SYMP02: Birds and offshore wind farms: Conflict potential and perspectives

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Wind is promised to become the most important source of renewable energy in near future. Having installed wind farms in the most suited inland areas, developers are now seeking to exploit offshore wind resources. According to current plans, wind farms with a total capacity of thousands of megawatts will be installed in European seas within the next 10 years. Thus, erection of wind facilities offshore can become Europe's most extensive technical intervention into marine habitats. This extension is not without problems for the environment. Both, the North Sea and the Baltic Sea house large concentrations of breeding and resting birds, and are therefore of international importance. Moreover, both seas are part of a global flyway system: Every year tens of millions of birds pass on their way from breeding grounds to wintering areas and back. Hence, all European countries have obligations under national and international legislation as well as under international conventions, to protect and conserve habitats and bird populations. According to results obtained from wind farms installed onshore, the main potential hazards are: (1) risk of collision with wind turbines, (2) short-term habitat loss during construction, (3) long-term habitat loss due to disturbance by turbines including disturbances from sailing activities in connection with maintenance, (4) formation of barriers on migration routes, and (5) disconnection of ecological units, such as roosting and feeding sites. To date it is only possible to derive crude assumptions on impacts on birds from experiences with comparatively small onshore wind facilities. Offshore areas are rich in large bird species that are often considered to be comparatively sensitive to disturbance. Further, offshore wind turbines will be substantially taller and wind farms generally larger than onshore ones. Therefore, a greater conflict potential in marine areas can be expected compared to that inland. However, to assess the actual impacts of offshore wind farms on resting and migrating birds, detailed studies at pilot offshore wind farms are indispensable, especially data on migration routes and flight behaviour are still quite scarce. Due to political pressure to build offshore wind farms as soon as possible, a lot of studies are underway in different European countries. The symposium speakers will review recent developments and our current knowledge of (1) the seasonal distribution and density of seabirds, including a recently developed „wind farm sensitivity index"; (2) migration routes, analyses of flight altitudes, phenological and circadian patterns of different species; and (3) new field techniques to record flight patterns in remote marine areas automatically and a modelling approach to estimate collision risk.

SYMP02-1 Offshore wind farms and marine birds: where are the hot spots in German waters?

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The German parts of both the North Sea and the Baltic Sea hold internationally important numbers of several waterbird species, particularly divers, grebes, seaducks, terns and gulls. As a consequence, large parts are identified as Important Bird Areas (IBAs), with some areas designated as marine protected areas. For some species these areas are the most important ones throughout the whole North Sea and Baltic Sea. Hence, Germany bears a significant responsibility under several international agreements (e.g. Ramsar and Bonn Convention, AEWA). A special conflict may rise from the construction of offshore wind farms in these areas. For a quantitative evaluation of the areas under consideration, we developed a Wind Farm Sensitivity Index that incorporates different aspects such as flight behaviour, sensitivity to disturbances, distribution, population size and demographic parameters of the most common species. A brief overview of the hot spots, i.e. the areas with the highest potential for conflicts between conservation and use for offshore wind farms, will be presented.

SYMP02-2 Navigational bird migration strategies in the North Sea area and their relevance for applied ornithology

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The planning of offshore wind turbine parks in the North Sea raises the question how many migratory birds will face these obstacles. Observations with a small scale tracking radar at the Wadden isle Vlieland (NW Netherlands) provided density data per altitude during day and night and per species group. Further, a long-range surveillance radar registered patterns of bird migration simultaneously in the southern North Sea. Together, these radar data support the view that most bird movements offshore occur in waves and broad-front. Furthermore, the data illustrate the circadian rhythm in decision making by land birds while putting into sea or sticking to the coast and the arrival behaviour after a flight across the North Sea. The coastal zone appears to be a crucial transition area with respect of navigational strategy differences over water and over land. Understanding these strategies is important in order to get a quantitative impression of potential collisions with obstacles under different weather conditions. A very critical period seems to be the second half of the night when songbirds descend to low altitude.

SYMP02-3 When, where, and how – bird migration over the western Baltic Sea as studied by military surveillance radar

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Military surveillance radar gives us the unique opportunity to observe bird migration over wide parts of northern Germany, the German Bight, and the western Baltic Sea. Here for the first time, we simultaneously monitor the intensity and direction of migratory movements within the entire study area. We present phenological patterns of bird migration over the Western Baltic Sea and describe some migration hot spots. Furthermore, our radar data allow us to distinguish typical seasonal movements from irruptive escape or reverse migrations. The varying detection resolution caused by the continuously adjusted altered (secret) military settings is the most common methodological pitfall which impedes the tracking of single birds or flocks on the screen and thus the quantification of the instantaneous migration.

SYMP02-4 Adjustments of flight altitudes to weather conditions measured by vertically operated ship radars

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The risk of collisions of flying birds with offshore wind farms becomes especially obvious when the influence of weather on the behaviour of birds is considered. Within a project on possible impacts of offshore wind farms on the marine environment we measured flight altitudes of birds by vertically operated ship radars on the islands of Helgoland (North Sea), Fehmarn and Rügen (Baltic Sea). We present some aspects of how birds adjusted their flight altitude to particular weather situations. During periods with rain, birds decreased their flight altitudes (especially in the night). Headwind also forces them to fly lower. The 'general pattern' of increasing altitude in the first part of the night and progressively decreasing height in the course of the ongoing night was modified by the degree and height of the cloud coverage. Low clouds (0 to 300 m) caused birds to increase flight altitude (to fly above the clouds), whereas there is clear evidence that they flow below clouds of medium height (300 to 660 m). These findings have to be considered in discussions of how impacts of windparks on birds can be minimised. [Commissioned by the 'Federal Environmental Agency' (UBA/BMU)].

SYMP02-5 The use of marine surveillance radars in risk assessment bird studies in relation to wind turbines: a detection capacity test and methodological limitations

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Quantitative information on the volume of flight movements of birds and flight altitudes is necessary in order to be able to estimate collision risks with wind turbines. Nowadays marine surveillance radars are used to gather this information. In October 2001 a two-day field study was carried

out on the island of Vlieland, The Netherlands, to compare two X-band marine surveillance radars to the Flycatcher radar of the Netherlands Royal Air Force. The latter radar type is known to have a high detection capacity with the ability to detect small passerines up to 4 km. The main aim of this study was to determine detection capacities of marine surveillance radars depending on technical, environmental and 'bird aspect' variation. The detection test was executed with radars that were tilted. This allows measurements to be taken of altitude profiles of bird flights. The comparative studies revealed that the detection capacity of the 10 and 12 kW radar is high and sufficient to supply usable data on flight movements of birds in the lower aerial stratum, also for small passerines. Besides the wave length, the power of the radar, and weather conditions, the detection capacity of a radar is dependent on 'bird aspects' as well. Detection loss of radars can occur in relation to distance or height of birds, heading or flight direction of birds, and species differences; like size, shape of birds and flight speed. When working with a vertical radar, especially the direction in which the birds fly into the radar beam plays an important role in the detection of birds. Birds that are beamed head-front by the radar are less visible than birds that are beamed from the side. For the assessment of the potential effect of wind turbines on bird migration, especially migration at low altitudes (< 200 m) is most relevant. Information on migration at higher altitudes however does place migration at low altitudes in a broader perspective and for this reason is often studied as well, although here detection loss takes place due to limitations of marine surveillance radars (power), especially in the smaller bird species.

SYMP02-6 Different methods to estimate barrier effects and mortality, especially use of infrared video cameras

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In order to access the impact from offshore wind farms on migrating birds new methods applicable to the marine environment have to be applied. Using a surveillance radar to collect data on the spatial pattern of migrating bird flocks enable the researcher to assess the barrier effects of offshore constructions, and additionally, provide the basis for estimating the volume of birds passing through different parts of a given wind farm (the migration model). It is well known that birds collide with land-based wind turbines, and infrared cameras is one method which can estimate the collisions frequency at offshore wind turbines. However, due to the high number of relatively large turbines, a monitoring scheme aiming at covering an entire wind farm with respect to avian collisions, is not operational from an economical point of view. Hence, a modelling approach, using migration models from radar data and the collision frequency data from e.g. infrared cameras, is needed when estimating the number of birds colliding with the turbines in an offshore wind farm. Finally, the talk will briefly discuss other methods and the degree to which this kind of data is species and/or area-specific.