1 UPDATE ERRATUM TO THE GREAT BLACK-BACKED GULL COLLISION ASSESSMENT

1.1 INTRODUCTION

1. This document is an erratum to the ES Addendum submitted by Beatrice Offshore Windfarm Limited to Marine Scotland and accepted on 31st May 2013 which updates the collision mortality assessment for great black-backed gulls. This erratum updates sections 7.6.3.5 and 7.8.7.4 of the ES Addendum and 3.4.2.2 of the Report to Inform an Appropriate Assessment (contained at Annex 3B of the ES Addendum).

2. The method used to divide estimated collision mortality among each age class applied in the ES Addendum was incorrect. The method has been amended to ensure mortality is correctly apportioned among all modelled age classes, reflecting on-site observations and published accounts of rates of non-breeding in this species and similar species.

1.2 SUMMARY OF CHANGES TO ES ADDENDUM AND HRA

3. In summary, the results of the updated population modelling of collision mortality for great black-backed gulls do not change the assessment of significance presented in the ES Addendum, with all effects, including cumulatively with the proposed MORL Wind Farm, generating increases in the probability of population decline which are below the thresholds of significance defined in Table 7.4 of the ES Addendum.

4. The cumulative mortality for CIA Scenario 3 was calculated using the worst case scenario (WCS) for Beatrice and the WCS for each of the three individual MORL wind farm sites (referred to in the MORL ES as the 'Secondary Impact Assessment'[1]). However, MORL also present a 'Primary Impact Assessment'[2] on which they base their whole site assessment. This scenario combines the worst case for one of the three developments and realistic scenarios (RS) for the other two, and generates lower total collision mortality rates. A discussion of how the conclusions of the cumulative assessment are affected by use of either the MORL Primary or Secondary assessments has been included. Overall, the assessment of cumulative effects on great black-backed gulls remains non-likely significant (as reported in the ES Addendum).

5. In the assessment of effects with regards designated sites, this erratum presents a marginally significant increase in the risk of a 10% population decline of the East Caithness Cliffs SPA population of great black-backed gulls as a result of the cumulative mortality defined in CIA Scenario 3 of the ES Addendum. Applying the combination of mortality rates from Beatrice (WCS) and MORL (Primary Impact Assessment) to the assessment of potential effects on the East Caithness Cliffs SPA, together with the various conservative assumptions in the modelling, the

[1] Moray Offshore Renewables Limited – Environmental Statement: Chapter 7.4 Ornithology, page 145.
[2] Moray Offshore Renewables Limited – Environmental Statement: Chapter 7.4 Ornithology, page 134.

conclusions of the Report to Inform an Appropriate Assessment remain unchanged: no adverse effect is predicted on the integrity of the East Caithness Cliffs SPA due to collision mortality of great black-backed gull caused by the Wind Farm alone or in combination with the Moray Firth Round 3 Zone wind farms.

1.3 ASSESSMENTOF POTENTIAL EFFECTS

1.3.1 COLLISION EFFECTS – BEATRICE ALONE

1.3.1.1 Great Black-Backed Gull

6. The estimated levels of breeding season collision mortality identified in the updated modelling for the Wind Farm alone are 24 at 99% avoidance (identified as 9 in the ES Addendum) and 49 at 98% avoidance (identified as 18 in the ES addendum; Table 7.26). However, the number of breeding birds estimated to be in collision during the breeding season is almost certainly much smaller than these estimates. Over 20% of great black-backed gulls observed during the boat surveys were aged (as either adults or immature birds) on the basis of plumage. The percentage of adult birds (i.e. birds of breeding age) was 37.5% (120 of 320). During the breeding months (May – August inc.) this was slightly higher (39.5%; 15 of 38), however given the smaller sample size the value derived from all surveys (37.5%) was considered to be a more reliable estimate of the proportion of individuals at risk of collision which are expected to be breeding adults.

7. Furthermore, a proportion of these adults are likely to be non-breeding individuals. Compared to other seabird species such as skuas (Catry et al., 1998) and auks (Harris and Wanless, 1994), gulls typically have relatively large proportions of non-breeders in a population. Calladine and Harris (1996) estimated that within a lesser black-backed gull colony at the Isle of May, east of Scotland, 34% of adults in 1993, and 40% in 1994 did not breed. This was considered to be a 'normal' period, unaffected by culling measures which occurred in some other years. These results are similar to those from other studies of gull populations. Kadlec and Drury (1968) estimated that 15-30% of adult North American herring gulls did not breed in any one year, and Pugesek and Diem (1990) estimated that 36% of Californian gulls did not breed in any given year. Samuels and Ladino (1984) estimated that 45% of herring gulls did not breed in a North American study.

8. It could therefore be reasonably concluded that as a conservative estimate, for every two breeding birds recorded, another non-breeding individual is present within the population. Since the breeding population estimate is based on breeding pairs, this effectively increases the East Caithness Cliffs SPA population from 350 individuals to around 525. This would mean that approximately one in three adult birds at risk of collision would be a non-breeder, assuming that all birds from the SPA use the site equally. In reality it is very likely that the proportion of non-breeders encountered will increase with distance offshore, since these individuals are not constrained by the demands of incubation and feeding chicks. Therefore non-breeders are more likely to spend longer periods of time farther away from the colony, and range more widely than breeders.

9. To accommodate these demographic factors in the assessment of collision impacts within the population model, mortality was apportioned among each pre-breeding age class and the breeding/non-breeding components of the adult age class as described below. This effectively used the proportion of each age class in the population (at each time step of each simulation) to generate equivalent proportions of each age class predicted to be killed through collisions.

10. First, the proportion of the total mortality assigned to adults was adjusted to reflect the boat based observation that 37.5% of birds on the Wind Farm site were adults. This compares with the average proportion of adults in the total population estimated by the population model of 51.84%. A correction factor for adult mortality was calculated as the ratio of adults observed on site to the model estimate (37.5/51.84 = 72.3%). At each time step of each simulation adult mortality was multiplied by this correction factor to reduce the mortality predicted to affect this age class. Mortality of the pre-breeding age classes was then increased by the same overall amount in proportion to their presence in the population. In this manner the total mortality remained unchanged, but the relative levels on each age class were modified in line with direct observations.

11. Thus, the proportion of mortality affecting adults was on average 37.5%, with the remaining mortality (on average 62.5%) distributed among the pre-breeding age classes.

12. Secondly, as detailed above, only 65% of breeding age adults are estimated to breed in any given year. Therefore, total adult mortality was further sub-divided between breeding adults and non-breeding adults in the ratio 65:35. Thus, the average percentage of the total mortality assigned to breeding adults (37.5%) was multiplied by 65% to give a value of 24.4%. This is the average percentage of the total mortality assigned to breeding adults. The equivalent for non-breeding adults was 13.1% (37.5% multiplied by 35%). This is the average percentage of mortality assigned to non-breeding adults.

13. Overall therefore, the above steps were used to assign mortality to each section of the population in line with observed population demographics. The following example illustrates how this changed proportional mortality. With an initial age distribution of (17%, 13%, 10%, 8%, 52%) representing the percentage of the population in the pre-breeding age classes (one to four) and adults respectively, the average division of mortality among each section of the *modelled* population after applying the adjustment detailed above would be (23%, 17%, 13%, 10%, 24%) which sums to 87%. The remaining 13% is attributable to non-breeding adults (which are not modelled). Since the population estimates on which the population model is based are derived from estimates of breeding pairs, the model only includes breeding adults, not non-breeding adults. The above adjustments ensure that the mortality assigned to breeding adults and younger age classes matches their proportions in the population. Thus at a total mortality of 100, the model would apply a mortality of 87 to the age classes in the model.

14. This makes the assumption that mortality of non-breeding adults does not affect the breeding population and that adults move freely between breeding and non-

breeding. While, loss of non-breeding adults could reduce the number of breeding pairs, in the current example, with an estimated regional breeding population of 203 pairs (406 individuals), the number of individual non-breeding adults would be nearly 220. The number of individuals lost from this population of non-breeders as a result of the share of the total mortality assigned to them would be 3 individuals (13% of 24). This is not considered likely to have a noticeable effect on the modelled population. Furthermore, modelling the population and the effects of mortality in this manner generates conservative results, since the only source of replacement of breeding adults is through recruitment of pre-breeding age birds (i.e. age class 4). In reality the number of breeding birds would also be supplemented by recruitment of non-breeding adults. This form of buffering against losses has been found for other long lived birds such as divers (Grear et al. 2009).

15. The predicted additional probabilities of population decline within 25 years relative to the baseline (no collision) and the predicted probabilities that the population will be smaller than the baseline after 25 years on the basis of mortality levels of 49 individuals (at 98% avoidance) and 24 individuals (at 99% avoidance) are provided in Table 1.1 of this Erratum.

16. The breeding season collision mortality (24 at 99% avoidance, 49 at 98% avoidance) generated small increases in the probability of a population decline (Table 1.1; Figure 1; Tables A1 and A2 of this Erratum). Thus at this level of collisions (at 99% avoidance), the additional risk (above that predicted in the absence of collisions) of a population decline of 10% was 2.4% (identified as 1.5% in the ES Addendum), the increase in risk of a 20% decline was <0.1% (identified as 0.1% in the ES Addendum) and of a 50% decline was zero (no change from the ES Addendum).

Table 1.1: Predicted Increase in Probabilities of Great Black-Backed Gull Population Decline during 25 Year Simulation and in Final Year of Simulation due to Collisions on the Wind Farm Site.

Thresholds of Population Decline (% Reductions)	Additional Probability of Population Decline during 25 yr. Simulation Relative to No Collisions Scenario (used for effect assessment)		Increase in the Probability Population will be Smaller than 25 yr. Median Size Obtained with No Collisions (not used for effect assessment but included at request of MS)	
	Avoidance Rate		Avoidance Rate	
	98%	99%	98%	99%
10	0.096	0.024	0.647	0.606
20	0.009	<0.001	0.794	0.697
50	0	0	0.959	0.368

17. All of the increases in the risk of population decline predicted at an avoidance rate of 99% were below the thresholds defined in Table 7.4 (of the ES Addendum). Therefore the conclusion of a non-likely significant effect in terms of the EIA Regulations remains unchanged from the ES Addendum, which replaced the assessment in the Original ES (Section 13.4.2.5: small magnitude, minor significance).

18. It should be noted that the model predicts there to be a high risk of the population being smaller after 25 years due to collisions than in the absence of collisions (Table 1.1 of this Erratum). This reflects the reduction in the population growth rate which occurs with increasing mortality. Thus, the population is predicted to increase at a lower rate due to collisions, which inevitably means the population size will be smaller after 25 years, hence the high probabilities in Table 1.1 of this Erratum. However, the model predicts that growth remains positive on average until annual mortality exceeds 90 (and in 95% of simulations until mortality exceeds 60, Figure 1 of this Erratum, which replaces Figure 11 in Annex 7A of the ES Addendum). Thus these high increases in the probabilities of the population size being smaller after 25 years do not necessarily reflect population reduction, but rather slower potential growth.

1.3.2 CONSIDERATION OF THE MOST LIKELY SCENARIO

19. Reductions in collision mortality with the Most Likely Scenario (MLS) compared with the WCS lead to lower levels of predicted effect for all species. As an illustration, the predicted probability of a 10% decline in the great black-backed gull population caused through collision mortality (at an avoidance rate of 99%) in the worst case scenario was 2.4% (Table 1.1 of this Erratum). This falls to 0.9% (identified as 0.8% in the ES Addendum) for the most likely scenario (Table 1.2 of this Erratum).

Table 1.2: Predicted Increase in Probabilities of Great Black-Backed Gull Population Decline during 25 Year Simulation and in Final Year of Simulation due to Collisions on the Wind Farm Site during the Breeding Season using the Most Likely Scenario Number and Size of turbines.

Thresholds of Population Decline (% Reductions)	Additional Probability of Population Decline during 25 yr. Simulation Relative to No Collisions Scenario (used for effect assessment)		Increase in the Probability Population will be Smaller than 25 yr. Median Size Obtained with No Collisions (not used for effect assessment but included at request of MS)	
	Avoidance Rate		Avoidance Rate	
	98%	99%	98%	99%
10	0.024	0.009	0.606	0.391
20	<0.001	<0.001	0.697	0.381
50	0	0	0.368	0.080

1.4 ASSESSMENT OF CUMULATIVE EFFECTS

1.4.1 COLLISION RISK – BREEDING SEASON

1.4.1.1 Great Black-Backed Gull

20. The estimated levels of cumulative breeding season collision mortality identified in the updated modelling for the Wind Farm together with the Moray Firth Round 3 Zone were 32, 37 and 39 (at 99% avoidance, identified as 12 to 15 individuals in the ES Addendum, Table 7.37). However, the number of breeding birds estimated to be

in collision during the breeding season is almost certainly much smaller than these estimates, as detailed above. The same modelling adjustments of age related collision mortality detailed above were made to the cumulative totals in order to generate appropriate mortality rates for each age class.

21. The predicted additional probabilities of population decline within 25 years relative to the baseline (no collisions) and the predicted probabilities that the population will be smaller than the baseline after 25 years on the basis of mortality levels of 63 to 78 individuals (at 98% avoidance, identified as 24 to 30 individuals in the ES Addendum) and 32 to 39 individuals (at 99% avoidance, identified as 12 to 15 individuals in the ES Addendum) are provided in Tables 1.3 and 1.4 of this Erratum.

Table 1.3: Predicted Increase in Probabilities of Great Black-Backed Gull Population Decline during 25 Year Simulation and in Final Year of Simulation due to Collision Mortality (at an avoidance rate of 98%) during the Breeding Season on the Wind Farm Site and the Moray Firth Round 3 Zone Wind Farms.

Thresholds of Population Decline (% Reductions)	Additional Probability of Population Decline during 25 yr. Simulation Relative to No Collisions Scenario (used for effect assessment)			Increase in the Probability Population will be Smaller than 25 yr. Median Size Obtained with No Collisions (not used for effect assessment but included at request of MS)		
	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
10	0.208	0.337	0.430	0.647	0.647	0.647
20	0.037	0.099	0.154	0.794	0.794	0.794
50	0	<0.001	<0.001	0.993	0.994	0.994

Table 1.4: Predicted Increase in Probabilities of Great Black-Backed Gull Population Decline during 25 Year Simulation and in Final Year of Simulation due to Collision Mortality (at an avoidance rate of 99%) during the Breeding Season on the Wind Farm Site and the Moray Firth Round 3 Zone Wind Farms.

Thresholds of Population Decline (% Reductions)	Additional Probability of Population Decline during 25 yr. Simulation Relative to No Collisions Scenario (used for effect assessment)			Increase in the Probability Population will be Smaller than 25 yr. Median Size Obtained with No Collisions (not used for effect assessment but included at request of MS)		
	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
10	0.037	0.049	0.055	0.642	0.645	0.646
20	0.001	0.002	0.003	0.773	0.785	0.790
50	0	0	0	0.587	0.745	0.808

22. Thus at these levels of cumulative collision mortality (at an avoidance rate of 99%) the increase in the probability of decline by more than 10% was 3.7% for CIA Scenario 1 (identified as 2.3% in the ES Addendum), 4.9% for CIA Scenario 2 (identified as 2.9% in the ES Addendum) and 5.5% for CIA Scenario 3 (identified as 3.2% in the ES Addendum). The probability of decline by more than 20% increased from 0.1% for CIA Scenario 1 (identified as 0.3% in the ES Addendum) to 0.3% for CIA Scenario 3 (identified as 0.4% in the ES Addendum) and the probability of

decline by more than 50% was zero for all CIA scenarios (unchanged from the ES Addendum).

23. It is also worth noting that the MORL ES includes a collision mortality estimate for the entire development (termed the 'Primary Assessment') which is lower than that obtained by summing the WCS for each individual development. The MORL Primary Assessment has a collision estimate at 99% of 11, a reduction of 3 compared with the summed individual developments presented here for CIA Scenario 3. Application of this mortality would reduce the potential effect on the population.

24. None of these increases in the risk of population decline exceed the thresholds defined in Table 7.4 (of the ES Addendum). Therefore the conclusion of a non-likely significant effect in terms of the EIA Regulations remains unchanged from the ES Addendum, which replaced the assessment in the Original ES (Section 13.9.3.2: small magnitude, minor significance).

1.5 STATEMENT OF SIGNIFICANCE

25. Population models have been used in the ES Addendum to generate probabilistic predictions for effects. Three alternative thresholds for increase in the risk of a population decline have been applied (Table 7.4 of the ES Addendum). The outputs obtained in this manner do not lend themselves to the estimation of effects defined on a sliding scale of magnitude of effect and significance. Therefore, the results of the modelling have been used to determine if effects are either likely significant or non-likely significant in terms of the EIA Regulations, according to the predicted increases in the probability of population decline in relation to the thresholds (Table 7.4 of the ES Addendum). Collision risk during the breeding season was not found to cause any likely significant effects on the great black-backed gull population which has been recorded on the Wind Farm Site, either alone or cumulatively with the Moray Firth Round 3 Zone.

26. A summary of the effects of collision impacts on great black-backed gulls is provided in Table 1.5 of this Erratum.

***Table 1.5: Summary of Ornithology Effect Assessment using Worst Case Scenarios. The increase in the risk of a 10% population decline is provided for each effect assessed** (NB: the assessments also considered the increase in risk of declines of 20% and 50%, see text for details)*

Effect	Receptor	Scenario (effect assessment and predicted increase in probability of 10% decline in population size)				Rationale
		Wind Farm	Cumulative Scenario 1	Cumulative Scenario 2	Cumulative Scenario 3	
Collision (breeding season; at an avoidance rate of 99%)	Great black-backed gull	Non-likely significant (2.4%)	Non-likely significant (3.7%)	Non-likely significant (4.9%)	Non-likely significant (5.5%)	Risks of population decline all less or equal to minimum thresholds for significance (NB: risks of decline of 20% and 50% much less than thresholds).

1.6 *APPRAISAL OF EFFECTS ON CONSERVATION OBJECTIVES AND INTEGRITY OF SPAS*

1.6.1 EAST CAITHNESS CLIFFS

1.6.1.1 Great Black-Backed Gull

27. The following predictions of population decline were obtained using the Wind Farm alone (24 at 99%) and in-combination collision mortality estimates (32 – CIA Scenario 1, 37 – CIA Scenario 2 and 39 – CIA Scenario 3 at 99%; Table 1.6 and Figure 2, Tables A3, A3a and A4 of this Erratum).

Table 1.6: Predicted Increase in Probabilities of East Caithness Cliffs Great Black-Backed Gull Population Decline during 25 Year Simulation and in Final Year of Simulation due to Collisions on the Wind Farm Alone and Moray Firth Round 3 Zone Wind Farms

Thresholds of Population Decline (% reductions)	Additional Probability of Population Decline during 25 yr. Simulation Relative to No Displacement Scenario (used for HRA)				Increase in the Probability Population will be Smaller than 25 yr. Median Size Obtained with No Displacement (not used HRA but included at request of MS)			
	Wind Farm	Scenario 1	Scenario 2	Scenario 3	Wind Farm	Scenario 1	Scenario 2	Scenario 3
10	0.054	0.074	0.095	0.103	0.624	0.649	0.651	0.651
20	0.006	0.009	0.013	0.015	0.718	0.778	0.784	0.786
50	0	0	0	0	0.432	0.667	0.815	0.874

28. At these levels of collision, the additional probability (above that predicted in the absence of collision mortality) of the East Caithness Cliffs great black-backed gull population declining by more than 10% increased from 5.4% (the Wind Farm alone, identified as 2.3% in the Report to Inform an Appropriate Assessment) to 10.3% (Scenario 3, identified as 4.0% in the ES Addendum). The increase in the

probability of decline below 20% increased from 0.6% (the Wind Farm alone, identified as 0.2% in the ES Addendum) to 1.5% (Scenario 3, identified as 0.4% in the ES Addendum) and the increase in the probability of decline below 50% was zero for all scenarios (unchanged from the ES Addendum).

29. The predicted increase in the risk of a 10% decline for CIA Scenario 3 just exceeds the threshold for a likely significant effect, by 0.3%. However, the cumulative mortality on which this is based was calculated as the sum of the worst case effects for Beatrice and all three of the Moray Firth Round 3 Zone wind farms estimated independently. In the MORL ES there are two versions of their whole site collision estimates; one is the sum of the worst case scenarios for all three developments (the 'Secondary Impact Assessment'), while the other (the 'Primary Impact Assessment') uses the worst case scenario for one and a realistic scenario for the other two. This latter assessment generates smaller collision estimates (for great black-backed gulls 11 individuals at 99%, a reduction of 3 compared with the summed individual amount). Using the Primary Impact Assessment collision estimate in place of the Secondary Impact Assessment reduces the cumulative total collision mortality across the full extent of both wind farms to 36. This is less than the total mortality assessed for CIA Scenario 2 (37), at which level of mortality the model predicts an increase in the risk of a 10% population decline of 9.5% (Table 1.6 of this Erratum). Thus mortality of 36 would generate a risk of population decline below the threshold at which an adverse effect on site integrity would be concluded, as defined in Table 3.17 (of the Report to Inform an Appropriate Assessment).

30. It is also worth noting that, although the mortality assessment has accounted for non-breeding adults (by removing the mortality which would affect this group), not including them in the population model makes the assessment of mortality impacts precautionary for the following reason. In the population model, recruitment of breeding adults is only from the preceding younger age class, whereas in reality non-breeding adults also recruit to become breeding adults. Thus, non-breeding adults effectively provide a buffer for impacts on the breeding population. This buffering mechanism is absent from the model, thereby removing a source of population resilience and rendering the model more sensitive to increases in mortality.

31. Furthermore, gulls are amongst the species known to be attracted to smaller vessels such as the ones used for the boat surveys. The magnitude of bias in density estimates this behaviour introduces for this species is unknown. However, consideration of another species (gannet) which also shows attraction to boats may be instructive. A comparison has been made of density estimates generated from boat based surveys with those obtained from aerial surveys for this species (WWT 2012). This found that, on average, boat based estimates were 20 times higher than aerially derived ones, while the median difference was 7 times higher. If it is assumed that aerial surveys are a reliable means to estimate gannet density (on the grounds that these are large, obvious birds readily seen from above), this would imply that true densities for this species are in the region of 15% of those obtained from boat surveys. Reducing bird densities reduces collision mortality in a 1:1

ratio. Even if the estimated densities of great black-backed gull on the Wind Farm site derived from the boat survey data are only twice the real level due to attraction of birds to the survey vessels (i.e. a much smaller bias than has been found for gannet) then the collision estimates would be halved.

32. Taking the above considerations into account, it can be seen that the assessment of collision mortality on the population of great black-backed gulls is highly conservative.

33. Consequently, no adverse effect is predicted on the integrity of the East Caithness Cliffs SPA due to collision mortality of great black-backed gull caused by the Wind Farm alone or in combination with the Moray Firth Round 3 Zone wind farms.

The following Figures 1 and 2 replace Figures 11 and 15 in Annex 7A of the ES Addendum respectively.

Figure 1: Great black-backed gull – collision (breeding season) (this figure replaces Figure 11 in Annex 7A of the ES Addendum).

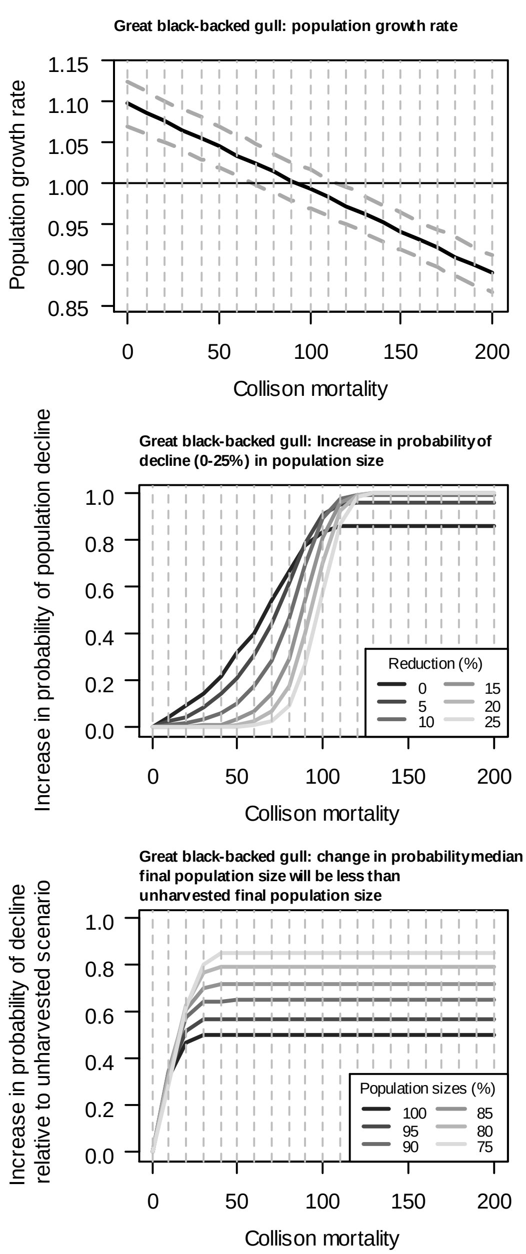
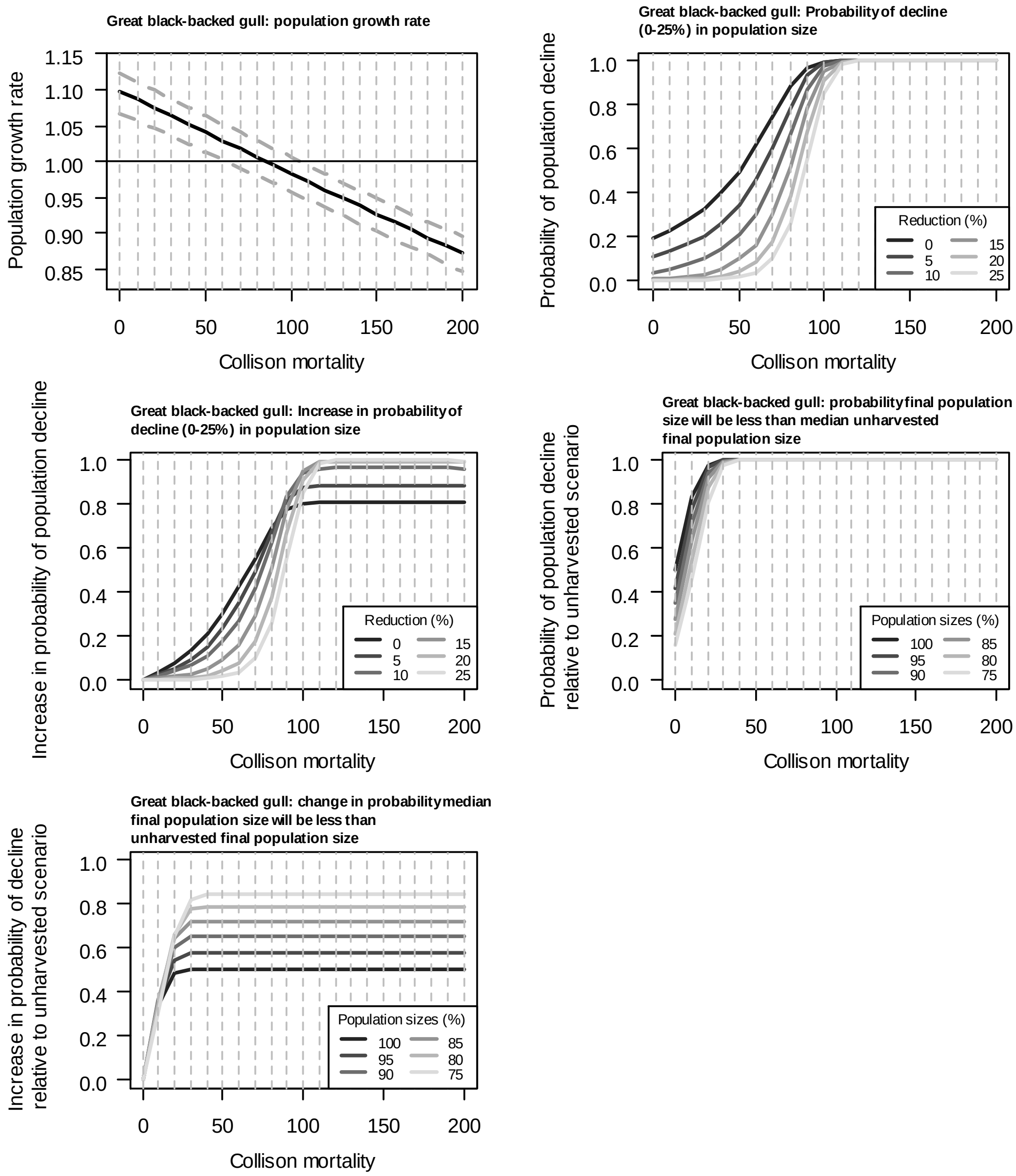


Figure 2: Great black-backed gull – collision (East Caithness Cliffs SPA) (this figure replaces Figure 15 in Annex 7A of the ES Addendum).



The following Tables replace Tables 21, 21a, 22, 35, 35a and 36 in Annex 7B of the ES Addendum respectively.

Table A1: Great black-backed gull probability of population decline during 25 year simulation period in relation to collision mortality during breeding season. Based on all populations listed in Table 7.2 of ES Addendum. (This replaces Table 21 of Annex 7B of the ES Addendum).

Thresholds of population decline (%)	**Number of birds in collision**												
	0	**20**	**40**	**60**	**80**	**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**
0	0.142	0.231	0.355	0.547	0.812	0.979	1.000	1.000	1.000	1.000	1.000	1.000	1.000
5	0.039	0.085	0.177	0.345	0.657	0.951	1.000	1.000	1.000	1.000	1.000	1.000	1.000
10	0.002	0.018	0.060	0.179	0.470	0.892	0.998	1.000	1.000	1.000	1.000	1.000	1.000
15	0.000	0.003	0.013	0.067	0.296	0.808	0.996	1.000	1.000	1.000	1.000	1.000	1.000
20	0.000	0.000	0.003	0.024	0.176	0.703	0.992	1.000	1.000	1.000	1.000	1.000	1.000
25	0.000	0.000	0.001	0.007	0.093	0.578	0.982	1.000	1.000	1.000	1.000	1.000	1.000
30	0.000	0.000	0.000	0.002	0.042	0.440	0.962	1.000	1.000	1.000	1.000	1.000	1.000
35	0.000	0.000	0.000	0.000	0.018	0.312	0.925	1.000	1.000	1.000	1.000	1.000	1.000
40	0.000	0.000	0.000	0.000	0.006	0.199	0.862	0.999	1.000	1.000	1.000	1.000	1.000
45	0.000	0.000	0.000	0.000	0.002	0.116	0.760	0.997	1.000	1.000	1.000	1.000	1.000
50	0.000	0.000	0.000	0.000	0.000	0.056	0.614	0.989	1.000	1.000	1.000	1.000	1.000

Table A1a: Great black-backed gull increase in the probability of population decline during 25 year simulation period in relation to collision mortality during breeding season. Based on all populations listed in Table 7.2 of ES Addendum. (This replaces Table 21a of Annex 7B of the ES Addendum).

Thresholds of population decline (%)	**Number of birds in collision**												
	0	**20**	**40**	**60**	**80**	**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**
0	0.000	0.089	0.214	0.405	0.670	0.837	0.858	0.858	0.858	0.858	0.858	0.858	0.858
5	0.000	0.046	0.138	0.306	0.618	0.912	0.961	0.961	0.961	0.961	0.961	0.961	0.961
10	0.000	0.016	0.058	0.176	0.468	0.890	0.996	0.998	0.998	0.998	0.998	0.998	0.998
15	0.000	0.003	0.013	0.066	0.295	0.808	0.996	1.000	1.000	1.000	1.000	1.000	1.000
20	0.000	0.000	0.003	0.024	0.176	0.703	0.992	1.000	1.000	1.000	1.000	1.000	1.000
25	0.000	0.000	0.001	0.007	0.093	0.578	0.982	1.000	1.000	1.000	1.000	1.000	1.000
30	0.000	0.000	0.000	0.002	0.042	0.440	0.962	1.000	1.000	1.000	1.000	1.000	1.000
35	0.000	0.000	0.000	0.000	0.018	0.312	0.925	1.000	1.000	1.000	1.000	1.000	1.000
40	0.000	0.000	0.000	0.000	0.006	0.199	0.862	0.999	1.000	1.000	1.000	1.000	1.000
45	0.000	0.000	0.000	0.000	0.002	0.116	0.760	0.997	1.000	1.000	1.000	1.000	1.000
50	0.000	0.000	0.000	0.000	0.000	0.056	0.614	0.989	1.000	1.000	1.000	1.000	1.000

Table A2: Great black-backed gull probability of population being smaller than median after 25 year simulation period in relation to collision mortality during breeding season. Based on all populations listed in Table 7.2 of ES Addendum. (This replaces Table 22 of Annex 7B of the ES Addendum).

Thresholds of population decline (%)	Number of birds in collision												
	0	20	40	60	80	100	120	140	160	180	200	220	240
0	0.500	0.971	1.000	1.000	1	1	1	1	1	1	1	1	1
5	0.429	0.951	1.000	1.000	1	1	1	1	1	1	1	1	1
10	0.352	0.925	1.000	1.000	1	1	1	1	1	1	1	1	1
15	0.280	0.886	0.999	1.000	1	1	1	1	1	1	1	1	1
20	0.206	0.833	0.999	1.000	1	1	1	1	1	1	1	1	1
25	0.147	0.762	0.997	1.000	1	1	1	1	1	1	1	1	1
30	0.098	0.673	0.991	1.000	1	1	1	1	1	1	1	1	1
35	0.059	0.573	0.980	1.000	1	1	1	1	1	1	1	1	1
40	0.032	0.453	0.958	1.000	1	1	1	1	1	1	1	1	1
45	0.015	0.331	0.919	1.000	1	1	1	1	1	1	1	1	1
50	0.006	0.218	0.846	0.998	1	1	1	1	1	1	1	1	1

Table A3: East Caithness Cliffs SPA great black-backed gull probability of population decline during 25 year simulation period in relation to collisions during the breeding season. (This replaces Table 35 of Annex 7B of the ES Addendum).

Thresholds of population decline (%)	Number of birds in collision												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	0.192	0.229	0.272	0.323	0.402	0.491	0.619	0.740	0.882	0.970	0.998	1.000	1.000
5	0.112	0.137	0.166	0.203	0.262	0.346	0.459	0.606	0.788	0.932	0.992	1.000	1.000
10	0.034	0.049	0.076	0.100	0.142	0.211	0.299	0.454	0.665	0.871	0.979	0.999	1.000
15	0.006	0.011	0.020	0.029	0.054	0.097	0.163	0.301	0.518	0.783	0.956	0.996	1.000
20	0.002	0.003	0.006	0.009	0.018	0.043	0.081	0.180	0.382	0.674	0.913	0.993	1.000
25	0.001	0.001	0.002	0.002	0.006	0.017	0.037	0.099	0.262	0.548	0.851	0.984	1.000
30	0.000	0.000	0.001	0.001	0.001	0.005	0.016	0.050	0.170	0.421	0.763	0.962	0.999
35	0.000	0.000	0.000	0.000	0.000	0.001	0.006	0.025	0.100	0.300	0.652	0.918	0.996
40	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.012	0.050	0.195	0.518	0.853	0.987
45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.022	0.115	0.379	0.750	0.962
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010	0.060	0.246	0.605	0.909

Table A3a: East Caithness Cliffs SPA great black-backed gull increase in the probability of population decline during 25 year simulation period in relation to collisions during the breeding season. (This replaces Table 35a of Annex 7B of the ES Addendum).

Thresholds of population decline (%)	Number of birds in collision												
	0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
0	0.000	0.037	0.079	0.130	0.209	0.299	0.426	0.548	0.690	0.777	0.806	0.808	0.808
5	0.000	0.026	0.054	0.092	0.150	0.234	0.347	0.494	0.676	0.820	0.880	0.888	0.888
10	0.000	0.014	0.042	0.066	0.108	0.177	0.265	0.420	0.631	0.837	0.945	0.964	0.966
15	0.000	0.006	0.015	0.024	0.048	0.091	0.157	0.295	0.512	0.777	0.950	0.991	0.994
20	0.000	0.002	0.005	0.007	0.016	0.041	0.079	0.178	0.380	0.673	0.912	0.991	0.998
25	0.000	0.000	0.001	0.002	0.006	0.016	0.037	0.098	0.262	0.548	0.850	0.984	0.999
30	0.000	0.000	0.000	0.001	0.001	0.005	0.016	0.050	0.170	0.421	0.762	0.962	0.999
35	0.000	0.000	0.000	0.000	0.000	0.001	0.006	0.025	0.100	0.300	0.652	0.918	0.996
40	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.012	0.050	0.195	0.518	0.853	0.987
45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.022	0.115	0.379	0.750	0.962
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010	0.060	0.246	0.605	0.909

Table A4: East Caithness Cliffs SPA great black-backed gull probability of population being smaller than median after 25 year simulation period in relation to collisions during the breeding season. (This replaces Table 36 of Annex 7B of the ES Addendum).

Thresholds of population decline (%)	Number of birds in collision												
	0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
0	0.500	0.832	0.981	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
5	0.422	0.774	0.966	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
10	0.349	0.709	0.947	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
15	0.277	0.631	0.919	0.996	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
20	0.213	0.547	0.873	0.989	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
25	0.156	0.457	0.807	0.978	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
30	0.111	0.357	0.725	0.954	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
35	0.071	0.261	0.621	0.916	0.996	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
40	0.045	0.184	0.507	0.851	0.986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
45	0.025	0.115	0.385	0.751	0.965	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000
50	0.013	0.063	0.269	0.620	0.916	0.995	1.000	1.000	1.000	1.000	1.000	1.000	1.000

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