

Population of Saker Falcon (*Falco cherrug*) in Western Slovakia between 1976 and 2010

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ABSTRACT—The population of Saker Falcon in Western Slovakia was under a systematic monitoring since 1976. Gathered data were used to assess the distribution and population trends. The population has grown almost fourfold, from 7 pairs in 1979 to 27 pairs in 2010. During the study period nesting of 47 pairs was recorded. A total of 797 juveniles fledged successfully from the nests. The area of distribution has changed and increased significantly, majority of the pairs from mountains has moved to the lowland cultivated land. Management measures, such as guarding of the nests and installation of nest boxes, were of crucial importance for the population. Nowadays the population is dependent on artificial breeding opportunities and alternate feeding sources, as Feral Pigeon is the most common prey at present. Negative factors were surveyed as well. Several actions for its elimination were carried out, such as insulation of dangerous power lines, reduction of illegal activities, management of nesting and breeding habitats. Implementation of most of the measures would not be possible without different conservation programmes.

Key words: Saker Falcon, *Falco cherrug*, Slovakia, population trend, conservation

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Introduction

The territory of Western Slovakia is an important nesting area of the Saker Falcon. The first specific data about nesting of a Saker in Slovakia come from 1885 and 1886 from a rock at Devín castle situated in part of Bratislava called Devín (Chernel, 1899). Ferienc (1964) described nesting of the species between 1928 and 1964. In that period the Malé Karpaty Mts were the most important breeding territory, with 6 recorded nesting pairs. Another 6–9 pairs were nesting in different orographic units in the western part of the country. It can be assumed, that there were another pairs nesting in the borderline floodplain forests of the River Morava, which was a strictly protected area until 1990. Until 1976 the population of Saker Falcon in Slovakia was not under systematic monitoring.

For the conservation of Saker Falcon in Slovakia implementation of three projects was very important. The project "Falco—Saker Falcon nest protection in the Malé Karpaty Mts", implemented between 1990 and 1994, has saved the population from a drastic decline due to nest robberies. Between 2006 and 2010 an international project for the conservation of Saker Falcon in Slovakia and Hungary was implemented. The project was supported within the programme of European Commission LIFE-Nature and contributed significantly to the conservation of the species. In 2010 a project supported from the Southeast Europe Saker falcon Network and Environment Agency (Abu Dhabi) was implemented in South-west Slovakia. As the main result of this project, conditions for connection between Slovak and Hungarian population were created by installation of nest boxes in border area.

Material and methods

Monitoring of population and prey composition

Until 1976 all data came from incidental observations. Since 1976 a systematic monitoring of the Saker population in Western Slovakia has been carried out. The aim of the monitoring was to determine the real number of nesting pairs, trophic and habitat preferences of the species, habitat conditions and influences, as well as the trends of these factors. Surveys of the negative factors were also part of the survey. Since 1990 the borderline floodplain forests of the River Morava has been included in the surveyed area. The monitoring was carried out by the same methodology (Chavko, 2010). We suppose that between 1979 and 1990 approximately 69% of all nesting pairs in Western Slovakia were under the systematic monitoring, while since 1991 it was 92%. Regular ringing of chicks was carried out as a supplementary method of monitoring. In 2008 a solar Argos/GPS transmitters were used for the first time in Slovakia to follow the movement of Saker Falcon individuals. Altogether 6 females were tagged with this type of transmitter between 2008 and 2010 in Slovakia within the above mentioned LIFE project.

The monitoring of prey composition was carried out systematically since 1976 by analysis of food remains collected from the nests, mostly after the juveniles fledged. The monitoring was carried out by the same methodology during the whole period. The remains were analysed by an expert

Management measures

Different management measures were implemented. Creating of artificial nesting opportunities can be considered for crucial. Since 1981 31 artificial nests and 28 nest boxes on trees were installed, mostly in Malé Karpaty Mts. After 1994 the nest boxes and nests were installed also on high-voltage pylons, mostly in cultivated land. Until 2010 altogether 151 nest boxes and 15 artificial nests were installed. Since 2007 aluminium nest boxes were used within the LIFE project and the project supported by SESN (85 out of 151), and were installed in cooperation with the responsible company Slovenská elektrizačná prenosová sústava, a.s. The sites for artificial nesting opportunities were selected after considering the biological requirements of the species.

Crucial for the practical conservation of Saker Falcon was the guarding of the nests after 1990, by physical guarding and phototraps. Until 1995 a physical guarding of the whole population in Malé Karpaty Mts was ensured. 2–3 nests were guarded each year within the LIFE project. The guarding was done by volunteers, experts or by members of cooperating local hunting associations.

The repatriation of suslik (*Spermophilus citellus*) was done on foothills of Malé Karpaty Mts, on historical hunting territories of Saker in Western Slovakia, on sites where the suslik was a common species in the past. Between 2007 and 2010 a total of 574 suslik individuals were released on the area of 40 hectares. Monitoring of the repatriated individuals as well as suitable sustainable management of the site was ensured.

To prevent the electrocution more than 1000 pylons of dangerous 22 kV power lines were insulated in Western Slovakia, mostly within the LIFE project. Another 1000 pylons

		All breeding attempts	Successful breeding attempts	% of success	Number of fledglings	Average number of fledglings per nest	
						All attempts	Successful attempts
Tree	natural nest	109	64	59%	180	1.7	2.8
	artificial nest	29	21	72%	61	2.1	2.9
	nest box	28	15	54%	51	1.8	3.4
Pylon	natural nest	8	7	88%	18	2.3	2.6
	artificial nest	12	11	92%	39	3.3	3.5
	nest box	136	116	85%	408	3.0	3.5
Rock	natural nest	18	9	50%	26	1.4	2.9
	artificial nest	5	4	80%	14	2.8	3.5
Total		345	247	72%	797	2.3	3.2

Table 1. Overview of breeding success of 47 Saker pairs in Western Slovakia between 1976 and 2010, according to different types of nests

	Breeding attempts				Average No. of fledglings per nest	
	Total	Successful	% of success	No. of fledglings	All attempts	Successful attempts
Mountains & floodplains	174	113	65%	305	1.8	2.7
Lowlands	171	134	78%	492	2.9	3.7

Table 2. Overview of breeding success of 47 Saker Falcon pairs in Western Slovakia between 1976 and 2010, comparing mountains and lowlands

were insulated in Eastern Slovakia. This action was implemented in cooperation with the responsible Companies Západoslovenská energetika, a.s. (which was also a partner of the LIFE project) and Východoslovenská energetika, a.s.

Results and discussion

Population

Article about trend and conservation of Saker Falcon population in Western Slovakia between 1976 and 2010 was published previously (Chavko, 2010). Some data have been specified and are published in modified form in this article.

In the study period significant changes in size and distribution of the Saker Falcon population in Western Slovakia were recorded (Figure 1). As mentioned in the methodology, majority of the pairs was known only since 1979, when 7 pairs were recorded (69% out of estimated total number of 10 pairs). In 2010, 27 pairs were known (92% out of estimated 29 pairs). Between 1976 and 2010 the reproduction dynamics of 47 pairs in Western Slovakia was studied. The average success between 1976 and 2010 was 2.3 fledglings/all breeding

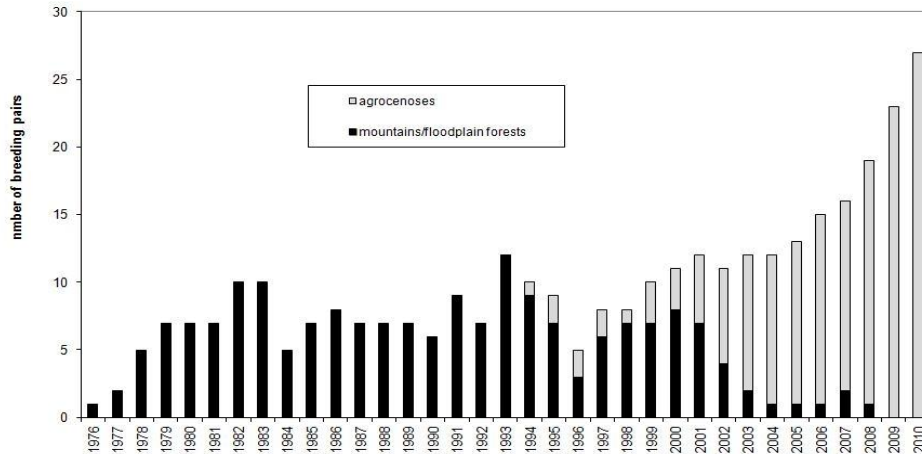


Figure 1. Trend of Saker Falcon population in Western Slovakia between 1976 and 2010 (after Chavko, 2010)

attempts ($n = 345$) and 3.2 fledglings/successful breeding attempts ($n = 247$), 47 pairs raised 797 fledglings (Table 1). From 1994 on, most of the pairs have moved gradually to cultivated land in lowlands with the last breeding in mountains or floodplain forests in 2008 (Figure 2). Out of the 345 recorded breeding attempts between 1976 and 2010, 153 were in mountains, 15 in floodplain forests and 177 in cultivated land. In Table 2 the success of nesting in traditional sites (mountains and floodplain forests) and lowlands is compared. The resettlement has been subject to significant negative impacts on nesting sites in mountains and floodplain forests, as well as to installation of nest boxes on high-voltage pylons in cultivated land. The new nesting areas were also suitable as feeding sites. In parallel with the relocation, a positive trend of the population (Figure 1), as well as an increase in the breeding success (Figure 2) were observed.

The losses represent 28% of all breeding attempts. Reasons of losses are listed in Table 3. Negative factors recorded during the monitoring are listed in Table 4. The influence of negative factors was so serious, that the population has stagnated until 2004, between 5 to 12 pairs. The threats and negative impacts are described by Chavko (2010). Nest robbery was in the 1970s and 1980s of the 20th century one of the major factors endangering Saker population in Western Slovakia. Only by intensive guarding of the nest between 1990 and 1995 it was managed to maintain the population. Out of the negative factors the illegal activities have the most serious impact on the population at present, mostly in lowlands, where the major part of the population is nesting.

Creation of artificial nesting opportunities is considered as the most important management measure for the Saker Falcon in Western Slovakia. At present, the whole population is nesting in artificial conditions. Without implementation of management measures, the nesting population of Saker Falcon in Slovakia would likely disappear.

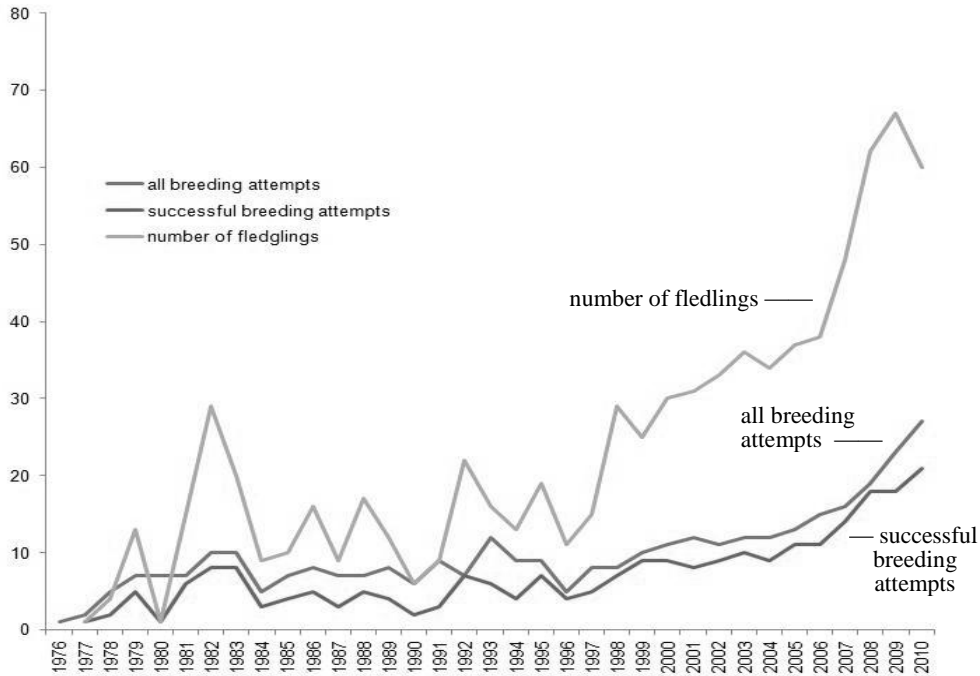


Figure 2. Breeding success of Saker Falcon in Western Slovakia between 1976 and 2010 (all breeding attempts and successful breeding attempts are in pairs, number of fledglings is in individuals)

Prey composition

In this article results of analysis of food remains collected between 2000 and 2009 are presented. Complete results from 1976 will be published in a separate article. The suslik was previously the dominant prey of Saker Falcon. As a result of intensive management practices, the structure of the country has significantly changed and the pastures with suslik colonies have disappeared (Ambros, 2008). As shown in Table 5, due to these changes the Saker Falcon adapted to other prey species. At present the Feral Pigeon (*Columba livia* f. *domestica*) is dominant in the prey of Saker Falcon in Western Slovakia. This situation is unsatisfactory mainly for two reasons. The first is food addiction of Sakers on pigeons as unnatural food sources. The second reason is the negative attitude of pigeon fanciers towards the Saker and the ensuing persecution of the species. For these reasons, it is necessary to continue the repatriation of suslik in Saker feeding territories, to re-establish the colonies. By analyzing the food remains it was also proved that the Saker feeds also on cadavers. The results show that most of the animals were killed by agricultural mechanism or road transport, what is documented by remains of a deer (*Capreolus capreolus*), fox (*Vulpes vulpes*) and an adult hare (*Lepus europaeus*). This fact increases the risk of death

Reason	Number of cases
Nest robbery	20
Assumed nest robbery	12
Human disturbance	21
Natural reasons	21
Unknown	24
Total	98

Table 3. Direct reasons of losses between 1976 and 2010

Threatening factor	Mountains	Lowlands
Lack of feeding opportunities, loss and degradation of hunting sites	important	not important
Lack of nesting opportunities, loss and degradation of natural nesting sites	important	not important
Nest robberies	important	not important
Poisoning	not important	important
Shooting	not important	important
Predation	important	not important

Table 4. Importance of different negative factors on population of Saker in Slovakia in mountains and lowlands

due to feeding on poisoned bait. The analyses have proved presence of at least 41 bird species (81% of prey) and 10 mammal species (19% of prey).

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Species	Number of individuals	%
<i>Columba livia</i> forma <i>domestica</i>	3433	61.8%
<i>Sturnus vulgaris</i>	386	6.9%
<i>Cricetus cricetus</i>	355	6.4%
<i>Phasianus colchicus</i>	242	4.4%
<i>Columba oenas</i>	198	3.6%
<i>Spermophilus citellus</i>	166	3.0%
<i>Columba palumbus</i>	127	2.3%
<i>Perdix perdix</i>	120	2.2%
<i>Larus ridibundus</i>	107	1.9%
<i>Lepus europaeus</i>	96	1.7%
<i>Microtus arvalis</i>	93	1.7%
<i>Streptopelia turtur</i>	32	0.6%
<i>Coturnix coturnix</i>	29	0.5%
<i>Pica pica</i>	22	0.4%
<i>Vanellus vanellus</i>	22	0.4%
<i>Streptopelia decaocto</i>	21	0.4%
<i>Alauda arvensis</i>	18	0.3%
<i>Turdus philomelos</i>	11	0.2%
<i>Coccothraustes coccothraustes</i>	10	0.2%
<i>Turdus merula</i>	8	0.1%
<i>Garrulus glandarius</i>	6	0.1%
<i>Talpa europaea</i>	5	0.1%
<i>Lullula arborea</i> , <i>Rattus norvegicus</i> , <i>Capreolus capreolus</i> , <i>Nyctalus noctula</i> , <i>Passeriformes</i> sp.	15 (5 species x 3 individuals)	0.3%
<i>Turdus viscivorus</i> , <i>Crex crex</i> , <i>Scolopax rusticola</i> , <i>Passer montanus</i> , <i>Passer domesticus</i> , <i>Anas platyrhynchos</i> , <i>Corvus corone</i> , <i>Falco tinnunculus</i> , <i>Apodemus sylvaticus</i> , <i>Aves</i> sp. juv	20 (10 species x 2 individuals)	0.4%
<i>Dendrocopos major</i> , <i>Loxia curvirostra</i> , <i>Pyrrhula pyrrhula</i> , <i>Galerida cristata</i> , <i>Lanius collurio</i> , <i>Anas crecca</i> , <i>Asio otus</i> , <i>Tyto alba</i> , <i>Gallus gallus dom.</i> , <i>Apus apus</i> , <i>Aves</i> sp., <i>Apodemus flavicollis</i> , <i>Ondatra zibethicus</i> , <i>Vulpes vulpes</i> , <i>Philomachus pugnax</i> , <i>Larus canus</i>	16 (16 species x 1 individual)	0.3%
Total	5558	100.0%

Table 5. Prey composition of Saker Falcon in Western Slovakia between 2000 and 2010

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