SAKER FALCON (*FALCO CHERRUG*, GRAY) AND ITS RELATION TO AGRICULTURAL LAND SLOVAKIA

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Abstract: *The aim of the present study was to monitor, assess and evaluate breeding success of one of the most important representatives of the birds of prey, which is the Saker Falcon (Falco cherrug, J.E.Gray, 1834), in an orogfraphic unit Trnavská pahorkatina hills, which is located in western Slovakia. The bird is important for nature and for humans, the system IUCN categorized it as ,, endangered species ". Saker Falcon therefore includes the right to the natural wealth of Slovakia, and deserves not only admiration, but also protection both in Slovakia, as well as globally. In this work, we evaluated the differences in the composition of the nourishment in different years, the most common causes and of factors that threaten its population, the most preferred type of an occupied nest and the development of population abundance from 2001 to 2013. Based on the observed results, we pointed out that in the past the Saker Falcon nested mainly in the mountains and alluvial forests of Slovakia, but due to human interference in its habitat, especially in the mountains of Malé Karpaty Mountains, this predator population gradually moved to the agricultural landscape. The main cause of resettlement of the population of Saker Falcon from mountains to agicultural landscape was a human impact, especially for forest activities. A huge influence on population size reduction of Saker Falcon has illegal nest robbery, disturbance of nesting pairs by forestal and agricultural activities. The major factor which contributes to diminishing its population is annually changing weather conditions and lack of food. In the past, the main prey were the European Ground Squirrel (Spermophilus citellus,L). Affected by the disposal of many pastures and intensive agriculture, its occurrence habitats nearly disappeared. In recent years, as a result of adaptation to new environment conditions, Saker Falcon dietary prefers especially pigeons. Increased incidence of Saker Falcon can therefore be seen near granaries and peri-urban areas. However, for nesting they mainly use manmade nests that one creates in the agricultural land on utility poles. Although mankind almost caused its extinction, the rescue of the entire population of Saker Falcon depend on humans.*

Key words: *Saker Falcon , agricultural land, Slovakia , threatening factors*

INTRODUCTION

Protection of biodiversity is seen as a way of use of the biosphere's ability to produce consistently the most benefits for current generations and to maintain its potential for future generations. As a result of intensive use of natural resources, many plants and animal species became extinct, some have become rare or endangered (ČUNDERLÍK, ONDRÁŠEK, 2010). Among animals, such species include the largest falcon breeding in Central Europe - Saker Falcon (BALIŠ, 1956 DANKO et al., 2002). He was listed globally endangered after its population declined, especially in Central Asia. The threats are a result of the negative human intervention in the biosphere, such as interference in its natural habitat, nest robbery and subsequent illegal trade for Falconry purposes (SABO, 2011). Other factors of threat (destruction of nests, poisoning, illegal blasting, construction of electric lines) were studied by DANKO ET AL., 2002; AND DEUTSCHOVÁ 2008. Although in Central Europe as a result of the cooperation of experts from Bulgaria, Hungary, Romania and Slovakia, in respect of the implementation of the LIFE project area started to increase its distribution, it still continues to be an endangered species (ARMSTRONG, SEDDON 2008; PRIMACK, 2011). In Slovakia, the Saker

Falcon occurs mainly in the lowlands and the mountains up to 800 metres. At present, its population is concentrated in the western and eastern parts of Slovakia. In western Slovakia it nestes only in the agricultural land of Trnavská pahorkatina hills and Podunajská rovina plain lowland. It does not build its own nests, but occupies the nests of other bird species, of buzzards, ravens, rooks. In the past, it nested very often near to large pastures with European Ground Squirrel occurrence. For nesting it uses the rock walls and treetops. Recently, however, falcons have preferred electric pylons of high voltage boxes and manmade nests (ANGELOV ET AL., 2012; CHAVKO 2014). In the past, falcons hunters kept killing them as an real enemy of small game (ČERVENÝ et al., 2004). Saker, Falcon as well as other predators, is an important part of the ecosystem. An important contribution of food chain helps to maintain the balance in the biosphere, because it functions as a top predator. Late in the 20th century, in his diet European Ground Squirrels dominated. As a result of agricultural intensification and the dissolution of its territories in the agricultural land, they were replaced by Domestic Pigeon (OBUCH, CHAVKO 1997). Prey of Saker Falcon are also animals that are considered to be pests of agricultural crops (mice, voles), but also the types of hazards in terms of transmitting infectious diseases, dead and infected animals and therefore farmers find the breed incredibly useful (NOGA ET AL., 2007; THIEDE, 2007).

MATERIALS AND METHODS

Trnavská pahorkatina hills are a part of the Podunajská nížina lowland located in the southwestern part of Slovakia. In the west it is surrounded by the Malé Karpaty Mountains, Podunajská rovina plain in the south, Dolnovážska niva river plain in the east and in the north Považské podolie (ADAMOVÁ et al., 2005). The territory of Trnavská pahorkatina hills belongs to a warm and partly dry climate zone, from moderately dry to dry lowland climate, with mild winters up to 90 days. The average annual temperature is around 10 ° C. The warmest month is July (20.7 °C.). The coldest January (-1.7 °C). The number of summer days is more than 50. The northern territory belongs to moderately moist areas with colder winters. Annual precipitation ranges from 386 to 681 mm, with an average value reaches 552 mm. Several smaller rivers and streams flow across the area. The most important is river Vah which interferes in western Slovakia with the migratory routes of birds. The geological base, geomorphological and climatic conditions and water regimes influence the flora and fauna around the area. At present, the original forests have been replaced by the prevailing agro-cenosis with monocultural crops grown (KOLLÁR et al., 2004). Extension of animals in the country is affected by their food and suitable environment demands. Most species of fauna belongs to the formation of deciduous forest, forest steppe and steppe (PONEC, 2001).

During the monitoring, to assess the state of population size of Saker Falcon, we collected data on the population size in 2001-2013, for selected locations of the orographic whole Trnavská pahorkatina hills (Fig.1),as well as nesting success, the number of the raised young out of the nest, their threats and factors of the structure of the food.

Nesting sites were searched from February to April. In this period all potential nesting pairs were recorded, as well as those which later did not nest successfully for some reasons. After locating of the nest was a regular inspection at intervals of 10-12 days was carried out. In tracking population trends, the number of nesting pairs which have successfully brought out fledged pups were detected. The first inspection was carried out in the period of incubation; the second control in the first half of June, when we investigated the number of juveniles; third check was in late June when the cubs were about 45 days old. In this period we investigated the number of juveniles referred to the nest as one of the most important parameters of nesting success.

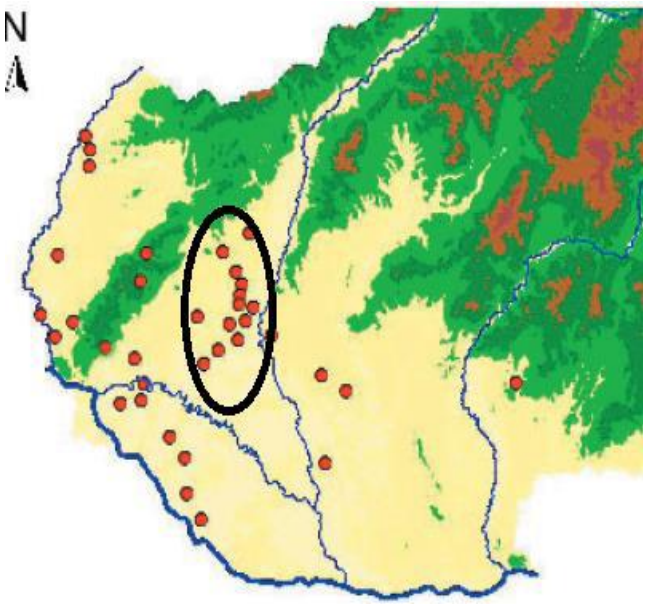

Figure 1 Monitored sites in Trnavská pahorkatina hills (Source:Chavko)

RESULTS AND DISCUSSIONS

First breeding Saker Falcon in western Slovakia was recorded in 1976 in the area of the Malé Karpaty Mountains. Since then the nesting area have expanded, falcons gradually colonized nine orographic units: Malé Karpaty Mountains, Trnavská pahorkatina hills, Podunajská rovina plain , Borská nížina lowland, Nitrianska pahorkatina hills, Strážovské vrchy Mountains, Burda, Dolnomoravský úval ravine and Ipeľská pahorkatina hills (Table 1).

Table 1

The period of nesting Saker Falcon in the western Slovakia (Source:Chavko)

Orographic unit	The period of nesting
Malé Karpaty Mountains	1976 – 2008
Trnavská pahorkatina hills	1997 – 2014
Podunajská rovina plain	1988 – 2013
Borská nížina lowland	1988 – 2013
Nitrianska pahorkatina hills	2002 – 2014
Strážovské vrchy mountains	1982 – 1993
Burda	1992 – 2001
Dolnomoravský úval ravine	1982, 2009
Dolnomoravský úval ravine	2005, 2006

In 1993, the gradual resettlement of pairs of mountains in the agricultural landscape of western Slovakia occurred, which were previously only falcons used for hunting and wintering. In 1996, a number of states were close to balance. In the following years, especially since 2000, there has been a steady increase in the breeding areas, located in agricultural lands and, in contrast, a steady decline until the total disappearance of breeding areas in the mountains. Since 2009 in western Slovakia, nesting pairs of Saker Falcon can be found only in agricultural land to which the entire population was relocated from Malé Karpaty Mountains.

Saker falcon monitoring results show a growing number of nesting in Trnavská pahorkatina hills, from 2001 until 2009. It was largely related to the resettlement of pairs nesting in the mountains of Malé Karpaty Mountains in this area. In 2010, the average breeding success decreased, mainly due to extremely bad weather conditions (frequent heavy rainfalls). An increasing number of successful nesting in 2011 was related to the implementation of the project of LIFE - Protection of Saker Falcon in the northeastern part of Bulgaria, Hungary, Romania and Slovakia, which has proved to be successful. In 2012, there was a drop nesting again. This situation is likely to be influenced by climatic conditions, this time mostly extremely dry weather. In 2013 very low breeding success was recorded again, because in the months of March and April, when the Saker Falcon nesting begins, it was very bad weather. Therefore, these spring months are important to result in successful nesting. Bad weather caused an overall low breeding success throughout the monitored area. Overall, in the monitoring period 185 nestings were recorded.

Table 2

The results of monitoring nesting Saker Falcon in selected years (Source:Chavko)

Yares	Number (pc)		
	Nesting pairs	Successful nesting	Fledged pups from the nest
2001	**3**	**2**	**9**
2002	**4**	**4**	**18**
2003	**4**	**4**	**14**
2005	**5**	**4**	**15**
2009	**10**	**8**	**30**
2010	**11**	**8**	**23**
2011	**13**	**11**	**31**
2012	**8**	**5**	**20**
2013	**8**	**4**	**13**

In terms of the number of pups of the nest, the weakest year was in 2001. Only 9 pups flew from the nest, while this number was reached by only two breeding pairs which represent 4.5 pieces for successful nesting. The most favourable year of the surge in the number of pups in the nest was 2011. In this year, 11 successful nestings were recorded resulting in 31 of the surge pups, which represents 2.82 pieces for a successful nesting. Year 2009, compared to 2010, shows approximately the same number of nestings; the only difference is the surge in the

number of pups. In 2010 the number of the raised young decreased, in comparison to 2009, by 7 units (Table 2). The average number of pups of the surge for the period is 3.7 units for a successful nesting and 2.85 pieces for the total number of nesting.

The most common and serious risk factor Saker Falcon population in western Slovakia is man. A significant influence of the reduction of the frequency of its population is caused by an illegal robbing of the nests, as well as disturbance of nesting pairs by forestry and agricultural activities. DANKO et al. (2002) reported that the direct impact that has a long-term effect on the population of predators in Slovakia is robbing of nests. We agree with the statement, as in the reporting period robbing of nests (14) caused the greatest losses. In the years from 2001 to 2013, 63 deaths nests were found, out of 185 nests in total. The losses due to human intervention represent approximately 48.6%; losses due to natural factor 44.9% and 6.5% of losses are caused by an unknown factor.

The major risk factor Saker Falcon but also contribute annually changing weather conditions and lack of food. Strong winds and rain during the breeding season can cause the fall of the nest, or drop out of the young. From 2010 to 2012 long -term rainfalls were the main reason for losses during this period. They caused hypothermia and deaths of the hatched young, with decreases in the availability of food. The big problem to achieve population stability is nest firing. Illegal firing of nests, mainly by hunters, is more risky than "pillars of death ". Hunters fire nests of other prey birds, threrefore Saker Falcon is losing nesting opportunities. Natural predators which are a danger to the young are, i.e. Northern Goshawk (*Accipiter gentilis*), the Eagle Owl (*Bubo Bubo*), Beech Marten (*Martes foina*), Common Raven (*Corvus corax*).

Saker Falcon is physically adapted for hunting in an open terrain. THIEDE (2007) states that during the breeding season his main food is small and medium-sized rodents, such as European Ground Sguirre (*Spermophilus citellus*), European hamster (*Cricetus cricetus*) and Field Vole (*Microtus arvalis*). Other mammals and small birds are minority. The proportion of mammals as a prey, depends on availability and the region. The results of our observation, however, refute the statement of the author, because the largest part in the diet of the Saker Falcon were pigeons. In 2013, the largest percentage in the diet represented domestic pigeon (*Columba livia f.Domestica*) - about 62 %. The Percentage of pigeon (*Columba oenas*) was 4%, Field hamster (*Cricetus cricetus*) 6%. European Ground Sguirre representation in the diet varied only about 3%. As ground squirrels hibernate, pigeons are the most important prey of the Saker Falcon during the year. At the beginning of spring, migratory birds are a part of food, especially European Starling (*Sturnus vulgaris*) trooper (Figure 2).

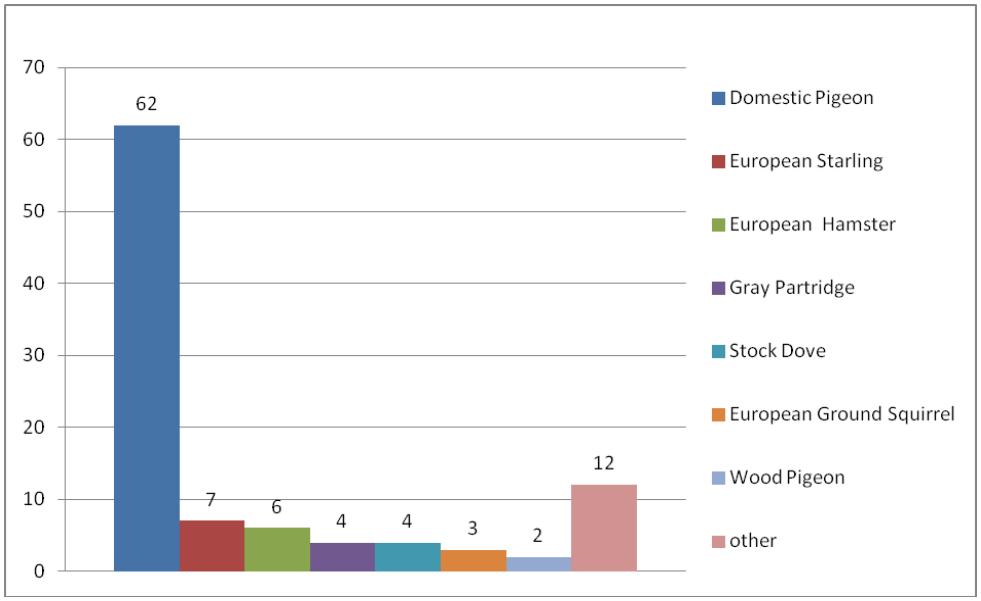

Figure 2 The dominant food Saker Falcon in 2013

ANGELOV ET. AL. (2012) states that most Sakers Falcons in Central and Eastern Europe use poles and pylons of high voltage power line for nesting, instead of their nests on trees and rocks. We are identified with the idea of the author, because of the data in Table 3. It shows that the most preferred type of the nest is a box placed on the mast. 136 nests in total placed on a mast were those with 84.6% success nesting. Another popular type of the nest was located in a tree, where a total of 109 recorded nesting with 60% success nesting. Although manmade nests on masts are not the most popular (only 12 nestings) among all types of nests, they have the highest success rate of nesting - up to 91.6%.

Table 3

Preferred types of nests of Saker Falcon

Type of nests	All nests	Successful nesting
Box on a mast	136	115
Nest in a tree	109	65
Artificial nest in a tree	29	21
Box on the tree	28	16
Artificial nest on a mast	12	11
Nest on the rock	18	9
Nest on a mast	8	6

The largest number of juveniles according to a type of nest was escorted from the manmade nests placed on the masts (408 pieces). Fewer younger (180) were escorted from the booths on the masts. The number of raised young for natural nests located on the masts and manmade nests placed in a tree ranged roughly at the same level, between 61 and 51 pieces. Very few juveniles were escorted from natural nests placed in a tree and a rock (Figure 3).

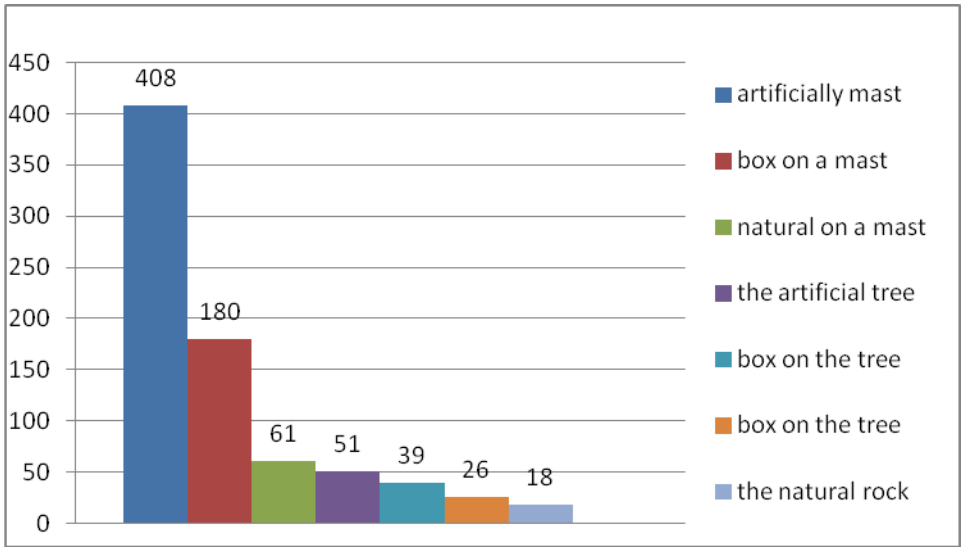

Figure 3 The number of raised young nests by type

CONCLUSIONS

From 2001 to 2013, in orographic whole Trnavská pahorkatina hills the developments of Saker Falcon population was monitored. By assessing of the results we can prove that the main cause of displacement of the population from the mountains to the agricultural landscape was the impact of humans, particularly for forestal activities. From 2001 until 2009, in a studied area we could notice a growing number of successful nesting (from 2-8 nesting pairs). In total, in the monitored period 185 nesting were recorded. During the period, the best years in terms of the number of juveniles that flew from the nest was in 2009 (with the 30 pups) and 2011, when the number of pups was 31. In 2011, there was a positive effect on the achievements of the LIFE implementation. The worst year in all evaluated indicators (number of nesting, the number of successful nesting, pups escorted from the nest) was 2001. Since this year, a gradual increase of the number of nesting in Trnavská pahorkatina hills occurred, due to the shift of pairs of Malé Karpaty Mountains. When the entire population of Saker Falcon nests, they prefer manmade nests (located on pylons of high voltage power lines) to natural nests on trees and rocks. As a result of intensive farming, there is a loss of pasture in Trnava region, where habitat occurrence of European Ground Squirrels almost disappeared, which was previously the main prey of Saker Falcon. Thus, this predator began to prefer in nourishment, especially, pigeons. The composition of food of Saker Falcon accounted more than 60% of them. European Ground Squirrel representation in the diet varied only about 3%. The largest rate of losses of Saker Falcon has anthropogenic impacts. They are mainly those associated with illegal nest robbing. Bad weather conditions (low temperature, rain, wind) lasting until the period to fledge pups from the nest contribute to the losses. In 2013, the greatest losses were recorded, in which nine nesting pairs nested unsuccessfully. A warning sign needed to be taken into account is that only about 5% of pups reach adulthood.

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