# The breeding population of the White Stork in Belarus in 2004-2005 – Results of the 6th International White Stork Census

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## Zusammenfassung

Der Internationale Weißstorchzensus 2004/05 war erfolgreicher als alle anderen Erfassungen zuvor. Neue Methoden der Datenerfassung und Analyse wurden genutzt. Das machte erstmals eine umfassende Hochrechnung der Populationsgröße in Belarus möglich. Nach der Hochrechnung und der Korrektur der vorhandenen Daten wurde der Weißstorchbestand in Belarus auf rund 21.400 Paare (HPa) hochgerechnet.

Diese Zahlen sind etwa zweimal so hoch, wie bei den vorherigen Zählungen. Dies wird großenteils auf die verbesserte Methodik des Weißstorchzensus 2004/05 zurückgeführt. Ein Vergleich von Probeflächenzählungen mit früheren Erfassungen weist jedoch einen realen Bestandsanstieg seit den 1980ziger und 1990ziger Jahren nach.

Die Verbreitung des Weißstorchs in Belarus ist ungleichmäßig. Die höchsten Siedlungsdichten finden sich im Südwesten, Westen und Südosten des Landes. Die durchschnittliche Siedlungsdichte (StD) für das ganze Land beträgt 10,3 Paare/100 km² bzw. 16,1 Paare/100 km² bezogen auf die nichtbewaldete Landesfläche. Die höchste registrierte Siedlungsdichte in einer Probefläche betrug 34,0 Paare/100 km².

Bezogen auf die Daten aus Probeflächen (decken 6,2% der Landesfläche ab) war der Bruterfolg des Weißstorchs 2004 relativ hoch. Nur etwa 4,1% der Paare (%HPo) brachten keine Jungen zum Ausfliegen. Der Gesamtbruterfolg (JZa) betrug 2,52 Junge pro Paar, bezogen auf die Anzahl erfolgreicher Paare (HPm) betrug der Bruterfolg (JZm) 2.66 Junge. Die Gesamtzahl der flüggen Jungen (JZG) wurde für das ganze Land auf 57.500 geschätzt.

Verglichen mit 1967 nahm der Anteil „traditioneller“ Nestunterlagen stark ab: Bäume von 69,5% auf 37,0% und Gebäude von 30,5% auf 12,1%. Dagegen hat es einen Anstieg des Anteils von neuen Nistunterlagen gegeben: Wassertürme auf 24,6% und Strommasten auf 24,8%.

## Summary

The national White Stork census of 2004-2005 in Belarus was more successful than all of the previous surveys. New approaches for data collection and analysis were used. This allowed a population estimate of White Storks to be made for the whole of Belarus for the first time. After extrapolation and correction of the available data, the Belarusian White Stork population was estimated to be around 21,400 breeding pairs (HPa).

This was almost twice as high as for previous censuses, mainly due to the higher quality of the 2004-2005 census. Nevertheless comparison of 2004/05 sample plot data with previous results for the same areas indicated that there had also been a real increase in White Stork population size during the 1980-1990's, at least in some large regions of the country.

The distribution of White Stork throughout Belarus is uneven. Population densities are highest in the southwestern, western and southeastern parts of the country. Mean population density (StD) for the whole country was 10.3 pairs/100 km², or 16.1 pairs/100 km² for open (non-forested) areas only. The highest density recorded on sample plots was 34.0 pairs/100 km².

According to data obtained from sample plots (covering 6.2% of the total area of the country), breeding success in White Storks was relatively good in 2004. Only 4.1% of pairs (%HPo) failed to breed successfully, and productivity (JZa) was 2.52 young fledged per breeding pair, and mean fledged brood size (JZm) was 2.66 young fledged per successful pair. The total number of fledging young (JZG) was estimated to be approx. 57,500.

Compared with 1967, the proportion of "traditional" White Stork nest supports decreased significantly from 69.5% to 37.0% (trees) and from 30.5% to 12.1% (buildings). By contrast, there has been a steady increase in the proportion of nests built on previously unusual types of support, to levels of 24.6% (water towers) and 24.8% (electric pylons) of all nests recorded in 2004-2005.

## Introduction

Until recently, the White Stork population in Belarus was considered to be well studied. According to the results of regular national White Stork censuses, conducted at least every 10 years from 1957 onwards, the population size was estimated at 10,000-13,000 breeding pairs. In the mid-1990s, according to the results of 5th International Census (SCHULZ 1999b), Belarus supported more than 7% of the world population. The population was considered to be stable, at least over the last two or three decades of the 20th century (SAMUSENKO 1999).

The national population size for all previous national censuses was estimated mainly on the basis of analysis of questionnaires, together with some additional field counts carried out by the census coordinators. There was significant variation in information on White Stork distribution in Belarus between different years and different regions, because the chosen census method depended greatly on the attitude of questionnaire respondents in the region.

## Material and Methods

The White Stork census in Belarus in 2004-2005 was carried out within the framework of the 6th International White Stork Census. This most recent national count adopted a new approach to data gathering. This was possible thanks to financial support from a number of national and foreign sponsors. The application of new ways of data gathering and analysis, complementing previously used methods, made the 2004/05 census more complete and precise compared with previous censuses. At a national level, the census was coordinated by the Institute of Zoology of National Academy of Sciences of Belarus, "Akhova ptushak Batskaushchyny" (APB-BirdLife Belarus) and the Ministry of Natural Resources and Environmental Protection of Republic of Belarus.

The total area of Belarus is 207,600 km$^2$. The country is divided into 6 administrative regions ("oblasts"), 118 smaller administrative districts ("rayon") and about 1,500 municipalities (city and village councils - "selsovet").

In 2004 over 4.5 thousand questionnaires were sent to all 118 administrative districts: to regional inspections for nature protection, education departments, APB members, active participants of previous counts, etc. In 2005, questionnaires were sent again to districts with a previous low response rate. Most of the data was received in 2004. During the two census, only two districts (Chechersk and Khotimsk) produced no White Stork nest data.

In addition to the standard questionnaire census, in 2004 full counts of White Stork nests were arranged for sample plots, together with recording of additional demographic parameters. The counts were carried out by specially instructed and experienced counters (stork experts), most of whom lived close to sample plots. The sample plots were located in all regions of Belarus. The data from five sample plots in Vitebsk region were merged into a single database of questionnaire data by the regional count coordinator, Viktor Biryukov. In the other five administrative regions, full counts were carried out at 22 sample plots, with a total area of 12,940 km$^2$ (6.2% of the total area of Belarus), and covering the territory of 25 administrative districts (Fig. 1). Sample plots varied from 50 to 2,000 km$^2$ in size. The greatest number of sample plots was located in the Brest region (10 plots), and the lowest in the Gomel and Mogilev regions (3 plots in each). Traditional international methods were used for data gathering and analysis, using standard abbreviations (SCHÜZ 1952, SCHULZ 1999a).

The population size of White Stork in Belarus was estimated using two methods.

Firstly: extrapolation of questionnaire data from the village councils onto the total area of administrative districts. Extrapolated data for population sizes in administrative districts were summed to give a total for each administrative region. The territory of a village council was considered to be covered by the questionnaire census if data on White Stork nests were received from at least one settlement. Altogether, census coordinators received data on White Stork nests from 73% of the village councils from five regions, but not from Vitebsk.

Secondly, questionnaire data were corrected by comparing the number of nests on sample plots (obtained by full counts) with the questionnaire data for the same territory. The difference between the questionnaire data and the results of full counts varied significantly – from a total absence of information about White Storks breeding in the area according to questionnaire data (two cases: Smorgon and Vilejka districts), to overestimation of the number of nests by between 2% and 24% (four cases: Luninets, Svisloch, Malorita, Slonim districts). On average, questionnaires from areas covered by full counts reported just over half of the actual number of White Stork nests obtained during full counts.

Because the sample plots with full counts were distributed unevenly in different regions and districts, we applied a unified correction factor to all questionnaire data for all regions (apart from Vitebsk) multiplying the number of pairs recorded by questionnaire by a factor of 1.805. For the Vitebsk region, as mentioned above, we used an averaged population estimate calculated by V. Biryukov (2004) of 2,500 - 2,600 breeding pairs.

To estimate the total White Stork breeding population for all of Belarus, we used the figures from the corrected questionnaire data. Estimates of the number of successful ($HPm_{estim}$) and unsuccessful pairs ($HPo_{estim}$) was made on the basis of the corrected questionnaire data, applying a ratio of successful (95.9%) to unsuccessful (4.1%) pairs recorded on the sample plots.

Extrapolated questionnaire data on the number of White Stork nests provided the basis for quantifying minimum population size and breeding density, at both national and district scales (Table 1 and Fig. 2). The corrected questionnaire data were used to calculate the maximum population size and breeding density at national and regional scales (Table 3). The mean number of pairs per 100 km$^2$ and open/non-forested area were calculated using the corrected questionnaire data.

Breeding success and productivity were calculated using results from the sample plots. The total number of young was estimated by using the estimate of the total number of successful pairs and mean fledged brood size for each administrative region separately, and then summing the regional figures.

The analysis of nest site locations was based on the data from questionnaires, as this covered the whole territory of the country

more completely, and allowed the possibility of comparison with data from previous surveys.

## Results of the census 2004-2005

### Breeding population

Table 1 presents the main results of the questionnaire survey, along with White Stork population numbers and densities in Belarus based on questionnaire analysis. In 2004-2005, questionnaires reported about 13,896 nests of White Stork. Of these, more than 1,000 nests (7.6%) were not used by birds, 12,839 nests were occupied, of which 287 pairs (2.2%) bred unsuccessfully (Table 1). Extrapolation of these data to territories of village councils from which no questionnaires were received resulted in a minimum estimate of the national White Stork population of 17,500 pairs (HPa).

Comparison of the questionnaire data with full counts from sample plots (Table 2) showed that the questionnaires provided incomplete data. In order to obtain a more realistic estimate of the size of the White Stork population in Belarus, we think it is necessary to correct the questionnaire data by a multiplication factor [based on the number of pairs recorded on sample plots], which brings the population estimate for White Stork in Belarus to around 21,400 pairs (HPa) (Table 3). The ratio of successful and unsuccessful pairs on sample plots slightly differed from questionnaire data: 95.9% and 4.1% respectively.

More than a quarter of all White Storks in Belarus breed in the Brest region (between 27.5 and 29.3% of the total number of breeding pairs, according to different estimates). The highest numbers of nests in individual settlements were also recorded on sample plots here. More than 20 pairs were recorded in 7 villages: Stakhovo (24pairs), Khorsk (22 pairs), B. Malishevo (21 pairs) in the Stolin district; Kozan-Gorodok (28 pairs), Lakhovka (23 pairs) in the Luninets district; Divin (29 pairs) in the Kobrin district; Babinets in the Pruzany district (22 pairs). The second highest number of White Stork nests was recorded in the Gomel region (between 17.6 and 18.4% of the national total), with the highest number of pairs (21) in the village of Liaskovichi in the Petrikov district. The Grodno, Minsk and Vitebsk regions account for around 12 to 17% of the Belarusian White Stork population. The Mogilev region supported the smallest proportion of the national population, at around 10%.

### Population density

Based on the minimum and maximum estimates of the national population of White Storks (extrapolated questionnaire data, subject to application of the correction factor) the mean breeding density of the White Stork (StD) is between 8.4 and 10.3 pairs/100 km$^2$. 13.1 and 16.1 pairs/100 km$^2$ and for non-forested habitats (StDSt) of around 16.1 pairs/100 km$^2$. Using the minimum population estimate, the White Stork breeding density varies from 0.5 (Minsk district) to 24.1 (Pinsk district) pairs/100 km$^2$ of total area of Belarus, or from 0.7 (Minsk district) to 48.5 pairs/100 km$^2$ for non-forested areas only (Fig. 2). In the Grodno and Brest administrative regions, White Stork breeding densities are higher than the national average for Belarus, with 8 districts having White Stork breeding densities higher than 15.0 pairs/100 km$^2$. For non-forested areas only, the Gomel region also has a higher than average breeding density. The lowest breeding densities of White Storks were found in the Mogilev, Minsk and Vitebsk regions (on average 6.1-6.4 pairs/100 km$^2$ of total area of Belarus, or 9.2-9.7 breeding pairs/100 km$^2$ of non-forested area of the country). The mean breeding density of White Stork on sample plots (20 pairs/100 km$^2$) was 2.0 to 2.4 times higher than that calculated basing on estimated numbers based on questionnaires. In a number of districts, the average White Stork breeding density on sample plots was much higher than the average for this districts in Belarus: Petrikov district – 34 pairs/100 km$^2$, Stolin district – 32.5; Pinsk district – 31.3; Zhitkovichi district – 29.0; Malorita district – 26.7; Volozhin district – 26 pairs/100 km$^2$ (Table 2).

### Distribution

As noted above, sample plots were located irregularly in different regions, and they also varied greatly in size (Table 2). Because of this, we were not able to use data from sample plots to describe the general pattern of White Stork distribution in Belarus, and the estimated breeding density of White Stork in administrative districts as shown on Figure 2 is underestimated to a certain degree. Nevertheless, more precise data to analyze White Stork distribution in Belarus is absent.

As it can be seen in Figure 2, White Storks have an uneven distribution in Belarus. The highest density is observed at lowlands in the south-west, west and south-east of Belarus. The lowest number of nests per unit area was recorded in the north and north-east of the Vitebsk region and the east of the Mogilev region, areas located closer to the eastern boundary of the species' current range. Low densities of White Stork in central parts of the Minsk region can be explained by the elevated landscape and high human population density here. In general, the distribution of White Storks in Belarus follows previously described patterns, with breeding density decreasing from the south-west to the north-east of the county (SAMUSENKO & LEVANOVICH 1990, SAMUSENKO 1992). The distribution of the species is largely explained by presence of well-developed river floodplains, non-forested and drained areas, as has been shown in the results of targeted research (KUSENKOV 1992, SAMUSENKO 2000, SAMUSENKO & KOZEL 2004).

### Breeding success

In 2004, the mean fledged brood size in occupied nests of White Storks on sample plots (in five administrative regions) was 2.52±0.38 nestlings per breeding pair (JZa) (mean±SD, n=1910) and 2.66±0.40 per successful pair (JZm) (n=1808) with about 57,500 nestlings fledged (JZG) (Table 3). In the Vitebsk region, the productivity from all pairs was 2.48 young per nest (JZa) (BIRYUKOV 2004). Productivity was higher than the levels which according to the literature –is high enough to ensure the sustainability of breeding population size in the White Stork (2.0 young per breeding pair (HPa), BURNHAUSER 1983). Brood size varied on sample plots in different districts from 1.93 to 3.32 nestlings per breeding pair (Kobrin and Petrikov districts respectively) and from 2.03 to 3.39 nestlings per successful pair (Malorita and Zhitkovich districts respectively). The proportion of nests with different brood size was as follows: 1 nestling – 8.0% of nests, 2 nestlings – 36.7%, 3 nestlings – 39.5%, 4 nestlings – 12.7%, 5 nestlings – 3.1%.

The results of the studies revealed some regional differences in reproductive success. Brood size was highest in the Pripyat River floodplain, exceeding 3.0 fledglings per breeding pair and per successful pair in the Pinsk, Stolin, Luninets, Petrikov, Zhitkovichi districts. These regions with high breeding success are important source areas for supporting White Stork populations not only in Belarus, but also across the species' range (SCHULZ 1999b). The results also established that breeding success of White Storks was lower in the western regions of the country (Brest and Grodno which are characterized by high density) than in the eastern regions (Gomel and Moglev), which are located close to the edge of the species' distribution range. This phenomenon, increased brood size close to the edge of distribution range, was described previously in Ukraine (GRISHCHENKO 2004) and Latvia (JANAUS & STIPNIECE 1999). Further analysis of the results of White Stork monitoring in Belarus will require more in-depth review and compilation of results from sample plots.

### Nest locations

According to data from TARLETSKAYA (1969), in 1967 as many as 69.5% of White Storks in Belarus nested on trees and 30.5% on the roofs of buildings (Fig. 3). No cases of nesting on pylons or towers were recorded. In subsequent decades, there was a decrease of use of trees and roofs by White Storks for breeding, and a shift to breeding on water towers and electricity pylons. As early as 1984-1985, 14.8% of White Stork nests were located on these new types of support (SAMUSENKO & LEVANOVICH 1990), increasing to 31.9% in 1994-1996 (SAMUSENKO 1999), and 59.4% in 2004-2005. The increase in use of electricity pylons and water towers is characteristic across the country, although there has been variation between regions in the rate of shift to new types of nesting location.

For example, in 2004-2005 the highest proportion of White Stork nests located on electricity pylons was recorded in the southern regions of Belarus, Brest and Gomel, whilst in the Vitebsk region White Storks preferred to breed on water towers (Table 4). Trees were used more frequently for nesting in the Mogilev region, and least in the Brest region. The proportion of nests on roofs was significant only in the Brest region, where in some settlements it is possible to find buildings with straw and reed roofs, which are good for nesting. In other regions of Belarus, less than 10% of White Storks nested on roofs. Negligible numbers of nests in 2004-2005 were located on other types of support: chimneys, towers, monuments and obelisks, hay stacks, cisterns, etc.

### Population dynamics at selected sample plots

Few data sets on population changes in White Stork that are suitable for analysis. Comparison of census data from sample plots with the available information for the same areas for earlier periods has established the following. Compared with the results of the 1974 White Stork counts (VOLOSHINENKO 1975), numbers of White Storks in 16 settlements in the Zhitkovichi district (around the Pripyatski Reserve in the Gomel region) have increased by 28%, from 76 to 97 pairs (SAMUSENKO & KOZEL 2005). White Stork numbers in the buffer zone of the Belavezhskaya Pushcha National Park (1700 km$^2$, Brest and Grodno Regions) increased by 23%, from 213 pairs in 1981 (DATSKEVICH et al. 1983) to 262 pairs in 2004 (A. Abramchuk, V. Prokopchuk, census data). In the Kobrin district of the Brest region (2,000 km$^2$), White Stork numbers increased by almost 10% - from 386 in 1998-2000 to 423 in 2004 (S. Levy, census data). V. Biryukov, the White Stork census coordinator for the Vitebsk region, considers that the White Stork population in the northern part of Belarus is also increasing, both in the mid–20$^{th}$ century and in the last decade (BIRYUKOV 2004).

As well as evidence of increasing White Stork numbers in large areas of Belarus, there are also examples of declines. Following the Chernobyl nuclear disaster in 1986, White Stork numbers in the exclusion zone had sharply decreased as early as the mid-1990's (NIKIFOROV et al. 1995). At present, White Storks have almost completely abandoned the Zone, with active nests registered only in some evacuated villages along the border of the exclusion zone, close to land still used for agriculture. Such a response by White Storks can be explained firstly by sharp changes in landuse resulting from the evacuation of people and cessation of agriculture (abandonment of fields, overgrowth of floodplain meadows and increase in forest cover). In the Khoiniki district which neighbours the exclusion zone (c. 600 km$^2$ of surveyed area), the number of occupied nests was practically the same in recent years: 59 in 2000 and 60 in 2004 (S. Bondarenko, census data).

White Stork numbers also decreased in the Berezinsky Biosphere Reserve following establishment of strict protection within the reserve at the beginning of 1970s, but numbers had stabilized by the beginning of 1990s (BYSHNEV 1992), with insignificant fluctuations since then (Y. Bogutsky, pers. comm.). On the sample plot in Pripyat floodplain (1,929 km$^2$), White Stork numbers fell by 5%, from 714 pairs in 1999-2000 to 678 in 2004 (SAMUSENKO & KOZEL 2004).

Analysis of the available data on changes in White Stork numbers in selected areas shows that White Stork population growth over the last several decades is much more prevalent than cases of population decline, with declines occuring mainly on territories subject to rapid changes in human landuse.

## Discussion

As mentioned above, all previous White Stork censuses in Belarus were based mainly on questionnaires. It was considered that the population was relatively stable, its size varying between 10,000 and 13,500 pairs (SAMUSENKO 1999). Such a situation looked unusual given the background of significant growth in White Stork numbers in neighboring countries during the 1980-1990's (after SCHULZ 1999b). According to results of 5$^{th}$ International White Stork Census, the breeding population of Latvia (the total area of the country is about 63,700 km$^2$) was estimated to be 10,600 pairs (Janaus & Stipniece 1999), while only 1,248 pairs were reported in the Vitebsk region (40,100 km$^2$) of Belarus to the south of Latvia (SAMUSENKO 1999). In Lithuania, 11,124 pairs were censused on an area of 64,564 km$^2$ (MALINAUSKAS & ZUBRA 1999), while 2,031 pairs were recorded in the Grodno region of Belarus (25,000 km$^2$) situated immediately to the southeast of Lithuania. At this time 6,293 pairs were reported for the Podlaskie Province of Poland (20,094 km$^2$) located to the west of the Grodno region of Belarus (JAKUBIEC & GUZIAK 2006). The average White Stork density as a whole for Belarus (5.7 pairs /100 km$^2$) was in 2.5 to 3 times lower than for adjacent parts of Poland, Lithuania and Latvia.

The postal questionnaire results from 2004-2005, indicated about 12,839 pairs (HPa) of White Stork, within the limits of previous estimates of population size (Tab. 1). But it was obvious that the earlier census methods did not allow an accurate estimate of White Stork breeding numbers and that serious population underestimates had been made in the past.

Therefore, new approaches were used during the White Stork census in 2004-2005, not only for information collection, but also for data analysis. In 2004, complete counts of nests and population data collection were carried out on sample plots, to complement the standard mail questionnaires. The total area of all the sample plots combined was about 6.2% of the whole area of the country. In general, minimum and maximum population sizes were estimated by applying a correction factor, combined with subsequent extrapolation of questionnaire data onto territories for which White Stork population data was missing. This allowed a population number for the whole territory of the country to be defined for the first time.

The White Stork population of Belarus was thus estimated to be around 21,400 breeding pairs (HPa). This was almost twice as high as estimates made in previous censuses, mainly due to the better quality of the census in 2004-2005. Nevertheless, comparison of sample plots results with previous data for the same areas shows a real increase in White Stork population size during the 1980-1990's, at least in some large regions of the country. The largest increase in White Stork numbers was recorded in the area around the Pripyatski Reserve, a 28% increase over the last three decades.

As in other countries, nest site selection of the White Stork in Belarus has changed significantly. The main reasons for this shift in nest location preferences can be explained by changes in natural habitats, increasing urbanization of the landscape, availability of new types of suitable structures, changes in building materials and construction styles, etc.

For example, many preferred White Stork habitats have been drained in the past. Now, we see a large increase in the area of natural wet meadows and floodplains overgrow by willow shrubs and trees, due to reductions in the intensity of economic human activity here. In addition, soft roof coverings (reed, thatch; Photo 1) have become rare in most areas, and it is difficult for birds to build their own nests on hard roofs (tiles, metal etc.). This has occurred in the area abandoned by humans after Chernobyl disaster (NIKIFOROV et al. 1995), as well as in the floodplains of large Belarusian rivers such as the Pripyat, Dnepr, Berezina and Neman (SAMUSENKO 2000). Therefore, birds very often stop nesting in such areas (mainly on trees) and move to the nearest human settlements for nesting. Therefore the frequency of nesting on trees and buildings (traditional nest supports in the past) is in constant decline.

Electricity pylons (Photo 2) and water towers (Photo 3) were first used as nest supports by storks in Belarus just over a decade ago, and the proportion of these is still increasing. This causes problems for both birds and humans. Unfortunately, in Belarus the new problem of White Storks nesting on electricity lines is addressed only by installing protective and bird scaring devices on pylons, or by destroying nests. In rare cases, in the process of planned upgrades of electricity networks, wooden electricity pylons with White Stork nests are left standing. We do not consider this adequate to resolve the conflict, especially taking into account the continuing increase in the number of White Storks breeding on pylons.

Thus, critical analysis of the questionnaire data and comparison with data from sample plots have allowed us to significantly improve the knowledge of numbers, distribution and population dynamics of the White Stork population in Belarus. The Belarusian White Stork population is large enough [not to be in danger]. Nevertheless, it is necessary to take protective measures to preserve the species and its habitats right now. Field studies on sample plots in 2004 provides a scientific baseline for further White Stork monitoring, understanding trends and mechanisms of population change, and for the identification of practical solutions to the problems identified during the census.

## Public relations work during the census

White Stork is an unofficial symbol of Belarus. This explains the success of the PR campaign accompanying the White Stork census. Thousands of people took part, ranging from schoolchildren and students, teachers, forestry workers, hunters, representatives of local authorities to professional ornithologists. For each sample plot, a local coordinator was appointed, usually from the membership of APB-BirdLife Belarus. Numerous articles in regional and national newspapers were published and variety of interviews for TV, radio and newspapers were given by census organizers and stork experts in different regions. 100,000 envelopes featuring the White Stork Census were produced by the Ministry of Communication (Photo 4). Prizes (field bird guides) were given to the 15 people who found the highest number of nests. The overall winner (S. Levy) reported 423 breeding pairs. Instructions for installation of artificial nest supports for White Storks were prepared and sent out to interested people.

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**Tab. 1. Results of the 6th International White Stork Census 2004-2005 in administrative regions of Belarus (questionnaire data and estimation) and their comparison with main questionnaire data of 1994-1996.**

**Ergebnisse des 6. Internationalen Weißstorchzensus 2004/05 in den administrativen Regionen von Belarus (Daten aus Fragebögen und Schätzung) und der Vergleich mit den Daten aus Fragebögen 1994 – 1996.**

| Region | Questionnaire data | | | | | | Estimation (min) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1994-1996 | 2004-2005 | | | | | | | |
| | HPa | HPa | HPm | HPo | HPx | % of village councils covering | HPa | StD | StDSt |
| Brest | 3820 | 3254 | 2822 | 125 | 307 | 63.9 | 5088 | 15.5 | 24.2 |
| Gomel | 2071 | 2178 | 1894 | 53 | 231 | 70.2 | 3053 | 7.6 | 17.6 |
| Grodno | 2031 | 1988 | 1767 | 43 | 178 | 79.1 | 2379 | 9.5 | 14.2 |
| Minsk | 1565 | 1837 | 1754 | 33 | 50 | 64.1 | 2531 | 6.3 | 9.7 |
| Mogilev | 1038 | 1165 | 1039 | 33 | 93 | 61.6 | 1770 | 6.1 | 9.3 |
| Vitebsk* | 1282 | 2417 | 2417 | 0 | 0 | 100.0 | 2550 | 6.4 | 9.2 |
| Totals | 11807 | 12839 | 11693 | 287 | 859 | 73.1 | 17371 | 8.4 | 13.1 |

* **Data from Vitebsk region summarized (both questionnaire and sample plots results of 2004) and estimated by regional coordinator V. Biryukov (2004).**

* **Die Daten der Region Vitebsk wurden zusammengefassten (Fragebögen und Zählergebnisse aus den Probeflächen 2004) und hochgerechnet durch den Regionalkoordinator V. Biryukov (2004).**

**Tab. 3. Total estimates of White Stork breeding population in Belarus 2004-2005 according to extrapolation and correction of census data (see Methods).**

**Berechnung des Gesamtbestandes des Weißstorchs in Belarus 2004-2005 basierend auf der Hochrechnung und der Korrektur der Zählergebnisse (sh. Methoden).**

| Region | Area, km² | $HPa_{corr}$ | $HPm_{estim}$ | $HPo_{estim}$ | JZa | JZm | JZG | StD | StDSt |
|---|---|---|---|---|---|---|---|---|---|
| Brest | 32800 | 5874 | 5633 | 241 | 2.38 | 2.52 | 14196 | 17.9 | 27.9 |
| Gomel | 40400 | 3931 | 3770 | 161 | 3.08 | 3.29 | 12404 | 9.7 | 17.1 |
| Grodno | 25000 | 3588 | 3441 | 147 | 2.62 | 2.66 | 9154 | 14.4 | 21.4 |
| Minsk | 40200 | 3316 | 3180 | 136 | 2.81 | 3.04 | 9667 | 8.2 | 12.7 |
| Mogilev | 29100 | 2103 | 2017 | 86 | 2.71 | 3.03 | 6110 | 7.2 | 11.1 |
| Vitebsk | 40100 | 2550* | 2445 | 105 | 2.48* | 2.48* | 6065 | 6.4 | 9.2 |
| Totals | 207600 | 21362 | 20486 | 876 | 2.52** | 2.66** | 57595 | 10.3 | 16.1 |

* **Data from Vitebsk region estimated by regional coordinator V. Biryukov (2004).**

** **JZa and JZm indices calculated for sample plots area in five regions except Vitebsk region.**

* **Daten aus der Region Vitebsk wurden durch den Regionalkoordinator V. Biryukov (2004) hochgerechnet.**

** **Der Reproduktionserfolg (JZa und JZm) wurde für die Probeflächen in fünf Regionen mit Ausnahme der Region Vitebsk berechnet.**

**Tab. 4. Location of occupied White Stork nests in Belarus in 2004-2005.**

**Neststandorte von Weißstörchen in Belarus 2004-2005.**

| Region | Trees | | Buildings | | Pylons | | Water-towers | | Others | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) | N | (%) | n | (%) |
| Brest | 748 | 22.8 | 1060 | 32.3 | 1016 | 32.4 | 385 | 11.5 | 37 | 0.9 |
| Gomel | 785 | 39.5 | 92 | 4.7 | 636 | 31.6 | 447 | 22.6 | 33 | 1.7 |
| Grodno | 798 | 40.3 | 179 | 9.1 | 445 | 22.5 | 529 | 26.6 | 29 | 1.5 |
| Minsk | 789 | 44.1 | 97 | 5.3 | 350 | 19.3 | 547 | 29.9 | 25 | 1.4 |
| Mogilev | 587 | 51.9 | 36 | 3.2 | 178 | 15.7 | 318 | 28.0 | 13 | 1.1 |
| Vitebsk | 950 | 39.3 | 56 | 2.3 | 490 | 20.3 | 864 | 35.7 | 57 | 2.4 |
| Totals | 4657 | 37.0 | 1520 | 12.1 | 3115 | 24.8 | 3090 | 24.6 | 194 | 1.5 |

**Tab. 2. Results of White Stork field researches on sample plots in 2004 (HPa = 100%) and their comparison with questionnaire data.**

*** Numbers refer to plots mentioned in Fig. 1**

**Ergebnisse der Weißstorcherfassungen auf Probeflächen 2004 (HPa = 100%) und ihr Vergleich mit den Daten aus den Fragebögen.**

| Sample plot | Control area, km² | % of administr. unit area | Questionnaire data | | HPa | HPm | HPmx | HPo | HPx | H0 | StD | JZa | JZm | Head expert (s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $HPa_{quest}$ | % of actual HPa | | | | | | | | | | |
| 1. Pruzhany | 600 | 21.4 | 66 | 53.7 | 123 | 103 | 19 | 0 | 1 | 29 | 20.5 | 2.50 | 2.50 | V.Prokopchuk, A.Abramchuk |
| 2. Kamenets | 1800 | 100.0 | 73 | 18.9 | 386 | 280 | 66 | 13 | 27 | 56 | 21.4 | 2.33 | 2.44 | V.Prokopchuk, A.Abramchuk |
| 3. Brest | 1280 | 80.0 | 18 | 8.8 | 205 | 135 | 52 | 13 | 5 | 18 | 16.0 | 2.20 | 2.41 | V.Fenchuk, I.Bogdanovich |
| 4. Zhabinka | 630 | 90.0 | 93 | 72.1 | 129 | 127 | 2 | 0 | 0 | 33 | 20.5 | 2.69 | 2.69 | O.Kalchenko |
| 5. Malorita | 150 | 10.7 | 46 | 115.0 | 40 | 33 | 2 | 1 | 4 | 8 | 26.7 | 1.97 | 2.03 | D.Kitel |
| 6. Kobrin | 2000 | 100.0 | 299 | 70.7 | 423 | 374 | 7 | 40 | 2 | 71 | 21.2 | 1.93 | 2.14 | S.Levy |
| 7. Ivanovo | 90 | 6.0 | 16 | 72.7 | 22 | 22 | 0 | 0 | 0 | 1 | 24.4 | 3.05 | 3.05 | N.Lapaj |
| 8. Pinsk | 390 | 12.2 | 96 | 78.7 | 122 | 101 | 5 | 4 | 12 | 7 | 31.3 | 3.06 | 3.18 | I.Samusenko |
| 9. Luninets | 1680 | 60.0 | 270 | 101.5 | 266 | 35 | 229 | 2 | 0 | 37 | 15.8 | 3.11 | 3.29 | A.Nefidovich, I.Samusenko |
| 10. Stolin | 510 | 15.0 | 100 | 60.2 | 166 | 130 | 22 | 1 | 13 | 6 | 32.5 | 3.01 | 3.03 | I.Samusenko |
| **Brest total** | **9130** | **27.8** | **1077** | **57.2** | **1882** | **1340** | **404** | **74** | **64** | 266 | 20.6 | 2.38 | 2.52 | |
| 11. Zhitkovichi | 1150 | 38.3 | 153 | 45.8 | 334 | 172 | 121 | 14 | 27 | 34 | 29.0 | 3.13 | 3.39 | I.Samusenko, M.Kozel, N.Lavnikovich |
| 12. Petrikov | 150 | 5.4 | 18 | 35.3 | 51 | 31 | 12 | 0 | 8 | 2 | 34.0 | 3.32 | 3.32 | I.Samusenko |
| 13. Khojniki | 600 | 30.0 | 18 | 27.3 | 66 | 60 | 1 | 4 | 1 | 13 | 11.0 | 2.80 | 2.98 | S.Bondarenko |
| **Gomel total** | **1900** | **4.7** | **189** | **41.9** | **451** | **263** | **134** | **18** | **36** | 49 | 23.7 | 3.08 | 3.29 | |
| 14. Grodno | 270 | 10.0 | 17 | 60.7 | 28 | 22 | 5 | 1 | 0 | 1 | 10.4 | 3.00 | 3.14 | D.Vintchevski |
| 15. Svisloch | 500 | 35.7 | 48 | 114.3 | 42 | 31 | 9 | 0 | 2 | 16 | 8.4 | 2.55 | 2.55 | V.Prokopchuk, A.Abramchuk |
| 16. Zelva | 250 | 27.8 | 19 | 65.5 | 29 | 28 | 1 | 0 | 0 | 0 | 11.6 | 2.64 | 2.64 | S.Klesov |
| 17. Slonim | 160 | 10.7 | 47 | 123.7 | 38 | 34 | 3 | 1 | 0 | 0 | 23.8 | 2.46 | 2.53 | S.Klesov |
| 18. Smorgon | 100 | 6.7 | 0 | 0.0 | 8 | 8 | 0 | 0 | 0 | 0 | 8.0 | 2.38 | 2.38 | A.Yasevich |
| Grodno total | 1280 | 5.1 | 131 | 90.3 | 145 | 123 | 18 | 2 | 2 | 17 | 11.3 | 2.62 | 2.66 | |
| 19. Vileika | 50 | 2.0 | 0 | 0.0 | 10 | 10 | 0 | 0 | 0 | 1 | 20.0 | 2.60 | 2.60 | L.Luksha |
| 20. Volozhin | 100 | 5.3 | 13 | 50.0 | 26 | 24 | 0 | 1 | 1 | 0 | 26.0 | 3.00 | 3.13 | O.Lukshits |
| 21. Logoisk | 100 | 4.2 | 8 | 47.1 | 17 | 14 | 0 | 3 | 0 | 0 | 17.0 | 2.65 | 3.21 | O.Lukshits |
| 22. Borisov | 80 | 2.7 | 1 | 7.7 | 13 | 0 | 13 | 0 | 0 | 0 | 16.3 | x | x | Y.Bogutski |
| **Minsk total** | **330** | **0.8** | **22** | **33.3** | 66 | 48 | 13 | 4 | 1 | 1 | 20.0 | 2.81 | 3.04 | |
| 23. Osipovichi | 100 | 5.3 | 3 | 21.4 | 14 | 13 | 0 | 1 | 0 | 2 | 14.0 | 3.14 | 3.38 | A.Sidarenko |
| 24. Dribin | 100 | 11.1 | 6 | 37.5 | 16 | 13 | 1 | 2 | 0 | 4 | 16.0 | 2.40 | 2.77 | V.Shenderov |
| 25. Mstislavl | 100 | 7.7 | 3 | 33.3 | 9 | 8 | 0 | 1 | 0 | 0 | 9.0 | 2.56 | 2.88 | A.Sidarenko |
| **Mogilev total** | **300** | **1.0** | **12** | **30.8** | 39 | 34 | 1 | 4 | 0 | 6 | 13.0 | 2.71 | 3.03 | |
| **TOTAL** | **12940** | **6.2** | **1431** | **55.4** | **2583** | **1808** | **570** | **102** | **103** | **339** | **20.0** | **2.52** | **2.66** | |

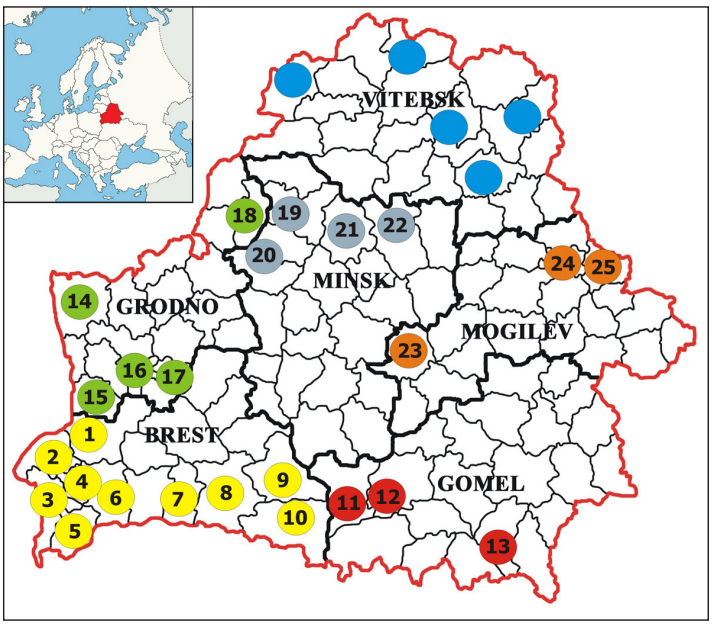


**Fig. 1. Sample plots location in Belarus during 6th White Stork Census in 2004. Numbers refer to plots mentioned in tab. 2.**

**Lage der Probeflächen während des 6. Internationalen Weißstorchzensus 2004. Die Zahlen beziehen sich auf die Probeflächennummern in Tab. 2.**

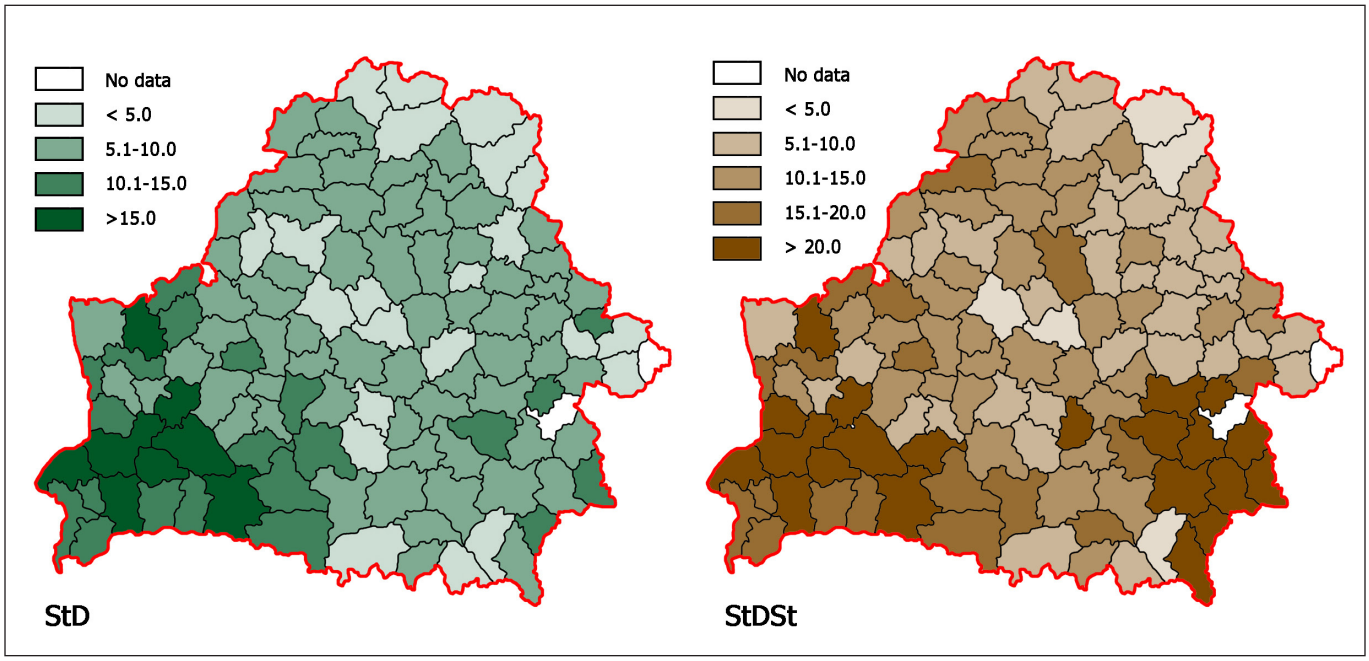


**Fig. 2. The White Stork population density in Belarus by administrative districts in 2004-2005: StD - number of breeding pairs per 100 km² of area; StDSt - number of breeding pairs per 100 km² of open/non-forested area.**

**Siedlungsdichte des Weißstorchs in den administrativen Regionen von Belarus 2004-2005. StD – Anzahl der Paare pro 100 km² Fläche; StDSt – Anzahl der Paare pro 100 km² nicht bewaldeter Fläche.**

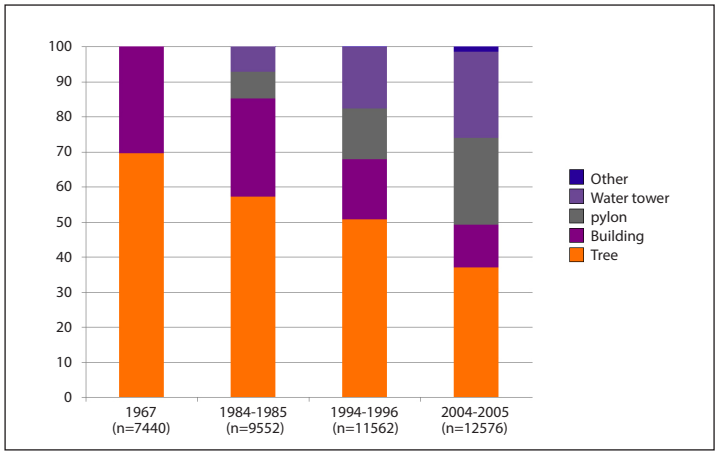


**Fig. 3. Dynamics of White Stork nest site preference (%) in Belarus according to results of national censuses.**

**Veränderung der Nistplatzwahl (%) des Weißstorchs in Belarus auf Basis der Ergebnisse der nationalen Zählungen.**

**Photo 1. Thatched roofs were abundant in Belarus in the past. At present such roofs suitable for White Stork nests occur mainly in southwestern part of the country (Khristibolovichi, Pinsk distr., Brest region).**

**Weichdächer waren in der Vergangenheit in Belarus sehr verbreitet. Derzeit werden solche Dächer vorwiegend im Südwesten des Landes durch den Weißstorch genutzt (Khristibolovichi, Pinsk Distrikt, Region Brest).**

**Photo 2. Considerable changes in nest site preference observed during recent decades in Belarus: increasing numbers of White Storks build nests on pylons instead of trees and buildings (Kochanovichi, Pinsk distr., Brest region).**

**Erhebliche Veränderungen in der Nestplatzwahl wurden während der vergangenen Jahrzehnte in Belarus festgestellt: zunehmende Anzahl von Nestern auf Strommasten, abnehmende Zahl von Nestern auf Bäumen und Gebäuden (Kochanovichi, Pinsk distr., Brest region).**

**Photo 3. White Stork nests on water-towers are typical for Belarusian villages (Khristibolovichi, Pinsk Distrikt, Region Brest).**

**Weißstorchnester auf Wassertürmen sind typisch für belarussische Dörfer (Khristibolovichi, Pinsk Distrikt, Region Brest).**


**Photo 4. Envelope featuring the White Stork Census produced by the Ministry of Communication of Republic of Belarus in 2004.**

**Briefumschlag zum Weißstorchzensus produziert durch das Ministerium für Kommunikation der Republik Belarus 2004.**

## Imprint

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