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DISTRIBUTION AND ESTIMATION OF THE POPULATION SIZE OF THE SHORT-TOED SNAKE-EAGLE *Circaetus gallicus* IN MACEDONIA

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ABSTRACT

Velevski M. & Grubač B. (2008): Distribution and estimation of the population size of the Short-toed Snake-eagle *Circaetus gallicus* in Macedonia. Proceedings of the III Congress of Ecologists of the Republic of Macedonia with International Participation, 06-09.10.2007, Struga. Special issues of Macedonian Ecological Society, Vol. 8, Skopje.

Data on the distribution of the Short-toed Snake-eagle *Circaetus gallicus* in Macedonia were gathered in the period 2000-2007. Presence of 61-77 pairs was confirmed, and estimation of the total Macedonian population was done to 120-150 pairs, with presently stabile trend. Estimated breeding density in Southern Macedonia was 20,3 km^2/pair. Most of the territories were located in the degraded oak forests in Southern Macedonia, on altitude of 300-800 m asl. (range 65-1200 m asl). However, the estimated breeding density was much higher in the Greek Juniper scrublands and pseudomaquies (5,8 km^2/pair), and therefore we consider these habitat types as typical for this species in Macedonia.

Key words: Short-toed Snake-eagle *Circaetus gallicus,* Macedonia, distribution, population size

Introduction

The Short-toed Snake-eagle (*Circaetus gallicus* Gm.) is distributed from the north-west Africa and south-west Europe to the Gulf of Finland and east to Asia, with disjunct populations in India and on the Lesser Sundas (BirdLife International, 2007). The total world population is estimated to be 10,000-100,000 individuals (Ferguson-Lees & Christie, in BirdLife International 2007), and its conservation status has been evaluated as Least Concern (IUCN 2007). In Europe its population is estimated to be 8400-13000 pairs (BirdLife International, 2004), with highest population (2000-3000 pairs) in Spain. On the Balkan Peninsula, it is most numerous in Greece (300-500 pairs), and the other countries have similar population sizes (Albania: 50-100, Bulgaria: 80-200, Croatia: 100-250, Serbia and Montenegro together: 130-170, BirdLife International 2004).

The Short-toed Snake-eagle is a migratory species, in Europe arriving at breeding territories in mid-March to mid-April, earlier in the south of the continent. It leaves the breeding areas mostly from mid-September to mid-October. Eastern European populations winter in India, occasionally South-east Asia, while western populations in sub-Saharan Africa (Cramp & Simmons, 1980). Occasionally, is known to winter in southern Europe, e.g. Spain (Martinez & Sanchez-Zapata, 1999), or possibly Greece (Handrinos & Akriotis, 1997).

In Macedonia the species has been recorded by many authors, but the total number of published observations is surprisingly low. Short overview is presented in Tab. 1.

Methods

Survey of the Short-toed Snake-eagle was performed in the period 2000-2007. All records were noted either as „territorial behaviour“ (pair or family, or single bird seen soaring, foraging or taking prey to the nest) or „movements“ (dispersion, migration or observations of birds flying high above unsuitable habitat for breeding). No special search for nests or roosting places was done. All individual records (n=162) were presented on a topographic map (1:100000), using ArcMap software. All records of single birds far from other known territories or other records were considered as „territory“, unless they were previously classified as „movements“, or were

Tab. 1. Literature data for the presence of the Short-toed Snake-eagle in Macedonia

Date	Location	Autor(s)
29.04.1916	southern Vardar Valley	von Viereck (1917)
< 1949	Skopje Valley, few pairs between Taor and Lisice	Karaman (1949)
21.07.1959	near Veles	Terrasse & Terrasse (1961a)
23.07.1959	Demir Kapija	Terrasse & Terrasse (1961a)
25.07.1959	Mountains around Prespa Lake	Terrasse & Terrasse (1961b)
1955-1959	Skopje Valley	Dimovski (1967)
08.04.1969	Badar Gorge	Danko & Sczilard (1971)
15.06.1969	Raec Gorge	Limbruner (1988)
01.06.1971	v. Kadrifakovo	Limbruner (1988)
19.04.1973	Babuna Gorge	Geiger et al. (1974)
05.08.1976	near Prilep	Ritzel (1979)
08.08.1976	south of Veles	Ritzel (1979)
1978	Prespa Lake	Vasić et al. (1985)
1980	Vardar Valley	Vasić et al. (1985)
?	southwest Macedonia	Vasić et al. (1985)
11.05.1980	near v. Peštani	Dijksen & Dijksen (1984-1985)
07.08.1982	Plačkovica	Puzović (1987)
1989	Konečka Mt.	Vogrin (1990)
?	Bistra Mt.	Ivanovski (1998)
10.07.2000	Gorčovski Rid, Ogražden Mt	Velevski et al. (2002)
23.07.2000	Kravičevo, Ogražden Mt	Velevski et al. (2002)
12-14.05.2006	Bregalnica River region, Nogaevci-Ubogo	Škorpikova et al. (2006)

done in period before March 15th and after September 1st. In some areas where more pairs exist in close proximity, the „territories" were established on the basis of clusters of data, but most valuable were the field observations, especially contemporary contacts. Data on altitude were extracted from the map.

Study area

Study area included large regions in Central and Southern Macedonia (Kumanovo region, Skopje region, Veles region, Štip region, Sveti Nikole region, Vardar valley, Tikveš region, Demir Kapija region, Mariovo region, Pelagonia Plain, Ogražden Mt., Osogovo Mt., Babuna Mt., Prilep region, Pelister Mt., Nidže Mt., Kožuf Mt., Dojran region) and less attention was paid to the mountains and valleys in western (Korab Mt., Bistra Mt., Stogovo Mt., Karaorman Mt.), south-western (Jablanica Mt., Galičica Mt., Ohrid and Prespa Lake), central (Jakupica Mt.), south-eastern (Belasica Mt., Strumica valley) and eastern parts (Maleševski Mts, Plačkovica Mt., Goten Mt.). Some areas (Bilina Mt., Skopska Crna Gora Mt., Žeden Mt., Šar Planina Mt., Čeloica Mt., Ilinska-Plakenska Mts, Bigla Mt., Dešat and Krčin Mts.) remained almost completely unsurveyed. Most of these regions have been surveyed by the authors in the period before 2000, and no breeding records of the species were found. In all these regions extensive montane forests develop, that are mostly not suitable for sustaining significant number of breeding pairs of the Short-toed Snake-eagle.

Results and Discussion

In the period 2000-2007, 68 (61-77) territories of Short-toed Snake-eagle were located in Macedonia, distributed in central, eastern and especially southern regions (Fig. 1.).

Within these regions, they occupy mostly degraded oak habitats (n=37 territories), and Greek Juniper scrublands or pseudomaquies (n=19 territories). Some pairs (n=5) also occupy territory largely on pastures, where they probably breed on individual trees or in neighbouring woodlands, and 4 territories are in Black Pine *Pinus nigra* stands.

Most of the territories (n=37) are on altitude between 300 and 800 m asl (range 65 -1200 m, mean = 576 m, median = 560 m).

Estimated breeding density in southern Macedonia (regions of Mariovo, Tikves Lake and Demir Kapija) is 20,3 km^2/pair (ranging from 29,8 km^2/pair in Mariovo to 5,8 km^2/pair in Demir Kapija). Mean neighbouring nest distance is estimated to ca. 5 km (minimum 1,1 km), but the average can be as low as 2,4 km at Demir Kapija.

Based on these data, population size of the Short-toed Snake-eagle in Macedonia is estimated on 120-150 pairs. No major changes in the occupied territories have been noted in the study period, and therefore we consider the present population trend of the species in Macedonia as stabile.

Although it seems that largest part of breeding population of the Short-toed Snake-eagle in the country is found in the oak forests (mostly Pubescent oak, *Quercus pubescens*), the breeding densi-

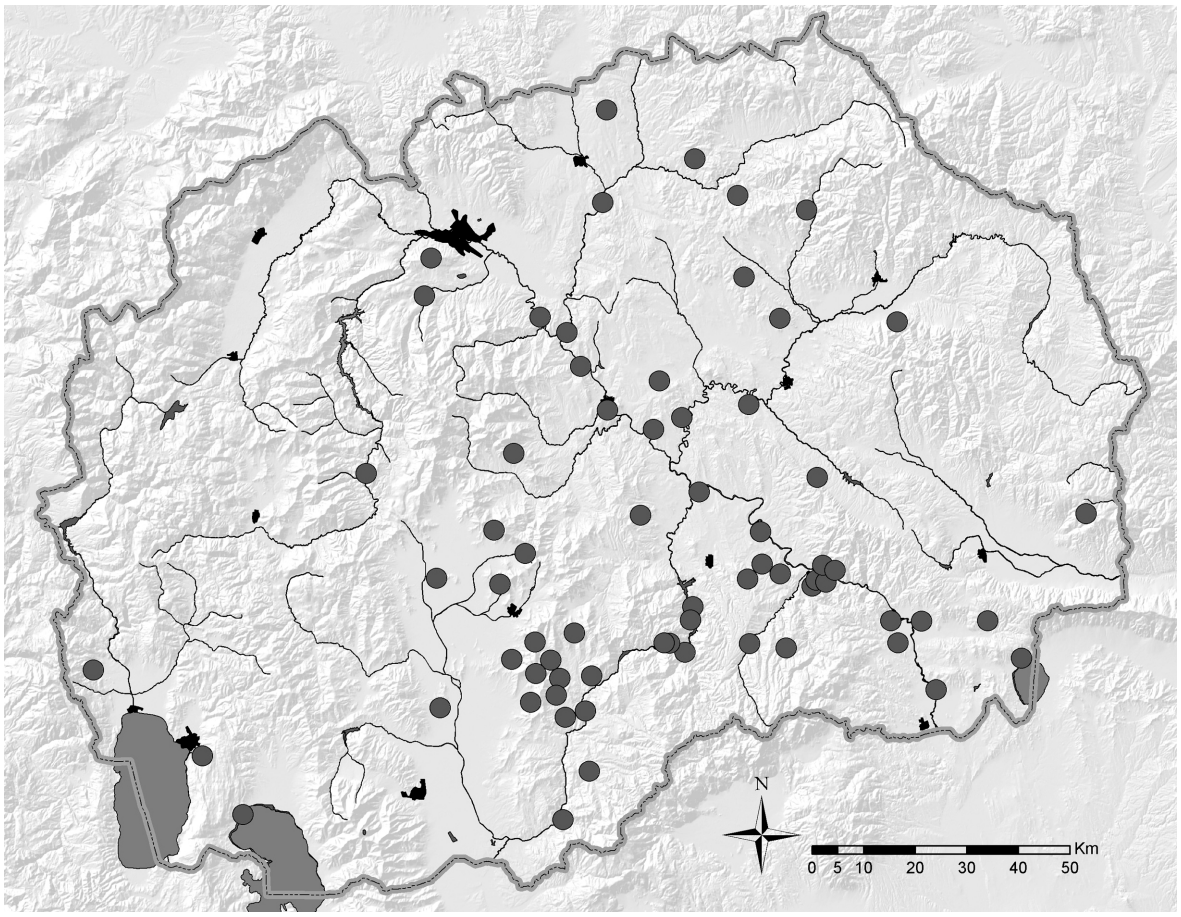

Fig. 1. Map of territories of the Short-toed Snake-eagle in Macedonia

Tab. 2. Breeding densities and mean nest distance for the Short-toed Snake-eagle in some European countries

Country/region	density (km²/ pair)	mean nest distance	Reference
Spain, southwest	8,5		Amores & Franco (1981)
Greece/Dadia-Lefkimi-Soufli	13,71	2,2 km	Vlachos & Papageorgiou (1994)
Greece/Dadia-Lefkimi-Soufli	16,9	2,7 km	Bakaloudis et al. (2005)
Italy, central	48,6	4,4 km	Petretti (1988)
Belarus		6 km	Ivanovsky (1992)
Italy, central		13-34 km	Bocca (1989)
France, southern	166,6		Cheylan (1981)
Macedonia, southern, estimation	20,3	5 km	this work

ty is much higher in the typical sub-Mediterranean parts of Macedonia, especially at Demir Kapija and around Tikves Lake. In these regions, xerophylous vegetation dominates, with number of Juniper (*Juniperus excelsa*, *Juniperus foetidisima*) trees and evergreen Kermes Oak (*Quercus coccifera*). Juniper trees seems to be of great importance, as the species is known to have preference of conifer to deciduous species (e.g. at Dadia-Lefkimi-Soufli forest in Greece, Bakaloudis et al. 2001). With our research, three out of four nests were found on Greek Juniper (*J. excelsa*), while the fourth one was found on Black Pine (*Pinus nigra*). The estimated breeding densities found in Macedonia are comparable to those found by other authors in Europe, and the density at Demir Kapija is higher to the density found in Dadia Forest in Greece (Tab. 2).

In Europe, the species is found to breed at wide range of altitudes, even up to 1700 m (Thiollay, in Bakaloudis et al. 2001). Bocca (1989) found it at 1200 m in northwest Italy, which is the same as the highest breeding altitude found in Macedonia (1200 m asl., Konjarnik, Mariovo region.). Therefore, it can be expected that in Macedonia the Short-toed Snake-eagle also breeds at higher altitudes, with lower densities. When foraging, the species has been

often observed significantly higher, even at mountain pastures of Bistra Mt., Galicica Mt (1600 m asl), Jablanica (2000 m) or Kozuf Mt. (2100 m).

Summary

During the survey on the distribution of the Short-toed Snake-eagle *Circaetus gallicus* in Macedonia, presence of 61-77 pairs was confirmed, and the total population was estimated to 120-150 pairs, with stabile trend. The breeding density was greatest in Juniper shrubs and pseudomaquies in Demir Kapija region (5,8 km^2/pair), and the average density in Southern Macedonia was estimated to 23,3 km^2/pair. These results correspond with the findings in other European countries. Typical habitats of the species in Macedonia are the Greek Juniper and Kermes Oak shrubs, and the first species is of great importance for breeding.

The altitude range where territories were located spans from 65 to 1200 m, with higher number of pairs (n=37) having territories in from 300 to 800 m asl.

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