THE EFFECT OF WIND TURBINES ON BIRDS AT THE SMØLA WIND POWER PLANT, NORWAY : COLLISIONS, DISPLACEMENT, AND AVOIDANCE

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SUMMARY: Comprehensive research on the effect of the Smøla wind power plant on birds has been carried out since 2006. Deaths of birds, particularly white-tailed sea eagles, in collisions are a major concern, and there is evidence that birds of some, though not all, species avoiding the wind park area relative to controls. Preliminary data suggests white-tailed sea eagles show no tendency to avoid turbine blades, treating them as if they are not there. The results indicate the importance of careful siting of wind power installations to minimize risks of conflicts with wildlife and conservation issues.

Keywords: wind turbines, birds, collision, displacement, avoidance

INTRODUCTION

The wind power installation on Smøla island, Norway (20 2MW and 48 2.3MW turbines; Figure 1) was completed in October 2005. Development was controversial as it is located within an area containing an unusually dense white-tailed sea eagle (*Haliaeetus albicilla*) breeding population. Following construction, deaths of birds, particularly white-tailed sea eagles, through collisions with turbine blades soon became a serious concern to the operator, the authorities, and the public (Figure 2).

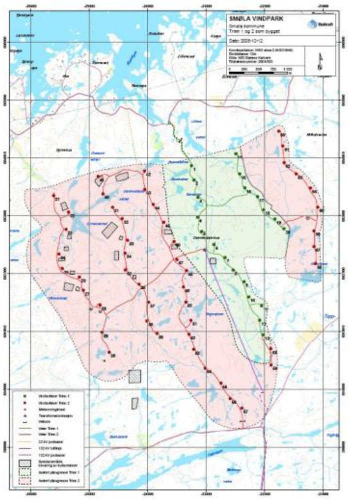

Figure 1. Map of Smøla wind turbine power plant.

Systematic studies of the effect of the installation on birds began in 2006. Here we report selected early results, to end 2009; the full research programme, methods and results can be found at http://www.nina.no/archive/nina/PppBasePdf/rapport/2009/505.pdf

Figure 2. White-tailed sea eagle killed by wind turbine blade. Photo: K. Bevanger

COLLISIONS

At least 114 birds of at least 24 species were killed in collisions with turbine blades (Figure 3). These were minimums; we almost certainly did not find all dead birds (test efficiency of trained dogs used in the study was 33-55%). Tests showed about 10% of corpses disappeared each week. Most casualties were Smøla willow ptarmigan (*Lagopus lagopus variegatus*) and white-tailed sea eagles.

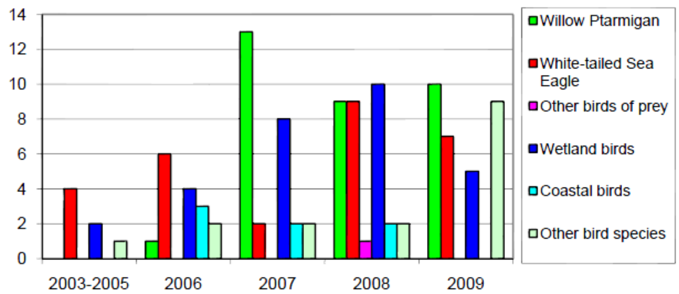

Figure 3. Numbers of birds killed by wind turbine collisions, Smøla, 2003-2009. NB search effort 2003-2006 was not systematic.

White-tailed sea eagles are of particular concern as they are long-lived, slow breeding, and live at low densities; so that extra mortality from wind turbines may threaten the population. Overall, one white-tailed sea eagle was killed per 10 turbines each year. There was no decreasing trend with time (a further 8 birds of this species were killed in collisions, January-May 2010; or 36 in total).

Collisions with this species occur mainly in spring. 57% were full adults (5+ years old); 29% aged 1-4 years; and 14% <1 year. This is probably because of territorial behaviour in spring and because the turbine installation area is little used by the species except in the breeding season.

DISPLACEMENT

Before the wind power plant was built, 13 pairs of white-tailed sea eagle bred within the plant. In 2009, 2 pairs bred in the same area. However, in the Smøla archipelago as a whole the number of breeding pairs increased to 61, from 53 in 2002. This suggests that the breeding population has been displaced, though whether these are new pairs or (in part) old pairs which have moved, is not yet known. This displacement depends on their being suitable alternative breeding sites for the species, which might not be the case in other locations.

Data on small birds indicates avoidance of the vicinity of wind turbines by several common species. In contrast, radio tracking data on the Smøla willow ptarmigan, of particular concern as the subspecies is found only on this island, suggests birds did not avoid going near wind turbines. Population densities are higher inside the wind turbine power plant area in autumn, but not in spring, compared to a control area (Figure 4). There were no significant differences in breeding success (Figure 5).

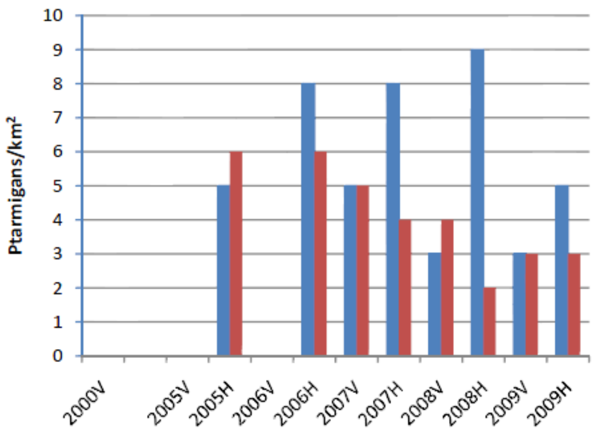

Figure 4. Population density of Smøla willow ptarmigan (birds/km^2) in spring (V) and autumn (H) in the wind-power plant area (blue) and control area (red) in 2005-2009 on Smøla.

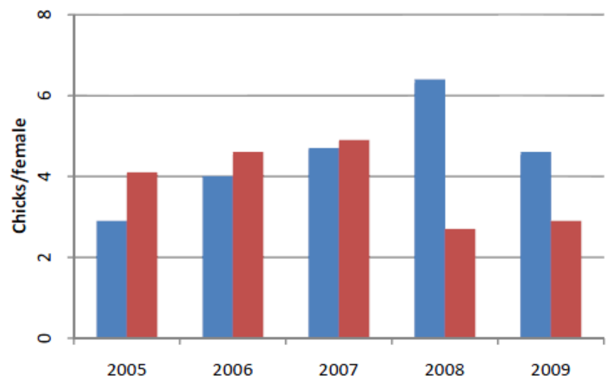

Figure 5. Chick production of Smøla willow ptarmigan expressed as number of chicks per female in August in the wind-power plant area (blue) and control area (red) during 2005-2009 on Smøla.

AVOIDANCE

Avoidance of turbines was studied observation -ally and using a specially built radar (Figure 6).

Figure 6. Merlin radar system for investigating bird flight in the wind power plant. Photo: K. Bevanger

Initial results suggest that the white-tailed sea eagle on Smøla does not show any behavioral response to turbine blades; i.e. that it treats them as if they are not there. This may be because motion blur renders turbine blades invisible at short range. This finding needs confirmation, but if confirmed calls into question the very high avoidance rates normally assumed in modeling collision risk. An alternative explanation is that the turbulence generated by the rotor blades is interpreted as "thermals" by the eagles

CONCLUSION

The programme is a work in progress; more comprehensive results will be forthcoming. Future work will include mitigation measures. However, it is clear that careful siting of wind power plants is a primary measure for reducing the potential for conflicts with wildlife protection issues.

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