



*This paper forms part of the proceedings from the BOU conference **Marine Renewables and Birds**
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Avoidance behaviour and flight intensities of birds in an offshore wind farm in the Netherlands

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Flight patterns of birds were studied in the framework of a 3-year effect study in the Dutch Offshore Wind Farm Egmond aan Zee (OWEZ). A combination of visual observations and continuous radar observations were carried out between 2007 and 2010, to assess flight intensities, flight altitudes and flight paths. Visual observations provided information at species level. A combination of horizontal and vertical radar with automated data recording provided continuous data on flight patterns, also at night time and in adverse weather. In our presentation we show results on occurrence of macro- and micro-avoidance behaviour, based on flight paths of birds through the wind farm area. We also show results on the number of birds at risk of colliding with the turbines, based on flight intensities and flight altitudes of birds in the wind farm area.

Flight patterns of many different species were registered visually. Interspecific variation in reactions was considerable, while intraspecific variation was low. Reactions of the birds to the wind farm could be separated into four categories. Local birds either avoided the wind farm (e.g. seabirds such as Gannets *Morus bassanus*) or did not (e.g. Cormorants *Phalacrocorax carbo* attracted to the wind farm from the mainland). Similarly, migrant birds either did (e.g. geese) or did not avoid the wind farm (e.g. terns, nocturnal thrushes).

Seasonal and diurnal variation in bird activity were recorded in both flux and flight altitudes from sea level up to 1.5 km. High-altitude passages were mainly of nocturnal migratory birds including waders and thrushes. Movements during the day at lower altitudes primarily included gulls, as well as other local seabirds.

This study was commissioned by 'NoordzeeWind' (a joint venture of NuonVattenfall Endorsement FC and Shell Wind Energy).