



**NATURAL RESEARCH INFORMATION NOTE 4**

**TURBINE SEARCH METHODS AND  
CARCASS REMOVAL TRIALS  
AT THE BRAES OF DOUNE WINDFARM**

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### INTRODUCTION

This Information Note details methods used in determining rates of turbine strike and scavenging at the Braes of Doune Wind Farm. The Bird Strike Searches are to detect turbine related bird deaths at the site to monitor collision rates and species involved. The Carcass Removal Trials are to investigate a) the efficiency of searchers and b) estimate rates of scavenging in the area. This is intended to estimate how many bird strike victims are missed by the Bird Strike Search method.

This work is part of wider efforts at the Braes of Doune to detect any impacts from the wind farm on the local population of red kites (*Milvus milvus*). Other work includes radio tracking of red kites and also generic bird survey techniques.

Results of the work are presented as brief summaries; a fuller description is intended to be published at a later date. This note is therefore intended as an interim report of techniques applied so far at the Braes of Doune and is in response to a growing professional interest in this kind of post construction bird monitoring at wind farms.

### BIRD STRIKE SEARCHES IN THE TURBINE AREA

Wind farm studies from the USA shows that the majority of birds hit by turbines remain within 63m of the structure (Young *et al* 2003). On the basis of this finding, workers on several US projects search an area 126 - 140m around the turbine (Johnson *et. al.* 2003, Young *et al* 2003). The height of the turbines at Doune is 65m at the hub of the blades, with the blades themselves being 40m long. This is a good match with the height of the turbines involved in the US studies (Johnson *et. al.* 2003). These factors determined the choice of plot size and search method at the Braes of Doune wind farm.

A plot size of 130m x 130m was chosen for the site, with each plot centred on a turbine and the sides orientated north/south, east/west. The corners of each plot were marked with stakes protruding 1m from the ground and marked with fluorescent tape. This was to help the searcher's orientation within the plot. In addition bamboo canes, also marked with fluorescent tape were stuck into the ground at intervals during the transecting. These also assisted in making sure the transect route was followed as accurately as possible. Compass and GPS were used to follow the transects as precisely as possible.

The plot was covered with search transects 10m apart, with the searcher looking 5m on either side. Depending on the terrain each plot requires 1.5 – 2.5 hours search time. Due to the difficult terrain, the optimum number of turbines that could be searched by this method each day is three. As one man-day per week was allotted to turbine searching and there are 36 turbines at the site it requires 12 weeks to cover the entire site. Therefore the method is a sampling one. This work began in January 2007.

Any carcasses found had their position noted with GPS to a ten-figure reference and were photographed. The state of each carcass was recorded using the following condition categories, following Johnson *et. al.* 2003:

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Intact – a carcass that is completely intact is not badly de-composed and shows little or no sign of being predated or scavenged.

Scavenged – an entire carcass showing signs of being fed upon by a predator or scavenger or a dismembered carcass (portions) in one location (e.g. wings, skeletal remains, legs, pieces of skin, etc.).

Feather patch – ten or more feathers at one location indicating predation or scavenging. If only feathers are found, 10 or more total feathers or two or more primaries must be discovered to consider the observation a casualty.

Most carcasses or parts found near turbines were considered wind farm related casualties unless another cause of death was apparent. Carcasses of kites and other key species were dealt with under special protocols (Duffy, unpublished 2006) and these deal with the possibility of injured birds also. Red kite carcasses or those of any other key species (such as other large raptors) are taken for post-mortem on the day of discovery or as soon as possible after the event. Carcasses of other species were frozen or retained for potential post-mortem analyses or identification.

### Summary of Results

Each turbine was searched by transects on four occasions between January 2007 and March 2008. In the course of these, remains of 18 birds and one bat were discovered. In addition six other birds or their remains were found through other work including the most notable cases of turbine strike (1 red kite and 1 buzzard). The 19 cases found during transect work included long-eared owl (1), wood pigeon (1), meadow pipit (4), red grouse (11), siskin (1) and soprano pipestrelle bat (1). Seven of these were considered to be definite or probable turbine victims: long-eared owl, wood pigeon, siskin, soprano pipestrelle bat, meadow pipit (1) and red grouse (2). The remaining 12 birds were thought not to be strike related or cause of death unknown. Of this group, nine were red grouse, with five of these probably predated.

### **CARCASS REMOVAL TRIALS**

There is evidence that searcher efficiency in wind farm studies can be influenced by height and type of vegetation (Morrison 2002). It was therefore sensible that the Carcass Removal Trials should be carried out in similar habitat to the wind farm. The turbine and reference study areas were avoided to reduce any attraction of kites to these areas that may skew results or increase the chance of turbine related mortality. An area 1km to the east of the turbines was chosen due to its similar altitude, topography and vegetation height to the turbine area.

Three plots of the same size as those searched in the wind farm were marked out in similar manner. The sides of these were again orientated north/south, east/west and the three plots were positioned side by side orientated east/west and marked with corner posts.

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Three trials were originally planned to take into account variations in fox (*Vulpes vulpes*) activity during the year. At other sites seasonal variation in vegetation height may be a consideration but this was not the case at this trial site, with heather dominating the vegetation layer. Trials took place in late March, late September and January.

Pheasant carcasses were considered appropriate to use as they weigh 750 – 1700 g (Snow and Perrins 1998) and so more than span the weight ranges of medium sized raptors such as kite and buzzard. These were also readily available from various sources during the winter and can be frozen for use later in the year. Females only were used as these were considered to be closest in colouration to kites. Each carcass was marked with a numbered rubber pigeon ring or leg tag so the identity of each one could be confirmed on discovery and established if moved by scavengers.

Carcasses were left out in the trial plots by one worker as early as possible on the search day and searched for by another worker from mid-morning. This was to try and ensure that no carcasses were removed by scavengers before the searcher had an opportunity to find them. The location of each carcass was randomly chosen by a simple 'map and pin' method and the searcher was not aware of these locations. Each positioned pheasant carcass had its GPS location recorded when it was laid out and this was recorded when found by the searcher to confirm the identity of each bird. Carcasses were left untouched to be monitored to detect rates of scavenging. Three carcasses were laid in each plot, with nine in total to be discovered.

All carcass locations were re-visited by the kite researcher 1, 3, 5 and 10 days after the initial day of positioning. This range and number of visits was partly determined by other tasks to be completed. The state of each carcass was noted (intact/ part scavenged / completely scavenged / missing) and signs and presence of scavengers noted. Prior to the second and third trials carcass sites were visited to remove any remaining feather patches. This was to give an impression of how long these could persist and avoid confusion in the forthcoming trial. After the third trial, the plots were systematically re-visited on Days 70, 80 and 90 to determine potential detectability of feather patches after the three month gap between turbine searches.

### Summary of results

Of 27 carcasses positioned over the three trials, 20 (74%) were found by the searcher. A fall of snow during the third trial made location of carcasses difficult on that occasion. Therefore a figure of 89% may be more accurate, based on 18 carcasses positioned during the first two snow-free trials.

Carcasses in snow-free conditions were partly or completely scavenged by Day 5 after being laid out, but several remained intact to Day 3. By Day 10 all had been reduced to feathers only. The presence of snow made carcasses last longer (all intact on Day 5) but these were quickly demolished after snow cover receded. Birds, especially red kites and ravens, were the main scavengers with foxes having almost no role in consuming carcasses despite their signs being recorded in the plots. These results, incidentally, justified the protocol of not using the wind farm site for the scavenging/carcass removal trials.

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On all three visits after Trial 3 (Day 70, 80 & 90) feathers were still visible from at least 5m at eight (88.9%) of the nine carcass sites, with only traces of feathers visible at < 1m at the ninth. This gives optimism that feather remains of bird strike victims have a high chance of being detected even after the three month interval between each individual turbine search.

### HEALTH ISSUES

Staff involved in the collection of dead or injured birds were briefed on issues relating to handling birds and the risk from avian flu or other diseases. Health measures such as the provision of facemasks and disposable gloves were available for anyone potentially handling dead or injured birds at the site.

### DISCUSSION AND CONCLUSION

As many aspects of wind farm and bird research are in their relative infancy in Scotland the methods described above are very much open to further refinement. The assessment of how efficient the Carcass Removal Trials is still based on a small number of trials and carcass recoveries. These methods (as in all aspects of research) are at least in part limited by resources and this must also be taken into consideration. A higher frequency of searching may well produce more evidence of turbine related bird-strike and more trials would hopefully further reinforce the suitability of the method. However, it should also be noted that the level of turbine, and other, monitoring at the Braes of Doune surpasses that of almost all other wind farms in Scotland.

The Bird Strike Search technique has proved a successful means of searching for carcasses and bird remains and provides a high chance of recovering remains of larger birds.

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