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Waterbirds around the world

A global overview of the conservation,
management and research of the
world's waterbird flyways

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Cover photography: Whooper Swans *Cygnus cygnus* arriving at Martin Mere, England. Photo: Paul Marshall.
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Variation in the behavioural responses of Whooper Swans *Cygnus cygnus* to different types of human activity

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The impact of human activity on bird populations has been studied and discussed extensively in recent years (Hill *et al.* 1997, Gill & Sutherland 2000, Nisbet 2000, Gill *et al.* 2001) but variation in the birds' response to disturbance is still poorly understood. Variation in the behaviour of wintering Whooper Swans *Cygnus cygnus*, wintering in and around the Black Cart Special Protection Area (SPA), near Glasgow (55°53'N 04°27'W), was analysed to:

- assess the effects of the different conditions and different types of disturbance on the swans, by testing whether the type and timing of disturbance, and location of swans, affected the distance at which the swans became alert;
- determine whether the swans become habituated to human activity, by testing whether their response to disturbance events diminishes over time;
- describe variation in the time taken for the swans to resume feeding following disturbance, to determine whether recovery rates are more rapid at times (e.g. late in the day) when pressure to resume feeding might be greater; and
- describe temporal and spatial factors affecting the time that

the swans spend feeding and being alert, to determine the landscape features (including the frequency and type of human activity) likely to influence the behaviour of the birds, with a view to advising on site management for the species in the wintering range.

This short note presents a summary of the results; they are presented in full in Rees *et al.* (2005).

Observations were made in winters 1997-98 to 1999-2000 inclusive at the Black Cart SPA in Scotland, which receives at least 1% of the Icelandic-breeding Whooper Swan population in winter. The site is semi-rural, consisting of mixed farmland interspersed with light industrial development, adjacent to Glasgow Airport and within two km of the Paisley conurbation (Fig. 1, Rees *et al.* 2005).

All fields and sections of river within the study area were visited at least two days a week to map the number and distribution of swans, and note the crop type in each field. The swans' behaviour and human activity at the site were monitored during three main periods each winter, in autumn (late October-early November), mid-winter (January) and spring (March). The data



Fig. 1. Whooper Swans *Cygnus cygnus* on the Black Cart Water, Scotland, with Rolls Royce factory in the background. Photo: Rebecca Woodward, WWT.

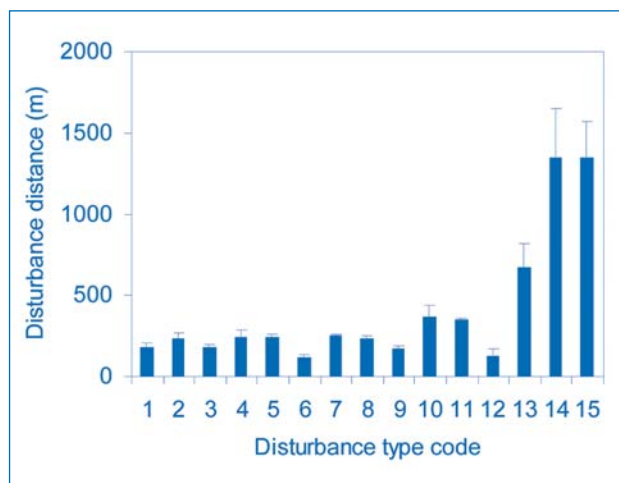


Fig. 2. Mean distance (\pm SE) at which different types of disturbance alerted the swans over the 3-year study. Note: 1 = car, 2 = van, 3 = tractor, 4 = other farm vehicle/lorry, 5 = construction vehicle, 6 = bicycle, 7 = pedestrian, 8 = pedestrian with dog, 9 = farm worker on foot, 10 = angler, 11 = wildfowler, 12 = cattle, 13 = bird scaring at airport, 14 = helicopter, 15 = aircraft. From (Rees *et al.* 2005).

were analysed using two-way and three-way ANOVAs in SPSS (version 11), and generalised linear modelling in GLIM (version 4).

Overall, the swans' feeding activity varied within and between years, and in relation to the feeding site, but there was less variation in the amount of time spent alert. Disturbance frequency resulting from human activity was lower with increasing flock size and with increased distance to the nearest road or track.

Distances that humans could approach before alerting the birds similarly varied with field characteristics (e.g., size and proximity to roads or tracks), and also with the type of disturbance involved. Helicopters and other aircraft alerted the swans at longer distances than ground-based disturbances (Fig. 2), but the proportion of birds alerted was lower. On the ground, anglers and wildfowlers alerted the swans at greater distances than other pedestrians. Similarly cars and bicycles were able to approach closer than other vehicles.

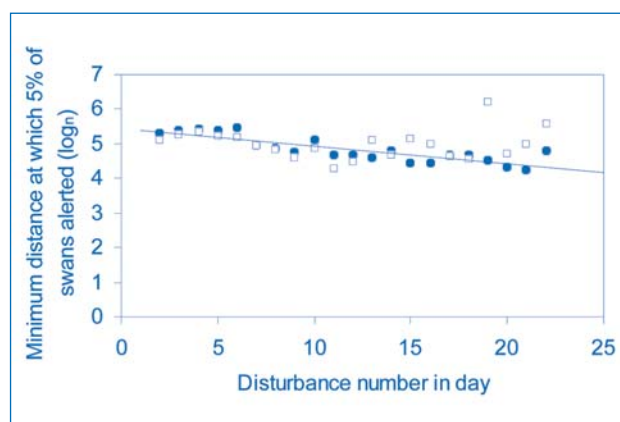


Fig. 3. Distance (\log_n transformed; open squares) at which Swans became alert in relation to the number of previous disturbances recorded in the day. The linear regression line is for fitted disturbance distance n values (closed circles; distance = $0.0545 \times$ disturbance number + 5.46). From (Rees *et al.* 2005).

The distance at which $>5\%$ of the flock became alert because of human activity decreased with the number of previous incidents in the day (Fig. 3), indicating that swans become less sensitive to disturbance events if daily disturbance frequency is high, but there was no evidence that habituation to disturbance persisted over longer periods. The time taken for the birds to resume undisturbed behaviour varied with the duration of the disturbance event, which in turn depended on the type of disturbance involved, with pedestrians alerting the birds for longer periods than vehicles and aircraft. Recovery rates following disturbance were also associated with field size, flock size and the proportion of the flock alerted.

Feeding activity was influenced by a range of variables, including: year, season, field location, crop type and the number of days that the flock had used the field (32.9% of variance in the data explained by these variables), with disturbance factors explaining an additional 4.9% of variance in the proportion feeding per hour. Conversely, alert activity was influenced mainly by disturbance events.

The range of factors influencing the swans' feeding behaviour, and variability in their response to human activity, has implications for management programmes and for attempts to predict the effects of human activity on the birds at a local and wider scale.

Given the variation in feeding activity for undisturbed swans, and in their response to different types of disturbance under different conditions, information on factors affecting both disturbed and undisturbed behaviour is needed to determine whether changes in disturbance levels affect food intake for other species over a winter season. Factors influencing behaviour also may vary at different parts of the flyway, depending on changes in food availability, predation risks and energetic requirements. Determining variation in a species' response to human activity throughout the year and migratory range would be necessary for any assessment of the impact of disturbance at a population level.

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