

Distribution status and breeding of the White Stork *Ciconia Ciconia* in Greece

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Abstract - Two thousand three hundred and eighty seven nests (2387) of White Storks *Ciconia ciconia* were found in Greece during the Summer of 1993. Here are presented the geographical distribution and breeding success of the species. The average population density (StD) was found to be 8.4 pairs per 100 Km², ranging from 46.05 to 0.09 pairs per 100 Km². The average number of fledged young per nest (JZm) was 2.87, ranging from 2.3 to 5.0. The highest nest was found at an altitude of 940 m a.s.l. while the majority of the nests (76%) were found at an elevation <:100 m a.s.l. The White Stork prefers as nesting sites electrical poles, both with platform (artificial nests) (53.5%) and without platform (18%). Wetland areas seems to play the most important role affecting the density and geographical distribution of the species. The lack of suitable nesting sites appear to be the critical limiting factor for the species population size.

Introduction

The White Stork *Ciconia ciconia* is one of the most familiar species of the world with wide geographical distribution. Its habit of nesting near human settlements has made it possible to have reliable information on its status, distribution and population densities for many European countries. The data show that the population abundance of the species is progressively decreasing in Europe and mainly in the western part of the continent (Bairlein and Zink 1979, Bairlein 1991, Boettcher-Strein *et al.* 1989, Chozas 1986, Dallinga and Schoenmakers 1987, Delic and Matijevic 1988, Goriup and Schulz 1990, Luthin 1987).

Greece, is considered to be one of the most important breeding areas of the species in the Balkan peninsula. However, information regarding its geographical distribution, population numbers and nesting site selection are limited (Goutner and Tsachalidis 1995, Heckenroth 1969, Holzinger 1986, Holzinger and Kunkle 1986, Jerrentrup 1989, Martens 1966, Warncke 1967). The White Stork in Greece, until 1950 had a wide geographical distribution in the whole country (Martens 1966). In recent decades the species has been restricted only to the central and northern parts of the country and to the island of Lesbos (Figure 1).

The present study was conducted on a national scale during the summer of 1993 with the following objectives:

- (1) to determine the geographical and altitudinal distribution, size and population density of the species;
- (2) to determine the characteristics of its nesting site selection.

Methods

The study was carried out from March to September 1993 in the whole country. All communities (towns and villages) were included in the census. Questionnaires and informative letters were sent to the local offices of the farm wardens.

Inquiry forms were sent to every community which was known to have, or had in the past, breeding pairs of White Storks in their territory. The information gathered was grouped according to districts and the later was used as the working unit.

From the questionnaires the following data were obtained for each district and prefecture: (a) the number of the breeding pairs, (b) type of nest - site selected, (c) number of active nests with and without fledged young and (d) mean number of fledged young per nest.

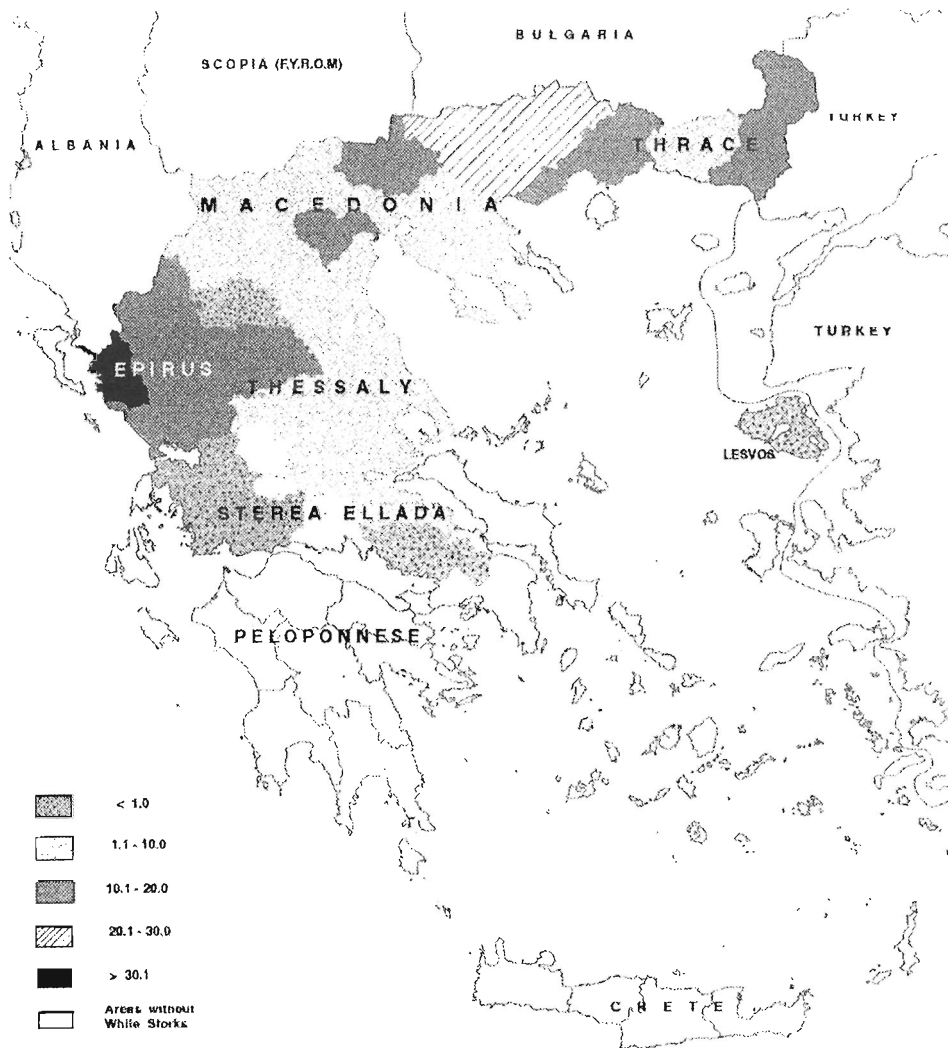


Figure 1. Geographical distribution and density (pairs/100 Km²) of White Storks in Greece.

Results

The main part of the population of the White Stork in Greece arrives between 20 of March and the beginning of April. Departure to the wintering grounds begins around the middle of August and continues until early September.

From the 1500 questionnaires returned 848 (56,5%) reported positively (presence of nests), while the rest 652 (43,4%) reported negatively. The percentage response by community varied from 92% to 47%. The rate inquiries responses was considered high enough to obtain reliable representation of the state in each district. The total number of nests (HPa) counted in the whole country was 2387. From this figure 135 nests (5,6%) were found without young (HPo) and the

rest 2252 (94,4%) were found with fledged young (HPm) (Table 1).

In order to check the reability of the answered questionnaires, we selectively made direct census by visiting 250 (29,5%) communities in different parts of the country and checked the number of the reported nests. The conducted search showed that the reported number of nests in the selected areas was close to that found by us (ranging from ± 2 to 4%). The fact that local authorities reported a correct number of nests show their growing concern for wildlife conservation in general.

As it is shown in Table 1 the total population of White Storks in Greece in 1993 was found to be 4774 individuals. From the population distribution of the White Storks in Greece it is found that the highest

Table 1. Distribution of nesting pairs, density and breeding succes per district and perecture of the White Stork in Greece.

DISTRICT Perfecture	Lowland area (Km ²)	HPm	HPo	HPa	JZG	JZa	JZm	Number of pairs per 100 km ² (StD)
1	2	3	4	5=3+4	6	7=6/5	8=6/3	9=5/2*100
THRACE	4236	448	31	479	1193	2.49	2.66	11.31
Evros	2708	256	24	280	703	2.51	2.75	10.34
Rodopi	957	86	3	89	198	2.22	2.30	9.30
Xanthi	571	106	4	110	292	2.65	2.75	19.26
MACEDONIA	12498	1297	85	1382	3765	2.72	2.90	11.06
Kavala	497	51	-	51	129	2.53	2.53	10.26
Drama	375	105	5	110	291	2.65	2.77	29.33
Serres	1958	448	34	482	1319	2.74	2.94	24.62
Halkidiki	770	22	-	22	56	2.55	2.55	2.86
Thessaloniki	2421	192	11	203	592	2.92	3.08	8.38
Kilkis	1728	169	9	178	523	2.94	3.09	10.30
Pieria	591	18	1	19	51	2.68	2.83	3.21
Imathia	845	96	10	106	260	2.45	2.71	12.54
Pella	1153	92	9	101	251	2.49	2.73	8.76
Kozani	986	44	4	48	115	2.40	2.61	4.87
Florina	593	53	2	55	160	2.91	3.02	9.27
Kastoria	215	6	-	6	15	2.50	2.50	2.79
Grevena	366	1	-	1	3	3.00	3.00	0.27
THESSALY	5288	254	9	263	748	2.84	2.94	4.97
Magnisia	905	28	-	28	80	2.86	2.86	3.09
Larisa	2552	133	6	139	409	2.94	3.08	5.45
Karditsa	1247	29	-	29	84	2.90	2.90	2.33
Trikala	584	64	3	67	175	2.61	2.73	11.47
EPIRUS	929	155	6	161	465	2.89	3.00	17.33
Ioannina	165	17	-	17	50	2.94	2.94	10.30
Thesprotia	76	33	2	35	97	2.77	2.94	46.05
Preveza	357	50	3	53	152	2.87	3.04	14.85
Arta	331	55	1	56	166	2.96	3.02	16.92
ST. ELLADA	3318	88	4	92	254	2.76	2.89	2.77
Fthiotida	974	73	4	77	216	2.81	2.96	7.91
Viotia	1212	4	-	4	11	2.75	2.75	0.33
Etol/nia	1132	11	-	11	27	2.45	2.45	0.97
PELOPONNESE	1088	1	-	1	5	5.00	5.00	0.09
Mesinia	1088	1	-	1	5	5.00	5.00	0.09
ISLANDS	1058	9	-	9	22	2.44	2.44	0.85
Lesvos	1058	9	-	9	22	2.44	2.44	0.85
TOTAL	28415	2252	135	2387	6452	2.70	2.87	8.40

HPm : Number of nests with fledged young

HPo : Number of nests without fledged young

HPa : Number of active nests

JZG : Number of fledged young

JZa : Mean number of fledged young per active nest

JZm : Mean number of fledged young per nest

StD : Number of pairs per 100 km²

proportion is located in central and northern districts. Macedonia was found to have the highest number of nests (1382), followed by Thrace (479), Thessaly (263), Epirus (161) Sterea Ellada (92), Lesvos island (9) and Peloponnese (1). The average density (StD) of pairs per 100 Km² was 8.4, ranged from 46.05 (Thesprotia-Epirus) to 0.09 (Messinia-Peloponnese). The altitude of the nest sites ranged from 0 to 940 m above sea level. However, the majority of nests (76%) was located in an altitude ranging from 0 to 100 m a.s.l., and 13% from 101 to 200 m a.s.l. (Figure 2).

Discussion

Wetlands seems to be the most important ecological factor affecting the distribution and population abundance of the White Stork. Macedonia and Thrace districts, where the most wetland areas in Greece are located, showed the highest population density. Furthermore, the higher proportion of lowland areas and the intensive irrigation system used in the above districts is an additional contribution to the species abundance.

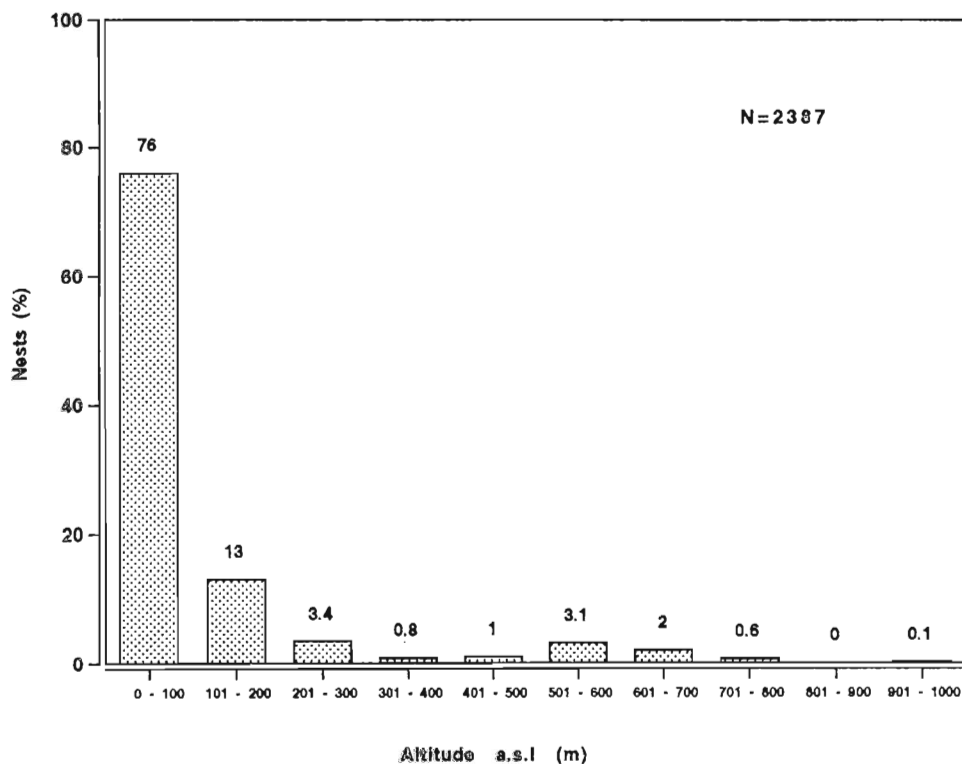


Figure 2. Altitudinal distribution of breeding White Storks in Greece.

One of the nests found in the prefecture of Florina at an altitude of 940 m a.s.l. seems to be the highest reported in Europe.

The average number of the fledged young (JZm) per nest was 2.87, ranged from 2.3 to 5.0 (Table 1). The 42.6% of the examined nests had 3 young, the 31.3% 2 young, the 18.0% 4 young, the 1.4% 5 young, while 1% had 1 young per nest (Figure 3). Only the 5.7% of the examined nests were found without young probably indicating immature breeding pairs or failure due to natural causes (predators, adverse climatic conditions, etc).

As it is shown in Figure 4, White Stork prefers to nest electrical poles with platform on their top (53.5%) and without platform (18%). Other places selected by the White Stork for nesting were church towers (9.5%) and the roof of churches (8.1%).

The high proportion of the White Stork's nests at low altitude (<100m a.s.l.) shows that the species prefers to breed in lowland areas.

The average population density of 8.4 pairs per 100 Km² shows that Greece should be considered one of the most important breeding areas in Europe. The average density (pairs/100 Km²) of White Stork was reported to be 4.9 in Bulgaria (Michev *et al.* 1989a, 1989b), 7.9 in Croatia (Muzinic 1989), 4.2 in Hungary (Jacob 1977) and 1.5 in Spain (Chozas 1986).

The White Stork has always been a protected species in Greece. Nevertheless, its population size has fallen in some prefectures (Serres) by 45% over the past 14 years (Tsachalidis, in preparation), due to mainly to direct and indirect human factors. The first include the extensive use of insecticides and the contamination of

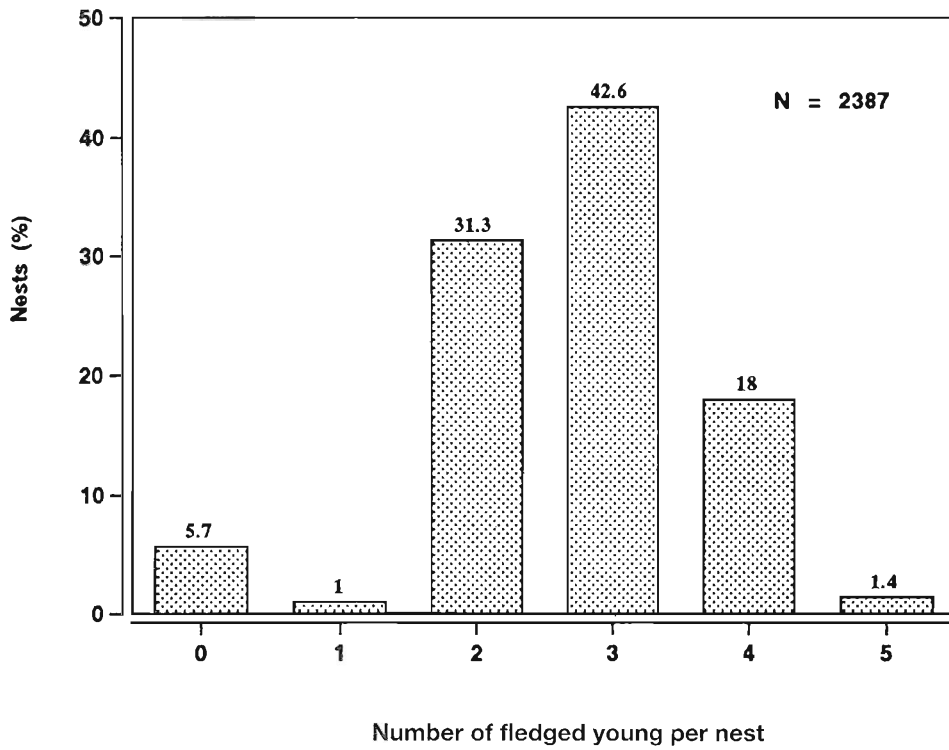


Figure 3. Percentage of the fledged young per active nest of the White Stork in Greece.

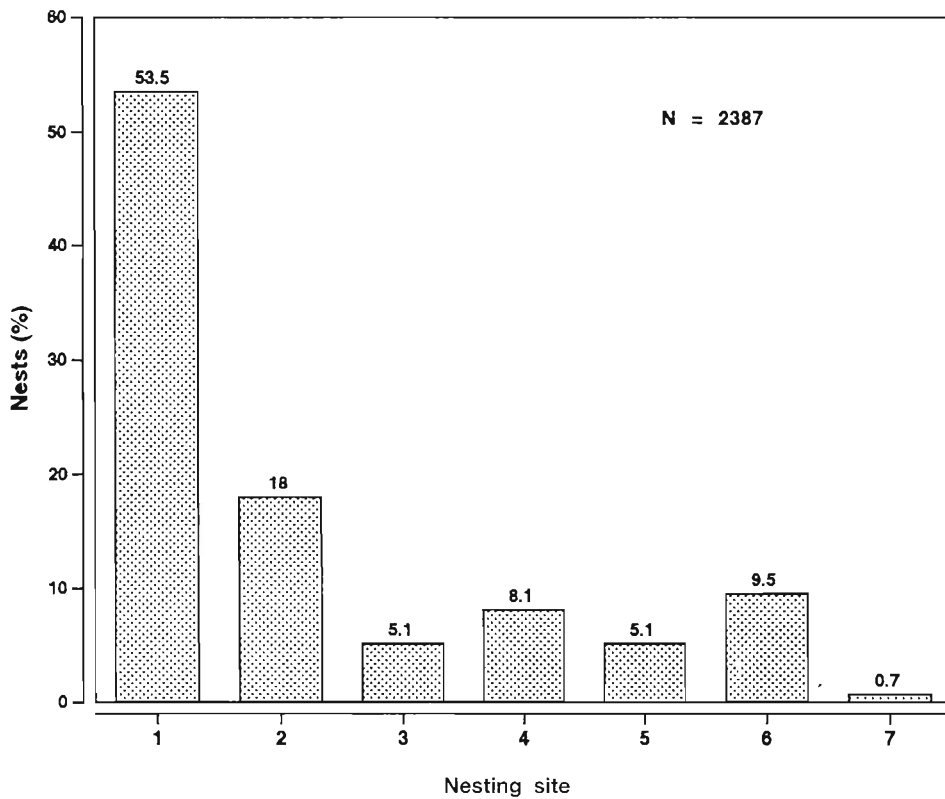


Figure 4. Preferred breeding sites of the White Stork in Greece.

(1. Electrical poles with platform, 2. Electrical poles without platform, 3. Trees, 4. Roofs of churches, 5. Buildings (houses, schools, etc.), 6. Towers of churches, 7. Others).

the soil and water by toxic chemical waste products, while the second include the drastic destruction by the farmers of old trees from their fields in order to ameliorate the mechanisation of harvesting. The lack of suitable places for nesting, seems to be the main limiting factor affecting the population size of the species in Greece. It is essential to promote public awareness and especially to induce the farmers to realise the importance of preserving old trees in their fields as nesting sites of the White Stork and to avoid extensive use of insecticides and other toxic waste products.

The practice of the Greek Electrical Company to construct and place on the top of the electrical poles specially designed platforms, seems to be the most important management tool to protect and increase the number of the White Stork in Greece.

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Riassunto - Nell'estate 1993 sono stati censiti in Grecia 2387 nidi di Ciconia bianca (*Ciconia ciconia*). Si è inoltre studiata la distribuzione sul territorio ed il successo riproduttivo della specie. La densità media di popolazione è 8.4 copie per 100 km² con minimi di 0.09/km² e massimi di 46.05/km². Il numero medio di giovani all'involo è 2.87 (2.3 min, 5.0 max). Il nido più alto è stato riscontrato a 940 m slm ma la maggior parte di essi (76%) è ad altitudini inferiori a 100 m slm. La Ciconia bianca preferisce i pali elettrici come sito di nidificazione, con piattaforma (nidi artificiali) (53%) o senza (18%). Le zone umide sembrano il fattore più importante per spiegarne la densità e la distribuzione geografica. La mancanza di siti idonei per la nidificazione invece sembra il principale fattore limitante la dimensione ottimale delle popolazioni.

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