

# Fossil and Subfossil Record of Species of the Genus *Lynx* Kerr, 1792 (Mammalia: Felidae) in Bulgaria

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**Abstract:** Fossil and subfossil records of species of the genus *Lynx* in Bulgaria cover five taxa (two of them not identified at the species level), the oldest one of Early Pliocene: *Lynx issiodorensis*, *L. spelaeus*, *L. lynx* as well as *Lynx* sp. 1 and *Lynx* sp. 2. The Pleistocene deposits of the Kozarnika Cave provide the most abundant fossil record of lynxes (three taxa). The great majority of records comes from Northern Bulgaria (ten localities), and only three localities are from the Southern Bulgaria. Only three localities are from mountain regions and all other are located in the hilly or plain landscapes throughout the country. Mandibles are the most frequent among the identified remains, representing more than half of all collected finds.

**Kew words:** Lynxes, Felidae, Balkan Peninsula, Quaternary mammals

## Introduction

In the recent fauna, lynxes (*Lynx* Kerr, 1792) survived through four species. The genus has Holarctic distribution. Two species are spread in the Nearctic Region, i.e. Bobcat, *Lynx rufus* (Schreber, 1777), and Canadian Lynx, *L. canadensis* Kerr, 1792, and two other occur in the Palearctic Region, i.e. Eurasian Lynx, *L. lynx* (Linnaeus, 1758) and Iberian Lynx, *L. pardinus* (Temminck, 1827) (SUNQUIST & SUNQUIST 2009).

The Issoire Lynx, *Lynx issiodorensis* (Croizet & Jobert, 1828), is the oldest known lynx in Europe. The species existed in the Villafranchian (3.0–2.0 Ma). The Mediterranean Cave Lynx, *Lynx spelaeus* (Boule, 1906), replaced *L. issiodorensis* in the Middle Pleistocene (0.721–0.126 Ma) (TESTU 2012). The phyletic relationship of *L. spelaeus* with the coexisting *L. lynx* and *L. pardinus* remains unclear (TESTU 2012, BOSCAINI et al. 2016). Probably *L. spelaeus* survived till MIS3, i. e. 0.059–0.024 Ma (TESTU 2012).

Territory of Bulgaria lies on the periphery of the recent geographical range of the genus in South-eastern Europe. Thus, all data on the Quaternary distribution of lynxes in Bulgaria have an important

significance for tracing the history of lynxes on the Balkans and in South-East Europe. The present review aims to collect all scattered information on the fossil and subfossil history of lynxes in Bulgaria.

### Taxa account

UTM code of each locality is given after its name.

#### 1. Unspecified Lynx, *Lynx* sp. 1

(1) Muselievo (Pleven Region; LJ 23): Final Ruscinian (SPASSOV 2003), Early Pliocene – second half of the Middle Ruscinian, MN 15 (3.3–3.1 Ma). According to Popov (2004), the fauna from Muselievo should be referred to MN15b-subzone with an absolute age 3.8–3.6 Ma. Whereabouts: Vertebrates Department, NMNHS.

#### 2. Issoire Lynx, *Lynx issiodorensis* (Croizet & Jobert, 1828)

(2) Varshets (Montana Region; FN 89): *Lynx issiodorensis issiodorensis* (Croizet et Jobert, 1828) (Spassov 1997a, 1997b); MN 17 / MNQ 17, 2.4–2.1 Ma (SPASSOV 2003) (Fig. 1). Whereabouts: Vertebrates Department, NMNHS.

(3) Kozarnika Cave (Vidin Region; FP 43): Early Pleistocene (1.6–1.4 Ma, MNQ 19–17, SIRAKOV et al.

2010); 10 finds – canine tooth, unciformis, phalanx 1 dig. 5 ant., phalanx 1 dig. 5 post., metatarsalia 3 sin. prox., phalanx 1 dig. 5 ant. sin., incisor tooth, dex. os trapezoideum sin. talus dex., phalanx 1 (GUADELLI 2009, SIRAPOV et al. 2010). GUADELLI et al. (2005) dated finds of *L. issiodorensis* as level B2-2 (i. e. 1.4–0.9 Ma) but SIRAPOV et al. (2010) dated them as B2-2–B2-1. According to POPOV & MARINSKA (2007), the upper boundary of the B-s zone is at 0.75–0.9 Ma. Whereabouts: unknown.

### 3. Mediterranean Cave Lynx, *Lynx spelaeus* (Boule, 1906)

(4) Kozarnika Cave (Vidin Region; FP 43): Late Pleistocene (A-1 level, younger than 31,237 ± 389 B. P.; SIRAPOV et al. 2010). M1 inferior dex. (GUADELLI et al. 2005, 2009, SIRAPOV et al. 2010). Whereabouts: unknown.

### 4. Unspecified Lynx, *Lynx* sp. 2

(5) Kozarnika Cave (Vidin Region; FP 43): Early Pleistocene (1.6–1.4 Ma, MNQ 19–17, SIRAPOV et al. 2010) – metacarpus 1 dex., talus dex., calcaneus dex., tibia sin. dist., talus sin., metacarpus 1 dex. (GUADELLI et al. 2009). GUADELLI et al. (2005) and SIRAPOV et al. (2010) dated finds of this unspecified lynx as level B2-2 (i. e. 1.4–0.9 Ma). Whereabouts: unknown.

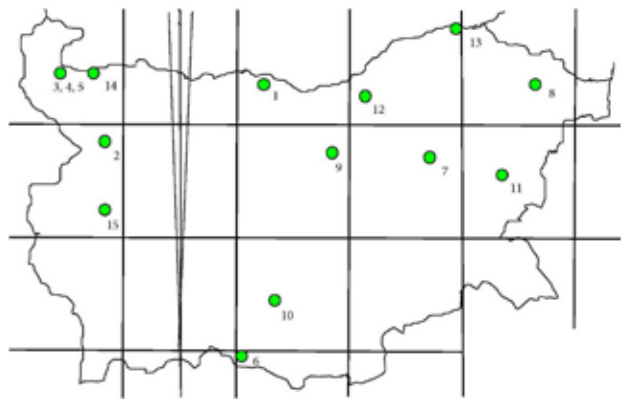
### 5. Eurasian Lynx, *Lynx lynx* (Linnaeus, 1758)

Most authors recognise the modern lynx in Bulgaria as belonging to the Carpathian subspecies (*Lynx lynx carpathicus* Kratochvil & Stollman, 1963) (SUNQUIST & SUNQUIST 2009). Besides this statement, there are some strong circumstances that allow separating the Balkan population of *L. lynx* as a distinct subspecies (SPASSOV et al. 2006). The recent status of the species in the country is “critically endangered, CR” [D+E], BDA-II, III (SPIRIDONOV & SPASSOV 2011) although it was assumed to be extinct at the early 40s of 20<sup>th</sup> century (SPIRIDONOV & SPASSOV 1985). The current species distribution is confined to the westernmost border regions neighbouring to Serbia (ZLATANOVA et al. 2001, SPIRIDONOV & SPASSOV 2011). It is believed that these lynxes represent a part of the “population that formed in the last 20–25 years in Eastern Serbia”.

It is believed that until the beginning of 20<sup>th</sup> century the lynx has been widespread throughout all larger mountains in Bulgaria (SPIRIDONOV & SPASSOV 1985, SPASSOV et al. 2006). Numerous data for the probable occurrence of lynxes in the inner parts of the country still need confirmation. In this article, only the “firm” proofs are presented, i. e. bone fossil and subfossil records of the former distribution of the Eurasian Lynx in Bulgaria. We found a total of 10 records of



**Fig. 1.** *Lynx lynx* – Late Holocene (Late Medieval Ages, 16 (?17)–19<sup>th</sup> century A.D.), fragmentary mandibula sin. ad. (Photo: Z. Boev)



**Fig. 2.** Fossil and subfossil record of *Lynx* spp. in the Quaternary of Bulgaria: *Lynx* sp. 1 – Muselievo (1); *Lynx issiodorensis* – Varshets (2), Kozarnika (3); *Lynx spelaeus* – Kozarnika (4); *Lynx* sp. 2 – Kozarnika (5); *Lynx lynx* – Borikovska Cave (6), Ovcharovo (7), Salmanovo (8), Hotnitsa (9), Dolnoslav (10), Golyamo Delchevo (11), Shirokovo (12), Popina (13), Staliyska Mahala (14), Sofia City (15)

the Eurasian lynx from various palaeozoological and archaeozoological sites in the country, both from Northern and Southern Bulgaria, as follows:

(6) Borikovska Cave (Smolyan Region; LF 09): Late Pleistocene (NIKOLOV 1977, 1983). Whereabouts: unknown.

(7) Ovcharovo (Targovishte Region; MH 68): Early Neolithic (8000 B. P.) – Chalcolithic (VASILEV 1985). Whereabouts: unknown.

(8) Salmanovo (Shumen Region; MH 98): Early Chalcolithic (Deneva Mound; 5000 B. P.) – mandibula sin. ad. with teeth (POPOV 1933). The first record from Bulgaria (SPASSOV et al. 2001). Whereabouts: Vertebrates Department, NMNHS.

(9) Hotnitsa (Veliko Tarnovo Region; LH 87): Late Chalcolithic (ca. 7000 B. P.) (SPASSOV et

al. 2015). Whereabouts: Vertebrates Department, NMNHS.

(10) Dolnoslav (Plovdiv Region; LG 34): Chalcolithic, 5530–5480 ± 60 B. P. – mandibula dex. ad. with teeth (SPASSOV et al. 2001). Whereabouts: Vertebrates Department, NMNHS.

(11) Golyamo Delchevo (Varna Region; NH 35): Middle Chalcolithic – two mandibulae with teeth (IVANOV & VASILEV 1975). Whereabouts: unknown.

(12) Shirokovo (Ruse Region; MJ 12): Early Holocene – one tooth – DP4/ sin. (juv.) (MITEV 2004). Whereabouts: Vertebrates Department, NMNHS.

(13) Popina (Silistra Region; MJ 98): Medieval Ages, 6–11th Century A. D. – fragmentary mandible (IVANOV 1965). Whereabouts: unknown.

(14) Staliyska Mahala (Montana Region; FP 74): Early Iron Age (Bagachina; 8th Century B. C.) – one tooth – canine (Georgi Ribarov, unpublished data). Whereabouts: unknown.

(15) Sofia City (Sofia City Region; FN 82): Late Medieval Ages (16–19th Century A. D.) – mandibula sin. ad. with teeth. The newest find in the country (Fig. 2) (Boev, In press). Whereabouts: Vertebrates Department, NMNHS.

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## Conclusions

Fossil and subfossil record of the lynxes in Bulgaria covers five taxa (two of them not identified at the species level) from 15 localities, the oldest one of Early Pliocene. The Pleistocene deposits of the Kozarnika Cave provided most abundant fossil record of lynxes (three taxa). The great majority of records comes from Northern Bulgaria (ten localities) against only three localities from the Southern Bulgaria. This might mean that most of the past territories inhabited by lynxes have been located northward the Stara Planina Range but the mountain is not a barrier for species' distribution and the revealed localities represent most probably a random occurrence. Only three localities are from mountainous regions and all other are located in the hilly or plain landscapes throughout the country. This could be explained by less-explored mountain landscapes by archaeologists and the more inhabited lowland areas by humans in the ancient times. Mandibles are the most often among the identified remains, representing a half of all collected finds.

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