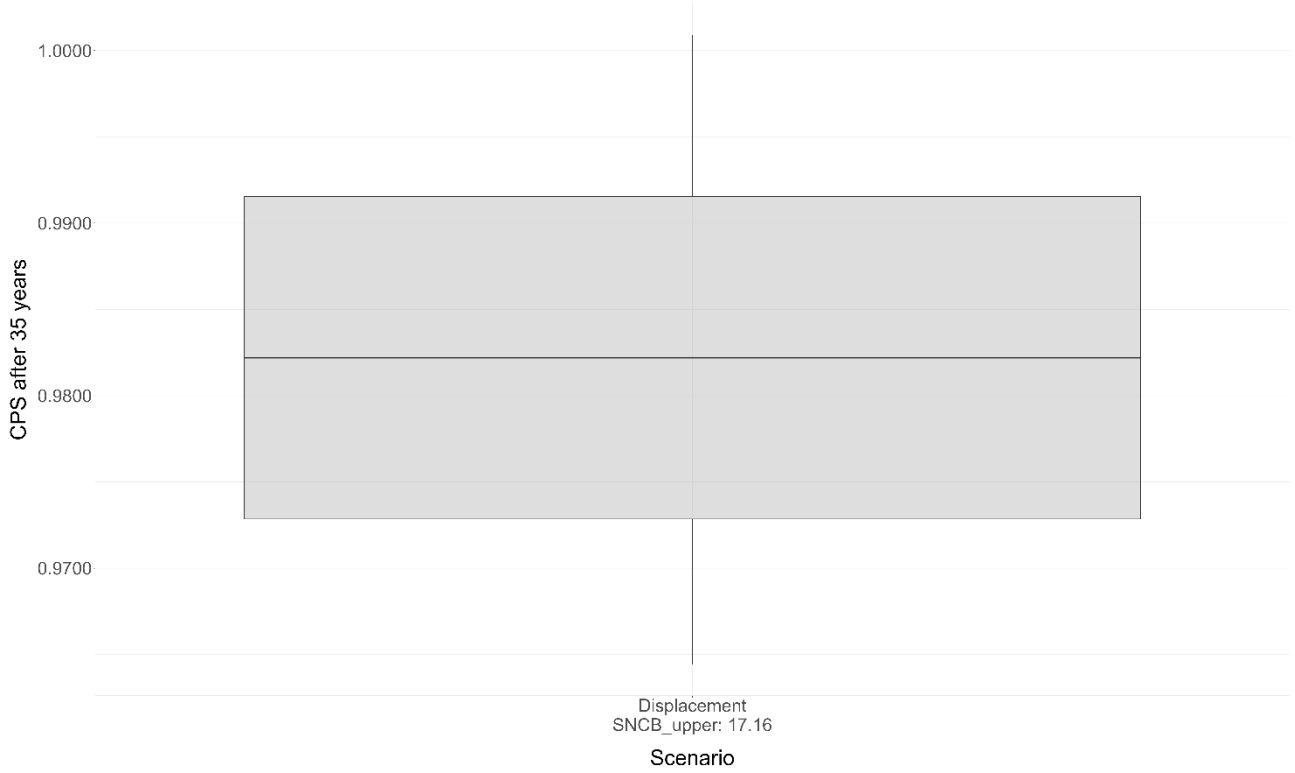

Figure A. 3: Counterfactual of Population Size after 35 years for the guillemot population at the Buchan Ness and Collison Coast Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.1.2 Forth Islands Special Protection Area

Guillemot

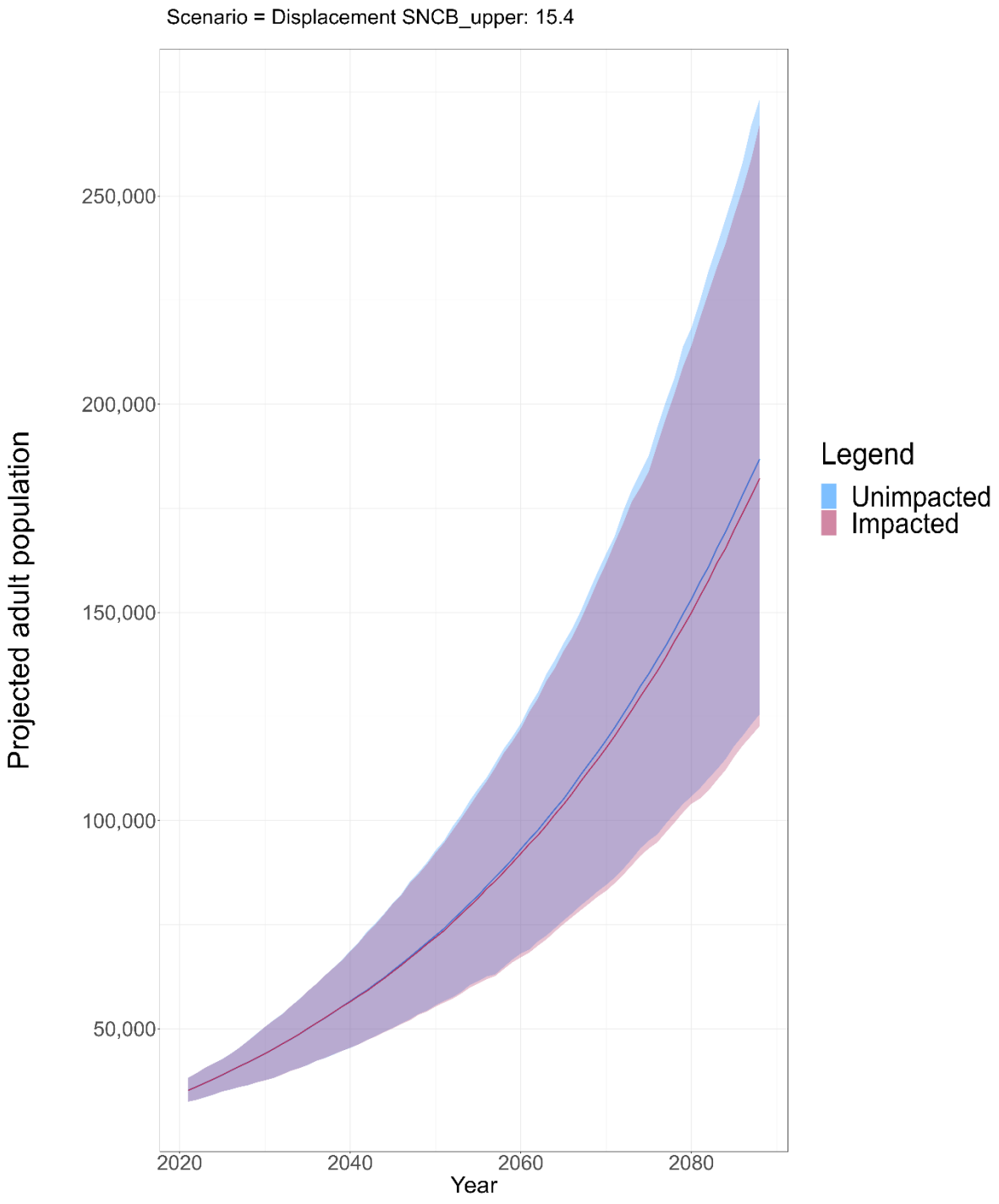

Figure A. 4: Guillemot population projection over 35 years at the Forth Islands Special Protection Area from project alone impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

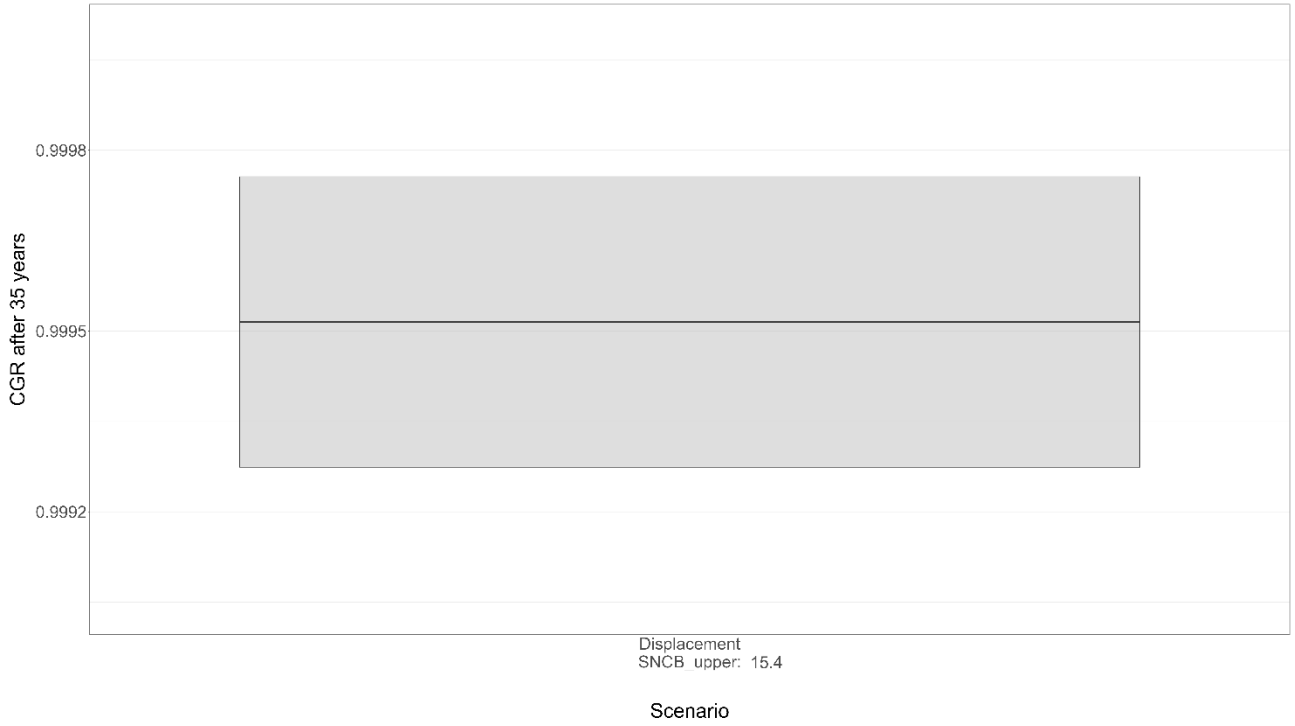

Figure A. 5: Counterfactual of Growth Rates after 35 years for the guillemot population at the Forth Islands Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

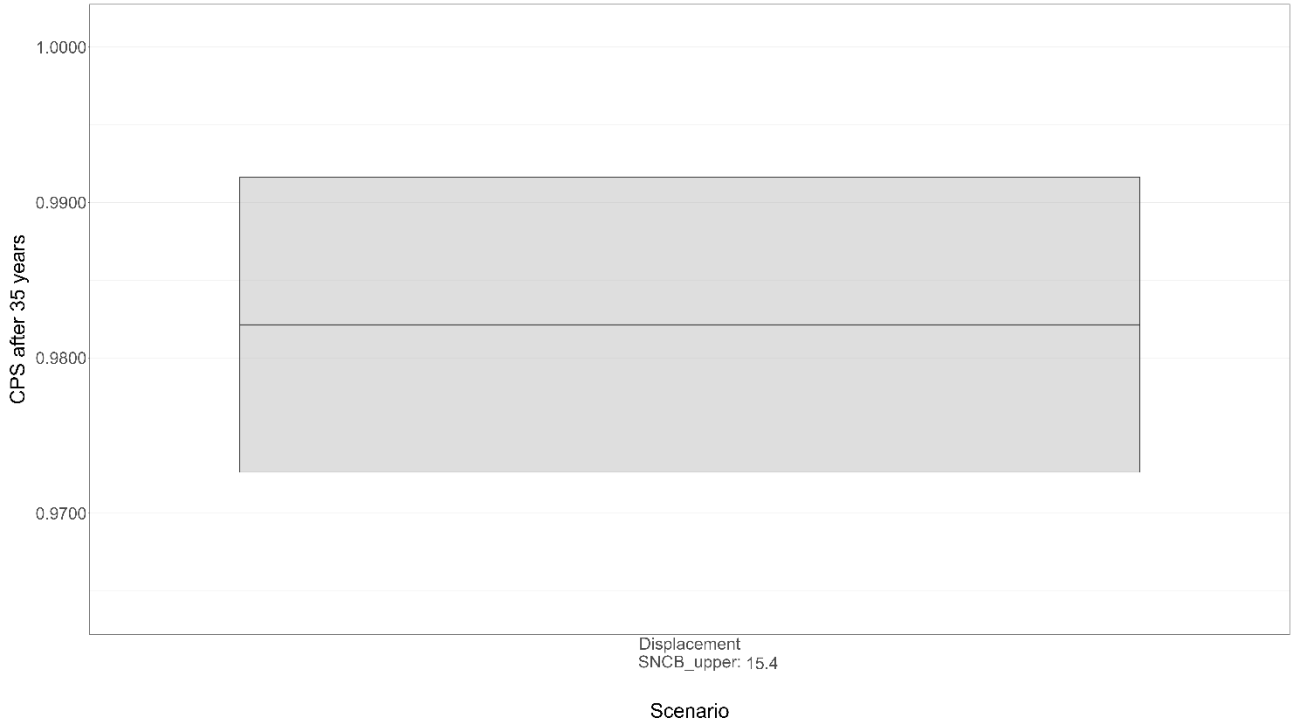

Figure A. 6: Counterfactual of Population Size after 35 years for the guillemot population at the Forth Islands Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.1.3 Fowlsheugh Special Protection Area

Guillemot

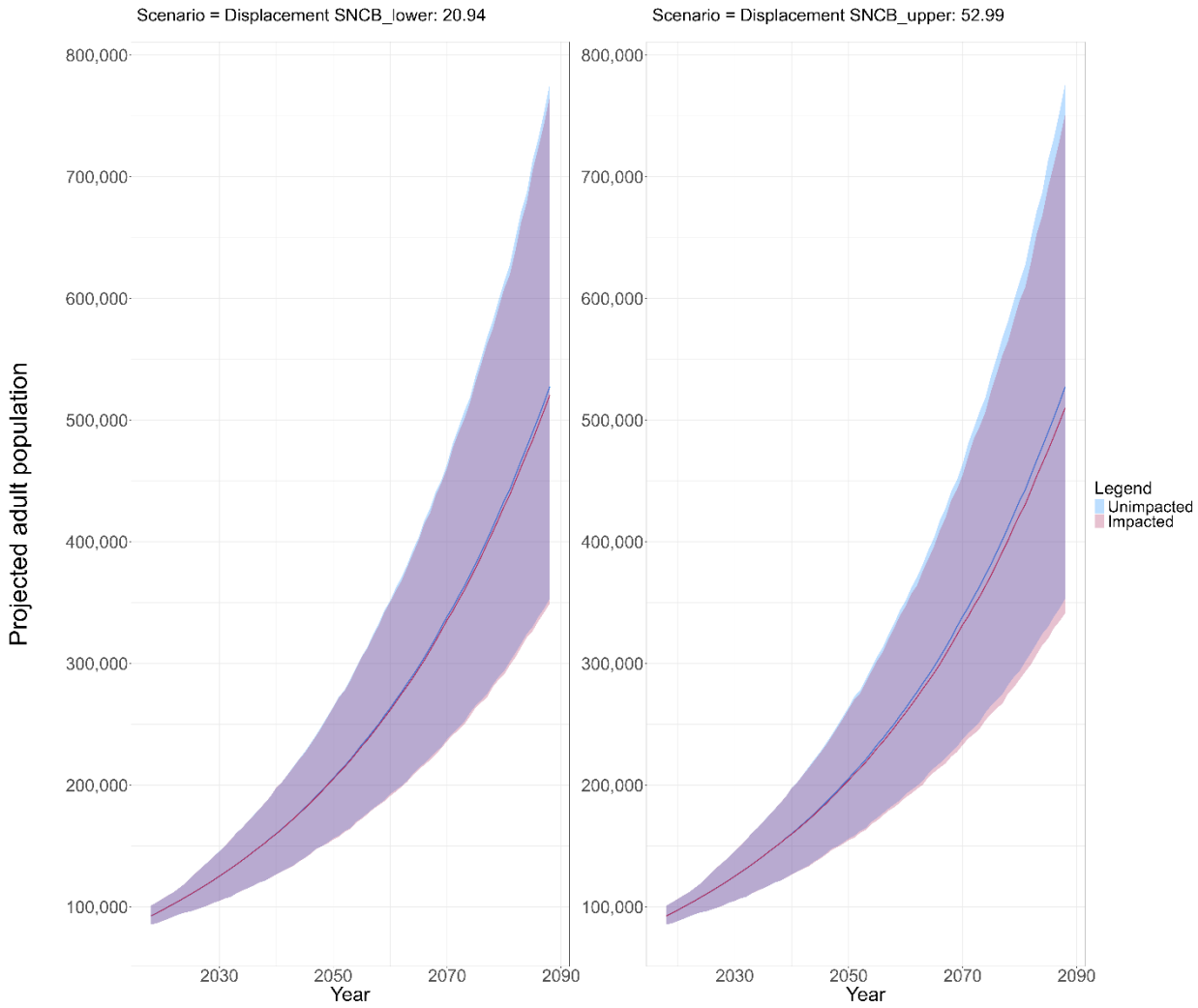

Figure A. 7: Guillemot population projection over 35 years at the Fowlsheugh Special Protection Area from project alone impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

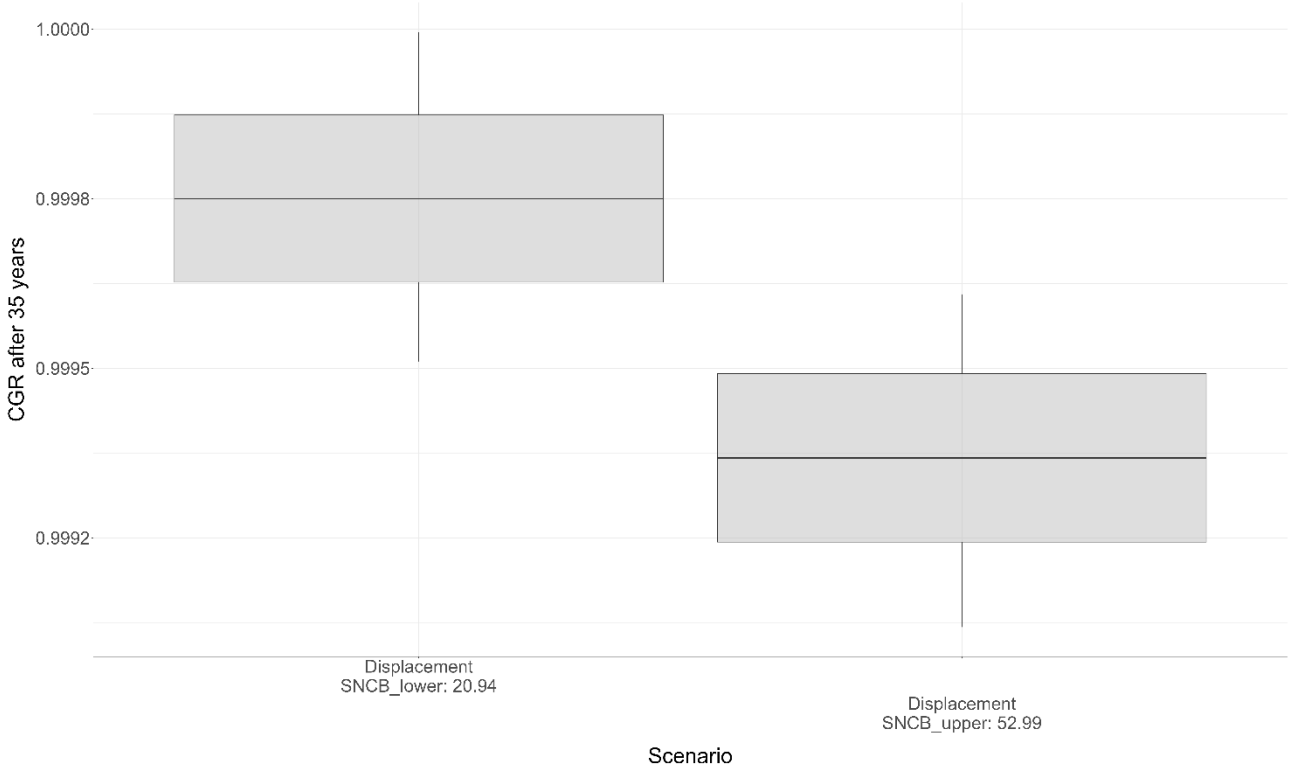

Figure A. 8: Counterfactual of Growth Rates after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

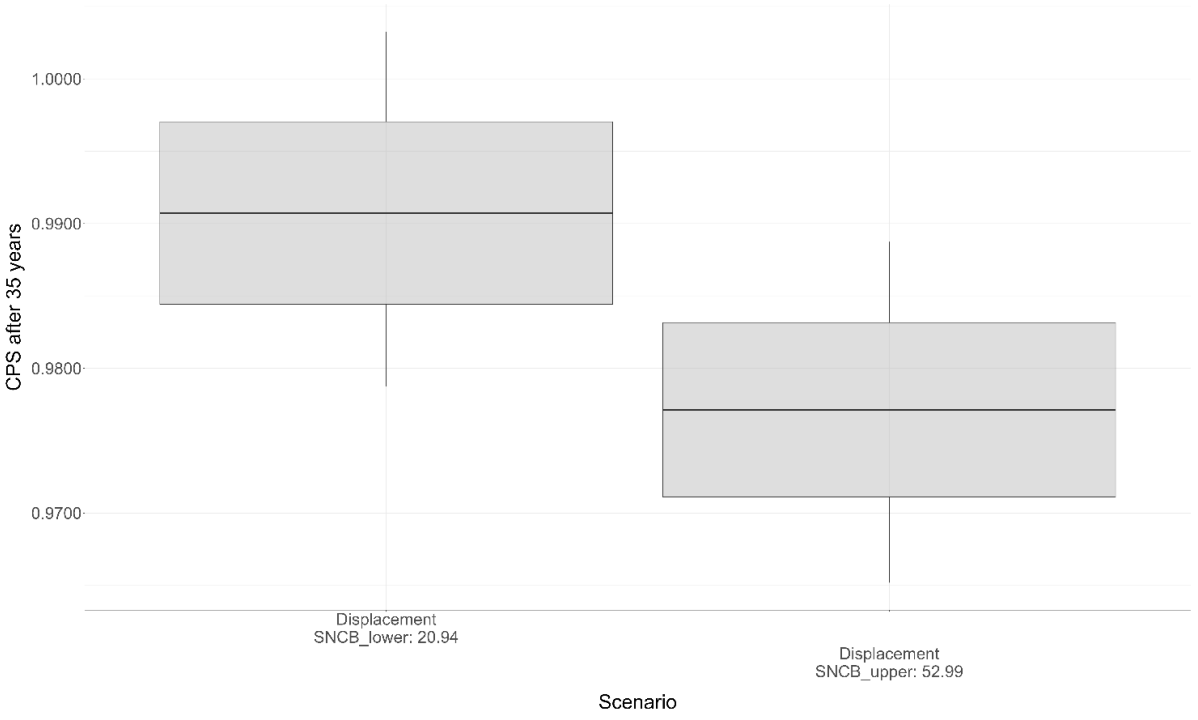

Figure A. 9: Counterfactual of Population Size after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.1.4 St Abb's Head to Fast Castle Special Protection Area

Guillemot

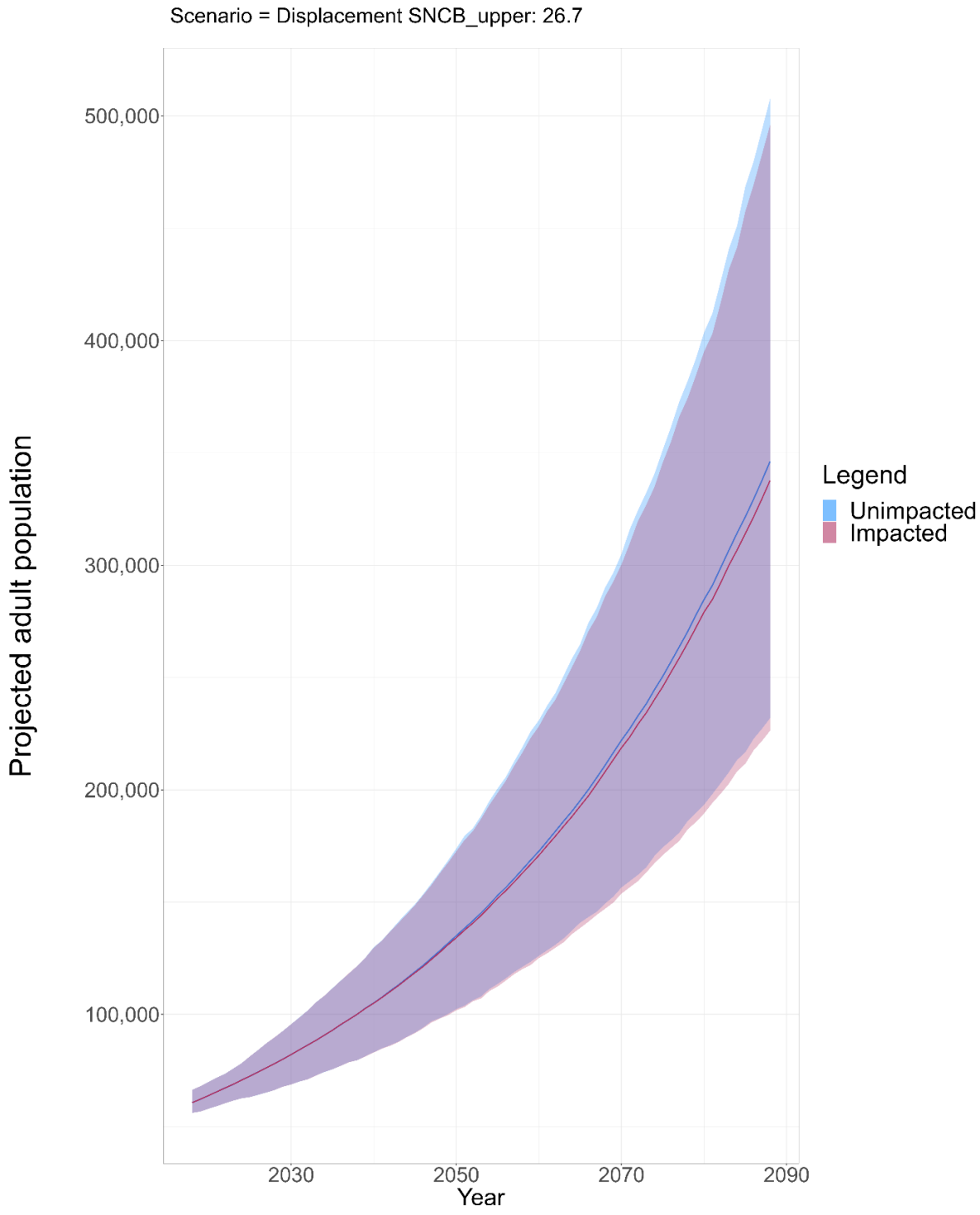

Figure A. 10: Guillemot population projection over 35 years at the St Abb's Head to Fast Castle Special Protection Area from project alone impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

Figure A. 11: Counterfactual of Growth Rates after 35 years for the guillemot population at the St Abb's Head to Fast Castle Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

Figure A. 12: Counterfactual of Population Size after 35 years for the guillemot population at the St Abb's Head to Fast Castle Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.1.5 Troup, Pennan and Lion's Head Special Protection Area

Guillemot

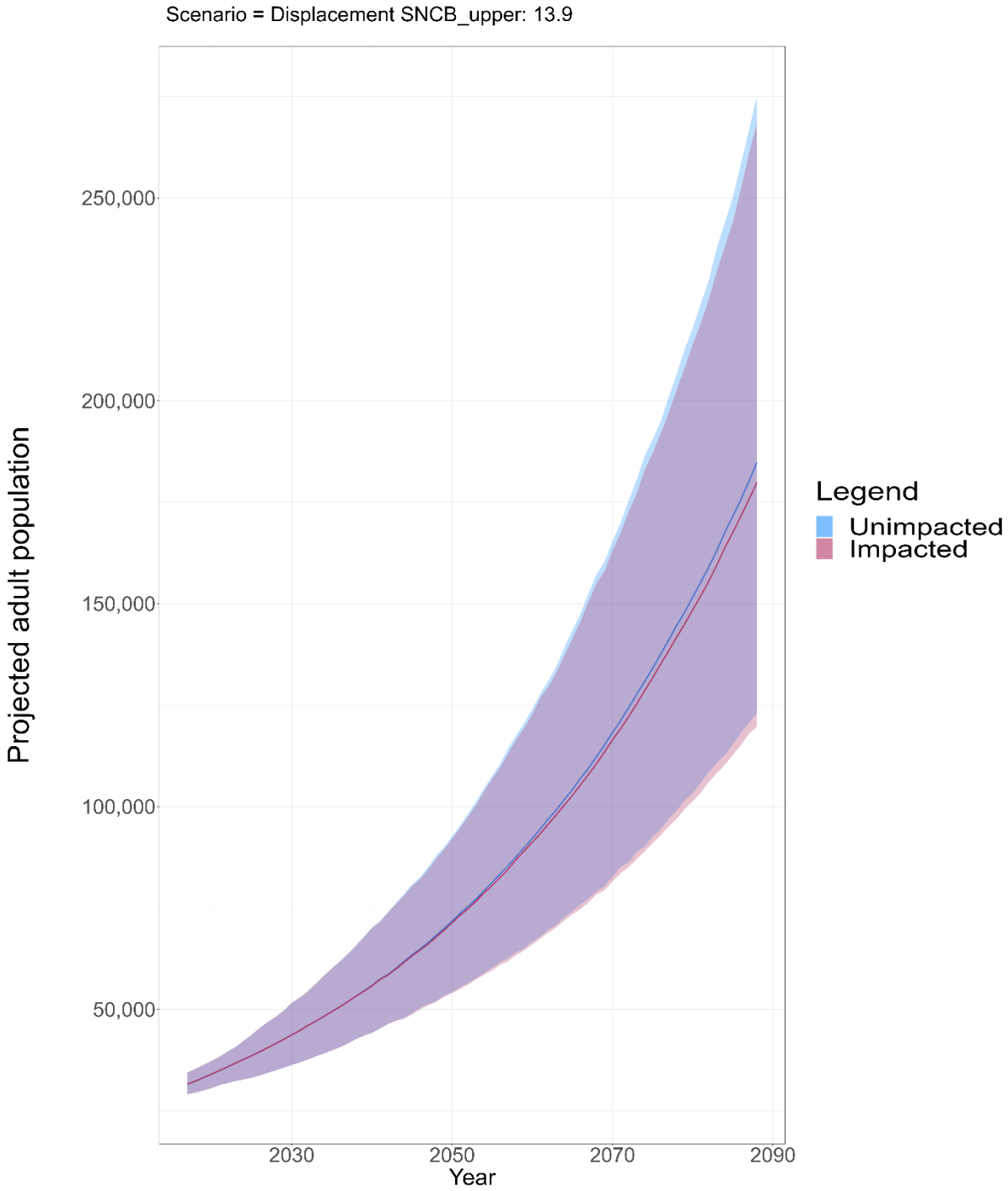

Figure A. 13: Guillemot population projection over 35 years at the Troup, Pennan and Lion's Head Special Protection Area from project alone impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

Figure A. 14: Counterfactual of Growth Rates after 35 years for the guillemot population at the Troup, Pennan and Lion's Head Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

Figure A. 15: Counterfactual of Population Size after 35 years for the guillemot population at the Troup, Pennan and Lion's Head Special Protection Area from project alone impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.2 Morven Programme assessment

A.2.1 Buchan Ness to Collieston Coast Special Protection Area

Guillemot

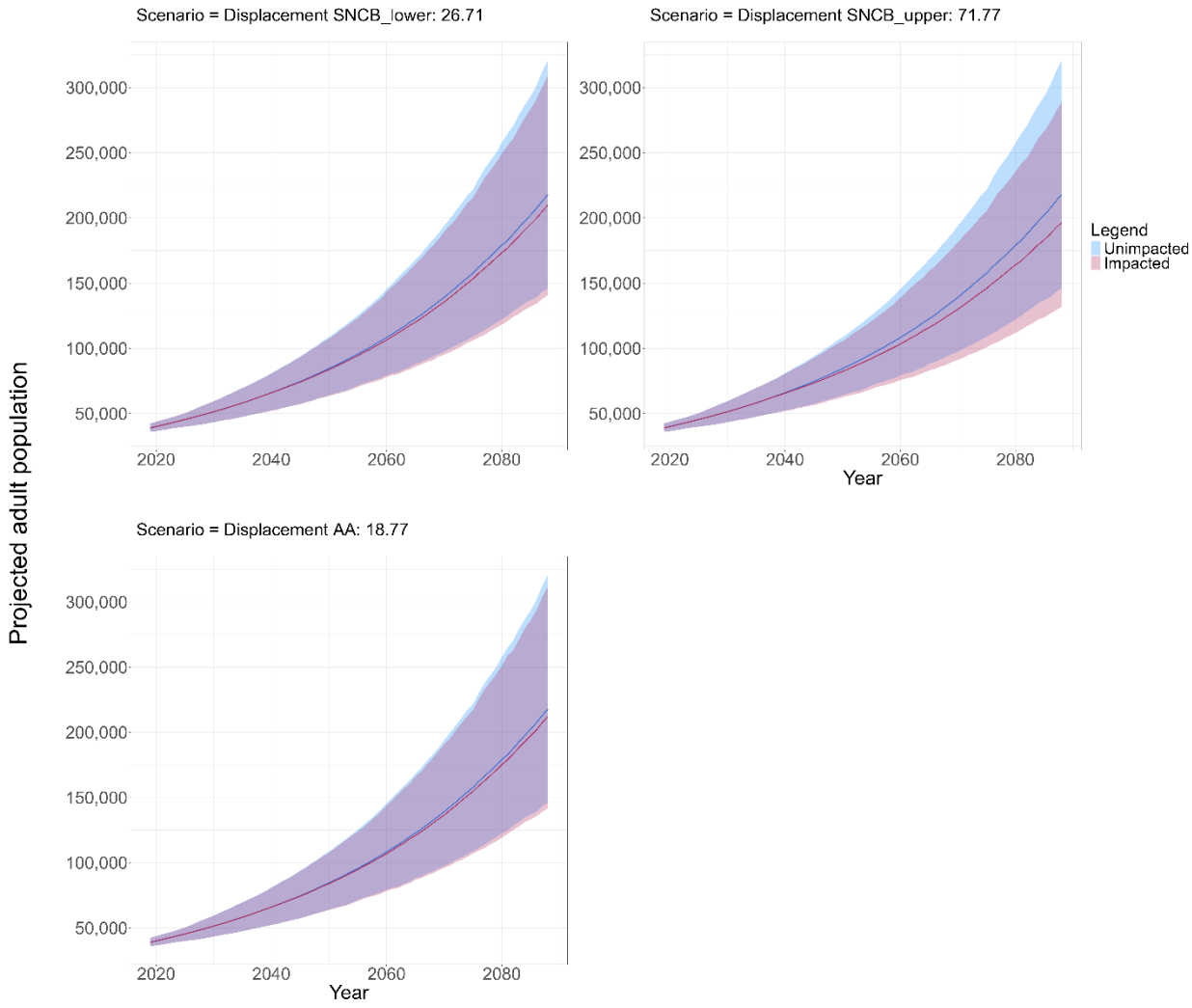

Figure A. 16: Guillemot population projection over 35 years at the Buchan Ness to Collieston Coast Special Protection Area from the Morven Programme impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

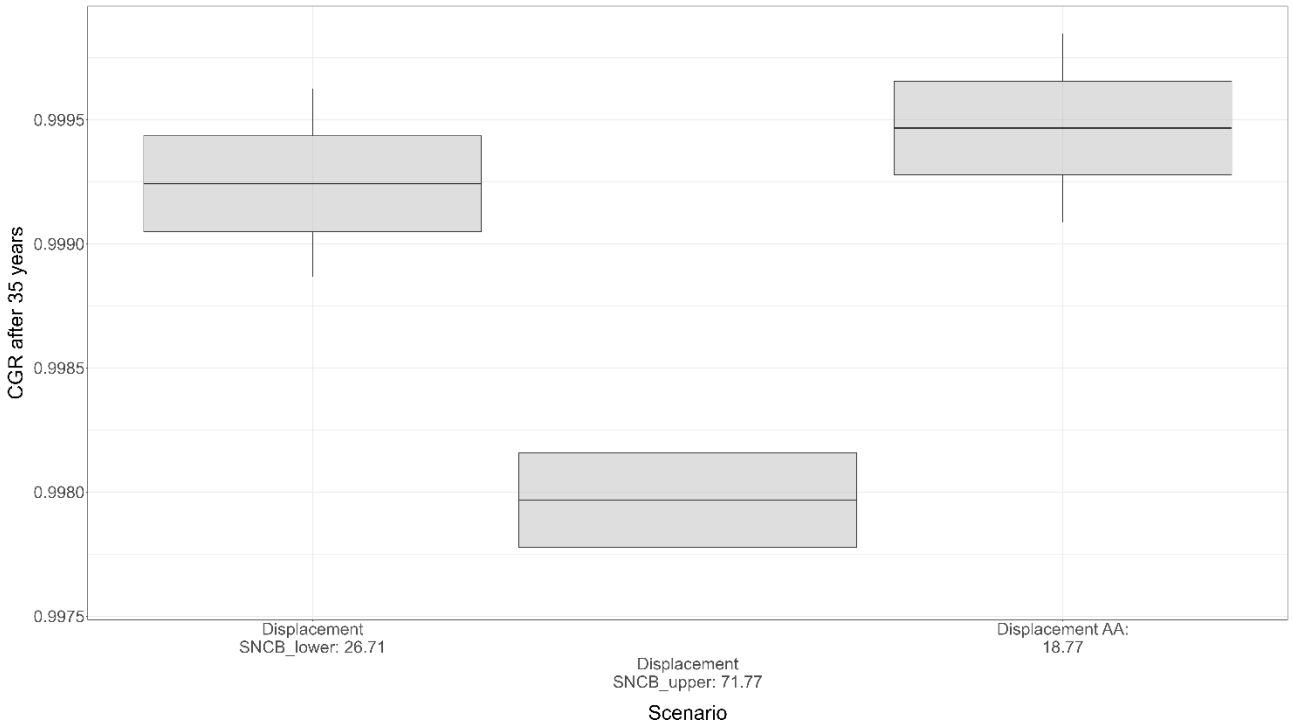

Figure A. 17: Counterfactual of Growth Rates after 35 years for the guillemot population at the Buchan Ness and Collison Coast Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

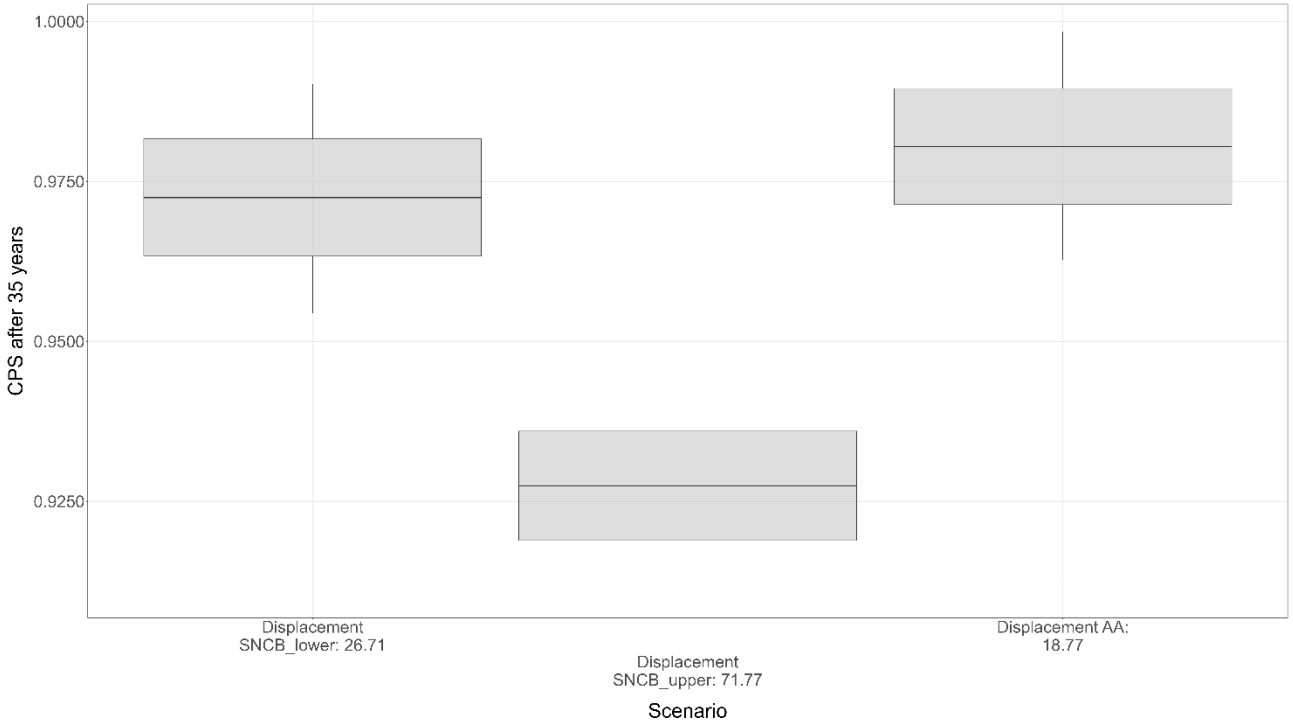

Figure A. 18: Counterfactual of Population Size after 35 years for the guillemot population at the Buchan Ness and Collison Coast Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.2.2 Forth Islands Special Protection Area

Guillemot

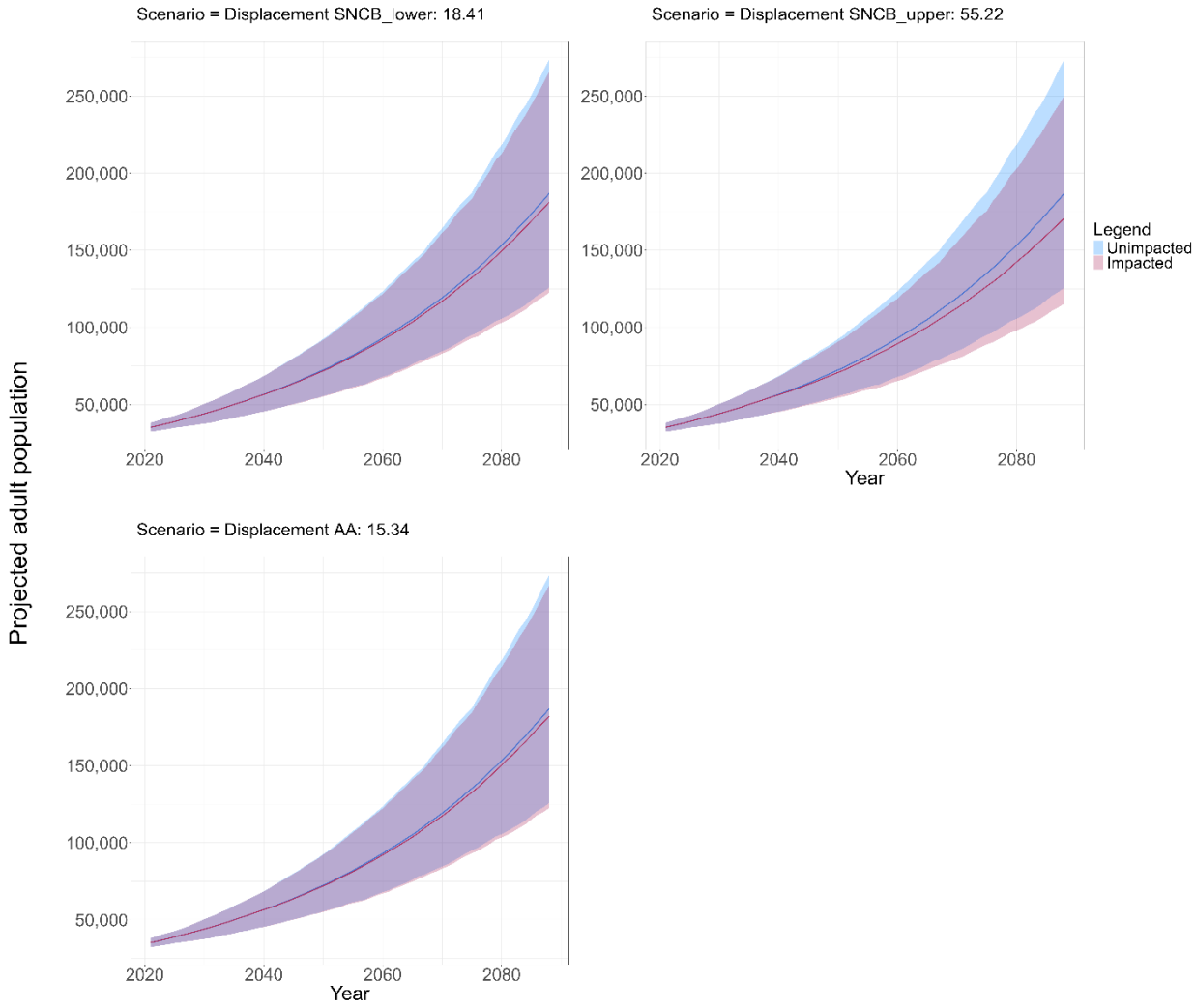

Figure A. 19: Guillemot population projection over 35 years at the Forth Islands Special Protection Area from the Morven Programme impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

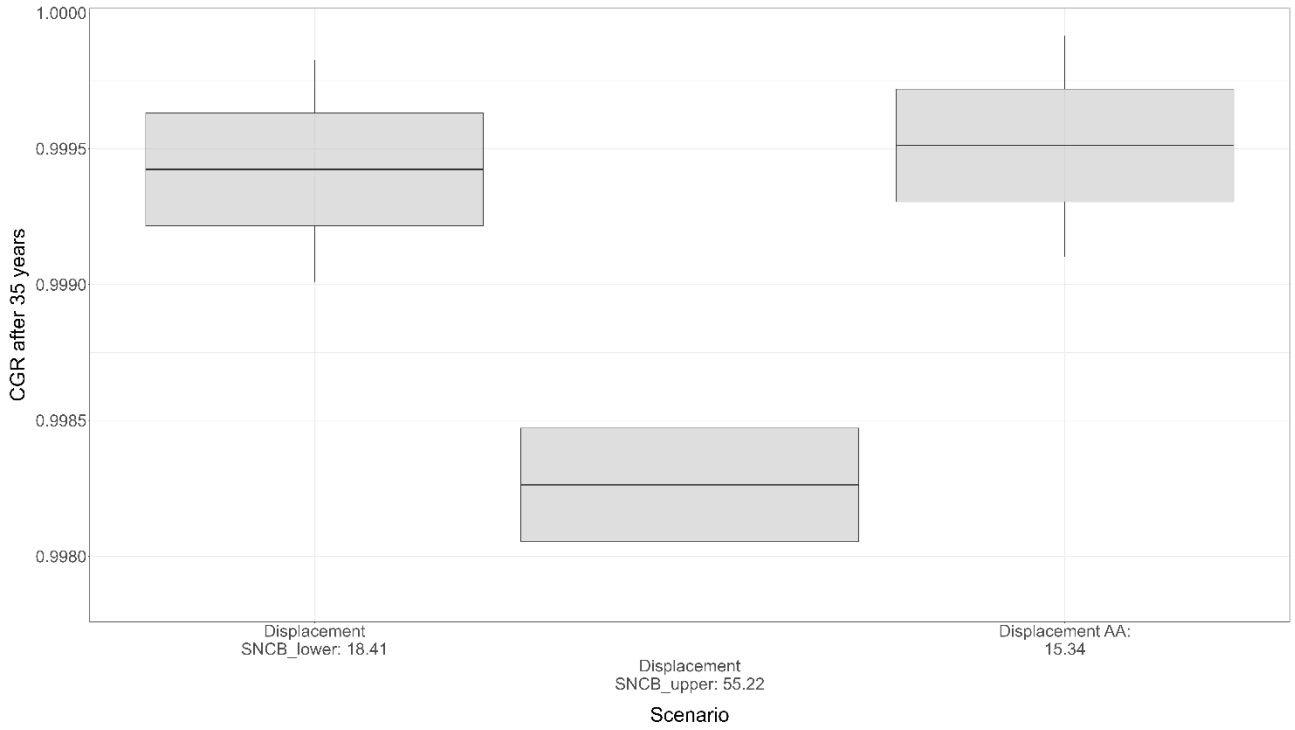

Figure A. 20: Counterfactual of Growth Rates after 35 years for the guillemot population at the Forth Islands Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

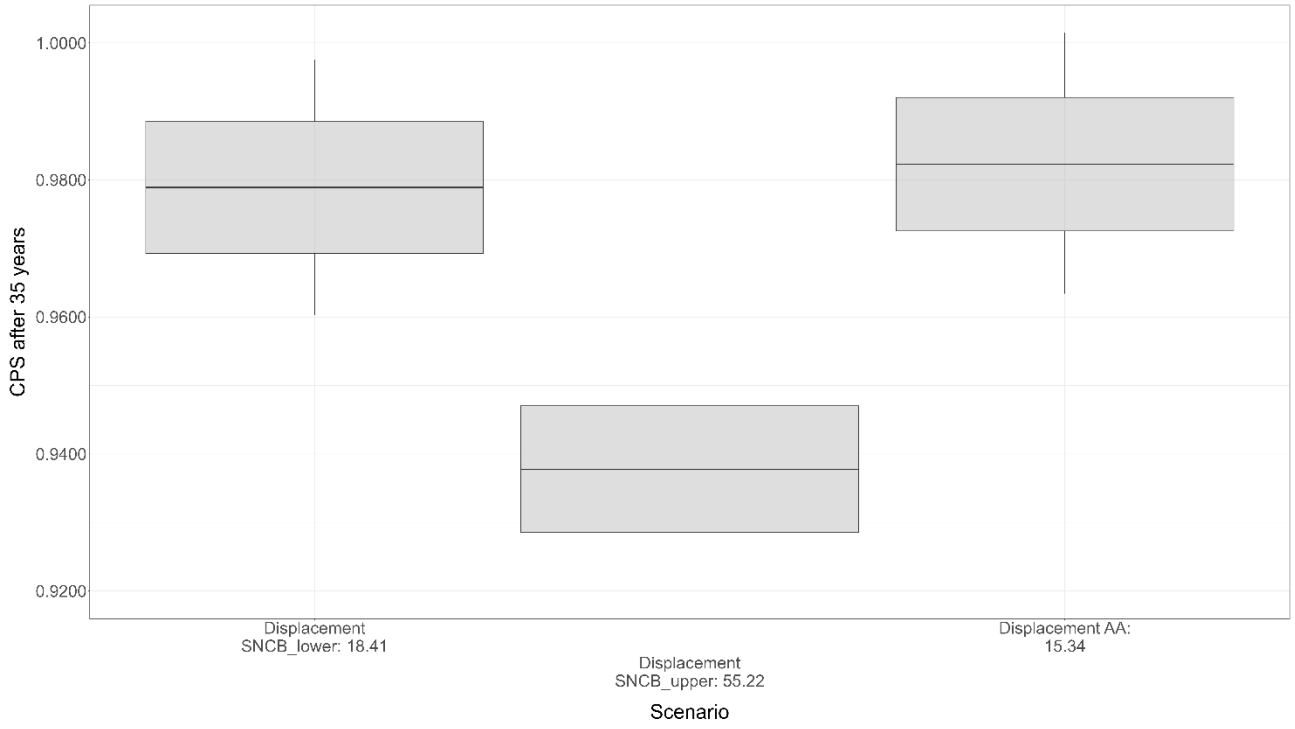

Figure A. 21: Counterfactual of Population Size after 35 years for the guillemot population at the Forth Islands Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

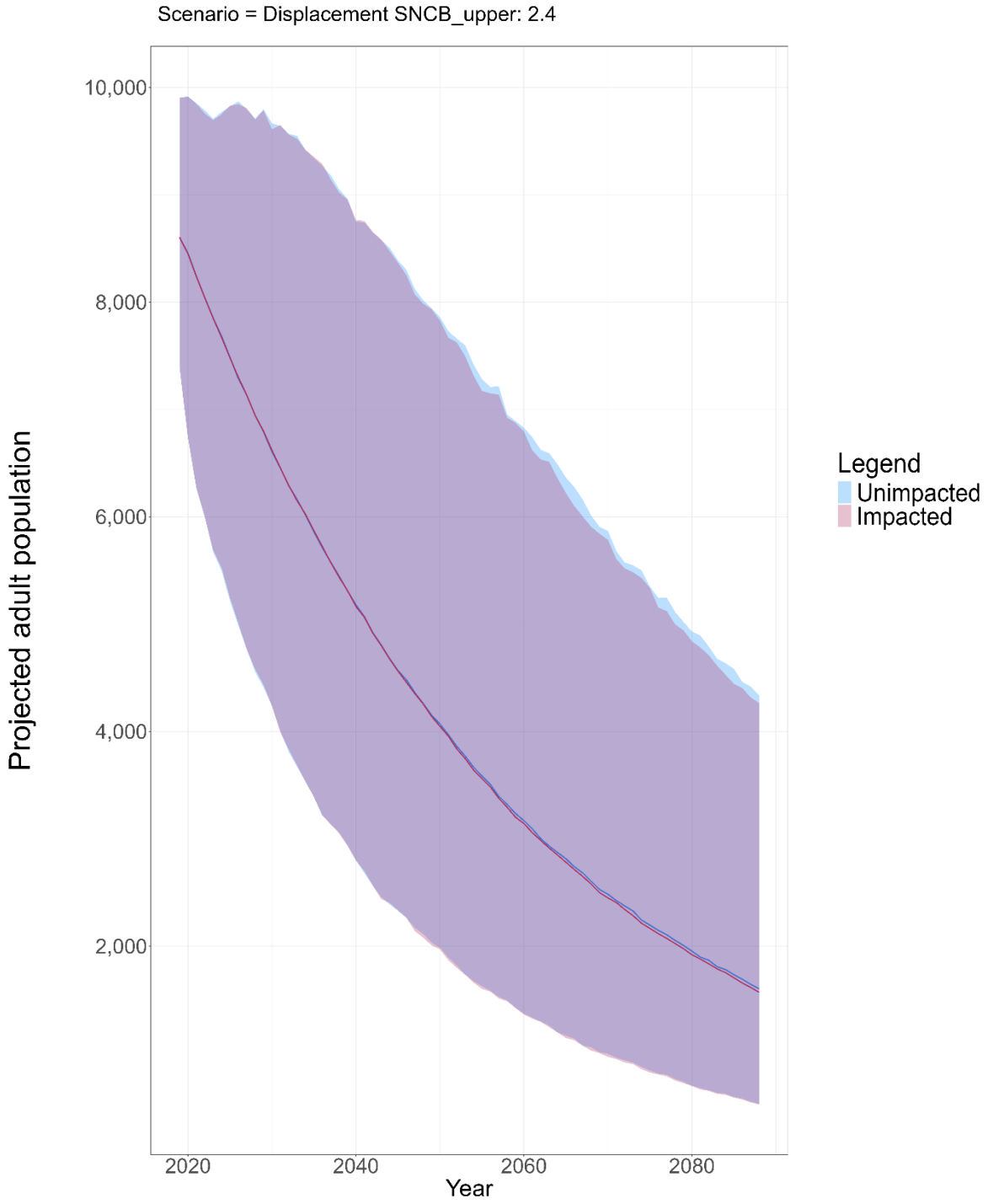

Figure A. 22: Razorbill population projection over 35 years at the Forth Islands Special Protection Area from the Morven Programme impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

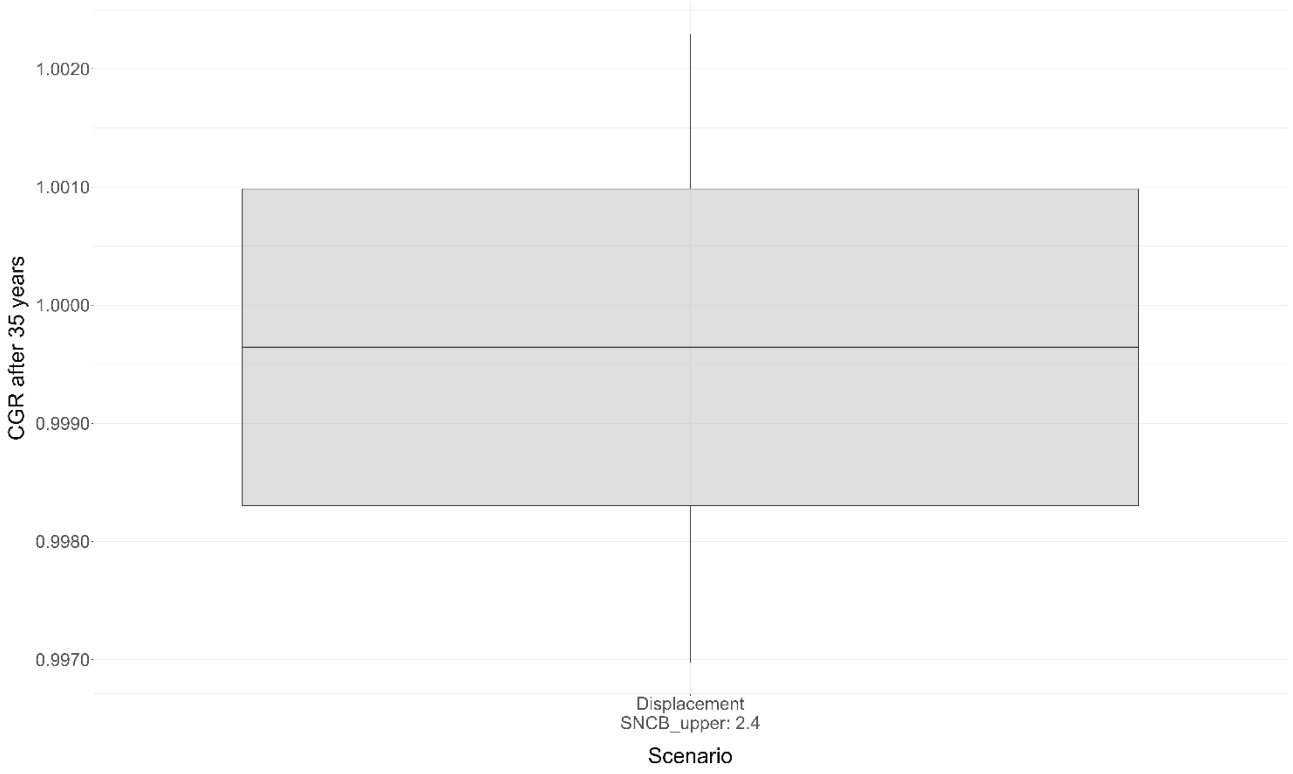

Figure A. 23: Counterfactual of Growth Rates after 35 years for the razorbill population at the Forth Islands Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

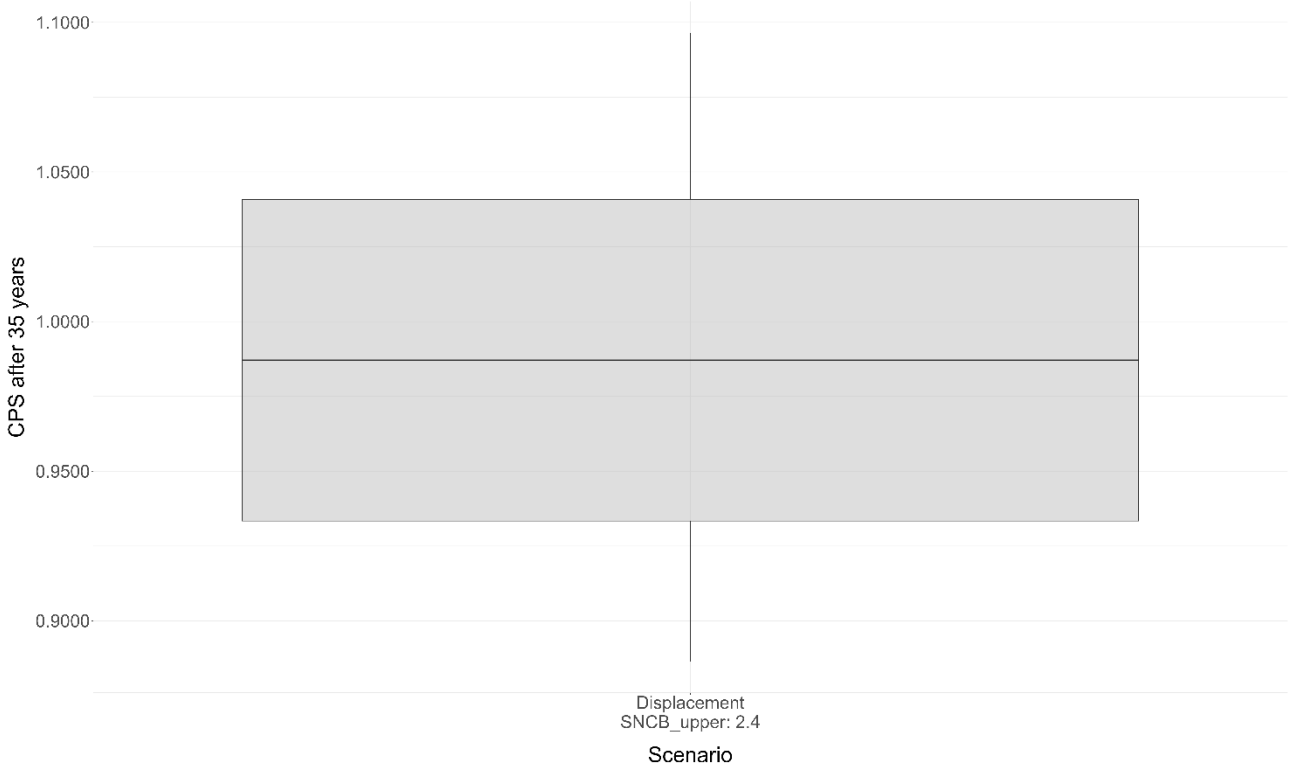

Figure A. 24: Counterfactual of Population Size after 35 years for the razorbill population at the Forth Islands Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.2.3 Fowlsheugh Special Protection Area

Kittiwake

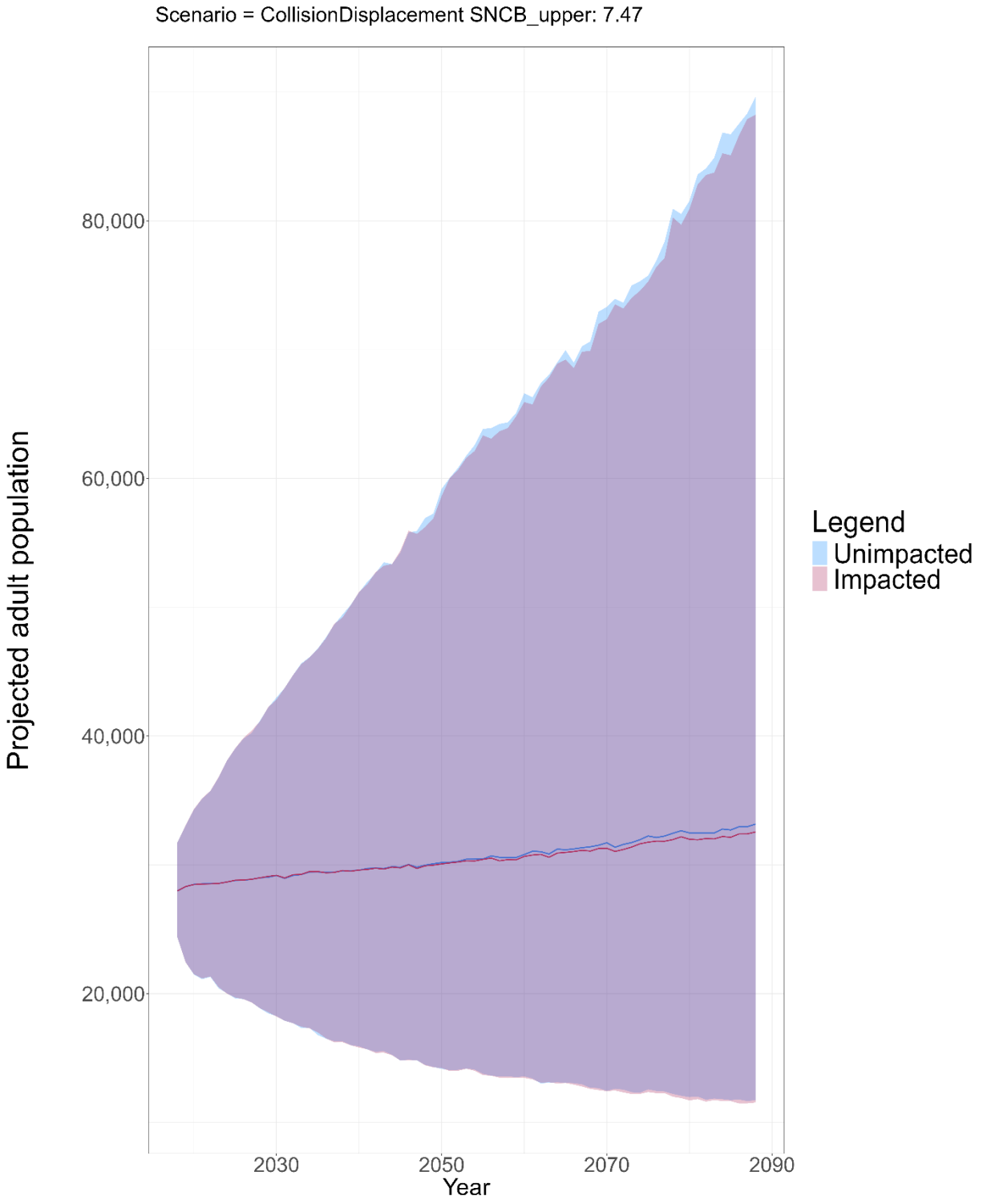

Figure A. 25: Kittiwake population projection over 35 years at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

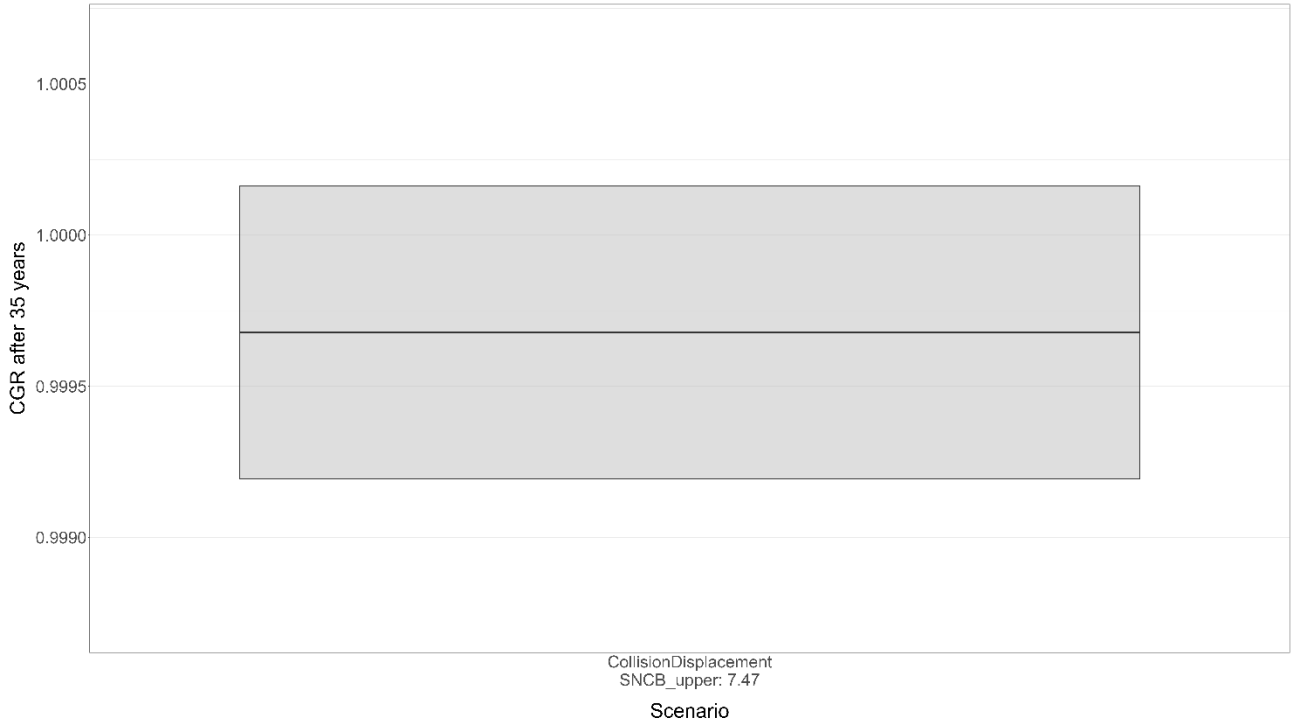

Figure A. 26: Counterfactual of Growth Rates after 35 years for the kittiwake population at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

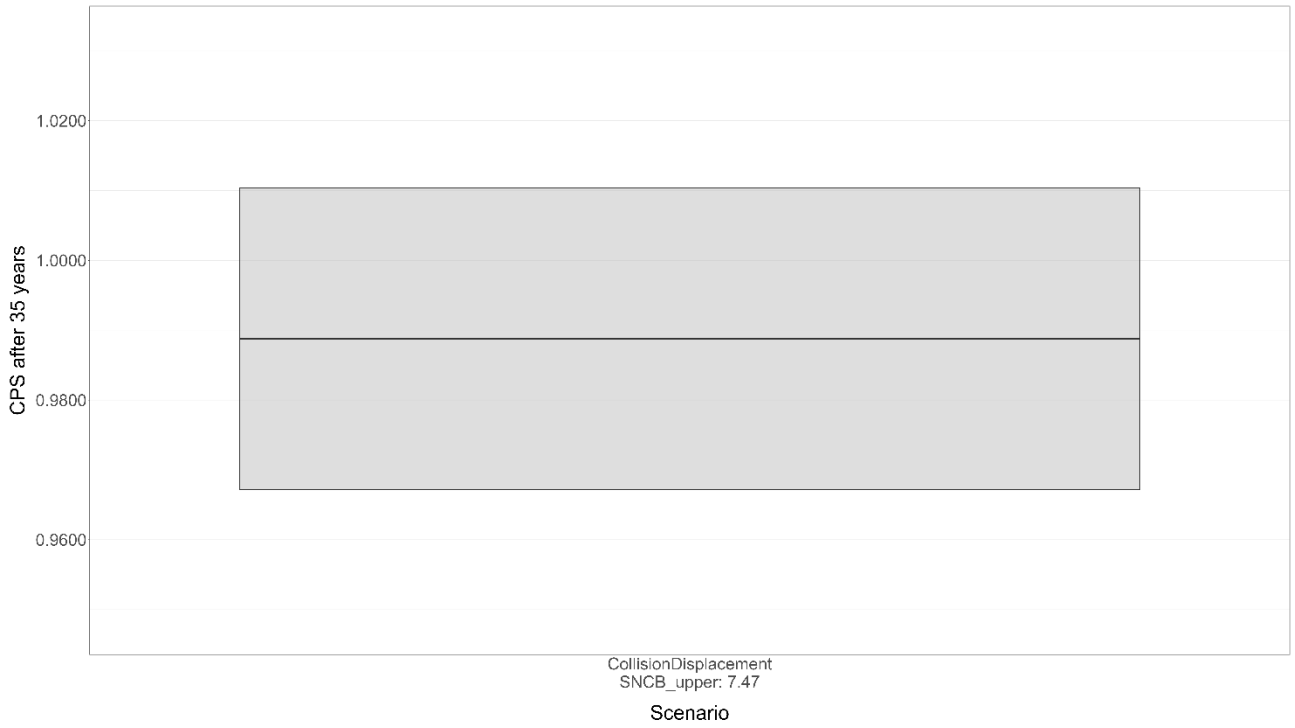

Figure A. 27: Counterfactual of Population Size after 35 years for the kittiwake population at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

Guillemot

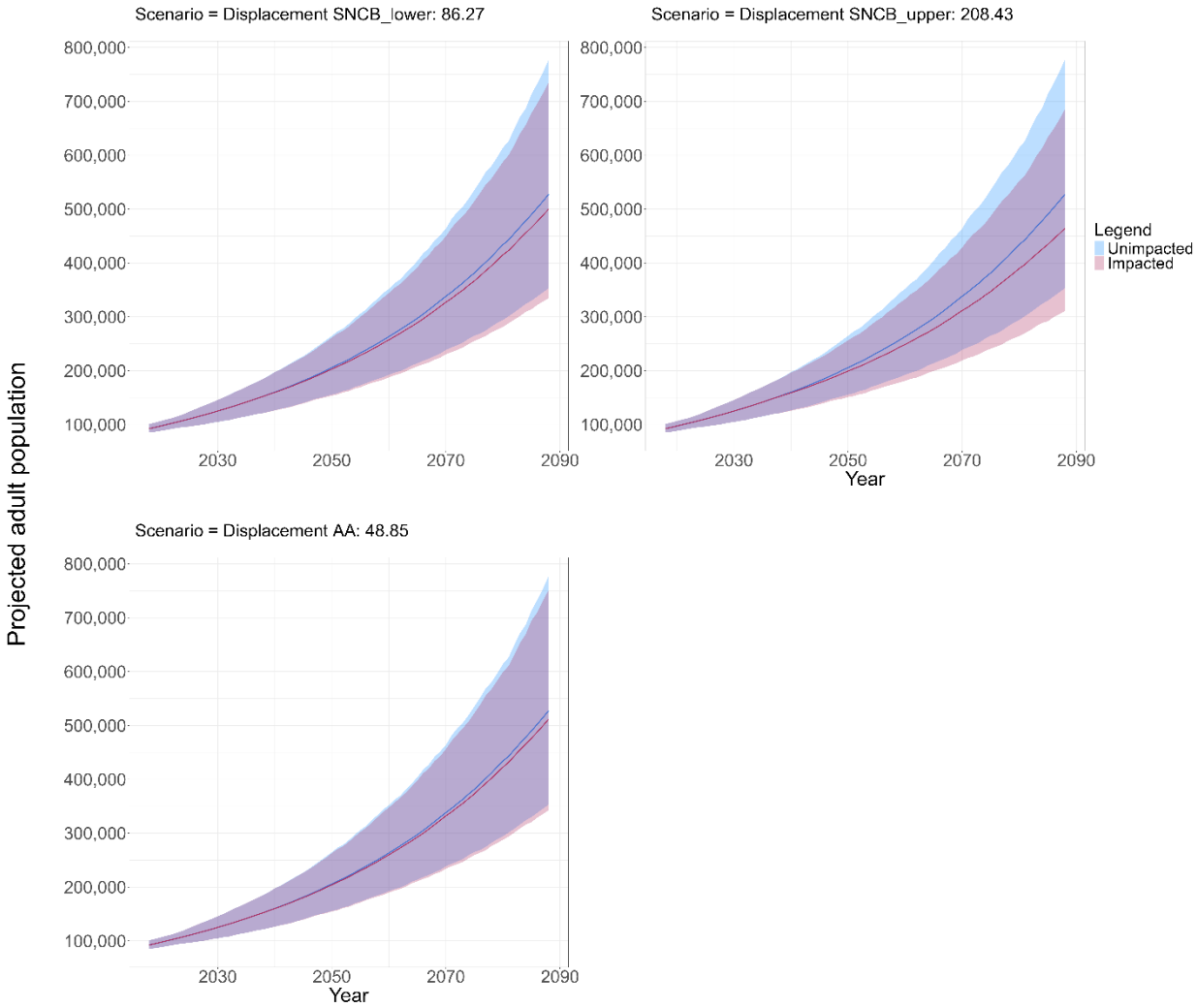

Figure A. 28: Guillemot population projection over 35 years at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

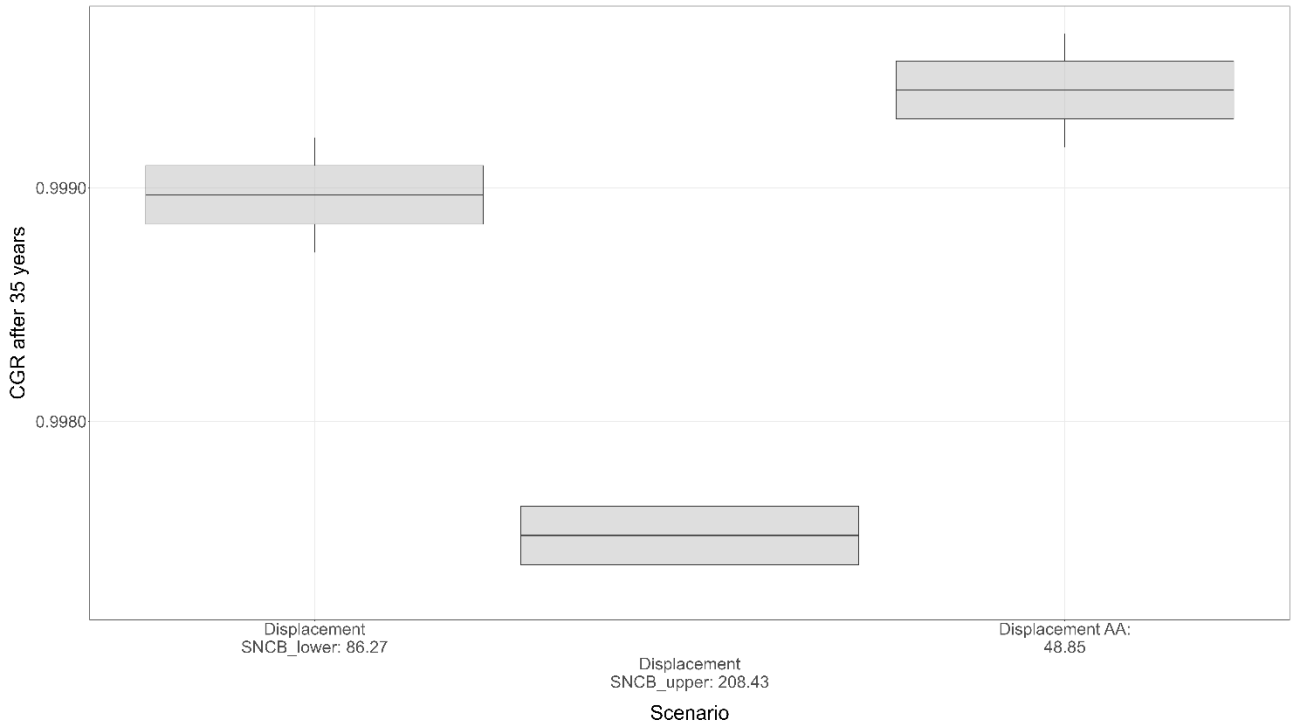

Figure A. 29: Counterfactual of Growth Rates after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

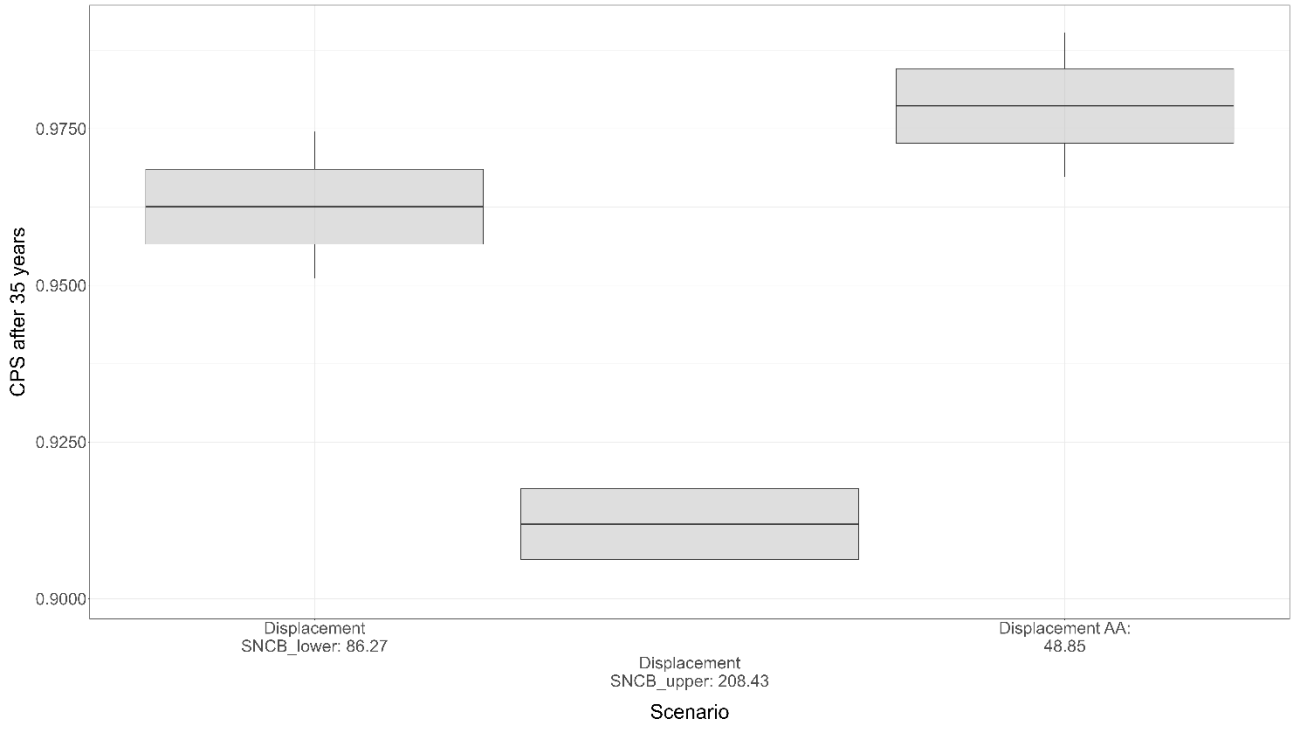

Figure A. 30: Counterfactual of Population Size after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

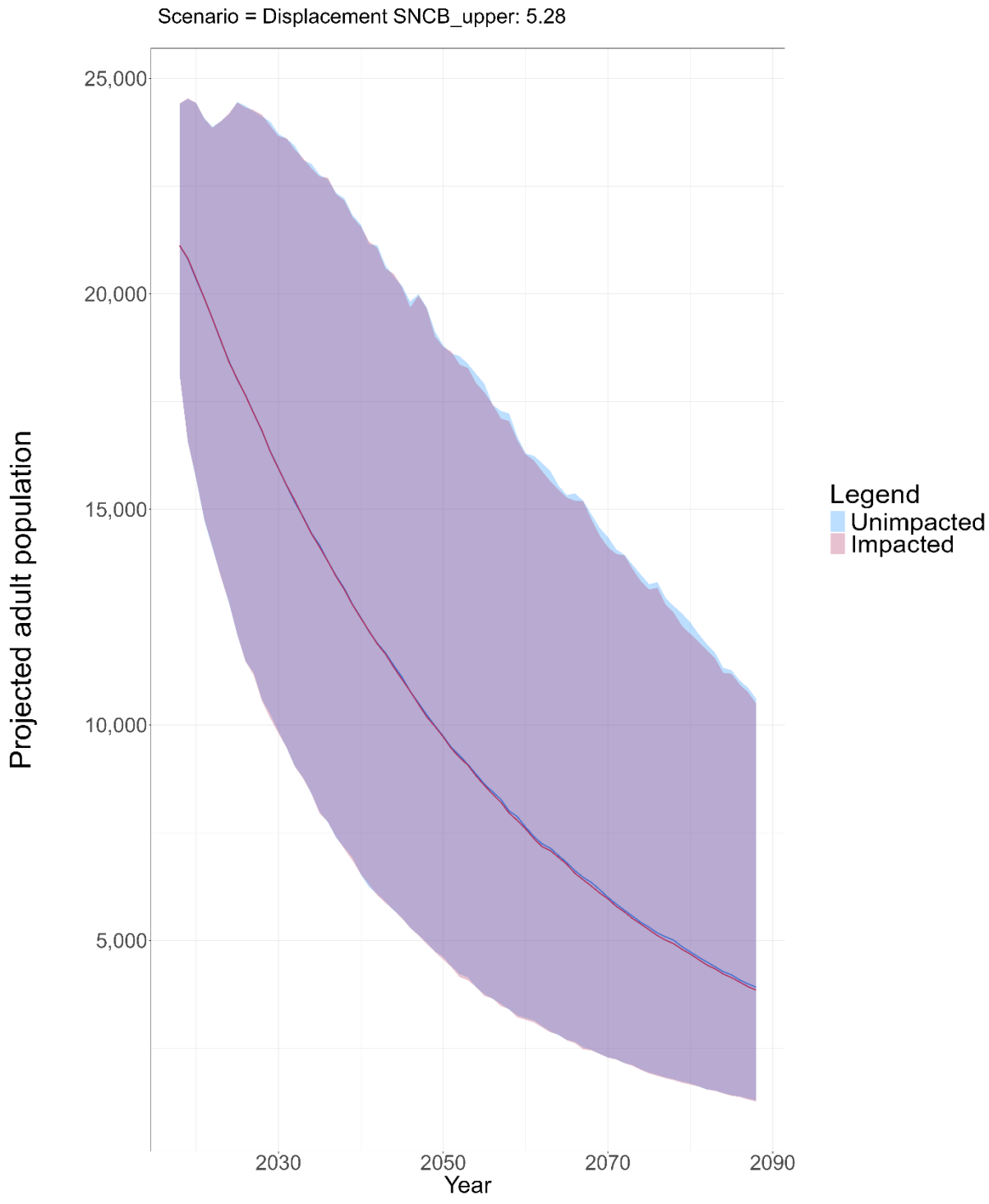

Figure A. 31: Razorbill population projection over 35 years at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

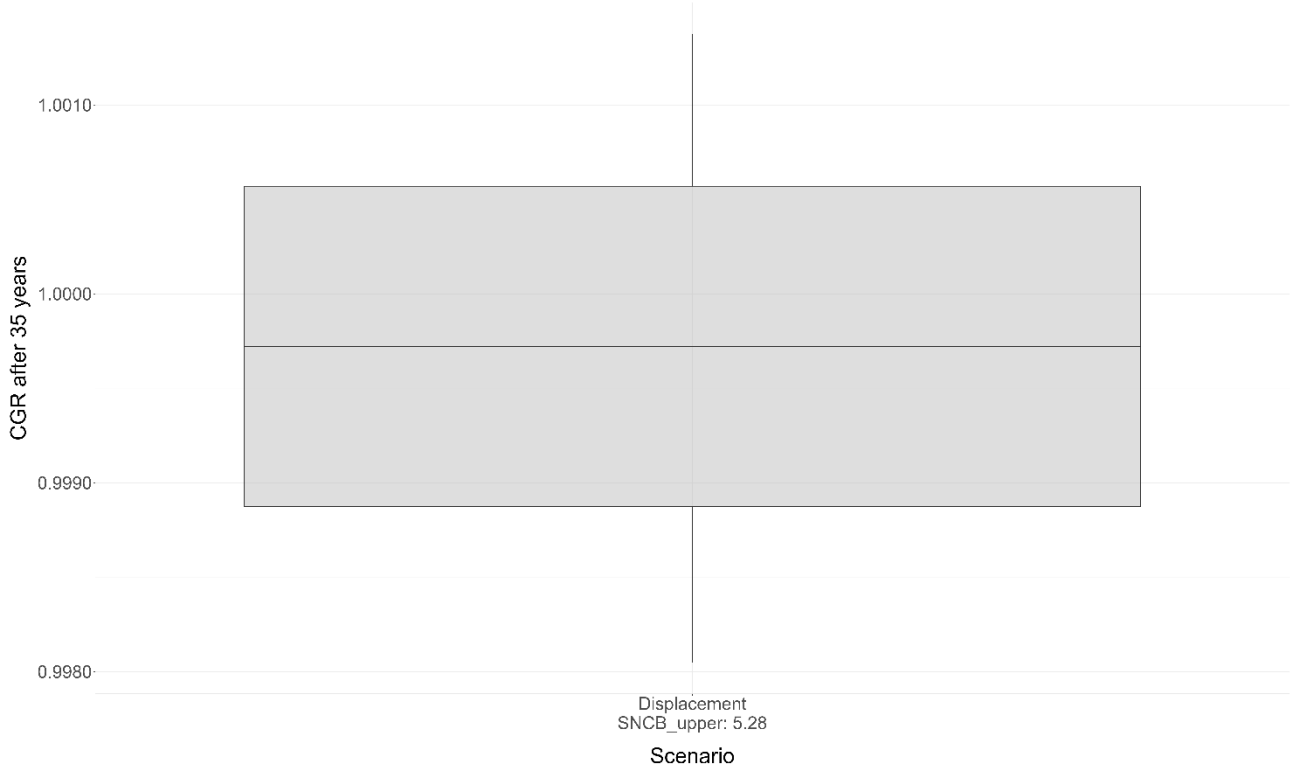

Figure A. 32: Counterfactual of Growth Rates after 35 years for the razorbill population at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

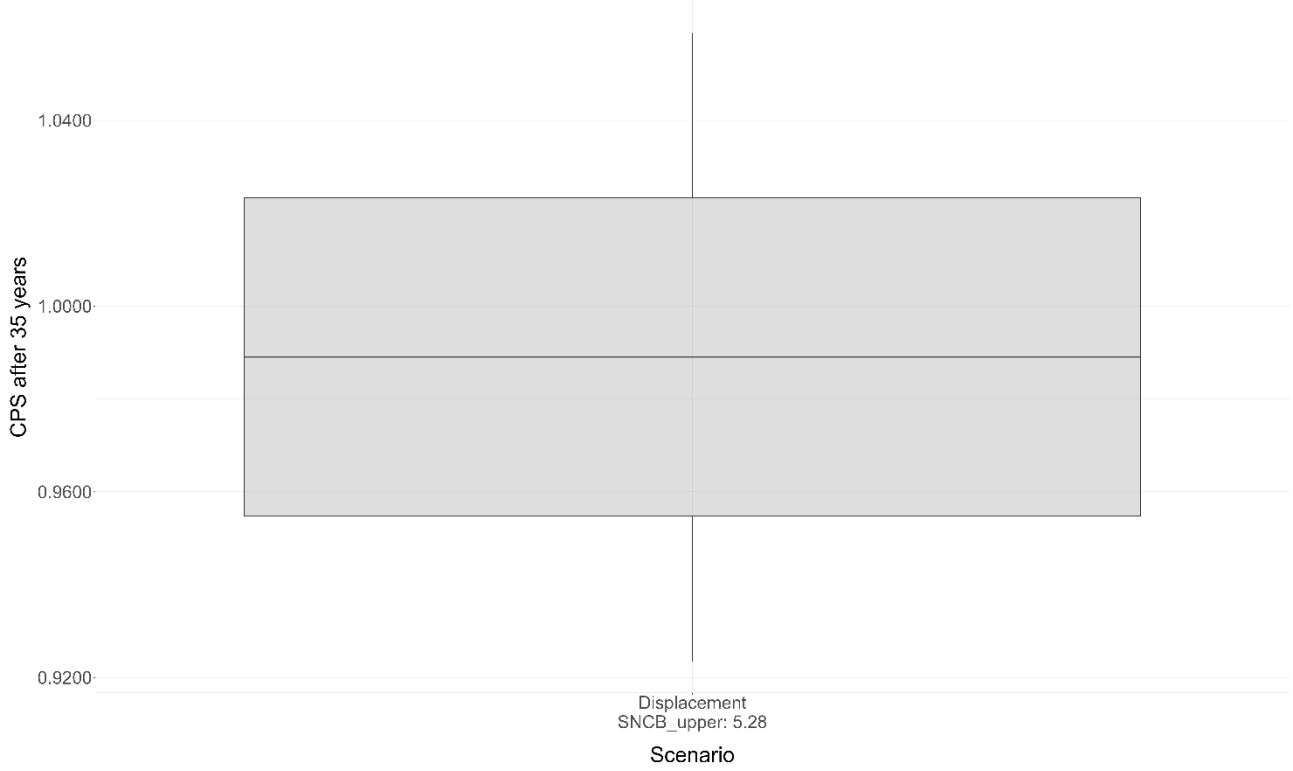

Figure A. 33: Counterfactual of Population Size after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.2.4 St Abb's Head to Fast Castle Special Protection Area

Guillemot

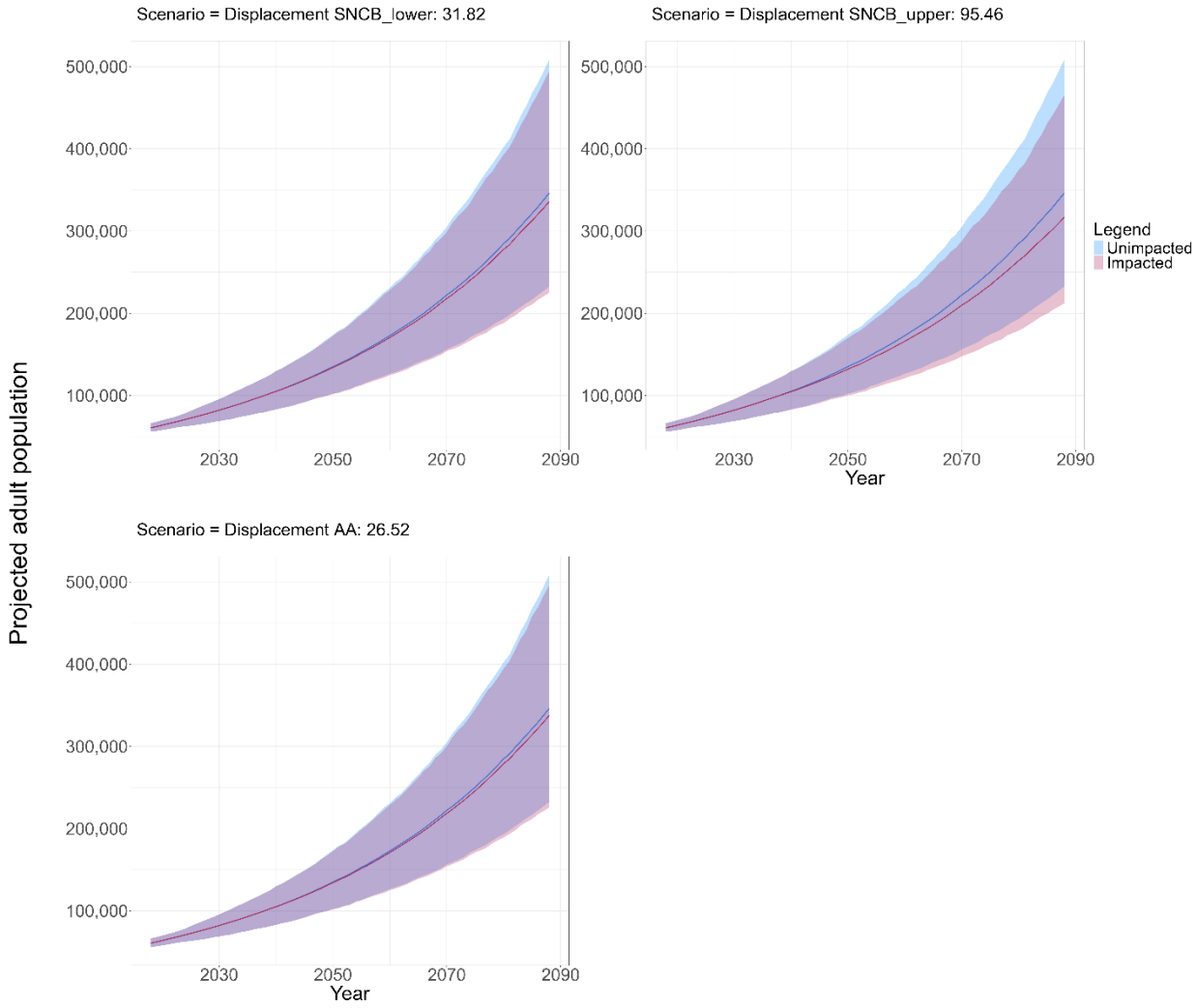

Figure A. 34: Guillemot population projection over 35 years at the St Abb's Head to Fast Castle Special Protection Area from the Morven Programme impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

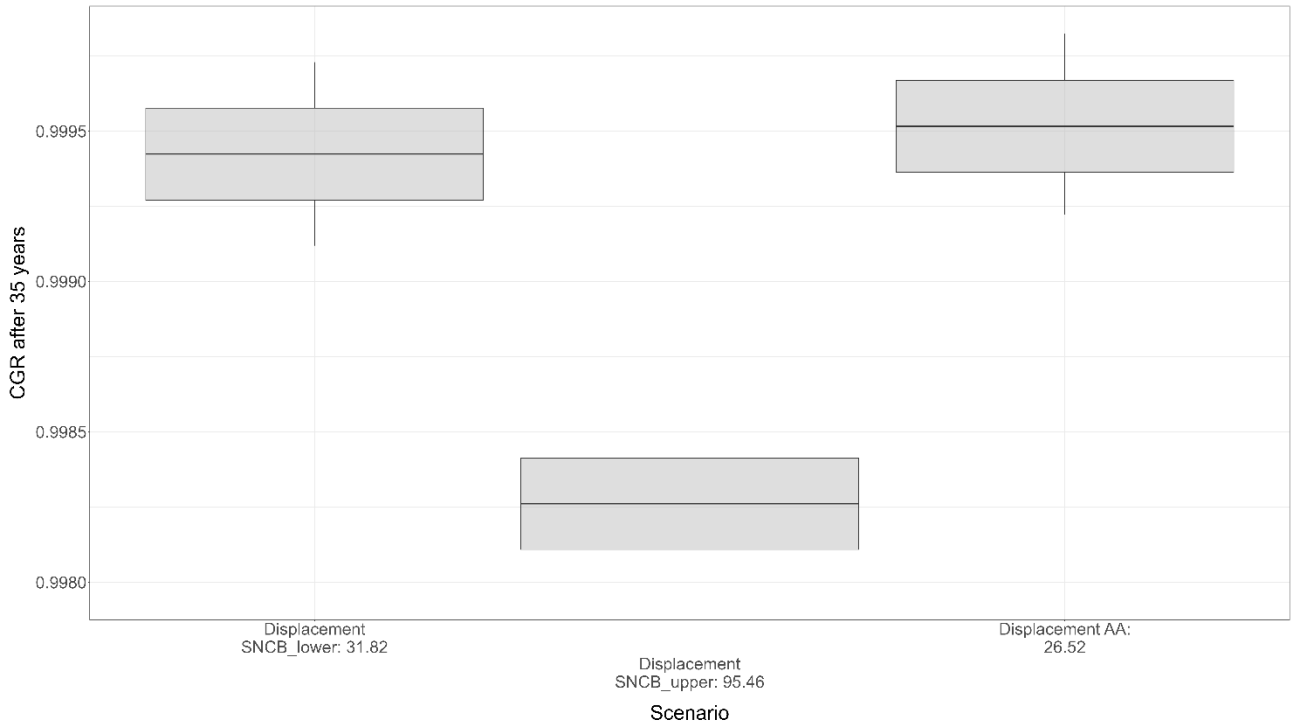

Figure A. 35: Counterfactual of Growth Rates after 35 years for the guillemot population at the St Abb's Head to Fast Castle Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

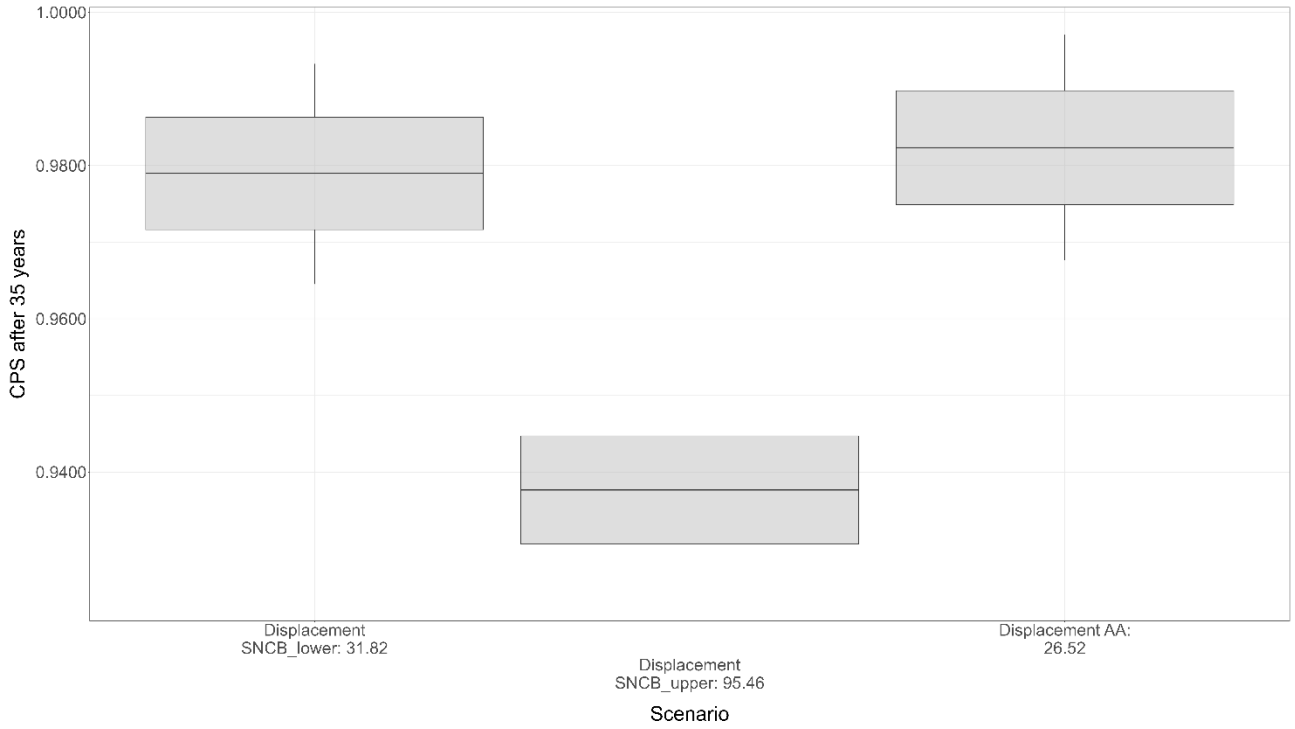

Figure A. 36: Counterfactual of Population Size after 35 years for the guillemot population at the St Abb's Head to Fast Castle Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

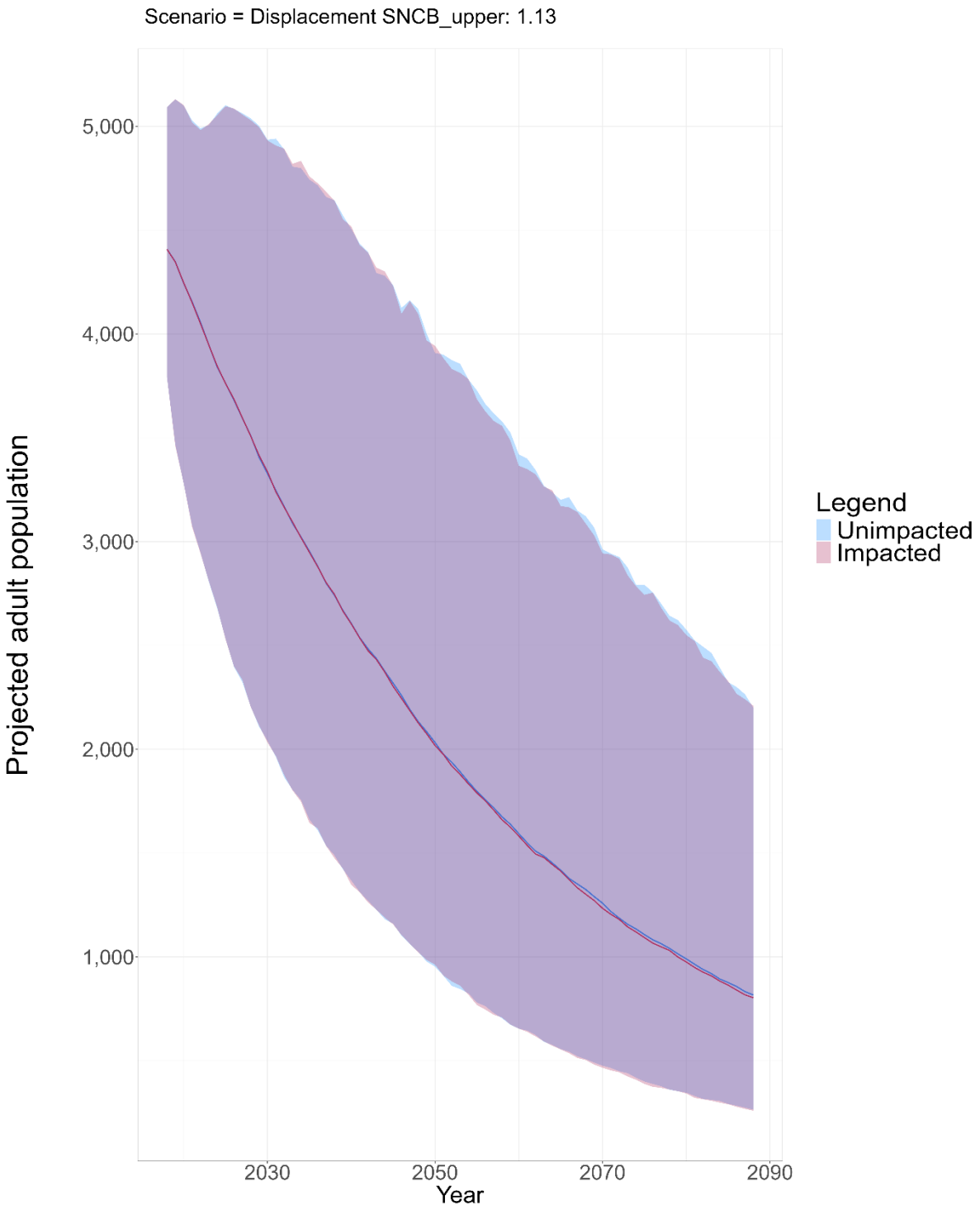

Figure A. 37: Razorbill population projection over 35 years at the St Abb's Head to Fast Castle Special Protection Area from the Morven Programme impacts. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body)

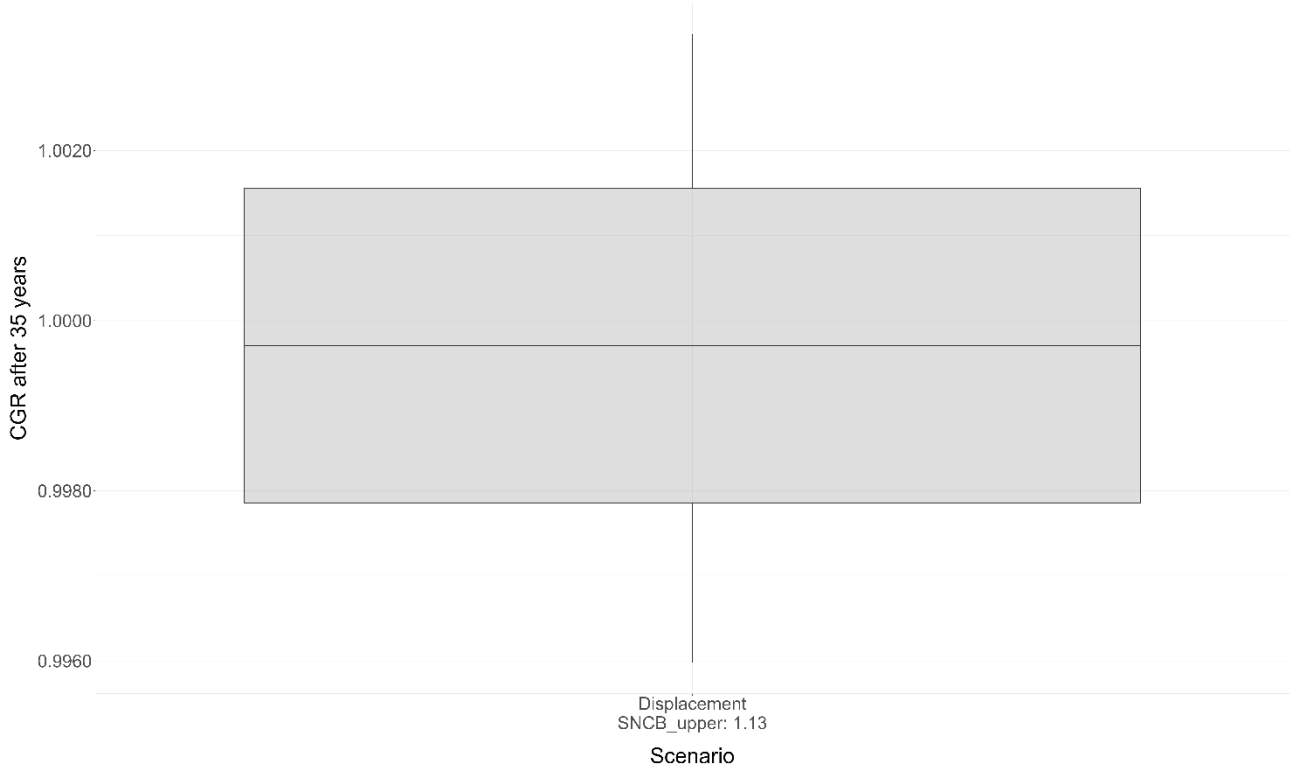

Figure A. 38: Counterfactual of Growth Rates after 35 years for the razorbill population at the St Abb's Head to Fast Castle Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

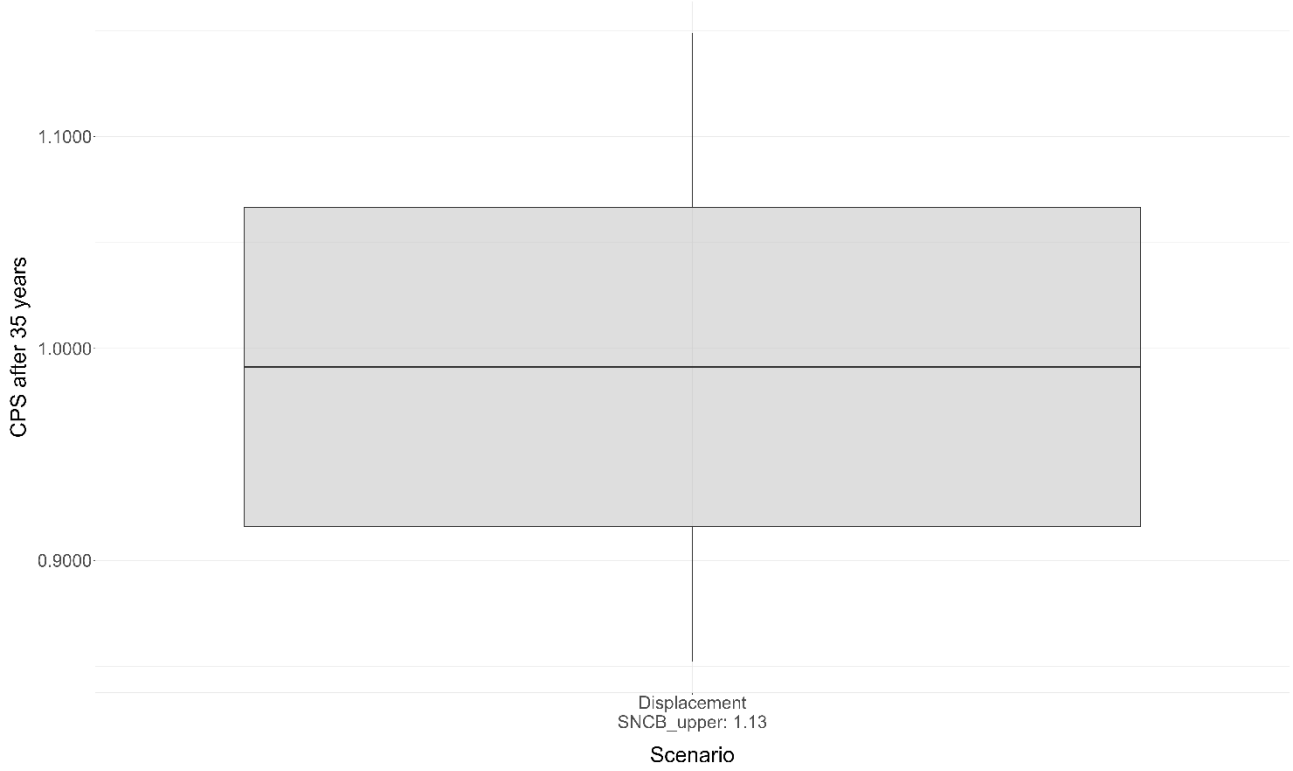

Figure A. 39: Counterfactual of Population Size after 35 years for the razorbill population at the St Abb's Head to Fast Castle Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body)

A.2.5 Troup, Pennan and Lion's Head Special Protection Area

Guillemot

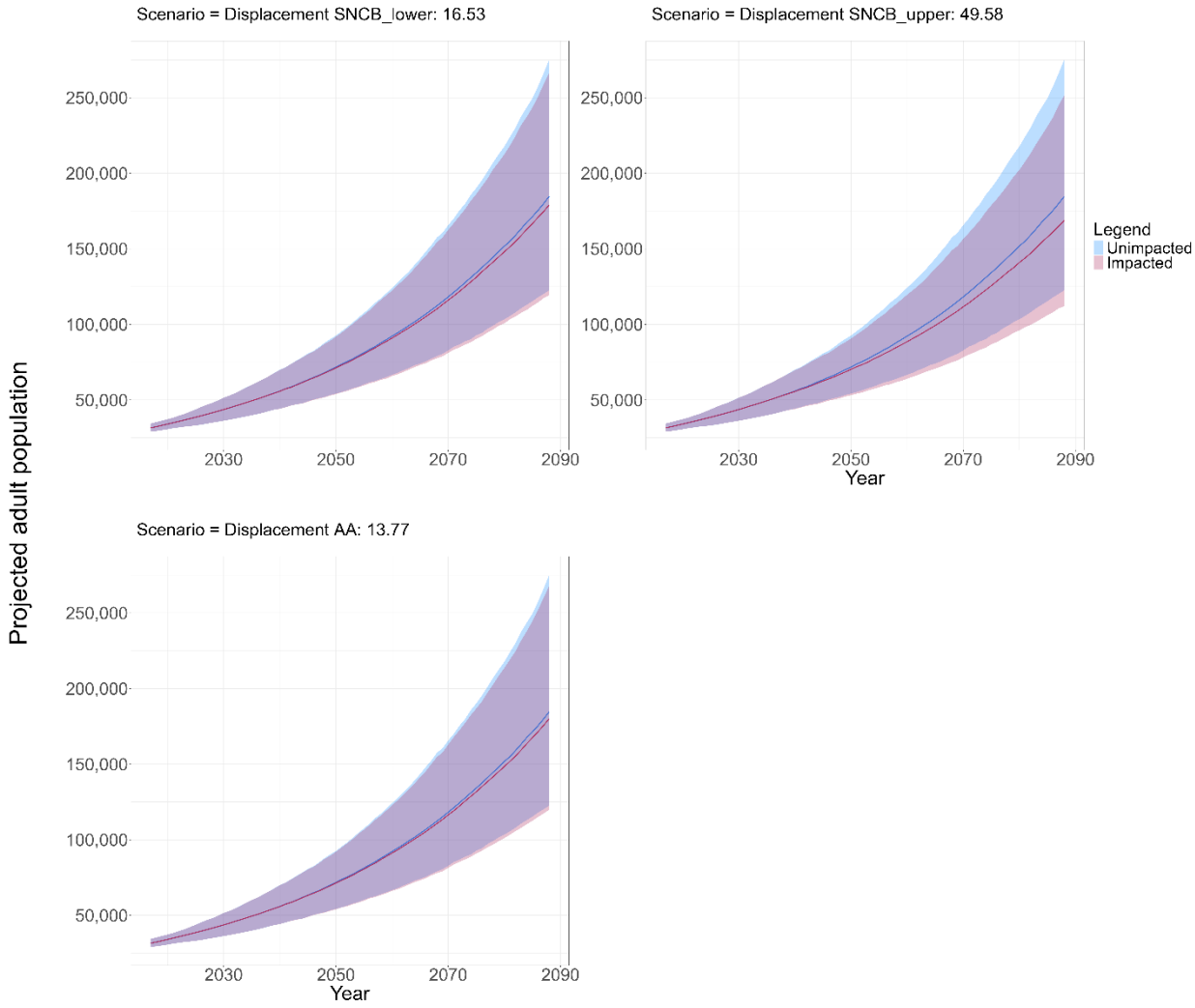

Figure A. 40: Guillemot population projection over 35 years at the Troup, Pennan and Lion's Heads Special Protection Area from the Morven Programme impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

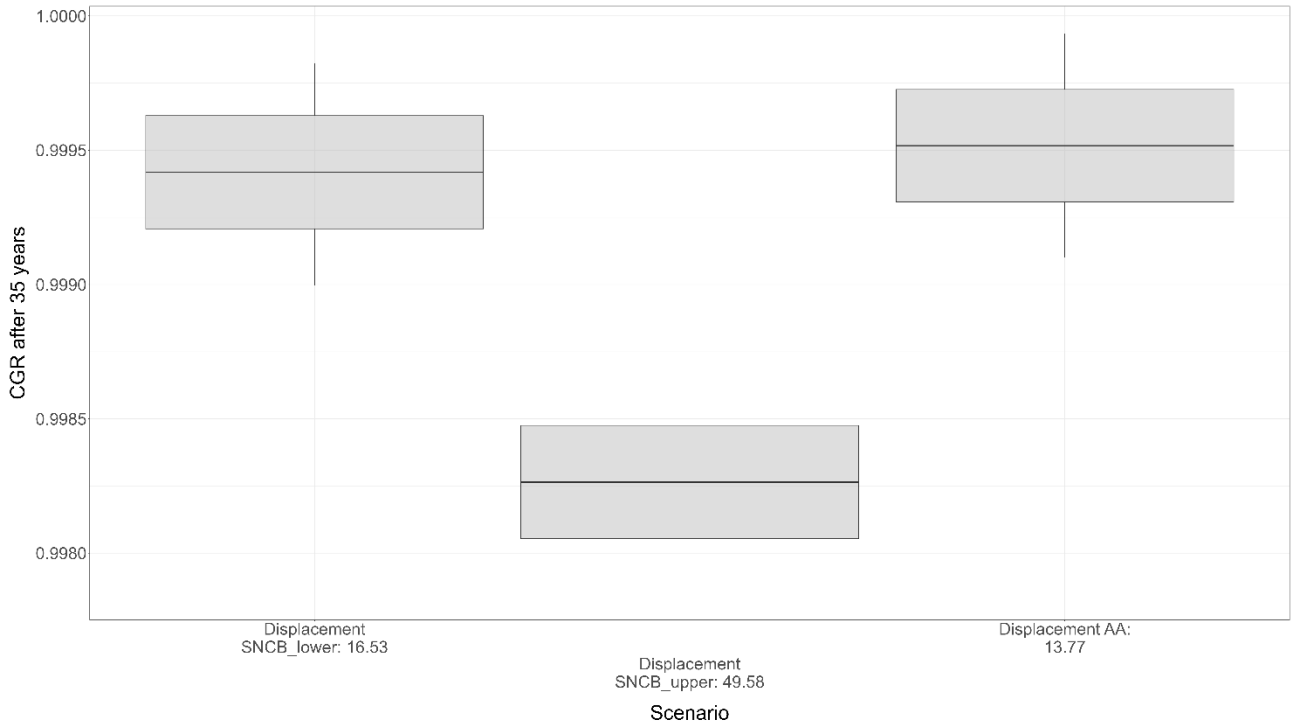

Figure A. 41: Counterfactual of Growth Rates after 35 years for the guillemot population at the Troup, Pennan and Lion's Heads Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

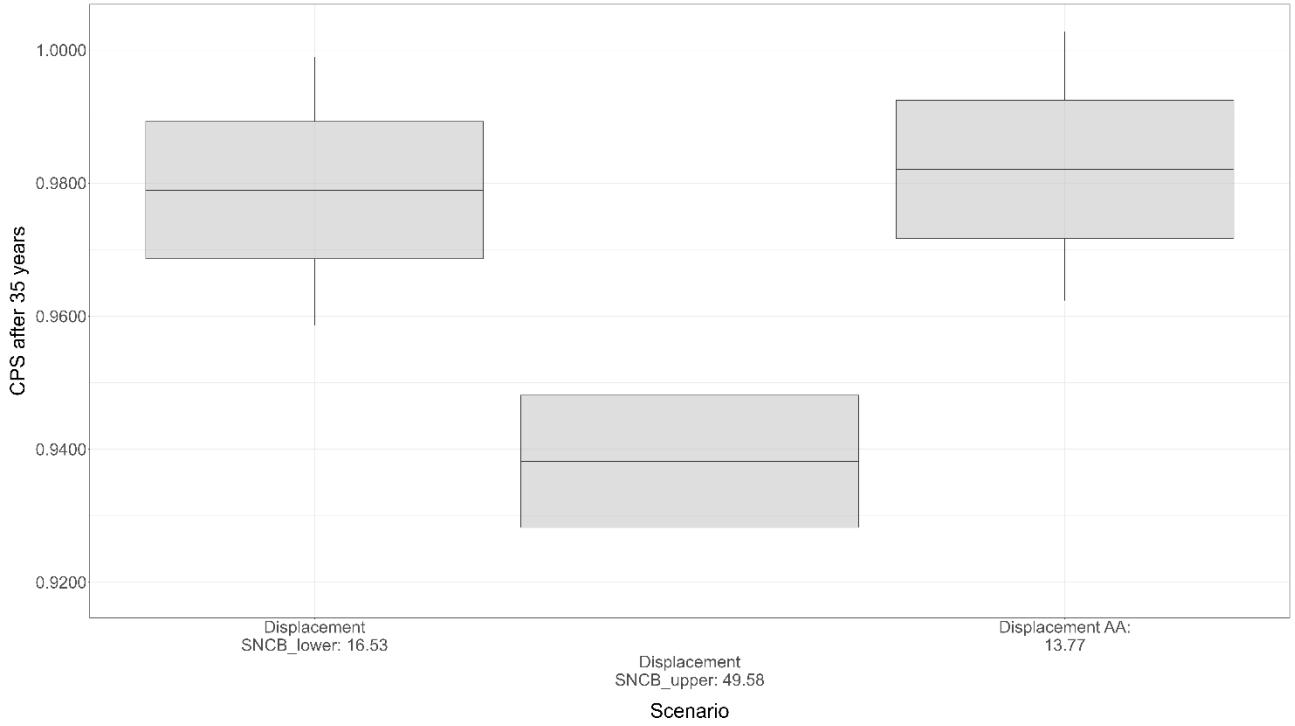

Figure A. 42: Counterfactual of Population Size after 35 years for the guillemot population at the Troup, Pennan and Lion's Heads Special Protection Area from the Morven Programme impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3 In-combination assessment

A.3.1 Buchan Ness to Collieston Coast Special Protection Area

Kittiwake

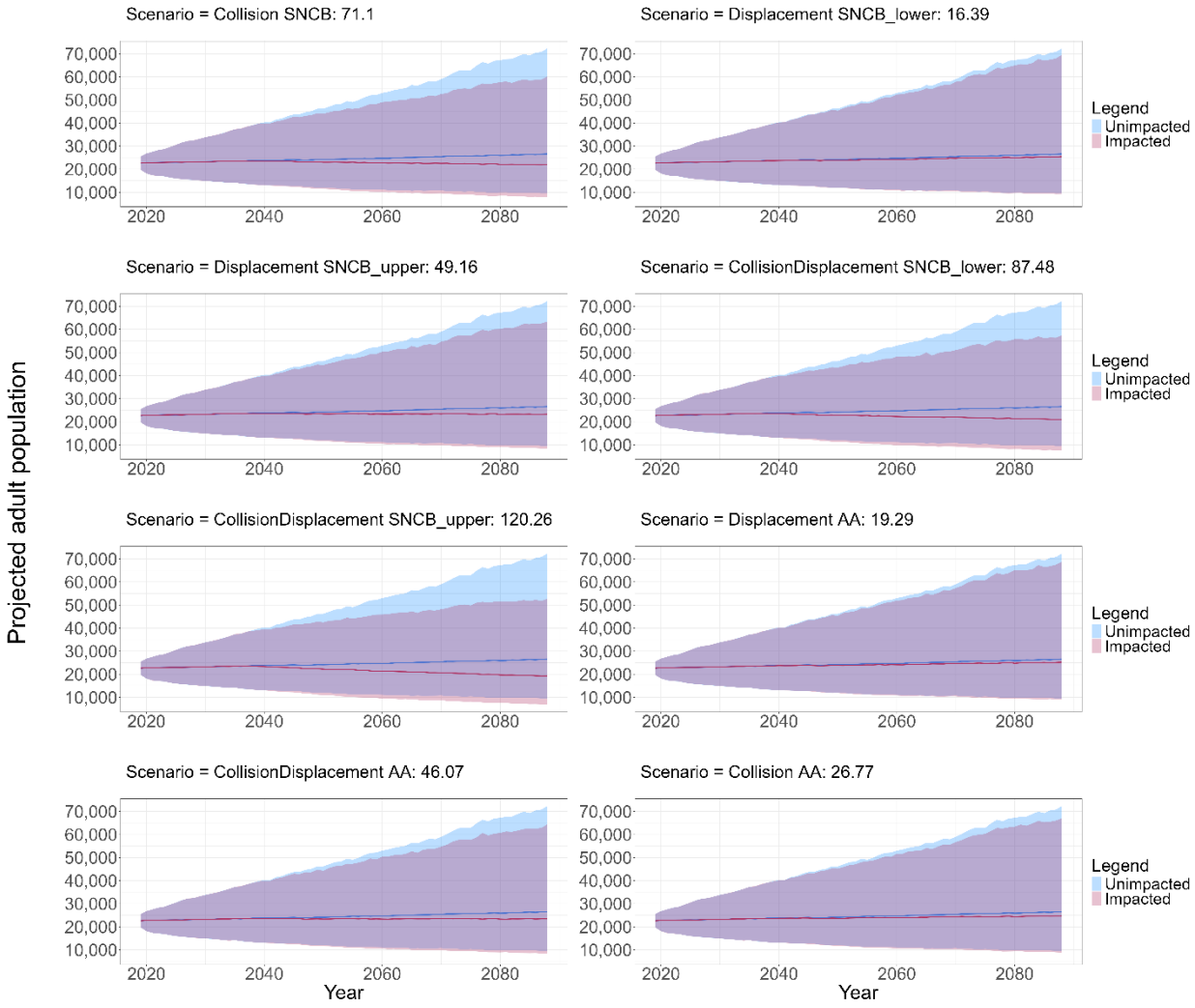

Figure A. 43: Kittiwake population projection over 35 years at the Buchan Ness to Collieston Coast Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

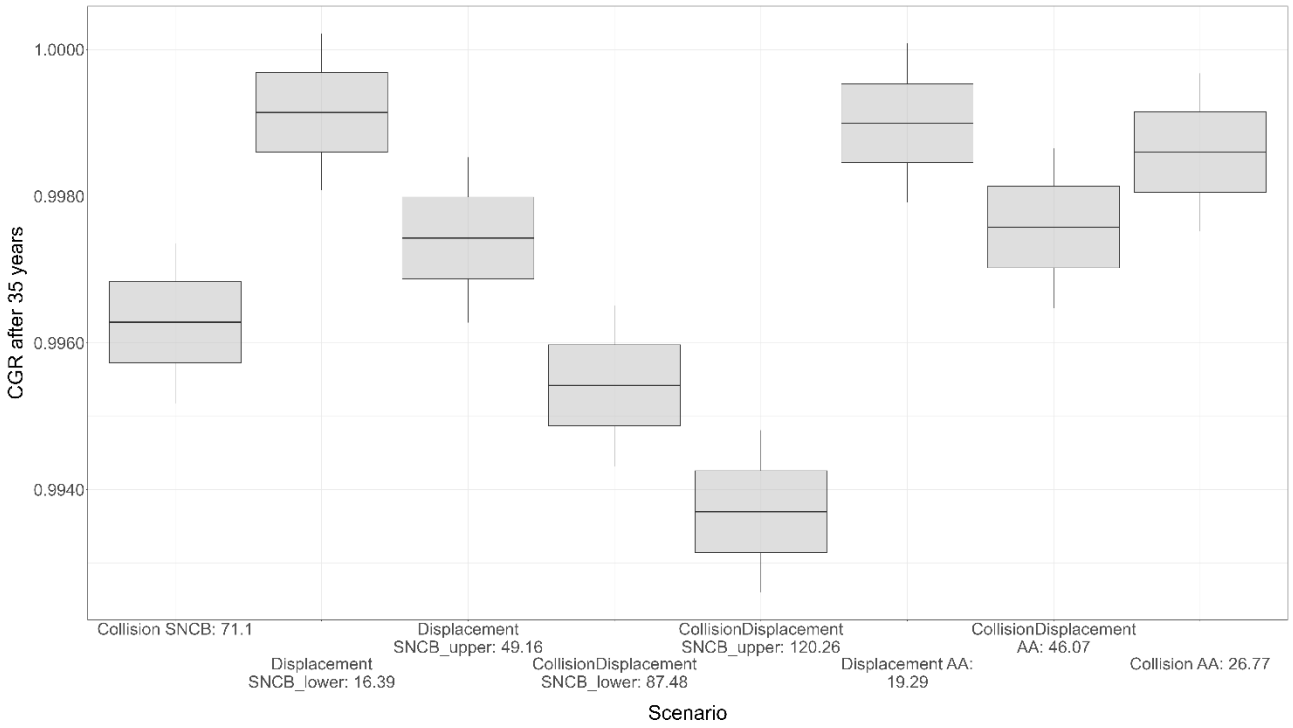

Figure A. 44: Counterfactual of Growth Rates after 35 years for the kittiwake population at the Buchan Ness and Collison Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1sd; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

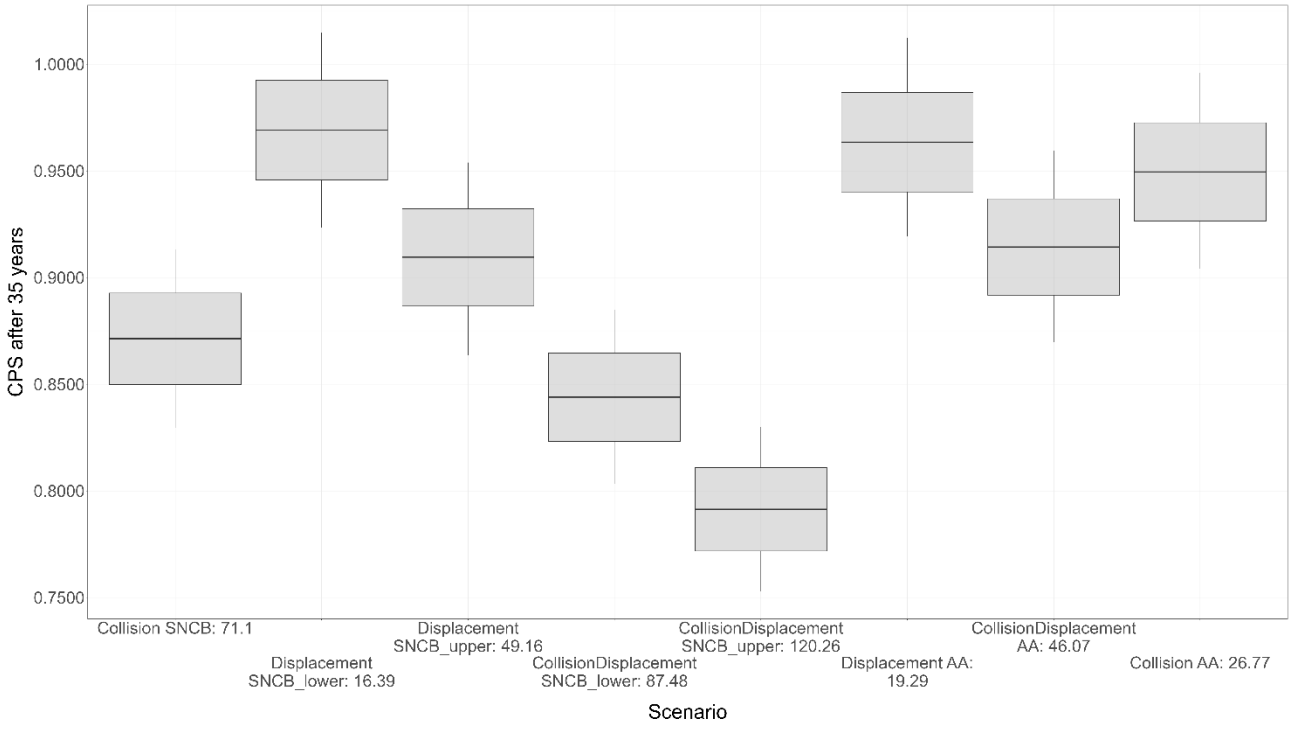

Figure A. 45: Counterfactual of Population Size after 35 years for the kittiwake population at the Buchan Ness and Collison Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Guillemot

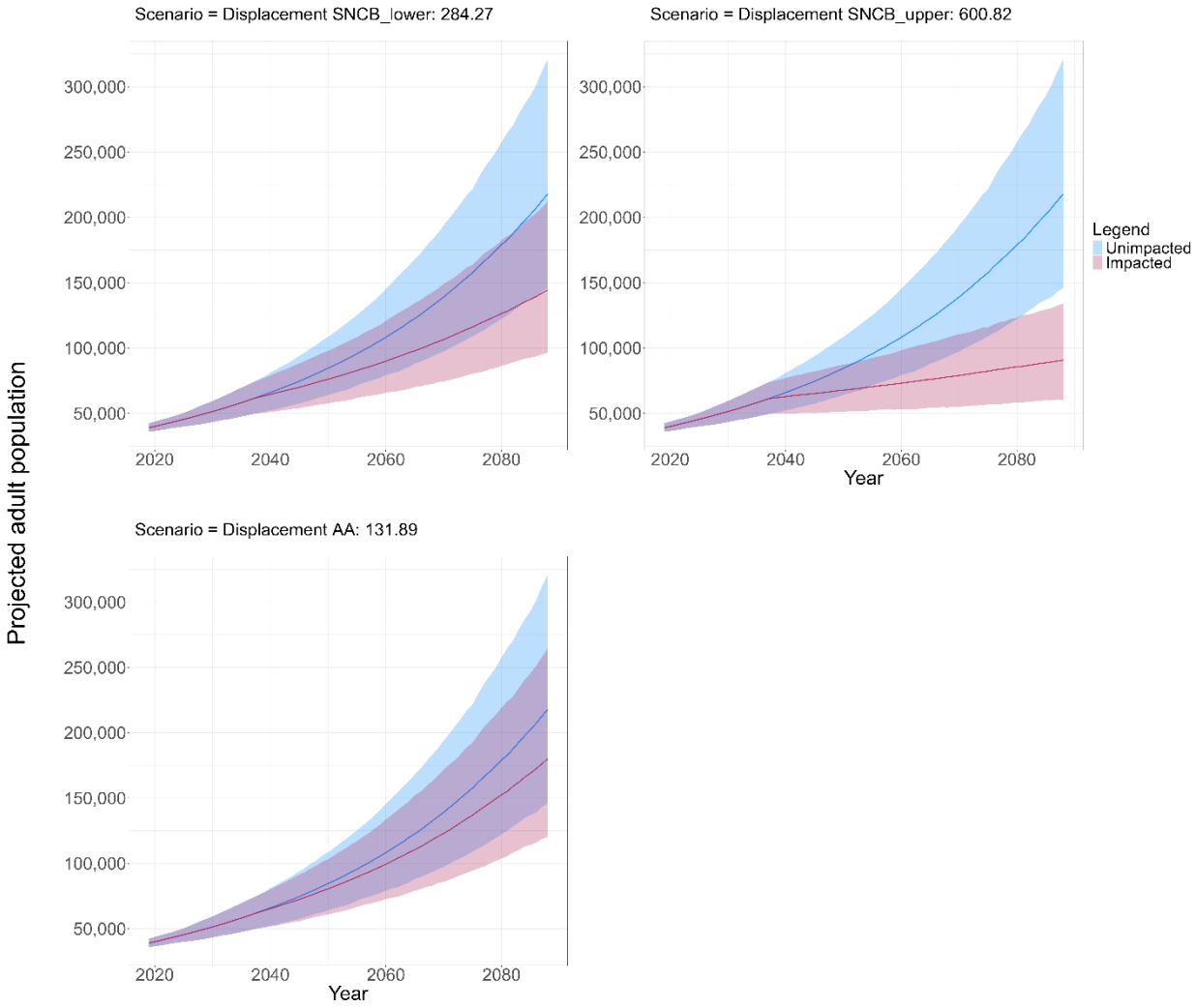

Figure A. 46: Guillemot population projection over 35 years at the Buchan Ness to Collieston Coast Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

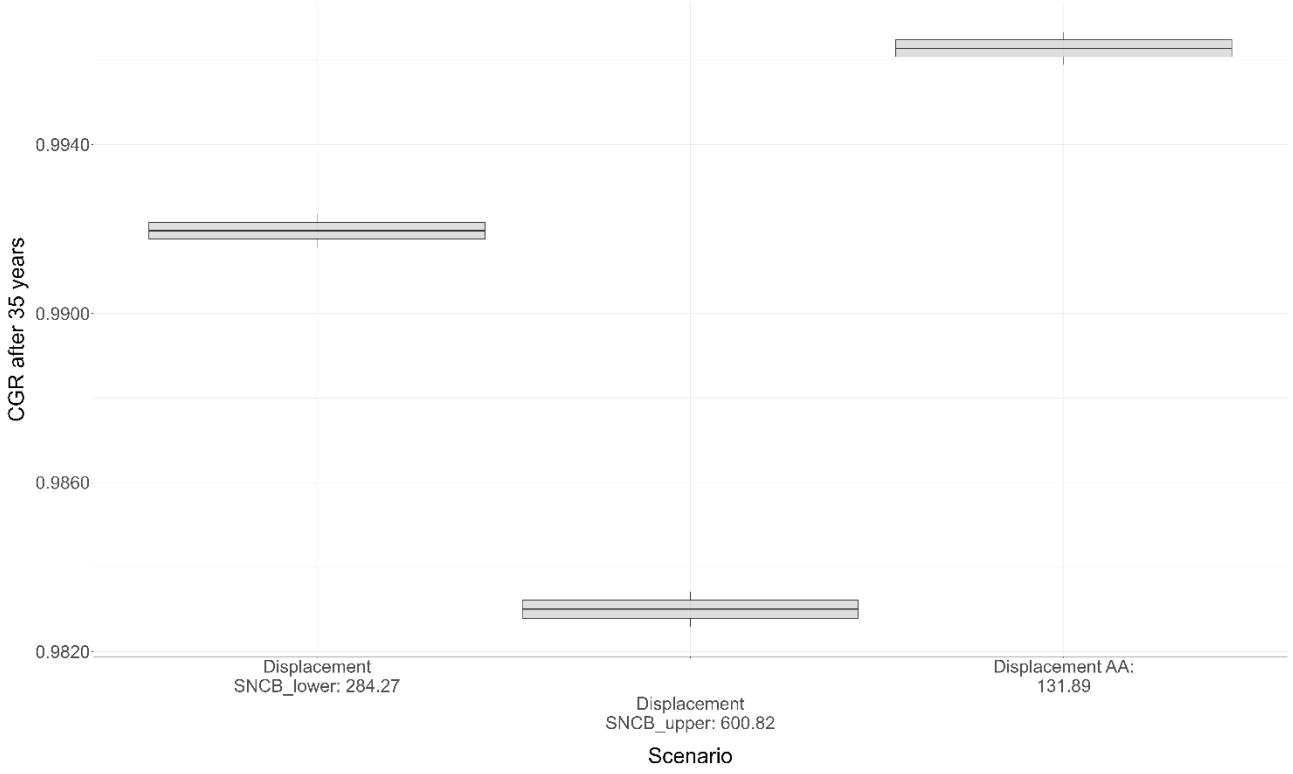

Figure A. 47: Counterfactual of Growth Rates after 35 years for the guillemot population at the Buchan Ness and Collison Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

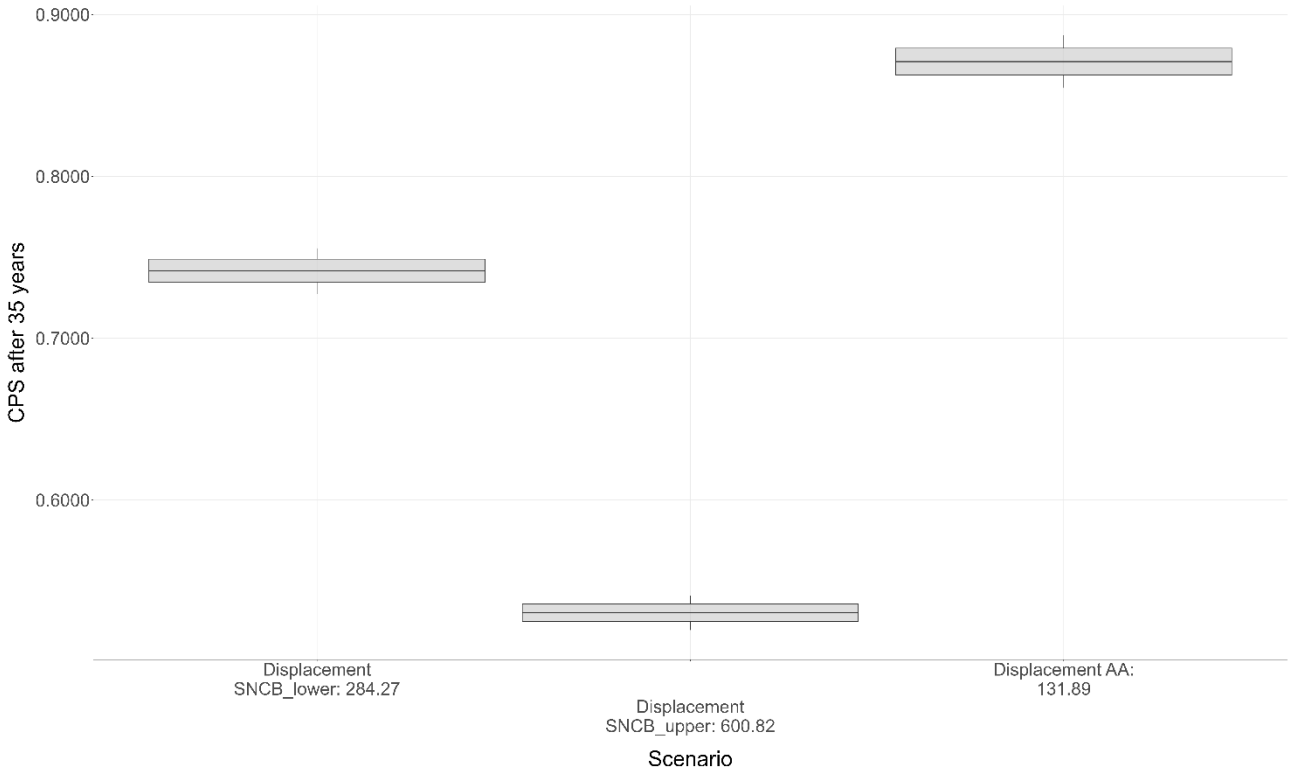

Figure A. 48: Counterfactual of Population Size after 35 years for the guillemot population at the Buchan Ness and Collison Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.2 Coquet Island Special Protection Area

Puffin

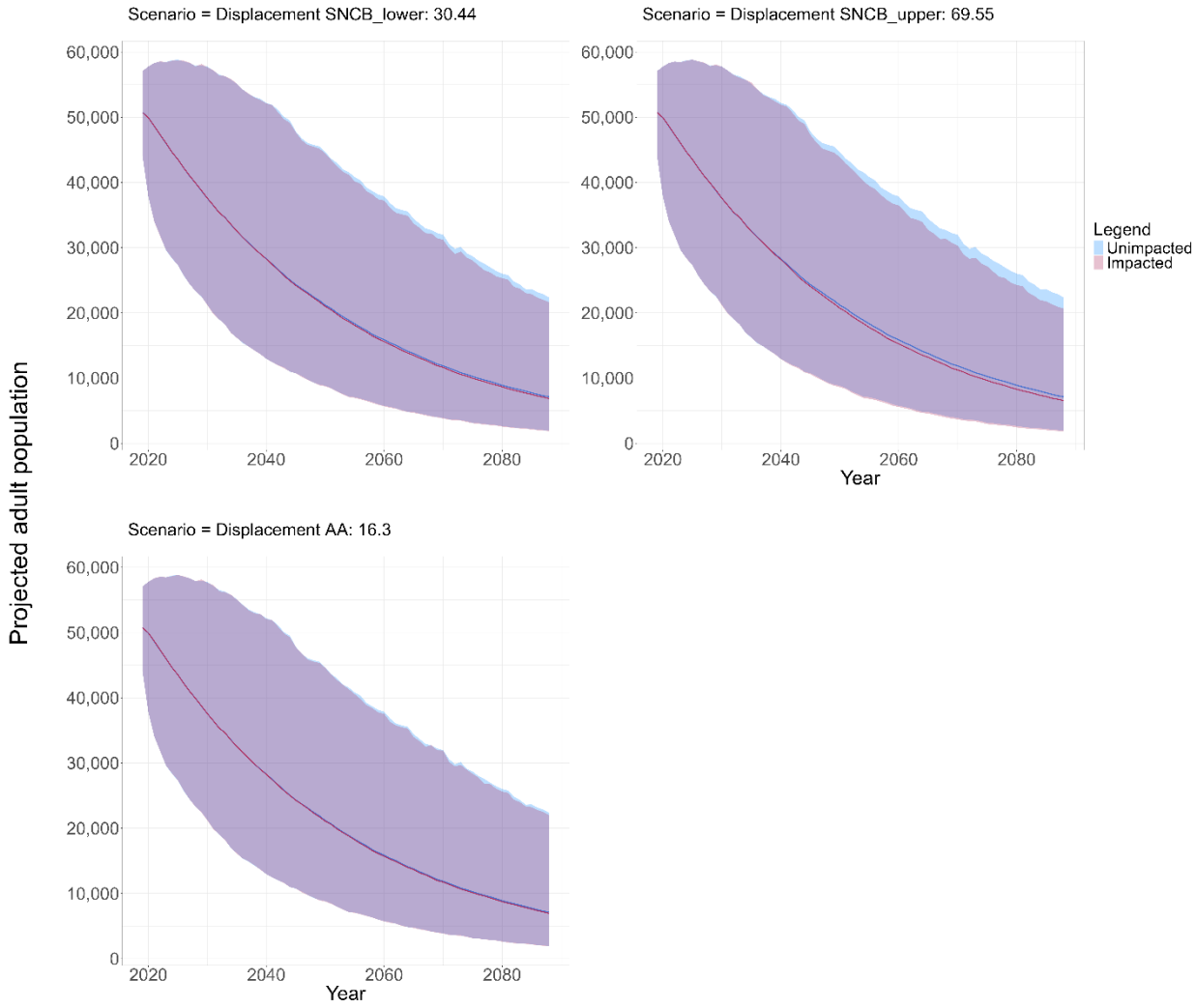

Figure A. 49: Puffin population projection over 35 years at the Coquet Island Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

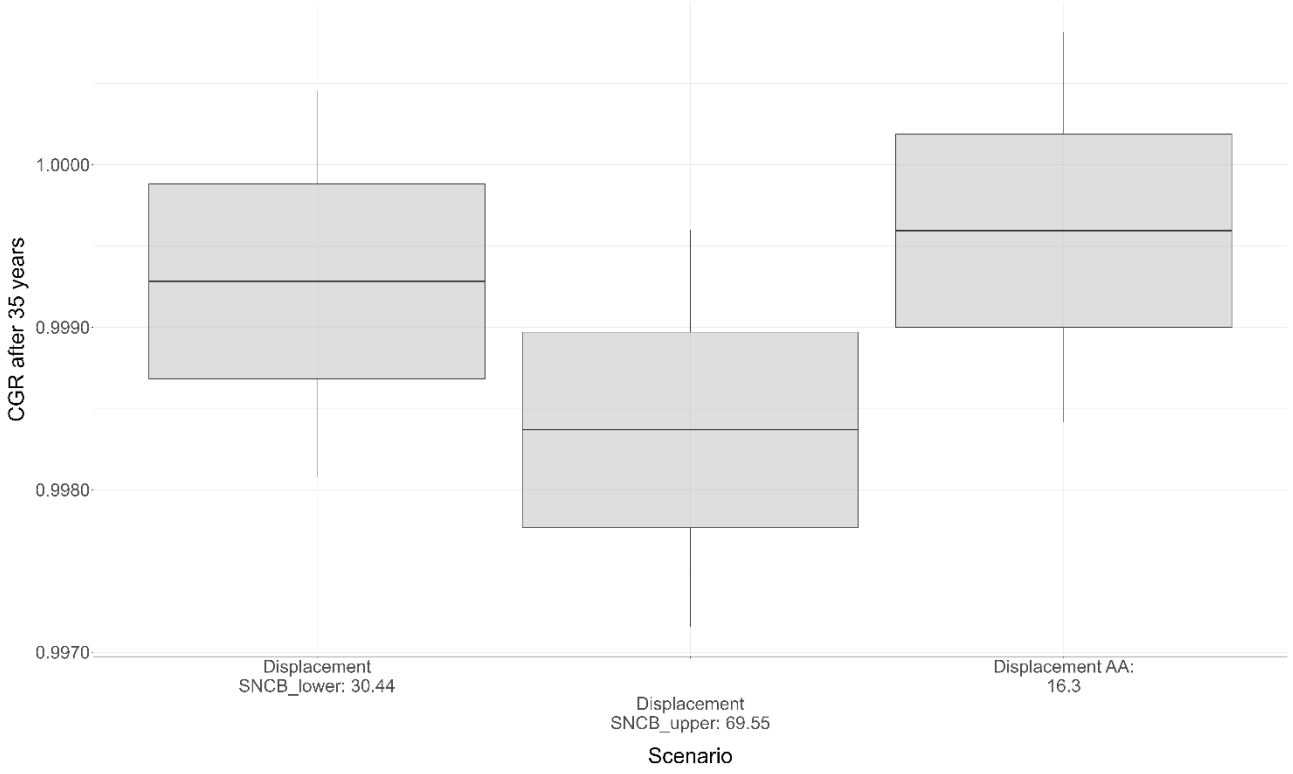

Figure A. 50: Counterfactual of Growth Rates after 35 years for the puffin population at the Coquet Island Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

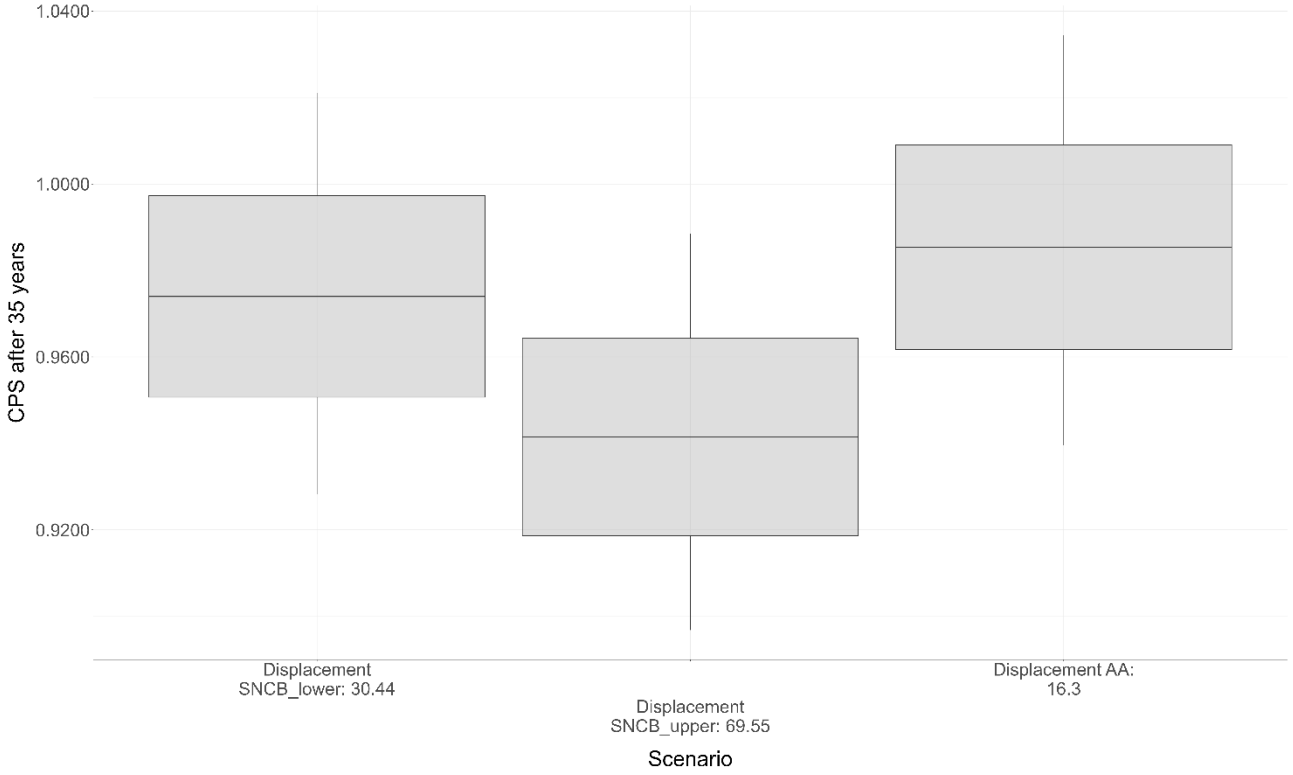

Figure A. 51: Counterfactual of Population Size after 35 years for the puffin population at the Coquet Island Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.3 East Caithness Cliffs Special Protection Area

Kittiwake

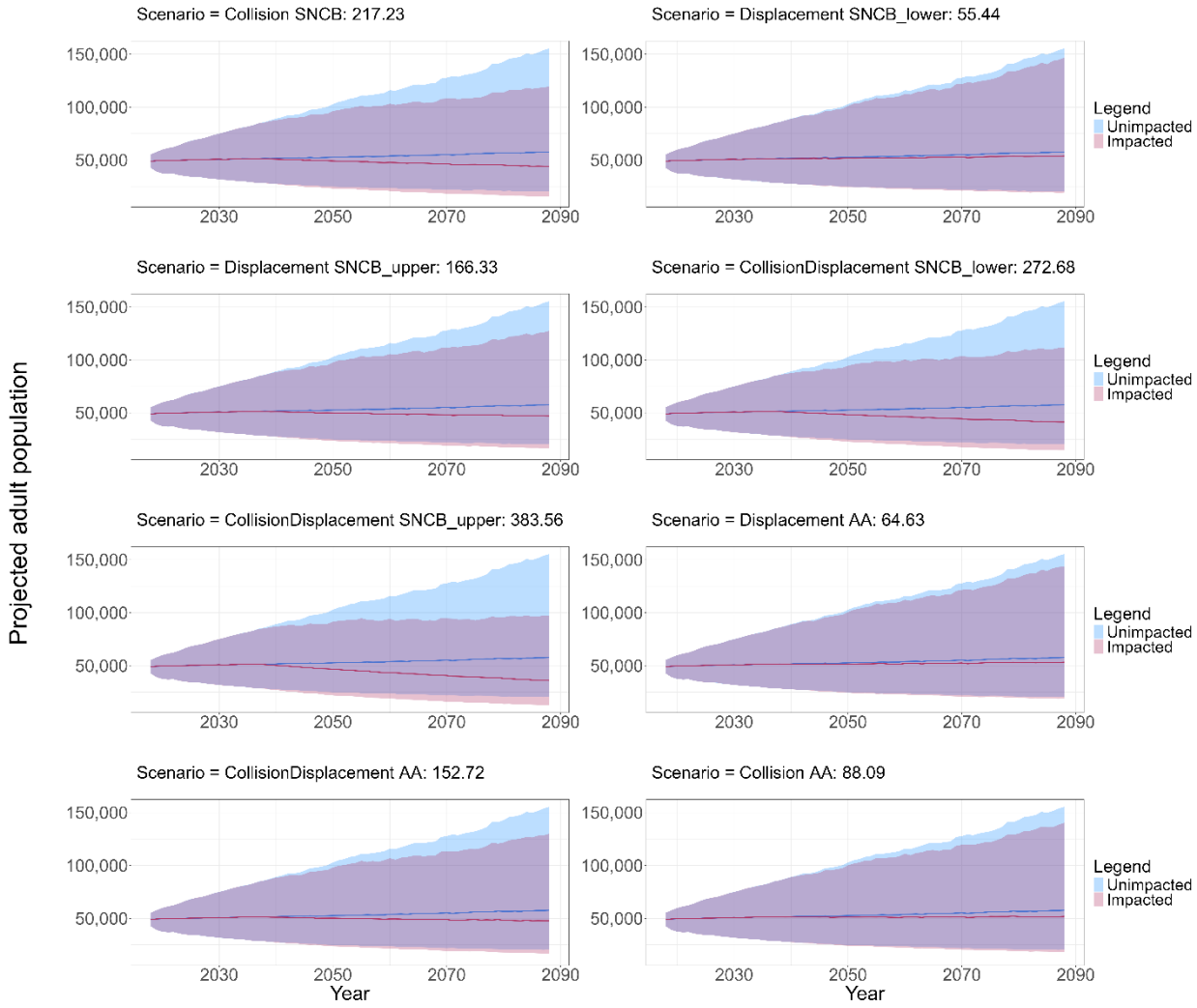

Figure A. 52: Kittiwake population projection over 35 years at the East Caithness Cliffs Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

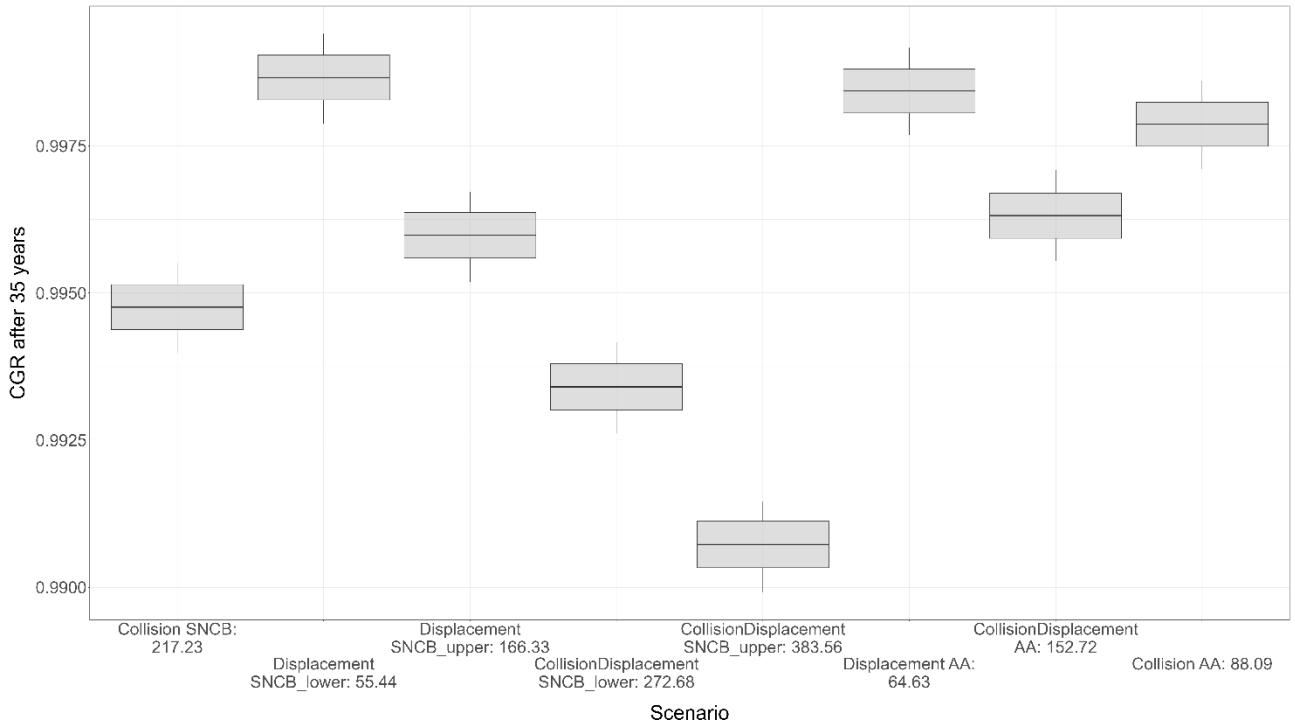

Figure A. 53: Counterfactual of Growth Rates after 35 years for the kittiwake population at the East Caithness Cliffs Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

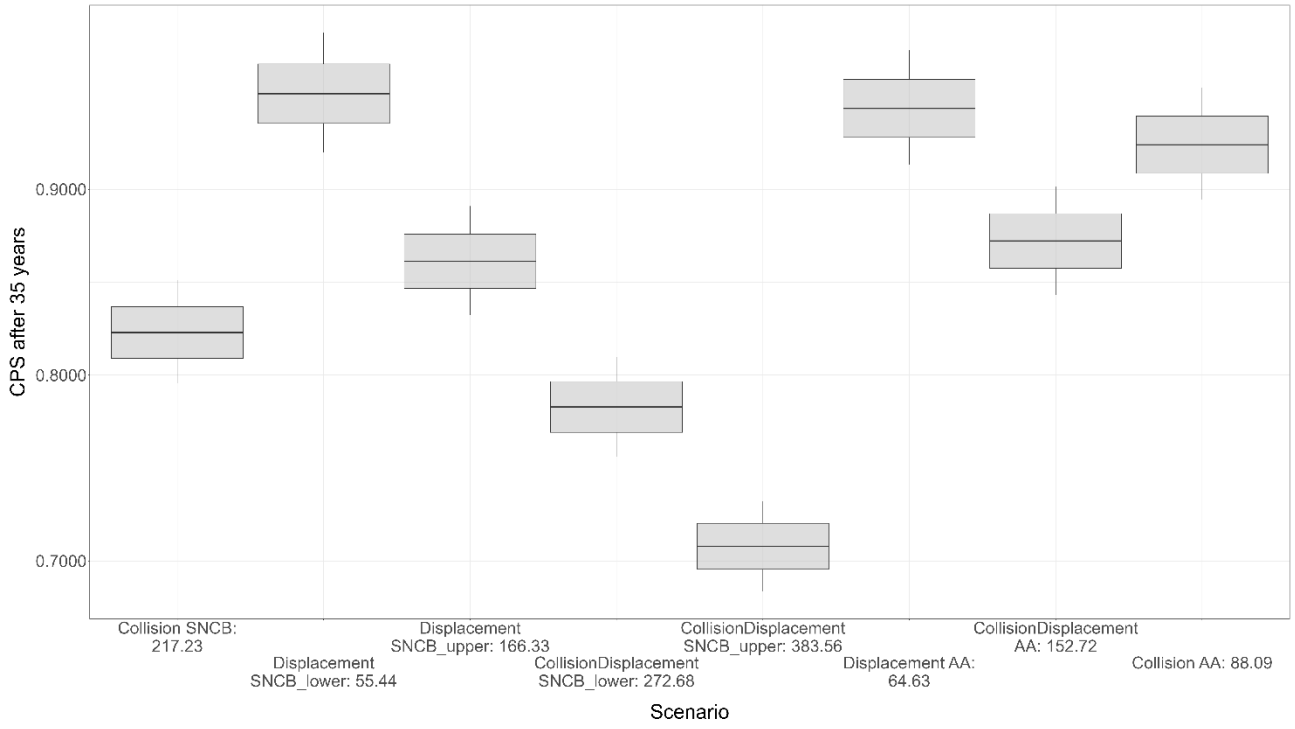

Figure A. 54: Counterfactual of Population Size after 35 years for the kittiwake population at the East Caithness Cliffs Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

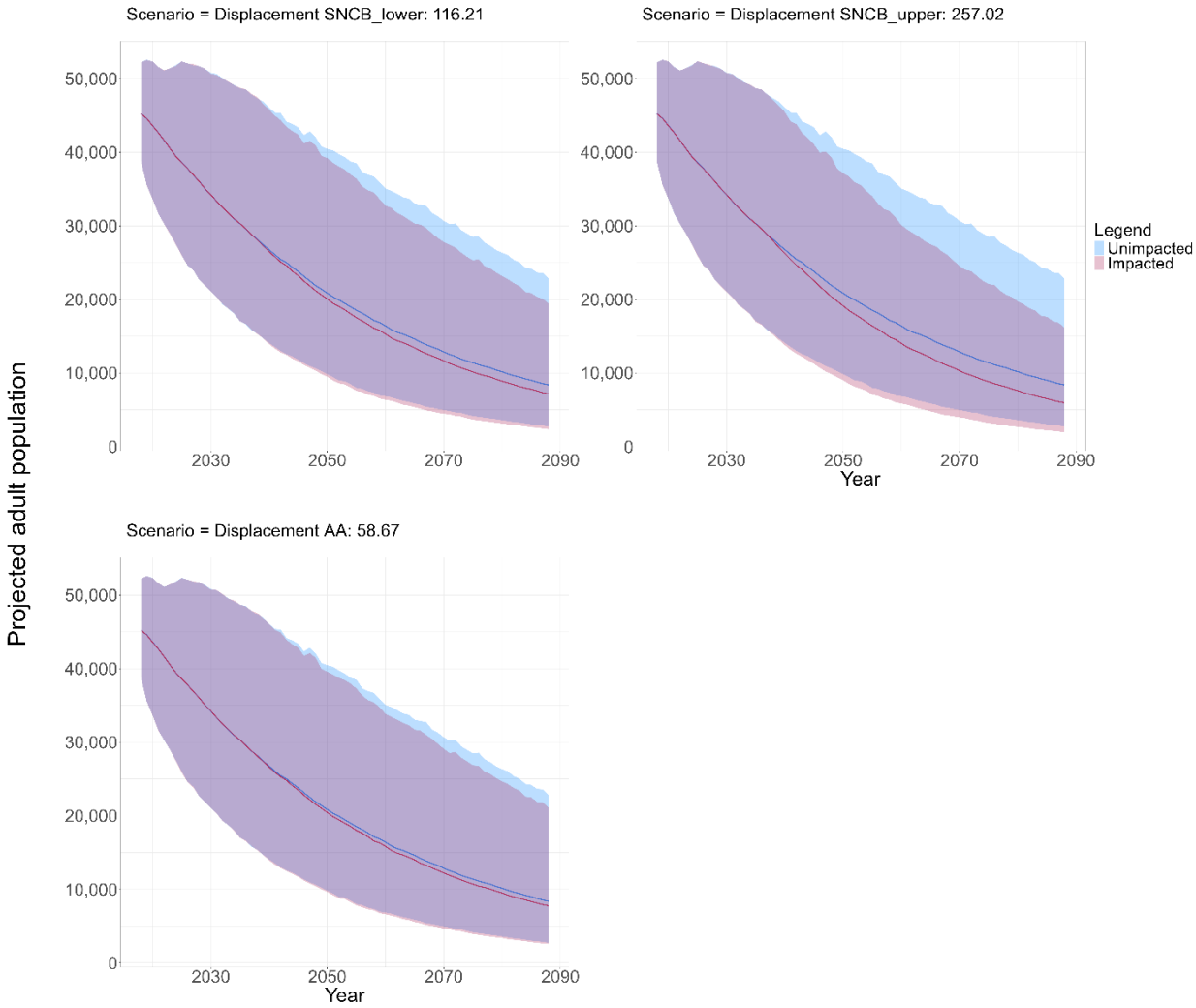

Figure A. 55: Razorbill population projection over 35 years at the East Caithness Cliffs Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

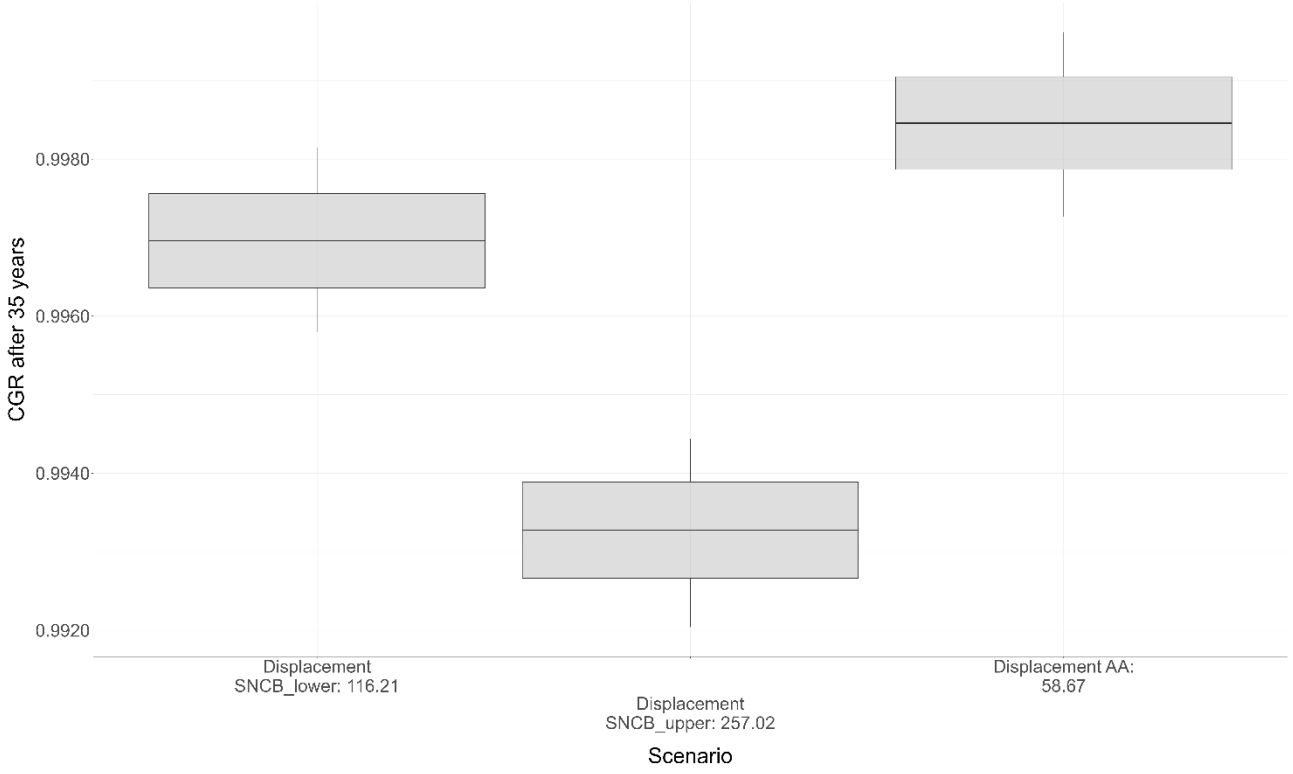

Figure A. 56: Counterfactual of Growth Rates after 35 Years for the Razorbill Population at the East Caithness Cliffs Special Protection Area from in-combination impacts. Bold Bar is Median; Box Defines +/- 1SD; Whiskers Define Upper and Lower 95% Confidence Limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

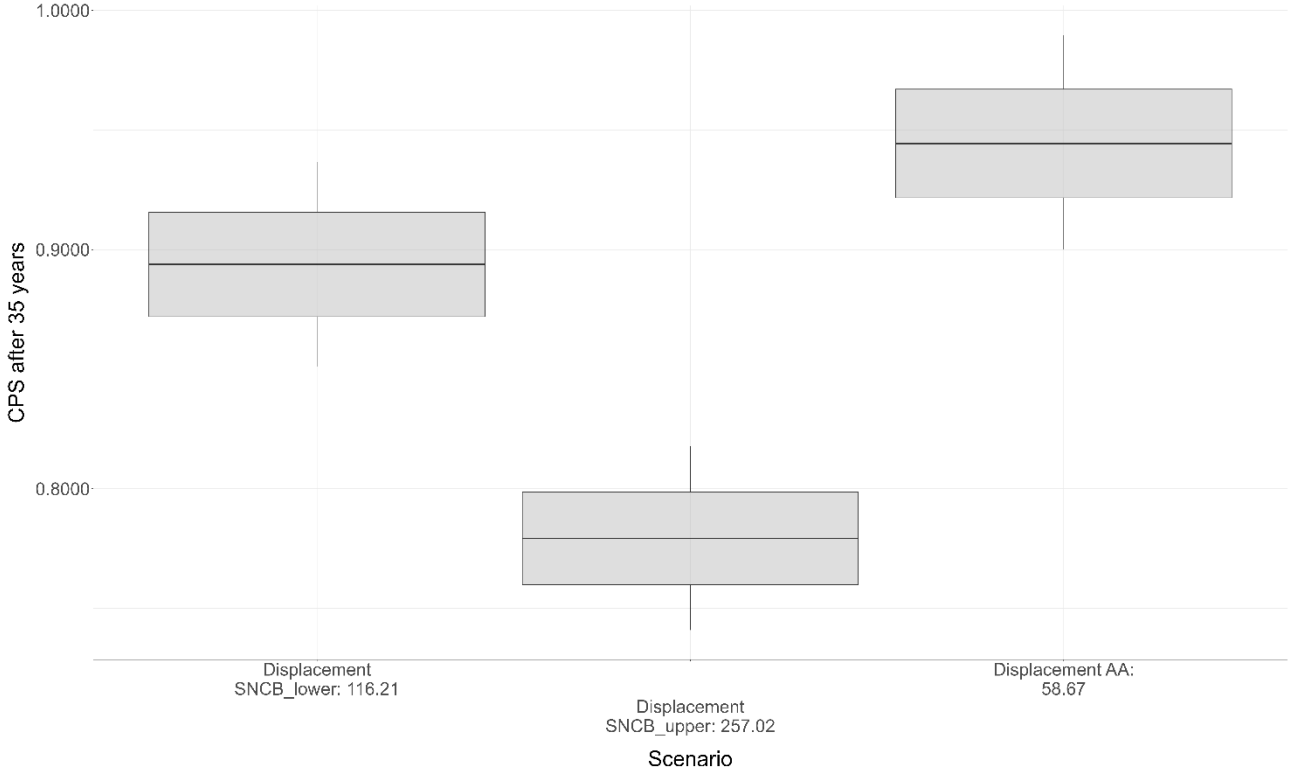

Figure A. 57: Counterfactual of Population Size after 35 years for the razorbill population at the East Caithness Cliffs Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.4 Farne Islands Special Protection Area

Puffin

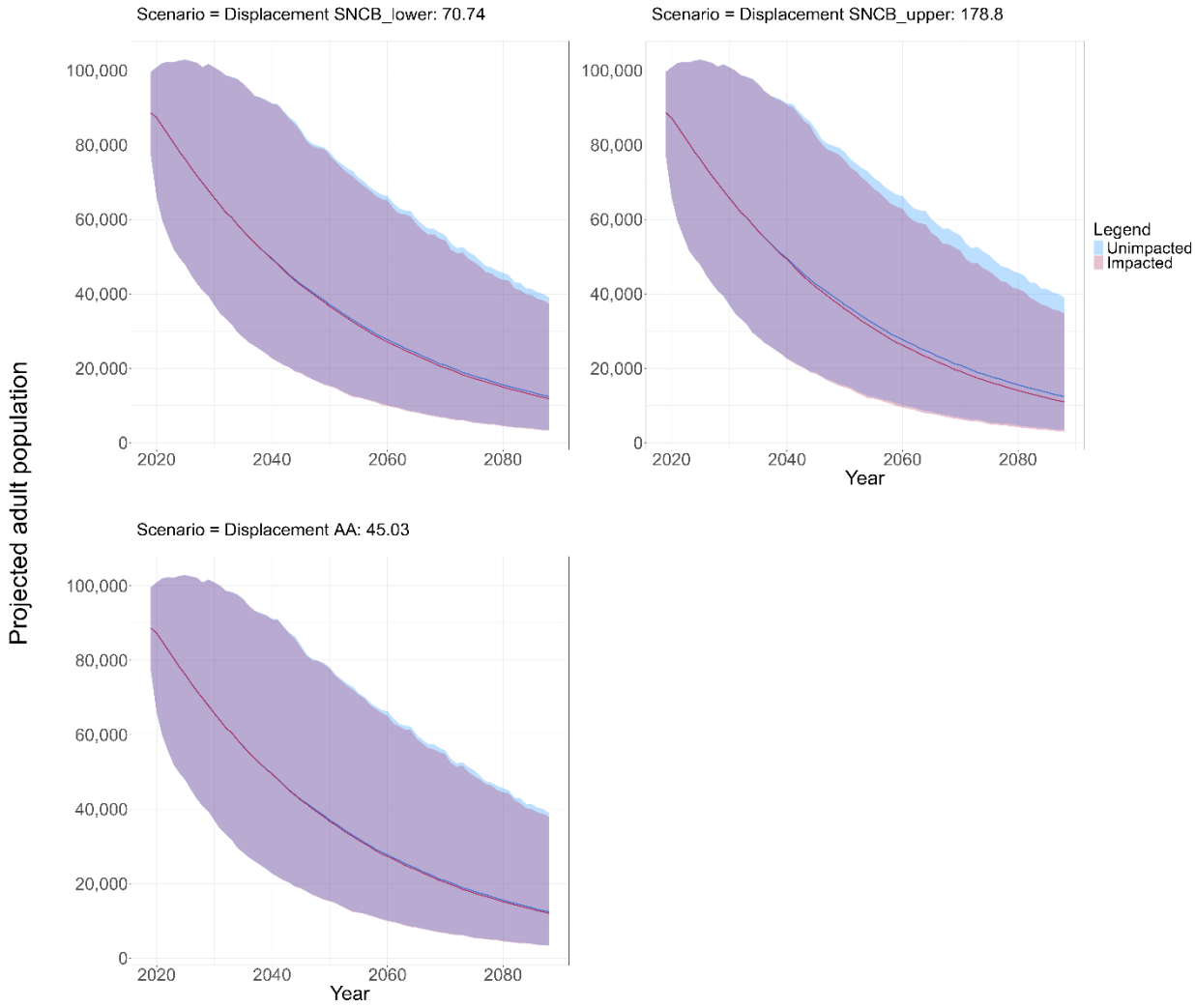

Figure A. 58: Puffin population projection over 35 years at the Farne Islands Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

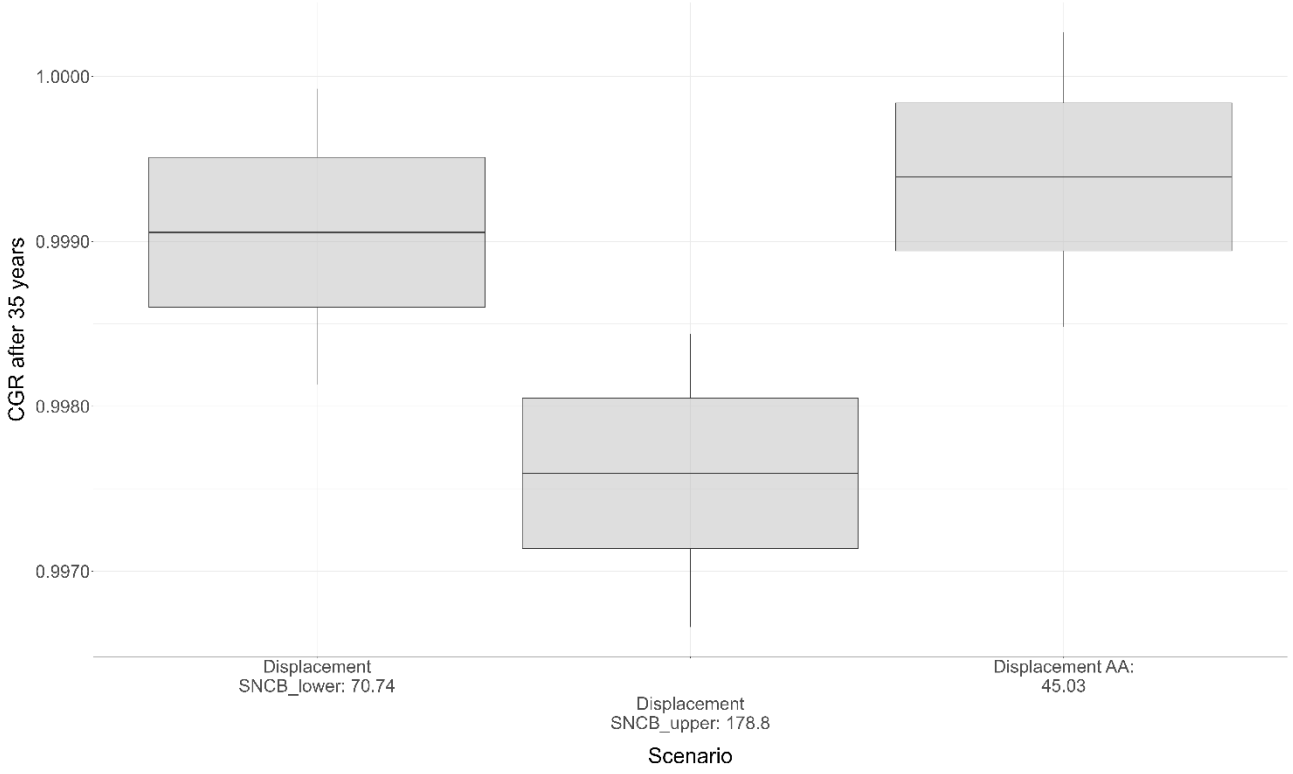

Figure A. 59: Counterfactual of Growth Rates after 35 Years for the puffin Population at the Farne Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

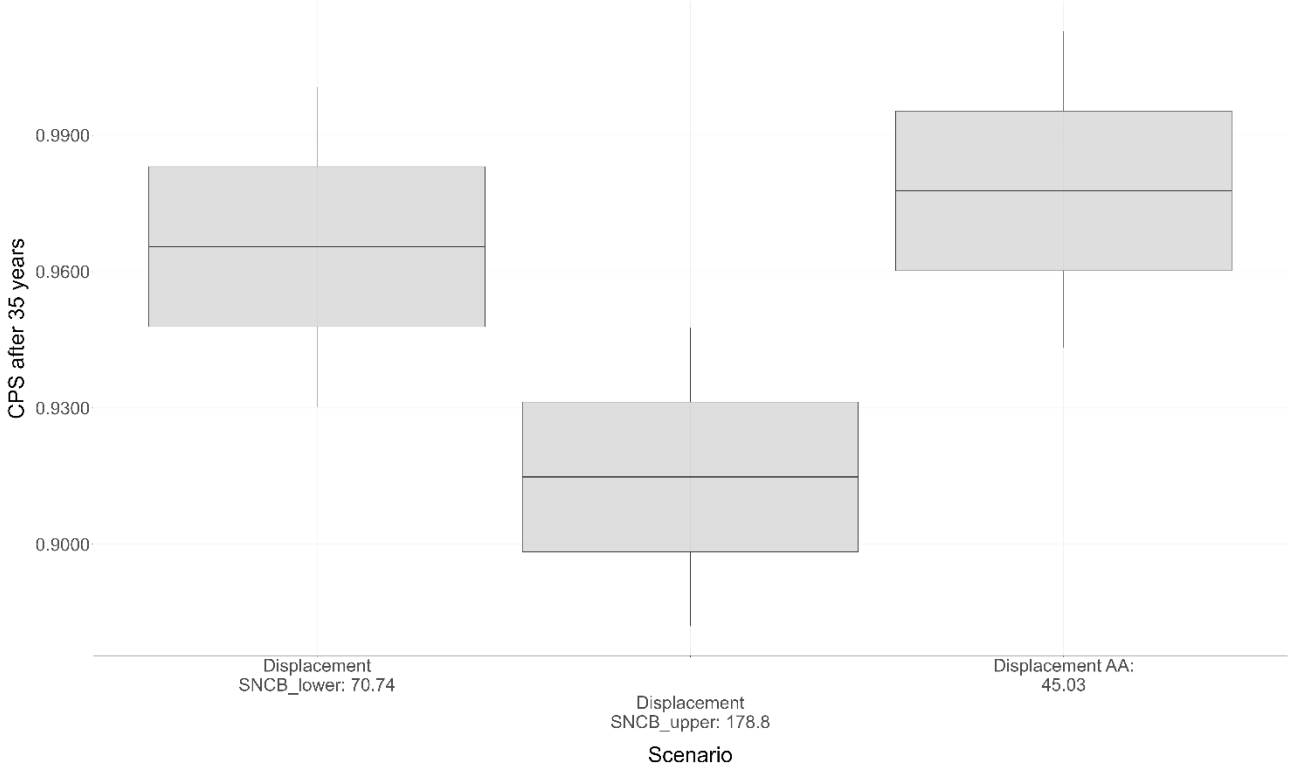

Figure A. 60: Counterfactual of Population Size after 35 years for the puffin population at the Farne Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.5 Flamborough and Filey Coast Special Protection Area

Kittiwake

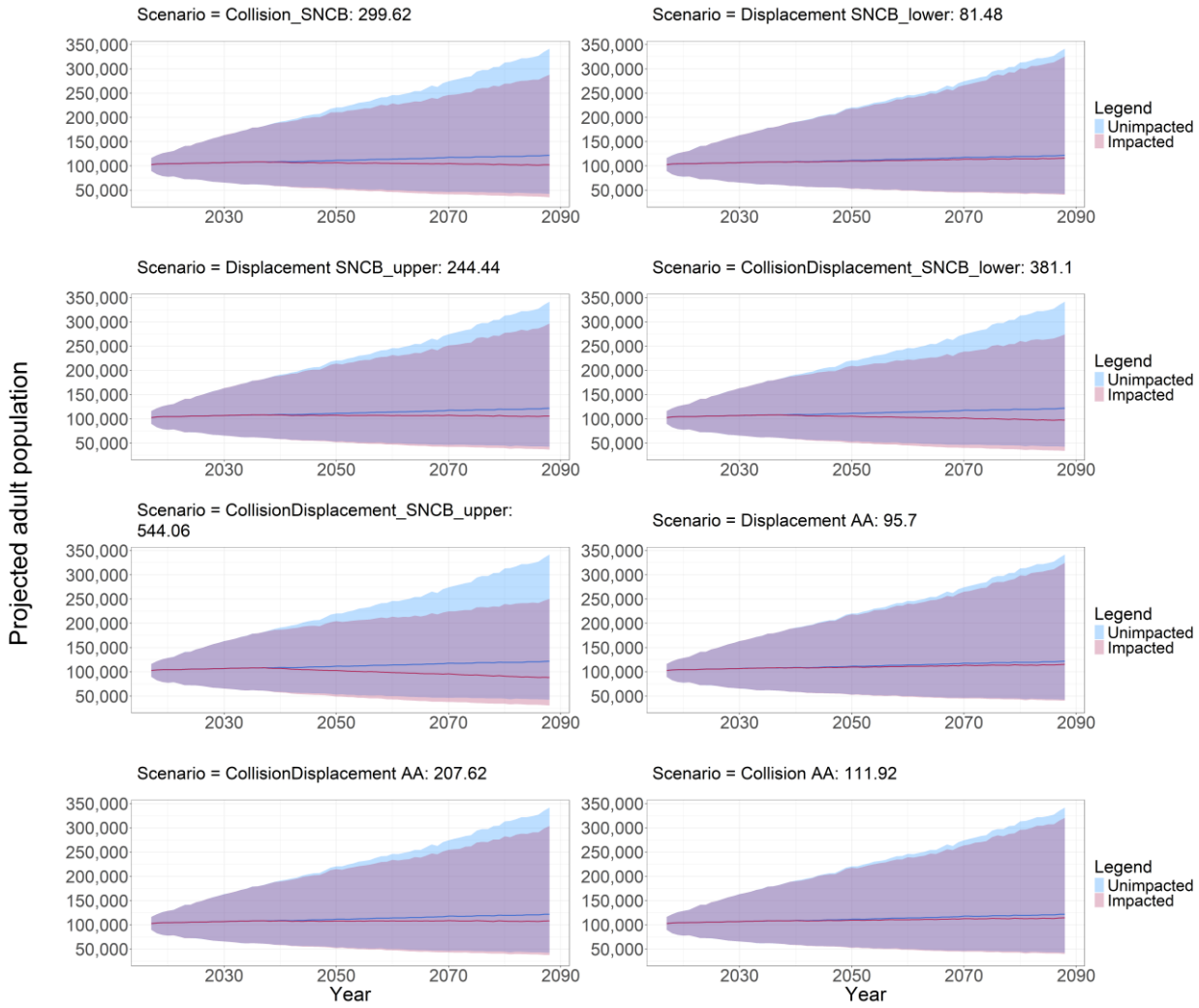

Figure A. 61: Kittiwake population projection over 35 years at the Flamborough and Filey Coast Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

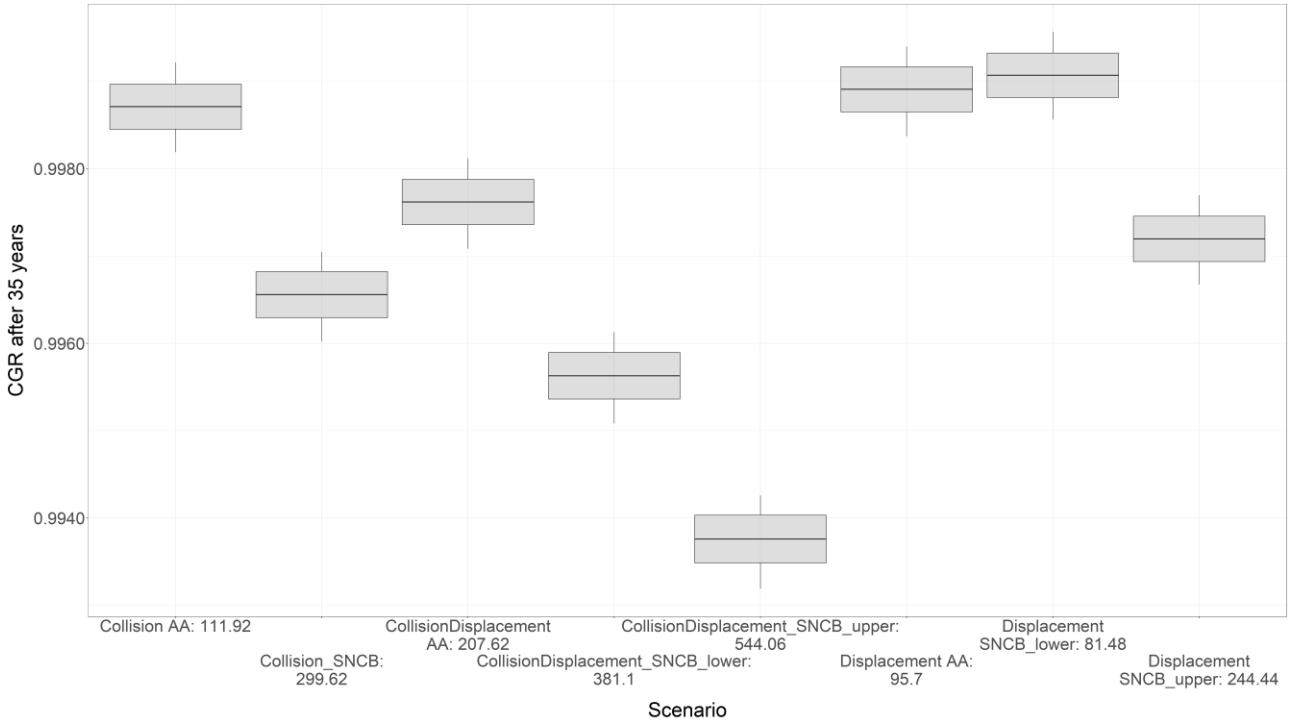

Figure A. 62: Counterfactual of Growth Rates after 35 years for the kittiwake population at the Flamborough and Filey Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

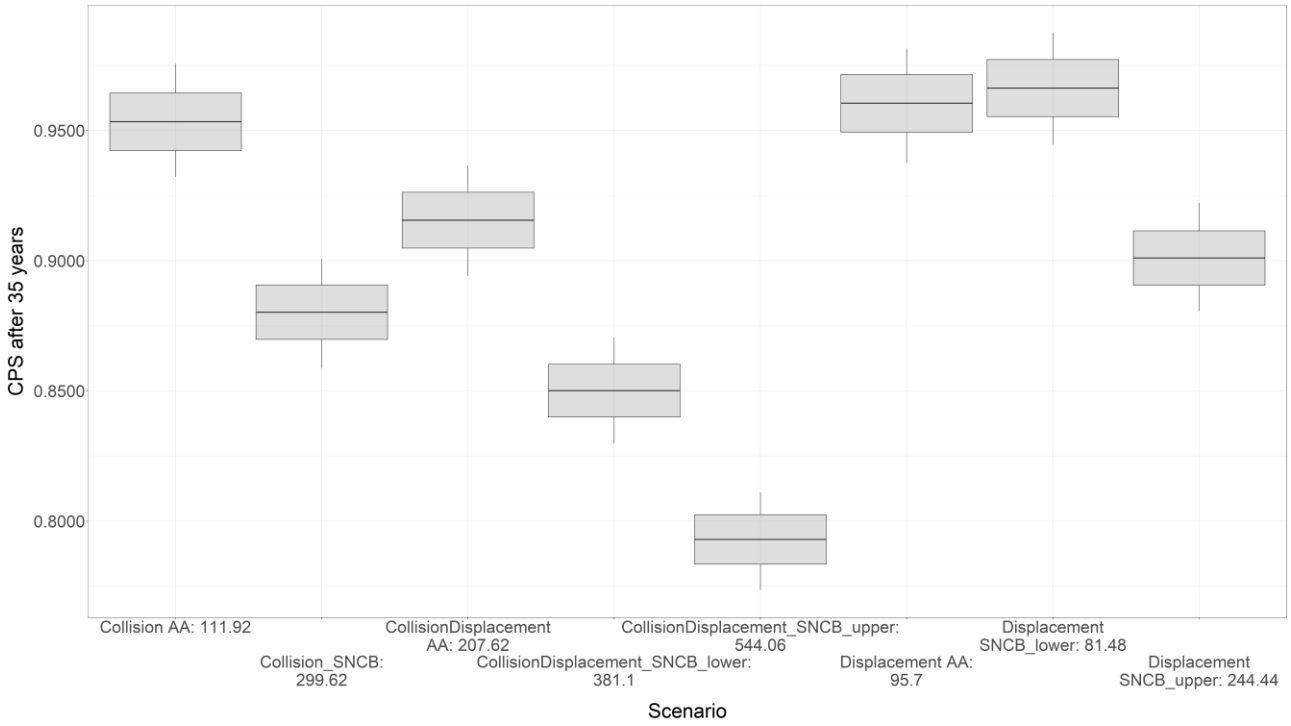

Figure A. 63: Counterfactual of Population Size after 35 years for the kittiwake population at the Flamborough and Filey Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

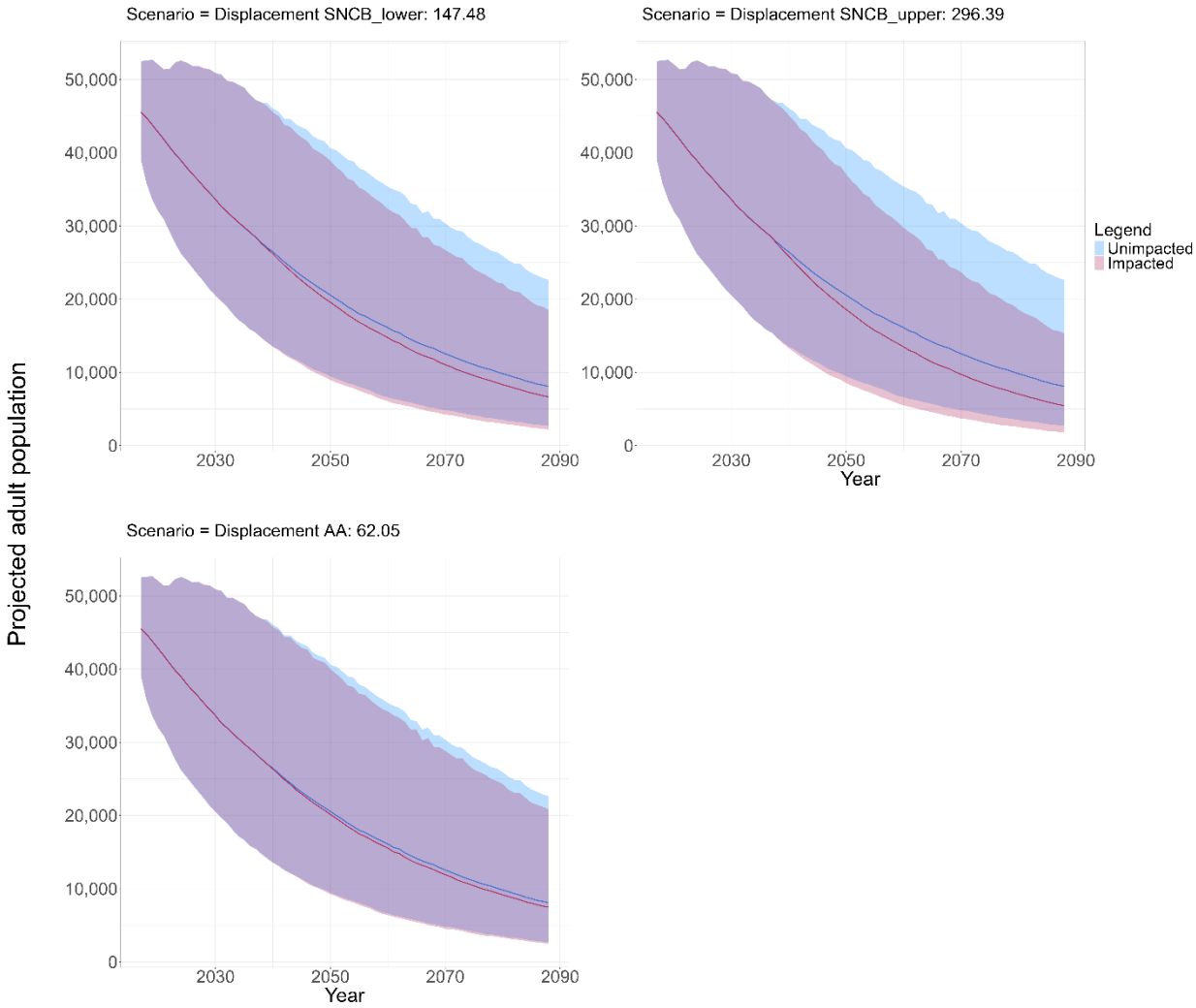

Figure A. 64: Razorbill population projection over 35 years at the Flamborough and Filey Coast Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

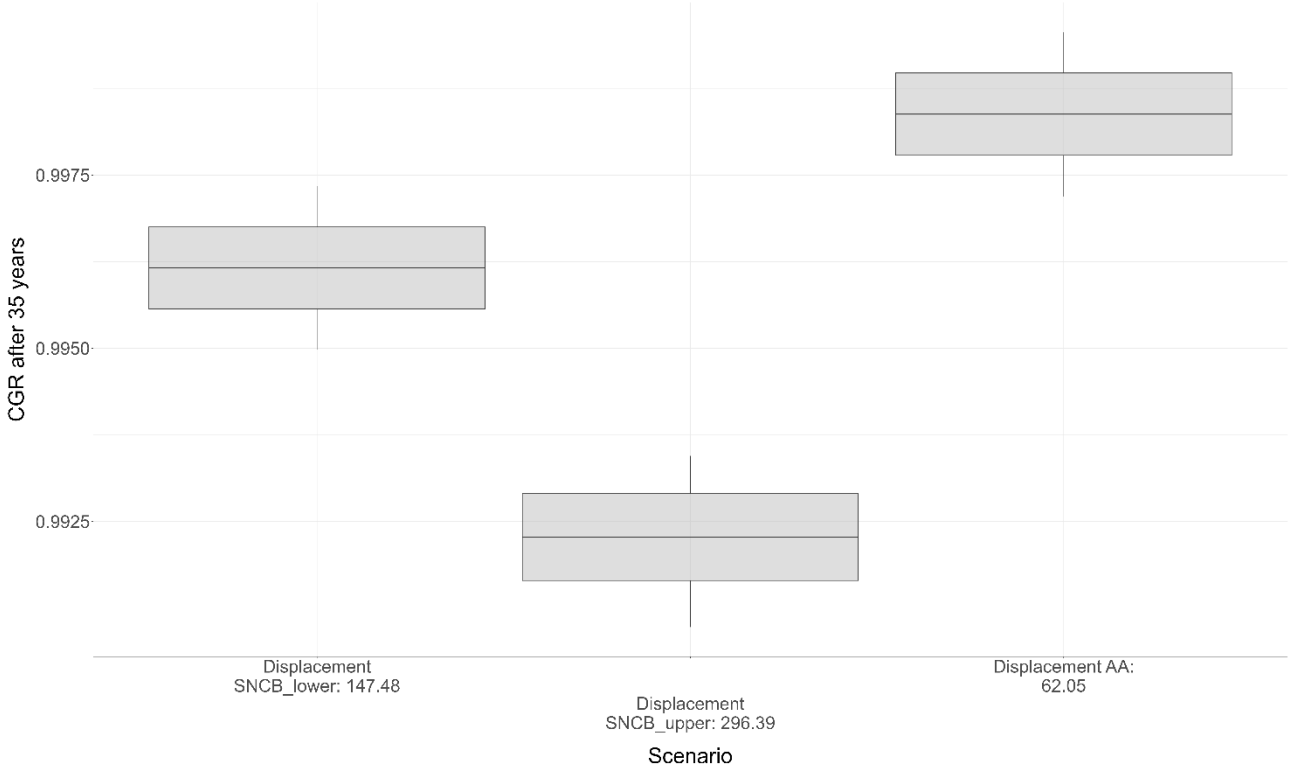

Figure A. 65: Counterfactual of Growth Rates after 35 years for the razorbill population at the Flamborough and Filey Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

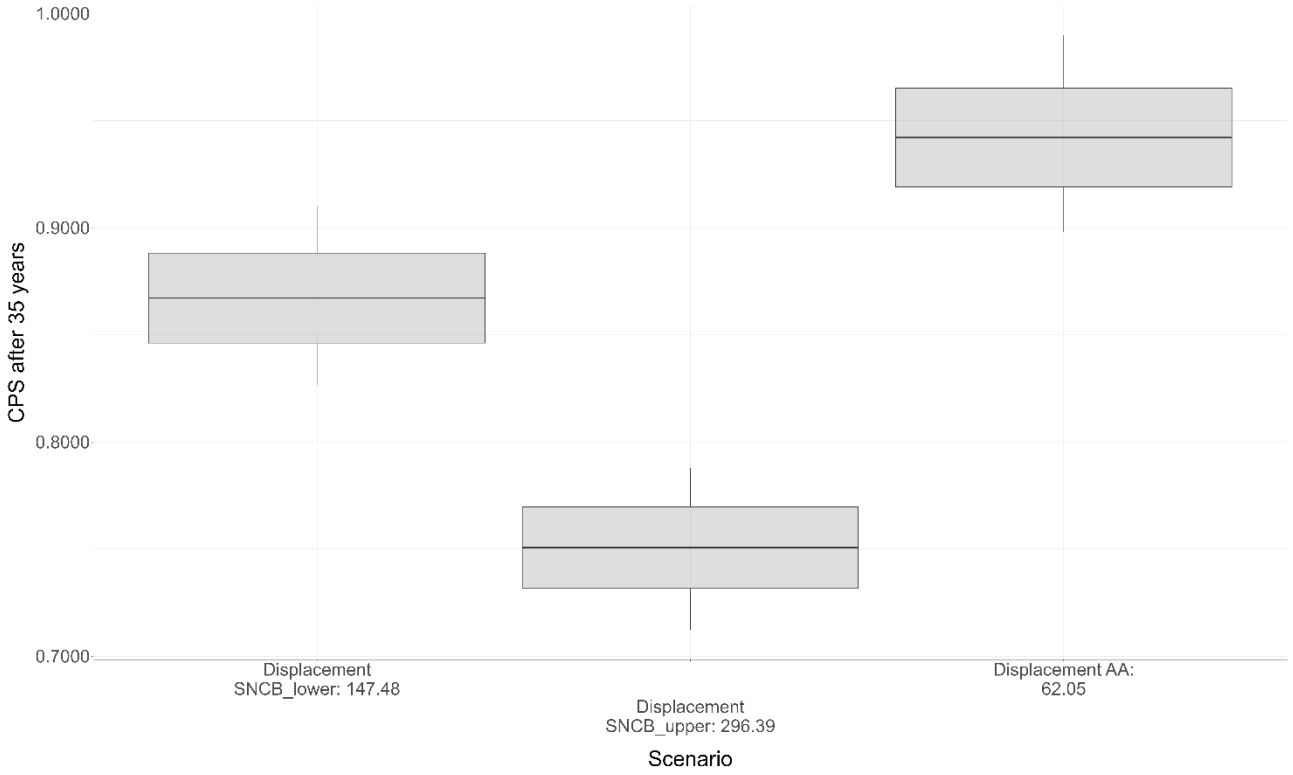

Figure A. 66: Counterfactual of Population Size after 35 years for the razorbill population at the Flamborough and Filey Coast Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.6 Forth Islands Special Protection Area

Guillemot

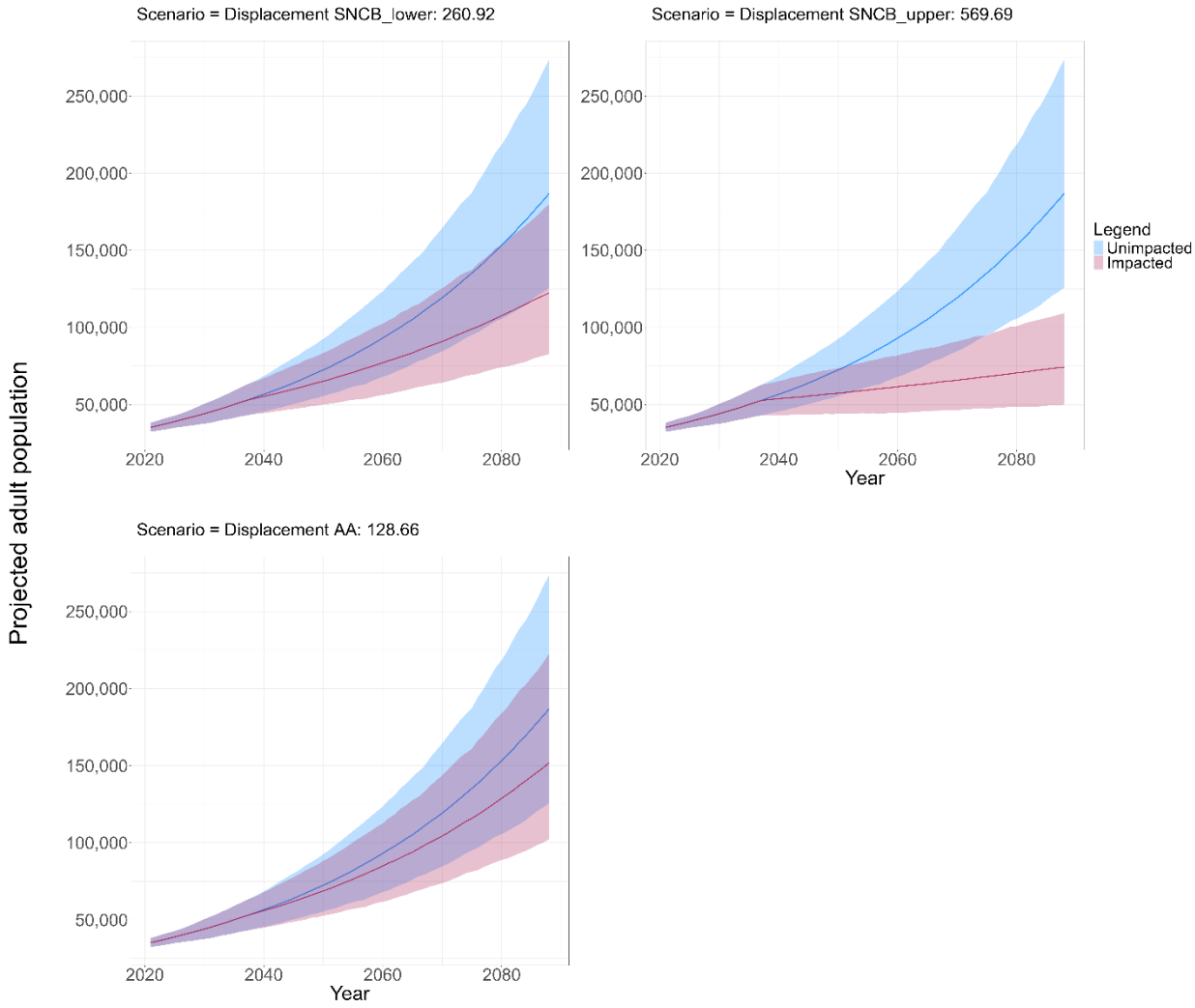

Figure A. 67: Guillemot population projection over 35 years at the Forth Islands Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

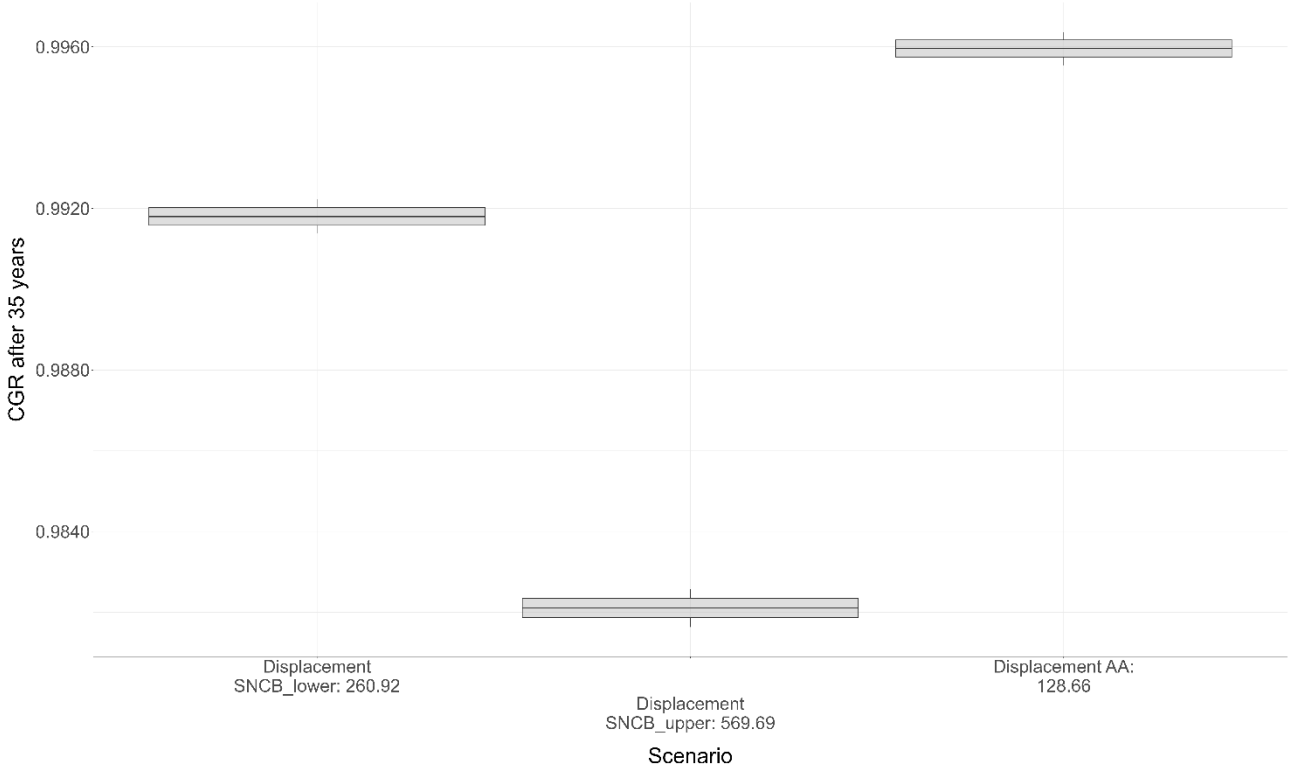

Figure A. 68: Counterfactual of Growth Rates after 35 years for the guillemot population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

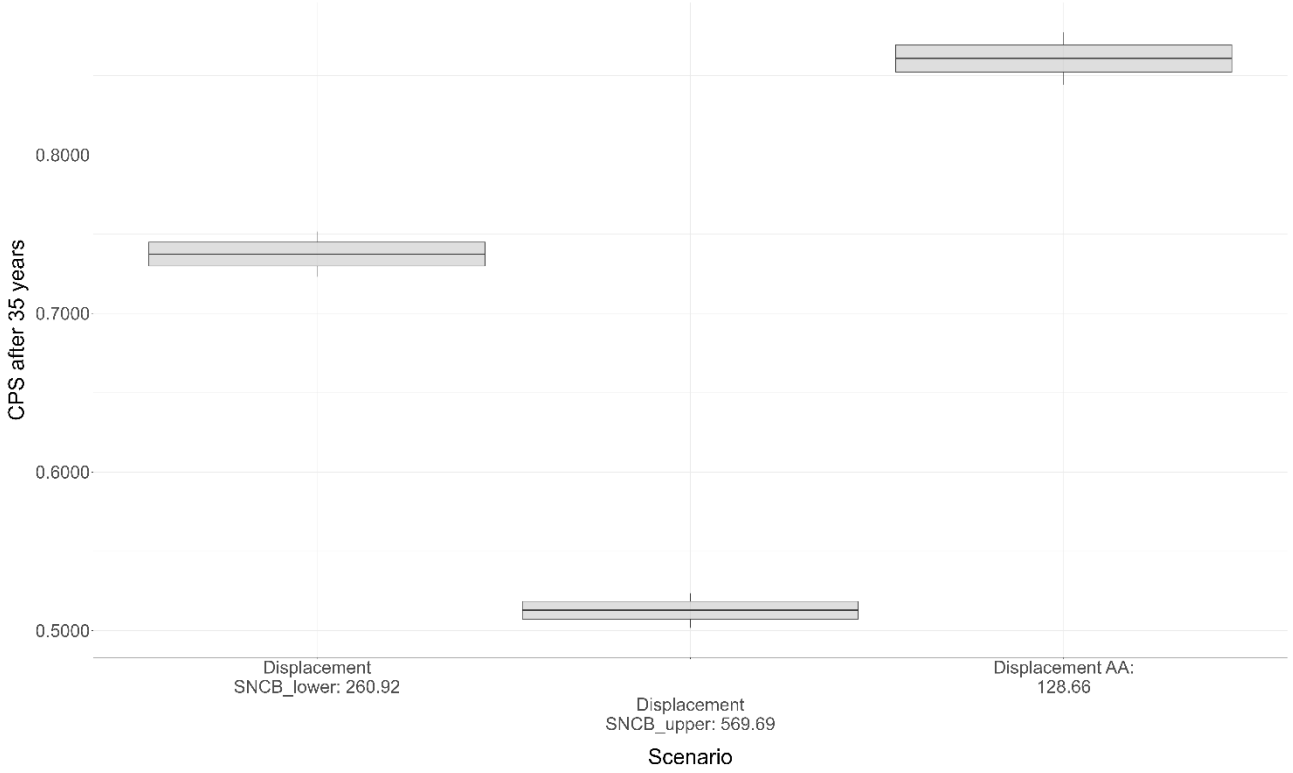

Figure A. 69: Counterfactual of Population Size after 35 years for the guillemot population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

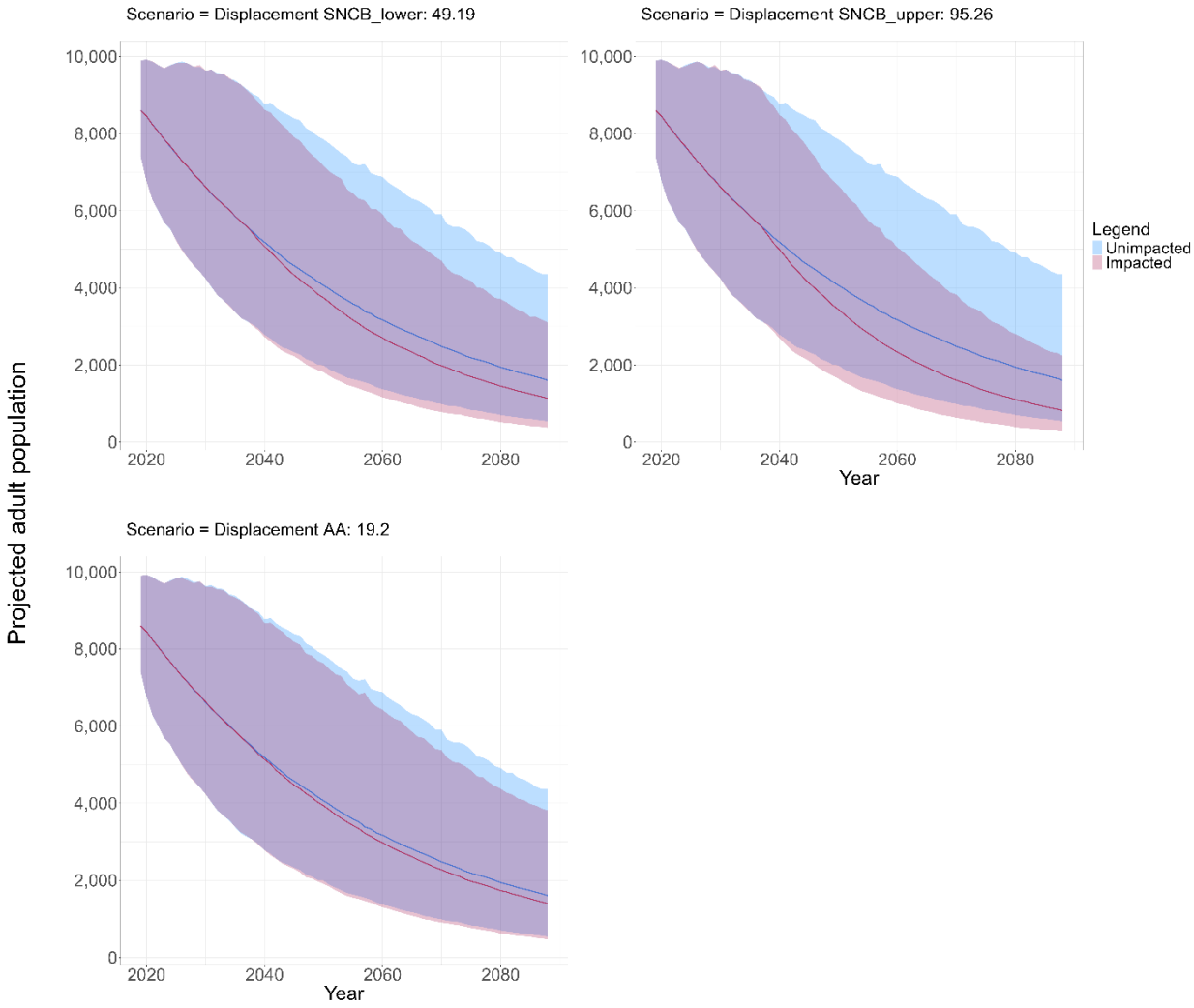

Figure A. 70: Razorbill population projection over 35 years at the Forth Islands Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

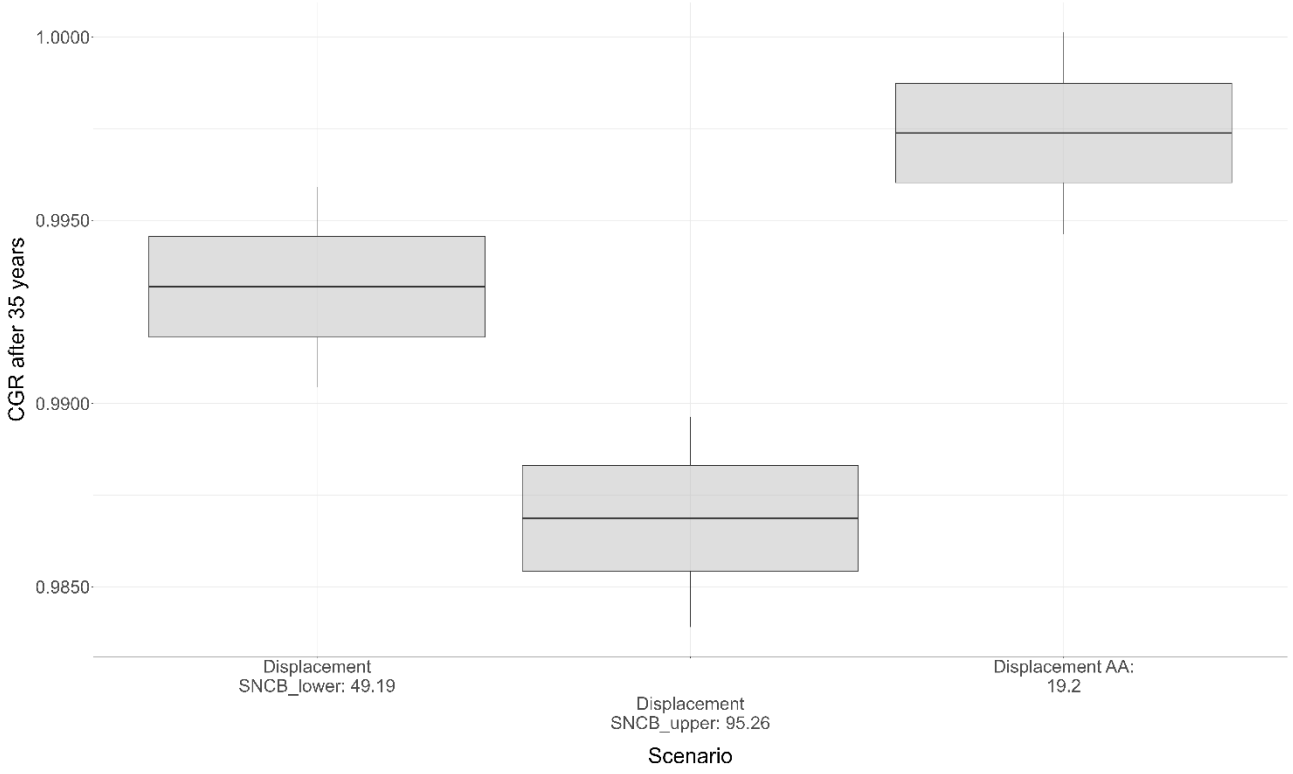

Figure A. 71: Counterfactual of Growth Rates after 35 years for the razorbill population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

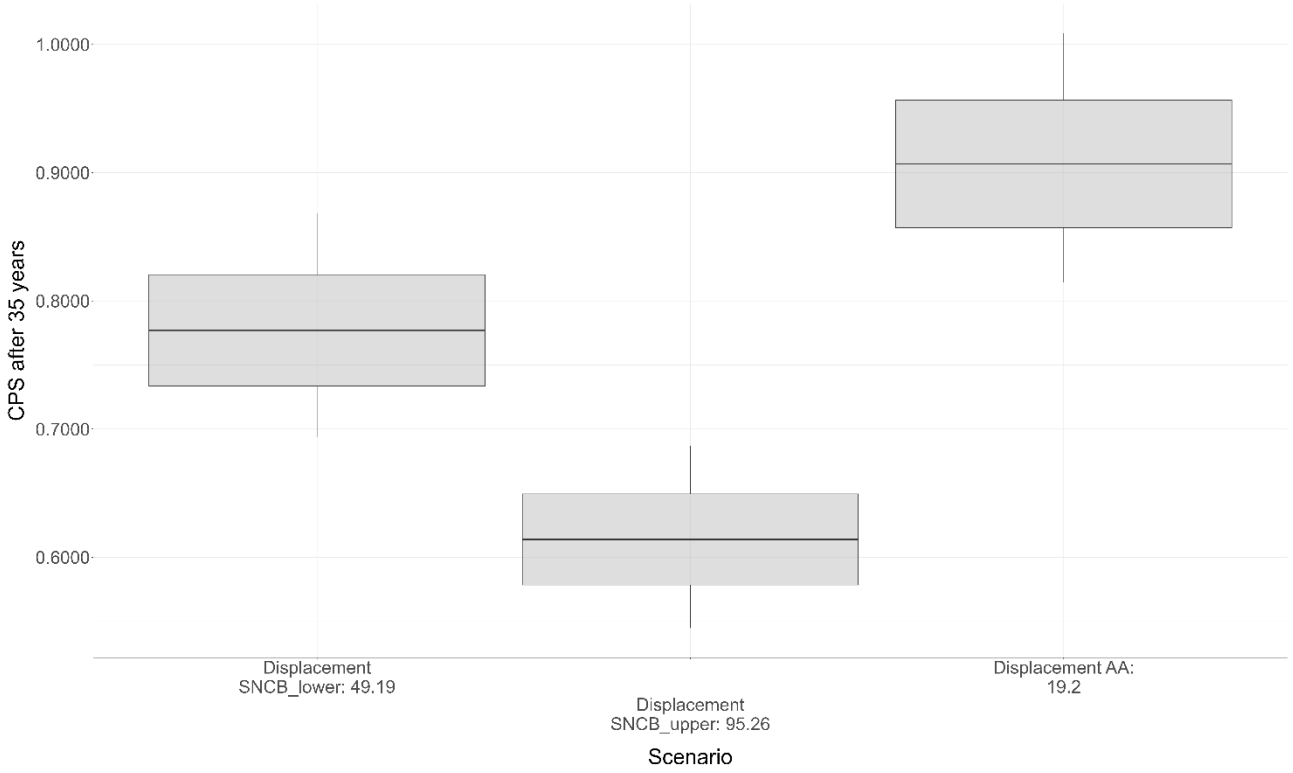

Figure A. 72: Counterfactual of Population Size after 35 years for the razorbill population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Puffin

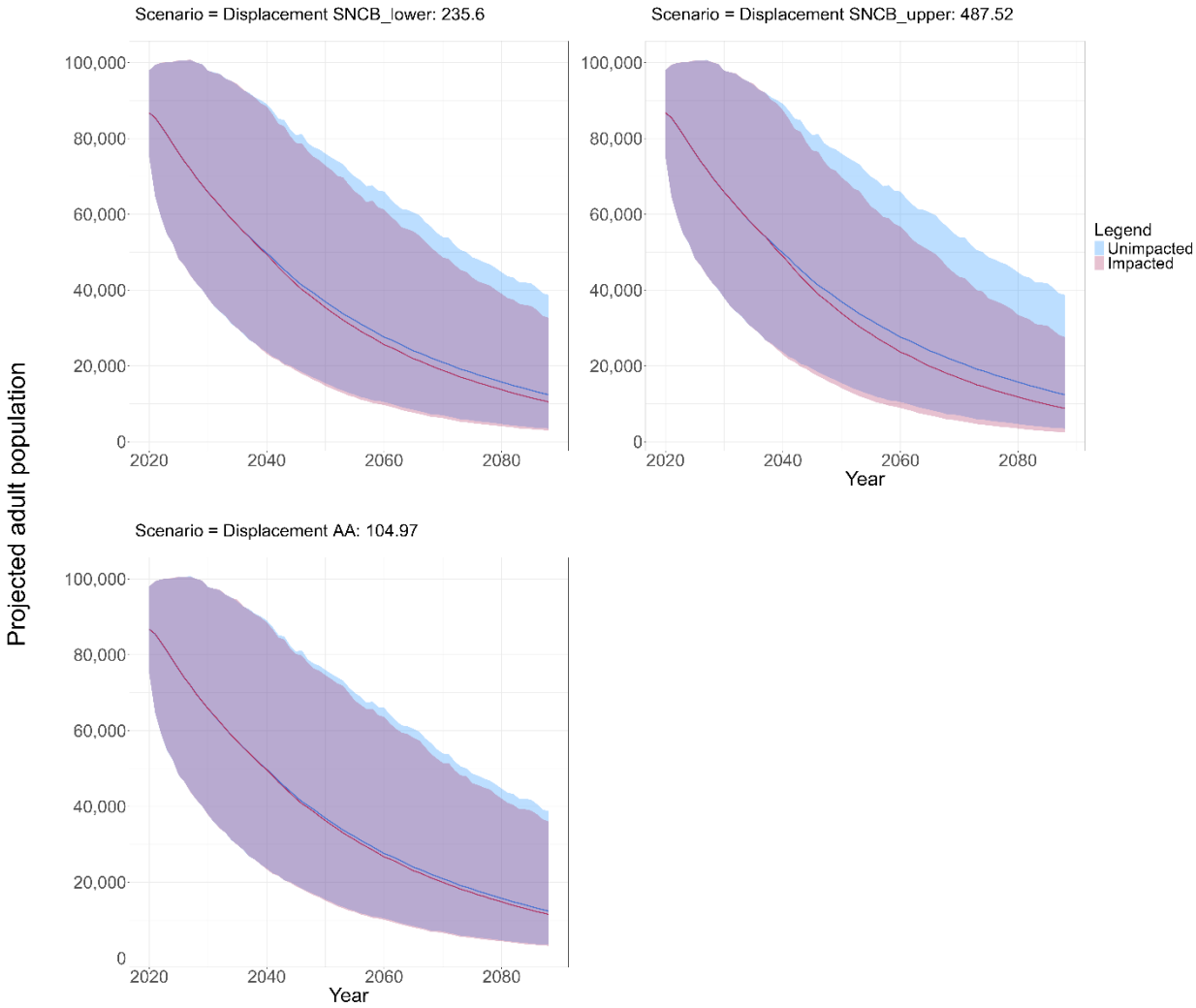

Figure A. 73: Puffin population projection over 35 years at the Forth Islands Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

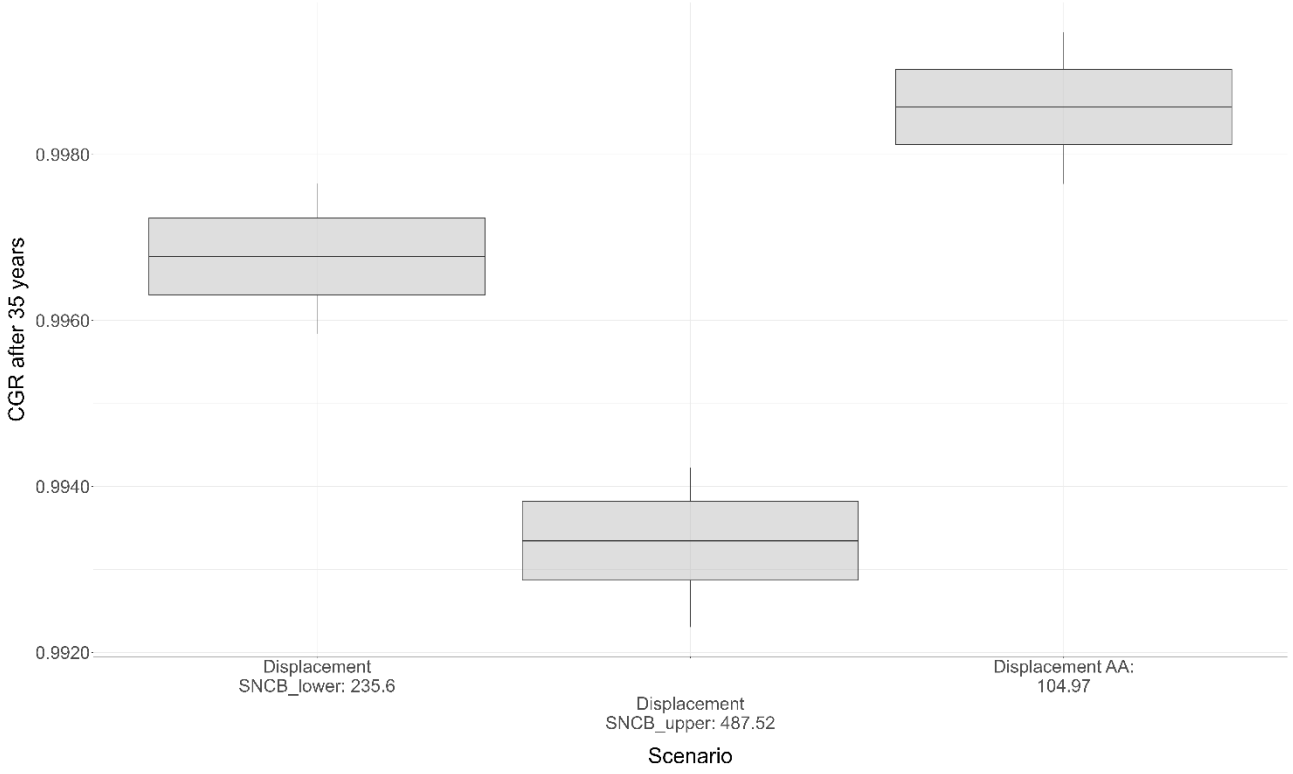

Figure A. 74: Counterfactual of Growth Rates after 35 years for the puffin population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

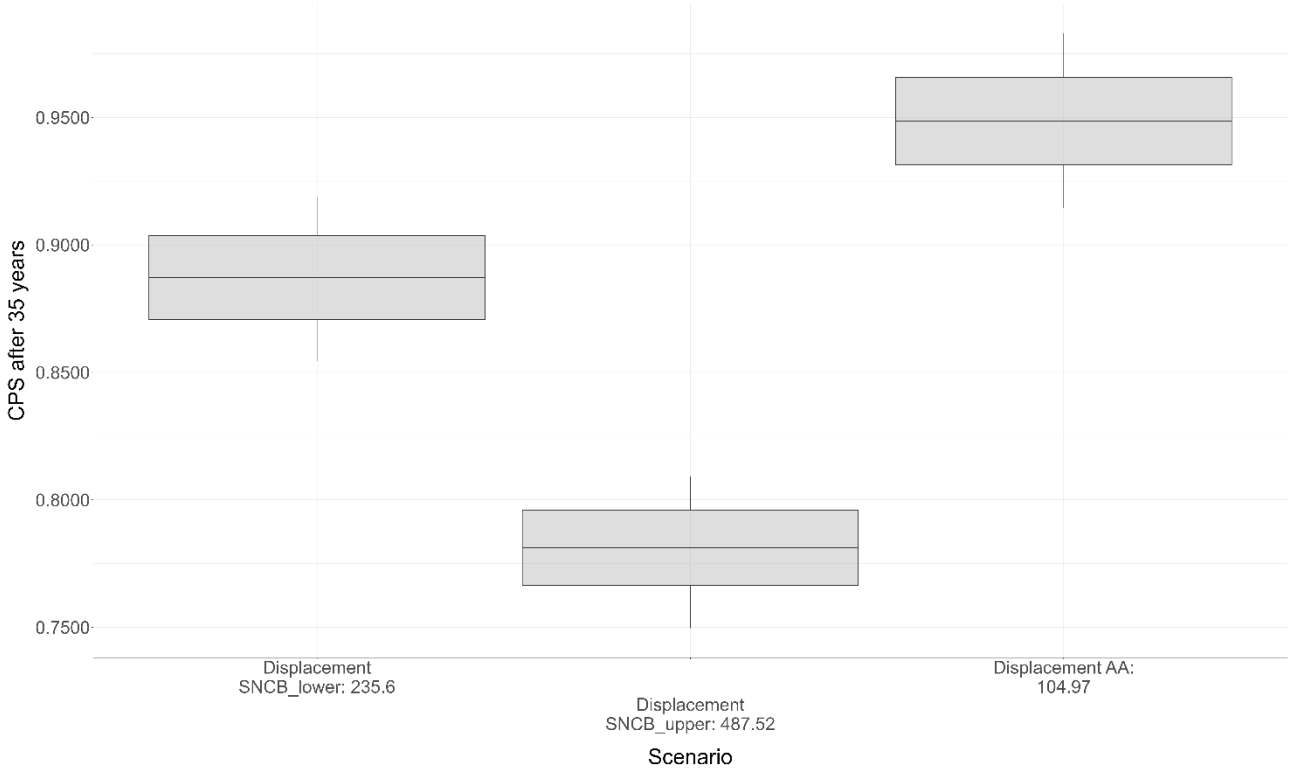

Figure A. 75: Counterfactual of Population Size after 35 years for the puffin population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Gannet

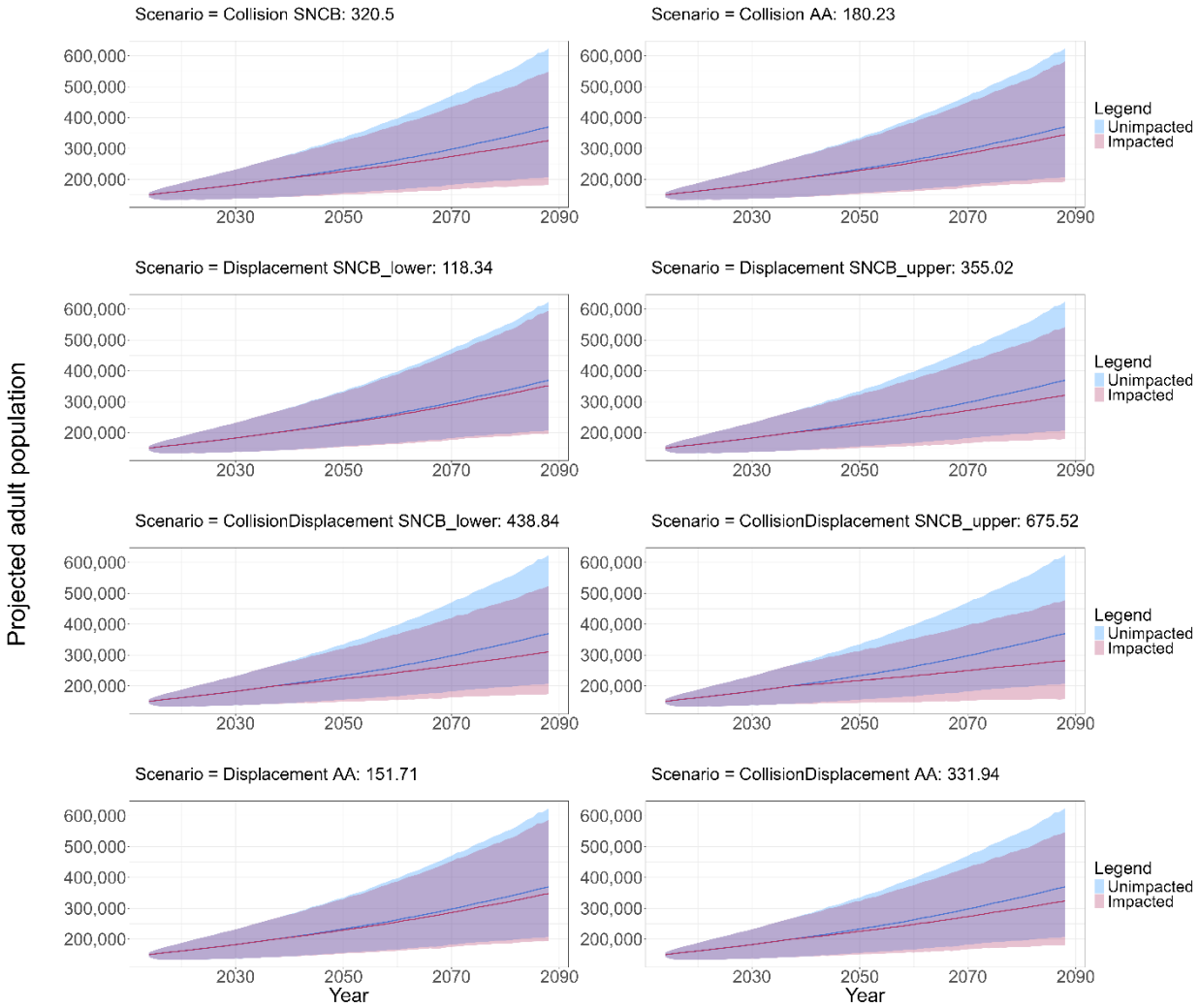

Figure A. 76: Gannet population projection over 35 years at the Forth Islands Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

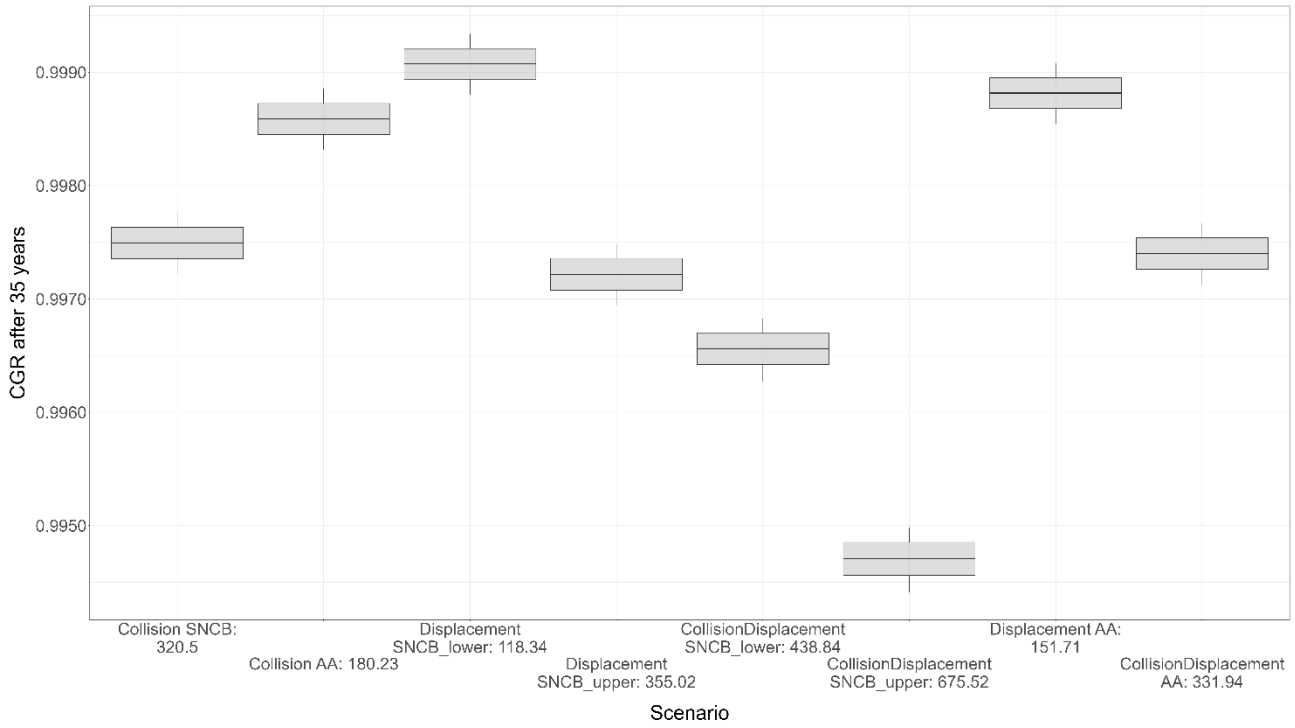

Figure A. 77: Counterfactual of Growth Rates after 35 years for the gannet population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

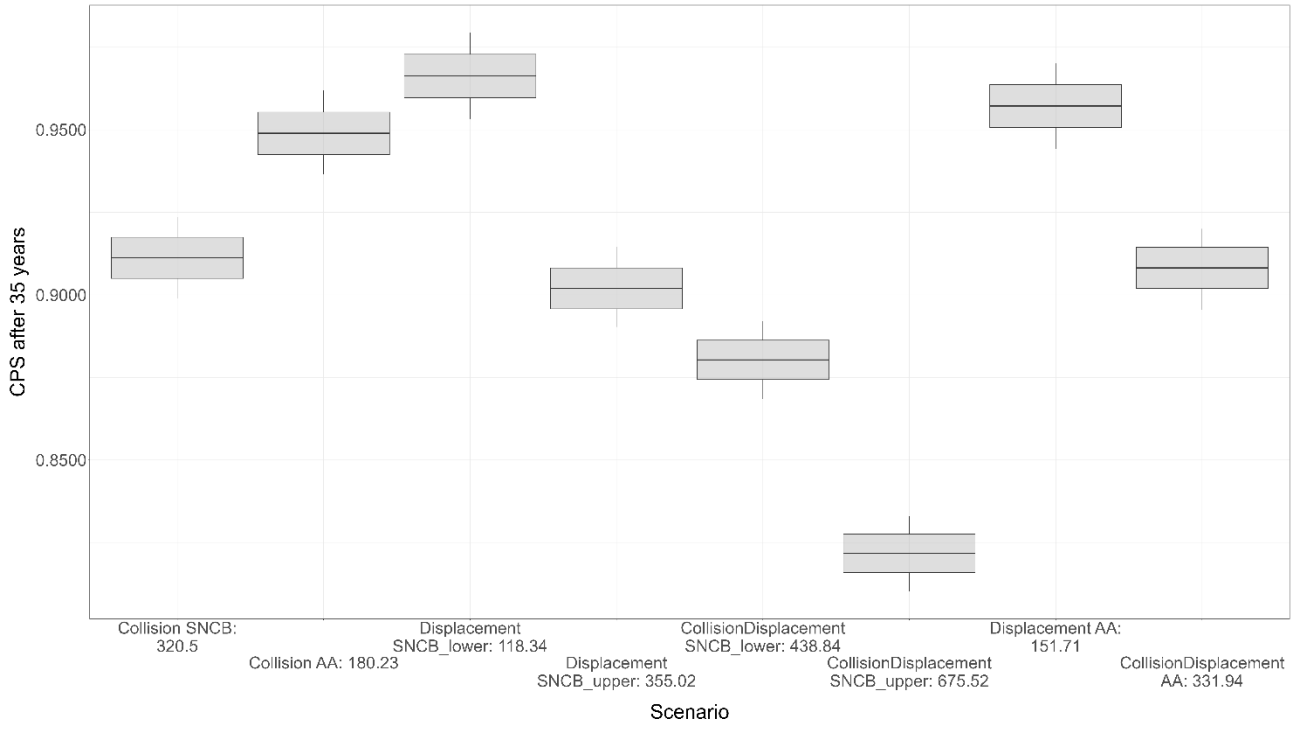

Figure A. 78: Counterfactual of Population Size after 35 years for the gannet population at the Forth Islands Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.7 Foula Special Protection Area

Puffin

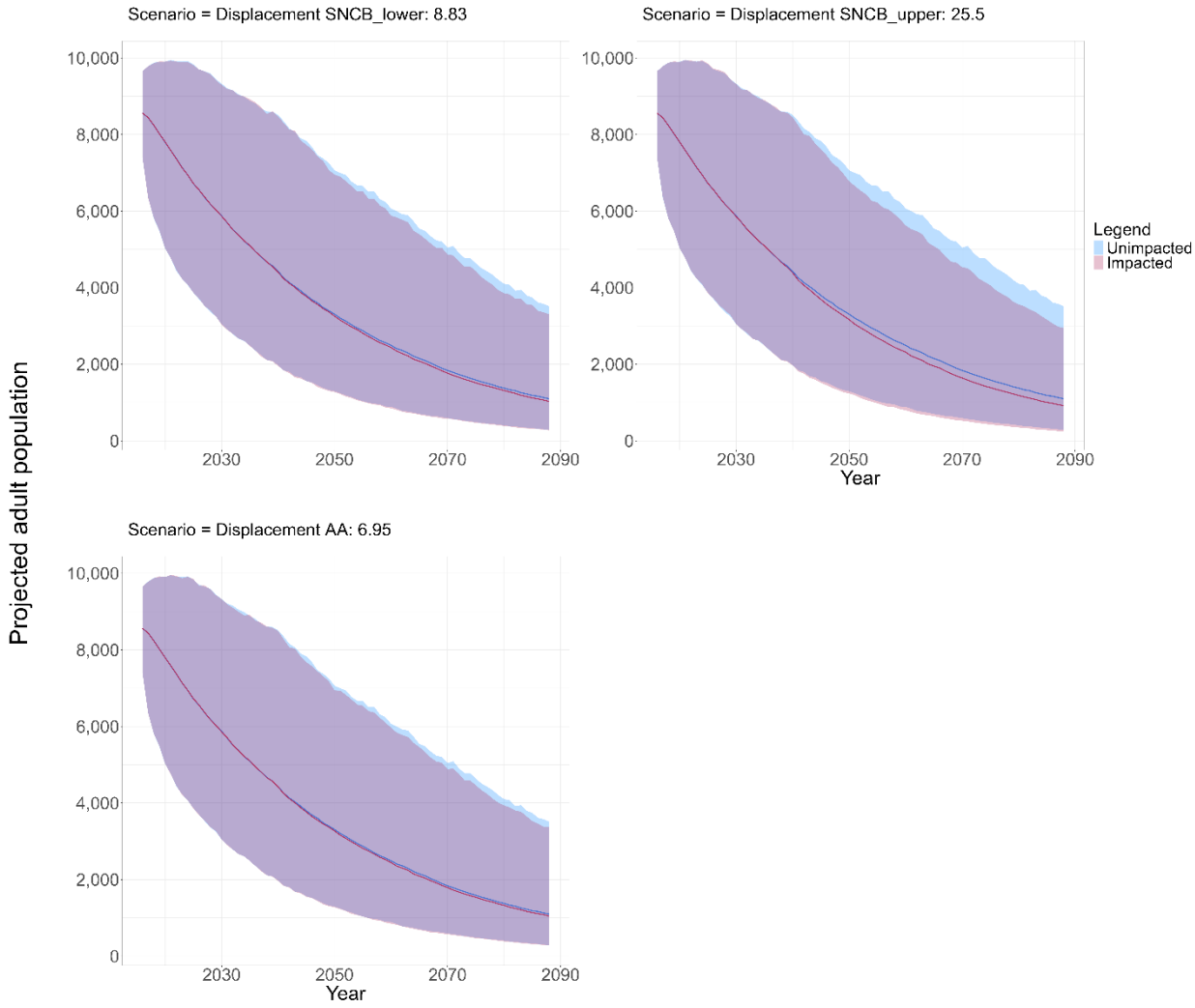

Figure A. 79: Puffin population projection over 35 years at the Foula Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

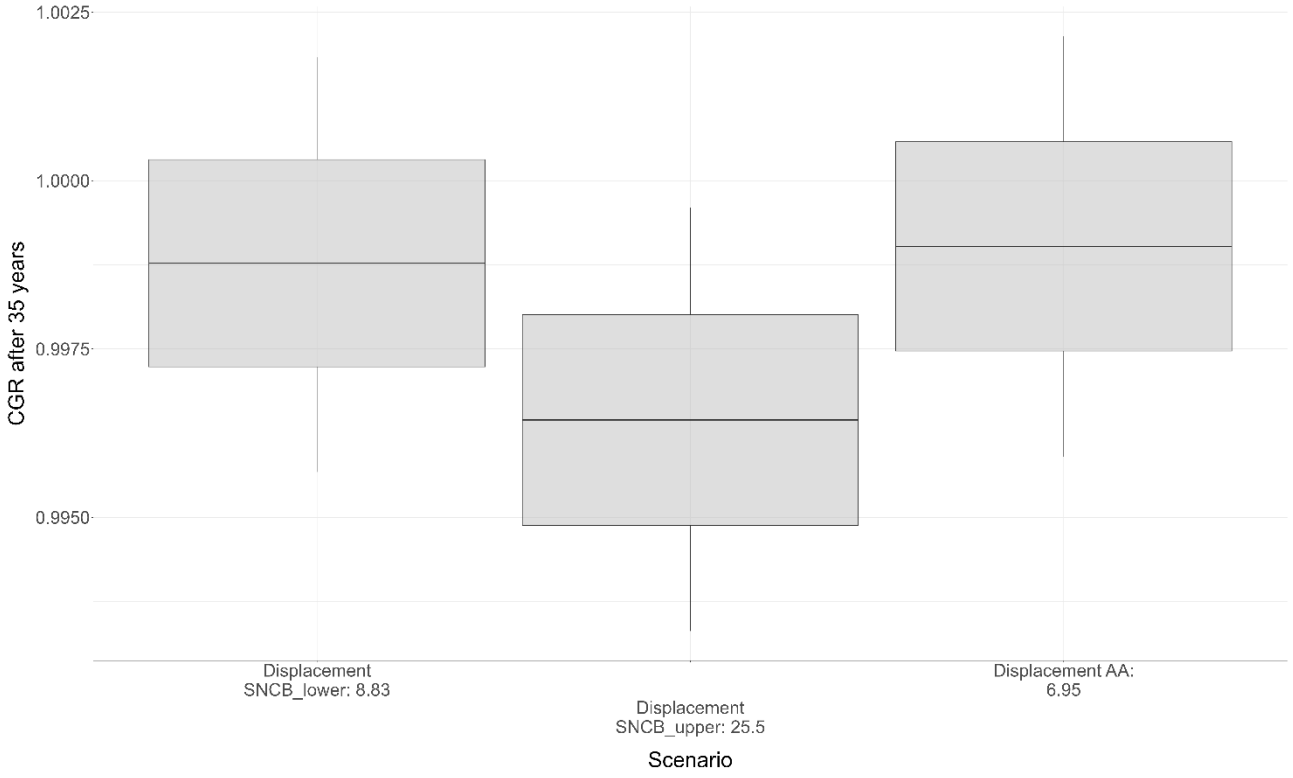

Figure A. 80: Counterfactual of Growth Rates after 35 years for the puffin population at the Foula Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

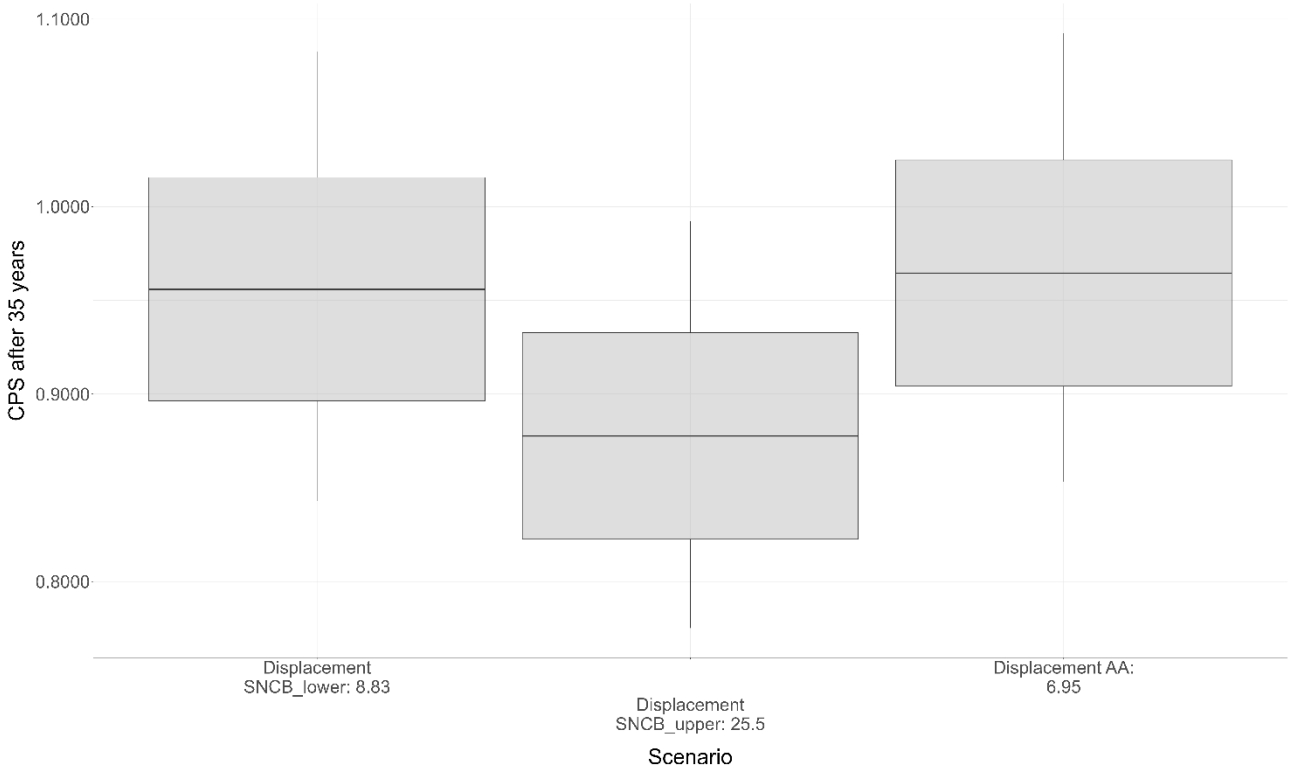

Figure A. 81: Counterfactual of Population Size after 35 years for the puffin population at the Foula Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.8 Fowlsheugh Special Protection Area

Kittiwake

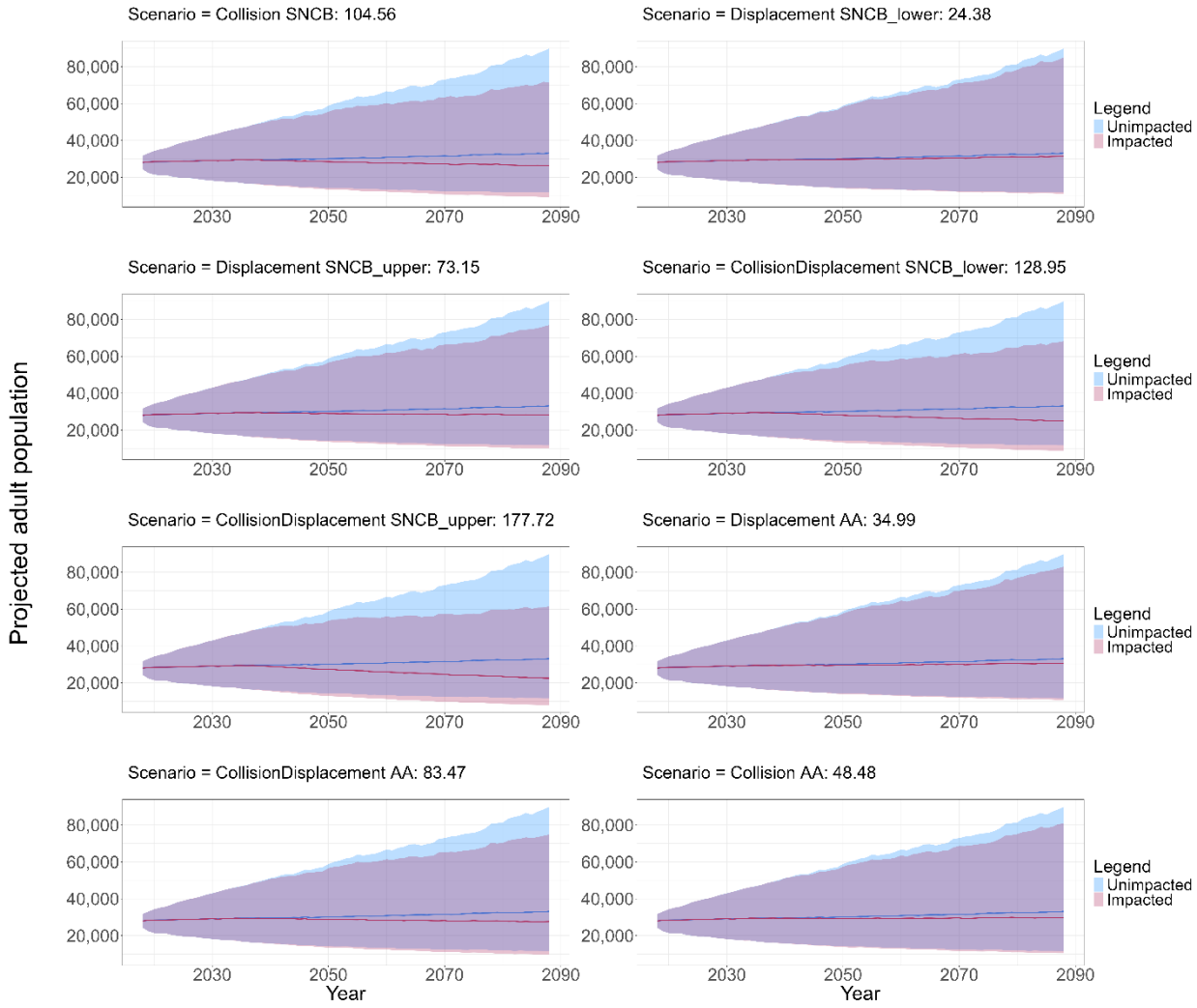

Figure A. 82: Kittiwake population projection over 35 years at the Fowlsheugh Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

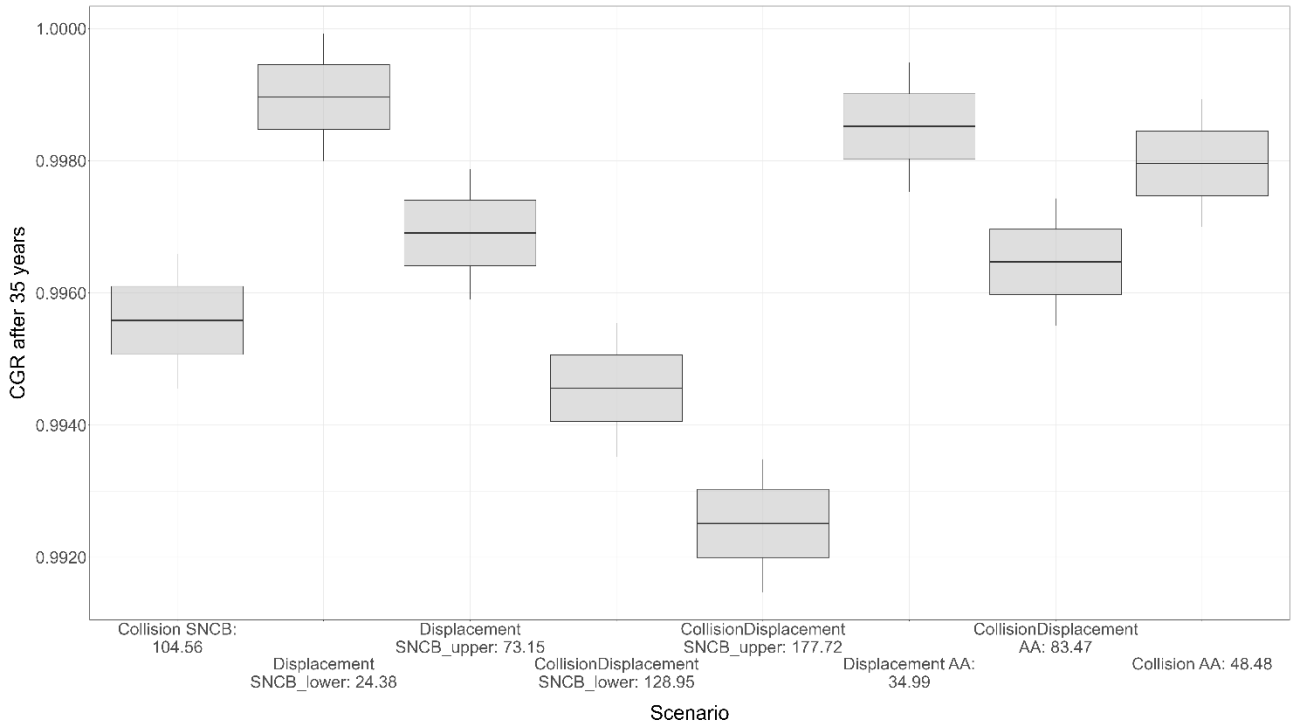

Figure A. 83: Counterfactual of Growth Rates after 35 Years for the Kittiwake Population at the Fowlsheugh Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

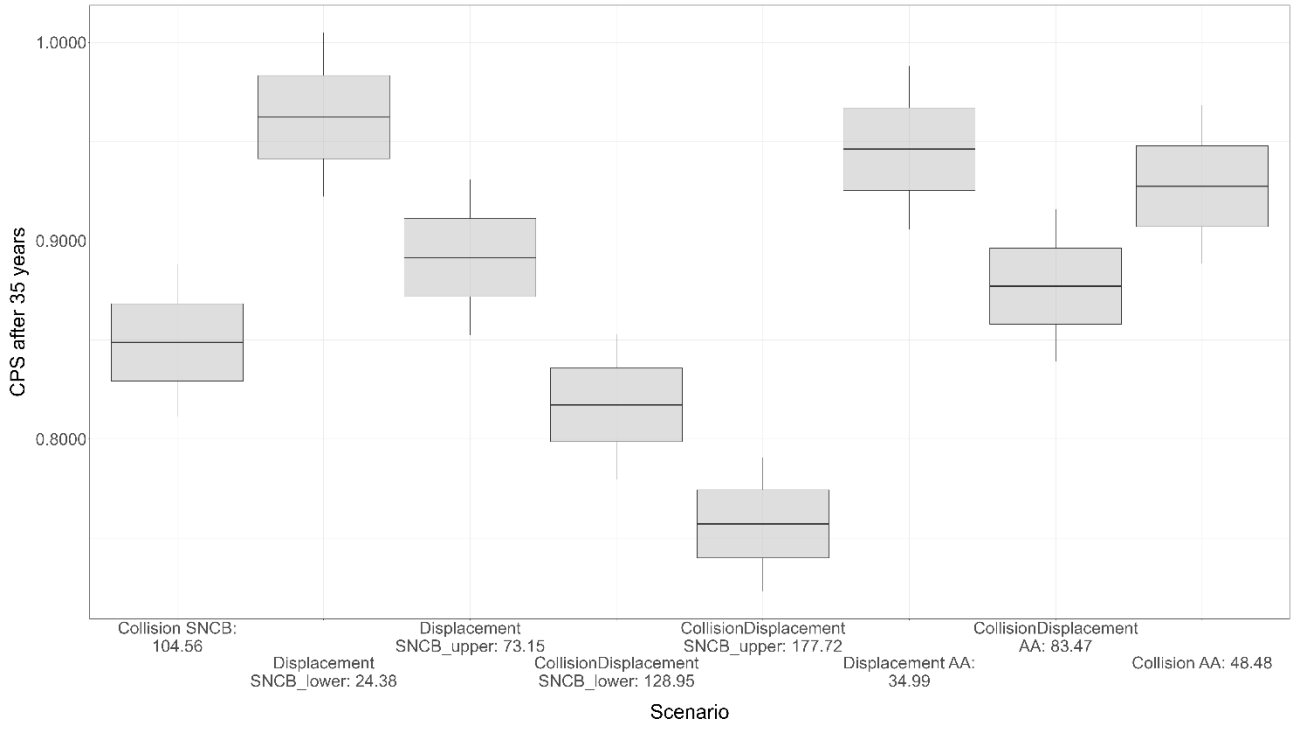

Figure A. 84: Counterfactual of Population Size after 35 years for the kittiwake population at the Fowlsheugh Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Guillemot

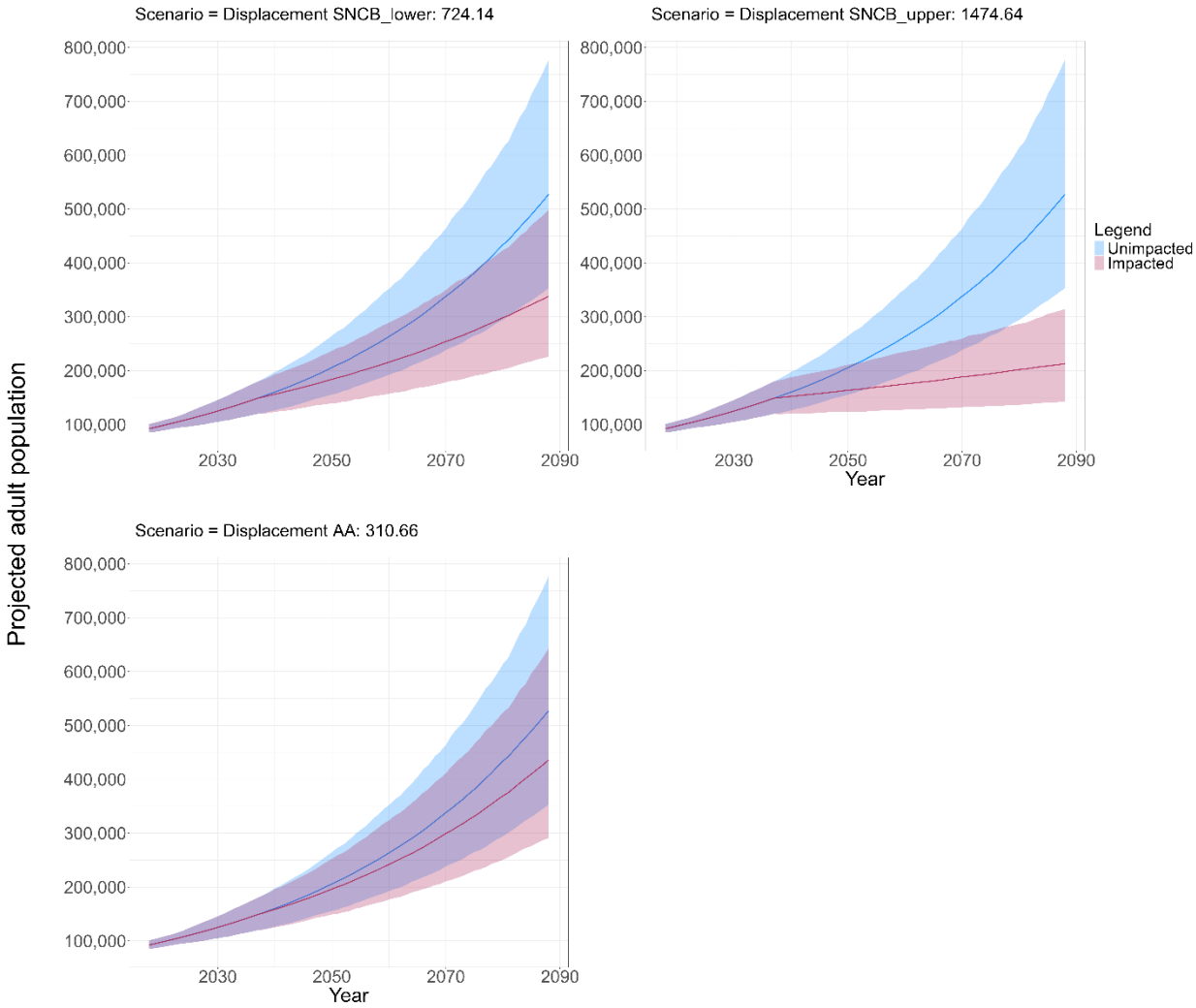

Figure A. 85: Guillemot population projection over 35 years at the Fowlsheugh Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

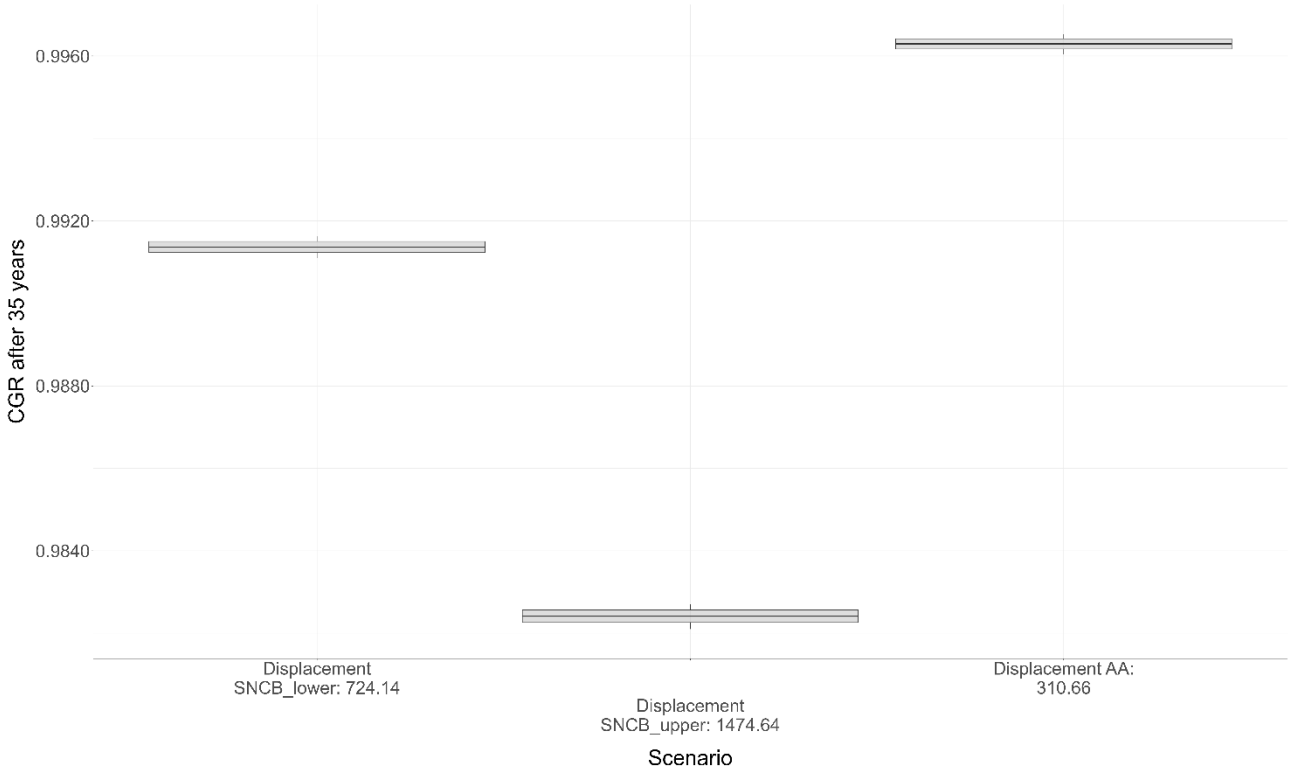

Figure A. 86: Counterfactual of Growth Rates after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

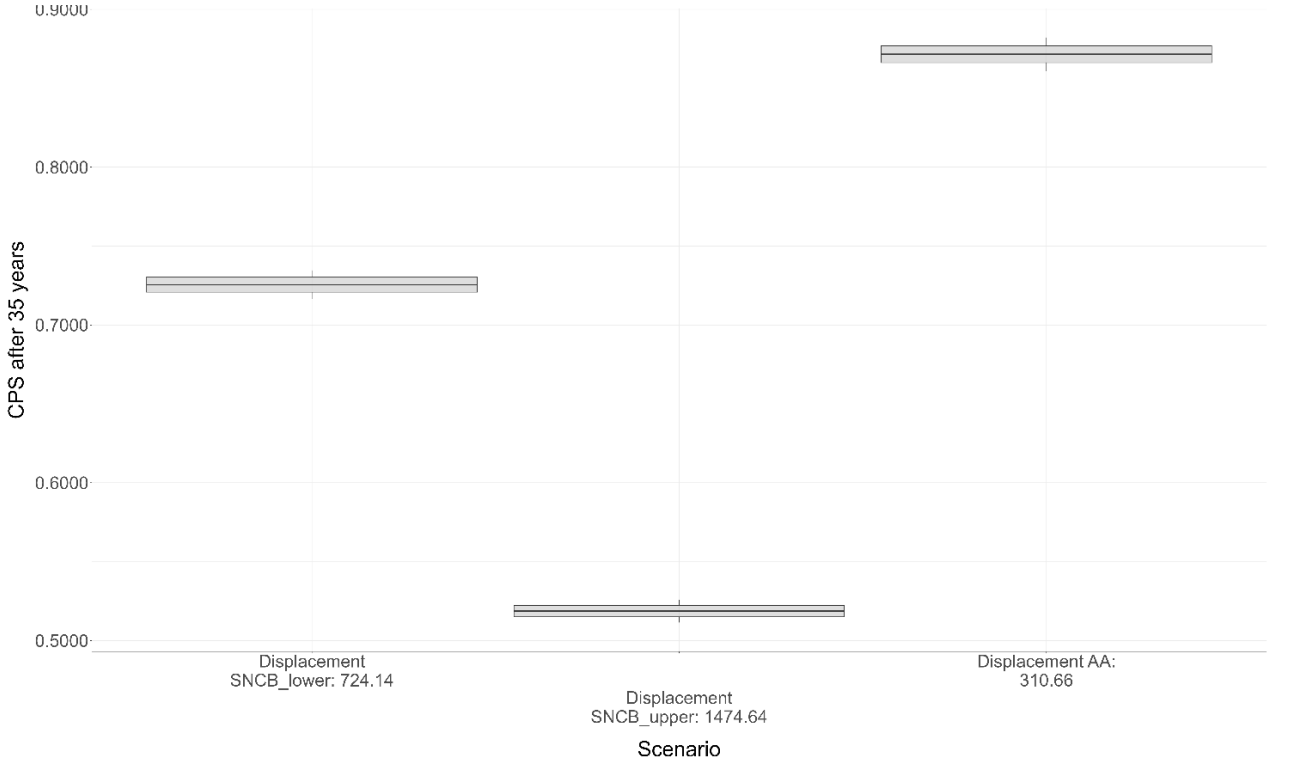

Figure A. 87: Counterfactual of Population Size after 35 years for the guillemot population at the Fowlsheugh Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

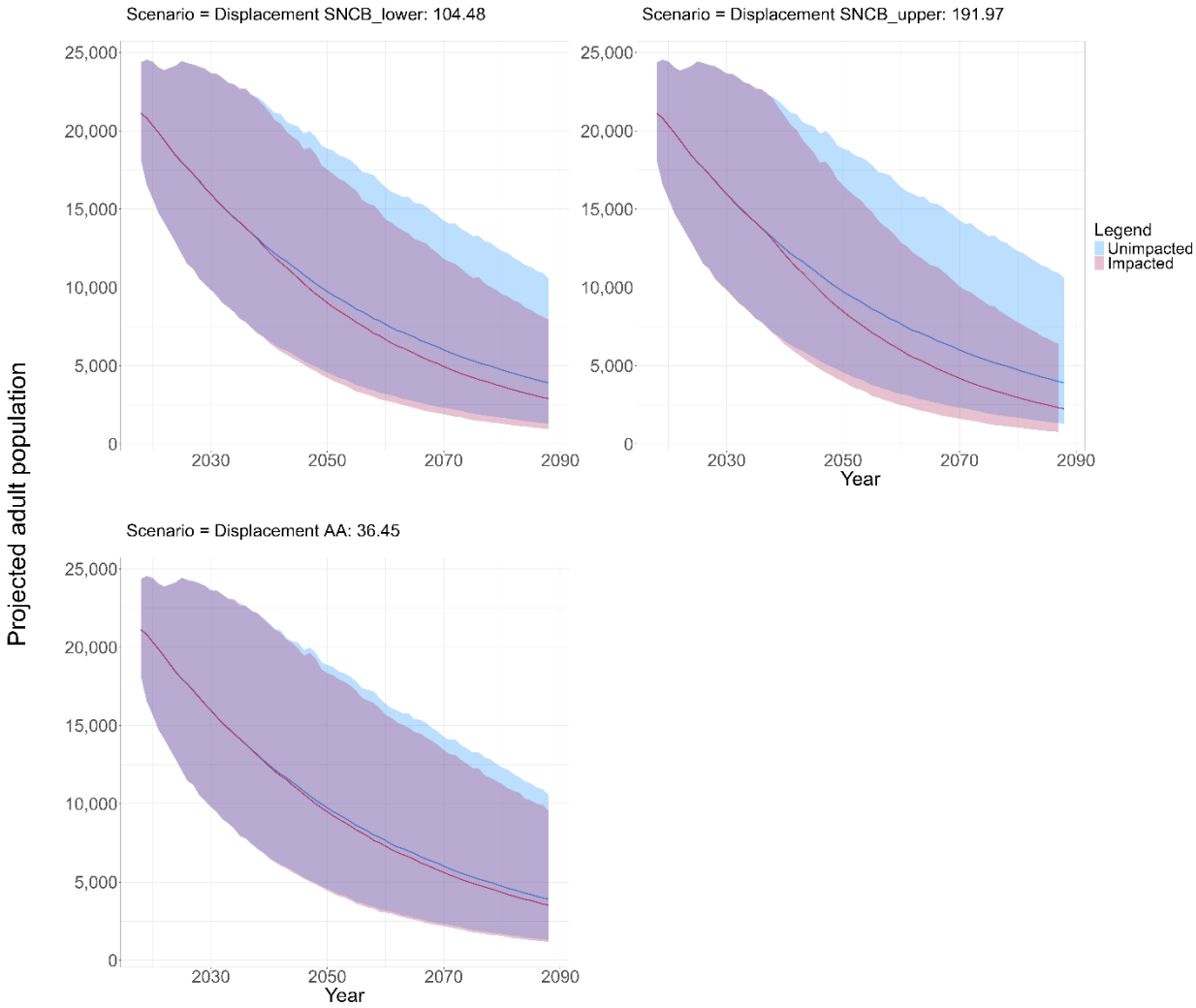

Figure A. 88: Razorbill population projection over 35 years at the Fowlsheugh Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

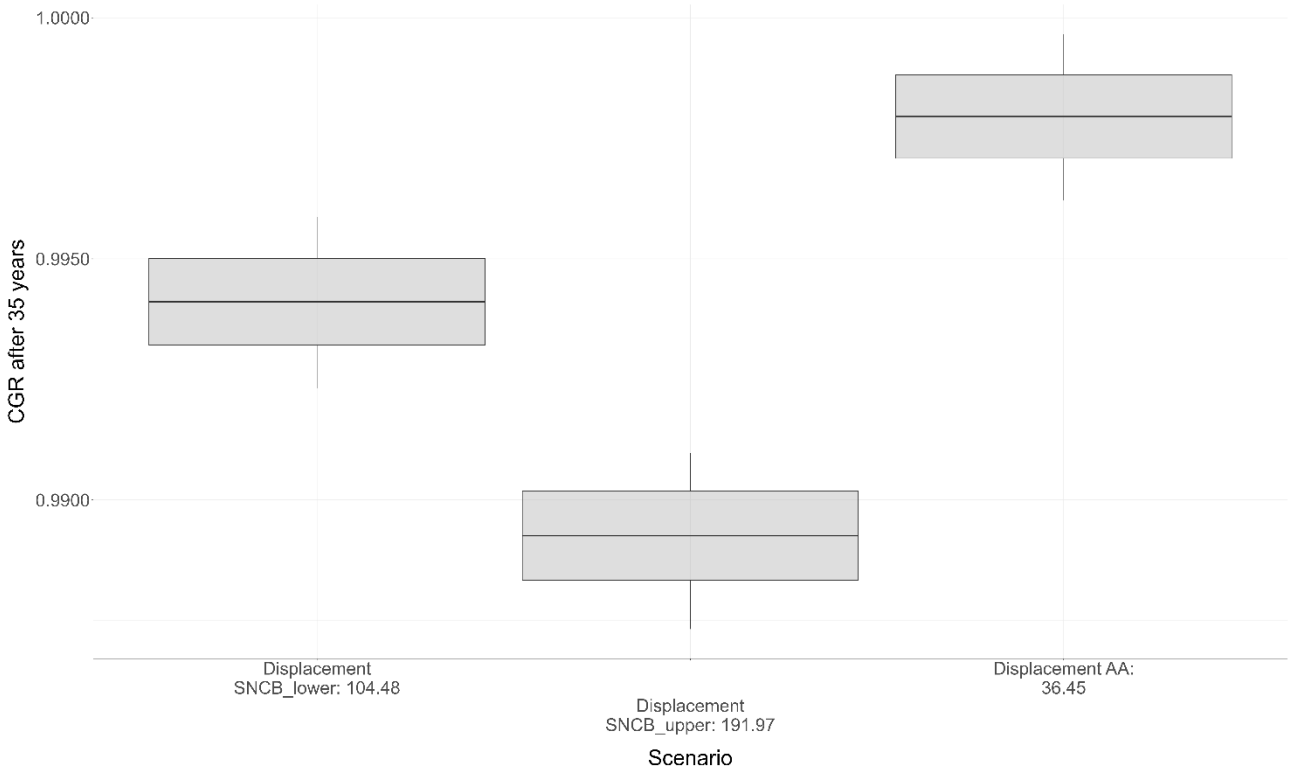

Figure A. 89: Counterfactual of Growth Rates after 35 years for the razorbill population at the Fowlsheugh Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

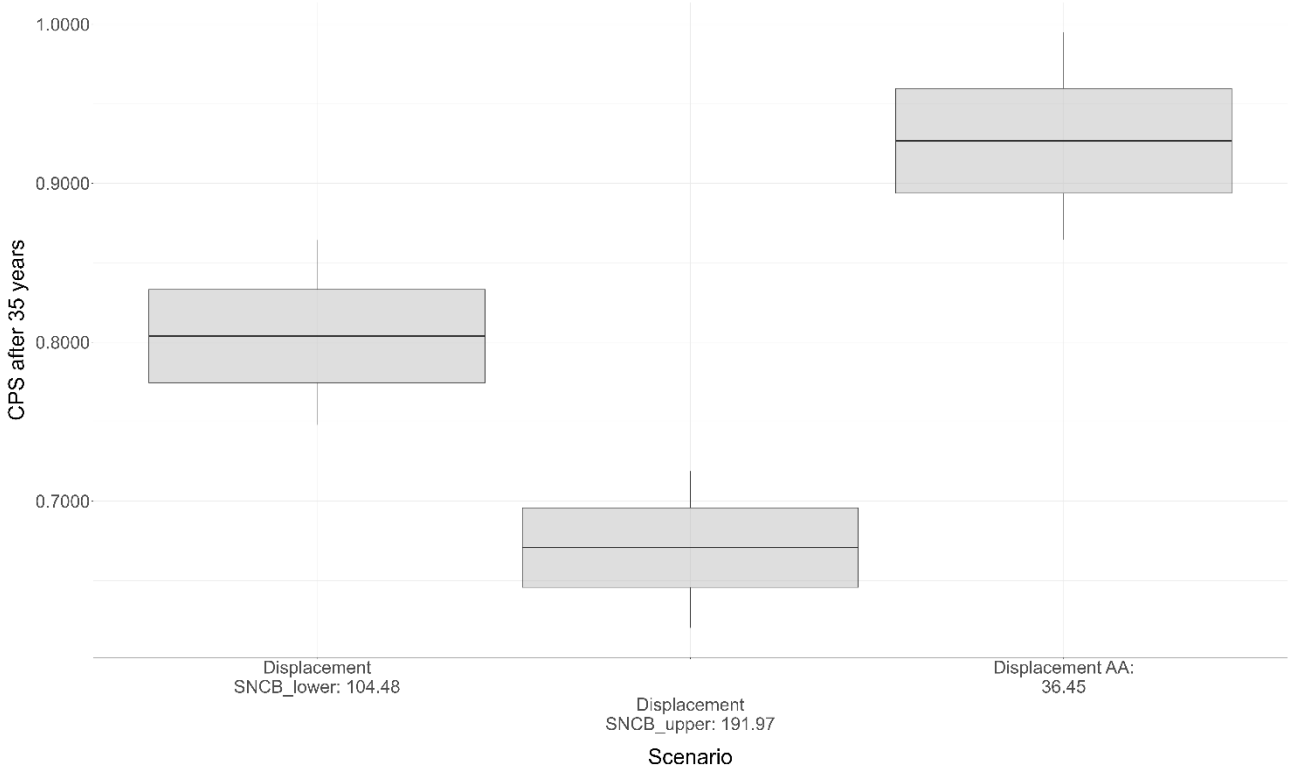

Figure A. 90: Counterfactual of Population Size after 35 years for the razorbill population at the Fowlsheugh Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.9 Hermaness, Saxa Vord and Valla Field Special Protection Area

Puffin

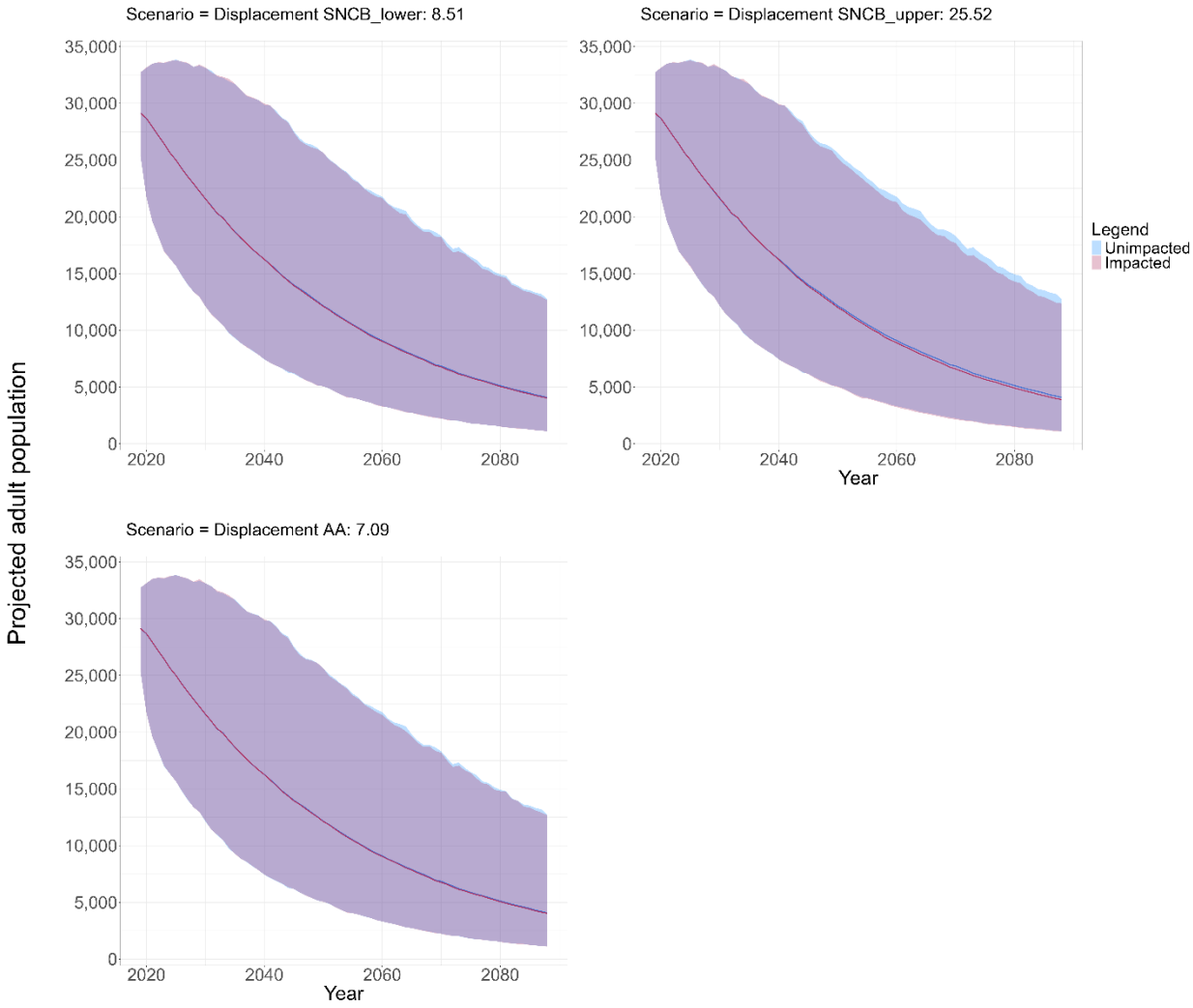

Figure A. 91: Puffin population projection over 35 years at the Hermaness, Saxa Vord and Valla Field Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

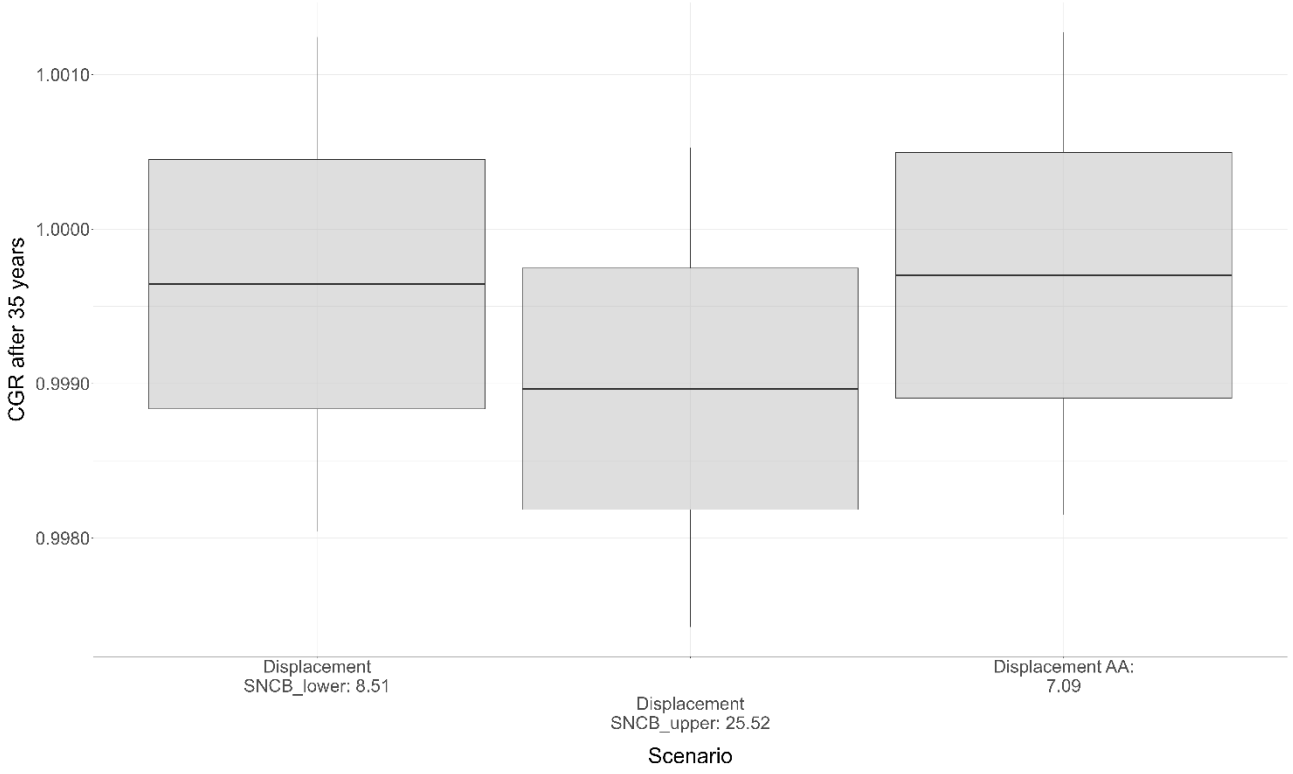

Figure A. 92: Counterfactual of Growth Rates after 35 years for the puffin population at the Hermaness, Saxa Vord and Valla Field Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

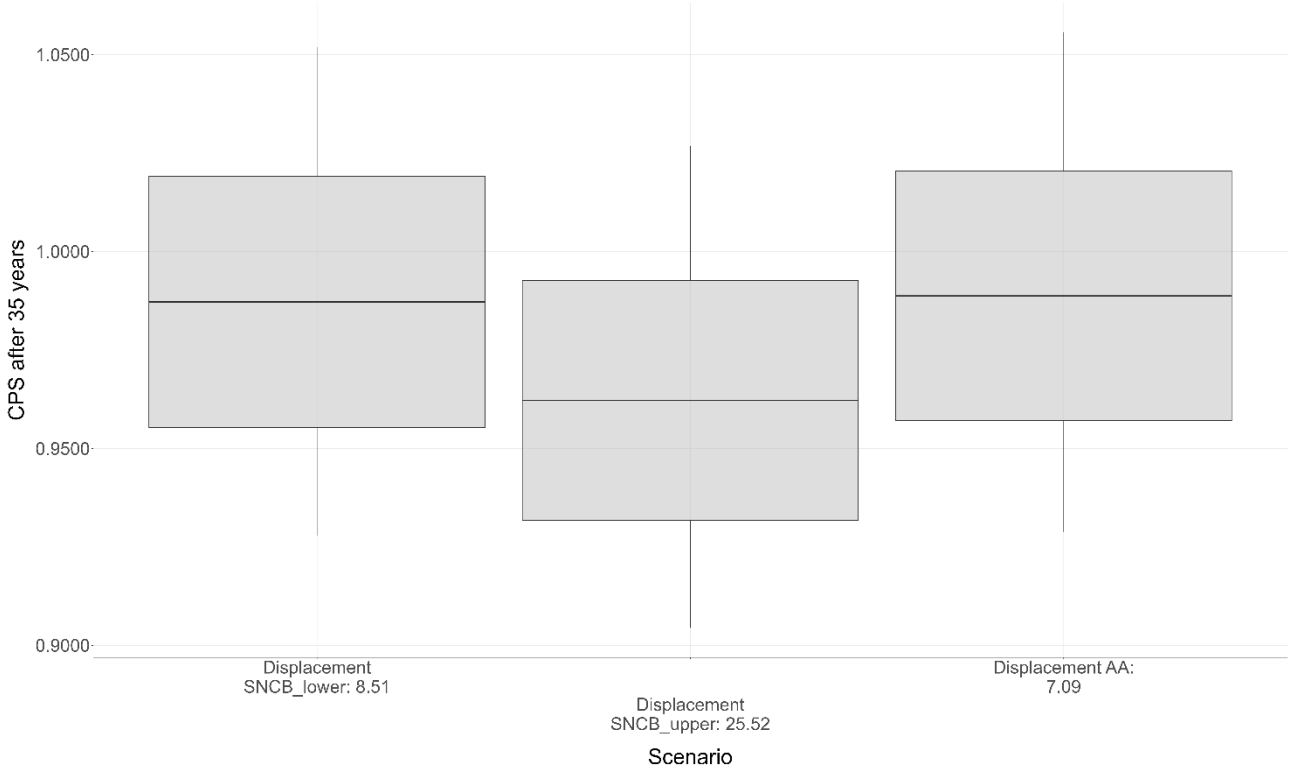

Figure A. 93: Counterfactual of Population Size after 35 years for the puffin population at the Hermaness, Saxa Vord and Valla Field Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Gannet

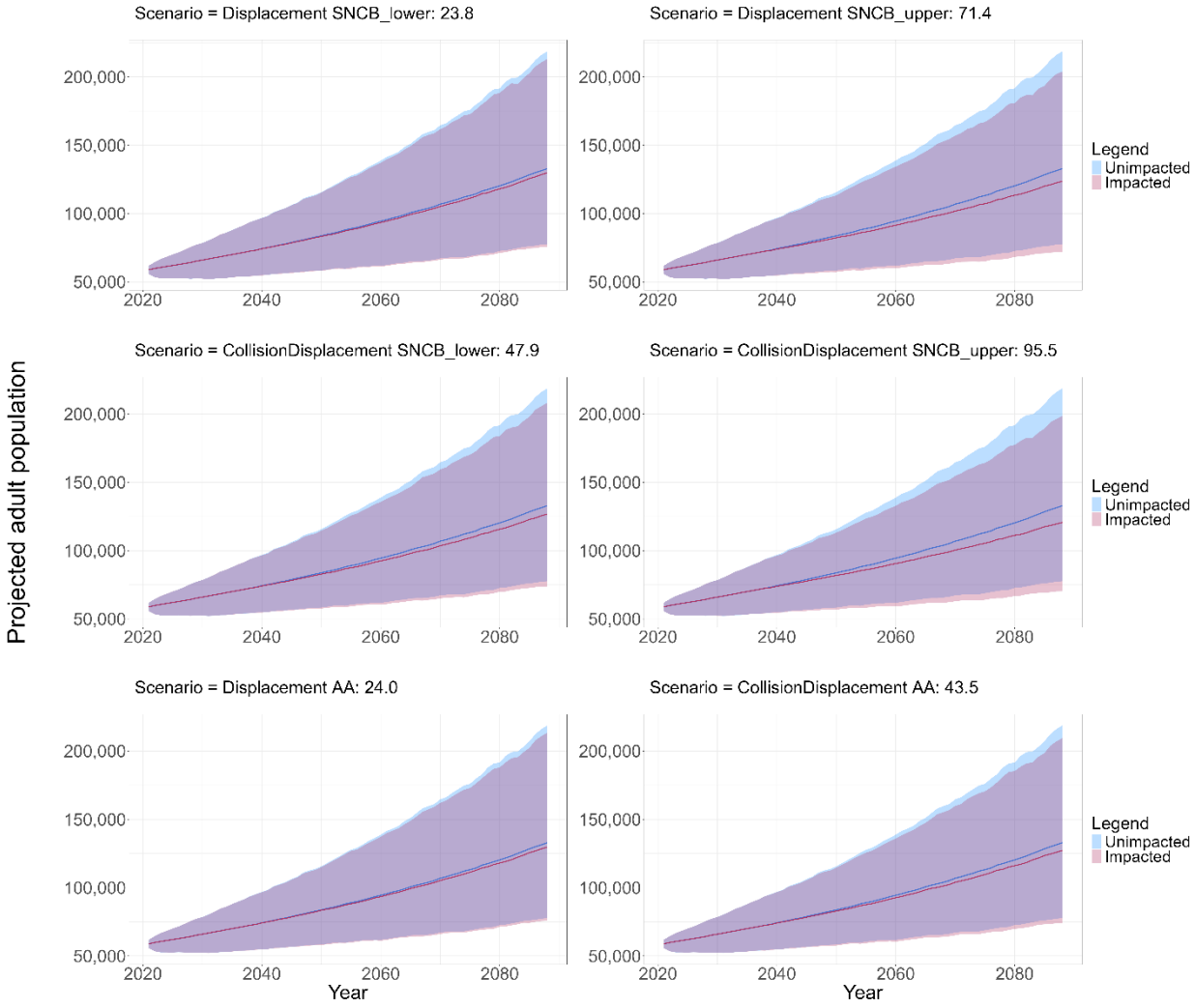

Figure A. 94: Gannet population projection over 35 years at the Hermaness, Saxa Vord and Valla Field Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

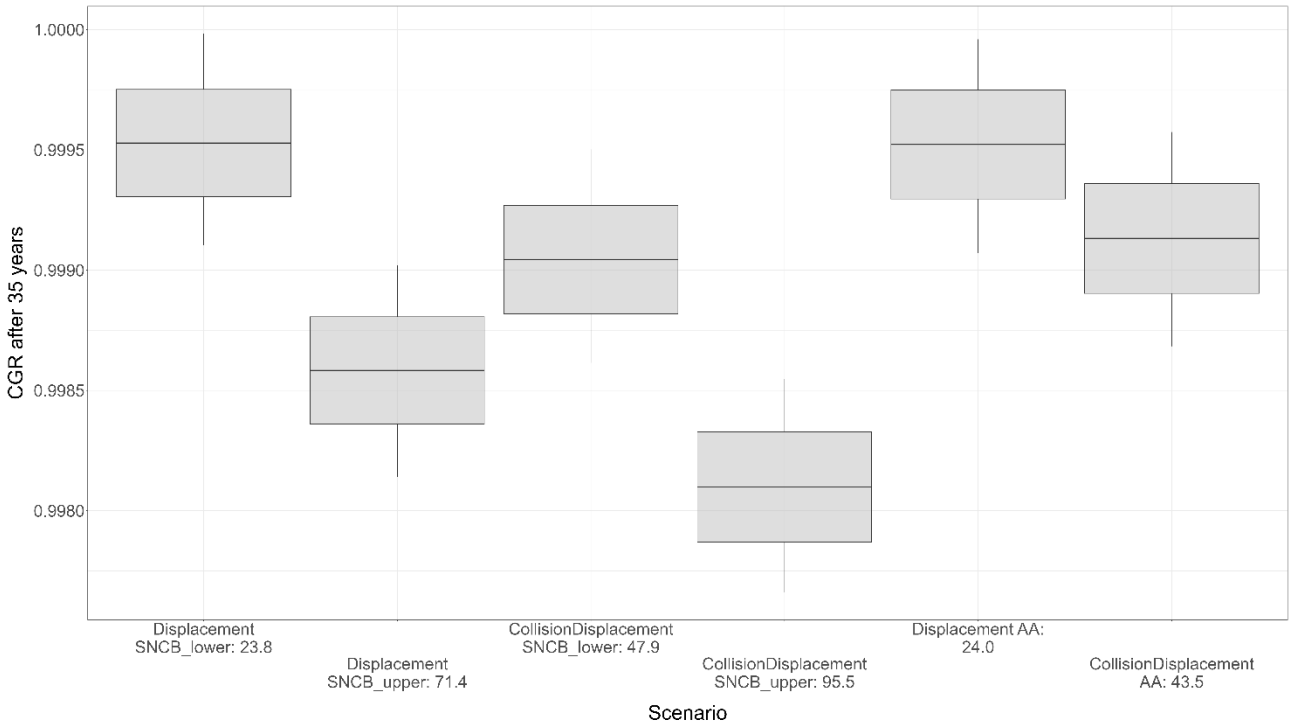

Figure A. 95: Counterfactual of Growth Rates after 35 years for the gannet population at the Hermaness, Saxa Vord and Valla Field Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

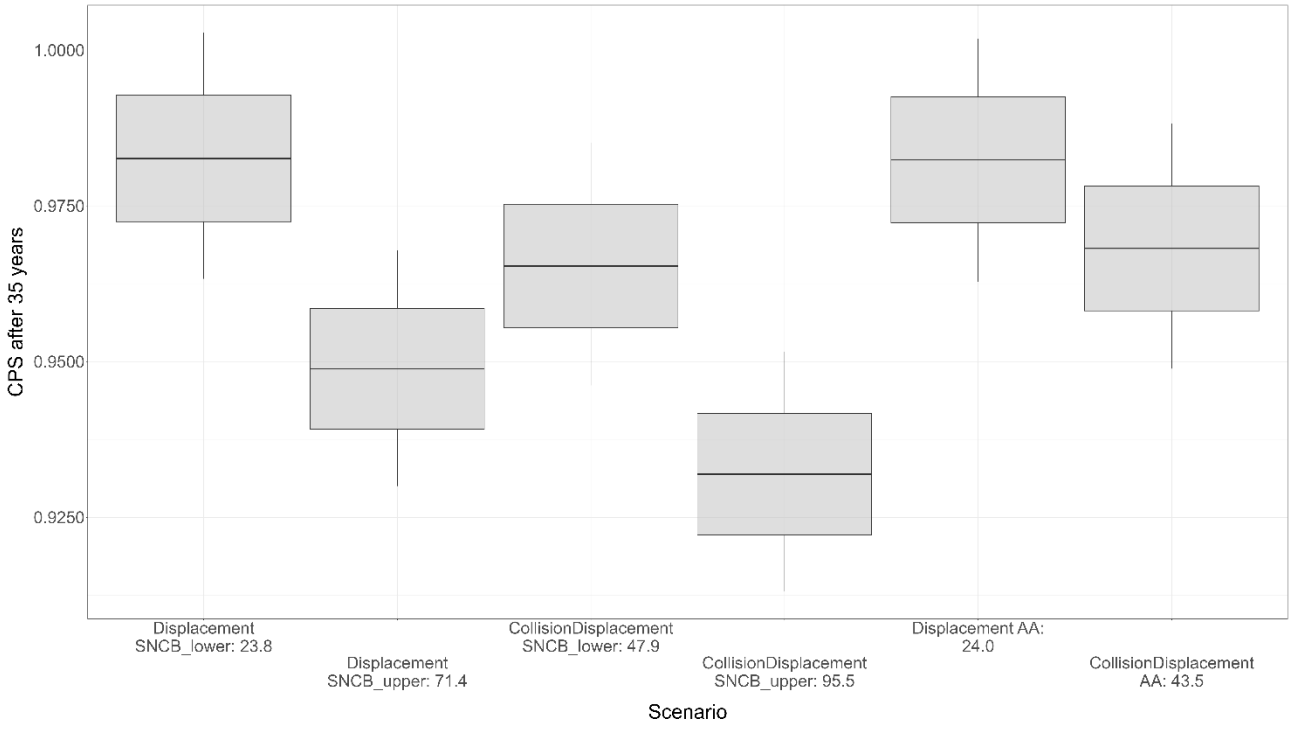

Figure A. 96: Counterfactual of Population Size after 35 years for the gannet population at the Hermaness, Saxa Vord and Valla Field Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.10 St Abb`s Head to Fast Castle Special Protection Area

Kittiwake

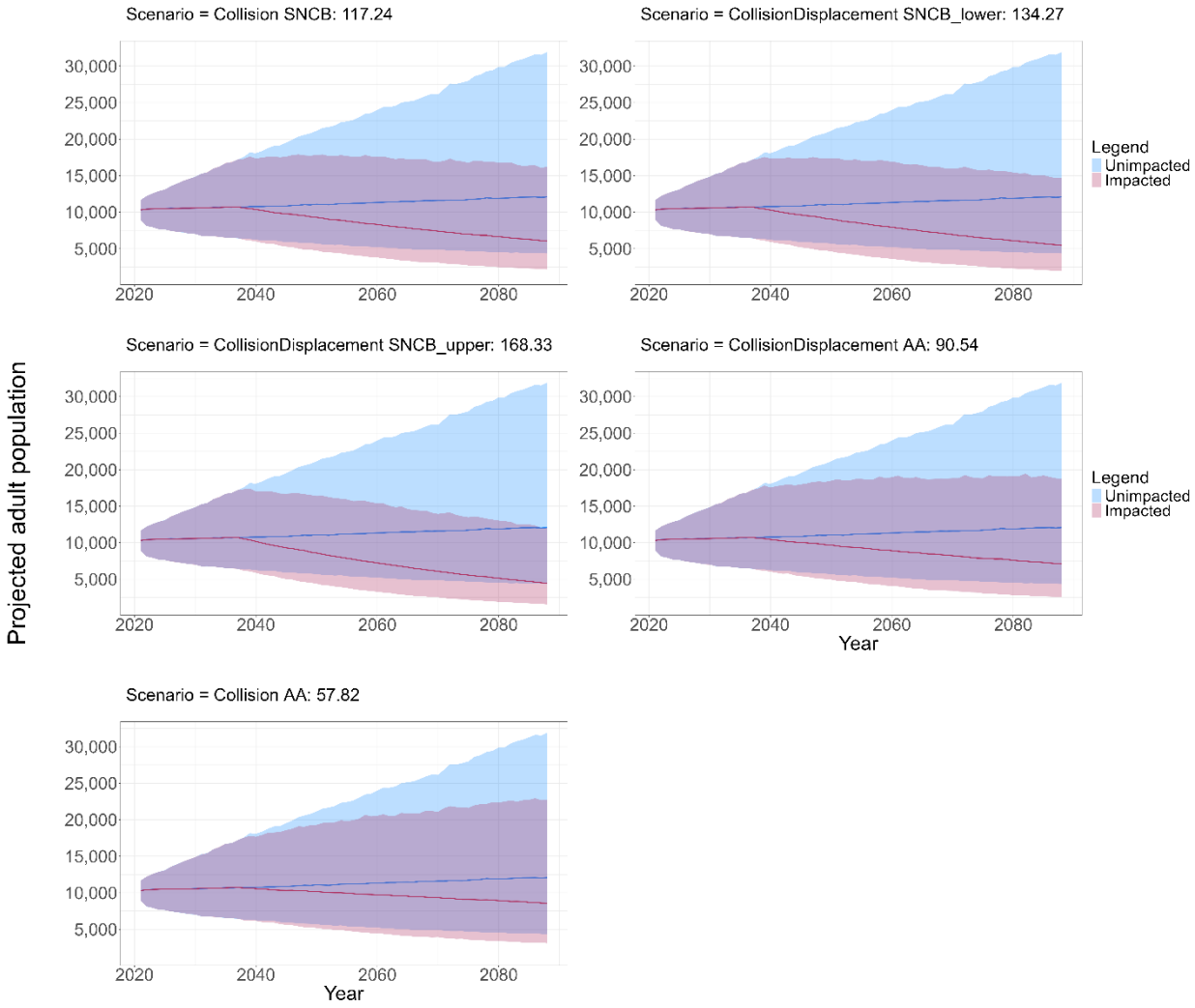

Figure A. 97: Kittiwake population projection over 35 years at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

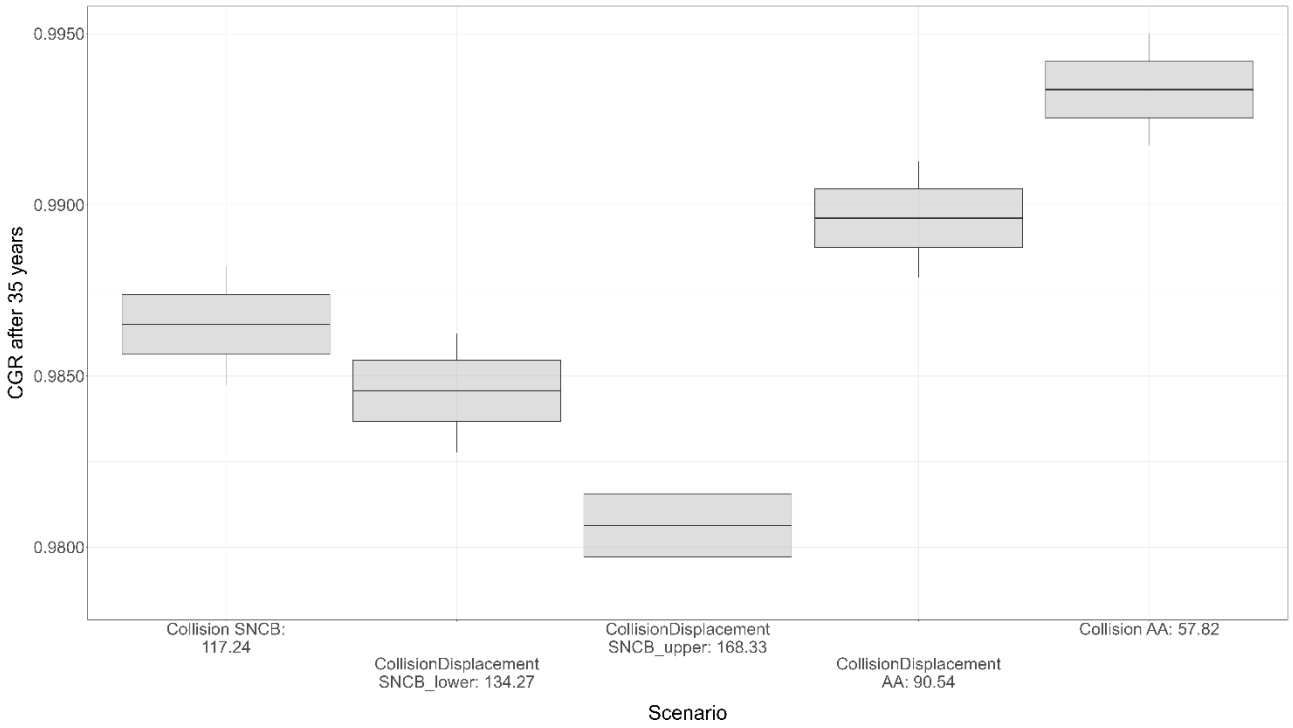

Figure A. 98: Counterfactual of Growth Rates after 35 years for the kittiwake population at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

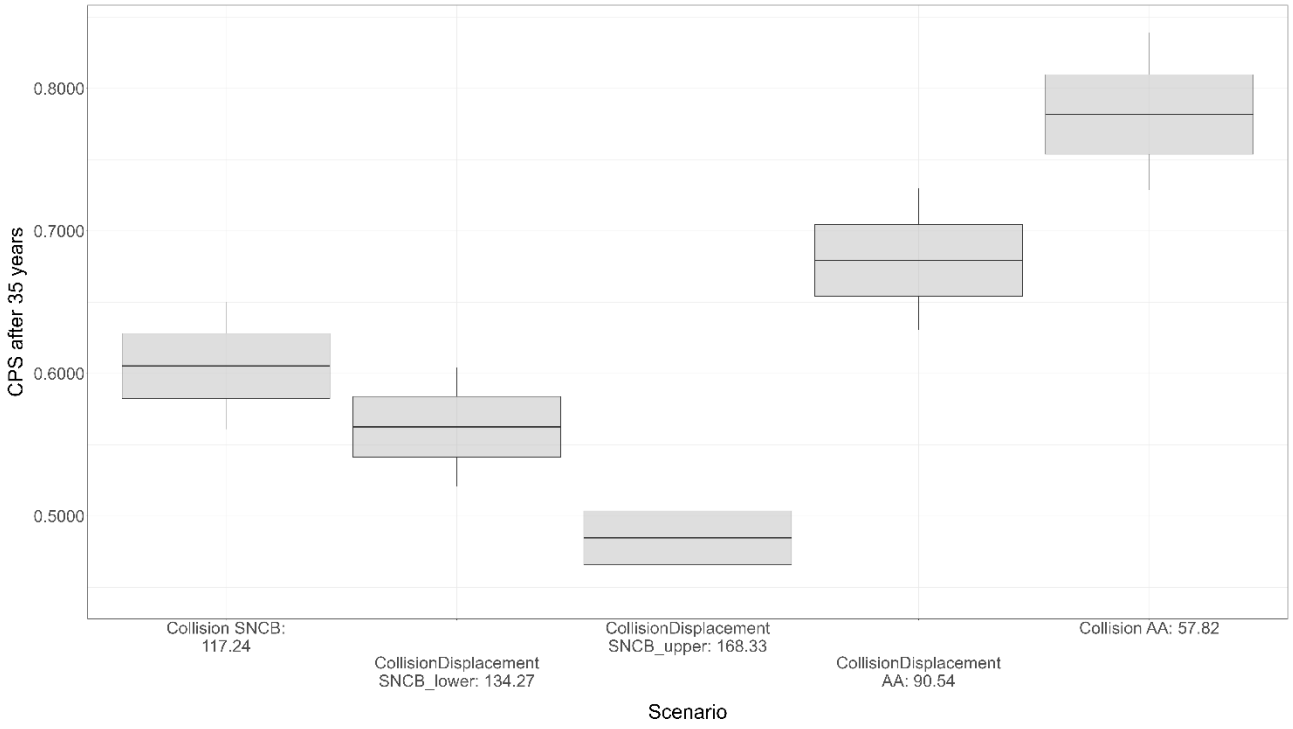

Figure A. 99: Counterfactual of Population Size after 35 years for the kittiwake population at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Guillemot

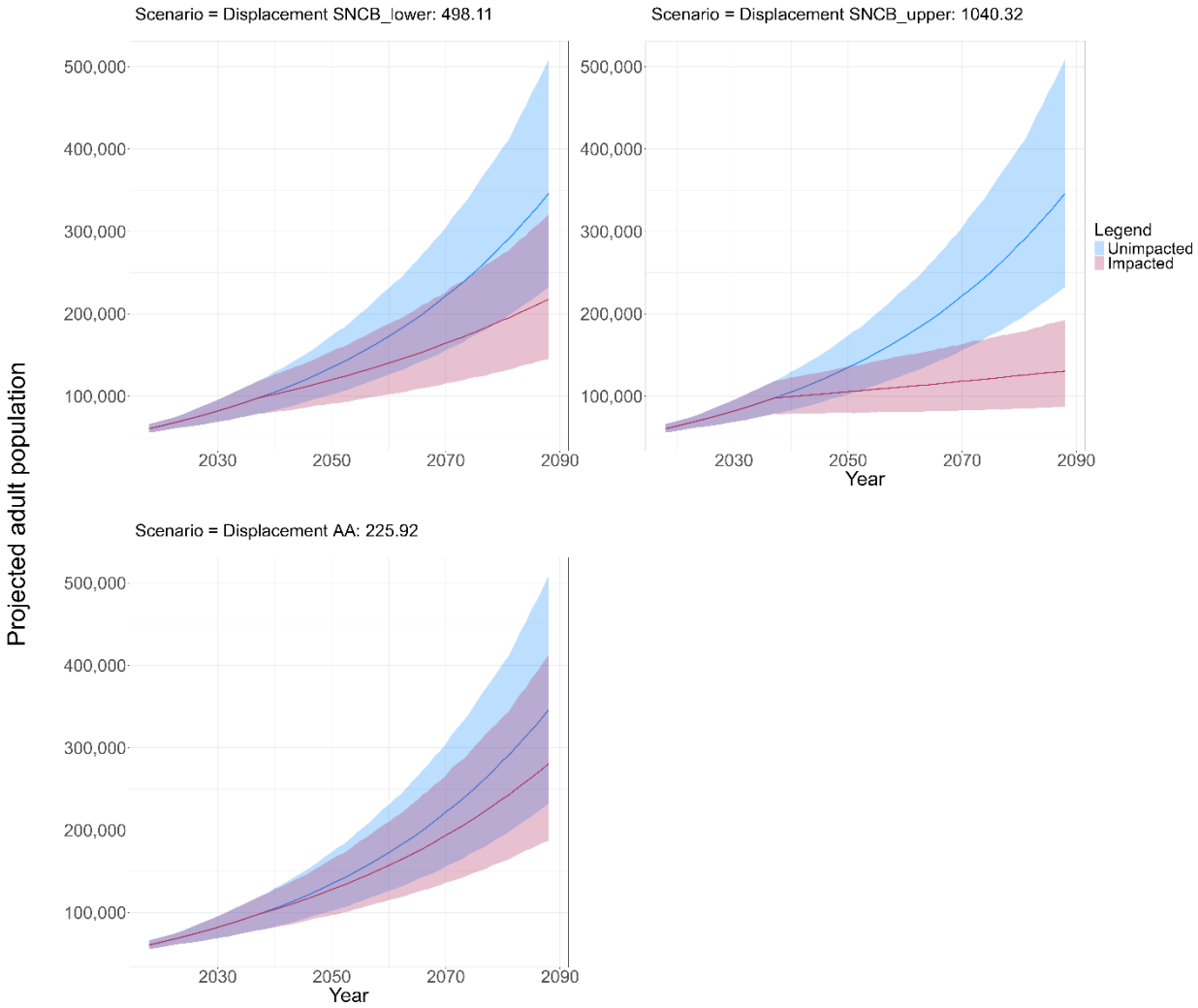

Figure A. 100: Guillemot population projection over 35 years at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

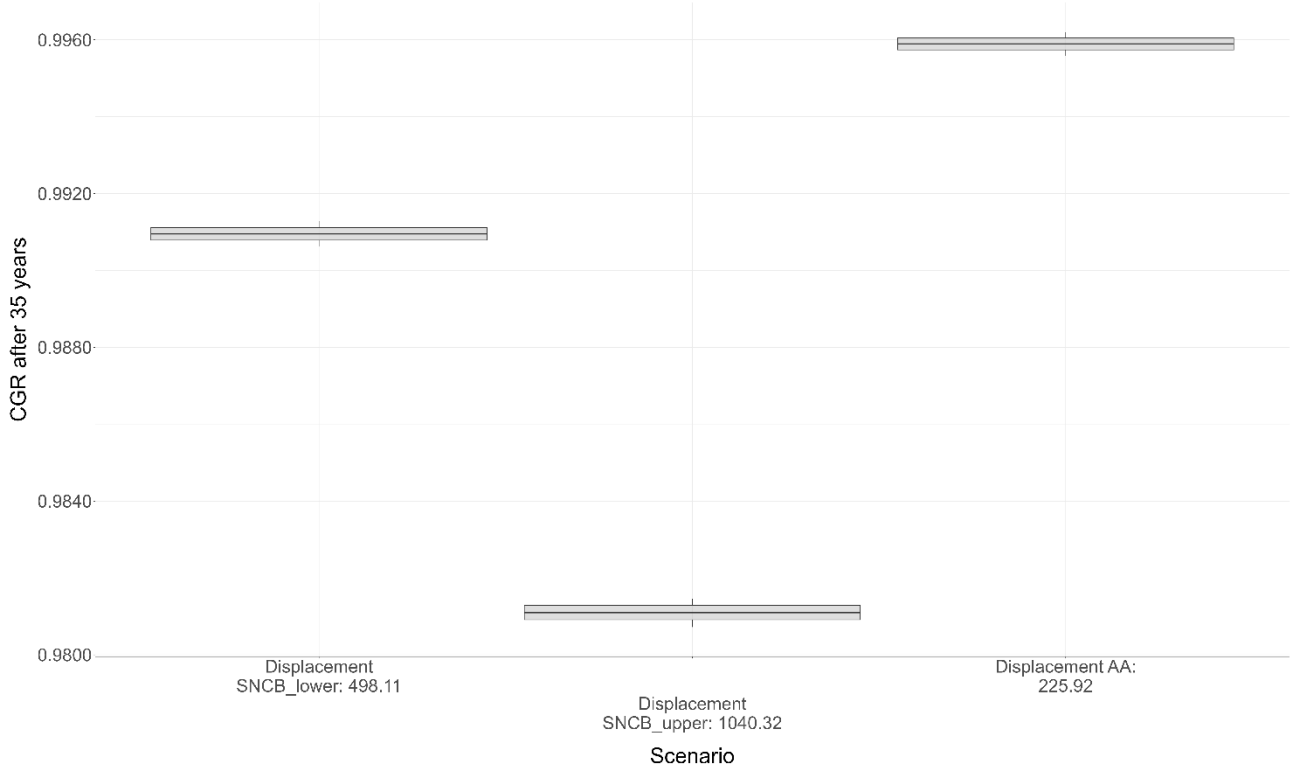

Figure A. 101: Counterfactual of Growth Rates after 35 years for the guillemot population at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

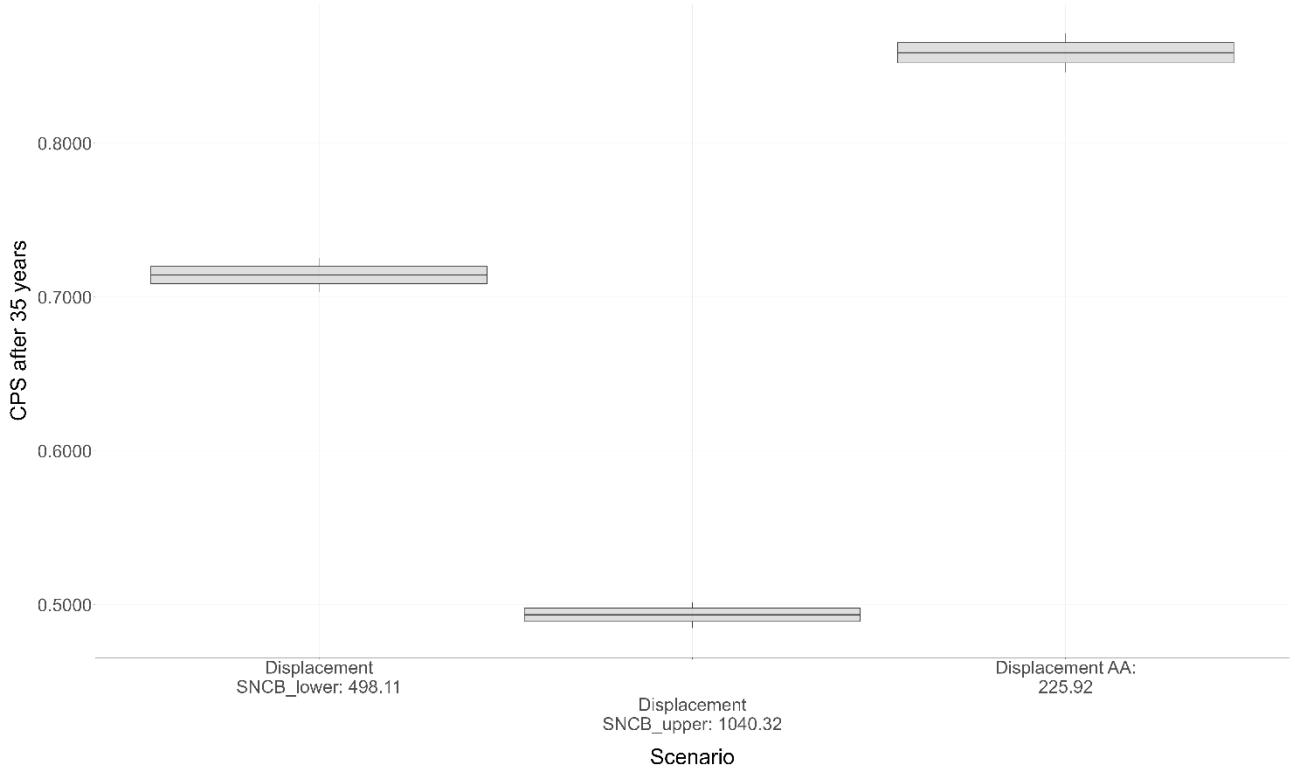

Figure A. 102: Counterfactual of Population Size after 35 years for the guillemot population at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Razorbill

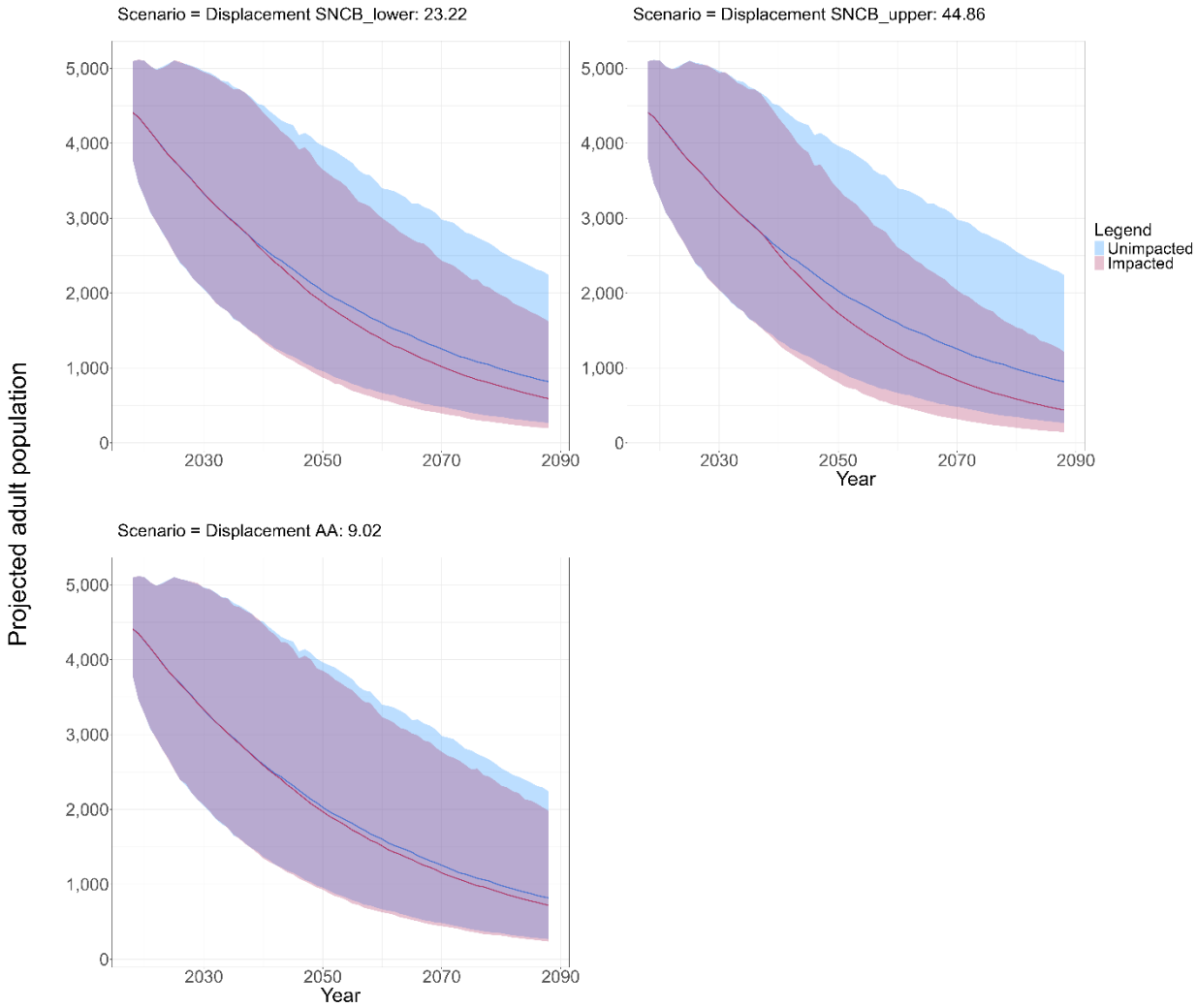

Figure A. 103: Razorbill population projection over 35 years at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

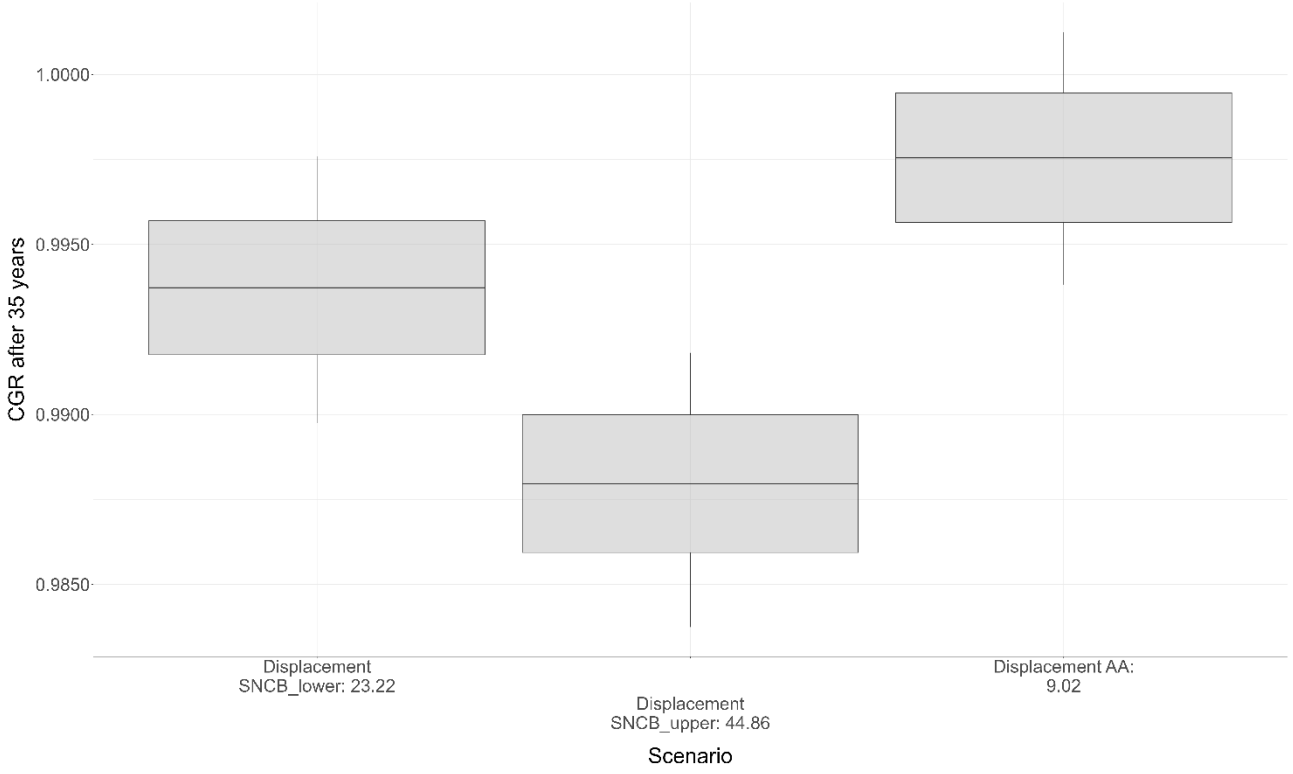

Figure A. 104: Counterfactual of Growth Rates after 35 years for the razorbill population at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

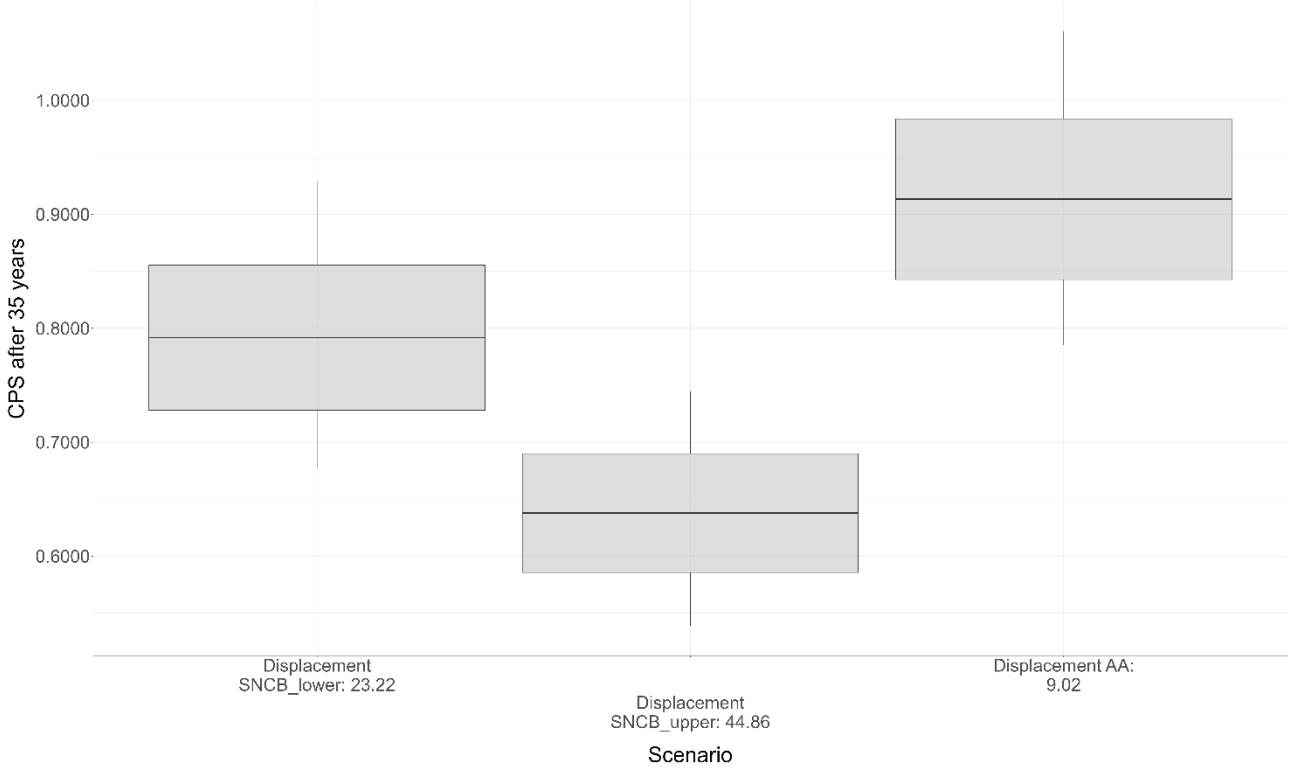

Figure A. 105: Counterfactual of Population Size after 35 years for the razorbill population at the St Abb's Head to Fast Castle Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

A.3.11 Troup, Pennan and Lion's Heads Special Protection Area

Kittiwake

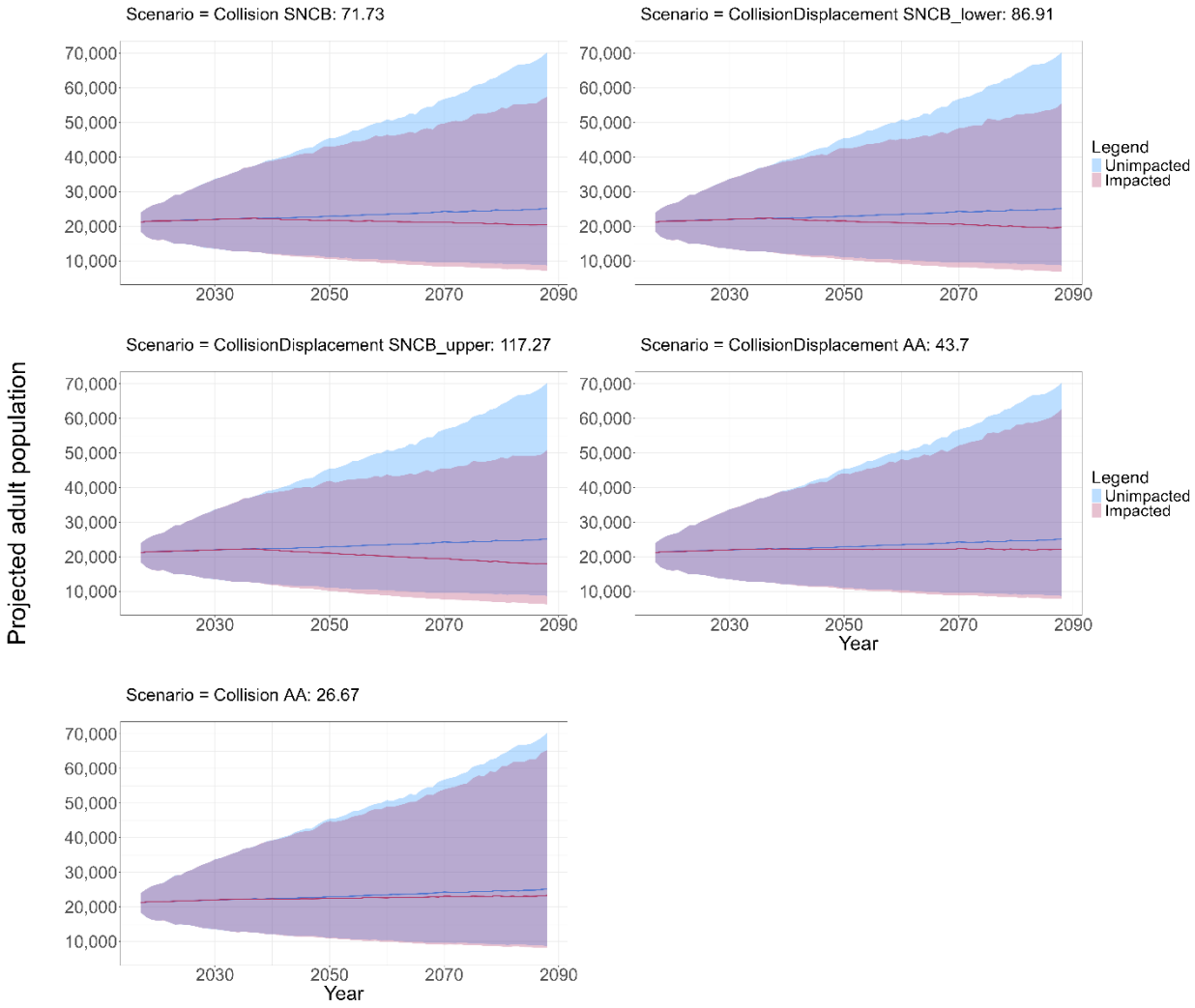

Figure A. 106: Kittiwake population projection over 35 years at the Troup, Pennan and Lion's Heads Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

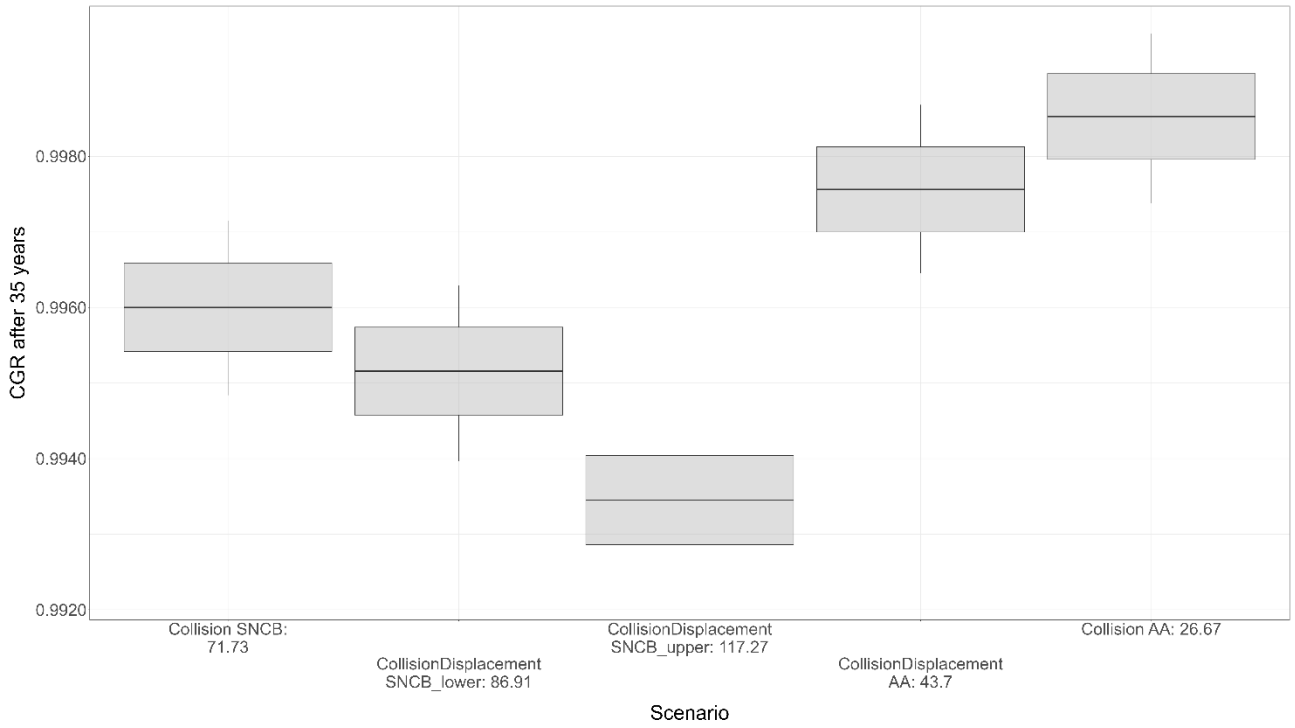

Figure A. 107: Counterfactual of Growth Rates after 35 years for the kittiwake population at the Troup, Pennan and Lion's Heads Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

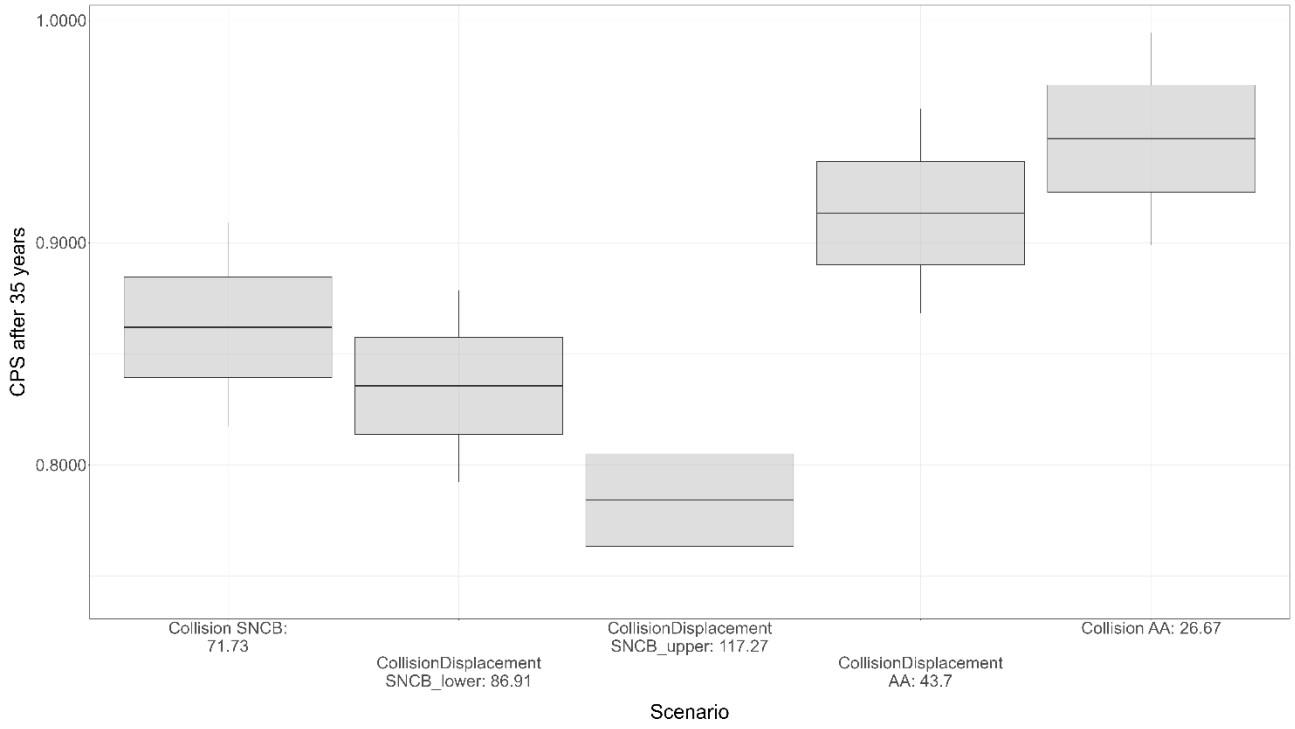

Figure A. 108: Counterfactual of Population Size after 35 years for the kittiwake population at the Troup, Pennan and Lion's Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

Guillemot

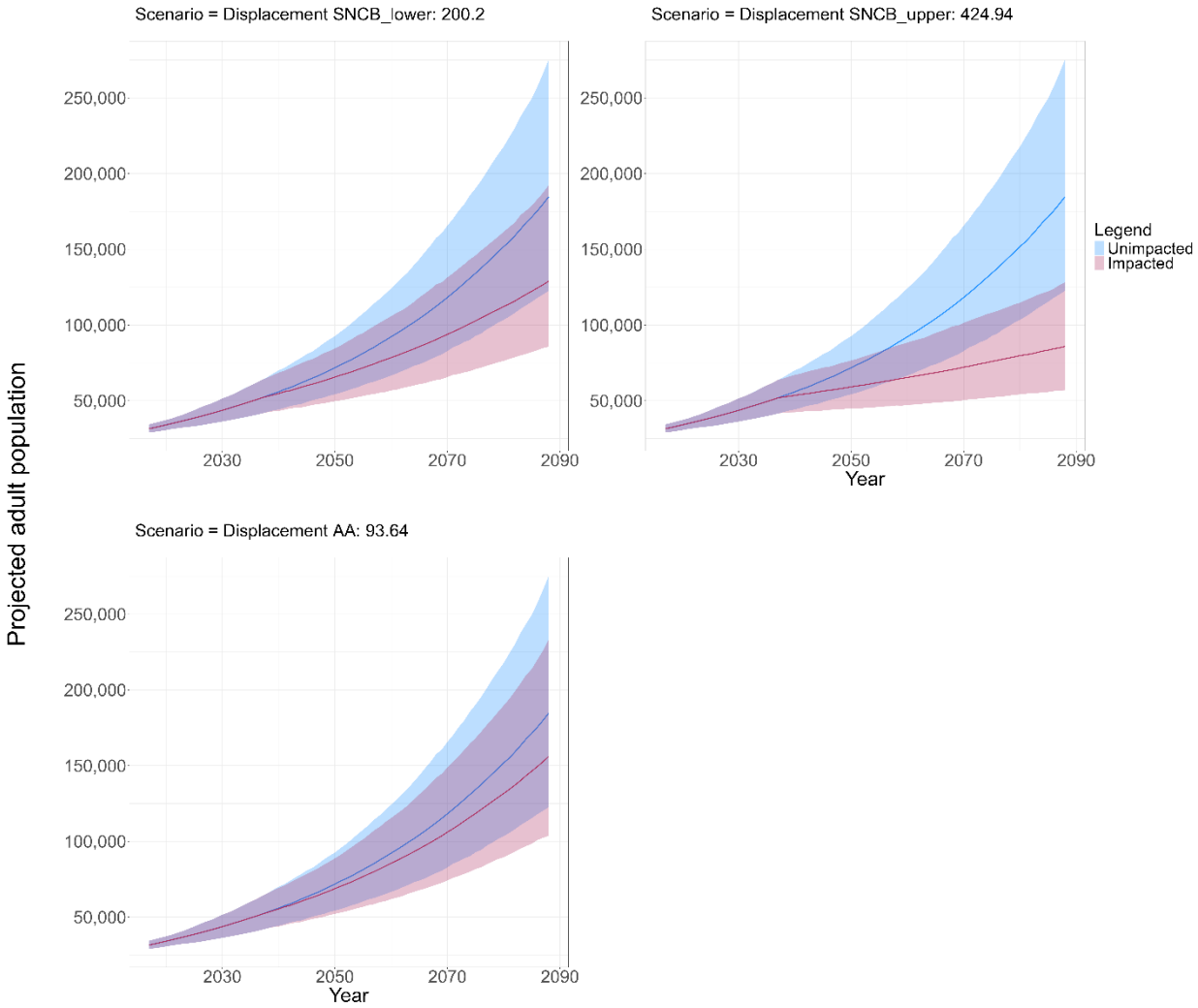

Figure A. 109: Guillemot population projection over 35 years at the Troup, Pennan and Lion's Heads Special Protection Area from in-combination impacts. Each plot represents a different impact scenario in terms of additional adult mortalities. Lines represent median population size and purple areas define upper (97.5%) and lower (2.5%) confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

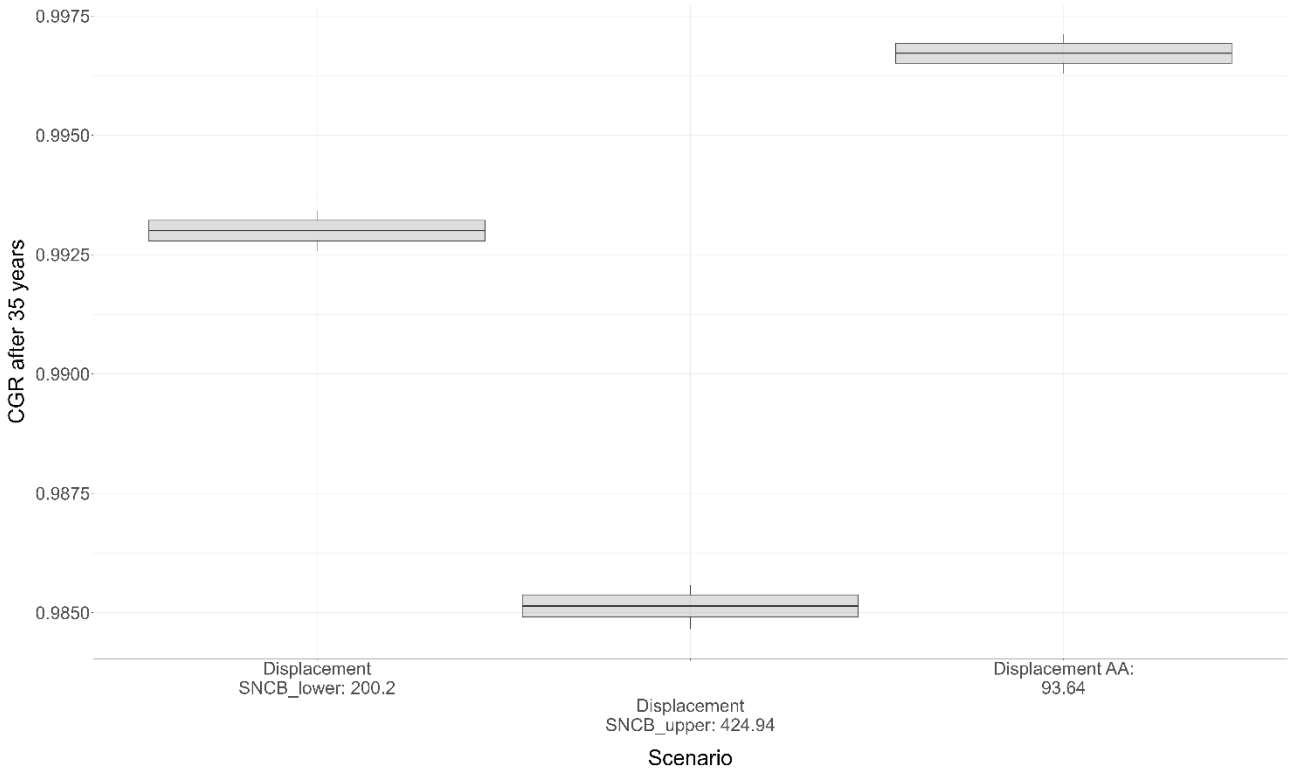

Figure A. 110: Counterfactual of Growth Rates after 35 years for the guillemot population at the Troup, Pennan and Lion's Heads Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)

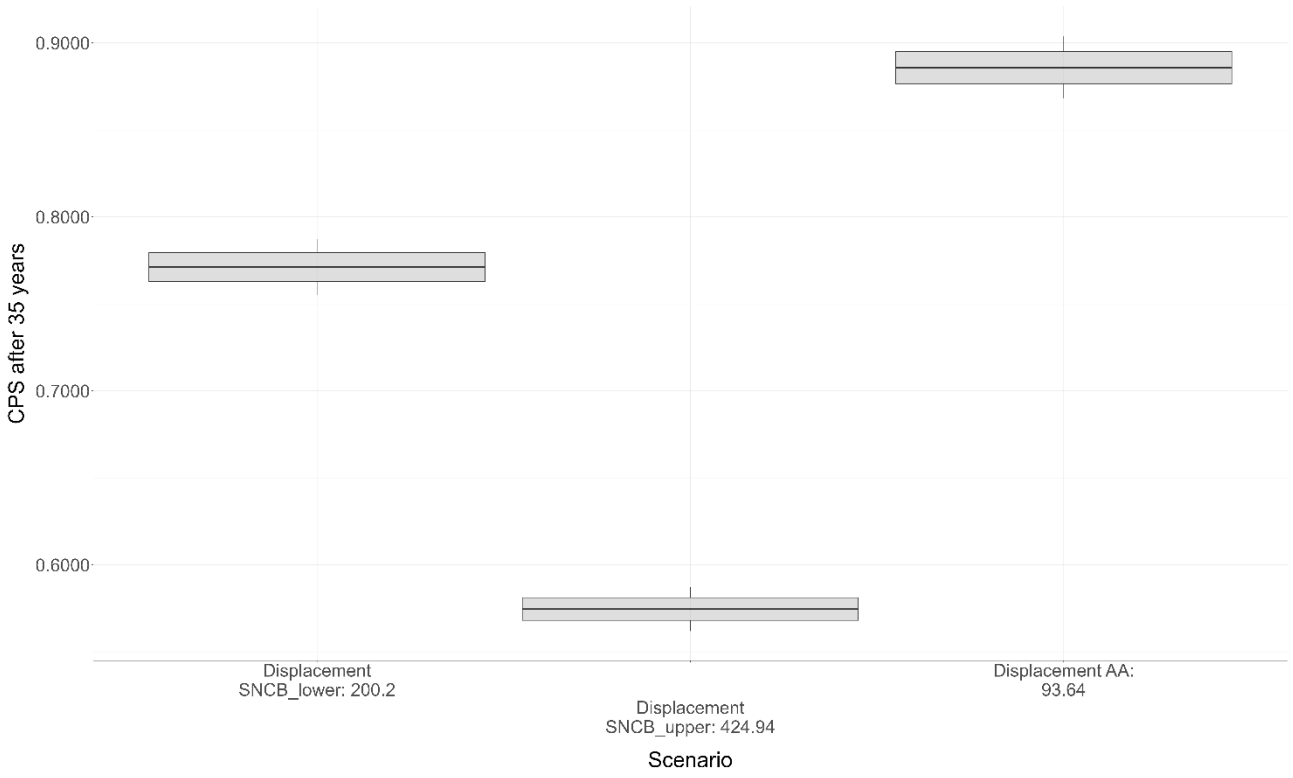

Figure A. 111: Counterfactual of Population Size after 35 years for the guillemot population at the Troup, Pennan and Lion's Special Protection Area from in-combination impacts. Bold bar is median; box defines +/- 1SD; whiskers define upper and lower 95% confidence limits (SNCB = Statutory Nature Conservation Body; AA = Applicant Approach)