Moray West Offshore Ornithology

Updated Population Viability Analysis

MORAY WEST OFFSHORE WIND FARM

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Contents

1 Introduction

This short note provides an update to the Population Viability Analysis (PVA) conducted for the assessment of offshore ornithology for the Moray West Offshore Wind Farm.

An error in the modelling process was identified which resulted in mistakenly using the number of breeding individuals of a given colony as the input for the number of birds in the whole population (i.e. over all age classes), which is then used as the starting population size for the model projections. This is fully explained in Section 2 of this note. The note then further provides summary results for both Moray West alone and in-combination with other projects including a comparison of results presented in the Report to inform Appropriate Assessment (RIAA) and those that have now been corrected.

Results are presented only for those features where PVA was applied in the RIAA. These are as follows:

- Moray West alone:
  - East Caithness Cliffs SPA – kittiwake
  - North Caithness Cliffs SPA – guillemot
- Moray West in combination with other projects:
  - East Caithness Cliffs SPA – kittiwake
  - East Caithness Cliffs SPA – guillemot
  - East Caithness Cliffs SPA – razorbill
  - North Caithness Cliffs SPA – kittiwake
  - North Caithness Cliffs SPA – guillemot

Finally, Section 5 reviews the implications for the RIAA conclusions in light of the updated PVA metrics.

2 PVA Update

A coding error (a missing divisor) found in the model scripts prevented the correct conversion of number of breeding individuals (available from colony counts) into total population size. Total size is then proportioned over age classes (following the population's stable age distribution) to produce the starting population vector, one of the required model inputs. In practical terms, breeding numbers were taken as total population sizes and, as a consequence, populations were under-represented, and the effects of wind farm impacts were therefore overestimated.

Furthermore, colony counts for the populations of guillemot and razorbill required to be corrected, by a factor of 1.34, to account for the presence of non-breeders and immature birds in the surveyed colonies.

Table 1: Updated auk population sizes applied to Population Viability Analysis

Species	SPA	Previous initial population size (breeding individuals)	Rectified initial population size (breeding individuals)
Razorbill	East Caithness Cliffs	30042	40256
	North Caithness Cliffs	3507	4699

Table 1: Updated auk population sizes applied to Population Viability Analysis			
Species	**SPA**	**Previous initial population size (breeding individuals)**	**Rectified initial population size (breeding individuals)**
Guillemot	East Caithness Cliffs	149228	199966
	North Caithness Cliffs	38863	52076

Model scripts were amended, models re-run and results updated accordingly.

3 Comparative Results – Moray West Alone

3.1 East Caithness Cliffs SPA - kittiwake

Tables 2 and 3 below, present PVA metric outputs for the East Caithness Cliffs SPA kittiwake population, firstly as presented in the RIAA and secondly with updated results. The results show lower percentage changes in growth rate in addition to lower ratios of unimpacted to impacted growth rates and population sizes.

Table 2: Original RIAA PVA Outputs for Kittiwake at East Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.23	0.998	0.93	0.43
	50			0.90	0.41

Table 3: Updated PVA Outputs for Kittiwake at East Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.13	0.999	0.96	0.46

Table 3: Updated PVA Outputs for Kittiwake at East Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
	50			0.94	0.44

Taking the descriptive paragraph for PVA metrics included the RIAA (Paragraphs 6.8.4.23 and 6.8.4.24); the updated modelling would lead to the following text being considered appropriate:

If additional mortality of 50 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.13%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 94-96% of that which the model predicts would occur in the absence of any additional in-combination impact.

The PVA model predicts a positive growth rate for the kittiwake population at East Caithness Cliffs SPA with a resulting end population size higher than that designated at the SPA. However, the population at the SPA has exhibited a declining population trend in recent years with this trend potentially likely to continue regardless of the presence of the Moray West Offshore Wind Farm.

3.2 North Caithness Cliffs – guillemot

Tables 4 and 5 below, present PVA metric outputs for the North Caithness Cliffs SPA guillemot population, firstly as presented in the RIAA and secondly with updated results. The results show lower percentage changes in growth rate in addition to lower ratios of unimpacted to impacted growth rates and population sizes.

Table 4: Original RIAA PVA Outputs for guillemot at North Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.26	0.997	0.91	0.26
	50			0.88	0.18

Table 5: Updated PVA Outputs for guillemot at North Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.15	0.999	0.95	0.35
	50			0.93	0.33

Taking the descriptive paragraph for PVA metrics included the RIAA (Paragraphs 6.8.5.23 to 6.8.5.25); the updated modelling would lead to the following text being considered appropriate:

The proportion of the SPA population affected by displacement mortality is low in all seasons and also represents less than a 1% increase in baseline mortality of the population. In addition PVA modelling (Appendix 4.5) does not indicate any population level effects on the guillemot population at East Caithness Cliffs SPA as a result of impacts occurring in the post-breeding season.

If seasonal displacement impacts were to be combined, noting that this is likely to over-estimate the total impact, a total mortality of 34 birds would be predicted. If additional mortality of 50 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.15%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 93-95% of that which the model predicts would occur in the in the absence of any additional in-combination impact.

PVA modelling (Appendix 4.5) indicates that this level of mortality is not considered to result in population level effects with the final population size still likely to be above the population originally designated for the SPA. There is therefore considered to be no indication of an adverse effect on the integrity of the guillemot feature of the SPA as a result of displacement impacts.

4 Comparative Results – In-combination

This section provides comparative results for all three species (kittiwake, guillemot and razorbill) in terms of in-combination mortality.

4.1 East Caithness Cliffs SPA - kittiwake

Tables 6 and 7 below, present in-combination PVA metric outputs for the East Caithness Cliffs SPA kittiwake population, firstly as presented in the RIAA and secondly with updated results. The results show lower percentage changes in growth rate in addition to lower rations of unimpacted to impacted growth rates and population sizes.

Taking the descriptive paragraph for PVA metrics included the RIAA (paragraph 6.9.4.13); the updated modelling would lead to the following text being considered appropriate:

If additional mortality of 350 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.88%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 65-74% of that which the model predicts would occur in the absence of any additional in-combination impact. Should the population grow at the rate calculated in the PVA model over the next 35 years, then the additional mortality through in combination collisions is not considered to counter a conservation objective to restore the population, as it would still allow the population to grow with minimal delay in reaching the same population level as the un-impacted population. However, in the context of a population trajectory that is currently declining and may continue to decline (or at best be stable) the additional mortality over 35 years causing a reduction in growth rate of 0.88% would have potential to impact the population and make it more difficult to restore the population to a favourable condition.

Table 6: Original RIAA PVA Outputs for Kittiwake at East Caithness Cliffs SPA Assuming a Mortality of 350 Birds

Impact Scenario	Years	% Change in Growth Rate	Ratio of Impacted to Unimpacted Growth Rate	Ratio of Impacted to Unimpacted Population Size	Centile for Impacted Population
Unimpacted	-	-	-	1	0.50
Impacted	35	-1.58	0.985	0.58	0.083
	50			0.46	0.046

Table 7: Updated PVA Outputs for Kittiwake at East Caithness Cliffs SPA Assuming a Mortality of 350 Birds

Impact Scenario	Years	% Change in Growth Rate	Ratio of Impacted to Unimpacted Growth Rate	Ratio of Impacted to Unimpacted Population Size	Centile for Impacted Population
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.88	0.992	0.74	0.21
	50			0.65	0.17

4.2 East Caithness Cliffs SPA – guillemot

Tables 8 and 9 below present in combination PVA metric outputs for the East Caithness Cliffs SPA guillemot population, firstly as presented in the RIAA and secondly with the updated results. The results show lower percentage changes in growth rate in addition to lower rations of unimpacted to impacted growth rates and population sizes.

Table 8: Original RIAA PVA Outputs for Guillemot at East Caithness Cliffs SPA Assuming a Mortality of 200 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.27	0.997	0.91	0.25
	50			0.88	0.20

Table 9: Updated PVA Outputs for Guillemot at East Caithness Cliffs SPA Assuming a Mortality of 200 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.12	0.999	0.96	0.39
	50			0.95	0.37

All metrics have improved due to the updates to the PVA modelling and using the updated outputs the concluding text for the in-combination assessment for guillemot at East Caithness Cliffs (paragraph 6.9.4.35) would change to:

If additional mortality of 200 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.12%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 95-96% of that which the model predicts would occur in the absence of any additional in-combination impact. Should the population grow at the rate calculated in the PVA model over the next 35 years, then the additional mortality through in combination displacement mortality is not considered to counter a conservation objective to restore the population, as it would still allow the population to grow with minimal delay in reaching the same population level as the un-impacted population.

4.3 East Caithness Cliffs SPA - razorbill

Tables 10 and 11 below, present in-combination PVA metric outputs for the East Caithness Cliffs SPA razorbill population, firstly as presented in the RIAA and secondly with updated results. The results show lower percentage changes in growth rate in addition to lower rations of unimpacted to impacted growth rates and population sizes.

Table 10: Original RIAA PVA Outputs for Razorbill at East Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.31	0.997	0.90	0.41
	50			0.86	0.38

Table 11: Updated PVA Outputs for Razorbill at East Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.14	0.999	0.95	0.44
	50			0.93	0.44

All metrics have improved due to the updates to the PVA modelling and using the updated outputs the concluding text for the in-combination assessment for razorbill at East Caithness Cliffs (paragraph 6.9.4.48) would change to:

If additional mortality of 50 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.14%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 93-95% of that which the model predicts would occur in the absence of any additional in-combination impact. Should the population grow at the rate calculated in the PVA model over the next 35 years, then the additional mortality through in combination displacement mortality is not considered to counter a conservation objective to restore the population, as it would still allow the population to grow with minimal delay in reaching the same population level as the un-impacted population.

4.4 North Caithness Cliffs – kittiwake

Tables 12 and 13 below, present in-combination PVA metric outputs for the North Caithness Cliffs SPA kittiwake population, firstly as presented in the RIAA and secondly with updated results. The results show lower percentage changes in growth rate in addition to lower rations of unimpacted to impacted growth rates and population sizes.

Table 12: Original RIAA PVA Outputs for kittiwake at North Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.99	0.99	0.71	0.20
	50			0.62	0.15

Table 13: Updated RIAA PVA Outputs for kittiwake at North Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.55	0.995	0.83	0.32
	50			0.77	0.30

Taking the descriptive paragraph for PVA metrics included the RIAA (paragraph 6.9.5.11); the updated modelling would lead to the following text being considered appropriate:

If additional mortality of 50 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.55%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 77-83% of that which the model predicts would occur in the in the absence of any additional in-combination impact.

4.5 North Caithness Cliffs – guillemot

Tables 14 and 15 below, present in-combination PVA metric outputs for the North Caithness Cliffs SPA guillemot population, firstly as presented in the RIAA and secondly with updated results. The results show lower percentage changes in growth rate in addition to lower rations of unimpacted to impacted growth rates and population sizes.

Table 14: Original RIAA PVA Outputs for guillemot at North Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	0.26	0.997	0.91	0.25
	50			0.88	0.21

Table 15: Updated RIAA PVA Outputs for guillemot at North Caithness Cliffs SPA Assuming a Mortality of 50 Birds					
Impact Scenario	**Years**	**% Change in Growth Rate**	**Ratio of Impacted to Unimpacted Growth Rate**	**Ratio of Impacted to Unimpacted Population Size**	**Centile for Impacted Population**
Unimpacted	-	-	-	1	0.50
Impacted	35	-0.15	0.999	0.95	0.35
	50			0.93	0.33

Taking the descriptive paragraph for PVA metrics included the RIAA (paragraph 6.9.5.22); the updated modelling would lead to the following text being considered appropriate:

If additional mortality of 50 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in-combination total) then the model predicts a reduction in growth rate of 0.15%. Under this scenario, the predicted median impacted population size after 35-50 years would be approximately 93-95% of that which the model predicts would occur in the in the absence of any additional in-combination impact

5 Assessment Implications

The updated PVA results presented in this note have reduced the scale of impact for all SPA features compared to those presented in the RIAA. While the RIAA predicted no adverse effects on site integrity and therefore there are no implications for the conclusions stated, the updated PVA provides further strengthening of the case presented.