

What is wrong with the protection zone of a 1-km radius around Black Stork *Ciconia nigra* nests?

Andriy A. BOKOTEY^{1*}, Natalie V. DZIUBENKO¹, Iu. M. STRUS¹

¹State museum of Natural History National Academy of Sciences of Ukraine, Lviv, Ukraine

*Corresponding author; e.mail: bokotey.a@gmail.com

Abstract At the end of 2016, the concept of protection zones around nests of rare species of birds was introduced into Ukrainian legislation. This applies to the Black Stork *Ciconia nigra*, a species listed in 2009 in the Red Data Book of Ukraine. For all species except Storks, the radius of a protection zone is equal to European standards, but for this particular species, it was increased to a radius of 1,000 m around the nest throughout the whole year. In 2006-2018 studies of the distribution and abundance, biotope preferences, and nesting biology of the species were conducted on the territory of the Ukrainian Polissya (Volyn, Rivne, Zhytomyr, Kyiv, Chernihiv, and Sumy regions). In the Western Polissya (Volyn and Rivne area) permanent monitoring of the nesting biology of Black Stork was done. The studies have shown that the radius of 1,000 m around the nest is excessive and inappropriate. The first drawback of such an approach is the lack of seasonality when creating a protection zone. The second one is such a large radius. This paper aims to provide arguments supporting an optimal size of protection zones around Black Stork nests. It was proven that 54% of nests are located not farther than 200 m from the edge of the forest. The importance of the 500-meter forest area around the nest is also confirmed by Belarusian scientists. According to their data, in 83.3% of cases, the perching place of Black Storks is located within this distance and is needed for birds to estimate the safety of approaching a nest. It is recommended to consider seasonality and to create protection zones of two types: zones of strict protection (with a radius of at least 100 m around the nest) and zones of seasonal protection (radius of not less than 500 m). Within zones of strict protection, any human activity and even the presence of people should be forbidden throughout the year. In areas of seasonal protection, the same should be applied only in a period between March 15 and July 30. On forest roads and clearings that pass through the area of strict protection, we recommend the installation of special signs.

Keywords Black Stork, conservation, nesting territory, protection zones.

Introduction

Preservation of biological diversity in forests that are used for industrial forestry is one of the most important and difficult problems in nowadays Ukraine. Recently, thanks to pressure from public environmental organizations, the Ministry of Ecology and Natural Resources of Ukraine and the

State Agency of Forest Resources of Ukraine have brought the country's legislation closer to other European standards (Supplementary material Appendix 1, Table A1), by introducing the concept of protected areas around nests of rare birds, including the Black Stork *Ciconia nigra* listed in the Red Book of Ukraine (Red Data 2009) with the status of "rare". These changes are reflected in the new Sanitary Rules in the Forests of Ukraine (Sanitarni pravyla 2016), approved by Decree # 555 of the Ukrainian Government dated 27.07.1995 (as amended by the Resolution of the

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Cabinet of Ministers of Ukraine dated 26.10.2016 # 756) (Postanova Kabinetu... 2016) and the Order # 557 of the Ministry of Ecology of Natural Resources of Ukraine dated 29.12.2016 “On additional measures for the conservation of rare and endangered species of animals and plants” (Nakaz Ministerstva 2016).

However, instead of using international experience in determining the size of protected areas around Black Stork nests and the results of research by Ukrainian scientists involved in this species, both documents define the completely unrealistic size of a protected area. In particular, the Sanitary Rules in the forests of Ukraine state: “It is prohibited to carry out sanitary measures around the nesting places of Black Storks (with a radius of 1,000 m)”. The Decree of the Ministry of Ecology of Natural Resources of Ukraine # 557 defines the same radius of the protection area throughout the year.

The first drawback of this approach is the lack of seasonality in determining the size of a protected area, the second - the excessive radius. Such legislative initiative has provoked strong opposition from forestry workers. Around one nest, 314 hectares of forest are completely removed from forestry use, mostly mature and pre-mature forests, which have the greatest industrial value. This has led foresters to hide information about the existing Black Stork nests in

forests and even caused the damaging of some nests. We have identified cases where forestry workers have destroyed nests to be able to continue their business activities.

In Ukraine, more than 90% of the population of about 1,000 pairs of breeding Black Stork are nesting in commercial forests and only 7% in nature reserves. Therefore, to preserve the species, it is necessary to find the optimal solution, which will ensure maximum protection of the nesting areas of a Black Stork, and at the same time, forestry workers will be able to perform their planned tasks (Bokotey *et al.* 2019).

The purpose of our work is to define and justify the optimal size of a protected area around Black Stork nests.

Study area

The material was collected over 2006-2009 during the inventory of Black Stork nests in Ukrainian Polissya (Volyn, Rivne, Zhytomyr, Kyiv, Chernihiv, and Sumy regions) and further monitoring studies of Black Stork nest biology in Western Polissya (Volyn and Rivne regions) in 2010-2020 (Figure 1). The works were carried out within the framework of the “Ciconia-Ukraine” project, which is implemented by the West-Ukrainian Ornithological Society and the State Museum of Natural History of the National Academy of Sciences of Ukraine, with the financial support of the Ciconia Foundation (Liechtenstein).



Figure 1. Breeding range of Black Stork in Ukraine (green area) and the study area.



Methods

The material was collected by questioning employees of state forestries, hunting farms, nature reserves, and the local people. In all cases, the information about the nests was checked by visiting them in the non-nesting period (September - March) or in the second half of June (to ring the chicks). The identified nests and nesting areas were described and mapped in detail. In addition to questionnaires, we searched for nests in suitable areas during the winter. Overlay analysis in GIS was used for the analysis of cartographic material. The exact locations of 108 Black Stork nests and layers containing information on forest types, predominant forest species, forest vegetation conditions, forest age, and forest productivity indicators were used. To assess the impact of deforestation as a fragmentation factor, Global Forest Watch data was used in cross-section with circular buffers around 141 Black Stork nests. Habitat structure analysis was performed in limited areas around the nests, namely in circular buffers with a diameter of 0 to 500 m around the nests, with a step of 100 m. The methods were described in detail in our previous paper (Bokotey *et al.* 2017).

Results

The results of research in Ukrainian Polissya show that there is a relationship between the overall structure of forest cover in the region and the distribution of Black Storks. The stork inhabits the most common types of forests. It has a greater advantage of nesting in wet oak-pine forests (8% more often) compared to other forests. Less often chooses for nesting fresh oak-pine forests and fresh pine forests (8% and 5% respectively).

Concerning the age composition of forests, the Black Stork prefers forest stands of older age groups. It prefers incoming forests 20% more often than others, and mature forests in almost 18% of cases. In general, the most suitable habitat for the settlement of the species are forests of older categories. Usually, in these forests, intensive forestry measures are carried out, in particular directional, sanitary, reforestation fellings, or fellings of the main use.

Cuttings were detected in 37.3% of nesting areas within the 100-meter buffer zone around the nests. In more than 14% of plots (in 100-meter buffers) the loss of forest cover exceeds 20% of the total forest area in them. The results show that deforestation is one of the main threats to the local nesting population in the region and a major factor in the fragmentation of the nesting environment of the Black Stork (Strus *et al.* 2017).

The above research results indicate the timeliness and feasibility of legislative protection of nests of Black Storks and other rare species of birds in forests, by creating protected areas around them.

The stork's nest is a large massive structure that can only withstand a well-developed strong tree. The tree must also have the appropriate crown configuration so that the storks can build a nest. In addition, a stork, like a bird with a large wingspan, is unable to manoeuvre in dense forest and builds its nest near the edge or clearing, on thick side branches, or at the fork of the trunk. However, even in older forests, it is difficult to find trees that meet all these requirements (Löhmus and Sellis 2003).

When choosing a nesting place, storks take into account several main factors: the presence of older stands, the proximity of forage areas, the location of the nest given the territory of other individuals of its species, as well as the factor of disturbance.

Another very important feature of the Black Stork's nesting behavior is that it flies up to the nest hiding in the woods, rather than descending on it from a height. This is due to the need to protect offspring from birds of prey. Thus, nests are never located on the edge of the forest, but only rarely in the depths of the forest. To determine the optimal distance of the nest to the nearest open space (felling, forest lawns, or other types of open areas), we measured it for 147 nests (Figure 2).

As can be seen from Figure 2, the Black Stork chooses nesting sites near the edge of the forest. 54% of the nests are located no further than 200 m from the edge of the forest, and 27% - no further than 100 m. This small area of forest between the nest and the edge of the bird is needed for the bird to fly unnoticed between the trees to the nest. The longer this route is, the harder it is for the bird to

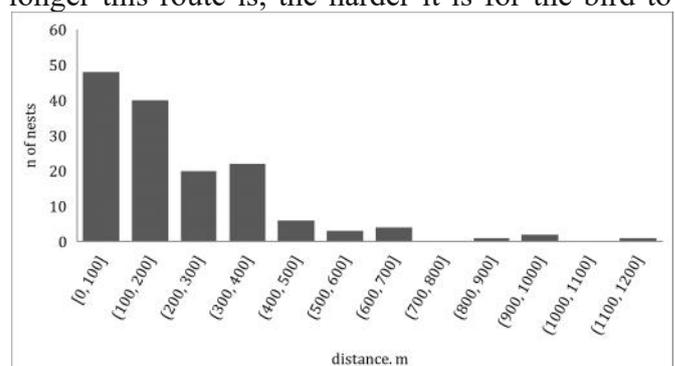


Figure 2. Distribution of Black Stork nests in Western Polissya by distance to the nearest open space (forest edge, clearings, meadows, etc.).



overcome it by manoeuvring between the trees, and the more energy it will spend flying to the nest, especially during the period of feeding the chicks.

The bird needs a small distance from the open space to the nest for this reason. Before approaching the nest, the bird first sits on a perch near the nest to make sure there is no danger and only then flies through the woods to the nest. Studies by Belarusian ornithologists have shown that such a Black Stork perch in 83.3% of cases at a distance of up to 500 m from the nest (Dmitrenok *et al.* 2012).

Discussion

Thus, from the above, there is no reason for the radius of the protection area around the nest of the Black Stork in 1,000 m. The stork is a fish-eating bird and feeds on rivers and standing water outside the forest, often at a distance of 5-10 km to its nest (Strazds 2011). Therefore, it is difficult for us to understand the motivation of the authors of the law, who quite unreasonably identified the protection area around the nest of the Black Stork, with a radius of 1,000 m.

The protection area should consist of two parts - the area of strict protection and the area of seasonal protection. For Black Storks, the area of strict protection should include an area with a radius of at least 100 m around the nest. It is recommended to prohibit any activities and works in this area throughout the year, and during the nesting period - even the presence of people in order to avoid disturbances in the habitat and the species, especially during the breedings season. In the forest zone of Ukraine, the nesting period of the Black Stork lasts from March 15 to July 30.

On forest roads and clearings passing through the strict protection zone, there should be warning signs of the following content – “Attention! Breeding place of animals listed in the Red Book of Ukraine. Trespassing is prohibited from March 15 to July 30. At other times of the year, please do not disturb their habitats.” In addition, in the seasonal protection zone during the breeding period, it is recommended to prohibit any activities and works in the area with a radius of at least 500 m around the nest.

Conclusions

From the above facts, the area around the nest with a radius of 1,000 m is not as useful for the protection of Black Storks in modern highly fragmented forests, as it leads to conflict situations between conservationists and forestry workers.

The protection area should be seasonal and consist of two parts - a strict protection area (with a radius of at least 100 m around the nest) and a seasonal protection area (with a radius of at least 500 m). The strict protection zone should function all year round and any activity, even people trespassing, should be prohibited. Any activity from March 15 to July 30 is prohibited in the seasonal protection area.

We recommend installing warning signs on forest roads and clearings that pass through the strict protection zone.

Based on the results of the Ciconia-Ukraine project, we have developed a National Action Plan for the protection of Black Storks in Ukraine for the next 5 years, which states the need to introduce seasonality in the creation of a protection zone and its optimal size (Bokotey *et al.* 2019). This plan was approved by the Ministry of Ecology and Natural Resources of Ukraine and came into force on March 11, 2019. Finally, a monitoring programme should be developed for future research to evaluate the effectiveness of these measures.

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Editors' note: We received an email from the authors (ND) on February 02, 2022 acknowledging receipt of the reviewer's comments. ND conveyed her pleasure at receiving the provisional acceptance of the manuscript and suggested that the authors would undertake the suggested revisions and return the manuscript within two weeks. Unfortunately the war between Russia and Ukraine broke out and we have since been unable to contact the authors. Working with the reviewer we have revised and published the manuscript. These are extraordinary circumstances. We ardently hope that the authors are safe and will resume communications soon.



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Appendix. Appendix 1. Table A1 Standard Protection Zones in several European countries; m: meters; (max): maximum; (min): minimum.

Country	Protection zone (radius, m)		Author	Source
	Strict protection	Seasonal protection		
Hungary	100 m	400 m	Kalocsa and Tamas, 2006	Kalocsa, B. and E.A. Tamas 2006. An analysis of nesting data of Black Storks <i>Ciconia nigra</i> in the Gemenc region of the Danube-Drava National Park (1992-2003). <i>Biota</i> 7: 47-50.
Poland	200 m (max)	500 m (max)	Rozporządzenie, 2016	Rozporządzenie. 2016. Rozporządzenie Ministra Środowiska z dnia 16 grudnia 2016 r. w sprawie ochrony gatunkowej zwierząt (Dz. U. z 2016 r. poz. 2183).
Germany	100 m	500 m	Ryslavy and Putze, 2000	Ryslavy, T. and M. Putze. 2000. Zum Schwarzstorch (<i>Ciconia nigra</i> [L., 1758]) in Brandenburg.
Czech Republic	200 m		Pojer and Vojtechovska, 2016	Pojer, F. and E. Vojtechovska. 2016. The Black Stork in the Czech Republic: present status and Conservation. <i>Ornithos Hors-série</i> 1: 36-37.
Latvia	250 m		Strazds, 2011	Strazds, M. 2011. Conservation Ecology of the Black Stork in Latvia. PhD thesis. University of Latvia. 96 pp.
Estonia	250 (automatic zone after nest is registered, but usually more after designation of species protection site)	around strict protected zone, but depends on location and biotopes around	Government of Estonia, 2021	Nature Conservation Act of Estonia. 2021. Available at: https://www.riigiteataja.ee/en/eli/ee/508112013010/consolide/current
Belarus	250 m		Red Book..., 2004	Ministry of Natural Resources and Environmental Protection and National Academy of Sciences of the Republic of Belarus. 2004. Red Book of the Republic of Belarus: Animals. Minsk, Belarus
Ukraine	1000 m		Cabinet of Ministers of Ukraine, 2016	ЗАТВЕРДЖЕНО постановою Кабінету Міністрів України від 27 липня 1995 р. № 555 (в редакції постанови Кабінету Міністрів України від 26 жовтня 2016 р. № 756) ' [APPROVED by the Resolution of the Cabinet of Ministers of Ukraine of July 27, 1995 № 555 (as amended by the Resolution of the Cabinet of Ministers of Ukraine of October 26, 2016 № 756)]
	100 m	500 m	Recommended in this paper ¹ , 2021	
France	60-80	200 m (min)-300 m (max)	Office National Des Forêts, 2013.	9200-13-MOP-SAM-004 Prendre en compte la cigogne noire dans les forêts publiques (2013)
Serbia	100 m (year round)	200 m (during breeding season from 15 March to 15 July)	Institute for Nature Protection of Vojvodina Province (INPVP)	Based on the decision of the INPVP according to Article 74 of the Law on Nature Protection
Austria		300 m (from 15 March to 31 July)	Recommended by BirdLife Austria, 2012	BirdLife Österreich. 2012. Horstschutz - Ein Leitfaden. [BirdLife Austria. 2012. Nest Protection - A Guide]
Austria	3,000 m (only for wind farms)		Recommended by BirdLife Austria 2021	BirdLife Österreich. 2021. Leitfaden für ornithologische Erhebungen im Rahmen von Naturschutz- und UVP-Verfahren zur Genehmigung von Windkraftanlagen und Abstandsempfehlungen für Windkraftanlagen zu Brutplätzen ausgewählter Vogelarten. In p. 40. BirdLife Österreich, Wien. [BirdLife Austria. 2021. Guidelines for ornithological surveys as part of nature conservation and EIA procedures for the approval of wind turbines and recommended distances for wind turbines to breeding sites for selected bird species. BirdLife Austria, Vienna. 40 pp.]
Spain ¹	Castilla y León Region	Castilla & León declares critical sectors where some activities are regulated. There is no any radius or minimum distance	Castilla & León Regional Government	Decree 83/1995, of 11 May 1995, approving the Black Stork Recovery Plan Recovery Plan for the Black Stork and complementary measures for its protection in the measures for its protection in the Community of Castilla & León.
	Castilla La-Mancha Region	Castilla La-Mancha declares critical sectors where some activities are regulated. There is no any radius or minimum distance	Castilla La-Mancha Regional Government	Decree 275/2003, of 9 September 2003, recovery plans for the Iberian imperial eagle (<i>Aquila adalberti</i>), the Black Stork (<i>Ciconia nigra</i>) and the conservation plan for the Black Vulture (<i>Aegypius monachus</i>), and declaring the areas critical for the survival of these species in Castilla-La Mancha as sensitive areas
	Extremadura region (draft version)	250 m	Extremadura Government	Drafting phase

¹Regional governments have the mandate to elaborate actions plans in Spain. 2 of out 5 regions with black stork populations have action plans in Spain), three are still missing. Extremadura region is composing now the draft of its action plan of the Black Stork.

