

# Bird fatalities at wind turbines

- How many birds actually collide with wind turbines at a well-known hotspot of bird migration, the island of Fehmarn in northern Germany? – [t.gruenkorn@bioconsult-sh.de](mailto:t.gruenkorn@bioconsult-sh.de)



by  
Thomas Grünkorn, BioConsult SH, Husum, Germany  
at CWW 2011, Trondheim, Norway



Fehmarn/Germany (island within the circle) is the shortest link between Scandinavia and middle Europe

Under field conditions, not all collision victims can be found. Wind farms nowadays cover large areas, detectability of carcasses varies with surface cover and bird size, scavengers remove carcasses. We followed a systematic approach, accounting for effort (searched transect length [m]), search efficiency and removal rates (experimental approach) to calculate true collision rates at wind turbines. Earlier studies at the German North Sea coast had already adapted the American methodology to local conditions (Grünkorn et al. 2005 / 2009). In late summer and autumn 2009, BioConsult SH and ARSU applied the same methodology on the island of Fehmarn\*. Whereas most other studies are carried out in the context of environmental impact assessments of wind farms during the approval process with no wind turbines present, this study yielded true bird collision rates at existing wind turbines.

This poster presentation shows:

- systematic line transect search effort on a weekly basis in the 4 wind farms of the island. Repeated experimental assessment of searcher efficiency and removal rates. GIS intersection of search effort and vegetation coverage.

Further modules of this project see poster presentation:

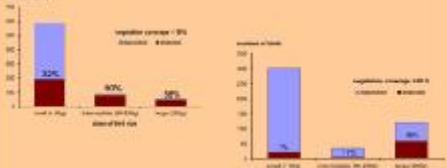
Reichenbach & Grünkorn: "A multi-method approach to determine the impact of existing wind power plants on bird and bat migration on the island of Fehmarn, Germany" at this conference showing:

- vertically tilted x-band radar to measure flight heights of migrating birds (day and night-time),
- weekly synchronous daytime watches at 6 vantage points,
- mapping of staging birds on 2/3 of the island area,
- installation of automatic ultrasound recorders („anabats“) at turbine height and on the ground.



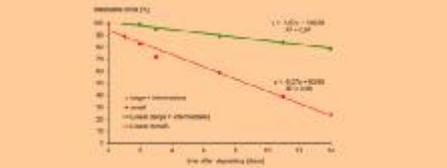
## Experiments on search efficiency - are we blind hens in the search of grains of corn?

The rate of detected carcasses in relation to their total number depends on many different parameters. We chose an experimental approach and deposited birds (mostly road and lighthouse kills) of different size classes (small, intermediate, large) in different vegetation coverage to estimate the search efficiency.



## Experiments of carcass removal rates by scavengers / decaying process - can searchers compete with foxes?

We deposited bird carcasses (mostly road and lighthouse kills) and controlled their presence and detectability twice over a period of two weeks. After 7 days of exposure (= line transect search interval) 89% of large and intermediate and 59 % of small birds were still detectable.



## Real search of collision victims - "no slough too tough, no dive too deep" (1,042 km of survey effort).

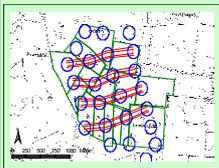
In total, we found 61 birds or their remains. The cause of death is not always obvious. Thus, we chose a pragmatic approach and classified the cause of death only by the distance to the closest wind mill. Fatalities within the radius of the total height of the wind mill were considered to be a collision victim. Other causes of death within this area may slightly overestimate the collision risk.

Bird species	number [n]
Herring gull	15
Black-headed gull	9
House martin	7
Common buzzard	4
Golden plover	3
Barn swallow	3
Sand martin	3
Wood pigeon	2
Mallard	2
Goldcrest	2
Common eider	1
Tree sparrow	1
Osprey	1
Domestic pigeon	1
Red kite	1
Rook	1
Moorhen	1
Collared dove	1

The species list of fatalities (left) was clearly dominated by staging birds. Merely the two Goldcrests can be related to the broad-fronted nocturnal mass migration of songbirds.



an obvious collision victim: this Golden plover was cut in half by a rotor



We conducted 16 controls on a weekly basis walking linear transects, which were GPS-logged and intersected with different classes of vegetation coverage with the help of GIS-software.

## Results - A look through rose-coloured glasses? - at least compared to traffic, power lines, windows and transmission towers

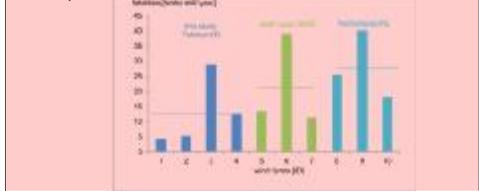
The number of detected carcasses only represents the minimum value of the total number of bird collisions. Taking into account the control interval, the experimentally determined „search efficiency“ (in different vegetation coverage) and the „removal rate“, an estimation of the total number of bird victims is feasible.

$$\text{collision fatalities} = \frac{\text{control interval [days]} \times \text{number of carcasses [n]}}{\text{carcass persistence [\%]} \times \text{search efficiency [\%]}}$$

wind farm [ID]	1	2	3	4
fatalities	7	9	20	15
extrapolation	29	26	56	41
wind mills	23	16	17	11
fatalities/mill/study period	1.3	1.6	3.3	3.7
fatalities /mill/ year	4	5	23	13

13 victims/mill/year on average

We estimate that on the island Fehmarn 13 birds are killed per mill and year on average. Despite being a hot spot of bird migration the magnitude of bird fatalities is in the same magnitude (and not higher) to e.g. the west coast of Schleswig-Holstein/Germany (Grünkorn et al. 2005 and 2009) or the Netherlands (Krijgsveld et al. 2009).



## Literatur

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Grünkorn, T., A. Diederichs, D. Poszig, B. Diederichs & G. Nehls. 2005. Entwicklung einer Methode zur Abschätzung des Kollisionsrisikos von Vögeln an Windenergieanlagen. Untersuchungen im Auftrag des Landesamtes für Naturschutz des Landes Schleswig-Holstein. \*pdf at [www.bioconsult-sh.de](http://www.bioconsult-sh.de)

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Krijgsveld K.L., K. Akershoek, F. Schenk, F. Dijk & S. Dirksen. 2009. Collision risk of birds with modern large wind turbines. Ardea 97(3): 357-366.

## Summary

BioConsult SH GmbH & Co. KG. and ARSU GmbH conducted a comprehensive research project about the impact of 4 existing wind farms on Fehmarn/Germany on bird (and bat) migration, here reporting on the estimation of true collision rates. Systematic line transect searches plus experiments to determine search efficiency and carcass removal rates allow the calculation of collision rates and help to assess potential impacts of wind farms on migrating birds and bats and to guide further wind farm placements. We estimate that at the current wind farms on the island of Fehmarn, on average 13 birds are killed per wind mill and year. Despite being a hot spot of bird migration, the magnitude of bird fatalities is comparable to other areas at the west coast of Schleswig-Holstein/Germany (Grünkorn et al. 2005 and 2009) or in the Netherlands (Krijgsveld et al. 2009). Further results of the projects see poster presentation Reichenbach & Grünkorn at this conference.