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Magpie *Pica pica* in Warsaw — abundance, distribution and changes in its population

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Abstract. Magpie in Warsaw is sedentary and ubiquitous species inhabiting all types of urban habitats. This study (1986–1990) estimated the breeding population in the entire area of Warsaw (485km^2) at 6–8 p./km^2, and in winter (on the area of plots 245km^2) — at 11–17 ind./km^2. The frequency of distribution in both seasons was 92–93% in the whole area 92–93%, and 100% in the inner city plots. Density in the inner city (52km^2 — 19 p./km^2, in winter — 29 ind./km^2) was 3 times higher than in the outer urban zone (150km^2 — 7 p./km^2, in winter 54km^2 11 ind./km^2) and 4–5 times higher than in outskirts (283km^2 — 5 p./km^2, in winter 139km^2 — 6 ind./km^2). Density of population in winter decreased on outskirts and increased in inner city areas. The highest abundance was in green riverside belt (24 p. and 38 wintering ind./km^2), in housing estates (21–25 p., 32 ind./km^2) and in city parks (20–23 p., 36–37 ind./km^2). The lowest was in peripheral forest parks and agriculture areas (2–4 p., 4–7 ind./km^2). Colonization of the inner Warsaw by Magpie began in 1950-ties. Since then its population in this area (52km^2) increased from few pairs to 800–1200 pairs. It reached the position of subdominant in the bird community, and its success is probably most dynamic among all species of the avifauna of Warsaw.

Key words: Magpie *Pica pica*, Warsaw, urban avifauna, changes in avifauna

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INTRODUCTION

The aim of this work is to describe the present and past status of the Magpie in Warsaw: — the abundance of the breeding and wintering population of the species, its distribution within the area studied, and in main habitat types. Also the colonization of Warsaw by Magpie during last decades and position reached by the species in bird community of the city will be discussed. The main data are from inventory carried out in the years 1986–1990.

Magpie is the species rapidly expanding to urban areas in Central and Eastern Europe. Inquiry concerning the changes of avifauna in cities of that region between 1950 and 1984 (Luniak 1990) indicated an increase, or new settling of Magpie in 19 out of 27 cities investigated. Similar inquiry concerning changes of avifauna of 4 cities in Eastern Poland and 15 cities of European Russia (Konstantinov *et al.* 1996) in the period 1984–1994, revealed an expansion of Magpie in 16 (out of 19) cities, and placed this species (together with Hooded Crow *Corvus corone cornix* and Mallard *Anas platyrhynchos*) among three species for which an increase was reported most frequently. Several recent publications confirm an expansion of Magpie as a common phenomenon in cities of the region — e.g. in Berlin (Witt 1997), Osnabrueck (Kooiker 1996), Lvov (Bokotey 1997), in several cities and towns in Poland. The same tendency was reported from cities in Siberia (Ilyichev *et al.* 1987).

Magpie is a common bird in the whole lowland territory of Poland. Its occurrence in agricultural landscape is presented by Dombrowski (1997) and Górski (1997). During the last decades it has settled and has become a common element of avifauna of urbanized areas. The ecology of urban Magpie population in Poland was described by Harmata (1985), Górski (1997), Górska & Górski (1997), Jerzak (1995, 1997), Klejnotowski (1974).

STUDY AREA AND SOURCES OF DATA

The study area covered the whole (within administration boundaries) territory of Warsaw (485km^2), which is the biggest city (1.9 mln. inhabitants) in Poland. Warsaw is relatively rich in green areas and open spaces. In total such habitats cover about 63% of Warsaw. In the central part of the city there are many parks and green patches. On outskirts there are considerable areas of agriculture use, large forest parks and extensively developed lands with small houses and gardens. Warsaw is crossed by 28km long belt of large river — the Vistula (Wisła) with its green flooded terrace. The general level of degradation of natural environment, particularly by pollution, is relatively high in Warsaw.

The main source of data the work is based on are results of the inventory of the avifauna of Warsaw (Luniak 1996). The field work was carried out mainly in the years 1986–1990 by about 63 members of the Warsaw Ornithological Club (see "Acknowledgments"). Their counts were based on methods described and discussed by Luniak *et al.* (1990). The entire area of Warsaw (485km^2) have been divided into 260 irregular plots, delineated according to the mosaic of habitats and structure of the urban landscape. At least 4 counts were carried out in all plots (total 485km^2) during the single breeding season. Similarly, 3–4 counts were carried out during the winter season in 160 plots (245km^2). Winter counts covered the entire city center (52km^2), the whole belt of Vistula river and large areas in other parts of the city. The estimations of the Magpie population were based on reports of observers, who carried out field counts. Results of the winter census might have considerable error of underestimation of the number of birds.

ABUNDANCE AND FREQUENCY

Results of the inventory in Warsaw show (Tab. 1) that Magpie population is relatively abundant and it's commonly distributed in the study area. Comparison between data from the breeding and wintering seasons suggests that abundance and frequency of the overall population, in the scale of city area — do not change much during the phenological cycle.

Table 1. Number and frequency of the Magpie population in overall Warsaw area and in its inner part. Frequency — number (n) and percentage of plots where breeding pairs or wintering birds were recorded

[Tabela 1. Liczebność i częstość występowania sroki na całym obszarze Warszawy i w jej śródmieściu. Częstość — liczba (n) i procent pól w których stwierdzono pary lęgowe lub zimujące osobniki.]

Area censused (km^2)	Total number	Density per km^2	Frequency	
			n	%
Breeding population — pairs:				
— Warsaw (485)	2900–4100	6.1–8.4	241	92%
— inner city (52)	800–1200	15.4–23.1	41	100%
Wintering population — individuals:				
— Warsaw (260)	2800–4300	10.8–16.5	148	93%
— inner city (52)	1200–1800	23.1–34.6	41	100%

Magpie population in Warsaw seems to be typical as concerns two parameters discussed (i.e. abundance and frequency) for those in other big cities (of at least half million inhabitants) in the European region between Brussels and Lvov (Tab. 2 — part A). Densities of breeding populations from large areas (41–162km^2) in 5 examples of such cities (Tab. 2 — A) are of similar rank as in Warsaw.

Comparison with recent data from medium and small size towns in Poland (Tab. 2 — B) — indicates much wider range of differences. Densities of Magpie population in two towns situated in Jasło (central/southern — C/S — Poland) and in Zielona Góra (C/W Poland) — were distinctly higher than in Leszno (C/W), Gliwice (S/W) and other towns, which are distributed in the northern part of the country.

DISTRIBUTION IN THE STUDY AREA

The distribution of Magpie, considered in the large scale of the overall Warsaw area, showed differences in relation to three zones of the macro-gradient of

urbanization (Fig.1 and 2, Tab. 3). Density of the breeding and wintering populations in the zone of inner city was about 3 times higher than in the outer urban zone and 4–5 times higher than in outskirts of Warsaw (Tab. 3). The last zone (outskirts) included mainly habitats representing low degree of development (i.e. urbanization) — suburban houses, agriculture and horticulture habitats, forest parks etc. The proportions of the density of Magpie population were similar in the breeding and in winter. In the region of Warsaw, in an agriculture landscape, the density 4.3 p./km^2 (24km^2 plot) was recorded by Kot (1988).

Differences in proportions between breeding and wintering populations in each of three zones of the urbanization gradient (Tab. 3) could be interpreted to indicate that some part of the Magpie population emigrate in winter from the periphery to inner areas of the city, where there are more favorable conditions for wintering.

The dependence of Magpie distribution on the urbanization gradient was indicated in all cases where such large-scale comparisons were made in other cities in Poland. In the central urban zones of Koszalin and Słupsk (NW Poland) Górski (1997) recorded densities (10.5 and 9.1 p./km^2, data from 1992) respectively 10 and 4 times higher than in suburban zones of those cities. In total this proportion for 11 towns of the Koszalin region was 8.2 versus 1.2 p./km^2. In Zielona Góra L. Jerzak (dr. thesis) recorded the density of Magpie population in 1987 — 11 p./km^2 (data from 20km^2), i.e. at least 2–10 times higher than in small towns of the region and at least 20 times higher than in surrounding rural landscape. A difference of this magnitude between urban and peripheral zones

Table 2. Comparison of densities of the breeding population of Magpie in Warsaw with that in some cities/towns in adjacent part of Europe. ( ) — data from plots within the city.

[Tabela 2. Porównanie zagęszczeń lęgowej populacji sroki w Warszawie z zagęszczeniami w innych dużych miastach tej części Europy i mniejszych miastach Polski. ( ) — dane z wydzielonych powierzchni.]

City, inhabitants, area		Years	p./km^2	Frequency	Source
A. Cities over 0.5 mln. inhabitants:					
Warsaw	485km^2	1986–90	6.8	92%	
Brussels	162km^2	1989–91	6.2–13.6	94%	Rabosee et al. 1995
Berlin					
— (9 plots)	(ca 110km^2)	1988–91	(ca 6)		Witt 1997
— (former GDR)	(403km^2)	1976–83		(82%)	Degen & Otto 1988
Poznań	(83km^2)	1978–79	(8.3)		J. Ptaszyk
Szczecin	(41km^2)	1980	(8.7)		W.Zyska
Lvov	155km^2	1994–95	8		Bokotey 1997
B. Cities/towns (below 0.3 mln inhabitants) in Poland:					
Jasło, 40,000	37km^2	1990	15–21	93%	M.Stój
Zielona Góra, 0.1 mln.	20km^2	1995	16.9	95%	L.Jerzak
Słupsk, 0.1 mln.	43km^2	1990–92	4.7		Górski 1997
Leszno, 60,000	32km^2	1990–93	4.1–4.4	46%	Kuźniak 1996
Olsztyn, 0.2 mln.	88km^2	1993	3.5	42%	J.Nowakowski
Gliwice, 0.2 mln.	136km^2	1988	3.2		Dyrcz et al. 1991
Koszalin,0.1 mln.	65km^2	1992	3.5		Górski 1997
6 towns in Koszalin region, 16,000–46,000,	10–26km^2	1992	2.5 (0.9–4.4)		Górski 1997

Table 3. Total density of breeding (p./km^2) and winter (ind./km^2) populations within three zones of the urbanization gradient (see Fig. 1 and 2).

[Tabela 3. Ogólne zagęszczenie populacji lęgowej (p./km^2) i zimowej (os./km^2) w trzech strefach gradientu urbanizacji (patrz ryc. 1 i 2).]

Zone (km^2)	Breeding	Winter
Inner city (52km^2)	19.2	28.8
Outer urban zone (150km^2, in winter 54km^2 censused)	6.9	10.7
Outskirts (283km^2, in winter 139km^2)	4.8	5.5

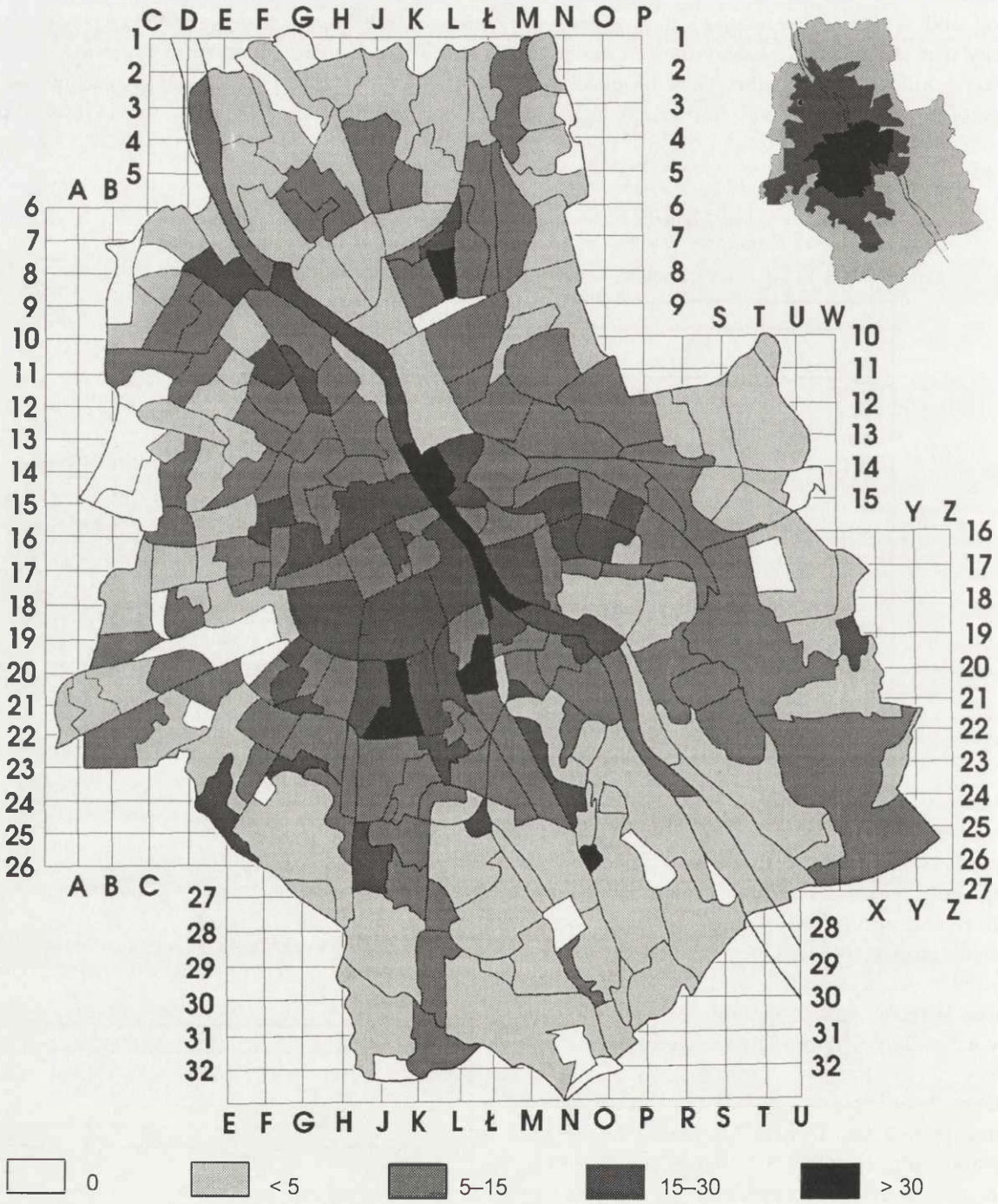

Fig. 1. Density (pairs/km^2) of the breeding population in plots distributed within 3 zones of urbanization gradient: inner city, outer urban zone, and outskirts — shown on the scheme in the upper corner.

[Ryc. 1. Zagęszczenie (p./km^2) populacji lęgowej w polach podziału miasta rozmieszczonych w 3 strefach gradientu urbanizacji: śródmiejskiej, pozaśródmiejskiej i peryferyjnej — pokazanych na schemacie w górnym rogu.]

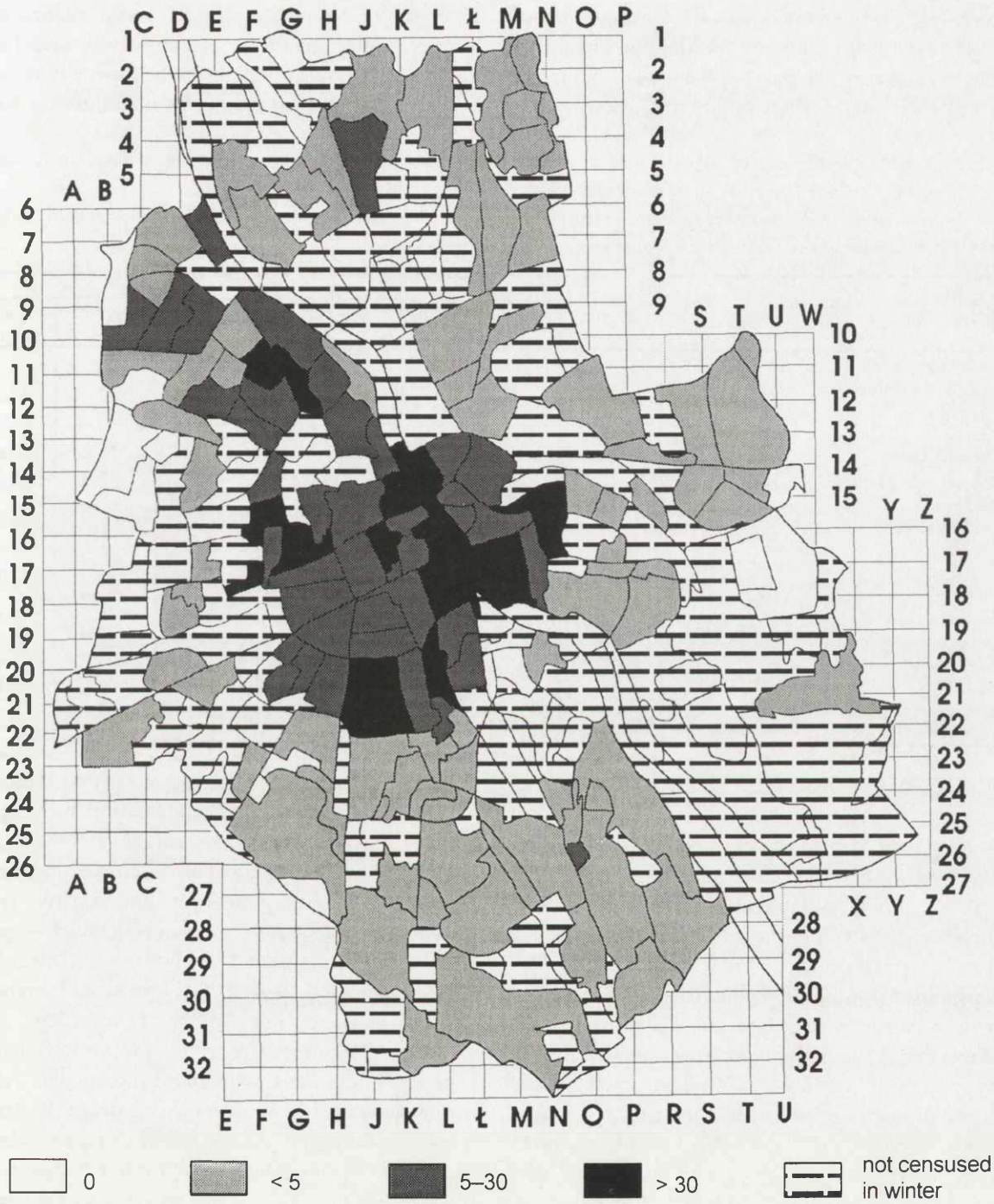

Fig. 2. Density (ind./km^2) of the winter population in plots and within 3 zones of urbanization gradient (see Fig. 1).

[Ryc. 2. Zagęszczenie (os./km^2) populacji zimowej w polach podziału miasta w obrębie 3 stref gradientu urbanizacji (patrz ryc. 1).]

(4.5 : 1.3 p./km^2) was recorded also in Kraków (Harmata 1985) at the early stage of colonization (data from 1977 and 1978) of this city by Magpie. The same tendency is shown by Haafke (1987) on data from large area scale (89km^2) in the town Ratingen in Germany.

— The highest densities of breeding population (24–27 p./km^2) were recorded in the green riverine belt of Vistula (within three zones compared), and then in parks and in housing estates in the inner city zone. The lowest densities (2–6 p./km^2) were in built up areas of

Table 4. Habitat distribution (density) of Magpie population in inner Warsaw and in two outer zones (urban zone and outskirts — see Fig.1 and 2, Tab. 3) of the urbanization gradient. * — data of Gorzelski *et al.* (1994). \ — no data.

[Tabela 4. Rozmieszczenie środowiskowe (zagęszczenie) sroki w śródmieściu Warszawy i w dwóch pozaśródmiejskich strefach gradientu urbanizacji (strefa miejska i peryferyjna — patrz ryc. 1 i 2). \ — brak danych.]

Habitats	Inner city			Outer zones			
	breed. p./km^2	winter ind./km^2	plots (km^2)	breed. p./km^2	plots (km^2)	winter ind./km^2	plots (km^2)
A. Green and open areas							
Riverine belt of Vistula	24	38	(1.2)	27*	(7.9)*	\	
Young parks	23	36	(5.5)				
Old parks	20	37	(4.0)				
Allotment gardens	16	49	(2.3)	\		\	
Peripherial parks, cemeteries, allotment gardens				11	(7.3)	15	(2.9)
Open derelict areas	4	18	(1.1)	\		\	
Agriculture areas				4	(81.2)	7	(48.3)
Forest parks				2	(38.9)	4	(32.1)
B. Built up areas							
Green housing estates	25	32	(17.7)	13	(7.6)	32	(5.8)
Housing estates poor in green	21	32	(9.1)	5	(23.2)	6	(21.4)
Built up city center	12	17	(7.2)				
Green industrial built up areas				12	(5.2)	6	(3.8)
Extensively built-up areas with green				11	(32.3)	20	(16.8)
Built up industrial areas poor in green	6	17	(1.7)	6	(13.7)	\	

DISTRIBUTION IN HABITATS

Assessment of Magpie distribution in main types of habitats in the study area (Tab. 4) indicate:

— In comparable habitat types the density of winter and breeding populations in inner city plots was at least twice as high as those in two other zones (i.e. outer urban zone and outskirts). This is particularly pronounced in examples of housing estates and parks. Exceptions in this regularity were green riverine belt of Vistula, and built up areas of industry, where no significant differences between inner city and outer zone were recorded. Also the habitat of densely built up areas in the city center, which represented the highest degree of urban development, had relatively low density of Magpie population. In spite of those exceptions, data in Table 4 confirm the statement above (see section "Distribution..."), concerning the impact of macro-gradient of urbanization on the distribution of Magpie in Warsaw;

industry poor in vegetation cover (within both zones compared), in open derelict areas and in peripheral areas of agriculture and forest parks;

— There was no distinct difference, as concerns densities of Magpie population, between two general categories of habitats — green areas (Tab. 4 — part A) and built up areas (part B). In both above categories of habitat types the highest, the lowest and immediate densities of Magpie population were recorded;

— In the inner city zone, proportions between population densities recorded in particular habitats during the breeding season in comparison to densities in winter — suggest general stability and sedentary life of Magpie in this zone. In two outer zones in some types of habitats (Tab. 4) Magpie population seems to decrease in winter. This supports the interpretation above (see "Distribution in the study area") concerning winter emigration from peripheries to habitats of higher degree of urbanization.

The highest density of Magpie population in Warsaw was recorded (data of W.Nowicki) in three plots situated in the inner city:

— District of green housing estates Mokotów West (220ha): 3.9 p/10ha and in winter 4.1–6.1 ind./10ha;

— ZOO/Praski park (70ha): 3.1 p./10ha and 4.3–7.1 ind/10ha;

— Green belt of the right riverside of Vistula (70ha): 3.1 p./10ha and 2–6 ind./10ha.

Any comparisons of results above with data from other cities in Poland are limited by differences of time (dynamic growth of urban Magpie populations), space censused (mainly plots below 0.5km^2 were investigated) and of local site conditions. Data from Poznań (J.Ptaszyk, Tab. 2) seem to be similar to those from Warsaw (Tab. 4) as concerns urban parks (17 p./km^2), extensively built up areas with green (12p./km^2) and peripheral agriculture areas (4p./km^2). The only substantial difference in the comparison above concerns density in green housing estates (6 p./km^2). But ten years difference in the origin of data above should be kept in mind when comparison to results from Warsaw in done. Results of Górski and Kotlarz (1997) from Słupsk show much more differences in comparison to Warsaw: in the city center (3.6km^2) 4p./km^2 were recorded in 1990, in housing estates (1km^2) — 40p./km^2 and in suburban allotments (0.5km^2) — 50p./km^2, which is one of the highest density of Magpie known in Poland. The differences above concerns not only population density in particular habitats but also the opposite (in comparison to data from Warsaw) direction of its increase — the density in the city center was much lower than in suburban allotment gardens.

Also comparison with data obtained from large plots in Berlin (Witt 1997, Tab. 2) indicate differences to data from Warsaw as concerns densities of Magpie breeding and wintering populations in particular habitats. In Berlin the highest density (32 p./km^2, 5km^2 plot) was recorded recently (1991) in the district of high-rise buildings in the outer zone of the city. This result is similar to highest densities in Warsaw, indicated above.

Winter concentrations of roosting Magpies observed in Warsaw exceptionally exceeded one hundred of birds, while in Berlin up to 420 roosting birds were observed (Witt 1997), and on outskirts of Lvov — up to 1700 birds (Bokotey 1997).

COLONIZATION OF WARSAW BY MAGPIE

Up to the middle of century Magpie was not noted among birds observed in the center of Warsaw, according to ornithological and popular publications. In 1950/60-ties the species was fairly common (breeding and wintering) in suburban and outskirts areas of Warsaw, while in the inner part of the city only very few breeding pairs were known (Luniak *et al.* 1964). Fragmentary data concerning the period 1971–1976 (e.g. Luniak 1981, Nowicki 1992) allow to estimate of 50–200 breeding pairs in the Magpie population in the 50–100km^2 area of inner Warsaw. Then (in the period 1971–1988) — it increased by 3–5 times.

Data from 20 green areas in the inner city indicate 9 pairs of Magpie breeding in 4 of these areas in the years 1971–1976. After about ten years (1982–1988) there were 17 of those areas occupied by at least 35–46 pairs. In some areas the number of breeding Magpies grew from 0–1 to 7–11 pairs during the time of few years. Among 20 areas considered only 2 examples of decrease was observed — by 1 pair in each case.

Results of the inventory made in 1986–1990 (Tab. 1) show that during last three decades the species colonized the area of inner Warsaw with about one thousand pairs. Magpie became one of the commonest bird species there (see the next section) with high density of breeding and wintering population (Tab. 4).

The colonization of urbanized areas by Magpie, and the rapid growth of its population in cities during recent decades, is widespread phenomenon in the whole region of Central and Eastern Europe. Data from several cities and towns in Poland (e.g. Cracov, Lublin, Łódź, Poznań, Olsztyn, Zielona Góra, Leszno) indicate that settling of Magpie in inner areas of those cities began mostly since 1960-ties i.e. in approximately the same time as it was in Warsaw. An increase of Magpie population in Warsaw seems to be one of the most dynamic — in comparison with available data from other cities in Poland and from Berlin (Tab. 5).

POSITION IN BIRD COMMUNITY

Results of bird inventory in the area of 52km^2 of inner Warsaw (W.Nowicki — dr. thesis) place the

Magpie on the following positions in the ornithocenosis of this area:

— In the breeding bird community it is among subdominants on the 8th position (1.5–2.0%) according to the number of pairs (Tab. 1) and on the 5th position (2%, 320–480kg) according to total biomass (breeding pairs) of the breeding bird community;

Table 5. Changes of the Magpie breeding population in cities/towns in Poland and in Berlin (sources in Tab. 2).

[Tabela 5. Zmiany populacji lęgowej sroki w miastach Polski i Berlinie (wg źródeł w tab. 2).]

City (its part), years compared	Years	Increase	Abundance reached
Warsaw (inner area)			
— (50–100km²), 1960/62–1971/76	10–15	x >10	50–200 p.
— (52km²), ca 1975–90	ca 15	x >10	800–1200 p.
Berlin			
— (3 central districts, 31km²), 1969–89	21	x 8	6–9 p./km²
— (2 SW districts, 77km²), 1974–94	21	x 1.6	3–4 p./km²
— (Maerkisches Viertel, 5km²), 1984–91	8	x 3	32 p./km²
Poznań (plot 5km²),			
— 1963–69*	6	x ca 2	26 p.
— 1969*–79	11	x 3	70 p.
* (Klejnotowski 1974)			
	3	x ca 2	8.7 p./km²
Szczecin (38km²*, 41km²), 1978*–80			
— (inner area), 1978–80	3	x 3	206 p.
	15	x 2	195 p.
Słupsk, 1978–92			
— (inner area, 14km²)	15	x 2.3	67 p.
	15	x 2.3	229 p.
Koszalin, 1978–92			
— (inner area, 17km²)	15	x ca 2	179 p.
Zielona Góra, 1982–1995	14	x 3	17 p./km²
Leszno, 1972–91	20	x >10	130–140 p.
Osnabrueck (Koiker 1996)			
— (24km²) 1984–1993	10	x 3.5	228 nests

— In wintering community Magpie is on 12th position (1%) according to the number of individuals (Tab. 1) and on 8th position (0.5%, 240–360kg) according to total biomass;

— Among 20 resident species occurring regularly in the area during the whole year Magpie is on the 6th (2%) position;

— Among 14 omnivorous species occurring regularly in the area Magpie is on the 6th (1%) position during the whole year;

— Among 5 ubiquitous species (i.e. breeding in all main types of habitats of the area) Magpie is on the 3rd (5%) position (after the *Passer domesticus* and *Parus caeruleus*);

— Among 17 species breeding in open nests on trees — Magpie is on the 2nd (20%) position, after *Streptopelia decaocto*;

— Among 3 nest robber species Magpie is the most common (75–80%), two others are *Corvus corone cornix* and *Garrulus glandarius*. Comparison of breeding density of Magpie and Hooded Crow on 40 plots in inner Warsaw did not indicate any clear mutual dependence in distribution of both species.

Data above show the Magpie as a species which achieved position among of the most significant elements of bird community in highly urbanized areas of Warsaw. Rapid growth of its population in the city, and its present ecological situation — allow to consider Magpie, in the present avifauna of Warsaw, as the species of most dynamic and spectacular success.

CONCLUSIONS

Magpie in the overall area of Warsaw is, during the breeding and winter seasons, a relatively abundant and commonly distributed species. Its status in Warsaw, in respect to both parameters above, is typical for other big cities in this region of Europe.

The large-scale distribution of the Magpie breeding and wintering populations is parallel to the macro-gradient of urbanization. Total density of breeding and wintering populations in the inner city was 3 times higher than in the outer urban zone and 4–5 times higher than in outskirts. Such dependence is known also from other cities/towns in Poland.

The Magpie in Warsaw is a sedentary, eurytopic and ubiquitous species. It inhabits all types of terrestrial urban habitats during the entire year, in spite of the fact that in some habitats of suburban zone a decrease of population was recorded in winter. Its abundance was highest in green riverside belt of Vistula, and also parks and housing estates in the inner city. Lowest density of population was recorded in peripheral forest parks and agriculture areas, built up industrial areas, open derelict areas and peripheral housing estates poor in green. Dependence, stated above, of the Magpie

distribution on the macro-gradient of urbanization, was generally related to preference of the species to particular types of habitats.

Colonization of the inner Warsaw by Magpie, and its rapid increase in the overall city area, begun in 1950-ties. The rate of growth of Magpie population in that area (50–100km^2), in each of two 10–15 years periods during the last three decades — was about 5–20 times. Magpie, a former rarity, reached a position of subdominant, and the main nest robbing species, in the bird community of inner Warsaw. It is probably, among other birds of Warsaw, a species of the most dynamic and spectacular success.

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STRESZCZENIE

[Sroka w Warszawie — liczebność, rozmieszczenie i zmiany populacji]

Praca przedstawia stan liczebny populacji lęgowej i zimowej sroki na całym obszarze administracyjnym Warszawy, rozmieszczenie tego gatunku na obszarze miasta i w różnych typach środowisk, zasiedlenie

przez srokę obszaru śródmiejskiego w ciągu ostatnich dziesięcioleci, oraz miejsce tego gatunku w awifaunie śródmieścia.

Podstawowy materiał pochodzi z inwentaryzacji awifauny Warszawy przeprowadzonej w latach 1986–1990. W okresie lęgowym badano cały obszar administracyjny miasta (485km^2), a zimą — znaczną jego część (245km^2), m.in. całe śródmieście (52km^2). Badania terenowe opierały się na co najmniej 4-krotnych kontrolach, w jednym roku, każdego z 260 pól wydzielonych na podstawie mozaiki krajobrazu miasta (ryc. 1 i 2). Badania terenowe były wykonane przez zespół około 63 obserwatorów. Dane o liczebności populacji sroki oparto na dokonanych przez nich ocenach. Wyniki z okresu zimowego mogą być obciążone znacznym błędem zaniżenia wynikającym głównie z trudności wykrycia ptaków.

Inwentaryzacja wykazała, że sroka jest w Warszawie gatunkiem licznym (tab. 1) i pospolicie rozprzestrzenionym (ryc. 1 i 2). Jej zagęszczenie, w skali całego miasta, jest dość podobne jak w innych porównywanych dużych miastach Europy (tab. 2A), natomiast w porównaniu z małymi miastami w kraju — różnice te są znacznie większe (tab. 2B).

Rozmieszczenie sroki na obszarze miasta wykazało znaczną zależność od gradientu urbanizacji. Średnie zagęszczenie w śródmieściu było znacznie około 3-krotnie wyższe niż w strefie miejskiej poza śródmieściem i 4–5 razy wyższe w porównaniu ze strefą peryferyjną (tab. 3, ryc. 1 i 2). Podobną prawidłowość była wykazywana również z innych miast w kraju.

Występowanie sroki przez cały rok stwierdzono we wszystkich wyróżnionych typach środowisk (tab. 4), jednak zimą w niektórych środowiskach w strefie peryferyjnej znaczny obserwowano spadek liczebności w stosunku do okresu lęgowego. Najwyższe zagęszczenia stwierdzono w pasie zarośli wzdłuż Wisły oraz w parkach śródmiejskich, najniższe — w peryferyjnych parkach leśnych, na terenach rolniczych i na zabudowanych terenach przemysłowych (tab. 4). Różnice występowania sroki w poszczególnych biotopach odpowiadały opisanemu wyżej gradientowi liczebności w trzech strefach urbanizacji (tab. 3).

Do lat 50-tych sroka nie była wykazywana z obszaru śródmieścia Warszawy, mimo jej pospolitego występowania na terenach podmiejskich. Na początku lat 60-tych w śródmieściu gnieździło się kilka-kilkanaście par. Na początku lat 70-tych na obszarze 50–100km^2 było już 50–200 par lęgowych, a w ciągu następnych 10 lat jej stan wzrósł 3–5-krotnie (ryc. 3). Inwentaryzacja dokonana w latach 1986–1990 wykazała, że w ciągu trzech dziesięcioleci sroka osiągnęła w śródmieściu Warszawy liczebność około tysiąca par. Podobnie intensywny wzrost tego gatunku zanotowano również w innych miastach Polski oraz w Berlinie (tab. 5).

Sroka jest obecnie w śródmieściu Warszawy subdominantem o udziale w ogólnej liczebności i biomasie awifauny lęgowej na poziomie 2%. Jest jednym z 5-ciu gatunków występujących regularnie we wszystkich typach środowisk śródmieścia. Jest druga (po sierpówce) pod względem liczebności wśród gatunków budujących otwarte gniazda w koronach drzew i krzewów. Jest najliczniejszym (75–80%) i najszerzej rozprzestrzenionym drapieżnikiem ptasich lęgów. Dynamika zasiedlenia śródmieścia Warszawy przez srokę i osiągnięta przez nią pozycja w awifaunie — pozwalają uznać ją tu za gatunek o najbardziej spektakularnym sukcesie.