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THE BIRDS OF BYDGOSZCZ, POLAND 1990-1995

PTAKI MIASTA BYDGOSZCZY W LATACH 1990-1995

Piotr Indykiewicz[*] & Roman Kucharski
Maciej Korczyński[**]

* Katedra Zoologii Wydział Zootechniki Akademii Techniczno-Rolniczej, ul. Ks. A. Kordeckiego 20, 85-225 Bydgoszcz, Polska
** Katedra Botaniki i Ekologii Wydział Rolny Akademii Techniczno-Rolniczej, ul. Kaliskiego 7, 85-796 Bydgoszcz, Polska

According to the observations made from 1990 until 1995, it was concluded that the birds of the Bydgoszcz area (58,07 N, 18.03 E) consisted of a total of 145 species. These included 114 breeding species, 61 wintering species and a further 68 species recorded on passage. The number of species recorded in 11 districts (total area 26 km^2) ranged from 15 to 95. In the most selected building ground types (exc. up-town quarters), higher species diversity was recorded than in some other towns of Poland.

During the last 60 years (1936-1995) the number of recorded species increased from 77 to 145 and three species disappeared altogether. Above modifications are therefore the result of a). demographic changes, b). structural and spatial town modifications and thus differences in a range of the study areas and their structure, c). initiation and intensification of urbanization, d). degradation of the suburban natural environment, e). improved ornithological coverage and observations.
KEY WORDS: *birds, avifauna, birds of town*

1. Introduction

The present achievements of the Polish investigations on the subject of urban birds is a result of special interest, on the subject for last 50 years. This period was initiated by Szarski's (1955) works on birds of Wrocław and numerous other publications made after the suggestions of the Department of Natural Protection (Luniak 1977). Other works were undertaken on the birds of Kraków (Ferens 1957), Wrocław (Przybyła and Szarski 1957), Lublin (Riabinin 1959) and about the birds of the park areas of Poznań (Sokołowski 1957) and Toruń (Dubicka 1957, Strawiński 1963). During the next 15 years further articles on the subject were also published. Other examples worthy of mention are those on the birds of Łódź (Graczyk 1962, Jankowski 1967), Toruń (Strawiński 1963), Warszawa (Luniak, Kalbarczyk, Pawłowski 1964), Bielsko Biała (Rakowski 1965) and Olsztyn (Okulewicz 1971).

A further advancementin the study of town birds was initiated by Tomiałojć (1970), who described the birds of Legnica based on numeric data from recording areas in different town habitats. Up until 1986, 30 articles were published about the birds of 25 towns and their respective areas (parks, gardens and river banks), (Luniak, Głażewska 1987). These were, for example, articles about the birds of Darłowo and Sławno (Górski, Górska 1974), Poznań and Koszalin (Górski, Górska 1979, 1980, Winiecki 1980), Września (Lewartowski 1976) and Siedlce (Luniak 1972, Krzyżańska 1986) as well as a more recently published article about the birds of Lublin (Biaduń 1989) and Częstochowa (Czyż & Królikowski 1990). But there has been no such worki undertaken in Bydgoszcz as yet. During the interwar period Keller (1934) published a short document which presented the list of species of the birds of Bydgoszcz and its surroundings. It was supplemented with a few species added by Skuratowicz (1937) but both publications were contributory by nature. As Skuratowicz (1937) wrote in his article *„this list* [of birds] *is not complete as records were collected during accidental trips, but not in periods of lengthier walks".*

2. Description of investigation area

2.1. Natural conditions of Bydgoszcz

The town of Bydgoszcz (58.07 N, 18.03 E), is located along the lower run of the Brda river, that flows through the Toruńska Valley. This valley is on the route of anisotropic plant migration, which took part from the post-glacial period up to

the present time. Suburban regions of the are included into neighbouring mezo-regions: the Fordońska Valley, the Świecka Upland and the Brda Valley (Walas 1973, Kondracki 1980).

The sculpture of the earth's surface in this area was determined by the Brda river terraces, however the original landscape was eroded away to a significant extent by post glacial meltwater (Jankowski 1975). Many inner city investment zones have been located entirely amongst these post glacial terraces (I-V). From the pre-glacial stream valley terrace at the north part of the town, the VI-th wooded terrace is visible. Further, the strongly undulated slope of the Świecka valley rises up to an altitude of 40 m. This is also the southern part of the Nadwiślański Landscape Park Group.

Sharp flexion, furrowed by ravines, is the border between post-glacial terraces and proglacial stream valley terraces at the south part of the town. Snady XI-th terrace spread out behind.

The lower most are regions of the Brda river estuary (alt. 29.2 m), the center of the city is at altitude of 40-50 m whereas southern districts are at a height of 70 m. Upper Fordon terrace is spread out at a level of more than 90 m (Jankowski 1975).

The local climate of Bydgoszcz has become a city climate. Despite the thermic inversion resulting from the town being located in a valley, the average temperature in the middle is higher than the upland – average temperature from 1931-1969 is higher ca. 0.3°C (Wiszniewski 1971). Decreased frequency of stronger winds as well as the increase of calm periods and dryer air stagnation in the middle of the city were also observed (Hohendorf, Domański 1966, Hohendorf 1969, 1974).

In a geobotanic way Bydgoszcz is located on the border of two great spatial units – it is at the subdivision of the Littoral Plain Belt and Pomeranian Upland, as well as the subdivision of the Great Valley Belt. The main part of town is included into Wielkopolsko-Kujawska Province (Szafer 1971).

At present, most of the town forest plant communities are fresh forests (*Peucedano-Pinetum)* and subboreal mixed forests (*Serratulo-Pinetum).* Near water-flow at the edge of Świecka Valley and partly along the Brda river swampy meadows occur: *Circaeo-Alnetum* and, rarely, *Ficario-Ulmetum.* At the north part of the town, on clay soils small parts of mid european forests (*Galio-Silvatici-Carpinetum)* and modified brightoak woods (*Potentillo albae-Quercetum*) occur (Korczyński 1994).

Water plant communities exist mainly in artificial water reservoirs. Most of these are flooded peat, clay and gravel excavations. The largest water reservoirs are recreation lakes in Myślęcinek and cinder – path in Brdyujście. Indigenous

high rushes (*Phragmitetum, Typhetum angustifoliae, Typhetum latifoliae)* grow along river banks and *Myriophylletum spicati* on the bottom. Typical rushes *(Glycerietum maximae)* grow along the Brda river banks. In water, some communities resistant to pollution and salinity grow – *Potamogetonetum pectinati* and *Sagittario-Sparganietum emersi.*

Since 1920 rapid expansion and development of Bydgoszcz has taken place. Until 1920 the town covered an area of 8,45 km^2 and was settled by nearly 55.000 citizens. Together with suburban districts there were no more than 100.000 people in Bydgoszcz. Presently, Bydgoszcz covers the area of 174.48 km^2 and is settled by more than 382.000 citizens (Licznerski 1971, Wajda 1991), (Fig. 1).

Developed and built up areas lie along the Brda river as a strip more than 20 km long and are up to 8 km wide. The composition and structure of the town is as follows: industry and transport – 27.9 %, multi – family housing – 4.0 %, single – family housing – 6.0 %, services – 2.9 %, squares, parks and cemeteries – 4.2 %, gardens – 2.4 %, agriculture – 14.6 %, woods – 26.1 %, water – 3.9 %, unimproved areas – 8.0 % (Fig. 2).

Industrial areas are located mainly at the east and south-east part of the town, whereas the agricultural regions of highest productivity are in Łęgnowo and Łoskoń. Poor soils lie fallow and are very obvious on unimproved, agricultural areas.

2.2. Districts description

Smukała and **Opławiec** consist of large buildings, surrounded by mixed young woodland. The Brda river is the focal point here, with its barrier-resorvoir. Built up areas are separated from forests by high (to 20 m) upland slopes.

Jachcice – a practically unsettled belt along the Brda river. This part of the river is surrounded with a narrow, ripped belt of *Caricaeo-Alnetum.* Further, extensive meadows and abandoned fields spread out. Buildings appear beyond the culmination of the river slope.

Osowa Góra – is a mainly range building district with small gardens around its houses. The Central part of the district is covered with strongly modified dry forest, whereas on the west siede – ponds grown over with *Typhetum angustifoliae* are found.

Miedzyń – a district of range and single buildings on the south slope. High verdure is limited only to the trees near houses. Poorly spontaneous plant communities.

The above districts are situated to the west side of tawn and there is a very low settlement ratio (73 citizens per 1 ha of net living area).

Śródmieście – is the most settled of all the towns regions (more than 350 citizens per 1 ha of net living area). Here there are typical urban compact buildings, together with a few green areas (mainly city parks) not greater than 6.5 ha (Wincenty Witos Park). The sometimes winding Brda river crosses Śródmieście with its crosses Śródmieście with its strenghened banks, at this point.

Szwederowo – a district of differant spatial structure. Apart from many old, extensive buildings, some high new tower block squares also appear. There is a narrow belt of ponds along the stream at the northern part of the district.

Wyżyny and **Kapuściska, Skrzetusko** and **Bartodzieje** – districts were developed before the end of the 1970's. Among the housing blocks are found poor grassy communities and other small enclaves of single storey buildings. On Bartodzieje – is a small water reservoir (old clay-pit), now used for recreation purposes, with a narrow belt of *Phragmites australis.*

Łęgnowo – is an agricultural district with the most fertile soils in the study area. Narrow building belts along few roads. On the west side fields pass to wet meadows and osier beds.

Fordon – this is the largest of all the town districts. It is different in as much as it is divided by two terraces: upper and lower. The first of these is an open, post-agricultural area covered with sandy grasses at the initial stage of succession. The second or lower terrace is an intensive housing estate which was created in the 1980's. Among these buildings further grassy areas occur, in amoangst which other plant communities with *Tanacetum vulgare* and *Calamagrostis arundinacea* are also found. The southern part of lower terrace is rather poorly wooded. Partly flooded clay excavations covered with *Phragmites australis* occur, as do scrub areas dominated by Pinea and bushes of *Robinia pseudoacacia.* Additionally there are large areas of species poor rough grassland. Along the near by Wisła river, narrow belts of osier-beds and wet meadows with *Phalaris arunndinaceua* also occur.

Myślęcinek – largely consists of a southern exposure forested area along the Świecka upland slope (relative height – up to 40 m). This lope is covered with mixed woodland dominated by Beech and Lime.

3. Material and methods

Observations were taken on eleven selected monitoring areas (the total area – 26.02 km^2 – i.e. 14.91 % of the town area) representing parts of the following

districts: Smukała, Opławiec, Jachcice, Osowa Góra, Miedzyń, Szwederowo, Śródmieście, Kapuściska, Wyżyny, Łęgnowo I, Łęgnowo II, Fordon, Skrzetusko, Bartodzieje i Myślęcinek. Where some ot the recorded areas included parts of neighbouring districts, common names were given to them: Smukała/Opławiec, Kapuściska/Wyżyny, Skrzetusko/Bartodzieje, Łęgnowo (Fig. 1).

To compare the species composition of bird groups, the Sorensen index was used in a method given by Głowaciński (1975).

In instances when the numeric value of the above index range fluctuated from 60 % – 80 % compared bird groups were recognized as significantly similar. This was also applied for index values higher than 80 % (Tomiałojć 1970). For ranges lower than 40 % – bird groups were recognized as different (Górski 1982). The information on bird status has been arranged according to the scale used for the purposes of the Atlas of the birds of Poland (Instrukcja PAO 1986).

Most of the data and information for the above article was unfortunately collected in an unsystematic way, especially during the period from 1992 to 1995, far fewer records were obtained between 1990 and 1991. This and other factors have meant that there was a lot of data and information but not in a sufficient form to be able to make accurate comparisions. However, the authors still believe that this paper may play a very important role as a source of information for further more detailed studies.

In this work some results of observations were used after: J. Zieliński, K. and J. Podgóreczny, J. Lema, F. Racinowski and R. Kriger. We would like to thank them for the above results.

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4. Results and discussion

4.1. Avifauna of Bydgoszcz town 1990-1995

Based on previous information and data collected from 1990 to 1995, it was concluded that the avifauna of Bydgoszcz consisted of 145 species, representing, 17 orders and 44 families. More than falf of the species observed (n = 83 i.e. 57 %) belong to the same order *Passeriformes*. Nearly 1/3 belong to *Anseriformes* (15 species), *Charadriformes* (13 species), *Piciformes* and *Accipiteriformes* (6 species each) as well as *Columbiformes* (5 species). A further, 11 orders are represented by only or three species. Among the bird species recorded within the border of the town of Bydgoszcz 114 species were found to be breeding birds; 61 – to wintering birds and 68 – were passage migrants (Tab. 1).

During the whole year 44 species are resident in the town. They are as follows: *Tachybaptus ruficollis, Ardea cinerea, Cygnus olor, Anas platyrhynchos, Aythya fuligula, Bucephala clangula, Mergus merganser, Accipiter nisus, Perdix perdix, Phasianus colchicus, Gallinula chloropus, Fulica atra, Larus canus, Larus argentatus, Alcedo atthis, Picus viridis, Dryocopus martius, Dendrocopos major, Dendrocopos minor, Troglodytes troglodytes, Erithacus rubecula, Turdus merula, Turdus piliaris, Parus palustris, Parus montanus, Parus cristatus, Parus ater, Parus caeruleus, Parus major, Sitta europea, Certhia brachydactyla, Garrulus glandarius, Pica pica, Corvus monedula, Corvus frugilegus, Corvus corone, Corvus corax, Passer domesticus, Passer montanus, Fringilla coelebs, Carduelis chloris, Carduelis carduelis, Coccothraustes coccothraustes, Emberiza citrinella.*

Of these, only six species were found to be wintering and were not recorded in other seasons. Winter species were as follows: *Anas crecca, Clangula hyemalis, Buteo lagopus, Cinclus cinclus, Lanius excubitor, Carduelis flammea* (Tab. 1).

It was proved that within the town borders 145 bird species were observed (breeding, wintering and migrating birds). In particular districts numbers of recorded species range from 19 to 95. The highest annual total (95) was recorded in Smukała/Opławiec, followed by Myślęcinek and Łęgnowo (75 species).

The lowest species totals were recorded in the following districts: Szwederowo (19), Kapuściska/Wyżyny (25), Bartodzieje/Skrzetusko (27), (Fig. 3).

The differences in annual bird species diversity between districts were determinated by several factors, though especially by the number of breeding species. The above result was not significantly affected by wintering birds since the number of species recorded during the winter in most of the districts ranged from only 3 to 18. It should be mentioned however that there were exceptions; these were Smukała/Opławiec and Łęgnowo where significantly greater number of wintering and breeding bird species were recorded with totals of 43 and 33 species respectively (Tab. 2).

Moreover, species diversity of breeding birds from different districts were affected by variegated biotype structure and different levels of development. The following discussion supports the above conclusions. On all the recorded areas nearly similar numbers of breeding bird species were recorded (i.e. 22 – 29 species), (Strawiński 1971, Luniak, Głażewska 1987). Exceptions being: Szwederowo, Kapuściska/Wyżyny and Skrzetusko/Bartodzieje where only 13 – 15 „town" breeding bird species were recorded (Tab. 2).

So, we can accept that in each district breeding „town" birds were a constant element of avifauna whereas species diversity was affected by species from other groups. Further, it was concluded that in typical suburban districts (residental

buildings, gardens, fragments of pine wood etc.) i.e. Osowa Góra and Miedzyń (QS = 81; tab. 3) specific gropus of birds occurred, consisting of 41 breeding species (exc. 29 „town" species).

The same group, on wide area of mixed wood and dry forest i.e. Myślęcinek, consisted of 43 breeding species (exc. 29 „town" species; tab. 3). In Smukała/Opławiec, Jachcice and Łęgnowo (QS = 61–64; tab. 3) with its prevailing open landscape element for example the Brda river, fresh wood, wet meadow and osier-beds, specific groups of bird species consisted of 72 breeding species (exc. 29 „town" species). On the other hand in typical town districts the number of specific species was nuch lower. In the Fordon district, an area of large housing blocks with areas of poor pine wood and a lot of post-agricultural open areas with different ruderal plant communities and small water reservoirs (stream and clay-excavation), specific groups of species consisted of 21 breeding birds (exc. 25 „town" species). On the contrary in Śródmieście, a district of residential type duildings with relatively few green areas and the Brda river, only 10 species enter the specific group (exc. 24 „town" birds).

In other districts i.e. Szwederowo, Skrzetusko/Bartodzieje and Kapuściska/Wyżyny, with large buildings and small green areas specific groups consist of, respectively: 3, 5 and 6 breeding species (exc. 13 and 15 „town" birds).

As it was mentioned above, specific and constant element of the avifauna in the districts, were birds known to be typical of town buildings (Strawiński 1971, Luniak, Głażewska 1987). In Bydgoszcz, amongst developed areas, between 30 and 70 breeding species were recorded (Tab. 4) depending on the district, whereas in other Polish towns 52 breeding bird species were confirmed (Luniak, Głażewska 1987). The latter total consists of: 34 species from table 4, and 18 species recorded only from 1 or 2 areas – which according to Luniak and Głażewska (1987) allow us to treat them as not a typical element of birds in the town. Using the above criteria it was concluded that the breeding avifauna of Bydgoszcz is represented by 30 of the 32 species of town birds found in other Polish towns. The only two species, not confirmed in Bydgoszcz were *Hirundo rustica* and *Muscicapa striata* (Tab. 5). It should also be emphasized that in most of the selected types of town buildings (exc. residential estates), much higher species diversity was recorded than in other Polish towns. For example, in younger residential districts (less than 20 years) breeding birds were represented by 22 species, whereas in other towns – from 4 to 13 (average – 9 species) were recorded. In older residential districts (more than 20 years old) 21 species of breeding birds were recorded in Bydgoszcz, whereas in other towns – from 7 to 18 (average – 14 species). Higher species

diversity was also recorded in older street-type residential areas. In other towns this group of bird species was represented by 8 – 22 species (average – 13) whereas in Bydgoszcz 24 species were recorded (Tab. 5). Lower species diversity in comparison with the national average was recorded only in residential estate districts. Groups of town bird species were represented by 26 species in Bydgoszcz by comparison with 9 – 23 species in other Polish towns. In residential estate districts in Bydgoszcz we did not record the following breeding birds: *Corvus monedula, Streptopelia decaocto, Apus apus, Delichon urbica, Hippolais icterina* and *Hirundo rustica*. It should also be added that in Bydgoszcz like in other Polish towns, the number of bird species nesting in buildings was the same. Only in younger residential housing districts were 2 additional species recorded in Bydgoszcz (Tab. 5). Close contact with plants was not necessary for the presence of the above bird species.

4.2. Changes in avifauna of Bydgoszcz in 1929-1995

To carry out a full estimation and study of the way birds have changed in Bydgoszcz from 1929 to 1955, especially changes accompanied with the withdrawl of certain bird species from the town area is extremely difficult. The main reason is the lack of data on the number and density of birds in the same periods for comparision purposes. Another, very important factor is a difference in administration borders of former and present Bydgoszcz, that cause differences in size of investigated areas by Keller (1934) or Skuratowicz (1937) and present ornithologist. For these reasons we can only disscuss the changies of avifauna in the town as a whole without detailed analyses of birds concerned with its comparable previous and nowadays areas.

It should be mentioned, however, that among 77 species recorded in the Bydgoszcz area from 1927 to 1936 (Keller 1934, Skuratowicz 1937) only three of them were not currently confirmed, i.e.: *Crex crex, Luscinia svecica* and *Coracias garrulus* (Tab. 1). It is to be emphasized also that in the mid-war period only a few and separated breeding sites of *Coracias garrulus* in Pomorze and Wielkopolska were known (Hammling 1929, 1933, Robien 1938, 1939, Sokołowski 1936). Presently this species is in the Polish Red Data Book of Animals as an endangered species (Głowaciński 1992).

It is possible and appropriate to provide an analysis of changes in species diversity around the edge of the town of selected bird groups (breeding and wintering species).

The avifauna of Bydgoszcz during the mid-war period consisted of 77 species from 12 orders and 29 families (Keller 1934, Skuratowicz 1937). But in the first haft of the 1990's the above number was nearly doubled. Presently, as was mentioned above 145 bird species from 17 orders and 44 families were recorded in Bydgoszcz (Tab. 6).

The most interesting thing is an increase in the number of breeding species. At the end of the 20's – and during the first five years of the 1930's – (1927-1936) there were only 45 breeding bird species recorded in Bydgoszcz (33 species – confirmed breeding, 12 species where – breeding was unknown). Now, 145 breeding species have been recorded (Tab. 1). Significant increase of the number of breeding species was recorded in the following orders: *Passeriformes* (19 species more), *Charadriiformes* (6 species more), *Columbiformes* (5 species more). It should be emphasized that nearly all the species recorded by Keller (1934) and Skuratowicz (1937) both the breeding species (45) and occasional, observed species (14) belong prsently to the group of nesting town species. The only exceptions were: *Upupa epops, Fringilla montifringilla, Pyrrhula pyrrhula.* During Keller's observations the first two species previously mentioned were recorded very rarely (occasionally). Only *Pyrrhula pyrrhula* was known to have bred. Presently *Upupa epops* is observed only during migration, and *Fryngilla montifringilla and Pyrrhula pyrrhula* are winter birds.

An increase in the number of breeding and wintering bird species found in Bydgoszcz during the 1927-1995 period, is a result of many factors, of which the most important are:

- reasons of zoogeographic nature (*Streptopelia decaocto, Larus argentatus),*
- structural and spatial town modifications (*Larus ridibundus, Larus marinus*),
- initiation and intensification of urbanization on some bird species (*Corvus monedula, Columba palambus, Streptopelia turtur*),
- degradation of suburban natural environment (*Galerida cristata, Motacilla alba*),
- intensification of ornithological observations etc.
- differences in a range of the study areas and their structure.

Some examples of the above factors that have caused changes in the number of bird species in Bydgoszcz are given below:

Columbiformes

- *Streptopelia decaocto* – the orginal expansion into Poland was only recorded from 1940 (Nowak 1965, Górski 1989) so it was not possible either for Keller nor Skuratowicz to record that species;

- *Streptopelia turtur* – breeding sites were rarely recorded from Bory Tucholskie by Dobbrick (1912) and from Pomorze by Robien (1928), Lenski (1934). An increase in the number of records has been recorded since the 1980's (Przybysz 1983, Bednorz 1983). First accidental flying records into suburban regions of Toruń were recorded at the end of the 50's (Strawiński 1963).
- *Columba palumbus* – at the time a rare breeding species. Only in the 1940's and the 1950's was it recorded near Bydgoszcz. In Toruń it was recorded by Strawiński (1963).

Charadriformes

- *Tringa ochropus* – between 1963-1982 the species was seen near Bydgoszcz, but only on passage (observations by Kotlarz, Jesionowski, MS [in:] Tomiałojć 1990 : 200);
- *Larus canus* – to the end of the 50's observed only as a passing bird and in winter near Toruń (observations by Tomiałojć, Nitecki [in:] Tomiałojć 1990 : 216);
- *Larus argentatus* – first breeding evidence recorded in Poland by Bednorz (1971) near Łebsko Lake in 1968. It was occasionally observed near Świecie and Toruń in winter seasons between 1979-1983. From Bydgoszcz to Solec Kujawski alaong the Wisła river some, mainly young individuals, (small groups of 20 – 25 birds) were observed in winter from 1979 to 1983 (observ. Bagiński, Kotlarz, Jeleński [in:] Tomiałojć 1990: 219);

Passeriformes

- *Prunella modularis* – already at the end of the XIX century it was a numerous speces in Pomorze (Borggreve 1869, Holland 1871), but large increase in abundance was recorded in the mid-war period (Robien 1928). However, it was not recorded either in Bydgoszcz nor in Toruń (Strawiński 1963).
- *Remiz pendulinus* – after the last World War a constant and rapid increase in abundance was observed in Poland (Tomiałojć 1990). Nesting in Toruń was recorded in 1953-1954 (Dubicka 1955, Graczyk 1955);
- *Emberiza schoeniculus* – first records from Toruń come from the spring passage in 1954 however near the Wisła the species was a rather numerous bird (Strawiński 1963).

Another reason why Keller (1934) and Skuratowicz (1937) did not record some species could be due to insufficient knowledge of biology as well as diagnostic traits. Examples could be as follows:

- *Luscinia luscinia* – Keller (1934) does not state the exact name of the species of nightingale in Bydgoszcz but does indicate that the nightingale is „more frequent in town parks and gardens even in the city and near main streets". Skuratowicz (1937) recorded that only *Luscinia megarhynchos* could be found

in Bydgoszcz. However in the 1950's only *Luscinia luscinia* was recorded from Toruń and both species of the above genus from Ciechocinek (Strawiński 1963). Such possible inconsistency in recording may be as a consequence that until the 1940's the western range of this species crossed from Szczecin along the Noteć river and then due south through Nakło, Żnin (Sokołowski 1936, 1962; Stresmann 1948, Schendzielorz 1933),

- *Certhia brachydactyla* – according to Tomiałojć (1990) the few records of this species in some places may be due to the „considerable lack of familiarity of both its call and song".
- *Columba livia* – Glutz, Bauer and Bazel (1980) confirm, that the town form of this pigeon is synantropic population of the rock-pigeon but an earlier town population of pigeons was recognized as having arrived from housed pigeons that had escaped from capitivity. So, some authors of previous publications about birds found in towns ignored some of the above species (Luniak, Głażewska 1987).

5. Conclusions

According to observations taken in Bydgoszcz during 1990-1995 it was concluded as follows:

- the avifauna of Bydgoszcz consist of 145 bird species from 17 orders and 44 families with: 114 breeding species, 61 wintering species and 68 migrating species;
- the number of species recorded averaged from 19 (Szwederowo) to 95 (Smukała/Opławiec);
- throughout the year species diversity of the towns birds in particular districts were affected by the number of species which began breeding, as well as by variegated biotype structure and urban development;
- a constant element of the avifauna of all districts was a group of bird species typical to urban building areas;
- in most of the selected building types (exc. residence estate) nuch higher species diversity (21 – 24 breeding species) in comparison with orher Polish towns were recorded.

Further, it was also concluded that:

- during the last 60 years (1936-1995) the number of town bird species in Bydgoszcz increased from 77 to 145, at the same time three species disappeared (*Crex crex, Luscinia svecica* and *Coracius garrulus);*

- greater increase in the number of breeding birds (from 45 to 114) during the last 60 years was recorded among *Passeriformes* (19 species), *Charadriiformes* (6 species), *Columbiformes* (5 species);
- nearly all breeding and occasional species observed from 1927 to 1936 presently belong to breeding town bird spacies (exc. *Upupa epops, Fringilla montifringilla, Pyrrhula pyrrhula);*
- an increase in the number of breeding and wintering bird species in Bydgoszcz during 1927-1995 period is a result of the following: reasons of geographical distribution; structural and spatial town modifications; initiation and intensification of urbanization of some bird species; degradation of suburban natural environment (spatial reduction, antropogenical environment changes, sandbanks formation in the Wisła river as a result of water-level lowering).

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PTAKI MIASTA BYDGOSZCZY W LATACH 1990-1995

Streszczenie

Bydgoszcz (53°07'N, 18°03'E) jest miastem o powierzchni 174,48 km^2 położonym wzdłuż dolnego odcinka rzeki Brdy i zamieszkiwanym przez 382 tys. osób. Obszary zainwestowane miasta położone są wzdłuż rzeki i ciągną się na odcinku ponad 20 km pasem do 8 km szerokości. Tereny przemysłowe i komunikacja zajmują 27,9 % powierzchni miasta; mieszkalnictwo wielorodzinne – 4,0 % mieszkalnictwo jednorodzinne – 6,0 %; skwery, parki i cmentarze – 4,2 %; ogrody działkowe – 2,4 %; uprawy – 14,6 %; lasy – 26,1 %; wody powierzchniowe – 3,9 % (Rys. 2).

Materiał fotograficzny do niniejszego opracowania zgromadzono w latach 1990-1995, prowadząc obserwacje na powierzchniach próbnych (o łącznej powierzchni 26,02 km^2, co stanowi 14,9 % powierzchni miasta) obejmujących reprezentatywne części następujących dzielnic: Smukała, Opławiec, Jachcice, Osowa Góra, Miedzyń, Szwederowo, Śródmieście, Kapuściska, Wyżyny, Łęgnowo I i II, Fordon, Skrzetusko, Bartodzieje i Myślęcinek (Rys. 1).

Na podstawie przeprowadzonych obserwacji stwierdzono, że awifaunę Bydgoszczy stanowi 145 gatunków ptaków (reprezentujących 17 rzędów i 44 rodziny), w tym: 114 gatunków lęgowych, 61 gatunków zimujących i 68 gatunków przelotnych. Ponad połowa awifauny miasta (83 gatunki) należy do rzędu *Passeriformes* (Tab. 1).

Liczba gatunków stwierdzonych w poszczególnych dzielnicach wahała się od 19 do 95. Największą różnorodność awifauny w ciągu roku stwierdzono w Smukale/Opławcu, odnotowując tam 95 gatunków oraz w Myślęcinku i Łęgnowie (po

75 gatunków). Najmniejsza natomiast różnorodność gatunkowa była cechą właściwą takich dzielnic, jak: Szwederowo, gdzie odnotowano 19 gatunków, Kapuściska/Wyżyny (25 gatunków) i Bartodzieje/Skrzetusko (27 gatunków) (Rys. 3). O tak ustalonej hierarchii całorocznej różnorodności gatunkowej awifauny pomiędzy dzielnicami decydowała przede wszystkim liczba gatunków ptaków przystępujących do lęgów, mozaikowatość struktury biotopowej oraz stopień inwestycji urbanistycznych (Tab. 3).

Stałym elementem awifauny wszystkich dzielnic były ptaki uznawane za gatunki typowe dla miejskiej zabudowy (Tab. 2). W większości wyróżnionych typów zabudowy (poza dzielnicami willowymi) stwierdzono, w porównaniu z innymi miastami Polski, znacznie wyższą różnorodność gatunkową (21-24 gatunki lęgowe) (Tab. 5).

W ostatnich 60. latach (od 1927-1936 do 1990-1995) w składzie awifauny Bydgoszczy odnotowano istotne zmiany jakościowe. W okresie tym nastąpił niemal dwukrotny wzrost liczby gatunków (z 77 do 145), przy jednoczesnym ustąpieniu trzech gatunków, tj.: *Crex crex, Luscinia svecica* i *Coracias garrulus* (Tab. 1). Największy wzrost gatunków lęgowych (z 45 do 114) stwierdzono wśród *Passeriformes* (o 19 gatunków), *Charadriiformes* (o 6 gatunków) i *Columbiformes* (o 5 gatunków) (Tab. 6). Niemal wszystkie gatunki lęgowe i sporadycznie obserwowane w latach 1927-1936 obecnie należą niemal wyłącznie do awifauny lęgowej miasta. Wyjątek stanowią, jedynie *Upupa epops, Fringilla montifringilla* i *Pyrrhula pyrrhula.*

Wzrost liczby gatunków lęgowych i zimujących na obszarze Bydgoszczy w latach 1927-1995 spowodowany jest m.in.: przyczynami o charakterze zoogeograficznym; zmianami strukturalnymi i przestrzennymi miasta; zapoczątkowaniem (lub zintensyfikowaniem) procesu urbanizacji określonych gatunków ptaków, a także degradacją środowiska podmiejskiego (ograniczenie przestrzenne i zmiany antropogenne w siedliskach, tworzenie się mielizn i łachów na Wiśle w wyniku obniżenia poziomu lustra wody), a także zintensyfikowaniem penetracji ornitologicznej.

Table 1. Avifauna of Bydgoszcz in 1990-1995
Tabela 1. Awifauna Bydgoszczy w latach 1990-1995

No. Lp.	Species Gatunek	Species status Status gatunku		
		Breeding Lęgowy	Wintering Zimujący	Migrating Przelotny
1	2	3	4	5
1	* *Tachybaptus ruficollis*	+	+	+
2	*Podiceps cristatus*	+		+
3	*Phalacrocorax carbo*	+		+
4	* *Ardea cinerea*	+	+	+
5	*Ciconia ciconia*			+
6	*Cygnus olor*	+	+	+
7	*Cygnus cygnus*			+
8	*Anser fabalis*			+
9	*Anser albifrons*			+
10	*Anser anser*			+
11	*Anas crecca*		+	
12	* *Anas platyrhynchos*	+	+	+
13	*Anas acuta*			+
14	*Netta rufina*			+
15	*Aythya ferina*	+		+
16	*Aythya nyroca*			+
17	*Aythya fuligula*	+	+	+
18	*Clangula hyemalis*		+	
19	*Bucephala clangula*	+	+	+
20	*Mergus merganser*	+	+	+
21	*Haliaeetus albicilla*		+	+
22	*Circus aeruginosus*			+
23	* *Accipiter gentilis*	+		+
24	*Accipiter nisus*	+	+	+
25	* *Buteo buteo*	+		+
26	*Buteo lagopus*		+	
27	*Falco tinnunculus*	+		+
28	**Perdix perdix*	+	+	
29	*Phasianus colchicus*	+	+	
30	**Gallinula chloropus*	+	+	+
31	**Fulica atra*	+	+	+
32	*Grus grus*			+
33	*Charadrius dubius*	+		+
34	*Vanellus vanellus*	+		+
35	*Gallinago gallinago*			+
36	*Numenius arguata*			+
37	*Tringa erythropus*			+
38	*Tringa ochropus*	+		+

39	*Actitis hypoleucos*	+		+
40	*Larus ridibundus*		+	+
41	*Larus canus*	+	+	+
42	*Larus argentatus*	+	+	+
43	*Larus marinus*		+	+
44	*Sterna hirundo*	+		+
45	*Columba livia*	+	+	
46	*Columba oenas*	+		
47	*Columba palumbus*	+		
48	*Streptopelia decaocto*	+	+	
49	*Streptopelia turtur*	+		
50	**Cuculus canorus*	+		
51	*Strix aluco*	+	+	
52	**Asio otus*	+		
53	*Caprimulgus europaeus*	+		
54	**Apus apus*	+		+
55	**Alcedo atthis*	+	+	+
56	**Upupa epops*			+
57	**Jynx torquilla*	+		
58	**Picus viridis*	+	+	
59	**Dryocopus martius*	+	+	
60	**Dendrocopos major*	+	+	
61	*Dendrocopos medius*	+		
62	*Dendrocopos minor*	+	+	+
63	**Galerida cristata*	+		+
64	*Lullula arborea*	+		
65	**Alauda arvensis*	+		+
66	**Riparia riparia*	+		+
67	**Hirundo rustica*	+		
68	**Delichon urbica*	+		
69	* *Anthus trivialis*	+		
70	*Anthus pratensis*	+		+
71	*Anthus spinoletta*			+
72	**Motacilla flava*	+		
73	**Motacilla alba*	+		
74	*Bombycilla garrulus*		+	+
75	*Cinclus cinclus*		+	
76	**Troglodytes troglodytes*	+	+	
77	*Prunella modularis*	+		
78	**Erithacus rubecula*	+	+	
79	*Luscinia luscinia*	+		
80	**Luscinia megarhynchos*	+		
81	**Phoenicurus ochruros*	+		
82	**Phoenicurus phoenicurus*	+		
83	**Saxicola rubetra*	+		
84	**Oenanthe oenanthe*	+		+

85	**Turdus merula*	+	+	
86	**Turdus pilaris*	+	+	+
87	**Turdus philomelos*	+		
88	*Turdus iliacus*			+
89	*Turdus viscivorus*			+
90	*Locustella naevia*	+		
91	*Locustella fluviatilis*	+		
92	*Acrocephalus palustris*	+		
93	*Acrocephalus scirpaceus*	+		
94	*Acrocephalus arundinaceus*	+		
95	**Hippolais icterina*	+		
96	**Sylvia nisoria*	+		
97	**Sylvia curruca*	+		
98	**Sylvia communis*	+		
99	**Sylvia borin*	+		
100	**Sylvia atricapilla*	+		
101	**Phylloscopus sibilatrix*	+		
102	**Phylloscopus collybita*	+		
103	*Phylloscopus trochilus*	+		
104	**Regulus regulus*	+		+
105	**Muscicapa striata*	+		
106	**Ficedula parva*	+		
107	**Ficedula hypoleuca*	+		
108	**Aegithalos caudatus*	+		+
109	**Parus palustris*	+	+	
110	*Parus montanus*	+	+	
111	**Parus cristatus*	+	+	
112	**Parus ater*	+	+	
113	**Parus caeruleus*	+	+	
114	**Parus major*	+	+	
115	*Sitta europaea*	+	+	
116	*Certhia familiaris*	+		
117	*Certhia brachydactyla*	+	+	
118	*Remiz pendulinus*	+		
119	**Oriolus oriolus*	+		
120	**Lanius collurio*	+		
121	*Lanius excubitor*		+	
122	**Garrulus glandarius*	+	+	
123	**Pica pica*	+	+	
124	*Corvus monedula*	+	+	+
125	**Corvus frugilegus*	+	+	+
126	**Corvus corone*	+	+	+
127	*Corvus corax*	+	+	+
128	**Sturnus vulgaris*	+		+
129	**Passer domesticus*	+	+	
130	**Passer montanus*	+	+	

131	**Fringilla coelebs*	+	+	
132	**Fringilla montifringilla*		+	+
133	**Serinus serinus*	+		
134	**Carduelis chloris*	+	+	+
135	**Carduelis carduelis*	+	+	+
136	*Carduelis spinus*		+	+
137	**Carduelis cannabina*	+		
138	*Carduelis flammea*		+	+
139	*Carduelis hornemanni*		+	
140	**Carpodacus erithrinus*	+		
141	**Pyrrhula pyrrhula*		+	+
142	**Coccothraustes coccothraustes*	+		+
143	**Emberiza citrinella*	+	+	
144	*Emberiza schoeniclus*	+		
145	*Emberiza calandra*	+		

*species confirmed in 1927–1936
gatunki stwierdzone w latach 1927–1936

Table 2. Comparison on avifauna from selected Bydgoszcz districts in 1990-1995

Tabela 2. Porównanie awifauny wybranych dzielnic Bydgoszczy w latach 1990-1995

District Dzielnica	Species status Status gatunku		Studied area [km^2] Powierzchnia obserwacji [km^2]	Urban „built–up areas" species Gatunki zabudowy miejskiej
	Breeding Lęgowy	Wintering Zimujący		
Smukała/Opławiec	74	43	3.13	26
Jachcice	46	6	2.17	22
Osowa Góra	57	14	2.75	25
Miedzyń	61	7	1.97	29
Szwederowo	16	7	0.93	13
Śródmieście	34	18	4.15	24
Kapuściska/Wyżyny	21	10	1.37	15
Łęgnowo	66	33	2.56	23
Fordon	46	6	2.97	25
Skrzetusko/Bartodzieje	18	12	1.04	13
Myślęcinek	72	3	2.98	29

Table 3. Similarity of breeding birds groups (QS) among selected districts of Bydgoszcz in 1990-1995

Tabela 3. Podobieństwo ugrupowań ptaków lęgowych (QS) pomiędzy wybranymi dzielnicami Bydgoszczy w latach 1990-1995

District Dzielnica		K	J	I	H	G	F	E	D	C	B
Smukała/Opławiec	A	81	33	51	64	34	50	31	76	93	63
Jachcice	B	70	47	62	61	45	63	48	67	62	
Osowa Góra	C	74	35	71	33	39	55	36	81		
Miedzyń	D	71	33	53	31	37	48	34			
Szwederowo	E	32	71	50	34	65	54				
Śródmieście	F	44	42	51	54	45					
Kapuściska/Wyżyny	G	32	67	65	37						
Łęgnowo	H	71	31	56							
Fordon	I	59	52								
Skrzetusko/Bartodzieje	J	31									
Myślęcinek	K										

Table 4. Comparison of number of bird species in selected Bydgoszcz regions in 1990-1995

Tabela 4. Porównanie liczby gatunków ptaków wybranych terenów Bydgoszczy w latach 1990-1995

Study areas Teren badań	Number and status of species Liczba gatunków i status			Urban „built – up areas" birds Gatunki zabudowy miejskiej
	Breeding Lęgowy	Wintering Zimujący	Number of recorded bird species Łącznie	
Smukała/Opławiec Jachcice – Łęgnowo –Myślęcinek	98	53	110	29
Miedzyń – Osowa Góra	70	14	79	29
Fordon	46	6	47	25
Śródmieście	41	18	41	24
Kapuściska/Wyżyny Skrzetusko/Bartodzieje – Szwederowo	30	17	39	15

Table 5. Breeding bird species of town buildings in Bydgoszcz during 1990-1995
Tabela 5. Awifauna lęgowa terenów zabudowy miejskiej w Bydgoszczy w latach 1990-1995

Species Gatunek	Type of town buildings Typ zabudowy miejskiej							
	Mm		Ms		S		W	
	MPo	Byd	MPo	Byd	MPo	Byd	MPo	Byd
*Passer domesticus**	>	+	>	+	>	+	>	+
*Sturnus vulgaris**	>	+	>		>	+	>	
*Corvus monedula**	>	+	>	+	>	+	>	
Streptopelia decaocto	>	+	>	+	>	+	>	
*Apus apus**	>	+	>	+	>	+	>	
Carduelis chloris	<		>		>	+	>	
*Phoenicurus ochruros**	>	+	>	+	>	+	>	+
Passer montanus	<	+	<	+	<	+	>	+
Turdus merula	<	+	>	+	>	+	>	+
Parus major	<	+	>	+	<	+	>	+
Parus caeruleus	>		<	+	<	+	>	+
*Delichon urbica**	<	+	>		>		<	+
Sylvia curruca	–	+	>	+	<	+	>	+
*Columba livia**	<	+	<	+	<	+	–	
Fringilla coelebs		+	<	+	<	+	>	+
Serinus serinus	<		–	+	<	+	>	+
Pica pica	<	+	<	+	<	+	<	+
Columba palumbus	<		<		<	+	<	
Hippolais icterina			–		<		>	+
*Hirundo rustica**	–		–		<		>	
Muscicapa striata	–		–		<		>	
Phoenicurus phoenicurus		+		+	–	+	>	+
Carduelis carduelis	–	+	–			+	>	+
Corvus frugilegus	–				<	+		+

Species Gatunek	Type of town buildings Typ zabudowy miejskiej							
	Mm		Ms		S		W	
	MPo	Byd	MPo	Byd	MPo	Byd	MPo	Byd
Acanthis cannabina					–		<	+
Galerida cristata		+		+	–			+
Sylvia communis		+				+	<	+
Falco tinnunculus		+	–	+	<	+		
Oenanthe oenanthe		+		+			–	+
Strix aluco			–		–		–	+
Corvus corone			<			+		+
Sylvia borin		+					<	+
Sylvia atricapilla		+					<	+
Phylloscopus trochilus		+		+		+	<	+

Types of town buildings: Mm – younger residential estates (below 20 years), Ms – older residential estates (above 20 years), S – old built up areas of street type, W – small houses (villa) areas. **Frequency of species occurrence in particular building types** (in 10 Polish towns); „–" recorded in 1 or < 1/10 of the number of census plots in particular building type, „<" – recorded in 1/10 – 1/2 of the number of tested areas, „>" – recorded from more than 1/2 of tested areas. **Data from:** MPo – Luniak i Głażewska (1987), Byd – Bydgoszcz 1990-1995. „*" – species nesting inside buildinga, close contact with plants not necessary for occurrence.

Typy zabudowy: Mm – osiedla mieszkaniowe młodsze (poniżej 20 lat), Ms – osiedla mieszkaniowe starsze (powyżej 20 lat, S – zabudowa stara typu ulicznego, W – zabudowa willowa, **Częstość występowania gatunku w poszczególnych typach zabudowy** (w 10 miastach polskich): „–" gatunek stwierdzony na 1 lub < 1/10 liczby zbadanych powierzchni próbnych danego typu zabudowy, „<" – gatunek stwierdzony na 1/10-1/2 liczby zbadanych powierzchni próbnych danego typu zabudowy, „>" – gatunek stwierdzony na więcej niż 1/2 liczby zbadanych powierzchni próbnych danego typu zabudowy. **Dane:** MPo – Luniak i Głażewska (1987); Bydgoszcz 1990-1995. „*" – gatunki gnieżdżące się w budynkach, dla których bliska obecność zieleni nie była głównym warunkiem występowania.

Table 6. Avifauna of Bydgoszcz in 1929-1995
Tabela 6. Awifauna Bydgoszczy w latach 1929-1995

Order Rząd	Number of species Liczba gatunków	
	1929–1936	1990–1995
Podicipediformes	1	2
Pelecaniformes	–	1
Ciconiiformes	1	2
Anseriformes	2	15
Accipitriformes	2	6
Falconiformes	–	1
Galliformes	1	2
Gruiformes	3	3
Charadriiformes	–	13
Columbiformes	–	5
Cuculiformes	1	1
Strigiformes	1	2
Caprimulgiformes	–	1
Apodiformes	1	1
Coraciiformes	3	2
Piciformes	4	6
Passeriformes	57	83
Total *Łącznie*	77	146

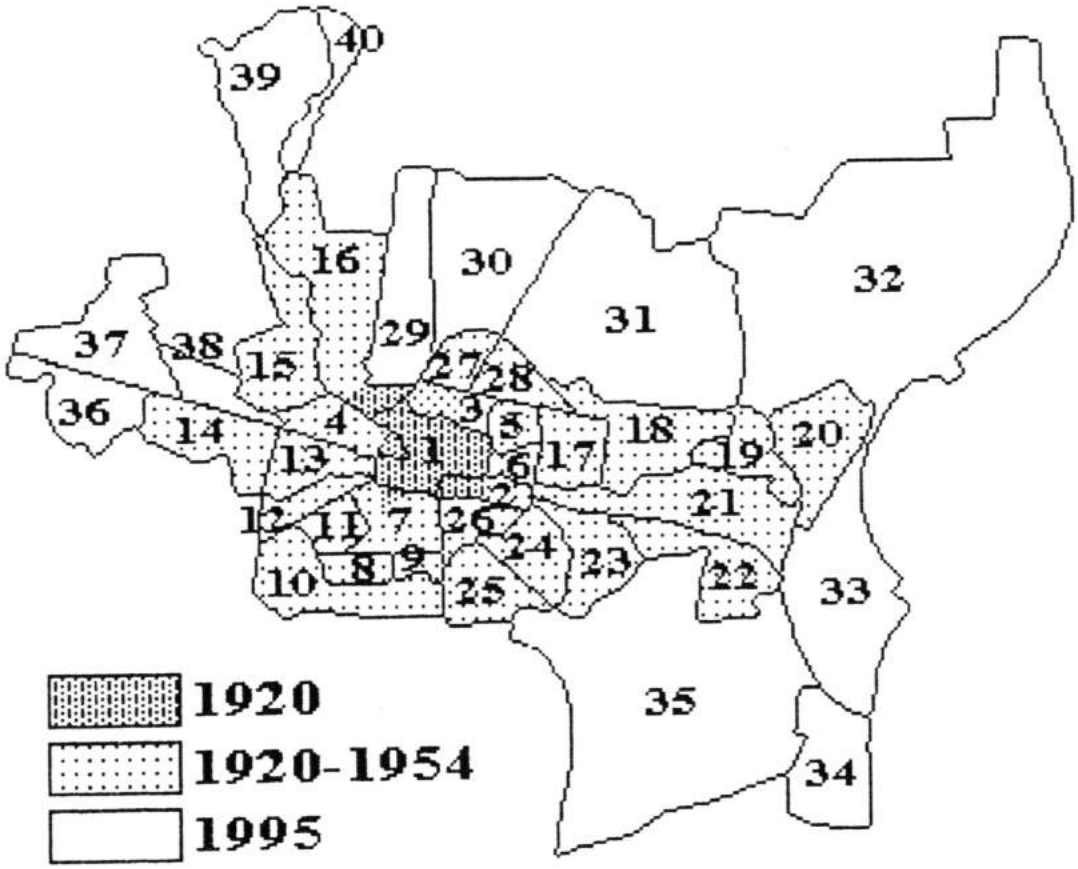

Fig 1.
Administrative borders in Bydgoszcz during 1920, 1920-1954, 1995 against a background of actual town dirvision into city – plan units Granice administracyjne Bydgoszczy w latach 1920, 1920-1954, 1995 na tle aktualnego podziału miasta na jednostki urbanistyczne 1 – Śródmieście, 2 – Babia Wieś, 3 – Bocianowo, 4 – Okole, 5 – Bielawy, 6 – Skrzetusko, 7 – Szwederowo, 8 – Biedaszkowo, 9 – Bielice, 10 – Aerodrome (lotnisko), 11 – Górzyskowo, 12 – Błonie, 13 – Jary i Wilczak, 14 – Miedzyń, 15 – Czyżkówko, 16 – Jachcice i Piaski, 17 – Bartodzieje, 18 – Bydgoszcz Wschód, 19 – Sierniecżek, 20 – Brdyujście, 21 – Zimne Wody, 22 – Czersko Polskie, 23 – Kapuściska, 24 – Wyżyny, 25 – Glinki, 26 – Wzgórze Wolności, 27 – Zawisza, 28 – Osiedle Leśne, 29 – Rynkowo, 30 – Myślęcinek, 31 – Las Gdański, 32 – Fordon, 33 – Łęgnowo II, 34 – Wypaleniska, 35 – Łęgnowo I, 36 – Prądy, 37 – Osowa Góra, 38 – Flisy, 39 – Opławiec, 40 – Smukała.

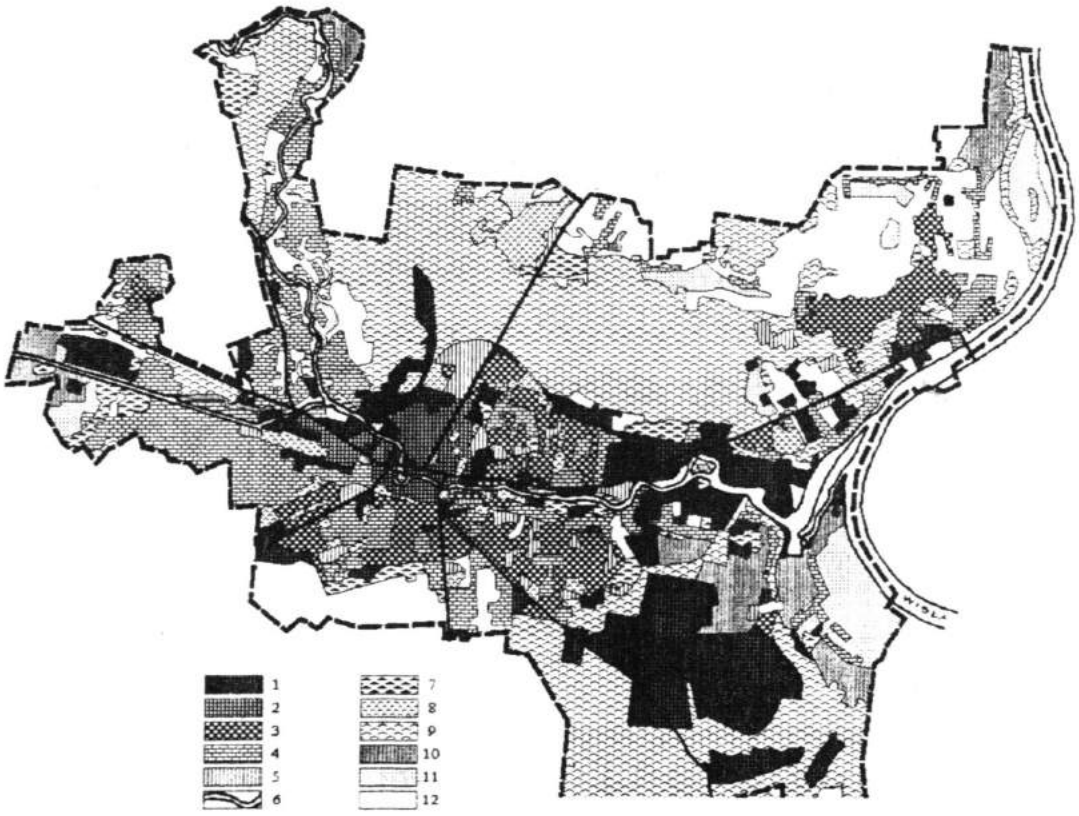

Fig. 2
Usage of area in Bydgoszcz
Acc. to Korczyński and Dysarz map (1995)
Użytkowanie terenu w Bydgoszczy
Na podstawie mapy Korczyńskiego i Dysarza (1995)
1 – industry and transport, 2 – compact buildings from the turn of the 19-th century, 3 – multi-family housing, 4 – single-family housing, 5 – services (schools, sport, health sercices, etc.), 6 – rivers and dices, 7 – gardens, 8 – parks, 9 – woods, 10 – meadows, 11 – arable fields, 12 – uninvested areas (airfield at the south-east part of town). 1 – przemysł i komunikacja, 2 – zwarta zabudowa z przełomu XIX i XX wieku, 3 – mieszkalnictwo wielorodzinne, 4 – mieszkalnictwo jednorodzinne, 5 – usługi (oświata, sport, służba zdrowia, itp.), 6 – rzeki i kanały, 7 – ogródki działkowe, 8 – parki, 9 – lasy, 10 – łąki, 11 – pola uprawne, 12 – tereny niezainwestowane (lotnisko w południowo-wschodniej części miasta).

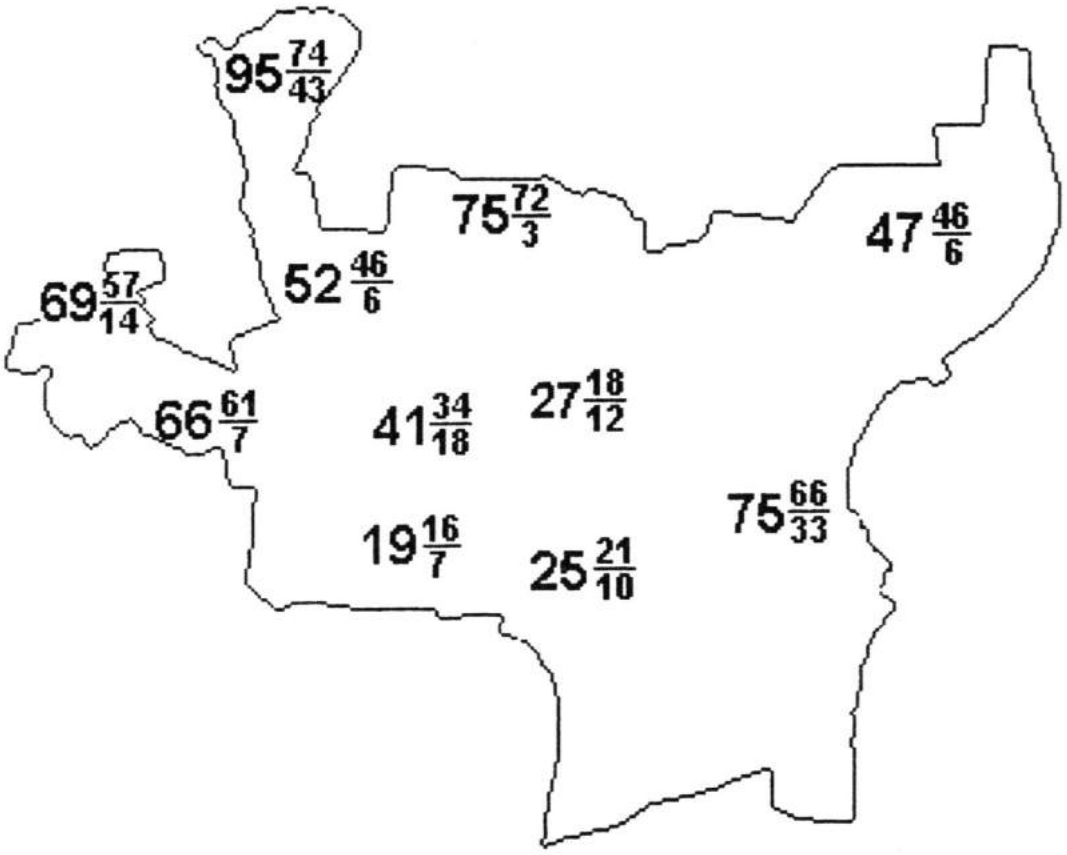

Figure 3
Species diversity of avifauna of selected districts of Bydgoszcz in 1990-1995
Różnorodność gatunkowa awifauny wybranych dzielnic Bydgoszczy w latach 1990-1995

$92\frac{74}{51}$

92 – number of bird species recorded, 74 – number of breeding birds, 51 – number of wintering birds.
92 – liczba gatunków ptaków stwierdzonych, 74 – liczba gatunków lęgowych,
51 – liczba gatunków zimujących.