

Study on the Historical Distribution of Vultures in Macedonia

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Executive Summary

Ornithological investigations within the Republic of Macedonia started relatively later in comparison to the other Balkan countries. With a few exceptions, we may say that serious investigations started during the First World War, with the arrival of numerous ornithologists within the German army. As a result of extensive and wide-ranging research, they collected 3,258 stuffed specimens and recorded the presence of 260 bird species (this only by ornithologists included in the Macedonian Commission) (Stresseman, 1920).

Additionally, independent investigations were made by the ornithologists of the German army who were not included in the Macedonian Commission. Thus, the territory of Macedonia became the most thoroughly investigated area within the Balkan region. Nevertheless, the most important point of these activities was the fact that the discovery of an unbelievable richness and diversity of bird fauna far beyond the expectations of the German ornithologists become publicly known.

From his own adventures, as well as those of other ornithologists and naturalists, very picturesque reports were made by Prof. Franc Doflein (1921) in his monography "Mazedonien," which made this area very popular. For a long period this unique book was an excellent lure for numerous naturalists, foreign and domestic. Consequently, after the First World War, some of the German investigators that were working through the war remained and other ornithologists from Germany and other countries came to Macedonia to study this bird paradise, including vultures.

Of the domestic investigators of that period, we wish to single out the great figure of Dr. Stanko Karaman, with his article on the ornithofauna of the Skopje valley. He collected over 1,200 stuffed bird specimens and recorded 208 bird species. Later, Dr. Nikola Nezlobinski, who was studying the ornithofauna of Lake Ohrid and vicinity, collected more than 700 stuffed birds, including all four species of vultures. Mr. Ante Ilic focused primarily on the birds of the Pelagonia valley (Bitola), but he occasionally visited some other locations, mostly collecting bird eggs (1,119 specimens). With these investigations, the knowledge of the birds of Macedonia was markedly improved, not only from the taxonomic aspect, but also concerning the distribution and other life history features.

The famous German ornithologist, Dr. Wolfgang Makatsch, was also exposed to the temptation to see the Macedonian bird richness firsthand. He fulfilled his wish, visiting the Vardar River valley near Veles (including the Babuna and Topolka River gorges), the swamp on the Crna River near Bitola, Pelister Mountain and Lake Ohrid. As he reports (1950), he was so astonished by such a panorama of bird diversity and richness that it made an unforgettable impression on his mind until the end of his life.

After the Second World War, which took lives of a large number of vultures like the first one, there was still a remnant of the former bird richness. In that period, the Serbian ornithologist, Dr. Sergej Matvejev, undertook the task of reviewing the bird collections all over former Yugoslavia, including those in the Museums at Skopje and Struga. Afterwards, he made field investigations of locations which had not been visited before, such as the mountains of Shara, Karadzica, Pelister and Kozuf. As a

result of these activities, in cooperation with the Macedonian ornithologist, Dr. Aleksandar Dimovski, reports were published which stated that in the territory of Macedonia, 278 species were present, 207 of which were nesting species.

Later on, after the calming of the political situation, Macedonia again became the object of investigations by foreign ornithologists with a strong desire to visit the already excellently described nesting localities of vultures. Unfortunately, these investigators recorded the decline of the populations of all four vulture species (in contrast to the situation during the period between First and Second World Wars).

The main reasons for this decline were large drainage projects which resulted in the desiccation of swamps and marshes, an increase in hunting activities, a proclamation that birds of prey were "harmful game," indirect poisoning of vultures as a result of the broad program for wolf control and nest robbery.

Other factors include the reduction of stocks of meat cattle, sheep and goats, the transition from extensive cattle grazing to intensive farm cattle production, as well as general impacts on the environment. All these activities had strong negative repercussions on the status of biodiversity as a whole, and especially on the vultures.

Consequently, the Bearded and the Black Vulture are probably no longer nesting within Macedonia, and the prognosis for the other two species will probably be the same. Grubac had the luck to see the last two nests of the Bearded Vulture and to study the birds, while the nesting pair of Black Vultures was investigated only within the Skopje Zoo.

In accordance with recorded data on the historical distribution of vultures in Macedonia, we can conclude that in the past, all four species (Bearded Vulture, Black Vulture, Griffon Vulture and Egyptian Vulture) were widely distributed within the Republic of Macedonia, with a high frequency and abundance. All four vulture species nest in Macedonia, but the Egyptian Vulture is only a Summer resident.

Nesting sites were concentrated on unapproachable mountain cliffs and vertical rocks, as well as in river gorges. Vultures fly around in neighbouring areas, often far from the nesting site, while searching for food.

The most often inhabited localities were the gorges on the Vardar River and its tributaries. In the northern part of the country, these areas include the Treska River gorge "Matka" near Skopje, the upper and lower Pcinja River gorge and the vertical rock cliffs along the river Vardar between Skopje and Veles.

In the central part of the country, the most important nesting sites are the Topolka River gorge as well as the upper and lower Babuna River gorges. More southerly nesting sites were recorded on the vertical rock cliffs of the Bregalnica River in its lower reaches and in the Raec River gorge.

In southern Macedonia, the most famous nesting sites are the Vardar River gorge "Demir Kapija" and the Crna River gorge, especially the vertical rock cliffs on the upper reaches of the artificial lake, "Tikvesko Ezero."

From the literature, nesting sites were recorded on the vertical rock cliffs in the mountain zone of the Babuna Mountain near Prilep, on the mountainous rocky terrain along the Patiska River at Karadzica Mountain near Skopje, along the upper flow of the Treska River in the vicinity of Makedonski Brod and the high mountain rocky terrain of Shar Planina and Korab Mountains.

The last nesting sites of the Bearded Vulture were recorded in the high mountain rock cliffs of Korab Mountain in northwest Macedonia (1981) and in the Crna River gorge (1985). Within the last few years, only solitary specimens have been recorded.

In the past, the Griffon Vulture was seen very frequently, even in the Skopje valley. It was nesting in the Treska River gorge "Matka" near Skopje as well as in the Pcinja River gorge in the region of Katlanovo. In the Topolka, Babuna, Raec and Crna River gorges, the Griffon Vulture is still nesting with highly reduced populations. The critical period for their survival is the winter months, due to a lack of food.

Frequently, a large number of individuals become indirect victims as a result of wolf poisoning activities, or by poisoning from material in rubbish dumps, especially the one near Negotino. Cases of egg stealing have also been frequently recorded.

The Egyptian Vulture was formerly the most common vulture in Macedonia, at all described nesting sites. Until recently, it was estimated that the Macedonian populations of this vulture were stabilized. But the process of decline within the last 10 years has continued.

The Black Vulture, that colossus of a bird, has not been seen to nest here for years. In contrast to the other three vulture species, the Black Vulture preferred to built nests in old tall trees, mostly elms, that were formerly very frequent, especially in the Skopje and Kumanovo valleys as well as in Ovce Pole. (The elm has been attacked by a virus within the last few decades and is now almost completely extinct.) Notwithstanding the fact that the Black Vulture had the highest abundance in Ovce Pole, it was never as numerous as the Griffon Vulture. Usually, the Black Vulture was flying in the same flocks as the Griffon Vulture. Occasionally, Black Vultures nested within the rocks of river gorges, but these sites were rarely recorded. In the last decade, only solitary birds have been recorded. The last Black Vulture nest was built in the Skopje Zoo, but eggs were not successfully hatched.

Introduction

In modern history, the territory of Macedonia (Fig. 1) was not safe for field investigations and free movement in the natural environment until after the end of the First World War. This situation was the result of a long period of Turkish occupation (five centuries), followed by several years of devastating and bloody Balkan Wars, as well as the First World War. Because of this, the investigation of ornithofauna in Macedonia started much later than in northern Europe, and even later than in the countries of the northern Balkans (which became free from Turkish occupation at an earlier date).

The populations of the four vulture species were drastically reduced due to war activities and direct killing, as well as from the cutting of old nesting trees in the valleys for firewood. After the First World War, projects to drain marshes and wetlands were introduced in order to protect the human population from the illness “malaria.” These same activities continued with even greater effect after the Second World War, primarily in order to enlarge the land surface for agricultural purposes. Such human activities have resulted in a decline in the frequency and abundance of most bird species, including vultures.

The fact of past negative anthropogenic influence notwithstanding, there still exists a portion of the former “bird paradise.” It results from a mixture of the various biogeographic regions and landscapes present within a restricted region of Macedonia, as well as because one of the main migratory routes passes through the area.

Figure 1 – Map of the Republic of Macedonia.

Investigations until the First World War

The first investigator to present serious data on the ornithofauna of Macedonia was McGregor (1906). In the period between March 1903 and August 1905, he was a British consul in Bitola, south-western Macedonia (within the Turkish empire). McGregor primarily investigated the birds of Pelagonia, with occasional excursions to Pelister Mountain, Krushevo and Resen. During his fieldwork, he registered 152 species of birds. With respect to vultures, he mentioned that the Griffon Vulture was more frequently present, while the Bearded Vulture (Lammergeier) was registered only on one occasion.

At the same approximate period, collaborators from the Museum of Serbia in Belgrade investigated the birds in the vicinities of Skopje, Tetovo, Bitola and Dojran Lake. Altogether, they collected and prepared 200 stuffed bird specimens, which are deposited in the Museum (Stojicevic, 1907).

Investigations during the First World War

A decade after McGregor, during the First World War, investigations of bird fauna were intensified on both sides of the so called “Thessaloniki Front” line, which extended along what is now the border between Macedonia and Greece. British

ornithologists were investigating south of this front, i.e., in the current territory of Greece (Clarke, 1917; Sladen, 1917, 1918; Harrison 1918; Chasen, 1921 and Glegg, 1924).

German ornithologists were investigating on the north side of the front, i.e., in the territory of the Republic of Macedonia. Within the Headquarters of the German Army, a special investigating commission was established, the so-called "Mazedonische Landeskundliche Kommission." This commission was under the leadership of the famous naturalists, Prof. Franz Doflein and Prof. Mueller. In 1917, they were investigating the area around the village of Udovo and the mountain of Plaush, as well as Shara and Korab mountains.

During the next year, most of their investigations were focused on the birds in the vicinities of Veles, Skopje (the area of the mountain Goleshnica-Jakupica massif), Katlanovo lake/marsh, Prespa, Ohrid and Dojran Lakes, as well as the Demir Kapija gorge. The German team collected various natural samples from all these numerous Macedonian localities, among them a large collection of 3,258 bird specimens that are still deposited in the Museum in Munchen. Stresemann studied this bird collection from Macedonia, with the results being published in the monograph, "Avifauna Macedonica" (1920). The report of the entire field investigation was published by Doflein (1921) in his life work, the monograph "Mazedonien" (Fig. 2).

On this occasion, we shall mention some of the adventures of Prof. Doflein connected with the bird investigations in Macedonia. His first experience was with the Udovo locality, near the river Vardar. Each evening after sunset, in the treetops of the hoary oak and elm trees, various bird species such as buzzards, falcons, hawks, and Imperial and Golden Eagles were concentrating for resting. Prof. Doflein was most impressed, however, by the presence of the Griffon and Black Vultures that were the last to come for resting on the highest trees.

Following intensive killing by German soldiers, the vultures rarely came to this locality for night resting. Nevertheless, the Headquarters' order to stop shooting the large birds - because they were "natural monuments" - was not completely accepted, especially by the higher ranking officers and military doctors. In addition, Bulgarian

Figure 2 – The title page of Doflein's monograph.

soldiers were also shooting the large birds. At the end of the War, the giant trees were left in place as bird habitat, but they later became victims of the increased need for firewood.

In 1918, shortly after arriving in Veles, the team of Prof. Doflein visited the River Topolka gorge (Fig. 3), where a nesting pair of Egyptian Vultures was flying by. Over the next few days, they visited the River Babuna gorge, where they noticed numerous nests of Egyptian Vultures in holes and crevices in the vertical cliff face. Griffon Vultures were also nesting in the gorge, but Egyptian Vultures were more numerous.

When the team was returning to Udovo, Prof. Mueller visited the Demir Kapija gorge (Vardar River - Fig. 4). There he noticed a large flock of Griffon Vultures nesting on the inaccessible vertical cliffs. Some of the nests were very high, while others were near the water surface. Another smaller colony of Griffon Vultures was nesting high on the vertical cliff face (approximately 1,300 m) on the right side of the gorge, near the locality Han Abdipasha.

When Prof. Doflein and his taxidermist, Mr. Aigner, visited the former Katlanovo lake/marsh near Skopje (Fig. 5), they were excited by the view of an

uncountable richness and variety of birds, including three species of vultures, the Griffon, Black, and Egyptian Vulture. They also saw eagles, falcons, harriers, and buzzards. They took special note of one giant Griffon Vulture that was resting through the night on a solitary ancient tree from where he could survey the entire area. This made it impossible for the team to approach him. Egyptian and Black Vultures were also resting on the trees present within the marsh. The team had occasion to notice how the three vulture species interacted when animal carcasses were present.

Figure 3 – Topolka River gorge (from Doflein, 1921)

Figure 4 – Two views of Demir Kapija gorge (from Doflein, 1921)

Figure 5 – Katlanovo marsh (from Doflein, 1921)

Some other German soldier-ornithologists not associated with the Kommission were also independently investigating the birds in Macedonia. For example, from January-June 1916, Viereck investigated the area around Skopje, Stip, Strumica, and later, Dojran Lake. In 1917 he published his results. Altogether, he collected 114 bird specimens that were later taxidermically preserved. He reported the presence of Black Vultures flying separately and in pairs, usually accompanied by Griffon Vultures. In the vicinity of Valandovo, he noticed Bearded Vultures on two occasions. On the second occasion, he succeeded in collecting a female specimen.

From August 1916 until February 1917, Gengler - like the German soldiers - independently investigated the birds of Macedonia, mostly in the northern part. Altogether, he collected 141 bird specimens for his private collection. The results of his investigations were published in 1920 under the name "Balkanvoegel." Concerning vultures, most of his records are for the Griffon Vulture. Three birds were observed eating carrion in a meadow near the village of Hadzalar (=Miladinovci). On another occasion, he recorded one specimen of Griffon Vulture near the village Slupcane (vicinity of Kumanovo). He also succeeded in collecting a Griffon Vulture specimen near Skopje. Regarding Black Vultures, he lists three records, one near the village Miladinovci (two specimens on carrion) and two in the vicinity of Skopje. From a locality near Skopje, he succeeded in collecting one large male specimen. The Egyptian Vulture was also recorded by Gengler at several locations (in the vicinity of the villages Romanovci and Agino Selo, both near Kumanovo, as well as near the village Ajvatovci-Skopje).

Schlegel the younger was also a German soldier who investigated the birds of Macedonia independently of the Kommission, from April 1916 until May 1917. Under instructions from his father (the elder Schlegel), his investigations were focused on the Skopje valley, where he recorded 85 bird species. These results were

published after his death, by his father (Schlegel, 1918). For vultures he gives only a general survey, pointing out that the Griffon Vulture was a very frequent bird in Macedonia.

Prof. Fehringer in the period between February 1917 and July 1918 investigated birds at localities near Udovo, Miletkovo, Skopje, Prilep, Strumica, Kumanovo, Mavrovo (Bistra Mountain), as well as Kozuf Mountain and the vicinity of Dojran Lake. Altogether he recorded the presence of 191 bird species, and collected 149 bird specimens. This collection was deposited in the Zoological Museum in Berlin. The results of these investigations were published in two articles (Fehringer, 1920; 1922).

Results of investigations made by ornithologists within the British army will be not included in this report because, after the First World War, the territory south of the front was and remains today incorporated within the Greek State.

Investigations after the First World War

A decade after the First World War, German ornithologists again started to investigate the birds of Macedonia, mainly at the same attractive localities that were already investigated during the War. In the spring of 1927, Henrici and Fehringer investigated the birds at Ovce Pole, and along the river Vardar near Veles (Makatsch, 1950). In the Babuna river gorge, they recorded two nesting pairs of Egyptian Vultures and one nesting pair of Griffon Vultures. In the Topolka river gorge, they registered one nesting pair of Egyptian Vultures. The nest was on the vertical face of the rock, about 100 m above the water surface. After a difficult climb, when they came close to the nest, the nesting bird attacked them. There were two eggs in the nest, resting on a thick bed of sheep wool, and around the nest an unpleasant smell was present resulting from the scattered remnants of tortoise shells, as well as bones of various animals. In the vicinity of this nest, another new one was also present but not yet occupied.

Banzhaf and Henrici, in the summer of 1929 in the Topolka river gorge, reported two juvenile birds in the nest of an Egyptian Vulture (Banzhaf, 1931). In the year 1939, Henrici came to Macedonia for a third time and, accompanied by the local ornithologist from Bitola, Mr. Ilic, they investigated the marsh along the Crna River in Pelagonia, as well as locations around the villages Rotino and Nize Pole on the mountain Pelister. On this field trip, Henrici was focused on collecting bird eggs for his famous egg collection.

The most significant reports on the presence, distribution, nesting, feeding and migration of the birds of Macedonia are due to the famous Macedonian zoologist, Stanko Karaman. As a scientist, he was most productive between the two World Wars. With respect to bird investigations, his first paper was published in 1928 describing the ornithofauna of the Skopje valley, including the surrounding mountains. He recorded 208 bird species and collected 1,200 specimens, which are deposited in the Macedonian Museum of Natural History. In the subsequent period leading up to the Second World War, he extended his investigations to other parts of Macedonia (Karaman, 1931a; 1937; 1948; 1950). Throughout his field investigations and preparation of taxidermic specimens, he was accompanied by D. Rucner and K. Bogoevski.

Concerning vultures, he gives many records for all four of the species present in Macedonia. In 1922 he presented data about the presence of three specimens of Bearded Vulture (for the Treska River gorge, at the locality Matka near Skopje – Fig.

6), but not as a nesting place. He mentioned that this species (despite the reduction of its population during the First World War) was still nesting on the mountains Shara and Pelister. On one occasion, he obtained a live specimen of a Bearded Vulture (in order to make a taxidermic preparation), which was caught in a wolf trap near Prizren (Kosovo). On another occasion, he observed several young specimens of Bearded Vulture in the rocks over the river Vardar, specifically at the location where the river Pcinja flows into the Vardar. These were the last of Karaman's records concerning the Bearded Vulture before the Second World War.

Figure 6 – Treska River gorge. Left, 1918 and right, 1980 (different aspects).

In his papers Karaman also reports that the Griffon Vulture was very frequent in the Skopje valley, more frequent than anywhere else within the territory of former Yugoslavia. He pointed out that the Griffon Vulture was a casualty not only throughout the First World War, but also in the years after the war. Many unscrupulous hunters wanted to have a trophy of a taxidermically prepared specimen of Griffon Vulture. For example, within only one day at the Museum of Natural History in Skopje - where Dr. Karaman was a director - five specimens of Griffon Vulture and one specimen of Black Vulture were brought in by hunters wanting taxidermic preparation. All these specimens were killed while feeding on the carrion of a dead dog.

In the Treska River gorge at Matka, 40 specimens of Griffon Vulture were observed nesting. Another smaller colony was nesting on the vertical rocks where the River Pcinja flows into the Vardar River. During the day, birds from this colony were present primarily around the Katlanovo lake/marsh, looking for food.

Through the years, Karaman noticed a decline in the number of Griffon Vulture specimens, not only as a result of shooting by hunters, but also because of the collection of eggs and juveniles. Therefore, Dr. Karaman determined that this species could become endangered and suggested that protection measures be undertaken, such as a law for bird protection.

According to Karaman, the Black Vulture was rarely present in the Skopje valley in comparison to the Griffon Vulture. He reports that 2-3 pairs were nesting in the Treska River gorge at Matka, another several pairs on old tall trees in the Skopje plain, especially below the village Brazda, and at the base of Vodno Mountain.

Black Vultures were usually coming to carrion accompanied by Griffon Vultures, and also flying in the same flocks as the Griffon Vulture, but not more than 2-3 specimens at a time. Karaman never saw Black Vultures flying alone. He reports that the Black Vulture was more frequent and numerous in the Ovce Pole valley than in the Skopje valley, but not so numerous as the Griffon Vulture.

From a Black Vulture nest built on an old tall tree near the village Erdzelija in Ovce Pole (between Stip and Sveti Nikole), Karaman collected two eggs for the egg collection of the Macedonian Museum of Natural History.

The Egyptian Vulture, according the data of Karaman, is a migrant species in Macedonia. He investigated this species mostly in the Skopje valley. The Egyptian Vulture came into the Skopje valley in early Spring, especially around the Katlanovo lake/marsh, in search of food (carrion of dead animals), which the peasants from the surrounding villages were discarding. In Autumn, before migration, the Egyptian Vultures often gathered together in the meadows beside the former Ajvatovci lake/marsh (a component of the former large Katlanovo lake/marsh), below the

village of Ajvatovci. Karaman (1931b), in his paper concerning fishing activities within Katlanovo Lake, presents several historical photos of the lake taken before it was drained (Figs. 7-8).

Figure 7 – View of Katlanovo Lake (from Karaman, 1931b).

Figure 8 – Traditional method of harvesting of carp on Katlanovo Lake (from Karaman, 1931b).

Karaman reported that the Egyptian Vulture was nesting on the vertical rocks in the Treska River gorge at Matka, just over the Monastery Saint Nicolas. He also recorded a nesting pair of Egyptian Vultures in the rocks of the mountain Jakupica, at an elevation of 1900 m asl.

Dr. Nikola Nezlobinski, a medical doctor from Struga, started to investigate and collect bird specimens in the year 1924, mainly from the surroundings of Ohrid Lake and the neighbouring mountains. In 1936 he established the City Museum (Fig. 9), where he exhibited the taxidermically prepared specimens.

Figure 9 – Mementos of the dedication of the Museum to Dr. N. Nezlobinski.

Unfortunately, during the Second World War, the Museum was damaged by the Italian army. The inventory books as well as the written documentation were completely destroyed, although the bird collection was relatively well protected. After his death in 1942, his collaborators, Mr. G. Rudnev and Mr. M. Sulev, continued to enlarge the bird collection, which has reached 700 specimens including 7 vultures of all four species (Fig. 10).

Figure 10 – Current exhibits of vultures at the City Museum, Struga.

After the Second World War, the ornithologist from Belgrade (Serbia), Dr. Sergej Matvejev, scientifically reviewed the bird collections and published his results. Within these bird collections, all four species of vultures were present (Bearded Vulture - 1 specimen; Griffon Vulture - 1 specimens; Black Vulture - 2 specimens; Egyptian Vulture - 3 specimens).

On two occasions the British ornithologists Thorpe, Cotton and Holms visited Macedonia (late Summer, 1934, and early Autumn, 1935), and investigated the birds of Prespa and Ohrid Lakes, including Galicica Mountain which is situated between the two lakes. Thorpe (1936), published the results of this investigations, indicating the presence of 120 bird species. The vultures were not the main subjects of his study, however.

Ante Ilic (1942), as a passionate hunter, was also highly interested in investigating the birds. He was mainly collecting eggs from bird nests during the period between 1938 and 1941. He worked primarily in the marsh along the Crna River in Pelagonia and the mountains Pelister and Kajmakalan. He also visited numerous other localities such as Kriva Palanka, Veles, Krusevo, Skopje, Resen, Selecka Mountain, and the three natural lakes (Ohrid, Prespa and Dojran). Altogether he collected 1,119 already hatched eggs. He later donated this egg collection to the

Museums of Natural History in Belgrade, Zagreb and Bonn, as well as to private collectors like Makatsch, Henrici and Bautren, with whom he closely cooperated.

It is still unclear what happened to the manuscript that he prepared in the year 1942. However, Makatsch used most of his data for his exclusive monograph “Die Vogelwelt Mazedonicus” (Makasch, 1950). Concerning the vultures, in his manuscript Ilic (1942) reported the presence of the Bearded Vulture in Pelagonia and in the Pelister and Selacka Mountains, but he was not sure on which of these two mountains the Bearded Vulture was nesting. Exact nesting sites for the Bearded Vulture were noted at the localities Pletvar (on the rocks over the crossing Pletvar, on the Babuna mountain near Prilep) and Patiska Reka (rocks over the village Patiska Reka, on the Jakupica Mountain near Skopje).

In April 1939, Ilic reported about 10 nesting pairs of Griffon Vulture in the Babuna River gorge, near Veles. In March 1941, only three nests at this location were occupied by nesting birds. According to Ilic, the Egyptian Vulture was not frequent in the Pelagonia region. The closest nesting site for this species was on the southern side of Pelister Mountain. In May 1940, Ilic obtained a specimen of Egyptian Vulture from the village Bukovo. Therefore, he assumed that this bird was nesting somewhere on the mountain Selecka.

Dr. Wolfgang Makatsch, a Professor at the German High School in Thessalonica, Greece, is the key figure who was completely devoted to the investigation of birds in the Aegean part of Macedonia. In order to have a complete knowledge of the birds inhabiting the entire geographic territory of Macedonia, Makatsch undertook field trips to the most attractive bird sites within the Republic of Macedonia.

Veles-localities: In April 1938, he visited Macedonia for the first time. He later spent 10 days in the vicinity of Veles. On the hills of the left side of the Vardar River, he reported the presence of Griffon and Egyptian Vultures, but he was also astonished by the diversity and richness of bird species that were present in the flowered gardens along the Vardar River.

His next destination was the Babuna River gorge, where in the high vertical rocks on both sides of the river he heard an unimaginable richness of various birds and sounds, which surpassed all his expectations (Fig. 11). Over the gorge, a flock of 10 Griffon Vultures was flying, accompanied by several Egyptian Vultures. Other groups of Griffon and Egyptian Vultures were crowded on the sharp promontories of the rocks. The nests of the vultures were situated on the rocks where it was impossible to reach them without using a rope. During that visit, he also reported the presence of the Black Stork (*Ciconia nigra*), and a dozen other rare birds. Makatsch's third visit was made on the right bank of the Vardar over Veles, where a wide area of river deposits were luxuriously overgrown by willows and Tamarix. Everywhere could be heard the singing of nightingales, which were more frequent at this locality than in any other place Makatsch had visited. Everywhere was a magnificent view of birds on the trees in the meadows and along the Vardar River.

The fourth of Makatsch's field trips was again in the Babuna River gorge, where he spent several days. Using equipment, he succeeded in reaching one of the Griffon Vulture nests about 90 m over the river surface, where he found one juvenile bird. Before sunset, on the other side of the gorge, he counted 22 Griffon Vultures crowded together on a projecting rock. This experience overwhelmed him so much, that it stirred him to come again to this locality to continue his unusual monitoring.

Figure 11 – Two views of Babuna River gorge showing nesting sites (from Makatsch, 1950)

On his third visit to the Babuna River gorge, besides other birds, he reported that eight Griffon Vultures were flying in a circle over him and one Egyptian Vulture flew past closely to him. When he reached one of the nests, he saw 10 Griffon Vultures and four Egyptian Vultures in one flock flying in a circle over the gorge. At the same time, one Bearded Vulture and two Black Storks passed close to him. Makatsch spent two more days in the vicinity of Veles, delighted by the luxurious richness of the bird fauna.

Dojran Lake: At the end of May 1938, Prof. Makatsch came again to this part of Macedonia to visit Lake Dojran. On the road from Gevgelija to Dojran, he noticed an abundance of birds within the vineyards and mulberry orchards. The next day he climbed the hills on the western side of the Lake, then went down along the shore. Everywhere he saw multitudes of birds, including flocks of Pelicans, Cormorants, Sawbill Ducks (*Mergus albellus*), Black Kite (*Milvus migrans*), White-tailed Sea Eagle (*Haliaeetus albicila*), as well as many smaller birds and nests.

The third day he visited the northern marshy area of the Lake, where he noticed two Black Vultures and one Griffon Vulture eating carrion. Over the next few days, in the reed belt (*Phragmites* belt) he found a nest of a Mute Swan (*Cygnus olor*) with five eggs and suggested that this was the southernmost nesting site of Mute Swan in Europe.

When Makatsch was coming back from Dojran Lake, he stopped again at the Babuna River gorge, where he saw Griffon and Egyptian Vultures flying in a circle over the gorge. He visited again some Griffon Vulture nests and noticed that the juvenile birds were quite well grown. Young birds were also present in another two nests of Griffon Vultures that he had already visited before.

The marsh along the river Crna Reka: At the beginning of June 1938, Makatsch left Veles and went to Bitola. The day after his arrival he visited the Pelagonian marsh that was spread along both sides of the river Crna Reka (15 kilometers in length and 3.5 km wide – Fig. 12). He was amazed by the fascinating view of bird richness at this locality. He saw: Dalmatian Pelican (*Pelecanus crispus*), Grey Heron (*Ardea cinerea*), Purple Heron (*Ardea purpurea*), Squacco Heron (*Ardeola ralloides*), Eurasian Spoonbill (*Platalea leucorodia*), Redshank (*Tringa totanus*), Glossy Ibis (*Plegadis fasciellus*), Little Egret (*Egretta garzeta*), Black-crowned Night Heron (*Nycticorax nycticorax*), Lapwing (*Vanellus vanellus*), Black Tern (*Chlidonias niger*), large noisy flocks of Common Coot (*Fulica atra*), as well as Eurasian Bittern (*Botaurus stellaris*).

Figure 12 – The river, Crna Reka, near Bitola (from Makatsch, 1950)

On the evening of the same day, he met the local ornithologist, Mr. Ilic, in Bitola. They both found a joint interest in further cooperation. They spent the next few days together investigating the marsh birds. In the middle of June, they climbed up Pelister Mountain. At an elevation of 1,700 m they saw a Griffon Vulture and at 2,000 m a pair of Golden Eagles (*Aquila chrysaetos*) and a Bearded Vulture. After

departing from Bitola, Makatsch once again visited Veles and the previously mentioned localities.

In June 1939, Makatsch came again to Bitola and, together with Mr. Ilic, visited the marsh on the river Crna Reka. They also spent a few days on Pelister Mountain again.

During the Second World War (1944) he spent six days at locations near Skopje, but he did not give data concerning the results of this field trip in his previously mentioned monographical study (Makatsch, 1950).

Bodenstein was another German ornithologist who investigated during the Second World War (1943-1944). He visited localities along the Vardar River near Udovo, Demir Kapija and Skopje. According to Makatsch (1950), the only vulture data Bodenstein gives is for a pair of Black Vultures that were noticed near Gradsko. Bodenstein's papers, published after the war (Bodenstein & Kroyman, 1967), focused on other birds, but did not include vultures.

Investigations after the Second World War

The first ornithologist after the war period who worked on Macedonian ornithofauna was Dr. Sergej Matvejev from Belgrade. In 1946, he began a study of the bird specimens collected from Macedonia. He reviewed the bird collection of the Macedonian Museum of Natural History in Skopje (Matvejev, 1948), including four species of vultures. In 1950, he published list of species after having also reviewed the bird collection from City Museum in Struga, where all four species of vultures were also present. In June 1953, Matvejev investigated the birds on the Sar Planina mountain range, and in July travelled to Jakupica Mountain. In March 1954, he investigated in the vicinity of Dojran Lake and on Kozuf and Pelister Mountains on two different occasions.

During this two year investigation, Matvejev collected 113 bird specimens, 62 of which were deposited in the collection of the Zoological Department, Institute of Biology, Faculty of Natural Sciences, University of Skopje, and 51 specimens to the Institute of Ecology and Biogeography of the Serbian Academy of Science in Belgrade.

In addition to his investigations, he has collected 1,880 ornithological notes and published them in a joint paper with Dr. A. Dimovski. Dimovski & Matvejev (1955), gave a short history of the ornithological investigations previously completed in Macedonia, as well as long list of species. Altogether, 278 species were listed, 207 of which were classified as nesting birds, and the other 71 species as wintering and migratory birds. All four vulture species were classified in the category of nesting birds.

Goetz (1956) wanted to prepare photographic documentation of the Macedonian birds. At a meeting with Dr. Stanko Karaman, it was recommended that the best site for monitoring and taking photos of vultures in Macedonia was in the area of Demir Kapija. Dr. S. Karaman suggested that he use a dead horse as bait. All attempts by Goetz to find an appropriate horse in the local village to be used as carrion for the vultures were unsuccessful. Therefore they used sheep intestines, but the vultures did not take the bait. A solution was found accidentally, when they found the carcass of a large dead dog that had been thrown in the thick bushes near the Vardar River. They took the carcass from the bushes and threw it in the river. Eventually, the carcass was carried to shore. The vultures did not approach the carcass immediately, but rather a crow made the first approach. Very soon after the crow, two

Griffon Vultures approached the carcass, then 12 other Griffon Vultures and one Egyptian Vulture arrived. When a Black Vulture advanced, all the other vultures withdrew and waited until the Black Vulture finished with its meal. Then all 14 Griffon Vultures pushed each other and fought about where to feed on the carcass. The Egyptian Vulture did not dare approach the group, but rather waited on the side for small pieces of food. After two hours, nothing was left of the carcass and the vultures flew away.

Dimovski (1957) published a survey of the distribution of birds on the Osogovski Mountains. Concerning vultures, he reported only one note for the Griffon Vulture on the highest peak of the mountain (Ruen, 2,150 m), while the Egyptian Vulture was found more frequently on the rocky terrain. Egyptian Vultures were usually spotted flying in pairs, rarely individually.

Hughes & Sumerfield (1959), within their long list of bird species that were studied on their trip through Yugoslavia, reported only Griffon and Egyptian Vultures, both from the locality of Babuna River gorge, near Veles.

Micholitsch (1959), after his arrival in Macedonia in 1956, visited Dr. Stanko Karaman in Skopje. From Karaman he learned that in the winter of 1955/56, in the area of Babuna River gorge, 30-40 mostly Griffon Vultures were poisoned by bait set for wolves. Because of this, Karaman suggested to Micholitsch that it was better to visit Demir Kapija gorge, because he had noticed nesting Griffon and Egyptian Vultures on an earlier visit to the area. Despite Karaman's suggestions, Micholitsch visited the Babuna River gorge, then continued on to the marsh on the river Crna Reka. During the course of a few days, he collected data on 55 bird species, including two species of vultures. The first day in the Babuna River gorge, he noticed two Egyptian Vultures and five Griffon Vultures that were flying over the gorge the whole day, and sometimes descending to only 20 m above him. He noticed the same birds during the next two days. On the fourth day he travelled to the Pelagonia region, to the marshes of the river, Crna Reka, near the village of Karamani. There from a distance he saw 15 unusual birds, most of them white but a few brown. The birds were resting on the dried shore of the marsh. When Micholitsch came closer, he determined that these birds were Egyptian Vultures, white adults and brown sub-adults. When he approached to a distance of 30 m, the birds just moved back. When he came even closer, the birds flew away in an easterly direction.

Benson et al. (1962) published a list of the birds of Yugoslavia on the basis of studies made in 1959/60. They reported that two pairs of Egyptian Vultures were seen in the Babuna River gorge, and one pair between Veles and Bitola. Of the Griffon Vultures, they reported 12 specimens in the Babuna River gorge and another several specimens near Skopje, without giving any further details.

Geroudet (1967) focused on special monitoring of the Long-legged Buzzard (*Buteo rufinus*) in the Demir Kapija gorge in July 1963. During that time, he reported numerous specimens of Griffon Vulture and one specimen of Black Vulture.

Danko & Szilard (1971), came to Macedonia with the intention of preparing photographic documentation of the country's birds. They were mostly interested in vultures and other birds of prey, therefore they investigated rocky terrain exclusively, where they expected to find nesting sites. In the beginning of April 1969, they spent a week in the vicinity of Veles (in the Babuna and Topolka River gorges), then in the Pcinja River gorge (below Katlanovo), the Raec River gorge (Fig. 13), as well as along the Vardar River from Skopje to Gradsko. Altogether, they found four nests of Egyptian Vultures, but all without eggs. The first nest was on the vertical rocks over the Pcinja River, where one bird was nesting while the other flew around. The second

nest was on the rocks over the highway Skopje-Thessaloniki (before Veles). Around the nest they noticed a sheep skin and several bones. The third nest was in the Topolka River gorge, but it was impossible to reach for study. The fourth nest was found in the Babuna River gorge, with remnants of a hedgehog skin nearby, but still without eggs in the nest. In the Babuna River gorge, as well as in the Raec River gorge, they noticed many Egyptian Vultures, but did not succeed in finding their nests. They also did not find nests of Griffon Vultures, however Griffon Vultures were flying over them in all the previously mentioned localities. For example, in the lower part of Babuna River gorge, they saw five birds, then later another three, and in the upper part of Babuna River gorge they saw a total of 12 birds. In the Raec River gorge, they saw 10 Griffon Vultures and near their campsite on Babuna River they saw 20 Griffon Vultures on the carrion of a dead horse. They noticed two Black Vultures circling over the road at the village of Vinicani (before Gradsko). They made a photo of one of these birds in flight.

Figure 13 – Raec River gorge (BIOECO photograph, 2003)

Kratzer (1973), intrigued by the paper of Danko & Szilard (1971), decided to visit the rocky terrain around Veles, including the Topolka and Babuna River gorges. He spent four days there in August, where in the Topolka River gorge he noticed several white Egyptian Vultures. He reported that he saw four Griffon Vultures in the Babuna River gorge, another four specimens in the Topolka River gorge and five specimens flying over Veles. He noticed another Black Vulture flying very high over Veles, two more birds flying over the Babuna River gorge, and two in the Topolka River gorge. He was not able to give the exact number of Griffon and Black Vultures, because the birds were flying over an area, then disappearing and reappearing at various times.

Matvejev & Vasic (1973), in the Catalogue of Birds of Yugoslavia, reported the presence of the Bearded Vulture on the Karadzica and Sar Planina Mountains (Matvejev, 1953 in refs.), as well as in the area of Pletvar, near Prilep (Vasic, 1967 in refs.).

Geiger et al. (1974), attracted by the article of Danko & Szilard (1971), visited Macedonia in April 1973, focusing on the vultures in the Babuna and Topolka River gorges. While driving along the Vardar River (between Katlanovo and Veles), they noticed one Egyptian Vulture, then later two birds near the Demir Kapija gorge, and one bird on the hills near the village of Nov Dojran. Three birds were noticed in the Babuna River gorge, and one pair in the Topolka River gorge. One Black Vulture together with one Griffon Vulture, were seen flying at a high elevation in the area between Veles and Negotino. Another 11 Griffon Vultures were noticed flying over the hills of the gorge below Negotino. In the gorge itself (Demir Kapija), a pair of Griffon Vultures flew out from a nest and another three birds were circling over the nests.

Sterbetz (1980), passing through Macedonia on his way to Greece in early Summer 1976, gave a brief description of the birds. He mentioned one juvenile and four adult Griffon Vultures near Negotino.

In July 1980, Grubac (1983), gave a short report of his first monitoring study of a pair of Bearded Vultures. The birds were nesting on a sharp, unreachable vertical

rock (at an elevation of 2,100 m) in the high mountain region of northwestern Macedonia (probably Korab Mountain). Nearby on the steep rocky slope, a small colony of Griffon Vultures and a pair of Golden Eagles (*Aquila crysaetos*) were nesting. Below the rocks, the terrain was overgrown by thick coniferous forests of fir and spruce which were filled with many wild animals. Over a rocky, wide area of high mountain pastures, about 20,000 sheep were grazing throughout the summer months. The next year (1981), Grubac revisited the same area, but only one of the pair of Bearded Vultures was present - the other could not be located.

Because of a decline in the population, Marinkovic et al. (1985) undertook a wide investigation to ascertain the current status of the Griffon Vulture in former Yugoslavia. In the period between 1980-1982, they checked all nesting site areas previously published, especially those in Macedonia. They want to determine which nests were still active based on previous nesting records.

For a more complete census, they introduced an additional calculation for potential nests that are situated in unreachable places, based on the number of birds noticed in the air at places where the birds typically congregate. They reported the following results for Macedonia: On the transect from Kosovo through Skopje to the southern part of Macedonia - five colonies of Griffon Vultures were noted with 25 active nests from 27 existing pairs. They also pointed out several important reasons for the decline of the population and the extinction of the colonies at some nesting sites:

- Reduction in the number of wild and domestic animals - a potential food source for the vultures;
- Poisoning by strychnine, especially in the period of the 1950s-1960s;
- Robbing of eggs and juvenile birds from nests for trade purposes;
- Killing of adult birds for trade with private collectors.

Vasic et al. (1985), reporting on the current status of birds of prey in former Yugoslavia, gave special attention to those of Macedonia because harassment of the birds and destruction of habitat were most observed there. They started their own investigations in 1977. For the purposes of this report, only the data concerning the vultures of Macedonia were extracted.

It was feared that the nest of Bearded Vulture that Grubac (1980) was monitoring in north-western Macedonia was the last one. The next year it was not occupied, and only the female had been seen in the vicinity. However, in 1982, Grubac saw a pair of adult females and a sub-adult male at a distance of 1.2 km from the deserted nest. According to these authors, in the period between 1979-1982, the Bearded Vulture was seen in five other areas around Macedonia. In the past, nesting had been reported four different times (Makatsch, 1950; Matvejev & Vasic, 1973).

In 1980, 40 pairs of nesting Egyptian Vultures were found in Macedonia. These 40 included: two nesting pairs in the Topolka River gorge, three nesting pairs in the Babuna River gorge, three nesting pairs in the Demir Kapija gorge, one nesting pair in the lower Pcinja River gorge, one nesting pair in the Raec River gorge, and another three nesting pairs in two other localities. The nests in the vicinity of Veles and Demir Kapija were looted by organised foreign collectors.

Nesting sites of the Griffon Vulture were found in the following localities: two nesting pairs in the Topolka River gorge (in the period between 1973-1980), and 3-4 nesting pairs in the lower Babuna River gorge (in the period between 1973-1981). An additional 12 birds were seen flying together in the same area. In the Vardar River gorge (Demir Kapija), between 1973-1982, 15-20 pairs were nesting. Two nesting

pairs were found in the Treska River gorge (Matka) between 1979-1982. At least 30 nests were looted by well-organised foreign collectors during the years 1983-1985.

Concerning the Black Vulture, Vasic et al. (1985) reported that this bird was no longer nesting in the territory of Macedonia. They quoted from the reports of Kratzer (1973) and Geiger et al. (1974), but also from their own data of March and July 1980 and 1982 on three different localities in southern Macedonia. They believed that Kalaber (1970) overestimated his count of 22 Black Vultures seen in April 1970.

Grubac (1986) was monitoring a pair of Black Vultures that were nesting in a large cage at the Skopje Zoo. In the same cage were five captured Griffon Vultures, three pairs of Imperial Eagles (*Aquila heliaca*), and one White-tailed Sea Eagle (*Haliaeetus albicilla*). The pair of Black Vultures had already been together 5-6 years. The breeding season started in February and finished at the beginning of March. The female laid only one egg per year (reddish-brown with dark spots). The previous year, the egg was broken before it hatched, under unclear circumstances. The nest was built on the ground, using less diverse materials compared to nests in the wild. It was built of branches 40-70 cm in length and 2-3 cm in diameter. Even after removal of the egg, the female continued to sit on the nest and to attack everything that came close to the nest.

Trpkov (1987) gave a survey of the vultures in former Yugoslavia, including Macedonia, as a highly reduced and threatened bird species. Trpkov quoted the existing published data on their former distribution, as well as commenting on their current status and reasons for their threatened extinction. He had registered three Bearded Vultures near Negotino in 1981, another on the Stogovo Mountain in 1983, and one on the highlands of Vitacevo, near Kavadarci, in 1987. He also reported about a stuffed Bearded Vulture in the office of the Hunting Society in Prilep.

Trpkov recorded Egyptian Vultures along the Vardar River between Skopje and Demir Kapija in the period 1961-1987. He also reported them on Bogoslovec Hill in Ovce Pole - along the bank of the Bregalnica River - in 1969 and 1973, and also along the Pcinja River and highlands of Vitacevo in 1987. He did not give any new data concerning the Black Vulture or the Griffon Vulture.

Limbrunner (1988) made three visits to Macedonia, focusing on ornithological monitoring and photo documentation in areas along the Vardar River between Skopje and Veles, the Babuna River, as well as in Ovce Pole. Limbrunner reported the Egyptian Vulture as the most frequent bird of prey during all three years of his visits to Macedonia (1969, 1971, 1972). Each day of his investigation on the Babuna River (Fig. 14), he noticed 10 birds flying in a flock or resting on the rocks near a slaughterhouse in the area where the Babuna River flows into the Vardar River. In 1969, he found one very easily accessible nest of Egyptian Vultures in the Raec River gorge, where he discovered two eggs. In 1971, the same nest was no longer occupied. The nesting pair had moved to another nest 500 meters from the old one. Another nesting pair was registered on a high rock over the Katlanovo-Veles road. This was the same nest already discovered by Danko and Szilard in 1969 (Danko & Szilard, 1971). In 1972, this nesting pair was still present.

Figure 14 – Babuna River gorge (BIOECO photograph, ca. 1960s).

In May 1971, Limbrunner found another occupied nest in the same area with two eggs in it. The nest was constructed with a thick layer of sheep wool and pieces of paper, but also included pieces of tortoise shells. In 1972 this nest was destroyed and the building material used for another nest. In 1971, Limbrunner found an occupied nest in the Babuna river gorge. Also in 1971, he discovered a third Egyptian Vulture nest, but it was located on an unreachable recess in a vertical rock wall in the Babuna River gorge.

In 1972, Limbrunner and his team located an occupied nest in the rocks of the Topolka River gorge, situated on a vertical rock wall 50 m above the surface of the river. At first, only one bird was sighted in the nest; however, after a while a second bird landed in the nest with sheep wool in its bill. The eggs of Egyptian Vultures in Macedonia, according to Limbrunner, are highly pigmented compared with those from Turkey, which have a completely white colour.

Concerning the Griffon Vulture, Limbrunner reported that this species was less numerous than the Egyptian Vulture. In May 1971, he monitored 15 Griffon Vultures, which were flying in a flock at Ovce Pole, near the village of Kadrifakovo. At the end of May 1972, in the Topolka River gorge he noticed a Griffon Vulture nest (Figs. 15-16). He monitored the young nesting bird, already covered by feathers, for an entire hour. When he approached the nest to a distance of 6-8 meters, the nesting bird did not react. When he tried to come closer, the nesting bird started to screech, snarl, and bristle. Once it flew out of the nest, but remained very close and soon returned to the nest. The next day, Limbrunner's team noticed 10 Griffon Vultures flying in a flock over the gorge.

Figure 15 – Topolka River gorge (from Limbrunner, 1988).

Figure 16 – Griffon Vulture in Topolka River gorge (from Limbrunner, 1988).

The Black Vulture had been seen by Limbrunner on only one occasion in 1969, when one bird was spotted in a flock with 11 Griffon Vultures at Ovce Pole, near the village of Kadrifakovo (Fig. 17).

Figure 17 – Black Vulture flying over Ovce Pole (from Limbrunner, 1988)

Grubac (1989) in his short report on the distribution and biology of the Egyptian Vulture in former Yugoslavia, reported that this species is very rare except in Macedonia. In the period between 1980-1986, he studied the Egyptian Vulture in Macedonia. In his paper (1989), he gave data on distribution, habitats, prey, nesting and abundance, together with reasons for population decline and problems concerning its conservation. On a separate map, Grubac showed the main areas of distribution of the Egyptian Vulture. For southern Macedonia, he reported vultures in the area of the Crna Reka River, the Vardar River around the Demir Kapija gorge, the Bosava River, the Vitacevo highlands, Selecka Planina Mountain and the Mariovo district. For eastern Macedonia, he reported vultures in areas along the Bregalnica, Zletovica and Peinja Rivers and for north-western Macedonia, near the Treska River. (The information received for the Crn Drim River gorge in south-western Macedonia was only verbal.)

Altogether, Grubac counted 25 nesting pairs, with another eight pairs assumed to be nesting close to where he had seen the birds. Another 15-20 pairs that had been mentioned by other investigators were not checked. On one occasion he reported the presence of 51 specimens together in a group (45 adults and 6 sub-adults) on a trash pile in southern Macedonia (probably near Negotino). On the basis of this data, Grubac suggested that in the period between 1980 and 1986, about 60 nesting pairs of Egyptian Vultures were present in Macedonia. Regarding nesting sites, the birds exclusively choose unreachable cliffs and steep rocky terrain.

Concerning vertical distribution, the birds were seen at elevations from 100 to 2000 m. Their preference, however, was for dry areas below 1,000 m on rocky terrain with cliffs, gorges, and steep, high bluffs, but also in steppic dry lands and landscapes covered by sub-Mediterranean bushes and occasional forests. The main food of the Egyptian Vulture was the carrion of dead domestic and wild animals, birds, reptiles and amphibians.

The breeding season started immediately after the return of the birds from their wintering sites, near the end of March. The eggs (1-2) were laid in the beginning of April, and the young birds hatched in June. The juvenile birds, usually only one per nest, but very rarely two, started to fly in August. The autumn migration started in the first half of September. The main reasons for the population decline were the same as with other species of vultures: killing and nest robbing, and the reduction of nutrient resources in the devastated environment. Many difficulties concerning the conservation of the birds are connected with the lack of enforcement of wildlife laws.

Grubac (1990), in his scientific/popular study on the Bearded Vulture, included all hitherto published data, adding his own results of monitoring in Macedonia. The book is luxuriously illustrated with numerous colour photos of the birds and their nesting sites (Fig. 18). Grubac first lists the common names of the species and their area of distribution. He then gives a general description of the Euro-Asian subspecies, *Gypaetus barbatus aureus*, followed by a survey of the historical distribution of the species in Europe as well as the typical habitats, hunting areas and nesting sites.

Figure 18 – The last Bearded Vulture nest in Southern Macedonia (from Grubac, 1990).

Grubac (1990) gives very unusual data within his chapter entitled “Feeding Habits,” that 80% of the Bearded Vulture’s food consists of bones. As he noticed, the Bearded Vulture is the only bird of prey that eats bones. If a bone is too large to be swallowed, the vulture drops the bone from the air onto an especially chosen flat stone surface (called "koskarnik" in Macedonian), in order to break it into pieces. According to personal monitoring, this technique was mostly used to break tortoises. In the chapter on “Life History Characteristics” of this species, Grubac explains how the male and female become a pair, the wedding parade, breeding, building of the nest, care of the juveniles, and their behaviour before and after the first flight. In the conclusion of the book, Grubac gives suggestions for conservation activities for this unique, perfect flying organism.

Grubac (1991a), again focused on the biology and the status of the Bearded Vulture, reporting the results of his investigations made in the period 1980-1986. He repeated his studies of July 1980, concerning a nesting pair of Bearded Vultures in the high mountain cliffs of north-western Macedonia. One young bird hatched that year. The next year (1981), only the female was noticed near the nesting site. In 1982, in

the same locality, Grubac noticed a female and a sub-adult male close to the nesting site; however, the old nest was not occupied. In 1984, Grubac discovered another pair of nesting Bearded Vultures in rocky cliffs in southern Macedonia at a relatively low altitude (350-1,500 m msl). This nesting pair was the object of detailed monitoring. That year (1984), the nesting pair raised one juvenile bird. The next year (1985) in the early spring, the female was poisoned and the nest, probably the last one, became deserted.

Based on the monitoring of this nesting pair, Grubac gave very precise data on the biology and ecology of the Bearded Vulture in Macedonia. The nest was started in November and was completed by the end of December. Dry branches and sticks 1.7-2 cm in diameter and about 70 cm in length were used as building material. The nest was covered by a thick layer of sheep wool. Eggs were laid at the end of January in southern Macedonia and in February in north-western Macedonia. The eggs were oval shaped, usually reddish-brown with dark spots, though sometimes with varying colours, even in the same clutch. During the incubation period both sexes sat on the nest, exchanging places only once per day. For the first six weeks after hatching, one of the parents was always in the nest. Later, the parents came only 1-2 times per day to feed the juveniles. Up to the age of 13 weeks, the parents tore pieces of prey and gave the food to the juveniles beak to beak.

Grubac (1991b) again reported on the status of the vultures in Macedonia, using data from other authors and collaborators, as well as his own data collected in the period 1980-1989. For this period, he reported on the presence of all four vulture species as follows:

1. The population of the Egyptian Vulture was represented by 47 directly counted nesting pairs, and another 13-23 pairs assumed to be nesting within the territory of Macedonia or, altogether, about 60-70 nesting pairs. Therefore, his assessment concerning the threatened status was that the population was fluctuating in a predictable manner. The nesting sites were restricted to cliffs and unapproachable vertical rocky terrain, at elevations between 200 and 1,250 m msl.

2. Grubac's assessment on the status of the Bearded Vulture was that the population was reduced to 1-2 nesting pairs, concluding that the species was critically endangered and in danger of extinction.

3. The Griffon Vulture was nesting in four localities. Represented by 25 directly counted nesting pairs, Grubac assumed that the total number of nesting pairs could be as many as 35-40. His assessment concerning the threatened status was that the species was endangered.

4. The Black Vulture was represented by 1-2 nesting pairs and a few solitary specimens. He also reported on the presence of two deserted nests built on old tall trees of *Juniperus excelsa* (Grecian Juniper) and *Pinus nigra* (Black Pine).

Micevski (1994) investigating the birds of the high mountain area of Shar Planina Mountain reported 25 specimens of Griffon Vultures, without giving further details.

Grubac (1997) once again made a survey on the status of the vultures in the area of the Central Balkans, focusing on the populations in Macedonia. In this paper, Grubac cites the records of Makatsch (1950), Micholitsch (1959), Terrase & Terrase (1961), Kalaber (1970), Danko & Szilard (1971) and Limbrunner (1988), as well as his own results of investigations made during the years 1980-1992.

Concerning the Egyptian Vulture, Grubac estimated that there were over 100 nesting pairs in the territory of Macedonia, 75 of which he personally counted. The nesting sites were restricted to the rocky terrain of central and southern Macedonia. In

1992, however, 60-70 specimens were poisoned at a rubbish dump near Negotino. Therefore, the population had been significantly reduced.

The Bearded Vulture, in the period 1980-1986, was represented by three nesting pairs (Grubac, 1991a; 1991b). One pair was nesting in north-western Macedonia until 1981, at which time the male disappeared, the nest was deserted, and only the female was left. Another nesting pair had been discovered by Grubac in 1984 in the Crna River gorge, southern Macedonia. However, in 1985, the female was poisoned. Grubac brought the poisoned bird to the Skopje Zoo for medical treatment, but the treatment was unsuccessful. After the bird died, it was stuffed and displayed in the Macedonian Museum of Natural History. The male was noticed near the nesting site until Autumn, 1986. This pair had been monitored in detail by the author.

The third nesting pair was recorded near the border with Greece. Grubac was informed by his collaborators that a flying pair of Bearded Vultures in the Mariovo Region (during the period 1989-1991), and another flying pair in April 1997 (near Demir Kapija gorge) were noticed.

By 1991, the population of Griffon Vultures had been reduced to 26-38 pairs which were divided into five small nesting colonies. A flock of 49 non-nesting birds was often recorded in the area of Korab and Shar Planina Mountains.

The last record for the Black Vulture (1 or 2 specimens) comes from October 1996 in the Crna River gorge, without any mention of a nesting site.

Grubac (1998), at a 1993 international symposium in Greece, reported on Black Vultures in the Republic of Macedonia. Even though the paper was published in 1998, the period in which the data were collected was also 1980-1991 (the same period as the previous paper). In this paper, Grubac gives more data about Black Vulture distribution and presents a distribution map with historical and current data (Fig. 19).

In order to be able to proclaim two areas as Strictly Protected reserves, the Macedonian Ministry of Environment and Physical Planning, under the leadership of Mr. Dimitar Rolevski, conducted two investigation projects on birds of prey. Investigations under the first project were conducted during the period 1984-1992 in the Crna River gorge. The results indicated that, of the 34 species of birds of prey known from Macedonia, 23 species are present in the area of Crna River gorge (17 of which are nesting there). As a consequence of this richness of bird of prey diversity, taken together with the local edaphic factors, in 1977 the Crna River gorge was proclaimed as a "Strictly Protected Reserve" under the name "Tikveshko Ezero."

Regarding the vultures, their status in the year the reserve was proclaimed (1977) was as follows:

- Griffon vulture – 12 nesting pairs + 5 juveniles;
- Egyptian vulture – 6 nesting pairs;
- Bearded vulture – 1 flying bird noticed;
- Black vulture – 1 flying bird noticed

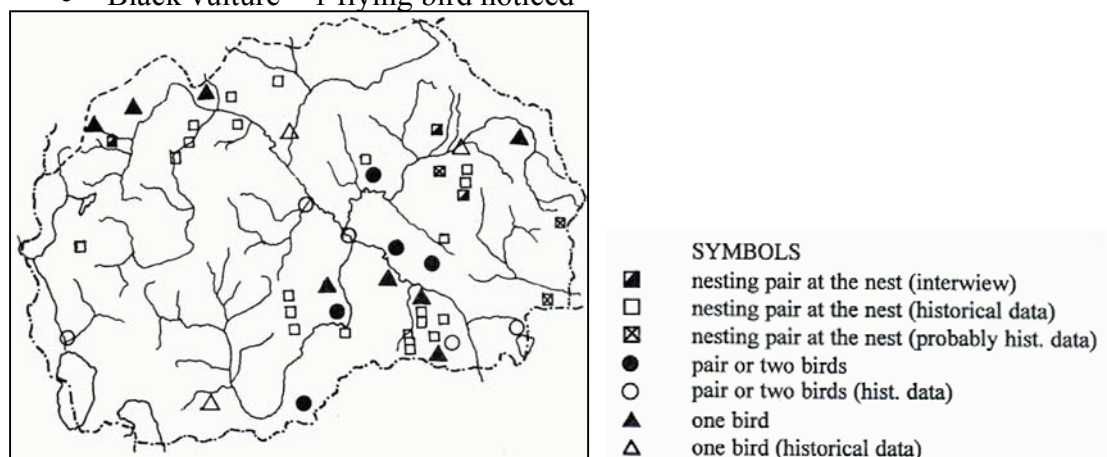


Figure 19 – Black Vulture distribution in Macedonia (from Grubac, 1998).

Investigations within the auspices of the second project were conducted during the period 2000-2003, in the Vardar River gorge at “Demir Kapija” and vicinity. Besides the other birds of prey, the current situation with the vultures is the following:

- Griffon Vulture – 38 specimens, including juveniles;
- Egyptian Vulture – 2 pairs nesting in the gorge, another 4 pairs in the wider vicinity;
- Bearded Vulture – 1 flying bird noticed;
- Black Vulture – 1 flying bird noticed

In the year 2003, the Demir Kapija gorge should be named as a “Strictly Protected Reserve,” even though hitherto it had lower level of protection.

Figure 20 – Traditional method of sheep herding practiced extensively until the Second World War. It provided a ready source of food for vultures (BIOECO photograph).

Conclusions

In accordance with recorded data on the historical distribution of vultures in Macedonia, we can conclude that in the past, all four species (Bearded Vulture, Black Vulture, Griffon Vulture and Egyptian Vulture) were widely distributed within the Republic of Macedonia, with a high frequency and abundance. All four vulture species nest in Macedonia, but the Egyptian Vulture is only a Summer resident.

Nesting sites were concentrated on unapproachable mountain cliffs and vertical rocks, as well as in river gorges. Vultures fly around in neighbouring areas, often far from the nesting site, while searching for food.

The most often inhabited localities were the gorges on the Vardar River and its tributaries. In the northern part of the country, these areas include the Treska River gorge "Matka" near Skopje, the upper and lower Pcinja River gorge and the vertical rock cliffs along the river Vardar between Skopje and Veles.

In the central part of the country, the most important nesting sites are the Topolka River gorge as well as the upper and lower Babuna River gorges. More southerly nesting sites were recorded on the vertical rock cliffs of the Bregalnica River in its lower reaches and in the Raec River gorge.

In southern Macedonia, the most famous nesting sites are the Vardar River gorge "Demir Kapija" and the Crna River gorge, especially the vertical rock cliffs on the upper reaches of the artificial lake, “Tikvesko Ezero.”

From the literature, nesting sites were recorded on the vertical rock cliffs in the mountain zone of the Babuna Mountain near Prilep, on the mountainous rocky terrain along the Patiska River at Karadzica Mountain near Skopje, along the upper flow of the Treska River in the vicinity of Makedonski Brod and the high mountain rocky terrain of Shar Planina and Korab Mountains.

The last nesting sites of the Bearded Vulture were recorded in the high mountain rock cliffs of Korab Mountain in northwest Macedonia (1981) and in the Crna River gorge (1985). Within the last few years, only solitary specimens have been recorded.

In the past, the Griffon Vulture was seen very frequently, even in the Skopje valley. It was nesting in the Treska River gorge "Matka" near Skopje as well as in the Pcinja River gorge in the region of Katlanovo. In the Topolka, Babuna, Raec and Crna River gorges, the Griffon Vulture is still nesting with highly reduced

populations. The critical period for their survival is the winter months, due to a lack of food.

Frequently, a large number of individuals become indirect victims as a result of wolf poisoning activities, or by poisoning from material in rubbish dumps, especially the one near Negotino. Cases of egg stealing have also been frequently recorded.

The Egyptian Vulture was formerly the most common vulture in Macedonia, at all described nesting sites. Until recently, it was estimated that the Macedonian populations of this vulture were stabilized. But the process of decline within the last 10 years has continued.

The Black Vulture, that colossus of a bird, has been not been seen to nest here for years. In contrast to the other three vulture species, the Black Vulture preferred to built nests in old tall trees, mostly elms, that were formerly very frequent, especially in the Skopje and Kumanovo valleys as well as in Ovce Pole. (The elm has been attacked by a virus within the last few decades and is now almost completely extinct.)

Notwithstanding the fact that the Black Vulture had the highest abundance in Ovce Pole, it was never as numerous as the Griffon Vulture. Usually, the Black Vulture was flying in the same flocks as the Griffon Vulture. Occasionally, Black Vultures nested within the rocks of river gorges, but these sites were rarely recorded. In the last decade, only solitary birds have been recorded. The last Black Vulture nest was built in the Skopje Zoo, but eggs were not successfully hatched.

The main reasons for the decline of vultures in Macedonia were large drainage projects which resulted in the desiccation of swamps and marshes, an increase in hunting activities, a proclamation that birds of prey were “harmful game,” indirect poisoning of vultures as a result of the broad program for wolf control and nest robbery.

Other factors include the reduction of stocks of meat cattle, sheep and goats, the transition from extensive cattle grazing to intensive farm cattle production, as well as general impacts on the environment. All these activities had strong negative repercussions on the status of biodiversity as a whole, and especially on the vultures. Consequently, the Bearded and the Black Vulture are probably no longer nesting within Macedonia, and the prognosis for the other two species will probably be the same.

This study was undertaken within the framework of the Action Plan for the Conservation, Recovery and Reintroduction of Vultures on the Balkan Peninsula and Adjacent Areas.

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