The Barn Owl Monitoring Programme: Establishing a Protocol to Assess Temporal and Spatial Variation in Productivityat a National Scale

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Source: Ardea, 97(4) : 421-428

Published By: Netherlands Ornithologists' Union

URL: https://doi.org/10.5253/078.097.0404

The Barn Owl Monitoring Programme: establishing a protocol to assess temporal and spatial variation in productivity at a national scale

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Leech D.I., Shawyer C.R., Barimore C.J. & Crick H.Q.P. 2009. The Barn Owl Monitoring Programme: establishing a protocol to assess temporal and spatial variation in productivity at a national scale. In: Johnson D.H., Van Nieuwenhuyse D. & Duncan J.R. (eds) Proc. Fourth World Owl Conf. Oct–Nov 2007, Groningen, The Netherlands. Ardea 97(4): 421–428.

Once regarded as Britain's most abundant owl species, Barn Owl *Tyto alba* numbers declined substantially from 1850 to 1950. While more recent surveys suggest that numbers may now have stabilized, breeding range declines and the species' unfavourable European conservation status have resulted in its inclusion on the Birds of Conservation Concern Amber List. As existing schemes were not suited to monitoring the abundance of low density, nocturnal species, the Barn Owl Monitoring Programme (BOMP) was established by the British Trust for Ornithology in 2000, assisted by the Wildlife Conservation Partnership. Under BOMP methodology, approximately 600 potential breeding sites (c. 10% of the national population) located throughout the British Isles are visited by volunteer observers each year who record owl occupancy and productivity. These data are used to assess long-term trends, and the results from the first six years of data collection (2000–05) are presented in this paper. As expected, given the short time-span of data collection, there was no strong evidence for a significant temporal trend in either occupancy or productivity. Habitat type appears to play a significant role in determining both occupancy rates and productivity. A greater proportion of sites in areas of natural or semi-natural grassland were occupied by Barn Owls and broods produced at these sites were significantly larger than those produced in pastoral or arable habitats. Areas of rough grassland are likely to support greater numbers of small mammals, particularly voles *Microtus* spp., providing more food for adults and nestlings. There was some evidence to suggest that occupancy rates were higher towards the western part of the country, possibly due to the milder winter conditions in these areas.

Key words: Barn Owl, *Tyto alba*, monitoring, site occupancy, productivity, brood size, habitat, grassland, vole, *Microtus*, United Kingdom

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INTRODUCTION

The most recent nationwide survey of the Barn Owl *Tyto alba* in the United Kingdom (UK) suggested a breeding population of about 4000 pairs (Toms 1997, Toms *et al.* 2000, 2001). The Barn Owl has qualified under international criteria, through its 'moderate decline' in Europe, as a species of European conservation concern (SPEC category 3; Tucker & Heath 1994). In the UK, it has been included on the Amber List of Birds of Conservation Concern (Gregory *et al.* 2002) due to a decline in its geographical breeding range of 25–49% between the national breeding bird atlases of 1968–72 (Sharrock 1976) and 1988–91 (Gibbons *et al.* 1993) and because it is listed as a species with unfavourable conservation status in Europe.

As it is elusive, primarily nocturnal, largely non-vocal and occurs at relatively low densities, the Barn Owl is poorly monitored by established national surveys used to assess the abundance of terrestrial bird species in the UK, such as the British Trust for Ornithology (BTO) & Royal Society for the Protection of Birds (RSPB) Breeding Bird Survey (Raven *et al.* 2007). In order to identify further changes in its conservation status and to determine the impact of the conservation efforts directed at the population, a species-specific monitoring programme was required. In 2000, the Barn Owl Monitoring Programme (BOMP) was established by the BTO, assisted by the Wildlife Conservation Partnership (WCP) and funded by The Sheepdrove Trust, with the aim of producing annual trends in nest site occupancy and productivity at a national scale. In this paper, we outline the methodology of the scheme and present an analysis of the first six years of BOMP data, collected over the period 2000–05.

METHODS

Barn Owls are most easily surveyed by monitoring potential nest sites during the breeding season (Bunn *et al.* 1982, Shawyer 1987, Bibby *et al.* 1992). As absolute numbers of Barn Owls are difficult to assess (Toms *et al.* 2001), rates of site occupancy may be a useful guide to overall population levels of breeding Barn Owls. Nest visits also allow timing of breeding and productivity per breeding attempt to be recorded and provide good opportunities to trap and ring adult and young birds, thereby facilitating the study of survival rates and dispersal.

WCP and BOMP Network sites

In the first year of BOMP, WCP selected 125 nest sites that they undertook to monitor annually. The WCP area of operations, most of southern and central England, was divided into five regions on the basis of administrative boundaries and 25 sites were selected from each region. Each site consists of a single nest box or pair of adjacent boxes, the latter designed to allow females to lay a repeat brood before the young from the first brood have fledged. Three nest box designs were employed: 'Pole' boxes mounted on stand-alone poles and 'A-Frame' boxes mounted on trees (Dewar & Shawyer 1996), plus a hybrid design used at sites in the south-west of England that was similar in terms of both box volume and siting location (on poles or trees). With the exception of the south-west, the relative proportion of box types across regions was held constant. Starting in 2002, an additional set of 75 sites were also selected, using similar criteria, and have been monitored by the WCP for BOMP each year.

Since 2002, a further 320–380 BOMP 'Network' sites have been monitored each year by volunteer recorders, who guarantee to participate in the project for a minimum of three years. Again, sites consist of either single or paired nest boxes, although the designs and dimensions are more variable than at WCP sites. Sites are selected by recorders and therefore reflect the distribution of the human population, but despite some resulting aggregation, most regions and habitats included in the species' UK range as indicated in the last Breeding Atlas (Gibbons *et al.* 1993) are reasonably well represented, with the possible exception of Wales and parts of northern Scotland (Fig. 1). While there are potential biases associated with monitoring schemes based on non-random site selection (Freeman *et al.* 2007), the geographical extent of coverage and the high proportion of the UK population included in the BOMP sample (c. 10%, assuming current population estimates are accurate) suggest that the results are likely to be representative of the population as a whole.

Another potential criticism of BOMP methodology is the focus on artificial nest sites, which, while they permit collation of accurate breeding data and facilitate the capture of both juveniles and adults, may not be representative of natural sites in terms of occupancy probability or productivity. However, many 'natural' nest sites utilised by Barn Owls in the recent past have been provided by human activity. In addition, the increasing trend for barn conversions and the loss of mature trees from the British countryside is potentially reducing the availability of 'natural' sites and increasing the species' dependency on boxes. Project Barn Owl estimated that there were some 25 000 boxes in the UK (Toms *et al.* 2000) and noted that 40% of Barn Owl breeding attempts located by fieldworkers involved pairs using nest boxes, compared with 30% in buildings and 30% in trees, although the sample size was small (n = 97). Again, trends identified by BOMP are therefore likely to be broadly representative of the UK population.

Fieldwork

A minimum of two visits to each site are made per year, the first between April and mid-May, when initial breeding attempts are likely to be underway, and the second between mid-July and early August, when first broods are at the point of fledging and some second broods may be initiated. Observers are encouraged to visit sites more frequently where possible, in order to increase the accuracy of any productivity data col-

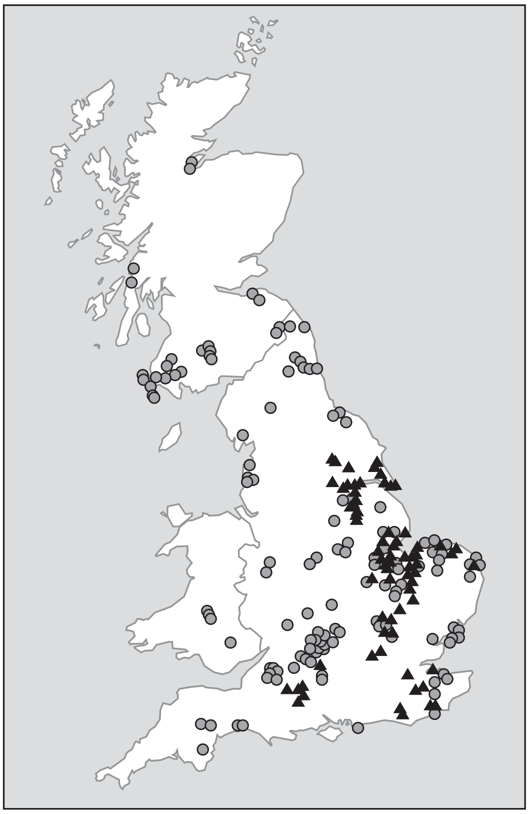

Figure 1. Distribution of Wildlife Conservation Partnership (black triangle) and Barn Owl Monitoring Program Network (grey circle) sites monitored in 2005 in the United Kingdom.

lected. Barn Owls tend not to be easily disturbed by careful fieldwork (Percival 1990, Taylor 1991). Several long-term studies of the breeding biology of Barn Owls indicate that monitoring active nest sites is unlikely to bring about desertion (de Bruijn 1994, Taylor 1994). Taylor (1991) found no significant differences in productivity between nests visited only at the late chick stage and those that received multiple visits, and Percival (1990) also failed to find any effect of visit rate on the number of fledged chicks when analysing BTO Nest Record Scheme data. Taylor (1994) also noted that site fidelity was high, with only 0.9% of males and 5.6% of females changing nest sites between consecutive breeding seasons. Nest site inspections are therefore unlikely to compromise the welfare of Barn Owls, or the integrity of the data gathered, provided that they are carried out carefully following the protocol outlined in the BOMP Barn Owl Fieldwork guidance notes.

At each site the presence/absence of Barn Owls and their breeding status are recorded. Nest site occupancy provides a minimum estimate of Barn Owl abundance in a specified area, as non-breeding individuals or pairs and those breeding in unmonitored sites may be overlooked. However, given their high degree of nest site fidelity (Taylor 1994), it is reasonable to assume that changes in observed occupancy rates can provide useful information about the species' status and population trends. In years of particularly abundant prey or favourable weather conditions, birds may additionally breed in areas of poor quality habitat where nest box provision, and monitoring, is lower, resulting in a non-linear relationship between the size of the 'true' population size and that of the monitored population. There was relatively little evidence of this happening in the area intensively surveyed by Shawyer, however, and variation in nest site quality within the UK is generally less marked than in some continental populations. This said, determining the extent to which inter-annual variation in occupancy is related to site quality would be a useful further validation of this method

Once an active nest has been located, the number of live and dead eggs and chicks present at each visit are recorded following BTO Nest Record Scheme (NRS) protocol (Crick *et al.* 2003), and the stage of nestling development is noted using standardised NRS status codes. At WCP sites, additional measurements of nestling primaries are taken to help establish accurate laying dates. The majority of BOMP Network participants are trained ringers, and are therefore able to ring young and adults encountered.

At WCP sites, the dominant habitat in the area surrounding the nest site is recorded using the BTO habitat coding system developed by Crick (1992). At BOMP Network sites, participants are asked to collect data in a more quantified manner, recording the proportion of the area in 0.5 km radius around the nest box that can be attributed to each of 16 major habitat types. To allow direct comparison of habitat trends identified using the two datasets, each BOMP Network site was assigned a dominant habitat. WCP and BOMP Network sites were then grouped into three principal habitat types: arable, pastoral and natural/semi-natural grassland.

Calculation of occupancy rates

A site was classed as 'used for nesting' if a breeding attempt had been made, defined as the presence of one or more eggs or chicks on at least one visit made during the season. If a Barn Owl(s) was encountered or if fresh pellets were present, but no eggs or chicks were recorded during the season, the site was classed as 'used for roosting'. Sites that were not visited and those at which Barn Owls were prevented from nesting, e.g. by the presence of other species, were excluded from all analyses.

For analysis, boxes within 1 km of each other were treated as a single site and if a breeding attempt was initiated in either box then the site was classed as 'Used for nesting'. However, in a few cases overlapping breeding attempts did occur in these 'paired boxes'. If this occurred during any season, the paired boxes were treated as two separate sites in all years as there was the potential for simultaneous breeding. As males were seldom caught at the nest site, it is impossible to exclude the fact that such situations may have been due to a polygamous individual fathering multiple broods. However, the incidence of paired boxes being occupied simultaneously was very low (<0.5% of breeding attempts per annum) and therefore this is unlikely to significantly affect any results presented.

Calculation of breeding parameters

Few nests were found sufficiently early for the laying date of the first egg (FED) to be recorded directly. Laying dates were therefore estimated by back-calculation using information on clutch size, stage of nest contents and primary feather growth was used to estimate laying dates (Shawyer 1998, Crick *et al.* 2003). The key factor to ascertain in determining clutch size is whether laying had been completed. Thus, records were omitted from these analyses if nests were only visited once, if they were only visited when the eggs were cold (suggesting the nest had failed before the first visit), if laying may still have been in progress on the last visit or if the maximum recorded brood size exceeded the maximum number of recorded young (Crick *et al.* 2003).

Clutch and brood sizes reported in these analyses refer to the maximum number of eggs and chicks respectively recorded at any visit to the nest (Crick *et al.* 2003). Clutch sizes of a single egg were excluded from the analysis as this sample is likely to include clutch sizes estimated at '1+' where eggs were present but no count was made. Records were excluded from the analysis of brood size if no visit was made while any of the young were alive.

Analytical methods

Factors influencing the proportion of sites at which Barn Owls were present, whether breeding or non-breeding, and the proportion of occupied sites at which Barn Owls bred were investigated in the current analysis. As the dataset included information from the same nest sites in several different years, a repeated measures GENMOD procedure was used in SAS v9.1 (SAS Institute 2001), with a site identifier as the repeated variable and specifying an autoregressive correlation function. As the mean life-expectancy of an individual is 3 years (maximum 13 years) (Robinson 2005), the use of a repeated-measures approach allows us to control for the fact that the same pair might be breeding at a specific site in successive years. In all models of occupancy rates, a binomial error distribution was assumed and a logit link function was specified. Terms for northing, easting, year of data collection and primary habitat type were included as independent variables in all models of occupancy rate.

As productivity may vary between first and second broods, any breeding attempts identified as repeats by observers were removed from the dataset prior to analysis of laying date, clutch size and brood size. Analyses of laying date were performed using a repeated measures GENMOD procedure in SAS, assuming a normal error distribution and specifying an identity link function, while analyses of clutch and brood sizes were performed using a repeated measures GENMOD procedure, assuming a Poisson error distribution and specifying a log link. Terms for northing, easting, year of data collection and primary habitat type were included as independent variables in all productivity models.

RESULTS

BOMP coverage

Data from the first six years of BOMP, 2000–05, were used in all of the following analyses. Since 2002, 200 WCP sites have been monitored in each year, but the totals were slightly lower for the initial two field seasons (159 in 2000, 170 in 2001). Data were collected at BOMP Network sites from 2002 onwards. While the importance of consistent coverage is emphasised to participants, all efforts are voluntary and the annual totals of monitored sites are therefore more variable, ranging from a low of 327 sites in 2004 to a high of 386 in 2003. Sites were distributed across the whole of the UK (Fig. 1), but again, due to the voluntary nature of the survey, coverage did to some extent reflect human population density. The number of monitored sites was greatest in the south-east England, and lowest in south-west England, Wales and northern Scotland.

Occupancy rates

The proportion of WCP sites at which Barn Owls were recorded as present (Fig. 2), whether breeding or merely roosting, declined significantly over the period 2000–05 (Table 1). However, no significant temporal trend was detected in the BOMP Network data over the period 2002–05 (Table 2), and when the analysis of the WCP data was limited to the same time span, the effect

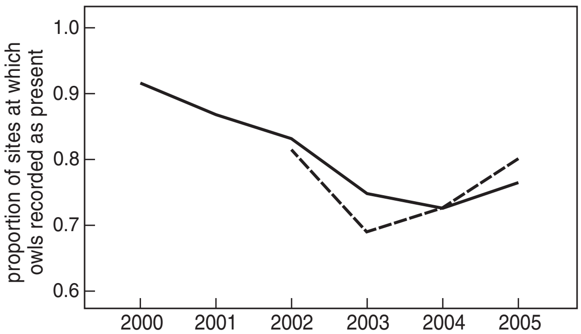

Figure 2. Proportion of Wildlife Conservation Partnership (solid line) and Barn Owl Monitoring Program Network (dashed line) sites at which Barn Owls were recorded as present, irrespective of breeding status, in each survey year.

of year was no longer significant ($\chi^2_1 = 2.30$, $P = 0.129$). The proportion of observed pairs that attempted to breed decreased over time at BOMP Network sites (Table 2), and while a similar trend was reported from WCP sites, it was not statistically significant.

Occupancy rates at WCP sites varied significantly between habitats (Fig. 3), with Barn Owls present at a greater proportion of sites in areas of natural or semi-natural grassland (Table 1). However, habitat did not

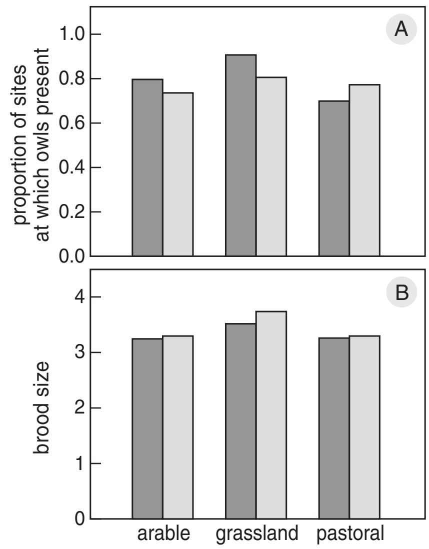

Figure 3. Predicted occupancy rates (A) and brood sizes (B) at Wildlife Conservation Partnership (dark grey) and Barn Owl Monitoring Program Network (light grey) sites located in different habitats. Values presented were calculated using the parameter estimates generated by the repeated measures GENMOD models, using the mean values for northings and eastings calculated from the WCP dataset (specifying an area in Cambridgeshire, OS Grid Ref TL1487) with the year set to 2003, the mid-point of the data run.

Table 1. Factors influencing A) the proportion of Wildlife Conservation Partnership sites at which Barn Owls were observed to be present, and B) the proportion of these sites from which evidence of breeding was reported for the years 2000–05. Statistically significant results in bold. Sample sizes given are number of site × year combinations.

	Coefficient	χ^2	*P*
A) Site occupancy (n = 1076)			
Northing	0.2190	3.93	**0.047**
Easting	–0.3587	3.03	0.082
Year	–0.2317	23.30	**<0.001**
Primary habitat		9.37	**0.009**
Arable	0.5611		
Grassland	1.4776		
Pasture	0.0000		
B) Proportion breeding (n = 863)			
Northing	–0.0569	0.39	0.535
Easting	–0.5594	6.45	**0.011**
Year	–0.0844	3.28	0.070
Primary habitat		1.73	0.422
Arable	0.1851		
Grassland	0.6265		
Pasture	0.0000		

Table 2. Factors influencing A) the proportion of Barn Owl Monitoring Program Network sites at which Barn Owls were observed to be present and B) the proportion of these sites from which evidence of breeding was reported for the years 2002–05. Statistically significant results in bold. Sample sizes given are number of site × year combinations.

	Coefficient	χ^2	*P*
A) Site occupancy (n = 1179)			
Northing	0.0339	0.21	0.644
Easting	–0.2009	4.39	**0.036**
Year	–0.0089	0.03	0.870
Primary habitat		2.22	0.329
Arable	–0.1945		
Grassland	0.2017		
Pasture	0.0000		
B) Proportion breeding (n = 915)			
Northing	0.0795	0.80	0.372
Easting	0.1663	2.04	0.153
Year	–0.1610	4.92	**0.027**
Primary habitat		1.28	0.527
Arable	–0.1307		
Grassland	–0.3904		
Pasture	0.0000		

appear to influence occupancy rates at BOMP Network sites (Fig. 3A), and no relationship between habitat type and the proportion of occupied sites at which birds attempted to breed was identified for either dataset.

Barn Owl occupancy rates at WCP sites increased significantly with latitude (Table 1). At BOMP Network sites (Table 2), occupancy rates were significantly higher towards the west of the country, as was the proportion of occupied WCP sites at which birds attempted to breed. However, both relationships are potentially confounded by a significant negative correlation between longitude and the prevalence of rough grassland habitats (logistic regression, n = 685, parameter estimate = –0.366, χ^2 = 13.16, $P < 0.001$).

Barn Owl productivity

Analyses of laying dates could only be performed for WCP sites, where chick age could be calculated by measuring the developing flight feathers. While mean laying dates became progressively earlier, no significant effect of latitude, longitude or habitat type was identified (Table 3). Analysis of clutch size data was only possible for BOMP Network sites and no significant patterns of temporal or spatial variation in terms of the number of eggs produced per attempt were identified (Table 4).

Sufficient data were collected to allow brood sizes to be analysed for both WCP and BOMP Network sites. The mean number of chicks per brood increased significantly over time at the WCP sites (Table 3). However, this was solely due to a very productive season in 2005, during which the mean brood size was 0.5 chicks greater than the average over the preceding five years. If the analysis is restricted to the period 2000–04, the temporal trend is no longer significant (χ^2_1 = 0.13, P = 0.715). At BOMP Network sites, brood sizes produced by pairs nesting in areas of natural or semi-natural grassland were significantly larger than those produced by pairs breeding in arable or pastoral areas (Table 4), on average by approximately 0.5 chicks (Fig. 3B).

DISCUSSION

The preliminary analyses of the BOMP dataset presented here demonstrate the potential of the Programme to explore patterns of spatial variation in Barn Owl breeding parameters. Habitat type appears to play an important role in determining occupancy rates and the number of chicks produced per breeding attempt, both of which were found to be significantly higher in areas of semi-natural or natural grassland than they were in areas of more intensive agriculture. A similar relationship was identified by Project Barn Owl in 1995–97, which found that the proportion of pairs rearing at least one young to fledging was 86% in the grassland-dominated southwest, compared with 61% in the more inten-

Table 3. Factors influencing Barn Owl laying dates and brood sizes at Wildlife Conservation Partnership sites 2000–05. Statistically significant results in bold. Sample sizes given are number of site x year combinations.

	Coefficient	χ^2	P
First egg date (n = 392)			
Northing	–0.0037	0.00	0.974
Easting	0.4025	3.14	0.077
Year	–1.8282	10.60	**0.001**
Primary habitat		0.54	0.762
Arable	–1.6596		
Grassland	0.3314		
Pasture	0.0000		
Brood size (n = 404)			
Northing	–0.0023	1.43	0.232
Easting	0.0039	1.25	0.264
Year	0.0249	5.51	**0.019**
Primary habitat		1.79	0.401
Arable	0.0016		
Grassland	0.0868		
Pasture	0.0000		

Table 4. Factors influencing Barn Owl clutch and brood sizes at Barn Owl Monitoring Program Network sites 2002–05. Statistically significant results in bold. Sample sizes given are number of site x year combinations.

	Coefficient	χ^2	P
Clutch size (n = 127)			
Northing	–0.0030	1.99	0.158
Easting	–0.0004	0.02	0.893
Year	0.0106	0.26	0.607
Primary habitat		3.07	0.215
Arable	0.0355		
Grassland	0.0850		
Pasture	0.0000		
Brood size (n = 637)			
Northing	–0.0004	0.09	0.767
Easting	0.0013	0.64	0.423
Year	–0.0032	0.07	0.794
Primary habitat		7.00	**0.030**
Arable	–0.0228		
Grassland	0.1202		
Pasture	0.0000		

sively arable south and eastern parts of England (Toms *et al.* 2000). These results are likely to reflect variation in the availability of small mammal prey, particularly the Field Vole *Microtus agrestis*, a key prey species of the UK Barn Owl population (Glue 1974, Taylor 1994). As voles generally favour habitats providing dense, grassy cover and a thick litter layer (Hansson 1977), small mammal abundance is negatively influenced by agricultural practices that reduce vegetation structure, such as regular cutting (Green 1990, Tattershall *et al.* 2000) and grazing pressure from livestock (Evans *et al.* 2006). Askew *et al.* (2007) reported a positive relationship between sward height and small mammal abundance in NE England and Shore *et al.* (2005) found that Bank Vole abundance was positively correlated with width of grassy field margins on UK farmland. Taylor (1994) demonstrated that the densities of small mammals in his Scottish study area were far greater in the rank grassland woodland margins than in the adjacent pastures or fields of arable crops and Aschwanden *et al.* (2007), working in Switzerland, recorded higher small mammal densities, principally Common Vole *Microtus arvalis*, in un-mown wildflower and herbaceous strips than were present in the surrounding arable and pastoral land. In agricultural regions, the area of suitable foraging habitat is therefore likely to be greatly reduced, restricted primarily to uncultivated or un-grazed field margins (Andries *et al.* 1994, Shawyer & Shawyer 1995, Tomé & Valkama 2001).

As Taylor (1994) stated, surprisingly few studies have looked in detail at the influence of habitat on Barn Owl breeding success. De Bruijn (1994) noted that the numbers of breeding Barn Owls were greater in areas of small-scale, extensive farmland than in more intensively cultivated regions of The Netherlands, with the density of breeding pairs positively related to correlates of rough grassland availability such as hedge length and the area of woodland margins. Taylor (1994) found that Barn Owl pairs breeding in young conifer plantations, where high quality vole habitat was plentiful, consistently raised larger broods than those nesting in lowland farmed areas. Furthermore, productivity of owls breeding in the latter habitat was correlated with the density of suitable grassland hunting habitat within a 1-km radius of nest sites (Taylor 2002). In a recent study, Bond *et al.* (2005) examined landscape characteristics within a 3 km^2 around 85 nest boxes in Sussex, England. They demonstrated that boxes remaining unoccupied over the period 1997–2003 were associated with higher levels of poor quality small mammal habitat, including improved grassland and suburban development, in the surrounding area, mirroring the relationship between habitat type and occupancy rates identified in the BOMP dataset.

While evidence for a latitudinal trend in occupancy rates is relatively weak, that for a significant longitudinal trend is stronger, suggesting that both the probability of occupancy and the proportion of occupied boxes at which breeding was reported was higher towards the west of the UK. While this relationship could result from regional variation in nest site availability (Toms *et al.* 2000) or the warming influence of the Gulf Stream in the western UK, the analysis is confounded by a significant decrease in the prevalence of rough grassland habitats with longitude and it is therefore not possible to determine whether climatic or habitat variation is responsible for this relationship.

Given the relatively short duration of the dataset, it is difficult to determine whether the temporal variation in occupancy rates and productivity identified in this study are indicative of long-term trends or are merely short-term fluctuations resulting from stochastic variation in environmental conditions, particularly in a population where productivity is likely to depend heavily on small mammal population cycles (Taylor 1994).

We urge the initiation of small-scale, intensive studies focusing on the impacts of increased availability of nest sites in areas where the population is stable, as these efforts would be of significant value in understanding demographic aspects relevant to overall monitoring efforts.

ACKNOWLEDGEMENTS

The BTO is extremely grateful to the Sheepdrove Trust for providing funding to permit the development and operation of this urgently needed programme, and to the Wildlife Conservation Partnership for their major part in its fieldwork and planning. The WCP expresses special thanks to Major Nigel Lewis for assisting them and for providing much of the data for the southwest region. We are very grateful to the volunteer Barn Owl observers who have visited sites as part of the BOMP Network. The BTO and WCP would also like to thank all the landowners who have allowed recorders access to Barn Owl sites for monitoring purposes. The authors would like to thank Mandy Andrews at BTO for collating the BOMP data and Karen Wright at BTO for help with database construction.

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SAMENVATTING

De Kerkuil *Tyto alba* werd vroeger in Groot-Brittannië beschouwd als de meest talrijke uilensoort, maar dat is allang niet meer zo na de forse afname van de aantallen tussen 1850 en 1950. Ook al geven recente inventarisaties aan dat de achteruitgang tot stand is gekomen, de verkleining van het verspreidingsgebied en de ongunstige status in geheel Europa blijven een bron van zorg, zodat de soort opgenomen is op de Britse 'Oranje lijst', de zogenaamde Birds of Conservation Concern Amber List. Omdat bestaande programma's niet geschikt waren om nachtactieve soorten die in lage dichtheid voorkomen, goed te inventariseren, werd in 2000 het Kerkuilen Monitoring project (Barn Owl Monitoring Programme: BOMP) gestart door de BTO in samenwerking met de Wildlife Conservation Partnership. Als onderdeel van het BOMP worden elk jaar ongeveer 600 potentiële broedplaatsen (bezet door 10% van de nationale populatie Kerkuilen) door vrijwilligers bezocht. Zij leggen vast of er uilen zijn en hoeveel eieren en jongen die produceren. Deze gegevens worden gebuikt om langetermijntrends vast te leggen, zoals voor de eerste zes jaar (2000–05) in dit artikel. In deze korte periode is duidelijk geworden dat zowel de kans dat een plek door uilen wordt bezet als het broedsucces afhangt van het habitattype. Door de Kerkuilen werd een groter aandeel van de plekken in natuurlijke of halfnatuurlijke graslanden bezet dan in cultuurgebrachte gebieden. Ook werden daar meer jongen grootgebracht.

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Research grants – The NOU supports ornithological research and scientific publications through its Huib Kluijver Fund and the 'Stichting Vogeltrekstation'. Applications for grants can be addressed to the NOU Secretary. Donations to either fund are welcomed by the NOU treasurer.

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Editorial address – Jouke Prop, Allersmaweg 56, 9891 TD Ezinge, The Netherlands (ardea.nou@planet.nl)

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World Owl Conference Special

Editors – David H. Johnson, Dries Van Nieuwenhuyse and James R. Duncan, in cooperation with Jouke Prop and Rob G. Bijlsma

Technical editor – Jouke Prop

Dutch summaries – Arie L. Spaans, Dries Van Nieuwenhuyse, Jouke Prop, Rob G. Bijlsma, or authors

Graphs and layout – Dick Visser

Drawings – Jos Zwarts

Cover photos - Serge Sorbi
front – Snowy Owl
back – Snowy Owl, Great Grey Owl and young Tengmalm's Owl

Production – Hein Bloem, Johan de Jong and Arnold van den Burg

Printed by Van Denderen, Groningen, The Netherlands, December 2009