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## Nesting of the House Martin *Delichon urbica* in the city of Poznań (1976–1978 and 1982–1989)

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**Ptaszyk J. 2001. Nesting of the House Martin *Delichon urbica* in the city of Poznań (1976–1978 and 1982–1989). *Acta Ornithol.* 36: 135–142.**

**Abstract.** Observations of nesting populations of the House Martin were carried out on three study plots in the city of Poznań: a city centre area (599.0 ha) and two housing estates (567.1 ha and 125.6 ha), a total area of 1291.7 ha. Throughout the 1980s House Martin numbers increased continuously over the whole area, the greatest population density being 4.6 occupied nests per 10 ha. The number of breeding pairs in the city centre was stable, and the density there varied from 2.1 to 3.0 occupied nests per 10 ha. The highest density of occurrence was recorded in the new housing estates, where increases in the House Martin population were recorded. These were related to the construction of new buildings, which provided fresh nesting sites. The nests were built at heights from the first to the fifteenth storey. Over 96% of the nests in the housing estates were built in the corners of the window openings. In the entire study area the preferred nesting sites were on the southern (35.2%), northern (26.1%) and eastern (13.3%) sides of buildings. In the city centre the greatest number of nests had south-facing entrances, while in one of the other study plots, the entrances to most nests faced north. No more than 7% of the total number of martins' nests available in a given year were occupied by *Passer domesticus*.

**Key words:** House Martin, *Delichon urbica*, nesting biology, urban habitats, population dynamics, nest-site

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### INTRODUCTION

In many large European cities an increase in the population of the House Martin has been noted since the 1970s (e.g. Szwarze 1975, Sharrock 1976, Plath 1977, Bruch et al. 1978, Tātner 1978, Harmata 1980, Witt & Lenz 1982, Mönke et al. 1983, Menzel 1984, Grimm 1987, Briesenmeister 1986, Bauer & Berthold 1996, Kuźniak 1996, Puszkar 1997, Witt 1999). However, in the same time some authors pointed to a decrease of the population of this species (e.g. Luniak 1972, Fouarge 1992, Piskorska 1992, Otto & Otto 1999), or its temporary disappearance (Sharrock 1976).

In Poland the study of the House Martin nesting population occurrence was performed in: Żnin (Kaźmierski 1969), Kraków (Harmata 1980), Gorzów Wielkopolski (Romaniszyn 1984, Jermaczek et al. 1992), Świebodziń (Jermaczek et

al. 1990), Gliwice (Dyrcz 1991), Sulechów (Czwałga 1992), Poniec (Lorek 1992), Witkowo (Piskorska 1992), Leszno (Kuźniak 1996), Lublin (Puszkar 1997) and Poznań (Ptaszyk 1971, Wesołowska 1988, Kryś 1998). The main purpose of the hitherto studies was the stock-taking of breeding pairs.

The aim of this work is to assess changes of the House Martin breeding population over the 1970s and 1980s in Poznań and to investigate environmental preferences of this species.

### THE STUDY AREA

In the period of the study the city of Poznań occupied an area of 229 km<sup>2</sup> and had about 700 thousand inhabitants.

The listing and observation of the House Martin nests was conducted over the area of 1291.7

ha (CP) comprising 3 study plots: the downtown area (C) and two off-centre areas covered with relatively new housing estates (P1 and P2).

Plot C (599.0 ha) — the downtown, was characterised by compactly arranged few-storey buildings along narrow streets, few squares and parks with water pools, from the east the area bordered at the river Warta.

Plot P1 (567.1 ha, district Winogrady) — the area was earlier at the city peripheries, recently its part is built with detached and semi-detached houses and the other part comprises 5 large housing estates (221.3 ha) and a 100 ha park. The houses were built in the years 1968–1985, the majority in the first half of the 1970s. The buildings in the housing estates had 5-, 13- or 16-storeys and their external elevations were covered with a granulate of fine stones. The number of high (13- or 16-storey) buildings was 49.

Plot P2 (125.6 ha, district Winiary) — the area also used to be at the city peripheries, recently with housing estate built in the 1960s (4-, 5-storey buildings), old tenement houses and detached houses, and a large housing estate built in the 1970s (5- or 11-storey buildings) without the coverage with fine stone granulate.

## METHODS

The data on the number of nests were collected over the years 1976–1978 and 1982–1989 according to the following classification: nests occupied by the House Martin, occupied by the House Sparrow *Passer domesticus* and those not-occupied. As not-occupied nests I assumed complete nests not used in a given year either by the House Martin or by the House Sparrow.

Moreover, each nest was classified according to its location and way of use. The height of the nest was described on the basis of the scale of the building storeys. The height of the nests built under balconies was described as corresponding to one storey below that of the apartment with a given balcony.

The following locations of the nests on the building were distinguished: in the corner of the window frame, under the eaves, in loggias, under the balcony on the waterspout, under the balcony on the bas-relief, under the balcony on the ledge; under the arcades, and other, including e.g. the nests on the neon lights.

In this study a colony was a group of closely situated five or more nests occupied by the House

Martin. Starting from 1982 I also noted the exposition of the nests and for the nests occupied by the martins — the direction of the inlet.

The observations were carried out in the second half of June, and exceptionally also in the first week of July.

## RESULTS AND DISCUSSION

### Abundance and density of population

In the time of the study a constant increase in the abundance of the House Martin population was observed over the whole area studied (CP), (Table 1, the line of the trend:  $y = 49.75x + 278.86$ ,  $n = 7$ ,  $r^2 = 0.87$ ,  $p \leq 0.01$ ). In the end of the 1970s and at the beginning of the 1980s, this increase could be explained by the fact that many new buildings were built in the areas P1 and P2, which were gradually colonised by the House Martin. This significant increasing trend followed mainly from an increase in the number of nests occupied by the martins in the study plot P1 ( $r^2 = 0.95$ ,  $p \leq 0.01$ ).

The highest mean densities of the nests in the period studied were ( $4.70 \pm 0.97$  nests/10 ha) and ( $4.46 \pm 1.77$  nests/10 ha) in the study plots P2 and P1, respectively. In the study plot P2 the number of the occupied nests was stable, except for the years 1978 and 1982, in which a decrease in their number was noted (Table 1). In the study plot P1 an increasing tendency in the number of the occupied nests was observed in the whole period studied ( $y = 35.679x + 92.321$ ,  $n = 8$ ,  $r^2 = 0.768$ ,  $p \leq 0.01$ ), with the greatest density of the occupied nests in the years 1982–1986 (mean density  $5.66 \pm 0.71$  nests/10 ha, Table 1).

The House Martin population was the most stable over the downtown area C (the line of the trend:  $y = 2.103x + 146.33$ ,  $n = 10$ ,  $r^2 = 0.364$ , n.s.). The density of the occupied nests established in the end of the 1960s was higher (mean  $3.63 \pm 1.00$  nests/10 ha) than the values from the end of the 1970s or the end of the 1980s, which were stable and on average equal to  $2.64 \pm 0.29$  nests/10 ha (Table 1). The higher mean value of the density of nests in the end of the 1960s (Ptasyk 1971, Table 1) was parallel to a higher density of nests observed also in the other cities in Poland, e.g. in Żnin and Kraków (Kaźmierski 1969, Harmata 1980). This increase in Poznań lasted for a relatively short time and soon the number of occupied nests decreased to 150–160 (Table 1). The stability in the size of the House Martin population

Table 1. Dynamics of nesting population of the House Martin during the study period. CP — whole area studied, C, P1 and P2 — study plots, N — number of nests; %n — nests occupied by the House Martin, n/10 ha — density of nests occupied by the House Martin; %HS — nests occupied by the House Sparrow; \* — data of Ptaszyk (1971).

Years	C (599.0 ha)				P1 (567.1 ha)				P2 (125.6 ha)				CP (1291.7 ha)				
	N	%n	n/10 ha	%HS	N	%n	n/10 ha	%HS	N	%n	n/10 ha	%HS	N	%n	n/10 ha	%HS	
1967*			2.6														
1968*			3.7														
1969*			4.6														
1976					183	100.0	3.2	0									
1977	225	66.7	2.5	11.1	149	87.2	2.3	0	81	84.4	5.6	6.2	455	76.9	2.7	6.6	
1978	240	69.2	2.8	4.6	138	79.7	1.9	0	58	67.2	3.1	12.1	436	72.2	2.4	4.1	
1982	164	75.0	2.1	4.9	288	89.9	4.6	0.3	57	71.2	3.3	14.0	509	83.1	3.3	3.3	
1983	207	72.5	2.5	3.9	308	97.1	5.3	1.0	69	89.9	4.9	7.2	584	87.5	4.0	2.7	
1984	216	78.7	2.8	5.8	371	94.9	6.2	0.3	71	88.7	5.0	1.4	658	88.9	4.5	2.3	
1985	225	79.1	3.0	4.9	347	96.3	5.9	0.6	67	89.6	4.8	0	639	89.5	4.4	2.0	
1986	207	79.2	2.7	7.2	381	93.4	6.3	0.5	76	90.8	5.5	0	664	88.7	4.6	2.6	
1987	199	70.4	2.3	7.0					77	88.3	5.4	5.2					
1988	220	72.3	2.7	2.3													
1989	217	82.5	3.0	4.1													
Average	212.0	74.5	2.6	5.6	270.6	93.4	4.5	0.4	69.5	84.9	4.7	5.4	563.6	84.8	3.7	3.2	

in the downtown area (C) studied could be also related to the stability of the biotope as no significant changes had been made in the area in housing, structure of green areas, number of squares and water pools for a long time.

A particularly low density of nests occupied by the House Martin noted in 1982, mainly in the study plots C and P2 (Table 1), coincided with a low number of nests observed in another city in the same region of Poland, in Gorzów Wielkopolski (Romaniszyn 1984).

A comparison of the data collected in 1986 only in the housing estate area P1 (221.3 ha) and in similar 5 housing areas covering 127.6 ha, in Rataje another part of Poznań (Wesołowska 1988), showed that the mean densities of the occupied nests were almost the same: 16.1 and 16.0 nests/10 ha in study plot P1 and in Rataje, respectively. In 1987 the mean density increased in Rataje to 19.0 nests/10 ha (Wesołowska 1988), while in 1997 it was only 9.9 nests/10 ha (Kryś 1998).

### The nests not-occupied and occupied by the House Sparrow

The contribution of not-occupied nests over the whole area of study (CP) varied significantly (Table 1) and in the end of the 1970s it was higher than in the 1980s (Table 1). In the downtown area C the frequency of not-occupied nests differed significantly in particular years ( $\chi^2 = 31.32$ ,  $df = 9$ ,  $p < 0.001$ ). In the years when the number of nests

was high (e.g. 1984–1986, 1989) the contribution of not-occupied nests decreased (Table 1). Part of the nests not occupied in the previous year was repaired and occupied by the martins. A similar tendency was observed for the number of the House Martin nests occupied by the House Sparrow (Table 1). However, the total contribution of the nests of the species studied occupied by the House Sparrow was small. The contribution of the nests taken by the House Sparrow increased in the years when the number of nests occupied by the House Martin decreased (Table 1). A similar relation was noted by other authors, e.g. Lind (1962), Müller (1987) and Piskorska (1992). However, they reported that the contribution of the martins' nests taken by the House Sparrow can be high and can reach even 40%, which is in contradiction to the results from Poznań. The above relation was different in different areas in Poznań (Table 1). Particularly rare cases of the House Sparrow taking the martins' nests in the study plot P1 were related to a large number of available nesting sites in this area, in crevices among the concrete blocks of which the buildings were constructed (Ptaszyk 1989).

Lind (1962) and Müller (1987) have reported that the House Sparrow take the greatest number of martins' nests in autumn and winter, treating them as shelter against the weather conditions, and in spring they occupy only 5% of the House Martin nests, usually soon after they have been

constructed, as breeding sites. It happens that the House Sparrow occupy the martins' nests treating them as alternative sites. A similar 5% contribution of the martins' nests occupied by the House Sparrow was reported by Romaniszyn (1984) from Gorzów Wielkopolski.

In 12 cases it was established that the House Sparrow occupied the nests abandoned even for a few years. There was no competition for nests between the species studied, or the House Sparrow nest parasitism against the House Martin. The observations seem to indicate that the House Sparrow takes only new or abandoned nests because such nests are free from parasites.

### The habitats chosen by the House Martin

Over 93% of the total number of House Martins nests were built on the apartment houses. In the study plot P1 these were exclusive sites used for building nests. In the study plot C, characterised by the compact arrangement of mainly 4-storey buildings, in the years 1977–1978, there was 47.5% of the total number of the nests occupied in the whole area CP. In the years 1982–1986 this contribution decreased to 25.6% (Table 1), which was accompanied by an increase of the number of breeding pairs in the other two study plots (Table 1). Schönbrodt & Spretke (1989) in Halle, and Rabose et al. (1995) in Brussels, reported the absence of this species in the compact urban area. In the compactly built old part of Sulechów, the nests appeared on the houses bordering on open space, e.g. the fields (Czwałga 1992). Starting from the 1980s, in Poznań, the House Martin occupied mostly new housing estates. Witt & Lenz (1982) reported that about 78.2% of the total number of breeding pairs in West Berlin were noted in new housing estates, while the lowest density of breeding pairs was found in the old city. Similar preferences were also reported by: Koop (1984), Brisenmeister (1988), Schwarz et al. (1992), Kuźniak (1996) and Puszkarski (1997) in a number of Polish and German cities.

In some cities the House Martin found also other environments attractive, like e.g. industrial areas (Grimm 1987).

### The height of nest location

In the whole area studied (CP) the nests were found at locations from the first to fifteen storey (Table 2). Over 75% of all nests were at the height of the first three storeys, while the contribution of nests built above the third storey was insignificant

Table 2. Height (in storeys) of the House Martin nests location — percentage of total occupied nests. CP — whole area studied, C, P1 and P2 — study plots, ( ) — total of occupied nests.

Storeys	C	P2	P1	CP
	(1576)	(472)	(2023)	(3345)
15 <sup>th</sup>			0.1	0.1
14			0.2	0.1
13			0.4	0.2
12			1.1	0.5
11			2.1	1.1
10		0.6	1.2	0.8
9		1.1	2.0	1.3
8		3.4	2.3	1.6
7		6.4	2.2	2.0
6		8.5	3.0	2.8
5	0.2	12.7	2.6	3.2
4	2.2	19.5	13.9	11.0
3	14.1	28.4	33.1	26.6
2	17.3	16.9	28.6	22.5
1 <sup>st</sup>	66.2	2.5	7.4	26.1

0.001]). In the years 1977 and 1978 the greatest number of nests was built on the first storey, later this domination was not so pronounced.

In the downtown area C mostly with 4-, 5-storey buildings, the martins' nests were mainly found at the height of the first storey — 66.2% of the total number of the occupied nests (Table 2). Practically no differences were found between the data from the years 1967–1969 (Ptaszyk 1971) and the recent ones. However in the paper from 1971 the storeys were mistakenly incorrectly numbered as 2–5 instead of 1–4.

In the old city of Poznań, similarly as in other cities with old and low housing, the greatest number of martins' nests were found at the height of the 1 and 2 storeys (Kaźmierski 1969, Ptaszyk 1971, Romaniszyn 1984), whereas in the areas with new apartment blocks and many tall buildings the nests were preferably built to the height of the 6th storey (Menzel 1984, Romaniszyn 1984).

In the study plot P1, about 83% of the total number of the occupied nests were placed at the heights up to the 5th storey (Figure 1). The distribution of the heights of the nests in the study plot P2 is close to that in P1, but the most frequently met nests were built at the height of the 3rd (28.4%) and 4th storeys (19.5%). Another difference was that in study plot P2 the contribution of the nests built between the 6th and 11th storeys was relatively high — 20.0%, while in study plot P1, where the tall buildings were more numerous, this contribution was lower — 10.7% (Table 2).

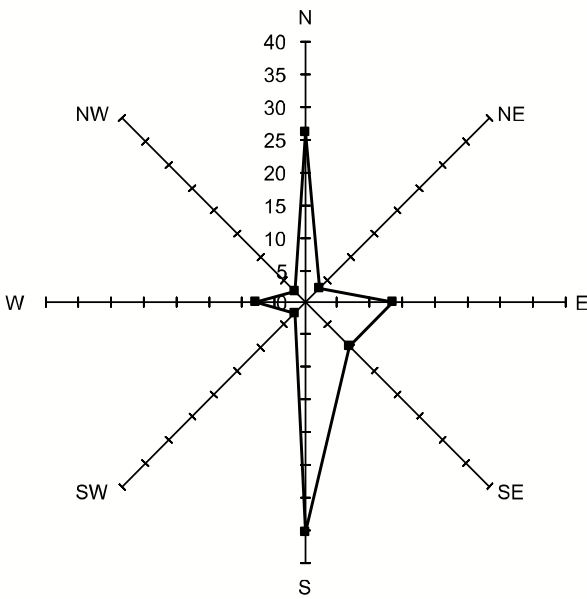


Fig. 1. Exposition (in %) of the House Martin nests including not occupied ones on the whole area studied (CP),  $N = 1837$ .

### Preferred nesting sites

The most preferred nesting site in the whole area studied (CP) were the corners of the window frames. However, differences in the preferred sites between the three study plots were noted and attributed mainly to the different character of housing (Table 3). The corners of the window frames were also reported as the preferred sites in 5 other large housing estates at some distance from the city centre of Poznań (Wesołowska 1988, Kryś 1998). In the study plots P1 and P2 a surpris-

Table 3. Sites (in %) of nests used by the House Martin. CP — whole area studied, C, P1 and P2 — study plots, () — number of occupied nests.

Nest situation	C	P1	P2	CP
	(1576)	(2023)	(472)	(2680)
Corner of the window frame	2.9	99.7	96.2	71.0
Under the balcony	21.2	0.1	0.4	6.5
Under the balcony on the waterspout	13.3	—	—	3.8
Under the balcony on the bas-relief	13.4	—	—	3.8
Under the balcony on the ledge	10.3	—	—	3.4
Under the arcades	17.7	—	—	4.8
Under the eaves	7.2	0.2	1.9	2.2
In loggia	4.1	—	1.5	1.5
Others	10.0	—	—	2.9

ingly low number of nests under the balconies was observed, although the number of balconies was high. A probable reason for this was the kind of wall cover of the buildings — the granulate, which must have made it difficult for the birds to attach the nests directly under balconies. The other factors unfavourable for this placement of nests were the lack of waterspouts, bas-relieves or moulds under the balconies. The low number of nests built in the loggias was simply a result of a small number of this kind of balconies in the areas studied.

The sites under the balconies were mostly preferred only in the downtown area C (Table 3).

In the majority of other cities, the House Martins usually built nests under the balconies or in the corners of the window frames (e.g. Chudinova & Brtek 1982, Menzel 1984, Jermaczek et al. 1990, Czwałga 1992, Piskorska 1992, Kuźniak 1996). The differences are usually explained by the character of architecture and thus housing and urban arrangement in particular areas or cities. As follows from the observations conducted in Manchester both in the 1930s and in the 1970s (Tatner 1978), the preferred nesting site there was under the eaves. Similar data were reported from Magdeburg (Briesenmeister 1988) and the old city of Gorzów Wielkopolski (Romaniszyn 1984).

The preferred location of nests under the balconies observed in the cities is probably related to the fact that this placement restricts the nest accessibility to predators, ensures the shelter against rain and provides a relatively large surface to attach the nest. The length of the balcony or the eave provides a possibility of choosing the best site, which, in the case of the location in the corners of the window frames is limited. In West Berlin in the years 1969–1976 an increase in the number of the occupied nests on average by 15.9% was noted, which was related to the increase in the number of new houses with long loggias (Bruch et al. 1978). However the availability of potential nesting sites is not the absolute factor guaranteeing an increase in the number of the House Martin in a given area, as proved by the observations in the housing estate Zacisze in Gorzów Wielkopolski. In spite of the presence of many loggias in this region no breeding pairs were observed there (Romaniszyn 1984) because of frequent strong winds in this area.

### Nests exposition

The greatest number of the nests in the whole area studied (CP) were built on the walls directed

to the south and to the north (Fig. 1), while the west and north-eastern expositions were avoided. The distribution of the nests was significantly different from the expected random distribution ( $\chi^2 = 1507.9$ ,  $df = 7$ ,  $p < 0.001$ ).

Results from the other cities (e.g. Menzel 1984, Romaniszyn 1984, Müller 1987, Wesołowska 1988, Piskorska 1992, Witt 1999) indicate significant differences in the nests exposition depending on the local conditions, including the micro-conditions near the particular walls (Bruch et al. 1978). A very important factor affecting the nest localisation are surely the winds (Fally 1987).

According to the meteorological data, in the period of the study in Poznań the winds from the west made about 40% of all kinds of winds (Farat 1996). The contribution of the nests placed on the walls of the west exposition was only 12.6%, while over 35% of the occupied nests were placed on the walls exposed to the south (Fig. 1).

### Direction of the nests' inlets

The distribution of the nests with inlets in particular directions was similar to that of their exposition (Fig. 1–2). A comparison of the data from the study plots C and P2 has shown that in the area of compact housing in which the nests were usually placed low (Table 2), the nests' inlets were more often directed to the west than in the study

plot P2, characterised by loose arrangement of higher houses. In the downtown area (C) narrow streets with houses at both sides make a protection against the wind, which thus ceases to make the birds avoid this direction. In the study plot P2, the houses are loosely arranged and do not protect against the wind, which forces the birds to avoid building nests on the walls exposed to the west and makes them choose those facing the south (Fig. 2).

According to Harmata (1980), in Kraków the majority of nests had inlets directed to the south and to the north, which the author related to the fact the dominant wind directions were from the west and north-west. The other authors report different relations (Romaniszyn 1984, Wesołowska 1988, Piskorska 1992).

### Nest colonies

In the whole area of study (CP) only 7 colonies of the House Martin were noted and all of them occurred in the downtown area (C). These colonies were made of from 5 to 10 occupied nests. The most of them had been observed earlier (Ptaszyk 1971). These colonies were found in more open sites, e.g. near the squares and open markets.

The fact that no nesting colonies were observed in the study plots P1 and P2 was related to the preferred nest-building in the corners of the window frames, which could host only one nest and building of a larger number of nests in the vicinity was impossible. Interestingly, in the study plots P1 and P2 a tendency was noted for the birds to build nests only in certain parts of the housing estates (only on certain buildings), irrespectively of the number of the House Martins in a given year.

Translated by M.Sc. Maria Spychalska

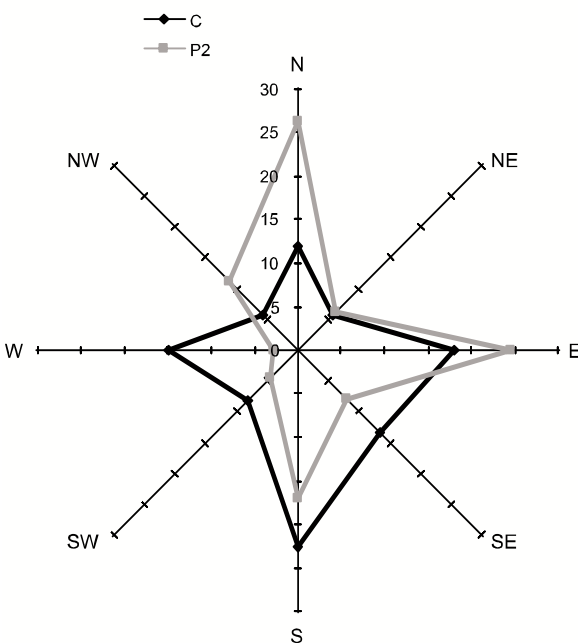


Fig. 2. The contribution of occupied nests (in %) whose inlets were made in particular geographical directions, in the study plots C ( $N = 1387$ ) and P2 ( $N = 318$ ).

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## STRESZCZENIE

**[Gnieźdzenie się oknówki w Poznaniu (1976–1978 i 1982–1989)]**

Inwentaryzację gniazd oknówek przeprowadzono na obszarze 1291.7 ha (CP) w Poznaniu ograniczonym ulicami: Lechicką, Naramowicką, Szelągowską, Ewangelicką, Marchlewskiego, Towarową, Zachodnią, Głogowską, Kolejową, Strusia, Wyspiańskiego, Reymonta, Grunwaldzką, Kraszewskiego, Kościelną, Poznańską, Pułaskiego, Obornicką, Szydłowską, Wojska Polskiego, Dojazd, Witosy i Piątkowską. Teren ten tworzyły trzy powierzchnie badawcze:

C — położona w centrum i w śródmieściu (599.0) pokrywająca się z terenem zbadanym w latach 1967–1969 (Ptaszyk 1971);

P1 — Winogrody (567.1 ha) — rejon kwartałów willowych i nowych osiedli mieszkaniowych położony poza zwartym śródmieściem, ograniczony ulicami: Armii Poznań, Obornicką, Piątkowską, Lechicką, Naramowicką i Szelągowską;



P2 — Winiary (125.6 ha) najbardziej peryferyjna powierzchnia z willami, nowymi osiedlami i lokalnie ze starą zabudową, wyznaczona ulicami: Obornicką, Szydłowską, Wojska Polskiego, Dojazd i Witosa do Piątkowskiej.

Najwyższe zagęszczenia stwierdzono w środowisku nowych osiedli mieszkaniowych (P1 i P2), gdzie wahały się w zakresie od 1.9 do 6.3 zajętych gniazd/10 ha (Tab. 1). Najmniejsze wahania liczebności par lęgowych stwierdzono na powierzchni śródmiejskiej (C), na której zagęszczenia wahały się od 2.1 do 3.0 zajętego gniazda/10 ha (Tab. 1). W latach 1982–1986 dla obszaru (CP) średnie zagęszczenie wynosiło 4.16 ( $\pm$  0.53) zajętego gniazda/10 ha. Oknówki umieszczały gniazda na wysokości od parteru do XIV piętra włącznie (Tab. 2). W śródmieściu (C), gdzie występowała niska zabudowa, oknówki budowały gniazda do wysokości IV piętra włącznie, jednak najwięcej gniazd było na parterze i pod balkonami (Tab. 2 i 3). Na obszarach z nowymi blokami mieszkalnymi (P1 i P2) ponad 96% ogółu zajętych gniazd było umieszczonych w narożnikach okiennych (Tab. 3).

Oknówki na całym badanym obszarze (CP) umieszczały gniazda głównie na ścianach o wystawie południowej (35,2%) oraz północnej i wschodniej (łącznie około 40 %), natomiast unikały ścian o ekspozycji zachodniej (Fig. 1).

Kierunki umieszczenia otworów gniazdowych badano tylko na powierzchniach C i P2 (Tab. 5): na powierzchni C dominowały gniazda z otworami

skierowanymi na południe (22.5%), a na powierzchni P2 — na północ (26.1%) i wschód (24.5%). Na śródmiejskiej powierzchni (C) blisko 15% gniazd miało otwory gniazdowe skierowane na zachód mimo, iż w Poznaniu z tego kierunku najczęściej wieją wiatry. Prawdopodobnie gęsta i mało zróżnicowana pod względem wysokości zabudowa tłumiała w śródmieściu siłę wiatru przez co nie docierał on ze znaczną siłą do wnętrza gniazd. Na powierzchni P2, gdzie oddalenie budynków nie ograniczało oddziaływania wiatru, tylko wyjątkowo otwory gniazdowe były skierowane w zachodnią stronę (Fig. 2).

W latach 1977–1978 udział gniazd oknówek zasiedlanych przez wróbla wynosił średnio 5.4% ogółu gniazd, natomiast w latach 1982–1986 był niższy i wynosił średnio 2.6% (Tab. 1).

W 12 przypadkach stwierdzono, że wróbel zasiedlał gniazda oknówek od kilku lat niezamieszkałe lub gniazda nowo zbudowane. Być może, tym sposobem wróble unikają pasożytów gniazdowych pochodzących od oknówek.

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*T. Cofta*