Re-introduction of Griffon Vulture (*Gyps fulvus*) in Kresna Gorge of Struma River, Bulgaria

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Introduction

Preparation of this project started in 2000 when Fund for Wild Flora and Fauna (FWFF) was created with the aim to restore the habitat and to return the four species of European Vultures in SW Bulgaria and Kotel Mountain. A complex of preparative measures and actions took place for the last 10 years including preventive actions against poison, increasing the food availability for vultures and studies - most of which were incorporated in VULTURA program first but later seriously boosted by the Balkan Vulture Action Plan (BVAP).

On 18–th February 2010 under the initiative and technical implementation by FWFF with negotiation with the Rila and Pirin National Park authorities the Spanish foundation GREFA translocated 26 Griffon Vultures from Spain for release in Kresna Gorge of Struma River in south-west Bulgaria. The aim of the project is to re-establish a Griffon Vulture colony in this part of Bulgaria that would serve as a "bridge" between Rhodopian and Macedonian subpopulations of the species. Also the feeding site and the existing colony will serve as a safe "stepping stone" for migrating vultures from Central and Western Balkan Peninsula (Croatia, Serbia and Macedonia) towards Rhodopi, Middle East, Africa and back. And finally the return of Griffon Vulture in this region aims to support the conservation efforts and to increase the chance of natural return of Egyptian Vulture, but also would be a base for future re-introductions of Egyptian, Black and Bearded Vultures.

The Griffon Vulture was reported as breeding species from the area for 1950s at latest. The most obvious reason for its extirpation was the mass and well organized country-wide use of strychnine to control wild predators and complex of less important threatening factors.

The nearest colonies of the Griffon Vultres in the region are located in Nestos Gorge in Greece (of about 150 km away) and Demir Kapiya in Macedonia (90 km away). A large area of Eastern Macedonia province in Greece and SW Bulgaria is not occupied from the species although the habitat is very much suitable. The last colonies in the area of Seres in Greece are reported to have been present until 1990-ies.

Today a relatively large gap between the colonies in Rhodopi Mts. and the ones in FYR of Macedonia exists. FWFF strategy is to create a coherent connection between all existing colonies of the species on the Balkans. This will benefit the entire Balkan and Eastern European population of the species and will support the conservation and revival of the other rarer and more threatened species as Egyptian, Black and Bearded Vultures.

An acclimatization aviary has been built on the left bank of Struma River near the village of Rakitna, Municipality of Simitli, Blagoevgrad District. The aviary and the assembled feeding site are fenced with mesh, but also an electric fence avoids penetration of terrestrial predators. The size of the aviary is 18x10x5 meters. The size of the fenced feeding site is 2 decares.

The successful "French" technology of release of Griffon Vultures using acclimatization aviaries (Choisy & Terrasse, 2007) with slight modifications as release of one by one birds (O.Hatzofe, perss. comm.) and shorter stay of the birds in the aviary, (Heptenstall at all, 2007 and Stoynov, 2008) as well as "hard" release of single birds and change of the season for release (Stoynov, 2008) have been used.

Transfers

The GREFA team has organized the collection of the birds for release in Bulgaria. Some birds were rehabilitated juveniles (n=6), while the others where wild caught in Valencia, Spain. Most of the wild caught birds were immatures and subadults. Only 5 birds were identified as complete adults. After intensive veterinary tests in the wildlife hospital of GREFA in

Majadahonda, the birds were transported by the team of GREFA to Bulgaria by van. They arrived in Kresna Gorge on 18-th February 2010. The birds were immediately settled into the new aviary, with the necessary official part with participation of local people, officials and mass media.

Releases

By accident the aviary was partly opened by a stormy wind yet on 20-th February 2010 and 15 birds succeeded to escape. By chance a team member of FWFF was in the area to close the aviary and to prevent the rest 11 birds to escape. All 6 juveniles remained into the aviary. Most probably the most experienced ones escaped – all being subadults and adults.

To avoid dispersal the feeding site was permanently supplied with food, and most of the birds were fixed in the area despite their short stay into the acclimatization aviary. Some birds started to express breeding behavior. Also some exogenous birds were soon attracted.

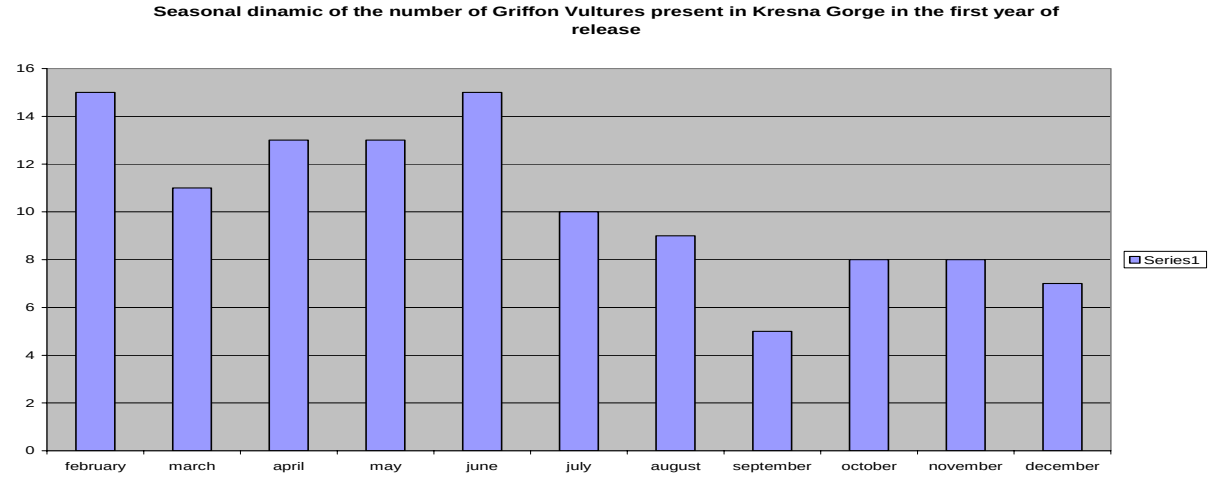
One male adult was released on 3-th of June 2010, by "hard" release. It adapted well to the wild and joined the group in the wild, but was poisoned at the feeding site just a week after the release (see section **Mortalities**).
Three young birds were released in September 2010 by hard "release". They most probably migrated with a group of exogenous juvenile Griffon Vultures in October 2010.

Presence of certain identified Griffon Vultures in Kresna Gorge at feeding and roosting sites in 2010.

N	ID of the bird\ month	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	F02 ad., male	x	x	x	x	(†)						
2	F07 ad., male	x	x	x	x	x		x				x
3	F09 ad., male	x										
4	G10* juv., female								x	x	x	
5	G23 ad., female	x	x	x	x	x	x	x	x	x	x	x
6	G24 subad., male	x			x	x	x	x			x	x
7	G28 ad., female	x										
8	G29 ad., female	x										
9	G30 ad., female	x		x								
10	G31 subad., female	x				x	x	x			x	x
11	G32* ad., male					†						
12	G33 subad., male	x	x	x	x	x			x		x	x
13	G34 subad., male	x	x	x	x	x	x	x				†
14	G37 ad., female	x										
15	G38* juv., male								x			
16	G39* juv., male								x			
17	G42 ad., male	x	x	x	x	†						
18	G46 subad., male	x				x						
19	G47 subad., male	†										
20	B18 imm., female			x	x	x	x	x		x	x	x
21	White wing –tag N			x		x						
22	Croatian juvenile									x		
23	Exogenous 1									x		
24	Exogenous 2									x		
25	Exogenous 3				x	x						
26	Exogenous 4				x	x		x				
27	Exogenous 5		x	x	x	x	x	x				
28	Exogenous 6										x	

Number of identified birds	15	7	10	11	15	6	6	5	6	7	6
Highest number of birds observed at once	15	11	10	9	9	7	9	4	6	7	7
Total number of recorded birds	**15**	**11**	**13**	**13**	**15**	**10**	**9**	**5**	**8**	**8**	**7**

* Birds released intentionally after the unintentional release of the first group of 15. G32 was released on 3-th of June 2010. G39 was released on 8-th of September 2010. G10 and G39 were released together on 21.09.2010.



Monitoring techniques

The vultures were frequently observed at the feeding site and the known roosting sites. It appeared that the feeding of the group of Griffon Vultures in the acclimatization aviary always and very successfully attracted the birds in the wild, so they were checked for markings while perching on the top of the aviary (photographed from a hide or observed from a distance by spotting scope). Many times birds from outside were observed to try to eat from the food inside the cage through the mesh of the cage especially, when the query inside is in its peak. This has happened even when an easy accessible food with same origin is found just 3-4 meters from the cage. This worked even if the birds in the wild are not hungry. They many times just watched how the birds in the aviary were eating and left the area when the query finished even without eating, although food outside the aviary has always been available. However this worked only when the number of the group of vultures in the cage was equal to, or bigger from the group of birds outside. When the number of the birds in the aviary dropped (after some more releases) bellow the number of the birds in the wild, this method of attraction stopped working or at least not as well as it was.

Marking of the birds appeared to be very important tool for following the dispersal and the success of the re-introduction. However using the same colors of rings seems to be not as efficient as if different colors and combinations are used locally. For example most of the birds within the first group were marked with red darvic rings on their right legs (n=12). Thus the few with blue rings (n=3) were always easily distinguished from the others. Also the first exogenous bird observed in March 2010 was distinguished from the others by the lack of any ring and being immature. Later on when the Griffon Vulture from Kotel B18 joined the group in Kresna – being the only bird with green ring made it the most recorded individual. Many times we observed several birds bearing red ring and one with green – and the record seemed like this "G??; G??; G??; G?? and B18".
Two of the blue rings F07 and F02 were frequently observed. They were easily distinguished one from another following the characteristics of their plumage- some feathers were missing due to moulting, but also some primary feathers were damaged during the transportation.

However the two birds were almost always easily distinguished from all others with the red rings even from 1 km distance.

May be having two birds with single blue rings to different legs and also the same with red rings will be better. We put a green ring to the left leg of a bird we recaptured in the cage. So after that it bearded red ring to the right and green ring to the left leg. This made it easily distinguishable from all others even from long distance, and very brief observation.

We also used digiscoping. We took pictures of all observed birds with 300, 450 and 600 mm lenses in RAW format. After that digitally enlarged on the screen and improved through Adobe PhotoShop we found the number of the photographed birds either pictured from a hide or in flight or anywhere. Digiscoping is also useful when birds are photographed in the air and later the temporal changes and characteristics of the plumage are compared.

A camera trap was used to follow the presence of the vultures at the feeding site. We recorded several times Griffon Vultures, Golden Eagles and plenty of Ravens. However the used camera was not good enough to be able to read the ring of the Griffon Vultures and they were only recognized by the color of the ring. Yet the use of the camera gave us an idea about the frequency and the time of feeding of the birds at the feeding site.

Figure 1. Picture of digiscoped wing tag N (1). Two juveniles exogenous birds distinguished one from another through the differences in their missing feathers (2 and 3). Picture from the camera trap at the feeding site (4). Reading rings of the vultures perched at the top of the aviary, while the birds inside are fed (5).

Mortalities

G47 was hit by car on the motorway in Kresna Gorge on 25-th of February 2010.

On 11 of June 2010 G42 and G32 were poisoned at the feeding site with disposed by mistake of the project team poisoned wild boar. G46 was observed on 12 June 2010 in bad condition suffering after the poisoning, but it recovered on its own. All vultures in the wild, as well as all in the acclimatization cage have been fed with the carcass of the same wild boar.

Obviously only the birds that have eaten the digestive tract of the wild boar have ingested the poison. In this incident G32 died just a week after it has been released on 3–th of June 2010. Although no other dead vultures have been found after this incident, it seems that F02 disappeared after it. So it probably became a victim as well. The autopsy of G32 made in Wildlife Breeding and Rehabilitation Center of Green Balkans in Stara Zagora showed clear signs of poisoning. The toxicological analyzes made in Stara Zagora for carbamates and organophosphates were negative. Bad coordination with the second laboratory in Sofia has led to second search for the same group of pesticides instead of different ones, whish also proved the result of the first. Thus no more material for analyzes was available and the poison chemical was not discovered.

Figure 2. 11-th June 2010 G42 died on its roosting place secondary poisoned after eating poisoned wild boar. These 400 kV pylons (considered relatively safe for birds) are frequently used for roosting by Griffon Vultures in Kresna Gorge. This picture is taken few minutes after the bird died (1.5 km from the feeding site).Picture taken by Emilian Stoynov.

Figure 3. 12-th of June 2010 G32 was found dead (1.2 km from the feeding site) reported by local shepherd. Picture taken by Emilian Stoynov.

On 1-st of December 2010 G34 was found killed after an electrocution accident on a 20 kV powerline near the town of Belogradchik in NW Bulgaria (220 km N from Kresna Gorge). In the veterinary protocol for import this bird was sexed as female. During the autopsy in Natural History Museum in Sofia it turned that the bird is male.

Dispersals

Despite the proven dispersal of G34 in NW Bulgaria, where it was found dead, G46 was reported to have participated in a query near Madjarovo – Eastren Rhodopi (240 km E from Kresna Gorge) on 13-th of November 2010.

The remarkable story of G46 could be followed in the pictures bellow:

Figure 3. 12-th of June 2010 G46 is in bad condition. Not far from here G32 was found dead. Few hours earlier a local shepherd saw it and tried to capture it, but became scary and has given up. Few seconds after this picture was taken the bird flew away descending in the gorge. Picture taken by Emilian Stoynov.

Figure 4. 18-th June 2010 G46 already recovered on its own and came to the feeding site again. Picture taken by Hristo Peshev.

Figure 5. 13-th of November 2010 G46 photographed near Madjarovo in Eastern Rhodopi in a query with tens of Griffon Vultures. Picture taken by Lyubomir Andreev – Lupy.

Breeding

Although three or four pairs performed breeding behavior soon after the release, nesting of only one pair was documented. Around 10-th of May 2010 an egg was laid and incubation started for first time documented in Kresna Gorge for the last 60 years. The egg laying by the pair G23xG42 was preceded by more than a month lasting flight displays, copulations and nest building by the two birds. Although the possible breeding of 1 to 3 more pairs is still possible it remained hidden for us.

In June 2010 G42 the male of the first documented breeding pair was poisoned. Luckily the female G23 has found new mate (G33) for next breeding season and started copulations and nest building in the same niche on 5-th of December 2010. Till the end of the year 6 copulations were observed with four of them recorded over several days around 14.45 o'clock in the nest niche.

Attracted exogenous birds

On 12-th of March 2010 the first non identified exogenous bird was observed. It was immature and was not ringed.

On 27-th of April 2010 two new birds were observed at the feeding site. One was B18 – released by our team in Kotel Mountain (400km from Kresna Gorge) in 2009. The other was with white wing tag with one letter "N". Most probably the last bird originates from Serbia. It has been previously observed at Studen Kladenets – Eastern Rhodopi (M. Kurtev /BSPB. pers. comm.).

Two unidentified immatures were present in May and June 2010.

One ringed Croatian and two other juveniles (could also be Croatian, unless Goran Susic is sure he ringed all juveniles at Cres Island) were observed in a group for two days in October 2010 obviously on the way to their wintering grounds.

Figure 6. 18-th of June 2010 a non ringed exogenous juvenile Griffon Vulture perching on the acclimatization aviary. Picture taken by Hristo Peshev.

Other species
The Griffon Vultures presence and the feeding site became a reason for observations of other rare and threatened species that have not been recorded in the area for decades. On 12-th of May 2010 an adult Egyptain Vulture was observed. On 30-th of March 2010 a Greater Spotted Eagle was present at the feeding site. A Black Kite was present for few days in June 2010. Golden eagles are now frequent visitors at the feeding site especially in winter.

Interspecific competition
Ravens
When slaughter offal is disposed at the feeding site tens of ravens (up to 60) are gathering and chase any Griffon Vulture in the area. In such cases Griffon Vultures are making short visits at the feeding site and usually roost at least 2 km away. When food is less frequently disposed and small but, entire (closed) corpses of sheep and goats are provided at the feeding site, the ravens are not gathering too much and the vultures can even roost over the acclimatization aviary.
The ravens are disturbing the vultures at the roosting and breeding cliff. But they are severely attacked by peregrine falcon, which does not disturb the vultures in turn. So it appears that the vultures would be happy to have breeding paragrine falcon on their cliff instead of a pair of ravens.

Golden Eagle
Especially in cold months Golden Eagles are frequently present at the feeding site. Ravens are scared from the eagles and fly away any time it comes. Unfortunately this does not help the Griffon Vultures, because they are scared by the Golden Eagle too. When a Golden Eagle passes over the roosting and breeding cliff of the Griffon Vultures in the gorge all vultures are flying off in panic.
Also Griffon Vultures have never been observed around one of the best cliffs in the gorge, although very suitable for Griffon Vultures, because it is an actual Golden Eagle breeding area.
At the same time the first documented nest of Griffon Vulture in Kresna Gorge in 2010 is an old Golden Eagle nest just 2 km away from recently occupied territory.

Recaptures
In early May 2010 a hole in the mesh of the acclimatization aviary was opened to serve as a trap (according O. Hatzofe idea and proven working in Bulgaria according to Stoynov 2009). G24 was recaptured on 18-th of May 2010 and released again 4 days later. It was recaptured again on 18-th of June2010 and released again on 9-th of July 2010. G33 and G23 were trapped together on 19-th of September 2010 and released again two days later.

Figure 7. G24 the first bird trapped into the aviary in Kresna Gorge through the hole in the mesh opened at the top of the aviary. A method described by Ohad Hatzofe – NPA Israel and adopted for use in Bulgaria by FWFF since 2007.

Overview

Despite the untimely release of the first group and the sad accident with providing poisoned food to the feeding site – two factors, that led to immediate dispersal of at least 6 and the death of at least 2, but may be three vultures and the fact that one was hit by car and one was electrocuted we still succeed to establish the base nucleus of the Griffon Vulture colony in Kresna Gorge. The presence of Croatian and Serbian Griffon Vultures and the increase of exogenous birds migrating towards summer and wintering areas showed that the site is important as a "stepping stone". The birds that moved from Eastern Rhodopi to Kresna Gorge and vise versa show that the site is also important as a bridge between Rhodopian and Western and Central Balkan Peninsula's colonies of the species. So the releases must continue until the colony in Kresna Gorge reaches the estimated optimal number of 10-12 pairs.

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