Second opinion on Sejerøbugten and Smålandsfarvandet EIA's and Appropriate Assessments

Research note from
DCE - Danish Centre for Environment and Energy

Date: 26 November 2015

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No of pages: 11

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Introduction

Environmental Impact Assessments (EIA's) and associated Appropriate Assessments of two offshore wind farms in inner Danish waters, Sejerøbugten and Smålandsfarvandet, were published in 2014 and 2015 (Zydelis & Heinänen 2014a, 2014b, Skov & Heinänen 2015a, 2015b).Updated Appropriate Assessments for the two sites became available in draft versions in November 2015 (Skov & Heinänen 2015c, 2015d).

NIRAS was commissioned by Energistyrelsen to review the Appropriates Assessments as well as the updated drafts. In that context NIRAS requested input for the review from DCE, Aarhus University. The request was formulated in the seven points, cited below in their original wording.

1) Surveys covering a 10 year period (2004 – 2014). What issues might this provide e.g. disturbance of scoter flocks resulting in lower counts or even higher counts due to double counting? Are these issues likely to cause a significant constraint to the assessment conclusions? Also, are there likely constraints in using data that has the potential to be out of data e.g. due to a change in scoter distribution, population size etc?
   Common Scoter displacement are currently assessed including a buffer of 3 km. Can this be considered insufficient and open to challenge? What evidence suggests a greater buffer distance is appropriate? DOF have referred to this report (http://www.sofnet.org/1.0.1.0/1267/download_21126.php) to justify +5km displacement for Common Scoter (4km in fx the Rødsand report from 2000).

2) Scoter displacement is assessed at a rate of 75% within the wind farms and 50% within the 3 km buffer. Is this supportable with existing evidence / knowledge? If a greater buffer area is suggested in question (1) what level of displacement could be appropriate > 3km?

3) Redistribution analysis by DHI/Rambøll is carried out by which densities of displaced birds are moved into areas of similar habitat quality outside the displacement zone associated with the wind farm. Redistribution is limited to a defined study area – what evidence is there for redistribution of scoters and what distances are involved? Are there significant within-winter movements between relatively distant core areas so that displacement induced increases in density would not only be felt at a local level?

4) Estimation of density-dependent mortality caused by increases in densities areas outside the displacement zone associated with the wind farm is calculated. The authors apply a 1% increase in density would lead to a 2.5% increase in mortality based on the oystercatcher studies of Durell et al. (2000), Durell et al. (2001) and Goss-Custard & Durell (1984). While the authors admit this is somewhat problematic are there any alternatives and can it be said to be precautionary if applying to seaduck?

5) Assessment is undertaken by comparing predicted mortality against the regional population i.e. 500,000 birds. It is unclear what the population trend is for the regional population – what evidence is there for it being stable or in decline? Common Scoter is also a migratory feature of Sejerø Bugt og Nekselø SPA (DK005X094). What is the population and trend of the SPA? Can an assessment against the EU regulations be said to have been completed if the PBR assessment is against the regional population

only, i.e. not including a proportion of the designated population of the SPA? Should the *Nmin* within the PBR account for the 20th percentile or is there enough certainty to apply the recorded regional population?

6) Moulting periods are not specifically discussed within the assessment. Is the area including the SPA known to support scoter during this period? If so, would it be appropriate to adjust displacement rates and density dependent mortality? DOF have criticised the assessment in that displacement mortality is calculated for birds able to fly not flightless birds. DOF state in their hearing response that moulting is Jul-Sep, and wintering is Oct-Apr. Is this accurate?

7) Are you familiar with densities of CS in the Baltic Sea around the German OWF's? And if so would you expect there to be a cumulative impact on density-dependent mortality with the Danish OWFs?

In this memo the seven questions are addressed, followed by general comments on the issue.

Replies to the questions posed

Ad 1

Aerial human-based observations of birds were used to provide information on bird abundances and distribution in the study area for the two offshore wind farms. Such surveys are performed from a survey altitude of 250 feet and at a speed of ca. 100 knots.

Aerial surveys of Common Scoters are particularly challenging because these birds react strongly towards anthropogenic disturbances. Furthermore, Common Scoters are relatively small and dark coloured, and frequently show a highly clumped distribution. Estimation of flock sizes can be very challenging in cases with high densities.

Adequate observation conditions when surveying Common Scoters is essential. High wave activity dramatically influences the detectability of the birds. If observers strictly follow the survey protocol by making sure that all birds present in the inner perpendicular transect band are detected, then lack of accurate flock size estimation in the outer bands will not influence the density estimation, but failure to do so will typically result in biased density estimations.

Double counting is not regarded a severe problem. The survey aircraft travels at high speed, and flushed flocks settle soon after the passage of the aircraft.

The degree to which human-based aerial surveys underestimate abundance has been studied in comparative studies of different survey methods. Such comparisons are far from trivial to conduct. The results indicate that bird densities are underestimated by the human-based aerial surveys.

Comparison of data over the 2004-2014 survey period does not raise any concern.

The distance out to which the distribution of a species is affected by the presence of wind turbines is available from some studies. The study that is geographically closest to these two planned offshore wind farms is the

Horns Rev 2 site, where post-construction surveys demonstrated reduced densities in the post-construction period out to a distance of 5 km (Figure 1). These estimations were based on average pre-construction and average post-construction survey data, and not on a single survey data example. This is at the same time the most comprehensive description of displacement rates for Common Scoter from wind turbines. Both disturbance distances and rates can be acquired from this study. It is recommended that the displacement scenarios from Horns Rev 2 are used for both the Sejerøbugten and the Smålandsfarvandet appropriate assessments.

It is of more concern that the two appropriate assessments use survey distribution and abundance data from one single survey to describe the general Common Scoter distribution in the area, in both cases an April survey. The justification for doing so is that these surveys displayed the highest abundance of birds. But the distribution of Common Scoters at this time of year is considerably different from both the moulting period and the winter period.

In April the birds are on transit during their spring migration, and often occur at less traditional locations and greater water depth. So, even though the April surveys revealed the highest numbers of birds in the study area, the utilization of shallower areas in eastern parts of the bay may well represent higher Common Scoter utilization when taking the temporal aspect into consideration, i.e. a given area may not contain the highest density in April, but if the number of days the birds utilize the area is taken into account, the same area may, cumulated over the winter, be more important to the Common Scoters. This aspect is not dealt with in the present analysis.

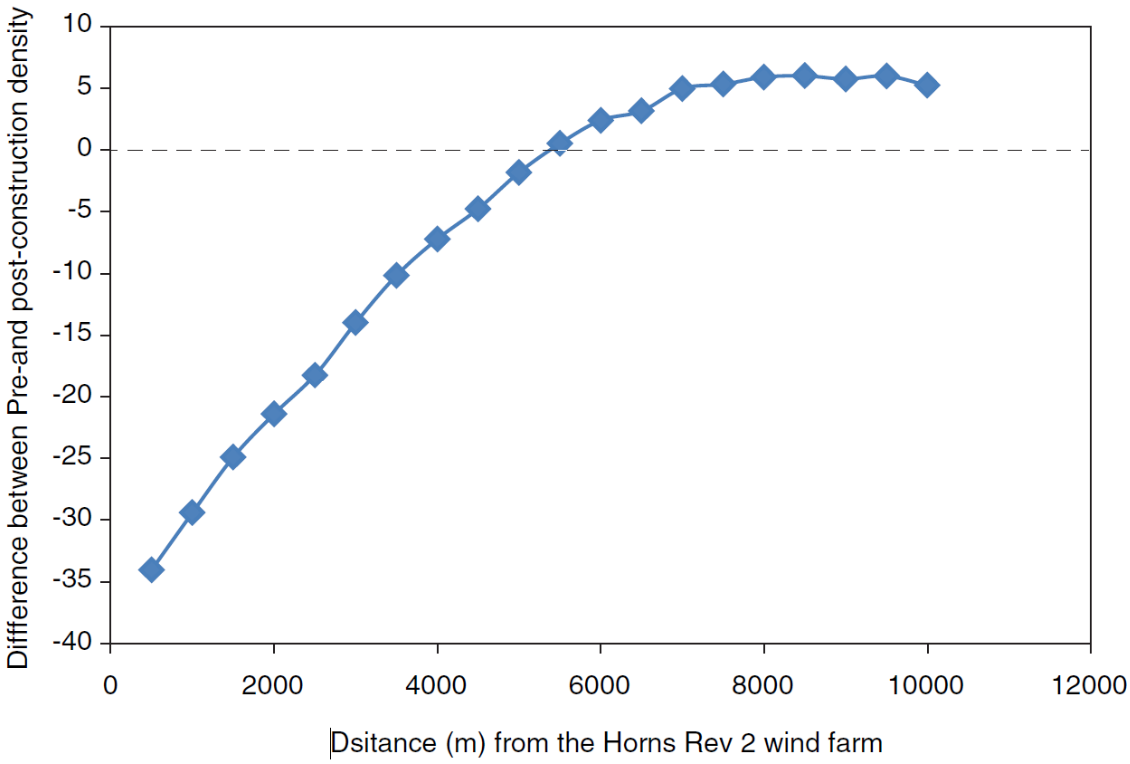

Figure 1. Differences between pre- and post-construction abundances by 0.25 km grid squares (y-axis) of Common Scoter in the Horns Rev 2 survey area in relation to 500 meters distance intervals (x-axis) from the periphery of the Horns Rev 2 offshore wind farm. Negative values indicate lower abundances after the construction of the Horns Rev 2 offshore wind farm. From Petersen et al. (2014).

Using survey data from the survey displaying the highest numbers of birds has implication for the subsequent estimation of density dependent mortality. There is no guidance on how this should be approached. Assuming that the estimation of density dependent mortality also has a temporal aspect suggests that mean densities would be a more appropriate unit to use.

Ad 2

As mentioned under Ad 1, it would be appropriate to use displacement information from the Horns Rev 2 study when evaluating potential displacement effects for the Sejerøbugt and Smålandsfarvandet wind farms. The percentage abundance change between the pre- and post-construction period is not quoted in Petersen et al. (2014). From the above Figure 1 it appears that the displacement effect is linearly decreasing with distance away from the wind farm, and extends out to a distance of ca. 5 km. The percentage reduction in density within the wind farm footprint and in the buffer zone out to a distance of 5 km was calculated from the Horns Rev 2 data set. The above Figure 1 represents a 62 % reduction between pre- and post-construction densities of Common Scoters within the footprint of the wind farm, while in the buffer zone, out to a distance of 5 km there was an overall reduction of 37 %.

Ad 3

Little is known about individual Common Scoter within-winter movements between different suitable staging areas. Unpublished geolocator data on wintering distribution of Common Scoters from Iceland show that the Icelandic birds move to a specific wintering area, and stay there for the duration of the winter. The spatial accuracy of such geolocator data is not accurate enough to evaluate small-scale (< 100 km) changes in wintering location.

Thus, defining the mechanisms behind choice of location in the event of a displacement will be based on "best guess". Birds that redistribute will seek to optimize their conditions under the given situation, and the choice of new location could well be outside the study area of the two wind farm study sites in question.

The relocation principles used by the authors followed the principle that birds move to a place with the same suitability scores as the one they were displaced from. But whether they move to the nearest or the furthest available site is undefined, and how large increases of density are allowed for the individual sites is also undefined.

Relocation of birds between locations with the same suitability score will be legitimate in situations with no inter- or intra-specific competition and sufficient food resources for the birds. But in situations where food resources are limited, relocation and increased density of birds will lead to increased competition, and relocation might therefore well be from one suitability class to a lower one, or alternatively that other birds are forced into less suitable habitat. So, apart from the birds that are estimated to die, birds may experience reduced physical conditions that in turn may lead to reduced reproduction success, and thus a carry-over effect on the population size. This last aspect seems not to be included in the calculation.

Ad 4

The estimation of density-related extra mortality is the weakest point in the appropriate assessments. Whether or not density-dependent mortality rates are comparable between Oystercatchers and diving ducks remain unknown. This requires assuming that food is a limited resource throughout their wintering range, so that birds follow an ideal free distribution at carrying capacity. It is therefore difficult to assess whether the estimated density dependent mortality rates are precautionary.

The fact that data from the survey with highest densities of Common Scoters was used to estimate density dependent mortality seems a very precautionary step, as discussed under Question 1. Using mean density over multiple surveys seems more appropriate.

When estimating the cumulated effect, including for instance Horns Rev, the density figures used there was means over ten surveys. It needs clarification as to how the density dependent mortality was calculated from wind farms other than Sejerø and Smålandsfarvandet.

Given the uncertainties related to estimation of the displacement-induced extra mortality, we recommend that precautionary principles are used. Addressing this issue in more detail will require the use of agent-based models. This is not a trivial undertaking, but such a modelling approach would be beneficial for the assessment at a strategic planning level in order to inform multiple users/wind farm sites.

Ad 5

Up until ca. 2011 the population estimate for Common Scoters in the Eurasian flyway population was 1.6 million individuals (Delany and Scot 2006).Wetlands International revised the Eurasian flyway population to 500,000 Common Scoters in ca. 2011. This estimate was revised in summer 2015 on the background of primarily German, Danish and UK information (http://wpe.wetlands.org/view/2372).

For the Danish waters, including the North Sea, a winter population of 600,000 individuals was estimated. At the same time Germany estimated 500,000 birds in German Baltic and North Sea. On top of that the UK estimate for the wintering population has increased to over 100,000 individuals. The wintering range of the Eurasian flyway population of Common Scoters ranges from the southern Baltic and south Norway via Scotland, along the European west coast to the coasts of Morocco/Mauritania.

The majority of the wintering population is believed to be within the German/Danish/UK waters, summing up to an estimated 1.2 million birds. Not accounting for wintering numbers in the Netherlands, Belgium, Ireland, France, Spain and Portugal implies that the estimate of 0.6 to 1.2 million birds is a conservative one.

The revised estimation of the population size is said to be stable. Based on the above this seems to be a legitimate assessment.

The PBR analysis is performed against the Eurasian flyway population. That will be the appropriate unit to perform the analysis on.

The evaluation of the local impact on the Sejerø Bugt and Nekselø SPA (DK005X094) is evaluated in terms of a calculated number of dead birds as a result of increased density dependent mortality from the displacement from the wind farms. It seems that the number of dead birds estimated relates to the entire study area and a break down into within and outside the SPA has not been performed. Judging from the nature of the data this should be a readily feasible exercise. Whether or not the information would help decision makers is a different matter, given the following points:

1. that the entire evaluation was based on a single, not typical survey result
2. that the principles for relocation of displaced birds needs better description
3. and that the translation of increased density into increased mortality seems very uncertain.

Ad 6

Common Scoters are known to moult in the Sejerøbugt area, and to a minor degree in the Smålandsfarvandet area. The major moulting area for the species in Danish waters is in the shallow waters between Læsø and Anholt and historically also the southern Danish North Sea off Rømø/Fanø (Joensen 1973, Petersen & Fox 2009).

In Sejerøbugten Common Scoters mainly moult in the SPA and the waters between Røsnæs and Sejerø, including the footprint of the proposed Sejerø offshore wind farm (Petersen et al. 2015). In the Smålandsfarvandet area moulting birds (primarily Common Eiders and Velvet Scoters) moult in and around the shallow water, including the footprint of the proposed wind farm.

The main moulting period for Common Scoters is June to September. Males start their moult earlier, upon return from their breeding grounds, which they leave as the females are well into incubation. There are both sex- and age-related differences in timing of moult, and females are known to moult into November. The main moulting period is June to September, though.

Because of their inability to fly during the moulting period, these birds are particularly sensitive to human disturbances during that time. In the Sejerø Bugt area more than 17,000 Common Scoters were estimated in the summer of 2015. One of the core moulting sites was in the proposed wind farm area (Petersen et al. 2015).

During the summer these waters have high levels of human activity, particularly from recreational sailing. One of the frequently used routes is from the harbor of Sejerø southwards to the tip of Røsnæs (Petersen et al. 2015). A wind farm at the proposed Sejerø location would reroute this sailing activity towards the east or to the west of the wind farm. In case the sailing traffic is rerouted east of the wind farm, which would create additional stress to concentrations of Common Scoters in that area, this would cause additional displacement of moulting Common Scoters.

Clearly, the issue of moulting Common Scoters should be given more attention in the Appropriate Assessment.

Ad 7

The majority of wintering Common Scoters in western Europe originate from Russian breeding grounds. The birds perform a northeast-southwest oriented migration. A very small part of the population breeds in the UK, Ireland and Iceland, while small numbers breed in Scandinavia. The rest of the population breeds in Russia. Thus, the majority of the 100,000 Common Scoters wintering in the UK come from Russian/Scandinavian breeding grounds, passing Danish waters.

The PBR calculations estimates removal potential from the entire flyway population, and therefore correctly include displacement effects from for instance Horns Rev 1, 2 and 3. No attempt has been done to include the potential impact from German offshore wind farms. This is regarded a serious shortcoming.

In the German North Sea there is only one wind farm in areas with high numbers of Common Scoters, namely the Budendiek offshore wind farm off the island of Sylt and only a few kilometers south of the border between Danish and German EEZ (Dorsch and Nehls 2012). Post-construction investigations have been carried out for this site, but the report is at this stage not publically available. The baseline reports are available. The baseline report from 2011-2012 estimated very high concentrations of Common Scoters in the area, with maximum densities in the study area of almost 500 individuals/km^2 in March 2011. In this report the mean density of Common Scoter by season (spring, summer, autumn, winter) was calculated for the wind farm footprint and buffer zones of 500 m, 1, 2 and 4 km. In winter most Common Scoters were recorded in the footprint of the wind farm, namely a mean of 718 individuals. When including a buffer zone of 4 km the mean winter number was 4,104 individuals.

In the present absence of estimates of direct displacement effects from the Budendiek wind farm, displacement results from the Horns Rev 2 wind farm could readily be applied.

The remaining wind farms in German North Sea are constructed at water depths greater than those preferred by Common Scoters. This is also true for offshore wind farms in German Baltic.

General comments

The present document comments on EIA's and Appropriate Assessments for the Sejerø and Smålandsfarvandet offshore wind farms, specifically in relation to Common Scoter.

The use of estimations of density dependent mortality caused by displacement, held up against a calculation of the PBR for the Eurasian flyway population of Common Scoter is ambitious and interesting. But given the limitations, calculation of that specific value is clearly the weakest point of the analysis. Yet, it is used as the core value to evaluate the potential impact of the wind farms on the Common Scoter population.

The rationale seems to be that a proposed wind farm can be established if the impact from the construction, in addition with impacts from other wind farms or other anthropogenic impacts in the same flyway of a bird species, does not exceed 100% of the estimated PBR. It is important to realize that when the 100% PBR level is reached, no more wind farms should be established within the entire areas of the flyway population where potential impact on Common Scoter could occur. Thus, it would seem more ambitious to seek to reduce the impact from every single proposed wind farm. Thorough screening of new sites will be essential to achieve that.

In the situation of the present Sejerøbugt and Smålandsfarvandet wind farms it is recommended that assessments are made on the basis of the number of displaced birds, not only Common Scoters, using estimation of density dependent mortality entirely as an additional information and weighed appropriately in respect to the associated uncertainties.

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