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Historical and Current Status of Glossy Ibis *Plegadis falcinellus* in Turkey

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ABSTRACT

The aim of this study is to provide the first comprehensive synthesis of past and present information available on the distribution and population status of breeding and wintering Glossy Ibis *Plegadis falcinellus* in Turkey. The Gloss Ibis used to be a widespread breeding species in the central and western part of Turkey. Approximately 2,500-2,795 pairs were breeding over at least 16-24 sites during 1950s and 1960s. During this period, Meriç Delta, Manyas Lake and the Amik Lake were holding the largest breeding populations and the total number of known breeding population reached up to 2,000 pairs in just these three sites. In the 2000s, the whole breeding population in Turkey was estimated to be between 500 and 1,000 pairs only. Currently, the species is breeding regularly in eight and irregularly in five wetlands. The current breeding population is estimated to be between 282-421 pairs. The species may also irregularly breed in another 8 different wetlands. Wetland drainages, water pollution, habitat alterations mainly due to cutting the willow trees *Salix alba* and reedbed fires are additional reasons for the dramatic decreases observed. The species used to be only a breeder before 2004 in the region. However, after 2004 the species started to expand their length of stay and 2005 onwards they started to overwinter as well and became a resident species. Establishment of monitoring and conservation programs is recommended.

Introduction

Glossy Ibis *Plegadis falcinellus* is one of the least known species in Turkey since there is no specific published study and or report on its population and distribution. Therefore, the existing information is very limited and it can only be obtained by investigating published historical site-based faunistic studies and observations by ornithologists made between 1950s and 2000s. These existing studies are mainly focusing on other breeding waterbird populations and scarcely include quantitative

information on abundance and distribution of Glossy Ibises.

An important step needed to conserve Glossy Ibises is to synthesize all the available information. The aim of this study is therefore to provide the first comprehensive review of past and present quantitative baseline information on the distribution and population status of breeding and wintering Glossy Ibises in Turkey.

Methods

Study Area

Turkey is a transcontinental country that lies between Europe and spans about 780,000 km². Turkey lies in the temperate climate zone with an average precipitation of 643 mm, ranging from 250 to 2,500 mm in the country (DSI 2015). The elevation of the country increases from the west to the east. Mountain ranges stretch along the north and south coasts. The highest amounts of precipitation are seen along these mountain ranges. Being at the junction of the Arabian, Eurasian and African continental plates, Anatolian peninsula of Turkey is known to have started to evolve from the Paratethys Sea, during the Oligocene epoch and land formation and sedimentary deposition has continued up to the modern-era (Sengör and Yilmaz 1981). The formation of a land from the bottom of a sea has led to a very large number of wetlands and aquatic diversity (Kılıç and Eken 2004; Eken *et al.* 2006).

Breeding population

All published and unpublished information about the breeding populations of Glossy Ibises in Turkey during the 20th and early 21th century was collected by the authors. It includes the following references: Aharoni (1930); Meinertzhagen (1935); Coiffait (1955); Koßwig (1956); Kumorloev (1963; 1964; 1970); Lehmann (1971; 1974); Renkhoff (1972; 1973); Vauk (1973); Martins (1989); Husband and Kasperek (1984); Dijkzen and Kasperek (1985), Kasperek (1985; 1988; 1992); Ertan *et al.* (1989); Kılıç and Kasperek (1990); Turan (1990); Kirwan (1993); Hustings and Van Dijk (1994); Ertan (1996); Yazar and Magnin (1997); Karauz *et al.* (2007), Kılıç and Eken (2004), OST (1968-1969), Anonim (1973-85), Anonim (2008-2019), Gürpınar (1973, 1975, 1977), DHKD (1990). The breeding information collected from the literature is given with related source of information.

Based on our observations, Glossy Ibises are frequently breeding in mixed colonies with some other waterbirds, especially Grey Herons *Ardea cinerea*, Great Egrets *Ardea alba*, Little Egrets

Egretta garzetta, Eurasian Spoonbills *Platalea leucorodia*, and Great Cormorants *Phalacrocorax carbo*, therefore we also searched the available information of the breeding status of these species in Turkey. Besides the literature review we also investigated the distributions and sizes of wetland habitats throughout Turkey (Ataol and Onmuş, in pub. 2018), in which Glossy Ibises prefer breeding. Some of those investigated sites were treated as possible breeding sites for Glossy Ibises as well and included in the distribution list.

Recent monitoring

We surveyed some of the known breeding sites and collected data on breeding numbers during the breeding seasons between 2016 and 2018. In some of the sites, we censused the number of occupied nests and provided our own data. Since Glossy Ibises frequently prefer to breed in mixed colonies with other species as mentioned, sometimes it was very difficult to carry out a direct census due to large number of different breeding waterbirds in vicinity. In addition, inaccessibility of some of the breeding grounds also prevented us from to applying a direct census. If any of these two constraints were met, we provided breeding population estimations based on the number of observed Glossy Ibises in or around suitable breeding habitats. The breeding information collected from our field surveys is given with “this study” statement..

The data concerning the breeding population in the Manyas Lake includes both data from the literature and our various field surveys between 2012 and 2018. We also provided information about the breeding biology of the species, and specific factors threatening the breeding populations.

Wintering and migration populations

The data on the wintering population were obtained from mid-winter waterbird Census Surveys between 1990 and 2017 (Dijkzen *et al.* 1990; DHKD 1992; 1993; Yazar *et al.* 1996; Aydemir *et al.* 1999; Kurt *et al.* 2002; Çağlayan *et al.* 2005; Suseven *et al.* 2006; Onmuş 2007; Akarsu and Balkız 2010; Erciyas and Isfendiyaroğlu 2012; Orman 2015).

The available records of Gloss Ibises submitted by different observers to Kusbank (<https://ebird.org/turkey/home>) were also used. These data were first verified and then used in conjunction with the data on the wintering population to evaluate changes in the distribution and migration of Glossy Ibises.

Results

Breeding Population

The Glossy Ibis used to be a widespread breeding species in the central and western part of Turkey in the past. During 1950s and 1960s, approximately 2,500-2,795 pairs were breeding in at least in 16-24 different sites (Table 1). Among these sites, seven of them were regular breeding sites and five of them were irregular breeding sites. Besides the confirmed sites, we also identified 21 different sites where various Ardeidae, Threskiornithidae and Phalacrocoracidae species were breeding in the 1950s and 1960s. Among them, eight different sites were selected as sites where the Glossy Ibis may have bred at least irregularly. During that period, Meriç Delta, Manyas Lake and the Amik Lake had the largest breeding population and the total known breeding population was reaching up to 2,000 pairs in just these three sites. Kılıç and Eken (2004) stated without giving any specific source of information that the estimated population of Glossy Ibises in Turkey were between 500 and 1,000 pairs at the beginning of 2000s.

Table 1. Summary of the current and historical breeding populations of Glossy Ibis in Turkey (2012-2017)

Year of Estimation	Breeding Pairs
1950s – 1960s	2,500 – 2,795
2000s	500 – 1,000
2012–2017	281 – 410

Currently, there are only eight active breeding colonies: Manyas Lake, Marmara Lake, Işıklı Lake, Uluabat Lake, Göksu Delta, Meriç Delta, Eber Lake and Nallıhan Bird Paradise (*S. Ekşioğlu, pers. obs 2019*). Besides these, the species may also breed in Kızılırmak Delta, Yeşilirmak Delta and Sultan

Marshes as well. Breeding of one pair was recorded in 2015 in Nallıhan Bird Paradise where there was no previous breeding documented. A summary of the historical (1950s and 2000s) and the current (2012-2017) breeding populations of Glossy Ibises in Turkey are given in Table 2 and Table 3, respectively. The distribution of confirmed and possible breeding populations of Glossy Ibises in Turkey is given in Figure 1.

Manyas Lake is an important breeding area for Glossy Ibises. The first breeding record in Lake Manyas dates back to 1959, although large flocks of ibises had been observed long before. The first breeding ibises were recorded on the Kabak and Kazak Islands located in the south of the lake. Due to the construction of an embankment and a regulator at the outlet of the lake, the breeding islands, 3,200 ha swamps, wetland meadows, mud plains and shallow coastal belts to the south of the lake were completely destroyed. Subsequently, breeding waterbird colonies including Glossy Ibises began to use the 52 ha Sığırcı Creek Delta located at the northeast of the lake and this area was declared as a National Park (NP) in 1959. However, artificial water level increases in Manyas Lake have caused many Willow trees *Salix alba* to die. To compensate those negative changes NPs planted willow trees in the national park area. The NP area became suitable for the nesting of colonially breeding waterbirds during 1970s and the area was closed to human activities, enabling the breeding populations to increase. However, the number of colonially breeding waterbird species started to decrease during 1985s as a result of fluctuating water levels and an increase in pollution. Due to observed decreases in breeding waterbirds, a 128-ha site next to the 52 ha Sığırcı Delta NP was also included in the NP area in 1998 and completely closed to human activities. Waterbird colonies then began to use this area since 2004 and the number of breeding Glossy Ibises has increased (Karauz *et al.* 2007). However, highly eutrophic status of the lake, large fluctuations of water level due to changes in rainfall regime and increased water demand for agriculture are serious threats for all the colonially breeding waterbirds in Manyas Lake. Detailed information on the changes in the breeding population

of Glossy Ibises in the Manyas Lake is given in Table 4.

Table 2. Detailed information of the historical breeding population of Glossy Ibis in Turkey. D: Delta; L: Lake; M: Marshes; Dm.: Dam; B.P.: Bird Paradise; Stat.: Status; Freq.: Frequency; Breeding Status; C: confirmed; P: possible. Breeding Frequency; Regular: R; Irregular: I; Disappeared: Ds. *: wetlands drained and/or significantly reduced in size due to extensive irrigation projects for agriculture (Disappeared).

Site name	Breeding Stat./Freq.	Historical Breeding Population		Source of information
		Pair	Year	
Meriç D.	C / R	800	1950s-1960s	Ertan et al 1989; Yazar&Magnin 1997
Manyas L.	C / R	750	1950s-1960s	Ertan et al 1989;
Marmara L.	C / R	30	1970s-1980s	This study
Uluabat L.	C / R	20	1970s-1980s	Ertan et al 1989;
Göksu D.	C / R	10	1970s-1980s	Yazar&Magnin 1997
Eber L.	C / R	100	1970s-1980s	Ertan et al 1989;
Işıklı L.	C / R	30	1970s-1980s	Ertan et al 1989; Yazar&Magnin 1997
Yeşilırmak D.	C / R	10	1950s-1960s	Kılıç & Eken 2004
Kocaçay D.	C / R	40	1970s-1980s	Yazar&Magnin 1997
Sultan M.	C / R	200	1950s-1960s	Ertan et al 1989;
Ereğli M.	C / R	50	1997	Ertan et al 1989;
Akşehir L.	C / R	20	1990	Ertan et al 1989; Yazar&Magnin 1997
Hotamış M.	C / Ds	75	1997	Ertan et al 1989; Yazar&Magnin 1997
Karamık M.	C / Ds	20	1990	Ertan et al 1989; Yazar&Magnin 1997
Amik L.	C / Ds	500	1930s-1960s	Kumerloeve 1964, 1970
Nallıhan B.P.	C / I	0	2000-2010s	This study
Kucuk Menderes D.	C / I	10-20	1980s	Ertan et al 1989
İznik L.	C-P / I	10-15	1970s-1980s	Ertan et al 1989
Kızılırmak D.	P / I	0-50	1970s-1980s	This study
Eğirdir L.	P / I	0-10	1970s-1980s	This study
Balıkdamı M.	P / I	0-5	1970s-1980s	This study
Sarıyar Dm.	P / I	0-5	1970s-1980s	This study
Seyfe L.	P / I	0-5	1970s-1980s	This study
Beyşehir L.	P / I	0-20	1970s-1980s	This study
Bafa L.	P / I	0-10	1970s-1980s	Ertan et al 1989; Yazar&Magnin 1997

Table 3. Detailed information of the current breeding population of Glossy Ibis in Turkey. D: Delta; L: Lake; M: Marshes; Dm. Dam; B.P.: Bird Paradise; Breeding Status; C: confirmed; P: possible. Breeding Frequency; Regular: R; Irregular: I; Disappeared: Ds. *: wetlands drained and/or significantly reduced in size due to extensive irrigation projects for agriculture.

Site name	Breeding Stat./Freq.	Current Breeding Population		Year	Source of information
		Min-Max	Pair		
Meriç D.	C / R	100	100	1997	Yazar & Magnin1997
Manyas L.	C / R	30	50	2016-2017	This study
Marmara L.	C / R	20	30	2011	This study
Uluabat L.	C / R	14	20	1997	Kılıç & Eken 2004
Göksu D.	C / R	10	10	1997	Kılıç & Eken 2004
Eber L.	C / R	50	60	2014	This study
Işıklı L.	C / R	20	30	2016	This study
Yeşilırmak D.	C / R	7	10	1997 (*)	Kılıç & Eken 2004
Kocaçay D.	C / I	0	10	2009-2016	This study
Sultan M.	C / I	0	10	1994 (*)	Kılıç & Eken 2004
Ereğli M.	C / I	0	5	2000-2004 (*)	Kılıç & Eken 2004
Nallıhan B.P.	C / I	1	1	2015	Ekşioğlu, per. obs, 2019
Kucuk Menderes D.	C / I	0	0	2012-2017	This study
İznik L.	P / I	0	10	2014-2016	This study
Kızılırmak D.	P / I	30	40	2012-2016	This study
Eğirdir L.	P / I	0	10	2014-2016	This study
Balıkdamı	P / I	0	5	2012-2014	This study
Sarıyar Dm.	P / I	0	5	2012-2014	This study
Seyfe L.	P / I	0	5	2012-2016	This study
Beyşehir L.	P / I	0	10	2012-2014	This study
Bafa L.	P / I	0	10	2012-2016	This study

Figure 1. Current and historical breeding distributions of breeding Glossy Ibises in Turkey.



Table 4. Detailed information on the changes in the breeding population of Glossy Ibises in the Manyas Lake

Pair	Year	Source of Information
25	1966	DHKD; 1990
105	1967	DHKD, 1990
300	1968	OST, 1968-69
69	1973	T.Gürpınar, pers.com, 2007
91	1974	T.Gürpınar, pers.com, 2007
450	1975	T.Gürpınar, pers.com,2007
450	1977	T.Gürpınar, pers.com, 2007
404	1978	Anonim, 1973-85
379	1979	Anonim, 1973-85
730	1980	Anonim, 1973-85
572	1981	Anonim, 1973-85
740	1982	Anonim, 1973-85
701	1983	Anonim, 1973-85
700	1984	Anonim, 1973-85
40	1985	Anonim, 1973-85
10	1995	Karauz et al, 2007
8	2000	Karauz et al, 2007
5	2001	Karauz et al, 2007
30	2002	Karauz et al, 2007
34	2003	Karauz et al, 2007
9	2004	Karauz et al, 2007
26	2006	Karauz et al, 2007
10	2007	S.Karauz
61	2008	Anonim, 2008-2019
262	2009	Anonim, 2008-2019
115	2010	S. Ekşioğlu; Anonim, 2008-2019.
25	2011	S. Ekşioğlu; Anonim, 2008-2019.
25-35	2012	S. Ekşioğlu; Anonim, 2008-2019.
39	2014	L. Sınay; Anonim, 2008-2019.
50	2017	O.Onmuş

Our data showed that the breeding population of Glossy Ibises decreased steadily in Turkey. The observed decrease has started as a result of wetland drainage activities after the 1940s and 1950s and this decrease probably continued into the 1970s or 1980s. Wetland drying activities in Turkey first started as a result of laws enacted to combat malaria and have been continued in order to gain new farmland. Subsequently, with the operation of the dams and the consequent increase in the irrigated areas, the amount of water in the wetlands decreased, and intense wetland losses occurred, especially in closed basins (Ataol and Onmus, in pub. 2018). Wetland drainage has caused many waterbirds breeding populations to decrease (Onmus *et al.* 2011). Currently wetland drainages are prohibited according to the law in Turkey, but many wetlands are still in danger as a result of the changes observed in hydrological

regimes in basins due to the construction of new dams and ponds, excessive water usage for irrigation and for human activities (Eken *et al.* 2006). Thus, water level changes in wetlands and direct human intervention on these natural wetland habitats are still a serious problem for many breeding waterbirds in Turkey (Gul *et al.* 2013).

Breeding Biology

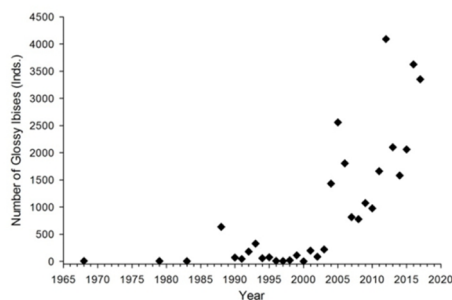
According to our observations in the field, the species prefers mainly to breed on Willow trees in its entire breeding range in Turkey. But they also breed on the ground in dense reedbeds which have stable water levels where there are no human activities and/or predation risk made by chackals, stray dogs, foxes and wild boars. Species tend to regularly visit their possible breeding location and spend a lot of time (two or four weeks in Manyas Lake before laying eggs) in or in the vicinity with the aim of checking the nest site security and appropriateness. They seem to be more sensitive to disturbances and/or predation than other similar species. During the onset of the breeding season, human activities and/or possible predators (mainly mammals) may easily change their breeding decision. Due to this behaviour, the species was observed to breed later than other similar species in the large breeding colony of the Manyas Lake.

Wetland drainage, water pollution, habitat alterations mainly due to cutting the Willow trees and reedbed fires, have caused a dramatic decrease and fluctuation in all *Ardeidae* and *Threskiornithidae* species in their entire breeding populations in Turkey (Gul *et al.* 2013).

Wintering and migration populations

A total of 1,823 different observations made between 1968 and 2017 were found in Kusbank data. These data were corresponding to 29,989 individuals. The total number of Glossy Ibis individuals observed in a single migration flock between 1968 and 2004 shows a stable trend with approximately 200 and 300 individuals per year in spring prebreeding migration. Since 2005, however, the number of migrating Glossy Ibis started to increase and reached up to 3,200 individuals (Figure 2).

Figure 2. The number of migrating Glossy Ibises in Turkey



During migration season, the Glossy Ibis was observed throughout the Central and Western Anatolia. The largest prebreeding migration flocks so far has been observed in Kızılırmak Delta (3,200 Ind/per single migrating flock), Goksu Delta (2,500), Eber Lake (1,536), Meriç Delta (1,200), and Sultan Marshes (600). The observed change in the total number of Glossy Ibis individuals observed during prebreeding period between 1968 and 2017 in Turkey. This observed increase may either represent a real increase in the total number of migrating birds and/or it may represent a bias due to the increased number of observers in Turkey. More research is needed to reveal the real reason.

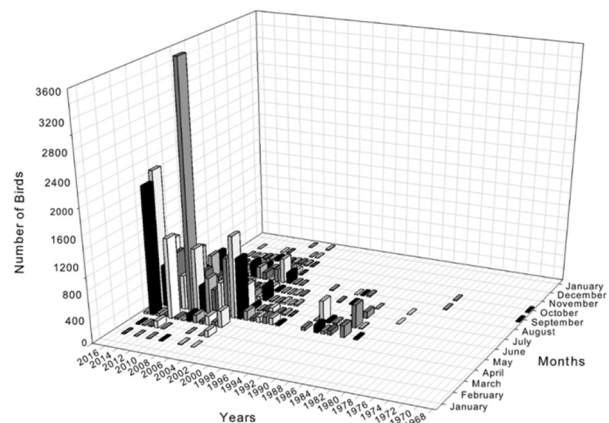
Total number of Glossy Ibises observed in a month in different wetlands between 1968 and 2016 are given in Figure 3. The Glossy Ibis used to be summer migrant species (i.e., observed during prebreeding period- spring migration, during breeding and post breeding period-autumn migration) between 1968 and 2004. However, after 2004 a small number of individuals started to enlarge their duration of stay during autumn and Glossy Ibises started to overwinter in small numbers in 2005, and then they became a resident species in Turkey afterwards.

Discussion

Glossy Ibis breeding population underwent a large decline during the second half of the 20th century in Turkey. The current breeding population size of Glossy Ibises in Turkey makes the species very susceptible to the risks of local extinctions, because many anthropogenic activities in wetlands in Turkey

today also results indirectly in habitat degradation of the breeding waterbirds (Onmus and Siki 2013). Currently, we observed no direct disturbances to neither Glossy Ibises nor to the other breeding *Ardeide* or *Threskiornithidae* species. However, indirect disturbances are probably the main threat for the species and occurs by local people exploiting existing wetland products such as fishing, reedbed cutting, and hunting. The other important threat is the existing unfavourable conditions of many wetlands that experienced dramatic hydrological regimes changes both over years and over the weeks during the breeding period. Although direct wetland drying operations have long been discontinued in Turkey, the amount of water reaching wetlands has steadily decreased since the 1990s due to a steady increase in the number of dams and excessive irrigation demand for crops, especially with the increase in underground water withdrawal in closed basins (Ataol and Onmus in pub 2018). In coastal wetlands possible predation by yellow legged gulls may pose a threat (personnel observation).

Figure 3. The observed change of Glossy Ibises from a summering species into a wintering species in Turkey. Glossy Ibises used to be a summer migratory species but at the beginning of 2004's they duration of stay started to increase and they started also to overwinter in Turkey



In contrary to the observed decrease in the breeding population, the migratory population is increasing. The formation of a wintering population is thought to be the result of the global climate warming. Global climate change has already been proven to have

changed the distribution of many bird species in Turkey (Abolafya *et al.* 2013).

This study is the only study made so far on Glossy Ibis in Turkey, but there is a lot of information still missing. There is no established Species Action Plan for Glossy Ibises in Turkey. The establishment of monitoring and conservation programs is recommended. A ban of wetland destruction and rehabilitation of the key wetlands used by the species to breed is urgently needed.

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