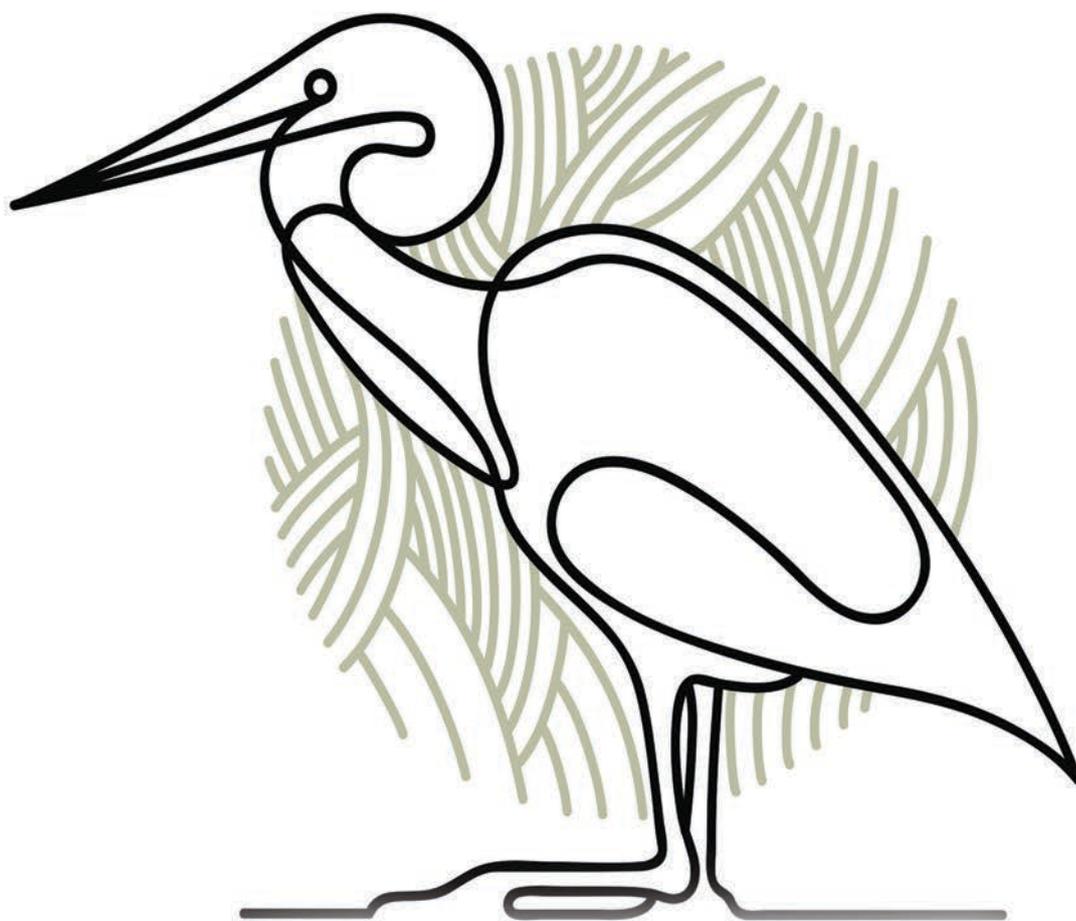


Assessment of the population status, habitat use and phenology of the target species

Technical report
Action A2



LIFE Prespa Waterbirds
LIFE/NAT/GR/000936

December 2017

SOCIETY FOR
THE PROTECTION
OF PRESPA



Recommended citation: Society for the Protection of Prespa, 2017. *Assessment of the population status, habitat use and phenology of the target species*. Report within the framework of the project “LIFE Prespa Waterbirds” (LIFE15 NAT/GR/000936).

The project is 60% co-financed by the Directorate - General for Environment of the European Commission.

**Assessment of the population status, habitat use and
phenology of the target species**

**Report under the framework of LIFE project “Prespa Waterbirds”
LIFE15 NAT/GR/000936**



Society for the Protection of Prespa

December 2017

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1. Introduction

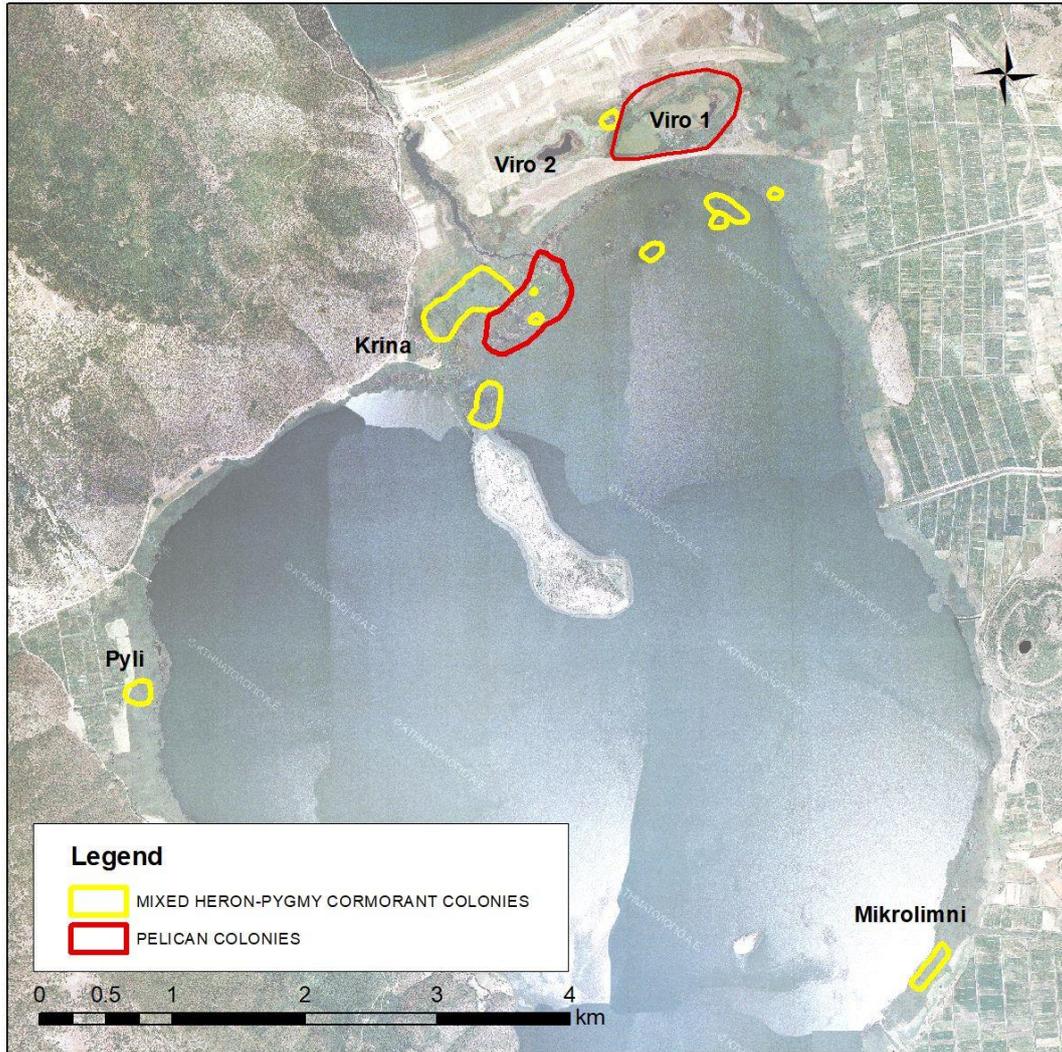
1.1. Pelicans

The two pelican species, the Dalmatian pelican (DP) and the great white pelican (GWP) nest in mixed colonies at Lake Lesser Prespa at least since the 1960s (Terrasse et al., 1969). Over the last thirty years their populations have grown significantly and in the last three years (2014-2016) they are in the range of 1112-1326 breeding pairs for the DP and 486-710 for the GWP (Table 1). The increasing population trends of the two species in Prespa are attributed to a series of management measures implemented over the last decades (Barov and Derhé 2011, BirdLife International 2012a). It is noted that the DP colony of Lesser Prespa is the largest on Earth (Catsadorakis 1997). The Prespa breeding population represents more than 60% of the Black Sea/Mediterranean flyway population (Catsadorakis et al., 2015) and around 17% of the global population (Catsadorakis and Portolou 2017).

The colonies are located on islets consisting of reed rhizomes in two areas in Lake Lesser Prespa (Map 1): a. in the periphery of the lake north of the island of Agios Achilleios and b. in the region of Vromolimni or Viro, the largest of the two shallow, "inland" lakes enclosed by reedbeds in the northern part of Lake Lesser Prespa (Catsadorakis & Crivelli 2001). (Map 1). Vromolimni is used by pelicans as a nesting place since at least 1967, hosting in the last years over 1/3 of the breeding population of the DP and the largest part of the breeding population of the GWP (SPP unpublished data). The islets in the area of Krina - Agios Achilleios were colonized for the first time in 1990 and hold about 2/3 of the breeding population of the DP and a smaller number of GWP (Catsadorakis et al., 1996, SPP unpublished data).

The Prespa pelicans use both Lake Lesser Prespa and Lake Great Prespa for feeding, but they also move outside the Prespa basin to feed during the breeding season (Alexandrou et al., 2014). In Lesser Prespa they mainly use the shallow waters formed in spring in the periphery of the lake (Map 2). During the 1990s and up to the mid-2000s, the largest concentrations of feeding individuals up to the beginning of May were being observed in the Koula channel through which the water of Lesser Prespa flows into Great Prespa (Pyrovetsi & Economides 1998), but in recent years, due to the lack of flowing water, no such concentrations are observed anymore (SPP unpublished data).

Dispersal and migration of DPs to northeastern Greece and Turkey takes place in late summer and early autumn (Crivelli et al. 1991b). The birds return to Prespa and lay eggs between February and March (Crivelli et al. 1998), while recently a total shift towards earlier arriving and laying of eggs has been observed, i.e. the first birds arrive to Prespa and lay eggs from mid to late January (Doxa et al. 2012). Migration of GWPs to the countries of eastern Africa takes place late in the end of summer and the birds return to Prespa in April-May (Hatzilacou 1992).



Map 1. The areas where pelican colonies (in red) and mixed heron-pygmy cormorant colonies (in yellow) lie in the last two decades.

1.2. Pygmy cormorant

The species holds at Prespa its largest colony in Greece, one of the 4 remaining in the country (Portolou et al. 2009). In 2014-2016 its population ranged from 1050-2514 pairs (Table 1, SPP unpublished data). The earliest population data date back to the late 1960s and show a variation with a rather upward trend (Catsadorakis 1997). The pygmy cormorant breeds and partially winters in Prespa.

Until 1988 the colony was located in the reedbed of Mikrolimni (southeast Lake Lesser Prespa) next to a mixed heron colony (Catsadorakis 1997). Then, the population was divided into 3 sub-colonies: 1. The main one is still located in a large reedbed on the northwestern side of Lesser Prespa together with a mixed heron colony 2. In a reedbed north of Mikrolimni, also with a mixed heron colony, and 3. In the Vromolimni/Viro area

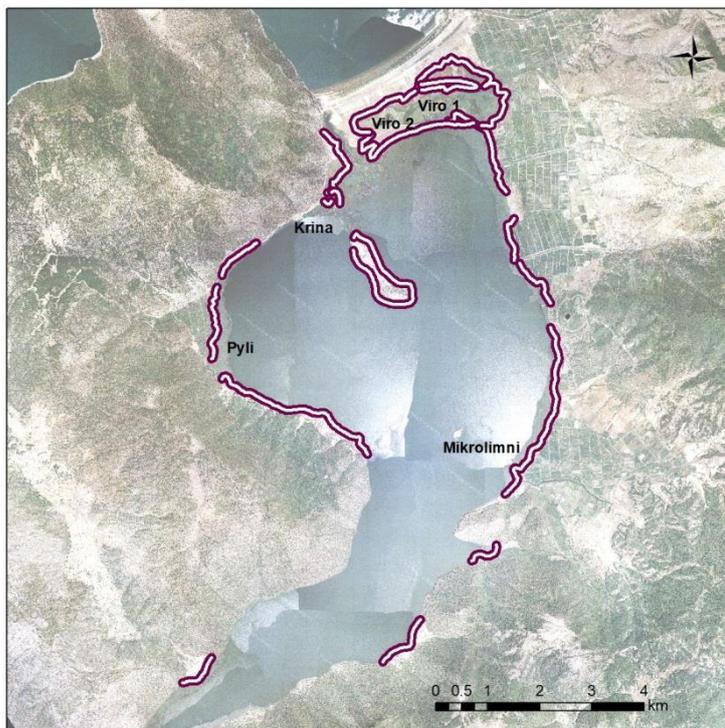
(Catsadorakis et al. 1996). In recent years, the large reedbed of Krina - Aghios Achilleios hosts the entire breeding population of pygmy cormorants (Map 1).

The pygmy cormorants at Prespa feed in the shallow waters at the shores of both lakes, as well as in protected open water areas situated among the reedbeds of the Lesser Prespa (Willems & de Vries 1998, Kazantzidis & Naziridis 1999).

1.3. Herons and glossy ibis

The four target species of herons (great white egret, little egret, night heron and squacco heron) and the glossy ibis nest together or side by side at Lesser Prespa, mainly in the large reedbed of Krina – Agios Achilios (Map 1). This reedbed is used by herons without interruption since 1990 and in recent years it hosts the vast majority of the breeding populations of Prespa. The colony is usually divided into two sections. Population data over the last three years are found in Table 1. Previously, the main colony of herons was located in a reedbed north of Mikrolimni, but now this reedbed is used less frequently and only by a few pairs. Colonies have been established in some years also in other areas: in some islets north of Agios Achilios, on islets in the northeastern part of the lake, between Viro 1 and Viro 2 and in the reedbed of Pyli in the southwestern part of Prespa. The sites which historically hosted mixed pygmy cormorant - heron colonies are shown in Map 1.

All herons feed in the shallow waters and wet meadows extending at the mild-sloping lakeshores of Lesser Prespa (Map 2) while some -the great white egret and the little egret- also feed at Great Prespa. The intensity of use of the above feeding sites varies within the breeding season for the different species.



Map 2. Feeding sites of waterbirds in Lake Lesser Prespa.

Some facts of particular interest are: a. The great white egret was first observed nesting in Greece at Lake Lesser Prespa in the late 1960s. While it occasionally nested at various wetlands in Northern Greece, in a relatively recent record (2003) its distribution seems to have shrunk (Legakis & Maragou 2009). Lake Lesser Prespa hosts the largest breeding population in the country (Catsadorakis 1997, Kazantzidis et al., 2013) and is one of only two-three breeding sites left in Greece (Catsadorakis 1997, Legakis & Maragou 2009). b. After 25 years of absence, the glossy ibis nested again at Prespa in 2005 (Malakou 2007) following implementation of a wetland restoration plan for the wet meadows of Lesser Prespa by the SPP through the LIFE project "Protection and conservation of priority bird species in Lake Lesser Prespa". It is assumed that the dramatic reduction of areas of open shallow waters after the 1960s (Pyrovetsi & Karteris 1986) was the main reason that the species ceased to nest in the area (Catsadorakis 1997).

1.4. Ferruginous duck

The species is very rare in Greece and has a very small population mainly in the southern regions of the country (Legakis & Maragou 2009). There have been scattered but regular observations since the 1960s in Lake Lesser Prespa, while in recent years there have been indications that at least 1-4 pairs nest each year (Alexandrou et al., 2014), but no systematic counts had been conducted so far.

Table 1. Number of breeding pairs of target species at Lake Lesser Prespa in the period 2014-2016.

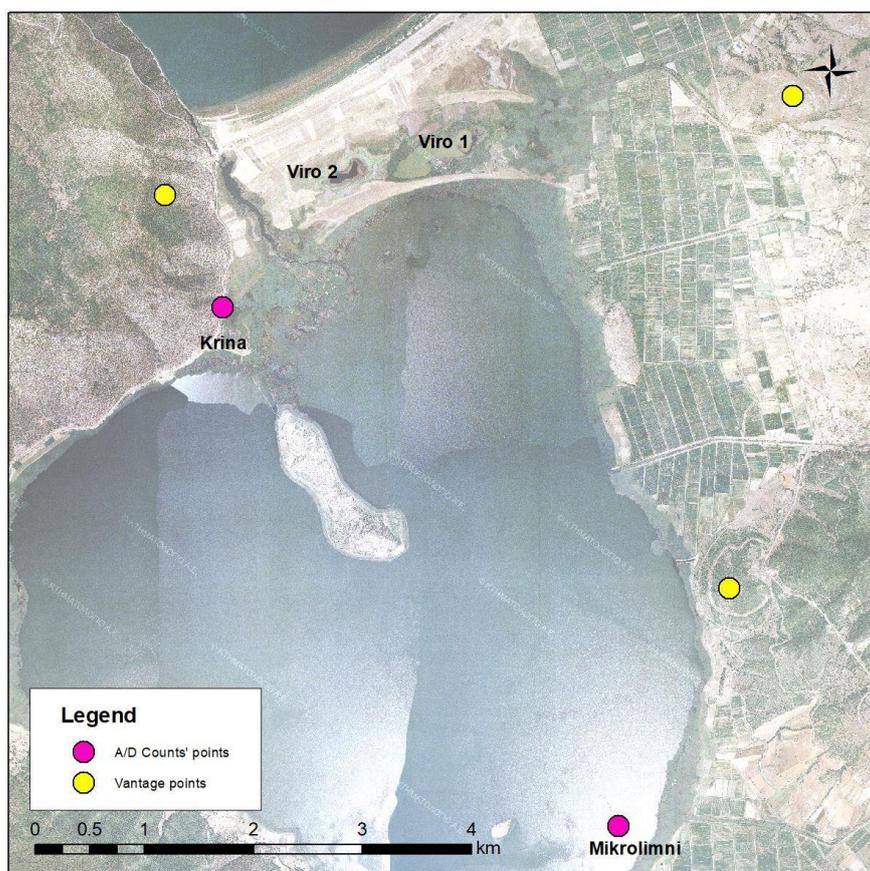
Species	2014	2015	2016
Dalmatian pelican	1112	1276	1326
Great white pelican	516	486	710
Pygmy cormorant	2514	2274	1050
Great white egret	87	115	128
Little egret	108	91	139
Squacco heron	25	36	48
Night heron	162	222	120
Glossy ibis	0	7	12

In this study, different monitoring techniques were used to assess the population status of the target species breeding at Lake Lesser Prespa and to assess habitat use and phenology in 2017. These assessments will inform decision-making regarding the management of reedbeds in the area, to be implemented under the framework of LIFE Prespa Waterbirds project (LIFE15 NAT/GR/000936).

2. Methods

2.1. Pelicans

Pelican colonies are censused through an agreed protocol developed by the International Pelican Research and Conservation Project. Methods include mainly counts from vantage points and late - period in situ visits and counts of fledged/nearly fledged young. In 2017 the breeding population size and the breeding success of DP were estimated by a combination of methods: regular bi-weekly observations from vantage points (Map 3) from January - when DPs usually arrive in Prespa- to May and from drone photos taken on 29/3 and 26/4 (numbers of nests) and 31/5/2017 (numbers of fledged chicks). The number of breeding pairs and the breeding success of GWP were estimated from drone photos taken on 31/5/2017 (number of nests), while the number of fledged chicks was counted during a field visit paid on 27/7/2017. The drone is used as a complementary method to counts from vantage points. Drone photos are particularly useful for a few colonies that are not visible from any vantage point and especially valuable for the GWP which arrives at the area much later in spring and nests at the most concealed parts of the breeding islets in a time of the year when vegetation has grown significantly, thus not allowing adequate view of the colonies from vantage points. The drone is flown at a height of 50-100 m. above the colonies.



Map 3. Locations of counts: Vantage points in yellow and A/D counts' points in purple.

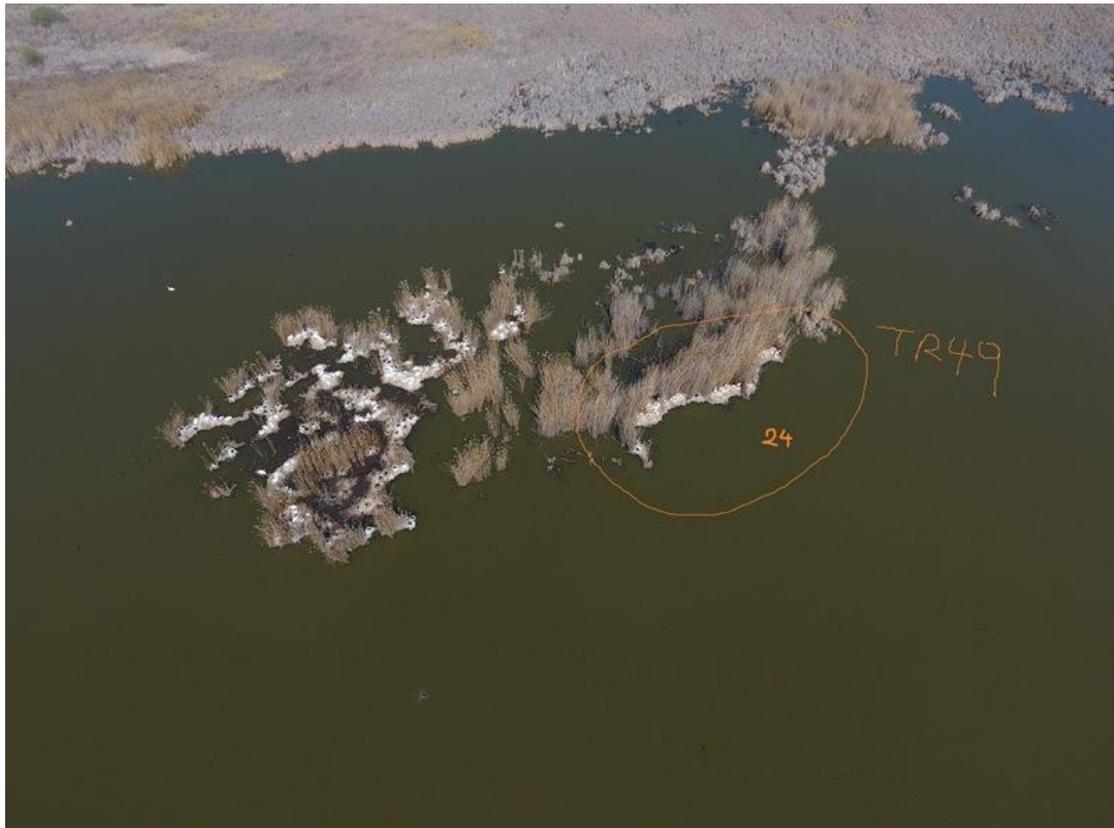


Photo 1. Aerial photo taken on 29/3/2017 where part of the VIRO colonies is seen. Inside the orange circle a DP colony (TR49) where 24 nesters were counted.

2.2. Pygmy cormorant, herons and glossy ibis

Pygmy cormorant and heron colonies are situated within dense reedbeds growing over deep water (>2m) spread all around Lesser Prespa lake fringes and censusing them is very problematic due to inability of visual counts of birds and nests even from a high vantage point. An exception to this is the great white egret, whose large nests can be monitored from high vantage points. In 2017 a combination of methods was used to census these colonies: counts from vantage points for the great white egret, arrival-departure (A/D) counts at dusk mainly used for the pygmy cormorant (Catsadorakis unpublished in Willems & de Vries 1998,) and estimation of active nests from drone photos for all species. Additionally, drone photos were used to estimate breeding success for the great white egret. The A/D counts were carried out twice, on 11/5/2017 and 6/6/2017 from 18:45 until 21:15. A short description of the A/D count method is the following: From a vantage point, some hundreds meters away of the breeding colony, the numbers of both departing and arriving birds are counted. In order to estimate the total population size, net numbers are calculated by subtracting the number of departing birds from the number of arriving birds. Drone flights were accomplished on 26/4, 11/5 and 6/6/2017 and a large number of high quality photos was taken and analysed later.

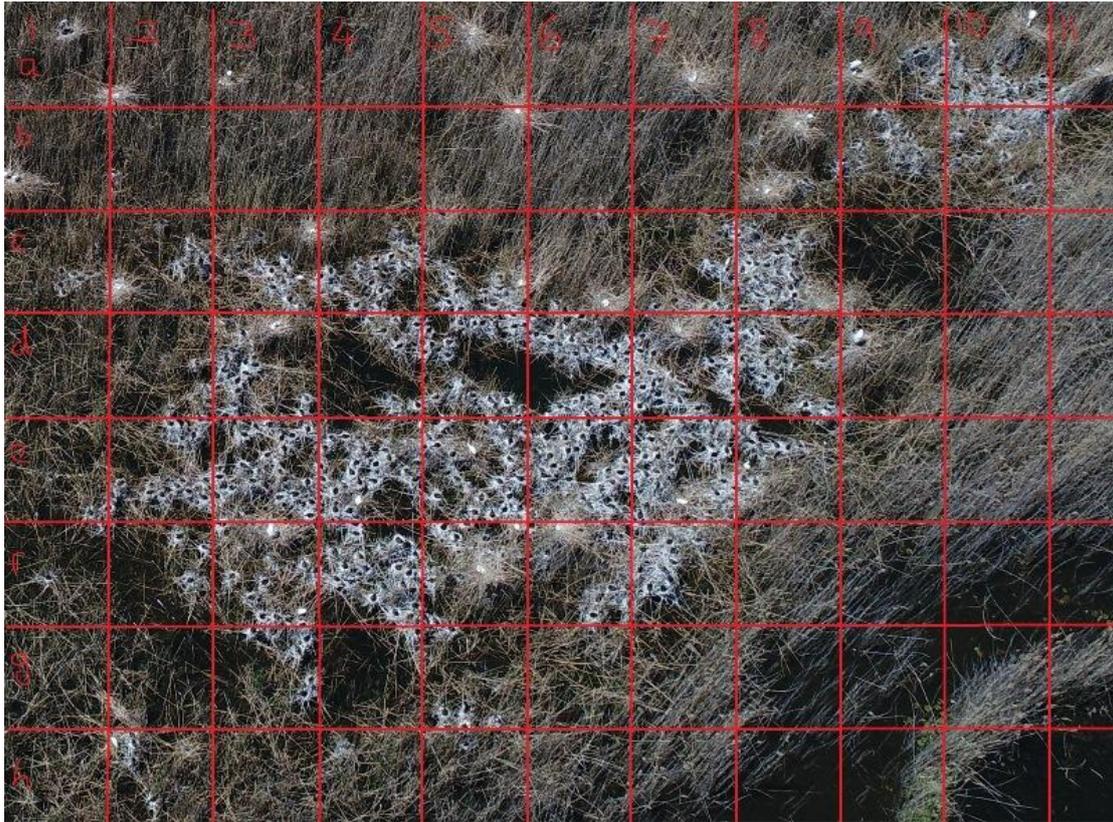


Photo 2. Use of a grid to count nests of pygmy cormorants and heron species on a drone photo taken on 26/4/2017 over the mixed pygmy cormorant-heron colony at Krina reedbed (unit B).

2.3. Ferruginous duck

The goal of the study is to assess the population size of the species in Prespa, collect data on phenology (arrival – departure dates, courtship, laying dates, hatching and fledging dates) as well as habitat use and distribution within the Lake Lesser Prespa along the year.

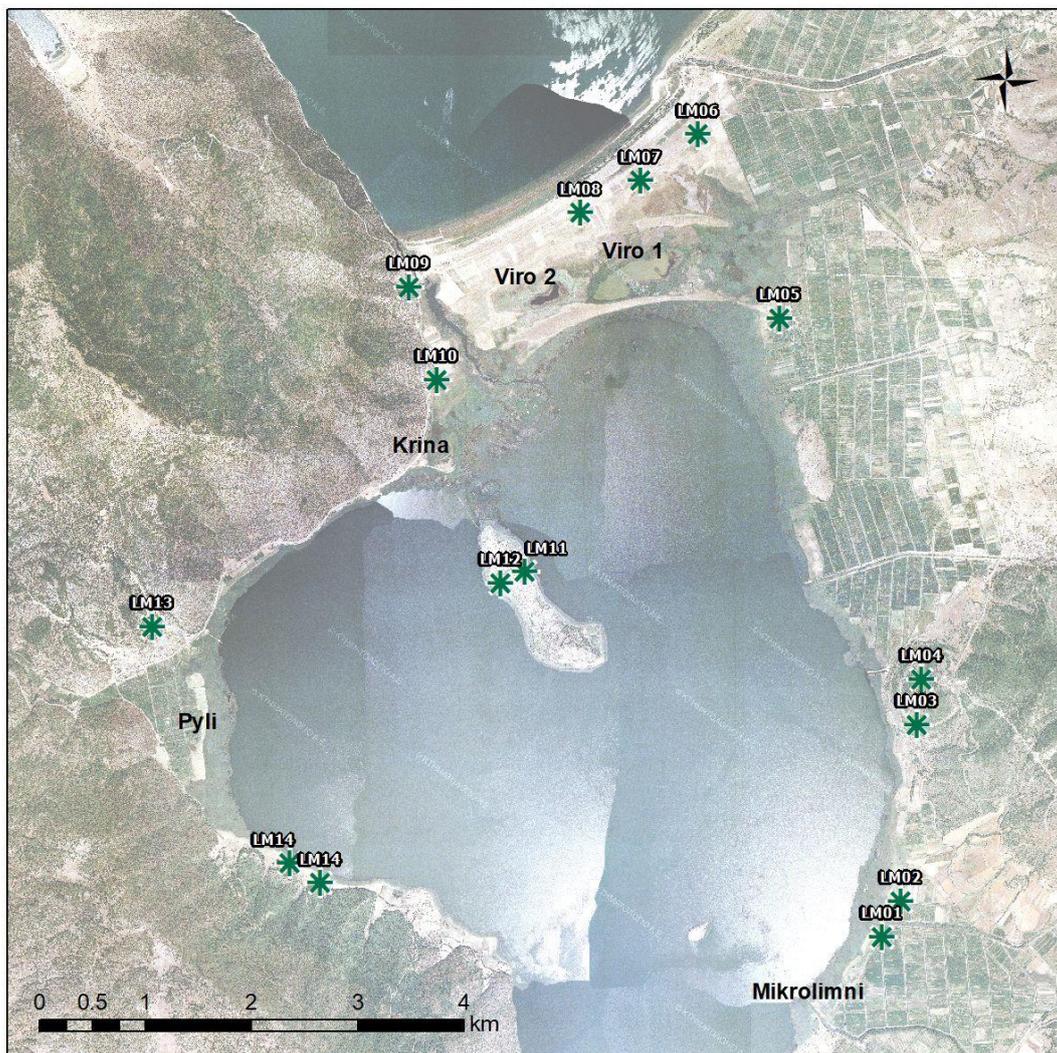
Description of methodology: The researcher remains in pre-selected vantage points (12 points) with a good view at suitable habitats for the species and watches a particular and preselected area (18 sampling sites in total) for a total of 30' (but divided in 5' minutes which are considered as separate sampling bouts). For every observed individual or group of individuals the researcher records number, sex, age, families and brood size. Every single observation is positioned accurately on a specially prepared map.

Sampling may last from dawn up to ca 10.00am and the last two hours before dusk. Sampling dates were centered around 30/4, 15/5, 30/5, 15/6, 30/6, 15/7, 30/7.

2.4. Habitat use

Littoral areas with a depth of water of 0-30 cm are considered as ideal feeding habitats for all species of herons and the glossy ibis. Cormorants and pelicans need somewhat deeper

waters of 50-130 cm, and of course cormorants can also feed in deeper water. Finally, some species of herons such as night and squacco herons feed in very shallow waters with depths of up to 15 cm but they also use the method of lurk-and-strike, i.e. they lurk from tree branches or reeds near the edge of water, at water depths deeper than 15 cm, and when the prey passes by they strike. Description of methodology: The observer visits successively from dawn until ca 12:00 am a number of preselected and delineated suitable sampling sites and counts all birds present there regardless of their activity. It is assumed that all birds observed at shallow open waters and wet meadows (Map 4) are using or have used or are going to use the site for feeding. The starting site varies between samplings so that sampling sites are visited different times of day during the sampling period. The census takes place every 10 days for three consecutive days in the period March-July.



Map 4. Vantage points for the assessment of habitat use by waterbirds at Lake Lesser Prespa.

3. Results

3.1. Pelicans

The winter of 2017 was extremely cold with very low temperatures in January resulting in a delayed arrival of DP and onset of egg laying for the DP. The first DPs arrived at Prespa on the 13th of February. In total, 1310 DP breeding pairs were estimated at Prespa in 2017 (Table 2). The DP breeding performance was estimated to 0.95 fledged chicks/ breeding pair. The first GWP were observed at Prespa on the 24th of February, yet most of them arrived in April and some continued arriving until early May. A total of 649 breeding pairs of GWP were estimated in 2017, of which about half (315) settled on a single colony, the largest GWP colony ever recorded at Prespa. GWP's breeding success was estimated to the very high value -for the species and the area- of 1 fledged chick/ breeding pair (Table 2).

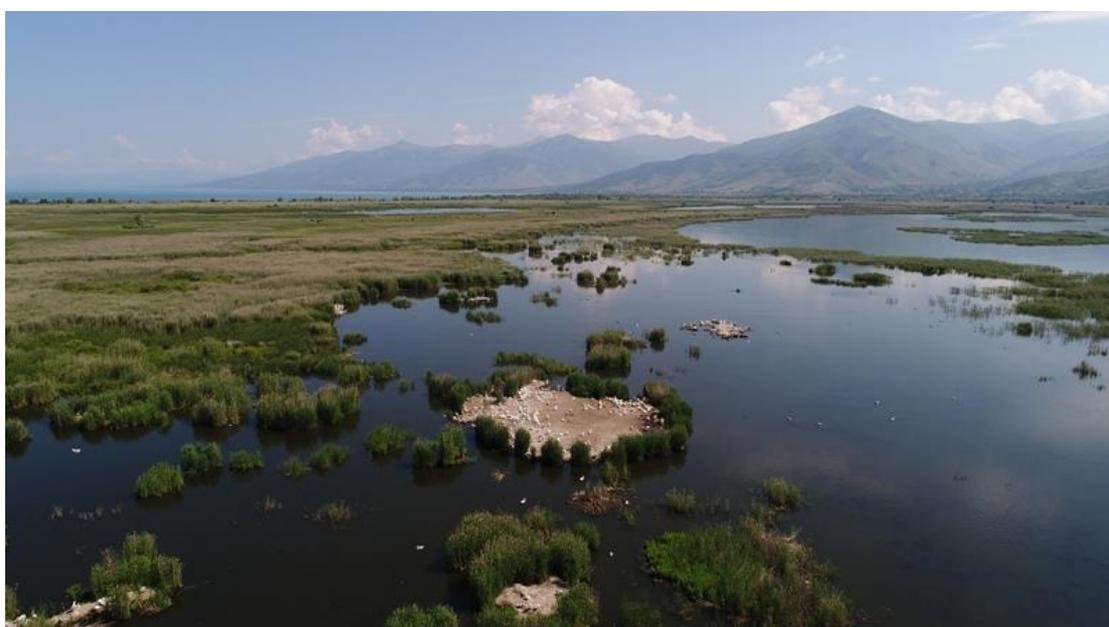


Photo 3. Drone photo of pelican colonies in Lesser Prespa taken on 31/5/2017.

Table 2. Dalmatian pelican and great white pelican breeding data at Prespa in 2017.

Species	Lesser Prespa	Vromolimni	Total Prespa 2017	Breeding success
Dalmatian pelican	922 br. pairs	388 br. pairs	1310 br. pairs	0.95 fledged chicks/br. pair
Great white pelican	54 br. pairs	595 br. pairs	649 br. pairs	1 fledged chicks/br. pair

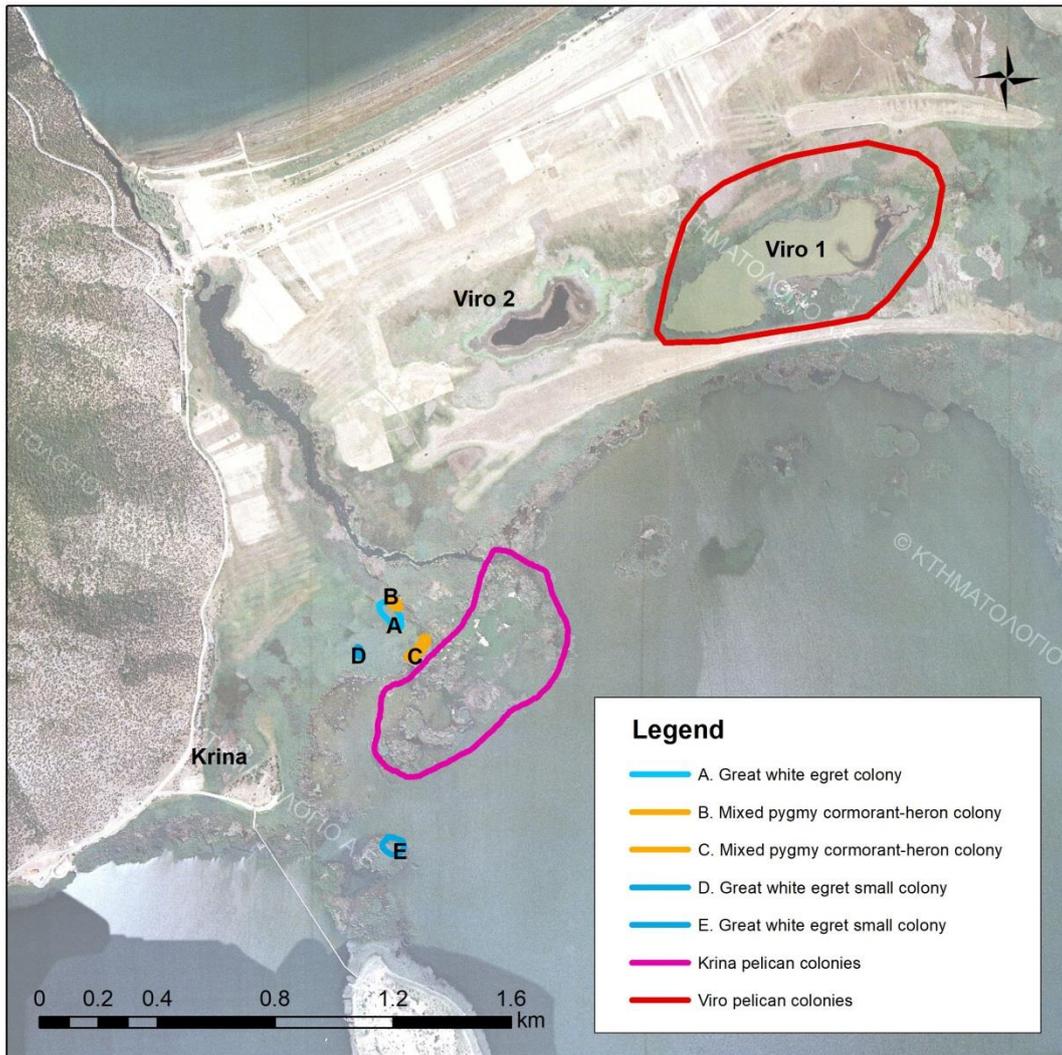


Photo 4. Field visit to Viro colonies on 27/7/2017 to count great white pelican chicks.

3.2. Pygmy cormorant, herons and glossy ibis

Numbers of breeding pairs of all species in 2017 were equal to or below the average of last years' values. Table 3 presents all breeding data from the six species nesting in the Prespa reedbeds. Only the Krina reedbed was occupied in 2017 and no nests were observed in the Mikrolimni and Pyli reedbeds. Great white egrets were the first species to settle in the reedbed in the first ten days of March. Their nests were established in 3 units, the main one being a large elongated area with 101 nests, the rest few nests were built in two other parts (Units D and E) of the Krina-Agios Achilios reedbed (Map 5). The pygmy cormorants started nesting in early to mid-April and occupied two distinct areas in the Krina reedbed, where two units of more or less similar size were established (units B and C, Map 5). The nests of the little egret, the night heron, the squacco heron and the glossy ibis were built inside and in the margins of the two pygmy cormorant units. All the former species started nesting after the middle of April, while the squacco heron arrived at Prespa a bit later, in the end of April.

Although when the first count of great white egret nests was conducted in the middle of March the number of breeding pairs was found to be 110, well within the range of recent years, a month later, on 26/4, only 82 nests were still active and on 11/5 only 57 nests had chicks inside. This was a surprising finding meaning that only 50% of great white egret breeding pairs managed to raise their chicks. Moreover, the breeding success of these breeders was also surprisingly low leading to a very low average of 1 fledged chick/ breeding pair.



Map 5. The distribution of pelican and pygmy cormorant-heron colonies at Lake Lesser Prespa in 2017.

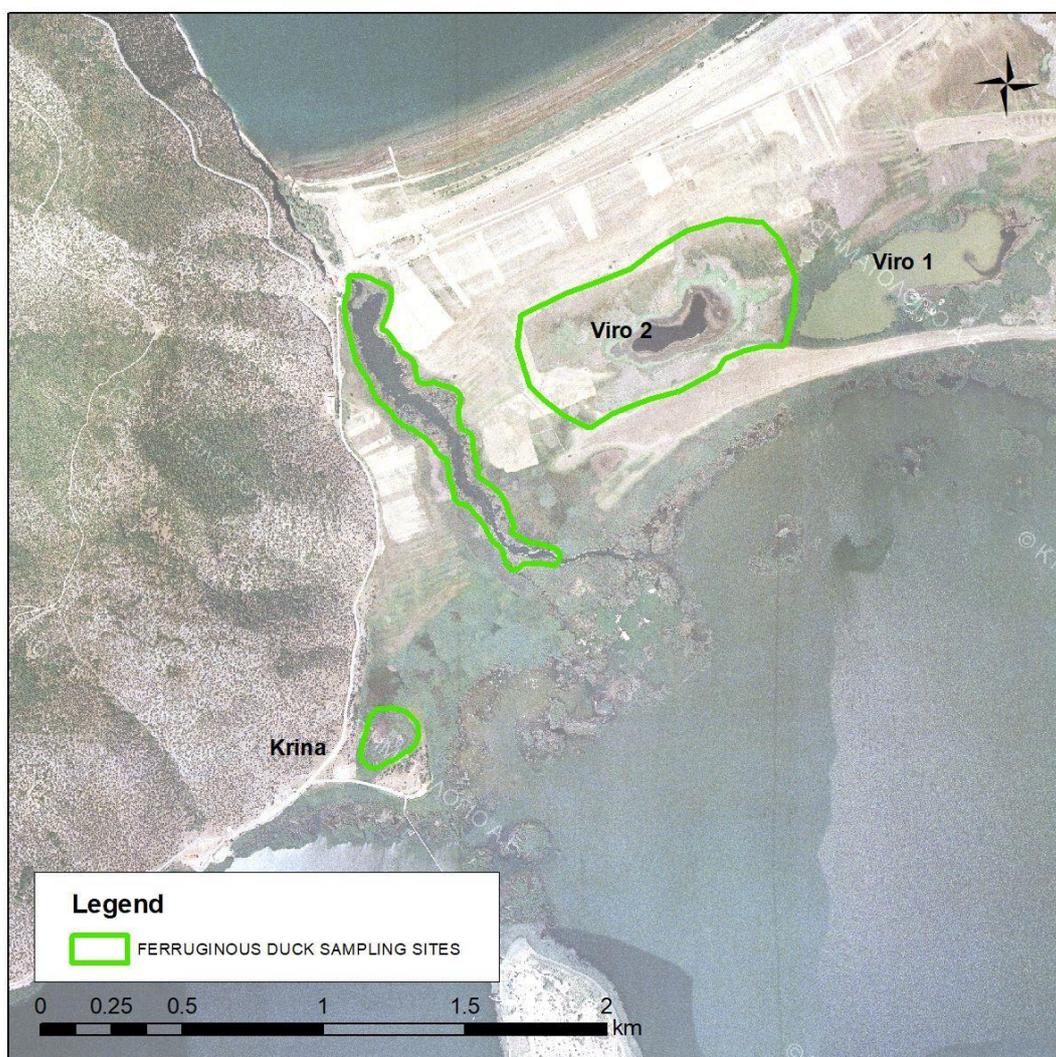
Table 3. Pygmy cormorant, herons and glossy ibis breeding data at Prespa in 2017 (breeding pairs).

Species	Krina reedbed unit A	Krina reedbed unit B	Krina reedbed unit C	Krina reedbed unit D	Krina-Agios Achilios reedbed unit E	Total Prespa 2017
Pygmy cormorant		514	860			1374
Great white egret	101			6	3	110
Little egret		21	90			111
Night heron		29	119			148
Squacco heron		3	35		1	39
Glossy ibis			4			4*

*The Glossy ibis breeding population was estimated only through A/D counts.

3.3. Ferruginous duck

In 2017 the population was estimated to be at least 10 pairs. Map 6 depicts in green the main areas used by the ferruginous duck for nesting and feeding.

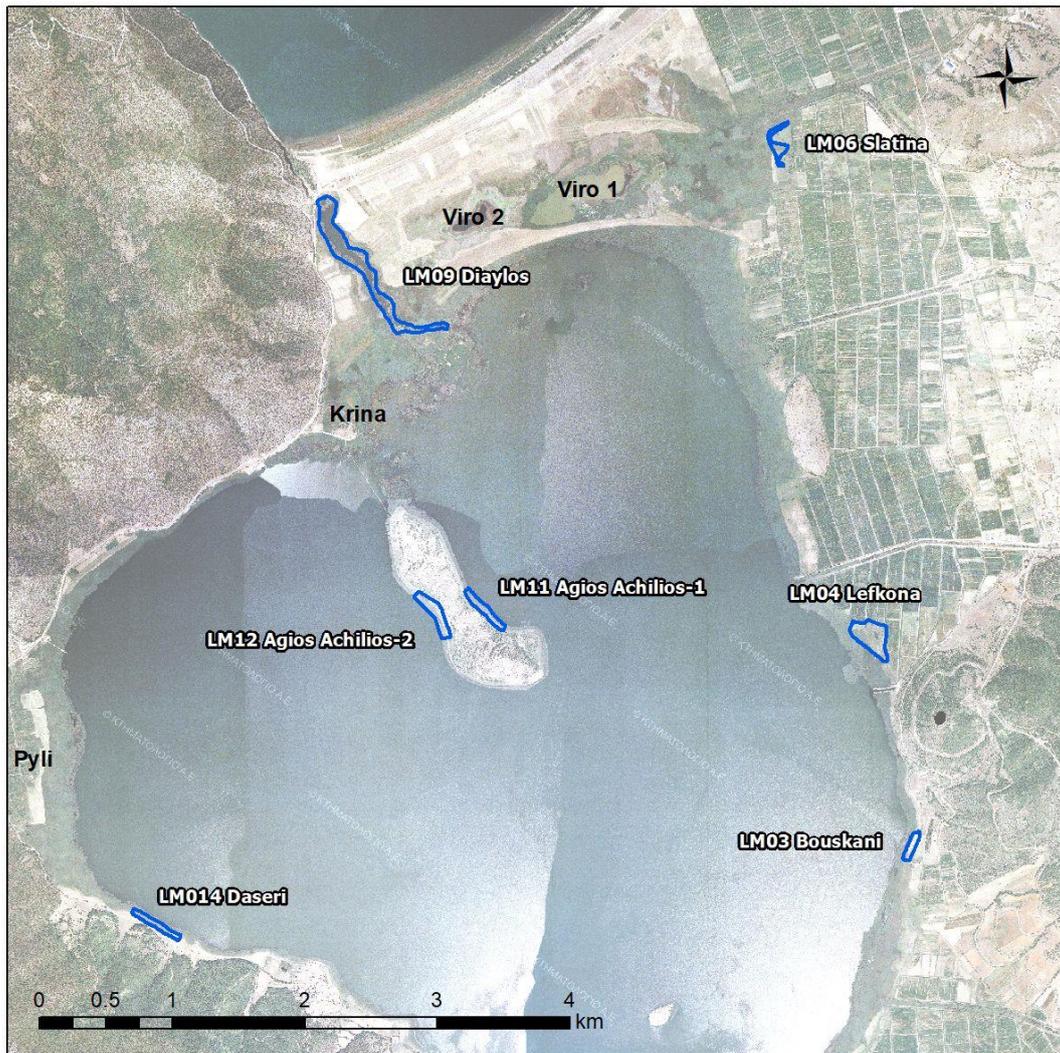


Map 6. Areas used by the ferruginous duck for nesting and feeding at Lake Lesser Prespa.

3.4. Habitat use

All areas with shallow water up to a depth of 30 cm are potentially good feeding sites as long as they are not occupied by dense vegetation of reeds or other aquatic plants. As many of these sites are currently occupied by reeds –and this is exactly the problem that this LIFE project aims to deal with- the sites where waterbirds were observed feeding during this field period are not necessarily the optimal feeding sites but the only ones that existed at that time. Moreover, as this year was a very dry year and consequently shallow water areas remained inaccessible to waterbirds, the habitat use counts of 2017 are not considered typical and the results demonstrate this very point: the numbers of waterbirds observed at sites used extensively in previous years were very low this year. The most heavily used sites

by pygmy cormorants, little egrets, squacco herons and night herons were LM03 (Bouskani) and LM09 (Diavlos). Swallow water areas around Agios Achilios (LM11 and LM12) were of special importance to the squacco heron. These areas are actually the only shallow water areas that were available to birds in 2017. The great white egret frequently used Lefkona (LM04), Slatina (LM06) and Daseri (LM14), all these sites include wet meadows and swallow water areas and demonstrate the great white egret's feeding ecology as it feeds on a wider spectrum of habitats and prey compared to the other target species.



Map 7. The most used feeding sites (swallow water areas) in 2017 at Lake Lesser Prespa.

4. Discussion

The winter of 2017 was extremely cold with very low temperatures in January resulting in the delayed arrival and onset of egg laying by DPs. The abandonment of some nests by early nesters observed in previous years (SPP, unpublished data) did not occur in 2017 due to this delayed arrival. These early breeders often abandon their nests as, despite the increasingly

often milder winters (related with climate change), the food availability is still very limited at Prespa this time of the year. In 2017, the delayed onset of the species' egg laying led obviously to higher synchronization of the breeding cycle and this resulted to an enhancement of the breeding performance. However, this episode is unlike the overall pattern recorded during the previous years when the mild winters led to an early start of the species' breeding season.

The Prespa population of the GWP has manifested an unprecedented change in the last couple of years: the formation in 2016 and 2017 of the largest monospecific breeding colony that has ever existed in Prespa with 304-326 nests which led to an exceptionally high breeding success –for the species and the area. It is probable though that this colony might split again into smaller sub-colonies (clusters of nests) in the following years (as was the case before 2016) and thus the breeding success will decrease to more “ordinary” levels.

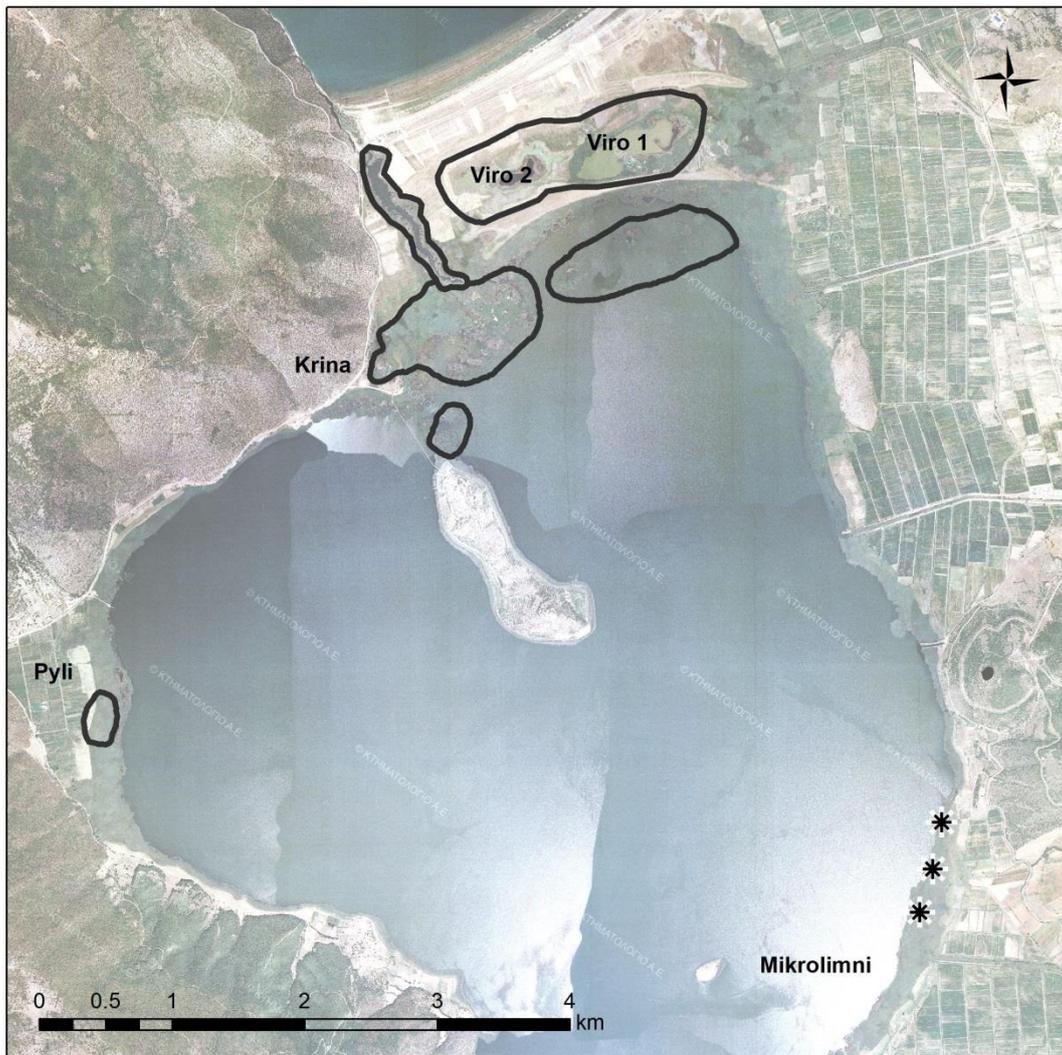
As stated before, 2017 was a very dry year with minimum snowfall and freezing weather conditions in January, following an also dry year in 2016. Low precipitation resulted in very low quantities of water flowing in the lake in spring from the whole catchment area. As a result, the water level of Lake Lesser Prespa remained low. In a typical year, the water level rises so that the waterline surpasses the dense zone of reedbed surrounding the lake and forms extensive areas of shallow water that remain for a few months without high vegetation. These very shallow water areas (up to 30-40 cm deep) are the most valuable foraging areas for waterbirds (herons, ducks, pelicans, cormorants) as they are abounding in benthic and swimming aquatic organisms, such as insects and their larvae, tadpoles, amphibians and small fishes. In this dry year, however, as the water level stayed low, the waterline remained in the dense reed bed and so the shallow water areas remained inaccessible to waterbirds and thus totally useless. As a consequence, waterbirds had had a hard time finding suitable feeding sites. This is reflected in the numbers of breeding pairs, which this year remained below the average. Moreover, the lack of food had disastrous results for some species such as for the great white egret. The breeding success of this species was extremely low in 2017. Due to the absence of suitable feeding grounds, 50% of the species' nests were abandoned and those pairs that finally managed to raise their young had a low breeding performance.

5. Management implications

The areas occupied currently by the nesting colonies (pelicans, pygmy cormorants and herons) should remain completely undisturbed, and therefore all the breeding sites and a zone around 100 meters around them should be left unmanaged (Map 7). This safety zone of 100 m. is considered satisfactory according to literature (e.g.: Vos et al., 1985, Rodgers & Smith 1995, Rodgers & Smith 1997). The main areas used by the ferruginous duck should also be left unmanaged.

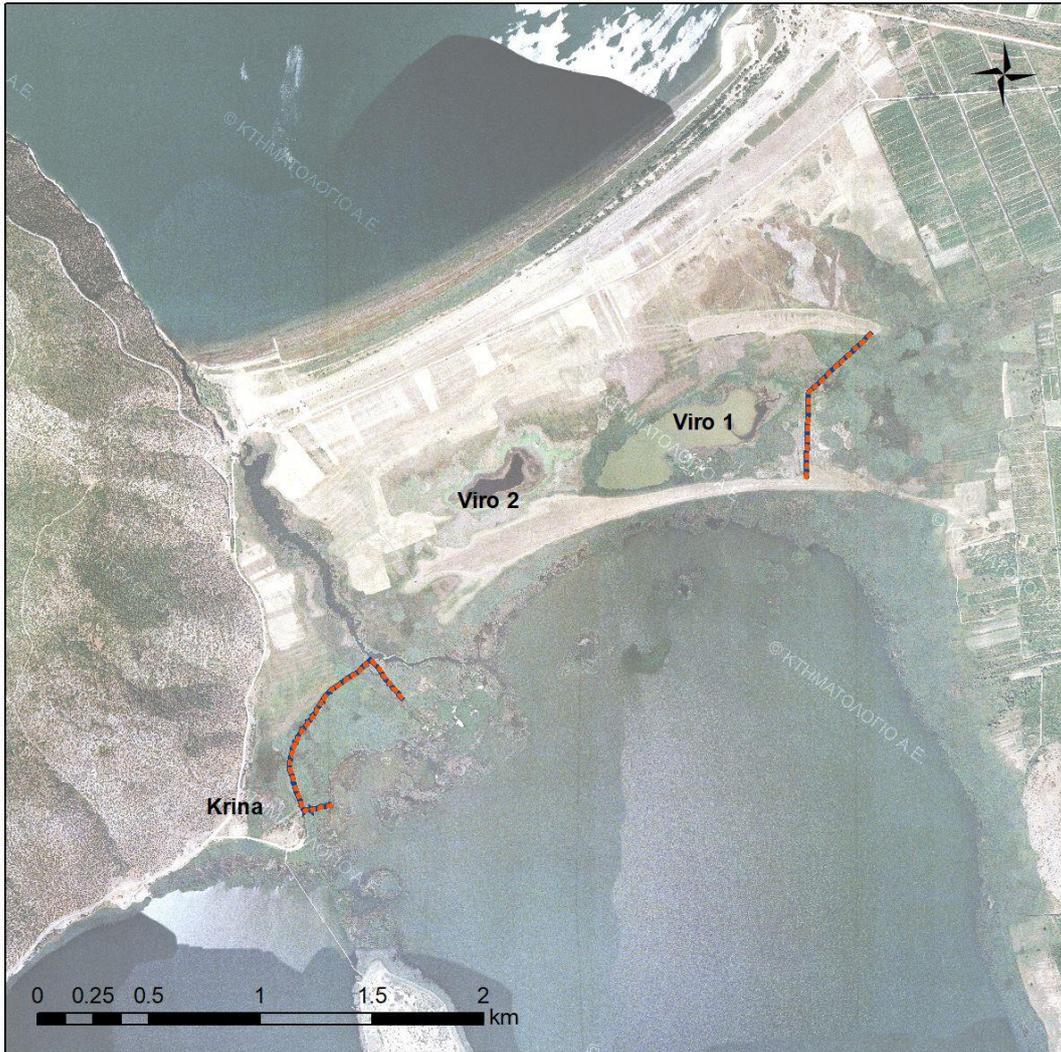
The non-intervention areas according to the above are presented in Map 7. These areas include:

1. The pelican, pygmy cormorant and heron colonies plus a 100 m. buffer zone around them.
2. The main breeding and feeding habitats of the ferruginous duck.
3. The islets north of Agios Achilleios island.
4. The small ponds north of the Mikrolimni reedbed, which are important roosting areas for the pygmy cormorant.



Map 8. Non-intervention areas according to this study.

Map 8 illustrates two special areas where the reed should be systematically cut. These areas will act as firewalls around the colonies. Both pelican colonies and pygmy cormorant-heron colonies have been threatened several times in recent years by uncontrolled fires set by local farmers in their attempt to clear the vegetation from drainage ditches and from there they spread to the reedbed and the bird colonies.



Map 9. Firewalls for colonies' protection: areas where systematic cutting of reed should be implemented.

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