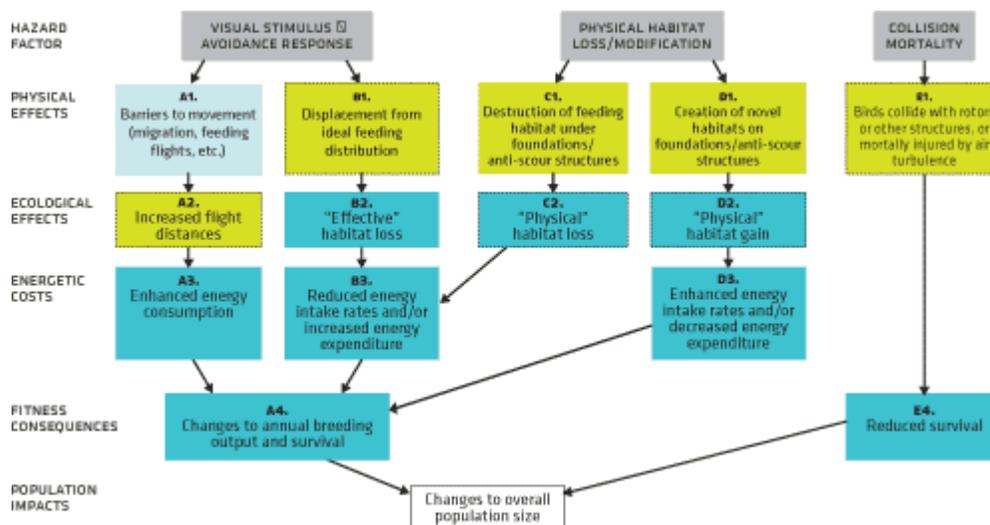


## Summary of Denmark Avian Wind Power Research: Effects of an Offshore Windfarm on the Long-Tailed Duck (*Clangula hyemalis*)

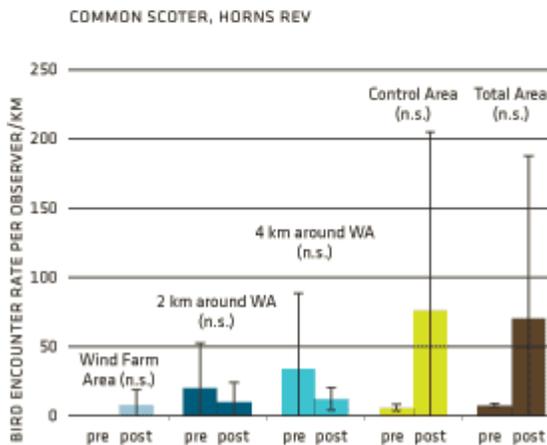
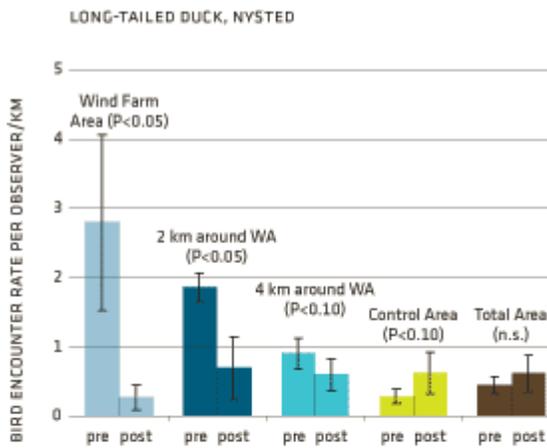
- Baseline and Post-Construction Surveys were performed at Rodsand in Denmark. Baseline studies were done from 2000-2002, construction occurred in 2003, and post-construction surveys were in 2004 and 2005 (Desholm et al 2001, Kahlert et al 2002, Desholm et al 2003, Kahlert et al 2004(a), Kahlert et al 2004(b)).
- Surveys conducted to address the following potential avian impacts (figure from Fox et al 2006).



- Ducks were generally seen flying over water depths of 6-12 meters (Kahlert et al 2002).
- In baseline studies, long-tailed ducks were one of only a few species that showed a spatial attraction to the wind farm area (and the four buffer zones surrounding it) and were therefore targeted as a species susceptible to impact (Desholm et al 2001, Kahlert et al 2002).
- During construction, long-tailed ducks showed reduced preference for turbine construction areas. However, few surveys were performed during this time, so no

conclusions can be drawn regarding long-tailed ducks reactions to construction (Kahlert et al 2004(a)).

- Post-construction (2004-2005), long-tailed ducks showed significantly reduced densities in the wind farm area (Kahlert et al 2004(b)).
- The selectivity index for the wind farm area was +0.71 during pre-construction when calculated on the basis of number of clusters, decreasing to +0.35 for the post-construction phase. When including the 2 km zone around the wind farm the corresponding values were +0.70 for the pre-construction phase as compared to +0.39 for the post-construction phase (Peterson et al 2006).
- Reduced density and selectivity indicates that long-tailed ducks exhibit an avoidance response to off-shore wind turbines. Constructing turbines can affect local distributions of the species, but as a result, fewer birds will come within the risk zone of the rotorblade sweep area. Density shown in the following figure (from Fox et al 2006)



- Similar studies were conducted for the Horns Rev wind farm, but long-tailed ducks were not observed in significant numbers at this location (Petersen and Fox 2007).

### **Literature Cited**

1. Desholm, M., Kahlert, J., Petersen, I.K. & Clausager, I. (2001): Base-line investigations of birds in relation to an offshore wind farm at Rødsand: results and conclusions, 2000. - Report from NERI, 42 pp.
2. Kahlert, J., Desholm, M., Petersen, I.K. & Clausager, I. (2002): Base-line investigations of birds in relation to an offshore wind farm at Rødsand: results and conclusions, 2001. - Report from NERI, 50 pp.
3. Desholm, M., Petersen, I.K., Kahlert, J. & Clausager, I. (2003): Base-line investigations of birds in relation to an offshore wind farm at Rødsand: Results and conclusions, 2002. - Report from NERI, 64 pp.
4. Kahlert, J., Petersen, I.K., Fox, A.D., Desholm, M. & Clausager, I. (2004): Investigations of birds during construction and operation of Nysted offshore wind farm at Rødsand: Results and conclusions, 2003 - Annual status report from NERI, 82 pp.
5. Kahlert, J., Desholm, M., & Clausager, I (2004). Investigations of migratory birds during operation of Nysted offshore wind farm at Rødsand: Preliminary analysis of data from spring 2004. NERI Note, 36 pp.
6. Petersen, I.K., Christensen, T.K., Kahler, J., Desholm, M., Fox, A.D (2006). Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark. NERI Report, 166 pp.

7. Petersen, I.K. and A.D. Fox (2007) Changes in bird habitat utilization around the Horns Rev 1 offshore wind farm, with particular emphasis on Common Scoter. Report commissioned by Vattenfall A/S, 40 pp.
  
8. Fox, A.D., Christensen, T.K., Desholm, M., Kahler, J., Petersen, I.K (2006). Danish Offshore Wind: Key Environmental Issues. Section 7: Birds Avoidance Responses and Displacement.  
<http://193.88.185.141/Graphics/Publikationer/Havvindmoeller/kap07.htm>. Accessed 7 December 2010.