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Cavity breeding birds and clearcuts

Allan Carlson

Carlson, A., Department of Wildlife Ecology, The Swedish University of Agricultural Sciences, Uppsala

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Introduction

Concern of the effects that modern silvicultural practise have on birds has never been greater. Bird species depending on old successional stages have declined in numbers, while species preferring young forests have shown a corresponding increase (Järvinen et al. 1977, Järvinen & Väisänen 1977, Väisänen et al. 1986, Virkkala 1987, 1989). Changes in distribution and in population sizes are often explained by modern managed forests having been depleted of essential quality attributes. Such quality aspects for forest birds have been identified as density of dead stems (Haapanen 1965, Haila et al. 1977, Niemi & Hankowski 1984), density of deciduous trees (Angelstam 1990), and availability of breeding and roosting cavities (Sandström 1992).

The aim of this study was to evaluate the value of leaving cavity trees for hole nesting birds on clearcuts.

Methods

This study was carried out during 1989 and 1990 in the province of Uppland, Sweden (at approx. 60°N 17°E). The landscape at the study site was dominated by vast forests. Four clearcuts varying in size between 3–6 ha and similar sized parts of adjoining forests were used in the study. The clearcuts were estimated to be 1–2 years old. Each year, between late April to early June, two clearcuts and two forest plots were thoroughly censused 7–10 times for hole-nesting birds. All stems on clearcuts were searched for natural cavities, position of the tree (noted on a map 1:10000), type of cavity (woodpecker excavated or limb hole, for definitions see Sandström 1992), whether occupied by birds, or not, and species were recorded on the field protocol. The location of cavity trees in relation to the transition edge between the clearcut and the forest was estimated from the maps. A similar procedure was adopted for cavity trees found in the forest plots.

Results

The dominating deciduous tree in the area was aspen (*Populus tremula*). Consequently all cavities in this study were found in aspen stems. There were 116 cavity trees in the forest plots and 69 on the clearcuts. The proportion of cavities excavated by woodpeckers and those of limb hole was equal in forest (53% and 47%) and in clearcuts (55% and 45%, respectively). Within the distance of 0–100 m there were no differences between forest and clearcut in the distribution of cavities (Kolmogornov Smirnov Two Sample test; DN = 0.5, P = 0.70). Furthermore, cavities were evenly distributed on the four distance classes

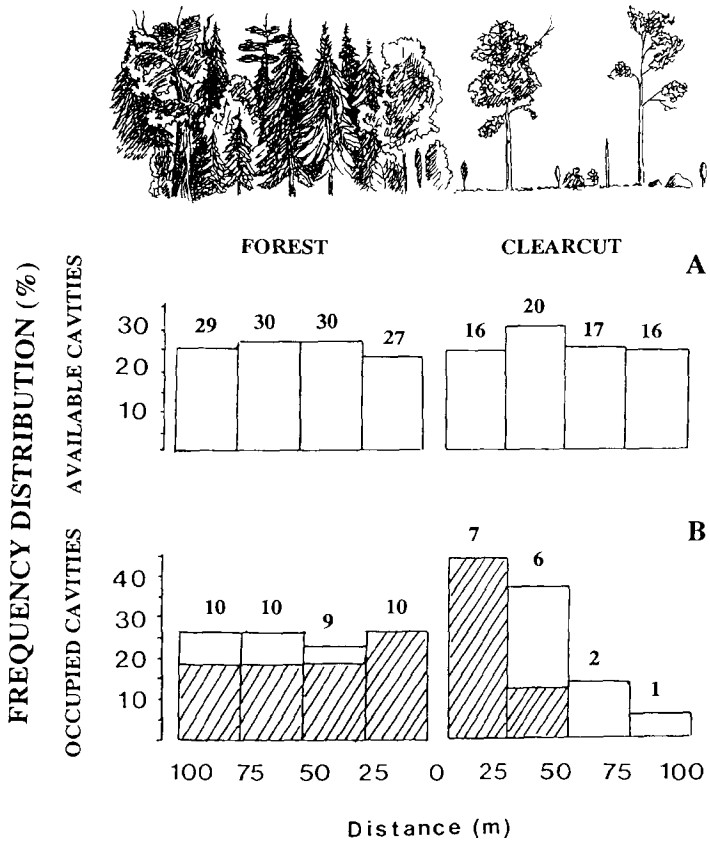

Fig. 1. Frequency distribution (%) of available cavities (A) at different distance intervals from the edge in forest and on clearcut. The lower histogram (B) shows the occupancy frequencies of available cavities at the different distances. Hatched area denotes the proportion at each distance interval made up by the three most abundant foliage gleaners (Great Tit, Blue Tit and Pied Flycatcher). Sample size is given above each bar.

both in the forest ($\chi^2 = 0.8$, NS) and on the clearcut ($\chi^2 = 0.6$, NS) (Fig. 1).

During the two years, 10 bird species were recorded breeding in the cavities (Table 1). It should be noted that Crested Tit, Willow Tit and Coal Tit were confined to the forest. On the other hand, Starling, Green Woodpecker and Black Woodpecker were found nesting only in cavities on clearcuts. In the two habitats there were no significant differences in the proportion of available cavities occupied ($Z = 1.28$, $P > 0.10$). In the forest, nests in cavities were more or less evenly distributed ($r_s = -0.2$, $P = 0.7$) (Fig. 1b). The picture differs for the clearcut data set, where there is a marked drop in nests in cavities with increasing distance from the edge ($r_s = -0.98$, $P < 0.001$) (Fig. 1b).

Discussion

The most salient result that emerged from this study was a pronounced decline in the number of cavity nesting birds on clearcuts with increasing distance from the forest edge. This pattern cannot be explained by the distribution of cavities, since these were evenly distributed in the dis-

Table 1. Distribution of nests for cavity breeding birds in forest and on clearcut, respectively.

	Forest	Clearcut
Black Woodpecker *Dryocopus martius*	0	1
Green Woodpecker *Picus viridis*	0	1
Great spotted Woodpecker *Dendrocopos major*	1	1
Starling *Sturnus vulgaris*	0	4
Pied Flycatcher *Ficedula hypoleuca*	12	4
Great Tit *Parus major*	14	2
Willow Tit *Parus montanus*	3	0
Crested Tit *Parus cristatus*	2	0
Coal Tit *Parus ater*	2	0
Blue Tit *Parus caeruleus*	5	3
Total number of species	39	16
Proportion of available cavities occupied	0.34	0.23

tance interval studied both in the forest and on the clearcuts. The decline is even more accentuated when looking at the distribution of passerines (excluding the starling). The three most common cavity nesters recorded in this study; the Great Tit, the Blue Tit and the Pied Flycatcher, showed a pronounced aversion to nesting in cavities away from the forest.

The five tit species and the flycatcher depend on the forest for their foraging (Simms 1971). Breeding too far out on a clearcut in an isolated cavity tree only increases the demands on the parent birds since they have to commute to the forest on each foraging bout. Furthermore, during this commuting birds nesting on the clearcut are more exposed to potential predator attacks. Of course, both these costs increase with distance from the forest edge, which reduces the value of cavities with the degree of isolation from the forest. The aversion of foliage gleaners to breed out on clearcuts is probably only important during the first years when clearcuts actually are grasslands and only offer a few more or less isolated cavity trees.

In this study with limited sample sizes, the Starling and the three woodpecker species, except one pair of Great Spotted Woodpecker, were all found breeding in stems on clearcuts. All these four species have a foraging behaviour that differs from the tits and the flycatcher. The woodpeckers regularly made their foraging trips to the clearcut where they were observed feeding on dead wood debris on the ground, a behaviour that has been confirmed by telemetry studies of the Great Spotted Woodpecker and in the Black Woodpecker (pers obs, G. Mikusinski pers comm.). The Starling, on the other hand, was found breeding in cavities on the clear-cut but flew to nearby farmland, where they foraged. Starlings probably nested in cavities on the clearcuts because of a shortage of cavities of the right size closer to their foraging grounds. Thus, there is a clear difference between, on one hand the small passerines which are foliage gleaners, and the woodpeckers and Starling on the other hand, who have a different foraging behaviour. This discrepancy reflects nest distribution on clearcuts of these two groups.

This study has demonstrated that cavity-breeding foliage gleaning passerines are sensitive to whether cavity trees are isolated from the forest. This does not preclude the value of cavity trees left on clearcuts. Deciduous trees (most cavities are found in deciduous trees) on clearcuts may be of great importance for insects, they may serve as hunting perches for owls and diurnal birds of prey, etc.

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