

# The breeding population of Black Stork *Ciconia nigra* in the Iberian Peninsula

Luis Santiago CANO ALONSO<sup>1</sup>, Cláudia  
FRANCO<sup>2</sup>, Carlos PACHECO<sup>2</sup>, Susana REIS<sup>3</sup>,  
Gonçalo ROSA<sup>4</sup> & Manuel FERNÁNDEZ-GARCÍA<sup>5</sup>

<sup>1</sup> Departamento de Zoología y Antropología Física (Vertebrados), Facultad de Biología, Universidad Complutense, Ciudad Universitaria, 28040 Madrid, Spain

E-mail: catuche.gallego@gmail.com

<sup>2</sup> Instituto da Conservação da Natureza, Rua de Santa Marta 55, 1169-294 Lisboa, Portugal

<sup>3</sup> Rua Quiloa, no3, 2800-230 Cova da Piedade, Portugal

<sup>4</sup> Rua da Juventude, lote 19, 2o dir, Pinhal dos Frades 2840 Seixal, Portugal

<sup>5</sup> GesNatura s.l., Avenida de Brasil 4. E-28020 Madrid, Spain

## Abstract

The Iberian Peninsula is situated in the western extreme of Europe, and it is the limit of the Black Stork distribution of the western Palaearctic. The Black Stork in Iberia occupies the south western quadrant of the Peninsula in both Portugal and Spain, and is geographically separate from the population in Central and Eastern Europe. In the early nineties the population was estimated at 230-270 pairs (European Birds Population: estimates and trends). We compiled recent data collected between 1995 and 2002 in a national (Portugal: 1995-1997) and regional (Spain: 1996-2002) census and surveyed the population of 405-483 pairs (83 confirmed and 13 possible pairs in Portugal and 322 confirmed and 65 possible pairs in Spain). However, the census effort was unequal between all areas and we suspect that the value might be slightly underestimated. The Iberian population represents between 4% and 7% of the European and about half of European Union breeding population. The increase in the estimates since the early nineties is certainly a result of better coverage and census efforts, but there is some evidence of a small increase in the population. There is apparent stability in the number of pairs in the core area and an expansion in the edge of the distribution. Most nests are placed on rocks (69%) in both riverine and mountain cliffs and the remaining (31%) are in trees, mainly Cork Oak and pines. Finally, we present current threats, limiting factors and conservation measures in both Portugal and Spain.

**Keywords:** *Ciconia nigra*, breeding, Iberian peninsula

Received 29 January 2007; accepted 9 May 2007

## INTRODUCTION

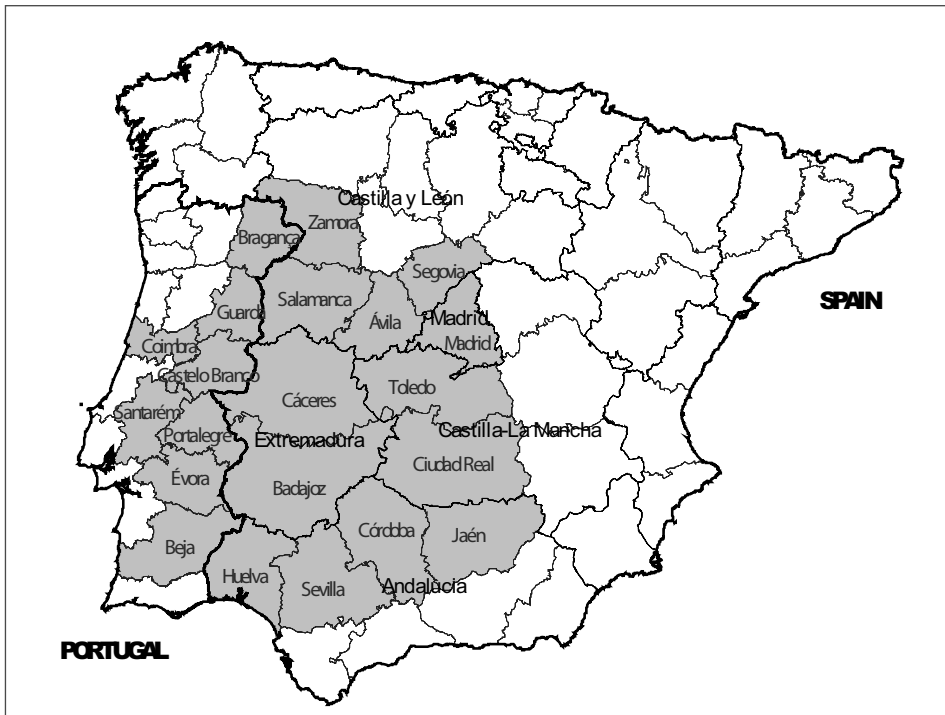
The Iberian Peninsula is located at the southwestern extreme of Europe, and it is at the western limit of the Black Stork's *Ciconia nigra* distribution in the western Palearctic. The Black Stork occupies the southwestern quadrant of the Iberian Peninsula in both Portugal and Spain. This population is geographically separate from a much larger one in Central and Eastern Europe (Cramp 1977). Until the end of the last century, information about the Iberian population was scarce and was always analysed separately in each country. In the eighties, the only information available for Portugal was published in a National Atlas of breeding birds (Rufino 1989), although there was no directed effort for Black Stork and the estimate was rather incomplete. In Spain, a national census was carried out in

1987 (Gonzalez 1987), but similarly it was incomplete.

In the nineties, the first national census was done in Portugal (Rosa et al. 2001). In this same period, the political situation changed in Spain; each Spanish Autonomous Community was granted environmental responsibility for its territory and each region organised its own Black Stork census. An outcome of this situation is that nowadays there is detailed information about the population and distribution of Black Stork in Spain, but this information is scattered and has never been analysed as a unit.

Although many studies were regionally important for the establishment and implementation of conservation measures, it is necessary to have a global and biologically more meaningful perspective of the

**Figure 1.** Administrative divisions in the Iberian Peninsula where the Black Stork breeding population occurs: provinces (brown) and Autonomous Communities (black) in Spain and districts (grey) in Portugal.



**Table 1.** Breeding pairs of Black Stork in Portugal and Autonomous Communities of Spain.

Country	Autonomous Communities	Pairs	Period	Method	Source
PORTUGAL	-	83-96	1995-97	National census	Rosa et al., 2001
SPAIN	Andalucía	52-66	1997, 2001, 2002	Forest rangers monitoring	CMA-Junta de Andalucía/Red Book
	Castilla-La Mancha	24-34	1999, 2001	Provincial census	CA y MA-JCCLM/Red Book
	Castilla y León	61-80	2000	Provincial census; Forest rangers monitoring	CMA-Junta de Castilla y León/Red Book
	Extremadura	173-195	2002	Forest rangers monitoring	DGMA-Junta Extremadura/Red Book
	Madrid	12	2001	Regional census	CMA Madrid/Red Book
TOTAL IBERIA		405-483			

Iberian population. Therefore, we decided to compile the information available from both countries instead of presenting it as separate national census. This might contribute to a better understanding of the population limitations and trends and for the definition of conservation measures, mainly in border areas between different administrative regions.

## METHODS

We compiled the most recent information about the breeding population of Black Stork in Portugal and Spain. The data from Portugal was obtained during the national census that took place between 1995 and 1997 (Rosa et al. 2001). Data from Spain comes from provincial and regional census carried out between 1997 and 2002 and compiled for the *Atlas of the Breeding Birds of Spain* (Cano & Hernández 2003) and for the *Red Data Book of Birds of Spain* (Cano & Hernández 2002). The contribution of the regional or provincial Environmental Services was essential to obtain an important part of the information about the

breeding population in Spain (see acknowledgements).

The information collected was the following:

Confirmed pairs - pairs with known nests and confirmed reproduction (all of Spain) and secure pairs, even if the nest was unknown (14 pairs in Portugal). This represents the minimum number of breeding pairs.

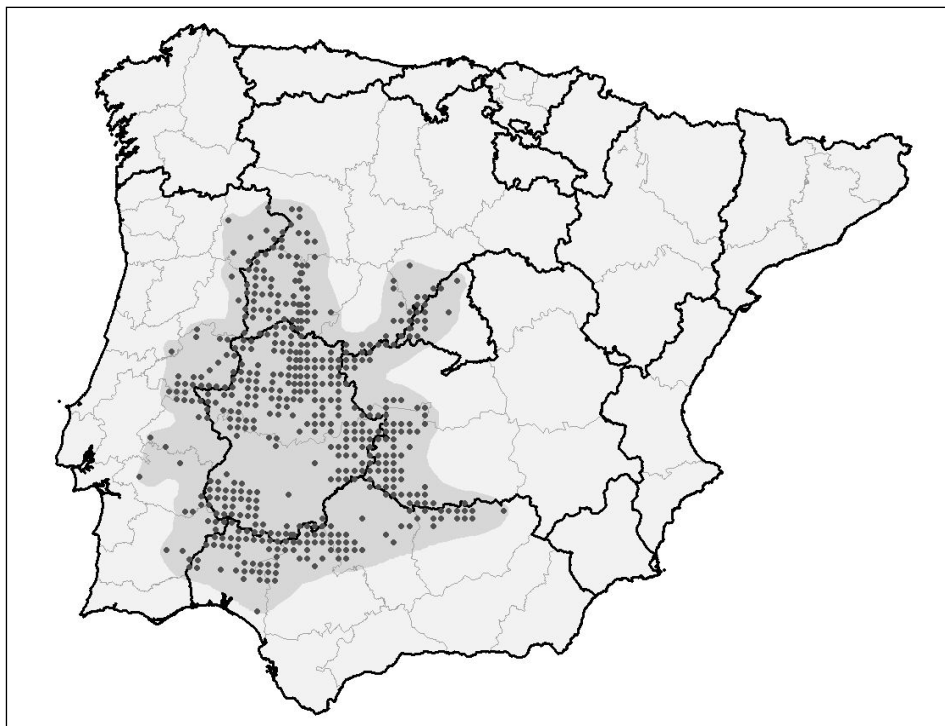
Estimated pairs - this is the number of confirmed breeding pairs plus the number of possible breeding pairs (pairs which the evidence suggest exist, although they are not secure).

Distribution of breeding pairs for the Iberian Peninsula in an UTM grid of 10 per 10 kilometres.

Breeding habitat. We defined the breeding habitat in the Iberian Peninsula according to the dominant forest type and topography. We identified three main types of nest supports: trees, river cliffs and hill cliffs. Data shown relates only to active nests.

Threats and limiting factors were identified from monitoring programs in both coun-

**Figure 2.** Distribution of confirmed pairs of Black Stork (dots in 10x10km square UTM grid) and range (darker), with administrative limits as background (see fig. 1).



tries and the *Red Data Book of Portuguese Vertebrates* (Almeida et. al. 2005 and the regional conservation plans (Castilla La Mancha and Castilla y Leon) and the *Red Data Book of Spanish Birds* (Cano & Hernández 2002) we consulted. The magnitude of threats and limiting factors was classified in four qualitative categories: Low, Medium, High and Unknown. Finally, we reviewed the conservation strategy for the Iberian Peninsula concerning the Natura 2000 Sites (Council Directive 92/43/EEC of 21 May 1992).

## RESULTS AND DISCUSSION

### Breeding population and distribution

The population estimate for the Iberian Peninsula is 405 to 483 pairs. This estimate shows an increase in the number of breed-

ing pairs when compared with a previous one published in the early nineties (Tucker et al. 1994). This increase results from better coverage and census effort, but there is also evidence of a small increase in both population size and range in both countries.

The Black Stork breeds in eight districts of Portugal and thirteen provinces of Spain, corresponding to five autonomous communities, one more autonomous community when compared with data from the first census (Fernández et al. 2001) (Figure 1). The distribution of the breeding pairs in Portugal and Spanish Autonomous Communities is shown in Table 1 and Figure 2. One Spanish Autonomous Community, Extremadura, contains the core of the Iberian population, in the centre of the distribution area, with 173-195 breeding

pairs. The number of breeding pairs per province in Spain and district in Portugal is shown in Figure 3. According to our data, there is apparent stability in the number of pairs in this region throughout the last decade, while an increase and an expansion of range was observed in some areas in the edge of the distribution (Figure 4). Analysing the distribution of Black Stork according to the main drainage basins shows that the Tagus basin, in the centre of the Iberian Peninsula, is by far the most important in Iberia, containing nearly 200 pairs. Guadiana basin has approximately 100 pairs, Douro has over 60 pairs, and Guadalquivir has nearly 30 pairs.

**Breeding habitat**

The Black Stork inhabits four main macro habitat types in the Iberian Peninsula:

- Steep river valleys, mainly in Tagus and

Douro basins. Cliffs are relatively common in the main river valleys and their subsidiaries and they are inhabited by an important part of the population, mostly in border areas between Portugal and Spain.

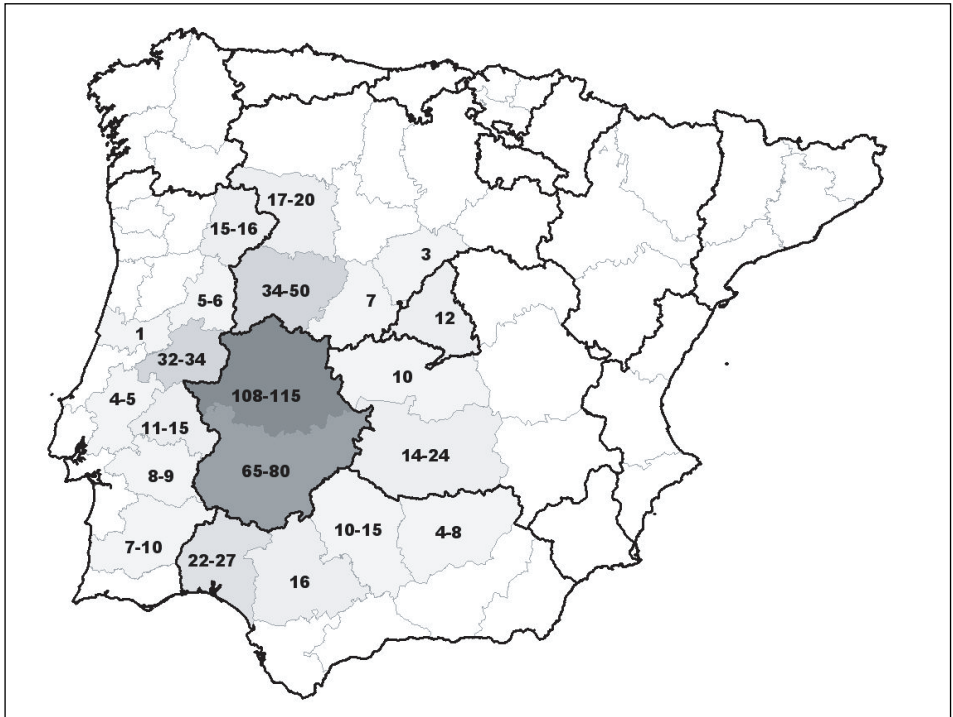
- Hills and mountains are used as breeding areas, especially if cliffs are available. This habitat type is well represented in the centre of Portugal and western Spain.

- Mature pine forests are an important breeding habitat, mainly in the mountains and valleys of the centre of the Black Stork's range.

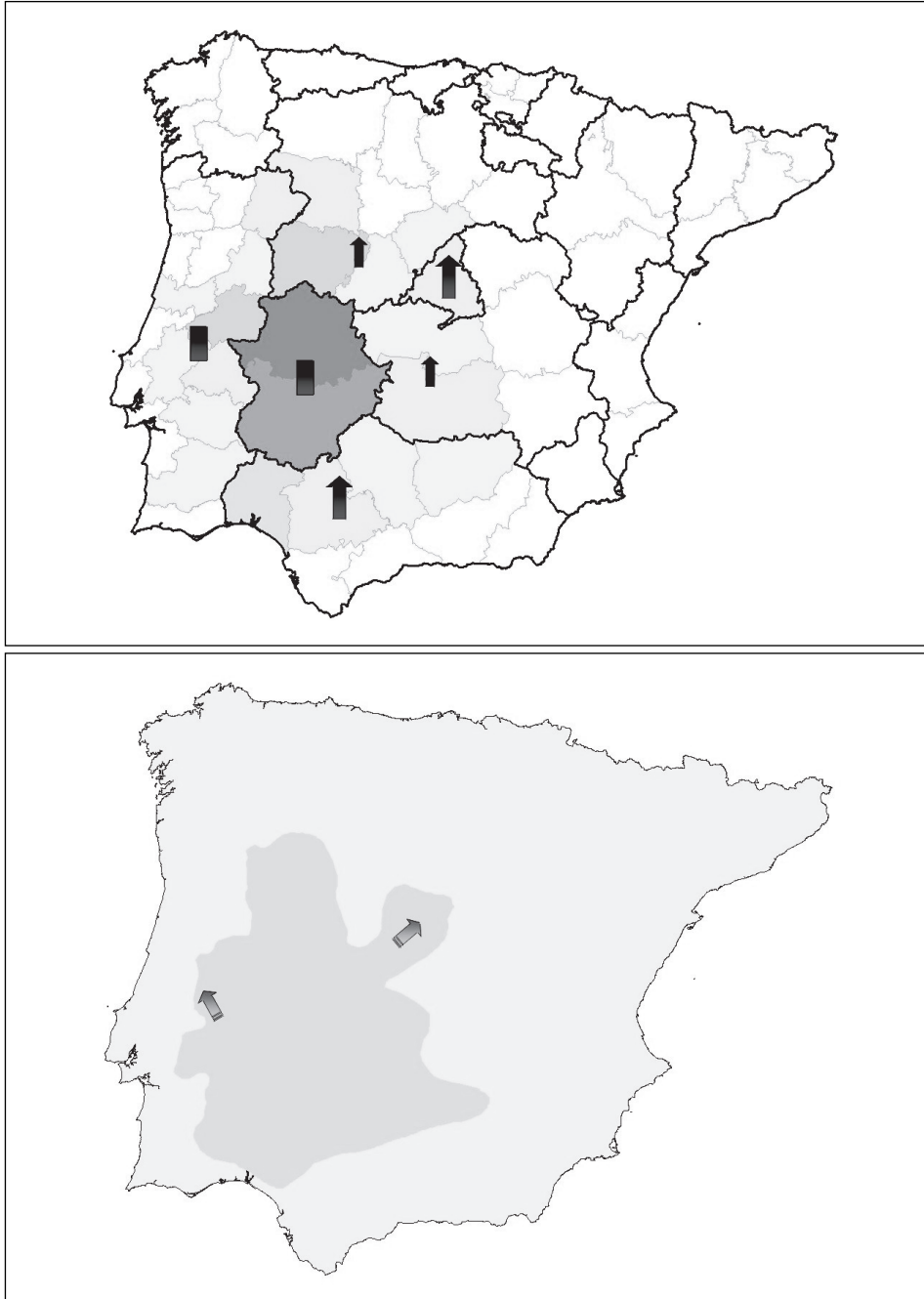
- Evergreen oak agro-system and Mediterranean wood and scrubland are the typical breeding habitat in the southwest and northwest of the species range.

There are basically three types of nest supports: trees, river cliffs and hill/mountain cliffs. The most important nest support is cliffs, which contain 55.3% of the active

**Figure 3.** Number of breeding pairs per province (Spain) and districts (Portugal). Darker colours represent higher abundance.



**Figure 4.** Trends in Black Stork breeding population. Top: number of pairs (rectangles- stability; small arrows – slight increase; large arrows – large increase; darker colours represent higher abundance). Bottom: areas of range expansion (indicated by the arrows).



**Table 2.** Threats and inferred magnitude for the Black Stork population in the Iberian Peninsula.

Threats and limiting factors	Magnitude
Habitat Loss and change	
1. Dams	High (big dams)
2. Forest Fires	Medium
3. Replacement of mature wood with fast growing tree plantations	Unknown
Pollution	
4. Water Pollution	Unknown
Human Disturbance	
5. Recreational Activities	High
6. Agriculture and forestry	Medium
7. Use and construction of roads	High
8. Shepherding	Unknown
Non natural Mortality	
9. Collision with and electrocution by power lines	Unknown
10. Accidental destruction of nests	Low
Nests	
11. Robbing of eggs and chicks	Low

nests; of which 44.2% are in river valleys and 11.1% are in hill or mountain areas. The remaining nests (44.7%) are located in trees, mainly *Quercus* sp. and *Pinus* sp.

**Threats and limiting factors**

We have identified 11 main threats to the Black Stork in Iberia (Table 2). Human disturbance, mostly the result of recreational activities such as angling, navigation, and hiking, is the most relevant and wide-spread threat. The construction and use of new dirt tracks and roads close to nest sites is also an important disturbance factor. Habitat loss and change caused by the construction of big dams has a significant impact by irreversible habitat loss. One example is the Alqueva dam, recently constructed in Portugal, which submerged the nest sites of 10% of the breeding pairs in the country. A significant loss of breeding and feeding habitat is also expected with the construction of the planned Sabor dam, located in a SPA (Special Protection

Area for birds; PT ZPE0037) and Natura 2000 site.

**Conservation instruments**

Council Directive 92/43/EEC of 21 May 1992 proposes an Environmental network in the European countries for the conservation of European biodiversity. In theory, the areas of this network will be protected. This network has been called "Natura 2000 Sites". Around 60% of breeding sites are in these protected areas, which contribute to reinforcing conservation measures. Nevertheless, about 40% of the population is still not covered by any kind of special protection measures. Only two Autonomous Communities in Spain, Castilla La Mancha and Castilla and León, have developed an action plan. Madrid, Extremadura and Andalucía (about 60% of the Iberian population) have not yet elaborated any action plan for the Black Stork. Portugal has elaborated a technical proposal for a national action plan.

It is relevant to note that an important part of the population breeds in river valleys along the border between the two countries. Management of these areas requires the development and application of similar rules and conservation measures in both countries, which rely on coordination and joined efforts between the administrations of the two countries. The first step in the conservation of important border areas was taken with the creation of protected areas in both countries along the Douro river (Arribas do Douro and Arribes del Duero Natural Parks). A similar process is now taking place along the Tagus river with the already existing Tejo Internacional Natural Park and the Tajo Internacional Natural Park, currently under development. One issue that is now being addressed by both countries from this cooperation perspective is the regulation of navigation along the international sections of the Douro rivers and Tagus rivers. Another example of cooperation was a INTERREG project, which included several studies of Black Stork between the autonomous region Extremadura (Spain)

and the interior of the centre and south of Portugal. An outcome of this project is the attainment of a broader view of the species' biology and requirements, which will allow the development of common strategies for the conservation of the Black Stork in Iberia.

### Acknowledgements

We are very grateful to: Roberto Carbonell Alanís, Iñigo Fajardo (Huelva), José Antonio Torres Esquivias (Córdoba), María Jesús Martos (Sevilla), Salvador Pacheco (Jaen), José Manuel Hernández García (Ciudad Real), Ignacio Molina (Consejería de Medio Ambiente de la Junta de Castilla y León), Emilio Ramos (Salamanca), Alberto Madroño (SEO/BirdLife), Luis Veríssimo, Delegación Provincial de Sevilla, Córdoba y Huelva de la Consejería de Medio Ambiente, Junta de Andalucía, Consejería de Medio Ambiente de la Junta de Castilla y León, Dirección General de Medio Ambiente, Junta de Extremadura, and Consejería de Medio Ambiente de la Comunidad de Madrid.

### References

- ALMEIDA, J., CATRY, P., ENCARNACÃO, V., FRANCO, C., GRANADEIRO, J.P., LOPES, R., MOREIRA, F., OLIVERA, P., ONOFRE, N., PACHECO, C., PINTO, M., PITTA GROZ, M.J., RAMOS, J. & SILVA, L. 2005. *Ciconia nigra*. In: Cabral M.J., Almeida, J., Almeida, P. R., Dellinger, T., Ferrand de Almeida, N., Oliveira, M.E., Palmeirim, J.M., Queiroz, A.I., Rogado, L. & Santos-Reis, M. Eds.: Livro Vermelho dos Vertebrados de Portugal. Instituto da Conservação da Natureza. Lisboa: 179-180.
- CANO ALONSO, L. S. & HERNÁNDEZ GARCÍA, J.M. 2003: Cigüeña Negra, *Ciconia nigra*. In: Martí, R. & Del Moral, J.C. eds. Atlas de las Aves reproductoras de España. Dirección General de Conservación de la Naturaleza-Sociedad Española de Ornitología. Madrid: 120-121.
- CANO ALONSO, L. S. & HERNÁNDEZ GARCÍA, J. M. 2002: Cigüeña Negra (*Ciconia nigra*). In: Madroño, A., C. González, Y J. C. & Atienza eds.. Libro Rojo de las Aves de España. SEO/BirdLife. Unpublished Inform for Dirección General de Conservación de la Naturaleza /Ministerio de Medio Ambiente. Madrid.
- CRAMP, S. 1977: Handbook of the birds of Europe, the Middle East and North Africa. The birds of Western Palearctic. Vol. 1. Ostrich to ducks. Oxford: Oxford University Press.
- FERNÁNDEZ, M., CANO, L.S. & PRADA, L. 2001: The Black Stork in the Region of Madrid (Central Spain): Status, Trends and Population changes, in press, Third International Black Stork Conference. Fourneau Saint-Michel. Belgium.



- GONZÁLEZ, J.L. 1987: Inventario de la población española de Cigüeña Negra. Unpublished inform, ICONA. Madrid.
- ROSA, G., PACHECO, C., MONTEIRO, A., CARVALHO, A. & ARAÚJO, A. 2001: Situação da Cegonha-preta *Ciconia nigra* em Portugal: Recenseamento da população nidificante (1995-1997), in press, *Airo* 11: 15-22.
- RUFINO, R. coord. 1989: *Altas das aves que nidificam em Portugal continental*. CEMPA/SNPRCN, Lisboa.
- TUCKER, G.M., HEATH, M.F., TOMIALOJC, L. & GRIMMETT, R.F.A. 1994: *Birds in Europe: Their Conservation Status*, in BirdLife conservation series 3. BirdLife International. Cambridge. U.K.

