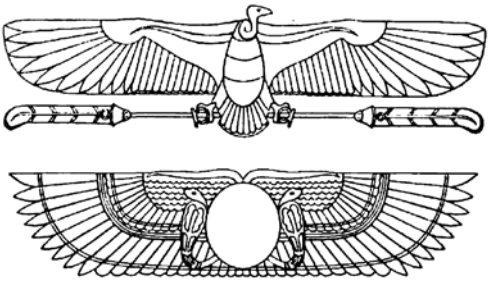
Saša Marinković
Branko Karadžić

GRIFFON VULTURE

Gyps Fulvus Hablizl 1883

Belgrade, 2008

Pribislav Marinković



BIRDS OF PREY PROTECTION FUND
Special Edition Vol I
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Griffon Vulture

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BIRDS OF PREY PROTECTION FUND BELGRADE

The Birds of Prey Protection Fund is a nongovernmental and nonprofit organization for monitoring endangered birds and reintroducing bird species that have become extinct in Serbia and the Balkan Peninsula.

Detrimental processes such as ecosystem disturbance, habitat fragmentation, increased pollution and excessive exploitation of natural resources have significantly intensified the process of species extinction in recent years. We now need to join efforts to slow down these processes and bring back some of the species that have disappeared from our region.

The Fund's activities focus on scientific research and popularization of science through education. The Fund has established a network of volunteers and collaborating ornithologists in order to supervise and protect the endangered species and their local habitats.

The Birds of Prey Protection Fund also organizes lectures and outdoor instruction courses, and prints books, brochures and posters so as to encourage popular awareness and concern, and create an attentive public environment for the protection of biological biodiversity. Its programmes are organized in cooperation with Belgrade University (Faculty of Biology and Institute of Biological Research "Siniša Stanković"). The Fund collaborates with various governmental and nongovernmental organizations in Serbia and other countries that support this idea and specialize in the field of protection of natural resources.

It is therefore the right time for all who wish to contribute to this noble activity to do so and join our mission of saving endangered species.

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INTRODUCTION

The subfamily of vultures is the most endangered group of birds of prey in the Balkan Peninsula (BVAP 2002). Populations of four vulture species inhabiting the Balkans are currently declining and withdrawing from areas in which have lived in the past. These four species have therefore been included in the Biodiversity of Birds Annex I list (BirdLife International 2007). The important role of vultures and the fact that they are under growing threat have initiated various ecological studies and considerable conservation efforts in order to help these species survive. Besides programmes that are aimed to protect vultures in regions where they still persist, some countries and organizations have made significant efforts to reintroduce them in regions from which they had disappeared at earlier times (Switzerland, Austria and Italy) (Huston 2005). A successful programme of restoring a population of the Californian Condor in the Colorado River canyons after the species was at one point reduced to no more than ten individuals, shows that there are good chances indeed for successful protection of vultures despite the fact that they are the most endangered of birds of prey.

Four vulture species are natives of Europe and most of their populations inhabit the Iberian and Balkan Peninsulas. Approximately 22,000 pairs of Griffon Vultures have been recorded in the Iberian Peninsula alone (Parra & TellerIa 2004) and this number accounts for 94% of all European and about 60% of the world population of this species. The abundance of all populations of Black Vulture is estimated at some 10,000 pairs. Approximately 98% of the European population of that species is nesting in Spain, i.e. about 1800-1900 pairs (BirdLife International 2007). Almost 82% of the European population of Egyptian Vulture is scattered across the Iberian Peninsula. The entire European population of Bearded Vulture is estimated at no more than a few dozen pairs and approximately 66% of these birds live on the Iberian Peninsula. Griffon Vulture was successfully reintroduced in the Massif Central of Southern France, where the species had died out 100 years ago (Terrasse *et al.* 1994).

This success has inspired a programme of reintroduction of Black Vulture to Southern France. Donors of birds are the Spanish Black Vulture Protection Fund and the Frankfurt Zoological Garden. After a period of 120 years, Bearded Vultures now nest again in the Swiss Alps. Such efficient reintroduction of the Bearded Vulture is a result of joined conservation efforts of various zoos and other admirers of this bird species organized in a similar fashion as members of our Birds of Prey Protection Fund.

A joint Balkan action plan for bringing back disappeared birds of prey involves activities for reintroduction of the Black Vulture and other locally extinct species

The most abundant population of Griffon Vulture in the Balkan Peninsula is on the island of Crete (Photo S. Marinković)

(BVAP 2002). Reproduction of these birds in zoos facilitates programmes of their reintroduction to natural environments. *Ex situ* reproduction (reproduction in zoos) is especially required for species that have died out in our region.

All four European vulture species inhabited Serbia during the first half of the 20th century, and their populations were abundant at the time (Marinković *et al.* 1985). At present, however, only the Griffon Vulture survives owing to a permanent care by people involved in our Fund's activities (Marinković 1999). The Egyptian Vulture disappeared from Serbia a few years ago, while the Bearded and Black Vultures had disappeared in the second half of the 20th century (Puzović *et al.* 2000). No more than a decade ago, pessimistic views were prevailing regarding possibilities of protecting the Griffon Vulture from disappearing (Marinković & Orlandić 1992). However, the species persists thanks to a widespread popular support. Both favorable habitats and permanent care of local people have resulted in a significant improvement of conditions for the survival of this species. The Drina River basin is now becoming the safest place for Griffon Vultures in the Balkans (Marinković 1999).

Species become extinct and new ones arise in natural events that enable evolution of species and their habitats. Several catastrophic extinction events have been recorded during Earth's history. The most prominent among them is the disappear-

ance of dinosaurs. However, their extinction has enabled the evolution and adaptive radiation of mammals and birds. The rate of species extinction rapidly increased during the 20th century as a result of fast and sudden environmental changes that are caused by human activities (Pimm *et al.* 1995). Spontaneous changes of environments are slow processes that allow species enough time to adapt. However, species are not able to adapt to fast human-induced changes of natural environments, such as the climate change, stratospheric ozone depletion, habitat fragmentation, increased air, water and soil pollution, introduction of alien invasive species, etc.

The extinction of vultures has initiated improvement of legislation regarding nature protection. However, improved legislation is insufficient to ensure survival of these attractive birds of prey. To achieve that objective, it is necessary to ensure support and help not only from various national and international organizations of nature conservation, but also from each individual, especially local population and cattle breeders, in areas where these endangered birds are nesting or where they can be reintroduced. Interrelation between various international programmes for the protection of vultures and other endangered species, and protection of habitats in which they live, increases popular awareness of the need for biodiversity conservation not only on local, but on regional and global levels as well.

Insufficient knowledge is the prime enemy of endangered species. For example, Davidović (1957) believed in earlier times that "pest birds" should be destroyed without hesitation, and placed the Bearded Vulture in that group of species. In fact, Bearded Vulture does not cause any damage to people. Sadly, such misconceptions accelerated the disappearance of Bearded Vultures from Serbia in earlier periods. Our Fund carries out educational programmes aimed to inform local population about the significance of species extinction and to facilitate programmes of their reintroduction. This publication contributes to promoting the interest of a widest spectrum of people in the protection and conservation of vultures, and to expanding our knowledge about these extraordinary birds of prey. This guide is intended not only for students, but also for all enthusiasts and nature lovers in general. The fact that our activities have enabled reintroduction of some disappeared species gives a new meaning to our relations with nature.

WHAT ARE VULTURES?

The birds that use animal carrion for nutrition are represented by different and taxonomically distant families such as the stork-marabou family Ciconiidea, gull family Laridae, crow family Corvidae, etc. However, when we speak about vultures we

tend to think of birds of prey that belong to the taxonomic order of Falconiformes, i.e. of birds with powerful wings, curved bills and piercing vision adapted for the role of carcass cleansers in undisturbed habitats.

Vultures are the largest predators feeding on dead prey (Photo P. Kostin)

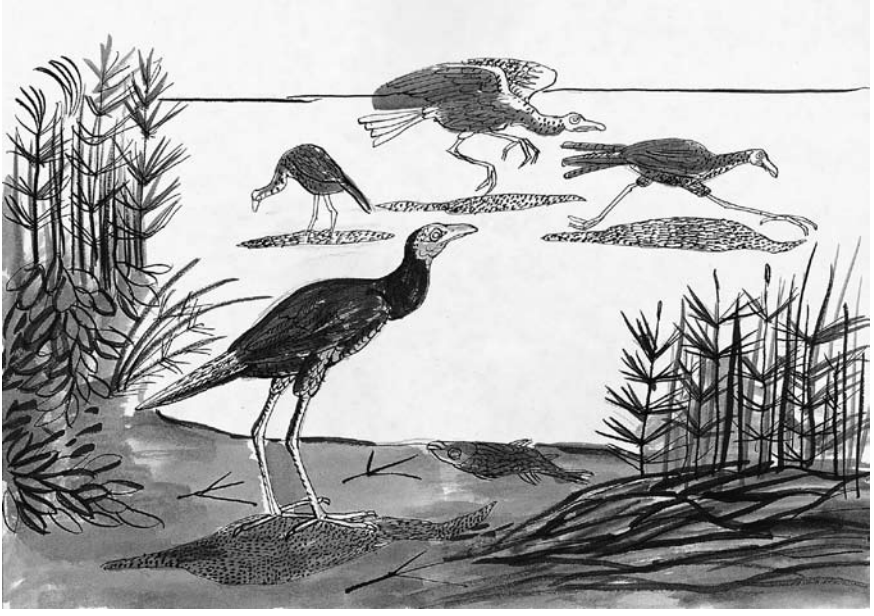
Adaptation to a specific type of nutrition and environment has resulted in a set of physiological, morphological, behavioral and ecological traits. In terms of morphology, these birds of prey can be easily identified by their either naked or down-overgrown heads, large eyes, strong hooked bills, big bodies and their ability to glide or more precisely, to circumnavigate in air streams. Vultures are specially adapted to fly at extremely high altitudes or for extremely long flights. These characteristics enable efficient search for food. They normally gather around food sources (i.e. dead animals) in large numbers. Vultures clean up animal carcasses fast, leaving no residues, so that by doing so they prevent epidemics of diseases that might otherwise break out after an extended process of decay of organic matter.

Despite the fact that all vultures are similar, they belong to two distant subfamilies: the New World vultures (Cathartidae) and the Old World vultures (Gypaetinae, Aegipiinae). These two distant groups of birds have evolved independently, while their similarity results from adaptation to similar conditions of life. This type of specia-

tion is known as "convergent evolution". The New World vultures are a very old group of birds. Their ancestors are birds of water habitats from the same lines as recent storks and flamingos. Long ago, they inhabited the whole world. In more recent times, however, they have been restricted only to North and South America. Compared to New World vultures, Old World vultures are a little younger, and they are related to kites and snake eagles. Recently they have inhabited regions in Asia, Africa and Europe. Numerous fossil relicts of Old World vultures have been found in America, and it is not quite clear why this group of birds has withdrawn from that continent in recent times. The New World vultures (Cathartidae) can be classified in a distal group of Falconiformes birds of prey (Brown & Amadon, 1969, Brown, 1976, Bock, 1994).

NEW WORLD VULTURES

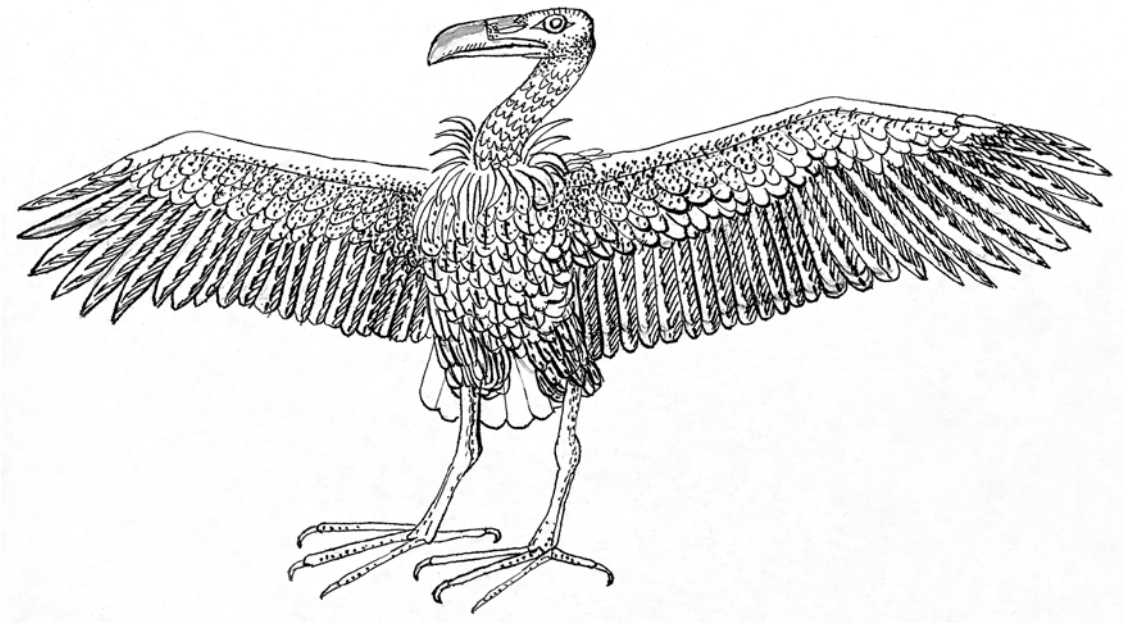
Approximately 65 million years ago, at the beginning of the Cenozoic, a complex development of terrestrial biomass and fast evolution of flowering plants accelerated strong adaptive radiation of mammals. These processes paved the way for a devel-



Terrestrial Long-legged Vulture runner *Neochatartes grallator* inhabited coastal areas of North American swamps during the late Eocene (N. Vukosavljević).

opment of birds of prey. The epoch of mammals started with small forms of animals. They were prey to early predator birds, but they were unable to provide enough food for vultures. Feeding on animal carrion is attractive for all carnivore species but hunting can only provide a constant source of food. Evolutionary development of sharp claws has significantly improved the abilities of contemporary birds of prey. However, some of the more recent birds of prey never use claws to hunt their prey.

The earliest fossils of New World vultures date back in the Paleocene (55-60 million years ago) and the oldest fossil (*Lithornis vulturinus)* has been found in England (Mundy *et al.* 1992). By the end of the Trias (7-25 million years ago), these birds reached their peak both regarding the abundance of their populations and spe-

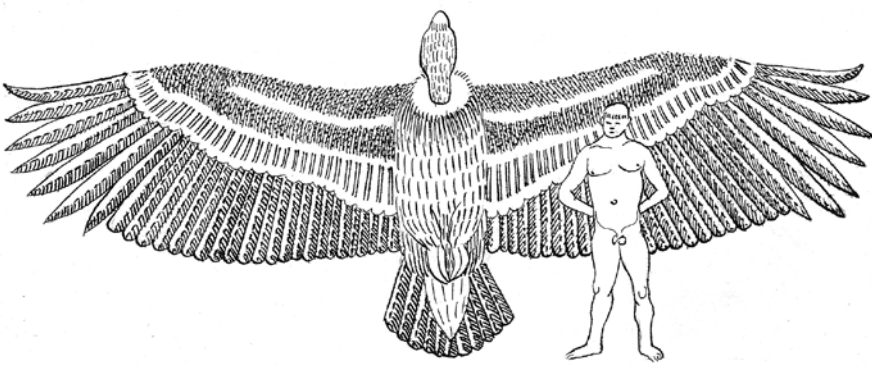


The wonder bird of the Ice Age *Teratornis merriami* has been found in the Pleistocene layer. Most of its fossil remains are located in sediments that are some 40,000 years old. Its wingspan was 3,40 meters (N. Vukosavljević).

cies diversity. First vultures descended from a group of birds that inhabited wetland habitats, more precisely the coasts of seas and lakes. They probably fed on dead fish or hunted barely movable molluscs. The best conserved fossil is also the most thoroughly examined vulture of that period *Neocathartes grallator.* The species with its

long legs and long neck, but without a hooked bill and sharp claws, resembled in appearance herons and storks (Swinton, 1975).

Development of grassland habitats initiated fast evolution of mammals (Maddock, 1984). Mammals evolved to bigger forms and their carcasses created a new ecological niche for scavengers. Pleistocene carnivore birds had two evolving options: to increase their size as their prey did (and consequently to loose the flying ability because of aerodynamic limitation) or to occupy the niche of cleansers of nature and survive to this day. Large, nonflying predator birds from the Miocene are not related to modern birds of prey. They are classified in the group of running birds Ratitae (*Diatryma steini*), which were 2 meters high, and cranes Gruiformes (*Brontornis*, *Liornis*, *Phororhcacos*), which totally lost their wings. Carnivore mammals efficiently outcompeted these birds. Because of the mammals' increasing size, birds of prey developed hooked bills for tearing at the prey since they were unable



The largest bird ever on the wing was *Argentavis magnificens*. It is comparable in size to an average grown man (N. Vukosavljević).

to swallow large prey in one bite. Predator characteristics and characteristics of scavengers often interlaced so that in some species we find distinctive scavenger phenotype characteristics, while in others they are mosaically arranged with predator characteristics. One of the most interesting predator groups is the genus Teratornis with species that were large birds (their weight exceeding 20 kg and wingspan 5.2 m). Like contemporary eagles, they had curved claws, so they actively hunted their prey (Rich, 1980).

A discovery of fossil remains of a gigantic bird in Patagony near Buenos Aires in 1979 was truly sensational (Martin, 1973). The species (*Argentavis magnificens*) was the largest bird ever to fly on Earth. Analyzed fossil remains clearly indicated that the bird was 1.80 meters tall, while its weight was approximately 120 kg. The length of its flight feather was 1.5 m, and wingspan of this giant was 7.60 m. Although the wings indicate that it was a flyer, most authors assume that such a massive bird was unable to flap its enormous wings, except on rare occasions. Instead, it glided in the wind, similarly as modern vultures do today. This species inhabited open grasslands in which strong winds were common habitat characteristics. This gigantic bird hunted armadillos and rodents that were abundant in grass communities. Its jaw indicates that it probably consumed prey in one piece, and that its prey was 15 cm in diameter. This bird lived 5-8 million years ago at the end of the Miocene and the beginning of Pliocene. The first known fossils of condors date from the Paleocene. The condors are frequently referred to as "Tertiary fossils" because their ancestors were contemporaries of dinosaurs. The condors are "relict" species because their historic distribution was much wider than their actual distribution (Fischer, 1963, Rich, 1980).

La Brea condor (*Breagyps clarki*) of the Upper Pleistocene found in Mexico (N. Vukosavljević).

This extraordinary old group of vultures has survived only in the New World. The New World vultures differ from other vultures with respect to their morphology, anatomy, behavior and genetic material. They can be easily recognized by their missing nose partition and by an extended first phalange on the interior foot finger. These primitive birds do not have vocal cords. Their flight feathers speak of their past. Like contemporary storks, they do not have fluffs at the base of each feather. The secretion of feces through the legs for cooling in warm climate is a rare trait that is characteristic only of some storks, flamingos and New World vultures (Rea, 1983). Besides their extraordinary visual sense, the American Black Vulture and Turkey Vulture also use their well developed sense of smell to find food in the tropical rain forests. Vultures of the Old World use sharp visual sensors to find prey and, avoiding forest regions,

King's Condor, a living fossil and relict of Amazonian tropical forests
(Handbook of the Birds of the World, Volume 2, pp 32 - 38, Del Hoyo, J., Elliott, A & Sargatal, J. eds Lynx Editions, Barcelona)

they prefer to search for food in open grassland communities. Besides, vultures of the New World Cathartidae are classified in the distal group of daily birds of prey Falconiformes. Using DNA analysis, scientists have separated them into a special order, Cathartiformes, on the grounds of their polyphiletic origin and their being distantly related to modern birds of prey Accipitridae (Sibley, 1960, Wolters, 1982, Ligon, 1967, Voous, 1973, Rea, 1983, Sibley,1997).

OLD WORLD VULTURES

First modern grass communities of monocotyledones originate from the late Oligocene, approximately 26 million years ago (Попов, 1983), i.e. the time when modern families of big herbivore mammals, especially ruminants, also evolved. Vultures of the Old World are younger (Feduccia & Voorhies, 1989). The oldest fossil of an Accipitridae bird of prey, a bone fragment more precisely, was found in England. It dates back to the late Eocene (40 million years ago) and has been identified as belonging to *Parvigyps paraecox*. Another somewhat younger fossil found

Palmnut Vulture from Congo is a unique vegetarian among the birds of prey (http://www.pbase.com/peterzwitser/image/87615597&exif=Y). (Photo P. Zwitser)

in France also dates back to the end of the Eocene. It consists of the remains of *Paleohierax gervaisii*, a species that is conspicuously similar to the recent species of Eagle (or Pulmnut) Vulture (*Gypohierax angolensis*) distributed in Africa, which has been classified by some authors in the subfamily of sea fishing eagles (Haliaeetinae) (Brown, 1976, Voous, 1973, Rich, 1983, Houston, 1990, Holdaway, 1994). This vegetarianian eagle species feeds on nuts of oily palm rafa and is therefore an exception to all other birds of prey. However, in swampy habitats, the diet of this species also involves dead or hunted shells, crabs and fish. Scientists believe that this separate and relict species of eagle is familiar to Old World vultures. These assumptions have been further substantiated by genetic analyses. We have to emphasize, however, that some characteristics of Eagle Vulture are unique. The

Million years	Epoch	Evolution Events
0.01	Cholocene	Development of human society, domestication of herds
1.6	Pleistocene	Mediterrenean Griffon, *G. melitalensis*
5.3	Pliocene	The largest bird ever on the wing, Argentavis magnificens
23.7	Miocene	Aegypiinae, Teratornitidae, falcon, development of ruminants and hoofed mammals
36.6	Oligocene	Development of grass communities, monocots, niche of scavengers
57.8	Eocene	Vulture runner, modern birds of prey, Palmnut Vulture
66.4	Paleocene	Condors, owls, development of terrestrial ecosystems, flower plants

The era of mammals – Cenozoic

species has persisted as a relict in the woods of Kongo and Angola, where it can find palm rafa.

Fossils of a griffon species (*Gyps melitalensis*) date back to the middle Pleistocene epoch. These fossils were excavated from sediments in two caves: Zebbug on Malta and Grotte de Grimaldi near Monaco. *G. melitalensis* was a larger bird than the more recent griffon species *G. fulvus* (Rich, 1980. Jurcsak, 1974). All genera of modern birds also existed in the Pleistocene, and by the end of that period fossil and recent species of Gypaetinae and Cathartidae coexisted (Mundy *et al.* 1992).

More than 40 fossil species of vultures have been described so far: one belonging to the family Neocatartidae, four to the family Teratornitidae, twenty-five species of the family Cathartidae and sixteen species of the family Accipitridae. Most fossil remains of Old World vultures have been discovered in North and South America. It is not clear why the Old World vultures have died out in North and South America (Wilson, 1980).

TAXONOMY AND ECOLOGICAL SPECIALIZATION OF VULTURES

Contemporary species of vultures have been classified in two distinct families: Cathartidae (the New World vultures) and Accipitridae (eagles, hawks and the Old

THE NEW WORLD VULTURES

Serbian	English	*Latin*
Црни амерички лешинар	American Black Vulture	Coragyps atratus
Ћурколики лешинари	Turkey vultures	
Црвеноглави	Turkey Vulture	Cathartes aura
Мали жутоглави	Yellow-headed Vulture	C. burrovianus
Велики жутоглави	Greater Yellow-headed Vulture	C. melambrolus
Кондори	Condors	
Краљевски	King Vulture	Sarcorhamphus papa
Калифорнијски	Californian Condor	Gymnogyps californianus
Андски	Andean Condor	Vullur gryphus

THE OLD WORLD VULTURES

Лешинар палмин орах	Palmnut Vulture	Gypohierax angolensis
Орао брадан	Bearded Vulture	Gypaetus barbatus
Сакупљачи	Gatherers	
Бела кања	Egyptian Vulture	Neophron percnopterus
Ћубасти лешинар	Hooded Vulture	Necrosyrtes monachus
Супови	Griffons	
Индијски белолеђи	Indian White-backed Vulture	Pseudogyps bengalensis
Афрички белолеђи	African White-backed Vulture	P. africanus
Дугокљуни	Long-billed Griffon	Gyps indicus
Пегави	Rűppell's Griffon	G. rueppellii
Капски	Cape Griffon	G. coprotheres
Белоглави	Eurasian Griffon	G. fulvus
Хималајски	Himalayan Griffon	G. himalayensis
Раздирачи	Rippers	
Лешинар смежураног лица	Lappet-faced Vulture	Torgos tracheliotus
Индијски краљевски лешинар	Pondicherry Vulture	Sarcogyps calvus
Евроазијски црни лешинар	Eurasian Black Vulture	Aegypius monachus
Белоглави лешинар	White-headed Vulture	Trigonoceps occipitalis

World vultures). The group of New World vultures includes seven species. The group of Old World vultures is more diverse since it is represented by 15 species. These species form two subfamilies: Aegypiinae and Gypaetinae. The subfamily Aegypiinae is evolutionary younger and related to Serpent Eagles (*Spilornis*), Bateleur and Philippine Monkey-eating Eagle (*Terathopis* and *Pihtecophaga*). The older subfamily (Gypaetinae) includes three monotype genera (*Neophron*, *Gypaetus* and *Gypohierax*), which are related to kites, harrier hawks and Madagascar Serpent Eagle (*Elanus*, *Polyboroides*, *Eutriorchi*) (Rich 1980).

OLD WORLD VULTURES - THE WAY OF LIFE

The Old World vultures descend from eagles. These two groups separated some 22 million years ago and probably evolved simultaneously with big herbivorous mammals, especially hoofed animals. Distribution of these vultures is correlated with the distribution of herds of herbivorous ruminants. Vultures have not evolved in regions from which large herbivorous mammals were absent (Madagascar, Ceylon, Australia, and New Zealand) (Huston, 1983, Holdaway, 1994). Open habitats of African plateaus were the focal points of evolution of ruminants. Nine species of vultures have been recorded there, making those areas also the foci of vulture diversification (Houston, 1974, Houston, 1975). According to trophic properties (type of food, way of searching for food) and behavior, we can distinguish three characteristic groups of vultures and two particular species: the Bearded Vulture and Palmnut Vulture (Kruuk 1967, König, 1976, König, 1983).

Feeding on animal carrion is attractive for most carnivore animals. However, the scarcity of dead animals in nature is a limitation for carnivores, and hunting therefore remains their basic strategy of feeding, whereas feeding on carcasses represents an additional source of food for carnivores. Due to several characteristics (high mobility, aerial control of large regions and teamwork), birds are able to find carrion much faster than any other group of animals. Even hyenas (the most specialized scavenger in the mammal world) are primarily hunters. On the other side, griffon vultures are carnivores that never kill their prey, so they are obligatory scavengers (Houston, 1984, Houston, 1983).

Bearded Vulture feeds on bone marrow. It disappeared from Serbia in mid-20th century
(Photo A. Milosavljević)

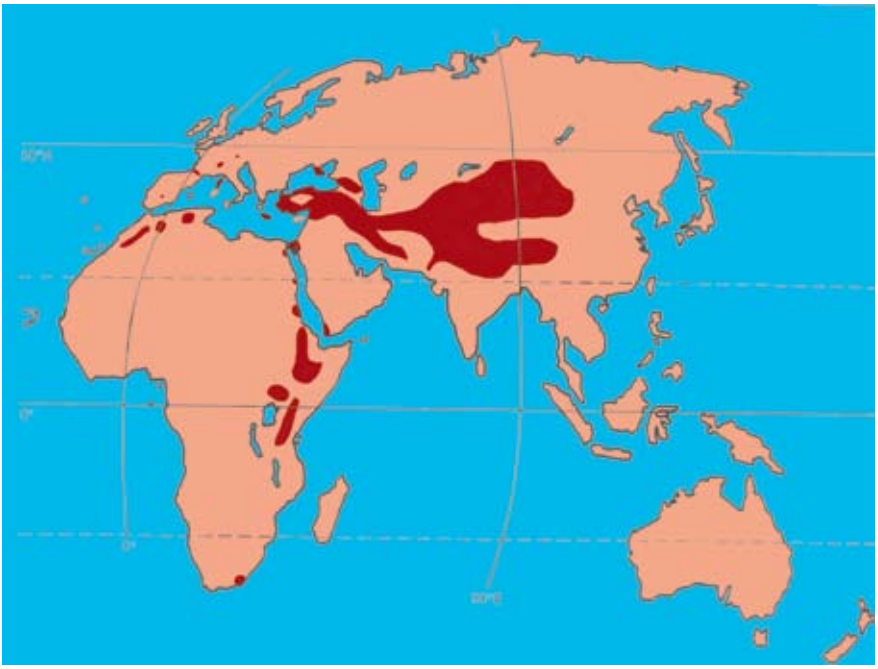
BEARDED VULTURE

Bearded Vulture used to inhabit high mountains of the Balkan Peninsula widely populated by chamois (Photo A. Milosavljević)

Many people think that Bearded Vulture is the most impressive of birds of prey. The species is unique at least regarding its way of life. At a first glance, Bearded Vulture resembles eagles and is therefore locally termed the "Bearded Eagle". Contrary to other vultures, its head is covered with feathers. From the bill base, thick feathers form a beard-like structure that is up to 5 cm long. The wings are narrower than the wings of other vultures, and their span exceeds 2.80 m. The cuneiform tail is long (Glutz et al. 1971). Young birds have dark feathers. After the maturation period (6 years), feathers covering an adult body and head change their colour to white. Birds living in natural environment impregnate their feathers by bathing in rainwater mixed with red soil (soils rich in iron oxide) and bone remains, and as a result their feathers change colour to a sorrel-yellow tone. Bearded Vultures weigh up to 7 kg. They nest in rock caves, where females lay two eggs (Cramp & Simmoms, 1979).

Bearded Vultures feed on connective tissues and bone marrow. Therefore, local population often call this species "kostoberina" (bone-eater). Feeding on bone parts is a unique way of feeding among birds. Such feeding ensures that even the remains of dead animals ultimately get completely eliminated. The Bearded Vulture does not compete for food with other vultures. When all other vultures have finished their feeding, the bones left behind are a suitable source of food for the Bearded Vulture, but not for other vulture species. But the species is unable to eat large bones. Bearded Vultures therefore throw bones from the air onto convenient rocky hillsides and consume pieces of smashed bones. Although the smashed bones have sharp edges, Bearded Vultures manage to digest them effectively with their strong gastric juices (Mundy *et al.* 1992).

In the past, this vulture inhabited Montenegro, Bosnia and Herzegovina and Macedonia. Until the mid-20th century, it nested around Sarajevo. In Serbia, it was distributed on the Stara (Balkan), Suva and Šar Mountains. According to current estimations, however, the species is no longer nesting in the Balkans, except on the island of Crete. Programmes of protection and reintroduction of this extraordinary

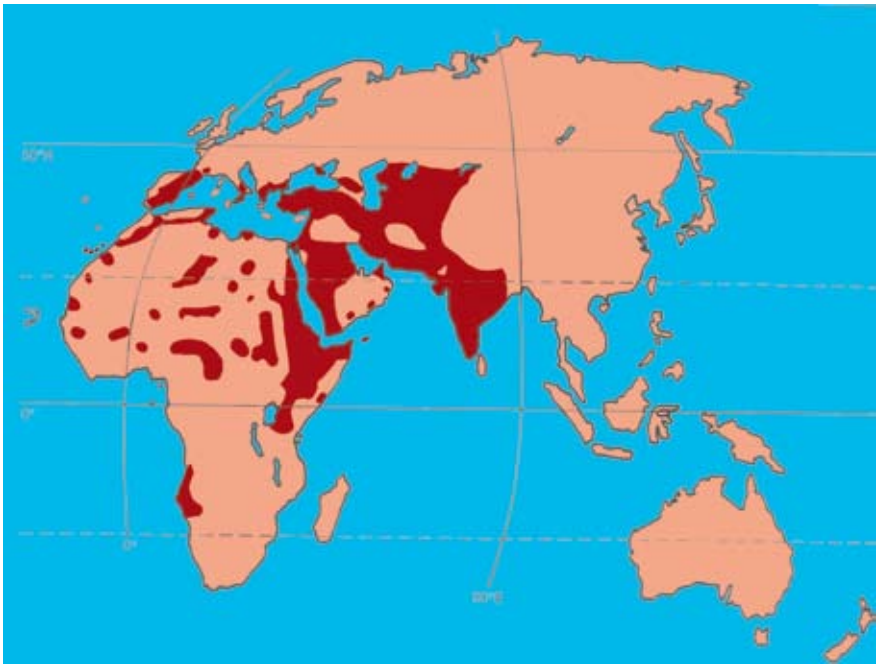


Distribution of Bearded Vulture

bird species originally began in Austria, Switzerland and Italy and they have so far proved successful (Frey & Bijleveld, 1994).

EGYPTIAN VULTURE

Egyptian Vulture is a small bird with a weak, tweezers-shaped bill, which is well adapted for tearing off meat and for picking and pulling out tiny pieces of meat between bones. The smallest among vultures are the Hooded Vulture and Egyptian Vulture. They feed on smaller pieces of meat that had already been torn up, on internal organs and soft rotting tissues. This species consumes a wide variety of food, from insects and small animals to disintegrating tissues of dead animals, including even feces. Egyptian vulture is distributed in Africa, Asia and Southern Europe, while hooded vulture is restricted to central parts of Africa only. Egyptian Vulture is a rare example of birds that use tools for finding food. In Africa, a local group of Egyptian



Distribution of Egyptian Vulture

Vultures have developed a skill of using tools. They throw rocks on Ostrich eggs in order to smash them and so get a tasteful meal (Cramp & Simmoms 1979).

"Crkavica" (cattle plague) is the traditional Serbian common name of this species. It has a weak and extended bill and naked head. Young birds are covered with dark feathers and have wedge-shaped (raven-like) tails. Like White Storks, its adults have white covering feathers and black flight feathers. However, in contrast to storks, Egyptian Vultures have much shorter necks and legs.

A programme of reproduction of endangered species is currently under way in cooperation with the Palić Zoo. The programme is supported by the Serbian Ministry of Environmental Protection (Photo P. Torsten)

Egyptian Vulture is a rare bird in European zoos and its reproduction rate there is low
(Photo A. Milosavljević)

Egyptian Vulture weighs around 2.5 kg and its wingspan is around 1.40 m (Mundy *et al.* 1992). European populations of Egyptian Vulture are migratory birds as they migrate to Africa for the winter. First flocks of Egyptian Vulture used to arrive in Serbia at the beginning of March every year while the last birds would leave our territory by the end of September. They nested on the rocks of various canyons and gorges. Females of the Egyptian Vulture lay two eggs (Glutz *et al.* 1971).

Egyptian Vulture inhabits mountainous terrains, such as the gorges of Đerdap, Zlot, Sićevo, Uvac, Drina and Rugovo. The last nesting of Egyptian Vulture in Serbia was observed on Mt. Suva planina. Recently, the species has been found nesting in Southern Bulgaria, central and northern parts of Greece and Macedonia. According to latest estimates, approximately 200 pairs of Egyptian Vulture currently nest in the Balkans. Over the past several years, there has been a sudden population decline of this species (BirdLife International, 2007).

The Palić Zoo, in cooperation with the Institute for Biological Research "Siniša Stanković", has launched a programme of reproduction of this species under controlled conditions. The programme, which is supported by the Ministry of Environmental Protection, is a necessary step towards forming a main flock for reintroduction of Egyptian Vultures in Serbia.

A juvenile of Black Vulture accompanied by its parents in Dadia Reservation, Greece (WWF. D. Vasilakis)

EURASIAN BLACK VULTURE

A separate group of four vulture species thrive on a special diet of skin and connective tissues of animal carcasses. Compared to all other vultures, these four species have the biggest bill, which is able to tear at the skin of dead animals. Therefore, these vultures are frequently referred to as "rippers" (Glutz *et al.* 1971).

Lappet-faced Vulture, Pondicherry Vulture (Indian Royal Vulture) and Eurasian Black Vulture (Cinereous Vulture) are distributed in Africa, India and throughout the Mediterranean, respectively. The White-headed Vulture inhabits Africa but, in contrast to these other species, it has advanced in terms of being able either to feed on dead animals, or to prey big felines, mostly lions and cheetahs. This group of vultures feeds on skin and connective tissue. They are the first to approach a source of food. Contrary to other vultures, these birds nest separately on trees, and do not gather in

Griffon "Sokrates" (label 18) was marked at the Uvac Gorge in 2006. In the autumn of the same year, it was observed in the company of Black Vultures at the "restaurant" of Dadia in Greece. The bird came back to Uvac in the spring of 2007 (Photo WWF T. Skarities)

large numbers around food sources. Mostly they feed on small carrion, but they also actively hunt lizards and small mammals (Mundy *et al.* 1992).

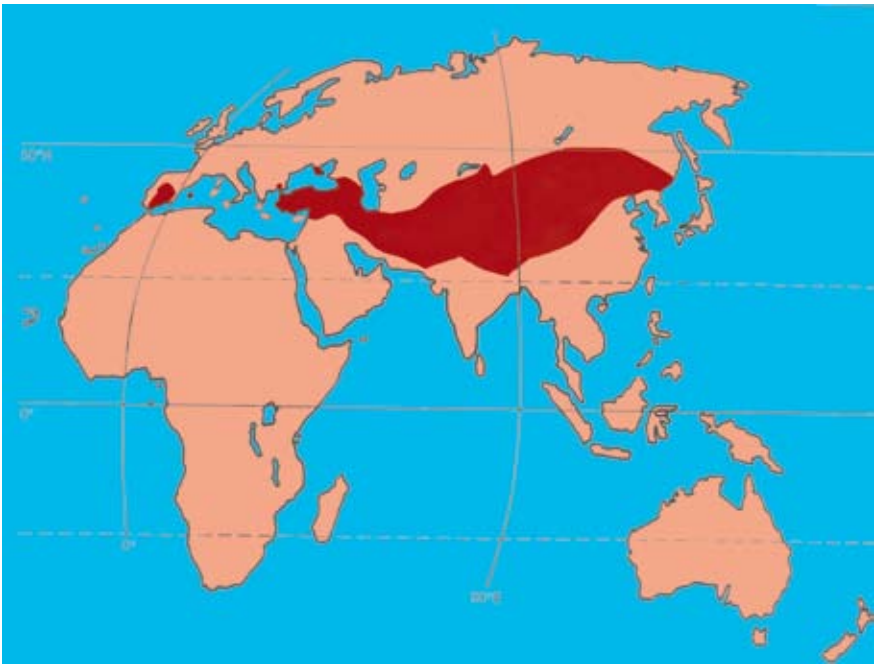
Black Vulture, which is known locally in Serbia as the Master Vulture (strvinar starešina), is one of the biggest birds of prey in the world, their wingspan being about 3 metres and weighing some 13 kg. The name "master" adequately describes this species as its aggressive behavior drives away all other vultures from dead animals. Contrary to other vultures, this species is able to cut the skin of dead animals with its strong bill. However, Black Vulture is not in competition with other vultures. By cutting the skin of dead animals, Black Vultures prepare the carcass for other species that will find their meal there. Black Vulture is a dark bird with a naked head and a small brown collar around the neck (Glutz *et al*. 1971).

Juveniles are almost indistinguishable from adult birds. However, with age the colour of their feathers gets a lighter hue. Sexual maturity of juveniles is reached after 5 years. They build large nests on trees. Width and height of their nests some-

A marked juvenile of Black Vulture in Dadia Reservation, Greece (WWF. D. Vasilakis)

times exceeds 3 and 2 metres, respectively. Females of the Black Vulture lay only one egg per nest (Cramp & Simmoms, 1979).

At the beginning of the 20th century, Black Vultures inhabited a wide area of the Balkan Mountains (Pannonian plain, valleys of the Drina and Lim rivers, Leskovac ravine, Vardar River valley and Pelagonia plain). They nested on Mt. Fruska Gora and in Bosnian valleys around the River Sava. In summer months, Black Vulture could be seen on Mts. Stara planina and Kopaonik. Populations of Black Vulture have declined seriously in the course of the 20th century and the species has completely disappeared in Serbia. Some authors estimate that only 30-40 pairs of this species still remain in the Balkans, and most of them nest in the Marica River valley in Dadia Sanctuary (Evros) in eastern regions of Greece and Bulgaria. Older residents of the Drina River valley can still be heard saying that "although vultures gather around carcasses, they wait for the chief among them to bite the carcass first and so signal the rest to start eating. Then it moves away, starts to prance and watches them". A programme for reintroduction of Black Vulture in Southern France has been supported by the Spanish Fund for the Protection of Black Vulture and the Frankfurt Zoological Garden. A similar programme for reintroducing Black Vulture in Serbia (in the river valleys of the Lim and the Uvac) is in a preparatory phase.



Distribution of Eurasian Black Vulture

EURASIAN GRIFFON VULTURE

Soft tissues (muscles and intestines) make the largest part of ruminant carcasses (approximately 50%). These parts become the food of "sanitation vultures". Griffons have perfectly adapted to feeding on animal carcasses. Contrary to other vultures their diet includes only dead animals, mostly muscles and intestines of ruminants. Griffons are the most diverse group of vultures, which includes 7 species (Weick, 1980, Mundy *et al.* 1992). Ruppell's Griffon is distributed in Central and East Africa, Cape Griffon in South Africa, Long-billed Griffon in India, Himalayan Griffon on the Himalayas and Tibet, while the Eurasian Griffon Vulture inhabits all of the Mediterranean region. This Mediterranean species is the only active colony living in Europe's continental climate and it has also settled in Serbia. Two species (African and Indian White-backed Vultures) differ from the other griffons. White-backed Vultures are smaller than other griffons (4-5 kg), they nest on trees and in search of food they cover smaller distances than other griffons (Cramp & Simmoms, 1979).

The colloquial Serbian name of the Eurasian Griffon Vulture is "beloglavi sup", the "White-headed Vulture". The species is unable to cut the skin of dead herbivorous animals with its bill. It therefore normally starts feeding after a Black Vulture has finished its meal. If a Black Vulture is not around, Griffon Vulture will start feeding through the mouth or anal hole of an animal carcass. Griffon Vulture has a strong bill capable of tearing off tendons and muscles of large herbivorous animals. The head and long neck are covered with white fluffs. These morphological traits have evolved so as to allow deep penetration into carcasses and search for internal organs. A little, fluff-made collar is located at the bottom of the neck. Juveniles have light brown and adults white collars. Juvenile birds have darker, light-brown feathers and black bills, whereas adult birds have paler feathers and pale-yellow bills. Griffon Vulture weighs up to 8.5 kg. The range of its rectangle-shaped wings is 2.8 metres. This type of wings is adapted for gliding in air currents. Claws have not been adapted for hunting and cannot be used for capturing prey. Its long neck becomes twisted during flight in order to reduce air resistance. Griffon Vultures nest on rocks, where they build smaller or larger groups of nests (colonies). The lifespan of Griffon Vultures in natural environment is approximately 20 years. Their females lay only one egg weighing some 250 grams.

Powerful rectangle wings enable wind glide at heights over 2500 metres and covering of distances over 4000 metres (Photo M. Jeremić)

Griffon Vulture was a frequent species in Serbia until the 1950s. It nested in gorges, on the fringes of the Pannonian depression and in mountainous regions. In recent times, the species has been observed only in three Western Serbian gorges. It inhabits the cattle breeding region of Pešter, where winter temperature occasionally falls to as low as -39°C. However, populations of Griffon Vulture have suddenly declined in the Balkan Peninsula. They are still to be found on Kvarner Islands (Croatia), in the Black River gorge (Vardar Macedonia) and on the Eastern Rhodopes (Bulgaria). A stable population counting a few hundred pairs has persisted only on the island of Crete. Simultaneous programmes of Griffon Vulture reintroduction are currently running in Herzegovina and at two spots on Mt. Stara planina: one is near Pirot (Serbia), and the other at Kotel (Bulgaria).

Griffon Vulture "Njegos" after getting exhausted and falling down on the Prokletije Mountains. The bird did not share the fate of its more unfortunate predecessors as it managed to return to its homeland colony at Uvac (Photo S.Marinković)

Distribution of Griffon Vulture

ADAPTATION OF GRIFFONS TO SCAVENGING

Griffons have undergone an ultimate feeding adaptation, since individuals of these carnivore species consume only animal carcasses and never hunt their prey. Therefore, only abundant herds of ruminants can provide enough dead animals for feeding griffons. The great probability that an occasional individual will die in a large herd of grazing ruminants is a good feeding opportunity for predator species that are able to follow grazing herds. Searching for food, herds of ruminants migrate hundreds of kilometres because they depend on either the alternating wet and dry seasons of Africa, or cold and warm seasons of temperate regions. Concerning migrant herds of herbivores in Africa, only a small percent of individuals (5%) die from large predators (Houston, 1983, Maddock, 1984, Hilborn & Sinclair, 1984). A much greater percentage of deaths among grazing herbivores is attributable to either epizootic diseases or food and water shortages during winter or dry seasons. Griffons feed mostly on mammals killed by various diseases pathogenic to

mammals. Resistance to mammal diseases, however, enables vultures to undertake a sanitary role in nature.

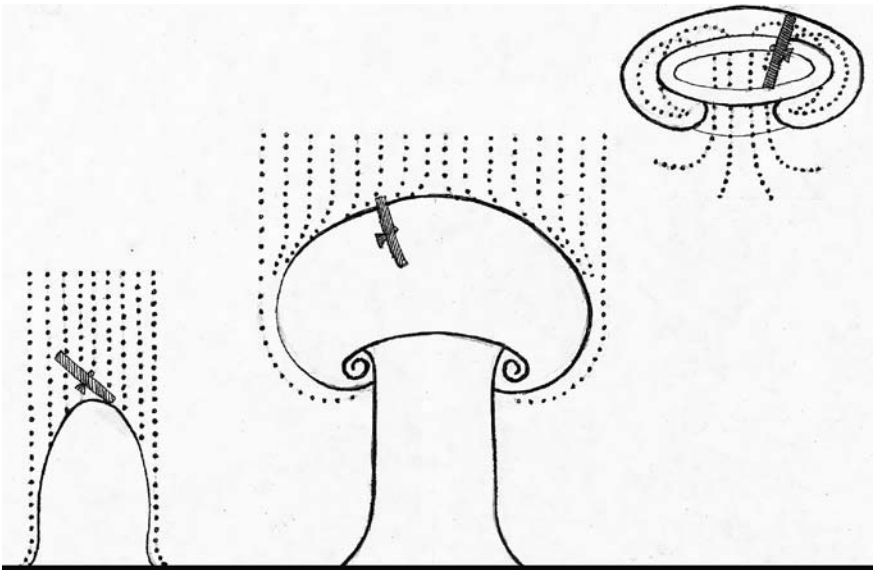
Various herds of wild ruminants had migrated across the Balkans during the past epochs. The most prominent among them were bisons, wild cattle and hoofed animals such as zebra. The disappearance of wild herds of ruminants in Europe and appearance of domesticated herds have caused a shift in Griffon Vultures' diet from wild ruminants to dead domestic animals. Domestication of wild herds of goats, sheep and cattle occurred during the Mesolithic epoch (approximately 10,000 years ago) but it did not affect Griffon Vulture in the Balkans. Nomadic cattle breeding was the most economical way of living in grassland environments. Nomadic migrations of domesticated herds only replaced natural migrations of wild herds. This type of

Circling in the "elevator" of warm air current. Thermals are usually created two and a half hours after sunrise (Photo M. Radojević)

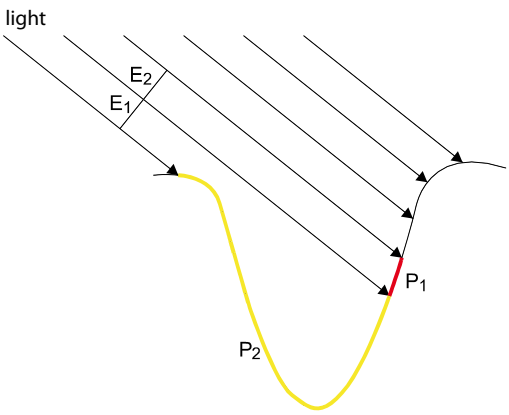
traditional cattle breeding is in harmony with the development of grassland communities. It is the most efficient way of exploiting renewable resources. On the other hand, the formation of Balkan countries has also created borders, which have become an overwhelming obstacle for cattle breeders and their herds on traditional migration routes. From the early 20th century, traditional nomadic cattle breeding has been on a steady decline in the Balkans. Changes in cattle breeding immediately resulted in dwindling griffon populations and their limited distribution.

Heavy flying birds have large wings and consequently a high air pressure per unit area. Such aerodynamic properties enable large birds to cover long distances by gliding, and to increase height and speed without undue use of energy. Large wings resist vertical air currents that are formed under particular atmospheric conditions. Such flight enables griffon vultures to follow migratory herds of ruminants. Only abundant herds can provide enough food for species that feed exclusively on dead animals.

Large birds need a lot of energy for flight. Griffons feed on half-disintegrated carcasses of low energy value. They follow herds of ruminants to distances up to 200 kilometres away from their nesting place. But active flight by flapping permanent wings requires a huge amount of energy. Infrequent and low-calorie diets are not sufficient to provide griffons with the energy required for active flight. Shortage in



Griffon vultures use "air elevators", i.e. warm air currents (thermals), to reach required heights (N. Vukosavljević).



Solar rays fall on the southern (red) and northern (yellow) slopes of a canyon. Incoming solar energy is the same for both sides of the canyon (E1=E2). Since the surfaces of these opposite slopes differ significantly (A1>>>A2), the energy flux (energy per unit area) is significantly greater on the southern than on the northern slope (E1/A1>>> E2/A2). Specific orography creates a strong temperature gradient in two adjacent regions and this effect facilitates the formation of permanent thermals.

physiological energy is therefore recompensed by using heat energy from the environment.

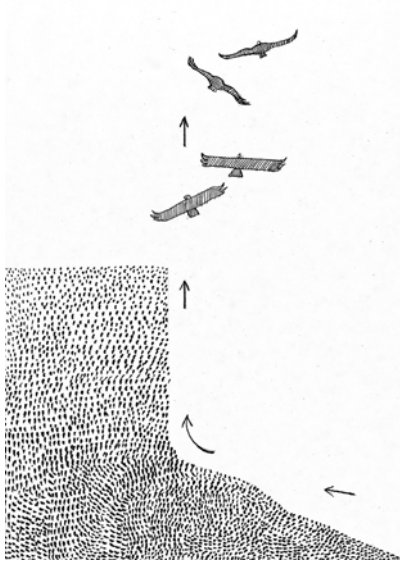
Each square metre of the Earth's spherical surface outside the atmosphere receives an average of 342 Watts of solar radiation throughout the year, 31% of which is immediately reflected back into space by clouds, atmosphere and the Earth's surface. The remaining 235 Wm^{-2} are partly absorbed by the atmosphere, but most (168 Wm^{-2}) warm the Earth's surface: the land and the oceans. The Earth's surface reflects that heat back into the atmosphere, partly as infrared radiation, and partly as sensible heat and water vapour that releases heat after condensing higher up in the atmosphere. Bare areas without vegetation radiate more heat than areas covered with vegetation. Due to unequal heating of air, the warmer (and lighter) air mass is elevated like a bubble from bare areas that are overheated by solar rays. The specific orography of canyons and gorges enables the formation of thermals, massive warm air bodies that migrate upwards. Solar rays are parallel, so their energy per unit area (in the same geographic area and on the same altitude) is approximately the same. If solar rays fall on two adjacent surfaces that significantly differ with respect to their area, as it is the case with southern and northern slopes of canyons, then the smaller surface will be heated much more than the larger surface. Consequently, the orography of canyons and gorges forms strong thermal gradients within a small area and this effect facilitates the formation of permanent thermals.

Large birds with large wings search for these air elevators. Cruising within air elevators, birds achieve significant heights without spending their own energy. By gliding within thermals, they can elevate up to 2500 m above sea level in less then 4 minutes. Thermals are usually formed two and a half hours after sunrise, and birds normally use them between 9:00 to 16:00 hours. Thermals are weak during cloudy

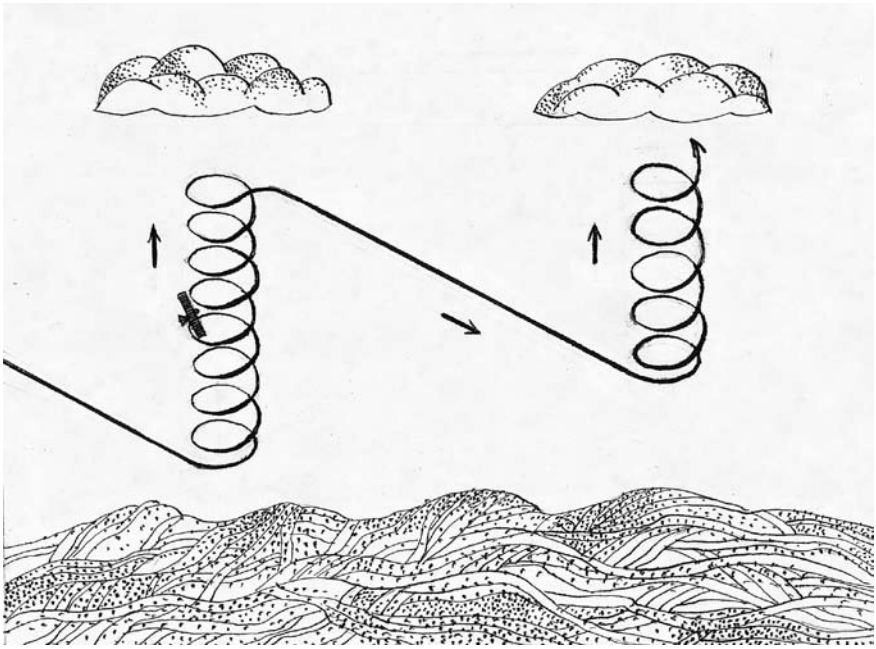
and rainy days, while snowing fully prevents their formation due to Albedo effect (Mundy *et al.* 1992).

Besides thermal elevators, griffons also use "side winds". When these winds pass along steep hillsides, they get lifted obliquely, so that griffons may use them. On these winds, griffons can elevate up to 500 m above surface (Pennycuick 1972a, Pennycuick1973). This is especially significant for seashore colonies where permanent winds blow every day from sea landwards.

After getting to a certain height, griffons go to another type of flying, the so-called sliding, when their potential energy is transformed to kinetic energy. Passing a distance of 11 metres, they loose one metre in height.



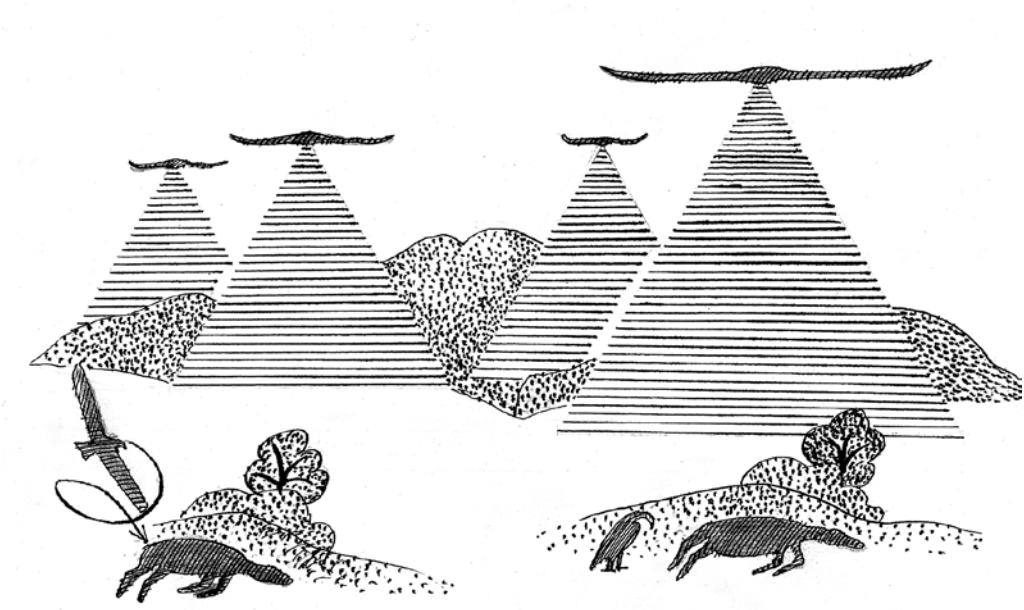
Griffons gliding on side wind (N. Vukosavljević).



Griffons use the shortest route between two thermals to cover long distances (i.e. to fly along "thermal streets") (N. Vukosavljević).

When they find another air elevator they regain the lost height. Griffons cruise through thermal streets that represent the smallest distance between two thermals. Using air elevators, griffons spend only 3.3% of the energy they would required for actively flapping their wings. The speed of flight during gliding is 15-30 km/h. The most frequent speed of sliding flight is 60 km/h, but it can increase to as much as 160 km/h (Pennycuick, 1971, Pennycuick, 1973).

When griffons search for food, they fly at heights ranging from 200 to 600 metres above the ground. However, during long cruising griffons may be lifted up to 3000 metres above sea level in order to reduce energy consumption and increase the speed of flight (Pennycuick, 1972, Pennycuick, 1973). Griffons are able to fly up to the greatest heights ever recorded for birds. For example, one of them collided with an aircraft in West Africa on November 29th, 1973 while flying at an altitude of 11.274 m as the aircraft instruments recorded. The bird flew away after collision, but both collision traces and remaining feathers clearly indicated that it was a Ruppell's Griffon. Estimated temperature at that height was -50°C and oxygen concentration around 7% and it was amazing that the bird managed to survive such severe con-



Collective search for food and exchange of information about the food detected among members of a flock of griffons (N. Vukosavljević).

ditions. Most authors assume that a storm had blown it out to such extraordinary height. It is obvious that flights like this one are exceptionally rare events.

Body size is of great importance to vultures. A large species would be dominant on a feeding ground and able to drive smaller species away from the food. The dimension of a body is in direct correlation with energy consumption. Big species spend less energy per mass unit. Therefore, large birds are able to starve for much longer periods than smaller birds (König, 1974, König, 1976). This is especially important for vultures that find prey by chance, rather than by hunting it. Accumulation of nutrients in the form of fat reserves is easer for large than for small birds. Due to irregular findings of animal carcasses in natural environment, and to a necessity to eat their prey as fast as possible and quickly leave the feeding ground, which then attracts other carnivores, griffons swallow their prey fast and accumulate it in the crop at the base of the neck (Valverde 1959, Alvarez *et al*. 1976, König 1974). Their crops can take up to 1.6 kg of food, which griffons then proceed to digest within the next 34 hours. They are able to starve up to three weeks without any visible physiological effect (König, 1976).

Griffon vultures detect food using their visual sense exclusively, and mostly by watching the behavior or activity of other birds of prey that may be attracted by a food source. The density of cork cells that enable daily vision is eight times greater in the eyes of griffon vultures than in the eyes of humans. Eagles flying at high altitudes can observe only movable prey, contrary to vultures, whose food is immobile. A griffon can recognize a rabbit-size dead animal from 3.5 km distance, but it is able to see another vulture from a much greater distance (over 6 km).

Only collective search proves efficient when food is occasional. The movement of migratory herbivores in groups has caused griffon vultures to develop collective life and nesting in colonies. Above a search area, a few birds form the so-called "comb" group. They keep 3 km distance from one another, sometimes even more and they communicate by using their vision. Sudden changes in flight course, exit from thermal streets and circling in a spiral are signals to other individuals that a food source has been discovered. The nearest bird that receives and interprets the signal starts acting in the same manner, and flying around the marked source of food. Information thus spreads efficiently among all individuals. This strategy of collective search for food enables fast gathering of many birds around a dead animal.

Because of such flocking around food sources, griffons have developed a specific ritual behaviour during feeding. Such behaviour mitigates natural violence, which is attributable to birds of prey, and enables all birds to feed (Mack & Bogel, 1989, Manning, 1972, McFarland, 1987). Ritual behavior also alleviates intraspecies com-

The "restaurant" at Uvac, the ritual "cock fighting" (Photo S. Marinković)

petition among griffons and its aim is to establish a hierarchy and retain order in the feeding process (König,1983, Valverde, 1959). There is usually a lot of food for one bird, but all birds of a flock have to eat (Newton, 1979).

Hierarchy is established either by ritual dance, mutual frightening or by fighting, which usually ends without any serious harm. The flock is divided in two groups: the "observers" and "candidates". Most birds in a flock are observers that move 100 or even more metres away from a food source, usually taking overlooking positions on nearby hills. The main task of this group is to provide security and, in case of danger, to fly away and warn the rest of the flock. The second group involves candidates (5-10 birds). The dominant bird among the candidates feeds first. The degree of aggressive behavior, which specifies a status in the feeding hierarchy, is variable and increases with individual starvation. The hungriest individuals that had starved the longest period approach the food source

Candidates at a feeding ground of the Busk restaurant, Herzegovina. Unfortunately, Griffon Vultures have disappeared from this one and some other colonies in Herzegovina (Photo S. Marinković)

The instinctive "Ostrich" pose of a juvenile Griffon Vulture, which bows its head in order to hide away from nest intruders (Photo S. Marinković)

first. After the dominant bird has satisfied its hunger, its aggressiveness is toned down and very soon it allows other birds to get their own bits of prey (Valverde, 1959). However, if dead animal is torn into pieces or a Black Vulture has ripped the skin of a carcass, then all griffons throng around it without any consideration of the hierarchy schedule.

GRIFFON VULTURE AND MAN

Even in the Stone Age, pre-historic human hunters had conflicting interests with griffons. The hunters knew they had to remove their prey quickly before vultures get hold of it. Dead animals in natural environments are rare and attractive sources of food for all carnivores, so the primitive man probably competed with griffons over dead animals. Large and easily detectable griffon vultures have lived near humans from the rise of civilization. They have therefore inspired different feelings in people: some have been disgusted by vultures because of their way of life, while others adored them. Some people use the word "vulture" to denote the worst human

characteristics, such as greedy scrambling and aggressiveness against the helpless and deprived. The harmonious relationship between earlier cultures and nature had enabled Griffon Vulture to adapt to shepherds and their herds and to survive to this day as their sanitarians. Griffons have been an inspiration to people throughout history. Humans have bestowed different roles on griffons and often attributed supernatural powers to these birds. They have been a significant inspiration throughout the cultural development of civilization.

The oldest petroglyphs (over 26000 years ago) with drawings of griffon vultures have been uncovered in graves of the southern African tribe known as San (Mundy *et al.* 1992). Perhaps the earliest role of griffons in human society is connected with the disposing of deceased people in a ritual known as "heavenly funeral" (excarnation). Old drawings dating back to 8870 BC have been discovered on the walls of the Chattel Hijack cave in Anatolia, Turkey (Schüz, von E., König, C.1973). These drawings show recognizable details of the ritual of heavenly funeral. From ancient times until present day, this tradition has persisted among Parsians of Central Iran. In funeral ceremonies, the remains of dead people are offered to Griffon Vultures on Dokhmama towers built specially for this purpose in deserts. Depressions in the central parts of the towers are bone receptacles. Similarly, Indian Persians, the followers of Zarathustra from Mumbai leave their deceased on special towers known as the "Tower of Silence" for heavenly funeral. According to Zarathustra (6th century AD), the supreme god Ahura Mazda, who is the wise god Ohrmazd, was presented as a bearded man with wings and tail of a Griffon Vulture and with Sun on his chest (Schüz, von E., König, C. 1983). The tradition of heavenly funeral has also persisted in Tibet and Mongolia. According to religious beliefs there, the spirit of a dead person ascends by itself, whereas his body is lifted to heavens by a holy bird (Hymalayan Griffon). Heavenly funeral cleanses the dead person of all sins, so this type of funeral is most popular in some parts of Tibet.

The ancient Sumerian king Eanatum had built a tomb in present-day Iran in 2650 BC as a symbol of victory. Images on the tombstone show griffons cleansing a battlefield full of killed enemy warriors. A famous Babylonian silver plate dating back in the Assyrian period (3200 years ago) shows a conquering warrior with Griffon Vultures (Schüz, von E., König, C. 1983).

Griffon Vulture was used as a symbol of two ancient Egyptian goddesses: Nekhebet and Mut. Nekhebet, the goddess of Upper Egypt, was a daughter of the supreme god Ra. Cobra symbolized her sister Uadet, the goddess of Lower Egypt. Nekhbet was the protector of El Cab, a town near Thebes (Schüz, von E., König, C. 1983). After the Upper and Lower kingdoms were united, these two goddesses were presented

The chest covering Tutankhamun's mummy with an image of Goddess Nekhebet, 1358-1349 BC

as a combined symbol, as for example on the Tutankhamun mask. During the New Kingdom period, the goddess Mut was adored and she stood for the griffon or the mother, and was a symbol of fertility and creation (Schüz, von E., König, C. 1983). Besides the Griffon Vulture, ancient Egyptians also adored the Egyptian Vulture, believing that the species was a divine bird and "pharaoh chicken". The Egyptian hieroglyphic sign depicting the Egyptian Vulture has become the "aleph" of the Hebrew alphabet, equivalent to "alpha" (α), the first letter of the Greek alphabet (Танасијевић, 1989). Egyptian Vulture was the first bird species to be put under protection.

A famous legend, one of the ancient Greek myths, describes how Prometheus had stolen fire from the gods and given it to mortal humans. For that, Zeus punished him by chaining him to the Caucasus Mountains. Each day a bird of prey would come to devour his liver and each night Prometheus would regenerate his liver. The legend has it that "Heracles succeeded to mollify Zeus to shoot the Griffon Vulture in the heart and to free Prometheus". The mighty Zeus then slung his arrow into the stars, forming the archer's constellation known as Sagittarius, and the Caucasian nations from that time on have considered Griffon Vultures as enemies of the people. Griffon had also been presented with the Greek god Cronus (or Roman god Saturn).

Herodotus first described a mythological quadrupled griffon bird with lion legs and talons and eagle head with eyes of piercing fire. Fusing the strongest of birds (eagle) and strongest of wild animals (lion), this creature symbolized the supreme animal strength and was dedicated to Apollo. According to Greek legends, griffons were safekeepers of gold in a country situated between the land of the one-eyed Arimaspians and Hyperborea in the north of Scythia. Other ancient authors wrote that griffons lived in Ethiopia and India. According to oral tradition, "griffons of India dig gold alone and use it to build their nests, and they forbid people to get this precious metal because they fear for their young". As never-sleeping guardians, griffons fight the Arimaspians, the Amazon warrior women and wild animals. Guardian griffons (Greek Γρυφ, Latin *gryphus*) symbolizing divine strength and constant vigilance were often presented on sarcophagi, weapons, vases and other artifacts (Srejović *et al.* 1989). Most often, they were associated with Apollo, but also with Dionysus and Artemis. The Gyps genus has borrowed its name from the Greek language, and referring either to the eagle's bill (γρυπος) or the legendary bird with a lion body.

In ancient Greek and Roman cultures, Griffon Vultures were used in prophesy rituals since ancient fortune tellers believed that they had the power to foresee the future and to know when and where someone would die. They sacrificed domestic animals to griffons and judged the outcome of an event by their success in attracting the birds (Grevs, 1987, Handrinos, 1983). The Greek writer Harapoloneus had suggested that all griffons were females and that only the north wind could impregnate them. Plutarch described how even Egyptians thought that griffons were only females, embodying the goddess of fertility, and that only the eastern wind could impregnate them by blowing for several days. The Greeks took over this belief from Egyptians and it persisted well into the middle centuries of the Christian era. Griffon Vulture is mentioned in the Bible at more than one occasion as an unclean creature, but has often been translated as the eagle, although *nesher* is a Griffon Vulture in Hebrew. Maybe the most impressive description by the prophet Ezekiel involves a legend that a heavenly bird would be called upon to clear the battlefield after the battle of Armageddon (VI century BC), and finally, a griffon would come to get his own due (Sušić & Grbac, 2002).

Similar zoo-ethnological practices and beliefs regarding griffons have been fostered in the Balkan Peninsula too. Oral tradition still existing in Bulgaria mentions the so-called "Kadi stone" ("Kadia" in the Turkish language meaning the judge) in the environs of Kotel town. Death penalties used to be carried out near the Kadi stone during the Ottoman Empire and griffons usually cleared the remains of executed victims.

A griffon ornament on a tombstone in the 10th century church of St. Stefan, Herceg Novi (Photo D. Grubišić)

Shepards used to make flutes from the hollow bones (ulna) of Griffon Vulture wings. One such Neolithic flute was excavated in Southern France in strata estimated to be 4200 to 3800 years old (Schüz, von E., König, C. 1973). This tradition was preserved throughout antiquity and up to the 20th century in cattle-breading areas of the Balkan Mountains (Mt. Stara planina). On Mt. Sokolske planine (Falcon Mountains) in the valley of the Drina River, local population believe the chief of all griffons dreams of a person that would die the next day and leads the whole flock to that place. In traditional superstition, Griffon Vultures are able either to initiate storm or to drive away clouds. Griffons are glorified in traditional tales by assuming

The sun-beathing posture enables birds to achieve optimal feather moisture for flight. This posture inspired medieval artists to create coats-of-arms with double-headed eagles (Photo S. Marinković).

that they can live for more than 200 years. Some shepherds believe counting up griffons would cause his cattle to die. On Mt. Pešter, there is a popular belief that it is recommendable neither to drive Griffon Vulture away from their food nor to kill them because it may possibly bring misfortune on their homes and families since the griffon would "come for his due anyway".

Griffon Vulture was a favorite symbol of power and control for medieval Byzantine lords. We can see it on coats-of-arms of medieval Serbian nobility, such as the dynasties of Nemanjić, Mrnjavčević, Lazarević and Crnojević. The ornament has often been used as a mantle decoration to mark peerage, or as an ornament in churches

and monasteries. The best conserved heraldic Griffon Vulture symbols are located on the wall of the Lazarica Church of Kruševac, and on the stone-plastic image of the Ljeviška Mother of God Church in Metohija. A legend has it that a Griffon Vulture had once saved a Hungarian princess from an enemy. A Griffon monument was built in Siofok, on the coast of Lake Balaton, in memory to this legend.

A double-headed Griffon as an ornament on the wall of Lazarica Church, Serbia, dated 1375 AD (Photo A. Milosavljević)

Even today, spiritual leaders in some African tribes prepare special potions by blending the brains and other body parts of griffons in the belief that it would make them clairvoyant. Feathers of griffon vultures were used frequently as amulets or

The double-headed Griffon as a heraldic symbol on a piece of clothing of the Nemanjic dynasty, Žiča Monastery, 1207 - 1220 AD

talismans for the protection against evil forces, for healing, or as decoration in the clothing of ancient nations. Condors also had a significant role for nations of the Americas. The ancient nations of Inkas, Mayas and Aztecs adored condors and their perfect "condor flight" along the Andean cliffs. The famous legends and ritual dances of North American Indians were dedicated to Californian Condors in order to celebrate the power of these birds. Condors were used in predicting rituals in North America. However, Californian Condor is declining and has become a rarety in the Cordilleras. This process is correlated with a decline in bison populations and abandonment of a traditional way of life of indigenous peoples. Californian Condor is at present one of the most endangered species. A report describing a ritual for predicting wealthy harvest in a Peruvian village that involved sacrificing of condors was published by Jerry & Libby McGahan in the National Geographic magazine in 1971. The upsetting report initiated campaigns for the protection of Andian Condors. It is not clear how much this traditional ritual has endangered condors but, as the population of this magnificent bird has been recently reduced to alarmingly few individuals, any additional pressure on that population would jeopardize its survival.

The construction of airplanes and paragliders was originally based on studies of the flight of vultures and their using of thermals. Gliders glide in warm air currents in

Ecotourism in Uvac Reserve. Watching Griffon Vultures in their natural environment inspires people with a need to preserve biodiversity (Photo S. Marinković)

immitation of griffons that have developed the skill to perfection. Modern paragliders are able to fly 45 metres forward per 10 meters of fall, while griffons may fly 110 metres per 10 meters of fall. Once they have reached a maximum height, griffons are theoretically able to cover a total distance of 16 km. This property is important as it enables them to fly from one thermal to another. Vultures have also provided inspirational reference in western movies, J. Rudyard Kipling's "The Jungle Book", the Bible, comic books, various Survival-type TV serials and they appear on coats-of-arms. Still, people are not fully aware how closely dependent these birds and human society have become. After the disappearance of wild herds, Griffon Vultures have survived owing to shepherding and cattle breeding. Currently they are completely dependent on humans. But griffons also have a great influence on us. Its magnificent flight inspires people to help preserve nature. Griffon Vulture have become a symbol of our care, and an important victory of reason over human selfishness. Protection of some species has cultural and economic significance that cannot be logically ranked by assessment methods, but should not be ignored (Crozier, 1992).

GRIFFON VULTURE TODAY

Griffon Vulture feeds on mammals only and over 95% of its diet consists of cattle carrion, mostly ruminant (Fernández 1975). Sudden change in cattle breading practices has significantly affected griffons. Transition from a traditional nomadic style of cattle breading to intensive use of breeding barns has significantly lowered the chances of Griffon Vultures finding dead animals on pastures (Marinković & Karadžić, 1999). In lowland regions, winter pastures have been replaced by arable land. As a result, vultures have vanished from the Pannonian and Vlaška lowlands and persist only in mountainous regions, where traditional herding of domestic animals is still practiced, especially during summer months. However, veterinary and sanitary guidelines require that dead cattle be either buried or burned. These measures have prevented the spreading of infectious diseases on the one hand, but make Griffon Vultures unable to find food on the other. In areas populated by Griffon Vultures, only 6% of dead cattle are available to them for feeding, while the rest are buried or burned (Marinković, 1999). The opening of feeding grounds for vultures resolves the problem of food shortage, especially over the winter period when cattle are kept indoors on farms. On the other hand, as the feed for griffons is supplied from slaughterhouses, artificial feeding grounds also resolve the problem of organic waste (Marinković & Vasić, 1996). "Restaurants for vultures" attract even griffons from neighbouring countries. For example, a single well-organized feeding station in the Uvac Gorge attracts large numbers of birds and this has resulted in a sudden increase in population density of Griffon Vultures. Traditional herding of domestic animals provides a lot of food for vultures, but only during summer months. In the winter, food is unaccessable to them. A programme for establishing a network of feeding stations based on the recycling of slaughterhouse waste is currently under preparation. The programme, once realized, will bring back vultures to regions from which they had disappeared over the past several decades (Popovo polje – Herzegovina, Pirot – Serbia, and Cotel – Bulgaria), so that all such vulture species may be reintroduced.

Griffon Vultures nest on steep hillsides in gorges and canyons. Gorges provide enough permanent wind, which is essential for their flight to great distances. Numerous canyons in Serbia provide refugia not only for rare birds, but for various other endangered taxa as well. Human impact on most canyons is minimal. In terms of expoitation, canyons are difficult and costly places. This fact has prevented human-induced disturbances of vegetation in many canyons and gorges that are located in central parts of the Balkan Peninsula. Moreover, the significant climate-

induced disturbances that occurred during the repeated glaciations and interglacial periods are low in canyons. The specific orography of canyons and gorges modifies radiant energy of insolation, increases air humidity and simultaneously attenuates hygro-thermic extremes (Mišić, 1979, 1981; Karadžić *et al*., 1996). Due to such microclimate conditions, canyons and gorges have represented refugia for many Tertiary species that had migrated southwards during glacial periods. The remains of Tertiary flora in combination with other species formed forests of complex and polydominant structure. A high diversity of phanerophytes, presence of many endemic Tertiary relics and biogeographic complexity are the main characteristics of these forests. The most frequent tree species in the analyzed forests is black hornbeam (*Ostrya carpinifolia* Scop.). In various combinations with other trees (*Juglans regia* L., *Fraxinus ornus* L., *Carpinus betulus* L., *Carpinus orientalis* L., *Quercus cerris L., Q. petraea, Q. pubescens*, *Fagus sylvatica* L. etc), black hornbeam forms mosaic-like patters with a large proportion of species in overlapping distribution. *Ostrya carpiaifoha* is distributed in the Apennines, Tyrol, western parts of the Balkan Peninsula, Asia Minor and Lebanon (Meusel *et al*., 1965). The closest relatives of this species are distributed in East Asia as well as North and Central America (Trinajstic & Cerovecki, 1978). This clearly indicates a Tertiary disjunction of the genus *Ostrya* Scop.

Relict species find their last shelter in Balkan gorges. Today these gorges are spots of highest biodiversity in Europe (Photo P. Kostin)

Some phaneropfytes (trees and shrubs) in canyon ecosystems have very restricted distribution (endemic taxa) and/or low population densities (rare and endangered species). This group of plants involves *Rhamnus saxatilis* Jacq., *Frangula rupestris*, *Chamaecytisus leiocarpus* (Kern.) Rothm., *Daphne alpina* L., *Evonumus verrucosa* Scop., *Staphylea pinnata* L., *Viburnum lantana* L., etc.

Most herbaceous plants also belong to the group of endemic and/or endangered species, for example *Centaurea derventana* Vis. et Panc., *Athamantha haynaldii* Borb. et Uchtr., *Corydalis ochroleuca* Koch., *Campanula lingulata* Wald. et Kit., *Dianthus petraeus* Wald. et Kit., *Doronicum columnae* Ten., *Iris bosniaca* Beck, *Melampyrum hoermenianum* Maly, *Arabis procurens* Wald. et Kit., *Saxifraga trydactilites*, *Minuartia bosniaca* (Beck) Maly, *Aethionema saxatile* (L) R. Br., *Onosma stellulatum* Wald. et Kit. *Polygala murbeckii* Deg., *Globularia cordifolia* L., *Epimedium alpinum* L., etc.

Using a set of multivariate statistical methods (Karadžić and Popović, 1993, 1994, Karadžić *et al*., 1999), Karadžić *et al*. (2001) described patterns of vegetation variability in Western Serbian canyons. The main environmental factors that affect vegetation variability in canyons involve strong hygro-thermal gradients and great soil heterogeneity. Karadžić, Marinković and Kataranovski (2003) emphasized that vegetation heterogeneity is not affected by environmental factors only, but also by biotic interactions (competition, strong predator or parasitic pressures, etc.).

Windmills in Spain increase mortality of vultures (www.iberica2000,org -documents)

Canyons in Serbia, and more generally in the Balkans are biodiversity hotspots. They are invaluable sources of endemic and medical plants (Karadžić *et al*., 1996, 2001, Djurdjević *et al*, 2004, Jarić *et al*., 2006). Most of these species are endangered taxa, so protection and conservation should be intensified in canyons.

Unfortunately, ecosystems in gorges, which are suitable for vulture nesting, were further disturbed over the past decades by the construction of hydro-electric power plants on the Rivers Drina, Lim and Danube, so that the Piva and Uvac gorges were flooded. These gorges were refugia not only for Griffon Vulture, but also for many other plant and animal species (Karadžić *et al.*

1996). Gorges were also disturbed by urbanization, development of road networks and mining exploitation of stone, for example in the Sićevo Gorge. A huge number of wires of a power grid distribution system around hydro-electric power plants are traps for careless birds during their flight in canyons. Dry feather is an insulator but wet feathers can create a short circuit (Schneider *et al.* 1997). Uncontrolled tourism can also be disagreeable to nesting birds and may cause them to abandon their colonies (Sušić & Grbac 2002). The building of windmill farms may also be a threat to vultures (Derwitt *et al.* 2006) . However, environmentalists believe that windmills are the solution for growing energy requirements and that they are acceptable from the environmental aspect.

Griffons do not have a natural predator other than man, who may hunt them for food like some tribes in South Africa do. Hunting of Griffon Vultures in fact has a long tradition. From the 19th century onwards, Griffons have been hunting targets attractive both for private collectors and collections of various European museums and zoological gardens (Ettinger, 1857, Hodek, 1877, Rudolf von Osterreich *et al.* 1878, Baronijan, 1958). At the end of the 19th century, hunters declared Griffons a pest species and tried to kill them on every occasion (Jović,1986, Karaman, 1950, Cvitanić, 1984).

Djurdjevac on Mt. Tara, 1936. Trophies inspire people with an illusion of power
(archive of Milutin Radovanović)

In some regions, like for example on the island of Crete, poachers kill these birds for trophy. Collecting vulture eggs used to be a profitable business across the Balkans. Expeditions of robbers were organized and financed by falconers, collectors and museum curators to collect samples from vulture colonies in the Balkans. Plunder frequently targeted vulture colonies, especially the Babune and Demikapija colonies in Macedonia until the end of the 19th century. It was difficult at the time to hunt vultures since they could be seriously wounded by shotgun only when fired at from close proximity. After World War One, hunting weapons were upgraded and leaded shotgun pellets replaced by bullets. Hunters did not kill vultures because they were afraid of their supernatural powers or considered griffons unuseful birds. It was most frequently the political, military and police elite that hunted vultures. Wounded birds were poisoned by lead from the ammunition (Mateo *et al.* 1997). A strong campaign against poison bullets in the USA has resulted in lead ammunition being replaced by non-toxic bullets (Hunt *et al*. 2006, Fischer *et al.* 2006.). Vultures can also be poisoned by eating carrion of animals killed by lead bullets due to the toxicity of bioaccumulated heavy metals. A case of poisoning of condors with bioaccumulated lead has been recorded in toxicological studies.

In the Balkan Peninsula, first records of poisoned decoys placed in natural environments to destroy "pests" (wolves, foxes, jackals) date back from 1888 (Rajzer, 1939). Their systematic poisoning and destroying began in the winter of 1947-1948 (Knežević & Knežević, 1956). A single decade of application of poisoned decoys had catastrophic effects on vulture populations, so that Bearded and Black Vultures died out in the region completely, while Griffon Vultures withdrew from the pastoral Eastern Balkan regions (Serbia, Romania and Bulgaria) (Matvejev, 1950). Such discouraging results came as a consequence of an absurd campaign of "pest prevention" organized by various hunting associations. "Pestcontrol" by poisoning did not significantly affect populations of wolves, which usually hunt their prey, but in 1959 about 700 Griffon Vultures were poisoned in campaign in Serbia and almost 2500 birds in the entire ex-Yugoslavia territory (Mardešić & Dugački, 1961). Systematic destroying of Griffon Vultures as a side effect of "pest" poisoning lasted for two decades throughout the Balkans before it was legally banned. Further systematic and public eradication of these birds stopped after poisoned decoys were banned along with the free sale of strychnine and potassium cyanide.

Poisonous decoys are still being laid occasionally by irresponsible and uninformed individuals, which is a real threat to small flocks. Today, some people use pest-poisoning preparations available in agricultural pharmacies, although they are toxic to birds (furadan and creosote). Over the past few decades, a widespread poi-

soning of birds of prey has taken place in Herzegovina, Croatia and Macedonia. Birds with a big radius of movement that exceeds state borders can get poisoned in a wider area, so that integrated measures of protection need to be implemented across the Balkan Peninsula. Poisoning is especially serious when attempts are being made to reintroduce and retain individuals of a locally extinct species in our environment.

A sudden decline in populations of two Indian species (Indian White-backed Griffon Vulture and Long-billed Griffon Vulture) since 1993 threatens to destroy these two species, which happen to be nature's sanitarians on the "Towers of Silence" in Mumbai, whose functioning daily requires up to 150 birds. Over a decade of unsuccessful attempts to identify their unknown disease, the White-backed Griffon and Long-billed Griffon Vultures have lost 97% and 94% of their respective populations, and their survival is threatened to an alarming degree. These birds are significantly more sensitive to some medicaments (diclophen for example) than mammals, and diclophen is widely used in both human and veterinarian medicine in India, Afghanistan and Pakistan. It has also been applied to cattle to treat their diseases. Although this medicine product has caused enormous numbers of dead vultures, it has not been detected in dead animals because of its rapid degradation in organism. Vultures are insensitive to infectious diseases of mammals and we therefore often as-

Destroying of Griffons at Lake Uvac (Photo S. Marinković)

sume that they are resistant to different poisons also (Pain et al. 2003). Due to their sensitiveness both to poisons and habitat disturbance, these species are indicators of undisturbed environment. According to some opinions, they could be used for tracing the mad cow disease (BirdLife International 2007). Vultures are top predators reactings first to any disturbance in ecosystem harmony (Risebrough, 2004).

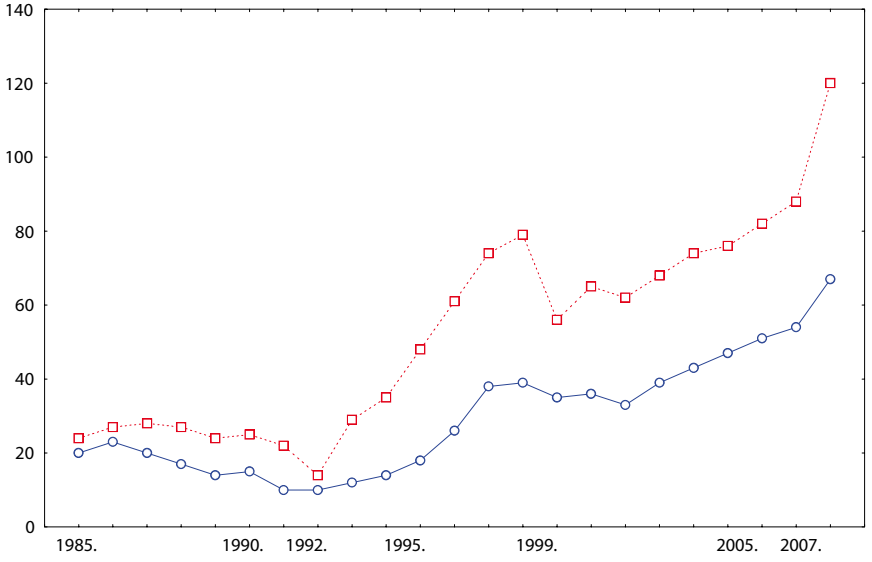
CENSUS AND CONTROL OF GRIFFON VULTURE

The first Griffon Vulture to be scientifically described was one from Iran, more precisely from the Sammamishin Alps. It was described by Karl Hablizl in 1783 (Mundy *et al.* 1992). The first Serbian document on Griffon Vulture was published in the Danica magazine in 1826. In his contribution titled "The Initial Listing of Serbian Monasteries" ("Početak popiseanija srpskih manastira"), Vuk Stefanović Karadžić reported that eagles nested and survived severe winter months in the ruins of the Transfiguration Monastery built in Turčinovac Cave of the Ovčar-Kablar Gorge and it seems actually to be the description of a Griffon population. The first documented

"Diplomatic" markings of the wing on a juvenile bird ready to travel (Photo Ž. Rogić).

nesting of Griffon Vultures was in the Danube loess steppe near Vukovar (Landbeck, 1843). After this description of a nesting place, travelling writers and pioneers in ornithology recorded Griffon Vultures all around Serbia throughout the 19th and in early 20th century (Baldamus, 1847, Mojsisovic, 1881, Dombrovski, 1895, Hoernes, 1886, Lintija, 1908, Hodek, 1877, Reiser, 1896, Reiser, 1939). They have left us invaluable data on distribution of Griffon Vultures in Serbia. Using this data, we have been able to find the locations of previous colonies and, consequently, the regions that are suitable for their reintroduction.

Detailed demographic researches of Griffon Vultures in Serbia began in the 1980s (Marinković, 1983, Marinković 1986). After a decade of intensive research, a wide action was launched to ensure better conservation and control of population growth of this endangered species (Marinković & Orlandić, 1992). Besides flock supervision, the main goal of those activities was to inform public about the importance of protecting Griffon Vultures and about the benefits of reintroduction of this disappeared species (Marinković, 1994). Hitherto successful protection of Griffon Vulture clearly indicates a widespread support to the conservation programme of Griffons among



The number of juvenile birds (blue) and pairs of Griffon Vultures (red) in Serbia. Changes are associated with human activities (e.g. disintegration of Yugoslavia in 1992, NATO aggression in 1999).

local population, and shows that Griffon Vultures are now safe in a wide area of the Drina River basin.

During a long period of more than two decades, both monitoring of the state of flocks and census of nests have been regularly performed several times each year. Griffon Vulture is therefore the most thoroughly studied of all bird species in Serbia. Griffon Vultures are a long-lived species. They form constant mating pairs that are traditionally tied to the same nest in a colony. Monitoring programmes involve detailed evidence of each nest in its mapped location. The nesting success of each pair is analyzed and each juvenile evidenced. About 700 (precisely 721) cases of successful nesting of Griffons have been recorded in Serbia over the past two decades (Marinković, 1999). Using video surveillence, we analyzed the behavior of Griffons in nests and at feeding grounds without disturbing the birds.

We have labelled Griffon legs with coloured rings in order to keep record and trace individual birds on rocks and during their visits to "restaurants". Each bird has its own file with morphometric, migratory and other relevant data. More recently, we began to attach colourful markings on the wings of juveniles, while young

Records of Griffons marked at Uvac or birds from neighbouring regions observed in the Uvac colony.

birds are still in their nests. When youngsters start to fly out, we are ablo to identify them individually during flight. The markings consist of letters and numbers and are large enough to be identified through binoculars from considerable distances (over 200 m). Several members of the Alpinistic and Speleological Academic Club (Vladan Milisavljević, Zeljko Rogić, Stojadin Stanojević and Vladimir Mrvić) accompanied by ornithologists (Sasa Marinković and Stefan Skorić) and rangers of the Uvac Sanctuary mark young birds in their nests every year. Regular monitoring of marked birds has shown that Griffons from the Uvac Gorge are able to migrate over 2000 km in all directions. On the other hand, a bird marked on the island of Cres in the Adriatic Sea has been traced 4000 km southwards, reaching Chad's territory in Africa (Sušić, 1994, Pavković, 2006).

Marked individuals enable the tracing of migratory activities of vultures. Records of the most remarkable travellers feature "Haji vulture 4" (Haji meaning the visitor of the Holy Land in Turkish), which had flown to Israel and settled there. The vulture "Hiperborejac" (Hyperborean vulture) has flown northwards as far as Estonia. It is still enigmatic what this Mediterranean species was looking for so far in the North. The bird was the first Griffon specimen ever to be observed and photographed in Estonia. It was observed in May 2005, but there has been no trace of it ever since. More frequent straying of Griffons northwards in Western Europe is probably due to an overpopulation of Spanish vultures on the one hand and to global warming and climate change on the other. The vulture "Dracula" has accidentally fallen near Luganj in Romania. The bird was transported to Timisoara Zoo but it was impossible to bring it back to Serbia due to bird flu restrictions. Many marked birds have been observed in Bulgaria (at Studen kamenac "restaurant") and Greece (in Dadia Sanctuary at the mouth of the Marica River). Some marked vultures have been observed in Macedonia, Herzegovina and Montenegro. The vulture "Njegoš" has fallen into Lake Plav and local ornithologists reacted

Griffon "Haji" has settled in Israel. This photo was taken while "Haji" was still in its original nest (Photo Ž. Rogić)

Griffon Vulture "Hiperborejac" migrated 1750 km from Uvac to Estonia. The number label fell off but the side of the marked wing was a clear enough indication that the vulture originated from the Uvac colony 2004 (Photo M. Riho, 2005)

in time to prevent its becoming another item on the wall of a hunting society and helped return it to its native colony in the Uvac River gorge. "Njegoš" did not have his wing markings in place. Instead, its wing was bleached with hydrogen peroxide, which made him a first punk-fashioned vulture in the Balkans. A bird named "Hrvoje" was marked in 1991 on the island of Cres and it was found later the same year on a feeding ground in the Alps (Sušić, 1994). After two years of drifting, this vulture arrived to the Uvac "restaurant" at the end of 1993. The bird was marked with a white letter "H" after its birth certificate name Hristo). Hrvoje made a nest not far from the Uvac "restaurant" and kept nesting in the same place over the next three years. After that period, all trace of this bird was lost. Markings normally last 4-5 years before falling off (Sušić, 1994, Pavković, 2006). After two to four years of drifting, birds usually come back to their native colony to make a nest. However, some birds fly away forever and never come back to their birthplace. On the other hand, thanks to our markings procedure we have been able to confirm that some vultures have never abandoned their native colonies, preferring to stay close to the Uvac "restaurant". "Rajko" (marked "R") and "Bravar" (marked "N") are two of such examples.

To identify the size of their homeland territory and main thermal routes, we attach radio-transmitters to adult birds to monitor their movement. Adult birds rarely abandon the chosen colony and rarely depart 100 km away from their homeland. Griffons may abandon their territory only if they are disturbed as it happened in Herzegovina during a civil war there (Marinković, 2007). Transcontinental wanderings of juvenile Griffons can be monitored by satellite and GPS equipment. Such tracking may provide data that will further our understanding of the relationships among different local populations belonging to a meta population of Griffon Vulture.

A centre for reproduction of vultures, especially Egyptian Vulture, has been established in the Palić Zoological Park. A similar centre for birds of prey in Uvac Gorge is close to the "restaurant" for Griffons. Such location is suitable for adaptation of birds to the surrounding environment in which they would be released (repatriation).

Two Griffons that returned home from Greece acccompanied by a Griffon from Cres KP (Archive "Birds of Prey Protection Fund - Griffon Vulture")

Development of similar centres in Popovo Polje plateau and on Mt. Stara planina is planned and a study under preparation. Monitoring the introduced marked birds and their adaptation will provide safe conditions for a return of other species of vultures that have disappeared from our country.

Bird watching is a fascinating hobby. Besides socializing with people involved in the Birds of Prey Protection Fund, each bird watcher has a chance to visit protected areas and watch Griffon Vultures in their natural habitat. Visits to protected areas are limited in scope in order to prevent disturbance of birds. By tracing marked birds, anyone can be of assistance and contribute to expanding out knowledge about the life of these extraordinary birds. To achieve this goal you too should grab a pair of binoculars and learn more about the birds in their own environment.

ABOUT THE FUND

The Institute for Biological Research "Siniša Stanković" initiated in 1985 a monitoring programme and demographic research of Griffon Vultures in Herzegovina and Serbia. A feeding ground ("restaurant for Griffons") in the gorge of the Trešnjica River was established in 1989. However, despite a well-elaborated legal basis for protecting birds and their habitats, the abundance of Griffon Vultures suddenly declined

Fixing radio-transmitters to the back of a Griffon (photo S.Marinković)

at the time. Frequent poisoning and disturbances during civil conflicts threatened to eradicate Griffon Vulture. During 1992, only 10 juveniles flew out of their nests in Serbia, while in Herzegovina they stopped nesting at all.

Our Fund has frequently organized lectures and public discussions in local communities, schools, municipalities and private homes. The Fund has also published attractive posters, calendars and instructional brochures to be distributed to local population. Domestic public was unaware at the beginning that Griffon Vulture is an endangered bird species and that people should try to protect it if they wish to keep these beautiful birds in their surroundings. It took some effort to convince locals to stop laying poisoned decoys. Griffon Vultures are useful to cattle breeders, and local population should therefore accept the advice to help save and actively protect these birds.

Nine years of permanent education inspired some locals with a wish to help protect this species and get widespread support in their local communities. In order to stop further and sudden decline of this species and to launch a local initiative, a

group of nature lovers and local citizens, together with ornithologists, founded the Birds of Prey Protection Fund in Nova Varoš on May 11th,1994 using the model of other relevant organizations, such as the FIRA, WWF and BVF. The "restaurant" at Uvac was launched at a time of economic crisis and galloping inflation, and the members suspended all their activities other than protection of Griffons. Nova Varoš municipality enabled the construction of a road to the feeding ground in Uvac Gorge, and the local public utilities supplied the food to be transported.

Widespread support to the idea promoted by the Fund has enabled undisturbed running of the programme of protection of Griffon Vulture in the Uvac River gorge. The "restaurant for Griffons" has attracted birds from other parts of the Balkans as

The last griffons abandoned Herzegovina in 1992 but it is possible to bring them back if our resolution is strong (Photo S. Marinković)

Launching of the Griffon Vulture protection programme in a local community at Gornja Trešnjica on November 26, 1988 (Photo S. Marinković)

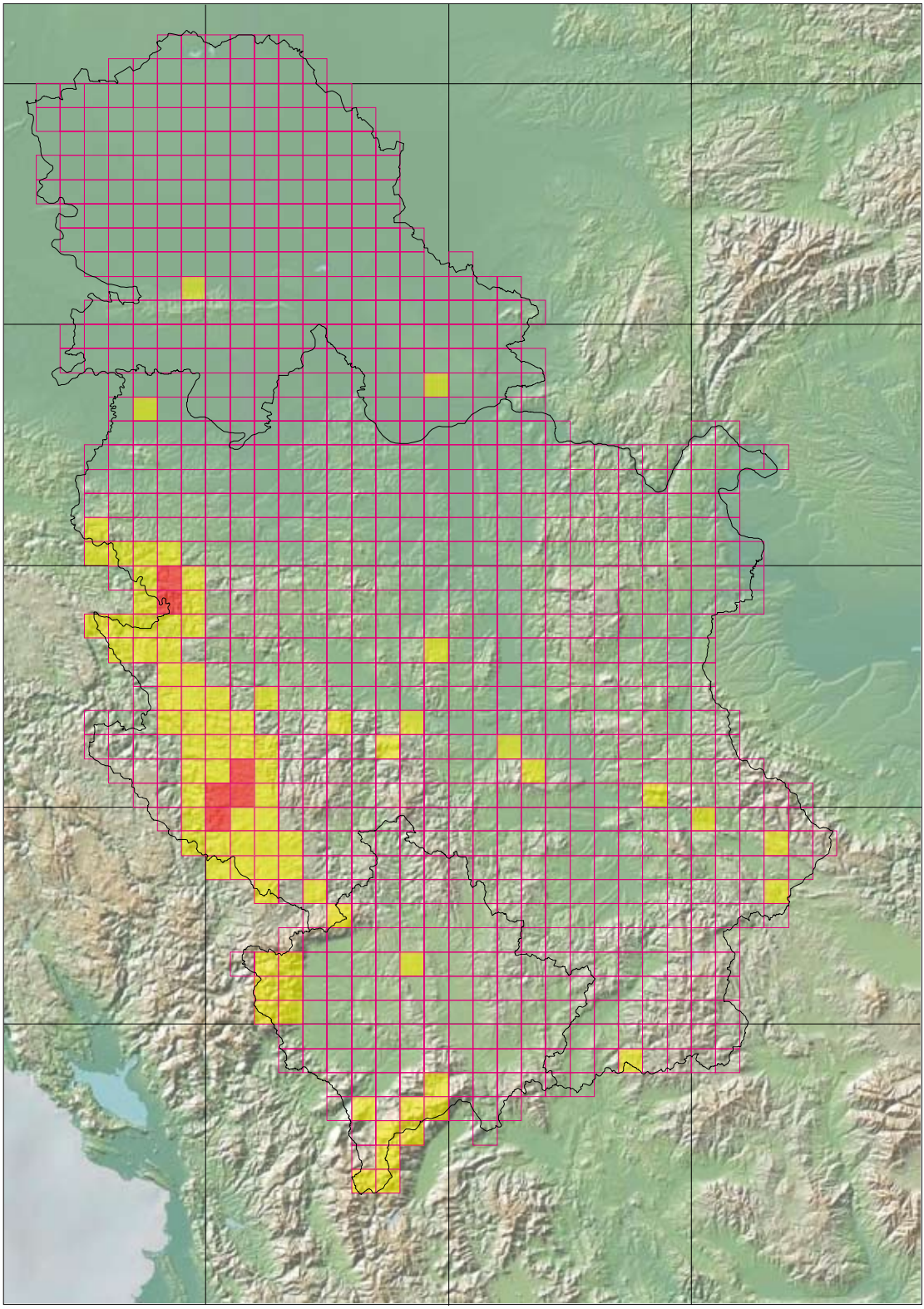
well. The flock at Uvac Gorge began to grow suddenly and everyone was able to see that Griffons were back home. Locals viewed their return as a success of their efforts, and Uvac gained popularity not only in Serbia, but all over Europe as well.

Today, over 200 birds fly above the "restaurant for Griffons". Uvac is the last resort and a hope for successful return of this species to the Balkans. The safety of these birds and popular support to the programme of Griffon protection raise hopes that we can bring back three other species of vultures in Serbia as well. The Fund has played its role and fulfilled one of its main tasks: the Griffon Vulture again has its haven in Serbia. The support for this campaign has decreased pressures from hunting and poisoned decoys laid in wilderness. Such increase in awareness and good "restaurant" organization, acting in synergy, have resulted in unhindered increase in Griffon population. The Institute for Biological Research, together with the Fund and Belgrade University, has been engaged in monitoring nests of Griffon Vultures for more then two decades and, together with the Uvac Reserve, it prepares conditions for return of other extinct species of vultures, especially the Black Vulture.

Reintroduction of the Eurasian Black Vulture, Egyptian Vulture and Bearded Vulture is a declared mission of the Fund. A huge number of citizens have already

supported this mission. It has enabled the Birds of Prey Protection Fund to be registered as a legacy institution in Belgrade on February 4th, 2004. The symbol of the Fund is an old drawing of a Black Vulture found on the wall of a cave. The drawing was made approximately 11000 years ago and renders one of the first impressions of vultures in the minds of primitive humans. The setting up of a net of societies for monitoring trends in vulture populations, general support of international organizations for nature protection and education of local citizens will create conditions for the return of extinct species to the Balkan Peninsula. We propose that you too be part of a team that will achieve that goal.

Griffon Vultures have only one juvenile per nest. It takes young birds 110 days to leave their nests (Photo Ž. Rogić)



Distribution of Griffon Vulture in Serbia

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