The Woolly Mammoth *Mammothus primigenius* (Blumenbach, 1799) (Elephantidae Gray, 1821) in the Pleistocene in Bulgaria - A Review

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**Abstract.** The study presents for the first time summarized data on the presence of the Woolly Mammoth remains in Bulgaria from literature data, published in the last 144 years. The exact dates of the appearance and disappearance of the species in the country remain unknown. All the 31 published localities outlined the species presence between 90,000 and 26,000 BP. The majority (74 %) of the localities were situated between 20 and 250 m a.s.l. in the Bulgarian lowlands and plains. The maximum altitude of the localities is 555 m a.s.l. The total number of the known finds exceeds 300.

**Key words:** Pleistocene megafauna, Proboscideans, Fauna impoverishment, Quaternary extinctions, Balkan environment.

**Introduction**

The Woolly Mammoth, *Mammothus primigenius* (Blumenbach, 1799), is the most common species of the late Pleistocene megafauna of the mammoth steppe biome and the largest Quaternary land animal of Holartic. Its lineage arose in northeast Siberia (Beringia) and its ancestor is the steppe mammoth - *Mammutthus trogontherii* (Pohlig, 1885) (Kurten, 2007; Lister & Sher, 2015). The Woolly Mammoth appearance in Europe after 200 ka is a result of a migration from the east (Stuart et al., 2002).

At the height of its distribution it was spread on three continents - Europe, Asia and North America. The Woolly Mammoth survived until 3,700 BP (Lister & Bahn, 2007; Vartanyan et al., 2008; Krzemiński et al., 2010).

In the Pleistocene the territory of Bulgaria was part of its range on the Balkans. After Álvarez-Lao et al. (2009) and Ma et al. (2021) the southern species’ range border in the SE Europe passed through Balkans (the southeast parts of Bulgaria) and the southern Pyrenees.

The most detailed information about the species in Bulgaria is presented by Markov (pers. comm.), who revised most of the preserved remains and summarized that *M. primigenius* in Bulgaria is known with “over ten finds” from 6 localities: Burgas, Zaraevo, Slivo Pole, Ryahovo, Cherepish and Parvomay. The author claims that “finds of *M. primigenius* in Bulgaria are usually single - without accompanying fauna, with unclear stratigraphy and, accordingly, of unknown age”. ... (p. 163). “Separate teeth and a few mandibles, mainly from North Bulgaria, demonstrate the presence of the species in the country. Again, these are isolated finds without other fauna, and the ineres-
ting problem of the last occurrence of this species in Bulgaria remains unresolved.” (Markov, pers. comm.: p. 145).

After Popov (1929a) in Bulgaria “mammoth remains were found in many places (Ruse, Popovo, Markovcha (pr. Markovo) village, Karlukovo village, Burgas, etc.).” Bakalov (1932) reports on Woolly Mammoth’s remains found near Burgas, Aytos, Novi Pazar, Haskovo, etc. Nikolov (1963) summarizes that remains of Woolly Mammoth in Bulgaria have been uncovered in the regions of Sofia, Lom, Svishtov, Ruse, Yambol, Plovdiv and many other places. Fuchs (1879) and Petz (1879) after Nikolov (1977) described fossils of *M. primigenius* from the vicinities of Stara Zagora1 and Yambol.

All these scattered data show that the distribution of the Woolly Mammoth in Bulgaria has not been the subject of a special study until now. The aim of the present study is to provide the records of the Woolly Mammoth remains in literature.

**Material and Methods**

In the present study is given a review of all available data on remains of the Woolly Mammoth in Bulgaria. For each site brief data on the location, approximate altitude, age (dating) and records, years and leaders of the excavations, as well as the source of the published data are presented (Table 1).

The chronosтратigraphy follows Cohen et al. (2013; Mya): Gelasian 2.588-1.800 (covering parts of the former Late Pliocene - Early Pleistocene); Calabrian 1.800-0.774 (Early Pleistocene); Chibanian 0.770-0.129 (Middle Pleistocene); Upper Pleistocene 0.129-0.0117 (Late Pleistocene); Greenlandian 0.0117-0.0082 (Early Holocene); Northgrippian 0.0082-0.0042 (Middle Holocene); and Meghalayan 0.0042-0.0001 (Late Holocene).

**Results and Discussion**

Markova et al. (2010) state that “In the Last Glacial Maximum (LGM), the mammoth was widely distributed throughout most of Europe except the Iberian Peninsula, the Apennine Peninsula, the Balkan Peninsula, and the Crimea Peninsula.” (p. 482). It is obvious that this author did not have the data from Bulgaria and the other Balkan ( southern) countries. Gromov & Baranov (1981) clearly state that the mammoth range included Crimea and Tanscaucasia. Other authors (Álvarez-Lao et al., 2009 and Ma et al. 2021) also support such a statement.

Collected data presented here mark that *M. primigenius* was present in the Bulgarian fauna in the Calabrian, Chibanian and the Upper Pleistocene, covering a period, approx. 90,000 - 26,000 BP (Table 1).

A part of the localities (Table 1), are listed without specifying their exact locations. This is because we follow available published data. Thus, it turns out that for Bulgaria there are reports in the literature about records of *M. primigenius* in at least 31 localities.

Obviously, the woolly mammoth disappears from the fauna of Bulgaria during the late Pleistocene. “The lack of dated remains leaves the question of the exact time of the species' extinction unresolved.” (Markov, pers. comm.: p. 192).

As is shown in Fig. 1 all the 31 localities are located in the lowlands and plains - the Danube Plain, the Upper Thracian Plain, the Burgas Lowland and the Sofia Valley. Several localities in the northwestern Bulgaria are found in the mountain foothills - in the Pre-Balkan. It makes an impression that the species has not yet been established in the

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1 In his publication Nikolov (1977) mistakenly names “Nova Zagora” as “Stara Zagora”.
southwestern part of the country. This distribution is a result of the specific orography of Bulgaria - the southwestern half is mostly mountainous and unfavorable for the woolly mammoths.

Table 1. Localities of fossil/subfossil bone remains of *Mammuthus primigenius* in Bulgaria.

<table>
<thead>
<tr>
<th>No</th>
<th>Locality</th>
<th>Location/ Province</th>
<th>Altitude a.s.l. (m)</th>
<th>Age Identification, type and number of finds</th>
<th>Years and leaders of excavations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Samuilitsa Cave</td>
<td>Near Kumino v. (Vratsa P.)</td>
<td>ca. 360</td>
<td>Middle-Late Paleolithic (90,000 – 42,000 BP) Elephas primigenius: “teeth”</td>
<td>1956-1959, N. Djambazov</td>
<td>Djambazov (1981)</td>
</tr>
<tr>
<td>2</td>
<td>Temnida Dupka Cave</td>
<td>Near Karlucho v. (Lovech P.)</td>
<td>250</td>
<td>Middle - Late Paleolithic (31,900-12,600 BP) Elephas primigenius: “many bones”; „bones and teeth”; “a few enamel plates from a molar; a tusk fragment and a small milk tooth”; „bones”</td>
<td>1938, R. Popov; 1982, N. Sirakov</td>
<td>Popov (1925, 1926, 1928, 1929b, 1931a, b, 1935, 1936, 1938); Mikov (1926) Beron <em>et al.</em> (2006)</td>
</tr>
<tr>
<td>3</td>
<td>Ryahovo</td>
<td>Near Ryahovo v. (Ruse P.)</td>
<td>21</td>
<td>Middle- Late Pleistocene Mammutbus primigenius: „left m3, right m3, right m3, right m3”</td>
<td>unknown</td>
<td>Markov (pers. comm.)</td>
</tr>
<tr>
<td>5</td>
<td>Markovo</td>
<td>Boshkov Dol Locality, Near Markovo (Markovcha) v. (Shumen P.)</td>
<td>275</td>
<td>Late Pleistocene Elephas primigenius: “a complete skeleton”</td>
<td>1908, unknown</td>
<td>Popov (1920; 1929b); Popow (1913)</td>
</tr>
<tr>
<td>6</td>
<td>Burgas</td>
<td>Burgas City (Burgas P.)</td>
<td>30</td>
<td>Late Pleistocene Elephas primigenius: “single bones and teeth”; <em>Mammuthus</em> primigenius: “right semimandible with m3, together with a fragment of the left m3”</td>
<td>unknown</td>
<td>Anonym. (1901); Popov (1929a); Bakalov (1932); Bakalov &amp; Nikolov (1964); Markov (pers. comm.)</td>
</tr>
<tr>
<td>7</td>
<td>“Karlucho caves” (Prohodma Cave, Svirchovitsa Cave)</td>
<td>Near Karlucho v. (Vratsa P.)</td>
<td>250</td>
<td>Late Pleistocene Elephas primigenius: “single bones and teeth”</td>
<td>unknown</td>
<td>Nikolov (1983); (1929a)</td>
</tr>
<tr>
<td>8</td>
<td>Peshtera</td>
<td>Near Staro Selo (Vratsa P.)</td>
<td>ca. 330</td>
<td>Late Pleistocene Mammoth: “fragments of a tusk”</td>
<td>1951-1953, N. Dzhambazov</td>
<td>Dzhambazov (1952)</td>
</tr>
<tr>
<td>9</td>
<td>Navasen</td>
<td>Near Navasen v. (Haskovo P.)</td>
<td>96</td>
<td>Pleistocene Elephas primigenius: “one well-preserved fossilized molar; part of a tusk”</td>
<td>1932, D. Ivanov</td>
<td>Anonym. (1932)</td>
</tr>
<tr>
<td>11</td>
<td>Popovo</td>
<td>Near town of Popovo (Targovishite P.)</td>
<td>210</td>
<td>Pleistocene Elephas primigenius: “single bones and teeth”</td>
<td>1923, Dobrev</td>
<td>Anonym. (1923); Popov (1929a)</td>
</tr>
<tr>
<td>12</td>
<td>Golyamata Peshtera</td>
<td>Near Veliko Tarnovo (Veliko Tarnovo P.)</td>
<td>230</td>
<td>Pleistocene Elephas primigenius: “small fragments of lobe bones; right lower jaw; several fragments of left mandible; canine tooth; fragment of a molar; more than 200 tusk fragments; main part of tusk; atlas; body of cervical vertebra; 6 processi transversi and processi spinosi; more than 50 fragments of ribs (Costae); broken humerus; three carpal bones (Ossa carpi); two bones from the fingers (Phalanges); several fragments of a third phalanx (Phalarex tertia)”</td>
<td>1900-1909, R. Popov</td>
<td>Popov (1913); Nikolov (1977, 1983); Beron <em>et al.</em> (2006)</td>
</tr>
</tbody>
</table>
13. Mladenova Propast
Near Chiren v. (Vratza P.) 311 Pleistocene Elephas (Mammuthus) primigenius; no data 1964, I. Nikolov (1977, 1983); Beron et al. (2006)

14. Zaranovo
Near Zaranovo v. (Targovishte P.) 299 Pleistocene Mammuthus primigenius: “left and right semimandible with m1 sin. et dext.” unknown Markov (2004, pers. comm.)

15. Slivo Pole
Near Slivo Pole v. (Ruse P.) 23 Pleistocene Mammuthus primigenius: “right m3; left m3, right m3” unknown Markov (2004, pers. comm.)

16. Cherepish
Near R/W station Cherepish, near Lyubitbol v. (Vratza P.) 215 Pleistocene Mammuthus primigenius unknown Nikolov (1969); Markov (2004, pers. comm.)

17. Parvomay
Near town of Parvomay (Plovdiv P.) 134 Pleistocene Mammuthus primigenius: “a fragment of m3d” unknown Bakalov & Nikolov (1964); Markov (2004, pers. comm.) V (1896)

18. Pirgovo
Near Pirgovo v. (Ruse P.) 68 Pleistocene Elephas primigenius: “remains” 1890

19. Ruse
Ruse City (Ruse P.) 45 Pleistocene Elephas primigenius: “single bones and teeth” 1895 V (1896); Popov (1929a); Nikolov (1963) V (1896)

20. Chervena Voda
Near Chervena Voda v. (Ruse P.) 134 Pleistocene Elephas primigenius: “mammoth teeth” 1892

21. Harmanli
Near town of Harmanli (Haskovo P.) 60 Pleistocene Elephas primigenius: “one well-preserved fossilized molar; part of a tusk; large leg bone” 1931-1932 Anonym. (1932)

22. Nova Zagora
Near town of Nova Zagora (Sliven P.) 196 Pleistocene Elephas meridionalis: no data; Elephas (Mammuthus) primigenius: no data unknown Fuchs (1879); Nikolov (1977)

23. Yambol
Yambol City (Yambol P.) 114 Pleistocene Mammoth: No data; Elephas (Mammuthus) primigenius: No data unknown Fuchs (1879); Nikolov (1963)

24. Aytos
Near town of Aytos (Burgas P.) 95 Pleistocene Elephas primigenius: no data unknown Bakalov (1932)

25. Novi Pazar
Near town of Novi Pazar (Shumen P.) 156 Pleistocene Elephas primigenius: no data unknown Bakalov (1932)

26. Haskovo
Haskovo City (Haskovo P.) 203 Pleistocene Elephas primigenius: “two tusks” unknown Bakalov (1932)

27. Lom
Near town of Lom (Montana P.) 20 Pleistocene Mammoth; no data unknown Nikolov (1963)

28. Sofia
Sofia City (Sofia City P.) 555 Pleistocene Mammoth; no data unknown Nikolov (1963)

29. Svishtov
Near town of Svishtov (Veliko Tarnovo P.) 88 Pleistocene Mammoth; no data unknown Nikolov (1963)

30. Plovdiv
Near Plovdiv City (Plovdiv P.) 164 Pleistocene Mammoth; no data unknown Nikolov (1963)

31. Unknown locality - - - Mammuthus primigenius: right m3 unknown Markov (pers. comm.)

Therefore, it is interesting to note here that the data from Bulgaria do not support the presented distribution map of the species by Álvarez-Lao et al. (2009), which shows that in the Balkans its range reached the Aegean Sea, but it is unknown why the Balkan Black Sea Coast remained outside it (Fig. 8, p. 67).

Conclusions
The presented data confirm that the territory of Bulgaria was part of the woolly mammoth’s distribution range during Pleistocene. The species was common in the largest plains and lowlands, at least in the late Pleistocene. The exact dates of the appearance and disappearance of the species in the country remain unknown. All the 31 published localities outlined the species presence at least between 90,000 and 26,000 BP. The majority (74 %) of the localities were situated between 20 and 250 m.a.s.l. The maximal localities altitude is 555 m a.s.l. The total number of the known records exceeds 300.
Fig. 1. Distribution of the Woolly Mammoth (*Mammuthus primigenius*) in the Pleistocene in Bulgaria (ref. to Table1): Samuilitsa Cave (1), Temnata Dupka Cave (2), Ryahovo (3), Kozarnika Suhi Pech Cave (4), Markovo (5), Burgas (6), “Karlukovo caves” (Prohodna Cave, Svirchovitsa Cave) (7), Pesht Cave (8), Navasen (9), Ovcharitsa River bank (10), Popovo (11), Golyamata Peshtera (12), Mladenova Propast (13), Zaraevo (14), Slivo Pole (15), Cherepish (16), Parvomay (17), Pirgovo (18), Ruse (19), Chervena Voda (20), Harmanli (21), Nova Stara Zagora (22), Yambol (23), Aytos (24), Novi Pazar (25), Haskovo (26), Lom (27), Sofia (28), Svishtov (29), Plovdiv (30).

For a significant part of the localities reported in the literature (18 out of a total of 31), there is no data on their specific location, as well as on the nature of the finds. However, the data collected here allow for the first time to outline the former general distribution of the woolly mammoth in Bulgaria, a key territory of the Balkan Peninsula and the periphery of the species range.

The first information about the species in Bulgaria was published 144 years ago (Fusch, 1879). It is apparent that all finds except those confirmed by Markov (pers. comm.) need to be revised in light of modern understandings of the composition of the genus *Mammuthus* Brookes, 1828 and the distribution of species within it. Unfortunately, the majority of these materials are now lost, their whereabouts are unknown, and they cannot be revised.

It is possible that some of the reports in the last century were misidentified and belonged to other species of the genus *Mammuthus* such as *M. rumanus* (Stefanescu, 1924), *M. meridionalis* (Nesti, 1825), *M. trogontherii* (Pohlig, 1881), reported for the country by Markov (pers. comm.), as well as of *M. intermedius* (Jourdan, 1861). However, any suggestion in this
direction would be speculative today. The information collected and presented here reflects the real state of the problem in Bulgaria at the present time.

Thus, at first glance, the present review is belittled. However, it is necessary to compile a comprehensive view of the state of study of the species, a research that has not been done so far.

As seen, the distribution of the mammoth has never been the subject of a specific research. Bearing in mind the wide distribution of the species and its large body size, which make it extremely advantageous in terms of taphonomy, there is no doubt that this scarce information will be supplemented to compile a more detailed picture of the appearance, distribution and disappearance of this species in the country.

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