LONG-TERM POPULATION TRENDS OF CORVIDS WINTERING IN URBAN PARKS IN CENTRAL POLAND

ABSTRACT: Changes in the numbers of corvids wintering in Warsaw (Central Poland), in the last sixteen years were analyzed. Four species were studied: Rook *Corvus frugilegus* L., Jackdaw *C. monedula* L., Hooded Crow *C. corone cornix* L. and Magpie *Pica pica* (L.) The results were based on density data for birds foraging in three urban parks. The bird counts were conducted in November and December 1988–2003. It was found that the number of wintering Rooks decreased significantly (0.5 fold), populations of Jackdaws and Hooded Crows – increased (4.25 and 3.95 fold, respectively), and no apparent trends were observed for Magpies during this period. Observed trends for Rooks as well as comparisons of limited data gathered earlier in other areas may confirm suggestions about the changing of migration routes of this species.

KEY WORDS: Corvidae, *Corvus frugilegus*, *Corvus monedula*, *Corvus corone*, *Pica pica*, wintering, long-term study

Long-term monitoring of bird numbers allows to detect population trends, predict population dynamics and show factors influencing on a species distribution and abundance. Most such studies describe the situation of breeding populations (van Strien *et al.* 2001, Chylarecki *et al.* 2006). Papers presenting trends in wintering populations are scarce, and concentrate mostly on waterbirds and waders (Cayford and Waters 1996, Austin *et al.* 2000, Kershaw and Cranswick 2003). However, the knowledge of the trends of wintering population is also important for explaining overall population dynamics of a given species. It is because several factors, which influence strongly species distribution and abundance, may occur mainly during cold season (e.g. weather-related mortality). Thus, analysis of trends of wintering population can help explaining the status of a given species in a region.

Corvids are one of the most important elements of the winter avifauna in Central Europe, both in agricultural areas and especially in cities (Luniak 1981, Hubalek 1999). Rooks *Corvus frugilegus* L., Jackdaws *C. monedula* L., Hooded Crows *C. corone cornix* L., and Magpie *Pica pica* (L.) consist nearly 25% individuals of all wintering species recorded in central Poland (Jędrzejewski 2000). Thus it seems, that the population fluctuations of those species, may have also a great importance for other birds wintering in the city, since strong interactions within wintering birds community (predation, competition)
are highly plausible (Gregory and Marchant 1995).

Specific conditions of the cities where corvids spend winters are incomparable with habitat from the suburbs or farmland. Normally, corvids have rather distant foraging niches (e.g. Waite 1984), but in cities where the predominant food in their diets is probably of human origin, all species may strongly compete. It is also possible, that the numbers of wintering corvids may be affected by the synurbization process, which has been observed especially for the Magpie (Jerzak 2002) and Hooded Crow (Vuorisalo et al. 2003). However, because of spatio-temporal dynamic of developing urban habitat, it is difficult to find relatively invariable plot for bird population comparison among consecutive seasons. As a consequence, population variation of a given species may be shaped both by real trend and local habitat variability (e.g. building up). Thus we concentrated the studies in urban parks, which had strictly constant shape, size and vegetation structure. We assume that observed trends reveal real population fluctuation of wintering birds. Urban parks are the most stable habitats in urban landscape since they have not been changing, logging and covering with buildings for last 50 years.

The aim of this paper is to present long-term data on wintering corvids, based on changes in the densities of foraging birds in three urban parks.

The study was carried out in Warsaw (Central Poland, 52°N, 21°E). The administrative borders of the city encompass 494 km², with 1.6 million inhabitants. In 1997, built-up areas comprised 36% of the city, agriculture areas 29%, parks, cemeteries, community gardens and other green areas - 9.4%, and woods and forest parks – 14.7% (Luniak et al. 2001).

The assemblage of corvids wintering in the city consists of Rooks, Jackdaws, Hooded Crows and Magpies. Rooks and Jackdaws were observed in winters in Warsaw at least from the end of 19th Century. At that time, the Rook was a breeding species, but the Jackdaw was confirmed as breeding in about 1930 (Luniak et al. 1964). The process of synurbization of the Magpie started at the end of 1960’s and the Hooded Crow in the early 1980’s (Luniak et al. 2001). The Jay Garrulus glandarius (L.) occurs mainly in forests on the outskirts of the city, but it slowly has started to invade green urban areas.

During winter, corvids forage in city parks, lawns and other green areas near buildings. However, all species of corvids achieved the highest densities in the old parks of the city (Luniak 1981, Luniak et al. 1997, 2001). Therefore, data for this study were collected in three urban parks: 16 ha (Ogród Saski), 10 ha (Ogród Krasińskich) and 6 ha (Żeromski Park). They are located in the city center or close to it, and they contain old trees, and open grassy areas. There are many pedestrian paths, and the parks are visited frequently. Birds are not fed regularly.

Fig. 1. Population trends of four species of corvids wintering in city parks in Warsaw.
by park visitors, but when they are, the food is mostly bread.

Students of Department of Ecology, Faculty of Biology, Warsaw University have been counting birds in the city parks at least from the mid-1980’s, as a part of their university classes. Those studies were conducted in early winter from the end of October to December in 1988–2003 period. 7–9 counts were made in each park every winter. We assumed that corvids data gathered even by students, are reliable because the birds are easily seen and recognized and all the counts were made with strictly the same methods (Brauze and Zieliński 2006). Our own counts were carried out during two winters (1996–1997 and 2003–2004) from November to February, and we counted the birds twice per month in each studied park.

Wintering Rooks arrive in Warsaw at the end of October (Luniak et al. 2001, and author’s data). As for the other corvid species, it is hard to establish when an exchange occurs between breeding and wintering populations or even whether any exchange takes place at all. It is known that Jackdaws and Hooded Crows arrive in areas where they spend the winter earlier than Rooks (Cramp and Perrins 1994). Therefore, we took only data from counts (both of the students and our own) conducted in November and December for further analysis, assuming that by that time, we were collecting data for corvids actually wintering in the city. Results of our own counts suggest that the numbers of corvids in the first period of winter (November–December) are similar to those observed in the second period (January–February) (Mann-Whitney U test, separate for each park and species – all cases \( P > 0.05 \)). Thus, data obtained from early winter counts are a reliable reflection of the number of wintering corvids. Moreover, we assumed that autumn and early winter data are most reliable, since winter mortality, which depends on e.g. weather conditions, does not affect the results.

Average numbers of observed birds were calculated for each year and park from all counts conducted between November and December, and later transformed into densities (individuals 10 ha\(^{-1}\)). We did not have results for all three parks for each year. Therefore we considered only those years where we had data for at least two parks, and it was possible to calculate average densities of corvids. Calculated densities had normal distribution (Kolmogorov-Smirnov test, all cases \( P > 0.5 \)). In total, we analyzed trends in corvid densities based on data from at least two parks for 13 winters between 1988–2003. We assumed that changes in numbers were reflected in the densities of birds foraging in the studied parks, therefore, from here on in, the words “density” and “numbers” are used in a similar sense in this paper.

The numbers of wintering Rooks significantly decreased in the studied period (\( y = -3.3858x + 6830.71, R^2 = 0.41, F_{1,11} = 7.72, P = 0.018, n = 13 \)). Opposite trends were observed for Jackdaws (\( y = 1.3230x - 2624.0, R^2 = 0.46, F_{1,11} = 9.53, P = 0.010, n = 13 \)) and Hooded Crows (\( y = 0.3990x - 791.18, R^2 = 0.346, F_{1,11} = 5.81, P = 0.035, n = 13 \)). We did not find any significant changes in the number of wintering Magpies (\( R^2 = 0.04, F_{1,11} = 0.49, P = 0.499, n = 13 \)) (Fig. 1), and all corvids pooled together (\( R^2 = 0.07, F_{1,11} = 0.82, P = 0.385 n = 13 \)).

The main problem with interpreting the results is the issue of the origin of the birds. The lack of such data makes it impossible to determine the relationship of observed trends with particular populations. Also, there is no information how many local birds do not migrate and spend the winter in Warsaw, and which part of the observed winter population consists of visitors breeding in other regions, especially in Eastern Europe (Gromadzki and Mokwa 2005). Therefore, it is hard to define the reasons that may be responsible for the observed trends. There are at least a few factors that may affect the observed pattern.

The first one is a shortening of migration routes, which may be related to climate warming and milder winters, as stated by Unger and Bauer (2001). Busse (1969) also suggests such a phenomenon for corvids, while recent studies confirm the connection at least for Hooded Crows (Sieffeke 1994, Busche 2001). On the other hand, the trends presented here based on 16 seasons only. Probably addition of data collected before 1988 into analysis would give more reliable pattern of long-term popula-
tion changes of corvids (Sparks and Tryjanowski 2005). It seems that the numbers of Rooks wintering in Warsaw increased from the mid-1970’s to the mid-1980’s, while a sharp decrease began to take place between 1987 and 1996 (Mazgajski et al. 2005). The results of this study indicate that the decrease started in mid-1980’s and is still proceeding. Similar trends were observed not only in other Polish cities (Hordowski 1995, Jakubiec and Jadczyk 2004), but also by Unger and Bauer (2001), who stated that the decrease in wintering Rooks in Thüringien, as well as in other parts of Central Europe, has been observed since about 1993. Our data suggest that such a decrease may have started even earlier in this part of the continent.

It is possible that the shortening of migration routes had started earlier, and led to a decrease in the number of Rooks wintering in Western Europe (Reichholf 1987), may explain the sharp increase of wintering corvids in Poland observed at the same time (Winniecki 2000, Jakubiec and Jadczyk 2004, Jadczyk and Jakubiec 2005, Mazgajski et al. 2005). Besides, if such a rapid increase of wintering corvids in Poland was related to a restoration of the Rook population in Eastern Europe, a similar trend should have been observed on all the wintering grounds. Therefore, it seems that the sharp decrease of wintering Rook numbers observed recently is connected with the wintering grounds coming closer to the breeding areas, and most of the Rooks are spending winters in e.g. Belarus and Russia.

It should be also noted, that in spite of clear population trend, variability of corvids density among consecutive seasons was high (up to 50–60 individuals × 10 ha¹ in case of Rook, Fig. 1). It is most plausible, that year-specific weather conditions may explain observed variability. Moreover, human activity in urban parks, especially artificial food supplementation, may additionally affect corvids densities in a given year (Avilova and Eremkin 2001).

The breeding population of Rook in Poland is rather decreasing (Tomiałojć and Stawarczyk 2003, Orłowski and Czapolak 2007), therefore it is possible that the wintering population is strongly strengthened by birds from Eastern Europe. Population trends from Finland in mid-1980’s (Solonen 1985, Tiainen 1985) revealed a decrease in numbers, therefore the birds, which spend winters in Poland, are probably of Russian origin.

An increase in the number of wintering Jackdaws could be also related to changes in Rook numbers, because Jackdaws are competitively weaker, and Rooks can, for instance, steal their food (e.g. Höglund 1985, author’s own data). Therefore, a decrease in the number of wintering Rooks may be an example of competition release and therefore creates the favorable situation for Jackdaws. On the other hand, Rooks, which may spend winters closer to their breeding grounds (e.g. on Belarus), may force local Jackdaws to migrate in search of better places to spend the winter (e.g. Central Poland).

In the case of the Magpie and Hooded Crow, it seems that a sharp increase in wintering numbers occurred in early 1980’s and later their populations were rather stable (Mazgajski et al. 2005). However, detailed data suggests that the numbers of Hooded Crows slowly increased and the numbers of Magpies reveal some fluctuations, with no significant trend (Fig. 1). It seems that the numbers of Hooded Crows in Polish cities are still increasing, and that started to decline in the countryside (Tomiałojć and Stawarczyk 2003, Chylarecki et al. 2006). It is possible that the birds wintering in Warsaw are of local origin, because they have increased in numbers (Luniak et al. 2001). Their population trends reflect probably the advanced synurbization process, which result in more sedentary behavior (e.g. Konstantinov et al. 1982). However, in the case of Hooded Crows, new data clearly demonstrate that the birds are shortening their migration routes (Siefke 1994, Busche 2001). Therefore their numbers may decrease in some areas, and at the same time increase in others, closer to their breeding grounds. If this is the case, it is possible that the numbers of wintering Hooded Crows in Warsaw may decrease in the future, similar to the trends observed for Rooks. More data from ringing, especially in Russia and Belarus, may reveal wintering corvids origin and explain observed population trends.
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