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Some thoughts on settlement patterns. Late Bronze Age habitat in the Șomuzul Mare basin[*]

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Abstract. *The study aims to examine the prehistoric landscape in order to identify settlement patterns and relations between contemporary sites. In the Șomuzul Mare basin, Northeastern Romania, the local topography, resources and climate compelled its prehistoric occupants to adapt for a better exploitation of resources and protection. The archaeological database includes 30 archaeological sites dated to the Late Bronze Age discovered in the study area. GIS software was employed in order to gather information about the topographic and climatic characteristics of the areas where prehistoric sites were established. Slope, solar exposure, wind shelter and density maps, as well as the distances to the closest water source were used to identify settlement patterns.*

Rezumat. *În acest studiu se dorește analiza mediului preistoric pentru a identifica modele de locuire și relații între așezări contemporane. Topografia locală, resursele și caracteristicile climatice au determinat comunitățile preistorice să adopte un anumit comportament pentru o mai bună exploatare a resurselor și protecție. Baza de date include 30 de situri atribuite perioadei târzii a epocii bronzului care au fost descoperite în bazinul hidrografic al Șomuzului Mare. Softurile GIS au fost utilizate pentru a obține informații referitoare la caracteristicile topografice și climatice ale zonelor în care au fost amplasate așezările. Hărțile pantei, expunerii solare, expunerii față de vânt și densității, cât și distanța față de apă au fost utilizate pentru a identifica modele de locuire.*

Keywords: Noua culture, Eastern Romania, landscape archaeology, GIS, settlement patterns.

Introduction

The geographical characteristics of an area influenced the behaviour of all prehistoric human groups. The local topography, resources and climate determined prehistoric people to adapt, engendering a variety of ways or models that cannot be fully understood yet. Landscape archaeology provides a wide range of tools and methods to analyse and, in a certain rate, to understand and explain ancient ways of life. The manner prehistoric people occupied a region and the changes resulting from their activities offers some hints in this

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direction. These slices of information can help us reconstruct, albeit partially, the landscape as saw by these people.

Analysing the settlement patterns from a certain region and in a limited period of time is a method to identify the relations between different communities, their relation and the resources allocation. In this kind of social system, every settlement, larger or smaller, has a predetermined purpose in the economy and hierarchic organization[2].

The corroboration of such information can lead to the identification of micro- and macro-regional characteristics that can provide the starting ground for explaining human behaviour in its complexity.

Aim and method

This study aims to analyse the prehistoric landscape in order to identify settlement patterns and relations between sites. For this purpose, archaeological data, landscape information and GIS analysis have been taken into consideration. As is the case with all attempts to understand the landscape and the prehistoric behaviour, this analysis too has an inherent margin of error, conditioned by the selective availability of the published data, the inaccuracy of the GIS programs, or even the subjectivity of the author.

Some of the archaeological data comes from literature, but most of the information about the landscape and the characteristics of the sites` topography was collected during personal field surveys. The archaeological database includes 30 archaeological sites dated to the Late Bronze Age (henceforth LBA). From the 21 settlements already published[3], only three sites were unidentifiable in the field due to anthropic impact (Fălticeni–*Vatra Târgului*, Fălticeni–*Șoldănești*, Preutești–*Livada lui Spânu Gheorghe*). Another nine sites are personal discoveries, part of them having been recently published[4].

The spatial database includes shapefiles with points representing the sites and the hydrography digitized from topographic maps. A 5-meter resolution Digital Elevation Model was created by digitizing the elevation curves from a topographical map of the study area. This was used to evaluate the relationship between the site locations and topography. This information was manipulated using the tools provided by ArcGIS 9.3 and SAGAGIS, in order to generate different maps (slope, aspect, density, and wind shelter) and calculate distances.

The observations made during personal field survey will be pointed out in this paper. Prehistoric communities were closely linked with the topography and the resources found in the landscape they occupied. Through landscape analysis, the topographical characteristics of the LBA sites and their proximity can be used to identify settlement patterns. To analyse the relation between the sites and aforementioned factors, we must obtain data on the areas

[2] PARSON 1972, 127.

[3] Among others: TEODOR, IONIȚĂ 1967; URSULESCU, MANEA 1981; NICULICĂ 2006; ANDRONIC 2008.

[4] GAFINCU 2014.

where the archaeological sites are located. On the basis of this information, the general characteristics can be observed, and the settlement patterns ascertained.

From the onset it must be stated that no LBA settlement of the study area has been investigated through archaeological digging. Stratigraphic information would undoubtedly be useful, but in their absence the observations have to rely on landscape analysis and field survey data.

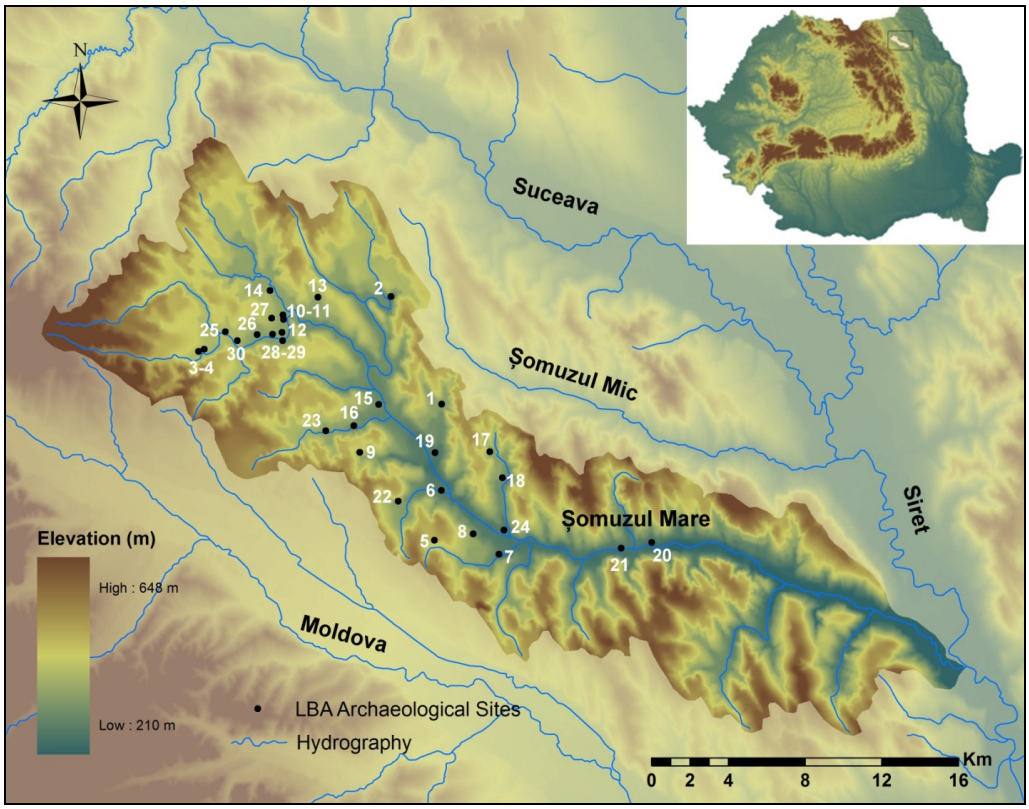

Figure 1. Geographic location of the hydrographic basin of the Șomuzul Mare River.

Study area

The characteristics of the landscape had a great effect on prehistoric behaviour, from choosing a settling place, to defining the relations with the neighbours. Depending on the natural resources existing in a certain area, those small-groups communities adopted a certain model for exploiting in an efficient way the available resources.

The study area overlaps a large region of the Suceava Plateau, spanning between the catchment basins of the Suceava River at the North, the Șomuzul Mic River at the North-East, the Siret River at the East, and the catchment basin of the Moldova River to the South and West (Figure 1). The slopes are mostly oriented on a North-West–South-East direction, and the Șomuzul Mare River closely follows the same direction. In the lower basin, the main

stream runs along a West–East direction, up to the confluence with the Siret[5]. The specific climate is conditioned by the strong winds that come from the North-West, making the valley of the river difficult to inhabit in cold season[6].

The vegetation in the basin was transformed due to human activities, especially during the last century. Nowadays, forested areas can be found on the high slopes located in lower catchment of the Șomuzul Mare River, while the upper basin is dominated by forest-steppe vegetation[7]. The brown argiloiluvial and podzolic soils are associated with the forested zone. The brown and grey-brown soils appear on the slopes with southern and eastern exposure, being most suited for agriculture. Luvic soils can be found along the main river and its tributaries[8].

Slope

The slopes from the basin of Șomuzul Mare River seems to be divided into three sections, which can be followed in LBA settling preferences (Figure 2). The upper basin is characterized by reduced slopes, especially near the main stream were most of the archaeological sites are located. In the middle basin, on the north-facing areas the slopes are stepper and difficult to inhabit. On the other hand, the south-facing slopes are more gentle, their bottom being most suitable for the LBA communities. The erosion processes have made the lower basin look like a deep canyon, with high slopes at the right of the river and middle and low slopes on the left. The most suitable areas to inhabit are the first terraces of the main river and its tributaries. Nevertheless, in this area were discovered only two LBA settlements, both of them located near the main river. Downstream, no LBA sites were discovered. This situation can be explained by the steep slopes or by scarce data due to the impossibility to conduct field surveying in the area. The first terraces are occupied by modern-day structures, and accordingly it is almost impossible to properly research the area.

The analysis of the sites shows that almost 57 % of them are located on a slope lower than 2°, 27% are between 2° and 4°, and only 16 % are between 4° and 8°, while the maximum value in the study area is 14.7° (Figure 3).

The slopes from the proximity of the LBA sites are different in the three divisions mentioned above. In the upper basin, along the main river, are located the sites on slopes between 0–2°, while the sites located on slopes higher than 3° are on the upper sectors of the tributaries. In the middle basin two situations appear: the sites discovered along the main stream are located on slopes lower than 2°, while the higher values are specific for the sites from the tributaries. The sites discovered along the main river in the lower basin appear in areas with slopes of 2–3 °.

[5] GHEORGHIU, LUPU-BRĂTILOVEANU 1992, 479.

[6] ERHAN, PLEȘA 1964, 191; ROȘU 1980, 409.

[7] ROȘU 1980, 480–481.

[8] BĂCĂUANU *et al.* 1980, 266.

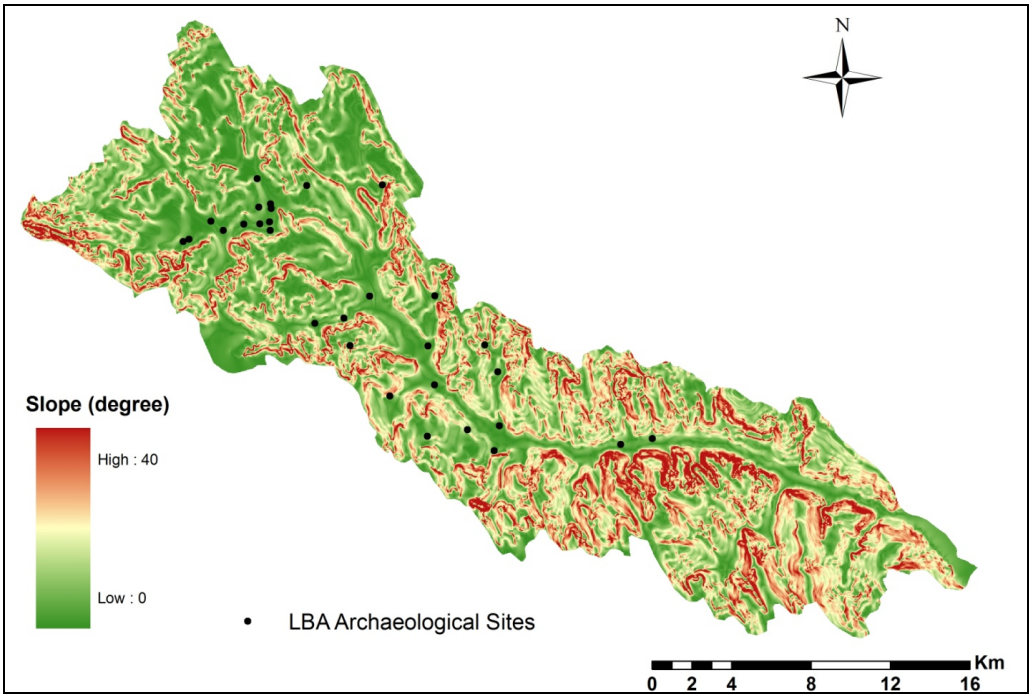

Figure 2. Slope map of the Şomuzul Mare basin.

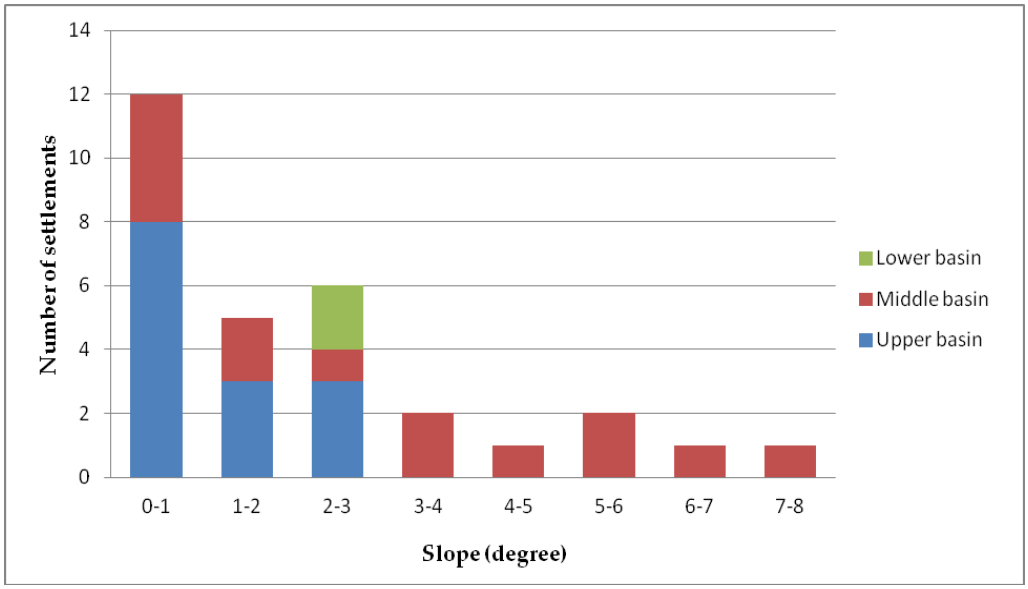

Figure 3. Histogram distribution of slope values for LBA settlements in the Şomuzul Mare basin.

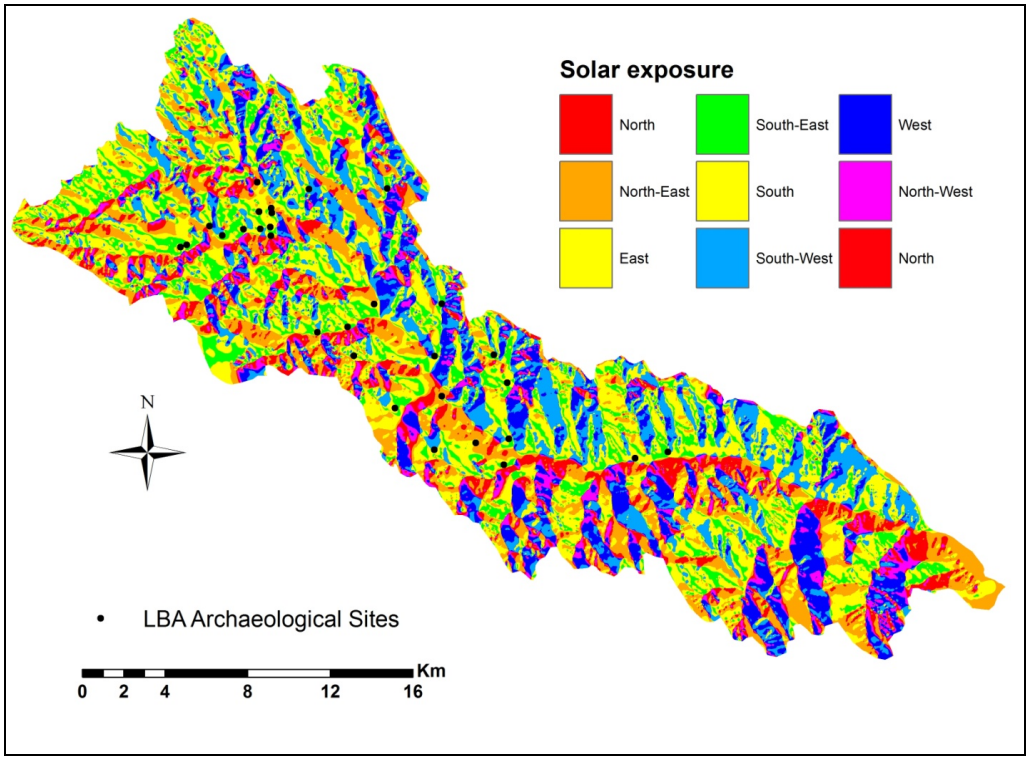

Figure. 4. Solar exposure map of the Șomuzul Mare basin.

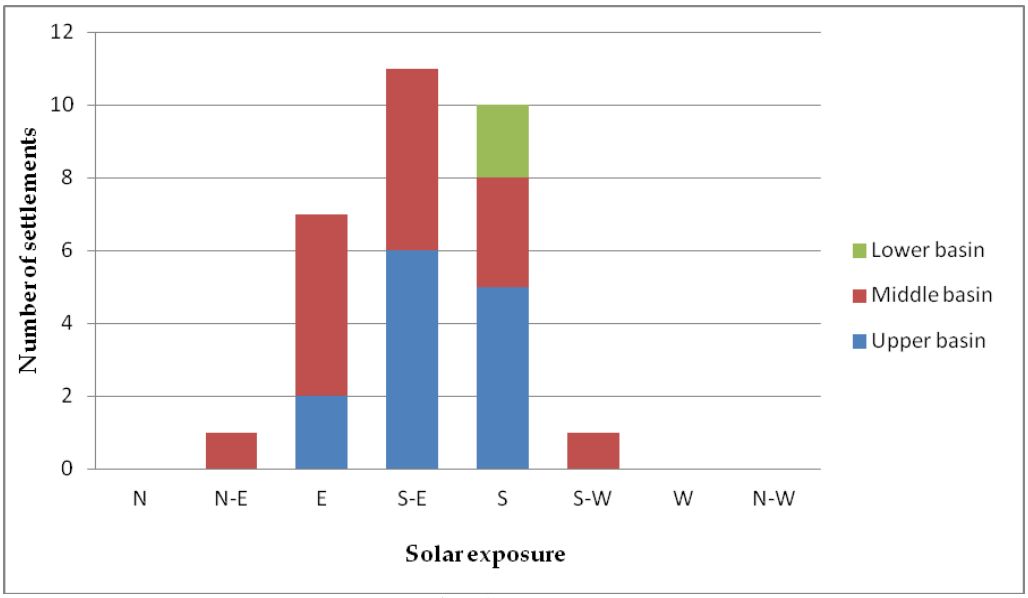

Figure 5. Histogram distribution of solar exposure values
for LBA settlements in the Șomuzul Mare basin.

The distribution of the sites with respect to the slope is obvious. Most of the sites occupy slopes with low values, usually located along the Șomuz River, while the higher values appear on the upper sectors of the tributaries. We can say that the places with lower slopes are the most preferred locations for LBA sites. The areas with high slope values are not typical for Noua settlements and can be seen as a concession.

Solar exposure

The general orientation of the slopes, with high values to the North-West and low values to South-East, makes the south-facing slopes the most suitable for habitation. It seems that across the entire study area the sites are located in places with eastern and southern solar exposure (Figure 4).

The orientation of the slopes where sites were established follows the eastern and south side of the slope (Figure 5). Thanks to this exposure, the inhabitants of the LBA settlements were receiving increased solar radiation. The areas with East to South exposure have a few advantages: the amount of heat, essential during the cold season, is greater, while in early spring snow melts faster[9].

Wind shelter

As the slope and aspect influenced prehistoric people to settle in certain places, the climatic factor would have been important as well. To determine which LBA sites are more or less wind-protected some spatial analysis can be done. The analysis was made with the Windshelter module in SAGA GIS, using a radius of 1 kilometre. Because there is no information about paleowinds from the study area, the present-day dominant wind direction was used (Figure 6).

As already mentioned, the dominant wind in the area come from the North-West, affecting especially the slopes with a northern exposure, while the bottoms of the south-facing slopes are the most protected. Furthermore, the main river is oriented almost in the same direction with the slope sides, which makes its valley hard to inhabit especially in the cold season[10]. However, on the tributaries there are some areas (Rădășeni valley) that are more protected and the mean temperature is higher, being favourable for dwelling and agriculture[11].

In the Șomuz basin, a part of the archaeological sites were discovered in wind-protected places, while others in very exposed areas, and a certain pattern can be observed (Figure 7). In the upper basin most of the sites that are sheltered or have a moderate exposure are located on tributaries, while the exposed and very exposed sites are usually along the main

[9] ASĂNDULESEI 2012, 141.

[10] ERHAN, PLEȘA 1964, 191.

[11] GHEORGHIU, LUPU-BRĂTILOVEANU 1992, 480.

stream. This situation is more obvious in the middle segment of the Șomuz River. The sites located along the river are exposed and very exposed, and only in two cases they have a moderate wind-exposure. Conversely, the settlements which were discovered upstream the tributaries are located in sheltered places. In this area there is one exception, the settlement from Fălticeni–*Buciumeni*, which is located near the source of tributary, but it is exposed to the winds. On the last segment the sites are located along the main river, in areas with moderate exposure or sheltered.

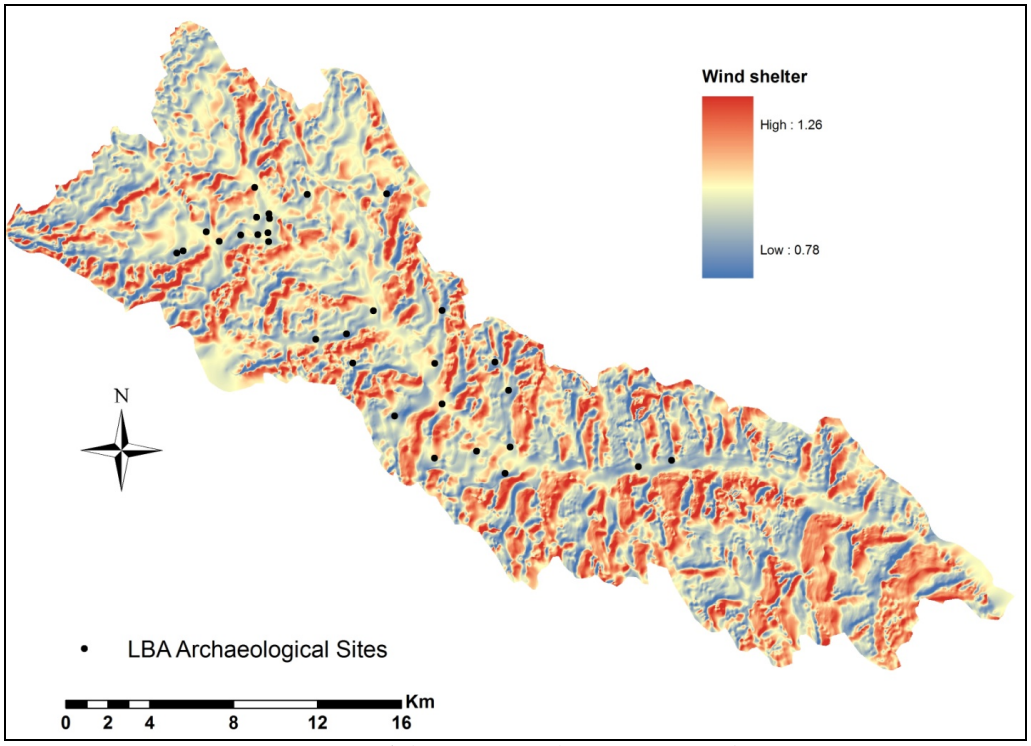

Figure. 6. Wind shelter map of the Șomuzul Mare basin.

Certainly, the most suitable places for the LBA communities to inhabit would have been the areas with moderate exposure to wind or the sheltered ones. We can observe that not all the settlements are located in such areas. In the middle basin a relation between the protected sites and the ones exposed can be identified. Here, most of the sites located at the junctions of the Șomuz River with its tributaries are exposed to the wind. Upstream, on each of these tributaries we can find at least one site, which is usually sheltered. There are only two settlements, Fălticeni–*Vatra Târgului* and Lămășeni–*Puntișoară II*, which do not follow this pattern. In the second case a settlement has yet to be discovered near the junction of the Lămășanca stream with Șomuzul Mare. The field surveys conducted in the area did not result in the discovery of the pair site. The only unexplored area where the site could be found remains in the perimeter of a contemporary village.

In the upper basin, the site distribution makes the relations between them to be difficult to follow. Here the wind-sheltered settlements mix with the exposed ones, and it is difficult to establish the pairs or groups. The geographical characteristics of this particular area, in particular the low relative elevation and slope oriented North-West to South-East, reduces the areas suitable to inhabit that are at the same time sheltered. As mentioned above, the high settlement density recorded in this area can be linked with the seasonality of the Noua people.

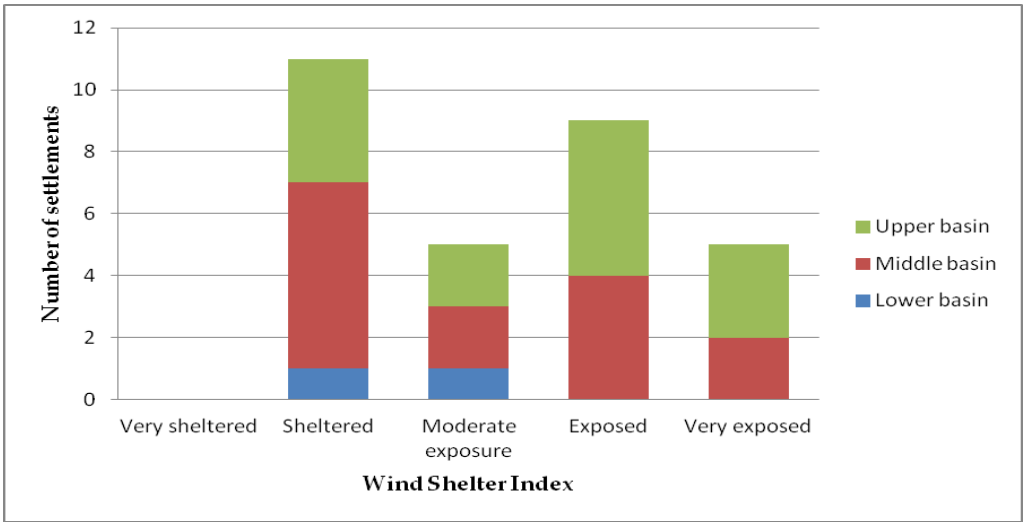

Figure 7. Histogram distribution of wind exposure values for LBA settlements in the Şomuzul Mare basin.

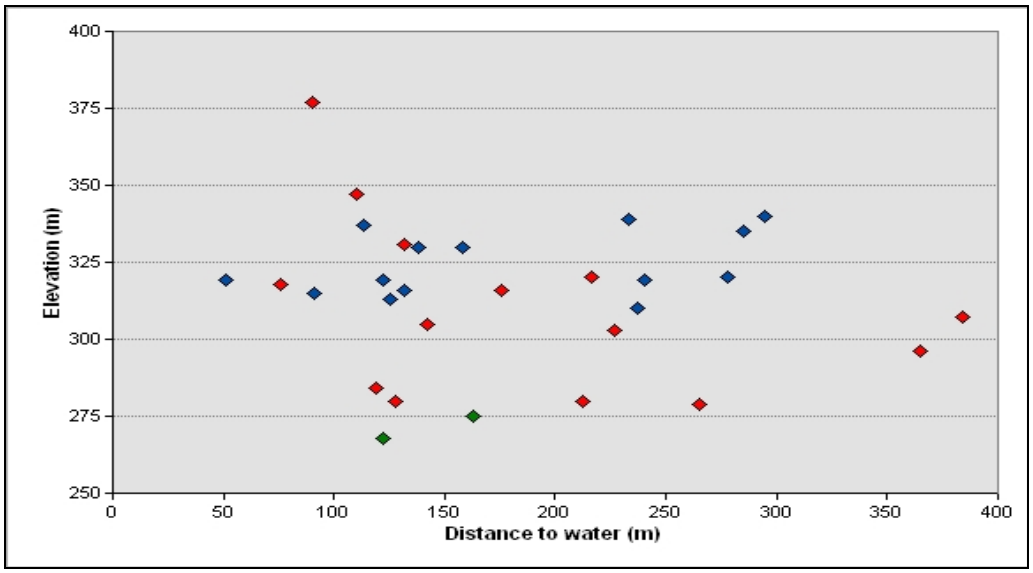

Figure 8. The distance between LBA settlements and the closest water source in the Şomuzul Mare basin.

Hydrography, distance to a water source and density

In the literature there is a constant debate about how important water is for LBA communities and the proximity of the settlements to a fresh water source[12]. The study area is crossed from the North-West to South-East by the Șomuz River, while its tributaries are almost perpendicular on its course. Large marshy areas with rich vegetation appear along the main river and near each junction. These green patches can be used for grazing especially during dry summers when the vegetation from the slopes is almost exhausted.

Most of the LBA sites are located at a distance between 100 m and 300 m from the water source, with a mean distance of 180 m. The settlements were not established in the near proximity of the water courses to avoid flooding, only a few being located at distances lower that 100 m (Figure 8).

Another fact that should be noted is the proximity to junction or marshy areas. In the study area, the majority of the sites (28) are located near a wetland, either along the meadow of the main river, junctions or powerful springs.

Most of the settlements, whether located in upper, middle or lower basins, are located in the proximity of a stream, which could have provided fresh water supplies to the LBA communities. The low number of sites discovered at a distance lower that 100 m shows that these areas were avoided, due to the risk of flooding[13].

Although the number of LBA sites discovered in the middle and upper basin is the same (14), these are distributed unequally (Figure 9).

A high density is recorded in the upper basin of the Șomuz River. Usually for Noua culture this kind of clustering is called "nest" and contains 4–5 settlements with "ashmounds", located within a radius of 2–3 kilometres from each other[14]. In the mentioned area there are a few differences towards this model. First of all, the distance is relatively smaller and the density reaches 2.8 settlements per square kilometre. Secondly, in this area there is only one settlement with "ashmounds", Cumpărătura–*Ponoare*, which is isolated in the eastern side of the Liteni Depression. In this area, the "nest" pattern is difficult to ascertain, although the number of settlement is consistent.

Nevertheless, the high number of LBA settlement can be associated with the seasonality of the Noua people. Here, most of the sites are small, rarely reaching one hectare. Probably, this site congestion is related to the resources existing in the area. The sites are located along the main river and secondary streams and have in the close proximity green patches with rich vegetation for grazing and fertile soils for agriculture. If the settlements were to coexist, there would be a constant struggle for resources.

[12] Among others: FLORESCU 1964, 146; VIERU 2012, 95–96; DIACONU 2014, 41.

[13] PETRESCU-DÎMBOVIȚA 1953, 448.

[14] SAVA 2004, 71; SAVA 2005, 101.

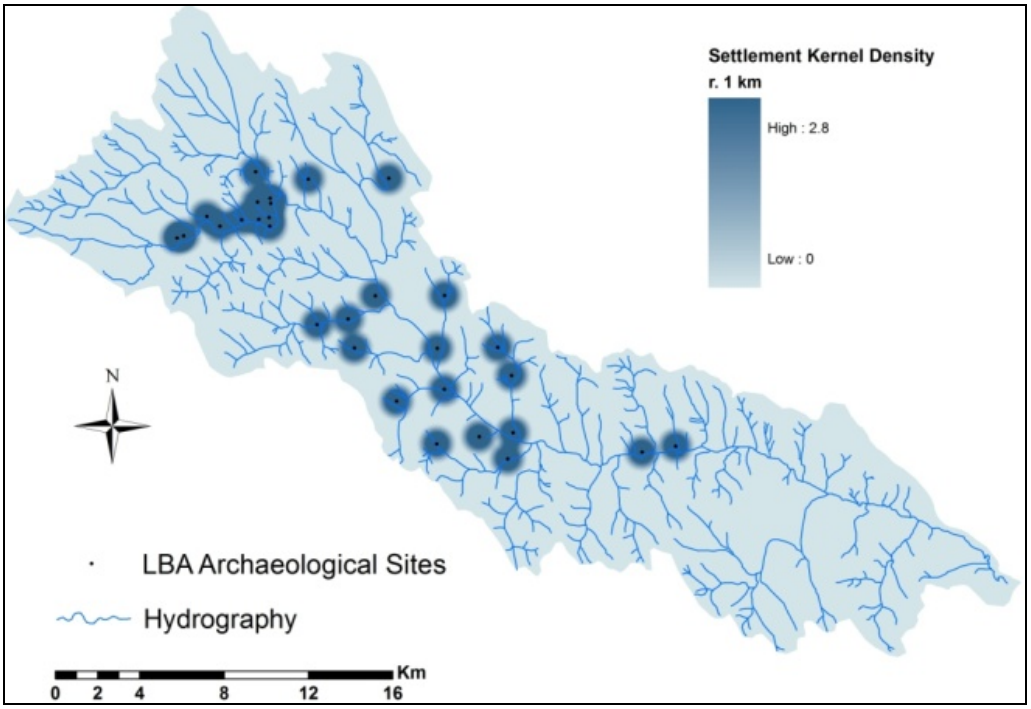

Figure 9. LBA settlement density in Şomuzul Mare basin

On the other hand, in the middle basin the sites are proportionate distributed and the resources equally shared. In this area the number of the settlements located along the main stream is smaller than the number of sites recorded near the tributaries. Every site discovered near the junction of the tributaries with the Şomuz River has at least a correspondent upstream the secondary stream.

Although the two settlements discovered in the lower basin (Preutești–Li*vada lui Spânu Gheorghe* and Preutești–*Silište*) are relatively close, the maximum density is one settlement per square kilometre. The area has patches with rich vegetation, especially along the Şomuz, but it seems that in this case it was not enough for the LBA cattle-breeders.

Stationary or temporary?

The literature on the characteristics of the Noua people features a constant statement: they were semi-nomadic/semi-sedentary people, with an economy based on animal breeding, with agriculture holding a secondary place in their economy[15]. Most of the osteological remains are from cattle, followed by sheep, goat and horse and, in a lower number, from pigs and wild animals. In the same community, some of the persons were shepherds, while others were practicing agriculture and craftsmanship[16]. The period of time a LBA community stayed

[15] Among others see: FLORESCU 1964, 147–148, 165; PETRESCU-DÎMBOVIȚA 2001, 285; SAVA 2004, 68–75; SAVA 2005, 66, 103.

[16] SAVA 2005, 100.

in a temporary settlement depends of the quantity of resources existing in its proximity. After the resources exhausted, especially the grazing grounds, the community moved a few kilometres away. The areas with a high settlement density suggest the existence of this type of relocation caused by the permanent search of resources[17].

One of the characteristics of the Noua culture is the existence of flattened mounds, of a greyish colour, called "ashmounds". The diameter varies between 15 and 40 meters, and the height reaches 0.80–0.90 meters[18]. The archaeological diggings uncovered a layer with ashy soil of 0.60–0.80 m which contains artefacts, animal and human bones, houses, ovens, and pits[19].

Corroborating the information existing about "ashmounds", E. Sava considered them to be places inside or near the settlement with a cultic and economical purpose, used later as dump deposits[20]. A large number of "ashmounds" have been associated with stationary settlements, while the sites where only a few were discovered have been considered a sign of seasonality. There were probably permanent settlements used during all seasons, while the temporary ones were used only during the warm season[21].

After conducting diggings in the LBA site from Rotbav–*La Părăuț* (Brașov County) and combining the information from other sites, L. Dietrich showed that the existence of the "ashmound" is related to the economical and cultic activities carried out in the proximity of the settlement. This area is the place where the hides were processed, the discoveries suggesting large differences between the artefacts discovered inside the settlement and the "ashmound"[22].

West of the Siret River and in particular in the study area, the number of settlements with "ashmounds" is low[23], the grey-coloured spots are clustered only in small groups and there are not visible all the time of the year[24]. In the Șomuzul Mare basin there are mentioned only three, Cumpărătura–*Ponoare*[25], Fălticeni–*Siliște* and Mihăești–*Roșia*[26], to which we can add other three, Mihăești–*Siliște*[27], Petia–*Țântă*[28] and Podeni–*Vatra Satului*[29]. Although for the Fălticeni–*Buciumeni* settlement "ashmounds" are mentioned[30], the first papers did not

[17] SAVA 2005, 101

[18] KAISER, SAVA 2006, 142.

[19] SAVA 2005, 73.

[20] SAVA 2005, 91.

[21] SAVA 2004, 71–72; Sava 2005, 101.

[22] DIETRICH 2011, 131–142; DIETRICH 2013, 227–246.

[23] NICULICĂ 2006, 200.

[24] GAFINCU 2014, 237.

[25] NICULICĂ 2004, 423–430.

[26] GAFINCU 2014, 231, 232–233.

[27] Only one area with greyish soil is preserved, the rest of the site being located in the enclosed space of an orchard.

[28] One "ashmound" can be distinguished near the south-eastern limits of the site. In this area the soil is greyish and contains more artefacts and bones than the rest of the settlement.

[29] After the ploughing can be seen three grey-coloured spots.

[30] ANDRONIC 2008, 140.

suggested their existence[31]. During personal field survey in the area we did not find any traces of greyish soil and the aerial photographs do not show any changes in soil colour.

The presence or absence of the "ashmounds" was linked with the short inhabitancy period of the sites. Other explanation is related with the absence of this type of discovery from the surface[32]. The second case can be pointed out by the observations made during the diggings carried out at Mihălășeni–*Lipovanu*[33] and Piatra Neamț–*Steagu Roșu*[34], where the "ashmounds" were not visible on the surface, but the excavations uncovered layers with greyish soil[35]. This situation is plausible but cannot be apply blindfolded in the study area.

Results and discussions

The analysis performed in the study area revealed a series of patterns of the Noua people settlements.

Always in search of rich vegetation, these cattle-breeders communities needed to adapt to the existing conditions and fairly share the resources from a restricted territory. While the aspect and the distance to a water source are the same across the entire area, some of the characteristics of the landscape show two models of adaptation.

The upper basin is the most populated and, at the same time, the most suitable place for economic activities. The slopes are gentle, receive more solar heat and the distance to water is relatively small. Along the main river, the low slopes cause the emergence of marshy areas with rich vegetation, preserved even during dry summers, so necessary for the sustenance of the herd.

On the other hand, this area has a big disadvantage. The low differences in elevation make the upper basin, at least in the areas where most of the sites were discovered, almost flat. This topography reduces the protected places that can be used during the cold winter. The wind shelter analysis shows that most of the sites are located in areas without protection.

This information argues for the seasonality of most of these settlements. From the 14 sites discovered here, only a few could be permanent, but in this state of research, without any excavations conducted in this area, it is difficult to say which were the temporary settlements and which the permanent ones.

The situation seems more clear in the middle basin. The sites located in the valley of Șomuz River have at disposal all the resources (water, vegetation, productive soils) and terrain condition (slope, aspect), but, with some exceptions, are exposed to wind. On the other hand, the settlements discovered on the upper sector of each tributary are sheltered, but the resources are scarce and the terrain is rougher. The symmetrical disposition of the

[31] NICULICĂ 2006, 165, 200; NICULICĂ, APARASCHIVEI 2007.

[32] VIERU 2013, 251.

[33] DASCĂLU 2007, 80.

[34] FLORESCU 1969, 85.

[35] DASCĂLU 2007, 80.

two types of sites on the tributaries makes us to assume that there was a close relation between them.

The low settlement density from the lower segment of the Șomuz River does not permit too many observations. Relying only on landscape characteristics and spatial analysis (slope, aspect, distance to water, density, wind shelter), it is difficult to say whether the settlements from the Preutești area were temporary or stationary.

Conclusions

Taking into consideration the landscape analysis and the archaeological data, a settlement pattern can be suggested. We consider that in the study area there are two types of LBA settlements:

a. The settlements where no "ashmounds" were discovered can be considered permanent, inhabited the whole year. The landscape characteristics show that this type of settlement is located in areas protected by wind, close to water sources, but with higher slope and poorer resources. Those are usually large settlements, with scattered ceramic fragments and adobe.

Certainly, there is the possibility that some of them could have "ashmounds" that aren`t visible on the surface. Until further research, which may prove their existence, we cannot say otherwise.

b. In the Șomuz basin the sites with "ashmounds" were discovered in areas with a lot of resources, but exposed to wind. Here, these sites seem to be an adaptation to a more effective exploitation of the available resources. Used only during the warm period of the year, this is the place where daily economical activities are performed and, probably, this is the place where from the herd is sent to the grazing grounds. The distance depends only on the rules applied in the shared landscape and the quantity of the available resources.

In the middle basin the relation between permanent and seasonal settlements is symmetrical, being related to the location along the course of the same tributary. On almost[36] each stream there are one or two sites with "ashmounds" and the permanent settlement located upstream. The situation is more complex in the upper basin. Here we can`t pair-up or group the temporary with seasonal settlements. Although there is mentioned one single site with "ashmounds", it is possible that some sites, especially the ones discovered along the valley of the main river to be seasonal.

These models of land use and adaptation to resources, terrain and climatic conditions can be used as a starting point for the research of the LBA seasonality and movement. It should be mentioned that this situation applies to this study area, but it is possible to be valid for other spaces with similar characteristics (topography and resources).

[36] The sites where the "ashmounds" were not identified are located in nowadays inhabited areas (Fălticeni–*Șoldănești)* or in areas destroyed by human activities (Țarna Mare–*În livadă*).

List of settlements

1. Bunești–*Școala Generală*; 2. Cumpărătura–*Ponoare*; 3. Drăgoiești–*Drăgoiasca I*; 4. Drăgoiești–*Drăgoiasca II*; 5. Fălticeni–*Buciumeni*; 6. Fălticeni–*Șelișteș*; 7. Fălticeni–*Șoldănești*; 8. Fălticeni–*Vatra Târgului*; 9. Lămășeni–*Puntișoară II*; 10. Liteni–*CAP*; 11. Liteni–*Cociorbă*; 12. Liteni–*La Fântânuță/Suhat*; 13. Liteni–*Izurcani*; 14. Liteni–*Șipoțel*; 15. Mihăești–*Roșia*; 16. Mihăiești–*Silișteș*; 17. Petia–*Silișteș*; 18. Petia–*Țântă*; 19. Podeni–*Vatra Satului*; 20. Preutești–*Livada lui Spânu Gheorghe*; 21. Preutești–*Selișteș*; 22. Rădășeni–*Dealul Heleștiucului*; 23. Rotopănești–*La Ghilitoare*; 24. Țarna Mare–*În livadă*; 25. Vornicenii Mari–*Pârâul Velnița*; 26. Vornicenii Mici–*La Grind*; 27. Vornicenii Mici–*Șes*; 28. Vornicenii Mici–*Hârb*; 29. Vornicenii Mici–*Sesii*; 30. Vornicenii Mici – *Șipoțel/În lung*.

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