ORNIS SVECICA 9:121–125, 1999

Symmetrical location of White Stork *Ciconia ciconia* nests in high-tension poles

ANTONIO LIMA-DE-FARIA

Abstract

The white stork *Ciconia ciconia* was found to build 24 nests on high-tension poles located in marshy fields near the city of Coimbra, Portugal. The metal poles consist of a central frame with three platforms, which ramifies into two arms in nearly vertical position. These arms are connected by a large horizontal frame. The nests were only situated on the high-tension poles. The number of nests in a single pole was found to be: 1, 2, 5, 6 or 7. In most cases the nests were located at the extreme ends of the metal frames whether these had a horizontal or a nearly vertical position. When two or more nests were present, a symmetrical pattern emerged in all cases observed, irrespective of the different nest locations. Four factors are considered when interpreting these findings: (1) The shape of the poles, (2) the size of the stork's wings, (3) the presence of a high magnetic field, and (4) the mental behaviour of the birds. The last aspect seems to be the most probable explanation but it demands further study.

A. Lima-de-Faria, Institute of Genetics, University of Lund, Sölvegatan 29, S-223 62 Lund, Sweden
E-mail: antonio.lima-de-faria@gen.lu.se

Received 4 February 1999, Accepted 5 May 1999, Editor: A. Hedenström

Introduction

The white stork *Ciconia ciconia* is common in southern Europe, migrating to the southern part of Africa during the winter. The species is absent from Britain, has nearly disappeared from Sweden, Denmark and Switzerland and is uncommon in Italy, France and Germany. However, it is still abundant in Portugal and Spain. According to Lack (1966) there were still about 93,000 pairs of white storks in Europe in 1958. These numbers have declined during the last decades.

Drainage of marshy meadows, where storks are foraging, has been considered one of the main causes of their decline. The construction of numerous high-tension poles and cables across the landscape, has also been pointed out as a potential cause to their decreased distribution, since birds can easily damage their body by flying against such cables.

The water system of the valley of the city of Coimbra, Portugal, has been improved in the last years. The irrigation of the river Mondego was changed to hydraulic regulation in the early 1990s. Before this the river bed was nearly dry during the summer, but now it is full of water all the year-round. According to local authorities this has led to an increase in the white stork population in the wet lands in the vicinity of Coimbra.

The white stork usually nests solitarily in sites such as towers, chimneys and trees, but only occasionally on the ground or rocks. In some cases small colonies have been described, of up to 30 pairs, but the reason for colony nesting remains unknown (Harrison 1975).

Observations

During a visit to the Institute of Botany at the University of Coimbra, I noticed a series of nests of white storks having a peculiar pattern of distribution. The photographer of the Institute was called to document the finding.

The locality where the nests were observed is near the village of S. Joao de Campo, situated about 12 km W of Coimbra. The date of the observation was 23 April 1996.

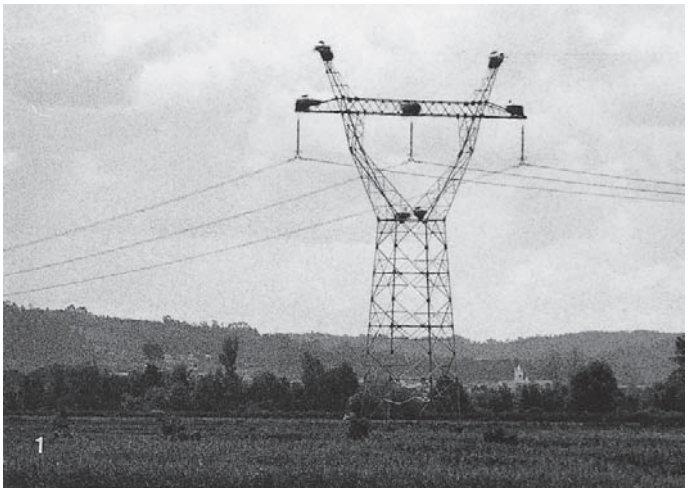


Figure 1. A pole with five nests located as in Figure 2 but having two more nests side by side on the third platform of the central frame.

En stolpe med fem storkbon med samma placering som i Figur 2, men som dessutom har två bon vid sidan av varandra på den tredje plattformen av den centrala strukturen.

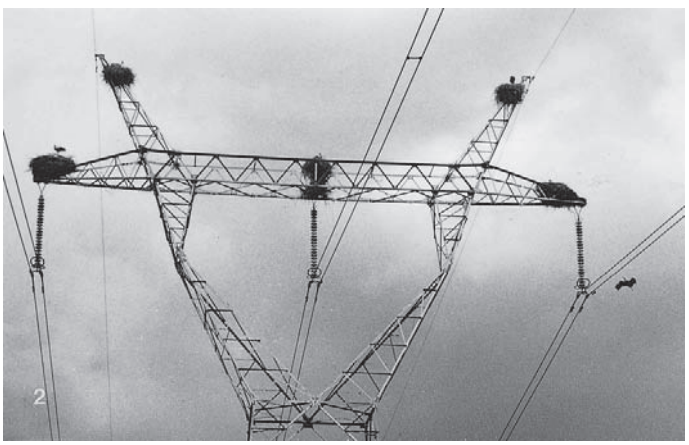


Figure 2. Pole with five nests. Two located at the extremes of the horizontal frame, two near the tips of the nearly vertical frames and one in the middle of the horizontal frame. Birds are seen in three of the nests and on the right side one is flying towards the nest.

En stolpe med fem bon av vit stork. Två är lokaliserade vid ändarna av den horisontella strukturen, två är nära ändarna av de metallgrenar som har en nästan vertikal position, och ett är beläget i mitten av den horisontella strukturen. Fåglarna syns i tre av dessa bon och på höger sida ser man en fågel som flyger mot sitt bo.

Figure 3. General view of four high-tension poles, all having white stork nests.

Översikt som visar fyra högspänningsstolpar, alla med storkbon.

Figure 4. The high-tension poles consist of a central frame with three platforms. This metal structure ramifies into two arms in nearly vertical position. These arms are united by a large horizontal frame. Two nests made by white storks are located at the extremes of the horizontal frame. A bird sticks its head out of the nest located on the right side.

Högspänningsstolpar består av en central struktur med tre plattformar. Denna metallstruktur förgrenar sig och bildar två armar som har en nästan lodrät position. Dessa armar är förenade med en lång horisontell struktur. Två storkbon är belägna vid ändarna av den horisontella delen. En stork syns i det bo som finns på höger sida.

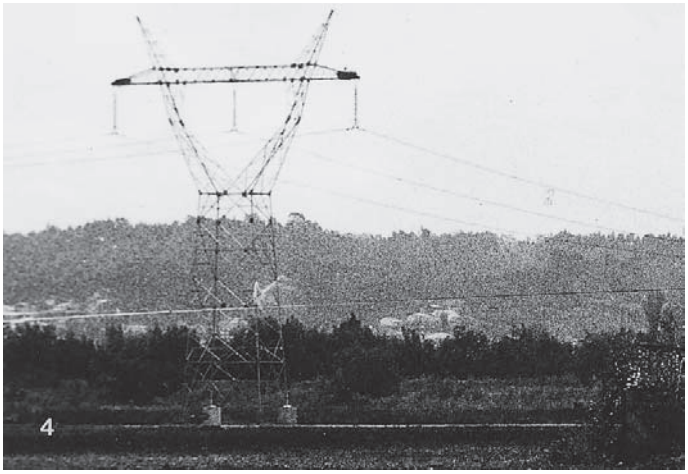
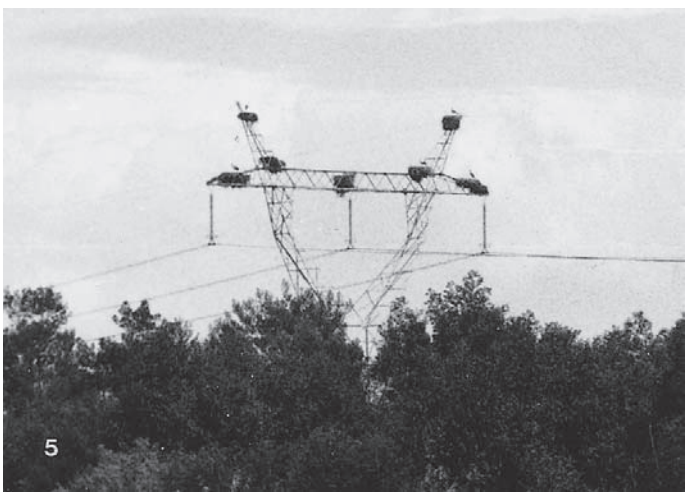


Figure 5. Seven nests are present in this high-tension pole. They follow the pattern of those shown in Figure 2. The two nests that were added to the case of five nests were built at the sites where the nearly vertical bars traverse the large horizontal frame. The white storks are seen on six of the nests. The symmetry of the nest pattern is most evident in this case.

Sju storkbon förekommer i denna högspänningsstolpe. De följer samma mönster som förekommer i Figur 2. De två bon som har tillkommit till de fem som fanns, blev båda byggda på det ställe där den nästan vertikala stången möter den långa horisontella strukturen. De vita storkarna syns i sex av dessa bon. Det symmetriska mönstret som boplaceringen följer är särskilt tydligt i detta fall.



The nests were located on high-tension poles. These consisted of a central frame with three platforms, which ramified into two arms in nearly vertical position. These arms were connected by a large horizontal frame (Figure 1).

The following features characterised the nests.

1) The nests were only situated on the high-tension poles that crossed the fields. No nests were found in trees, or nearby houses, although a search was made for such locations.

2) Most nests were occupied by white storks. In some of them the adults could be seen flying in and out feeding the young (Figure 2).

3) The adult birds were feeding on nearby fields, following tractors that ploughed the soil.

4) There were nests on all the high-tension poles that could be discerned as far as the horizon (Figure 3).

5) The total number of nests on all poles was 24.

6) Only one case with a single nest was observed. This was located at one of the extensions of the large horizontal bar.

7) As the number of nests increased a pattern of nest location emerged. A second nest appeared, far away from the first, and at the other extreme of the horizontal bar, hence forming a symmetric location (Figure 4).

8) When five nests were present: two occupied the positions just described, two were located at the tips of the vertical frames, and one was located in the middle of the horizontal bar (Figure 2). The nearly vertical frames finish in a sharp metal apex. The nests occurred a little below this tip (Figure 2). Yet, this position seems to be difficult and insecure for the establishment of a large nest. The symmetry of the nest distribution is evident.

9) When seven nests were present, the same five locations described for five nests were repeated. The two additional nests appeared at a most unexpected location, viz. the sites at which the vertical bars traverse the large horizontal frame. Again, the two additional nests were located symmetrically (Figure 5).

10) In another case in which seven nests were found a different, but still symmetrical pattern, was produced. This time, instead of building on the intersections of the vertical / horizontal bars, two nests appeared side by side on the third platform of the main structure (Figure 1). This place would seem the most natural one since it affords a stable and large area where to build a nest. No nests were found on the second and the first platforms which are larger still, and which are well above the ground.

11) The number of nests on a single metal pole was found to be 1, 2, 5, 6 or 7. When two or more nests were present, a symmetrical pattern emerged in all cases observed, irrespective of the variation in nest location.

12) The actual sequence followed in building of nests is not known, since no observer was present at the time the electrical poles were erected, some years ago. The sequence can only be inferred from the different numbers of nests found in single poles. The significant point is that whatever sequence has been followed, the result is a symmetric pattern.

Discussion

The interpretation of the symmetric pattern of white stork nests in electric high-tension poles can be accounted for by several factors.

1) The first aspect to be considered is the actual shape of the high-tension pole. It might seem that its symmetrical organization would favor the observed symmetry of nest location. However, the white storks could have disregarded its shape and instead adopted locations not related to it. For instance, they could have made their seven nests along the large horizontal bar which is a stable and easily accessible structure. It can be seen from the two nests present on the third platform, that the storks can build them quite close to each other. Using such a distance, they could have used the whole horizontal frame for a large number of nests. This was not the case. Besides, the high-tension poles are so large, and so many, that quite different outcomes could have occurred on different poles. The fact that there is a pattern, supports the contention that physical and mental factors may be involved in the choice of nest location.

2) The next factor to be considered is a physical component such as the size of the bird's body and wings, which influence their flight. White storks are large birds that need ample space to manoeuvre as they approach a nest site. This might seem to be a sufficient explanation for the choice of the ends of both the horizontal and nearly vertical metal frames. However, such reasoning is not easily applicable to locations on just the middle of the large horizontal bar, on the middle of the third platform, or on the intersections between vertical and horizontal bars. Due to the large size of the metal structures several nearby locations, to all these sites, would have been equally satisfactory from the point of view of flying ability, but would have resulted in a disruption of the symmetry.

3) A third aspect is the existence of a strong magnetic field in high-tension poles. According to Dr. Lennart Grahm at the Institute of Electrical Measurements, University of Lund, the tension in the cables is of the order of 380 kV. It is well established that birds, during migration, orient by a series of clues, one of them being the Earth's magnetic field (Bramnell 1974, Perrins 1976, Wiltschko and Wiltschko 1995). Does the intensity of the magnetic field play a role in the choice of nest location? A figure in Creutz (1985) shows three white storks that stopped to rest on a high-tension pole. Despite the difference in shape of this pole, as compared to the ones described in this work, the storks chose to occupy a position at the extremes of the horizontal frame and also in a symmetrical fashion. There was much space along the horizontal bars that allowed other alternative locations, but the storks followed the same pattern observed in nest building. In another figure found in Creutz's book, seven white storks stand side by side, quite close to one another, on the roof of a house. Hence, it cannot be excluded that the magnetic field may have an influence on the choice of location, since birds are able to sense magnetic fields.

4) Is the mental behaviour of birds also involved? Some of the most complex dwellings known in the

animal world are built by tropical weaverbirds. Their highly sophisticated nests consist of an entrance tube, an entrance chamber and an egg chamber. Using their beaks, these birds weave a pattern which follows a well defined plan of organization from start to end (Collias and Collias 1984). This is a situation comparable to the nests and trapping devices built by spiders. They follow also a plan of organization that results in a web of silk building a regular spiral. They start like the birds, from a fixed point and weave successively producing a geometric configuration still more complex than that of a bird, yet their brain is extremely small by comparison. If a human is to draw a spiral on a piece of paper, or the specific shape of a building, he or she, has to possess a picture of a spiral or of a building in their minds, before they put it on paper, otherwise they cannot do so. The same is to be expected of a spider or of a bird, when they decide to build a web or a nest. At present, little is known, in molecular terms, of human mental behaviour. Still less is known of what happens in the minds of animals in this context. Only future research can elucidate this situation.

The author returned to the same site in Portugal in the Spring of 1997 and found a similar activity at the nests that were photographed the previous year. It is known that white storks use the same nest year after year. In some cases there are records of the same nest being used since the XVI century (Lack 1966).

The high-tension cables that in other regions may have been a hindrance to the distribution of the white stork, turned out, in this locality, to be a source of nest sites to this population, once suitable feeding sites as marshy fields became restored.

Acknowledgements

I would like to thank Professor Dr. Jose Mesquita, Head of the Department of Botany, Coimbra University, and the Institute's photographer, Mr. Jorge Mascarenhas, for their kind collaboration.

References

Bramwell, M. 1974. *The World Atlas of Birds.* Mitchell Beazley Publishers Limited, London.

Collias, N. E. & Collias, E. C. 1984. *Nest Building and Bird Behavior.* Princeton University Press, Princeton.

Creutz, G. 1985. *Der Weisstorch.* Die Neue Brehm-Bücherei, A. Ziemsen Verlag, Wittenberg Lutherstadt.

Harrison, C. 1975. *A Field Guide to the Nests, Eggs and Nestlings of European Birds.* Collins, London.

Lack, D. 1966. *Population Studies of Birds.* Clarendon Press, Oxford.

Perrins, C. 1976. *Bird Life. An Introduction to the World of Birds*. Elsevier Publ. Projects, Lausanne.

Wiltschko, R. & Wiltschko, W. 1995. *Magnetic Orientation in Animals.* Springer-Verlag, Berlin.

Sammanfattning

Symmetrisk boplacering i högspänningsstolpar hos vit stork Ciconia ciconia

Tjugofyra bon av vit stork *Ciconia ciconia* var placerade i högspänningsstolpar lokaliserade vid sumpiga fält nära staden Coimbra i Portugal. Metallstolparna består av en central struktur med tre plattformar, som förgrenar sig och bildar två armar som har en nästan vertikal position. Dessa armar är förenade med en lång horisontal struktur. Storkbon i området förekom enbart i dessa högspänningsstolpar. Antalet bon i en enda stolpe varierade från ett till sju. I de flesta fall var storkbona placerade vid ändarna av metallstrukturen oberoende av om dessa hade ett horisontellt eller nära vertikalt läge. När två eller flera bon förekom i samma stolpe bildade dessa ett symmetriskt mönster i alla de observerade fallen. Denna symmetri var oberoende av boets lokalisering. Fyra faktorer anses vara inblandade i uppkomsten av detta fenomen: 1) Stolparnas form, 2) storkarnas vinglängd, 3) förekomsten av ett starkt magnetiskt fält, och 4) djurens mentala beteende. Den sistnämnda anses vara den mest sannolika orsaken, men den frågan kräver en djupare undersökning.