

Ewa GÓRSKA, Wojciech GÓRSKI

## Nest sites of the Magpie *Pica pica* in urban and rural habitats in the Koszalin Region, NW Poland

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**Abstract.** The height, chosen tree species and location of 1316 Magpie nests in 11 towns and 6 farmland plots were examined in 1992. t-tests revealed a difference significant at  $p < 0.001$  for the heights at which nests were located, with those in urban areas ( $\bar{x} = 13.2\text{m}$ ,  $SD = 3.7$ ,  $N = 513$ ) being higher than those in suburban areas ( $\bar{x} = 11.3$ ,  $SD = 4.1$ ,  $N = 232$ ), those in villages ( $\bar{x} = 9.6$ ,  $SD = 3.7$ ,  $N = 433$ ) and those on farmland (outside villages) ( $\bar{x} = 9.0$ ,  $SD = 3.7$ ,  $N = 138$ ). The heights of nests in villages and on farmland outside villages did not differ significantly.

The percentage distribution of chosen trees showed a predominance of similarities (using Renkonen's Index) for the biotopes compared: urban and suburban areas ( $Re = 73\%$ ), villages and farmland outside villages ( $Re = 77\%$ ). The percentage distribution of nest locations (single trees/shrubs, clumps of trees/shrubs, parks/cemeteries, gardens/orchards, avenues, rows of trees/hedgerows) also showed a predominance of similarities for urban areas, suburban areas, villages and farmland outside villages ( $Re$  values between 75% and 85%).

The data indicate substantial ecological plasticity in the selection of nest sites by Magpies and suggest that differences are due to local variations in nesting habitat rather than real differences between urban and rural populations.

**Key words:** Magpie *Pica pica*, nest sites, nest location, urban habitat, rural habitat

Department of Zoology, Pedagogical University, Arciszewskiego 22b, 76–200 Słupsk, POLAND

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### INTRODUCTION

There is already a relatively rich literature devoted to biotope- and microhabitat-related differences in the choice of nesting places by Magpies, including a review in works by Jerzak (1988, 1989). However, relatively few works address the subject in relation to the full range of urban and rural habitats occupied by Magpies in the same region. The work presented here reveals microhabitat differentiation, lists of tree and shrub species and heights for the locations of the nests of Magpies in the towns and agricultural landscapes of the Koszalin coastal region, NW Poland.

### STUDY AREA, MATERIALS AND METHODS

Material was collected in 1992 in towns and in study areas within the agricultural landscape of the Koszalin coastal region located along the central stretch of Poland's Baltic coastline. The 11 towns studied were Kołobrzeg, Darłowo, Ustka and Łeba (coastal), as well as Białogard, Karlino, Koszalin, Sianów, Sławno, Słupsk and Lębork (inland). These covered a total area of 263.36km<sup>2</sup>. The built-up areas and communication routes comprising the urban areas cover 62.61km<sup>2</sup>, while the remaining suburban areas within town boundaries cover 200.75km<sup>2</sup>. Within the agricultural landscape, material was collected from 6 study areas

("Mielno", "Boleszewo", "Cisowo", "Kobylnica" "Damnica" and "Potęgowo") covering a total of 559.70km<sup>2</sup>, of which villages accounted for 20.04km<sup>2</sup> and agricultural land outside villages some 539.66km<sup>2</sup>. More detailed information on the study areas may be found in Górski (1997).

Nests in towns were counted in the spring of 1992, and those in the countryside outside the breeding season, between November 1992 and February 1993. The towns and the agricultural landscape were each divided into two biotopes — the urban and suburban zones in the first case and the areas within and beyond villages in the second. The locations of particular nests in each of the biotopes were categorized in one of 6 habitats differing from the point of view of structure: rows of trees/hedgerows, clumps of trees/shrubs, avenues of trees, single trees/shrubs, gardens/orchards and parks/cemeteries. Also indicated was the species of tree or shrub in which the nest was located, as well as its height above the ground.

Considerations were confined to nests belonging to different pairs of Magpies (see Górski 1997).

Analysis involved a total of 1316 nest sites of Magpies, of which 745 were in towns (513 urban and 232 suburban) and 571 in the agricultural landscape (433 in villages and 138 beyond them).

## RESULTS

The urban zones of the towns had a clear (60%) prevalence of nests in rows of trees/hedgerows and clumps of trees/shrubs. Nests in these two microhabitats were also in the majority (over 62%) in the suburban zones, albeit with those in clumps of trees/shrubs prevalent (Tab. 1). Avenues of trees were of lesser significance as nest locations in both biotopes (although of greater importance in urban zones), as were gardens/orchards (which were of course more important in the suburban than urban zones), single trees/shrubs and parks/cemeteries. The last habitat of the suburban zone was only occupied to a limited extent (Tab. 1).

In villages the most important habitats containing nests were gardens/orchards, rows of trees/hedgerows and clumps of trees/shrubs, which together accounted for 72% of nests. Agricultural areas outside villages most often had nests in clumps of

trees/shrubs, in avenues of trees and in rows of trees/hedgerows (together 83% of nests). As in the suburban zone, nests located in parks/cemeteries were exceptional (Tab. 1).

Table 1. Microhabitat structure of Magpie nest sites in the towns (Re index = 80.4%) and in farmland (Re index = 75.3%) studied.

[Tabela 1. Struktura mikrosiedliskowa miejsc gniazdowania w badanych miastach i w krajobrazie rolniczym.]

Sites in towns	(% of nests	
	Urban areas	Suburban areas
Rows of trees/hedgerows	38.8	29.3
Clumps of trees/shrubs	20.3	32.8
Avenues	15.4	11.2
Gardens/orchards	9.7	16.8
Single trees/shrubs	9.4	9.0
Parks/cemeteries	6.4	0.9
TOTAL n	513	232

Sites in farmland	(% of nests	
	Villages	Outside villages
Gardens/orchards	25.9	8.0
Rows of trees/hedgerows	24.7	23.2
Clumps of trees/shrubs	21.5	33.3
Avenues	13.2	26.1
Single trees/shrubs	9.9	8.7
Parks/cemeteries	4.8	0.7
TOTAL n	433	138

There were great similarities in the microhabitat structure of the nest sites of Magpies in urban and suburban areas and in villages and agricultural areas outside them (Renkonen indices were of 80.4% and 73.5% respectively) — Tab. 1. The near-identical nature of habitat preferences was further illustrated by comparisons of the microhabitat structure of nesting places between urban areas and villages (Re = 82.1%), suburban areas and villages (Re = 84.1%), suburban areas and farmland outside villages (Re = 84.6%) and urban areas and farmland outside villages (Re = 76.3%). The similarity index for the percentage shares of the identified habitats occupied by Magpies in towns (urban + suburban areas) and the agricultural landscape (villages + areas beyond them) was also very high (Re = 80.4%). Urban areas had a predominance of nests in *Populus* and *Acer spp.*, as well as *Betula spp.*, fruit trees, *Salix spp.* and *Tilia spp.* (Tab. 2). All of the above except *Tilia spp.* were also among the most important trees for nesting in suburban areas, albeit with the importance of *Populus spp.* being less marked

than in the aforementioned biotope, while that of *Salix spp.*, fruit trees and also *Alnus spp.* was greater (Tab. 2).

In villages, a clear majority of nests were found in fruit trees and in *Acer spp.* Other more important species (supporting at least 5% of all nest found) were *Salix spp.*, *Populus spp.*, *Tilia spp.* and *Fagus sylvatica* (Tab. 2). Nests in *Acer spp.* were dominant in areas beyond villages, with the other species in which nests were built most often being the same as in villages, albeit with the addition of *Alnus spp.*, *Prunus spinosa*

suburban areas and villages (Re = 72.7%), suburban areas and farmland outside villages (Re = 74.1%), urban areas and farmland outside villages (Re = 70.9%).

Nests in towns were 1.5–20m above the ground, while those in the agricultural landscape were at heights of 2–20m. In urban areas nests were usually placed higher up than in suburban areas, but villages and agricultural areas outside them had similar percentage distributions for heights of nests (Fig. 1).

Table 2. Tree and shrub species used for Magpie nest sites in the towns (Re index = 72.8%) and in farmland (Re = 76.9%) studied — 1992.

[Tabela 2. Drzewa i krzewy, na których sroka umieszczala gniazda w miastach i w krajo-  
obrazie rolniczym (rok 1992).]

Tree and shrub species	% of nests			
	Urban areas	Suburban areas	Villages	Outside villages
<i>Populus sp.</i>	25.5	16.4	9.2	12.1
<i>Acer sp.</i>	22.6	18.5	20.9	24.3
<i>Betula sp.</i>	13.4	10.3	3.2	3.7
Fruit trees	9.9	17.2	27.2	12.1
<i>Salix sp.</i>	6.4	18.5	13.6	12.9
<i>Tilia sp.</i>	5.4	1.4	7.6	5.7
<i>Alnus sp.</i>	3.9	9.1	4.6	6.4
<i>Fagus sylvatica</i>	3.1	1.7	6.0	4.3
<i>Aesculus hippocastanum</i>	1.7	3.5	1.8	5.0
<i>Crataegus sp.</i>	1.4	1.4	0.5	4.3
<i>Quercus sp.</i>	1.4	0	0.8	0
<i>Ulmus sp.</i>	1.2	0	0	0
<i>Sorbus intermedia</i>	1.0	0	0	0
<i>Larix sp.</i>	0.8	0	0.9	0.7
<i>Sambucus nigra</i>	0.4	0.4	0	0.7
<i>Fraxinus excelsior</i>	0.4	0.4	0.8	0
<i>Picea sp.</i>	0.4	0.4	0.2	0
<i>Pseudoplatanus acerifolia</i>	0.2	0	0	0
<i>Robinia sp.</i>	0.2	0	0	0
<i>Carpinus betulus</i>	0	0.4	0.2	0
<i>Syringa sp.</i>	0	0.4	0.2	0
<i>Prunus spinosa</i>	0	0	0.8	5.7
<i>Pinus sp.</i>	0	0	0.9	0
<i>Juglans regia</i>	0	0	0.2	0
<i>Thuja sp.</i>	0	0	0.2	0
Not determined	0.7	0	0.2	2.1
TOTAL n	513	232	433	138

and *Aesculus hippocastanum*, which also accounted for at least 5% of nests (Tab. 2). The percentage distribution of the numbers of nests located in different types of tree showed an overall similarity when biotopes were compared: urban and suburban areas (Re = 72.8% — Tab. 2), villages and farmland outside villages (Re = 76.9% — Tab. 3), urban areas and villages (Re = 66.4%),

Within the four biotopes studied: urban areas, suburban areas, villages and farmland outside villages, it was in the first — urban areas — that nests were located highest above the ground (mean height 13.2m). Nests were placed lowest on average (at 9.03m) in the farmland outside villages — Tab. 3. The difference between the heights of nests in urban and suburban



areas was significant (t-test,  $p < 0.001$ ), as were the differences for this factor between urban areas and the other biotopes. However, the mean heights at which nests were located were not found to differ when villages were compared with farmland outside them (t-test, NS).

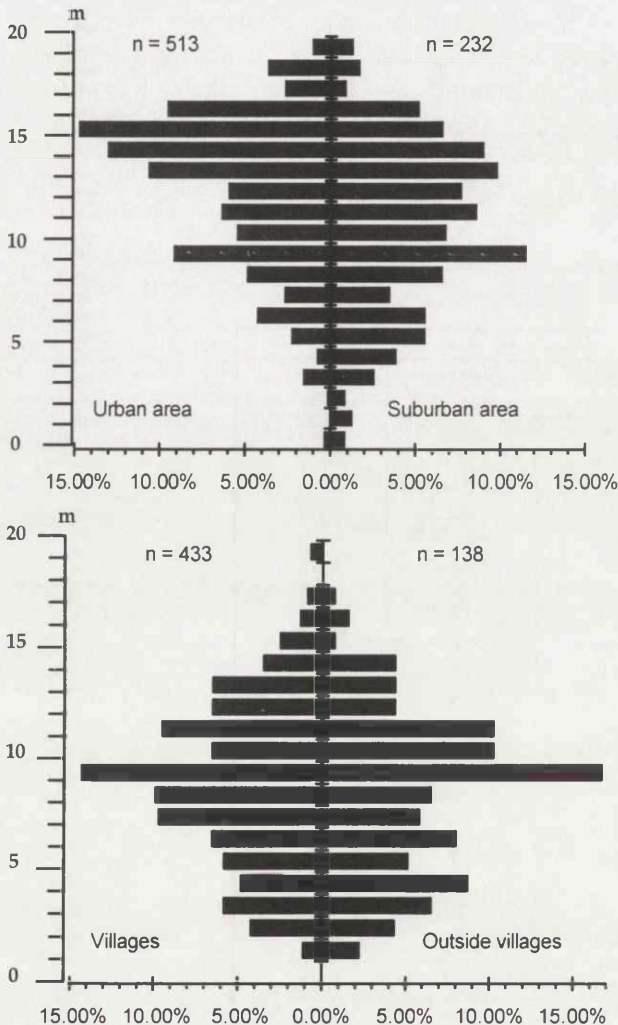


Fig. 1. Distribution (%) of Magpie nesting heights in towns and rural areas studied.

[Ryc. 1. Procentowy udział wysokości umieszczenia gniazd w badanych miastach i w krajobrazie rolniczym.]

## DISCUSSION

The densities of nests of Magpies in the four identified biotopes (urban areas, suburban areas, villages and farmland outside villages) — of which each constituted a unique mosaic of biotopes — were very varied, extending across a more than 80-fold

range from 21.2 nests/100ha in villages down to 0.26 nests/100ha in the farmland outside them (Górski 1997). Jerzak (1988) presented more detailed biotopic preferences in the nesting of Magpies in villages and in areas outside settlements in Poland, showing that the most frequently occupied biotopes are — in villages — gardens and farms (together with 87% of nests), and — in areas beyond villages — meadows, fields, mosaics of meadows and fields and the edges of bodies of water and wetlands. Nests were found most rarely at the edges of woods. Similar biotopic preferences were noted in villages in the Eastern Carpathians by Kunysz (1994), where 83% of nests were in gardens and farms. In our study areas too, a decided majority of nests in villages were within farms and the adjacent orchards and gardens. The selection by Magpies of nesting places near farms in the agricultural landscape is also stressed by many of the authors cited in the review work by Jerzak (1988).

Table 3. Elevation (m) of Magpie nest sites in towns (t-test,  $p < 0.001$ ) and in rural habitats (t-test, NS) studied.

[Tabela 3. Średnia wysokość (m) umieszczenia gniazd sroki w badanych miastach i w krajobrazie rolniczym.]

	n	$\bar{X}$	SD
Urban areas	513	13.2	3.7
Suburban areas	232	11.3	4.1
Villages	433	9.6	3.7
Areas outside villages	138	9.0	3.7

The microhabitat structure of the nesting places chosen by Magpies was very similar in all of the biotopes studied (Re ranged between 75 and 85%). In addition, converted data from Jerzak (1988, 1989) showed that the similarity of the identified types of habitat structure where Magpies nested in Poland in villages and outside them was very great (Re = 77%), as was the comparison for the towns and non-urban areas in the Lubuski region (Re over 80%). In Poland in general, irrespective of the biotope, Magpies most often place their nests in rows of trees and patches of trees and shrubs — as is confirmed by the data from Klejnotowski (1972) and Kunysz (1994).

In different regions of Europe there are quite considerable differences in the shares of different species of tree and shrub amongst those selected by Magpies as places to build their nests (as shown by the comprehensive review of the literature by Jerzak 1988, 1989; as well as Górski 1989, Hordowski 1994, Kunysz

1994, Vuorisalo *et al.* 1992). This is certainly related to the regional species composition and frequency of occurrence of different trees and shrubs in the areas occupied by Magpies. The different biotopes of Koszalin coastal region are characterized by a prevailing similarity (Re 66–77%) in the percentage shares of species of tree chosen by Magpies to locate their nests. A similar result comes from comparisons of the percentage shares of different species of tree and shrub in which Magpies build their nests in housing estates (Kunysz 1994) and in areas away from human settlement (Hordowski 1994) in south-east Poland (Re = 61%). Prevailing similarity (Re > 70%) is also shown by data from Jerzak (1989) portraying the percentage shares of trees and shrubs in which Magpies build their nests in the towns and non-urban areas of the Lubuski region. In contrast, the combining of information obtained from the different regions of Poland in the form of data from Jerzak (1988), show greater differences than similarities (Re = 26%) in the percentage shares of species of tree and shrub used by Magpies to locate their nests in villages and outside them.

The height of a tree is one of the important features affecting the choice of a place to nest among city-dwelling Magpies (Jerzak 1989). In towns and cities, Magpies generally build their nests at higher points than is the case in non-urban areas. The presence of tall trees has thus been an important factor permitting the colonization of the urban environment (Jerzak 1989, Klejnotowski 1974). Similarly, nests in villages are located considerably higher up on average than those among fields (Hordowski 1994, Jerzak 1988, Klejnotowski 1972). Data from the Koszalin coastal region confirm this, albeit with the mean height of nests among fields not differing in a statistically significant way from that in villages. This was the result of the type of landscape which is dominated by extensive monocultural fields without boundary strips planted with trees. There are few wetland areas and surrounding patches of scrub and trees mainly occur in rows and in avenues of tall trees along roads, where Magpies are very willing to locate their nests.

The data presented indicate the substantial ecological plasticity shown by Magpies in their selection of nest sites, and suggest that differences in the locations of nests are due to local variations in nesting habitat

rather than real differences between urban and rural populations.

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## STRESZCZENIE

### [Miejsca gniazdowania sroki w miastach i w krajobrazie rolniczym Pobrzeża Koszalińskiego]

Gniazda sroki policzono i opisano ich usytuowanie w roku 1992 w 11 miastach o łącznej powierzchni 263km<sup>2</sup> (w tym strefa miejska — 62km<sup>2</sup>, a strefa podmiejska — 201km<sup>2</sup>) i na 6 wielkoobszarowych powierzchniach próbnych w krajobrazie rolniczym Pobrzeża Koszalińskiego (łączna powierzchnia ok. 560 km<sup>2</sup>, w tym — wioski 20km<sup>2</sup>, a tereny rolnicze poza wioskami — 540km<sup>2</sup>). Bardziej szczegółową charakterystykę terenu badań podano w pracy Górskiego (1997).

Łącznie przeanalizowano 1316 miejsc gniazdowania sroki, z tego 745 w miastach (513 w strefie miejskiej i 232 w strefie podmiejskiej) i 571 w krajobrazie rolniczym (433 w wioskach i 138 poza wioskami).

W strefie miejskiej zdecydowanie przeważały gniazda usytuowane w szpalerach drzew/krzewów i w kępach drzew/krzewów, w strefie podmiejskiej również dominowały gniazda zlokalizowane w tych dwóch mikrosiedliskach (tab. 1). W wioskach gniazda najczęściej były umieszczane w ogrodach/sadach, szpalerach i w kępach drzew/krzewów. Na terenach rolniczych poza wioskami najwięcej gniazd zlokalizowano w kępach drzew/krzewów, alejach i w szpalerach drzew/krzewów (tab. 1). Struktura mikrosiedliskowa miejsc gniazdowania sroki w czterech badanych biotopach okazała się bardzo podobna (wartości wskaźnika Renkonena mieściły się między 75% a 85%).

W strefie miejskiej przeważały gniazda usytuowane na topolach i klonach oraz brzozech, drzewach owocowych, wierzbach i lipach. Wszystkie te drzewa, poza lipą, należały również do dominujących wśród drzew, na których sroki budowały gniazda w strefie podmiejskiej, przy czym znaczenie topoli było tu mniejsze niż w strefie miejskiej, wzrastał natomiast udział wierzb i drzew owocowych, a ponadto — olszy (tab. 2).

W wioskach zdecydowanie przeważały gniazda osadzone na drzewach owocowych i klonach oraz wierzbach, topolach, lipach i bukach. Na terenach poza wioskami dominowały gniazda umieszczone na klonach, a ponadto — wierzbach, topolach, drzewach owocowych, olszach, tarninie i kasztanowcach (tab. 2). Procentowy udział gniazd umieszczanych na poszczególnych rodzajach drzew i krzewów wykazywał przewagę podobieństw w poszczególnych biotopach (Re zawarte między 66% a 77%).

W miastach gniazda umieszczane były na wysokości 1.5–20m, w krajobrazie rolniczym — 2–20m. W strefie miejskiej, w porównaniu z podmiejską, przeważały gniazda wyżej usytuowane, natomiast w wioskach i na terenach rolniczych poza wioskami procentowy rozkład wysokości umieszczenia gniazd był podobny (ryc. 1). Sroki najwyżej lokowały swoje gniazda w strefie miejskiej (średnia wysokość — 13,2m) a najniżej na terenach rolniczych poza wioskami (średnio — 9,0m) — tab. 3. Różnice między gniazdami ze strefy miejskiej i podmiejskiej okazały się statystycznie istotne, podobnie jak między tymi a pozostałymi biotopami, natomiast różnica między średnią wysokością umieszczania gniazd w wioskach i na terenach rolniczych poza wioskami nie była statystycznie znacząca (tab. 3).

Przedstawione dane wskazują na znaczną plastyczność ekologiczną sroki w wyborze miejsca gniazdowania oraz sugerują, że różnice w lokalizacji gniazd w różnych biotopach wynikają raczej z lokalnej zmienności środowiska niż z trwałych właściwości miejskich czy polnych populacji tego gatunku.

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