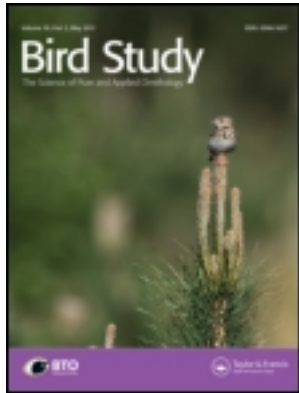


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SHORT REPORT

## Tree-stand age preferences of breeding Lesser Whitethroats *Sylvia curruca* in a forest in Central Poland

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**Capsule** Lesser Whitethroats *Sylvia curruca* nested within a large forest complex in central Poland. They showed a strong preference for stands of pine *Pinus* spp. aged 9–15 years, in which they nested at a high density (31 pairs/km<sup>2</sup>). The presence of these stands of young conifers was the result of particular forest management practices and certain low-fertility soil types. It is concluded that Lesser Whitethroats do not avoid the interior of forests *per se*, but simply do not usually find suitably large patches of preferred habitats within them.

Lesser Whitethroats *Sylvia curruca* are regarded as a typical edge habitat species (Mason 1976, Cody 1978, Kurlavicius 1995, Imbeau *et al.* 2003), which inhabit early-successional stages (Imbeau *et al.* 2003, Winkler 2005). In the Western Palearctic Lesser Whitethroats breed in diverse shrubby habitats within the gradient between forest and open sites (Cramp & Brooks 1992). In England and Wales the species is characteristic of hedges (Mason 1976, Fuller *et al.* 2001), in central Europe they breed in urban habitats (Koleček *et al.* 2010, Larsen *et al.* 2011), frequently nesting in low pines *Pinus* spp. and spruces *Picea* spp. (Bairlein *et al.* 1980, Bocheński 1985, Payevsky 1999). In eastern Europe Lesser Whitethroats prefer young plantations of these trees and undergrowth at forest edges (Levin & Gubin 1985). The species has also been described as a bird that avoids the interior of large forests (Gotzman & Jabłoński 1972, Mason 1976, Jędraszko-Dąbrowska 1979, Poulsen 2000, Magura *et al.* 2008, Larsen *et al.* 2011). The present study investigated the stand age preferences and the breeding pair density of Lesser Whitethroats inside a large coniferous forest.

The research was conducted in 2009 in an area of 791.3 ha situated inside the Bydgoszcz Forest complex (45 000 ha) in central Poland. The borders of the study area were at least 300 m away from the edges of the forest complex. This area was a mosaic of 184

stands of Scots Pine *Pinus sylvestris* with a small number of Silver Birch *Betula pendula* (5% on average). The age-classes of the trees were: 0–8 years, 4.1%; 9–15 years, 5.3%; 16–30 years, 9.1%; 31–60 years, 29.9%; 61–90 years, 20.3%; 91–120 years, 15.5%; over 120 years, 12.1%. Dirt roads and forest section lines occupied 3.6% of the study area.

Bird counts ( $n = 49$ ) recorded singing males whose position was mapped using a global positioning system device. Counts were made between the beginning of April and mid-June and started at sunrise and lasted for four to five hours. Every tree-stand was visited five times at two-week intervals. A breeding site/breeding pair was defined as the place where singing birds were recorded. Thirteen sites were recorded, eight sites were only single records of the singing males and at five sites records of a singing male, located closely to one another, were registered on more than one occasion. In these cases the maximum distance between the sites of singing did not exceed 10 m. As in the mapping method of Bibby *et al.* (2000), records of simultaneously singing birds were mapped, to differentiate more precisely between individual breeding sites. The migration period in which new birds were still settling was assumed to be the ten-day period starting from the date of the first observation of Lesser Whitethroats in the area.

Stand age preferences of Lesser Whitethroats breeding sites were determined by means of the Jacobs preference

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index,  $D$  (Jacobs 1974) (Equation 1).

$$D = (r - p)/(r + p - 2rp) \quad (1)$$

Where  $r$  is the proportion of a particular habitat's component on the territory and  $p$  is the proportion of the same habitat's component in the whole study area. The  $D$  index ranges from +1 (complete preference) to -1 (complete avoidance), and value of 0 indicates that the particular habitat's component was used in proportion to its availability in the study area. Breeding territory was defined as the area of a circle with a 25-m radius from the site of a single singing male or from the centre between two sites of a singing male, classified as one breeding site. The relevance of differences between the age of tree-stand areas inhabited and avoided by Lesser Whitethroats was determined by means of the Mann-Whitney non-parametric test.

In total, 13 breeding pairs of Lesser Whitethroat were recorded and the density across the whole study area was 1.6 pairs/km<sup>2</sup>. All breeding sites were recorded in tree-stands belonging to a narrow age-class of 9–15 years old. Their total area (42.14 ha) accounted for 5.3% of the whole study area. The mean density of Lesser Whitethroats in this area was 3.1 pairs/10 ha (31 pairs/km<sup>2</sup>).

**Table 1.** The number of breeding pairs of Lesser Whitethroats in even-aged pine stands. Stand age and size, the frequency of breeding pairs, and the Jacobs  $D$  preference index in each age-class are shown.

Tree-stand					
Age (years)	Area (ha)	No. pairs	Frequency (%)	Jacobs $D$ index	$r^a$
9	1.72	0	66	+0.93	0.23
	3.38	2			
	3.46	1			
	1.00	1			
	1.43	1			
10	2.35	1	75	+0.94	0.23
	2.84	0			
	3.58	3			
11	4.58	1	100	+0.95	0.31
12	3.11	0	0	–	–
13	3.63	1	100	+0.89	0.08
	0.37	0			
	1.93	0			
14	3.18	1	33	+0.85	0.08
	1.20	0			
	1.25	0			
15	3.13	1	33	+0.83	0.08

<sup>a</sup> $r$  (in the formula of  $D$  index) represents an average share of a particular age-class of the tree-stand in the Lesser Whitethroat territories.

Of 17 tree-stands in this age-class, Lesser Whitethroats were observed in 10 of them (58.8%); the frequency in individual age-classes was diverse (Table 1). Values of the Jacobs preference index  $D$  were very high and exceeded +0.83 for six age-classes, with the exception of a 12-year-old tree-stand in which Lesser Whitethroats were not observed (Table 1). The mean area of tree-stands at the age of 9–15 years occupied by at least one pair was 2.97 ha ( $n = 10$ ) and without the species it was 1.77 ha ( $n = 7$ ). Lesser Whitethroat inhabited larger areas of these tree-stands significantly more frequently (Mann-Whitney  $z = -2.24$ ;  $n = 17$ ;  $P = 0.02$ ).

The density of breeding pairs of Lesser Whitethroat recorded inside the Bydgoszcz Forest was relatively high in comparison to the densities in agricultural areas and river valleys in Poland. In large landscape areas containing those habitats Lesser Whitethroat density ranged from 0.4–1.6 pairs/km<sup>2</sup>. Within patches of those habitats densities ranged from 0.2 to 3.3 pairs/10 ha (Tomiałojć & Stawarczyk 2003, Kuźniak 2007). The relatively higher densities of Lesser Whitethroats in the forest study area seem to contradict the statement that this species avoids the interior of large forests.

Despite their relatively high density, Lesser Whitethroats were recorded in a very narrow spectrum of habitats within the forest, apparently selecting only larger areas of tree-stands within the 9–15 year age range. In this age-class Scots Pine in the study area reached heights of 2–5 m, with a high proportion of trees touching each other. The strong preference of Lesser Whitethroats for the habitat structure provided by these young stands may stem from opportunities for hiding nest-sites. In Europe, this species most often builds nests among lateral, dense branches at a mean height of 1 m above the ground (Mason 1976, Bairlein *et al.* 1980, Bocheński 1985, Payevsky 1999, Matantseva & Simonov 2008). Tree-stands that are too young do not reach an appropriate height or density of growth. In the case of older tree-stands, as a result of lower branches dying off, the larger distances between whorls and the gradual cutting out of single trees, their canopies are becoming too well-spaced and lateral branches within 1 m of the ground are sparsely distributed.

The nesting of Lesser Whitethroats in this study area indicates that this species does not avoid the interior of compact forests *per se*, but that such interiors usually lack suitably large patches of habitat that meet these birds' nesting requirements. The availability of favourable habitats for Lesser Whitethroat in the Bydgoszcz

Forest results from forest management, which from the mid-19th century was conducted with clear-cuts, subsequently planted mainly with Scots Pines. This management produces large areas of even-aged forestry monocultures. Gradual replacement of the practice of clear-cutting with partial clear-cuts in boreal forests (Söderström 2009) reduces the occurrence of large areas of coniferous young stands that are preferred by Lesser Whitethroats. This is because of the requirement to leave the areas where old trees cannot be extracted, using partial clear-cuts. The lack of sufficiently large young stands in other forest areas is also because of the introduction of the modern system of Forest Stewardship Council certification. According to this system, in countries such as Germany and the Czech Republic, the allowed limit of a logging area is only 0.25 ha (Stachura-Skierczyńska & Bobiec 2008), which is considerably lower than the area of clear-cuts preferred by Lesser Whitethroat in the study area considered here.

Apart from the forest management, the factor conducive to a high number of Lesser Whitethroat in the Bydgoszcz Forest was the local soil type. This area is situated on inland sand dunes, on which infertile podzols have formed. Their low fertility contributes to low annual growth rates of tree. Therefore, height and density of the young tree-stands preferred by Lesser Whitethroats remain within a wider range of tree-stand age-classes on these soils.

The occurrence of Lesser Whitethroats inside a large forest, as reported here, indicates that the widely applied classification of birds into edge species, interior species and interior-edge generalist species is not very precise. A critical analysis of this classification made by Imbeau *et al.* (2003) indicated that 'real edge species' are rare and most of them are connected with early-successional habitats usually present at the exposed edges of the forest. However, in forests with intensive management, early-successional habitat patches might also occur in large numbers in their interior, and these create favourable conditions for the reproduction of birds generally classified as forest edge species. It seems that the classification of Lesser Whitethroats as a typical edge species that avoids the interior of forests might only be relevant to less-modified forest habitats. This conclusion also corresponds with the research results in the Białowieza Forest, where in the primeval part Lesser Whitethroats are confined to forest edges, but inside the managed part they colonize young plantations (Tomiałojć & Wesołowski 2004).

The strongly simplified structure of pine stands connected with infertile soils and the type of forest

management used makes the Bydgoszcz Forest a model area for studies of the influence of age and size of even-aged tree-stands on avifauna. These two variables appear to determine the distribution and number of Lesser Whitethroats, and probably also other bird species in this area. Clearly, management of these forests could aim at creating the spatial structure of tree-stands of a particular age and size and thus achieve relatively precise regulation of distribution and numbers of Lesser Whitethroats within a forest.

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