

## RESTORATION OF GRIFFON VULTURE (*GYPSES FULVUS*) IN EASTERN BALKAN MOUNTAINS, BULGARIA

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**Abstract:** The current work presents the methodology and results following six year of the re-introduction of Griffon Vultures (*Gyps fulvus*) in the Eastern Balkan Mountains of Bulgaria, started in 2009 with pilot release and continued within the Vultures Return in Bulgaria LIFE08 NAT/BG/278 Project.

The practical releases started with 3 Griffon Vultures, released from the Kotel adaptation aviary found in the Kotlenska Planina (Kotel Mountain) in 2007. In the next two years 2008 and 2009 five more birds were released. In the period January 2010 - June 2015, a total of 44 more birds were released. At the same time (2010 – June 2015), a total of 65 Griffon Vultures were released from a nearby adaptation aviary found in the Sinite Kamani Nature Park.

Due to the relatively small distance between the Sinite Kamani Nature Park and the Kotlenska Planina sites, the Griffon Vultures released from the two sites have formed a joint group, regularly visiting both sites, depending on the presence of food and the weather conditions. At October 2015 there was a fixed group of some 25-35 Griffon Vultures constantly present in the areas of release. A minimum of 85 different Griffon Vultures were identified to have visited the feeding sites in 2015, and many non-marked birds also are frequently present. Up to 37 Griffon Vultures have been seen together at the roosting sites near Kotel in October 2015.

First breeding attempt of Griffon Vultures, released within the restoration programme was recorded in 2012 at about 60 km to the East of the release sites. All known breeding attempts from 2013 to 2015 were recorded in the vicinity of Kotel. In the breeding season 2014-2015 there were minimum three territorial pairs of Griffon Vultures in the Eastern Balkan Mountains.

## INTRODUCTION

A total of four species of vultures were known to nest in Bulgaria: Eurasian Griffon Vulture (*Gyps fulvus*), Black Vulture (*Aegypius monachus*), Egyptian Vulture (*Neophron percnopterus*) and Bearded Vulture (*Gypaetus barbatus*) (Patev 1950, Simeonov and Michev 1990).

In the beginning of XXI century only two of the species remained as nesting in the country - Griffon and Egyptian Vulture. The last breeding of Black Vulture was confirmed in 1992 in the Eastern Rhodopes (Marin et al. 1998, Stoynov et al. 2007) after a gap of more than thirty years, while Bearded Vulture has been considered extinct since the 70s of the XX century, despite the occasional sightings of individual birds (Donchev 1974, Stoynov 2007).

In 2003, following over 20 years of local conservation efforts, a long-term International Action Plan for the Recovery and Conservation of Vultures on the Balkan Peninsula and Adjacent Regions (BVAP) was initiated. It provides for a step-by-step recovery of the species, starting with Griffon Vulture in some strategic historical breeding sites and finishing with the reintroduction of Bearded Vulture. As an initial step, a Griffon Vulture adaptation aviary was constructed in the area of Kotlenska Planina (UTM MH65), near the town of Kotel, by the Fund for Wild Flora and Fauna (FWFF) in 2003 and 3 vultures were released in 2007 (Stoynov and Bonchev, 2012). In 2008 an additional adaptation aviary was also constructed by Green Balkans – Stara Zagora NGO in the territory of the Sinite kamani Nature Park (UTM MH43), 25 km away from the initial release site near the town of Kotel. Considering the proximity of the two adaptation aviaries and the behavior of the birds released from the two release sites, the current publication considers them as a common, Eastern Balkan Mountains release site. Both sites are known to be historical breeding area for the Griffon Vulture (Demerdjiev, 2007; Patev, 1950; Simeonov et al. 1990, Slotta-Bachmayr et al. 2004, Spiridonov, 1987).

### **Site description**

#### **Kotlenska Planina**

Kotlenska Planina is located in the Central part of the Eastern Balkan Mountains chain. Many clearly formed secondary ridges with steep slopes and deeply cutting gorges and ravines descend from the main ridge of the mountain to the Ticha and the Luda Kamchia river valleys. The terrain is steep and heavily indented. The region is sparsely populated, mainly in its periphery and along the river valleys. About 23 % of the mountain territory is occupied by primary broad-leaved forests mainly of European beech *Fagus sylvatica subsp. moesiaca*, at places mixed with European Hornbeam *Carpinus betulus*. The forests of Oak *Quercus dalechampii* are more limited, sometimes mixed with European Hornbeam *C. betulus* and Oriental Hornbeam *Carpinus orientalis*, and mixed forests of Turkey Oak *Quercus cerris* and Hungarian Oak *Quercus frainetto*. A

patches of natural mixed woods of White Fir *Abies alba* and Beech *Fagus sylvatica* have been established in the Western part of the mountain. The secondary forests and shrubs of Oriental Hornbeam have a very limited distribution in the region. The rest of the territory is occupied by open grasslands, used as pastures and farmland. A considerable part of the open areas, including the agricultural plots, have a secondary origin, i.e. they spread on territory previously occupied by old forests. The wet areas and the river valleys cover a comparatively small part of the mountain territory. Limestone rocks and karst formations are dispersed everywhere in the high mountain areas (Kostadinova & Gramatikov 2007). The mean altitude of the site is about 500 m above sea level and the highest peak is a little over 1000 m.

### **Sinite Kamani Nature Park**

The area is located in the Sliven Mountains, a part of the Southern slopes of the Eastern Balkan Mountains (part of Balkan Mountain chain). The Western part and the Southwestern limit of the area is defined by the Asenovets Reservoir and the Asenovska River. On the North it passes along a watershed ridge, which is practically the highest part of the area at over 1000 m above sea level. The Northern slopes are steep, covered by Beech forest. The Southern border of the area passes along the Southern slopes of the mountain just next to the town of Sliven. A considerable part of the area is covered by broadleaved forests. The mixed oak forests of *Quercus delechampii*, *Q. cerris*, *Q. frainetto* and *Q. pubescens* prevail. Forests of Crimean Beech *Fagus moesiaca* and European Hornbeam *Carpinus betulus*, as well as Silver Linden *Tilia tomentosa* and Oriental Hornbeam *Carpinus orientalis* are also represented. Shrub and grass associations on silicate base occupy 2 % of the area, while about 6% is covered by secondary steppe and dry calciphile grass communities. The grass formations have a secondary origin. The rock formations, which have given the name of the site, cover some 7 % of its total area.

As part of the strategy for restoration of the Griffon Vulture along Balkan Mountains, the Eastern Balkan Mountains were chosen as one of the most prospective release sites. In 2007 a “Viability Study on the reintroduction of the Griffon Vulture (*Gyps fulvus*) in Kotlenska planina, Bulgaria” (Stoynov et al. 2007) was elaborated by the team of the Fund for Wild Flora and Fauna in accordance with the IUCN Guidelines for reintroduction (IUCN, 1998) to justify the selection of the Central Balkan area as among the most prospective for the start of a full-scale reintroduction programme.

Three years later, a specialized project “Recovery of the Populations of Large European Vultures in Bulgaria” LIFE08 NAT/BG/278 was triggered in 2010. The project was carried out by Green Balkans - Stara Zagora NGO in partnership with the Fund for Wild Flora and Fauna (FWFF) and the Birds of Prey Protection Society (BPPS).

The overall aim of the project was restoring the populations of the three large vulture species in Bulgaria through reintroduction of the Griffon Vulture along the whole Balkan Mountain chain (four releases sites – from West to East – Vrachanski Balkan, Central Balkan, Sinite Kamani - Grebents and Kotlenska Planina). A complex of preparatory and direct conservation measures was applied and the capacity of NGOs and local institutions was increased for conservation action. The current article reports the results of the Griffon Vulture reintroduction in the Eastern Balkan Mountains for the period 2010-2015.

## MATERIALS AND METHODS

The original plan was to follow the release methodology successfully used for the restoration of Griffon Vulture in the Alps Choisy and Henriquet (1992), Terrasse (2006) and Terrasse and Choisy (2007). Their methodology provides for soft release (open the cage and wait for the birds to go out on their own) of subadult individuals (more than 3 years old) that have stayed some 2-3 years in the aviary (Sarrazin and Legendre 2000). The releases take place in autumn, as to avoid dispersal and migration (Terrasse and Choisy, 2007). Based on some experiments with the timing of releases in Bulgaria, we adapted the method as follows: first of all we also practiced hard release (release from hand) of immature birds (1-2 years old), which had stayed in the adaptation aviary for a period of a single month up to 1-2 years. We released most of the birds in late winter, spring and summer as to use the good flight conditions (warm weather), and to give more time to the vultures to adapt to the wild and store fat prior to winter.

A total of 100 Griffon Vultures were shipped and accommodated in the Sinite kamani adaptation aviary between January 2010 - July 2015. Another 50 were shipped and accommodated at the Kotlenska Planina adaptation aviary for between 2007 – July 2015, making a total of 150 birds secured for the area of the Eastern Balkan Mountains. A total of 123 of those birds originate from rehabilitation centres in Spain (which means that they were wild birds with previous flying experience, but had suffered some kind of injuries to be then collected and rehabilitated by those centres), other 10 birds came from rehabilitation centres in France, while the rest were captive bred in several European Zoos. It should however be noted that later, in the course of the project implementation, some of these birds were transferred to other release sites (such as Kresna Gorge release site), so when analyzing the results, the number of released vultures should be considered rather than the number of initially accommodated.

In most cases Griffon Vultures were admitted at the Wildlife Rescue Centre of Green Balkans – Stara Zagora for initial examination and quarantine. Birds were all treated against internal and external parasites and weighted. Following an average of a month, vultures were individually captured, re-examined, ringed, wing-tagged and forwarded to the adaptation aviaries in the Balkan Mountains

(Vrachanski Balkan, Central Balkan, Sinite kamani - Grebenets and Kotlenska planina). In several cases, when birds originated from controlled environment, such as zoos, vultures were directly accommodated at the adaptation aviaries, skipping the quarantine at the Rescue Centre.

A total of 100 of the vultures, released in the Eastern Balkan Mountains area were tagged with yellow PVC rings and matching wing tags on both wings with vertical three-alpha numeric code, starting with K. Two more Griffons, which voluntarily entered the adaptation aviaries were tagged and released with blue wing-tags with yellow inscriptions (B64 and B67). A single bird was released with a blue wing-tag with a horizontal orange inscription "10", two birds were released with green rings with white inscriptions (B18 and B20) and three birds were released with metal rings only.

Fenced supplementary feeding sites (vulture restaurants) were established right next to the adaptation aviaries and food (carcasses of livestock and/or slaughter offal were provided on regular basis). It appears that not only the amount, but mostly the frequency of food provision is of great importance for the settlement of a nucleus of birds, for the survival of the releases ones and thus for the establishment of a colony.

The vultures were frequently (every 2 to 4 days) observed by binoculars and spotting scopes at the feeding site and the known roosting sites. Local people and tourist reports on seen vultures and identified tags were used, as well as photo-traps in order to record and identify the birds present at the supplementary feeding site, adjacent to the release aviary. Initially the project employed a Microsoft Office Excel spread-sheet with individual data on every bird imported within the Vultures Return in Bulgaria Project.

An interactive web-database was later developed within the Vultures Return in Bulgaria Project and tested for optimizing the storing and processing of information.

The database currently stores individual information on every bird, supplementary feeding site and observation. It is also compatible with the data sent by the GPS/GSM transmitters and it is able to visualize the points of observation of a given bird in chronological order, thus tracking its overall movements and behavior following release.

## RESULTS AND DISCUSSION

The practical releases started with 3 Griffon Vultures, released from the Kotel adaptation aviary located in the Kotlenska planina in September 2007. In the next two years 2008 and 2009 five more birds were released. These first releases were used to try out and practise the release methods and to adapt them to the local conditions, which proved to be useful later on when additional groups of birds were released.

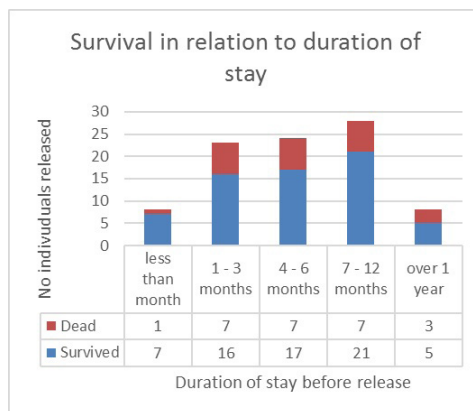
In the period January 2010 - June 2015, a total of 44 more birds were released from Kotlenska planina and additional 65 were released from the nearby Sinite kamani release site. A total of 109 Griffon Vultures were therefore released from the Eastern Balkans release site between 2009 - July 2015.

**Table 1.** Number of Griffon Vultures (*Gyps fulvus*) released in Eastern Balkan area

	Sliven	Kotel	Total
<b>2009</b>	0	5	<b>5</b>
<b>2010</b>	7	7	<b>14</b>
<b>2011</b>	12	11	<b>23</b>
<b>2012</b>	19	7	<b>26</b>
<b>2013</b>	8	0	<b>8</b>
<b>2014</b>	16	10	<b>26</b>
<b>2015</b>	3	4	<b>7</b>
<b>Average</b>	9	6	<b>16</b>
<b>Total</b>	<b>65</b>	<b>44</b>	<b>109</b>

Four different birds were tagged with VHF radio transmitters, to follow them during the adaptation period. One of these birds was later found dead. A total of 21 birds were tagged with prototypes of GPS/GSM transmitters.

Most of the birds released between 2010 – June 2015 stayed in the adaptation aviaries between 7-12 months (over 26 %) before release. Of them 7 (25 %) were confirmed to have later died. Other 24 (23 %) of the birds were kept between 4 - 6 months before release. Of them 7 (29 %) were confirmed to have later died. A total of 8 birds stayed in the adaptation aviary for less than a month, just one of them has later been confirmed to have died:



**Fig. 1.** Confirmed mortality of the Griffon Vultures in relation to their duration of stay in the adaptation aviaries prior their release

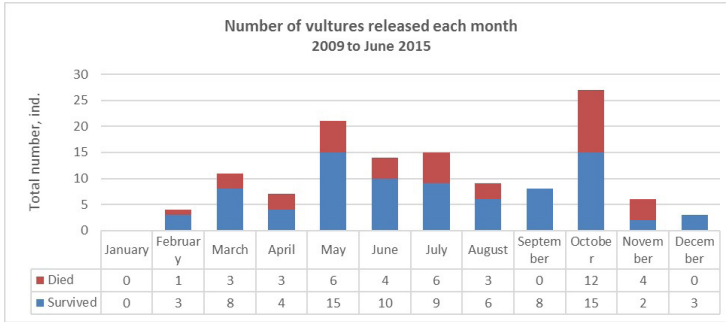
This data may be biased by the fact that a batch of adult, wild-caught Griffon Vultures was released from the Sinite Kamani site – all of them experienced birds, that quickly dispersed and discovered the natural vulture colonies on the Balkans and/or the other feeding sites and thus survived, but did not settle in the release area.

Vultures were released generally between March – October. Two main strategies were employed, focusing on early spring and autumn releases. The idea behind the spring releases was to coincide the start of the breeding season and force birds to quickly look for partners and nesting sites in close proximity to the release sites (Terrasse & Choisy 2007).

The autumn releases were intended to provide sufficient time for the vultures to explore the areas and locate the best roosting and feeding sites before the start of the winter (2009 – June 2015).

**Table 2.** Number of birds released in the various months of the year and their survival rate

	<b>Birds released</b>	<b>Survived</b>	<b>Died</b>	<b>Mortality %</b>
<b>January</b>	0	0	0	0
<b>February</b>	4	3	1	25
<b>March</b>	11	8	3	27
<b>April</b>	6	4	3	50
<b>May</b>	17	15	6	35
<b>June</b>	14	10	4	29
<b>July</b>	11	9	6	55
<b>August</b>	8	6	3	38
<b>September</b>	8	8	0	0
<b>October</b>	23	15	12	52
<b>November</b>	6	2	4	67
<b>December</b>	3	3	0	0
<b>Total</b>	111	83	42	38



**Fig. 2.** Number of vultures released each month and their survival rate

Birds were released depending on the particular weather conditions, preferably at the presence of experienced vultures outside the aviaries at the time of release.

A total of 42 of the 111 Griffon Vultures released in the area were eventually found dead between January 2010 - April 2015, which means a mortality of 38 %. A total of 16 of the cases were proven or suspected cases of electrocution, since the remains were found under electric pylons, or the cause of death was proven with necropsy. Three of the cases (7 %) tested positive for pesticides (organo-phosphates/carbamates). Sixteen out of 42 of the dead birds were reported between October - November, which turns out to be a critical period for the adaptation and survival of the vultures.

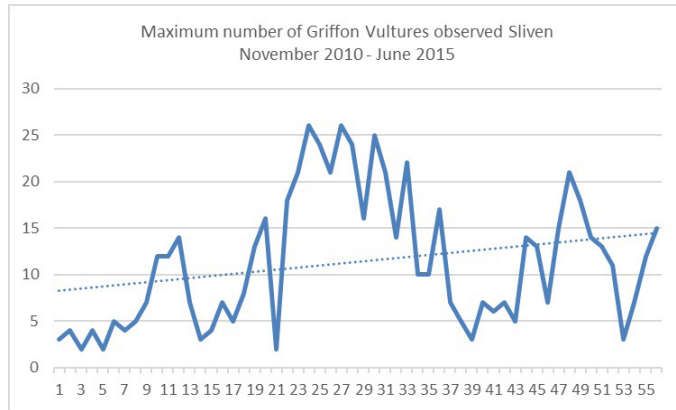
Following the start of the releases, there is a clear positive trend in the number of free-flying Griffon Vultures observed in the area. Due to the relatively small distance between the Sinite kamani and the Kotlesnka Planina sites, the Griffon Vultures released from the two sites have formed a joint group, regularly visiting both sites, depending on the presence of food and the weather conditions. The birds generally roost on top of the Sinite kamani adaptation aviary or on a rock massif in direct proximity to the Kotlenska Planina release and feeding site.

The maximum number of birds recorded within a single month is 29 different Griffon Vultures (June 2014). In 2014 alone, a minimum of 52 different Griffon Vultures were identified to have visited the Kotlenska Planina feeding site, of which minimum 10 non –marked individuals of different age. The numbers reached 85 different Griffon Vultures in 2015 (Peshev et al. 2015).

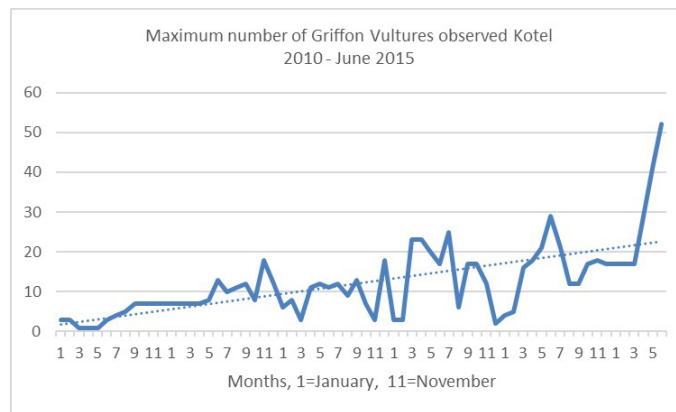
The figures 2 and 3 below are based on the maximum number of Griffon Vultures present in the Eastern Balkan Mountain feeding sites at a single observation. They do not consider the aggregated number of different birds observed in the given month, but represents the maximum concentration of birds counted at a single feeding event.

The Eastern Balkan Mountains release sites have been visited by birds released from Kresna Gorge, Serbia, Israel, Croatia and Eastern Rhodopi.





**Fig. 3.** Maximum number of Griffon Vultures observed at a single feeding event at the Sinite kamani supplementary feeding site (October 2010 - June 2015)



**Fig. 4.** Maximum number of Griffon Vultures observed at a single feeding event at the Kotlenska Planina supplementary feeding site (October 2010 - June 2015)

The first breeding attempt of Griffon Vultures released within the Balkan Mountains restoration programme was reported in May 2012, when a pair nested some 60 km to the East of the release site of Kotel – in the lower mountain area of Kamchiysika Planina. This may be attributed to the harsh winter conditions in the time of egg laying, because the birds were frequently observed at the feeding site in Kotel (flying over the 60 km distance every time). They returned to the release site in Kotel after the failure of the incubation that year. Next year the same pair laid on a cliff not far from the release site. The number of confirmed breeding pairs in the period 2012 – 2015 has developed as follows:

**Table 3.** Number of confirmed breeding pairs of Griffon Vultures in the Eastern Balkan Mountains (2012-2015)

Year	Number of confirmed pairs	Number of fledged young
2012	1	0
2013	1	0
2014	2	0
2015	3 (5)	0

**Table 4.** Detailed history of breeding pairs of Griffon Vultures in the Eastern Balkan Mountains (2012 - 2015)

Pair		Behavior observed	Period of the year	Notes
Male (year)	Female (year)			
7G Released 2009 Kotel	B18 Released 2009 Kotel	Display flights, nest located through transmitter	April – May 2012	Nest visited, eggshells found, reasons for failure unknown
7G Released 2009 Kotel	B18 Released 2009 Kotel	Copula, nest located	Nest abandoned end of March 2013	Nest location changed, new nest visited, eggshells found, reasons for failure unknown
7G Released 2009 Kotel	B18 Released 2009 Kotel	Copula, nest unknown	February - March 2014	Nest location changed
Tagged	Tagged	Display flights	February - March 2014	
7G Released 2009 Kotel	B18 Released 2009 Kotel	Copula, display flights	February - March 2015	Egg seen in nest, failure because of heavy snow in march 2015
K1U (born 2011) Released 2012 CB	K2N Released 2012 Sliven	K1U carrying grass, constructing a nest, copula	February - March 2015	Egg seen in nest, failure because of heavy snow in march 2015
K0H	K34	Flight displays+ Keeping territory, nest site selection	February - March 2015	Mating and nest building
K3W	K5M	Flight displays+ Keeping territory, nest site selection	February - March 2015	Mating and nest building
K0M	K4P	Flight displays+ Keeping territory, nest site selection	February - March 2015	Mating and nest building

Attracted other species.

The feeding sites and the presence of Griffon Vultures has attracted conspecifics, but also other species, that have been extinct from the area or have never been reported.

A young Eurasian Black Vulture (*Aegypius monachus*) has been attracted to the area of the Eastern Balkan Mountains and it has been documented to use the feeding sites in the area for a first time in the past thirty years.

The species was observed in three serial years as follows: first observation on the supplementary feeding site in Sliven in April 2013, photographed by the photo-trap set on site. Second observation of a single individual on September 25th 2014. The bird was roaming above the supplementary feeding site but feeding was not confirmed. Third observation of an individual in June 2015, the bird stayed for over a month in the area of Sliven – Kotel in a group with Griffon Vultures, using the same roosting sites.

In addition to that, the two feeding sites in the Eastern Balkan Mountains are often used by Egyptian Vultures (*Neophron percnopterus*). Two Egyptian Vultures – an immature and an adult individual were attracted to the area and stayed for nearly a month in July 2010. A juvenile Egyptian Vulture was observed at the feeding site of Kotlenska Planina in May 2012, while in 2014 three different Egyptian Vultures, one Imperial Eagle (*Aquila heliaca*) and one White-tailed Sea Eagle (*Haliaeetus albicilla*) were observed. In 2015 two or three different Egyptian vultures were observed for several times in the period May-July, once again in Kotel.

There are several well-documented visits of young Imperial Eagles (*Aquila heliaca*) to the feeding site in Sliven. A single bird has been observed every year between 2012-2015, most commonly in September – October. It is usually a second- or third year old bird, in several cases also with green rings.

A single juvenile White-tailed Eagle (*Haliaeetus albicilla*) has been reported at both release sites in the Eastern Balkan Mountains. Between June-August a single individual was seen at the feeding site of Sliven. A juvenile individual was also reported at the feeding site of Kotel on 02.12.2011, and 23.03.2013.

There are known breeding pairs of Golden Eagles (*Aquila chrysaetus*) in the areas of both the Sliven (2.5 km away) and the Kotel feeding sites (5 km away). The species can be seen at both sites all-year-round. The pair breeding near the Kotel feeding site, has been particularly aggressive towards the Griffon Vultures in the area and has managed to actively chase them off suitable roosting sites.

Black kites (*Milvus migrans*) are frequently observed at feed at the feeding site in Kotel.

## CONCLUSION

The first breeding attempt of Griffon Vultures has been reported in the Eastern Balkan Mountains after over 50 years of absence. At 2015 a small breeding colony has been formed and since mostly juvenile birds have been released, it is expected that the number of nesting pairs will gradually increase with time. The Griffon Vultures released from the adaptation aviaries of Sinite kamani Nature Park (Sliven) and Kotlenska Planina (Kotel Mountain) have formed a common group and are visiting both sites and using common roosting sites, regardless of their original release site.

There is a well-documented movement of Griffon Vultures between the Eastern Balkan Mountains and the two natural colonies of Griffon Vultures in the area of Studen kladenets (UTM LG80) and Madjarovo (UTM MG01), Bulgaria and Dadia (UTM MF35), Greece in the Eastern Rhodopes. This movement is valid for both birds released within the Balkan restoration programme, which move to the South and then back North, as well as birds originating from the natural colonies visiting the release sites to their North. The latter movement is confirmed with the tagging and post-release tracking of non-marked juvenile Griffon Vultures, which have accidentally entered the adaptation aviaries. The Griffon Vultures released in the Eastern Balkan Mountains tend to join the natural colonies to the South especially during harsh winters, yet they do return to the release sites in spring. This movement matches the expected natural movement of Griffon Vultures in the early XX century, which followed the transhumance of sheep from their summer pastures in the Eastern Balkan Mountains to their winter grounds in the South Bulgaria and back. Birds released from the Eastern Balkans Mountains are also known to have settled in a number of other release sites: Vrachanski Balkan (an average of 7 individuals), Eastern Rhodopes (a minimum of 20 identified individuals). Griffon Vultures released from the two sites in the Eastern Balkan Mountains have been observed in the following countries: Bulgaria, Greece, Serbia, Macedonia, Turkey, Italy, Hungary, France, Poland, Jordan, thus interactions and connections with the wild populations have been successfully established.

At 2015 there is a fixed group of some 25-35 Griffon Vultures constantly present in the area of release. A minimum of 85 different Griffon Vultures were identified to have visited the feeding sites in 2015 and up to 37 Griffon Vultures have been seen at the roosting sites near Kotel in October 2015.

The feeding sites are also used by Black Vulture, Egyptian Vulture, Golden Eagle, Imperial Eagle, White-tailed Eagle, Black Kite, Raven etc.

During the preparation of this article, in the early 2016, 8-10 pairs of Griffon Vultures formed pairs in two distinct colonies in Kotlenska Planina. The field teams have confirmed the laying of 6 eggs and the hatching of three chicks (by 20 April 2016). This turns out to be the milestone for the return of the species in the area, proving that the conditions are good and the species has been successfully restored in the Eastern Balkan Mountains.

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Special thanks to all experts and state institutions, who helped and assisted us throughout the project implementation, especially the Sinite kamani Nature Park Directorate.

The actions will continue through the Vultures Back to LIFE14 NAT/BG/649 Project, coordinated by Green Balkans, with the participation of Fund for Wild Flora and Fauna, Vulture Conservation Foundation, Junta de Extremadura and EuroNatur.

**Additional information:** For more information of the project and the releases, please visit:

[www.greenbalkans.org/birdsofprey/life](http://www.greenbalkans.org/birdsofprey/life)

<http://fwff.org/BG/griffon-vulture-reintroduction-in-kotel-mountain/>

[www.greenbalkans.org/vulturesback](http://www.greenbalkans.org/vulturesback)

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