

APPENDIX 3B.3

BIRD MODELLING: PRESENCE-ABSENCE MODELS OF SCARCER SPECIES

Graeme M. Buchanan, James W. Pearce-Higgins & Murray C. Grant
RSPB, Dunedin House, 25 Ravelston Terrace, Edinburgh EH4 3TP.

INTRODUCTION

Modelling of the relationships between bird abundance and moorland vegetation characteristics was undertaken for nine bird species that were recorded on more than 20 % of 154, 2km² plots in BD1228 (Appendix 3B.1). Bird abundance models also involved assessing the generality of relationships across the four study regions (North Pennines, South Pennines, South Scotland, Wales). In addition to these species, six species were recorded on 15 - 20 % of plots. These were dunlin (*Calidris alpina*), hen harrier (*Circus cyaneus*), lapwing (*Vanellus vanellus*), merlin (*Falco columbarius*), ring ouzel (*Turdus torquatus*) and short eared owl (*Asio flammeus*). The scarcity of these species meant that it was not possible to examine their habitat associations in the same detail as the species in Appendix 3B.1. However, the presence or absence of these species was examined in relation to vegetation characteristics. No tests of the generality of the described habitat associations across regions were performed, due to the smaller sample sizes.

Of the six species considered, two (hen harrier and ring ouzel) are considered to be of high conservation concern, while the remainder are of moderate conservation concern (Gregory et al 2002). Therefore, the habitat associations produced may still be of value in terms of informing conservation management, even though the information produced is less detailed than for the abundance models and the confidence that can be placed in some of them may be substantially less.

METHODS

For details of site selection, bird survey methods, vegetation surveys and non vegetation variables, see Appendix 3B.1.

Statistical analysis

The description of the bird: habitat associations of species that occurred on 15 – 20 % of surveyed plots focussed on their occurrence, rather than

abundance, because the small number of data points made modelling of abundance impractical. The methods are similar to those used in Appendix 3B.1, apart from the analysis using the presence or absence of a species in any of the bird survey visits to a plot as a binary dependent variable. Consequently, the analysis used a logit link and binomial error structure. As with the analysis of abundance (Appendix 3B.1), models were built in two stages. Initially, following the procedure followed for modelling abundance, models were built using the non-vegetation variables. Following Appendix 3B.1, the vegetation variables were then entered into these models and their significance tested. However, unlike the abundance models, the regional interactions were not examined. This was due to the small number of sample points, and the absences of some species from some regions. Consequently, the generality of the habitat associations across regions is unknown.

RESULTS

There was substantial variation between species and regions as to the percentage of plots on which they were recorded (Table 1). Hen harrier were not recorded on any plots in North Pennines and ring ouzels were not recorded in Wales. Dunlin, merlin and short eared owl were recorded in all regions, but on a small number of plots in each case.

After controlling for non-vegetation effects (see Appendix 3B.1), the occurrence of all species was correlated with at least one of the vegetation composition variables (Table 2). The chance of occupancy by hen harriers and short eared owls increased with the cover of heather, while lapwing were associated with the frequency of *Deschampsia flexuosa* on plots. The chance of occupancy of a plot increased with *Juncus squarrosus* cover for dunlin, hen harrier and lapwing, although the hen harrier quadratic relationship indicated that occupancy decreased if cover becomes too extensive. Structure was correlated with the distribution of all species except ring ouzel (Table 3). Three species appeared to benefit from taller, denser vegetation. Hen harrier occupancy increased with the extent of medium dwarf shrub cover and dense vegetation while the chance of a plot being occupied by merlin decreased with

the extent of short or open vegetation and increased with more extensive tall dwarf shrub. The chance of occupancy by short eared owls decreased with short vegetation, but was greater on plots with more extensive dense vegetation. Two species appeared to benefit from shorter, more open vegetation, with dunlin and lapwing occupancy increasing with the extent of short or open vegetation.

Table 1 Number of plots occupied for each region and the overall percentage of plots occupied for the seven species recorded on between 10 % and 20 % of plots

The number in parenthesis after each region indicates the number of surveyed plots.

	dunlin	hen harrier	lapwing	merlin	ring ouzel	short eared owl
North Pennines (25)	6	0	9	9	7	8
South Pennines (37)	13	3	6	8	9	5
South Scotland (71)	3	12	15	4	8	12
Wales (21)	1	9	0	3	0	1
% occupied	15	16	19	16	16	17

Table 2 Shape of significant relationships (see methods) between bird occurrence and vegetation composition, after controlling for non-vegetation effects

Significance of relationships is denoted by number of symbols: P<0.05 - 1 symbol, P<0.01 - 2 symbols.

	dunlin	hen harrier	lapwing	merlin	ring ouzel	short eared owl
Bare soil	-					
<i>C. vulgaris</i>		+				++
<i>D. flexuosa</i>			+			
<i>E. angustifolium</i>				-		
<i>E. nigrum</i>)				
<i>Erica spp.</i>			-			∩
<i>E. vaginatum</i>					-	
<i>G. saxatile</i>			+		+	
Tall rushes				--		
<i>J. squarrosus</i>	((∩∩	+	-		
<i>M. caerulea</i>						-
moss spp			+	-		
<i>N. stricta</i>)		
<i>S. cespitosus</i>		-				
<i>Carex spp</i>				-	∩	
<i>Sphagnum spp</i>						+
<i>Vaccinium myrtillus</i>						-

Table 3 Shape of significant relationships (see methods) between bird occurrence and vegetation height and structure, after controlling for non vegetation effects

^e denotes measurements made on the first visit (late April – early May) as opposed to late season vegetation survey (see methods). Significance of relationships is denoted by number of symbols: P<0.05 - 1 symbol, P<0.01 - 2 symbols, P<0.001 - 3 symbols.

	dunlin	hen harrier	lapwing	merlin	short eared owl
density		+	--) ^e
height mosaic				()	
medium dwarf shrub		+++ ^e			
medium vegetation		++ ^e			
openness	+++ ^e			--	
short grass				((--- ^e
short vegetation))) ^e
tall dwarf shrub				+	
tall grass			-		