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## Inventory of the avifauna of Warsaw — species composition, abundance, and habitat distribution

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**Abstract.** Investigations covered the administrative area of Warsaw (485 km<sup>2</sup>) in the period since 1986. A total of 213 bird species were recorded, 169 of them occurring regularly, 140–145 — breeding or probably breeding, about 78 — wintering regularly, about 28 — observed only in migration seasons. The list of sp. their abundance and habitat distribution is given in the Appendix. The overall bird population was estimated at 190–370 thousand pairs and ca 300–900 ind. in winter House Sparrows and Feral Pigeons made up 56% of the breeding population, and in winter 76% (including Rook). In comparison to the inventory made over thirty years ago the number of species inhabiting Warsaw seems similar, but interchange of species and changes of their populations were considerable. 94% of the breeding species were of native (mainly Palearctic) origin, but a majority of the population (56%) were southern species. Of the 7 main types of habitats distinguished, peripheral forest parks were richest in breeding species, the Vistula river was the richest in migrants and the built up areas had the highest density of bird populations.

**Key words:** urban avifauna, birds of Warsaw, number of population, changes in avifauna, faunistic composition

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### INTRODUCTION

Warsaw is the largest city in Poland, and its avifauna is relatively well known. The first ornithological inventory of that city was carried out over three decades ago (Luniak *et al.* 1964). Information on the later studies was given by Luniak (1983), Luniak & Głażewska (1987) and Luniak & Pisarski (1990). Some recent studies described changes in population sizes and distributions for selected birds of Warsaw: *Galerida cristata* (Lesiński 1988), *Anas platyrhynchos* (Engel *et al.* 1988), *Strix aluco* (Jabłoński 1991), *Turdus pilaris* (Konofalski & Nowicki 1992), waterfowl birds (Jędraszko-Dąbrowska & Cygan 1995), and several rare and endangered species (Kozłowski 1990). Changes in the avifauna of Warsaw during the last two decades

were described by Luniak *et al.* (1986), Luniak (1991) and Nowicki (1990, 1992).

### Data and methods

The paper is based mainly on the results of the bird inventory carried out within the administrative area of Warsaw (485 km<sup>2</sup>) in 1986–1990, but also results of observations made after that period were included. Most of the data below were previously presented in the working report by Luniak (1990b).

The inventory was carried out as a collective work of about 63 field observers from the Warsaw Ornithological Club, Polish Zoological Society, coordinated by the author and 3 ornithologists named in „Acknowledgements”. Methods of the inventory were described and discussed by Luniak *et al.* (1990).

At least 4 counts were done in each part of Warsaw (485 km<sup>2</sup>) during a single breeding season. Similar 3–4 counts were carried out during the winter season over an area of 260 km<sup>2</sup>. These covered the entire city centre (ca 50 km<sup>2</sup>), the belt of the Vistula river and large areas in other parts of the city.

### Study area

The administrative boundaries of Warsaw included (1991) an area of 485 km<sup>2</sup> and a population is 1.8 million inhabitants. A large river — the Vistula (Wisła) crosses Warsaw as a belt 28 km long and, with a floated terrace — about 1 km wide. There are numerous parks, cemeteries and allotment gardens in the central part of the city. On the outskirts there are considerable areas of agriculture, forest parks and extensively developed lands with houses and gardens. There is a 20 ha lake (Czerniakowskie), several ponds and small water bodies, streams and canals. In total, open spaces and green habitats covered in 1991 about 63% of Warsaw. They included: agricultural areas (arable land, orchards, pastures) — 29.6%, forest parks and woods — 12.6%, parks, gardens, allotments and cemeteries — 5.6%, green wastelands — 5.1%, green spaces in housing estates — 4.5%, open water (mainly Vistula) — 3.5%, technical (e.g. aerodromes) and sport grasslands — 2.1%.

## SPECIES COMPOSITION

### Number of species

The recent inventory indicated 213 species (listed in the Appendix below) of birds recorded within the administrative boundaries of Warsaw (485 km<sup>2</sup>), and among them:

- ca 169 sp. were considered to occur in Warsaw regularly, i.e. they were observed, or believed to be present, in at least a majority of years of the study period.

- 140–145 sp. breeding or probably breeding;
- ca 107 sp. observed in the winter season and among them ca 78 were considered as regularly wintering, and ca 29 — as rare visitors;

- ca 28 sp. observed only in the migration seasons or as visitors during the breeding season. Seventeen of these were rare visitors and ca 11 sp. considered as present regularly.

Among 140–145 breeding or probably breeding species (Appendix), broods were not confirmed for 5 species: *Anas crecca*, *Columba oenas*, *Caprimulgus europaeus*, *Luscinia svecica*, *Regulus regulus*.

The number of breeding species recorded in Warsaw tended to be greater than in other nearby cities where similar data were available. For Łódź (900 thousand inhabitants) 100 breeding species were indicated (Tranda *et al.* 1983), for the former West Berlin — 121 breeding species and about 200 regular visitors (Witt 1984), for the former East (GDR) Berlin 125 breeding and probably breeding species (Degen & Otto 1988), and recently (1990) in the area of united Berlin 127 breeding species were recorded (Berliner Orn. Arbeitsgemeinschaft 1991). In Prague 131 breeding species were recorded (Fuchs *et al.* 1990), in Vilnius — 185 species were observed during the period 1970–1993 and 105 of them were breeding (Idzelis 1993), in Vienna 145 species were observed in 1982–1987 during the breeding season (Boeck 1993). Results of an inquiry on the avifauna of 27 cities (0.2–8.0 million inhabitants) in Central and Eastern Europe (Luniak 1990a) indicated 39–130 regularly occurring species, and 29–107 breeding species, in highly urbanized areas within those cities.

In the entire region where Warsaw is located (Mazovia) the Regional Bird Inventory in Siedlce indicated a total of 295 species for the 15 year period through 1990 — this included 186 breeding and probably breeding species. Seen in this background — the number of species found in Warsaw was relatively high, if one takes into account the shorter research period, much smaller area and poor diversity of biotops within the city. Tomiałoć (1990) indicated about 350 species for all of Poland including about 232 breeding species.

### Comparisons with the former inventory

The former inventory (Luniak *et al.* 1964), was based on data mainly from the period 1958–1962. It was the result of much less intensive and less skilful field work than the present study. Also, the study area was not defined exactly. It was simply delineated as the central, peripheral and suburban zones of Warsaw. So, any comparison of that inventory to results of the present study should consider these differences.

The inventory of 1958–1962 indicated that about 130 bird species occurred regularly in the central and

peripheral zones of the former Warsaw, i.e. the smaller (and not exactly delineated) territory than is the recent administrative area of Warsaw. Among them about 109 species were recorded in the breeding season, about 100 species were considered to be breeding and about 51 species occurred in the autumn/winter season.

About 24 species present in the former inventory were not recorded in the recent one: *Botaurus stellaris*, *Branta bernicla*, *Melanitta nigra*, *Somateria mollissima*, *Aquila chrysaetos*, *Milvus migrans* (breeding at that time), *Circaetus gallicus*, *Arenaria interpres*, *Tringa stagnatilis*, *Calidris ferruginea*, *Burchinus oediconemus*, *Stercorarius sp.* (*parasiticus?* *longicaudus?*), *Larus melanocephalus*, *Tyto alba* (breeding), *Glaucidium passerinum*, *Picus canus*, *Coracias garrulus* (breeding), *Eremophila alpestris*, *Nucifraga caryocatactes*, *Parus cyaneus*, *Cinclus cinclus*, *Anthus cervinus*, *Motacilla cinerea*, *Lanius minor*, *Lanius senator* (breeding). None of these species was common in Warsaw over thirty years ago and almost all were rare. Several other species showed a considerable decrease. This involved mainly: *Streptopelia turtur*, *Athene noctua*, *Cuculus canorus*, *Jynx torquilla*, *Galerida cristata*, *Luscinia luscinia*, *Phoenicurus phoenicurus*, *Parus palustris*, *Certhia brachydactyla*, and *Lanius collurio* and breeding populations of *Sterna hirundo*, *S. albifrons*, *Upupa epops*.

22 new species were indicated by the present inventory or during the period since 1963: *Cygnus cygnus*, *Aix galericulata*, *Pernis apivorus*, *Circus aeruginosus* (breeding), *Dendrocopos syriacus* (breeding), *Columba oenas* (probably breeding), *Porzana porzana* (breeding), *Lymnocyptes minimus*, *Larus marinus*, *L. hyperboreus*, *L. cachinnans*, *Rissa tridactyla*, *Sterna paradisea*, *Asio otus* (breeding), *Aegolius funereus*, *Turdus torquatus*, *Saxicola torquata* (breeding), *Phylloscopus trochiloides*, *Ficedula parva* (breeding), *Ficedula albicollis* (breeding), *Panurus biarmicus* and *Carduelis hornemanni*.

10–12 new breeding species were indicated recently, while formerly they were not known as breeders. Those are: *Podiceps grisegena*, *P. nigricollis*, *Cygnus olor*, *Anas crecca* (?), *Aythya ferina*, *A. fuligula*, *Mergus merganser*, *Prunella modularis*, *Regulus regulus* (?), *Lanius excubitor*, *Locustella fluviatilis* and *Pyrhula pyrrhula*. Several other species distinctly increased their populations in the inner area of Warsaw: *Anas platyrhynchos*, *Columba palumbus*, *Streptopelia decaocto*,

*Turdus pilaris* (rapidly expanding), *T. philomelos*, *T. merula*, *Corvus corone cornix*, *Pica pica*, *Garrulus glandarius*, *Coccothraustes coccothraustes* and non-breeding gulls — *Larus ridibundus*, *L. canus*, *L. argentatus*. Recovery of *Falco tinnunculus* and *Corvus frugilegus* took place, after their decrease during the past two decades.

The data above allow us to suppose that there was not any radical change in the number of bird species inhabiting (breeding, wintering, visitors) Warsaw since the time of the former inventory. But the interchange of species and changes in their populations were extensive.

## ABUNDANCE

Population sizes are listed in the Appendix for the 168 species that occur regularly in Warsaw.

The differences in the ranges of assessments given there reflect variations in the extent to which the species were investigated. Hence, based on these figures the estimate of the overall bird population of Warsaw (Tab. 1) is quite an inaccurate approximation.

The figures in Table 1 show the dominant position, as far as numbers are concerned, of 3 species — House Sparrow *Passer domesticus*, Feral Pigeon *Columba livia dom.* and the wintering population of Rook *Corvus frugilegus*. Abundance of the next most numerous species were much lower. In the breeding season, these were (in thousand pairs): *Sturnus vulgaris* — 15–25, *Corvus monedula* and *Parus major* — 6–12 each, *Fringilla coelebs*, *Passer montanus* — 4–7 and *Parus caeruleus* — 3.5–5. In winter, *Fringilla coelebs* and *Sturnus vulgaris* were absent from this group, but in their place came (in thousand individuals): *Anas platyrhynchos* — 9–12 and *Larus ridibundus* — 7–10. As regards biomass, the dominance pattern was similar, except that House Sparrows (4–9 tons) were far outweighed by Feral Pigeons (22–42 tons) and, in winter, also by Rooks (33–49 tons). Then too, *Anas platyrhynchos* (9–12 tons) were high on the biomass list. This disproportion in the dominance structure of the avifauna in Warsaw is a typical feature of urban avifauna and of urban zoocoenoses in general (Luniak 1996).

There are little data in the literature that would provide for comparisons with the data from Warsaw.



Very similar values (200–300 thousand pairs) were obtained for the former West Berlin, whose area was similar to Warsaw (Witt 1984). Słupsk (total area 43 km<sup>2</sup>) is the only other city in Poland where the total number of pairs was estimated (Górski 1982). With 1186 pairs per km<sup>2</sup>, the density in Słupsk is much higher than in Warsaw (Tab. 1). However, this estimate was obtained by extrapolating the data from small sample plots, so the method itself could be the source of substantial error.

Table 1. Total numbers of bird population indicated by the inventory and percentage of the 3 super-dominant species. p — pairs, n — individuals. Biomass data for the breeding season concern only two parent birds in pairs, without offspring.

[Tabela 1. Ogólna liczebność awifauny wykazana w inwentaryzacji oraz udział 3 superdominantów. p — pary, n — osobniki. W biomase podanej dla okresu lęgowego uwzględniono tylko osobniki rodzicielskie z par, pomijając ich potomstwo.]

	breeding season	winter
Abundance over the whole area (in thousands)	190–370p	340–890n
Abundance per 1 km sq.	400–740p	810–1810n
Biomass over the whole area	39–69t	81–145t
Biomass per 1 km sq.	80–109kg	169–300kg
Abundance of super-dominant species (in thousands)		
— <i>Passer domesticus</i>	70–150p	140–400n
— <i>Columba livia dom.</i>	35–65p	70–150n
— <i>Corvus frugilegus</i> (winter)		80–120n
Approximate percentage of 3 super-dominants		
— in number (in biomass)	56% (70)%	76% (74)%

## FAUNAL COMPOSITION

Division on the 145 species breeding or probably breeding in Warsaw into faunal types according to the system proposed by Voous (1962) shows: 64 (44%) Palearctic species, 24 (17%) — European, 21 (15%) — Euro-Turkestanian, 16 (11%) — Holarctic, 9 (6%) Old World species.

Together with 2 cosmopolitan species — *Gallinula chloropus* and *Sterna albifrons* — this group amounted to 135 (94%) species in total. Among the 9 remaining species, 7 were of southern origin — *Denrocoptes*

*syriacus*, *Serinus serinus*, *Phoenicurus ochruros*, or southern origin — *Athene noctua*, Feral Pigeon *Columba livia dom.*, *Streptopelia decaocto* and *Phasianus colchicus*. The other 2 species were from the north — *Charadrius hiaticula* and Northeast — *Turdus pilaris*. The proportions of faunal types in Warsaw are very similar to those making up the breeding populations in other central European cities (Luniak 1990a) — Warsaw is therefore typical in this respect.

However, in quantitative and ecological aspects the relations above pose a completely different picture. Both dominant species — Feral Pigeon and House Sparrow, which during the breeding season make up 56% of the numbers and 70% of the biomass of the city's birds (see "Abundance") — are of non-native origin. The Rock Dove *Columba livia*, which is an ancestor of the Feral Pigeon, is a representative of Turkestanian-Mediterranean type of avifauna. In Poland it was artificially introduced when freed domesticated birds became established in the wild. The House Sparrow, though included by Voous (1962) among the Palearctic species, does in fact come from Asia Minor or North-East Africa. It expanded its range into Central and Eastern Europe in the early historical age, in the wake of the spread of corn cultivation. Both the House Sparrow and the Feral Pigeon live only in human settlements and are totally dependent on humans for their existence. Thus, 2 southern, non-native species comprise the quantitatively most important components of Warsaw's avifauna. Ecologically, these are also the most "urban" of all the species occurring in Warsaw because, as stated above, they are completely dependent on humans. Four other abundant species in Warsaw were ecologically connected with the city's built up areas — *Apus apus*, *Delichon urbica*, *Streptopelia decaocto* and *Phoenicurus ochruros*. The latter two species were also non-native, southern components of the avifauna. The quantitative dominance of avian immigrants from the south is a phenomenon typical for both the animal and plant life of cities (e.g. Sukopp *et al.* 1982).

## HABITAT DISTRIBUTION

Seven main types of habitats were distinguished within Warsaw (Tab. 2). The habitat distributions for each species are indicated in the Appendix and

summarized in Table 2. Below are the general characteristics of the avian communities present in each of the seven habitat types in Warsaw.

### Built-up areas (B)

This is the main habitat type in urbanized areas. It has a low bird species diversity, but the density of the bird population is very high in comparison to other areas. In the central part of the city it averaged 118–238 pairs (40–89kg) per 10 ha, and during the winter season — 321–579 ind. (80–145kg)/10ha (data from W. Nowicki from 2677 ha of built up areas). In new housing estates (2–5 years old) situated mainly on the

and most common in this habitat type. The bird communities of housing estates in Warsaw were described by Luniak (1994).

### Parks, gardens, cemeteries, allotments (P)

This habitat type has the great variety of bird life and is not endangered by urban development. It is rich in number of species and overall abundance. In old parks situated in the central area of Warsaw, 17–41 breeding species and 15–32 wintering species were recorded for areas of 10–74ha (Luniak *et al.* 1986, Nowicki 1992, data of W. Nowicki). The density of the bird population in such parks was 50–100 breeding

Table 2. Number of species and abundance of bird population inhabiting main habitat types (see Appendix 1.). ( ) — species for which the habitat is the main site in Warsaw. + — range of the total density <10 pairs or 20 ind./10 ha, ++ — 10–100 p. or 20–200 ind., +++ — >100 p. or >200 ind. Migr. — species occurring only, or mainly, in migration seasons, and regular visitors during breeding seasons.

[Tabela 2. Liczba gatunków i liczebność awifauny głównych typów siedlisk (patrz „Dodatek”).

( ) — gatunki dla których dane siedlisko jest głównym miejscem występowania w Warszawie. + zagęszczenie rzędu <10 par lub 20 osobników na 10 ha, ++ — 10–100 par lub 20–200 osobn., +++ — powyżej 100 p. lub 200 osobn. Migr. — gatunki występujące tylko, lub głównie w okresach wędrówek oraz regularnie zalatujące w okresie lęgowym.]

Type of habitat	Total	Breeding		Migr.	Wintering	
	sp.	sp.	pairs	sp.	sp.	ind.
B — built-up areas	31–32 (14)	23 (12)	+++	2 (0)	22–23 (12)	+++
P — parks and gardens	70 (31)	48 (24)	++	9 (5)	43 (23)	++/+++
F — forest parks, woods	74 (59)	68 (59)	++	2 (2)	36 (27)	+
R — Open areas: ruderal, industrial and derelict	23 (12)	15 (10)	+	1 (0)	12 (5)	+
A — suburban agricultural and extensively developed areas	86 (51)	66 (40)	+ / ++	0 (6)	40 (23)	+
W — water bodies	44 (27)	28 (25)	++	15 (5)	20 (6)	+ / ++
V — Vistula (open space)	74 (37)	8 (7)	+	47 (23) ++	34 (14)	+++

outskirts, only 10 breeding and 11 wintering species were recorded (Luniak 1994). The density of the bird population averaged 128 breeding pairs (35kg) /10 ha, and in winter — 174 ind. (39kg). The high abundance of birds in built up areas was mainly due to Feral Pigeons, House Sparrows and wintering Rooks — superdominants for this habitat. In addition *Apus apus*, *Delichon urbica*, *Streptopelia decaocto*, *Sturnus vulgaris*, *Parus major*, *P. caeruleus* and *Corvus monedula* are typical

pairs (18–23kg) per 10ha and in winter 207–249 ind. (77–145kg). In new parks situated mainly on the outskirts, 6–18 breeding species, and 7–13 wintering species were recorded on areas of 10–30 ha. The density per 10ha was 6–19 pairs and 31–72 wintering ind. (Luniak 1981b). Most of the birds inhabiting this type of habitat are wood ecotone species that have adapted to life in urban conditions (e.g. *Parus major*, *P. caeruleus*, *Sturnus vulgaris*, *Fringilla coelebs*, *Turdus*



*merula*, *T. pilaris*, *Passer montanus*, *Pica pica* or *Corvus corone cornix*). The bird communities of Warsaw in the habitats above were described by Luniak (1980, 1981b), Luniak *et al.* (1986), and by Nowicki (1983, 1992).

#### Forest parks and woods (F)

The largest number of breeding species were recorded in forest parks and woods situated on the city's outskirts. The abundance of birds making up this community was quite high during the breeding season but relatively low in winter. In the best studied area of this type — Bielański Forest (150 ha), 59 species of breeding birds (55 pairs/10 ha) were recorded during one season and 22–23 species (31 ind./10 ha) in winter (Luniak 1991). Several rarely observed species were among breeding birds of this habitat — raptors (e.g. *Accipiter gentilis*, *A. nisus*, *Buteo buteo*), woodpeckers (particularly *Dryobates martius*, *Dendrocopos medius*, *Jynx torquilla*), *Troglodytes troglodytes*, *Turdus philomelos*, *Parus ater*, *P. palustris* and *P. montanus*, *Certhia familiaris*, *Turdus viscivorus*, *Corvus corax*, *Pyrrhula pyrrhula*. Some species found in this habitat type were of particular faunal value for the Warsaw region (Kozłowski 1990), e.g. *Ficedula parva* and *F. albicollis*.

#### Ruderal sites (R)

These sites include open spaces associated with railways and industry, dumps, derelict lands, wide roadways, initial stage of housing construction, and other kinds of open places with poor vegetation and limited human presence. This type of site, which is often of transitional in nature, supported little bird life — both few species and small population sizes. In inner Warsaw W. Nowicki found a total of 15–17 breeding pairs on 105ha (10–17 pairs and below 1kg/10 ha). On the peripheral areas the avifauna of ruderal sites was usually even poorer, particularly in winter. Characteristic breeding species were *Oenanthe oenanthe*, *Phoenicurus ochruros*, *Galerida cristata*, *Sylvia communis*, *Motacilla alba*, sometimes *Charadrius dubius* and *Riparia riparia*. Among wintering species the most characteristic and dominant were *Passer montanus*, *Carduelis carduelis*, *C. flammula*. In recent years *Saxicola torquata* have been appearing as breeders in these sites — the new species in Warsaw and faunal rarities in central Poland.

#### Agriculture areas (A)

— and other extensively developed habitats. These sites included small farms with gardens, fields, orchards, meadows, small woods, groups of small houses in agriculture areas. Meadows and small riverine and midfield woods also were included in this habitat type. The high numbers of species present in this habitat type (Tab. 2) resulted from the variety of habitats represented by this category rather than from an inherently rich avifauna. Also, the abundance of avifauna in habitats of this type varied depending on local conditions. The richest bird communities were in sites with a variety of small houses, gardens and woods. The poorest occurred in broad, open areas with fields. Most of the species found in this habitat type were typical of built up areas (B), parks (P) and forest parks (F). Apart from these, there were typical meadow and field species, like *Alauda arvensis*, *Vanellus vanellus*, *Perdix perdix*, *Emberiza calandra*. These species usually avoided urban areas, but they were still found in many areas in the outskirts of Warsaw. Bird communities of such suburban areas were described by Luniak (1981a), and that of riverine woods and meadows — by Gorzelski *et al.* (1994).

#### Water bodies (W)

— lake Czerniakowskie (20 ha), ponds, canals, streams and brooks. The avian communities of such aquatic habitats were characterized by Jędraszko-Dąbrowska (1990) and Jędraszko-Dąbrowska and Cygan (1995). In Warsaw, and particularly in the inner area, there were few water bodies to provide breeding habitat for waterfowl and other species typical of these habitats. Only one species from among this guild — *Anas platyrhynchos* — nested commonly in the city (450–600 nests/broods in over 100 localities). The next most common species was *Fulica atra*, *Acrocephalus arundinaceus* and *Acrocephalus scirpaceus* (see Appendix), but their distribution in the city was limited to a few localities. In estuaries with the best conditions (area over 5 ha, rich vegetation), Jędraszko-Dąbrowska & Cygan (1995) found 10–15 breeding species with a density of 61–96 p./10ha over the total estuary area. In small estuaries (1–3 ha) with poor vegetation, 2–3 breeding species and 3–10 pairs were found. In winter, when water bodies often were frozen, the only common representatives of this community were *Anas*

*platyrhynchos* and *Larus ridibundus*. They concentrated in large numbers in a few feeding and diurnal roosting sites. At a majority of water bodies the presence of waterfowl was scarce.

### Vistula river (V)

The river and its flood terrace included two habitat types specific to the Vistula: — 1) open water areas and open banks; — 2) riparian willow thickets. Table 2. presents only data concerning the first type, but in the Appendix data from both sites are included.

1) Sites with open water and open banks (Tab. 2) were used mainly by migrants, winter residents, and visitors from other urban habitats. The presence of such species resulted in a diverse avian community, but there were few breeding species. Three of the breeding species (*Mergus merganser*, *Sterna albifrons*, *Charadrius hiaticula*) represent high faunal value in Central Poland (Kozłowski 1990). The winter bird community of this site was described by Jędraszko-Dąbrowska and Cygan (1995). They found 37 species of waterfowl and birds of prey numbering up to 535 ind./km (ca 800 ind./km<sup>2</sup>). No breeding species were recorded on the 5km long section of the Vistula that passes through the inner city (data of W. Nowicki). But the winter avifauna was relatively rich there: 24 sp. with 870–2225 ind. (560–1330kg)/km<sup>2</sup>. This high number of birds in the open areas of the Vistula was due mainly to the concentrations of *Anas platyrhynchos* and *Larus ridibundus* — up to eight thousand of each species. In the migration seasons their number was even higher. Among other birds typical of the winter avifauna in the open areas of the Vistula were *Bucephala clangula*, *Mergus merganser* and 2–3 species of *Larus* gulls. Other than the abundant Mallard (see above) and Black-headed Gulls, the species most typical of the migration seasons were other *Anseriformes*, gulls and terns *Laridae* (11 sp. recorded), waders *Charadrii* (18 sp.), *Phalacrocorax carbo* and *Ardea cinerea*.

2) About 15 breeding species occurred in the riparian willow thickets along the Vistula. The species most characteristic of these sites were *Remiz pendulinus*, *Locustella fluviatilis*, *Acrocephalus palustris* and *Luscinia luscinia*. The breeding birds of this habitat were described by Gorzelski *et al.* (1994).

Over the entire flood terrace of the inner city section of the Vistula (120ha of willow thickets, riverine woods,

river harbours, bridges and recreation grounds), a total of 39 breeding and 23 wintering species were recorded. The population density was 30–49 pairs and 34–90 individuals per 10ha in winter (data from W. Nowicki).

### CONCLUSIONS

1. Results of the inventory of Warsaw's administrative area indicated, since 1986, a total of 213 species with 169 of these occurring regularly. There were 140–145 breeding species, 107 recorded in winter, 28 species recorded only during migration or as visitors during the breeding season. Compared with other large cities in central Europe, Warsaw was quite rich in bird species.

2. The overall bird population in Warsaw was estimated at 190–370 thousand pairs and 340–890 ind. in winter, i.e. 400–740 pairs (80–109kg biomass) per km<sup>2</sup> during the breeding season and 810–1810 ind. (168–300kg) per km<sup>2</sup> in winter. Feral Pigeons and House Sparrows made up 56% of the total population and 70% of the total biomass in the breeding season, and (including Rooks) — 76% (number) and 74% (biomass) in winter.

3. Comparisons with the results of the ornithological inventory made over three decades ago was limited by differences in the quality of the data. Nevertheless, it seems that there was no radical change in the number of bird species inhabiting (breeding, wintering, visitors) Warsaw since that time. But there were extensive changes in species composition and population characteristics.

4. Almost all (94%) of the breeding species were native ones — most of them (44%) were Palearctic species. But in quantitative terms the majority of the birds (56%, and in the city centre — 73%) were House Sparrows and Feral Pigeons — synanthropic species of southern origin.

5. Of the 7 habitat types distinguished in Warsaw, the peripheral forest parks were the richest in breeding species, while Vistula river habitats were the richest in migrants. In the built-up areas, the main biotope of the city, only a few breeding species were found, but the density of the bird population was highest, particularly in winter.



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## STRESZCZENIE

### [Inwentaryzacja awifauny Warszawy — skład gatunkowy, liczebność i rozmieszczenie środowiskowe]

Podstawowy materiał pracy stanowią wyniki inwentaryzacji przeprowadzonej na całym administracyjnym obszarze Warszawy (485 km<sup>2</sup>) w latach 1986–1990, jednak uwzględniono również dane uzyskane po tym okresie. W badaniach terenowych uczestniczyło około 63 osób. Im wszystkim oraz współkoordynatorom badań (patrz „Acknowledgments”) — autor składa podziękowanie.

Jedynie dotychczasowe opracowanie obejmujące całość awifauny Warszawy (Luniak *et al.* 1964) opierało się na danych z lat 1958–1962. W międzyczasie ukazało się szereg opracowań inwentaryzujących występowanie wybranych gatunków, awifaunę określonych terenów lub typów środowisk, a także prace o zmianach awifauny Warszawy i stanie badań nad nią (patrz „References”).

Metodykę badań terenowych przedstawiono w pracy Luniaka *et al.* (1990). Ocena stanu awifauny opierała się na lustracji dokonywanej w poszczególnych wydzieleniach terenu badań conajmniej 4 razy w ciągu jednego sezonu lęgowego i na podobnej czterokrotnej lustracji zimowej, dokonywanej również w jednym sezonie. W okresie lęgowym zbadano w ten sposób całość obszaru administracyjnego Warszawy (485 km<sup>2</sup>), a zimą — jedynie część (260 km<sup>2</sup>) obejmującą m.in. całe centrum (ca 50 km<sup>2</sup>), pas Wisły z jej tarasem zalewowym oraz znaczne przestrzenie w pozostałych częściach miasta.

### Skład gatunkowy

Badania wykazały 213 gatunków — ich spis podano w „Dodatku”. Około 169 gatunków uznano za występujące regularnie, 140–145 uznano za lęgowe lub prawdopodobnie lęgowe, około 107 — stwierdzono zimą (około 78 regularnie zimujących), około 28

obserwowano tylko w sezonach wędrownych (około 11 regularnie) lub jako zalatujące w okresie lęgowym. W porównaniu z awifauną innych dużych miast Europy Środkowej (Łodzi, Berlina, Pragi, Wilna), z których są porównywalne dane — liczba gatunków stwierdzonych w Warszawie jest stosunkowo wysoka.

### Liczebność

Znaczne różnice oceny liczebności poszczególnych gatunków (patrz „Dodatek”) oraz mało precyzyjna ocena ogólnej liczebności awifauny Warszawy (tab. 1) odzwierciedlają nierówny stopień zbadania gatunków oraz różnych części terenu, m.in. niepełne pokrycie terenu badaniami zimowymi. Dane w tabeli 1. i w „Dodatku” obrazują dominującą pozycję 3 gatunków (wróbel, gołąb miejski i zimą gawron). Liczebność następnych w kolejności (szpak, kawka, bogatka, zięba, mazurek i sikora modra a zimą — krzyżówka i śmieszka) osiągała poziom znacznie niższy. Ocena ogólnej liczebności awifauny Warszawy wykazuje podobny poziom do liczebności awifauny dawnego Berlina Zachodniego (Witt 1984) — porównywalnego pod względem obszaru.

### Zmiany

Wyniki poprzedniej inwentaryzacji (Luniak *et al.* 1964), są naogół mało dokładne pod względem ocen liczebności i określenia granic badanego terenu, co ogranicza możliwość porównań. Mimo to istniejące dane pozwalają sądzić, że po trzydziestu latach nie nastąpiła radykalna zmiana ogólnej liczby gatunków występujących w Warszawie, szczególnie w jej centralnej części. Natomiast w składzie gatunkowym nastąpiły wyraźne zmiany.

W ciągu ostatnich trzech dziesięcioleci nie potwierdzono występowania około 24 gatunków wykazanych w poprzedniej inwentaryzacji. Jednak żaden z nich nie był wówczas pospolity w Warszawie, prawie wszystkie były rzadkie, a tylko 4 z nich uważano za lęgowe. U około 13 gatunków lęgowych widoczny jest wyraźny spadek liczebności.

Od czasu poprzedniej inwentaryzacji w Warszawie stwierdzono występowanie 22 nowe gatunki, w tym 8 lęgowych. Stwierdzono też lęgi conajmniej 9 gatunków dawniej uważanych za niełęgowe. Conajmniej 11 gatunków, w tym 8 lęgowych, wyraźnie zwiększyło liczebność, a dwa dalsze (pustułka i gawron)

odbudowały swoją populację po przejściowym spadku.

### Skład faunistyczny

Podział 145 gatunków, stwierdzonych w Warszawie jako lęgowe lub prawdopodobnie lęgowe, na typy faunistyczne wyróżnione przez Voos'a (1962), wykazuje najwięcej gatunków palearktycznych (64, t.j. 44%), które wraz z innymi rodzimymi składnikami awifauny stanowiły 94%. Wśród pozostałych 9 gatunków 7 było pochodzenia południowego i 2 — północnego.

Natomiast w aspekcie ilościowym i ekologicznym dominującą pozycję miały składniki obcego pochodzenia. Oba gatunki zajmujące w awifaunie lęgowej pozycję superdominantów (łącznie 56% liczebności i 70% biomasy) — wróbel i gołąb, są przybyszami z południa. Wśród 4 innych gatunków związanych najsilniej z zabudową miejską — dwa (sierpówka i kopciuszek), też są pochodzenia południowego.

### Rozmieszczenie środowiskowe

Występowanie poszczególnych gatunków w 7 wyróżnionych typach środowisk przedstawiono w „Dodatku”, a w tabeli 2. zestawiono liczbę gatunków i poziom liczebności awifauny tych środowisk.

Tereny zabudowy — główny biotop miejski, charakteryzowały się ubóstwem gatunkowym awifauny, jednak jej liczebność, w porównaniu z innymi środowiskami, była wysoka. Parki, ogrody i inne zagospodarowane tereny zieleni były

środowiskiem o wysokiej różnorodności i liczebności awifauny. W parkach leśnych i peryferyjnych zadrzewieniach stwierdzono najwyższą liczbę gatunków, a także stosunkowo wysoką liczebność awifauny lęgowej, ale zimą — znacznie niższą.

W środowiskach ruderalnych — na odkrytych i ubogich w roślinność terenach kolejowych, przemysłowych, rozległych placach robót ziemnych, składowisk — awifauna była uboga zarówno pod względem liczby gatunków jak liczebności. Do kompleksu środowisk rolniczych zaliczono obszary upraw rolnych i sadowniczych oraz związane z nimi gospodarstwa, a także łąki, małe zadrzewienia śródpolne i nadrzeczne. Wysoka liczba gatunków wykazana w tabeli 2. jest bardziej wynikiem połączenia zróżnicowanego kompleksu środowisk w jedną kategorię niż szczególnego bogactwa awifauny poszczególnych terenów. Również liczebność była tu bardzo zróżnicowana, na ogół jednak niezbyt wysoka.

Zbiorniki wodne (Jez. Czerniakowskie, oraz inne wody stojące, kanały, rzeczki i większe potoki) na terenach zurbanizowanych w centralnej części miasta stwarzały możliwości lęgowe małej liczbie gatunków, jednak na peryferiach ich awifauna była dość bogata. Pas Wisły ciągnący się na przestrzeni 28 km łączy w sobie dwa rodzaje środowisk: — Przestrzeń wodna z plażami była praktycznie pozbawiona awifauny lęgowej, ale występowało tu wiele gatunków wędrujących i zimujących, niektóre w znacznej liczebności. Zarośla, tereny trawiaste i starorzeczna tarasu zalewowego były miejscem występowania kilkunastu gatunków lęgowych.



## Appendix

Bird species recorded in Warsaw since 1986.

JD — data of Jędraszko-Dąbrowska (1990). Migr. — in migration seasons and visitors during breeding seasons, Wint. — In wintering season.

**Abundance** — estimation for the whole area of Warsaw. + — rare records, o — range <10, oo — 10–99, ooo — 100–999, oooo — 1000–9,999, X — no quantitative estimation. XX — abundance in non-breeding seasons respective to the number of breeding population. For non-breeding seasons an estimation for the period of highest abundance was given in years when the sp. was observed.

**Habitats.** Capital letters — main habitats of regularly occurring species, small letters — complementary habitats or records of rare sp. B or b — built up areas, P — urban parks, gardens, allotments, F — forest parks and woods, R — open areas: ruderal, derelict and industrial areas, A — suburban agriculture and extensively developed areas, W — water bodies, V — Vistula river with banks, beeches, willow thickets. " — inhabited only in breeding season, \* — in non-breeding seasons only.

## [Dodatek

Gatunki stwierdzone na obszarze Warszawy od roku 1986.

JD — dane Jędraszko-Dąbrowskiej (1990). Migr. — w okresach migracji oraz zalatywanie w okresie lęgowym, Wint. — w okresie zimowania.

**Liczebność** na całym obszarze Warszawy. + — rzadkie stwierdzenia, o — rząd liczebności <10, oo — 10–99, ooo — 100–999, o,ooo — 1000–9,999, X — brak oceny liczebności, XX — liczebność poza okrese lęgowym odpowiednia do liczebności populacji lęgowej. Dla sezonów nielęgowych podano ocenę w okresie najwyższej liczebności występowania w latach gdy gatunek obserwowano

**Siedliska.** Duże litery — główne siedliska gatunków występujących regularnie, małe litery — siedliska drugorzędne lub stwierdzenia gatunków rzadkich. B lub b — tereny zabudowane, P — parki miejskie, ogrody, ogrody działkowe, F — peryferyjne parki leśne i większe zadrzewienia, R — odkryte tereny ruderalne i przemysłowe, A — podmiejskie tereny rolnicze i ogrodnicze (gospodarstwa, tereny upraw, łąki, małe zadrzewienia) i mało zagospodarowane wraz z małymi osadami, W — zbiorniki wodne, V — Wisła z otwartymi lub ponośniętymi wikliną terenami zalewowymi. " — występowanie tylko w okresie lęgowym, \* — tylko poza okresem lęgowym.]

	Abundance in seasons:			Habitats
	Breeding pairs	Migr. ind.	Wint. ind.	
1	2	3	4	5
<i>Gavia arctica</i>			+	v
<i>Tachybaptus ruficollis</i> JD	20–25		+	Wv*
<i>Podiceps cristatus</i> JD	19–21	o	o	WV*
<i>P. grisegena</i> JD	2–4			W
<i>P. nigricollis</i> JD	1–2		+	Wv*
<i>Phalacrocorax carbo</i>		o		V
<i>Ixobrychus minutus</i> JD	15–22			W
<i>Egretta garzetta</i>		+		v
<i>Ardea cinerea</i>		<30	25–60	wV
<i>Ciconia ciconia</i>	9–10			A
<i>C. nigra</i>		+		v
<i>Cygnus olor</i> JD	3–5	X	20–50	WV*
<i>C. cygnus</i>			+	v
<i>Anser fabalis</i>		X		a
<i>A. erythropus</i>			+	v
<i>A. albifrons</i>		X	+	wv
<i>A. anser</i>		X		a
<i>Tadorna tadorna</i>			+	v
<i>Aix galericulata</i>			1	
<i>Anas penelope</i>		o	+	wV

	1	2	3	4	5
<i>A. strepera</i>				+	vo
<i>A. crecca</i>		1?	o	o	w"V
<i>A. platyrhynchos</i> JD		450–600	oooo	9,000–12,000	PWV
<i>A. acuta</i>			+	+	w
<i>A. querquedula</i>		<5	+	+	Wv
<i>A. clypeata</i>				+	wv
<i>Netta rufina</i>				+	w
<i>Aythya ferina</i> JD		3–5	<25	+	Wv*
<i>A. nyroca</i>				+	v
<i>A. fuligula</i> JD		4–10	oo	o/oo	Wv*
<i>A. marila</i>			+	+	wv
<i>Clangula hyemalis</i>				+	v
<i>Melanitta fusca</i>				+	v
<i>Bucephala clangula</i>				15–60	V
<i>Mergus albellus</i>				o	V
<i>M. merganser</i>		1–2		oo	V
<i>Pernis apivorus</i>			+		
<i>Haliaeetus albicilla</i>				o	V
<i>Circus aeruginosus</i>		1			W
<i>C. cyaneus</i>			+		
<i>C. pygargus</i>			+		a
<i>Accipiter gentilis</i>		5–7		15–25	FA*
<i>A. nisus</i>		3–4		20–60	b*p*FA*
<i>Buteo buteo</i>		6–7	X	10–30	FA*v*

1	2	3	4	5
<i>B. lagopus</i>			o	fAv
<i>Pandion haliaetus</i>		+		v
<i>Falco tinnunculus</i>	13-18		10-20	Bfra
<i>F. subbuteo</i>	1-2			F
<i>F. columbarius</i>			+	a
<i>F. peregrinus</i>		+	+	
<i>Perdix perdix</i>	250-500		XX	rA
<i>Coturnix coturnix</i>	5-10	x		A
<i>Phasianus colchicus</i>	450-700		XX	pfA
<i>Rallus aquaticus</i> JD	o			W
<i>Porzana porzana</i>	1-3			W
<i>Crex crex</i>	5-10			A
<i>Gallinula chloropus</i> JD	40-45		+	W
<i>Fulica atra</i> JD	190-210		50-100	WV*
<i>Grus grus</i>		X		a
<i>Pluvialis apricaria</i>		+		v
<i>P. squatarola</i>		+		v
<i>Charadrius dubius</i>	10-15	oo		rV
<i>C. hiaticula</i>	1-3	o		V
<i>Vanellus vanellus</i>	90-120	oo		A V*
<i>Calidris alba</i>		+		v
<i>C. minuta</i>		+		v
<i>C. temminckii</i>		+		v
<i>C. canutus</i>		+		v
<i>C. alpina</i>		o/oo		V
<i>Philomachus pugnax</i>		o		V
<i>Limicola falcinellus</i>		+		v
<i>Lymnocyptes minimus</i>			+	v
<i>Gallinago gallinago</i>	2	o		A V*
<i>Scolopax rusticola</i>		o		pf
<i>Limosa limosa</i> JD	12-15	o/oo		A V*
<i>Numenius arquata</i>		+		v
<i>Tringa erythropus</i>		+		v
<i>T. totanus</i>	1-2	o		WV*
<i>T. nebularia</i>		o		V
<i>T. ochropus</i>	1-2	o		F V
<i>T. glareola</i>		o		V
<i>Actitis hypoleucos</i>	<5	oo		w*V

1	2	3	4	5
<i>Arenaria interpres</i>		+		v
<i>Larus ridibundus</i>	25-100	>oooo	7,000-10,000	baWV
<i>L. canus</i>	15-20	ooo	2,500-3,000	b*a*wV
<i>L. fuscus</i>		o	<20	V
<i>L. argentatus</i> + <i>L. cachinnans</i>		o/oo	200-500	wV
<i>L. marinus</i>		o	o	V
<i>Rissa tridactyla</i>			+	w
<i>Sterna hirundo</i>	40-60	oo		w*V
<i>S. albifrons</i>	10-15	o		w*V
<i>S. caspia</i>		o		V
<i>S. paradisea</i>		+		V
<i>Chlidonias niger</i> JD	1-2	o		W"V*
<i>Columba livia dom.</i>	35,000-65,000		XX	Bpav*
<i>C. oenas</i>	1?			f
<i>C. palumbus</i>	750-1100			bPFa
<i>Streptopelia turtur</i>	10-25			Fa
<i>S. decaocto</i>	3,000-5,000		XX	Bpa
<i>Cuculus canorus</i>	50-120			pFa
<i>Athene noctua</i>	10-20		X	A
<i>Strix aluco</i>	60-100		XX	PF
<i>Asio otus</i>	5-15	X	o/oo	P*F A
<i>A. flammeus</i>		+		v
<i>Aegolius funereus</i>		+		
<i>Caprimulgus europaeus</i>	o?			F
<i>Apus apus</i>	3,000-8,000			B
<i>Alcedo atthis</i>	4-6	o	o	WV
<i>Upupa epops</i>	6-10	o		A
<i>Jynx torquilla</i>	20-30	o		p*F
<i>Picus viridis</i>	50-60		oo	pf A
<i>Dryocopus martius</i>	15-20	X	oo	F
<i>Dendrocopos major</i>	350-450		ooo	b*p"p*F
<i>D. syriacus</i>	2-3		o	p
<i>D. medius</i>	50-90		ooo	pf
<i>D. minor</i>	100-200		ooo	b*PFa
<i>D. leucotos</i>			+	f
<i>Galerida cristata</i>	45-65		oo	b* R
<i>Lullula arborea</i>	10-20			F
<i>Alauda arvensis</i>	1000-2000	X		rA



1	2	3	4	5
<i>Riparia riparia</i>	1300-1500			R v
<i>Hirundo rustica</i>	1000-1500			b A
<i>Delichon urbica</i>	1800-2400			B
<i>Anthus campestris</i>	30-40			RA
<i>A. trivialis</i>	500-900			F
<i>A. pratensis</i>	30-60			A
<i>Motacilla alba</i>	600-1100	ooo/ oooo		RAW*V*
<i>M. flava</i>	1000-1500	X		prAw*
<i>Bombycilla garrulus</i>			1000-5000	BP A
<i>Troglodytes troglodytes</i>	100-200		oo	p*F
<i>Prunella modularis</i>	150-250	X		pFv
<i>Erithacus rubecula</i>	2000-3500	>oooo	o	pF
<i>Luscinia luscinia</i>	700-1000			pF a V
<i>L. megarhynchos</i>	45-55			PFa v
<i>L. svecica</i>	o?			v
<i>Phoenicurus ochruros</i>	1000-2000		+	B Ra
<i>P. phoenicurus</i>	350-600			PF
<i>Saxicola rubetra</i>	200-300			A
<i>S. torquata</i>	8-12			Ra
<i>Oenanthe oenanthe</i>	250-450			Ra
<i>Turdus torquatus</i>		+		p
<i>T. merula</i>	2000-3500		1000-2000	bPF*F a
<i>T. pilaris</i>	500-650	X	3000-5000	B*b"PA
<i>T. philomelos</i>	600-1000	oooo		pF
<i>T. iliacus</i>		oooo	+	pF
<i>T. viscivorus</i>	5-10		o	p*F
<i>Locustella naevia</i>	20-50			A V
<i>L. fluviatilis</i>	40-60			F a V
<i>L. luscinioides</i> JD	10-15			W
<i>Acrocephalus scirpaceus</i> JD	120-150			W
<i>A. arundinaceus</i> JD	150-170			W
<i>A. schoenobaenus</i> JD	70-90			WV
<i>A. palustris</i>	700-1000			rA V
<i>Hippolais icterina</i>	1000-1600			bPf a
<i>Sylvia curruca</i>	1500-3000	X		bPfa
<i>S. communis</i>	1600-2200			p rA
<i>S. borin</i>	400-700			pF

1	2	3	4	5
<i>S. atricapilla</i>	1200-1800			PF
<i>S. nisoria</i>	5-10			f A
<i>Phylloscopus sibilatrix</i>	1000-1900	X		pF
<i>P. collybita</i>	2000-3000	X		pF a
<i>P. trochilus</i>	2000-3200	X		pF a V
<i>P. trochiloides</i>	+			p
<i>Regulus regulus</i>	o/oo?		oooo	pF
<i>Muscicapa striata</i>	400-800			pF A
<i>Ficedula parva</i>	10-15			F
<i>F. albicollis</i>	2-5			F
<i>F. hypoleuca</i>	400-800	X		pF
<i>Aegithalos caudatus</i>	10-20		50-200	F a*
<i>Panurus biarmicus</i>			o	W
<i>Parus palustris</i>	100-140		ooo	p*F a
<i>P. montanus</i>	350-600		ooo	Fa*v*
<i>P. cristatus</i>	50-100		500-2000	F
<i>P. ater</i>	10-20		500-2000	p*F
<i>P. caeruleus</i>	3500-5000		5000- 20,000	bPF a
<i>P. major</i>	6000-12,000		10,000- 40,000	bPF a
<i>Sitta europaea</i>	350-550		500-3000	PF
<i>Certhia familiaris</i>	100-200		X	p*F
<i>C. brachydactyla</i>	100-150		X	pF
<i>C. brachydactyla+</i> <i>C. familiaris</i>			ooo/oooo	bpF
<i>Remiz pendulinus</i>	90-110			wV
<i>Oriolus oriolus</i>	500-700			PFa
<i>Lanius collurio</i>	80-110			A
<i>L. excubitor</i>	1-2		+	A
<i>Garrulus glandarius</i>	250-300	X	400-600	pFa*
<i>Pica pica</i>	2900-4100		5000- 10,000	BP A
<i>Corvus monedula</i>	8000-16,000		15,000- 30,000	Bp"P*r*a
<i>C. frugilegus</i>	650-700		80,000- 120,000	Bp"P*r*A
<i>C. corone cornix</i>	800-1100		1500-2000	bPFAV*
<i>C. corax</i>	4-5		<20	F A*
<i>Sturnus vulgaris</i>	15,000-25,000	X	200-500	BPF"A"
<i>Passer domesticus</i>	70,000- 150,000		XX	BprA

1	2	3	4	5
<i>P. montanus</i>	4000-17,000		XX	bPFR*A
<i>Fringilla coelebs</i>	4000-7000		oo	bP <sup>o</sup> Pa
<i>F. montifringilla</i>			oo	Pf
<i>Serinus serinus</i>	500-900			Pf
<i>Carduelis chloris</i>	1200-2000		2000-5000	bPf A
<i>C. carduelis</i>	500-800		2000-5000	Pr*A
<i>C. spinus</i>	15-25		5000-10,000	p*FA*
<i>C. cannabina</i>	500-900		100-300	p rA
<i>C. flammea</i>			1000-5000	p RA
<i>C. hornemanni</i>			+	p
<i>C. flavirostris</i>			oo	rA

1	2	3	4	5
<i>Loxia curvirostra</i>			+	f
<i>Carpodacus erythrinus</i>	35-40			awV
<i>Pyrrhula pyrrhula</i>	20-30		1000-3000	P*Fa*
<i>Coccothraustes coccothraustes</i>	200-500		300-1000	PF
<i>Emberiza citrinella</i>	800-1500		1000-3000	F*rA
<i>E. hortulana</i>	40-60			A
<i>E. schoeniclus</i>	80-100		20-50	A*WV
<i>Miliaria calandra</i>	40-60			A
<i>Plectrophenax nivalis</i>			+	a