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Past distribution of *Castor fiber* in Bulgaria: fossil, subfossil and historical records (Rodentia: Castoridae)

Минало разпространение на евроазиатския бобър (*Castor fiber*) в България: фосилни, субфосилни и исторически сведения (Rodentia: Castoridae)

Zlatozar BOEV & Nikolai SPASSOV

National Museum of Natural History, Bulgarian Academy of Sciences, 1, Blvd. Tsar Osvoboditel, 1000 Sofia, Bulgaria; boev@nmnhs.com, zlatozarboev@gmail.com, nspassov@nmnhs.com

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Abstract. The paper summarizes numerous scattered data on the former distribution of the Eurasian beaver in Bulgaria, many of them unpublished till now. Data on fossil, subfossil and subrecent records (Late Pleistocene to 19th century AD) from 43 localities situated in 19 of the total of 28 provinces, and 209 bone/teeth finds of at least 11 skeletal elements are presented. Geographical, altitudinal and chronological distribution as well as the representation of particular rivers and skeleton elements is presented and analyzed. About 56 percent of the sites were situated between 100 and 300 m. a. s. l. Five sites revealed Paleolithic occurrence, 20 Neolithic, 12 Chalcolithic, six Bronze Age, two Iron Age. The six subrecent sites are dated to the last 2000 years. The species distribution declined about and after the turn of BC/AD. The 43 localities were situated along 28 Bulgarian rivers. All finds are related to lowland areas and lower courses of the rivers. Evidence for the last record in the country is dated 1750–1850 AD.

Key words. Extinct mammals, Balkan fauna, human-caused local extinctions, large rodents, mammal collections, changes in fauna.

INTRODUCTION

The Eurasian beaver (*Castor fiber* Linnaeus, 1758) was for a long time believed to have become extinct in Bulgaria in the early 17th century AD (Boev 1958). Peshev et al. (2004) summarized that most of the beaver localities represent former human settlements. More recent studies provided evidence for the species occurrence in 1750–1850 in northern Bulgaria (Beech 2007), i.e. 100–200 years later, but this communication remained out of sight for the zoological scientific community (see below).

Although it is presumed that we have a relatively complete record of the former distribution of this species in Bulgaria, the existence of numerous scattered data (often published in less accessible and poorly known sources in the past), as well as many unpublished records, was an impulse for us to present all data gathered in the present review.

MATERIAL AND METHODS

We tried to gather all available data (published and unpublished) on the beaver remains (bones, teeth) from the territory of Bulgaria. For each site we present as complete data as possible on the age, type and

number of finds, year and author(s) of the finding and a reference of the original information. In some cases we give the original former name of the sites, accompanied by their modern names (Table 1). Some sites are included without any information on the collected finds as it is missing in the relevant publications.

We divided the whole epoch of documented observations of the Eurasian beaver in Bulgaria into nine periods according to the intensity of human impact on the beaver habitats and frequency of records, based mainly on the archaeological classification: fossil–Pleistocene (Paleolithic), subfossil–Holocene (Neolithic, Chalcolithic, Bronze Age, Iron Age), and sub-Recent (Antiquity, Middle Ages, Modern Period). All localities of the beaver (incl. the Pleistocene ones) represent archaeological sites, i.e. all specimens originate from hunted animals, being a prey of humans. This means that the animals may have been killed in the settlement vicinities and transferred to them for processing and utilization.

Abbreviations: dex. – dexter; juv. – juvenilis; Prov. – Province (oblast); sin. – sinister; v. – village.

CHRONOLOGY

Until present the **fossil** record of *Castor fiber* covers only five localities, all situated in northern Bulgaria (Fig. 1).

Subfossil–Holocene record: A total of 32 localities contain a subfossil record of the beaver. The subfossil record is the most numerous and represents 74.4% of all finding sites. **Subrecent** record: It covers six localities, most of them in eastern Bulgaria. Only the site of Smardan Dupka Cave (Vidin Prov.) represents the subrecent species occurrence in northwestern Bulgaria.

According to Velkov (1956), Virgil (70–19 BC) in his *Georgiki* wrote about beavers living around the Black Sea whose smell was rather repulsive. We could accept this piece of information as the earliest written record of the beaver in the Bulgarian territory. Markov (1951) stated, without any reference given, that the Eurasian beaver was widespread in northern Bulgaria (along the Danube and its larger tributaries) in the past.

There is some indirect evidence for the presence of beavers in Bulgaria until the late historic times. The registers of the merchants from Dubrovnik (Croatia) noted that in the 16th and 17th centuries they imported many beaver skins from Bulgaria (Markov 1951). In the account (ledger) books of the Dubrovnik merchant Benedetto Marino di Resti, the skins of Bulgarian beavers were listed regularly in 1590–1605 (Boev 1958). The merchant Lika Brajkov had eleven beaver skins from Bulgaria in the stores in Drinopol/Edirne (now in NW Turkey) in 1606. Another merchant in Sofia had ten beaver skins in 1547. Thus, it is rather possible that *C. fiber* survived along the larger rivers of Marica, Tundža and Iskar at least until the last decades of the 16th century (Anonymous 1939).

DISCUSSION AND CONCLUSIONS

First published data (in a printed book) on the Eurasian beaver in Bulgaria are given by Berovič (1824), i.e. from the time of the last surviving beavers in Bulgaria. It is worth mentioning that P. Berovič gave both the Bulgarian and Turkish ("kunduz") names of the beaver, an indirect indication for the still active use of these words by the local population. He also presented the first published image of the beaver in the Bulgarian literature (Fig. 2).

In the neighbouring Romania, the beaver has also disappeared in the late historical times (last record in 1823 in the Danubian islands in Moldova Vechia; Boev 1975). The available archaeozoological information on its former distribution throughout the country is extremely scant. The remains of *C. fiber* were found in 13 of a total of 26 Neolithic sites known in that country till the 1970s. Similarly, in the Bronze Age 8 sites (out of 18) contained remains of beavers. There are also several paleofaunal remains from the Iron Age. All sites lie on large rivers. The subfossil material dating back to historical periods is quite poor in general (Necrasov & Ştirbu 1975).

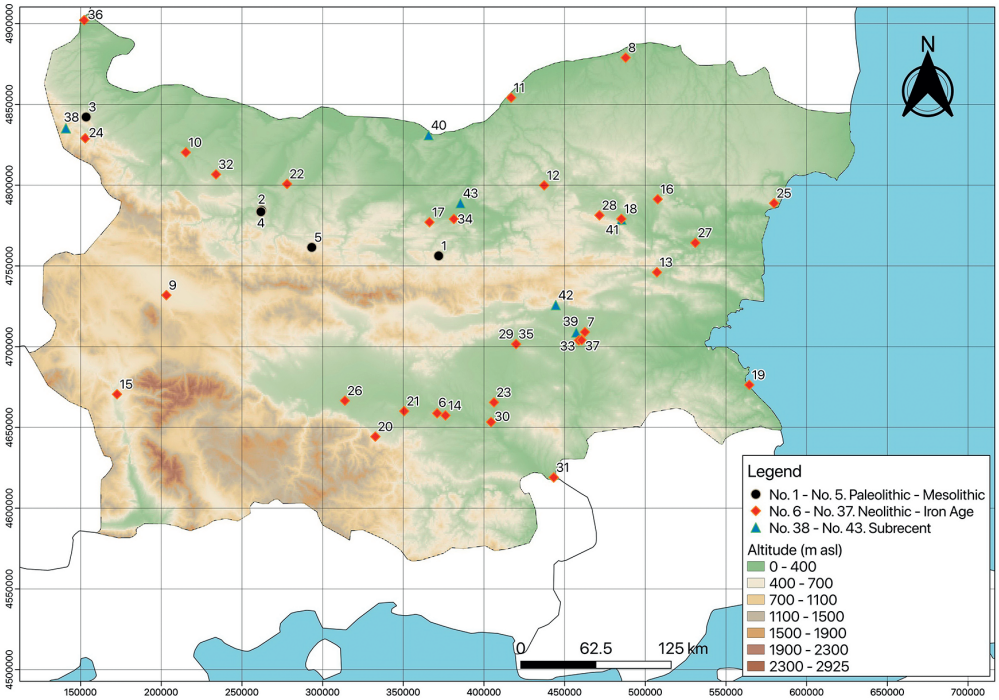

Fig. 1. Distribution of the Eurasian beaver (*Castor fiber*) in Bulgaria according to its fossil and subfossil record: circles – the Paleolithic sites: 1 – Bačo Kiro Cave; 2 – Temnata Dupka Cave, 3 – Kozarnika (Suhi Peč) Cave, 4 – Samuilica 2 Cave, 5 – Toplâ Cave; squares – the Neolithic, Chalcolithic, Bronze Age, and Iron Age sites: 6 – Âbălkovo, 7 – Maleva mound, 8 – Malak Preslavec, 9 – Slatina, 10 – Gradeŝica--Malo Pole, 11 – Ruse mound, 12 – Sultan mound, 13 – Keremitlik mound, 14 – Krum, 15 – Mursalevo, 16 – Madara, 17 – Emenska Cave, 18 – Salmanovo (Deneva) mound, 19 – Urdoviza, 20 – Dolnoslav, 21 – Debăr, 22 – Teliš mound, 23 – Gălăbovo, 24 – Temnata Dupka Cave, 25 – Vinica, 26 – Plovdiv, 27 – Golâmo Delčevo, 28 – Ovčarovo, 29 – Drânova Mogila, 30 – Čavdarova Češma, 31 – Kapitan Andreevo, 32 – Ohoden, 33 – Âmbol, 34 – Hotnica, 35 – Ezero, 36 – Balej, 37 – Âsa-Tepe; triangles – the Antiquity, Middle Ages and Modern Period sites: 38 – Smardan Dupka Cave, 39 – Kabile, 40 – Nove, 41 – Veliki Preslav, 42 – Hisarlăka, 43 – Nikopolis ad Istrum.

Фиг. 1. Разпространение на евразиатския бобър (*Castor fiber*) в България според фосилните и субфосилните данни: кръгчета – палеолитни находища: 1 – пещерата Бачо Киро, 2 – пещерата Темната Дупка, 3 – пещерата Козарника (Сухи Печ), 4 – Пещера Самуилица 2, 5 – Пещера Топля; квадратчета – находища от неолита, халколита, бронзовата епоха и желязната епоха: 6 – Ябълково, 7 – Малева могила, 8 – Малак Преславец, 9 – Слатина, 10 – Градещица-Мало Поле, 11 – могила Русе, 12 – могила Султан, 13 – могила Керемитлик, 14 – Крум, 15 – Мурсалево, 16 – Мадара, 17 – Еменска пещера, 18 – могила Салманово (Денева), 19 – Урдовиза, 20 – Долнослав, 21 – Дебър, 22 – могила Телиш, 23 – Гълъбово, 24 – пещерата Темната Дупка, 25 – Виница, 26 – Пловдив, 27 – Голямо Делчево, 28 – Овчарово, 29 – Дрянова могила, 30 – Чавдарова чешма, 31 – Капитан Андреево, 32 – Оходен, 33 – Ямбол, 34 – Хотница, 35 – Езеро, 36 – Балей, 37 – Яса-Тепе; триъгълничета – находища от атичността, средновековието и ново време: 38 – пещера Смардан Дупка, 39 – Кабиле, 40 – Нове, 41 – Велики Преслав, 42 – Хисарлъка, 43 – Никополис ад Иструм.

Table 1. Localities, finds and age of the fossil and subfossil record of the Eurasian Beaver in Bulgaria; C. – cave, c. – century, E – Early, L – Late, M – Middle; as – astragalus, at – atlas, fm – femur, in – incisor, hm – humerus, md – mandible, ml – molar, mx – maxilla, pml – premolar, pl – pelvis, sc – scapula, tb – tibia, ub – unspecified bone(s)/bone remnant(s)

Таблица 1. Находища, находки и възраст на фосилните и субфосилните останки от евроазиатския бобър в България; С – пещера, с. – век, Е – ранен, L – късен, М – среден; as – astragalus, at – atlas, fm – femur, in – incisor, hm – humerus, md – mandibula, ml – molar, mx – maxilla, pml – premolar, pl – pelvis, sc – scapula, tb – tibia, ub – неуточнен вид на костите/костните фрагменти

No №	site находището	municipality (province) община (област)	river река	altitude [m a. s. l.] височина [m н. в.]	age възраст	number of finds брой на находките	reference източник
1	Bačo Kiro C.	Drânovo (Gabrovo)	Andaka	335	L Pleistocene, M–L Paleolithic, 70,000–20,000 BP	2 ml, 1 pml, 1 md sin.	Kowalski & Nadachowski (1982)
2	Temnata Dupka C.	Karlukovo (Loveč)	Iskar	250	L Pleistocene, Epigravettian, 31,900–13,600 BP	1 ml	Popov (1994)
3	Kozarnika C. (Suhi Peč)	Belogradčik (Vidin)	Skomlâ	375	L Pleistocene, MNQ 18–26	9 ub	Fernandez (2009)
4	Samuilica 2 C.	Karlukovo (Loveč)	Iskar	330	L Pleistocene; M–L Paleolithic	3 ub	Djambazov (1981)
5	Toplâ C.	Golâma Železna (Loveč)	Kalnik	460	L Pleistocene, Würm	2 md sin., 2 ml, 1 in	Popov (1924), Nikolov (1983)
6	Âbalkovo	Âbalkovo (Haskovo)	Maric	130	E Neolithic, 6,500 BP	2 ub	Spassov & Iliev (2014)
7	Maleva	Veselinovo (Âmbol)	Tundža	120	E Neolithic – E Bronze Age	ub	Mikov (1939), Valčev et al. (2015)
8	Malăk Preslavec	Malăk Preslavec (Silistra)	Danube	60	E Neolithic, 6,000 BC	ub	Ribarov (1992)
9	Slatina	Sofiâ (Sofiâ)	Slatinska	550	E Neolithic	1 ub	Ninov (1992), Ivkovska (2008), Spassov, unpubl.
10	Gradešnica-Malo Pole	Gradešnica (Vraca)	Ogosta	190	E Neolithic	1 femur, 2 ub	Spassov et al. (2015)
11	Ruse	Ruse (Ruse)	Danube	100	Neolithic	skull, hm	Popov (1924)
12	Sultan	Popovo (Tărgoviše)	Popovska	210	Neolithic	ub	Popov (1924)

No №	site находището	municipality (province) община (област)	river река	altitude [m a. s. l.] височина [m н. в.]	age възраст	number of finds брой на находките	reference източник
13	Keremitlik	Lûlâkovo (Burgas)	Kamčiâ	230	Neolithic	ub	Popov (1924)
14	Krum	Krum (Haskovo)	Maric	115	Neolithic, 4,500–4,300 BC	1 ml	Boev (2014)
15	Mursalevo	Mursalevo (Kûstendil)	Struma	435	Neolithic, 6,000 BC	tb dex. juv.	Z. Boev, unpubl.
16	Madara	Madara (Šumen)	Matniška (Madara)	210	Neolithic	1 md, 5 ml	Popov (1904, 1924)
17	Emenska C.	Emen (Veliko Tărnovo)	Negovanka	230	Neolithic – Iron Age	ub	Nikolov (1977, 1983), Markov (1951)
18	Salmanovo (Deneva)	Veliki Preslav (Šumen)	Golâma Kamčiâ	90	Chalcolithic	2 md, 1 ml	Popov (1924)
19	Urdoviza (submerged)	Black Sea coast, Kiten (Burgas)	Kitenska (Karaagač)	–10	Chalcolithic–E Bronze Age, 3,000–2,000 BC	1 in, 1 scapula	Ribarov (1991a), Spassov & Iliev, upb.
20	Dolnoslav	Dolnoslav (Plovdiv)	Luda Âna (Širokata)	365	L Chalcolithic, 4,000 BC	2 hm, 1 md, 6 ub	Spassov et al. (2001)
21	Debar	Părvomaj (Plovdiv)	Mečka	135	Chalcolithic	ub	Detev (1966)
22	Teliš	Teliš (Pleven)	Iskar	190	Chalcolithic, 3,450–3,320 BC	ub	Ribarov & Boev (1997)
23	Galabovo	Galabovo (Stara Zagora)	Sazlijka	85	Chalcolithic – M Bronze Age	ub	Ribarov, unpubl.
24	Temnata Dupka C.	Tărgoviše (Vidin)	Čuprenska	350	Chalcolithic	ub	Nikolov (1977, 1983), Avramova (2002)
25	Vinica	Varna (Varna)	Batova	90	M Chalcolithic, 4,500–4,000 BC	ub	Ivanov & Vasilev (1979)
26	Plovdiv	Âsa-Tepe (Plovdiv)	Marica	160	L Neolithic	ub	Ivanov (1959)
27	Golâmo Delčevo	Golâmo Delčevo (Varna)	Kamčiâ	185	E Neolithic, 6,000 BC	1 md, 1 at, 1 tb, 8 ub	Ivanov & Vasilev (1975)
28	Ovčarovo	Ovčarovo (Tărgoviše)	Čobandere	295	M Chalcolithic	1 md sin., ul prox. sin.	Vasilev (1985)

Table 1. (continued)
Таблица 1. (Продължение)

No №	site находището	municipality (province) община (област)	river река	altitude [m a. s. l.] височина [m н. в.]	age възраст	number of finds брой на находките	reference източник
29	Drânova Mogila	Ezero (Sliven)	Blatnica	130	L Neolithic	1 UB	Spassov & Iliev, upb.
30	Čavdarova Češma	Simeonovgrad (Haskovo)	Marica	80	L Neolithic	2 md, sc, pl, 4 ub	Boâdžiev et al. (2016), Karastoânova (2018)
31	Kapitan Andreevo	Kpt. Andreevo (Haskovo)	Marica	30	L Neolithic	1 hm, 1 tb, 1 mx, 4 ub	Karastoânova (2018)
32	Ohoden	Ohoden (Vraca)	Skat	210	E Neolithic	UB	Spassov, unpubl.
33	Âmbol	Âmbol (Âmbol)	Tundža	100	Chalcolithic	UB	Ribarov (1984)
34	Hotnica	Hotnica (Veliko Tărnovo)	Bohot	100	Late Chalcolithic–E Bronze Age, 5,000 BC	1 skull, 2 md, 4 teeth, 31 ub	Boev (2009), Spassov et al. (2015)
35	Ezero	Ezero (Sliven)	Blatnica	130	E Bronze Age, 2,000–1,000 BC	3 UB	Ivanov & Vasilev (1979)
36	Balej	Balej (Vidin)	Timok	55	E Bronze Age	1 femur, 82 UB	Spassov et al. (2015), Spassov, unpubl.
37	Âsa-Tepe	Âmbol (Âmbol)	Tundža	100	L Iron Age	10 UB	Ribarov & Boev (1990)
38	Smardan Dupka C,	Kračimir (Vidin)	Stakevska	480	L Holocene, <17th c. AD	1 upper incissor	Boev (2013)
39	Kabile	Kabile (Âmbol)	Tundža	100	Hellenic epoch, 2,700 BC – 4th c. AD	ub	Ribarov (1991b)
40	Nove	Svišov (Veliko Tărnovo)	Danube	90	Roman and Byzantine periods, 1–7th c. AD	1 ub	Chrzanowska & Molenda (1983)
41	Veliki Preslav	Veliki Preslav (Šumen)	Golâma Kamčiâ	95	9–10th c. AD	ub	Boev & Iliev (1989)
42	Hisarlaka	Sliven (Sliven)	Asenovska (Asenovica)	245	E Byzantine (5–6th c. AD) to medieval (10–12th c. AD)	15 ub of 10–12th 2 ub of 5–12th	Ribarov (1990)
43	Nikopolis a/Istrum	Nikûp (Veliko Tărnovo)	Rosica	135	250–450 AD, 450–600 AD, 1750–1850 AD	1 fm, 1 ml, 1 as, 1 md, 1 hm, 1 fm	

The beaver disappeared from Serbia in 1857 (Godoman Swamp near Smederevo), while in Greece it survived until 1876 along the Alfeios river in the Peloponnese (Boev 1975). In Serbia and Greece there are no similar studies on the former distribution of the species. The last Balkan beaver (a mounted museum specimen in the collection of the Zoological Institute in Belgrade, Serbia), caught on the Danube bank in Serbia, was burnt away during the WW2 (Boev 1958).

We evaluated all information on the past occurrence of any locally extinct species and consider such type of research very important for assembling the puzzle of the paleoenvironment history.

As mentioned above, Boev (1958) stated that the beaver survived in Bulgaria until the early 17th century AD (first decade/s). The exhaustive study of the animal remains by Beech (2007) revealed new unexpected information. In the excavations of the Roman town Nikopolis ad Istrum in the deposits of 1750–1850, he found three bones of *C. fiber*. This author made a valuable contribution to our knowledge of the final history of this species in Bulgaria, but his discovery was not underlined as the latest record of the beaver and remained out of sight for the zoological scientific community. Anyway, his finds from northern Bulgaria shifted the time of the species disappearance from Bulgaria by ca. 150 years ahead. This fully corresponds to the known time of last records of the beaver in the other Balkan countries (Serbia, Greece, Romania). Possibly around the end of the 18th and the early 19th century, the beaver still survived in several remoted refuges in the riverine foothills being less accessible for hunters.

The geographical distribution of *C. fiber* in Bulgaria encompasses the whole territory of the country (Table 1). The species remains were registered in 19 of the total of 28 provinces of Bulgaria. Most of the sites are located in the lowland eastern part of the country (Fig. 1). Almost all sites are located in the lowland landscapes; the only two exceptions are the sites at

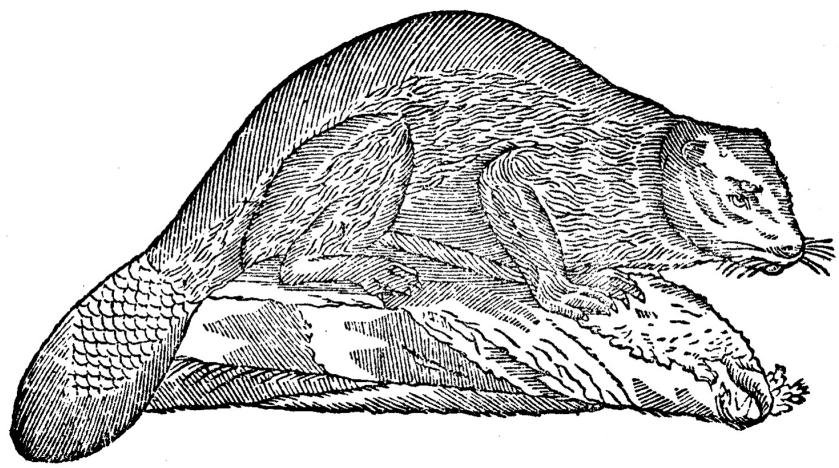

Fig. 2. The first illustration of the beaver, published in a Bulgarian book – the "Primer with Various Instructions" ("Bukvar s različni poučeniâ") by Dr. Petăr Beron, issued in Braşov (Romania) in 1824.
Фиг. 2. Първата илюстрация на бобър, публикувана в българска книга – "Буквар с различни поучения" от д-р Петър Берон, издаден в Брашов (Румъния) в 1824 г.

the foothills – Smardan Dupka Cave and Temnata Dupka Cave (Fig. 1), but the beavers may have been taken there by man.

More recent studies concluded that the beaver is a monotypic species (Busher 2016). However, according to the subspecific systematics given by Gabrys & Wazna (2003), the disappeared Bulgarian beaver populations belonged to *C. f. orientoeuropaeus* Lavrov, 1981 – Eastern European beaver.

The altitudinal distribution of the beaver in Bulgaria was between –10 and 550 m a. s. l. About 56% of the sites (24 of the total of 43) were situated between 100 and 300 m a. s. l. and only four sites were located above 400 m.

The chronological distribution of *C. fiber* in Bulgaria shows that most of the records (20 sites – 46.5%) originate from the Neolithic, followed by Chalcolithic (12 sites – 27.9%). Six records (13.9%) are subrecent, dated to the last 2000 years.

The distribution of the beaver in Bulgaria has been proved at 28 rivers, most of them being large rivers, both in the northern and southern parts of the country. About 37% of the sites (16) were situated along the largest four inland Bulgarian rivers – Marica, Tundža, Kamčiâ (incl. Golâma Kamčiâ), and Iskar – five, four, four and three localities, respectively. Three sites were located along the Danube, two at the Čobandere river and two at the Blatnica river. Along each of twenty other rivers, only one locality was found – Andaka, Asenovska (Asenovica), Batova, Bohot, Kalnik, Kitenska (Karaagač), Luda Âna (Širokata), Matniška (Madara), Mečka, Negovanka, Ogosta, Popovska, Rosica, Sazlijka, Skomlâ, Slatinska, Stakevska, Skat, Struma, and Timok.

Skeleton elements in the beaver findings include practically all body parts: 14 molars, 14 mandibles, 5 humeri, 4 unspecified teeth, 4 femori, 3 tibiae, 3 incisors, 2 scapulae, 2 crania, 1 premolar, 1 pelvis, 1 maxilla, 1 astragalus, as well as 154 unspecified bones, i.e. a total of 209 osteological remains known from all sites in the country.

The variety of bone remains confirms that the beavers were used as a source of both meat and skin. The largest number of finds (83) from a single archaeological site was collected from the prehistoric settlement near the Balej village (Vidin Prov.), situated between two large lowland rivers (Danube and Timok). Some finds are shown in Fig. 3.

We could accept that in the Holocene *Castor fiber* was widespread throughout the country and even in the Antiquity its range and number began to decrease. The process of its reduction continued until the modern times and the species totally disappeared from Bulgaria in the 19th century AD.

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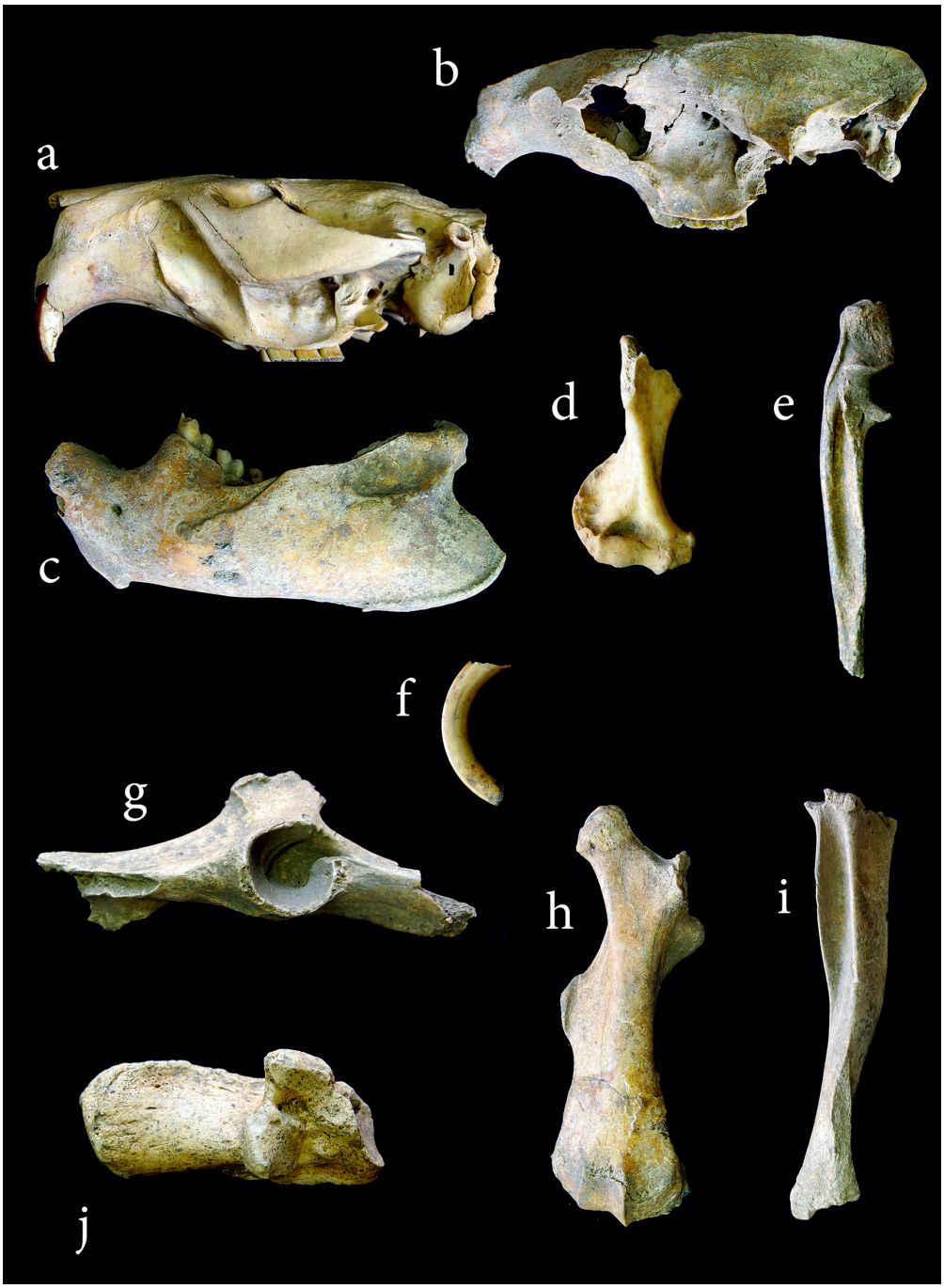
Fig. 3. Some subfossil bone finds of the Eurasian beaver (*Castor fiber*) from Bulgaria, Early Bronze Age, Balej (Vidin Prov.): (a) skull – left lateral view; (b) skull – left lateral view; (c) mandibula sin. – lateral view; (d) humerus dex. dist. – cranial view; (e) ulna dex. – lateral view; (f) mandibular central incisor – medial view; (g) pelvis (os coxae) sin. – lateral view; (h) femur sin. – cranial view; (i) tibia sin. – caudal view; (j) calcaneus sin. – dorsal view. Photo by Assen Ignatov.

Фиг. 3. Някои субфосилни костни находки от евразиатския бобър (*Castor fiber*) от България, ранна бронзова епоха, Балей (област Видин): (a) череп – ляв страничен изглед; (b) череп – ляв страничен изглед; (c) лява мандибула – страничен изглед; (d) humerus dex. dist. – краниален изглед; (e) ulna dex. – страничен изглед; (f) мандибуларен централенрезец – медиален изглед; (g) таз (os coxae) sin. – страничен изглед; (h) femur sin. – краниален изглед; (i) tibia sin. – каудален изглед; (j) calcaneus – дорзален изглед. Снимка: Асен Игнатов.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Р Е З Ю М Е

Статията обобщава множество разпръснати данни за миналото разпределение на евроазиатския бобър в България, много от които са непубликувани досега (Таблица 1). Представени са данни от 43 фосилни и субфосилни находища (късен плейстоцен до 19 век н. е.) от 19 от общо 28 области и 209 костни / зъбни находки не по-малко от 11 скелетни елементи. Представени и анализирани са географското, височинното, хронологичното, речното и на елементите на скелета разпространение. Около 56% от находищата са разположени между 100 и 300 метра н. в. Пет находища съдържат палеолитни находки, 20 – неолитни, 12 – халколитни, 6 – от бронзовата епоха, и 2 – от желязната епоха. Шестте субрецентни находища са датирани от последните ок. 2000 години. Разпространението на вида силно се съкращава около и след началото на н. е. 43-те находища са били разположени в поречието на 28 български реки. Всички находки произлизат от равнинни местности и долните поречия на реките. Доказателствата за най-късното му разпространение в страната са от 1750–1850 г.

A c k n o w l e d g e m e n t s

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