ACTA ZOOLOGICA BULGARICA
Acta zool. bulg., Suppl. 4, 2012:47-54

Natural Colonies of Lesser Kestrel (*Falco naumanni*) in European Turkey and Discussion on the Chances of Natural Re-colonization of the Species in Bulgaria

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Abstract: Lesser Kestrel (*Falco naumanni*, Fleischer, 1818) is a small falcon, extremely efficient in the combat against pests on cultural plantations. The current nesting status of the species in Bulgaria is extremely unclear. The option for natural re-colonization of the species is determined by the fact that Lesser Kestrels still breed relatively close to Bulgaria – in Turkey, FYRMacedonia and Greece.

The current study reports the location and nesting number of five active Lesser Kestrel colonies in European Turkey and discusses the option of natural expansion of the population for re-colonizing suitable areas in South-eastern Bulgaria.

Lesser Kestrel potentially suitable sites in Bulgaria are selected on the basis of a Habitat Suitability Model based on a set of indexed criteria applied in GIS environment.

Key words: Lesser Kestrel, colonies, European Turkey, re-colonization, Habitat Suitability Model

Introduction

Lesser Kestrel (*Falco naumanni*, Fleischer, 1818) is a small falcon species that is a useful ally of man in combating pests in agricultural landscapes. Once considered among the most abundant birds of prey in Europe (Bijleveld 1974), today, due to agriculture intensification, farmland abandonment, loss of nesting sites and intensive pesticide application (Hagemeijer, Iankov 1997) it has an uncertain future.

At present the entire European population is estimated at some 17000-21000 breeding pairs (BirdLife_International 2008), undergoing a small decline (BirdLife_International 2004). The strongest remaining Lesser Kestrel populations are found in Spain (12000-20000 pairs) and Turkey (5000-7000 pairs), while the species is considered to have already gone permanently extinct in Croatia, Slovenia (BirdLife_International 2004) and Poland (EUNIS 2010).

The disappearing population in the Balkans is thus an important link between the core Lesser Kestrel populations of Middle Asia and Turkey and the strongholds of the species in Western Mediterranean countries (Portugal and Spain).

Despite being widespread in Bulgaria in the mid-XIX century (Radakoff 1879), more recent estimates of Lesser Kestrel in Bulgaria have dropped to 0-5 breeding pairs for the period 1995-2000 (Barov 2002, BirdLife International 2004), while at present only single wandering birds and small flocks are being observed and no nesting Lesser Kestrels can be confirmed (Barov 2002, BirdLife International 2004, GB 2010).

It is however believed that the main threats which have caused the decline of Lesser Kestrel have been eliminated and that the species can be successfully restored in Bulgaria. This can be achieved through either natural re-colonization or human-induced reintroduction in potentially suitable areas.

At the same time Bulgaria borders Turkey, which is known to be a stronghold of the species, maintaining the third largest population of Lesser

Kestrels in the world (BirdLife International 2004, Parr *et al.* 1997). Such close proximity to the stable large Lesser Kestrel populations in Turkey would allow for avoiding isolation of the restocked Bulgarian population and could potentially assist a future connection of the Asian population to Western Balkan populations and thus to the growing Mediterranean population (Italy, Spain and Portugal) within the global range of the species.

The current paper therefore explores the possibilities of natural re-colonization of Lesser Kestrel in South-eastern Bulgaria, considering the present knowledge on the existing Lesser Kestrel colonies in North-western Turkey.

Materials and Methods

In order to establish the location and status of Lesser Kestrel population in Turkish Thrace, a 7-day field study was completed in the period April 17-23, 2010. During the planning of the expedition, local experts and birdwatchers, as well as Bulgarian researchers working in the area of Turkey were contacted to obtain information on the possible location and characteristics of the colonies. Initial data was kindly shared by two local divisions of BirdLife International and Bulgarian Society for Protection of Birds.

The period mid-April – mid-March was selected as it is the pre-laying period of Lesser Kestrels in Turkey, when birds are most conspicuous at the breeding colonies (Parr *et al.* 1995). The study was based on transect surveys as they have been proven to provide similar results to radio-tracking techniques (Franco *et al.* 2004) and allow for locating both foraging and breeding birds. The literature review completed showed that Lesser Kestrels preferred nesting in settlements (Franco *et al.* 2005) (Barov 2002; Simeonov *et al.* 1990), and foraging on adjacent areas close to roads within a particular distance from the colonies (Garcia *et al.* 2006; Liven-Schulman *et al.* 2004; Negro *et al.* 1993). Therefore a total of 2000 km were covered and 115 settlements in Turkish Thrace were visited in search of foraging or nesting birds. Same survey method was utilized by Parr (1995), whose team visited 369 settlements and spent an average time of 21 min per settlement (Parr *et al.* 1995).

In the settlements where colonies of Lesser Kestrels were found, additional information on the number of inhabitants, type of land use, number of cattle raised, etc., was collected through written interviews filled in by the local people to obtain a better perspective of the birds' breeding and foraging habitats. The reported number is however relative as no long-term observations on the nest usage and breeding success have been conducted.

The data obtained in the field were used to calibrate a Lesser Kestrel Habitat Suitability Model developed for identifying potentially suitable Lesser Kestrel areas and applied for a target area in South-eastern Bulgaria (Kmetova 2010). The model was developed in GIS environment, using a set of criteria, which describe the combination of independent environmental factors and their referent values, determining the presence of Lesser Kestrel as a breeding species in a given territory. The independent environmental factors selected were as follows: topography (altitude, slope and aspect), land management (land use, existence of protected areas and favourable land management practices), biological factors (proximity to existing Lesser Kestrel colonies, connectivity among sites, potential predator competition), and demographic factors (road network, population density, presence of deserted buildings).

The choice of that particular set of environmental factors, their weighting, ranking in order of significance and their particular tolerance ranges were based on the data collected within the first stage of the development of the current study (literature review, field visit and expert consultations). Three steps were followed when identifying potentially suitable Lesser Kestrel sites: identifying existing potential nesting sites (settlements); determining and analyzing the potential home range and foraging area the suitable nesting sites identified would offer, and finally locating the optimal site among them (Kmetova 2010).

The model was applied onto an area comprising 3076 km^2 and 97 settlements in 13 municipalities in South-eastern Bulgaria.

Results

During the 7-day field visit the team located and counted a total of 5 colonies of Lesser Kestrels in the European part of Turkey, at an aggregate number of minimum 68 pairs. Two of the colonies were found after shared information about birds feeding in these areas (Demerdzhiev pers.comm), another one was confirmed after data provided by a colleague in

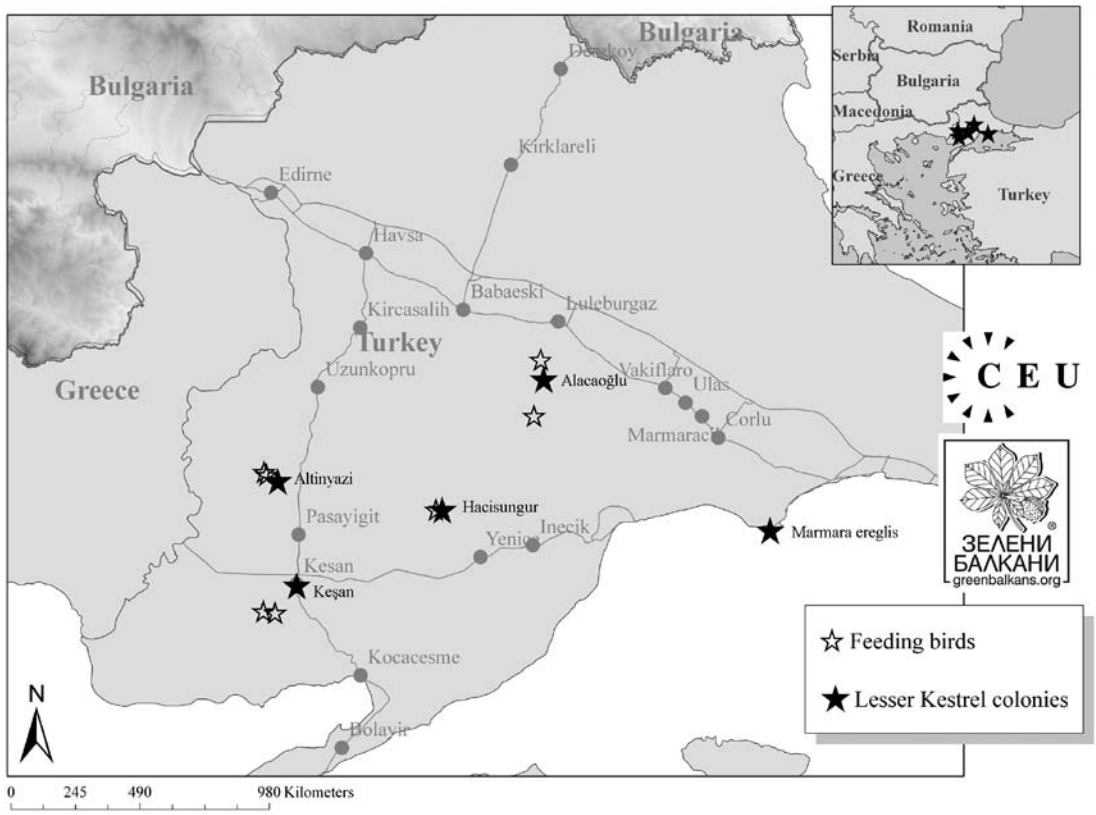

Fig. 1. Location of the Lesser Kestrel active colonies in European Turkey (2010).

Turkey (Bolya, pers. comm.) (Fig. 1).

Colony 1 is located in the village of Alacaoğlu, Lüleburgaz (41°17' N, 27°18' E). It was located following former observations of some 20 foraging birds, seen 4.8 km on the north and an observation of a single male seen 8 km on the south of the colony located (Demerzhiev in press). The estimated size of the colony, based on the number of observed males and the interviews of the local people, is assessed at some 23 pairs.

The examination of all other settlements in direct proximity to these observations found no other active colonies.

Colony 2 is located at the sea coast (40°57' N, 27°56' E). It was observed by Mr. Kerem Ali Boyla (pers. comm.) and confirmed within the present study. Birds, feeding over the sea as well as over deserted semi-urbanized areas (overgrown areas among construction sites and residential buildings) were observed along the coast in direct proximity to Marmara ereglis. A steep coast, some 10 m high with loads of cavities and holes covered with faeces was explored. The estimated size of the colony, based on the number of observed males is assessed at some 10 pairs.

Colony 3 is located in the village of Hacisungur (41° 0' N, 27° 1' E). It was found following a former observation of 25 Lesser Kestrels foraging over some arable land 1.4 km to the west of the village (Demerdzhiev pers.comm). The estimated size of the colony, based on the number of observed males, is assessed at some 10 pairs.

Colony 4 is located in the town of Keşan (40°51' N, 26°37' E), at an altitude of 130 m a. s. l. It was located following the observation of two groups of foraging birds recorded at 7.6 and 9.3 km to the south-west of the city. The first group was foraging over arable land in direct proximity to the main road and using the electricity cables for perching. The second group was reported very close to a group of agricultural buildings – barns and sheds yet no active nests of Lesser Kestrels were found out there. The examination of all other settlements in direct proximity to these observations found no other active colonies. The estimated size of the colony, based on the number of observed foraging males is assessed at some 10 pairs.

Colony 5 is located in the village of Altinyazi (41° 4' N, 26°34' E), at an altitude of 40 m. It was discovered following the observation of two groups of Lesser Kestrel foraging over arable land at 3.8 km

Table 1. Distance among the five located active Lesser Kestrel colonies in Turkey (km).

Lesser Kestrel colonies, Turkey	1	2	3	4	5	Average
Kestrel colony 1	-	63,2	38,4	74,7	66,1	**60,6**
Kestrel colony 2	63,2	-	76,3	110,7	114,9	**91,3**
Kestrel colony 3	38,4	76,3	-	38,1	38,8	**47,9**
Kestrel colony 4	74,7	110,7	38,1	-	24,7	**62,1**
Kestrel colony 5	66,1	114,9	38,8	24,7	-	**61,1**

and 2.7 km on the north-west, in direct proximity to the village of Balaban. Despite that, no active nests were observed in the village of Balaban. The estimated size of the colony, based on the number of observed foraging males and the interviews with the local people is assessed at some 15 pairs.

Two of these colonies were reported for first time and no number on any of these colonies had been published.

Within the 115 settlements visited, the team also investigated information on the presence of a Lesser Kestrel colony in the city of Uzunkupru (Boyla pers. comm.). Our observations however did not confirm the existence of an active colony at the time of the study.

The five confirmed Lesser Kestrel colonies are located at an average distance of 64.6 km from one another, with a minimum distance of 38.1 km (Colony 3 to Colony 4) and a maximum distance of 115 km (Colony 2 to Colony 5) (Table 1, Fig. 1).

The data obtained on the foraging habitats preferred by the species was used to calibrate a Habitat Suitability Model developed to determine the most suitable areas for Lesser Kestrel in South-eastern Bulgaria (Kmetova 2010).

When identifying potentially most suitable nesting sites in the target area in Bulgaria urban and populated areas were considered (Barov 2002, Cramp, Simmons 1987, Parr *et al.* 1997, Patev 1950, Simeonov *et al.* 1990, Tella *et al.* 1996), at an altitude of 0-500 m (Cramp, Simmons 1987, Simeonov *et al.* 1990), located at mostly flat areas (slope between 0-5 degrees) (Franco *et al.* 2005, Franco, Sutherland 2004) and preferably with a southern aspect (Simeonov *et al.* 1990). Having applied this set of criteria, a total of 15 out of 96 settlements in the target area got highest scores and were therefore processed for further analysis.

Within the next step the quality of the potential foraging area around these 15 settlements was identified. After a thorough literature review, a 4.5 km buffer area around the potentially suitable nesting sites was considered to comprise the most probable and favourable home range of Lesser Kestrels (Garcia *et al.* 2006, Liven-Schulman *et al.* 2004, Negro *et al.* 1993). The type of habitat and the topography of the plots were compared, giving preference to the presence of pastures, non-irrigated arable land, natural grasslands and sparsely vegetated areas all indicated as most favoured Lesser Kestrel foraging habitats (Barov 2002, Bustamante 1997, Donazar *et al.* 1993, Franco *et al*. 2004, Garcia *et al.* 2006, Parr *et al*. 1997, Tella *et al*. 1998).

Finally a set of additional criteria was applied – distance to road network, existing protected areas, connectivity among sites, distance to known existing colonies and distance to territorial pairs of potential predators, such as Long-legged Buzzard (*Buteo rufinus*) and Imperial Eagle (*Aquila heliaca*).

The model, further explained by Kmetova (2010), applied in GIS environment identified the areas around the villages of Shtit, Mustrak, Studena, Mladinovo and Oryahovo as potentially most suitable to sustain and form a core area for Lesser Kestrel in South-eastern Bulgaria (Fig. 2).

These 5 villages are among the 5 settlements closest to the nearest confirmed Lesser Kestrel breeding colonies in Turkish Thrace (between 112.9 – 119.6 km on average from all confirmed 5 breeding colonies).

The second best suitable set of areas for restoring Lesser Kestrels in South-eastern Bulgaria identified by the model were split in two groups as follows: Kapitan Andreevo and Generalovo to the South-west and Dositeevo, Lozen and Rogozinovo to the North-west.

The villages of Mramor, Srem and Svetlina were ranked as the third best set of potential Lesser Kestrel restoration sites (Fig. 2) (Kmetova 2010).

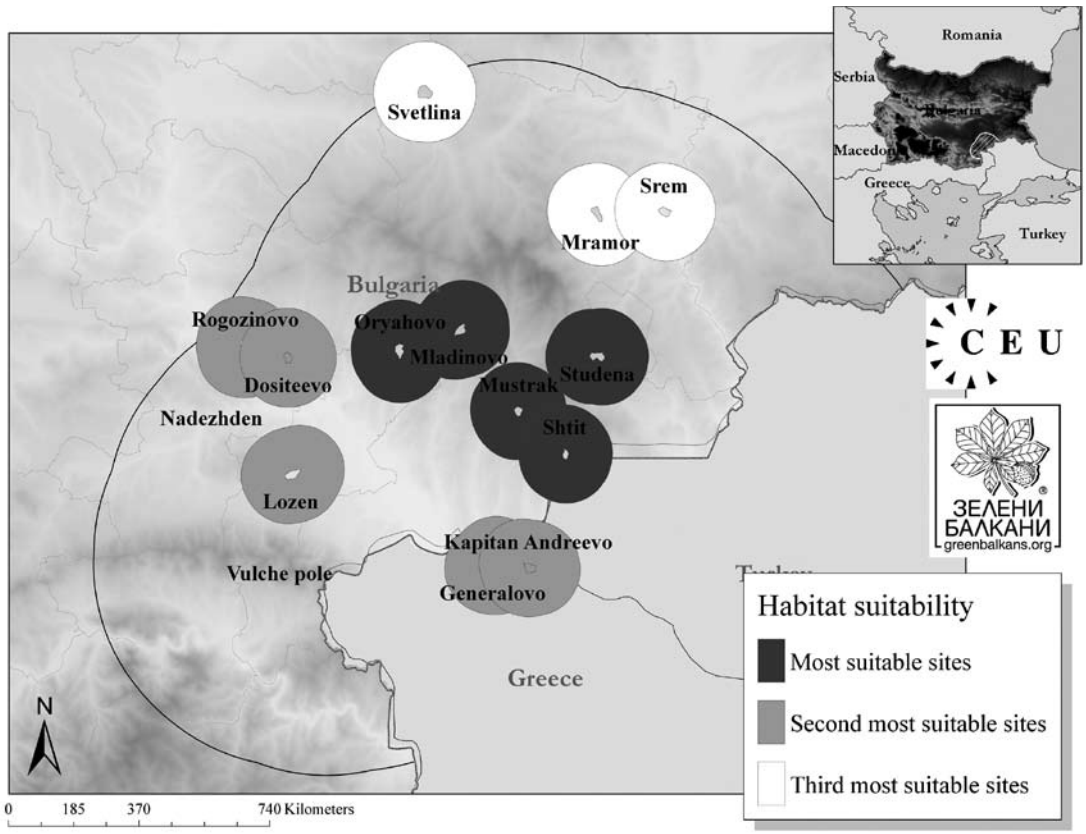

Fig. 2. Most suitable Lesser Kestrel habitats as identified by Lesser Kestrel Habitat Suitability Model.

Discussion

Considering the outcomes of the current study, two possible strategies towards population re-establishment can be discussed. The first strategy is to provide opportunities for natural re-colonization of the suitable areas through expansion of the nearby populations (Fig. 3). The alternative way is to launch a human-induced re-introduction programme.

The proximity of Lesser Kestrel potentially suitable sites in Bulgaria to existing Lesser Kestrel colonies is of great importance for securing good connectivity and exchange of genes of a re-established population within the global range of the species.

The possibility of natural re-colonization is determined by the fact that Lesser Kestrels still successfully breed fairly close to Bulgaria – in Turkey, FYRMacedonia and Greece (BirdLife International 2008, Cramp ,Simmons, 1987, Parr *et al.* 1995, Parr *et al.* 1997). A positive indicator in support of that strategy is the observation of groups of 23 – 25 birds in the area of the Eastern Rhodopes, Southern Bulgaria in 2000 (Barov 2002) (Fig. 3).

Lesser Kestrels are however incredibly phylopatric (Negro *et al.* 1997, Serrano *et al.* 2008, Serrano, Tella 2003). The studies on dispersal indicate distances between 30 km (Negro *et al.* 1997) and 7 km (0.1 km – 136 km) (Serrano *et al.* 2008, Serrano *et al.* 2003) off the natal site. In addition, surveys showed that Lesser Kestrels surveyed in North-eastern Spain preferred buildings that had previously been occupied by existing colonies and very few of the birds moved out of the subpopulation where they had hatched (Serrano *et al.* 2003).

Furthermore, the distance to the nearest unoccupied suitable building did not seemingly influence the tendency to disperse (Serrano *et al.* 2003). In addition, the re-colonization chances decreased as isolation increased (Hansky 1994), which is especially important considering the global negative trend of the species.

Therefore, when comparing the suitable sites, priority is suggested for the sites within 30 km or as close as possible to confirmed breeding Lesser Kestrel populations.

The results of the current study on the active colonies of Lesser Kestrels in European Turkey showed that the nearest confirmed breeding site

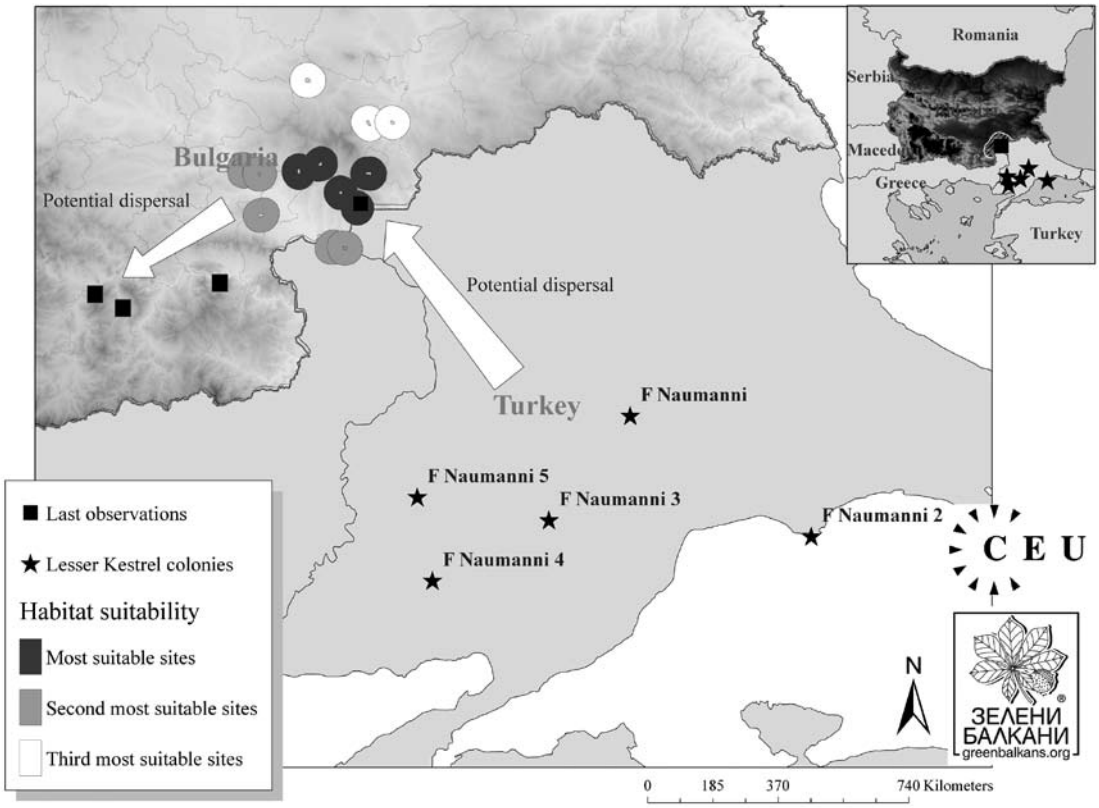

Fig. 3. Potential connectivity among the existing Lesser Kestrel colonies and Bulgarian sites as identified by Lesser Kestrel Habitat Suitability Model.

Table 2. Distance between confirmed breeding colonies of Lesser Kestrels in Turkey and suitable nesting settlements in Bulgaria (km).

Settlement	Distance in km					
	Lesser Kestrel colonies, Turkey					average
	1	2	3	4	5	
Kapitan Andreevo	96,1	159,2	98,7	99,8	75,2	105,8
Generalovo	99,4	162,4	101,2	101,1	76,6	108,1
Shtit	99,5	162,6	106,3	110,3	85,6	112,9
Mustrak	106,2	169,3	112,8	115,8	91,2	119,1
Studena	103,6	166,3	113,5	119,7	95,0	119,6
Valche pole	117,7	180,1	113,8	106,4	83,3	120,2
Lozen	121,9	184,9	121,7	117,2	93,5	127,9
Mladinovo	115,9	178,9	122,9	125,3	100,7	128,7
Srem	109,8	171,2	124,3	133,8	109,2	129,7
Oryahovo	119,6	182,7	124,7	125,1	100,7	130,6
Mramor	114,2	176,1	126,8	134,3	109,6	132,2
Dositeevo	128,7	191,8	131,2	128,5	104,6	137,0
Nadejden	133,5	196,6	133,8	128,7	105,3	139,6
Rogozinovo	133,0	196,1	134,9	131,3	107,6	140,6
Svetlina	135,2	197,3	145,7	149,7	125,1	150,6
Average	115,6	178,4	120,8	121,8	97,5	126,8

of the species was on average 98 km away from Bulgarian sites, while the most distant colony found in Turkish Thrace was found at an average distance of 178 km of the best suitable sites identified in Bulgaria (Fig. 3). Logically, the nearest settlements are those located at the Bulgarian – Turkish border – Kapitan Andreevo, Generalovo, Shtit, Mustrak, Studena, Vulche pole (Table 2).

Conclusion

Considering the distance measured between the potential Lesser Kestrel suitable sites in Bulgaria and the existing active colonies of the species located in Turkish Thrace, it is clear that the chances for natural re-colonization are slim and the process is unlikely to happen in the near future.

The idea of launching a re-introduction programme to restore or improve the status of Lesser Kestrel in Bulgaria through captive breeding and release is therefore supported.

In addition, the captive breeding and release of Lesser Kestrels in combination with proper habitat management has been proven to be successful for restoring and stabilizing the national populations of the species in numerous cases throughout Europe – France (LIFE 97 NAT/F/004119, LIFE05 NAT/F/000134), Portugal (LIFE02 NAT/P/008481), Spain (LIFE99 NAT/E/006341) (EC 2012).

We therefore suggest the initiation of a wide-scale restocking program for restoring the population of Lesser Kestrel in South-eastern Bulgaria as an important link between the core Lesser Kestrel populations of Middle Asia and Turkey and the strongholds of the species in the Western Mediterranean countries.

Acknowledgements: We are very grateful to all colleagues who shared information on the location of existing Lesser Kestrel colonies in Turkish Thrace, namely Kerem Ali Boyla, Jose and Ozlem Tavares (RSPB) and Dimitar Demerdzhiev (BSBP – BirdLife Bulgaria).
We are very grateful for the funding to conduct the expedition to Turkish Thrace, granted by Central European University (CEU) and Green Balkans.
We would like also to express gratitude to the colleagues, who assisted the compilation and execution of Lesser Kestrel Habitat Suitability Model in GIS environment – Evgenia Dobreva (Green Balkans) and Dr. Viktor Lagutov (CEU).
We are also very grateful for the kind support provided by KCM 2000 AD for publishing the present study. The current study was completed within LIFE11 NAT/BG/360 "Greater Chance for Lesser Kestrel in Bulgaria" Project, funded by the LIFE+ financial instrument of the European Commission.

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