

Status of the Lesser Kestrel *Falco naumanni* in Thessaly, Central Greece

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ABSTRACT

The breeding population of the Lesser Kestrel *Falco naumanni* has been estimated during a four-year study (1999-2002) in agricultural habitats in Thessaly, Central Greece. One hundred and thirty-four nests of the species were examined and the reproductive variables have been estimated. Mean clutch size was 4.0 eggs (n=134), mean brood size at hatching was 3.31 young (n=110) and at fledging was 3.16 young (n=102) per breeding pair.

One hundred and fifty-nine artificial nests (nest-boxes) were provided during 2001-02, in order to investigate whether a shortage of nest sites occurs.

INTRODUCTION

This paper covers a four-year study of the Lesser Kestrel *Falco naumanni* population in Thessaly, the main objectives of which were:

1. to estimate the breeding population of the species in the province of Larisa,
2. to estimate reproductive success and identify all negative factors affecting it,
3. to compare the reproductive parameters between natural and artificial nest sites.

The final aim of this work is to propose an integrated management plan, which will include nest sites and hunting areas, so that any further decline of the population in Thessaly will be avoided.

Over the last decades the species has suffered a massive population decline in large parts of its western Palearctic range (Cramp & Simmons 1980; Biber 1996), and is now of global conservation concern (SPEC 1 category). Research on this dramatic decline has revealed a number of factors including a reduction of favourable nesting habitats (restoration and/or demolition of old buildings), and intensification in agricultural practices (loss of feeding areas and reduction of prey availability) (Donazar, *et al.* 1993; Biber, 1996).

According to some evidence, the Lesser Kestrel had a widespread

distribution throughout Greece until 1980 (Hallmann 1996). The Greek population has greatly suffered from the same factors affecting the species throughout its range. Nowadays in Greece the Lesser Kestrel shows a discontinuous distribution and is mainly concentrated in Thessaly, where Hallmann (1996) in a preliminary report recorded 104 colonies including 2,679 pairs. This high concentration of the species in Thessaly can be explained by the presence of suitable habitats for hunting and nesting. Non-intensive cultivation of cereals interspersed with pasture-land with natural and low vegetation, as well as the existence of deserted houses and old barns for nesting, seem to favour the presence of the species.

Interest in the species in Greece has recently increased, mainly because people have recognized its beneficial effects on crops. Over the last years intense local population explosions of grasshoppers have been observed in some regions and farmers have recognized the potential of the Lesser Kestrel population for controlling them.

STUDY AREA

The study has been conducted in Thessaly, Central Greece, which includes the province of Larisa, comprised of 2,400 km² and characterized by a flat terrain surrounded by mountains.

The altitude ranges from 50 to 180m and the climate is characterized as thermo-mediterranean. The mean monthly temperature in July is 26°C and the mean annual precipitation is about 465mm.

In this vast area, different land uses can be distinguished, such as non-intensive agricultural land (with cereals as primary crop), intensive agricultural land (with cotton growing) and pasture on hill slopes and near villages.

MATERIAL AND METHODS

This study was started in March 1999 and is still in progress. The main study was based on three villages, Armenio, Stefanovikeio and Megalo Monastiri, with a high density of breeding pairs. The first two villages are situated on flat terrain surrounded by intensively cultivated land and the third is located on the edge of the hills, surrounded by non-intensively cultivated land and grassland grazed mainly by sheep and goats..

During the study, the number of Lesser Kestrel breeding pairs was estimated throughout the province of Larisa. One hundred and twenty villages were checked in 2001-2002, the total number of individual birds flying above the colonies was recorded and the possibly breeding pairs per colony were calculated. This method of survey was based on the Lesser Kestrel's habit of flying above the colony in the late evening, at the beginning of the breeding season, before roosting. Taking weather conditions into consideration, by using advantageous observation points with a good view the basic number of breeding pairs could be estimated. In order to compare the pairs estimated by direct counts with the precise number of breeding pairs, 20 colonies were checked, all the nests were found, and finally a correction in the number of pairs sighted in all colonies was made.

During the first two years of the study nests were found during the

incubation period. Nest contents were checked every 15 days to record possible failure of reproduction. They were also checked more frequently during the beginning of incubation to assess clutch size, just after hatching to estimate hatching success, brood size at hatching and date of hatching, and during fledging to record the number of young fledged (brood size at fledging) (Steenhof, 1987).

Three main habitats have been identified in the study area (cereal, edges of cotton fields and pastures) and the density of grasshoppers was estimated during 2001 and 2002 by placing random quadrants. Twenty-five transects from each habitat were searched fortnightly for two months (15 May -15 July), taking random directions and using 1.0m² quadrants placed on the ground every three metres (Sutherland 1996).

RESULTS AND DISCUSSION

Survey of breeding pairs in Larisa

The breeding pairs of the Lesser Kestrel during 2001-2002 were surveyed in the province of Larisa, which is the main distribution area of the species in Thessaly, and the results are presented in Table 1.

Table 1. The surveyed breeding pairs of Lesser Kestrel in Province of Larisa.

Town	Province	1995*		2001-2002			
		Number of colonies	Total breeding pairs	Number of colonies	Number of pairs observed	Estimated breeding pairs reduced by	
						30%	20%
	Larisa	49	1626	58	2427	1699	1942
Larisa	Farsala	23	593	27	954	668	763
	Tirnavos	7	94	7	185	130	148
	Elassona	4	49	6	104	73	83
Total		83	2362	98	3670	2570	2936

* Hallmann, 1996.

One hundred and twenty villages were checked in 2001-2002 and 98 colonies were found. By the number of individuals flying above the colonies during the incubation period and taking into account that the number of pairs observed constituted 20-30% of the precise number of breeding pairs in 20 colonies, the possible number of breeding pairs in Larisa oscillates between 2,570 and 2,936 pairs. Thus the total number of breeding pairs of the Lesser Kestrel in Thessaly may exceed 3000 pairs.

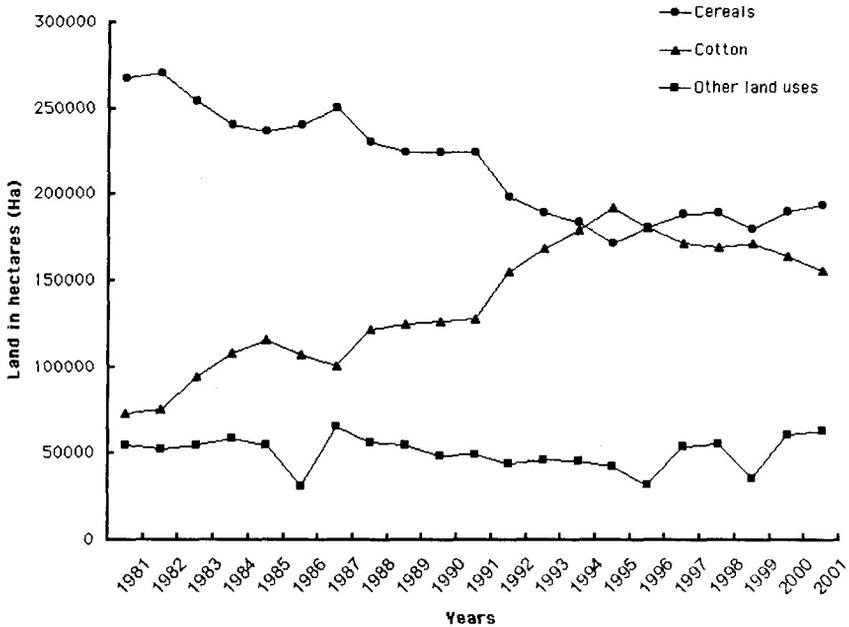
Changes in agricultural land use.

Analyzing the geographical distribution of the Lesser Kestrel in the plain of Thessaly, various land uses can be distinguished, which include intensive and non-intensive agriculture, pasture-land on hill slopes and other land uses on a

small scale.

As is shown in Figure 1, by using data from the National Statistical Service of Greece, dept. of agricultural statistics, over the last twenty years an intensive agricultural change has occurred in Thessaly. Non-intensive agricultural land, with cereals as a primary crop, has been replaced on a large scale by irrigation crops and industrial plants. In 1981, 52 % of the total agricultural land was cereals and 14% cotton. In 1995 there was a cotton boom in Thessaly and 39 % of the agricultural land changed to cotton crops because of the favourable EU price. Today wet cotton farming in Thessaly covers 31 % of the total agricultural land. These rapid changes in land use may explain the discontinued distribution, population decline and even absence of the species in some areas.

Figure 1. Land uses in Thessaly during the last 20 years.



Density of grasshoppers in different habitats.

The Lesser Kestrel, as mentioned above, prefers open areas with low vegetation for locating and hunting its prey. Such cultivated agricultural land with cereals interspersed with pastures seems to be the main feeding habitat in Thessaly. The cotton field offers some hunting opportunities (mainly round its edge) but only in spring losing its importance during the summer because of the increased size of the plants.

The importance of these three main habitats as feeding places is shown in Table 2 presenting the densities of grasshoppers. The densities do not differ between the two years in the three habitats and for this reason the data have been pooled.

Table 2. The mean number of grasshoppers estimated in different habitats during 2001-2002.

Habitat	Total no. of transects	Mean number of grasshoppers and crickets/m ²
Cereal	50	2.382±2.41
Edge of cotton land	50	1.392±1.63
Pasture	50	4.680±4.34

$F_{2,107}=9.89, P=0.001$

The results show that pasture-land has the largest density of grasshoppers and crickets, followed by cereals and cotton. Statistical significance has been shown by the comparisons of the density of grasshoppers only between cereals and pastures, cotton and pastures ($F_{2, 107}=9.89, P=0.001$).

Breeding performance

There were no significant differences in any breeding parameter between the three colonies in 1999 and 2000 and because no differences were found in each year the data have been pooled and the null hypothesis that the breeding parameters were similar between the two study years has been tested (Bakaloudis *et al* 2000) (Table 3). Table 3 shows that the breeding parameters were higher in 2000 than in 1999 but only the mean clutch size was significantly different between the two study years. The average clutch size was 3.68 eggs in 1999 and 4.43 eggs in 2000 and the mean was 4.0 eggs per breeding pair. The average brood size of successful nests was 3.31 young and, a few days before fledging, the mean brood size of successful nests was 3.16 young.

Table 3. Reproduction of Lesser Kestrel in different years. Numbers in brackets are sample sizes.

Year	Mean clutch size	Mean brood size at hatching	Mean brood size at fledging	Mean young fledged per territorial pair
1999	3.68 ± 0.13 (74)	3.24 ± 0.13 (58)	3.11 ± 0.14 (54)	2.27 ± 0.19 (74)
2000	4.43 ± 0.10 (60)	3.39 ± 0.13 (52)	3.21 ± 0.15 (48)	2.57 ± 0.21 (60)
Overall	4.02 ± 0.10 (134)	3.31 ± 0.09 (110)	3.16 ± 0.10 (102)	2.40 ± 0.14 (134)
2 sample <i>t</i> -test	$P < 0.001$	<i>ns</i>	<i>ns</i>	<i>ns</i>

Breeding in nest boxes.

One hundred and fifty-nine artificial nests (nest-boxes) were placed during 2001-02, 56 in 2001 and 103 in 2002, and Lesser Kestrels started readily to occupy them. 14% of these were occupied in the first year and 16.4 % in the second year.

Comparing the reproductive parameters in 2002 between natural and artificial nest sites there were no significant differences between them, with the

exception of the number of eggs in the natural sites, where the mean number of eggs per nest was larger. This was probably partially due to predation as the most occupied artificial nests are in open places, mainly in small groves, and there are signs that crows nesting there or in the surrounding area rob eggs. Even though some studies indicate that predation has decreased in the artificial nest sites (Valkama 1999), Hasenclever (1989) found that the kestrels using stick nests suffer partially from the predation of crows.

Proposals for conservation.

The levels of action for the protection of the Lesser Kestrel in Thessaly should be five: -

1. Protection of nest sites with the maintenance of traditional old buildings.
2. Reassessment of agricultural land uses.
3. Experiments with artificial nests.
4. Regular monitoring for understanding the discontinued distribution and adaptation of the species.
5. Education and public awareness.

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