

Population Trend of the Saker Falcon *Falco cherrug* in Hungary between 1980 and 2002

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ABSTRACT

In 1980 the Saker Falcon population was at a critical stage in Hungary with only eight pairs in 13 known territories. Past and present conservation efforts to save the species in Hungary included nest guarding, construction of artificial nests, insulation of electric poles and co-operation with stakeholder groups. These efforts resulted in a significant expansion of the area inhabited by the species in Hungary. Although there were fluctuations between years leading up to 2002, a steady increase of the population has been observed, reaching 113-145 pairs. During this period 1065 breeding attempts have been recorded with 2553 birds fledging. The number of unsuccessful breeding attempts totalled 226. Average breeding success varied between 2.0 and 3.7 fledglings per successful nest per year. While the population expanded into agricultural lowland areas, the mountain habitats have all but been abandoned with the exception of 6-8 nest sites. Most of the lowland pairs breed in artificial nests, which are renovated regularly. Expected land use changes may adversely affect the population in the future and today the population depends largely on ongoing conservation efforts.

INTRODUCTION

The Saker Falcon inhabits mostly open areas in Hungary, steppes and agricultural areas. It breeds in mountain ranges (the highest point of Hungary is 1015m) and lowlands. These birds breed both in tree nests and on cliffs. Breeding pairs appear at nests from the beginning of February onward, egg-laying occurs from mid-March to the end of March, incubation takes 32-33 days, and the chicks spend 42-50 days in the nest. Adults do not migrate in the winter.

The world population is in decline throughout most of its range, raising serious concern in a number of countries (Galushin *et al.* 2000; Ryabtsev 2000; Shagdarsuren *et al.* 2000; Turganbaev 2000; Vetrov 2000; Ye *et al.* 2000). The only Saker Falcon populations known to be increasing are found in the Carpathian Basin, in Hungary and Slovakia. The situation in Hungary was not always favourable for the species, and the rapid decline in the 1970s and early 1980s threatened the population with extinction.

This paper presents Hungarian Saker Falcon population problems during the early 1980s, the efforts made to solve them, and what effects these measures have had.

CONSERVATION PROBLEMS

By the beginning of the 1980s the Saker Falcon population reached a critical situation in Hungary. A number of factors resulted in a rapid population decline and low reproduction rate. The most significant factors adversely affecting the species were:

- Regular nest robbing by egg-collectors and for falconry
- Illegal shooting (nests and adults)
- Electrocution
- Disturbance by tourists, rock climbers, forestry activities
- Collapsing nests (mainly of corvids)

The cliff-broods were especially affected by regular nest robbing. Therefore the reproduction success at known nest sites was very low, with only a small number of young fledging. Despite legal protection of the species, illegal shooting also occurred both intentionally and unintentionally during pest control activities, when corvid nests occupied by Saker Falcons were shot at.

The extent of Saker Falcon electrocutions is unknown, but electrocutions occurred and still do so regularly. In a few cases entire groups of chicks have been electrocuted just after fledging. Electrocution is probably the most significant human-induced mortality factor affecting the species in Hungary today.

Disturbance by tourists and rock-climbers mainly affected nest sites in mountain areas, especially cliffs. Agricultural and forestry activities caused failures in tree-nest broods located in lowland areas.

In areas with limited nest-site availability Saker Falcons frequently occupy relatively unstable nests of crows *Corvus corone* or Common Buzzard *Buteo buteo*. These nests may not support a large Saker Falcon brood throughout the entire breeding period, often collapsing before the chicks are able to fly. The low number of breeding pairs in the 1980s was further diminished by the effect on the population of collapsing nests.

In the late 1970s activists of the Hungarian Ornithological Society (MME) started a conservation programme in co-operation with National Parks to stop the decline of the Hungarian Saker Falcon population and to ensure better breeding success. The following discusses the actions taken.

CONSERVATION ACTIONS

Monitoring

A basic element of the conservation effort was the continuous monitoring of the population. Known territories were regularly observed every year and the performance of the pairs recorded. Nest sites were reported to the local nature conservation authorities (i.e. national park directorates¹), which could initiate and enforce restrictions on human activities when necessary. Nests were typically climbed to once in a breeding season, when the chicks were ringed, or more often if necessary. Between 1980 and 2002, 1,112 chicks received aluminium rings. Birds were also rescued during general monitoring, if needed. Confiscated chicks or chicks rescued from collapsed nests were placed in natural nests. Unstable stick nests were reinforced or, in extreme cases, eggs were removed from *endangered nests and brought to other pairs' nests*.

Nest guarding

Stealing eggs or chicks from nests was one of the most acute problems affecting the Saker Falcon population during the beginning of the 1980s. To combat this, nest guarding was organised at regularly robbed nests, from the time of egg laying until fledging. The guards were volunteers, mainly students, living in tents in the vicinity of the nest sites on a weekly schedule. They guarded the nest during the day without disturbing the birds, and asked bypassing tourists to avoid certain areas. During this programme 75 breeding attempts were guarded with 209 juveniles successfully fledging from the nest sites.

Communication

The only way to tackle illegal shooting is to establish good relations with hunters and hunting groups. Efforts to save the Saker Falcon in Hungary were regularly communicated to the general public through television and radio programmes, newspaper articles or oral presentations with slide shows. Local contact and personal communication with hunters often occurred in the field and was viewed as particularly fruitful. In a few cases hunters received some financial reward after the successful fledging of the chicks. In addition, all known illegal shooting cases were successfully prosecuted in court (only one case resulted in a penalty).

Insulation of electric poles

Power lines in Hungary are typically constructed with grounded metal crossarms. This means that a bird perching on a crossarm needs only to touch one wire to get shocked. The usual practice of making medium voltage electric poles safe for birds is to overlay the metal crossarms with a plastic cover developed by MME. Areas near known nest sites are prime candidates for retrofitting. Long sections of electric lines have been insulated with the MME-designed products since 1991, when poles were first retrofitted in the Hortobágy area. The total number of poles fitted with crossarm covers exceeds 25,000, out of which about 8-10,000 are situated in known or potential Saker habitats.

¹ National park directorates in Hungary are the nature conservation authority in large areas around the protected territories of the National Parks.

Reintroduction of the suslik

The suslik *Spermophilus citellus*, formerly the most important prey animal for Sakers, was reintroduced to eight locations. These animals were relocated to pastures, mainly in foothill areas, where they used to be abundant but disappeared due to various reasons. Susliks were captured on grass airfields, where they are considered a nuisance and a source of danger for aircraft (because of making the ground uneven). They were usually captured in springtime, before their breeding cycle. The animals were carried to the new locations within a few hours after being caught. Burrows about 1 m long were drilled prior to the arrival of the animals in order to ensure protection from predators. Until they dug their own burrows, the reintroduced susliks were guarded for a few days. Approximately 2,700 animals were moved to eight locations. Although the reintroductions were successful, a few years later many of these pastures lost their susliks due to the disappearance of grazing livestock and subsequent vegetation growth.

Construction of artificial nests

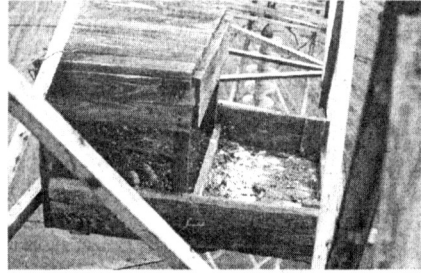
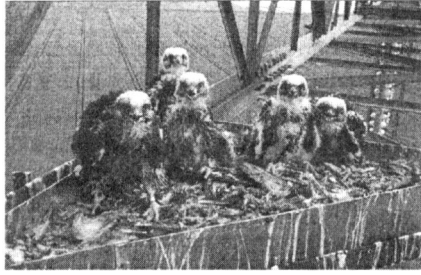
The construction of artificial nests is the most successful conservation action carried out in favour of the Saker Falcon in Hungary. In huge lowland areas abundant with prey, the number and density of breeding pairs can be significantly increased by this method which has various advantages:

- Artificial nests are durable.
- Artificial nests increase breeding safety.
- Artificial nests can be built at locations with little human disturbance.
- Conservationists spend considerably less time locating breeding pairs.

Between 1980 and 2002, 560 large-size artificial nests and platforms were built or fixed on trees and pylons, the majority of them in lowland areas. Artificial nests constructed by MME varied from “traditional” stick-nests resembling natural birds of prey nests to open wooden boxes and aluminium platforms placed on high voltage electric pylons (see Figure 1.). Wooden nesting boxes placed in trees were wrapped with sticks to make them less conspicuous. Nests on cliffs were built to increase breeding safety. Whatever the type of artificial nest constructed, they all allowed rainwater to flow easily through the nest.

Artificial nests were built at locations where their long-term existence seemed to be ensured. Another important consideration was the anticipated level of human disturbance during the breeding period. Nests were usually constructed in autumn and winter. On one occasion a pair of Sakers occupied a nest constructed just ten days prior to the time of egg laying. Artificial nests constructed for Sakers were also regularly occupied by other raptor species, such as *Falco tinnunculus*, *Falco vespertinus*, *Aquila heliac*, *Haliaeetus albicilla*. Forty-one artificial nests disappeared between 1980 and 2002 (due to trees falling or lack of renovation for various reasons).

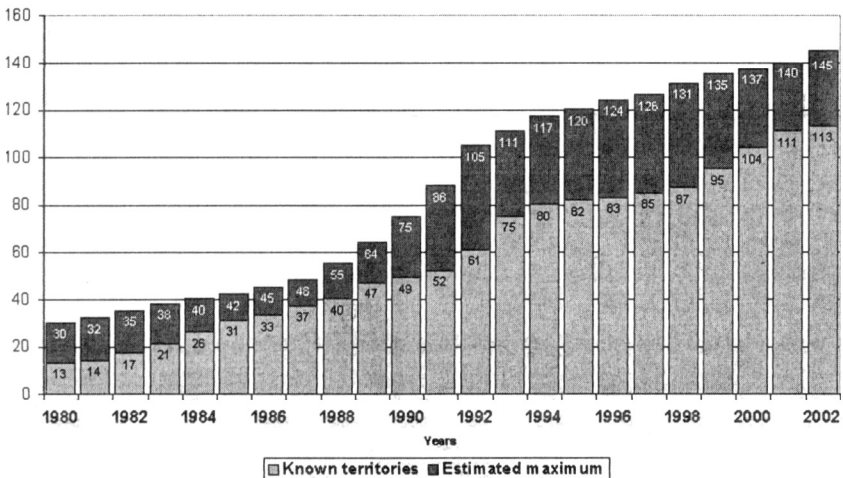
Figure 1.: Types of artificial nests



RESULTS

The MME conservation efforts resulted in increased population productivity, a significant growth in the number of breeding pairs, and an expansion of the breeding territories. In 1980 only eight breeding attempts were recorded in 13 known territories. The estimated maximum number of breeding pairs in 1980 was 30. After the conservation efforts, a steady increase of the population resulted in 113 known Saker Falcon territories with an estimated maximum of 145 breeding pairs in 2002 (see Figure 2). A total of 1,065 breeding attempts were recorded during this period, and the number of (recorded) successful breeding attempts increased from two successful nests in 1980 to 80 in 2002 (see Figure 3).

Figure 2.: Changes in the known and estimated number of Saker breeding territories, 1980-2002



While most of the breeding pairs in the 1980s inhabited mountainous areas, the overwhelming majority of pairs today breed in lowland areas. This is not just a consequence of the population expansion to the lowland areas. Many breeding pairs have disappeared from mountain habitats, mainly in the north-east of Hungary. It is suspected that missing adults in mountain habitats are not being replaced by younger birds, which started to breed in the nearby lowland areas with better prey supply. Declining suslik populations in the mountainous areas may also be contributing to the decline.

Figure 3.: Changes in the number of breeding attempts and successful breeding attempts, 1980-2002.

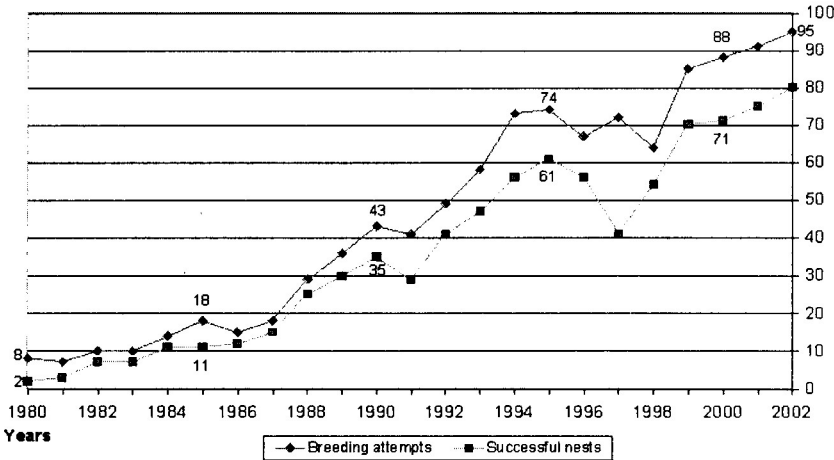
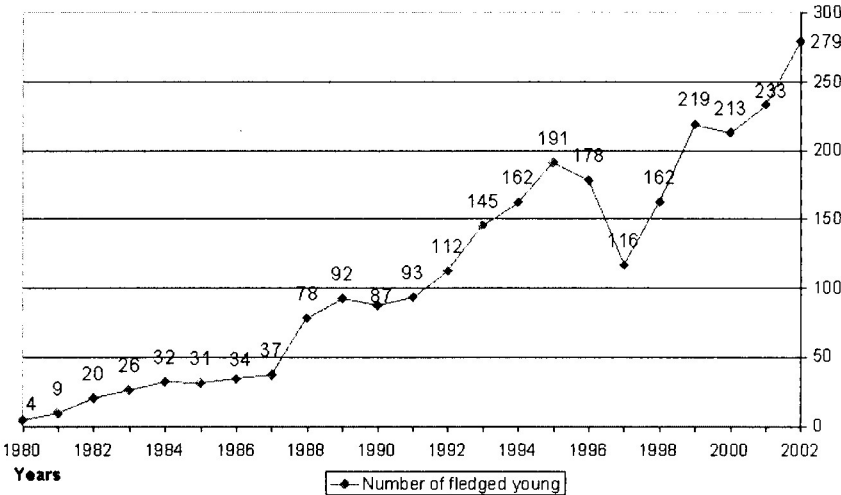


Figure 4.: Number of fledged young, 1980-2002



With the expansion of the population into lowland areas, the proportion of pairs breeding in artificial nests has gradually increased. In 2002, 89 pairs were

recorded breeding in artificial nests (79% of all known pairs). Figure 5 shows the distribution of pairs in different types of artificial nests in 2002. Though the proportion of pairs breeding in artificial nests built on trees is the highest (55%), the proportion breeding on electric pylons is also high (42%). Saker Falcons also nested in a variety of natural nests as shown in Table 1.

Figure 5.: Number of Saker pairs in artificial nests, 2002 (Total: 89 pairs)

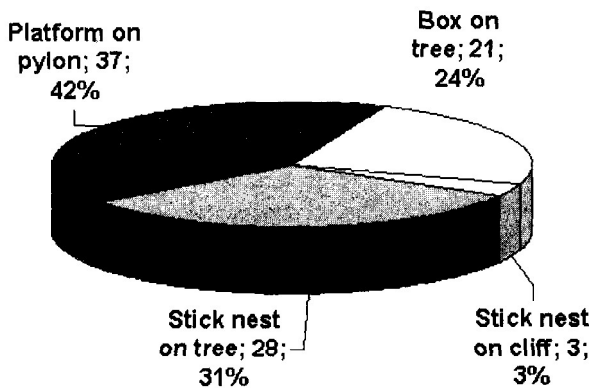
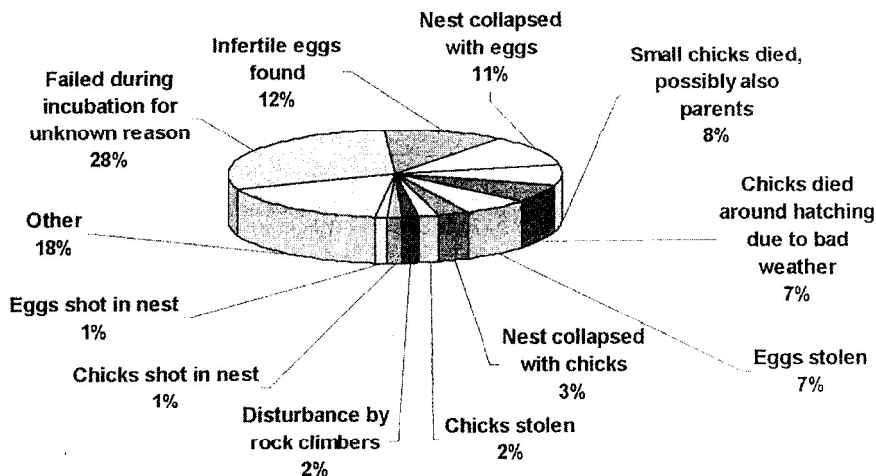


Table 1.: Frequency of Saker breeding attempts in natural nests of various bird species

Nest built by species	Occupancy by Saker		
	Regularly	Rarely	Occasionally
Cormorant (<i>Phalacrocorax carbo</i>)			X
White Stork (<i>Ciconia ciconia</i>)		X	
White-tailed Eagle (<i>Haliaeetus albicilla</i>)	X		
Goshawk (<i>Accipiter gentilis</i>)	X		
Common Buzzard (<i>Buteo buteo</i>)	X		
Long-legged Buzzard (<i>Buteo rufinus</i>)			X
Imperial Eagle (<i>Aquila heliaca</i>)	X		
Rook (<i>Corvus frugilegus</i>)			X
Carrion Crow (<i>Corvus corone</i>)	X		
Raven (<i>Corvus corax</i>)	X		

Table 2 summarises the breeding population data between 1980 and 2002. Of the 1,065 recorded breeding attempts, 839 (79%) were successful and 226 (21%) unsuccessful. Over 60% of the unsuccessful breeding attempts failed during incubation. The exact reasons could not be identified in a large proportion of these cases, but human disturbance may have played a role. A relatively high proportion of failures was attributable to collapsing natural nests (14%). In five cases hunters’ shot into nests, and nest robbing was recorded in 18 cases. Other causes of failure included storm damage, lightning, collapsed trees, dead parents, predation, and human disturbance (see Figure 6.).

Figure 6.: Causes of failed breeding attempts (n=211*)



**note that in additional 15 cases egg laying could not be proven*

CONCLUSIONS

Between 1980 and 2002 a significant increase in the Saker Falcon population was observed in Hungary. An important component of this expansion was due to changes in hunters' attitudes towards the Saker Falcon. These changes are partially due to the appearance of a stronger nature conservation movement and the accompanying phenomena of newly designated protected areas. The continuous communication with hunters and court cases that received great publicity practically eliminated the problem of illegal shooting by the mid-1990's. The increased reproductive success of mountain pairs was also to a great extent the consequence of regular nest guarding.

Due to these changes, birds fledging from mountain areas started breeding in the lowlands. On top of that, the newly appearing lowland breeding pairs found good opportunities to breed safely in provided artificial nests. In some areas the number of artificial nests is greater than the potential number of breeding pairs, which means that falcons have more than one option where to raise young.

Although a lot is known about the breeding biology of the Hungarian Saker population, we have little information on the post-fledging period of juveniles and about non-breeding birds. Very little is known about the movements and fate of most of the 2553 fledglings recorded in the analysed period, and ring recoveries are scarce. There have not been any telemetric studies on the species in Hungary so far. Possibly such investigations could reveal more information on these issues in the future.

Since the majority of the breeding pairs now use artificial nests for breeding, the success of the population depends largely on ongoing conservation actions, because most artificial nests need to be reinforced regularly. With Hungary's joining the European Union in 2004 land use changes are foreseen. The expected changes in agriculture are difficult to predict, and we can only hope that they will not have adverse effects on the population of Saker Falcons in Hungary.

Table 2.: Summary of the data of 1065 recorded breeding attempts between 1980 and 2002

Year	Estimated number of pairs	Known territories	Nest not found	Breeding attempts	Unsuccessful nests	Successful nests	Number of fledgling	Number of chicks per nest	Mean breeding success	Sex Of Ringed Chicks			
										Total	Male	Female	Not determined
1980	30	13	5	8	6	2	4	2x2	2,0	0	0	0	0
1981	32	14	7	7	4	3	9	1x2, 1x3, 1x4	3,0	3	0	0	3
1982	35	17	7	10	3	7	20	1x1, 1x2, 3x3, 2x4	2,8	10	1	1	8
1983	38	21	11	10	3	7	26	3x3, 3x4, 1x5	3,7	4	0	0	4
1984	40	26	12	14	3	11	32	4x2, 4x3, 3x4	2,9	10	0	0	10
1985	42	31	13	18	6	11	31	1x1, 2x2, 6x3, 2x4	2,8	19	2	5	12
1986	45	33	18	15	4	12	34	5x2, 4x3, 3x4	2,6	33	11	11	11
1987	48	37	19	18	3	15	37	3x1, 6x2, 3x3, 2x4, 1x5	2,4	22	12	9	1
1988	55	40	11	29	4	25	78	6x2, 11x3, 7x4, 1x5	3,1	31	9	7	15
1989	64	47	11	36	6	30	92	1x1, 7x2, 13x3, 7x4, 2x5	3,0	42	12	19	11
1990	75	49	6	43	8	35	87	7x1, 13x2, 7x3, 7x4, 1x5	2,4	33	7	12	14
1991	88	52	11	41	12	29	93	1x1, 8x2, 9x3, 7x4, 3x5, 1x6*	3,2	47	17	16	14
1992	105	61	12	49	8	41	112	7x1, 12x2, 12x3, 5x4, 5x5	2,7	66	32	32	2
1993	111	75	17	58	11	47	145	3x1, 9x2, 20x3, 11x4, 4x5	3,0	69	33	34	2
1994	117	80	7	73	17	56	162	4x1, 21x2, 12x3, 15x4, 4x5	2,8	60	11	12	37
1995	120	82	8	74	13	61	191	3x1, 11x2, 24x3, 21x4, 2x5	3,1	74	33	27	14
1996	124	83	16	67	11	56	178	2x1, 15x2, 18x3, 13x4, 8x5	3,1	66	23	33	10
1997	126	85	13	72	31	41	116	5x1, 11x2, 15x3, 6x4, 4x5	2,8	60	28	19	13
1998	131	87	23	64	10	54	162	8x1, 9x2, 19x3, 11x4, 7x5	3,0	36	19	12	5
1999	135	95	10	85	15	70	219	5x1, 14x2, 21x3, 27x4, 3x5,	3,1	54	27	19	8
2000	137	104	16	88	17	71	213	6x1, 15x2, 28x3, 17x4, 5x5,	3,0	103	50	47	6
2001	140	111	20	91	16	75	233	4x1 17x2, 28x3, 19x4, 7x5,	3,1	120	54	52	14
2002	145	113	18	95	15	80	279	3x1, 11x2, 25x3, 26x4, 15x5,	3,4	150	67	67	16
Total	113-145	113	291	1065	226	839	2553	64x1, 200x2, 286x3, 215x4, 73x5, 1x6*	3,0	1112	448	434	230

* additional four chicks were placed into a two-chick nest

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