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FORTIFICATIONS IN LANDSCAPE. PREFERENCES IN THE LOCATION OF THE EARLY BRONZE AGE SETTLEMENT IN BRUSZCZEWO

ABSTRACT

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Since the dawn of mankind, defence against an enemy has been one of the major stimuli of the growth of culture and civilization. Bruszczewo is a unique example of Early Bronze settlement in Great Poland.

The paper is intended to present the results of spatial analysis on the mentioned site with respect to different elements of the landscape. It will also show the results of the viewshed analysis and interpretation the defence potential of Bruszczewo settlement. For this purpose, DTM and thematic maps were produced. The last element presented in the paper will be the results of the analysis of the spatial pattern of the fortifications founded on the site.

Based on the mentioned results, it will be possible to interpret the phenomenon of the formation of the spatial layouts to create the surrounding environment. This information will allow landscape preferences that might have made Early Bronze Age communities choose specific settings for their settlement to be isolated.

Keywords: Early Bronze Age, Únětice culture, fortifications, defensive architecture, spatial analysis
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INTRODUCTION

The remains of the fortified settlement in Bruszczewo are undoubtedly among the exceptional finds of the Únětice culture in the region of Great Poland. This uniqueness lies in the defensive nature of the settlement. In the area of Poland discovered there were other

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examples of defence settlements from the Early Bronze Age (Chochorowski 1985; Kunawicz-Kosińska 1985; Lasak and Furmanek 2008; Jaeger 2016; Przybyła and Skoneczna 2011). However, complicated structures registered in these positions certainly of defensive functions are not analogical in the context of Bruszczewo. An example of a defence settlement of Únětice culture is also known in one of the regions of Germany (Schunke 2009, 273-319), but the type of fortification (surrounding ditch without palisade) and the type of huts (long hall huts) significantly differ from what we find in this case.

Not only defensive structures discovered in Bruszczewo such as ditch or palisade, have directly determined the uniqueness of this site. The above-mentioned elements, combined with natural features of the area and their location in the surrounding space gave rise to the emergence of a specific "defence" cultural landscape.

According to Janusz Bogdanowski, a landscape architecture researcher specializing in defence architecture, development in use of natural defences reflects the level of defender intelligence and civilization progress of human groups (Bogdanowski 1996). The above-mentioned scholar has identified five degrees of adapting environment to defensive purposes. In the present text, the author would like to discuss three of them which can be discussed for Bruszczewo, based on the current knowledge about the site. These are: taking advantage of local features, use of local material to consolidate and strengthen the defence, and the choice of hiding place.

TAKING ADVANTAGE OF LOCAL FEATURES

The location of the settlement in Bruszczewo was a very conscious, even strategic, choice (Fig. 1). This area, as a result of geological processes, has taken the shape of a small peninsula cutting into the valley of Samica (Hildebrandt-Radke 2013). This was a very good location for defence reasons. The terrain of the position itself clearly dominates in the context of the nearby landscape (Fig. 2a). In the Bronze Age, this area was probably surrounded by a lake (Fig. 2b) (Bork 2010; Haas and Wahlmüller 2010). Based on the remains of fascines and Early Bronze Age features found in the peat zone, the level of the lake water surface was estimated at 69.2 metres above sea level (Kneisel 2011, 49). Digging the ditch was a procedure designed to cut off the centre of the settlement from the rest of the environment. The area of the natural site was reduced to a minimum, reducing it only to a defence of the entry. Most likely, the only direct access road to the settlement remained a narrow, 2.5 m section, way located in the north-west part (Fig. 2c).

However, this place was a good choice not only in the defence context. The analysis of the results of the current peninsula form, exposure (aspect) in terms of directions of the world, indicate that most of the objects, and so the potential building, was placed on the southern slopes (Fig. 3). For latitudes of Poland on the slopes of the south exposure that are very sunny, better thermal and climatic conditions prevail, in contrast to the northern slopes of the exposure. Southern exposure increases the rate of vegetation. Today, human

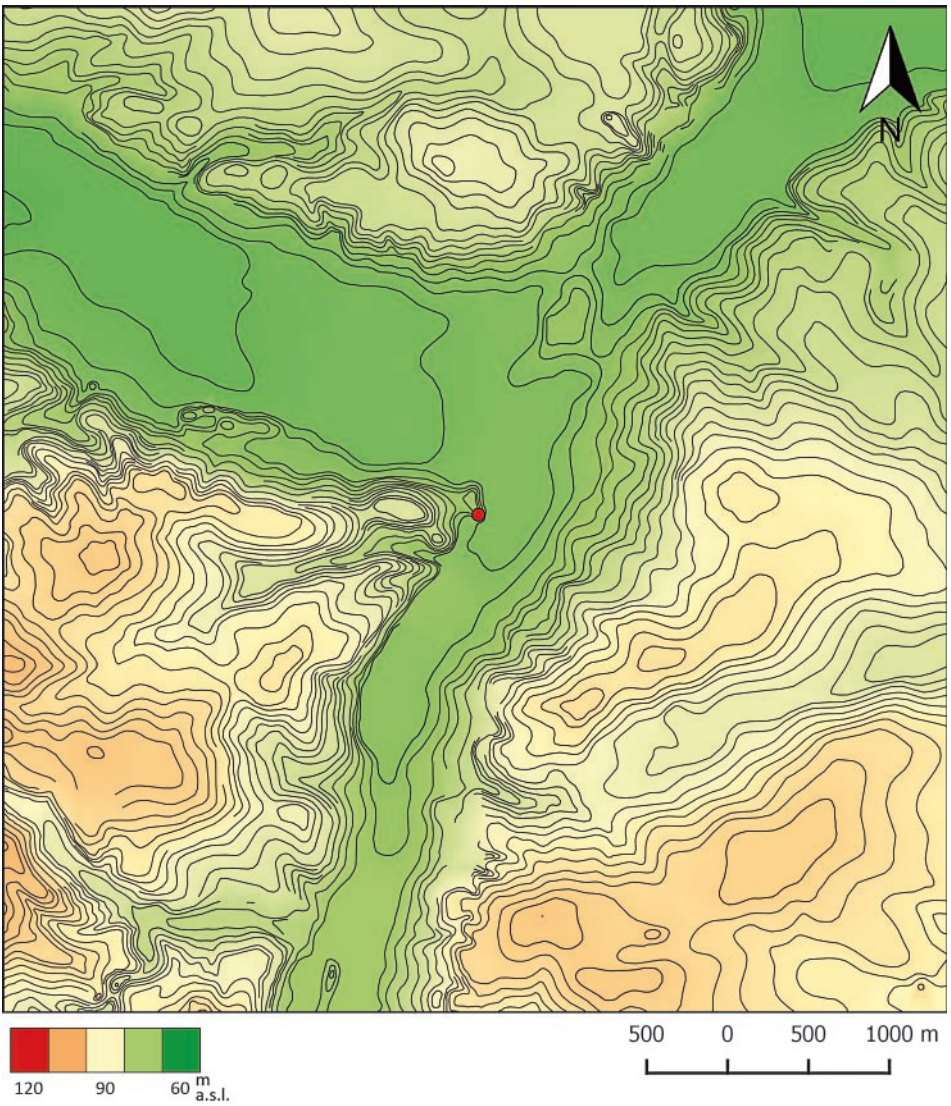

Fig. 1. Location of site Bruszczewo 5 on the topographical map

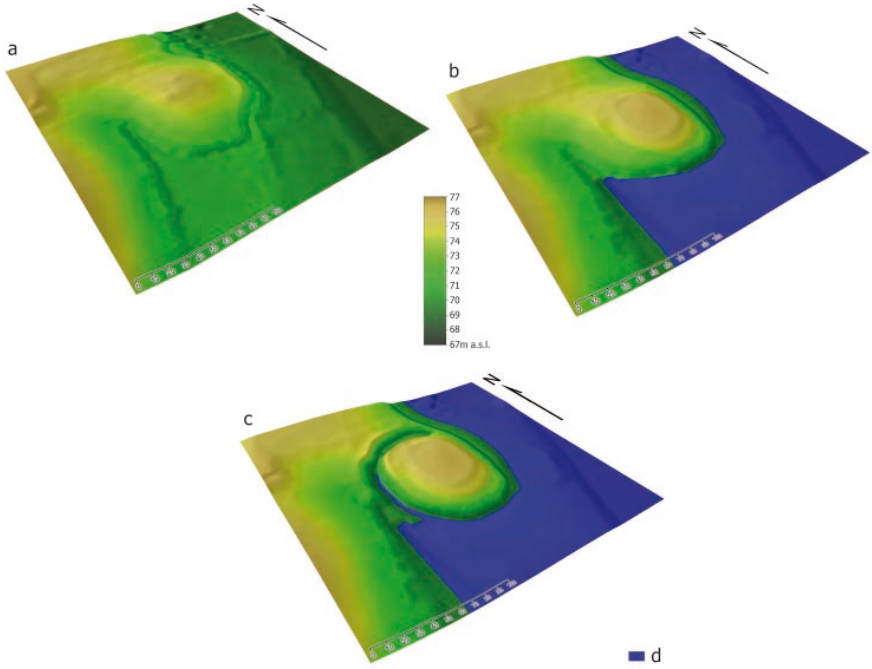

Fig. 2. Digital Terrain Models, a – modern terrain of the site, b – reconstruction of terrain from the Early Bronze Age, before settlement, c – reconstruction of terrain from the Early Bronze Age, including ditch, d – water level in the Early Bronze Age (after Kneisel 2011, 49)

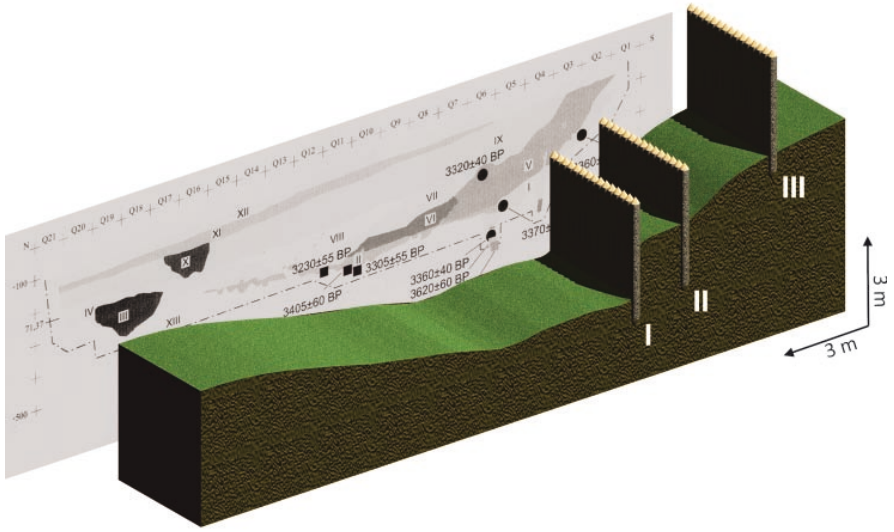

Fig. 5. Reconstruction of the location of three palisades

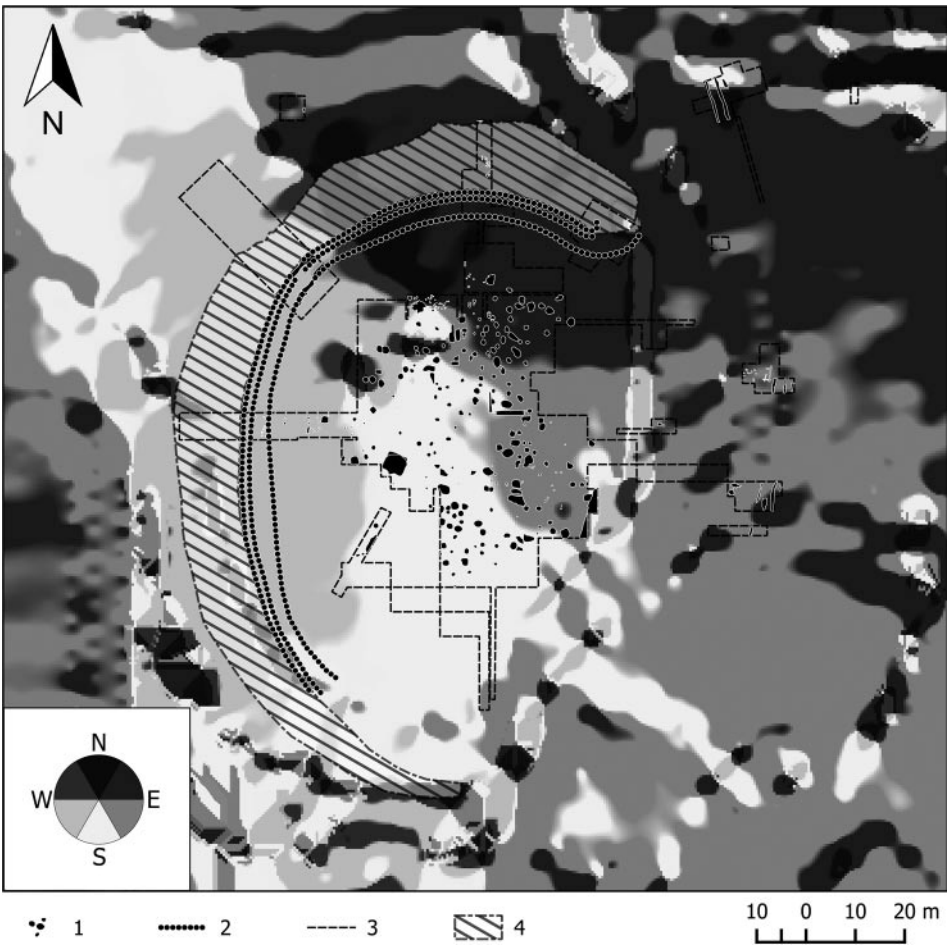

Fig. 3. Results of the analysis of exposure (aspect) of the slopes, in terms of directions of the world. 1 – archaeological features, 2 – palisade, 3 – trench borders, 4 – ditch

settlements and cultivation are found mainly on the southern slopes while on the northern ones, natural vegetation dominates (Neufert 2007, 271).

THE USE OF LOCAL MATERIAL TO CONSOLIDATE AND STRENGTHEN THE DEFENCE

On the site remains have been found indicating the existence of three rows of palisades which were preceded by a dug ditch, remains of a gate were also registered (Fig. 4). With all of the listed elements the Early Bronze settlement of Bruszczewo can be classified into

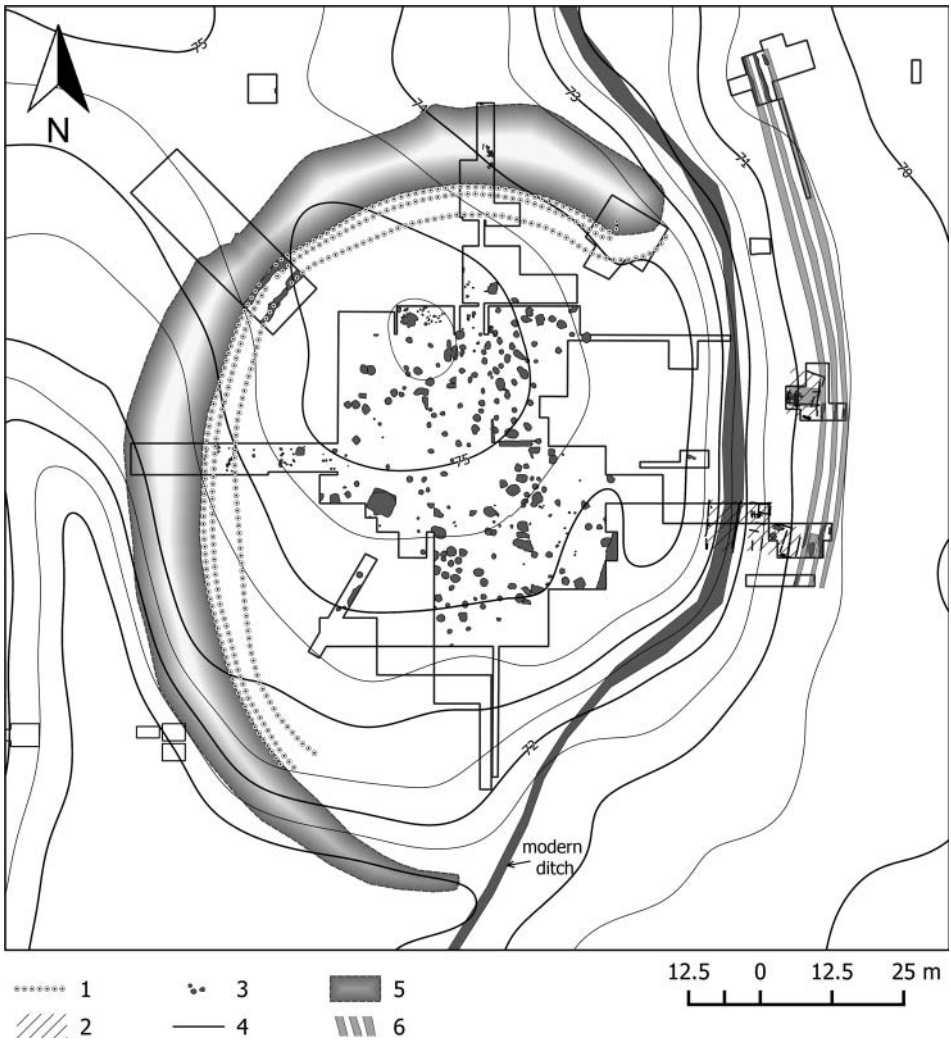

Fig. 4. Bruszczewo site no 5. Excavation plan, 1 – palisade, 2 – house structures, 3 – archaeological features, 4 – trench borders, 5 – ditch, 6 – fascine

highly organized type of settlements built in the long-wall system and "shield" type subsystem.

In the long-wall system, the main element is a wall, usually made in the form of a palisade, wall or an embankment. It may be supplemented or even replaced from the side of the lowest risk with natural fortifications, in case of Bruszczewo it was a lake. The settlement created a completely isolated space, circular in shape, with a diameter of approx. 120

m and area of approx. 1.5 hectares (Czebreszuk *et al*. 2004, 71). This shape determines the positive economy of forces (Bogdanowski 1996, 43).

The "Shield" type subsystem is the simplest variation of the above-mentioned system and places with natural defence features are artificially fortified, mainly from the greatest threat (Bogdanowski 1996, 44).

DITCH

The ditch was approx. 20 m wide and approx. 4 m deep. U-shaped in cross-section, with a flat bottom and gentle slopes (40 degrees from the palisade and 30 degrees on the opposite side). According to the Roman classification, it is one of the most developed forms, *cum lateribus directis* (Fig. 5). Due to the properties of the sediments which the ditch was built of (a large dust and clays fraction, with low permeability) it was certainly filled with water (Hildebrandt-Radke 2013, 66). However, most probably it did not come from the lake, but from precipitation (Bork 2010, 44).

An important element that is often overlooked in the context of defensive architecture is the existence of a narrow threshold, dividing the ditch slope and protecting it from shedding (Bogdanowski 1996, 40). This is precisely the function that the small bank, located between the second and third row of palisades, most likely had (Stróżyk 2015, 399).

PALISADE

The palisade forms a passive defence, it is a classic breastwork (Bogdanowski 1996, 42). In the case of Bruszczewo, there may have been a kind of platform located inside the settlement, along the palisade. This would explain a 20m empty area between the palisade and the centre (see Fig. 4). In this aspect, the defence method was frontal and vertical. The palisade was made of oak logs with an average thickness of 25 to 30 cm. They were dug in side by side, next to each other. It is known that the end of the palisade was placed at a depth of at least 70 cm below the Early Bronze Age layer. On the basis of this information one can estimate that the height of the wall was approx. 3 m (Ivanova, 2008, 136). An important element which should be mentioned is a narrow threshold, registered during excavations, separating the rampart slope from the ditch. The threshold keeps the slope from sliding down into the ditch (Bogdanowski 1996, 40). This function was served by a small embankment located between the second and third rows of the fortifications (Stróżyk 2015, 399).

GATE

The gate is a very important part of the entire defence structure. In the original building, gates resulted in the introduction of active defence (Bogdanowski 1996, 42). Unfor-

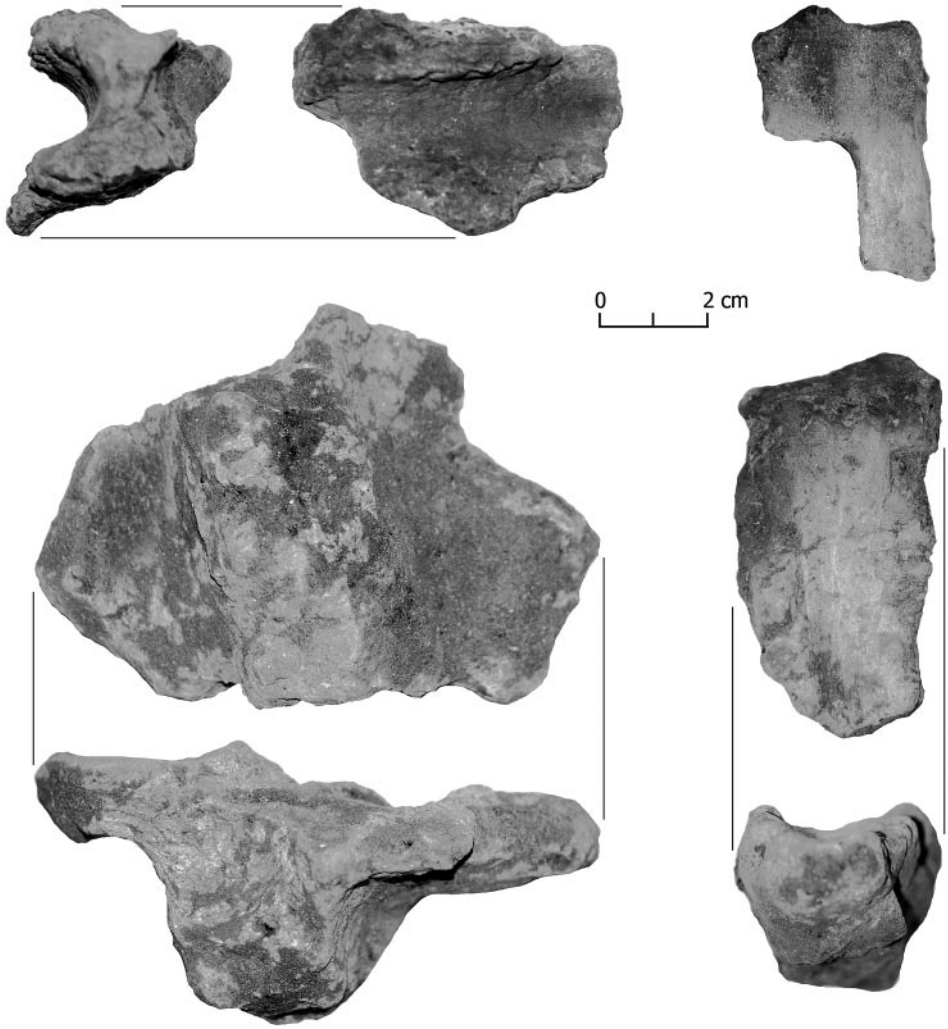

Fig. 6. Selection of daub fragments with imprints from gate area (trench no 51)

tunately, the current state of identification of this part of the Bruszczewo settlement does not allow us to give unambiguous interpretations (Stróżyk 2015, 391). In the course of excavations, a large amount of daub fragments were obtained. A characteristic feature of this material is the presence of imprints, most likely associated with existence of wooden structure (Fig. 6). Currently, the reconstruction of the gate remains an open question.

In the long-wall system, this structure is the weakest element of the whole. Therefore, in order to increase the defence properties, the gate width should be reduced. In the

present settlement gap in the palisade, which is regarded as the location of the gate, is approx. 2.5 m. This small space greatly increases the defence capabilities. In the case of the gate, entry in the long-wall system most often took the form of a simple door (Bogdanowski 1996, 42).

We do not have enough data on the layout of buildings inside the settlement to be able to determine the functional space (Jaeger and Stróżyk 2015; Stróżyk 2015, 392). Unfortunately, the area connected with buildings was destroyed as a result of advanced erosion processes (Czebreszuk and Suchowska 2010, 545; Czebreszuk 2015). All of the residential buildings were probably accumulated in the centre and eastern part. This is indicated by the dispersion of the archaeological features. The remains of huts discovered in the eastern, peat zone of the settlement, has a degree of regularity as to the orientation of their location. All are oriented on axes, north-east, south-west (Kneisel, 2011, 50, fig. 2) The issue remains unresolved, a 20-meter area of settlement emptiness remains, registered on the basis of geomagnetic prospection and a series of drillings (Czebreszuk and Müller 2015, 416; Stróżyk 2015, 399). It was located along the palisade and even further in the southern part of the site. Perhaps the area free from buildings was left in order to enhance the active defence inside the settlement. There was probably one additional exit from the settlement which might have been located in the north-eastern part of the settlement. The break in the fortifications at this point is much greater than in the case of the gate. The terrain is gentler, which means that the possible escape route would have posed no problems. It is possible that it was here held main transportation (Stróżyk 2015, 400).

CHOICE OF HIDING PLACE

In order to determine the visual relations between the closest landscape and the settlements a viewshed analysis was performed. The base was a digitally recreated terrain model of the area covered by the study. The landscape of Great Poland has often been subjected in the past to very rapid socio-economic changes that have had a major impact on its current appearance (Czebreszuk and Szmyt 2011). To create this digital elevation model (DEM), Messtischblatt maps were used from the first half of the twentieth century. These are some of the earliest cartographic materials made for the area. These maps are characterized by high accuracy (contour line at 1.25 m) and a lack of modern transformations. Thereby a good representation of the prehistoric topography around the settlement in Bruszczewo was obtained. To create a surface, the Delaunay triangulation algorithm was used. The sampling density of the model was 5 m. In the analysis, the Earth's curvature calculation was taken into account.

Palynological studies carried out in the vicinity of the peninsula indicate an open landscape (Haas and Wahlmüller 2010). In the Early Bronze Age period (2000-1770 BC), as a result of intense settlement, a process of deforestation of large tracts of land around it occurred (Hildebrandt-Radke 2013, 99). This is important because the dense vegetation

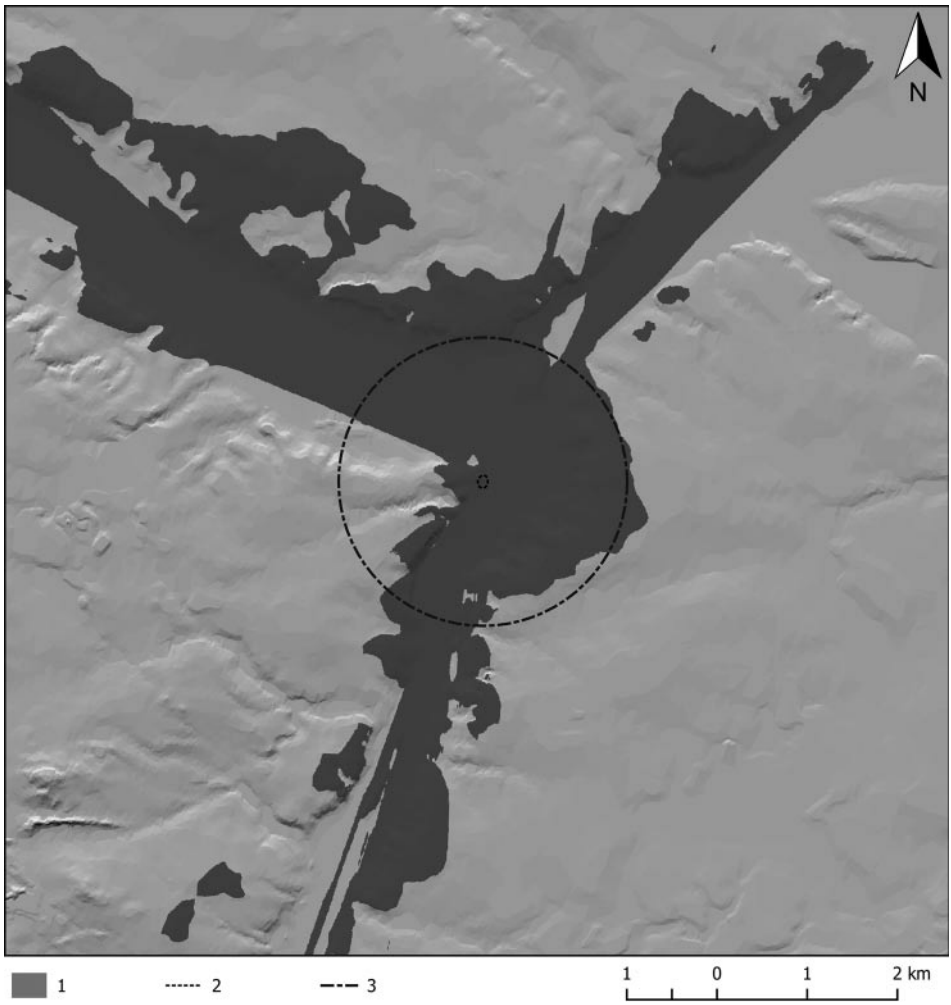

Fig. 7. Bruszczewo site no 5. Field-of-view map from the settlement:
1 – visible area, 2 – Bruszczewo settlement area, 3 – 1600 m buffer

can be one of the factors that disturbed the process of seeing (Wheatley and Gillings 2000, 5-7). The suggested results of the viewshed analysis, adopting the above estimated vegetation conditions, were not limited by landscape elements such as forest.

The first step was to determine the maximum field-of-view from the settlement. To this aim, the observer point was set at a height of 1.7 m (Wheatley and Gillings 2000, 6) in 30 randomly chosen locations within the settlement. The target, i.e. observed point, has also been increased to 1.7 m, as the value of average height of a man. On the basis of the visibility

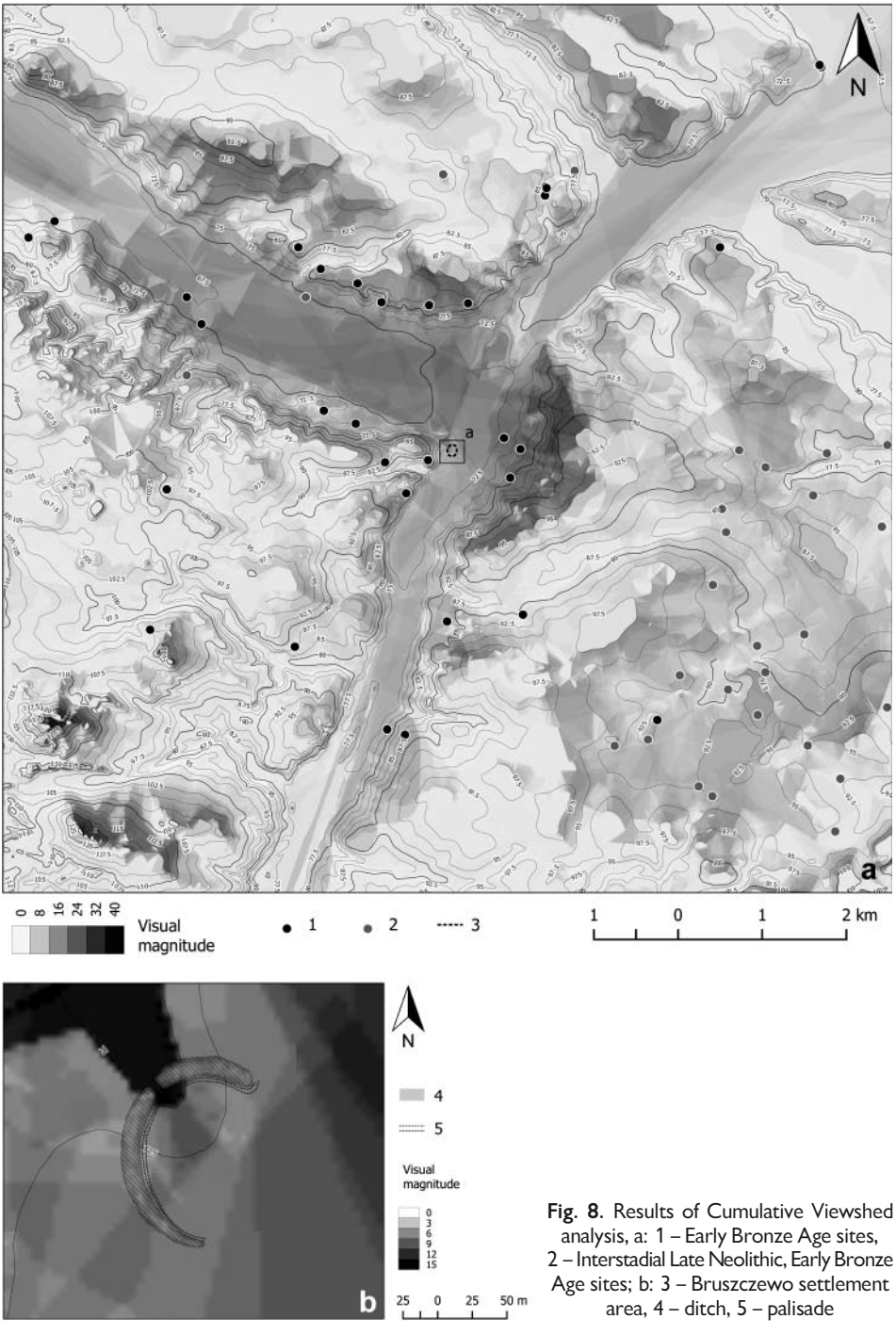

Fig. 8. Results of Cumulative Viewshed analysis, a: 1 – Early Bronze Age sites, 2 – Interstadial Late Neolithic, Early Bronze Age sites; b: 3 – Bruszczewo settlement area, 4 – ditch, 5 – palisade

map, an area potentially seen from the settlement was specified as well an area where it could be seen from (see. application and analysis criticism Wheatley and Gillings 2000, 7).

Only 21.7% of the examined area is visible from the observer positions. The resulting map of the field-of-view shows that the surrounding valley was almost entirely visible from the settlement. The rest of the area has a marginal importance in terms of visibility. The analysis results represent another important aspect of the site location. The unaided human eye is fully functional, when it comes to interpersonal contacts, at a distance of 1600 m (Hall 2003, 61). Within the buffer around the settlement with the above-mentioned range, approx. 78% of the area is visible (Fig. 7). The field-of-view in the immediate area is limited only from south-west. This location of the settlement allowed for full control of the nearest space, acting as a safe area for settlement (Murrieta-Flores 2010, 262, Stróżyk and Niebieszczański 2013, 194).

The next step was to examine the visibility relation which occurred between the site in Bruszczewo and settlements in neighbouring areas during its colonization (Late Neolithic, Early Bronze Age and Early Bronze Age). To this end, an analysis of the cumulative viewshed (CV) was conducted, by selecting 58 locations as observer points that can be contemporary to the Bruszczewo settlement. Data from the AZP (Archaeological Record of Poland) surface survey were used (Czebreszuk and Szydłowski 2010). The height of the observer, as previously, was set at 1.7 m. The CV is performed for a group of points to estimate the amount posts seen for each DEM cell (Bourgeois 2013, 133).

As a result of the analysis, it turned out that the target (settlement) was visible only from 12 sites. The greatest visual magnitude falls on the bottom area at the intersection of the valleys (Fig. 8). Not all of the settlement area was equally visible. By far, the largest part of the settlement, approx. 70% of the area, was visible from only 4 locations. The centre of the peninsula, where buildings were potentially located, was seen from 6 sites. It is worth noting the fact that, apart from purely defensive functions the location of the fortifications might have acted as a sort of curtain against a potential enemy. Palisades extending along the northern and western edges of the settlement probably hid all activities within the interior.

The biggest visual magnitude was recorded in the part with the gate (Fig. 8a). This shows that the position of the gate was a strategic intent. This area was the most visible, but at the same time it was a place where the most could be seen from. As the gate is the weakest element of fortifications (see above), its small size and good visibility, and facilitated control of the environment from that place as well as enabled the fastest response when a danger was perceived.

CONCLUSIONS

The functional analysis presented in the article shows the great building experience and spatial awareness of the Early Bronze Age population. The use of highly complex defence systems in the form of ditch and palisades required huge amounts of physical

strength but also logistics. The choice of location for settlement, in addition to economic opportunities (Kneisel *et al.* 2008, 168-169) offered natural defensive qualities. The location of settlements favoured control of the neighbouring valleys, which could have served as main roads, giving excellent visibility. The location of the site on lower parts of the area (the highest point in the settlement is 75.5 m) resulted in the fact that it was less visible. It potentially hindered the attacker's perception of the actions of the people and enabled them to defend it (Smith and Cochrane 2011, 83).

Probably all these factors contributed to the fact that settlement in Bruszczewo was a centre in the context of Únětice culture oecumene (Czebreszuk and Müller 2004, 312).

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