Submission by
the Royal Society for the Protection of Birds

to

Third Technical Meeting on the
Draft Delivery Plan for the Thames Basin Heaths
Special Protection Area

12 January 2007

Contents

Comments by Professor Rhys Green (Department of Zoology, University of Cambridge) on:

TBH23/10

Liley, D., Clarke, R.T., Mallord, J.W., & Bullock, J.M. (2006) *The effect of urban development and recreational access on the distribution and abundance of nightjars on the Thames Basin and Dorset heaths.* Footprint Ecology.

Version dated: 6 December 2006

Rhys E. Green
Professor of Conservation Science
Department of Zoology
University of Cambridge
Downing Street
Cambridge
CB2 3EJ

12 January 2007

1. Introduction

1.1 These comments refer to a report "The effect of urban development and recreational access on the distribution and abundance of nightjars on the Thames Basin and Dorset heaths" by Liley et al (2006). For brevity, I will refer to it as "LCMB". I will also refer to "Thames Basin Heaths Special Protection Area (SPA) Study: Final Report" by Environmental Dimension Partnership, version dated 24 October 2006. [Volumes I, II, III.1, III.2]. I refer to this as "EDP". I also mention Liley, D. and Clarke, R.T. (2003), Biological Conservation, 114: 219-230 as "L&C".

1.2 The LCMB study has four main components: (a) a study of visitor pressure on heaths which is used to develop a predictive model of visitor pressure at the level of access points and, after aggregation, at the level of heathland patches and also at the within-patch level, (b) a study of differences in nightjar density among patches and between the Thames Basin Heaths (TBH) and Dorset Heaths (DH), (c) a study of differences between areas occupied and not occupied by nightjars within patches, and (d) an evaluation of the relationship between nightjar density and visitor pressure, as estimated using the visitor model from (a). These components are described and assessed separately below.

2. Assessment of the LCMB modelling of visitor numbers and distribution

2.1 The study of visitor pressure used data from surveys at TBH and DH heathland patches. Surveys involved interviewing people as they left a heath. The number of people arriving on foot per 16 hours was found to vary considerably among access points. The foot visitor rate was modelled by assuming that the proportion of people resident within various bands of distance from the access point who visited the point was constant for a given band. Hence, visitor numbers can be obtained by multiplying these proportions by the numbers of residents per band and then summing across bands. The results give a crude prediction of visitor numbers.

2.2 For car visitors, Poisson regression models were used to model visitor numbers as a function of explanatory variables. Numbers of car visitors were modelled as a function of the number of car parking spaces at the access point and the distribution of residents with respect to distance from the access point. The model of car visitor numbers was broadly similar for TBH and DH.

2.3 By combining the outputs of the foot visitor and car visitor models it is possible to estimate the total number of visitors to each access point and, by aggregation, to each heathland patch. This can be done for patches with no direct visitor survey data using information on numbers of residents in the catchment and numbers of parking spaces. The dispersal of visitors from an access point to each component part of a heathland patch was modelled using interview data on approximate routes followed by visitors. The empirical distribution of the distances from the access point to the mid-point of the reported route was obtained for all patches combined. Some simple assumptions were then used, in combination with this empirical distribution, to determine the probability that a visitor present at an access point would visit each of the component 50 m cells of the patch. Multiplying by the numbers of visitors and aggregating across access points gives the estimated number of visits per cell.

2.4 My assessment of this part of the study is that the methods used are crude and are likely to give only approximate estimates of visitor numbers to given heathland patches. The performance of the models in estimating visit rates to individual 50-m cells is likely to be even more crude because it does not take into account the likely effects of vegetation type and the distribution of paths and other features. It is possible that, if reliable information on paths could be obtained, visitor distribution within patches could be better described. However, the analyses reported are sound and result from a sensible and thorough exploration of possible modelling approaches. Given the limitations imposed by the data available, my conclusion is that the estimates of visitor pressure are likely to be sufficiently accurate for the purposes for which they are used.

3. Assessment of the LCMB analysis of variation among patches in nightjar abundance in relation to visitor pressure

3.1 LCMB calculated densities of nightjar territories on each patch of heathland using 2004 nightjar survey data. They did this using as the denominator either the total area of the patch or the area of the part of it that was composed of heathland vegetation. They then calculated correlations between nightjar density and the density of houses in bands of distance around the patch, out to 5 km from it. They found that nightjar density was significantly negatively related to housing density for all of the progressively wider distance bands they examined. There was no clear tendency for a particular choice of distance band to give a higher correlation, so the results are clearly not sensitive to the choice of this distance. Neither did it make much difference whether total area or heathland area was used as the denominator. The strength of the negative correlation was similar for TBH and DH. The correlation was slightly stronger for TBH than DH when a narrow distance band (ca. <1 km) was used, and vice versa when a wider band was used.

3.2 The calculation of nightjar densities and correlation analysis using them has a defect, which is recognized by LCMB. This is that small patches and large patches have the same weight in the analysis, even though the density value calculated for a large patch is more reliable than the same density for a small patch, because of the greater effect of stochastic variation for small patches. The solution to this problem is that previously proposed by L&C. This is to perform Poisson regression of nightjar count with a log link. The log of the area of the patch is included in the analysis as an explanatory variable, as are other explanatory variables, such as house density. For the Dorset data the negative effect of house density was significant for all house density distance bands (out to 5 km) regardless of whether total patch area or the area of heathland vegetation within the patch was used to represent patch area. For TBH the negative effect of house density was significant for all choices of distance band except 1 km when total patch area was used, but when heathland area was used, the relationship was only significant when a distance band of 200 m was used. However, it should be noted that the magnitude (rather than significance) of the negative effect of house density was actually larger for TBH than for DH. The lower significance level for TBH probably arises because of the smaller sample of patches for TBH (23 patches cf. 58 for DH).

3.3 My assessment of this part of the study is that it is sound and thorough. The results indicate a similar relationship between nightjar density and house density to that found in a previous study of DH (L&C). LCMB also found the same effect with an expanded sample of patches in DH, and similar trends in the TBH patches. The Poisson regression results are to be preferred over the correlation analyses for reasons given above. These indicate that the negative effect of house density is not statistically significant for all distance bands or habitat denominator choices for TBH, whereas statistical significance is high and not sensitive to these choices for DH. However, the relationship between nightjar density and house density appears to be similar for TBH and DH. If anything, the effect of house density is larger (regression coefficients more negative) in TBH than DH. A useful addition to the analysis would be to do a formal test of whether the slope of the house density effect differs between TBH and DH. However, I am confident, based upon the standard errors, that such a test will indicate that the negative effect of house density on nightjar density is not significantly different between TBH and DH.

4. Assessment of the LCMB analysis of variation within patches in nightjar abundance in relation to visitor pressure

4.1 LCMB examine effects of visitors on the distribution of nightjars within patches by comparing modelled values of visitor pressure within nightjar territories to those outside them in the same patch. They find that there was significantly less visitor pressure inside nightjar territories than outside. LCMB take possible confounding effects of habitat into account by repeating this analysis separately for each of several broad habitat types. The same pattern emerges; within a given habitat, visitor pressure is lower inside nightjar territories than outside. This indicates that nightjars select areas within a patch with lower than average visitor pressure.

4.2 LCMB take this approach further by calculating the ratio of visitor pressure inside nightjar territories to that outside for each patch. If the ratio of these two quantities is less than one, this indicates that nightjars select areas with low visitor pressure. This ratio is significantly less than one both in DH and TBH. LCMB examine the possibility that this effect is spurious and due to a confounding effect of distance from the edge of the patch, which might affect nightjar density through some unknown mechanism unrelated to visitor disturbance. Visitor pressure is higher and nightjar density lower near to the edges of patches than in the centre. LCMB use various approaches to test whether a visitor pressure effect over and above the effect of edge-centre can be detected. These are very stringent tests of the hypothesis that visitor pressure affects nightjar density. There are indications of a significant additional effect in TBH but not for DH.

4.3 This part of the report is well-conducted and sound. It provides a clear indication that nightjars are more likely to occur in parts of a heathland patch where few visitors occur. It does not exclude the possibility that nightjars prefer areas with few visitors because they tend to lie in the centres of heathland patches which are selected by nightjars for some unknown reason unrelated to disturbance by visitors. However, all studies dependent upon correlation share this defect of being vulnerable to unknown or unmeasured effects. As such studies go, this is a robust one.

5. Assessment of the LCMB analysis of overall nightjar density in relation to visitor pressure

5.1 LCMB also present an analysis of nightjar density in relation to modelled visitor pressure. They do this by using their visitor model to estimate visitor pressure for each 50m cell; then they bin cells into categories of visitor pressure and count the number of nightjar territory centres in the cells within each bin. Finally, they divide the nightjar count by the area of land (all land or just heathland) within each bin. The results indicate a statistically significant negative relationship between nightjar density and visitor pressure in both DH and TBH. The relationships are similar for the two areas, but clearer for TBH. The negative effect of visitor pressure on nightjar density appears to accelerate (i.e. become increasingly steep) as the level of visitor pressure increases.

6. Comparison with the EDP study

6.1 In my opinion, the LCMB study is likely to be a more reliable guide to the possible impacts of housing development on nightjars than the EDP study. The principal reasons for this are as follows.

(a) LCMB analyse nightjar density and house density data from both TBH and DH, whereas EDP use data only from TBH.
(b) LCMB use Poisson regression models for the nightjar density analyses, whereas EDP used unweighted ordinary least squares models.
(c) LCMB carry out comparisons of visitor pressure inside and outside nightjar territories within habitat types, whereas EDP carried out a univariate analysis of effects of paths on nightjar distribution which did not take habitat effects into account.