Humphries S (Sophie)

From: Gayle.Holland@gov.scot
Sent: 01 November 2017 17:11
To: Sarah Arthur; Tom Young
Cc: Andrew Blyth; Jim.McKie@gov.scot; Frances.Pacitti@gov.scot; Nicola.Bain@gov.scot; Tracy.McCollin@gov.scot; Sophie.Humphries@gov.scot
Subject: RE: Response to ICOL scoping opinion ornithology questions 8 September 2017
Attachments: 2017 10 26 - Recalculating non-breeding season impacts Example using PI....pdf

Hi Sarah,
Please find attached the illustrative example on calculating non-breeding season effects from SNH. MSS have considered this and advise that it is the most appropriate method at this time, therefore Scottish Ministers advise that this approach should be followed. MSS have however highlighted caveats below which should be considered when completing the assessment:

- The approach assumes even mixing of birds from different colonies throughout the BDMPS areas and the BDMPS seasons. The reality is that birds from particular colonies are more/less likely to occur in particular areas and during particular periods of time than others (and these will vary with bird age). This is likely to result in bias in the resulting values though the degree and indeed direction of these biases remain unclear.
- The approach uses adjusted collision estimates based on the Crown Estate spreadsheet rather than recalculated Collision Risk Model (CRM) estimates. This is because the information required to undertake re-calculations using the CRM is often not available, or to track it down and re-run the CRM for each wind farm would be extremely time-consuming. However, this does mean that uncertainty around the collision estimates assumed may be considerable.
- Where seasons assumed in the Crown Estate report differ from that advised by SNH, the approach advised by SNH is to assume a uniform spread of the season's collisions across the months included in the season. An alternative solution is not readily apparent, but it is unclear how realistic this assumption is and it may result in under/over estimation of collisions.
- For Scottish SPAs, the relevance of seasons advised by Natural England and assumed in the Crown Estate report in apportioning collisions during the non-breeding season is unclear. Birds from the Bass Rock will have the same breeding season regardless of whether they are in English or Scottish waters. It is unclear what affect the combining of English and Scottish breeding season periods would have on the apportioning of collision effects during the non-breeding season to English and Scottish colonies.

The apportioning of non-breeding season effects to appropriate breeding colonies is a challenging thing to do. The approach advised by SNH is sensible and proportionate, but care will need to be taken when interpreting the results due to the complexity of the task and the issues mentioned above.

I will respond to the other points raised in your letter dated 26 October 2017 later this week.

Kind Regards
Gayle

From: Sarah Arthur [mailto:sarah.arthur@redrockpower.co.uk]
Sent: 26 October 2017 12:12
To: Holland G (Gayle); Tom Young

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Example of calculation of non-breeding season impacts to Forth Islands SPA - to consider non-breeding season impacts and application of the Crown Estate 'Headroom' recalculations to inform cumulative wind farm impacts.

This example uses Northern Gannet as the focal species and considers the wind farms of Beatrice (Scotland) and East Anglia One (England).

The key documents referenced are:

- Furness R.W. 2015. *Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS)*. Natural England Commissioned Reports, Number 164.[1]
- Smartwind (2015) *Clarification Note – Apportioning of predicted gannet mortality to the Flamborough and Filey Coast pSPA population* – Appendix N to the response submitted for Deadline IIA. 25th August 2015.[2]
- MacArthur Green (2017) – *Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality*. The Crown Estate. (Report and Spreadsheet).
  Spreadsheet - open the CRM Recalculation tab and for clarity we advise:
  Column M - CRM totals for ES / application / old CRM figures,
  Column P – CRM totals for as built design / new / updated CRM figures, and
  Column L - Adjustment figures.
- SNH recommended periods for seabird seasons.[3]
- Beatrice Offshore Wind Farm Environmental Statement Addendum.[4]

[1] http://publications.naturalengland.org.uk/publication/6427568802627584

[2] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010053/EN010053-001270-Appendix%20N-Clarification%20Note%20-%20Apportioning%20of%20predicted%20gannet%20mortality%20to%20the%20Flamborough%20and%20Filey%20Coast%20pSPA%20population.pdf

[3] https://www.snh.scot/sites/default/files/2017-07/A2332152%20-%20Suggested%20seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment%20-%203rd%20February%202017.pdf

[4] http://sse.com/media/341180/ES-Addendum-Signed-Cover-Sheet-and-Sections-1-15.pdf

An outline of the steps required is as follows:

1) Assess contribution of the focal colony to the BDMPS region (i.e. what proportion of birds in the BDMPS region consist of birds from the focal colony) – in this example the focal colony is the Forth Islands SPA (Bass Rock).

2) Extract seasonal collision estimates calculated for East Anglia One and Beatrice from the information submitted in the Hornsea / East Anglia 3 (EA3) PINS documentation (Cumulative Impacts table).

3)
   i) Calculate the number of collisions in period/s outside the breeding season for consented ('original') and as-built scenarios ('updated'). As-built scenarios should be taken from TCE 'headroom' estimates in MacArthur Green (2017).

   ii) Apportion the number of non-breeding period collisions to the Forth Islands SPA, according to age class, by adjusting the as-built/new scenario collision estimates by the proportion of Forth Islands SPA birds estimated to be within the BDMPS region during non-breeding period/s.

   iii) Where seasonal definitions differ between SNH guidance and TCE 'headroom' report, recalculate collision estimates to reflect SNH defined non-breeding period duration/s.

4) Repeat for all wind farms identified for consideration in cumulative impact assessment/in-combination effects. Sum all collision estimates for a non-breeding period/s cumulative impact total.

Step 1

Furness (2015) divides the periods of gannet non-breeding season into autumn (September to November) and spring (December to March). The population of gannets in the BDMPS region of the North Sea and Channel UK waters during:

- autumn is estimated to be 456,298 birds, and
- spring is considered to be 248,385 birds.

Furness (2015) calculates the age class proportions of gannets in autumn using a stable age structure model of 55% adult, 26% immature birds and 19% juvenile (percentages rounded to nearest whole point). As birds moult from juvenile plumage at end of first calendar year, in spring the proportions are assumed to be 55% adult and 45% immature birds (refer to section 7.2 Non-breeding components of the population on p.52 for details).

The assumption is made that all source (e.g. SPA) populations are mixed equally throughout the BDMPS region.

The contribution of the Forth Islands SPA (Bass Rock colony) to the autumn North Sea population is calculated as follows:

Table 1

Forth Islands population in BDMPS region (Furness 2015, p.314, Table 14)[5]	Adults 110964	Immature 52131	Juveniles 37750	Sum 200845
Proportion of Forth Islands birds present in autumn in BDMPS region (Furness 2015, p.314, Table 14)	100%	90%	90%	_
Number of Forth Islands birds in BDMPS	110964	46918	33975	191857
Proportion of autumn BDMPS comprising Forth Islands birds	110964/242340= 0.46	46918/(213959*.58) = 0.38	33975/(213959*0.42) = 0.38	42%

The contribution of the Forth Islands SPA (Bass Rock colony) to the spring North Sea population is calculated as follows:

Table 2

Forth Islands population in BDMPS region (Furness 2015, p.316, Table 16)	Adults 110964	Immature 89881	Sum 200845
Proportion of Forth Islands birds present in spring in BDMPS region (Furness 2015, p.316, Table 16)	70%	40%	_
Number of Forth Islands birds in BDMPS	77675	35952	113627
Proportion of Spring BDMPS comprising Forth Islands birds	77675/163701 = 0.47	35952/84684 = 0.43	45.7%

[5] Please note, there may be an issue with the figures in Furness 2015, when recalculating these figures using the Stable Age structure percentages worked back from the total Sum (200845) this would give 110464.75 (adults @55%), 52219.7 (immatures @ 26%) and 38160.55 (juveniles @ 19%). For the purpose of this illustrative example, we have used the figures as presented in Furness 2015, although we recommend that the stable age structure percentages, as reported in Furness 2015, are used to calculate the proportions of each age class from the total population given.

So of all birds in the North Sea and Channel BDMPS in autumn, it is expected that 42% originate from Forth Islands SPA (Bass Rock), comprising 46% of the adult birds in the North Sea and Channel and 38% of the immatures and juveniles. In spring 45.7% of birds in the same region are from Forth Islands SPA (Bass Rock), which is 47% of the adult birds and 43% of the immature birds. The age breakdown of those birds will be based on the stable age structure models presented in Furness 2015.

Step 2

The number of collisions from wind farms in UK waters in the North Sea are given in recent applications considered in England. These may be used as a source to inform cumulative impact assessment for Forth and Tay offshore wind applications. The number of collisions calculated in those recent applications may have been modified by recent work commissioned by The Crown Estate (MacArthur Green 2017), so care should be taken that the values reported are those that appear in the 'old CRM' totals in The Crown Estate spreadsheet : CRM – column m. (MacArthur Green 2017).

In Table 3 below we have extracted values from Table 1.11, Appendix N of the Hornsea 2 application (Smartwind 2015). We have picked two wind farms to illustrate the steps of the calculation, Beatrice wind farm in Scotland and East Anglia One wind farm in England.

Table 3

Wind farm	**Autumn period collisions**	**Spring period collisions**	**Band Model Option**
Beatrice	48.8	9.5	1
East Anglia One	124.5	4.7	2

Step 3

i)

Within The Crown Estate spreadsheet (refer to the CRM recalculation tab - MacArthur Green 2017) the annual collisions reported for Beatrice are 95.7 (consented value), this includes breeding period collisions, which are not addressed here but are reported in the ES Addendum for Beatrice wind farm (Section 7 Ornithology – table 7.20). The spring and autumn estimates of collisions are presented below.

The numbers of collisions reported for Beatrice wind farm are the same as those reported in the Crown Estate spreadsheets (see Step 3 Section a).
However, the figures reported for East Anglia One in the latest PINS documents and the Crown Estate Spreadsheet differ, so further calculations are required for that site (see Step 3, Section b).

a) Beatrice.

The Crown Estate 'Headroom' spreadsheet (MacArthur Green 2017) applied a 0.6069 adjustment to the CRM estimate to convert from the total application estimates to the as built estimates.

Table 4

	Autumn	**Spring**	**Non-breeding total**
Beatrice Application	48.8	9.5	58.3
Beatrice As Built (*0.6069)	29.6	5.8	35.4

b) East Anglia One.
Within The Crown Estate spreadsheet (refer to the CRM recalculation tab) (MacArthur Green 2017), East Anglia One wind farm is reported as having 213 annual collisions (consented value). We note that this figure was updated for part of the PINS process and that 131.6 annual collisions were reported more recently in the cumulative impact assessment for Hornsea 2 (Smartwind 2015) taking into account a reported reduction in turbines between those consented and build out. Our advice for this re-calculation is that for consistency the key reference is The Crown Estate spreadsheet (MacArthur Green 2017). This means that the correct adjustment should be taken from the spreadsheet and applied to the baseline for the wind farm site, and not the value from the PINS document. However, we acknowledge the ratio of autumn to spring collisions reported in the Hornsea 2 cumulative assessment (Smartwind 2015) would still be the same and have applied this in the following step:

Assuming that the ratio of autumn and spring collisions at East Anglia One remains the same, despite the overall annual estimate adjustment, it is calculated that the Crown Estate total of 213 annual collisions relates to 94.6% autumn collisions and 3.6% spring collisions (with small number of breeding season collisions) (based on Smartwind 2015 ratio).

We can reconstruct that the 213 annual collisions would have included 94.6% (201) autumn collisions and 3.6% (8) spring collisions (there is a small number of breeding season collisions not considered here).

Table 5

	Autumn	**Spring**	**Non-breeding total**
East Anglia One Application	201	8	209
EA One As built (*0.4483)	90.1	3.6	93.7

The modified non breeding CRM totals figures are 93.7 (East Anglia One) and 35.4 (Beatrice) – tables 4 & 5 above, due to CRM adjustment of 0.4483 and 0.6069 respectively. (CRM adjustment figures area taken from the TCE Report accompanying spreadsheet - in the CRM recalculation tab, column L - MacArthur Green 2017).

ii)
The total collisions attributed to Forth Islands for each period then should be adjusted by the age proportions and the proportional representation of the colony within the BDMPS for that period

Table 6

	Adult	**Immature**	**Juvenile**
Beatrice Wind farm			
Autumn Collisions	29.6 * 0.55* 0.46 = **7.5**	29.6 * 0.26 *0.38= **2.9**	29.6 * 0.19 * 0.38= **2.1**
Spring Collisions	5.8 * 0.55 * 0.47 = **1.5**	5.8*0.45*0.43 = **1.1**	-
East Anglia One			
Autumn Collisions	90.1 * 0.55 * 0.46 = **22.8**	90.1 * 0.26 * 0.38 = **8.9**	90.1 *0.19 * 0.38= **6.5**
Spring Collisions	3.6 * 0.55 * 0.47 = **0.9**	3.6 * 0.45 * 0.43 = **0.7**	-

iii)
The values have now been calculated for the number of collisions to each age class of gannet from Forth Islands (Bass Rock) SPA in each non-breeding season period. However, the seasonal period definitions used in the Furness 2015 BDMPS report do not match those in the SNH guidance on seasonal periods for seabirds in Scotland.

The recommended approach to this, in the absence of monthly collision estimates from all wind farms in the cumulative table is to assume a flat rate of collisions during the season, and recalculate according to the relative lengths of the periods.

The autumn post breeding period in the BDMPS report (MacArthur Green 2017) and the Hornsea 2 report (Smartwind 2015) is 12 weeks from September to November. The SNH recommendation is from October to December. As this is also a 12 week period no further adjustment is required.

In Spring, the Hornsea 2 table (Smartwind 2015) and the BDMPS report (MacArthur Green 2017) uses a 16 week period – December to March, whereas the SNH recommended period is January to mid-March – equivalent to a 10 week period. A proportionate recalculation based on relative length of time in the two periods is required. Therefore 10/16 or 0.625 * the number of collisions in spring is the final value required.

Table 7

	Autumn			**Spring**	
	Adult	**Immature**	**Juvenile**	**Adult**	**Immature**
Beatrice	6.8	3.2	2.4	0.9	0.7
East Anglia One	20.8	9.8	7.2	0.6	0.4
TOTAL	27.6	13	9.6	1.5	1.1

Step 4

The step should be repeated taking account of the CRM predicted impacts for all wind farms identified for inclusion in the cumulative assessment, and for each species of interest (gannet and kittiwake).