

# Project Barn Owl

## Title

Project Barn Owl 1995-1997

## Description and Summary of Results

Throughout the 18th and early 19th centuries the Barn Owl *Tyto alba* was regarded as being the most common owl over much of the UK. However, the population is thought to have begun to decline from the middle of the 19th century prompting an ambitious survey of the breeding population to be undertaken during the 1930s by George Blaker. This survey, based on a request for information on breeding pairs throughout England and Wales, suggested that the breeding population was around 12000 pairs.

The decline seems to have continued, becoming more general from about 1955 onwards. The 1968-1972 Breeding Atlas estimated there were 4500-9000 breeding pairs in Britain and Ireland, although based on an untested assumption of 2-4 pairs per occupied 10-km square. A four-year national survey of breeding Barn Owls, initiated in 1982 by the Hawk Trust (now the Hawk and Owl Trust), estimated 3778 pairs in England and Wales, with a further 640 pairs in Scotland and 33 pairs in the Channel Islands.

There appears therefore to have been a decline of 70% over the period 1932-1985 although the precision is unknown because of differences in the methods used by the two surveys. Both surveys were based on requests for information from casual observers and consequently subject to unknown regional biases. Also neither survey is strictly repeatable, but it is likely that the Barn Owl population in the UK has declined dramatically during the last 100 years and that this decline may be continuing.

The 1988-1991 Breeding Atlas showed a 43% decline in the number of 10-km squares with evidence of breeding since 1968-1972, but this estimate also has some uncertainty because of differences in observer coverage.

The changing agricultural landscape, changing weather patterns and a major expansion of the road network have all been implicated in the decline. But there have also been conservation efforts to reverse it, including nestbox provision, habitat protection and re-establishment, and attempts to introduce captive-bred Barn Owls into areas where wild pairs have disappeared, all with varying levels of success.

Because of this uncertainty and because of a Hawk Trust recommendation in 1987 that repeat surveys be conducted every ten years, Project Barn Owl was initiated with a central aim to carry out a repeatable survey of breeding Barn Owls in the UK.

Of the 1100 selected survey tetrads, 261 (20%), mostly at higher altitude in Scotland, were considered unsuitable for Barn Owls and were assigned as holding no birds, 889 were covered at least once during the survey period with 453 during three summer sessions and 148 during two. Coverage was similar across strata but varied significantly between eight regional project areas: more than expected in central and southern England and fewer in southern Scotland.

A total of 133 Barn Owl breeding attempts were recorded from 82 tetrads during the three years. Two squares were found to hold three pairs in at least one year and five squares held

two pairs. Of the 133, 105 were in England, 16 in Scotland and 12 in Wales. No breeding pairs were recorded within survey squares in Northern Ireland or the Channel Islands. Total estimates were produced for each year separately: 2830 breeding pairs in 1995 (95% confidence intervals: 1952-3761), 3967 in 1996 (95% CI: 2785-5252) and 3951 in 1997 (95% CI: 2769-5214). The 1995 figure was low probably due to poor coverage during the early stages of the project within a number of regions known to be important for Barn Owls (eg parts of SW England). A reanalysis taking account of this poor coverage in some regions of high Barn Owl density suggests that 3480 pairs would be more accurate for 1995. Both temporal and spatial differences in the national estimates were apparent, supporting anecdotal observations from local fieldworkers. Barn Owl populations in the south and east of England apparently had a good breeding season in 1996 but a poor one in 1997, with the reverse in Scotland and northern England. This is consistent with the survey findings. Regional density estimates showed the relative importance of SW England, southern England and East Anglia. However, there was much local variation within regions. For example, much of southern Scotland is unsuitable for Barn Owls, so the density in occupied squares is likely to be much higher than suggested by the regional means.

### **Methods of Data Capture**

The Barn Owl is acknowledged to be a difficult species to survey accurately, mainly because it is thinly distributed over a wide area, is largely nocturnal, is not particularly vocal, does not defend a clearly defined territory, and nests in tree cavities or buildings to which access may be difficult. During the breeding season too only the area immediate to the nest-site appears to be actively defended and many nesting pairs go unnoticed, even by people living close by. This means that locating breeding pairs is difficult without intensive fieldwork. After a series of trials (see Notes on Survey Design) tetrads were sampled. Fieldwork was carried out over three years, 1995 to 1997, to allow for the known short-term fluctuations in productivity (in turn largely due to fluctuations in small mammal numbers), and fieldworkers were asked to visit their tetrads twice in the first and third years of the survey period and once during the second year.

On a first visit (November to January and termed 'winter fieldwork') fieldworkers were asked to record all potential nest-sites within their tetrads, ie those sites potentially suitable for use by breeding Barn Owls, including farm buildings, tree cavities, bale stacks, cliff sites and nestboxes. The timing was set to facilitate the location of tree cavities, when leaves were absent, and to reduce the risk of disturbing breeding Tawny Owls *Strix aluco*. The locations of potential sites were recorded on 1:25000 maps to enable relocation during the summer to determine occupancy.

On a second visit (termed 'summer fieldwork'), between mid-June and the end of August, fieldworkers were asked to determine the occupancy of all the potential nest-sites they had located during the winter.

Observers were asked to minimize disturbance to breeding birds, and potential nest-sites were only searched (with the appropriate licence as the species is on Schedule 1 of the Wildlife and Countryside Act 1981) if no evidence of breeding was apparent from a site watch. Site watches, tested during the pilot year, involved fieldworkers watching from a vantage point at dusk to establish whether adult birds were consistently bringing food to the site or young birds were making begging calls. Both were taken as confirmation of

breeding and no further searches were made at such sites. If breeding was not evident from a site watch then fieldworkers actively inspected the site, searching for specific evidence. Where there was any doubt about the data received, further clarification was sought.

Records (sites) were classified into four types: 1) Confirmed breeding: breeding proven to have taken place, eg the presence of eggs or young (seen or heard), or adults regularly seen taking food in; 2) Possible breeding: not established definitely, but available evidence suggested that it may have done so, eg birds seen taking food into a site on a single occasion, unsubstantiated second-hand report; 3) Roosting: a single bird or pair of birds found to be occupying a site within which no evidence of breeding could be found, typically single birds found at sites near to one with confirmed breeding -- males will roost close to the breeding site at various stages during the nesting period; 4) Breeding status unknown: including a handful of records where fieldworkers stated that breeding had taken place but were unable to provide any supporting evidence.

Validation of fieldwork was carried out by the Project Officer (PO) who made visits to ca 6% of the tetrads selected for survey, primarily to enable potential biases to be examined and quantified. During these visits the PO carried out intensive fieldwork (but without any prior knowledge of the area) to locate all potential nest-sites and to determine their occupancy. The purpose was to compare results between observers and to provide an estimate of the proportion of owls detected. This assumed (not unreasonable) that the PO would find every breeding pair of owls within the tetrad being validated. During the visit, all sites noted were classified as: a) Suitable -- considered by the PO to be suitable for breeding Barn Owls, ie site should definitely have been recorded by the fieldworker; b) Possible -- the PO considered that breeding Barn Owls could have used the site, but it was not ideal, ie site should probably have been recorded by the fieldworker; or c) Unlikely -- the site was not considered by the PO to be suitable, but its presence may have been recorded by the fieldworker. These included cavities that appeared suitable from the ground, but which on closer inspection using a ladder, proved to be too small.

Classifying potential sites in this manner enabled the PO to identify whether fieldworkers were correctly recording sites of different types and to make improvements to the survey guidelines if required. Such comparisons were made on a tetrad-by-tetrad basis to determine which sites were being recorded by fieldworkers and which were being missed. In general such validation demonstrated that fieldworkers achieved a high degree of survey reliability.

### **Purpose of Data Capture**

The central aim was to carry out a repeatable survey of breeding Barn Owls in the UK, producing a baseline that included a description of regional variations in population density.

### **Geographic Coverage**

All of the UK. 1100 tetrads were selected randomly for survey although some were considered unsuitable and were not visited at all.

**Temporal Coverage**

The breeding seasons of 1995-1997, with a Pilot Survey in 1994. Two visits (one in the previous winter and one in the mid to late summer) were requested in 1995 and 1997 but only the summer visit in 1996.

**Other Interested parties**

The BTO ran the survey as a joint project with the Hawk & Owl Trust. The main funds for it came from Bayer AG, LIPHA SA, Sorex Ltd and Zeneca Agrochemicals.

**Organiser(s)**

Mike Toms (Project Officer) and Humphrey Crick, with some help from Trudi Dockerty in the early stages.

**Current Staff Contact**

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**Publications**

The main report of the survey is:

Toms, M.P., Crick, H.Q.P. & Shawyer, C.R. 2001. The status of breeding Barn Owls *Tyto alba* in the United Kingdom 1995-97. *Bird Study* 48: 23-37.

The survey was noticed in *BTO News* numbers 190, 194, 207, 214 and 223.

**Available from NBN?**

No.

**Computer data -- location**

BTO Windows network central area.

**Computer data -- outline contents**

To be determined.

**Computer data -- description of contents**

The files require further investigation to determine exactly which are the most important.

**Information held in BTO Archives**

2 archive boxes containing all the maps and data. All have been scanned.

## Notes on Access and Use

### Other information needed

#### Notes on Survey Design

The survey design involved a random sample of survey squares, stratified to increase efficiency and precision. A range of potential sampling strategies were evaluated using a combination of computer simulation and fieldwork trials in 1994. The latter investigated how the number, size and distribution of sample plots could best be manipulated to maximize survey efficiency and the precision of the final estimate. Simulations were also carried out using the 100-km square SE, mostly in Yorkshire, of the data gathered during the Hawk Trust's 1982-1985 national survey. This was considered to be representative of a moderately populated area, although ten of the 100 10-km squares were excluded because they represented areas that had been intensively studied during that survey and within which intensive nestbox studies were being carried out. Full details of the trials and the simulation process are reported by Crick *et al.* 1994 (*BTO Research Report* no. 163).

The confidence intervals obtained using randomly selected 5-km squares, tetrads (2-km squares) and 1-km squares were similar, given the same total area covered, so the choice of an appropriate size of sample square was based purely on the practicalities of what could be surveyed by observers in the field. Further simulations demonstrated that grouping subsamples of 1-km squares or tetrads within random 10-km squares provided larger confidence intervals than those obtained by sampling 1-km squares or tetrads completely randomly without grouping them within 10-km squares.

Potential stratification methods were also trialled. These showed that a stratification based on Barn Owl data from the two BTO breeding atlases maximized sampling efficiency and precision through the application of three strata. The greatest survey effort would be directed to squares where Barn Owls had been found in both atlas surveys and the least effort to squares where they had not been found during either. The simulations showed that ca 1100 tetrads would be needed to achieve confidence intervals of 20-25% around the population estimate, a figure similar to those obtained for a range of other single-species surveys, but the confidence intervals from an estimate of change in numbers in future years would be substantially narrower than those for a one-off estimate of numbers, given that the same survey areas were used in both surveys.

Some of the 1100 survey tetrads chosen fell in areas that were totally unsuitable for Barn Owls: eg wholly urban areas, or at too high an altitude on open moorland. These were placed in a 'zero class' following liaison with local co-ordinators and/or one year's fieldwork, and were assumed to contain no breeding pairs for the purposes of population estimation. Specially prepared information sheets provided fieldworkers with the means to recognize and correctly record the various potential nest-sites. Such information was further supplemented by a series of regional training workshops aimed at providing field experience of different site types, and the successful application of the information sheets was evaluated by examining survey responses and data collected during the validation visits.

By June the majority of breeding Barn Owls are at the late incubation or early nestling stage and the length and timing of the summer fieldwork was targeted to maximize the probability of detecting breeding pairs. Early breeding attempts that failed may have been missed because of the timing. However, pairs that fail early in the season fairly frequently lay a replacement clutch. In addition, running the survey over a three-year period, with separate estimates for each year, will also have reduced the effects of any potential biases associated with pairs that failed early. Decisions on whether breeding attempts were replacement clutches or second broods were taken on an individual basis following discussions with the fieldworkers concerned. Any bias introduced at this stage was unlikely to be systematic and, in the event, there were only a small number of nesting attempts (1.5%) that needed to be questioned as to whether they represented second or replacement nesting attempts.

### **Specific Issues for Analysis**

Survey results could be biased if coverage was not consistent over the course of the survey. In order to test for such bias it was investigated whether fieldworkers were more likely to drop out of the survey if they failed to locate Barn Owls. Analysis showed that 61% of fieldworkers with owls and 66% of those without carried on from 1995 to 1996, and 64% and 71% respectively for 1996 to 1997, suggesting that the presence of breeding Barn Owls did not influence the likelihood of a fieldworker continuing.

Fieldwork effort is also a potential source of bias. Each fieldworker spent, on average, 30 hours doing fieldwork during the course of the project. Median times differed among the six fieldwork sessions, although there were no significant differences between the summer sessions. This consistency in fieldwork effort across the summer sessions strongly suggests that the likelihood of breeding owls being found did not change as the project progressed. Within individual years, fieldworkers spent more time on winter fieldwork than on summer fieldwork during 1995 and 1996, when they were familiarizing themselves with their survey squares, but in 1997 this was reversed. There was no difference in fieldwork time for tetrads with or without a pair of Barn Owls.

Sixty-one of the 1100 survey tetrads received validation visits by the Project Officer during the project. This showed that fieldworkers identified 92% of 'suitable' sites and 84% of 'possible' sites. The figure for 'unlikely' sites was 46%, reflecting the value judgments made by the Project Officer about which sites a fieldworker might record. No breeding Barn Owls were missed by fieldworkers whose tetrads were validated. Overall, the results supported a high level of confidence in fieldworker ability and demonstrated the value of providing fieldworkers with detailed instructions and practical training.

An estimate of the number of breeding pairs in each of the three strata was calculated independently for each year of the survey. This was possible through knowledge of the sampling intensity within each stratum (in a given year) and of the number of breeding pairs found during fieldwork for that year. The estimates derived for the three strata were then summed to produce a national estimate of the number of breeding pairs. As the data were not normally distributed, a bootstrapping procedure was used to calculate the confidence intervals.