

Substitute nesting by Imperial Eagles (*Aquila heliaca*) in Slovakia

Náhradné hniezdenia u orlov kráľovských (*Aquila heliaca*) na Slovensku

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Abstract: During consistent monitoring of nesting pairs of Imperial Eagles primarily in Eastern Slovakia it was found that if for some reason the first clutch of eggs was destroyed at the very beginning of nesting, i.e. in late March or the first half of April, the eagles proceeded with substitute nesting. They built a replacement nest, so far always in a different place, in which a new clutch was laid. If the nesting was successful, then as a rule they raised one, and in two cases two offspring.

Abstrakt: Počas dôsledného monitoringu hniezdných párov orlov kráľovských predovšetkým na východnom Slovensku sa zistilo, že pokiaľ došlo z nejakých príčin ku zničeniu prvej znášky hneď na začiatku hniezdenia, t. j. koncom marca alebo do prvej polovice apríla, orly pristúpili k náhradnému hniezdeniu. Zatiaľ vždy na inom mieste postavili náhradné hniezdo, do ktorého zniesli náhradnú znášku. Pokiaľ bolo hniezdenie úspešné, spravidla vychovali jedno, v dvoch prípadoch aj dve mláďatá.

Key words: Imperial Eagle, *Aquila heliaca*, substitute nesting, Slovakia

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Introduction

The nesting territory of Imperial Eagles in Slovakia is divided into two parts, the south-west and the south-east, and so far we lack data on the occurrence and possible nesting of these eagles in the southern part of Central Slovakia. Monitoring of the Imperial Eagle population has been maintained in Eastern Slovakia since 1969, and in the western region since 1975. Part of the project named "Monitoring and protection of the nesting population of Imperial Eagles in Slovakia", which was prepared in

1990 and has been implemented since 1991, involves detailed monitoring of nesting pairs of this raptor, which has led to the discovery of further interesting aspects of their nesting biology. It is a well-known fact about birds in general that if for various reasons the nest or clutch of eggs is destroyed during the nesting period, this results as a rule in substitute nesting. This phenomenon is especially familiar among songbirds, but also among other sorts of birds, and in certain circumstances it also occurs among raptors, although to a lesser extent. During our monitoring of all Imperial Eagle nesting sites

known to us, we have encountered this phenomenon in this species as well, moreover in several cases.

The issue of substitute nesting by Imperial Eagles has not been widely studied. In the literature available to us, the laying of a replacement clutch is mentioned for example by Glutz et al. (1971), who write: "Loss of eggs may lead to a replacement clutch being laid in the same or in another nest, and this second clutch most often consists of one, occasionally two eggs." (Leverkühn l. c.). Similarly only Leverkühn is cited by Hudec & Černý (1977) and by Cramp et al. (1994). Bezzel (1985) remarks only briefly that "replacement clutches occur". None of these works describes any specific cases in support. Makatsch (1974) notes that after the early loss of the first eggs Imperial Eagles may occasionally lay a replacement clutch, and quotes one case of a single replacement egg being laid in the Slovakian-Hungarian population, but without closer localization. Within Hungary just one instance is recorded from the Bükk Hills when in 1999 a first nest with a clutch of two eggs was blown down by a gale, and one young bird successfully flew from the new substitute nest (Horváth in litt.). The first specific cases of substitute nesting, moreover from Slovakia, were published by Švehlík & Meyburg (1979).

Summary of established cases of substitute nesting in Slovakia

1. The deceased Slovak egg-collector L. Erdős (in verb.) mentioned in discussions that Imperial Eagles can produce a replacement clutch if their first eggs are taken. During the assessment of his estate it was found that he had in his collection one clutch of two fresh, unformed eggs dated 18th April 1965 from the Slanské Hills, as well as the replacement, also still unformed eggs dated 19th May of the same year from a nearby location. Other details (e.g. tree types and their distance from each other) are not included in the clutch description. The eggshell masses in the first clutch were over 15 g, compared with just under 11 g in the replacement clutch. We are most grateful to Mr. B. Matoušek for kindly providing us with these details.

2. In 1972 one old pair of eagles in the Slanské Hills built a new nest in the fork of a beech-tree, and by 30th March they were sitting on a clutch. However, on 7th April we found the nest had slipped and the shells of two eggs were lying on the ground. Despite the fact that the nest was steeply slanting and empty, the eagles were still trying to complete its construc-

tion. We consequently reinforced its foundations, but the eagles ultimately abandoned this nest (Danko, Šimák unpubl.). According to Švehlík and Meyburg (1979), these eagles later built a substitute nest 4 km away from the first one, in which they successfully raised two young. Additional verification of this information revealed, however, that these authors had not recorded the substitute nesting themselves, but had obtained the details second-hand the following year from a forester otherwise unknown to us (Šimák in litt.). In 1973 this location featured an older Imperial Eagles' nest (probably from the previous year), but because this information was not verified by a specialist, we consider its accuracy questionable, especially as far as the number of young flying from the nest is concerned.

3. In 1973 the same pair as in 1972 built a new nest in an oak in the same nesting area where the substitute nesting had taken place the year before. On 31st March the eagles were already sitting on the clutch. The nest construction was very unstable, and the whole thing threatened to fall together with the clutch. This expectation was fulfilled on 17th April, because the nest was found tipped up, and the eggs had fallen to the ground. Later on in their work Švehlík & Meyburg (1979) mentioned that the eagles once again built a substitute nest 150 metres away from the upset one, and that allegedly one youngster flew from this new nest. However, despite our own monitoring of this pair (Danko and Šimák), we acquired no knowledge of the substitute nesting.

4. In 1995 one old pair in the Volovské Hills re-established their previous year's nest at the top of a fir, which had died in the meantime. In early April the Košice Municipal Forests Company felled the nesting tree, thus destroying the nest and the clutch of two eggs. The eagles abandoned the nest and moved away into the Košice Basin, the area of their hunting-grounds. They stayed for about two weeks near the village of Šebastovce in fields with poplar avenues. During this time they performed courting flights, after which they settled in the trees and mated. Then the eagles disappeared from this location, which was a signal to look for them again back at their nesting site. The pair set up 2.6 km to NW from the destroyed nest, using another, older and previously-used nest, where on 21st April they were sitting on their second clutch. But when the nesting site was checked on 13th June, the nest was abandoned, although it contained two eggs. Near to the nest there was a hunters' hide tower, which was used

by foresters for hunting deer, despite our requests, and so the eagles also abandoned this nest.

5. In 1995 one young pair on the East Slovakian Plain built their nest in the three-branched top of a slim pine at the edge of some field woodland. By 4th April the birds were already sitting on the clutch, but on 17th April as a result of violent rocking of the nest in high winds, two eggs fell to the ground. In the autumn we used wire to reinforce the top of the tree, which was located in a suitable place for nesting, so that it could also serve this purpose in future years (see case 11 below). By consistently monitoring nesting pairs in the wider area in the following years, we found that this pair occupied another nesting place in alternate seasons which was 6.5 km away from the first. In spring 1996 in this other place we found a nest from the previous year built in an oak tree, which was most likely the substitute nesting-place of this pair in 1995, although we do not know what issued from it.

6. In 1997 the same pair built a new nest in the crown of an oak, and whereas the eagles were sitting on a clutch on 8th April, on 10th April the nest was already abandoned. On checking the nest we found that it had broken in two, and the eggs had fallen into the fork of the tree below. As in the preceding case the eagles built a substitute nest in a neighbouring nesting-place in a small group of poplars 5 km away from the first, where they were found on 18th May. However, inspection of the nesting-place on 4th June revealed that for some unknown reason the nest had been abandoned, although there was one partially-brooded egg in it with a developed embryo. Substitute nesting in this case was unsuccessful.

7. In the same year one older pair in the Slanské Hills built a new nest at the top of a pine tree, from which the eggs fell to the ground on 10th April as a result of high winds. The eagles then built a substitute nest not far away (cca 100 m), once again in the crown of a pine, where one egg was laid. This nest was found deserted for unknown reasons during checking on 15th July, so substitute nesting was not successful in this case either.

8. In 1999 an older pair of eagles watched by J. Mihók in the Košice Basin built a new nest in a poplar windbreak. The construction was very bad and the nest started tilting seriously, so it was necessary to reinforce it, which was done on 1st April. Despite our having carried out this activity many

times before without encountering any problems at all, this particular intervention disturbed the eagles and they abandoned the nest with its contents of three eggs. The clutch was therefore removed and placed in an incubator at the raptor rearing centre in Rozhanovce. Two chicks hatched from it, and the third egg was infertile. We put the chicks out into the nests of other pairs which had only one offspring, and they later flew from these nests successfully. After their first nesting was disturbed, the original eagles built a substitute nest in another poplar at the edge of some field woodland 3 km away from the windbreak, in which they successfully raised one youngster, seen on 6th August standing fully-fledged on the edge of the nest. This was our first confirmed case of successful raising of young by Imperial Eagles from a replacement clutch in Eastern Slovakia.

9. In 2000 an old pair nesting as a rule in the Slanské Hills built a second nest in an active farming area of the East Slovakian Uplands, at the top of a pine in a strip of mixed bush and tree greenery close beside a frequently-used road surrounded by private farming plots. This brushland moreover was used by local people as a source of firewood. The same pair had nested at this location as early as 1993, but because of the frequent disturbances the eagles deserted the nest on 29th April and did not attempt substitute nesting. In 2000 the eagles were sitting on a clutch by 25th March, but once again they were disturbed by people gathering sticks below the nest. When we went to check the nest on 1st April the birds were very restless, and immediately flew off when our car stopped by the roadside. Due to our bad experience from 1993 we decided to remove the clutch, doing so on 5th April, and because of the unsuitability of the location we also destroyed the nest and made it impossible to build a new one there. We named this kind of intervention (removing a clutch from a threatened nest and forcing the eagles to find another nesting-place) “guided nesting”. There were three eggs in the nest, which we took to an incubator at the raptor rearing centre in Rozhanovce. Two chicks hatched from them, and the third egg was infertile. We placed the young together in another Imperial Eagles’ nest which had an infertile clutch, and both of them flew successfully from there. Following our intervention the original pair of eagles returned to the Slanské Hills, where they built a substitute nest 3 km away from the first in an oak at the edge of a clearing. We watched them building the nest on 14th and 27th April, and when we checked them again on

14th May they were sitting on a clutch. When we returned for the ringing on 20th July there was one youngster in the nest, which successfully flew off in August.

10. In 2001 there was substitute nesting by two pairs. One pair in the Slanské Hills built a new nest at the top of an oak, but it became precariously tilted. For this reason on 6th April we reinforced it with wire. In addition it was located close by a frequently-used forest track. The eagles lost interest in the nest, however, and abandoned it, so we took the clutch of two eggs and put them in an incubator at the raptor rearing centre in Rozhanovce, but in this case nothing hatched from them. The eagles built a substitute nest in the crown of a pine at another place 1.5 km away from the first, in which they raised one offspring. At the end of June, however, local hunters shot the male bird, and the female alone could not cope with raising the nestling. The situation was complicated by heavy rain, so we did not check the nest again until 4th July. In it there was one exhausted, underfed and completely drenched youngster, which we took away, but which died shortly afterwards during the car journey. In this case it was only due to illegal human interference that the promising substitute nesting was unsuccessful, but the building of a substitute nest, laying of a replacement egg and initial raising of another chick nevertheless occurred.

11. In a second case in 2001 an older pair on the East Slovakian Plain had their nest, located in a poplar windbreak, destroyed by local hunters. They shot at the tree-trunk below the nest with a small-bore rifle to weaken it, then they also sawed into the trunk and threw the nest with three eggs to the ground, where we found it on 1st April. The pair consequently moved away and built a substitute nest in another poplar windbreak 1.7 km away from the first, and by 2nd May they were sitting on a new clutch. When we returned for the ringing on 23rd July there was one youngster in the nest, which successfully flew off in late August.

12. An interesting case occurred in 2002. The same pair on the East Slovakian Plain mentioned in examples 4 and 5 built a new nest in the top of an oak at the edge of some field woodland. At the very beginning of nesting, however, as March turned to April the nest was thrown down in high winds together with the clutch, and we were not able to ascertain the number of eggs. For substitute nesting the eagles

chose an older nest in the top of a pine-tree just 200 metres away from the first, which we had reinforced in 1995 and which they had successfully used for nesting in 2001. On 27th April 2002 the eagles were already sitting on a replacement clutch of eggs, by 21th June they were feeding and on 23rd July we discovered that there were in fact two youngsters in the nest! They were still holding out on the nest on 10th August, and later they successfully flew off. This was the first clearly recorded case of Imperial Eagles raising two young from substitute nesting.

13. Another case of Imperial Eagles raising two young from substitute nesting occurred in Western Slovakia in 2003, with an old pair of eagles nesting in the Považský Inovec hills. They built their nest at the top of a slim larch, and sat on the first clutch on 1st April. On 5th – 6th April there was a sudden gale in the area which threw the nest to the ground together with the clutch, as we discovered on 10th April. From the shells it was not possible to determine the number of eggs in the clutch. In May and June we observed the male bird carrying food further up into the hills, suggestive of substitute nesting. We found the new nest on 27th June, built in a spruce-tree about 3 km from the first nest. When we returned for the ringing on 5th July we found two youngsters in the nest, which later successfully flew off. While ringing on 23rd August we observed them flying above the Inovec ridge.

Summary and Conclusion

During monitoring of the Slovakian population of Imperial Eagles to date 13 cases of substitute nesting have been recorded. It follows from analysis of the recorded data that termination of the first, normal nesting occurred for these reasons:

1. In four cases due to removal of the clutch from threatened nests, either because unsuitable building made them liable to fall, or because the inappropriate choice of nesting tree made them liable to abandonment as a result of people's frequent disturbance of the surroundings. The removed clutches were subsequently placed in an incubator and the hatched-out young were placed in the nests of other pairs with few offspring, from where they later successfully flew.

2. In four cases due to the eggs falling out of the nest (twice as a result of strong bending of the nesting trees in high winds, and once each due to severe tilting or disintegration of the nests).

3. In four cases due to destruction of the nests (thrown down in two cases by high winds, once by cutting down of nesting tree and once by hunters).

4. In one case in 1965 the clutch was removed by an egg-collector.

In each of the above cases substitute nesting occurred, involving 11 instances of the eagles building new, replacement nests and two instance of their laying a replacement clutch in an old nest where they had nested the previous years. There was not one instance (bearing in mind that this was only possible in a small number of cases anyway) of the eagles laying a new clutch in the same nest (see Leverkühn's opinion on this point). In seven cases

the substitute nesting was successful, involving four instances of one youngster flying from the new nest, two instances of two youngsters and one more with a probability of two youngsters. In one case the number of youngsters flying was not established. In five cases the substitute nesting was unsuccessful, involving two instances of a replacement clutch containing a single egg being abandoned for unknown reasons, one substitute clutch containing two eggs being abandoned because of disturbing by hunters, one instance of the new clutch being removed by an egg-collector, and one other of the new chick dying following the shooting of the male of the nesting pair of eagles.

Tab. 1. Comparative table of details of substitute nesting by Imperial Eagles (*Aquila heliaca*) recorded primarily in Eastern Slovakia.

Tab. 1. Prehľadná tabuľka náhradných hniezdení orlov kráľovských (*Aquila heliaca*), zistených prevažne na východnom Slovensku.

case no./year	tree – 1st nesting	no. of eggs in first nesting	tree – substitute nesting	distance from 1st nest in km	no. of eggs in substitute nesting	no. of young hatched	no. of young successfully raised	remarks
1/1965	?	2	?	?	1	0	0	eggs in oolog. collection
2/1972	beech	2	oak	4	2 ?	2 ?	2 ?	unconfirmed, cited data
3/1973	oak	2	?	0.15	1 ?	1 ?	1 ?	unconfirmed, cited data
4/1995	abies	2	abies	2,6	2	0	0	abandoned
5/1995	pine	2	oak	6.5	?	?	?	success not established
6/1997	oak	?	poplar	6.5	1	0	0	abandoned
7/1997	pine	?	pine	0.1	1	0	0	abandoned
8/1999	poplar	3	poplar	3	?	1	1	successfully raised
9/2000	pine	3	oak	3	?	1	1	successfully raised
10/2001	oak	2	pine	1.5	?	1	0	male bird shot
11/2001	poplar	3	poplar	1.7	?	1	1	successfully raised
12/2002	oak	?	pine	0.2	2	2	2	successfully raised
13/2003	larch	?	spruce	3	2	2	2	successfully raised

We established that the eagles undertook substitute nesting only in those cases when the first clutch of eggs was destroyed in a sufficiently short time after the laying, that is during the period from the end of March until mid-April. At that point the eagles still have enough time to build a substitute nest and to lay a replacement clutch, involving a delay of about one month in nesting. If the first clutch was destroyed in the second half of April or later, then the eagles would not undertake substitute nesting. For this reason it is very important to monitor carefully all pairs of birds whose first nesting is terminated at an early stage, and not to consider the resulting state as final. In the replacement clutch as a rule the Imperial Eagles have one egg, only rarely two, and they most often raise a single youngster, only very rarely two.

A summary of the data is presented in the Tab. 1.

Súhrn a záver

Počas monitorovania slovenskej populácie orla kráľovského sa doteraz zistilo 13 prípadov náhradného hniezdenia. Z analýzy zaznamenaných údajov vyplýva, že k prerušeniu prvého normálneho hniezdenia došlo:

1. V štyroch prípadoch po odobratí znášky z ohrozených hniezd, kedy buď nevhodnou stavbou hrozil ich pád alebo nevhodným výberom hniezdneho stromu hrozilo ich zanechanie pre časté vyrušovanie okoliami ľuďmi. Odobraté znášky boli následne vložené do inkubátora a vyliahnuté mláďatá sa vložili do hniezd iných párov s malým počtom mláďat, odkiaľ úspešne vyleteli.

2. V štyroch prípadoch po vypadnutí vajec z hniezd (2x po silných výkyvoch hniezdnych stromov a po jednom prípade vplyvom silného vychýlenia alebo rozpadu hniezda).

3. V troch prípadoch boli zničené hniezda (2x spadnuté po silnej víchrici, raz vypílený hniezdny strom a raz zhodené poľovníkmi).

4. V jednom prípade v r. 1965 znášku vybral zberateľ vajec.

V každom z uvedených prípadov došlo k náhradnému hniezdeniu, pričom v 11 prípadoch si orly postavili nové náhradné hniezdo a v dvoch prípadoch zniesli náhradnú znášku do starých hniezd, v ktorých hniezdili v predošlých rokoch. Ani v jednom prípade (pokiaľ to v niekoľko málo prípadoch bolo ešte možné) nezniesli znášku do toho istého hniezda (viď názor Leverkusna).

V siedmych prípadoch boli náhradné hniezdenia úspešné, pričom v štyroch prípadoch vyletelo z hniezd po jednom mláďati, v dvoch prípadoch po dve mláďatá a v jednom prípade pravdepodobne dve mláďatá. V jednom prípade nebol počet vyletených mláďat zistený.

V piatich prípadoch boli náhradné hniezdenia neúspešné, pričom v dvoch prípadoch boli náhradné znášky obsahujúce jedno vajce z neznámych príčin zanechané, jedna náhradná znáška 2 vajec bola zanechaná pre vyrušovanie poľovníkmi, v jednom prípade bolo odobraté zberateľom vajec a v jednom prípade uhynulo mláďa po zastrelení samca z hniezdneho páru orlov.

Zistili sme, že k náhradnému hniezdeniu orlov došlo len v tých prípadoch, kedy bola zničená prvá znáška v dostatočne krátkom čase po jej znesení, teda v období od konca marca do prvej polovice apríla. Vtedy majú ešte orly dostatok času k stavbe náhradného hniezda a na znesenie náhradnej znášky, čím sa hniezdenie posúva asi o mesiac. Ak boli prvé znášky zničené v druhej polovici apríla a neskôr, k náhradným hniezdeniam už orly neprišli. Preto je veľmi dôležité pozorne monitorovať všetky páry, u ktorých v rannom štádiu hniezdenia dôjde k ich prerušeniu a nepovažovať daný stav za ukončený.

V náhradnej znáške majú orly kráľovské spravida jedno, zriedka dve vajcia a vychovávajú z nich najčastejšie jedno a len vzácne aj dve mláďatá. Súhrnné údaje sú znázornené v pripojenej Tab. 1.

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