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SPECIAL ISSUE: GLOSSY IBIS ECOLOGY & CONSERVATION

The Settlement of Glossy Ibis in France

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ABSTRACT

The Glossy Ibis *Plegadis falcinellus* was very rarely breeding in France until its settlement in Camargue in 2006, in a colony of ardeids. From then, the number of breeding pairs increased exponentially to reach 2,087 breeding pairs in 2017 distributed over ten colonies mainly in Camargue but also in others sites over the French Mediterranean coast. In parallel, breeding attempts occurred regularly in other regions, with some successes in Loire Atlantic on the Atlantic coast. Here we present some preliminary results on the ringing programme of chicks conducted in Camargue since 2006 and on the diet of the breeding birds. Finally, we discuss factors that influence the settlement of new colonies.

Introduction

Until recently, the Glossy Ibis *Plegadis falcinellus* rarely bred in France. During the 19th century, there was only one reported case: in 1844 in the Camargue, in the Rhône Delta in southern France (Dubois and Yésou 1992). Hugues (1937) and Mayaud (1938) reported that the species bred occasionally in the Camargue during the early 20th century. The first verifiable breeding events occurred in 1961 in Dombes (Chabert and Reymonet 1966) and in 1988 in Aude (Heinzel and Martinoles 1988; Figure 1). In five of eight years between 1991 and 1998, up to four Glossy Ibis pairs bred in the Camargue. In three of these years, some chicks successfully fledged (Pineau *et al*. 1992; Kayser *et al*. 1996; Dietrich *et al*. 1999). The two adult pairs breeding in 1995 were reared in captivity before release (Kayser *et al*. 2006). The origin of the birds breeding in the other years is not known and a captive origin cannot be discounted. After this period, there was no evidence of breeding in France for eight years (1999–2006). Nevertheless, the number of Glossy Ibises increased over this period in the Camargue, especially in the breeding period (Kayser and Cohez 2006). During that period, groups of dozens of individuals were seen, some ringed in Spain.

In this article, we documented the attempts and successes of settlement of Glossy Ibis in France

between 2006 and 2017, with a special focus on the research activities performed in Camargue.

Methods

We first presented information available on the number of breeding pairs for each region where attempts occurred between 2006 and 2017. The data were collected from the literature complemented by personal observations from regional experts or the authors themselves. Because Glossy Ibis in France was still rare during this period, detection of breeding Glossy Ibis was generally performed first by bird watchers and status of breeding occurs during annual census of breeding ardeids.

Since 2006, a Glossy Ibis ringing programme was launched by Tour du Valat in Camargue to provide insights into the migratory routes, survival, dispersal, and recruitment. Ringing operations occur two to four times a year on unfledged chicks captured in the nests in the Scamandre colony. Chicks were weighed, their tarsus was measured and they were fitted a PVC ring with unique code on one tibia and a metal ring on the other tibia. PVC rings allowed individual observations from a distance up to 300m. Resightings were realised by observers and the information transmitted to the authors.

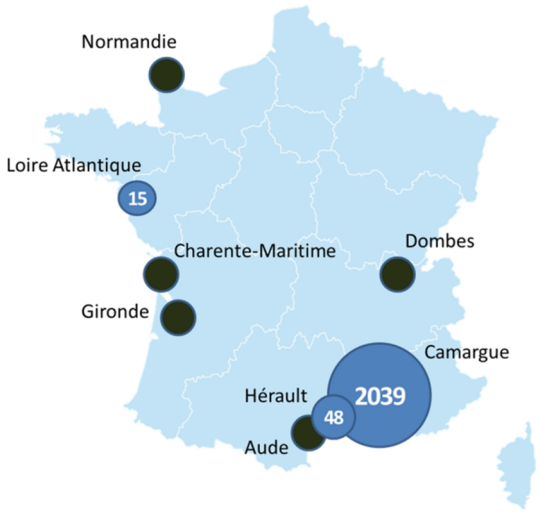
Thirty-four diet samples were collected from chick regurgitates during ringing operations in the Camargue in May 2010 and 2011. Regurgitates were stored individually in plastic bags and conserved in -20°C fridge before analysis. Animal items were sorted using binocular microscope and identified to the species whenever possible. They were then dried to assess the contribution in mass of each species to the diet.

Results

Camargue

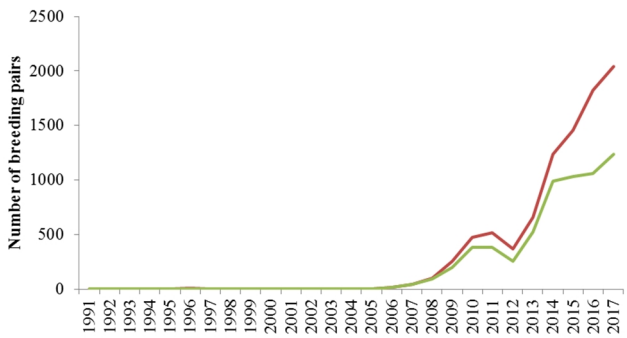
In 2006, 14 Glossy Ibis pairs settled in the Scamandre Natural Regional Reserve, Western Camargue. They raised 45 chicks to the fledgling state (Kayser *et al.* 2006).

Figure 1. Distribution of Glossy Ibis breeding sites in France. Numbers of breeding pairs in 2017 are indicated. Breeding attempts that occurred recently or in the past are presented as black circles



Since 2006, the breeding population of Glossy Ibis increased exponentially at Scamandre, reaching 1,236 pairs in 2017 (Figure 2).

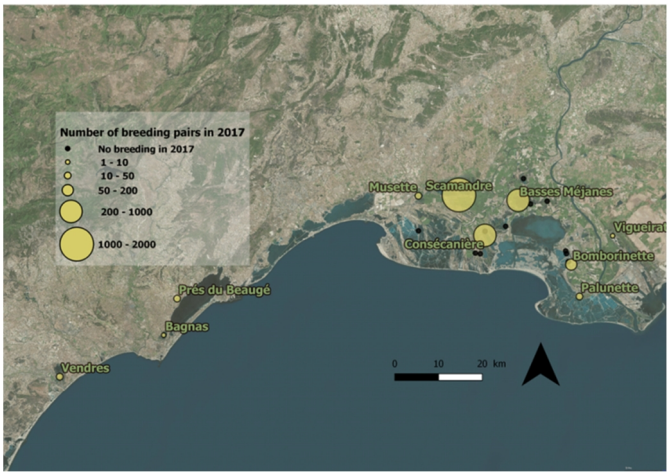
Figure 2. Evolution of the total number of breeding pairs along the French Mediterranean coast (in red) with a focus on the Scamandre colony (in green)



The Scamandre Natural Regional Reserve is a 220 ha area of reedbeds, riparian woods and open marshes. The Glossy Ibis nests and breeds in a 3 ha patch of French Tamarisk *Tamarix gallica* trees within a seasonally flooded marsh. Heron species breed alongside the Glossy Ibis (in decreasing order of abundance: Western Cattle Egret *Bubulcus ibis*, Little Egrets *Egretta garzetta*, Black-crowned Night Herons *Nycticorax nycticorax*, Squacco Herons *Ardeola ralloides*, Grey Herons *Ardea cinerea* and

exceptionally some Great Egrets *Ardea alba*). Since 2005, the total number of breeding pairs (Glossy Ibis and herons combined) has fluctuated between 3,000 and 9,000 individuals. Thus, Scamandre supports the largest mixed heron colony in France and one of the largest in Europe (Gauthier-Clerc *et al.* 2006).
The Scamandre colony was the sole breeding site for Glossy Ibis in France in 2006 and 2007 and it remains the main breeding site today, with 59% of the French population in 2017. From 2008 onwards, the number of Glossy Ibis colonies along the French Mediterranean coast increased steadily. In 2017, there were 10 colonies in the area: seven in the Camargue and three in the Hérault department (Figure 3).

Figure 3. Distribution of Glossy Ibis colonies along the French Mediterranean coast in 2017

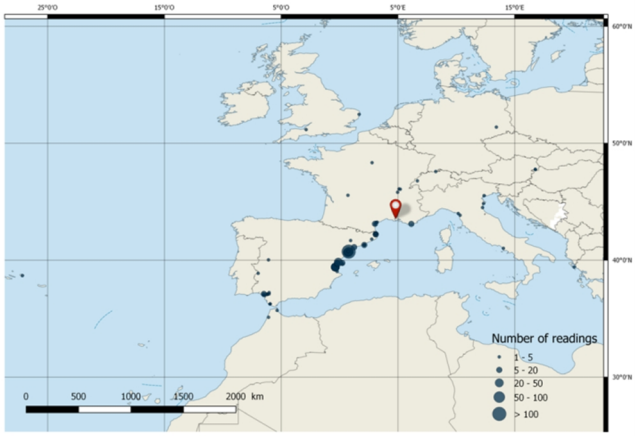


Thanks to ringing operations that occur annually in Spain (this issue) it is known that Spanish-born birds contributed substantially to the population increase along the French Mediterranean coast. We saw 53 different birds born and marked in Doñana at the colony of Scamandre between 2010 and 2017, 28 birds from Delta del Ebro, one individual from Albufera marshes in Valencia and one from Ravenna in Italy. At the Scamandre colony, Spanish-born birds represent on average 21.5% of all resightings during the breeding season, including local birds from the Camargue (range 12% in 2017- 47.2% in 2009).

Dispersion

3,462 different chicks were ringed in the Scamandre colony. It leads to 1249 resightings of 724 individuals outside Camargue. Resightings distributed over Europe mainly in Spain (93%) and 3 resightings occurred in Morocco (Figure 4).

Figure 4. Resightings of Glossy Ibis ringed as chicks at Scamandre colony (red pin), Camargue, Southern France from 2006 until 2017. This map does not include resightings that occurred in the Camargue



Diet of chicks

Regurgitates were dominated by the Red Swamp Crayfish *Procambarus clarkii* which was present in 28 of the 34 samples and represented 73% (± 24 SD) of the dry weight of those samples. Odonata and water beetles (*Dytiscidae*) were both found in 68% of the samples, and fishes in 41% of the samples. Other items included (in order of importance) water bugs (*Nepomorpha*), crustaceans (*Triops cancriformis*), orthopteran species, small mammals and frogs. The Red Swamp Crayfish is also abundant in Doñana, southwest Spain but contrary to the Camargue, it appears not to contribute to Glossy Ibis diet there during the breeding season (Macías *et al.*, 2004; Tablado *et al.*, 2010). In the Ebro delta, Crayfishs also accounted for less than 6% of the diet of the chicks (Bertolero and Navarro, 2018).

Hérault

The three sites in Hérault (Vendres, Bagnas, and Prés du Beaugé, Figure 3) are situated along the French Mediterranean coast, but they are ecologically and hydrologically distinct from the Camargue. The first site occupied in Hérault was located on Etang de Vendres with two pairs breeding in 2013. This increased to 20 breeding pairs in 2017 (D. Clément, pers. comm.). The two other sites (Prés du Beaugé and Bagnas) are adjacent to the Etang de Thau and were first active in 2017 with 20 and 8 pairs respectively. Similar to the Camargue sites, Glossy Ibis breeds on tamarisks in mixed colonies of Little Egrets, Western Cattle Egrets, Grey Herons and, sometimes, Black-crowned Night Herons. Marked Glossy Ibises have not been resighted at these sites, but birds born in the Camargue probably formed the source of those colonies.

Loire-Atlantique

At the Grand-Lieu lake, Glossy Ibis was observed irregularly in 1994, 1995 (transport of materials by birds certifying a nest attempt), 1996, 1999, 2000, 2001 and then annually from 2005 onwards. The first breeding success occurred in 2011 with a production of four Glossy Ibis fledglings from a mixed colony of 708 pairs of herons, 87 African Sacred Ibises *Threskiornis aethiopicus* and seven Eurasian Spoonbills *Platalea leucorodia* (Marion and Marion 2011; Reeber 2011). No nesting occurred between 2012 and 2014, although 15 adult Glossy Ibis were observed at the site in 2014 (Reeber 2016). In 2015, eight Glossy Ibis pairs bred in a mixed colony (not the same birds as those breeding in 2011 and 2012), six of these pairs bred in May (L. Marion and P. Marion, pers. obs. 2015) while two bred in July (Reeber 2016). The same colony was occupied by an estimation of 9 to 11 breeding pairs in May 2016. In 2017, 15 nests were found, in three distinct mixed colonies (Reeber 2018).
17 chicks were ringed in 2015 and 2016. Two of them were sighted within two months, at a maximum distance of 110 km from the ringing site. A small number of individuals remains in winter in the coastal swamps close to the lake (up to 55 individuals at Bourgneuf-en-Retz in 2015-2017, M. Maillard, pers. comm.).

Normandie

It is possible that one Glossy Ibis pair bred in 2014 in a mixed colony of herons (Grey Heron, Little Egret, Western Cattle Egret, Great Egret) that also includes one pair of Eurasian Spoonbills. The colony was in a willow plantation of a flooded peat bog near Baupte (Purenne 2016). The nest was not located, and Glossy Ibis has not been observed at the site since.

Charente-Maritime

One pair successfully bred in a mixed colony of herons and Eurasian spoonbills in marshes near Brouage in 2014 (M. Caupenne and L. Jomat, pers. comm. 2014).

Gironde

To date, there is no evidence of successful breeding, but breeding attempts in 2014 and 2016 have been reported (F. Cazaban, pers. comm. 2016).

Dombes

Since 2000, the number of Glossy Ibises in Dombes has increased up to 14 birds (some ringed in Spain and the Camargue) observed in March and April 2012. One bird was seen in a mixed-heron colony in spring 2012, two other individuals settled for one year, and more settled in 2016 and 2017. Nevertheless, no evidence of breeding exists in Dombes since 1961.

Discussion

The Glossy Ibis is now well settled in France and, the population is growing exponentially. The growing population of Glossy Ibis in the Camargue is consistent with the increase in breeding pairs in Doñana, Southern Spain and many local resightings support the hypothesised link between the populations. Besides the role of the Doñana population, the Camargue population has increased thanks to high local recruitment and high breeding

success. Indeed, some individuals were seen breeding when just one year old and other individuals were seen breeding successfully two times during the same breeding season (Kayser *et al.* 2009). Also, the Ebro delta population likely contributed. It has increased exponentially like the Camargue population, although the magnitude of the increase has been smaller: the Ebro delta population contained fewer than 300 breeding pairs in 2015 (this issue). Finally, we cannot discount exchanges from Eastern Europe where no recent ringing programme exists, excepting a few birds in Italy.

The year 2014 seems to be a year with high breeding attempts in new sites (Normandie, Charentes-Maritime, Gironde but also in the United Kingdom). It is believed that drier conditions in southern Spain may have pushed young birds further north this year, as in 1999 and 2005 (Santoro *et al.* 2013). These one-off attempts did not lead to colonization of the sites. Nevertheless, due to the Glossy Ibis's adaptability to forage on variable local resources (for instance invasive crayfish in the Camargue) and the increase of the breeding pairs in Southern Europe, it is predicted that new colonies will appear soon in France, as well as in the United Kingdom and the Netherlands (Boele and Winden 2012).

Factors that influence the settlement of new colonies are still unknown. Studies are currently underway to identify the extrinsic (climatic variables, habitat, social facilitation from other species) as well as intrinsic (individual characteristics) factors that influence the success of the settlement of Glossy Ibis colonies and the dispersion of individuals.

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