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Habitat selection and nest sites of the Magpie *Pica pica* in the city of Turku, SW Finland

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Introduction

Since the Second World War, urban populations of the Magpie *Pica pica* in Europe have increased (Klausnitzer 1988, Birkhead 1989, 1991). This has also happened in Finland (cf. Palmgren 1935, Tenovuo 1967, Tiainen 1987). In central Helsinki, the first Magpie nest was found in 1956 (Kajoste 1961), and in the late sixties the breeding population there was still only 1–2 pairs (Tenovuo 1967). In 1986, seven Magpie nests were found in the same area (Tiainen 1987). Nowadays the species is common in many cities in southern Finland (Tiainen 1987).

In this study, we compared the abundance of Magpies between three urban habitat types, and collected data on nest sites in these and other urban environments. The study was carried out in the city of Turku, SW coast of Finland. The city was founded in the 12th century, and the population is currently about 159 000. The Magpie population of Turku has clearly increased since the 1950s and 1960s, when the species did not breed regularly in central Turku (Tenovuo 1967). Interestingly, two isolated nesting observations were made in the 1950s, one at St. Michael's Church close to the city centre in 1952, and the other in a city park later in the decade (J. Nummelin, pers. obs.). In the 1960s the number of winter observations at the more sparsely built city margins increased, and in 1968 four nests were found in areas of small private houses in eastern Turku (R. Tenovuo, pers. obs.).

In 1982 a nest was found at the margin of the grid-plan city centre of Turku (R. Tenovuo, pers. obs.), and by 1988 the Magpie was clearly established in some urban habitats. In that year, the Environmental Protection Office of the city of Turku received about 90 answers to their newspaper appeal for information on nesting Magpies (J. Nummelin, unpublished). Seven to nine nest locations were reported from the city centre (the same area as in Table 1). In line transect censuses made in 1988 by T. Vuorisalo, J. Tiainen,

V. Multala and T. Pyyhtiä Magpies were found in areas of small private houses, industrial areas, and apartment block suburbs of Turku. The estimated breeding density of Magpies was significantly higher in areas of small houses (14.6 pairs per km^2) than in residential suburbs of apartment blocks (4.6 pairs per km^2). In industrial areas the estimated density was intermediate (7.6 pairs per km^2).

Material and methods

Magpie nests were censused in three types of urban habitats: the city centre, areas of small private houses, and apartment block suburbs. Each of the eight study areas represented only one of these habitat types. The areas included are described in Table 1. The city centre was the most urbanized habitat, with a great number of high buildings, and very little vegetation outside the city parks. In the small-house areas each private house was typically surrounded by a small garden with some trees and bushes. The apartment block suburbs formed urbanized 'islands' outside the city, and were surrounded by more or less natural coniferous forest, or agricultural land.

We tried to find every Magpie nest in the study areas, both old nests and those currently in use. Each study area was visited and carefully searched at least three times in April-May 1991 before the expansion of tree leaves, after which the nests became extremely difficult to find. We also identified the host tree species, and measured the height from the ground to the nest bottom (hereafter called 'nest height'). The height measurements were done with a hypsometer (Suunto PM-5/1520 P). If Magpies were seen at the nest, or if we were told by local residents that the nest was regularly visited by Magpies, the nest was regarded as currently occupied. In five cases we could not find the nest, although it was clear from the behaviour of the birds that a nest was located within the area. These cases are included in the estimates of breeding density for the respective areas (Table 2).

To obtain more data on nest locations, we also visited 18 additional Magpie nests outside the study areas, but inside Turku. Since these additional data were not collected systematically,

Table 1. Description of study areas. For details, see Andersson (1983).

Study area	Area type	Built	Size
City centre	grid-plan area	1828-recent	480 ha
Raunistula	small private houses (old industrial neighbourhood)	early 1900s	20 ha
Nummenmäki	small private houses (old industrial neighbourhood)	1900–1930	115 ha
Vasaramäki	small private houses	1910–1920s	55 ha
Puistomäki	small private houses	after 1945	32 ha
Varissuo	residential suburb, apartment blocks	1978–1984	70 ha
Uittamo	residential suburb, apartment blocks	1964–1982	33 ha
Runosmäki	residential suburb, apartment blocks	1970–1978	53 ha

the data were used only to study the nest building sites, in particular the tree species.

Results and discussion

The highest breeding densities of Magpies were observed in the areas of small private houses (Table 2), where the average estimated breeding density was 1.4 breeding pairs/10 ha (SD = 0.78, n = 4). This is the same density as was observed in the above mentioned line transect censuses of Vuorisalo et al. for that habitat type. This is fourteen times as high as the estimated breeding density in the city centre (Table 2). All the nests in the city centre were in marginal areas; none were found in the central business district or in the city parks. It is unclear whether the breeding distribution observed in the city centre is stable, or whether it represents an initial stage of colonization of that area. The number of known nest locations (n = 7, Table 2) within the city centre was approximately the same as the number (n = 7–9) reported to the Environmental Protection Office in 1988. Although in that year the nests were not systematically searched for, it seems that the number of nests in the city centre did not change much between 1988 and 1991.

Only one occupied Magpie territory was found in all the three apartment block suburbs combined. This gave an average density of 0.05 pairs/10 ha (SD = 0.08, n = 3) for that habitat type. This density is much lower than the 0.46 pairs/10 ha observed in the line transect censuses by Vuorisalo et al. It seems that among the three habitat types studied, areas of small private houses are preferred by Magpies, and that the birds only rarely breed in apartment block suburbs. As habitats, these are younger than areas of small private houses (Table 1).

The breeding densities observed in Turku fall within the range of densities observed in Helsinki and Central Europe. In central Berlin, breeding densities of 0.082–0.29 pairs/10 ha have been recorded (Klausnitzer 1988, p. 208). The density in central Helsinki was 0.07 pairs/10 ha (Tiainen 1987). These values are very close to the observed density in central Turku. In a more agricultural area in Sheffield, the breeding density was 0.81 pairs/10 ha (Birkhead 1989), which is slightly lower than the densities in the small-house areas in Turku.

In Central Europe the average area of Magpie territories is about 5 ha (Birkhead 1989). If this is also the case in urban habitats in southern Finland, the densities observed in areas of small private houses in Turku are close to saturation. One of the small-house areas, Raunistula, with 2.50 pairs/10 ha, even appears to be overpopulated. However, it is possible that parts of these territories extend outside the censused area, which would increase the average territory size. In Nummenmäki, one of the small-house areas, we also observed an aggregation of three occupied nests very close to each other (two within, and one just outside a small garden). This indicates either that nesting sites are limited, or that there may be differences in the territorial behaviour of Magpies between urban and rural areas.

Table 2. Numbers of magpie nests found in the study areas. Breeding density (pairs/10 hectares) is the sum of the number of occupied nests, and the estimated number of occupied nests not found.

Area	Occupied nests	Old nests	Estimated nro. of nests not found	Estimated breeding density	Mean h_{nest} (s. d.)	Number of tree species
City centre	5	2	0	0.10	6.3 (2.5)	5
Raunistula	5	1	0	2.50	10.0 (4.6)	4
Nummenmäki	8	1	1	0.78	5.8 (1.7)	6–7
Vasaramäki	5	2	2	1.27	5.0 (2.0)	3
Puistomäki	2	2	1	0.94	5.2 (2.9)	3
Varissuo	0	0	1	0.14	–	(1)
Uittamo	0	0	0	0.0	–	0
Runosmäki	0	0	0	0.0	–	0

Magpie nests were found in at least 17 species of trees or bushes, and in Virginia creeper *Parthenocissus* sp. growing on a house (Table 3). In any particular study area, nests were found in 3–7 host tree species (Table 2). These observations show that urban Magpies are very flexible in their choice of nest sites (cf. Birkhead 1991). Flexibility in the nest site choice of the Magpie has been documented by many authors, and it has undoubtedly contributed to the rapid spread of the species into urban habitats. In Birkhead's (1989) study area in England, "nests are built in a variety of locations, from the tops of 30-m beeches *Fagus sylvatica* to scrubby willows *Salix* or hawthorns just a metre or so high". In treeless urban areas of Sheffield, some nests were even found in railway watch-towers, on electricity pylons, and inside factories (Birkhead 1989). In Scandinavia, where urbanization of Magpies has started earlier than in Finland, nesting in buildings has been known for a long time (Brehm 1924).

Table 3. Tree species used for Magpie nests. N_1 is the number of tree individuals per tree species used as nest sites in the eight study areas, N_2 is the total number of tree individuals per species both within and outside the study areas. Nest heights were measured from the ground to the bottom of the nests. Standard deviations are indicated in parentheses. Mean h_{nest} in the eight study areas was 6.3 m (SD = 3.0, n = 32).

Tree species	N_1	N_2	Mean h_{nest}	
Abies sp.	1	0	6.5	
Picea abies	6	6	5.1	(1.9)
Pinus sylvestris	0	1	5.0	
Pinus cembra	2	2	5.5	(0.71)
Betula sp.	1	2	10.9	(3.0)
Ulmus glabra	1	2	9.4	(5.1)
Salix caprea	2	2	5.3	(1.1)
S. fragilis	0	1	4.0	
S. alba	1	1	9.5	
Salix sp.	0	1	5.5	
Populus rasumowskiana	1	1	6.8	
Tilia x vulgaris	0	1	7.5	
Prunus padus	2	7	5.5	(1.6)
P. cerasus	1	1	4.8	
Prunus sp.	1	1	6.5	
Malus domestica	1	2	4.6	(1.9)
Sorbus aucuparia	3	4	6.3	(0.4)
Crataegus sp.	4	9	2.7	(1.1)
Acer platanoides	6	6	10.1	(1.0)
Parthenocissus sp.	1	0	2.5	
Total	33	51	5.9	(2.8)

Earlier studies of nest sites of the Magpie in Finland have shown either a preference for coniferous trees (especially Norway spruce), or flexibility similar to that observed in Turku. In the Finnish nest-card material, the great majority of nests were in spruce or pine (89%, n = 398, von Haartman 1969). There are also a few known cases of nests in buildings (von Haartman 1969). Similarly, in an agricultural area in Suonenjoki in central Finland 92.5% of nests (n = 80) were found in coniferous trees (Paananen 1983). In contrast, in the vicinity of the city of Jyväskylä, all tree species occurring in the area were used as Magpie nest sites, and the birds preferred small deciduous trees, especially willows (Törmälä 1983). Without knowing the availability of different kinds of nest sites in these areas it is impossible to say whether nest sites in urban areas really are more variable than those used in agricultural areas.

The height of the nest varied significantly according to the tree species (Table 3). As expected, in hawthorns *Crataegus sp.* nests were built significantly lower in absolute terms (on average 2.7 m, n = 9) than in any of the other tree species we had enough data on, i. e. the Norway spruce *Picea abies*, European bird cherry *Prunus padus*, European mountain ash *Sorbus aucuparia*, and the Norway maple *Acer platanoides* (Anova; $F = 24.6$, $P < 0.001$, $df = 4$; Tukey's test used in pairwise comparisons). In the Norway maple, nests were located significantly higher (on average 10.1 m, n = 5) than in any of the other four species (Tukey's test). Nest heights did not differ significantly among the remaining tree species.

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Selostus: **Harakan habitaatinvalinta ja pesäpaikat Turussa**

Harakka on Suomessa selvästi kaupungistuva lintulaji. Turun kaupungin alueelta löydettiin ensimmäinen pesä jo 1952 (J. Nummelin), mutta vasta 1980-luvulla laji alkoi säännöllisesti pesiä kaupungin ruutukaava-alueella. Tutkimuksessa verrattiin harakanpesien tiheyttä kolmen eri kaupunkimaisen habitaatin välillä. Harakanpesät laskettiin huolellisesti keskusta-alueella, kolmella pientaloalueella ja kolmessa kerrostalolähiössä (Taulukko 1). Asuttuja pesiä oli tiheimmässä pientaloalueilla, keskimäärin 1,4 pesää/10 ha. Keskustassa tiheys oli 0,10 pesää/10 ha, ja kerrostalolähiöissä vain 0,05 pesää/10 ha (Taulukko 2). Havaitut tiheydet ovat samaa suuruusluokkaa kuin Helsingissä ja Keski-Euroopassa todetut.

Tutkituilla alueilla harakanpesien keskimääräinen korkeus maanpinnasta oli 6,3 m (SD = 3,0, n = 32). Pesiä löydettiin 17:ltä puu- tai pensaslajilta ja lisäksi yksi pesä omakotitalon seinässä kasvavasta villiviinistä (Taulukko 3). Pesän korkeus maasta vaihteli puulajeittain. Joustavuus pesäpaikan valinnassa on ilmeisesti edistänyt harakan leviämistä kaupunkeihin.

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