Swallow Feeding Survey

Title
Swallow Feeding Survey 2004

Description and Summary of Results
In the UK in the early 2000s, the long-term population trend of (Barn) Swallows *Hirundo rustica* was considered stable or increasing unlike in parts of Europe where, since 1970, significant declines had been reported. However, closer inspection revealed strong regional differences within the UK with increases in the west and declines in the east. Hence it was thought that there could be differences in the quality and/or availability of breeding or foraging habitats.
The Swallow Feeding Survey was therefore targeted at foraging Swallows and looked for national and regional patterns of association with specific habitats or landscapes.
Observers carried out in effect a series of point counts recording foraging Swallows and noting several characteristics of the habitats around these. A total of 3155 point counts were made for the survey, representing just under 400 tetrads visited (usually 4 points per tetrad each visited twice).
The single most important and most consistent variable associated with foraging Swallows was the presence of cattle and this applied in every UK region. Horses were also important in the southeast, and the presence of grassland itself was only important if livestock were present. More foraging flights were counted in areas containing a mixture of grass and arable fields rather than just one or the other, and there were more too if there were tall trees in the field boundaries, especially in the arable east of the UK, where their relative importance for concentrating prey may be more acute.

Methods of Data Capture
Volunteer observers recorded Swallow foraging activity for ten minutes at each of four count points around an allocated 2x2km square. The squares were selected using the pseudorandom distribution of Breeding Bird Survey squares as a basis with the BBS 1-km square located as the SW one of the 2-km square. Hence the squares selected were not necessarily coincident with the standard EJPUZ tetrad system used in many other BTO surveys. The points were the outer four corners of these 2-km squares or as near to these as was physically possible to reach and at least 500m apart. They were all therefore considered as independent from each other. Each count covered 100m radius and was visited twice during the summer between 23 May and 11 August 2004. An index of foraging activity at each site was derived from the number of foraging passes made by Swallows within the ten minutes, and the maximum count of birds present was also recorded.
Foraging activity was recorded as the number of feeding passes. A "pass" was defined as a Swallow flying at or below the height of mature trees (approximately 30m), in its characteristic foraging flight, twisting in pursuit of insects. An individual flying in one direction and returning in the other was equivalent to two individuals flying in one direction only (ie two passes). A high pass rate was considered as a good indicator of high prey

densities and therefore as an index of foraging activity, though not necessarily foraging success. The maximum number of Swallows present during each ten-minute point count was also recorded; at very high concentrations, such as over water, pass rates equated to abundance (maximum count), multiplied by the pass rates of one or two individual focus birds.
Note was made of any House Martins *Delichon urbicum*, Sand Martins *Riparia riparia*, Swifts *Apus apus*, Kestrels *Falco tinnunculus*, Hobbies *F. subbuteo* and Sparrowhawks *Accipiter nisus* seen.
The habitat was also assessed at each count point. Observers recorded the presence or absence of 13 habitat features (including such as buildings, water, cattle and sheep) within the 100m count radius and the proportion of this circle that was visible from the count location. They also estimated the proportion of total field boundary length greater or less than 2m high and whether mature trees were present. Weather categories were wind strength (calm, light, breezy), precipitation (dry, light rain, showers) and percentage cloud cover. Observers did not count in wind speeds exceeding Beaufort Force 4 (branches moving) or in persistent heavy rain.

Purpose of Data Capture
The main aim was to record the amount of foraging activity by Swallows in different areas and different habitats to try to find reasons for the apparent regional differences in numbers and population trends of the species over the last decade or two.

Geographic Coverage
Tetrads were covered in all of the UK and some in the Channel Islands. The Isle of Man was included but in practice there were no returns from there.

Temporal Coverage
The fieldwork period was 23 May to 11 August 2004, a period when the majority of Swallows would be on their breeding grounds. On both earlier and later dates many individuals could well have been migrants.

Other Interested parties
The survey was run by the BTO through its Regional Network. The funding came from the BTO's Swallow Appeal, and which included dedicated contributions from the D'Oyly Carte Charitable Trust, the Ernest Kleinwort Charitable Trust and Northumbrian Water Limited.

Organiser(s)
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Publications
The main report of the survey is:
Henderson, I., Holt, C. & Vickery, J.A. 2007. National and regional patterns of habitat association with foraging Barn Swallows *Hirundo rustica* in the UK. *Bird Study* 54: 371-377.
It was also noticed in *BTO News* numbers 250, 257 and 261.

Available from NBN?
No.

Computer data -- location
BTO Windows Network central area.

Computer data -- outline contents
The main datafile is one worksheet of an Excel file containing counts of the Swallows and the habitat information collected at the time.
Other directories contain reports, recording forms etc.

Computer data -- description of contents
The main data file is an Excel spreadsheet with 3 worksheets; Sheets 6 and 8 are needed as part of the GIS project associated with the analysis and Sheet 1 is the dataset.
The columns are: No. -- Site Number; county -- County in 4 letter format; tetrad -- identified as 4 figure grid reference of SW corner (note the SW 1-km square was the BBS square on which the tetrad was used and note they are not necessarily as per EJPUZ system); Region -- 14 regions defined for the survey; visit -- 1 or 2; obspoint -- A B C D for the 4 corners of the tetrad; gridref_6fig -- actual gridref of point; Month -- MA JU JL AU for May June July August; Season -- E(Early) or L (late); slpass -- no. of Swallow passes; slno -- estimated no of Swallows; HM -- no. of House Martin seen; SM -- no. of Sand Martin; SI -- no. of Swift; KE -- no. of Kestrel; HO -- no. of Hobby; SH -- no. of Sparrowhawk; pcinview -- percentage of 100m radius in view; grass -- % that was grassland; cereal -- % cereal; nonc -- % non-cereal crops; flower -- mostly 0 but * if rape or beans were in flower some specifically noted; harvested -- % harvested crop/stubbles; fallow -- % fallow; HTlt2 -- boundary % with hedge with trees under 2m; HTgt2 -- ditto over 2m; Hlt2 -- ditto hedge no trees under 2m; Hgt2 -- ditto over 2m; treeline -- % treeline (or wood edge); sheep -- 0 or 1 for presence of sheep; cows -- ditto cows; horses -- ditto horses; pigs -- ditto pigs; animalact -- evidence of recent animal activity (dung etc) but not present; spreadmanure -- manure spread; water -- waterbodies; sewage -- sewage works; manurehp -- manure heaps; buildings -- houses or buildings; farmyard – farmyard.
Other Directories:
Analysis1 -- contains a SAS program and 2 spreadsheets of some analysis results; Data -- has 2 original input files in the subdirectory and the main dataset as documented above; Project Funding and contracts -- contains 2 costings files; Reports & Papers -- contains copies of reports etc; Survey -- contains copies of recording forms instructions etc

Information held in BTO Archives
2 Archive Boxes containing folders of all the data -- each folder contains the data for one BTO region.

Notes on Access and Use

Other information needed

Notes on Survey Design
Each tetrad was selected from a distribution of 1-km squares used in the national BTO/ RSPB/ JNCC Breeding Bird Survey. BBS squares have a widespread, pseudorandom distribution in the UK in the sense they are selected by stratified random sampling according to landscape type, but their final selection can be modified by observer decisions on suitability. For the Swallow Feeding Survey, the BBS distribution was a convenient way of allocating survey squares to observers while also excluding unsuitable landscape types – those that were predominantly 'urban', 'woodland' or 'upland' (over 200m) in character. Thus 2-km squares were selected so that each suitable 1-km square from the BBS occupied the southwest quarter of a square in the Swallow Feeding Survey. Within each square, the four sample points to be visited by the observer were ideally located at the four corners, but in practice they were located as close as possible to this 'ideal' point, frequently being shifted by observers because of difficulties with access. An actual grid reference was recorded for each count point and, in all cases, the distance between any two count points was over 500m. All these sampling points were regarded as independent of each other, as breeding Swallows tend to forage within 300m of their breeding site (Turner, 2006: *The Barn Swallow*. T & AD Poyser).

Specific Issues for Analysis
In the reported analysis levels of inter-correlation between explanatory variables were checked for co-variation, to help interpret emerging effects. This procedure used correlation matrices, with tests for multi-colinearity where combined-variable effects may be problematic. Most statistical tests were generalized linear mixed models (GLMM) where observer differences (each square) were included as a random effect. Models included the visible area of the 100m count radii as an offset variable, repeated measures to cover the two visits, and binomial error terms. Binomial errors gave the most consistent best model fits to the data. Poisson and negative binomial error terms produced poor fits to the data or the models failed to converge. Regression models contained all predictor variables that allowed model convergence. Thus, in practice, predictor variables were excluded only where they were 'rare' and added 'noise' without any clear significant or close-to significant unilateral effects on Swallow pass rates, and where their inclusion in regression models caused models to fail (due to excessive zero counts or missing data).

All models included all livestock variables (the presence of cattle, pigs, sheep or horses) and all habitat variables (the presence of cereals and grassland, boundary quality and boundary height categories), and factors for 'season', the presence of 'farm buildings' and 'water'. Where a regional split of the data was not possible due to low count sample sizes, then neighbouring regions were grouped. Regression analysis was also used to assess habitat effects on foraging Swallows where only a small proportion of grassland (<5%) or no grassland was present in count circles, in predominantly arable landscapes. This examined the relative importance of habitat features, such as boundary presence or characteristics, under different landscape contexts, since it was thought that such features might be especially important in situations where livestock were generally absent. In addition, Wilcoxon signed-rank tests were used to provide supporting evidence to the modelling procedure, for consistent habitat effects on foraging Swallows, this time within squares, between the four observation count points. At this scale of analysis, all regression models failed to converge. The analysis, nevertheless, provided an alternative analytical approach, while controlling for observer differences (as the same observer collected data from all four points in a square) and, to a degree, landscape effects (as landscapes and habitat availability were likely to be more similar within squares than between them).