The BTO Barn Owl Monitoring Programme: 2000–09

The BTO Barn Owl Monitoring Programme (BOMP) was set up in 2000 and ran for 10 years, until 2009, with the aim of:

Monitoring Barn Owl populations through standardised recording of nest occupancy rates, breeding performance and survival at a set of Barn Owl nest sites broadly representative of the distribution of the Barn Owl in Britain.

The Barn Owl is a scarce breeding species that underwent a substantial population decline in the UK during the 20th century. It is listed as being of Amber conservation concern in the UK, but has been poorly covered by the national, long-running population monitoring schemes operated by the BTO.

Fieldwork involves repeat visits to registered sites, particularly to paired nest boxes, over the Barn Owl nesting season between April and October, to assess occupancy, gather breeding statistics, and ring adults and chicks. Colin Shawyer, of the Wildlife Conservation Partnership (WCP) has undertaken the development of BOMP methodology and has carried out fieldwork since 2000 at a set of 200 'core' sites, distributed across five regions of England. From 2002, BTO volunteers began gathering additional information at 'BOMP Network' sites over a wider geographical area. 365 additional sites were monitored in 2002 and an impressive 593 by 2009. The scale of the monitoring effort within BOMP, amounting to *c.* 15% of the national population of Barn Owl and with a good geographical spread, gives the results added importance.

One of the major successes of BOMP has been the recruitment of new volunteer surveyors; the BTO's Nest Record Scheme saw a four-fold increase in the number of Barn Owl nest records collected (including data from BOMP sites) following BOMP's initiation.

Monitoring at BOMP Network sites is carried out at two possible levels of commitment, described to potential contributors as Option 1 and Option 2.

Table 1. Visiting schedule adopted as standard for the BOMP Network sites, designed to document the key events in the Barn Owl's breeding cycle.

Visit period	Information sought, ringing activity
Late April to mid May	Site occupancy
	Count eggs and any chicks just hatched
	Catch and ring adults
	Identify moulted feathers
Mid July to early August	Count chicks at 6–8 weeks old
	Ring chicks
	Identify whether second broods begun
	Collect / identify moulted feathers
October	Count second broods at 6–8 weeks old
	Ring chicks

Requirements for Option 1:

- Site occupancy: a visit to the site in late April or early May usually reveals whether the site is occupied by Barn Owls (or has been during the current calendar year). A series of brief monthly visits from April to October is ideal.
- Second broods: these are important in determining the overall productivity of a pair.
- Habitat/land-use of surrounding area: the habitat surrounding the site is recorded using the standard BTO habitat codes (Crick 1992), which incorporates information concerning broad habitat types as well as more detailed information concerning crop types and livestock.

Requirements for Option 2:

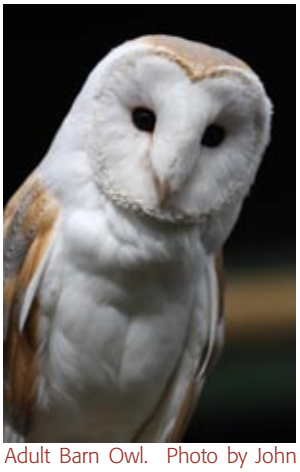
- Clutch size: the number of eggs present – recorded during a visit in late April or early May. For the most part, second broods are detected on the visits made in July or August.
- Hatching success: counts of unhatched eggs or eggshells.
- Brood size: the number of young present, preferably at early and late nestling stages.
- Age of young: as judged from the development of down, or estimated from feather length and wing length.
- Losses of young: any dead or missing young are noted.
- Prey stored at nest: presence, species composition, and number of prey stored at nests, to provide an indication of food availability.
- Dates of laying, hatching and fledging: these are recorded when visits coincide with these events, but hatching, and hence laying dates, can also be deduced from the age of the nestlings.
- Fledging success: the number of young fledged from a site.

Under Option 2, suitably licensed ringers are encouraged to ring the adults and young, record chick measurements and, for adults, note their age, sex, and state of brood patch and moult.

RESULTS

BOMP coverage

Figure 1 shows the distribution of all BOMP sites monitored over the 2000–09 study period. Coverage was generally good in the South, East and North of England. Although coverage was still poorer in western England and the majority of Scotland, many of the sites new to the project in 2009 were located in these areas, reflecting the targeted promotional effort. Coverage in Wales remained poor even though Barn Owls breed throughout much of the country (Gibbons *et al* 1993).



Adult Barn Owl. Photo by John Harding

Asynchronous hatching of eggs results in chicks of different sizes. Photo by Jez Blackburn.

Barn Owl Occupancy Rates

The occupancy rate of boxes and the proportion of birds that went on to breed decreased over the ten-year period (Figure 2). While the size of the Barn Owl population in the UK has not been estimated since Project Barn Owl finished in 1997, a study in the eastern half of England suggests that the population has doubled in this part of Britain since 2000 (Shawyer 2008). The observed declines in occupancy since the initiation of BOMP may therefore be due to a geographical clustering of monitoring sites, or to increases in the number of other boxes installed in the same area by people not taking part in the project. This would have created alternative, non-monitored, nest sites, potentially resulting in lower occupancy at BOMP sites.

BOMP data indicate that laying dates have advanced by about 1.6 days over the study period. BOMP sites in the north of the UK were more likely to be occupied by Barn Owls than those in the south, but there was no difference in occupancy rates between the east and west. This result may be due to a lower density of nest boxes in the north of Britain or the reduced availability of natural nest sites in this region (Toms *et al* 2000). Alternatively, it may reflect the expansion of Barn Owls onto higher ground

Table 2. Total number of BOMP sites surveyed annually 2000-09

	00	01	02	03	04	05	06	07	08	09
WCP	159	170	203	205	204	202	197	190	191	194
BOMP Network	-	-	365	395	338	368	453	475	572	593
TOTAL	159	170	568	600	542	570	650	665	763	787

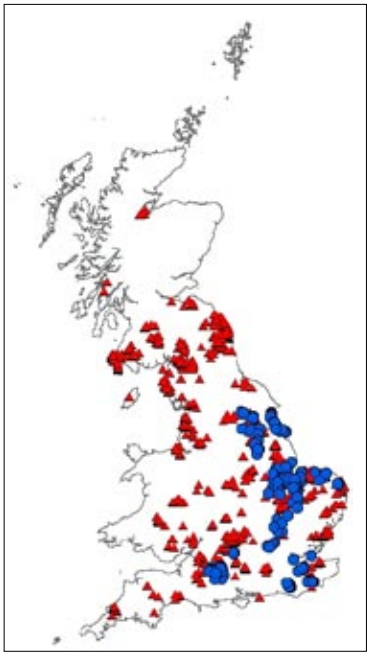


Figure 1. Distribution of WCP (blue circle) and BOMP Network (red triangle) sites monitored in 2000–09.

due to the amelioration of winter climate since the mid 1980's or latitudinal variation in climatic conditions or habitat quality. Site occupancy was highest in areas of rough grassland, with fewer boxes occupied on pastoral or arable land. This variation is likely to reflect the distribution of small mammal prey, particularly Field Voles *Microtus agrestis*, which are more abundant in areas of rough pasture and uncultivated land.

Temperature and snow cover have both been observed to influence Barn Owl survival rates, particularly those of juvenile birds, in Britain (Shawyer 1987) and on the Continent (Altwegg *et al* 2003, 2005). Temperatures in winter (from November to March) strongly influenced the rate of site occupancy and the proportion of pairs that bred, with occupancy and breeding pairs both higher following warmer winters. Occupancy rates fell after wetter winters, implying that survival rates were lower, and fewer of the pairs that were observed at boxes went on to lay a clutch. Cold weather can affect the birds through increased energy demand, and/or decreased prey availability as the abundance and activity of small mammals may also depend on the weather (Shawyer 1987, Pucek *et al* 1993). Wet weather can also impair the ability of Barn Owl to hunt, because their feathers are not waterproof and they cannot be exposed to rain for long periods of time.

Female weight at laying

Over the period 2001–09, 718 females were weighed at 161 different nest sites. Birds in the east were heavier than those in

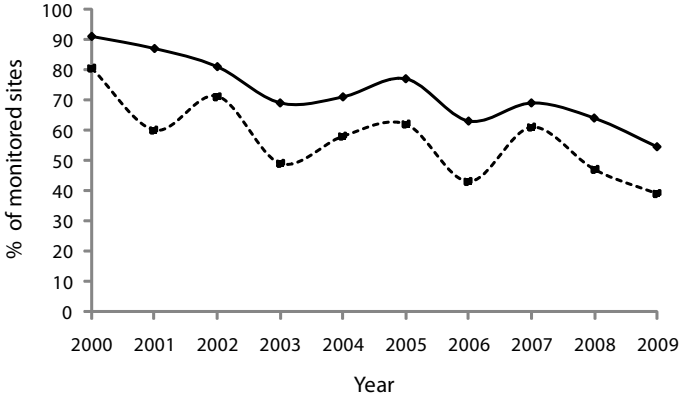


Figure 2. Annual variation in the proportion of BOMP sites at which Barn Owls were recorded as present (solid line) and the proportion of sites at which owls were recorded as breeding (dashed line).

Grassland sites had the highest Barn Owl occupancy. Photo by Jill Pakenham.

the west of Britain, and the mean weight reflected the stage of breeding. The weight of females increased as the breeding season progressed, so that females with chicks were lighter than those that were brooding or that had a combination of chicks and eggs on the nest. The lightest females were those that were not breeding. Habitat type was not important in explaining the differences in weight, but winter temperature and rainfall were. Females were heavier after milder and drier winters, as cold temperatures affect birds through loss of energy and reduced prey abundance, while rain impairs the birds' flight and hunting.

Female weight may depend on food availability. Photo by Colin Shawyer.

Barn Owl Productivity

The mean laying date occurred increasingly earlier over the 10 years of the project. Brood size varied with respect to the habitat around the nest, with pairs breeding in rough grassland having larger broods than those breeding in pastoral or arable land (Leech *et al* 2009). These results are likely to reflect differences in the availability of small mammal prey, particularly Field Vole, between habitats, as densities are likely to be higher in areas of rough grassland, the species' favoured habitat (Shawyer 1987, Harris & Yalden 2008) than in agricultural land, where harvesting and grazing by livestock reduces tussock structure, litter layer and length of sward, which are all necessary to provide Field Vole habitat (Shawyer 1998). Mean temperature during winter influenced laying date, clutch size and brood size. Following cold winters birds took longer to initiate breeding, probably because they were in poorer body condition. Cold weather also affected clutch and brood sizes, both of which were smaller the following spring, and wet winters resulted in smaller broods. These results were all consistent with those from analysis of the longer Nest Record Scheme dataset, running from 1980 to 2009.

Occupancy rates of other species

Data from BOMP sites can also be used to investigate variation in the occupancy rates of three additional species that frequently utilise Barn Owl nest sites - Stock Dove *Columba oenas*, Jackdaw *Corvus monedula a*nd Kestrel *Falco tinnunculus*. However, the results must be interpreted conservatively, as there is some evidence to suggest that these additional species, or their absence, are not always routinely noted down by all recorders. In addition, the design of the nest box may influence the presence of other species. The occupancy rate of Stock Dove did not seem to be related to any of the factors considered. Occupancy rates of BOMP sites by Jackdaw were higher towards the north of Britain, were greater at sites where there were paired boxes and were higher at sites using the pole-box design than at those using alternatives. Jackdaws seemed to avoid nest boxes where Barn Owls were present, and occupancy of Barn Owl boxes

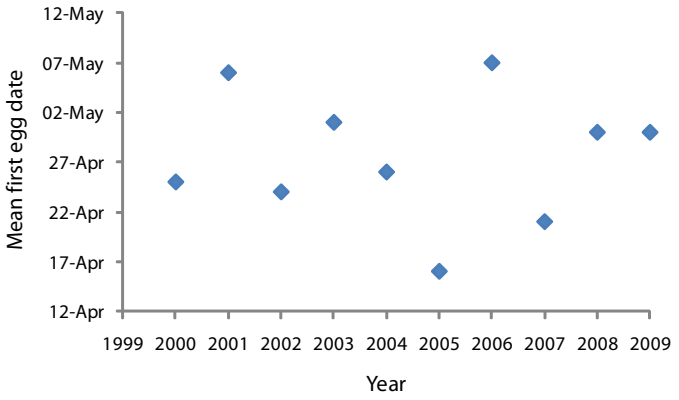


Figure 3. First egg date across the project. The mean laying date occurred progressively earlier across the 10 years.

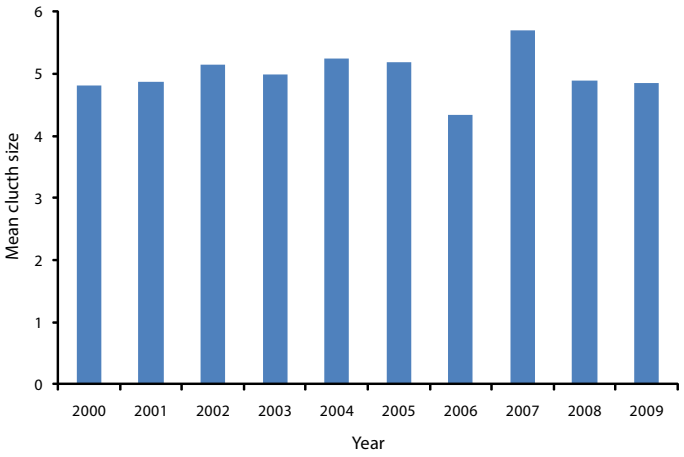


Figure 4. Clutch size across the project. The mean number of eggs remained similar throughout the years of the study.

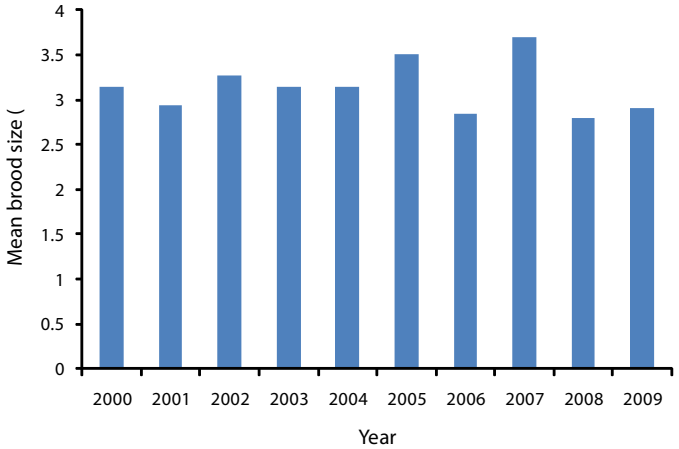


Figure 5. Brood size across the project. The mean number of chicks remained similar throughout the study.

Small mammals are the main components of the Barn Owl diet. Photo by Howard Lacey.

A mouse is fed to the chicks at the nest. Photo by Howard Lacey.

by this species was higher following drier winters. Occupancy rates of BOMP sites by Kestrel were highest in the south east of England, as might be predicted by their national distribution, and they preferred the polebox design, but occupancy rates were not affected by presence of paired nestboxes.

Acknowledgements

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Soft downy feathers on Barn Owls make them silent hunters but not very waterproof ones! Photo by George Higginbottom.