Whitefront Wintering Grounds and their Influence on Flocks

Previous background

The White-fronted goose (Anser albifrons) is a circumpolar migrant with a number of subspecies proposed (Ely et al., 2005). The population that migratesto western continental Europe originates from around the Barents Sea, and has been studied since at least the '60s (Boyd, 1965). Breeding success is apparently high, with (Boyd, 1965) reporting that around a third of Barents Sea birds over-wintering in England were first-winter geese. These historical data are backed up in a comprehensive report by Kondratyev and Zaynagutdinova (2008) in which the breeding biology of the species is reported from Kolguyev, an offshore Russian island. This study simultaneously casts Kolguyev as the spring arrival point of >30% of the total Western European wintering population - around 500,000 birds - and thus an important breeding and stop-over site. The following is known of the species: that geese live and migrate in family groups, and that parent-offspring relationships are strong and may continue beyond the first migration in the form of alloparenting (Warren et al., 1993; Miller and Dzubin, 1965); that winter site fidelity is high at least for the Greenland population Wilson et al. (1991); and that geese use favourable environmental conditions to migrate, following the band of emerging spring vegetation (Fox et al., 2003; van Wijk et al., 2012). Family structure appears to be preferred in larger geese such as the White-fronted goose (Jónsson and Afton, 2008). However, in some species, this structure is subsumed by foraging or collective defence requirements, and is not always strongly expressed, especially on wintering grounds (Johnson and Raveling, 1988).

Thoughts on the wintering grounds

Land

In the lower Rhine valley in the south and in Friesland in the north of both Germany and the Netherlands, the landscape is flat, open and human dominated.

There are no truly natural features, nor are there any relief features apart from the dykes, which follow rivercourses or line the coasts.

Fields

The open spaces almost exclusively consist of agricultural fields. These can be divided into three main types by their winter conditions: grassy fields with some livestock, grassy fields with no livestock, and cereal stubble fields which have been recently harvested. For convenience, and since livestock presence is changeable, these are better divided into green and brown fields, since these are the predominant colours. From the perspective of remote sensing too this classification makes sense since the difference between the two can be picked up via a vegetation index.

Finer classification of fields based on ownership, or on the exact crop grown is possible but not easy, since queries would have to be made of government records if these are maintained. Such a classification could be linked to the nutritional quality of the field for geese. For example, ownership could be linked to participation in conservation contracting schemes (in Germany at least, such policies must exist in the Netherlands), while crop cover information could be used to classify fields in terms of suitable foraging grounds. Further, when classifying fields, ownership records might show whether anti-bird measures such as flourescent tape are being deployed.

Turbines

Turbines are spread across the landscape. In Germany, and likely also in the Netherlands, restrictions exist on the minimum distance between turbines and settlements (towns, airports etc.). This is state specific in Germany (Friesland and the Rhine valley are in different states), and buffers around settlements - relating to turbine height and noise, among others - are used to define areas in which turbines are permitted to be built. This could be a useful system for classifying a study site without necessarily knowing where turbines are actually located. While digital maps of turbine locations must exist, these might not be accessible, and turbines are unlikely to be picked up by satellite imagery. Given building restrictions, turbines are usually located in the midst of agricultural fields. Since such fields are also important foraging sites, the presence of turbines could be a contributing factor in where geese forage.

Turbines and geese: Relation and questions

A turbine (array) could produce resistance to goose movement in the landscape. The number of flocks seen as a function of distance to the nearest turbine could take the form of a normal or skewed-normal distribution, with low flock sightings at the lower limit (very close to a turbine) explained by geese avoiding

turbines, and decreasing flock sightings at the upper limit (very far from a turbine) explained by turbine density and placement, and a spatial correlation between turbines and fields. An issue with relating flock frequency to turbine distance is that true absence data is not available from the long term dataset.

It's harder to think of a mechanism by which the presence of turbines might affect flock size. One line of logic is that since flocks might be found outside a certain buffer radius of a turbine, they may then serve as nuclei around which other groups might coalesce to form a larger flock. The flock size - turbine distance relation is then reduced to a relation between flock size and probability of finding a flock at that distance from a turbine.

A database of turbine locations over the study area is maintained by **Windstats.nl**.

An interesting question is how the flight of geese is affected by visibility. This question helps when trying to answer whether geese attempt to avoid turbines as they fly. Since geese probably navigate by sight, fog (usually low lying) could obscure turbines of a certain height. If geese fly without regard for visibility, it could be possible that they aren't trying to avoid physical features such as turbines, or that the avoidance mechanism is visibility independent.

Settlements

Settlement density is generally high. Settlements are mostly small and follow a typical nuclear pattern, and are themselves surrounded by fields. They are also easily picked up on satellite imagery. Settlements should act as both absolute barriers, in that no geese are found inside settlements, as well as to produce resistance in the landscape, in that geese maintain a distance from the nearest settlement. This distance is unlikely to be size dependent. Settlements should be treated not using the centroids of their polygons, but rather the settlement edge.

Water

In the lower Rhine valley, the major waterbody is the Rhine and its associated streams. In the Netherlands, the main rivers are distributaries of the Rhine. Lakes are to be found with a lower density than on Kolguyev and seem to have a larger size. This is also true for most of Friesland. Coastal Friesland, however, has two waterbodies that stand out: the Wadden Sea, and the IJsselmeer, an artificial freshwater lake closed off from the Wadden Sea and fed by the IJssel. Canals are evident in both regions. All waterways are so heavily managed that no meaningful distinction is drawn between natural and artificial ones.

Geese use both streams and lakes. Geese appear to roost on lakes and may also be found on them by day. From these roosts, geese fly to daily foraging grounds.

The frequency of foraging ground revisits is best studied using position logger data. Geese might also use larger waterbodies like the IJsselmeer or the Wadden Sea as roosts, but appear to prefer coastal waters. Determining whether the Wadden Sea is again a task solved by looking at position data.

Streams do not appear to be used as roosts, likely because too high a cost is associated with maintaining position. Sandbanks lining streams however seem to be suitable roosting grounds.

Water and geese

Since geese roost on or near lakes, it could be expected that a flock's position will be a function of the distance to the nearest waterbody. logger data here