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SPECIAL ISSUE: GLOSSY IBIS ECOLOGY & CONSERVATION

Past and Present: The Glossy Ibis *Plegadis falcinellus* in Tunisia

***Aymen NEFLA*[1*], *Ridha OUNI*[2], *Saïd NOUIRA*[3]**

[1]*Department of Biology, Faculty of Sciences of Tunis (FST), University Tunis El Manar, Campus 2092, El Manar Tunis. Tunisia.*
[2]*Tunisian Wildlife Conservation Society. Faculty of Sciences of Tunis (FST), Campus 2092, El Manar Tunis. Tunisia.*
[3]*Department of Biology, Faculty of Sciences of Tunis (FST), University Tunis El Manar, Campus 2092, El Manar Tunis. Tunisia.*
[*]*Corresponding author; e.mail: aymennefla2007@yahoo.fr*

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ABSTRACT

This work aims to clarify the current breeding status of the Glossy Ibis and describe the recent population dynamics of the species in Tunisia. We have used bibliographic data from 25 ornithologists and personal observations made during our long-term monitoring of the Tunisian wetlands. The Glossy Ibis was always observed in the winter (56.74% of observations) and before (8.61%) and after (28.78%) the breeding period. The majority of these observations (43.41%) were from southern Tunisia. The lowest percentage was recorded during the breeding period (5.85%) principally in Lebna dam at Cap-Bon (north-east Tunisia) where the breeding of the species on Tunisian territory was demonstrated for the first time in 2008. Another nesting case with 4 breeding pairs was recorded in June 2014 at Ichkeul Lake in northern Tunisia. Currently, the nesting populations of Glossy Ibis appear unstable at both breeding sites. In 2017, for the first time in the last three decades, there was no mixed heronry in the Ichkeul National Park and, therefore, no Glossy Ibis nesting. On the other hand, in Lebna the number of breeders continued to decrease year-to-year until just one couple was recorded in 2017. The current situation of the breeding populations in Tunisia is serious and requires urgent action by conservation stakeholders. It is therefore necessary to start an adequate conservation plan to safeguard the protection of the species in Tunisia. We suggest that more effort should be devoted to limit anthropic disturbances, especially during the breeding season, and to properly manage the recently-built dams around the Ichkeul Lake in order to guarantee sufficient levels of water for wading birds nesting.

Introduction

The Glossy Ibis *Plegadis falcinellus* is recognized as a widely distributed landbird species (Newton 2003). Due to its great dispersal capability it was recently able to colonize the New World by individuals who crossed the Atlantic (Santoro *et al*. 2013). Its current reproduction zone is vast and scattered, ranging from southern Europe, Africa and Madagascar to Central and South Asia, Philippines, New Guinea and Australia. It also breeds along the Atlantic coast of North America and in Islands from the Caribbean Sea (Matheu and del Hoyo 1992).

In the Western Mediterranean, Glossy Ibis recolonized the southern part of Italy (Brichetti 1986)

and Sardinia (Grussu 1987) during the 1980s. After a long absence and as a consequence of wetland management in Doñana National Park, the species recolonized Ebro delta and other Iberian sites since 1994 and increase
d in population from 8 in 1996 to 4048 in 2008 (log population size+1) (Figuerola *et al.* 2004; Santoro *et al.* 2010). Likewise, according to Kayser *et al.* (2006; 2009) Glossy Ibis populations continued to increase in number and size until the first recolonization in the Camargue in southern France.

In North Africa, Glossy Ibis had nested commonly in Morocco and Algeria from at least the 19th century (Heim de Balzac and Mayaud 1962; Thévenot *et al.* 2003). Subsequently, nesting recording had halted for almost a century only to begin again with new recordings of reproduction at the mouth of the Massa Wadi in 1994 (Rousseau 1994), in the palm grove of Marrakech, Morocco in the 1980s (Barreau and Bergier 2001;Thévenot *et al.* 2003) and recently in Smir marshes in northern Morocco (Amezian *et al.* 2012). In Algeria, Glossy Ibis started to breed again, first at Lake Tonga (Belhadj *et al.* 2007) and later at Lake Fetzara, Lake Tonga, Dakhla, and Chatt (Boucheker *et al.* 2009). The species has also bred recently in the Boussedra wetland in northeastern Algeria (Boudraa *et al.* 2015).

In Tunisia, the Glossy Ibis has always been observed in double passing (pre and postnuptial) and in the winter around Tunisian wetlands with the postnuptial passage being the most prominent (Isenmann *et al.* 2005). This bird had only ever been known as a wintering species (De Balzac and Mayaud 1962; Etchecopar and Hue 1964; Mayaud 1982). However, the species had bred for the first recorded time at the fresh water reservoir at Lebna dam near Cap-Bon (Ouni *et al.* 2009; Nefla *et al.* 2012). Also, another case of nesting with 4 breeding pairs was observed in June 2014 within the mixed heronry of Ichkeul National Park in northern part of Tunisia (Nefla *et al.* 2014).

Except for this bit of data and our personal observations and against the scarcity of information, no information has come to either reinforce our knowledge about the Glossy Ibis or investigate the sustainability of its establishment and nesting on Tunisian territory. These tasks seem indispensable and obligatory for making suitable decisions for conservation measures in order to carry out the necessary action plans to preserve and protect the species in Tunisia. This work aims to clarify the new breeding status of the Glossy Ibis and to retrace its history by describing the past and the current situation of the species in Tunisia.

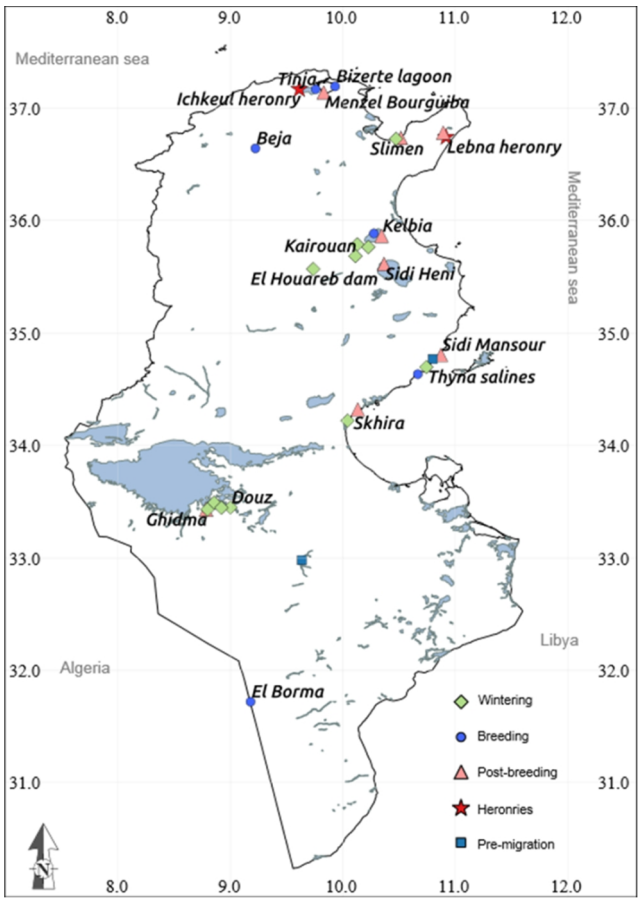
Study Area

The study concerned the Tunisian territory. Tunisia has an area of 164,150 km^2. It extends from north to south (750 km) over seven degrees of latitude (N 37° 20’ – N 30° 16’) and four degrees of longitude (E 7° 50’ – E 11° 30’) from west to east (400 km). All Tunisian IBAs (Important Birds Areas) cover 12,529 km^2, which represents about 13.1% of the national territory. Among these IBAs, 46 wetlands are distinguished, including the lagoon of the Ichkeul National Park and the Lebna dam reservoir, where the species has exclusively nested in Tunisia (Figure 1).

Methods

The development of this work was based on bibliographic data, our own observations (A. Nefla, pers. obs., 2008 to 2017) as well as the valuable observations of R. Ouni (from1987 to 2008) of surveying Tunisian wetlands and waterbirds including Glossy Ibis. In fact, bibliographic data used herein were collected from several observations made by 25 ornithologists and cover four phenological periods: Wintering (November-February), Pre-breeding passage (March-April), Breeding (May-July), and Post-breeding (August-October) (Appendix).

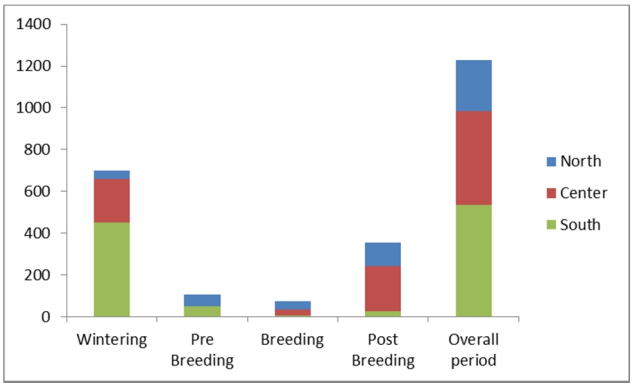
Figure 1.Map of Tunisia showing main recording sites and both nesting areas of Glossy Ibis in Tunisia during the four phonological periods (Wintering in green diamonds, Pre-Breeding in blue squares, Breeding in blue circles, and Post Breeding in pink triangles). Stars indicate Heronries



Results

The Glossy Ibis is always observed in the winter (56.74% of all observations) and during double passing (pre (8.61%) and postnuptial) with the postnuptial passage being the most prominent (28.78%). The majority of these observations are mentioned in southern Tunisia with 43.41% followed by recordings in central (36.66%) and northern (19.92%) parts of the country (Figure 2).

Figure 2. Numbers of Glossy Ibis specimens (Y axis) recorded over periods and geographic zones (X axis)



The Lowest percentage is recorded during the breeding period (5.85%) principally, in Lebna dam at Cap-Bon. Since the suspected breeding attempt in 1990 at the edge of a heronry at Kelbia/Sousse (Gaultier and Essetti in Isenmann *et al.* 2005) the nesting of the species on Tunisian territory is now proven for the first time in 2008 at Lebna in Cap Bon (Ouni *et al.* 2009; Nefla *et al.* 2012). Another nesting case with 4 pairs is observed in June 2014 at Ichkeul Lake (Nefla *et al.* 2014) (Table 1).

The only study that focused on reproduction of the Tunisian Glossy Ibis populations is conducted by Nefla *et al.* (2012). Currently the nesting populations of Glossy Ibis appear clearly unstable at both breeding sites. Indeed, at Ichkeul National Park the mixed heronry did not settle in 2017 as had not happened during last three decades, and the Glossy Ibis did not nest. However, the number of breeders continued strangely decreasing in Lebna from a one year to other until just a single couple was observed in 2017 (Table 1).

Table 1. Numbers of Glossy Ibis breeding pairs in the two mixed heronries from 2008 to 2017

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Lebna dam	8	18	3	3	2	3	3	2	2	1
Ichkeul N. Park	0	0	0	0	0	0	4	4	2	0

Discussion

Because of its vulnerability and conservation value, the Glossy Ibis is considered to be one of the most ecologically remarkable species, representing one of the six most widely distributed landbird species (Newton 2003). Glossy Ibis has always been regarded as wintering species in Tunisia which is why the majority of recordings of the species were done in the winter. However, breeding is first recorded at Lebna dam in Cap Bon in 2008, when nests are found in late Spring in a heronry, containing also Western Cattle Egret *Bubulcus ibis*, Squacco Heron *Ardeolaralloides* and Little Egret *Egrettagarzetta*. Since then the species became one of the Tunisian nesting birds. The reproductive performance recorded in recent studies indicates some environmental changes that promoted its installation. According to Nefla *et al.* 2012 the average clutch size over three years is 3.44 ± 0.73 eggs (N = 29 nests). Hatching success is 83%, with 2.86 ± 1.18 SD eggs hatched/nest and 2.65 ± 1.17 SD hatchlings/nest surviving until the age of 10 to 12 days. Also, egg mortality is 17% during the incubation phase and chick mortality is 7.2%. Currently, the situation of the breeding populations in Tunisia is serious and requires urgent action by conservation stakeholders by limiting illegal access and disturbances caused by fishermen and livestock near the heronry. Additionally, regular water releases from the six dams surrounding the Ichkeul lagoon should be scheduled. Thus, the number of breeding pairs has continuously decreased since the first nesting case. Tunisian wetlands are facing large challenges more than at any time in the past. The majority of sites are currently under threat from various sources such as drainage, urbanism and most likely from the prolonged drought that is considered to be the principal cause of instability, irregularity of reproduction, spatial dispersion and the decline of the species in Tunisian territory (Santoro *et al.* 2013). In fact, according toNefla *et al.* (2012), low levels of water in the Lebna dam open passages allowsentrance of predators and children of locals, causing huge disturbances to reach the bird nests and cause considerable loss in the number of nests, eggs and nestlings.

Future work

According to Underhill*et al.* (1999), ring recoveries point to nomadic movements of the Glossy Ibis. Due to the considerable tendency of their numbers to vary and their erratic occurrence, Glossy Ibis are not an easy species to monitor using regular waterbird counts (Taylor*et al.* 1999). We still don't know if any of the subjects occurring in Tunisia during any one of four phonological seasons conserved their migrant status or became residents.

In addition, determining eco-biological requirements for the sustainable establishment of breeding populations of Glossy Ibis in the Tunisian territory appear essential more than at any time in the past. Therefore, we propose to:

Investigate the effects of landscape and anthropic actions on the spatial and temporal distribution of Glossy Ibis;

Examine the effect of ecological factors, particularly parasite occurrence and pollutant bioaccumulation, on the reproductive success of the species;

Shed light on the influence of the availability and behaviour of prey in the feeding habits of the species, and

Carry out ringing missions in order to follow the dispersion of the Tunisian breeding population and to determine its origin.

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APPENDIX

References used in the study for each period

Wintering (November-February)	**Pre-breeding passage (March-April)**	**Breeding (May-July)**	**Post-breeding passage (August-October)**
HM, CM, OI, SP, VJ, BM, PC, CF, AH, MmL, DB, ML, OR, GTO, NA, DH, DA, AM	VG, KG, YP, FM, KY, SH, OR, GTO, NA	GTO, EI, GT, OR, NA, JB, DH, DA	MP, KY, AH, SM, GT, OR, GTO, NA, DA

AH: Azafzaf, H. in Isenmann et al. 2005; AM: Abdelli M.. pers. obs; BM: Bailo M. in Isenmann et al. 2005; CF: Christensen, F. in Isenmann et al. 2005; CMCezajkowski M. in Isenmann et al. 2005; DADabbar A.,pers. obs; DB Delpart B. in Isenmann et al. 2005; DH: H. Dlensi pers. obs ; EI Essetti I. in Isenmann et al. 2005; FM: Fay M. in Isenmann et al. 2005; GT : Gaultier T. in Isenmann et al. 2005; GTO: Group of Tunisian Ornithologists, pers. obs.; HM: Hemprich M. in Isenmann et al. 2005; JB: Jmaa B.,pers. obs.; KG: Knötzsch G. in Isenmann et al. 2005; KY: Kayser Y. in Isenmann et al. 2005; ML: Müller L. in Isenmann et al. 2005; MmL: Maumary L. in Isenmann et al. 2005; MP: Meininger P. in Isenmann et al. 2005; NA: Nefla A., pers. obs; OI: Olsen I. in Isenmann et al.2005; OR Ouni R., pers. obs.; PC: Parnell C. in Isenmann et al. 2005; SH: Spiekman et al. 1993; SM: Smart M. in Isenmann et al. 2005; SP: Svensson P. in Isenmann et al. 2005; VG:Vaillant G. in Isenmann et al. 2005; VJ: Van der Winden J. in Isenmann et al. 2005: YP: Yésou P. in Isenmann et al. 2005.