

Phenology of the Black Stork (*Ciconia nigra*) migrations in Ukraine

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ABSTRACT - Data on Black Stork migration was collected from 1973 till 2000 for the spring passage and from 1964 till 2000 for the autumn migration. They were grouped based on administrative regions of the country. In spring, Black Storks arrive generally during the second half of March and the first half of April. In West Ukraine, the migration begins earlier. The course of migration is similar to that of White Stork. Periods of autumn migration are more extended and more variable. Normal autumn migration occurs in August and September. The last birds are observed from the end of August till October.

Introduction

Black Stork (*Ciconia nigra*) is one of the rare bird species in Ukraine. It is listed in the Red Book of the country. Southern limit of its present breeding range goes over western and northern regions of Ukraine : Chernivtsi, Khmelnytsky, Zhitomir, Kyiv, Chernigiv, Sumy. Since the 1970s and 1980s, range widening and increase

in number were observed (GRISHCHENKO *et al.*, 1992; GRISHCHENKO, 1994a, 1996). The present breeding population is estimated to be at least 400-500 pairs. During migration and over-summering Black Storks can be observed almost in the whole territory of Ukraine.

Materials and methods

Data for this study were collected in 1981-2001. We used our own observations, informations collected from birdwatchers, teachers, hunters and foresters and literature sources (KORZYUKOV *et al.*, 1991; MARISOVA *et al.*, 1991; GRISHCHENKO & SKILSKY, 1992; VOINSTVENSKY, 1992; GRISHCHENKO, 1994b; KNYSH, 1994, 2001; TROGLODYTES, 1993, 1994; TARANENKO *et al.*, 1995; VESELSKY, 1995; GUZIY, 1996; AFANASYEV, 1998; BUCHKO, 1998; KHLEBEESHKO & TSITSYURA, 1998; POLYSHKEVIH, 1998; KOSTIN & BESKARAVAYNIY, 1999; REDINOV, 1999a, b). Many phenological dates were obtained as additional information during censuses of White

(*Ciconia ciconia*) and Black Storks in different regions of Ukraine, during conservation actions "the year of the White Stork" in 1987 and "the year of the Black Stork" in 1990-1991 (GRISHCHENKO *et al.*, 1992; GRISCHTSCHENKO, 1992), from monitoring stork populations since 1992 (GRISHCHENKO, 1999). Collected data cover the period from 1973 till 2001 for the spring and from 1964 till 2001 for the autumn. They were grouped on administrative regions (oblasts) of the country. Mean dates (M), standard errors (SE) and standard deviations (SD) were calculated.

Table 1 - *Times of arrival of Black Stork in Ukraine. - Dates d'arrivée de la Cigogne noire en Ukraine. M = mean date / date moyenne; SE = standard error / erreur standard; SD - standard deviation / écart-type.*

Region	n	M	SE	SD	lim. dates
Vinnitsa	4	01.04	-	-	28.03-06.04
Volynia	19	03.04	2,3	10,1	15.03-24.04
Zhitomir	25	07.04	1,9	9,5	17.03-22.04
Transcarpathians	22	08.04	2,8	12,9	17.03-27.04
Ivano-Frankivsk	9	02.04	3,8	11,5	16.03-16.04
Kyiv	19	07.04	1,3	5,5	28.03-18.04
Lviv	24	30.03	2,0	10,0	02.03-20.04
Mykolayiv	2	07.04	-	-	31.03-14.04
Odesa	1	30.04	-	-	-
Poltava	1	23.03	-	-	-
Rivne	18	05.04	2,3	9,9	22.03-26.04
Sumy	5	06.04	2,1	4,8	30.03-12.04
Ternopil	2	30.03	-	-	28.03-01.04
Kherson	2	07.04	-	-	28.03-16.04
Khmelnitsky	11	01.04	3,4	11,3	11.03-20.04
Cherkasy	6	05.04	2,2	5,4	28.03-12.04
Chernigiv	11	12.04	2,7	9,0	30.03-24.04
Chernivtsi	5	27.03	2,5	5,7	20.03-04.04
Total	186			8,8 ± 0,8	

Results and discussion

Spring

For the spring migration, we have information from 18 of 25 regions of Ukraine (186 dates). In spring Black Storks arrive as a rule during the second half of March and the first half of April (Table 1). The earliest dates of arrival are: March 2 1992 (Lviv region), March 11 1991 (Khmelnitsky region), March 15 1993 (Volynian region). Average arrival dates for those regions fall at the end of March and the first decade of April.

In West Ukraine, the migration begins earlier. According to the phenological map of arrival, the Black Stork migrates in spring in a fashion similar to that of the White Stork (GRISCH-

TSCHENKO *et al.*, 1995). There are two large mountains to the north and southeast of the Carpathians that deviate flyways, one of them going to the north-east over the central part of Ukraine. This conclusion is confirmed by the comparison of mean dates in several regions for both species. Black Storks arrive earlier in a same area as the White Storks. Pearson correlation coefficient is 0,749 ($p < 0,01$; 12 regions with $n > 4$).

The variability of arrival times is in a median range. Standard deviation for separate regions fluctuates from 4,8 to 12,9 days (taking into account only those regions for which we have more than 4 dates). Average standard deviation is $8,8 \pm 0,8$ days ($n=12$; \pm SE).

Table 2 - *Times of beginning of Black Stork autumn migration in Ukraine. - Dates de début de la migration d'automne de la Cigogne noire en Ukraine.*

Region	n	M	SE	SD	lim. dates
Vinnitsa	2	20.08	-	-	-
Volynia	6	29.08	7,9	19,3	05.08-20.09
Dnipropetrovsk	4	27.08	-	-	29.07-10.09
Donetsk	3	14.08	-	-	12.08-16.08
Zhitomir	7	15.08	3,1	8,2	04.08-25.08
Transcarpathians	7	31.08	2,8	7,5	15.08-05.09
Zaporizhyya	3	11.08	-	-	08.08-12.08
Ivano-Frankivsk	9	21.08	4,7	14,1	02.08-05.09
Kyiv	3	23.08	-	-	13.08-28.08
Lviv	11	18.08	1,7	5,7	08.08-28.08
Mykolayiv	5	17.08	5,8	12,9	29.07-29.08
Odesa	11	22.08	3,2	10,6	03.08-31.08
Poltava	2	17.08	-	-	12.08-23.08
Rivne	4	17.08	-	-	15.08-23.08
Sumy	3	24.08	-	-	16.08-09.09
Kharkiv	1	26.08	-	-	-
Kherson	4	23.08	-	-	03.08-03.09
Khmelnitsky	3	09.08	-	-	02.08-15.08
Cherkasy	11	19.08	3,0	9,9	04.08-05.09
Chernigiv	1	12.08	-	-	-
Chernivtsi	6	20.08	4,5	11,0	08.08-05.09
Total		106		11,0 ± 1,4	

Autumn

For the autumn migration, we have information about the beginning of passage (21 regions, 106 dates) and the last observations (21 regions, 144 dates). Data about the beginning of passage may be biased because non-breeding Black Storks are observed during summer months in many places in Ukraine outside of their breeding range. We used only dates of arrival clearly related to passing birds, but it is not always possible to separate them from movements of over-summering storks.

Normal autumn migration occurs in August and September. First passing birds arrive as a rule in the first half of August, but sometimes Black

Storks are observed already at the end of July (Table 2). In other places the start of migration can be delayed to the end of August or even the first half of September. The average first dates in all regions occur during the second and third decades of August. The migration ends at very different times: from the end of August till October (Table 3). The latest observations of Black Storks are the following : October 20 1991 (Volynian region), October 21 1993 (Ivano-Frankivsk region), October 21 1981 (Kyiv region), October 10 1990 (Lviv region), November 1 1991 (Rivne region). The average last dates in all regions fall during the second and third decades of September.

Table 3 - Times of end of Black Stork autumn migration in Ukraine. - Dates de fin de la migration d'automne de la Cigogne noire en Ukraine.

Region	n	M	SE	SD	lim. dates
Vinnitsa	2	20.08	-	-	-
Volynia	6	29.08	7,9	19,3	05.08-20.09
Dnipropetrovsk	4	27.08	-	-	29.07-10.09
Donetsk	3	14.08	-	-	12.08-16.08
Zhitomir	7	15.08	3,1	8,2	04.08-25.08
Transcarpathians	7	31.08	2,8	7,5	15.08-05.09
Zaporizhya	3	11.08	-	-	08.08-12.08
Ivano-Frankivsk	9	21.08	4,7	14,1	02.08-05.09
Kyiv	3	23.08	-	-	13.08-28.08
Lviv	11	18.08	1,7	5,7	08.08-28.08
Mykolayiv	5	17.08	5,8	12,9	29.07-29.08
Odesa	11	22.08	3,2	10,6	03.08-31.08
Poltava	2	17.08	-	-	12.08-23.08
Rivne	4	17.08	-	-	15.08-23.08
Sumy	3	24.08	-	-	16.08-09.09
Kharkiv	1	26.08	-	-	-
Kherson	4	23.08	-	-	03.08-03.09
Khmelnytsky	3	09.08	-	-	02.08-15.08
Cherkasy	11	19.08	3,0	9,9	04.08-05.09
Chernigiv	1	12.08	-	-	-
Chernivtsi	6	20.08	4,5	11,0	08.08-05.09
Total	144			13,3 ± 1,2	

Duration of the autumn migration is more extended and more variable. Standard deviation for the start of migration fluctuates in all regions from 5,7 to 19,3 days (only regions with 5 and more dates). Average standard deviation is $11,0 \pm 1,4$ days ($n=9$; \pm SE). For the end of migration, the standard deviation varies from 5,6 to 22,9 days; on average it is $13,3 \pm 1,2$ days ($n = 15$; \pm SE).

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Phénologie des migrations de la Cigogne noire (*Ciconia nigra*) en Ukraine

La Cigogne noire est une espèce rare en Ukraine, où elle est inscrite sur la liste rouge. La population nicheuse est actuellement estimée entre 400 et 500 couples. La limite sud de son aire de nidification couvre les régions de l'Est et du Nord : Chernivtsi, Khmelnytsky, Zhitomir, Kyiv, Chernigiv, Sumy. Depuis les années 1970 et 1980, on observe un élargissement de sa zone de répartition ainsi qu'une augmentation de ses effectifs. Pendant la migration et la fin de l'estivage, la Cigogne noire peut être observée sur la quasi-totalité du territoire ukrainien.

En se basant sur toutes les sources possibles, les données phénologiques recueillies couvrent la période 1973-2001 pour le printemps et 1964-2001 pour la saison automnale. Au printemps, sur la base de 186 dates relatives à 18 des 25 régions d'Ukraine, les cigognes noires arrivent, en règle générale, durant la seconde moitié du mois de mars et la première moitié d'avril (Tableau 1). Les dates les plus hâtives sont les suivantes : 2 mars 1992 (région de Lviv), 11 mars 1991 (région de Khmelnytsky), 15 mars 1993 (région de Volynian). Les dates moyennes d'arrivée pour ces différentes régions se situent à la fin du mois de mars et dans la première décade d'avril. En Ukraine de l'ouest, la migration débute plus tôt. Selon la carte phénologique, la Cigogne noire, au printemps, effectue sa migration de la même manière que sa blanche cousine. Il y a deux grandes zones montagneuses au nord et au sud-est des Carpates qui dévient les flux de migration, l'un d'eux passant par le nord-est au-dessus de la partie centrale du pays. Les Cigognes noires arrivent cependant plus tôt que les blanches.

Pour la migration automnale, nous disposons d'informations relatives au début (21 régions, 106 dates) et à la fin du passage (21 régions, 144 dates). Des Cigognes noires non nicheuses étant observées un peu partout en Ukraine même en dehors de l'aire de nidification, les données relatives au début du passage migratoire sont moins significatives. Seules les dates de passage évident ont été utilisées. La migration automnale se déroule normalement durant les mois d'août et septembre. Les premiers oiseaux arrivent généralement dans la première quinzaine d'août, mais parfois certaines Cigognes noires sont déjà observées à la fin juillet (Tableau 2). A d'autres endroits, la migration peut être retardée jusqu'à la fin août ou même la première moitié du mois de septembre. En moyenne, la migration débute au cours de la deuxième ou troisième décade d'août. La migration s'achève à des moments différents suivant les régions, à partir de la fin du mois d'août jusqu'en octobre (Tableau 3). Les dates d'observations les plus tardives sont les suivantes : 20 octobre 1991 (région de Volynian), 21 octobre 1993 (région d'Ivano-Frankivsk), 21 octobre 1983 (région de Kyiv), 26 octobre 1990 (région de Lviv), 1^{er} novembre 1991 (région de Rivne). Les dates moyennes tombent dans les seconde et troisième décades de septembre.