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QUATERNARY HISTORY OF VULTURES IN BULGARIA – FOSSIL AND SUBFOSSIL RECORDS

Kvartarna povijest strvinara u Bugarskoj – fosilni i subfosilni nalazi

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ABSTRACT

Based on their bone remains, four species of vultures have been identified in Bulgaria so far, one of which, *Gyps bochenskii*, has a preglacial distribution and is extinct. Of the remaining three recent species, Cinereous Vulture *Aegypius monachus* has the most ancient distribution (from about 1.6 Ma ago). In general, vultures in Bulgaria were distributed from Gelasian to Meghalayan. Except for the site of *G. bochenskii*, the sites of all other vultures represent inhabited caves or ancient and medieval settlements in Bulgaria. The most widespread is the Griffon Vulture *Gyps fulvus*, followed by the Bearded Vulture *Gypaetus barbatus*. Analysis of the bone finds shows no traces of processing with a view to any specific use. Most of the deposits are located in the foothills and semi-mountainous regions of the country with an altitude of 92 to 544 m.

Key words: Accipitrid vultures, subfossil birds, ornithoarchaeology, Quaternary fauna, birds of Balkans, rare birds

INTRODUCTION

Accipitrid vultures always had a specific role in natural ecosystems as utilizers and neutralizers of carcass remains of large animals, mainly mammals and birds. In Europe and the Balkans in general, they are postglacial settlers, although in the Pleistocene interstadials they also spread northward. We can consider the vultures (both Aegypinae and Gypaetinae) of the Palearctic as Tertiary relics (Mlíkovský 1998, Mayr 2017). This feature makes them particularly important for study and conservation in modern natural habitats in Europe, where

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today all four species of vultures: Cinereous Vulture *Aegypius monachus*, Griffon Vulture *Gyps fulvus*, Bearded Vulture *Gypaetus barbatus*, and Egyptian Vulture *Neophron percnopterus* are highly endangered and have long since disappeared in large parts of their former (Early Holocene) range (Birdlife International 2015, Boev & Michev 1981). Therefore, any information about their past distribution is essential for their recovery and resettlement.

Traditionally, the first two species belong to the subfamily Aegypiinae Sclater, W. L., 1924, and the last two are referred to the subfamily Gypaetinae Vieillot, 1816. Such division is also confirmed by more recent research (Seibold & Helbig 1995).

The four European species were widespread on the territory of Bulgaria until the 1940s, when in only about two decades three of the four species rapidly disappeared, and the fourth, Egyptian Vulture, survived in greatly reduced numbers (Boev 1965, 1985, Boev & Michev 1981, 1982, Michev 1985a, b, c).

In the last decade, several NGOs in the country have been successfully working on the artificial breeding and release into the wild of vultures of all four species. Dozens of birds have already been released and there is successful nesting in the areas of their reintroduction (Stoynov *et al.* 2017, Parvanov *et al.* 2018, Stoynov 2018, Arkumarev *et al*. 2020, 2022, Ivanov *et al*. 2022, Peshev *et al.* 2016, 2022).

MATERIAL AND METHODS

In the present study, an attempt was made to collect all available literature data on fossil and subfossil finds of vultures in order to trace their former distribution throughout the country. Data were collected on 4 vulture species (three recent and one extinct).

The chronostratigraphy follows Cohen et al. (2013; Mya): Gelasian (GE) 2.588-1.800 (covering parts of the former Late Pliocene – Early Pleistocene); Calabrian (CA) 1.800-0.774 (Early Pleistocene); Chibanian (CH) 0.770-0.129 (Middle Pleistocene); Late Pleistocene (UP) 0.129-0.0117 (Late Pleistocene); Greenlandian (GR) 0.0117-0.0082 (Early Holocene); Northgrippian (NO) 0.0082-0.0042 (Middle Holocene); and Meghalayan (ME) 0.0042-0.0001 (Late Holocene). In most cases, altitude data is provided for the nearest present-day settlement in regard to the archaeological site location. All sites were inhabited by humans or were settlements. Only remains of *Gyps bochenskii* were found in deposits of non-anthropogenic origin.

All vulture bones (and bone fragments) found were carefully examined for any unnatural changes (damages) to the bone surface. As a result, no traces of cutting, gnawing or chewing by animals, and no cutting or piercing of bones were found. The only exception was a diaphyseal fragment of an ulna, which had a circular opening (with an irregularly shaped break) that could not be definitively attributed to human activity. Taxonomy follows del Hoyo (2020).

RESULTS AND DISCUSSION

Chronostratigraphic distribution

The collected and summarized data on the four species (Table 1) of vultures proved their occurrence in Bulgarian lands as follows: Cinereous Vulture (Fig. 1) - Calabrian to Meghalayan (Early Pleistocene to Late Holocene); Bearded Vulture - Greenlandian to Meghalayan (Early to Late Holocene); Griffon Vulture (Fig. 1) - Northgrippian to Meghalayan (Middle to Late Holocene); *G. bochenskii* (Fig. 2) - Gelasian (Late Pliocene to Early Pleistocene).

G. bochenskii is the only species with a preglacial distribution, whose age is about 2.25 Ma (Boev 2016a). It is the oldest vulture in Bulgaria. The species is extinct and was described based on materials from a destroyed former cave in NW Bulgaria. The remaining three species of vultures were established based on Holocene finds, except for the early Pleistocene remains of the Cinereous Vulture in Temnata Dupka Cave (Table 1). The find of the Griffon Vulture from the Arkata Rock Shelter has practically not been precisely dated by archaeologists, but judging by its appearance it is very likely that it is also of Holocene age. Considerations: a smooth and clean surface without any decals and fresh and clean marks on the surfaces of the fracture sites of the bone, as well as the modern occupation of this area by Griffon vultures and the using the niche by the birds.

Table 1. Localities of fossil/subfossil bone remains of vultures in Bulgaria (ref. to Fig. 3)
Tablica 1. *Lokaliteti fosilnih i subfosilnih nalaza supova u Bugarskoj (ref. za sliku 3)*

No	Locality	Province	Altitude (m)	Age	References
Gyps bochenskii Boev, 2010					
1.	Varshets	Montana	323	Early Pleistocene	Boev (2010, 2016a)
Gyps fulvus (Hablizl, 1783)					
2.	Arkata Rock Shelter	Kardzhali	402	Late Pleistocene (Palaeolithic, 120,000 – 10,000 BP)	Ivanova *et al.* (2010)
3.	Chavdarova Cheshma	Haskovo	80	Northgrippian (Late Neolithic, 4900 – 4850 BC)	Boev (2017)
4.	Bagachina	Montana	400	Meghalayan (Late Iron Age, 8 c. BC)	Boev (1996, 1999)
5.	Kabile	Yambol	129	Meghalayan (Antiquity, 1st millennium BC-6 c. AD)	Boev, Ribarov (1993)
6.	Ratiaria	Vidin	43	Meghalayan (Antiquity, 2 – 4 c. AD)	Iliev *et al.* (1993)
7.	Forum Serdica	Sofia City	544	Meghalayan (Antiquity, 2 – 4 c. AD)	Boev (2018)
8.	Northern Wall Serdica	Sofia City	544	Meghalayan (Antiquity, 3 – 6 c. AD)	Boev (2020)
9.	Veliki Preslav	Shumen	92	Meghalayan (Medieval, 9 – 10 c. AD)	Boev & Iliev (1991)
10.	Hisarlaka	Sliven	243	Meghalayan (Medieval, 10 – 12 AD)	Boev (1999)
Aegypius monachus (Linnaeus, 1766)					
11.	Temnata Dupka Cave	Lovech	200	Calabrian (Early Pleistocene, 1.6 Mya)	Boev (1994)
12.	Forum Serdica	Sofia City	544	Meghalayan (Antiquity, 2 – 4 c. AD)	Boev (2016b)
Gypaetus barbatus (Linnaeus, 1758)					
13.	Kazanlak	Stara Zagora	407	Northgrippian (Early-Middle Neolithic, 8000 – 7000 BC)	Kovachev (1988); Boev (1993)
14.	Hotnitsa	Veliko Tarnovo	101	Northgrippian (Late Chalcolithic, 5000 BC)	Boev (2009)
15.	Nicopolis-ad-Istrum	Veliko Tarnovo	135	Meghalayan (Antiquity, 2 – 6 c AD)	Boev (1991), Boev, Beech (2007)
16.	Pliska	Shumen	145	Meghalayan (Medieval, 9 – 10 c. AD)	Boev (1999), Ninov (1991)

Figure 1. Ulna sin. of *A. monachus*, NMNHS 17 223 – medial view (bellow), radius dex. of *G. fulvus*, NMNHS 17 224 – medial view (above) from Forum Serdica (Sofia City). Photo: Z. Boev.

Slika. 1. *Lijeva ulna A. monachus, NMNHS 17 223 – medijalno (ispod), desni radijus G. fulvus, NMNHS 17 224 – medijalno (iznad), Forum Serdica (Sofia). Foto: Z. Boev.*

Fig. 2. Reconstruction of the Zygmunt Bochenski's vulture *Gyps bochenskii* Boev, 2010. Drawing: Zlatozar Z. Boev

Slika 2. *Rekonstrukcija supa Gyps bochenskii Boev, 2010. Ilustracija: Zlatozar Z. Boev*

Geographic distribution

Bone remains of vultures have been found in a total of 15 archaeological sites (Fig. 3). Only in one site (Forum Serdica, Sofia City) were found the remains of two vulture species (No. 7 and 12, Table 1) that inhabited the surroundings of the ancient city at the same time. In all the others, finds of only one species were found. Most (11 out of a total of 16) deposits are located in mountainous areas and half of the sites are located in Northern Bulgaria. This could be explained by the fact that most of the half of the territory of Northern Bulgaria is occupied by the Pre-Balkan (and other small mountains) – the largest karst region of Bulgaria and second largest in the Balkans, stretching from west to east all the way to the Black Sea. In the Pre-Balkan are also located the largest rock massifs, caves, and chasms, which are preferred nesting and roosting habitats for vultures. The karst regions in southern Bulgaria (except for the so-called Rhodope Karst) have a significantly more limited area. Griffon Vulture was recorded in more than half (9 out of 16) of the sites, followed by Bearded Vulture (four sites), Cinereous Vulture (two sites), and Bochenski's vulture (one site). Even today, the genus *Gyps* Savigny, 1809 is the most successful genus among vultures, represented by 8 species in the recent world avifauna (del Hoyo 2020).

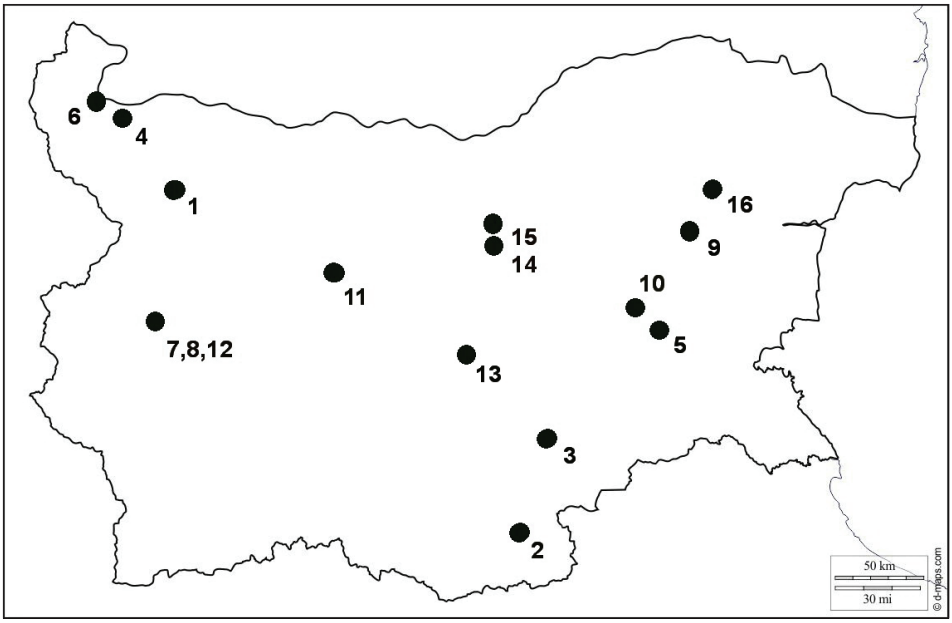

Fig. 3. Location of the palaeontological (1) and archaeological (2-16) sites where bone remains of vultures have been found in Bulgaria. The numbering follows that in Table. 1.

Slika 3. *Položaj paleontoloških (1) i arheoloških (2-16) lokaliteta na kojima su pronađene kosti supova u Bugasrkoj. Brojevi lokaliteta prate popis u Tablici 1.*

Altitudinal distribution

All deposits are located in semi-mountainous areas with an altitude of 92 to 544 m.a.s.l. Almost half of them are above 300 m.a.s.l. This picture does not correspond to the natural altitudinal distribution of vultures. It is skewed due to the fact that human-inhabited settlements were considered, which were conveniently located in low-lying areas. In search of food, vultures move 50 km or more from their nests or roosting places. This is another reason why we should not take this distribution of their altitudinal distribution as representative.

Taphonomic analysis

In the presented localities, the fieldwork (archaeological/palaeontological excavations on the ground) was carried out by a number of specialists for more than 40 years. In most cases, the osteological material was delivered by them to the laboratory after the excavations were completed. Often these were rescue archaeological excavations carried out in a very short time frame (for example, sites Chavdarova Cheshma, Forum Serdica, Northern Wall Serdica, Hotnitsa; Table 1). In other cases (sites Arkata Rock Shelter, Bagachina, Kabile, Ratiaria, Veliki Preslav, Kazanlak; Table 1) archaeologists did not provide information on the taphonomy of the collected animal bones. In site Varshets the materials were accumulated by natural agents, in this case by surface water runoff, which carried the remains into a former rock niche in a ruined Plio-Pleistocene cave. Sites Kabile, Ratiaria, Forum Serdica, Northern Wall Serdica, Veliki Preslav, Hisarlaka, Nicopolis-ad-Istrum and Pliska are ancient and medieval cities and the remains of vultures were found in the so-called "garbage pits" outside their fortress walls. In these cases, it concerns birds caught from the surroundings of these settlements. Site Temnata Dupka Cave is a large cave inhabited during the Palaeolithic. The remains were collected from the accumulated so-called "kitchen waste". In conclusion, it can be summarized that a targeted taphonomic analysis of the materials from these deposits has not been carried out. Their dating is according to the data provided by archaeologists.

Utilitarian aspects

One of the widespread uses of vultures is to make stabilizers for hunting arrows from their contour (primary and secondary flight and tail) feathers. This explains the relatively frequent presence of bone remains of the Bearded Vulture and especially the Griffon Vulture among the archaeozoological finds. The large size of these birds, as well as the many eagles, and their large feathers, make them particularly valuable for making hunting arrows and various types of ornaments (Clark 1948, Prummel 1987, Mannermaa 2003). Conversely, the most numerous of the vultures in Europe to the present day, the Egyptian Vulture, has

not been found in Bulgaria in any settlement, both from antiquity and the Middle Ages, despite its stable and high numbers compared to the other vultures. This could be explained by its relatively smaller feathers, which is why the Egyptian Vulture was not of much interest to hunters in this regard. In prehistoric times in Italy, the large flight feathers of large birds of prey were used also for ritual purposes. On the humerus and ulna bones of *G. barbatus* and *A. monachus*, cut marks were found, proving the purposeful removal of flight feathers from the wings of captured specimens (Peresani *et al.* 2011).

According to finds from Germany (Hohle Fels), a musical instrument (flute) was made from the ulna of *G. fulvus* of Late Palaeolithic (ca. 35,000 BP) (Conard *et al*. 2009). A fragment of an ulna of *G. fulvus*, possibly of Holocene age, from the Arkaka rock shelter in the Eastern Rhodopes has an odd circular opening (Fig. 4), but no purposeful processing can be assumed. It turns out that at the opposite end of Europe in the Iberian Peninsula (in Portugal and Spain) the making of wind musical instruments from the long bones of vulture wings was widespread (Moreno-Garcia et al., 2004). Similar artifacts have not been found in Bulgaria. According to some information in "Bolov Kamak" locality near the town of Belogradchik (NW Bulgaria), killed Egyptian vultures were placed, hung on stakes, to drive away the birds that feed on grape grains in the vineyards: Common Starlings, Eurasian Jackdaws, Eurasian Blackbirds, etc. (Krastev 1976). The last two aspects of the "utilization" of vultures seem rather unusual and of limited possible interest in the past. However, this does not exclude other, so far unknown, aspects of the use of the body parts of these birds in people's lives in the distant past.

Figure 4. Ulna dex. shaft of *G. fulvus*. Arkata Rock Shelter (SE Bulgaria). Photo: Z. Boev.

Slika 4. *Desna ulna, dijagiza G. fulvus. Arkata Rock Shelter (JI Bugarska). Foto: Z. Boev.*

Conclusions

Based on their bone remains, four species of vultures have been identified in Bulgaria so far, one of which (*G. bochenskii*) has a preglacial distribution and is extinct. Of the remaining three recent species, *A. monachus* has the most ancient distribution (from about 1.6 Ma ago). In general, representatives of the group in Bulgaria were distributed from Gelasian to Meghalayan. Except for the site of *G. bochenskii*, the sites of all other vultures represent either primitive man's (Palaeolithic) sites or ancient (from Antiquity) and medieval settlements in Bulgaria. The most widespread is *G. fulvus*, followed by *G. barbatus*. Analysis of the bone finds shows no traces of processing with a view to any specific use. Most of the deposits are located in the foothills and semi-mountainous regions of the country with an altitude of 92 to 544 m.

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SAŽETAK

Ovaj rad predstavlja prvi pokušaj sažimanja svih podataka o rasprostranjenosti strvinara u prošlosti u Bugarskoj. Podaci su prikupljeni za četiri vrste, od kojih je jedna - *Gyps bochenskii* fosilna. Recentne vrste (bjeloglavi sup *Gyps fulvus*, sup starješina *Aegypius monachus* i kostoberina *Gypaetus barbatus*) poznate su s ukupno 15 lokaliteta u zemlji. Sve su kvartarne starosti, a najstarija je iz ranog pleistocena, datirana prije 1,6 milijuna godina. Sva istražena nalazišta (osim fosilne vrste) predstavljaju nekadašnja ljudska staništa (špilje) ili antička i srednjovjekovna naselja. Svi su u rasponu od 92-544 m.n.m. Na kostima nisu pronađeni tragovi obrade.