LIFE10 NAT/GR/000638

Monitoring of the Lesser White-fronted Goose in Greece

Reporting period: 2011-2017

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Table 1: Abbreviations

CRC	Color Ring Code
GWfG	Greater White-fronted Goose
Inds.	Individuals
Juvs.	Juveniles
LWfG	Lesser White-fronted Goose
MA	Management Authority
RbG	Red-breasted Goose
SPS	Smart Patrol System
WR	Wildlife Refuge

1. Introduction

Monitoring of the Lesser White-fronted Goose (LWfG) population was conducted in the framework of the LIFE10 NAT/000638 project "Safeguarding the Lesser White-fronted Goose Fennoscandian population in key wintering and staging sites within the European flyway", as an indicator of the effectiveness of the concrete conservation actions implemented by the LIFE+ project from September 2011 until April 2017. LWfG monitoring was coordinated by the Hellenic Ornithological Society (HOS), while fieldwork was conducted by the Management Authorities of the Kerkini Lake, Ismarida Lake and Evros Delta National Parks.

The present report provides a conclusive overview on LWfG phenology in Greece. A brief analysis covers the monitoring effort from 15/09/2016 to 29/03/2017, while we also present the results of the overall monitoring effort since 2011. For comparison purposes, data acquired systematically starting from the first LWfG LIFE project (LIFE96 NAT/GR/003217 "Conservation of *Phalacrocorax pygmeus* and *Anser erythropus* in Greece" 1997-2000), as well as historical data, are also included in the analysis.

The LWfG monitoring results present the trending wintering and staging phenology of the LWfG population in Greece. The monitoring periods of 2014-2015, 2015-2016, and 2016-2017 have run parallel to the implementation of high tech, advanced and comprehensive patrolling system (Smart Patrol System - SPS) that allowed through CCTV a complete coverage of the LWfG sites in Kerkini Lake and Evros Delta. As a result, we also examine the response of LWfG and other geese to the new patrolling regime.

2. Materials and Methods

Monitoring was focused on the main wetlands where the LWfG are found, mainly in Kerkini Lake and Evros Delta and less frequently in Ismarida Lake. Further monitoring visits were also conducted, at areas where the species had been found in the past, such as Lakes Koronia and Volvi and the Nestos Delta. All areas belong to the Natura 2000 network, are characterized as National Parks and also contain Wildlife Refuges. In order to protect the LWfG from accidental shooting and illegal killing, goose hunting has been banned within the SPA boundaries of these areas since 2012.

Monitoring took place from early October until late March at Kerkini Lake and Evros Delta, two to three times per week, for six consecutive wintering periods starting from October 2011 and continued until March 2017. Ismarida Lake was monitored during early January until February with further visits when the LWfG flock could not be observed in the other project areas. Other areas were also monitored irregularly, when some or all the LWfG went missing from the monitored sites. Monitoring was supported by each area's Management Authority (MA) and the LWfG were observed by 20-60x and 90x telescopes from suitable positions. During a monitoring visit the area was scanned for goose flocks, with focus to all known sites the LWfG visit.

Data collected included the position of the flock relatively to the observer, the number of juveniles and adults observed, the number and size of discrete sub-flocks, the number of families/pairs, the position in mixed goose flocks, behavior/activity, other species of goose present and Color Ring Codes (CRC). When observation conditions were favorable, videos of

the LWfG were captured in order identify individual LWfG from their distinctive belly patches. Observation distances were on average between 500-800m.

During 2011-2012, 2012-2013 and 2013-2014 wintering periods, data on LWfG flock movements were collected with standardized entry tables. During the 2014-2015, 2015-2016 and 2016-2017 wintering periods, monitoring was conducted with electronic protocols supported by the use of tablets in the field and customizable application. Through Cybertracker (http://www.cybertracker.org) field data collection system, monitoring protocols were created based on the primary data entry tables in order to produce datasets comparable between year 2011 and 2017. These protocols automatically collected data such as the observer's position, date and time and contained all the relevant data fields described above.

3. Results

3.1. Wintering period 2016-2017

During the 2016-2017 wintering period, the LWfG flock was first observed at Kerkini Lake on the 15/9/2016, which is the earliest date that the LWfG flock has ever arrived in Greece according to all available data. The first 41 LWfG were seen feeding along with 2 Great White-fronted Geese (hereafter GWfG) at the inner Delta of Strymonas River (Stomio area) in great distance. It is likely that the same flock was in Valdak Marshes on 5/09/2016 since LWfG with the same Colour Ring Codes (CRC) were observed (WR and OGR) within the flocks. On the 24/9/2016 another 5 LWfG were added to the group. On 28/9/2016 the number rose up to 102 and on 18/10/2016 the flock counted 113 individuals. The maximum single count for the project area was observed on 18/12/2016, counting 130 individuals, which is the largest number of LWfG individuals ever recorded in the area. The flock was regularly observed until 6/01/2017.

Following a period of cold weather when Kerkini Lake remained frozen and the available grass was fully covered with snow, all goose species scattered at the surrounding areas, often outside the Wildlife Refuge (WR). For a period of 18 days the LWfG could not be observed in any known site. On 24/01/2017, 38 individuals reappeared at Kerkini Lake, among them the LWfG with Color Ring Code (CRC) OL. The numbers of LWfG observed at Kerkini Lake varied until 8/03/2017 when the 129 LWfG observed and remained until 22/03/2017. The low water level of the lake during winter revealed vast open grasslands allowing the goose flocks to occupy a larger area. The LWfG were mostly observed at great distances (800m -1000m) near the river mouth, both from the eastern dyke of the lake and the observation tower at Stomio area (Annex II, Map 1,5).

It seems likely that the LWfG flock may have not visited the Evros Delta at all, or only for a short period of time, during which it was not observed. At least 4 individuals were observed at Evros Delta, a single individual and a family of 2 adults (Annex III, Photo 1,2) along with a juvenile LWfG in a larger flock of GWfG (at least 2,000) and several RbG (at least 50), feeding at Kalavos area. Observed initially at Paloukia Lagoon (2 inds. 3/02/2017), all following observations came from Kalavos area (4 observations). The LWfG observed were seen scattered in between the larger GWfG flock, a behaviour suggesting that these LWfG were probably part of the Western LWfG population and not from the Fennoscandian, which at that time was present at Kerkini Lake. All goose species at Evros Delta were found mainly at

the north western part of Dimitriadis meadow and when hunting stopped, mainly at Kalavos area. GWfG in smaller numbers and Greylag Geese were also observed at Paloukia Lagoon, Nymfon Lagoon or even Antheia area.

According to Color Ring Codes (CRC) observed only at Kerkini Lake, with the LWfG code ring OL and the LWfG pair WR, OGR along with 3 juveniles (21 observations) were observed. No LWfG were observed in any other sites in Greece although GWfG and RbG were reported in many areas not only in Northern Greece but as south as Evia and Attica (Strofilia, Sxinias and Iliki Lake. The harsh weather of January, also resulted in impressive numbers of geese at Ismarida Lake, Vistonida Lake, Nestos Delta and the surrounding Lagoons (21-22/01/2017 Mid-winter counts: 4,428 GWfG, 173 Greylag Geese, 29 RbG, data from the monitoring team of MA of Nestos River, Vistonida-Ismarida Lakes). Additionally to the project sites, other areas monitored for LWfG included Koronia –Volvi Lakes, Doirani Lake, Epanomi Lagoon, Gallikos-Axios-Loudias-Aliakmon river delta, Kalochori area, Strymon estuaries and the western part of Nestos Delta.

Table 2: Overview of LWfG winter monitoring at Kerkini Lake, Evros Delta and Ismarida Lake 2016-2017

	Kerkini Lake	**Evros Delta**	**Ismarida Lake**
Monitoring started	15/09/16	01/10/16	23/12/16
Monitoring ended	24/03/17	23/3/17	10/02/17
First observation of LWfG	15/09/16	03/2/17	-
Last observation of LWfG	22/3/17	06/3/17	-
Time LWfG spent in the area	188 days	31	0
No. of observations	80	5	0
Total Visits	90	45	8
Max. Number observed	130	3	
Flock size and associations	Flock range: 2 – 130 33,65% in mixed flocks	Flock range: 1 – 3 100% in mixed flock	-
Age distribution	36 2cy	1 2cy	-
Space use	Strymonas mouth, Trigono	Kalavos, Paloukia Lagoon	-
Observations of CRC	OGR, OL, WR		-
Observations in other sites	-	-	
"Missing period"[1]	days 24[1]		
Total time spent in Greece (days)		188	
[1] Missing period: subsequent observations of <50% of the flock in all project sites for > 2 weeks.			

3.2. Overview of LWfG Monitoring in Greece 2011 - 2017

Between the 2011-2017 wintering periods, LWfG were only observed in Kerkini Lake and Evros Delta. There is only one observation during the 2012-2013 wintering period where two LWfG were observed at Koronia Lake. No further observations have been reported elsewhere although for a certain period of time ("missing period"), when the flock moved from Kerkini Lake to Evros Delta, LWfG were not observed at either site. Several visits have been made in various suitable areas while the flock remained unaccounted for, with no success in finding any specific site. There is a possibility that the LWfG may visit a remote area within the Evros Delta, were observation conditions are very difficult (large distance and uneven terrain) or that the flock withdraws further inside the riparian forest in Kerkini Lake so that no observation can be made possible.

During the reporting period, the LWfG have been arriving in Greece (Kerkini Lake) each wintering period earlier than previously, resulting in almost in a 3-week difference between the first and last monitoring season. As mentioned before, during 2016-2017, part of the LWfG flock arrived on 15/9/2016, which is the earliest arrival of the LWfG ever recorded in Greece. Moreover, the flock seemed to have spent during the 2016 autumn migration, less than a week at the staging sites in Hungary. At the same time, the timing of departure was more stable with no significant changes being observed between the monitoring periods (Figures 1 and 2).

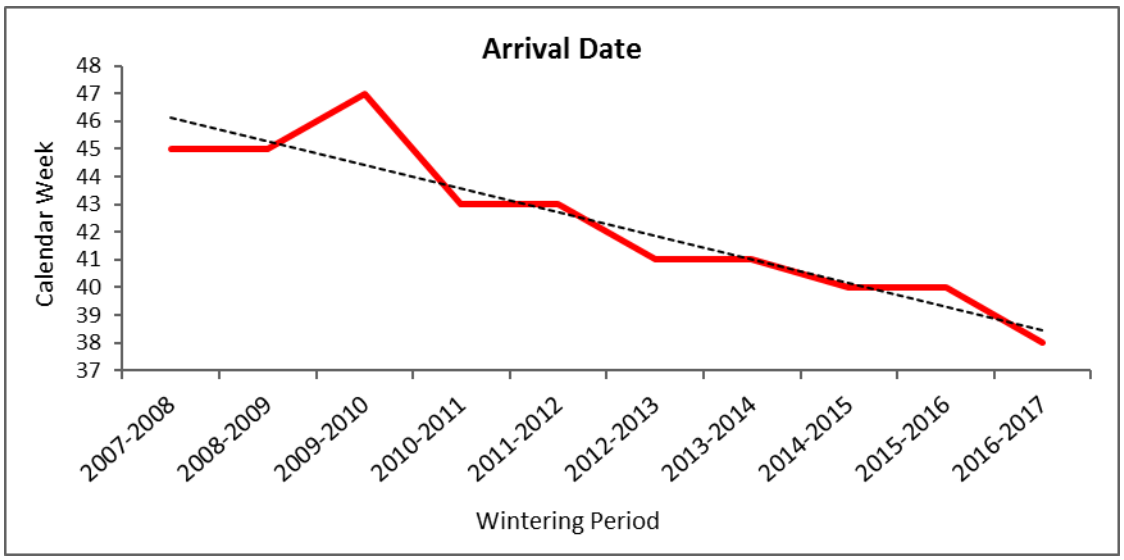

Figure 1: Arrival dates of LWfG in Greece.

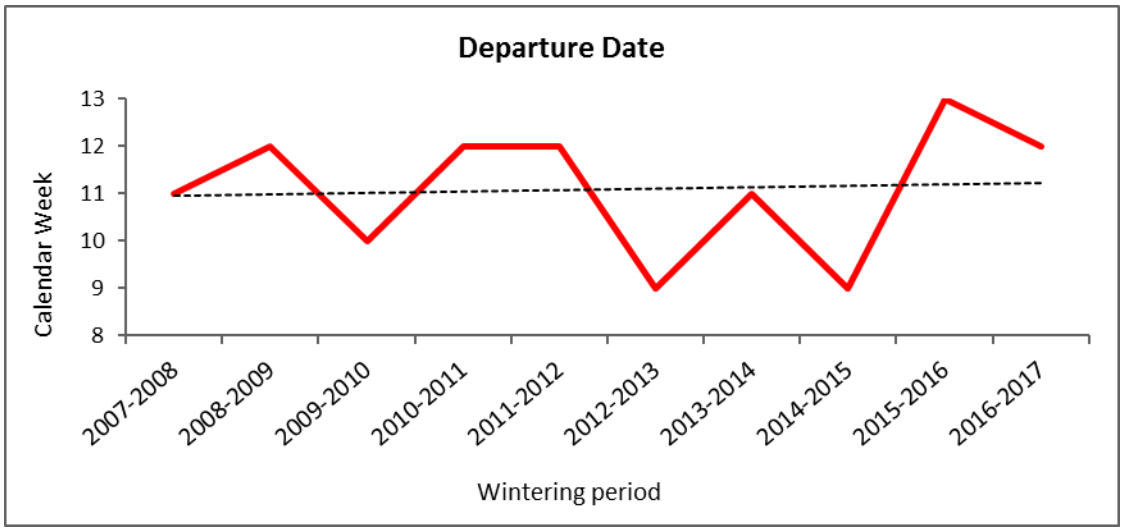

Figure 2: Departure dates of LWfG in Greece.

The number of LWfG individuals observed in Greece reached a record number during 2015-2016, with a total of 144 LWfG observed (Figure 3). Although the overall time spent in Greece seems to have been extended to a 6 month period, which is the longest period the Fennoscandian population spent in any single country, the period spent in Evros Delta has diminished in favor of the time spent at Kerkini Lake. During 2016-2017, only 4 LWfG were observed at the Evros Delta (possibly of the Western Main LWfG population) and no observation of a significant number of LWfG was made possible (Figure 4).

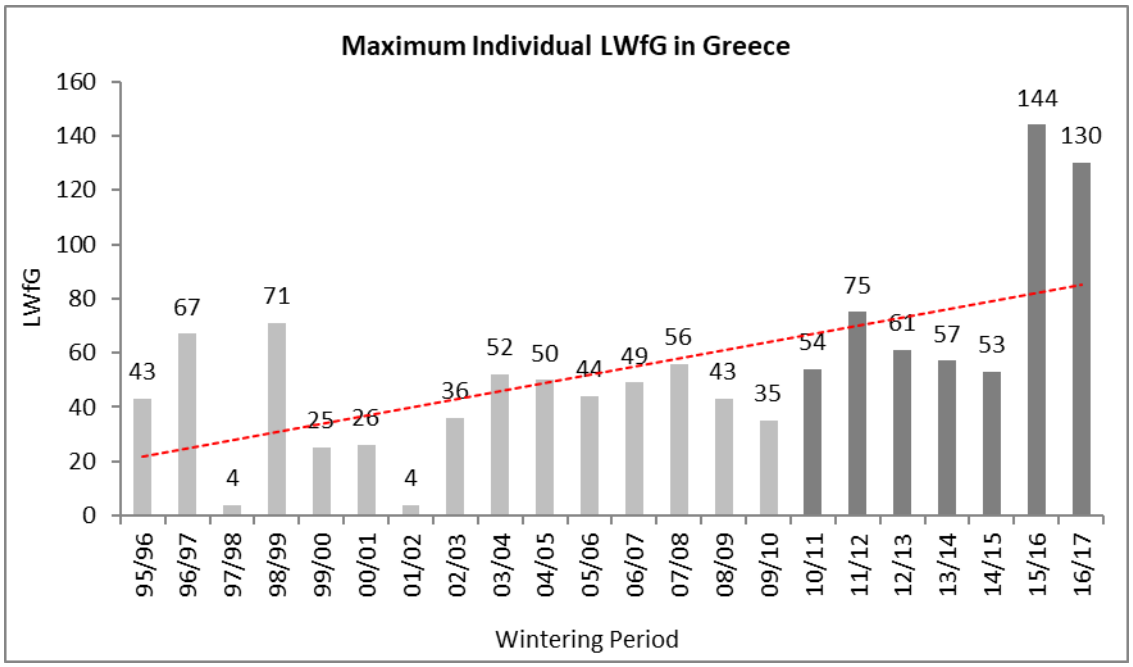

Figure 3: Maximum annual number of LWfG individuals observed in Greece during 1995-2017. Monitoring of the flock became systematic since 2002-2003 through the consecutive LIFE+ programs, thus LWfG observations in Greece became stable.

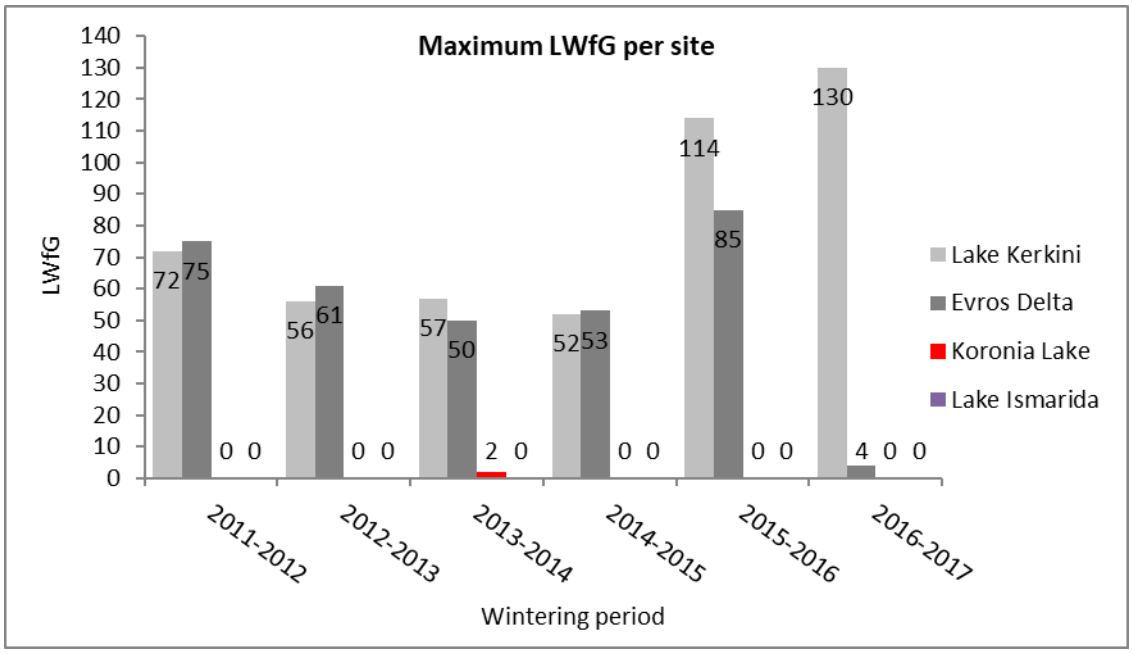

Figure 4: Maximum annual number of LWfG inds. observed in Greece per site, 2011-2017

3.2.1. Age distribution

During the reporting period most observations of juvenile LWfG originated from Kerkini Lake, in contrast to the previously reported pattern that showed a higher number of juveniles wintering in the Evros Delta. In comparison to the number of juveniles observed at the Valdak marshes in Norway, there is a significant difference between the number of juveniles observed at the breeding sites and at the wintering sites in Greece, especially during the 2011-2012 and 2016-2017 periods. On a regular basis, the juvenile LWfG observed in Greece are fewer than the ones observed in Norway before migration, with one exception during 2012-2013 (Table 3). At the same time, the total number of individuals in Greece is slightly higher than the numbers observed during autumn in Norway (Figure 5).

Table 3: Overview of juveniles observed in Greece and Norway

Wintering Period	Norway	Greece	Kerkini Lake	Evros Delta	Percentage in the flock
2011 – 2012	44	11	11	-	14,67%
2012 – 2013	9	11	11	2-3	18,03%
2013 – 2014	9	1-5	1-5	2	8,77%
2014 – 2015	11	8-10	8-10	-	18,87%
2015 – 2016	74	55	55	-	38,19%
2016 – 2017	37	36	36	-	27,69%

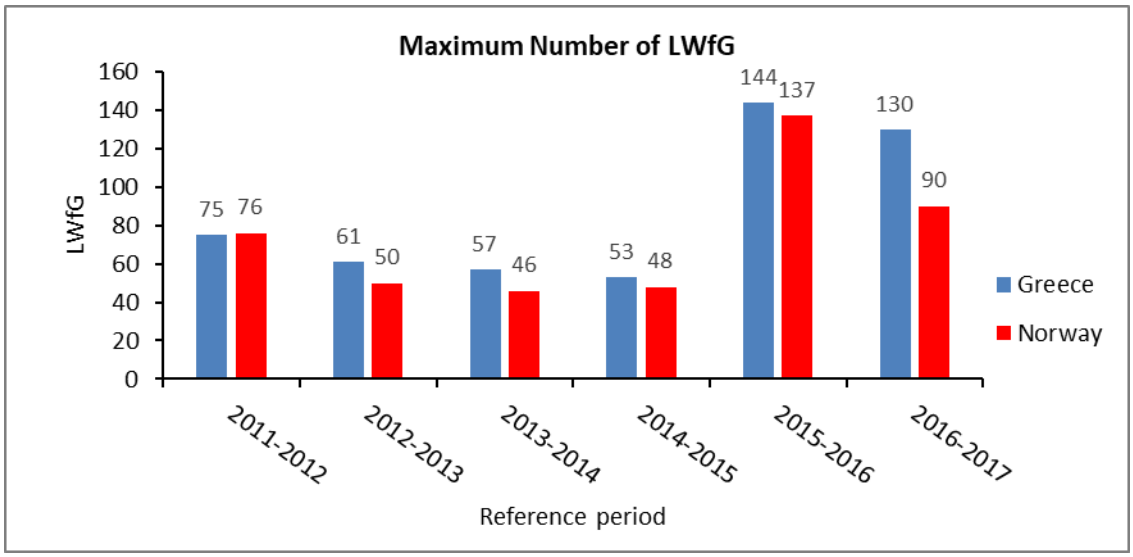

Figure 5: Maximum annual number of LWfG observed in Greece and Norway (autumn), 2010-2017

The first observation of juvenile LWfG in Greece was made in Evros Delta on 05/01/1997. Starting from the 1996-1997 wintering period and until the 2013-2014 wintering period, the rate of juvenile observations in Greece, compared to the numbers of juveniles observed at Valdak marshes, was ranging on average of 22%. During the course of the LIFE project (2011-2017) the percentage was on average 69, 6%. The rate of juvenile observations during 2016-2017 alone, reached 97.3%.

The distance in which the flock was usually observed was greater than 600m especially upon the arrival of the LWfG in Greece. Moreover, poor visibility due to mist and haze (Kerkini Lake) or high vegetation (Evros Delta) made ageing of the LWfG possible only occasionally and when the observation conditions were favorable altogether.

There seems to be a positive correlation (+0.68) between the percentage of juveniles within the flock and the amount of time the LWfG flock remained in Greece, suggesting that the more juveniles come with the adults the more time they tend to spent wintering in Greece. (Figure 6).

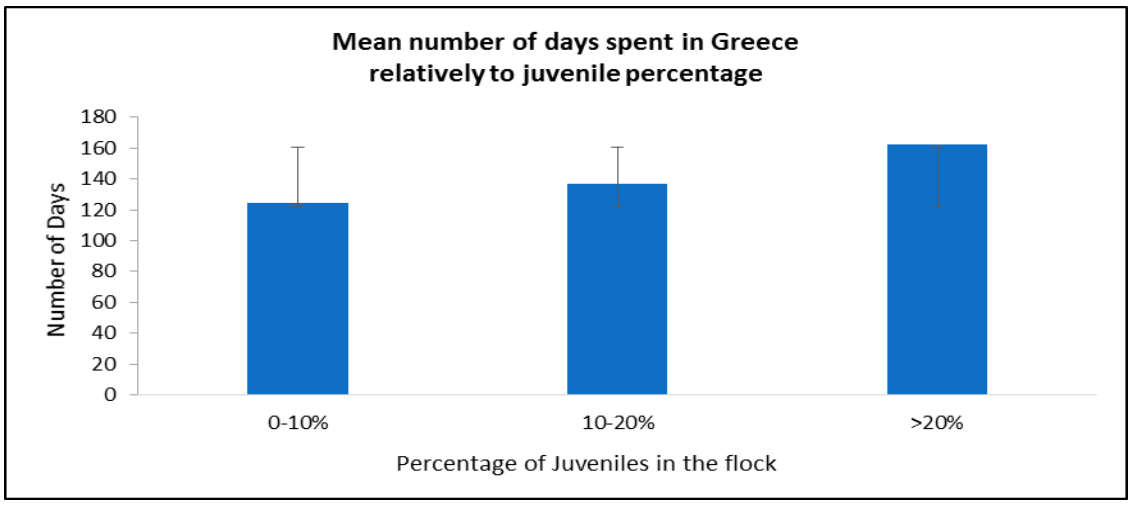

Figure 6: Mean number of days the LWfG spent in Greece in comparison to juvenile percentage within the flock. Data from 2005-2009 and 2011-2017 (LIFE05 NAT/FIN/000105 and LIFE10 NAT/GR/000638).

3.2.2. Flock associations

Regarding flock associations with the other species of geese (mainly Greater White-fronted Goose), the LWfG continue to show a tendency to remain separate from other goose flocks. During the reporting period, the LWfG formed uniform LWfG flocks (77.38% in Kerkini Lake and 68.30% in Evros Delta) and at a smaller percentage the LWfG were observed in mixed groups with other species of geese (22.63% in Kerkini Lake and 31.70% in Evros Delta). Even so, the LWfG flock was observed mainly at the edge of the larger group of geese observed (75%) and less often dispersed within it (25%).

During the 2015-2016 and 2016-2017 wintering periods; the GWfG and Greylag geese observed in Kerkini Lake until early December were much fewer than the total number of LWfG observed at the same area and mixed with the LWfG flock, which numbered more than 100 individuals. In the beginning of January the larger flock of LWfG observed in Kerkini Lake separated in smaller groups of 2 to 98 LWfG individuals. In generally, when approaching the departure date, late February to late March, the flock seemed to reunite again in one group. In Evros Delta, the observed groups seldom separated in smaller groups (2 groups max) and all the observations of 2-4 LWfG that remain mixed with GWfG most likely belonged to the Western main population.

3.2.3. Timing and Length of Wintering LWfG in the Project Areas

On average (2011-2017) the LWfG spent 103.9 ± 42.2 days in Greece, arriving after mid-October in Kerkini Lake and leaving by the end of March from Evros Delta. Starting from the 2013-2014 wintering period this pattern has progressively changed. Specifically, by the last monitoring wintering period (2016 – 2017), the LWfG arrived at Kerkini Lake earlier by almost a month (Figure 7), and during three monitoring periods they moved from Evros Delta back to Kerkini Lake (2013-2014, 2014-2015, 2015-2016) after a short period of time, or never reached Evros Delta at all (2016-2017). On average, the flock spent 158 ± 17.49 days in Greece (Figure 8), of which 105.17 ± 44.17 were in Kerkini Lake and 20.17 ± 14.19 were in Evros Delta (Figure 9). Exceptional was the 2016-2017 wintering period during which the flock spent 188 days in total in Greece. The missing period remained stable counting on average 21.67 ± 3.5 days, ranging from late December - mid-January until late January. This is of particular importance, since during January hunting activity reaches its peak; both at Kerkini Lake and Evros Delta (see also Demertzi et al, 2017). Departure dates, although with variations remained more or less stable.

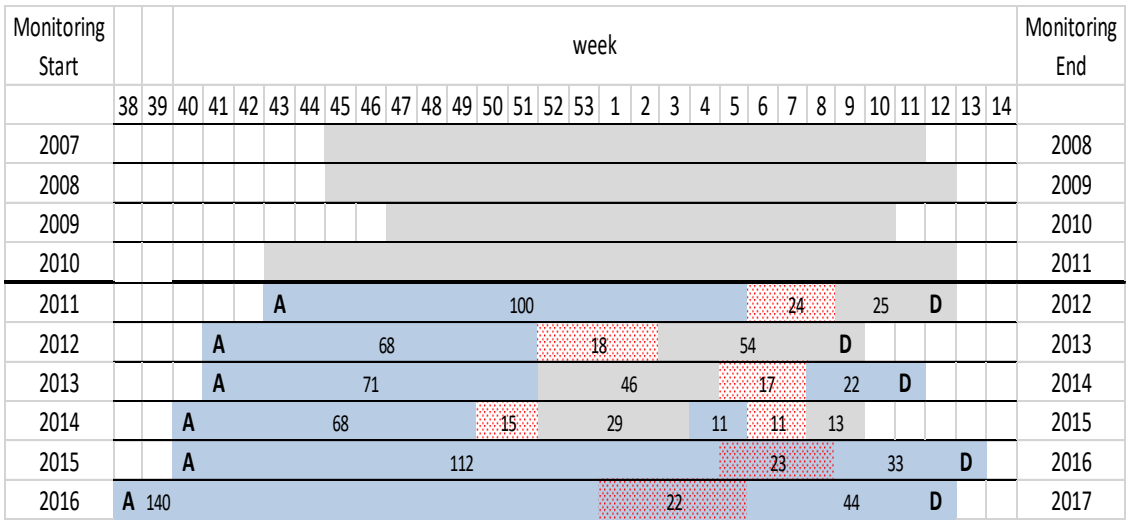

Figure 7: overview of LWfG wintering phenology in Greece during the LIFE+ program (blue: Kerkini Lake, grey: Evros Delta, red-dotted: Missing period).

Regarding the timing when LWfG peak numbers were reached, differences are also notable (Table 4). Because of the observations of the 2015-2016 and 2016-2017 wintering periods, when the LWfG appear to have left Kerkini Lake only for a short amount of time, a clear change in the timing when peak LWfG numbers occur is revealed. Since this change is more evident during the last two monitoring periods, LWfG monitoring must continue in order to establish whether this is a temporary or permanent trend in the wintering phenology of the species.

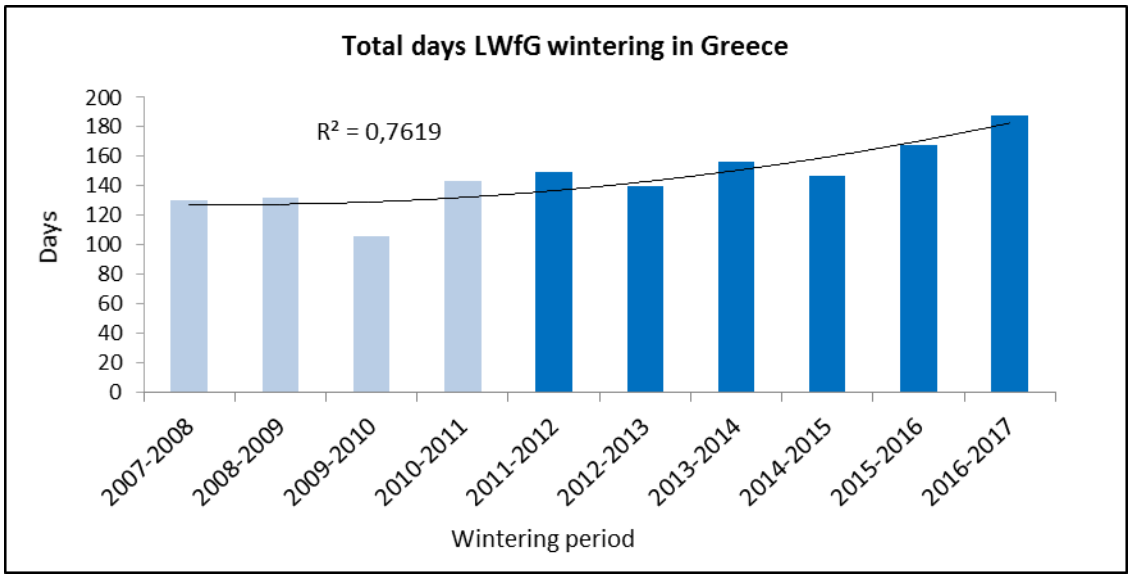

Figure 8. Total days the LWfG spent in Greece. In recent years, a slight increase in the total number of days the flock stays in Greece has been observed.

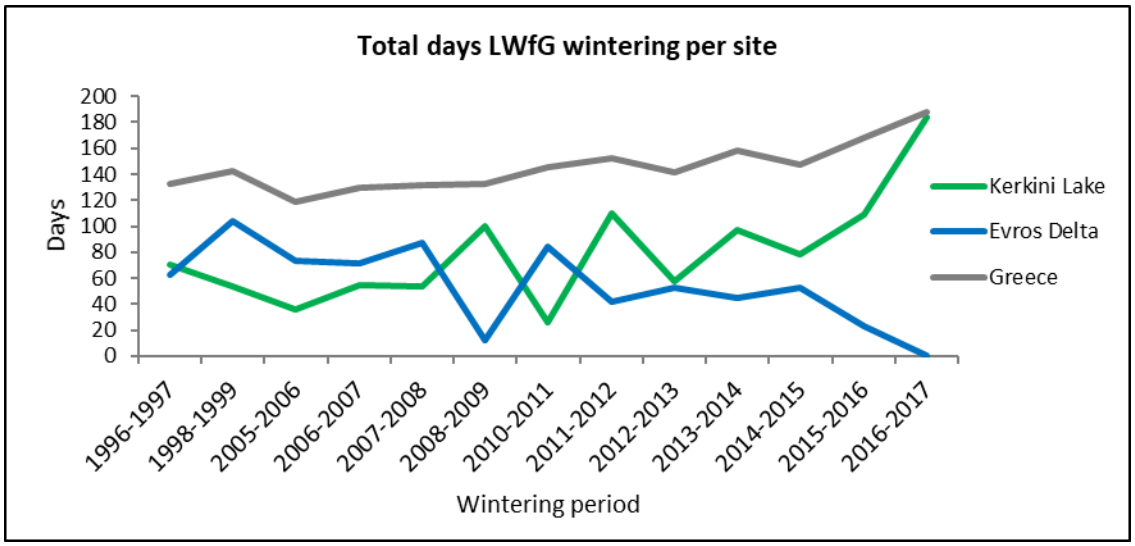

Figure 9: Total number of days the LWfG spent wintering in Greece and in the 2 project areas. Data 1997-2017.

Peak numbers in Greece were observed between weeks 52 and 12, with a second smaller peak in week 7 (Figure 10). This comes as a result of the different arrival times at Kerkini Lake of the various groups that constitute the flock during migration and the differences in reappearance following the period that the flock cannot be observed in any known site (missing period). It has been more evident that since the increase in LWfG numbers, the flock separated in various groups – families (2- 6 groups). It has been observed that the family with the 2 ringed LWfG (WR and OGR) along with their young, usually arrived early and reappeared after a shorter period of time, when the larger part of the flock went missing. During the end of the wintering period and before the LWfG begun the spring migration, the flock reunited, hence the second peak during weeks 12-13. The peak weeks for Kerkini Lake were between weeks 52-53. In Evros Delta the highest peak was observed during weeks 11-12 with a second peak following the arrival of the flock to the Evros Delta on the 53-1st week. In total, the time the species spent in Evros Delta has shortened and presented irregularities from year to year.

Table 4: Overview of LWfG average timing during 1996-2013 and 2011-2017

Area	Days per wintering period during 1996-2013	Days per wintering period during 2013-2017	Peak weeks 1996-2013	Peak weeks 2011-2017
Greece	130,9 ± 42,2	158 ± 17.49	51-52	52-53, 7, 12-13
Kerkini Lake	60,9 ± 46,9	105.17 ± 44.17	44-48	53, 7, 12-13
Evros Delta	47,2 ± 38,6	20.17 ± 14.19	52 & 11-12	11-12

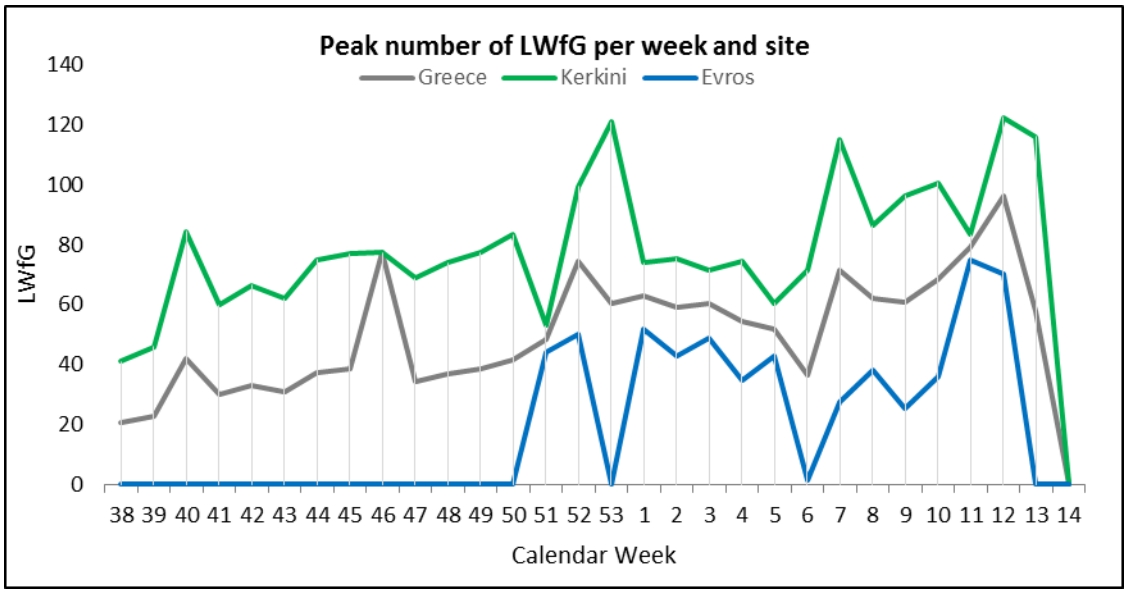

Figure 10: Mean number of LWfG (*Anser erythropus*) observed per week in Kerkini Lake Evros Delta and Greece (Average maximum). Changes have been observed at the average weak the observed population peak occurs. (Week numbers are automatically calculated based on the date by Microsoft Excel). Data 2011-2017

Regarding the other species of geese in Kerkini Lake and Evros Delta, the GWfG reached a peak on the 7th week in Evros Delta and during the 8th week in Kerkini Lake, arriving usually in significant numbers after the 50th week of the year and leaving by the 12th week of the following year (Figure 11). The Greylag Goose presented various peaks, appearing on the 39th week in Kerkini Lake, reaching the first peak during the 46th week and then on the 3rd week usually progressively reducing in numbers until the 13th week (a small population breeds at the Lake). In Evros Delta, it reached a peak during the last week of the year (53) and following, during the 7th and 9th week abruptly departing by the 11th week (Figure 12). The Red-Breasted Goose, a less frequent visitor, usually arriving during very cold weather, appeared in maximum numbers during the 3rd week and the 8th week in both areas (Figure 13)

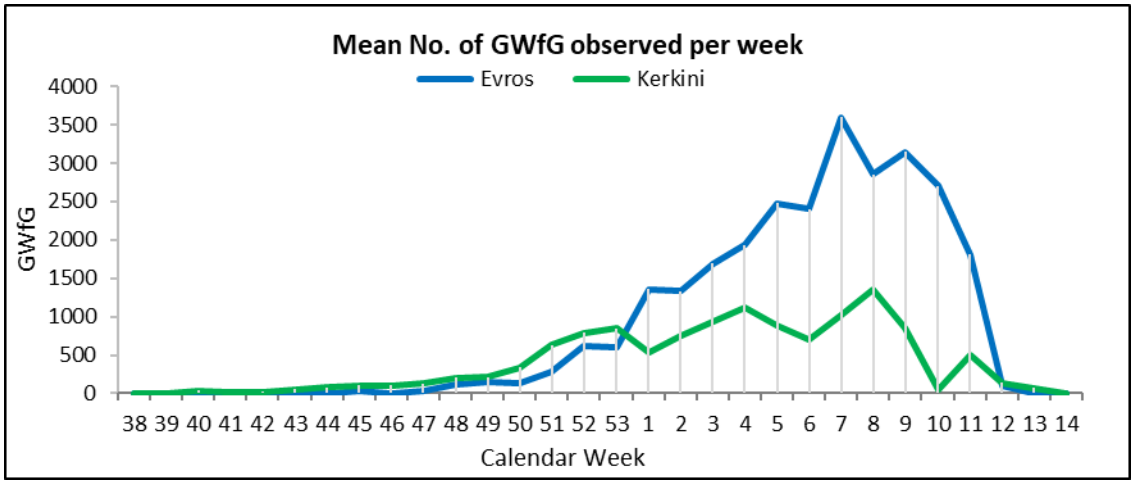

Figure 11: Mean number of GWfG (*Anser albifrons*), per week observed in Kerkini Lake and Evros Delta (average max). (Week numbers are automatically calculated based on the date by Microsoft Excel). Data 2011-2017.

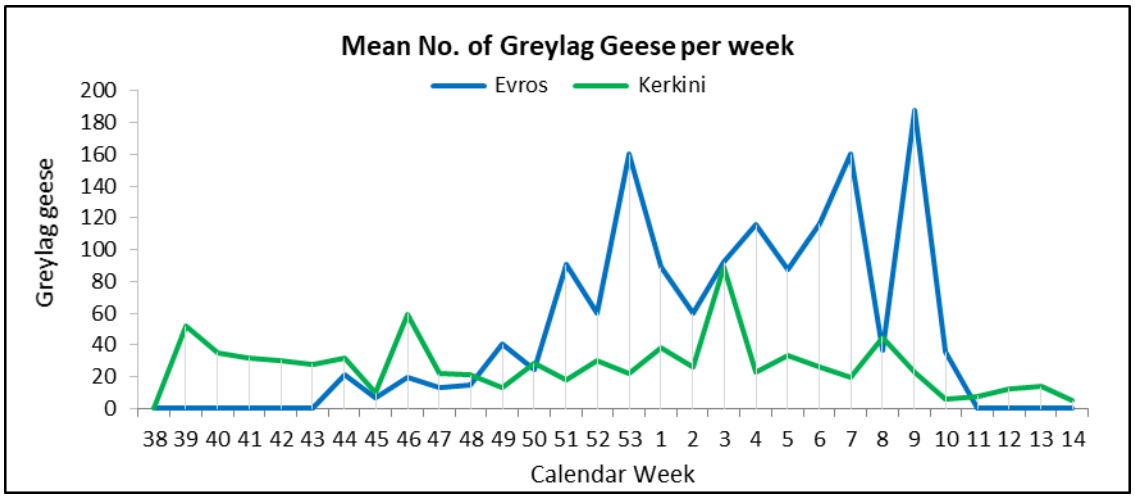

Figure 12: Mean number of Greylag geese (*Anser anser*) observed per week in Kerkini Lake and Evros Delta (Average maximum). (Week numbers are automatically calculated based on the date by Microsoft Excel). Data 2011-2017.

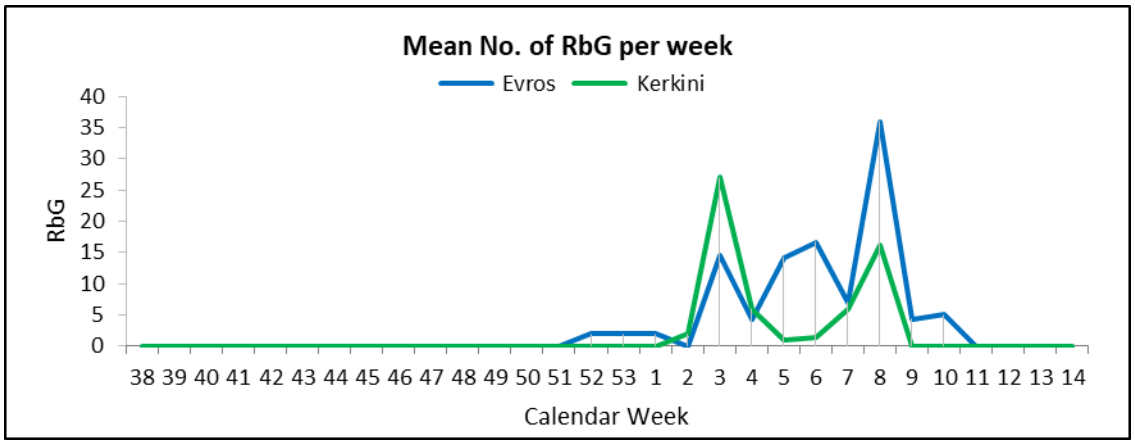

Figure 13: Mean number of RbG geese (*Branta ruficollis*) observed per week in Kerkini Lake and Evros Delta (Average maximum). (Week numbers are automatically calculated based on the date by Microsoft Excel). Data 2011-2017.

Wintering period 2011-2012

The first LWFG were observed in Kerkini Lake on 19/10/2011. The LWfG remained there until 5/2/2012 and on 23/2/2012 they were observed in Evros Delta. LWfG were not observed in any site, for a period of almost two weeks between 10- 22/2/2012 (24 days). The last LWfG departed on 18/3/2012 from Evros Delta. In total, they spent 149 days in Greece of which 100 days were at Kerkini Lake and 25 days in Evros Delta.

Wintering period 2012-2013

On 13/10/2012 the first LWfG appeared at Kerkini Lake where they stayed until 21/12/2012. The first observation from Evros Delta came on 9/1/2013 after a period of 18 days that no LWfG was observed in any site. The last LWfG was seen in Evros Delta on 2/3/2013, although the last significant number (15 LWfG) was observed in Evros Delta until 19/2/2013. Additionally, on 20/1/2013 1 LWfG was seen and photographed in Koronia Lake and on

25/1/2013 2 individuals were reported from the same area. The LWfG spent in Greece 140 days in total, of which 68 in Kerkini Lake and 54 in Evros Delta.

Wintering period 2013-2014

The LWfG flock was first observed in Kerkini Lake on 6/10/2013 and last seen on 12/3/2014 also in Kerkini Lake. In total they stayed for 93 days at Kerkini Lake, which consisted of two distinct periods (71 days +22 days) and 46 days in the Evros Delta. For about 17 days the flock couldn't be traced in any project site. In total the LWfG stayed in Greece for about 156 days.

Wintering period 2014-2015

The LWfG were first observed in Kerkini Lake on 1/10/2016. In total they stayed 79 days in Kerkini Lake also in two different periods (68 +11 days). In Evros Delta they stayed 42 days in two separate periods (29 +13) and the last individual was observed on 24/2/2016. The flock could not be observed in the project sites for a period of 25 days (15 + 11). The Management Authority of Lakes Koronia - Volvi reported an unidentified flock of geese of equal individuals as the missing LWfG at the western part of Koronia Lake (42 inds) flying NW, along Bogdanas stream on 9/2/2015. In total the LWfG remained in Greece for 147 days.

Wintering period 2015-2016

During this period the flock was first seen in Kerkini Lake on 2/10/2016 and departed also from there on 20/3/2016. They remained there for 145 days in total in two distinct periods (112 + 33) although, the period that part of the flock was in Evros Delta a small group of LWfG remained in Kerkini Lake. The time spent in Evros Delta is presumed to be 23 days in total although during that period the flock (28-85 inds.) could not be observed regularly. This period is the shortest stay during all the monitoring years. There is no distinct missing period for this winter yet the number of individuals observed was unstable for about 23 days. In total the LWfG stayed in Greece for 168 days.

Wintering period 2016-2017

During the last wintering period of the project, the first LWfG were observed in Kerkini Lake on 15/9/2017. The flock remained at the Lake until 6/01/2017 when a period of exceptionally cold weather hit northern Greece, covering the wider area of Kerkini Lake with snow. For a period of 18 days the flock was unaccounted for, when 38 individuals reappeared at the Kerkini Lake on 24/1/2017 (total number of LWfG 130). Individuals' numbers varied until 8/3/2017 and LWfG were last observed there on23/03/2017. At Evros Delta, one family of 3 LWfG and a single individual remained from 3/2/2017 until 6/3/2017. In total, the LWfG spent 188 days in Greece of which 170 at Kerkini Lake. This is the longest period the LWfG have ever remained in Greece and at Kerkini Lake. Additionally, the Fennoscandian LWfG flock did not appear to visit the Evros Delta at all.

3.2.4. Identification of LWfG individuals

3.2.4.1. Observations of color-ringed individuals

Wintering period 2011-2012

During the first year of the project, 5 Color Ring Codes (CRC) were observed in Greece (Table 5). The first CRC was observed on January in Kerkini Lake. In Evros Delta, 5 CRC have been identified with a total of 16 observations. The WR code was observed in Evros Delta for the first time, although it has been observed for 2 consecutive years in Kerkini Lake before. The CRC ORL, Finn (male/ringed 18/05/2006), has been observed in Greece since 2006, which was also the year that the bird was ringed at the Valdak marshes. The poor visibility and long distances allow only a short glimpse of the rings when conditions are favorable, as a result, there are 6 unidentified CRC observations from Kerkini Lake and one from Evros Delta this period.

Wintering period 2012-2013

During 2012-2013 the CRC was observed in Kerkini Lake on 15/10/2012. In total 8 CRC and 1 unidentified CRC were observed in Greece, 8 CRC in Kerkini Lake and 4 CRC in Evros Delta. It has been observed that Color Ring Codes GR, OR and RR are confusing due to loss of one of the two color rings. In that way, they can easily be mistaken for OGR and RGR CRC. During this period RR and GR were observed simultaneously with OGR and RGR on 15/10/2012. Similarly, OR was recorded on 19/10/21012 at the same time as OGR. For this reason they are included as separate color codes (Table 5).

Wintering period 2013-2014

During 2013-2014 there were 5 CRC observed in Kerkini Lake and 4 in Evros Delta. The first CRC observation was on 7/10/2013 (Kerkini Lake) were the rings OGR, OL, WR and one LWfG with only a metal ring were identified. On the following days Color Ring Code BL was added. In Evros Delta the first 2 CRCs were observed on 20/12/2013 although it was not made possible to identify them. The observers noted that the two colour-ringed LWfG were possibly a pair. On 2/1/2014 the BL code was observed and the following days, codes OGR, WR and OL. There are no unidentified CRCs in Kerkini Lake for that wintering period and 3 unidentified CRCs observations in Evros Delta. Identification in both areas is demanding due to long distances from flock, mud covering the CRCs and often poor visibility. It has been noted that the LWfG bearing the CRC WR and OGR are possibly a pair, a fact confirmed in the following periods.

Wintering period 2014-2015

The first CRC observation for the period 2014-2015 was made on 3/10/2014 were the codes BL, OL, WR and OGR were recorded in Kerkini Lake. On 24/10/2014 another code was added, which belonged to Finn (color code ORL). The previous observation of the same bird was on 2011-2012. In total, 5 CRCs have been recorded. In Evros Delta, the first LWfG individuals bearing a CRC were seen on 7/01/2015 with codes WR, OL and OGR. The same LWfG were observed also on 11/02/2015. No further CRCs were reported and thus the estimated max of LWfG was 55 individuals since in both project areas 53 individuals were reported (53+ 2 CRC missing in Evros).

Wintering period 2015-2016

During winter 2015-2016 the first CRCs were observed on 3/10/2015 reporting 3 LWfG with codes OGR, ORL (Finn) and WR. On 5/11/2015 another CRCs OL and BL were observed. Also, on 24/2/2016 a CRC was observed that could be GL yet due to uncertainty it is categorized as unidentified. No CRC observation was reported in Evros Delta, since monitoring conditions were very difficult during this period and the flock was visible only a handful of times. In Kerkini Lake, the pair OGR – WR was observed together with 3 juveniles.

Wintering period 2016-2017

The first CRC (WR) observed on 18/9/2016 at Kerkini Lake, was also observed on 5/9/2016 in the Valdak marshes, Norway. It is likely that WR, OGR and OL were also present at Kerkini Lake from 15/9/2016 yet due to long observation distances safe identification was not possible. In total 4 CRCs have been identified, among which Finn (ORL). No CRCs were observed in Evros Delta. Once again, the WR - OGR couple was observed with 2 juveniles. The absence of other CRCs suggests that many previously ringed LWfG have either lost their color rings or have died. CRC observation by the MA ornithologists has improved significantly over the years and is believed that all CRCs arriving in Greece are recorded. A complete table with all the observations of the CRCs can be found in the Annex I.

Table 5: Overview of CRC observations (K= Kerkini Lake, E = Evros Delta)

CRC	2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		Total number of obs.
	K	E	K	E	K	E	K	E	K	E	K	E	
BL		4	4	2	10	2	1		1				24
GL			1						?				1
GR		4											4
OGR		4	8	1	10	3	1	2	23		18		70
OL			3	1	11	1	2	2	14		15		49
OR			1										1
ORL	3	2					1		1		1		8
RGR			1										1
RR			1										1
WR		2	5	2	10	2	1	2	23		20		67
Metal Ring Only					2								2
Sum obs. per area	3	16			11	11	6	6	23	-	21		
Sum CRCs per area	1	5			6	4	5	3	5	-	4		
Unidentified CRCs	6	1			-	3	-	-	1	-			4

3.2.5. Recording of Belly Patches

Recorded videos in Kerkini Lake from the 2013-14 wintering period have been examined based of quality and analyzability giving 5 complete profiles. For the wintering period 2014-2015, it hasn't been made possible to obtain suitable videos since the flock was mainly found in great distances from observation points (≈ 500- 800m) and low visibility due to the prevailing weather conditions. During 2015-2016 and 2016-2017 a number of good quality videos have been obtained and added to the video data-base for the creation of a belly patch catalogue for future reference. Again, most of the videos are not eligible for analysis and many LWfG are partially profiled (only 1 or two sides of the belly patches). The 4 LWfG observed in Evros Delta during February 2017 have also been photographed by ornithologist Didier Vangeluwe (Royal Belgium Institute of Natural Sciences), giving a partial profile for comparison.

Evaluating the method of drawing the LWfG directly at the field in lieu of obtaining video series, it presents various difficulties when practiced at the Greek project areas. Firstly, the flock maintains long distances from any observation point, especially upon arrival and quite often moves behind loose vegetation (Evros Delta). Moreover, the flock moves as a unity and it is quite demanding to visually isolate an individual in order to accurately draw the belly patch pattern. Even during video analysis, many playbacks are needed in order to safely collect the appropriate frames depicting a single individual from all sides. It is more likely for the researcher to misplace belly patches, due to haze, water reflections, and muddy smudges on the belly of a bird and even to avoid drawing LWfG with smaller patterns, thus create the false perspective that LWfG with certain patterns are more frequent visitors than others. A combination of video profiling and belly patch drawing seems to be the most effective way to profile LWfG individuals (Figures 14, 15).

Figure 14: Individual identified by three sides in Lake Kerkini 2013-2014 (Ind. Code A004-7/10/2013)

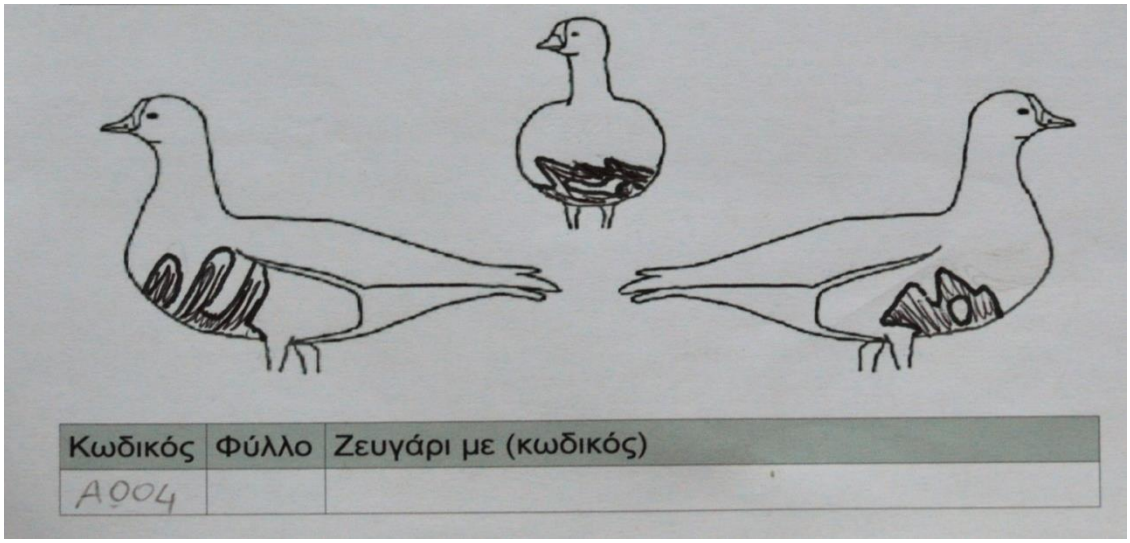

Figure 15: The produced drawing of the same individual (Ind. Code A004- 7/10/2013).

3.3. Habitat Use by LWfG

To assess habitat use by the LWfG during the first 3 wintering periods, the monitoring teams of Evros Delta and Kerkini Lake estimated the position of the flock in the area by recording it on a 500x500m grid in each project area on the provided maps for that purpose. During the 2014-2015, 2015-2016 and 2016-2017 wintering periods protocols were transferred in an electronic form automatically storing the position of the observer by build-in GPS (GPS tablets). When data were introduced, the coordinates of the observer were stored, and the position of the flock was estimated by the distance from the flock and the angle with respect to magnetic North the flock was observed. Additionally, when specific marks the observer felt familiar with were in the vicinity (trees, natural formations, fencing), the respected grid square was also noted (more frequently used by the monitoring team in Kerkini Lake).

3.3.1. Kerkini Lake

At Kerkini Lake during all wintering periods the flock was observed primarily at Stomio (mouth of Strymonas River) and Trigono area. There were no observations of LWfG individuals at Mandraki area or at the fields near Limnochori village. Although the analysis results showed that during most winters the LWfG flock favors the areas near Stomio which were flooded during the winter periods 2010 to 2013, during the 3 year winter periods of 2013-2016 the flock has shifted its primary habitat use preferring areas closer to the eastern dyke, hence avoided the January flooding and extended their stay in the Lake. During the 2014-2015 wintering period, the LWfG had to depart from Kerkini Lake (11/2/2015) due to a sudden flooding of the lake although the flock had already returned once from Evros Delta (21/1/2015). During 2016-2017, the water level of the lake was particularly low, allowing the LWfG to expand their feeding sites up to 1km from the river mouth (Annex II, Map 1, 5).

3.3.2. Evros Delta

Habitat use in Evros Delta was limited in Dimitriadis meadow and specifically in the western to western-northern part of the meadow. Hunting activity continues to be the limiting factor for the expansion of geese to other suitable habitats. The goose flocks remained within the boundaries of the Wildlife Refuge and rapidly dispersed to other suitable areas when the hunting season ended (Annex II, Map 2, 4).

The LWfG presence since 2013 was unstable and shortened. Hunting pressure seems to be a repressive factor not only due to the eminent risk of accidentally shooting, but also due to the "overcrowding" effect created in the Dimitriadis meadow (Karmiris et al. 2009). Especially during 2016-2017, in Evros Delta precipitation was particularly low, leading to shrinkage of available fresh grass within the Dimitriadis meadow. As a result the quality of the habitat was low and the large number of geese was confined at the northernmost area of the meadow, closer to the Wildlife Refuge border where most goose hunters frequented and ready to expand further when the limiting factor was withdrawn. Plant associations in Dimiatriadis meadow are equally variable and highly dispersed due to variation in environmental conditions. Water in this case, plays a vital role since the presence or absence of it influences habitat quality (water quality, depth, salinity levels etc.) (Karmiris et al. 2011). The decrease of suitable natural habitats for geese in the Evros Delta was already mentioned more than 20 years ago (Handrinos & Goutner 1990).

Food availability at Dimitriadis meadow is limited, since grass associations are also limited in comparison to those of halophytes (Karmiris et al. 2009). This might explain the absence of LWfG in Evros Delta (irregular numbers compared with previous years) the past two years, and even draws attention to the possible further degradation of available natural grasslands in Evros Delta as a result of climate change.

During 2014-2015 there was one observation (24/2/2015) of an LWfG individual feeding with 3,000 GWfG at Kalavos area, whilst during 2016-2017 3 LWfG were observed in Kalavos along with 2500 GWfG and at least 50 RbG. The first observation in Paloukia lagoon after many years was also in February 2017, when 2 LWfG were observed feeding among GWfG.

Visibility continues to be an issue that affects accurate LWfG identification in Evros Delta, due to high vegetation and long distances from accessible observation points. During 2016-2017 when most geese were observed foraging and roosting in Kalavos, the main body of the mixed flock (GWfG-RbG-LWfG) observed didn't allow to approach closer than 500-600m to properly examine the for LWfG presence, often resulting to escape flights of several thousands of geese (2000-3000 GWfG mainly).

4. Discussion

4.1. Threats and Counterweight Actions

4.1.1. Human stressors

4.1.1.1. Hunting pressure

As stated in the previous chapter, hunting activity limits goose populations and especially the LWfG within the Dimitriadis meadow, in the core area of the Wildlife Refuge (WR). In Evros Delta, most goose hunters concentrate at the border of the WR (Kalavos), pushing geese further inside Dimitriadis meadow, distancing themselves from the congregation of hunters that surrounds the northern part of Dimitriadis meadow and Kalavos. Goose hunting intensifies in the beginning of January when the first GWfG arrive and as of 2017, lasts until 31/01 (GWfG numbers peak during week 7). During the2016-2017 period, hunting was banned for 8 days (10-18/01/2017) due to the extreme cold weather. During that time, as well as after the end of the goose hunting season, most geese in the area were found feeding and roosting in the Kalavos area. Even though during the Smart Patrol System operation the rate of illegal killing was low at the project areas, there are still incidents that prove that poaching exist, even within the protected areas (Demertzi, A. et al., 2017). Of particular importance is the encounter of a Dalmatian Pelican shot dead in Kalavos, the size and form of which certainly cannot be confused with any other species of bird (January 2016). Similarly, a shot and wounded Red-breasted Goose was found in Kalavos, a species very distinct that cannot be confused with any game species (January 2017). .

Furthermore, during 2016-2017, at Kerkini Lake there were various incidents of poaching within the WR (Trigono area, Megalochori area) that demand local authorities to be on guard (Demertzi, A. et al. 2017). The SPS remote unit in Kerkini Lake is placed at the core roosting site of the LWfG and therefore offers a clear view of the area in case poachers or unauthorized individuals approach Stomio area. Equally, the SPS units in Evros Delta cover almost entirely the WR area and can warn authorities if anyone is found within the core of the WR.

4.1.1.2. Human presence

During the 2014-215, 2015-2016 and 2016-2017 wintering periods, increased human activity was observed within the protected areas and close to the primary LWfG feeding and roosting sites, mainly for recreational activities (photography, birdwatching, ecotourism) and hunting. It has to be noted that uncontrolled movement within the wildlife refuge can be also an important disturbance factor. Human presence and passing by vehicles can displace goose flocks further inside the protected area and away from the peripheral roads, and thus restrict their feeding grounds. Roads with a traffic volume of 20-50 cars per day have been found to have a serious depressing effect on goose utilization in a range of 0-500m from the road. Even a road which does not carry cars daily was found to have a depressing effect on

utilization and a disturbance distance of approximately 100m (Madsen J., 1985). Furthermore, frequent vehicle movements and especially slow moving cars with irregular stops forces goose flocks to escape flights with average flight distances 300-400m (Madsen J., 1985) which may result in significant energy costs for the wintering birds. In areas with hunting activity, the disturbance flight may reach the 500m. The disturbing effect of shooting on flight distances of geese, have also been noted in a study, where it was found that in the years following a ban on shooting of GWFG and Bean Geese (*Anser fabalis*), the flight distances of wintering flocks decreased from generally 500 to 200m. As a result geese expanded their feeding grounds close to roads and banks previously avoided (Gerdes, Reepmeyer, 1983).

In Evros Delta, a 5 year ban limiting access to Wildlife Refuge has been imposed, which forbids unauthorized vehicles from passing through the Wildlife Refuge. The restriction was imposed on January 2015 and immediately traffic was reduced and directed outside the WR by the SPS patrol team in an effort to minimize disturbance to the wintering waterfowl. The following winter periods, it has been observed that traffic resumed mainly because no fines were imposed, hence most passer-byes ignored forest service's warnings and continued moving through the WR. During 2016-2017, traffic was particularly low until January, probably due to good weather conditions that didn't favor hunting activity. As a result, waterfowl was observed by the monitoring team in short distances, moving away from the observer in a more calm fashion, especially around Paloukia lagoon.

At Kerkini Lake, the SPS also recorded a few vehicles approaching the core of the wildlife refuge in Stomio area for recreational purposes and the Management Authority was informed in order to control and limit eco-touristic activities at the perimeter of the protected area.

4.1.2. Natural Stressors

According to the monitoring results, the presence of natural predators is evident in many cases both at Kerkini Lake as well as in Evros Delta. At Kerkini Lake, the presence of raptors close to the LWfG flock is frequent although no LWfG predation by raptors was recorded. Larger raptors occasionally disturbed the flock which reacted with short escape flights to near-by places. Most common raptors seen near or flying around the flock were Spotted Eagle (*Aquila clanga*), Peregrine Falcon (*Falco peregrinus*) and Marsh Harrier (*Circus aeruginosus*). Furthermore, the SPS (winter 2015-2016) recorded movements of Golden Jackals (*Canis arueus*) at Stomio area, near the roosting flocks of geese although no evidence of predation was recorded. During 2016-2017, the MA of Kerkini Lake also recorded a pack of wolfs *Canis lupus* (8 individuals) at the western part the Lake.

Similarly, in Evros Delta, frequent was the presence of the White-tailed Eagle (*Haliaeetus albicilla*) and Spotted Eagle (*Aquila clanga*) in Dimitriadis meadow, yet no interaction was recorded with the LWfG flock or any other species of geese present. Golden Jackals (*Canis aureus*) and Red Foxes (*Vulpes vulpes*) were seen regularly near or in Dimitriadis meadow suggesting possible disturbance to roosting flocks. During March 2015-2016, on a visit to the northern part of the meadow, various spoors of possible Golden Jackal or Fox were

observed, as well as parts (1 wing and various skeletal parts with feathers) of GWfG and Ruddy Shelduck (*Tadorna ferruginea*) also suggesting predation on geese. On February 2017, 2 White-tailed Eagles were observed predating on northern Pintails (*Anas acuta*) at the NW part of Dimitriadis meadow yet again, no interaction with GWfG occurred.

4.2. Monitoring Effort

Following the project's proposal, the overall pattern of the Fennoscandian LWfG population observed wintering in Greece is the main indicator of project's effectiveness. Since the beginning of the project an increase of the total number of individuals observed in the Greek project areas has been observed, which peaked during wintering period of 2015-2016. Additionally, the average time the flock spent in Greece was extended, with the first observations coming from Kerkini Lake even on mid-September.

Dissemination actions have increased the public engagement in the conservation efforts for the species, with a significant number of people trained on LWfG identification. As a result, many reports of LWfG, especially in Evros Delta come from people outside the project team, mainly photographers and birdwatchers. Furthermore, especially during the "missing period", birdwatchers were informed through chain e-mail and helped in the search of the LWfG. In addition, on January 2017 when the cold weather brought thousands of GWfG in Greece, in various sites outside the project areas, there was fast information exchange between birdwatchers, wildlife photographers, Management Authorities and HOS, to examine any flock that might contained LWfG individuals. Although no LWfG were found, the increased number of observers allowed simultaneous searches.

Monitoring efforts have been significantly improved in terms of efficiency, resulting in more accurate and useful data gathering. The monitoring teams of the Management Authorities of Kerkini Lake, Ismarida Lake and Evros Delta of the project areas have gained a valuable expertise regarding the species, ensuring the long term efforts in LWfG identification and monitoring.

Through the Local Action Plans for the protection of endangered species of fauna in Kerkini Lake, Lake Ismarida and Evros Delta, local stakeholders and mainly public services responsible for wildlife protection have come together to discuss strategies coping with illegal killing and to coordinate patrolling efforts. In Evros Delta, the Forest Directorate also organized seminars (2015-2017) for forest officers, wildlife rangers, hunters and local people in order to increase awareness regarding the avifauna of Evros Delta and the methods to protect it.

Furthermore, the Smart Patrol System scheme that run along the monitoring scheme, regulated human presence within the Wildlife Refuges, limiting illegal actions to the peripheral zone, thus creating a secure zone for the LWfG to winter safely. The CCTV systems installed in both areas seem to have a preventing effect to the regular users of both areas (hunters, fishermen, shepherds), which avoided the areas surveyed and acknowledged the WR borders. The Forest Service officers participating in the SPS are also engaged in the

LWfG conservation scheme, better informed and well-trained to cope with illegal killing incidents.

4.3. Habitat changes

The main roosting and feeding sites of the LWfG in Greece and elsewhere have decreased over the course of time due to human activities. Fragmentation of suitable habitats, changes in land use practices, extensive stock grazing or abandonment of traditional stock grazing and changes in the natural hydrology of many wetlands (Ismarida Lake, Evros Delta), have shrunken available wintering grounds for the species, maximizing the need to safeguard the few areas that LWfG still visit. The expected results of climate change will further reduce suitable habitats for LWfG as that might be the case in Evros Delta. Progressively the species has chosen Kerkini Lake over the Evros Delta, possibly due to habitat degradation. This increases responsibility in Greece, since from now on the LWfG may depend solely on one site, hence effort must be given to improve conditions in the previous visited areas to increase available options for the species.

At Kerkini Lake, it has been made evident that one of the factors influencing space and food availability is the water level of the lake and the timing with which water floods open spaces during late winter-early spring. It has to be pointed out that Kerkini Lake is a reservoir created in order to provide flood protection and irrigation for the valley of Serres, and therefore conservation targets must be balanced with the needs of the local communities. Effort has been given in order to reach a common ground among local stakeholders and follow a moderate flooding protocol in favor of the many species found in Kerkini Lake. If the low water level with steady influx observed during winter periods 2013-2017 persists, regulated flooding will favor LWfG population greatly.

At Ismarida Lake, a previously favored area of the LWfG population, fragmentation of the LWfG habitat due to roads, salinization of the water body and uncontrolled hunting has led the species to abandon the area. The high number of GWfG observed during 2016-2017 in the wider area of Lakes Ismarida, Vistonida and the neighboring lagoons, surpassed the highest numbers observed in Evros Delta and Kerkini Lake (more than 4,000 inds.). This observation underlines the importance of these areas for the goose populations when environmental conditions are demanding at their primary wintering areas. Patrols at the area, ensured that hunting remained within legal limits and the hunting ban imposed during January had a positive effect for the stressed avifauna. An overall habitat restoration plan is needed for the area in order to ensure suitable conditions for LWfG to return as well as clear WR borders to be marked peripheral and be respected by hunters.

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ANNEX

CONTENTS

TABLE A: Frequency of observations of each Color Ring Code per area and year (updated)

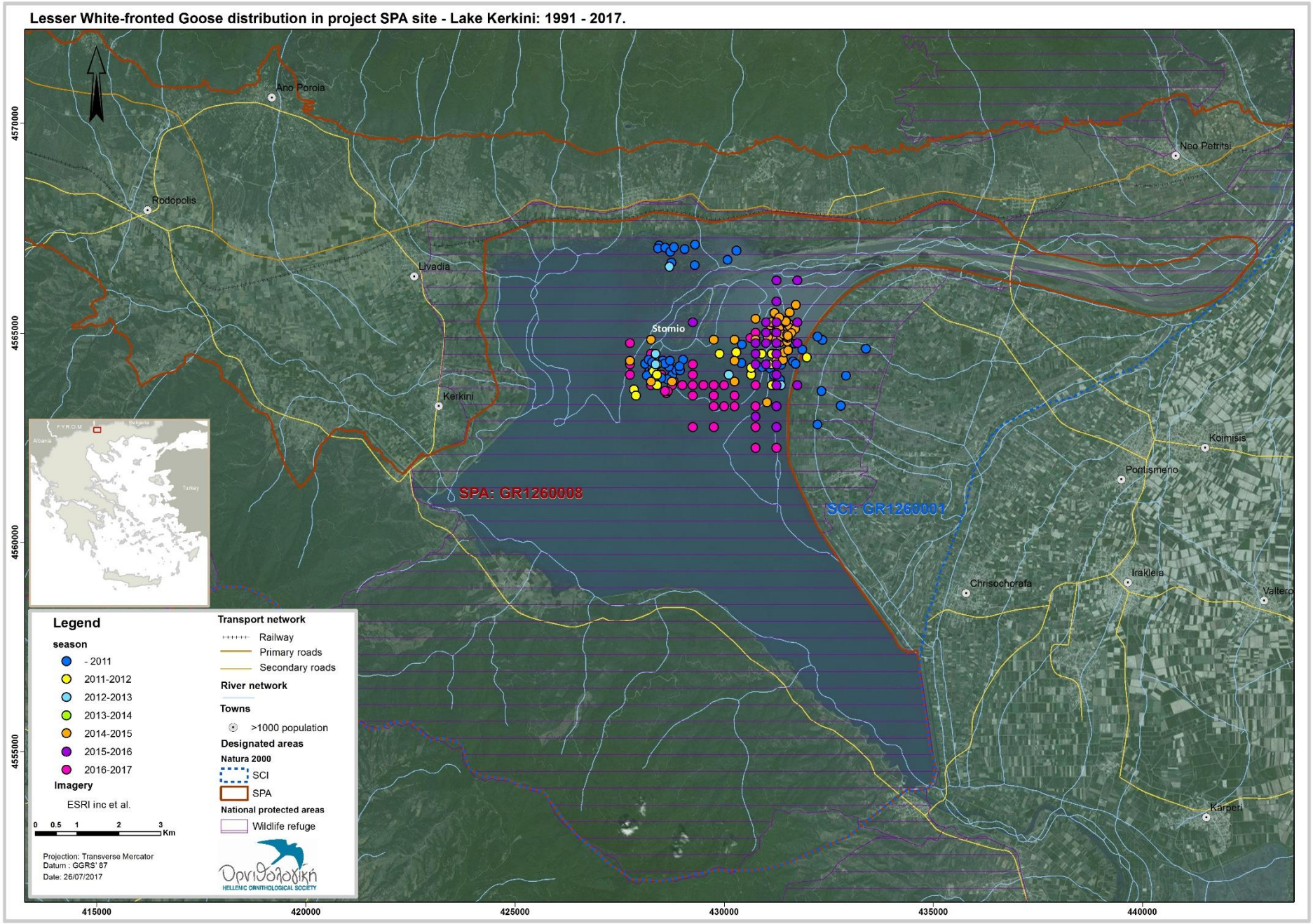
Color Ring Code	1996-1997		2000-2001	2002-2003	2003-2004		2004-2005		2005-2006	2006-2007		2007-2008		2008-2009	2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		Total obs. Per CRC
	E	K	K	K	E	K	E	K	E	E	K	E	K	K	E	K	E	K	E	K	E	K	E	K	E	K	
BGR				1																							1
BL							5		1					3	4		2	4	2	10		1		1			33
BRL				2		1	4	1	6	1			7														22
BWL				1																							1
GBR			2	2		1																					5
GL																		1									1
GR															4												4
Green Neck Ring	1																										1
OGR															4		1	8	3	10	2	1		23		18	70
OL																	1	3	1	11	2	2		14		15	49
OR																		1									1
ORL										20		12		3	2	3						1		1		1	43
OYR							3		5	1																	9
RBL			2					1																			3
RBYL		3																									3
RGR																		1									1
ROR										3			6														9
RR																		1									1
RWL				1			3	1	5	17	1	10	1														39
RWR										2	1		15	3													21

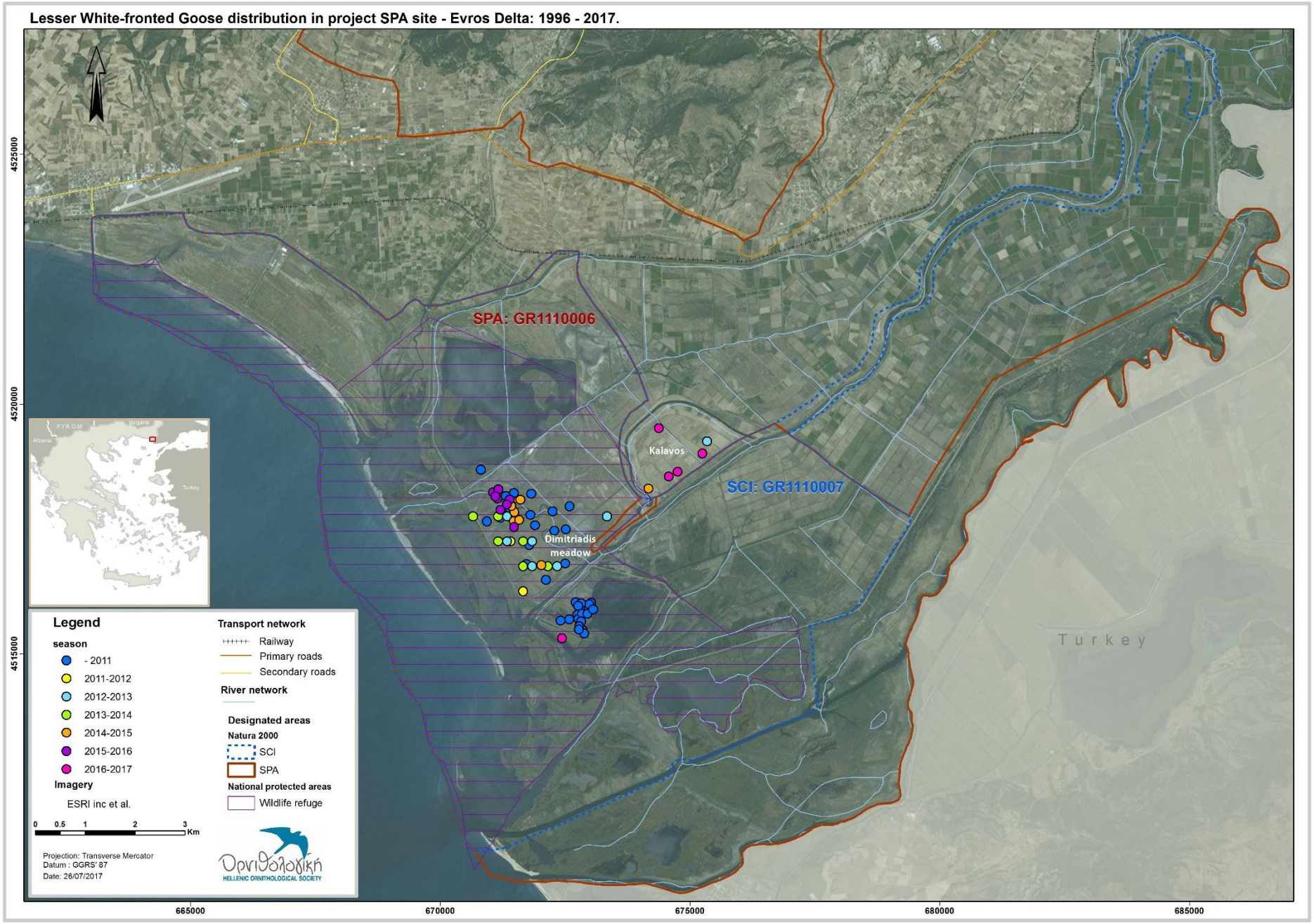
WBR				1																							**1**
WGL				3	1	1	4	1																			**10**
WR														1	2		2	5	2	10	1	2		23		20	**68**
WYL							3	1																			**4**
YGL			2																								**2**
BGR				1																							**1**
YR							2		4			8		1													**15**
YRL								1																			**1**
YRR			2	1																							**3**
Total obs. year/area	**1**	**3**	**8**	**12**	**1**	**3**	**24**	**6**	**21**	**44**	**2**	**30**	**29**	**11**	**16**	**3**	**6**	**24**	**8**	**41**	**5**	**6**	**-**	**61**		**21**	**422**
CRC's per year & area	**1**	**1**	**4**	**8**	**1**	**3**	**7**	**6**	**5**	**6**	**2**	**3**	**4**	**5**	**5**	**1**	**4**	**8**	**4**	**4**	**3**	**5**	**-**	**5**		**5**	
Unidentified						**1**		**1**			**1**		**2**	**2**	**2**	**11**	**1**	**4**	**3**					**1**			**29**

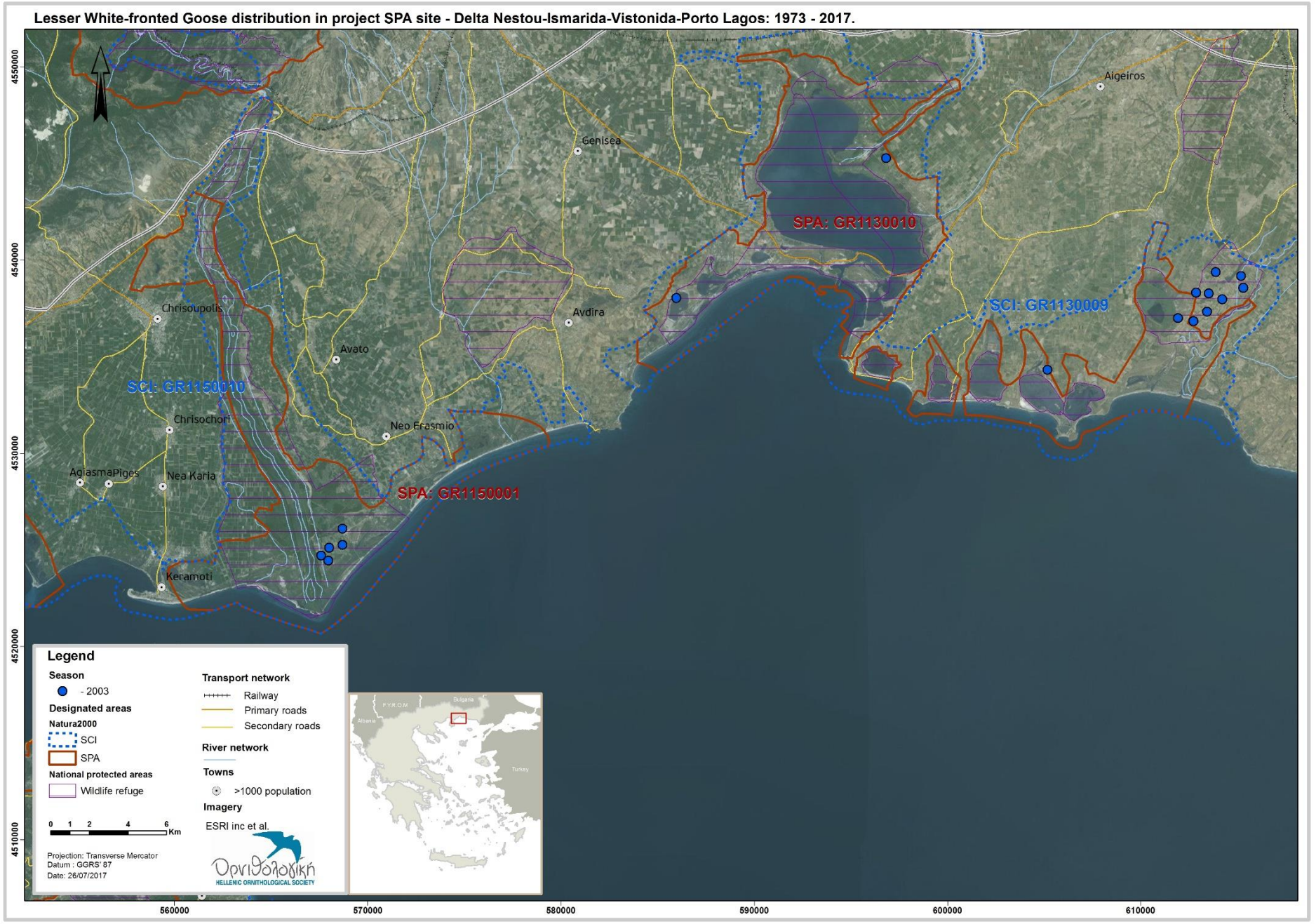
TABLE B: Observation years for each CRC (updated)

RING	FIRST DATE		LAST DATE	
	Evros Delta	Kerkini Lake	Evros Delta	Kerkini Lake
BGR		28/11/02		28/11/02
BL	31/12/04	27/11/08	14/01/14	5/11/15
BRL	04/01/05	21/10/02	04/03/07	10/02/08
BWL		20/11/02		20/11/02
GBR		23/11/00		20/11/03
GL		15/10/12		15/10/12
GR	06/03/12		18/03/12	
GREEN NECK RING	10/02/97		10/02/97	
OGR	28/02/12	15/10/12	11/2/15	15/2/2017
OL	10/01/13	20/10/12	11/2/15	25/2/17
OR		19/10/12		19/10/12
ORL	03/01/07	27/11/08	28/02/12	12/12/16
OYR	07/01/05		04/03/07	
RBL		23/11/00		28/11/04
RBYL		07/11/96		04/02/97
RGR		15/10/12		15/10/12
ROR	20/02/07	30/11/07	04/03/07	10/12/07
RR		15/10/12		15/10/12
RWL	31/12/04	28/11/02	07/03/08	01/12/07
RWR	20/02/07	21/12/06	03/03/07	15/03/09
un	06/03/12	20/11/03	10/01/13	21/10/12
WBR		24/11/02		24/11/02
WGL	03/01/04	20/11/02	24/02/05	28/11/04
WR	28/02/12	15/03/09	11/2/15	8/3/2017
WYL	31/12/04	28/11/04	07/01/05	28/11/04
YGL		23/11/00		30/11/00
YR	21/02/05	27/11/08	15/02/08	27/11/08
YRL		28/11/04		28/11/04
YRR		23/11/00		28/11/02

Annex II


Lesser White-fronted Goose distribution in project SPA site - Lake Kerkini: 1991 - 2017.
Ano Poroia
Rodopolis
Livadia
Kerkini
Stomio
Nea Petritsi
Koimisis
Pontismeno
Irakleia
Chrisochorafa
Valtero
Karperi
SPA: GR1260008
SCI: GR1260001
Legend
season
- 2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
Imagery
ESRI inc et al.
0 0.5 1 2 3 Km
Projection: Transverse Mercator
Datum : GGRS' 87
Date: 26/07/2017
Transport network
Railway
Primary roads
Secondary roads
River network
Towns
>1000 population
Designated areas
Natura 2000
SCI
SPA
National protected areas
Wildlife refuge
HELLENIC ORNITHOLOGICAL SOCIETY
4570000
4565000
4560000
4555000
415000
420000
425000
430000
435000
440000


Lesser White-fronted Goose distribution in project SPA site - Evros Delta: 1996 - 2017.
SPA: GR1110006
SCI: GR1110007
Kalavos
Dimitriadis meadow
Turkey
F.Y.R.O.M
Albania
Bulgaria
Turkey
Legend
season
- 2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
Imagery
ESRI inc et al.
Transport network
Railway
Primary roads
Secondary roads
River network
Designated areas
Natura 2000
SCI
SPA
National protected areas
Wildlife refuge
0 0.5 1 2 3 Km
Projection: Transverse Mercator
Datum : GGRS' 87
Date: 26/07/2017
Ορνιθολογική
HELLENIC ORNITHOLOGICAL SOCIETY
4525000
4520000
4515000
665000
670000
675000
680000
685000


Lesser White-fronted Goose distribution in project SPA site - Delta Nestou-Ismarida-Vistonida-Porto Lagos: 1973 - 2017.
Aigeiros
Genisea
SPA: GR1130010
SCI: GR1130009
Chrisoupolis
Avdira
Avato
SCI: GR1150010
Chrisochori
Neo Erasmio
AgiasmaPiges
Nea Karia
SPA: GR1150001
Keramoti
Legend
Season
- 2003
Designated areas
Natura2000
SCI
SPA
National protected areas
Wildlife refuge
Transport network
Railway
Primary roads
Secondary roads
River network
Towns
>1000 population
Imagery
ESRI inc et al.
0 1 2 4 6 Km
Projection: Transverse Mercator
Datum : GGRS' 87
Date: 26/07/2017
Ορνιθολογική
HELLENIC ORNITHOLOGICAL SOCIETY
F.Y.R.O.M
Bulgaria
Albania
Turkey
4550000
4540000
4530000
4520000
4510000
560000
570000
580000
590000
600000
610000


Antheia area
Drana Lagoon
Kalavos
Dimitriadis Meadow
Paloukia Lagoon
Nymfon Lagoon
Evros Delta GR006
3.60 km
© 2016 Basarsoft
Image © 2016 TerraMetrics
© 2016 Google
Image © 2016 DigitalGlobe
Google earth


Mandraki
Trigono
Megalochori
Stomio
(Strimonas mouth)
Kerkini
Limnochori
Korifoudi
Lake Kerkini GR020
4.79 km
Image © 2016 CNES / Astrium
Google earth

Annex III

Photo 1. An adult LWfG among GWfG in Evros Delta, 6/2/2017, Iliadis, G., MA of Evros Delta

Photo 2. An LWfG family feeding among GWfG in Kalavos, Evros Delta, 6/2/2017, Vangeluwe, D., Royal Belgian Institute of Natural Sciences

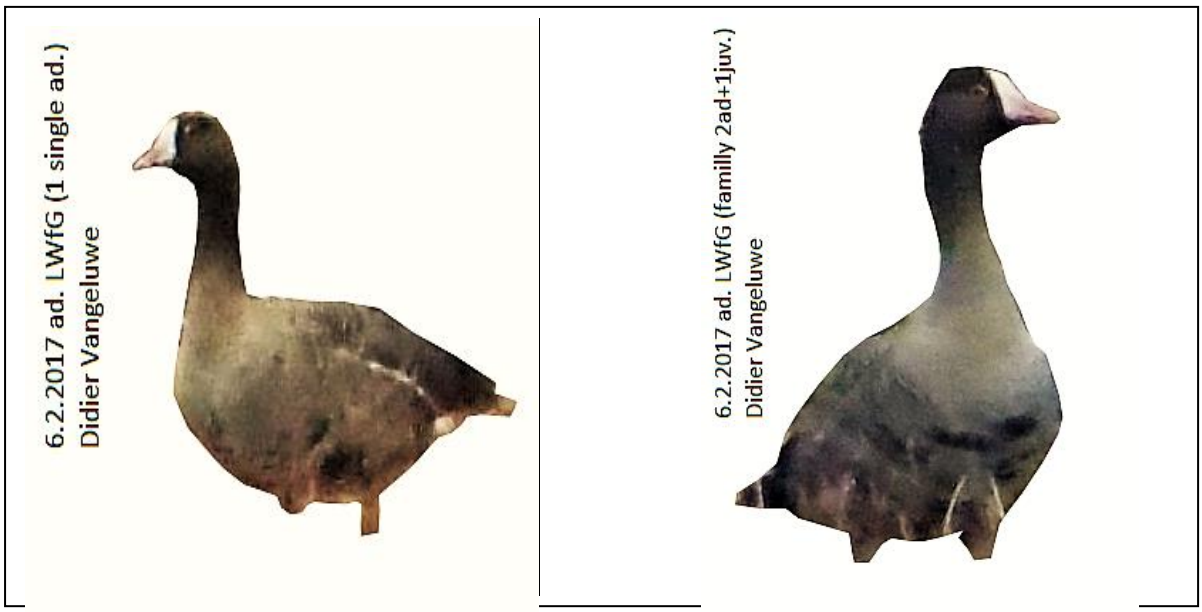


Photo 3. Two distinct LWfG feeding among GWfG in Kalavos, Evros Delta, profiling the belly patches of the individuals, 6/2/2017, Vangeluwe, D., Royal Belgian Institute of Natural Sciences

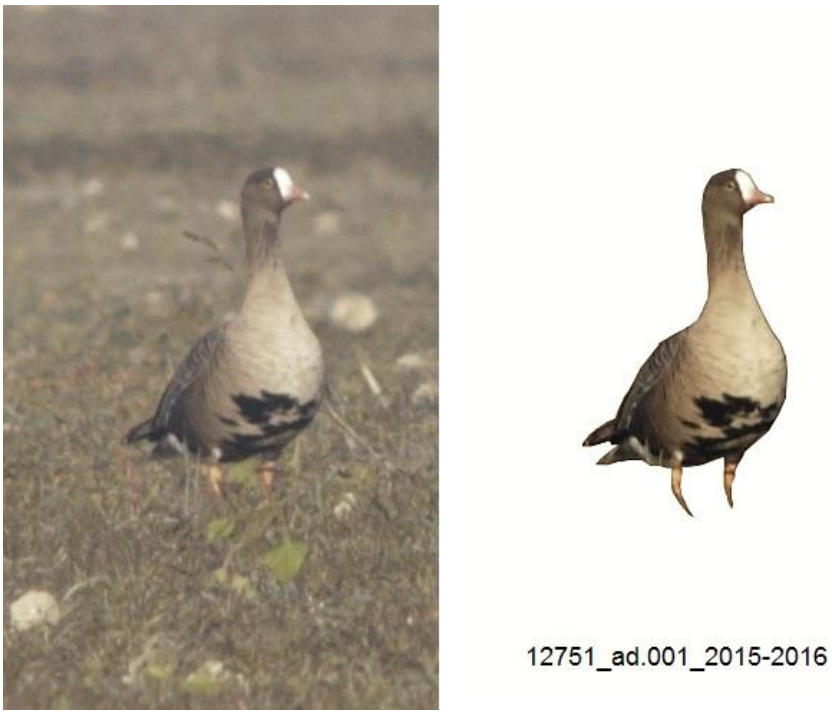


Photo 4. A partially profiled (one side only) individual in Kerkini Lake during 2015-2016 (original photograph, Papadopoulos K. MA Kerkini, 3/10/2015)

Photo 5. Juvenile LWfG in Kerkini Lake, 28/09/2016, Naziridis, Th., MA of Lake Kerkini