



## Landscape analysis of the Early Bronze Age mounds in the Middle and Lower Tundzha River

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Todor Valchev & Adela Sobotkova

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### Abstract

The second half of 4th and the first half of the 3rd millennium BC is one of the most dynamic and interesting periods in the Balkan history. This is a period of movement of people, ideas and innovations. During this time, the Tundzha River valley sees the arrival of the steppe people – mainly the Yamnaya culture communities, which originally spread from the Ural Mountains to the Hungarian Plain. Their presence is attested by burial mounds, which represent a new way of depositing the dead within earthen monuments so as to facilitate the remembrance of venerated relatives and claims to land. This paper reviews the properties of ten excavated Early Bronze Age mounds in the Yambol Province (Bulgaria), showing that these mounds are substantial in size and tend towards high-prominence locations in the landscape. These attributes are then used to extract mounds of similar properties from a dataset of 1090 mounds registered in the Yambol Province since 2009. Two different sets of criteria produce two subsets of 52 potentially Early Bronze Age mounds, differing slightly in location.

Keywords: burial mounds, predictive modelling, Tundzha River, Early Bronze Age

## 28.1 Introduction

The second half of the 4th millennium BC marks the beginning of one of the most dynamic and interesting periods in the Balkan history – the Bronze Age. This is a time of migrations of people, transfer of technological know-how, exchange of ideas and innovations, and cultural influences. Around 3100 BC, large groups of migrants of the so-called Yamnaya culture, a.k.a. Pit-Grave culture or Ochre-Grave culture, appeared in the Balkan Peninsula. These people were nomads who originally lived in the North Black Sea area and whose culture spread from the Urals to the Carpathians. Many scholars believe that the climatic changes in the 4th millennium BC – a further dry-out of the steppes – have forced people and their livestock to travel further to the west to the Hungarian Plain (Panayotov 1989: 55; Heyd 2011: 549; Frînculeasa et al. 2015: 84).

The Yamnaya culture is known only from its burial traditions, which typically involves inhumation. Individual graves appear in primary position under a burial mound, or as secondary single graves dug in already existing mounds. The grave-pit is rectangular (occasionally oval) in shape, sometimes with a ‘stepped’ profile. Primary burial is often dug into the virgin soil. The bottom is often covered with organic mats or tree bark. The dead person, usually an adult male, is buried resting on their back, in supine position, with legs bent in the knees. The main orientation of both the pit and the dead is in east–west direction, with the head usually towards the west. The dead person has been sprinkled profusely with red ochre, usually in the head, feet and wrist area. Ceramic vessels, ochre pieces, bronze or copper tools and weapons are sometimes included as grave goods. Spiral hair-rings, interpreted as hair decorations, made from copper, gold or silver wire are found near the skulls in some of the graves. The grave-pit is covered with timber beams. Another relatively common element of the grave assemblage is the presence of animal bones and teeth as part of a meat offering. The offering is usually found inside or next to the grave-pit, dedicated either to the dead person or consumed as part of the funerary ceremonies. An earthen mantle has been heaped over the

grave. In cases when the mound builders dug a secondary grave in or near an existing mound, they have usually piled the mound further, increasing its height (Panayotov 1989: 45–47; Heyd 2011: 539–541; Iliev 2011: 391–396; Agre 2015: 149; Alexandrov 2015: 37–39; Frînculeasa et al. 2015: 47, 83; Alexandrov & Kaiser 2016: 359–360).

This paper reviews the properties of ten excavated Early Bronze Age mounds in the Yambol Province (Bulgaria), showing these mounds are substantial in size and tend towards high-prominence locations in the landscape. These attributes are then used to extract mounds of similar properties from a dataset of 1090 mounds registered in the Yambol Province since 2009.

## 28.2 Yamnaya culture in the Tundzha River valley

At the end of the 4th millennium BC the communities of the Yamnaya culture crossed the Stara Planina Mountain and reached the valley of the Tundzha River, which passes through the territory of southeast Bulgaria. It is one of the biggest rivers in the Upper Thracian Plain with 350 km total length and a watershed of 7884 km<sup>2</sup> (Varbanov 2002: 184). The terrain in the Tundzha River watershed is level to rolling. Abundant water and mild climate offered optimal natural conditions for the Yamnaya people newcomers (Connor et al. 2013).

With the newcomers in the Tundzha River valley arrived also the tradition of building burial mounds. Mounds, also called tumuli, barrows or kurgans, are conical earthen constructions that range from 0.5 m to 10 m in height and up to 60 m in diameter. Covering the dead with these impressive monuments marked a new way of treating the dead, who until now have been buried near the settlements. The monumentality and topographic prominence of burial mounds served the memory and veneration of deceased relatives and ancestors as *lieux de mémoire* (sites of memory). The time and effort used in their construction has been correlated with the prestige and privileges of the deceased

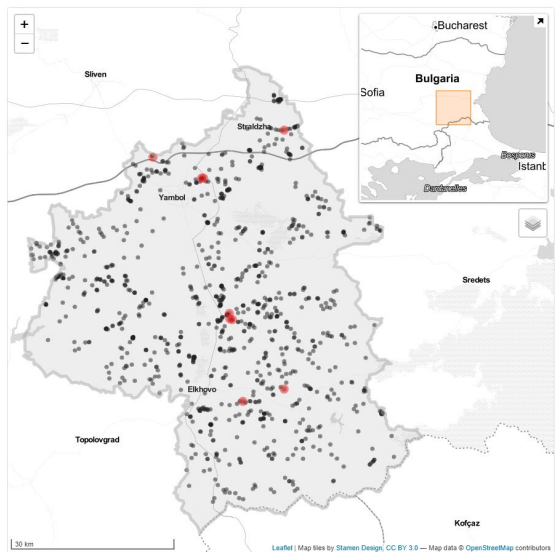


Figure 1. Excavated Bronze Age burial mounds (red circles) and other mound locations in Yambol.

and their clan (Harding 2011: 22, 26, 28; Heyd 2011: 540, 546; Alexandrov 2015: 43–44; Frînculeasa et al. 2015: 47, 85; Alexandrov & Kaiser 2016: 359), or with the power of their offspring (Snow 2006).

In fact, one of the earliest graves under a burial mound in the Upper Thracian Plain was found during the archaeological excavation of Gonova mogila near Targovishte, Stara Zagora District. In Grave 1, the dead person was buried resting on their back, in supine position with flexed legs. The grave had a southeast–northwest orientation and the buried individual was covered with red ochre. The grave inventory included a 17.4 cm long obsidian blade and large numbers of copper and shell beads. Grave 1 was dated to the end of Bodrogkeresztúr culture in eastern Hungary and it indicates steppe connections (Panayotov 1989: 49; Kanchev 1991: 45–46, 56–57; Heyd 2011: 543; Alexandrov & Kaiser 2016: 366). However, it is only during the first half of the 3rd millennium BC that a real wave of burial mound construction can be observed in the valley of the Tundzha River. With only few exceptions they are located in the hilly regions east of Sazlijka River up to the Black Sea coast (Heyd 2011: 546; Alexandrov 2015: 38; Alexandrov & Kaiser 2016: 362, 365).

## 28.3 Tundzha Regional Archaeological Project (TRAP)

In 2008, the Tundzha Regional Archaeological Project (TRAP) began operating in the Yambol Province under the direction of Shawn Ross, Adela Sobotkova, Iliya Iliev and Stefan Bakārdžiev. Its aims were to diachronically investigate the cultural landscapes of the Middle Tundzha River using non-destructive field methods such as the pedestrian survey, satellite remote sensing, and digital recording employing relational databases, mobile computing, and geographic information systems (GIS). The results from the project were published in two books: *The Tundzha Regional Archaeological Project Elhovo Survey* (Iliev et al. 2012) and *The Tundzha Regional Archaeological Project: Surface Survey, Palaeoecology, and Associated Studies in Central and South-east Bulgaria, 2009-2015 Final Report* (Ross et al. 2018).

While conducting a total-coverage surface survey, TRAP teams also started monitoring the condition of burial mounds through-

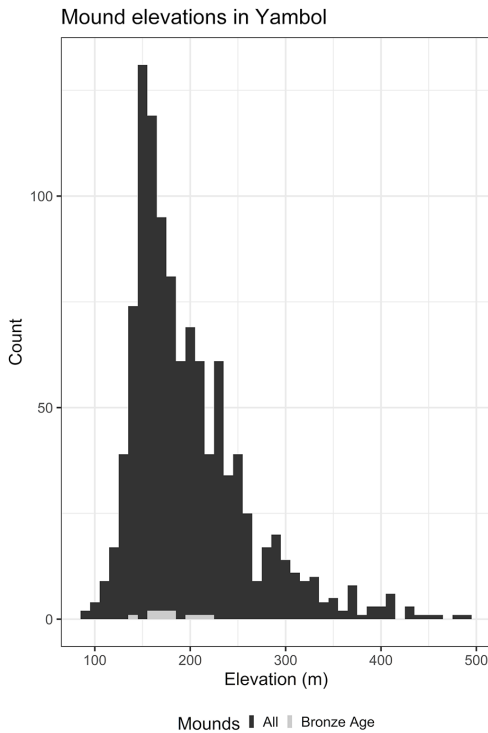


Figure 2. Distribution of elevations among Yambol mounds (n=1090, black) and excavated Early Bronze Age mounds (n=10, grey).

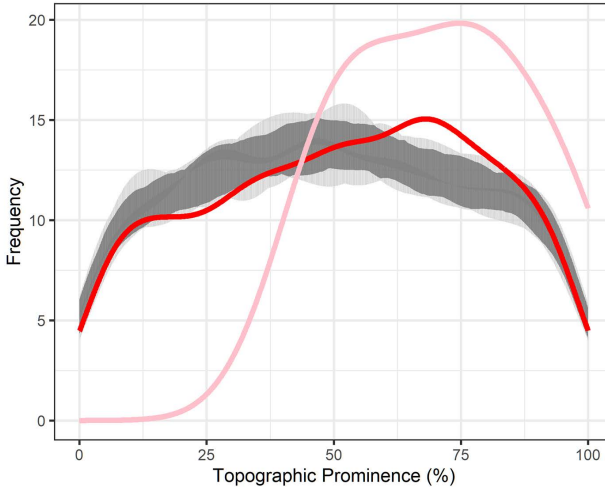


Figure 3. Density curves showing the prominence distribution within the Yambol Region (dark grey), among the Yambol mounds (red), and the excavated Early Bronze Age mounds (pink).

out Yambol. The mounds had been built from the Early Bronze Age to the beginning of Late Antique period in connection with mortuary practices. According to the Bulgarian culture Heritage Law, accepted on 13th March 2009, burial mounds are cultural monuments of national significance – ‘archaeological sites [...] with superior value for the culture and history of the country’ (point 50(1) from the Law).

In 2017, Sobotkova and Valchev focused on systematic cataloguing of burial mounds (Sobotkova & Weissova 2019; 2020; Valchev & Sobotkova 2019). This collaboration produced a module to record burial mounds (Nassif-Haynes et al. 2019; henceforth Burial module). The Burial module was designed to capture the locations, morphology, and preservation status of burial mounds marked in the Soviet military topographic maps (which show the locations of over thousand mounds), as well as artefact scatters and

other features associated with the mounds or discovered en route (Valchev & Sobotkova, 2019; Sobotkova & Weissova, 2020). After the initial deployment in 2017, the module was improved and reused in 2018 in the Bolyarovo municipality, Bulgaria, in 2020 in Perachora, Greece, and in 2022 in the Elhovo municipality (Sobotkova et al. 2021).

## 28.4 The analysis of the TRAP database

To date the TRAP database collects 1090 burial mound records, which encompass over 90% of extant burial mounds in the Yambol District. The detailed spatial and structured information permits us to compare the excavated mound data with not-yet-excavated sites and to identify potential burial mounds from the Early Bronze Age and Yamnaya community.

In the last two decades, 10 burial mounds connected with the Yamnaya culture were excavated (Fig. 1). Seven have been registered in the system before excavations and data for the remaining three were added on the basis of archaeological reports (Iliev 2011; Agre 2015; Alexandrov 2015, 33–34; Iliev

<b>TRAP</b>	<b>Heigh Max</b>	<b>Diameter Max</b>	<b>Elev Aster</b>	<b>Slope Aster</b>	<b>Prom 250mbuff</b>	<b>LU Around</b>	<b>LU Top</b>
8007	4.50	15.0	211.4289	4.16	96.77	Pasture	Pasture
6009	1.50	22.0	202.5368	6.39	66.42	Scrub	Scrub
6003	6.00	63.0	162.7948	5.11	51.61	Scrub	Scrub
8345	3.20	37.6	173.6934	5.31	62.23	Pasture	Pasture
8346	1.00	20.0	167.3124	4.36	95.29	Pasture	Pasture
8357	3.00	32.0	185.0000	0.80	51.45	Pasture	Pasture
8502	4.00	45.0	175.2958	2.30	81.95	Pasture	Pasture
NA	2.70	37.0	144.9163	4.39	75.72	Pasture	NA
NA	4.00	50.0	155.1873	3.92	43.73	Perennial	NA
NA	6.80	48.0	217.1393	3.09	79.78	Perennial	NA

Table 1. Attribute data of the excavated Early Bronze Age mounds in Yambol.

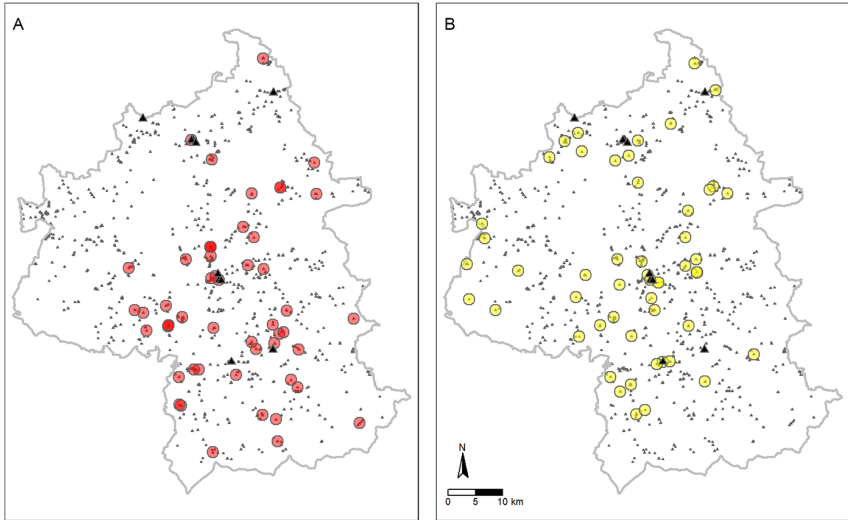


Figure 4. A – locations of potential Early Bronze Age mounds based on prominence and height ( $n=52$ ) are indicated by red circles; B – locations of potential Early Bronze Age mounds based on prominence and ruggedness ( $n=52$ ) are represented by yellow circles. Small grey triangles indicate mound distribution in Yambol ( $n=1090$ ), with large black triangles marking the excavated Early Bronze Age mounds ( $n=10$ ).

& Bakārdžiev 2020). We can say that Early Bronze Age mounds are from 1 to 7 m high with from 15 to 60 m in diameter (Table 1). Most of them are situated on hilltops and surrounded by pasture and sometimes with visible bedrocks. Figure 2 shows that Early Bronze Age mounds occupy elevations from 144–211 m a.s.l., which, however, is the most popular band of elevation for all mounds in the region.

Except for one mound in the flatlands of Straldzha, the Early Bronze Age mounds also enjoy a prominent position. Prominence means they have visual control of the majority (50+%) of the surrounding landscape. The mean prominence is 70% and median is 71% for the Early Bronze Age mounds. High prominence differentiates these mounds not only from the surrounding



terrain but also from other mounds. In fact, a density curve produced by a Monte Carlo model in Figure 3 shows that while Early Bronze Age mounds occupy the top quartile of prominence, mounds in general (and regardless of chronology) have a disproportionately high representation in the 70–80% prominence band – far more than if they were distributed within the Yambol Province at random. High prominence, while somewhat diagnostic, is thus not a sufficient determinant for a Bronze Age mound (e.g. it does not necessarily differentiate it from a prominent Roman Period mound), but needs to be combined with other criteria. One also needs to note that these environmental properties are extracted from a fairly coarse (30 m resolution) terrain data. The saving grace is that the locations are true and the automated data extraction from raster is done consistently for each point. Despite these reservations, the rationale of ancient mound builders seems clear: they prioritised prominent locations for religious or pragmatic reasons (Saxe 1970; Morris 1991), but avoided the highest peaks in the region, choosing mid-range outcrops and ridges instead.

Having reviewed some characteristics of the excavated Early Bronze Age mounds, we can now look for extant mounds that share similar attributes. If we start with the averages as cut-off values and constrain mound landscape prominence to 70+% and height to 3+m, 52 out of 1090 database mounds satisfy these criteria (Fig. 4a). If we replace the height constraint with a ruggedness index of 1.6+, the number of candidates also reaches 52, but their locations shift considerably (Fig. 4b).

This example of querying the environmental and morphological data in the TRAP database illustrates how the current dataset can be harnessed to predict potential Early Bronze Age mounds among the unexcavated features. These constraints can be relaxed or hardened, additional criteria can be added, etc. The resulting sites, however, should be seen as probable candidates before validation in the field. Utilisation of a machine-learning approach with a greater training dataset (excavated mounds) would likely generate predictions with a specific probability, allowing one to prioritise ground-truthing according to their level of confidence.

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