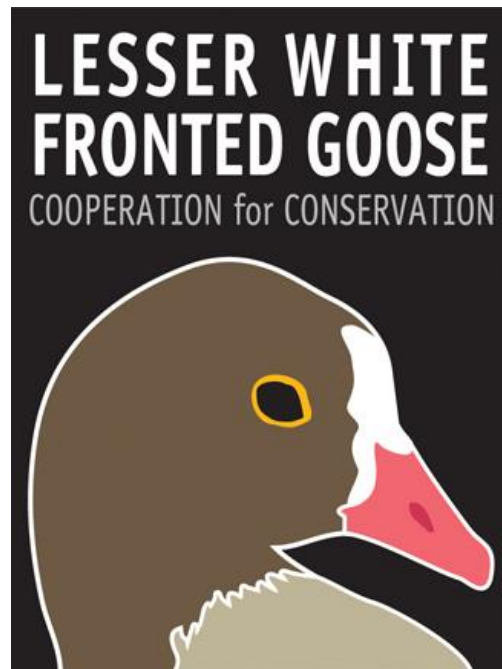




LIFE10 NAT/GR/000638



A Smart Patrol System for safeguarding the Lesser White-fronted Goose in Greece 2012-2017 Final Report



May 2017

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Abbreviations

CC	Control Center
CCTV	Closed Circuit Television
FSO	Forest Service Officers
GWfG	Great White-fronted Goose
HOS	Hellenic Ornithological Society
MA	Management Authority
MU	Mobile Unit
LWfG	Lesser White-fronted Goose
RbG	Red-breasted Goose
SPA	Special Protected Area
SPS	Smart Patrol System
WR	Wildlife Refuge

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1. Introduction

The present report reviews the results of the patrolling efforts in Kerkini Lake, Ismarida Lake and Evros Delta (Greece) in the framework of Action C1 “Reduce direct killing and disturbance of Lesser White-fronted Geese at key wintering grounds in Greece by introducing new patrol schemes, techniques and systems”, implemented in the framework of the project LIFE10 NAT/GR/000638 “Safeguarding the Lesser White-fronted Goose Fennoscandian population in key wintering and staging sites within the European flyway”. In the first part of the report, patrolling efforts for Kerkini Lake, Ismarida Lake and Evros Delta are examined from the beginning of the action implementation in 2012, aiming to review the patrolling results at the LWfG wintering sites. In the second part, the efficiency of the Smart Patrol System (hereafter SPS) is evaluated and along with suggestions for improvement. The present report provides a conclusive overview of the means and methods followed during the SPS, as well as the main guidelines for successful patrol planning for the three areas in the future. The period covering the patrolling efforts of the present report extends from 4/12/2012 to 11/03/2017 (first and last patrol).

During the first trial patrolling period (winter 2012-2013) the main methods were established and the means of patrolling were acquired (equipment, car, protocol design). The SPS CCTV was complete in 2014 at Evros Delta and in 2015 at Kerkini Lake. Additionally, during the 2014-2015 autumn and winter seasons, electronic protocols were introduced, resulting in enhanced patrol data collection and overall upgrade of the patrolling effort and efficiency. As a result, patrol data collected during the 2014-2015, 2015-2016 and 2016-2017 seasons allow further analysis. Hunting activity in Greece is regulated by the Department of Wildlife and Hunting Management of the Ministry of Environment and Energy. Responsible for the lawful character of hunting and the subsequent law enforcement in case of any violation of the hunting legislation, is the Forest Service and the Body of Game Wardens of the Greek Hunting Confederation and its regional Federations and local affiliates, supervised by the Greek Ministry of Environment and Energy. Along with the Police, these are the only authorities that can stop and search individuals and enforce hunting law.

Collaboration with the local Forest Services and the Management Authorities of Kerkini Lake, Ismarida Lake and Evros Delta National Parks was essential for the successful integration of the patrolling efforts into the overall management of the areas. During the first patrolling period, the Hellenic Ornithological Society requested from the Decentralized Administration of Macedonia-Thrace (General Department of Forestry and Rural Affairs) the participation of Forest Service Officers (hereafter FSOs) in the SPS. As result FSOs of the Evros Prefecture and Rhodopi Prefecture Forest Directorates and the Forest Services of Aleksandroupolis, Xanthi and Sidirokastro took part in the SPS.

2. The Smart Patrol System

The Smart Patrol System - SPS was developed in order to update effectively the patrol efforts for safeguarding the remaining wintering areas of LWfG in Greece. It is a complete patrolling scheme combining state-of-the-art technologies with on-the-ground patrol tackling illegal killing and human disturbance at the two critical areas where the LWfG feed and roost during the winter period in Northern Greece.

The main operational units of the SPS are the Remote Unit, the Control Center and the Mobile Unit. In Kerkini Lake, the Remote Unit comprises of two sensors (CCTV cameras), optical and thermal, installed at a 10m height. They are powered by solar panels and are operated by the Control Center (CC) that guides a manned Mobile Unit (MU) to relevant incidents where illegal shooting and/or disturbance are suspected to occur. In Evros Delta, the SPS system can survey a much larger area using two sets of thermal and optical sensors installed at 8m and 15m height respectively, also operated by a CC that guides a similar MU. In both areas the sensors used are located inside the WR and cover the largest possible surface the LWfG use during their stay in each area. The CCs are also equipped with a VHF station communicating with the Mobile Unit patrolling the area and geolocating the MU in order to be able to guide it to any location/incident through satellite maps. The CC records continuously during the use of the CCTVs, simultaneously from all sensors which offers the advantage to use recorded videos as potential evidence in case of an illegal incident.

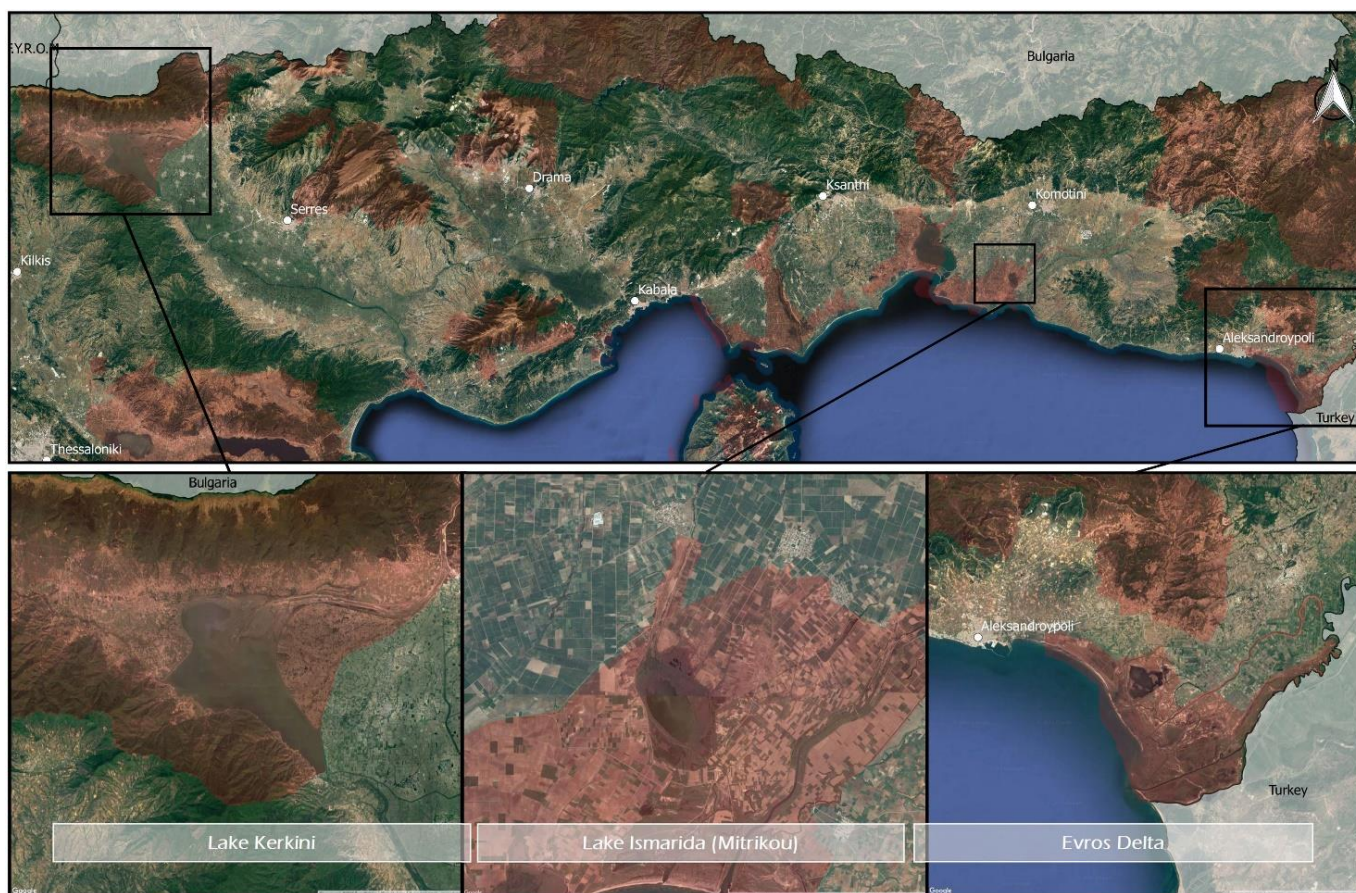
At a regular shift, a Mobile Unit is manned with a FSO, an accompanying SPS warden responsible for data collection, while a second SPS warden operates the CC that directs the Mobile Unit. Starting the patrol, the Mobile Unit covers the area for an initial estimation of human presence during which, the FSO performs checks on vehicles and individuals. Since the main focus of the patrol is hunting and illegal killing activity, priority is given to hunters and areas close to WR in order to ensure hunting law compliance. At the CC, the second warden inspects the area via the CCTV aiming to spot individuals and vehicles moving within the system's range and informs the Mobile Unit of their exact location (Demertzi et al. 2017).

3. Review of Patrolling Efforts

3.1. Summary

Patrolling of the three project areas in Greece (Map 1), was designed and organized during the first year of the project. Kerkini Lake and Evros Delta were supported a Smart Patrol System each, whilst in the overall patrol planning emphasis was also given to these two areas. At Ismarida Lake, no LWfG had been recorded since 2008 and as such, 10 patrols / season were foreseen for the area in order to limit hunting law violations in case the LWfG revisited the previously known sites. Additionally, an observatory / hide was built on the west site of the lake offering panoramic views and shelter for the patrolling team there. Patrols at Ismarida Lake were carried out by the Management Authority of Nestos Delta, Vistonida – Ismarida Lakes supported by FSOs from the Forest Directorate of Rhodopi and the Forest Service of Stavroupoli (Xanthi). At Evros delta, until the SPS installation was finalized, patrols were carried out by 2 SPS wardens supported by FSOs from the Forest Service of Aleksandroupolis and the Forest Directorate of Evros Prefecture. At Kerkini Lake, patrols were carried out also

by 2 SPS wardens, joined by FSO from the Forest Service of Sidirokastro. In total 41 FSOs participated in the patrols in all three areas.



Map 1. The three project sites where patrols took place in Greece during 2012-2017.

The 1st pilot patrolling season began in December 2012. The patrolling methods were designed, the necessary communications and permits were established and the required means were obtained (equipment, vehicles etc.). During the 2nd patrolling season 2013-2014, patrolling was fully supported by the local Forest Services and focus was given into improving patrolling operability and effectiveness. In that course, the patrol teams were provided with improved protocols and grid maps of the areas in focus. Until this period, focal point of the patrols was hunting activity and control of violations concerning hunting law, thus the performed checks were limited to hunters. Along the 3rd season, 2014-2015, the patrol teams were provided with electronic protocols (GPS tablets/Cybertracker[®]) to facilitate and improve data collection, while the paper grid maps were transferred to georeferenced maps readily available through smart applications (PDF Maps[®], Google Store). During this period, all human activity within the patrolled areas was monitored and checked to assess the possible disturbance factor to the wintering LWfG population. This is the first season that the SPS was fully operational in Evros Delta, thus patrols were supported by the CC operator and a CCTV system covering most of the LWfG area. During a patrol shift the CC operator scanned the area detecting vehicles and human presence and guided the Mobile Unit through VHF towards the location in order the FSO to perform a check. During 2015-2016, the SPS was fully operational both at Kerkini Lake and Evros Delta. The CC operator in Kerkini Lake contributed to the patrols similarly to Evros Delta, although human presence within the CCTV monitored area

was comparatively sparser than that at the Evros Delta. Patrol teams in both areas closely cooperated with the respective Management Authorities, coordinating patrols to achieve the optimum patrol density in each area. Closing on the 5th season, 2016-2017, patrols carried on under full SPS operability and similarly to the previous season.

Overall, from 2012 to 2017, 777 patrols have been carried out in all three areas, with 2,367 checks performed on 2,928 persons, of which 1,905 were hunters. As expected, most of the checks were performed in Evros Delta (Table 1 and Figure 1), while in Kerkini Lake since 2014-2015 the number of checks progressively increased due to checks conducted on almost all individuals encountered and not only hunters and/or suspected poachers.

Table 1. Overview of the patrolling efforts at the three project sites during 2012-2017.

YEAR	Evros Delta	Lake Kerkini	Lake Ismarida	TOTAL
Patrols			Total	777
2012-2013	40	33	10	83
2013-2014	96	80	10	186
2014-2015	76	78	10	164
2015-2016	90	88	10	188
2016-2017	68	80	8	156
Checks			Total	2367
2012-2013	17	5	13	35
2013-2014	373	1	6	380
2014-2015	407	45	42	494
2015-2016	594	184	31	809
2016-2017	361	232	56	649
People			Total	2928
2012-2013	60	9	13	82
2013-2014	529	2	11	542
2014-2015	750	47	49	846
2015-2016	594	184	31	809
2016-2017	361	232	56	649
Hunters			Total	1905
2012-2013	57	8	13	78
2013-2014	505	2	11	518
2014-2015	432	31	39	502
2015-2016	357	27	31	415
2016-2017	258	78	56	392

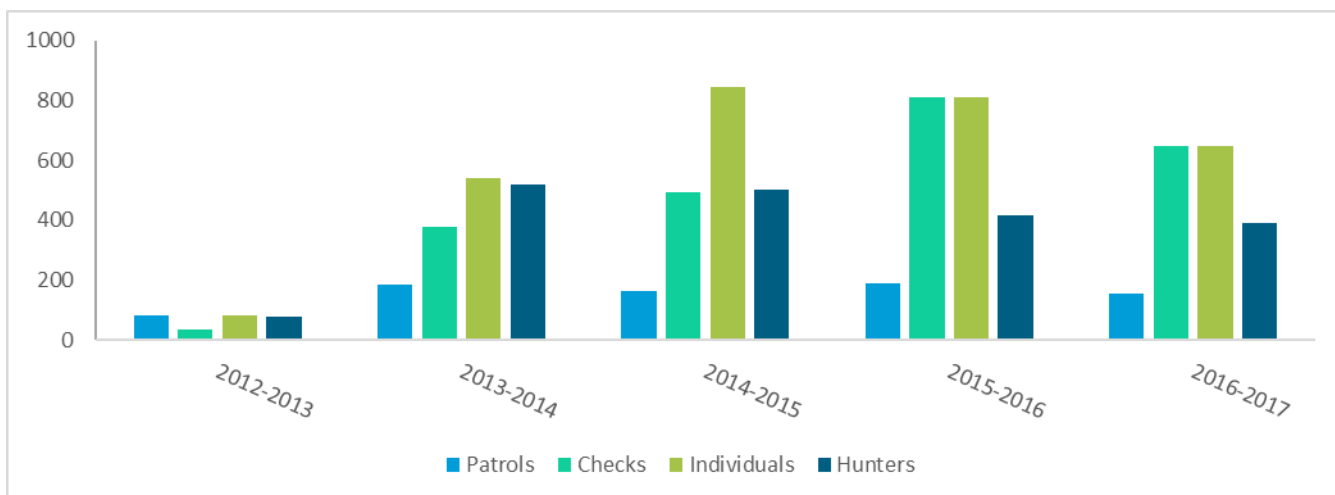


Figure 1. Progress of the patrolling scheme in all areas

Regarding violations of hunting law and complaints issued over the course of the 5-year patrolling scheme, a relatively small number of incidents was recorded. Many of the violations recorded by the patrol teams were difficult to assert and further prosecuted due to the nature of the illegality. Hunting before and past legal hours was encountered frequently and in all three areas, however it was not possible to identify the perpetrators. Similarly, hunting within the WR was confirmed in Evros Delta through evidence such as empty and disposed cartridges, while at Kerkini Lake the frequently encountered perpetrators in all cases fled the scene. Regarding shooting a protected species, in most cases the shot bird was directly encountered either in the hunting bag or injured/dead in the field (Evros Delta) or identified by photographs taken from distance (Kerkini Lake). The most common violation observed, was hunting without the relevant license or only with the receipt of payment. Hunting within the WR was also frequent, followed by shooting before/past legal hours and use of lead shot (Figure 2). Overall, 55 violations were recorded, while 15 complaints were issued by the Forest Service Officers with most cases being treated with warnings and recording of personal details (Figure 3).

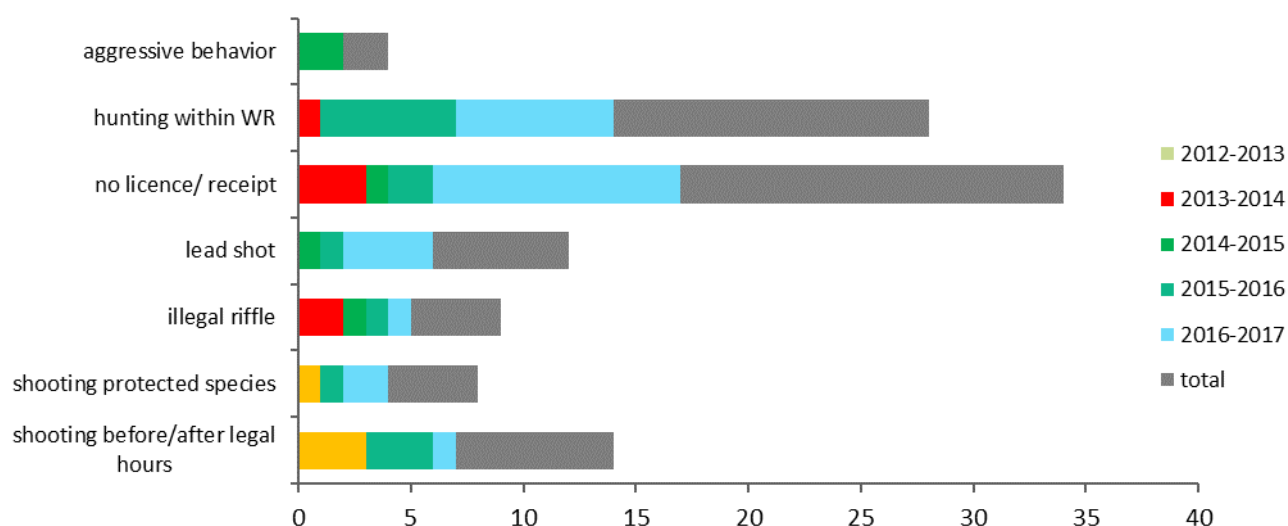


Figure 2. Violations of Hunting Law recorded in Kerkin Lake, Evros Delta and Ismarida Lake, 2012-2017

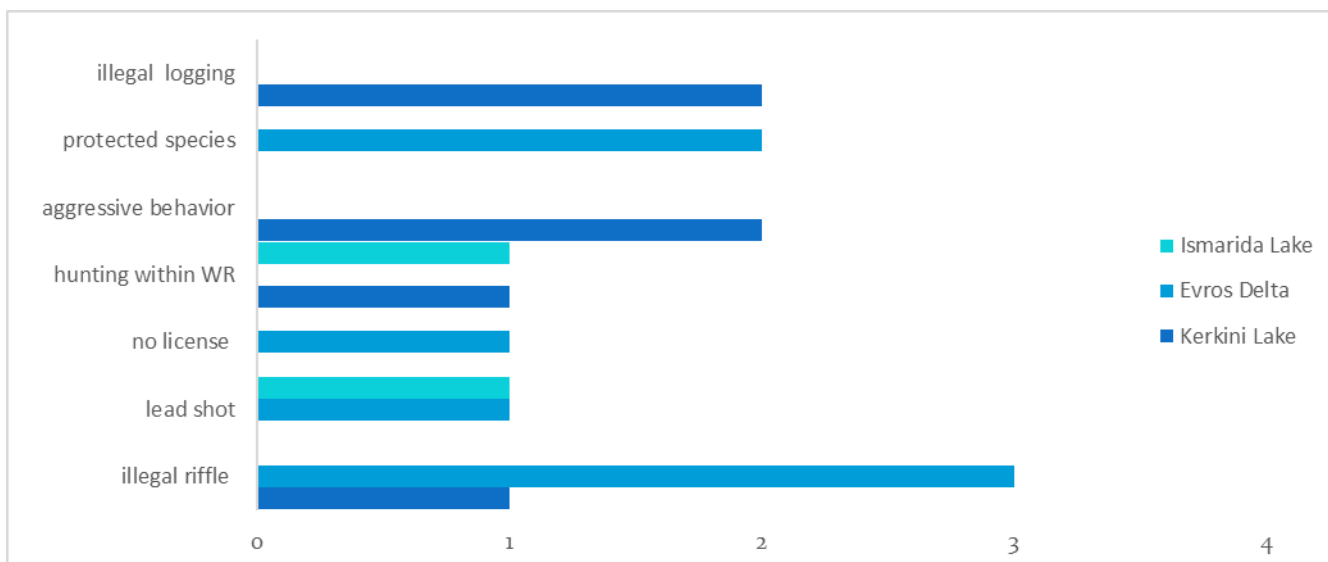


Figure 3. Number of complaints issued by the FSO by area and type of violation during 2012-2017

3.1.1. Kerkini Lake

During the five period patrolling schemes, 359 patrols took place at Kerkini Lake, resulting in 467 checks of 474 people of which 146 were hunters. Patrols were performed as 4-hour shifts and programmed during morning hours according to the sunrise (starting one hour before sunrise, usually 6:00-10:00) and afternoon hours according to the sunset (one hour after sunset, usually 15:00-19:00). The patrols were supported by 13 FSOs and 2 coordinators from the Forest Service of Sidirokastro who issued a total of 6 complaints regarding hunting law violations (3) and illegal logging (3). In total, 24 violations regarding hunting law were recorded by the patrolling teams, with most common the violation of the legal hunting hours and hunting within the WR. Unfortunately, not all violations were possible to assert. During 2013-2014, 2015-2016 and 2016-2017 three serious issues were confronted, all concerning poaching within the WR, incidents that bore many similarities and in which the perpetrators were most likely the same individuals.

During the SPS function, the issue of uncontrolled touristic traffic was highlighted, since tourists, wildlife photographers and birdwatchers were spotted by the CCTV very close to the critical LWfG habitat. Considering patrolling seasons 2015-2016 and 2016-2017 during which all encountered individuals in the area were checked, tourists were encountered a lot more often than hunters (Figure 4), while hunters are the second most frequent group of visitors encountered by the patrol teams (Annex, Map 2). Observations from the patrolling periods within 2014-2017 and since the electronic protocols were introduced, agreed that most checks were performed during afternoon hours (16:00-18:00) (Figure 5), in January and usually on weekends (Figure 6). Hunters were mostly found during January, when weather conditions were favorable for hunting. Touristic flow during patrols was found more or less stable in the area, reaching a peak during December.

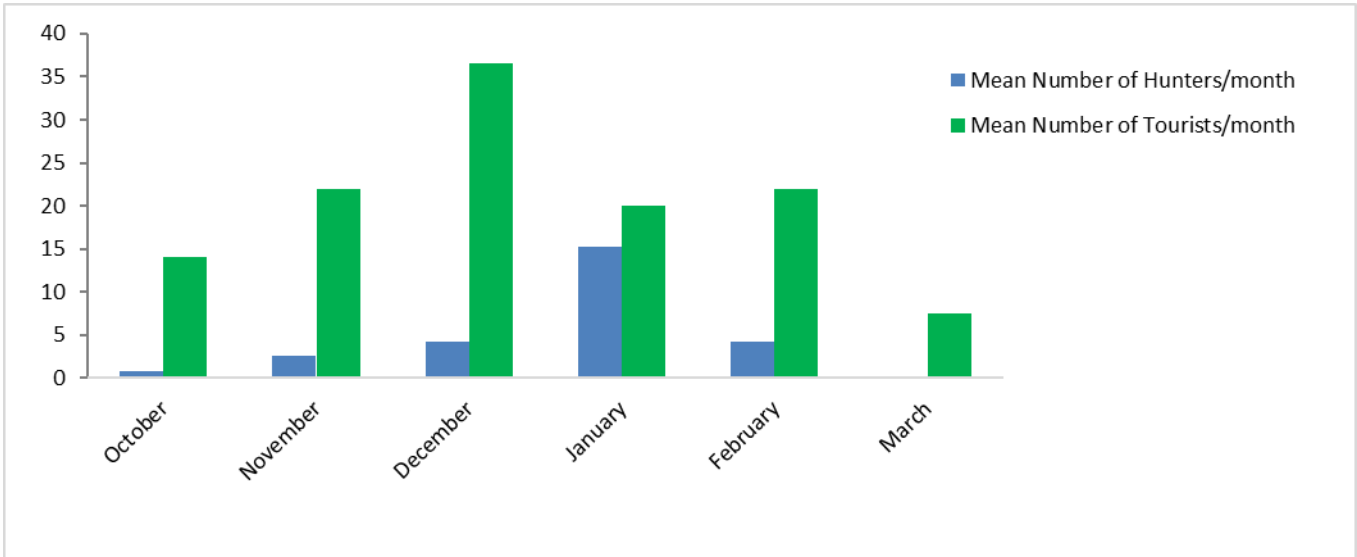


Figure 4. Mean Number of Hunters/Tourists checked in Kerkin Lake per month, 2015-2017

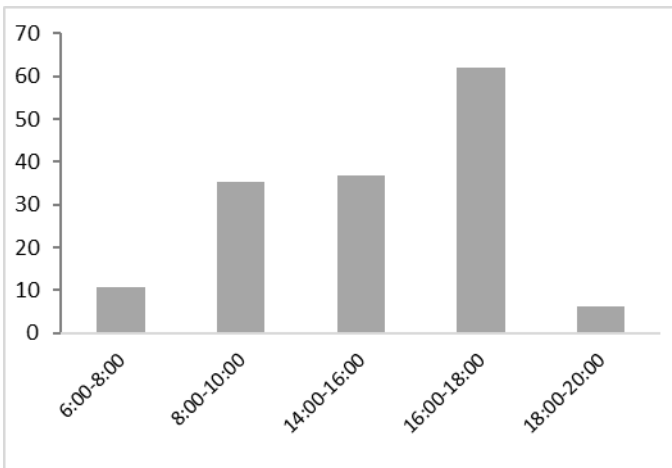


Figure 5. Total number of checks performed per 2-hour period in Kerkin Lake, data from 2014-2017 patrolling seasons.

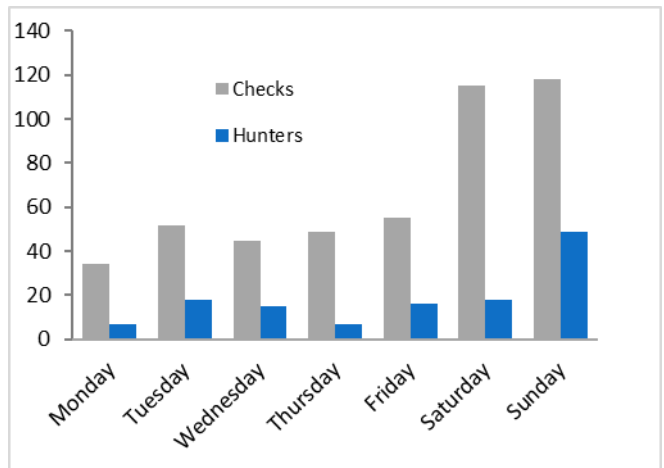


Figure 6. Mean number of checks performed on weekdays in Kerkin Lake, 2012-2017

3.1.2. Ismarida Lake

Since no LWfG have been observed at Ismarida Lake since 2003 (Panagiotopoulou, M., et al., 2009), the area was less heavily patrolled and patrols focused exclusively on hunting activity control (Annex, Map 3). Patrol routine included the areas of Ptelea and Elos Lagoons, Ismarida Lake and the WR area of the cultivated fields on the east side of the lake. In total 48 patrols were performed, resulting in 148 checks on 151 hunters. The patrols were supported by 7 FSO and 1 coordinator, who issued 2 complaints in total, although 6 hunting law violations were recorded. Most common violations were hunting without a hunting license or only with the receipt of payment for the hunting license, despite most hunters actually owning a license (personal details kept and cross-referenced at the Forest Service Department).

A frequent problem that surfaced regarding the WR was the unclear borders, and the absence of informative signs regarding the protected area boundaries. The issue has been pointed out both by the MA and the Central Macedonian Hunting Association to the respective Forest Directories, hence resolution is pending. Patrols were programmed according to sunrise/sunset hours, following 4-hour shifts.

According to the data gathered with electronic protocols (automated time stamp in entries) most hunters were found during afternoon hours (18:30-20:30), on January and during weekends (Figure 7). The combined patrols between MA and Forest Service have had a very good impact in the area, since the presence of the patrol increased hunting law compliance amidst the hunting community of the area. Additionally the construction of the observatory on the hill overseeing Ismarida Lake eased the patrolling efforts as it provided with a good overall view of the area from above.

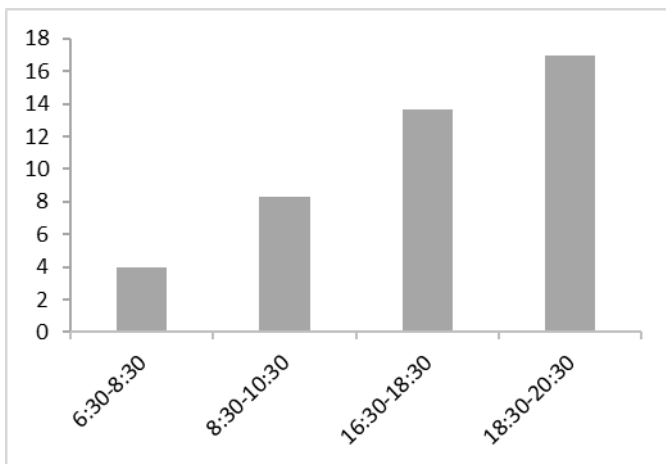


Figure 7. Total number of checks performed per 2-hour period in Ismarida Lake, 2014-2017.

3.1.3. Evros Delta

Evros Delta is one of the most popular areas for waterfowl hunting in Greece and as a result patrolling in the area was designed in 8-hour shifts starting early morning (5:00-13:00), during afternoon hours (14:00-22:00) or during the night (23:00-7:00). Starting in December 2012 and until March 2017, 370 patrols took place, with 1,752 checks were performed on 2,294 people, of which 1,609 were hunters. Overall, 21 FSOs and 3 coordinators from the Forest Service of Aleksandroupolis and the Forest Directorate of Evros Prefecture participated in the patrols, issuing 7 complaints. The patrol teams also recorded 19 cases of violation of hunting law that were not asserted with most common being hunting without a license or only with the receipt (in all cases identification details were kept by the FSO for crosschecking at the Forest Service). Quite common was also the violation of the legal hunting hours (see also: Kazantzidis, S., et al., 2014) a violation almost impossible to assert. In five cases, protected species were found shot (a common shelduck *Tadorna tadorna*, a Rudy shelduck *Tadorna ferruginea*, a Dalmatian Pelican *Pelecanus Crispus* , a red-crested pochard *Netta rufina* and a Red-breasted Goose *Branta ruficollis*)

With the completion of the CCTV SPS installation, it was observed that some hunters were moving close to the WR borders or parked their vehicle within it. Those were systematically informed by the Mobile Unit to move to outside the protected area, resulting in progressively no such incidents being recorded at all. Since 01/2015, moving through the WR has been forbidden, yet despite the first months the measure was enforced, the following seasons (2015-2016, 2016-2017) it has been observed that vehicles continued to move within the WR without the relative permission and in defiance of the FSO warnings (Annex, Map 4).

Through the CCTV system other than violations of hunting law, incidents recorded include three cases of wildfire, two cases of immigrants crossing into Greece and one occasion of boat theft attempt. In all cases the relevant authorities were immediately notified. Additionally, the CC operator recorded wildlife and livestock movement within the critical LWfG habitat in order to assess the possible threat level. According to the data gathered, the maximum number of hunters in the area was observed during January (Figure 8), and being the predominant category of visitors (69.34%), with tourists consisting only the 5.45% encountered during patrols (Figure 9). Most checks were performed during Sunday and Saturday (Figure 10) and during morning hours (6:00-10:00) (Figure 11).

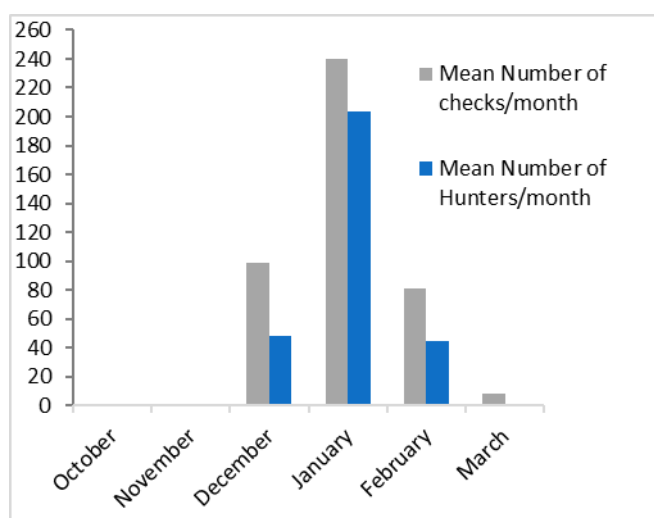


Figure 8. Mean number of checks performed per month and mean number of hunters checked in Evros Delta, 2012-2017

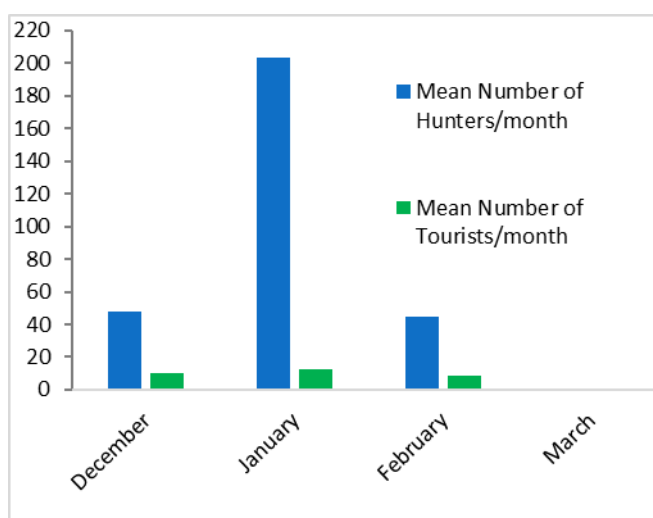


Figure 9. Mean Number of Hunters/Tourists checked in Evros Delta per month, data only from seasons 5-6, 2015-2017

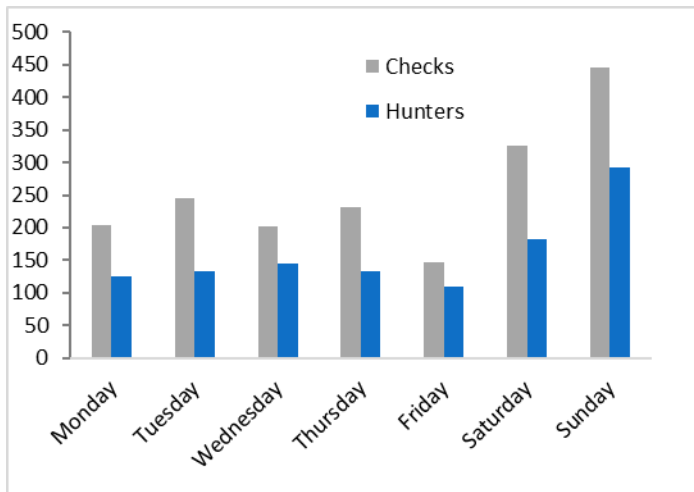


Figure 10. Mean number of checks performed by weekdays in Evros Delta, 2012-2017

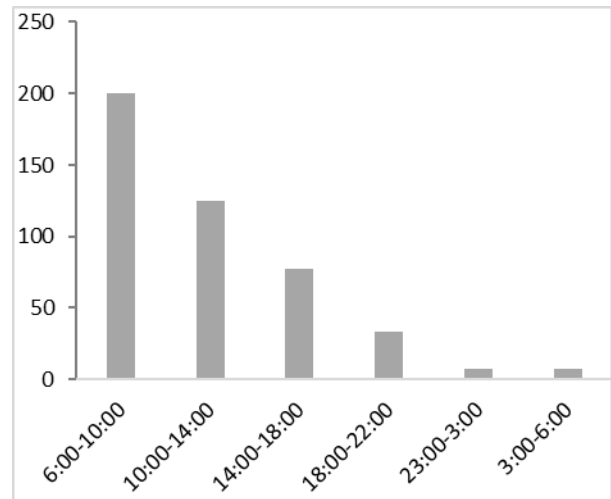


Figure 11. Total number of checks performed per 4-hour period in Evros Delta, data only from seasons 3-5, 2014-2017

Since the main focus was the protection of the WR and specifically the areas where the LWfG were observed, the patrol team moved mostly at the western part of the Delta heavily patrolling Kalavos area, where hunters congregated at the borders of the WR to hunt Greater White-fronted Geese (Annex, Map 4).

4. Smart Patrol System – Conclusions

The SPS is a novel method of patrolling in Greece incorporating advanced technologies and expertise to tackle illegal killing and regulate hunting activity in the sensitive habitats of the LWfG. In terms of technology, the system is based on CCTV coverage of the LWfG critical habitat, with 2 sensors in Evros Delta and 1 in Kerkini Lake, directly communicating with the Mobile Unit via VHF and tracking its movements with GPS. The MU collected all data in the electronic protocol, automatically storing position, time and date of the observations made by the patrol warden, increasing efficiency and data quality. This allows further analysis of the events of each patrol season and progressively leads to better formulated patrol plans.

During the SPS implementation, local authorities became engaged and experienced with these new techniques. In total, 64 people were involved in the patrols with 47 of them being Forest Service Officers, increasing awareness regarding the threats the LWfG faces in Greece and increasing engagement of the local law enforcing authorities in the protection of the species. The functioning of the Smart Patrol System both in Lake Kerkini and Evros Delta had positive effects to the overall safeguarding of the LWfG by limiting poaching incidents to the peripheral zone of the roosting and feeding sites of the species. It has been observed over the course of the project that people were increasingly aware of the SPS and avoided the inspected area, whilst hunters and visitors were informed regularly by the patrolling teams about the presence of the LWfG and were provided with relevant LWfG identification and project material. Thus the patrols played an instrumental role in the dissemination of the project's objectives.

Although violations of hunting law were recorded in both areas monitored by the CCTV SPS, the low number of incidents under the complete coverage of the LWfG areas can be a reassuring development. In Evros Delta, the

encounter of shot protected species, often unmistakable due to size and appearance (Dalmatian Pelican *Pelecanus crispus*) in Kalavos area, close to the critical habitat of the LWfG in the Delta, has surfaced as a worrying issue. Additionally, the finding of empty used cartridges inside the WR and at the LWfG feeding sites show that while the LWfG are significantly safer, more still needs to be done.

At Lake Kerkini the SPS system highlighted the issue of uncontrolled touristic flow in the area as a possible threat for the LWfG. The CCTV recorded the occasional presence of tourists near the roosting site of the LWfG moving with 4x4 vehicles and thus disturbing the avifauna present. Additionally, the remote control of the CCTV system in Lake Kerkini has been proven very useful, since it allowed access any time from any place and alert for possible threats at the LWfG roosting site. The insisting poachers of the area are thought to be the same company of 2-3 men whose identities are known. Poaching within the WR and close to the LWfG main habitat in Kerkini Lake is the most serious incident concerning the area that needs to be addressed effectively. In 2008, at the same area the poachers were found during 2016-2017, an adult male Lesser White-fronted Goose, individually color-ring-marked was found dead (Tsougrakis, Y., et al., 2009).

The main drawback of the SPS stems from the technologically advanced design of the parts consisting the system. Maintenance and repair of the Remote Units is strictly determined by weather conditions, prohibiting a fast attendance of the system and possible further damage of the Units. Additionally, the salinity of the Drana Lagoon at the Remote Unit of Evros Delta has proven to be a damaging factor for the equipment installed and as a result frequent visits were required to apply protective paint and regularly clean system parts with deionizer water. Moreover, the main sensor at the Remote Unit in Evros Delta had to be uninstalled and sent for repair to the manufacturer in two occasions. Nonetheless, since the SPS will be transferred to the local Management Authorities, the respective authorities operating the system will be able to cope successfully with the technical particularities of the system as long as it is frequently used and attended. Last but not least, even though the SPS is a technological advancement in the patrolling of both areas, combined patrol teams of the Management Authorities with the local Forest Services is essential to its future success and operability. In order to act as a successful preventing measurement against illegal killing and poaching incidents, the authorities responsible for hunting law enforcement, need to be familiar with the SPS function and fully engage to control hunting activity at the areas where the LWfG is found in Greece. While the CCTV from the Smart Patrol System can spot a violation, only an on-the-ground patrol team can attend the incident and assert the violation.

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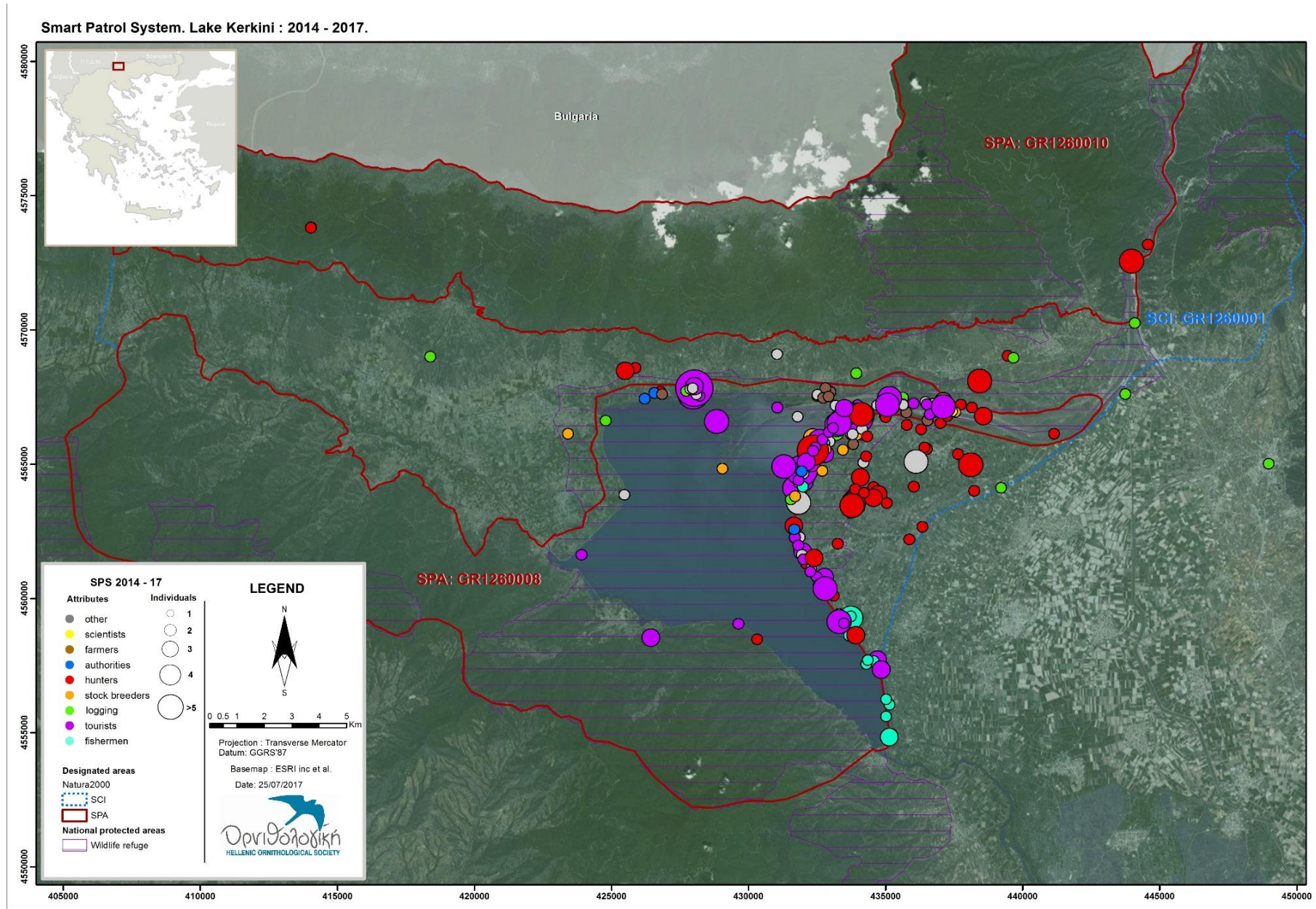
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6. ANNEX

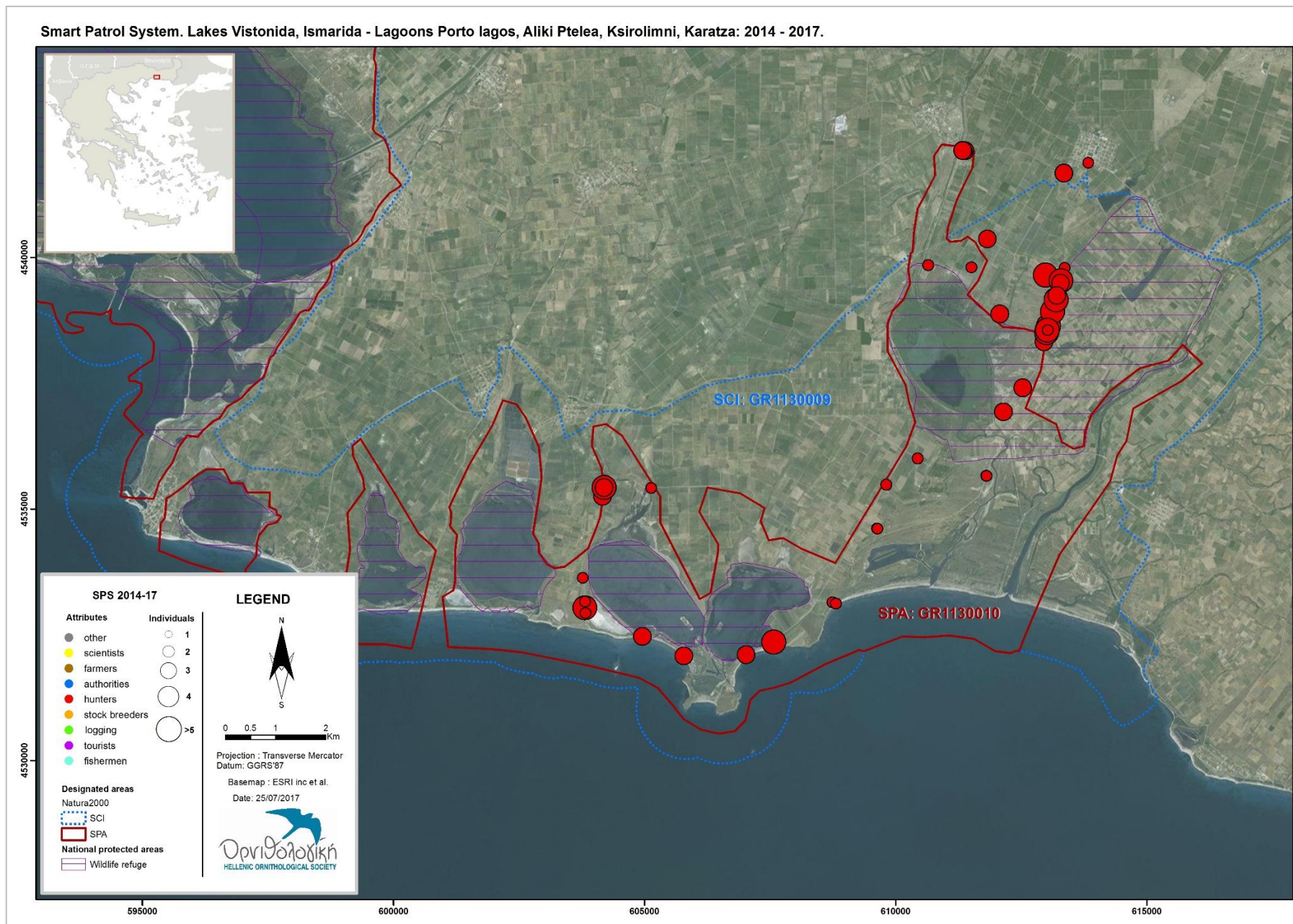
Map 2	Checks 2014-2017 Kerkini Lake	Page 15
Map 3	Checks 2014-2017 Ismarida Lake	Page 16
Map 4	Checks 2014-2017 Evros Delta	Page 17

The following maps present checks performed by the patrol teams in Kerkini Lake, Ismarida Lake and Evros Delta. Data were collected via electronic protocols and only refer to winter periods 2014-2015, 2015-2016 and 2016-2017. Only data with accurate coordinates are included (exact location of check). Individuals are not discriminated based on whether they were acting or not relevantly to their attribute, yet only by the attribute they claimed during the check. The category Tourists refers both to visitors from other areas for eco-touristic purposes (birdwatchers, photographers, etc.) as well as local people found at the area for recreational purposes (jogging, walking, collecting mushrooms etc.). Hunters that were checked within the Wildlife Refuges of the respected areas were moving through the protected area and not actively hunting, unless stated otherwise.

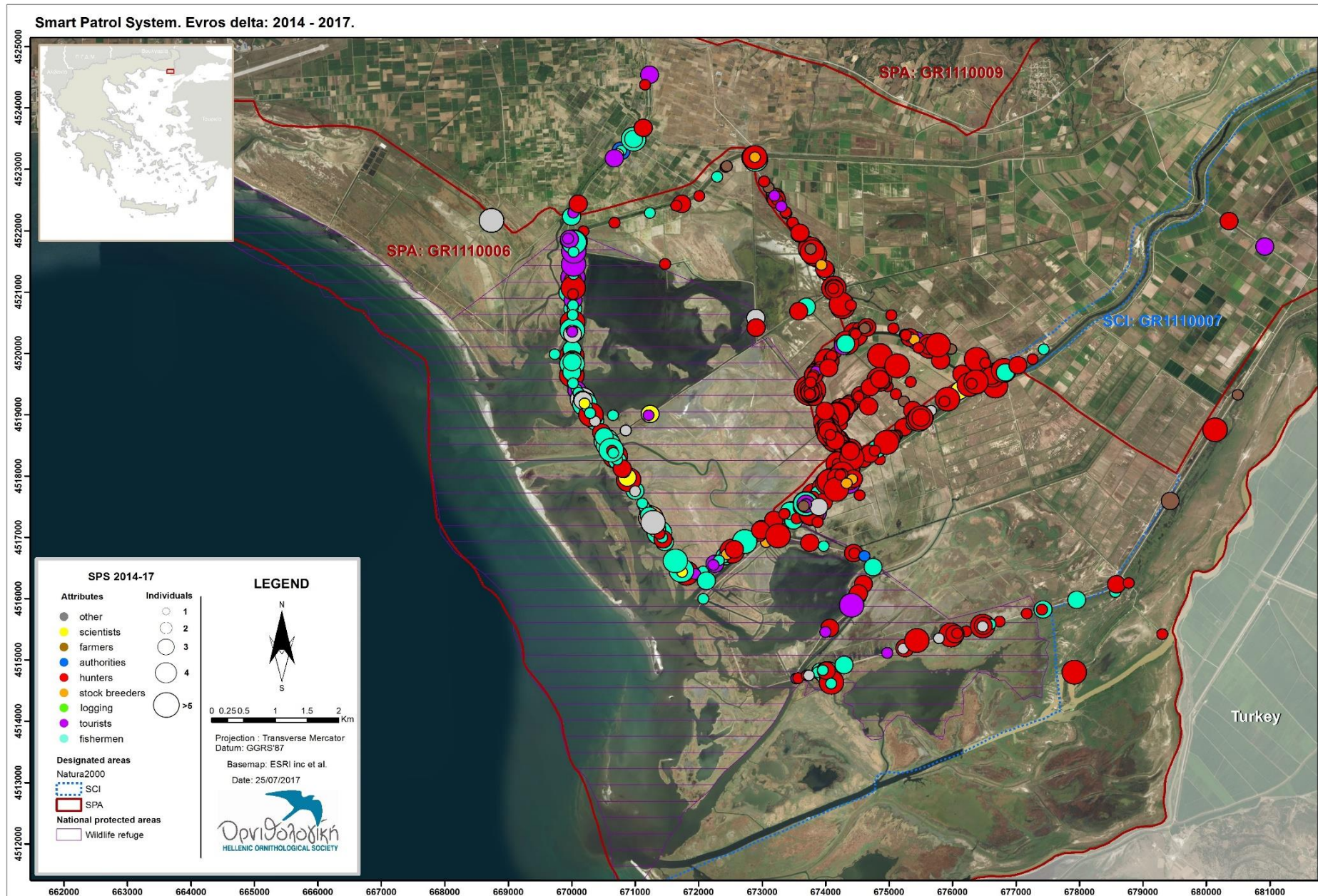
Map 2: Checks by the patrolling team during the 2014-2015, 2015-2016, 2016-2017 seasons at Kerkini Lake.



Map 3: Checks by the patrolling team during the 2014-2015, 2015-2016, 2016-2017 seasons at Ismarida Lake and surroundings



Map 4: Checks by the patrolling team during the 2014-2015, 2015-2016, 2016-2017 seasons at Evros Delta



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Final Report

LIFE10 NAT/GR/000638

Hellenic Ornithological Society