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ARTICLES

ZSOLT MOLNÁR, JÓZSEF-GÁBOR NAGY

HABITAT MODELS AND SOCIAL SYSTEMS IN MIDDLE BRONZE AGE CENTRAL NORTH-WESTERN TRANSYLVANIA. STATE OF RESEARCH[1]

ABSTRACT

Zs. Molnár, J.-G. Nagy 2013. *Habitat Models and Social Systems in Middle Bronze Age central north-western Transylvania. State of research*. ACC 48: 5–86.

The existence of fortifications is attached to the emergence of formalized territorial units of a quasi-political nature. The current paper examines Middle Bronze Age settlement sites, metal finds and natural resources of Central north-western Transylvania.

Our aim is to investigate the differences, transformations and the dynamics of settlement systems in the study area during the Middle Bronze Age using cartographic documents and data relating to the landscape around the sites (using satellite images, aerial photographs and geophysical measurements) stored in a geographic information system (GIS).

The research also draws on macro-regional palaeoenvironmental data on Central north-western Romania. Modelling the territories of Transylvanian prehistoric communities provides information about the division of space and possible land use strategies. A uniformly general model cannot be applied in case of the Transylvanian Middle Bronze Age settlement system. The settlement founding culture's different characteristics, the special topographical and ecological conditions of the distribution areas determined the quality of the established settlement network.

There is evidence that Middle Bronze Age chiefdoms form peer polities controlling territories of different size along one or a larger number of river valleys. Our approach reflects the current stage of research of the subject; the future field research is expected to bring in new, more conclusive evidence in this matter.

Key words: Transylvania, settlement pattern, cost distance, GIS, landscape archaeology

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ARGUMENT FOR AN APPROACH

In recent decades issues related to the Middle Bronze Age Otomani-Gyula-varsánd[2] and Wietenberg[3] cultures was addressed in several archaeological studies written by researchers from Romania as well as by authors from other countries. Even though the study of the habitat and settlement system has been pursued with energy by Bronze Age scholars, many questions — e.g., social organisation of Central and north-western Transylvanian Middle Bronze Age communities and settlement system models — remain unanswered.

A study of the complex relationships existing in the Middle Bronze Age — an ambitious and challenging — may be expected to help improve our understanding and refine our interpretations of social and economic behaviour of human communities. In an attempt to grasp the nature of social and political organisation within societies of Early Europe, prehistorians have offered multiple explanations of social and economic differences by developing a number of theoretical models and concepts[4]. Without debating theoretical approaches it is worthwhile noting that most of the socio-political models developed for the Bronze Age are dominated by a top-down approach and involve an extrapolation from the strict archaeological record accepting a series of related anthropological concepts[5].

From our point of view a top-down approach model does not necessary mean a politically and economically heavily centralized society. The premise of the social model proposed here is that tells (Otomani culture) and fortified hilltop settlements (Wietenberg culture) are the power and economic centres on their territory (Steward 1955, 9ff., 51, 178ff.; White 1959, 17ff.). If tells are considered as more than multi-layer settlements, but a 'package' connecting together central settlement structure, social, economic and certain environmental factors, this expanded definition can be used to classify the territories of all the cultures of the Middle Bronze Age in the Carpathian Basin. In this sense the notion of a central site (or of a multi-layer, fortified settlement) reflects the same phenomenon and can be used as synonymous (Fischl, Hellebrandt, Rebenda 2011, 108; Fischl, Reményi 2013, 726ff.; Fischl, Kienlin 2013, 28). A uniformly general model cannot be applied in case of the Transyl-

[2] This group of issues is addressed in: Bóna 1975, 120ff.; Máthé 1988, 27ff.; Bader 1998, 43ff.; Thomas 2008, 15ff.; Gancarski 1999 (ed.); Gancarski 2002 (ed.); Steiner 2003, 83ff.; Przybyła, Blajer 2008, 52ff.; Németi, Molnár 2012, 10ff.; Górski 2012, 89ff.

[3] Relevant monographs: Chidioşan 1980; Andriţoiu 1992; Boroffka 1994; Andriţoiu, Rustoiu 1997.

[4] Recently published reviews: Renfrew 1982, 5ff.; Renfrew 1986, 1ff.; Shanks, Tilley 1987, 41ff.; Molnár, Ţoca 2011, 119ff.; Harding 2013, 378ff.;

[5] For a hierarchical approach see: Kristiansen 1998, 371, 374, 412; Kristiansen 2000, 9; Gogâltan 2005, 38; Harding 2006, 113ff.; Gogâltan 2010, 13ff.; Dani 2009, 21; for a second opinion and a different approach see: Kienlin 2012, 15ff.; Kienlin 2012a, 251ff.; Brink 2013, 434.

vanian Middle Bronze Age settlement system. The settlement founding culture's different characteristics, the special topographical and ecological conditions of the distribution areas determined the quality of the established settlement network[6]. The analysis of the Central north-western Transylvanian settlement system is important — despite the archaeological data deficiency of the current stage of research — because the differences and possible relations between the central site and the countryside may reflect a similar social hierarchy (Shennan 1986, 119ff.; Fischl, Reményi 2013, 729).

The Bronze Age society investigation toolkit consists of archaeological models and theoretical models of society offered by modern comparative anthropology (Wason 1994, 16f; Shanks, Tilley 1987, 137).

Over the last few decades important exhaustive reviews were published on the emergence of chiefdom and middle range society concepts and their interpretations[7]. In the Carpathian Basin the hierarchical organization of Bronze Age chiefdom societies or the extent of socio-economic control are still open questions. The institutionalization of group-controlled hierarchies is the optimal means of exercising and retaining power. In case of Central north-western Transylvania this process is connected to the existence of bands of warriors with various numbers of members and networked power strategies (Johnson 1982, 389ff., 409ff., Fig. 21:1, Table 21:1, Fig. 4). The networked power strategies are based on the personal system of kinship, trade partnership and alliances. Mutual gifts meant the base for the retention of the relations system. This type of social organization strategies bring together the members of a community in a unified ideological and economic unit. There is room within this system also for mutual co-operation and competing rivalry (Earle 2002, 18). Bronze weapons, regarded as elements of the prestige goods category, and fortifications — the result of community labour, are primary indicators of social hierarchy in our study area (Firth 1973, 77ff.; Halas 2002, 351ff.). The panorama of Bronze Age society outlined by Kristian Kristiansen and Thomas Larsson, with its system of cross-regional connections, strong intercultural influences in the elite-centred ideology, crystallized power and religious institutions, and the expression of status symbols, is tempting and definitely a subject for debate (Kristiansen 1998, 58ff.; Kristiansen 2004, 180ff.; Kristiansen, Larsson 2005, 8ff., 161ff., 225ff.; see critique: Nordquist, Whittaker 2007, 75ff.). For the time being in Transylvanian research we have no sufficient archaeological evidence for a similar panorama of society.

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[6] Same opinions for other geographic areas: Dani 2009, 17ff.; Fischl, Hellebrandt, Rebenda 2011, 108; Fischl, Rebenda 2012, 494ff.; Szeverényi, Kulcsár 2012, 336; Fischl, Kienlin 2013, 6ff.

[7] Carneiro 1981, 39ff., Feinman, Neitzel 1984, 37ff.; Earle 1987, 279ff.; Kristiansen 1998, 44ff.; van Creveld 1999, 2ff.; Cobb 2000, 5ff.; Haas 2001, 6f.; Earle 2001, 105ff.; Earle 2002, 43ff.; Parkinson 2006, 23ff.

The fortifications of the better known Otomani tells may be interpreted as evidence on the existence of a central authority. The network of fortified settlements operating as symbols of the power system in practice protected and controlled the adjacent areas[8]. The fortification of Carei-Bobald, Otomani-Cetățuie/Várhegy, Sălacea-Dealul Vida/Vida-domb, Săcuieni-Cetatea Boului/Ökörvár tells, and the maintenance of defensive ditches required significant manpower and proper central co-ordination[9]. The work volume and the magnitude of mobilized manpower are measures of social control, indicating the power of the leader of the the power of the community leaders (Earle 1991, 85; DeMarrais et al. 1996, 18; Thrane 2009, 15). The existence of a social hierarchy and of a group of warriors is suggested by a great number of bronze weapons and jewellery unearthed in north-western Transylvania and north-western Romania[10]. In central Transylvania the number of bronze finds interpreted as prestige goods is much more modest (Soroceanu 2012, 24ff.). The carrying of weapons is the warrior elite's means of individual and collective identity expression, and also represents a new symbolic means of exercising power (Earle 2000, 39ff.; Earle, Kristiansen 2010, 9f; Earle 2013, 357; Fischl, Reményi 2013, 732). In the Carei Plain and Eriu Valley at the epicentre of the Otomani-Gyulavarsánd culture complex[11] however, there is only a small number of metal artefacts that may be interpreted conclusively as prestige goods. At the present stage of research not a single sword is recorded in the Carei Plain and the Eriu Valley, and only seven daggers belonging to the Middle Bronze Age are known[12]. Nevertheless this apparently modest number of finds may could gain new meaning if we consider that 258 graves excavated at Gemeinlebarn F yielded no more than seven daggers (Neugebauer 1991, 16ff.; Harding 2007, 57) or that only 30 daggers are known from the Füzesabony culture area (Thomas 2008, 234 footnote 238). Imported by whatever means these symbolically charged objects undergo a transformation of meaning, "getting a new identity". Through these weapons the bearers differentiate themselves from other elites and from non-elite social groups (Stein 1999, 66; Arnold 2000, 28f; Aldenderfer 2010, 22ff.; Daróczi 2011, 117; Earle 2013,

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[8] For views on this subject see: Renfrew, Bahn 1999, 197; Harding 2000, 274, 294ff.; Sahlqvist 2001, 89; Duffy 2008, 129ff.; Reményi 2003, 55ff.; Otterbein 2004, 12ff., 118ff.; Kristiansen, Larsson 2005, 225ff.; Neustupný 2006, 2ff.; Chapman, Gaydarska, Hardy 2006, 20ff.; Harding 2007, 32, 40, 147ff.; Parkinson, Duffy 2007, 100, 125; Gogâltan 2008, 39; Thrane 2009, 13ff.; Earle, Kristiansen 2010, 14ff.; Earle, Kolb 2010, 75, 85; Németi, Molnár 2012, 53.

[9] Ordentlich 1973, 26ff., 110ff.; Bader 1978, 128; Gogâltan 2008, 45; Németi, Molnár 2012, 53.

[10] On bronze metallurgy in western Romania and north-western Transylvania see: Hänsel 1998, 21; Gogâltan 1999, 128ff., 195ff.; Molnár 2011, 272ff.; Găvan 2012, 57ff.

[11] On the notion and terminology of the Otomani-Gyulavarsánd culture complex: Németi, Molnár 2012, 10ff.

[12] Detailed analysis: Molnár 2011, 295ff. It needs to be emphasised that the discovered daggers represent different types that were not produced locally.

357). Ethnographic examples demonstrate that the existence of different identities and special-status social groups is not a prerequisite of a strongly hierarchical society (Hodder 1979, 448ff.). The existence of prestige objects does not necessarily reflect a stratified and complex social structure distinguished by a set of strict rules. In this sense the so-called sanctuary discovered at Sălacea in 1968 is evidence only on organized ritual life[13]. The participation of community members at repetitive, collective social activities helps to create and maintain a social memory with specific key markers and communal identity, playing an essential role in contacts with foreigners (Chapman 1997a, 1ff.; Chapman 1997b, 33, 41; Chapman 1997c, 141; Whittle 2010, 38; Daróczi 2011, 22; Daróczi 2012, 200). Without debating the complex subject of Bronze Age spirituality[14], we are unable to separate the cult building identified at Sălacea — a unique structure discovered on Otomani-Gyulavarsánd territory suspected of significant social and ritual functions — by virtue of its dimensions or topographic position, from other buildings (Ordentlich 1972, 71, 83, Fig. 5–6; Chidioşan, Ordentlich 1975, 15ff.; Bader 1990, 182ff.; Gogâltan 2012, 16)[15].

To conclude, the image which unfolds from data available to us is of a more modest society than the one outlined by K. Kristiansen. The investigated chiefdoms of central north-western Transylvania seem to be closer to the tribal/segmented societies than to the complex, strongly hierarchical chiefdoms. The analyzed social formations can be included in the category of so called hill fort chiefdoms (Earle 1997, 12f.). Nevertheless, investigating the settlement system — with proper criticism — the use of hierarchical models might shift the current deadlock of the Romanian research. From a methodological point of view — even if sometimes it is difficult to consider hilltop settlements and tells investigated here as 'central' in terms of economic and social control exercised over adjacent 'dependent' sites on possible lower ranks, the scientific correctness makes us apply as strictly as possible the elected theoretical models. No doubt, to archeologically prove the outlined models will be the task of the future research.

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[13] On this subject see: Renfrew 1985, 14; Rappaport 1999, 24ff.; Brück 1999, 317, 325. Rituals can be detached from an exclusively religious context and employed also for non-religious processes. In case of such archaeological approach the focus is shifted to the significance of ritual practices (well framed repeated public action based on generally accepted cultural knowledge) for social communication and how it helps social groups to generate, present and negotiate differences (Bertemes, Biehl 2001, 12ff.; Insoll 2004, 34ff. on the history of research; Marcus 2007, 9ff.; Renfrew 2007, 109ff.; Gramsch, Meier 2013, 193ff.).

[14] A synthetic article on the ritual aspects of Bronze Age tells in the Carpathian Basin: Gogâltan 2012, 7ff.

[15] This building may have been a "cult house", interpreted as a sacred ancestral precinct, site of rituals and commemoration (Vandkilde 2013, 169ff.).

RESEARCH GOALS AND METHODOLOGY

The current paper presents — based on archaeological data — two Middle Bronze Age habitat models discernible in central and north-western Transylvania. Our focus is on the internal logic of the settlements and settlement clusters identified in the Carei Plain, Eriu Valley and Someşul Mic River Basin attempting to understand the construction of social space. Through the study of settlement networks, modelling the territories of interacting polities and possible communication routes we try to sketch the habitat features of the studied region. Habitat models proposed here are based on the theoretical background of the *peer polity interaction* theory. The *peer polity interaction* concept includes an area's overall economic and social relations system of the independent, politically equivalent territorial units (including imitation and competition, the exchange of goods and information, or war). Structural changes and uniformity process of the socio-political units within the region are the result of long-term interactivity. In an ecological sense, some of the common features could have evolved independently in the adaptation process of the region (Renfrew 1982, 5f; Renfrew 1986, 1ff.; Shanks, Tilley 1987, 41ff.). The research had an interdisciplinary character. In our approach to investigate the social transformations and the dynamics of the settlements, next to the results of archaeological excavation and surveys we used information about the landscape and environment[16] of the study area (satellite images, aerial photographs and geophysical measurements) stored in a GIS database.

During the research databases were used with information acquired from fieldwalking and excavations overlaid on military topographic maps and ortho-photo-plans. To detect traces of human activity, oblique aerial photographs were also used. The data were digitized, and the maps were standardized in stereo '70 reference system[17]. In interpreting the spatial distribution of settlements we have taken into account the central place theory set of ideas, that there is a correlation between the size and the function of settlements (Johnson 1972, 769ff.; Collis 1986, 38f; Grant 1986, 13ff.; Kipfer 2000, 102). The distribution of archaeological sites is modelled directly by the socio-cultural and economic needs of the community, allowing the functional interpretation of archaeological phenomena (Willey 1953, 1).

To define the hinterlands of Bronze Age settlements in the Carei Plain — Eriu Valley and the Someşul Mic Basin we used cost surface based models corroborated with the establishment of the viewshed areas[18]. Most GIS pro-

[16] Review papers on the concepts: Smyntyna 2006, 85ff.

[17] The data were analyzed using various GIS programs. By georeferencing and vectorizating raster digitized maps we obtained a digital terrain model (Florea, Ştefan 2011, 221).

[18] Changes in the size and shape of settlements territory may reflect socio-economic changes and environmental use (Posluschny 2010, 313). Cost analysis as a method of studying the cultural landscape has been criticized. Although influenced by vegetation of the area and weather conditions, viewshed analysis provides useful information about the reasons for founding a settlement in a given area (Gaydarska 2007, 22).

grams can calculate *cost distance* or *least cost path* based on the cost surface model (Conolly, Lake 2006, 213ff.; Herzog, Posluschny 2011, 221ff.). Although different algorithms may be used to calculate slope (Kvamme 1992, 129; Conolly, Lake 2006, 215ff.), they are not discussed in archaeological papers[19]. Modelling the territories and possible routes of communication helped us reconstruct the possible role of fortifications in a region (Wheatley 1995, 171ff.; Posluschny 2008, 167).

The cost surface analysis was generated basing on a reclassification of slopes in five categories[20]. In ArcGIS software we used the Cost allocation calculation on the Bronze Age tells and fortifications considered micro-regional power centres. If slope values and related cost surface are lower, the coverage enlarges. The territories controlled by different centres delimited using cost surface analysis were compared with the area of influence defined using the Thiessen polygon[21] method and XTENT[22] model (Fig. 7:1–2; 8:1; 15:1–2; 16:1).

Viewshed, cost surface and shortest possible route analysis were made for the most important fortresses with the help of Spatial Analyst module of ArcGIS (Fig. 8:2; 9:1–2; 10:1–2; 16:2)[23]. The spatial analyses used in the study were based on a Digital Elevation Model derived from the well-known SRTM (Shuttle radar topography mission) model. First, contour lines were generated with a 20 m interval, and next a DEM was created with the ArcInfo — Topogrid-tool. These were used to create a TIN model of the study area. As the studied region is very large we used a resolution of 50 m for the resulting grid. All other raster based analyses were made with the same resolution.

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[19] The algorithm is based on empirical data from soldiers passing distances over different types of terrain. A model where speed is calculated in km/hour was created (Gorenflo, Gale 1990, 240ff.).

[20] Values were defined depending on the increase of the slope (1 for slopes between 0–2°, 2 for slopes 5–10°, 5 for slopes 10–30°, a value of 100 for slopes with maximum 30°, and for the course of Someşul Mic and Eriu rivers which represents a major barrier in the area a value of 10000 was given).

[21] The spatial distribution of settlements can be seen as an adaptation of communities to environmental conditions (Bintliff 1988, 129ff.; Bintliff 2013, 62ff.). The problems with the territorial analysis made using Thiessen polygons is that this method does not take into account natural barriers (river crossings or mountain areas), the size or importance of the sites as the territory is divided into identical polygons (Ducke, Kroefges 2008, 246). Where the boundaries of the territories cannot be determined accurately, a way of reconstruction is possible by locating the central points of each territory (Kipfer 2000, 563).

[22] For socio-political conditions — based on archaeological data — spatial containment models, see: Renfrew 1981, 269ff.; Grant 1986, 19ff.; Renfrew, Bahn 1999, 172ff. Application of XTENT model in GIS makes possible territorial modelling and partitioning, sites hierarchy and their weight integration, realistic distance models and topographic features within a compact, official framework (Ducke, Kroefges 2008, 247). The method takes into account the size of the settlements and the distance between them as factors determining the areas of influence of the power centres. According to the users of the model the influence of the central space decreases every km with 0.5–3% reduction (Renfrew, Level 1979, 149ff.).

[23] Next to meeting other criteria, based on viewshed analyses, a fortification can be identified as a power centre, or not, with control over a micro-region (Posluschny 2008, 167). The topographical characteristics of points — height, slope, aspect — were extracted from the DEM with the help of Extract Values to Points command of the Spatial Analyst Tool.

The catchment area of the settlements has to be searched around the site within a radius covered in a day (from 1–2 km[24] to 5–6 km)[25]. Our delimitations take into account the different patterns of production and economic exploitation of the environment (Chisholm 1962, 47ff.; Chisholm 1979, 47ff.)[26]. Agricultural potential estimates are based on analysis of the catchment areas of settlements (Binford 1982, 6f; Renfrew, Bahn 1999, 242) calculated using GIS program based on Euclidean distances between sites (Conolly, Lake 2006, 209ff.).

The shortest routes of communication between different fortifications suspected of being micro-regional power centres (Fig. 12:2; 13:1–2; 18:2; 19:1–2) were measured using *Spatial Analyst* tools. The *Cost Allocation* analysis method was used from the *Distance* menu[27].

CHRONOLOGICAL FRAMEWORK

In the chronological system of Paul Reinecke the Middle Bronze Age represents the sequence RB A2 (Gogâltan 1999, 16ff., 42f; Fischl, Reményi 2013, 726). The periodization of the Middle Bronze Age used here mostly follows the model developed by István Bóna, which is a good starting point for a more detailed chronological and cultural analysis of the period (Bóna 1992, 17). At the current stage of research — from a chronological point of view — the Middle Bronze Age tripartite division corresponds to the Otomani and Wietenberg culture development phases (MB I: Otomani I/ Wietenberg I; MB II: Otomani II/ Wietenberg II; MB III: Otomani III/ Wietenberg III).

Chronologically the first phase of the Middle Bronze Age (MB I) precedes the Apa-Hajdusámson type bronze hoard finds period. The MBA I concurrent with the final phase of period A1 in Central European chronology begins some-

[24] In the so-called *face to face societies* with a low level of social stratification and a limited population of 150–200 people the catchment zone radius will be less than the average 1–2 km (Bintliff 2013, 65).

[25] Introduced in by C. Vita-Finzi and E. Higgs in 1970 "site catchment" represents the maximum area of motion exploited with limited costs. Analysis is made of the natural resources of an area in order to reconstruct a community's subsistence mode (Vita-Finzi, Higgs 1972, 28; Renfrew, Bahn 1999, 258ff.; Bintliff 2013, 61ff.). Hinterland delimitation is difficult because the economic use of farthest seating land is ineffective (Binford 1982, 6ff.; Renfrew, Bahn 1999, 242; Posluschny 2010, 315).

[26] For the application of the ethno-archaeological model and critique, see: Stone 1991, 343ff., Posluschny 2010, 315ff.

[27] The resulting regions — which show some resemblance to the Thiessen polygons — were transformed to vector format. For the shortest path analyses a high value was added arbitrarily to the cost surface along the Someşul Mic and Eriu valleys. The influence of this "wall" is observable on the shortest path images. The cost weighted and the direction surfaces were created for the most important fortresses as being the starting points, with the Spatial Analyst → Distance → Cost Weighted module. On these surfaces a Shortest Path analysis was performed for the other important fortresses.

time after 2100 BC and ends around 1900 BC (Vulpe 1996, 43; Gogâltan 1999, 75).

The second phase of the Middle Bronze Age (MB II) based on the Hajdúsámson bronze hoard horizon and the gold find from Cófalva/Țufalău (Mozsolics 1968, 54ff., Pl. 2–3) corresponds to the period A2 in of the Bronze Age in Central European chronology. The dendrochronological evidence shows that this historical period begins around 2000–1900 BC (Becher, Krause, Kromer 1989, 440). In the international literature with the typo-chronological and stylistic analysis of the artefacts the chronological interval is well outlined. During MB II are seen for the first time the well-known Otomani II — Gyulavarsánd artefacts, the shapes of which — despite the observed changes in form and ornamentation — are organically related to the preceding period (Otomani I). The dating of Otomani II pottery using imported Wietenberg II pottery and other assorted artefacts became more accurate[28].

The beginning of the third phase of the Middle Bronze Age (MB III) is set to 1700 BC (Forenbaher 1993, 253) and is traditionally dated around 1600 BC (Warren, Hankey 1989, 169; Gogâltan 1999, 76). Sabine Gerloff considers that this phase of the Bronze Age is between 1650–1500 BC (Gerloff 1993, 80ff.). Broadly, this phase takes in periods A3 and B1 in Central European chronology (Forenbaher 1993, 251ff.).

THE GEOGRAPHIC AND ECONOMIC FEATURES OF THE STUDY AREAS

We chose as our study area two micro-regions with different geographic and cultural characteristics: the Carei Plain and the Eriu Valley in north-western Transylvania inhabited by Otomani communities, and the basin of the Someş River in central Transylvania occupied by Wietenberg communities (Fig. 1:1).

The Carei Plain stretches on the eastern half of the Nyírség, with an average elevation of 150–160 m, towering above the neighbouring Eriu Plain with a 30–40 m height difference.

The Eriu Plain forms a transition towards the hill-country, its higher parts reaching the limit of Tăsnad hills. The study area once bordered on its eastern side by the Vermeş marsh; a swampy area wedged between the continental dunes of the Eriu Plain, on the west, the marshy floodplain of the Crasna River, with, to the north-east Europe's largest eutrophic swamp with an area of 400 km^2, until its drainage in the 1890s — the Ecedea swamp (Geografia

[28] For the Central Transylvanian classical Wietenberg culture period, material culture and chronology, see: Chidioşan 1974, 153ff.; Boroffka 1994, 246ff.; Daróczi 2012a, 52. C14 data were published for the second phase of the culture (Wietenberg II / Wietenberg B) from Oarța de Sus (Kacsó 2004, 60, note 143; 1610–1445 BC), and for the third phase (Wietenberg III / Wietenberg B) from Sighişoara — Cartierul Viilor site (Popa, Boroffka 1996, 56, note 40; 1685–1524 BC).

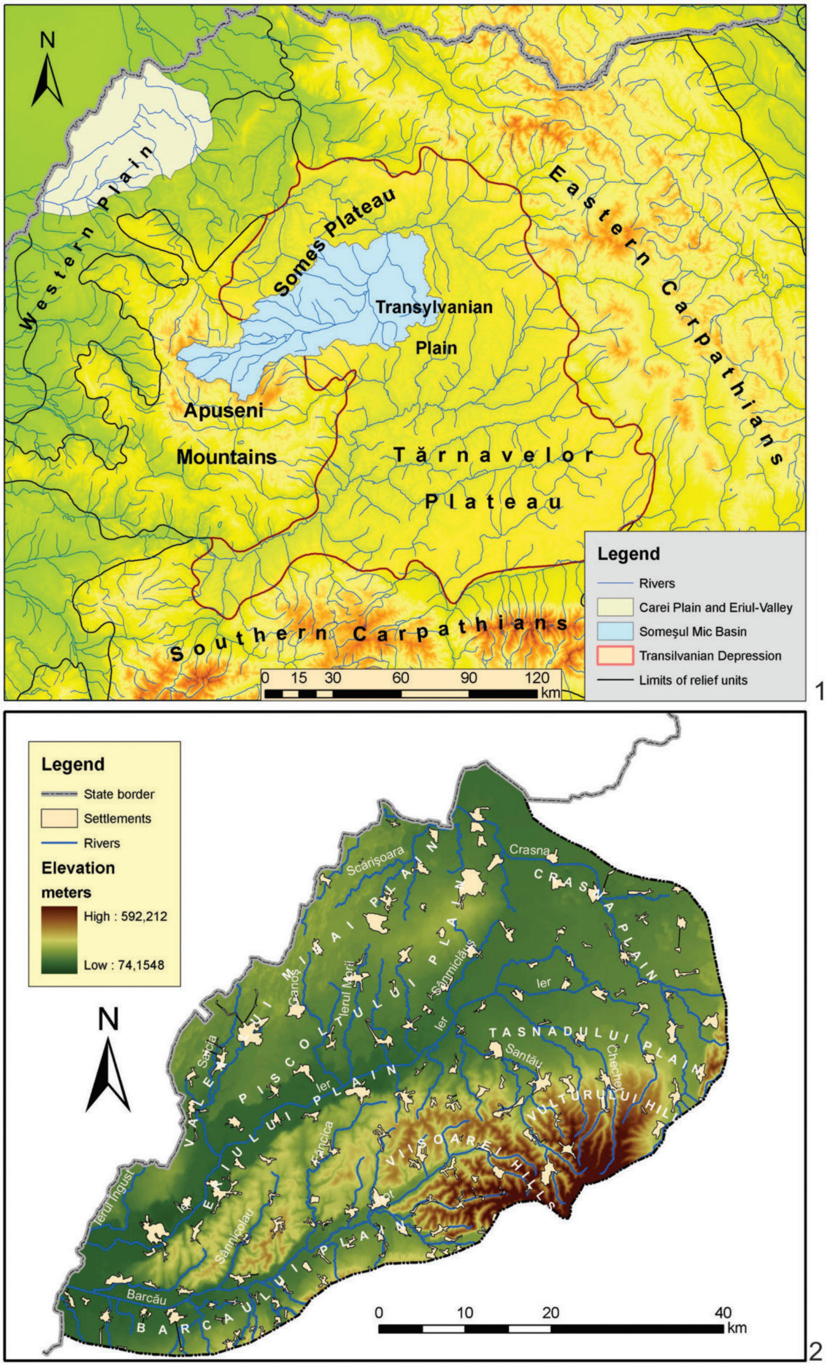

Fig. 1. 1 — Geographic units of the Transylvania and marking of the study area;
2 — Geographical map of the Carei-Plain and the Eriu Rivers Valley; drawn by Authors.

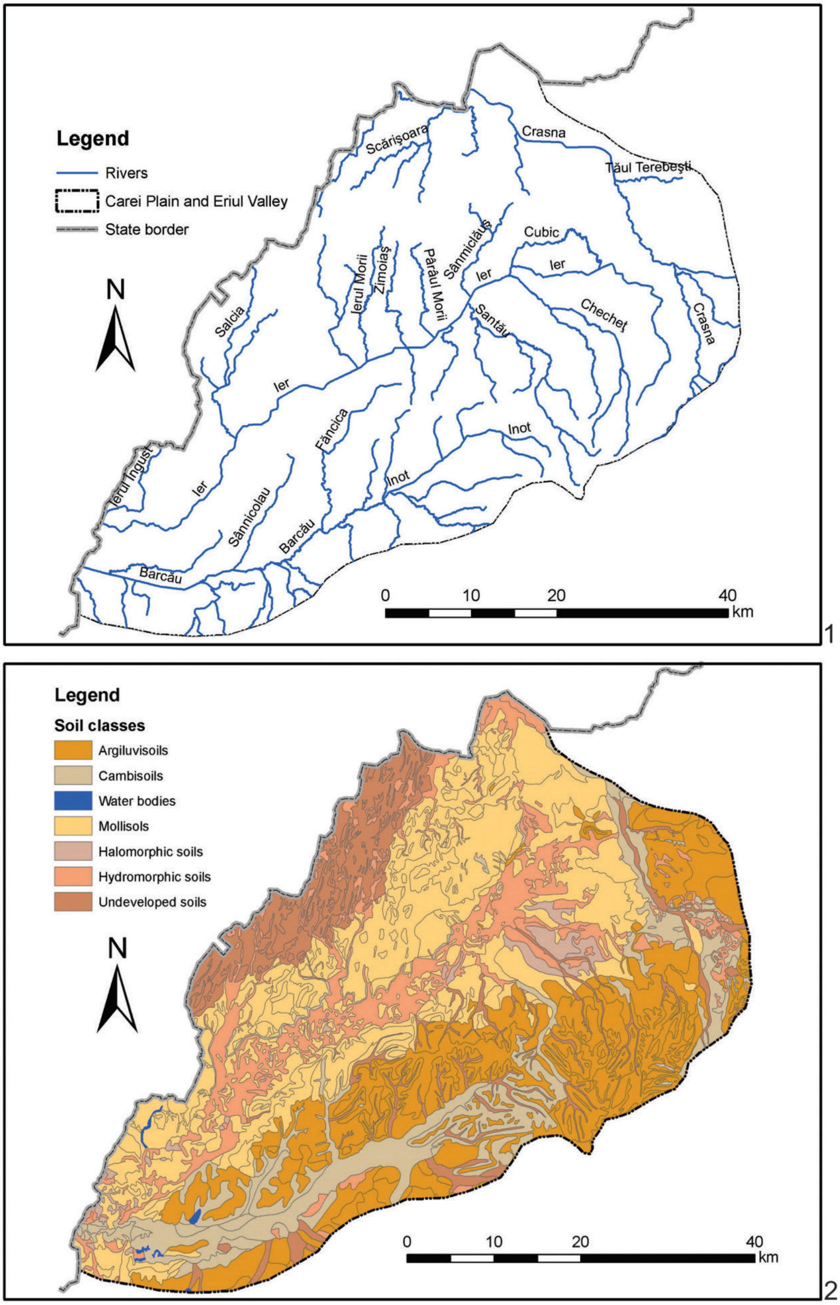

Fig. 2. 1 — Hydrological map of the Carei-Plain and the Eriu Rivers Valley; 2 — Soil map of the Carei-Plain and the Eriu Rivers Valley; drawn by Authors.

1992; Karácsonyi 1995, 7ff.; Karácsonyi, Ardelean 2003, 11ff.; Szabó 2012, 61ff.) (Fig. 1:2).

The vast tract of sandy alluvial deposits — dotted with inter-dune marshes and small open bodies of waters, cut by streams — of the Tisa, Someş and Crasna rivers, took form at the end of the Ice Age and gradually was moulded by the wind into today's landscape. The Carei Plain, the Eriu Valley and the north-eastern area of Hungary were part of a wider geographic region with the same vegetation (Sümegi, Bodor 2000, Fig. 4).

By comparing the results of palynological research made at different points on the Great Hungarian Plain with findings from the Eriu Valley we can reconstruct the vegetation of the Carei Plain — a wooded steppe — and its climate (Sümegi, Bodor 2000, 87, Fig. 3, 4; Bogdan, Diaconeasa 1960, 141ff.). According to the Eriu Valley pollen diagram the study area was under a forest stand with a significant quantity of hazel mixed with oak and European spruce (Bogdan, Diaconeasa 1960, 153, Fig. 4)[29]. The identified levels of pollen of cereal plants and water-loving species taken together with a reduction in tree pollen would document the growing impact of Middle Bronze Age communities on the environment. Parallel to the intensification of human impact the lake system was slowly filling up and the lake shores become marshy (Sümegi 2003, 182; Juhász 2005, 62ff.). The Subboreal period of the Holocene, described by some palynologists as the "beech-forest phase" (Cârciumaru 1996, 9ff.; Tanţău et al. 2009, 164), is characterized by a steady and continuous cooling of the climate, with no significant fluctuations and increased rainfall (Davis et al. 2003, 1711; Sümegi et al. 2004, 407; Medzihradszky, Bíró 2007, 21f; Tanţău et al. 2009, 170; Feurdean et al. 2010, 2203ff., Fig. 4; French 2010, 46, Table 2:1; Daróczi 2012b, 40). The faunistic and palynological study of the Bátorliget bog, located in the neighbourhood of the Carei Plain, indicates a more open type of forest with a rich shrub vegetation, formed at the end of the Neolithic age and persisting into the Middle Bronze Age (Sümegi 2003, 181ff.; Sümegi 2004, 326). Palaeoenvironmental analysis of the Pocsaj marsh, evolved due to the ponding of one of Eriu river branches, shows a similar picture. Data from palynology and malacology research reveal a marshy area dotted with open stretches of water. From the specific floodplain environment suitable for grazing, open pastures with some weed species took form, alternating with forest stands and tracts of loess[30]. During this period the Great Plain became a forest-steppe, the rainfall-fed abandoned river channels filled up with water and the marshes were flourishing (Kácsonyi

[29] It should be noted that the pollen analysis samples were actually made on a 20-km stretch between the three settlements, where the opening angle of the Eriu valley is lower (Bogdan, Diaconeasa 1960, 147). Since the width of the valley, even here is big, the 150 collected pollen grain equally well can be from a local and from an external source (Jakobson, Bradshaw 1981, 80ff.; Sümegi, Bodor 2000, 86).

[30] The Pocsaj area is considered as the gateway to the Eriu Valley, the meeting point of Barcău and Eriu valleys: Dani 2005, 307; Sümegi 2005, 133ff. Zone 4.

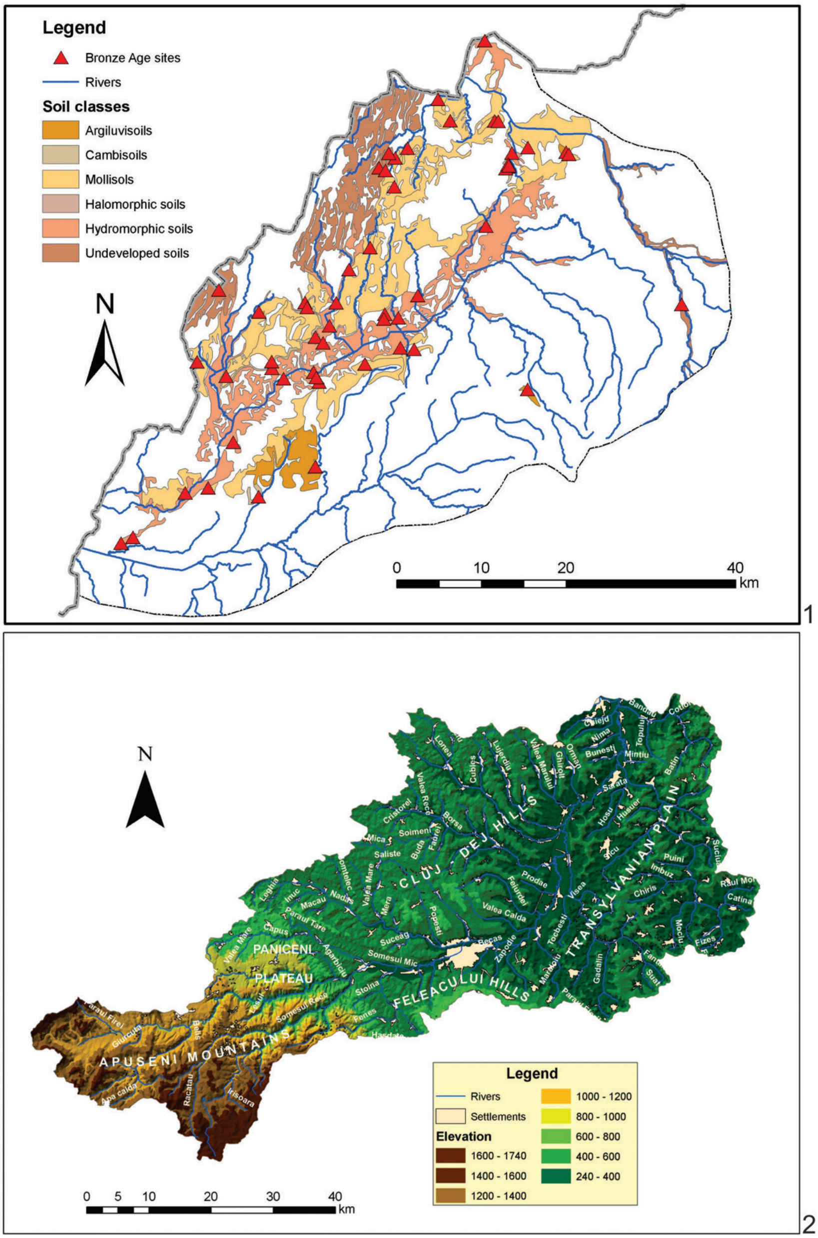

Fig. 3. 1 — Map of soil types superposed by MBA settlements from the Carei-Plain and the Eriu Rivers Valley; 2 — Geographical map of the Someşul Mic Basin; drawn by Authors.

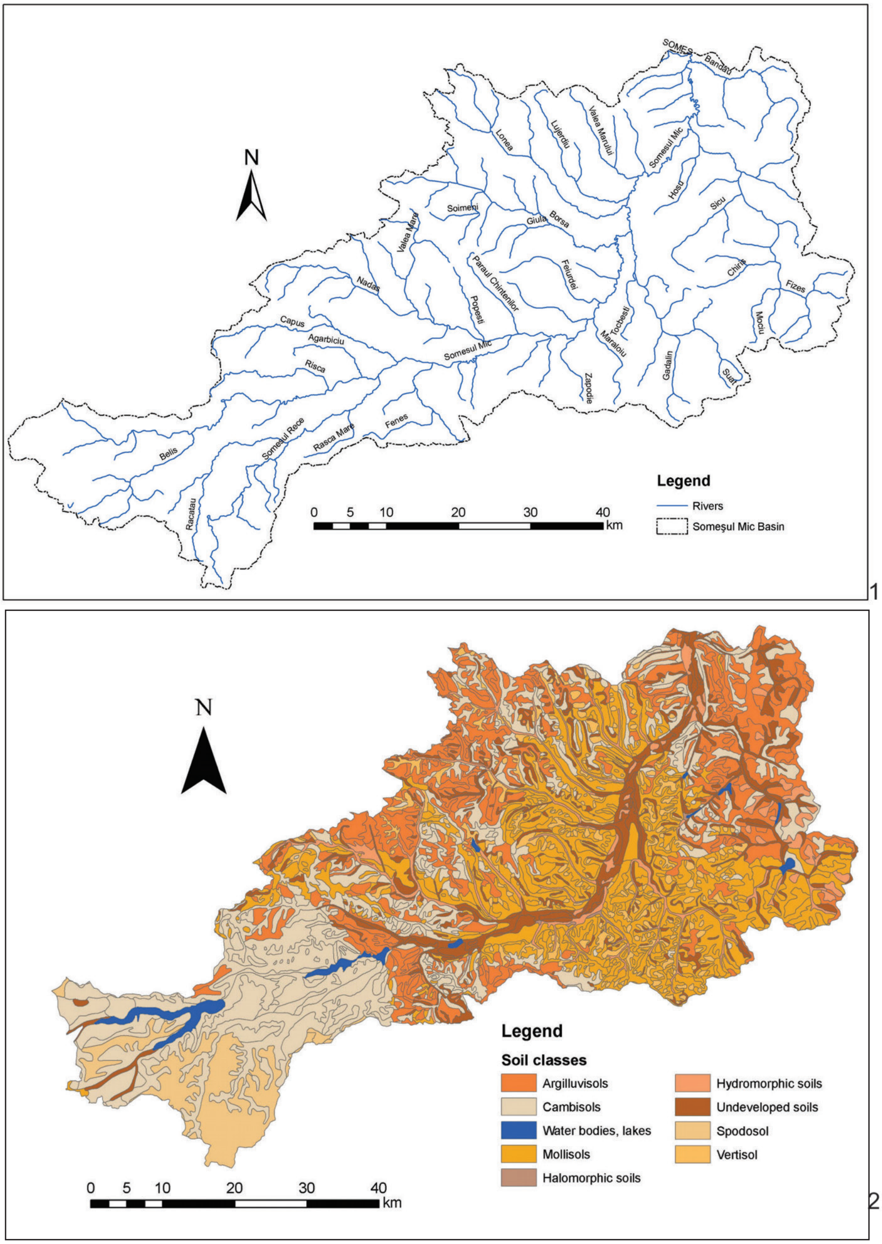

Fig. 4. 1 — Hydrological map of the Someşul Mic Basin;
2 — Soil map of the Someşul Mic Basin; drawn by Authors.

1994–1995, 195ff.; Willis 1997, 200; Berglund 2003, 9). The size of the floodplain changed depending on the precipitation. Decomposing organic matter from the vegetation, soil erosion, the soil and organic matter washing in from the high bank in the Carei Plain — characteristic for the forest-steppe zone (Badea et al. 1983, 618; Ciută 2009, 67) — led to the formation of a thicker deposit of absorbent soil with a humus content of more than 7%, poor in mineral salts and phosphates (Karácsonyi 1995, 8; Ghinea 2002, 363). The significant amounts of cereal and trampled weed pollen discovered in palynology profiles highlights the use of ploughing in agriculture (Sümegi 2005, 133). The archaeological and archaeozoological data also show that the region's large livestock grazing and agricultural cultures by clearing the forest obtained tracts of land for extensive grazing and crop cultivation[31]. Forest clearance documented by cyclical changes in the proportion of tree pollen not only made it easier to hunt game and to rear livestock more efficiently, but also furnished the fuel[32] necessary to metallurgy[33] and in pottery production.

The second micro-zone investigated from the geological point of view belongs to the structural unit of the Transylvanian Depression[34], formed at the end of the Cretaceous (Mutihac 1990, 376). The evolution of the current relief and terraces forming are the result of oscillatory tectonic movements and gradual deepening of the erosion base in the Someşul Mic basin (Cristea, Baciu, Gafta 2002, 17) (Fig. 3:2). The morphological features of the area are reflected given by the axis of Someşul Mic 1–2 km wide corridor at the level of the floodplain and the first terrace. The Someşul Mic Valley corridor is characterized by an accumulative relief consisting of two levels: a lower level

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[31] For archaeobotanical and archaeozoological studies, see: Ordentlich 1968, 141ff.; Cârciumaru 1996, 94f, 144; Ciută 2009, 104 (Otomani-Földvár fortified site in the Eriu Valley); Cârciumaru 1996, 68, 94; Ciută 2009, 102ff. (Carei-Bobald tell in the Carei Plain). For the archaeozoological data of the area, see: Bader 1978, 131ff.; Haimovici 1987, 37ff.; El Susi 2002, 243ff.; Bindea 2008, 95ff.; The archaeozoological studies have shown however that the samples are too general, pastoralist modalities, the bred animal species and their quantitative indicators, as well as the communities' dietary preferences have changed in every settlement (Bökönyi 1988, 124; Gál 2005, 150).

[32] For Bronze Age logging and environmental change, see: Behre 1988, 633ff., Sümegi 1999, 196; Sümegi, Bodor 2000, 87; Sümegi 2003, 206; Sümegi 2004, 330; Sümegi 2005, 133ff.; Fărcaş, Tanţău 2004, 230ff.; Juhász 2005, 63, Tanţău et al. 2009, 172; Feurdean et al. 2010, 2203ff.

[33] For the raw material deposits of western Romania and their exploitation during the Bronze Age, see: Papalas 2008, 96ff.; Găvan 2012, 60ff.

[34] The Transylvanian Basin is surrounded by the Carpathian and Apuseni Mountains. The central area consists of alternating plates of Neogene origin — with the average elevation of 200–700 m — fragmented by rivers that have shaped the form of hills (Badea, Niculescu, Sencu 1976). In this region three geographic areas can be distinguished. The northern consists of Someşul Mare and Mic valleys, with an average elevation of 500–700 m. It extends north-east and south-west to the Carpathian Mountains and north-west — to the Someş Plain. The region is characterized by short, broad valleys and flat surfaces. South of this region are the Transylvanian Plain and the Târnavelor Plateau.

with an elevation of 2–3 m, subject to flooding, called the Floodplain[35], and a second, higher level with an elevation of 4–6 m, built by sand, gravel and colluvial materials (carried from the slopes) in various degrees of solidification and covered by herbaceous vegetation.

Soils in the Someşul Mic basin (Fig. 4:2) are quite diverse. The more elevated areas of the floodplain have the most fertile soils, formed by haplic and luvic chernozems. The most common local soils are haplic luvisoils, occupying most of the more stable slopes, and albic luvisols that appear insular on the interfluves. Alluvial soils in general typical for the Someş floodplain are represented by typical fluvisols, mollic and gleyic fluvisols (Feneş floodplain) (Săsăran, Vremir 2009, 20).

The peat bog in the wellspring area of the Someşul Cald River (Ic Ponor) yielded evidence on limited human impact on forests between the years 5100 and 3200–2750 cal. BP (Bodnariuc et al. 2002, 1485). Pollen spectra from Upper Someşul Mic suggest a change in the weather which led to the withdrawl of human communities from higher lying areas, a general phenomenon throughout Europe (Limbrey 1987, 251ff.). Recent palynological research in the Apuseni Mountains has shaped a new chronology of the forest evolution in the area[36].

The richness of the natural resources in the Someşul Mic Valley (Fig. 5:1) influenced the distribution of human settlements and communities economy. In the study area and its vicinity copper deposits occur at Băişoara, Pietroasa and Someşul Rece (Boroffka 2009, 141, nos. 6, 142, no. 28)[37], silver and gold at Băişoara (Boroffka 2009, 141, no. 6), Someşul Rece[38] and Valea Căpuşului[39]. There is evidence that salt mining and trade (Boroffka 2006, 71ff.)[40] are closely linked to mining and bronze metallurgy (Harding 2000, 253f; Rotea 2004, 7ff.). The presence of settlements near to the salt deposits was not

[35] On the origin and evolution of the Someşul Mic floodplain, see: Posea, Popescu, Ielenicz 1974.

[36] In 4800 BP beech (*Fagus*) quickly spread; hazelnut (*Corylus*), spruce (*Picea*) and other deciduous trees become less common, as indicated by reduced pollen values. Starting from 4000 BP until the present beech (*Fagus*) dominated the forests and the number of the other deciduous trees such as elm (*Ulmus*), spruce (*Picea*) and hazel (*Corylus*), except for hornbeam (*Carpinus*) and oak (*Quercus*), becomes reduced. Between 4500 and 2750 cal BP. Deforestation and agriculture were limited (Feurdean, Willis, Astaloş 2009, 971ff.).

[37] Mineral resources from Someşul Rece at Dealul Mieilor and Valea Seacă were exploited in the nineteenth century (Mureşan 1971, 28; Boroffka 2009, 142, no. 36).

[38] This area was mined in 1961–1962 for its low content of gold and silver (Mureşan 1971, 28; Boroffka 2009, 142, no. 36).

[39] Mineral resources from the Căpuşului Basin exposed by erosion contain reduced noble metals, small reserves that are not attractive economically (Mureşan 1971, 28).

[40] Iulian Marţian recalls evidence on prehistoric salt mining on the bank of the Salca stream and in the Rompaş area near the town of Dej (Marţian 1903, 285ff.). Rock salt extraction facilitated the transport and was used in preserving food, leather processing, animal husbandry and everyday consumption.

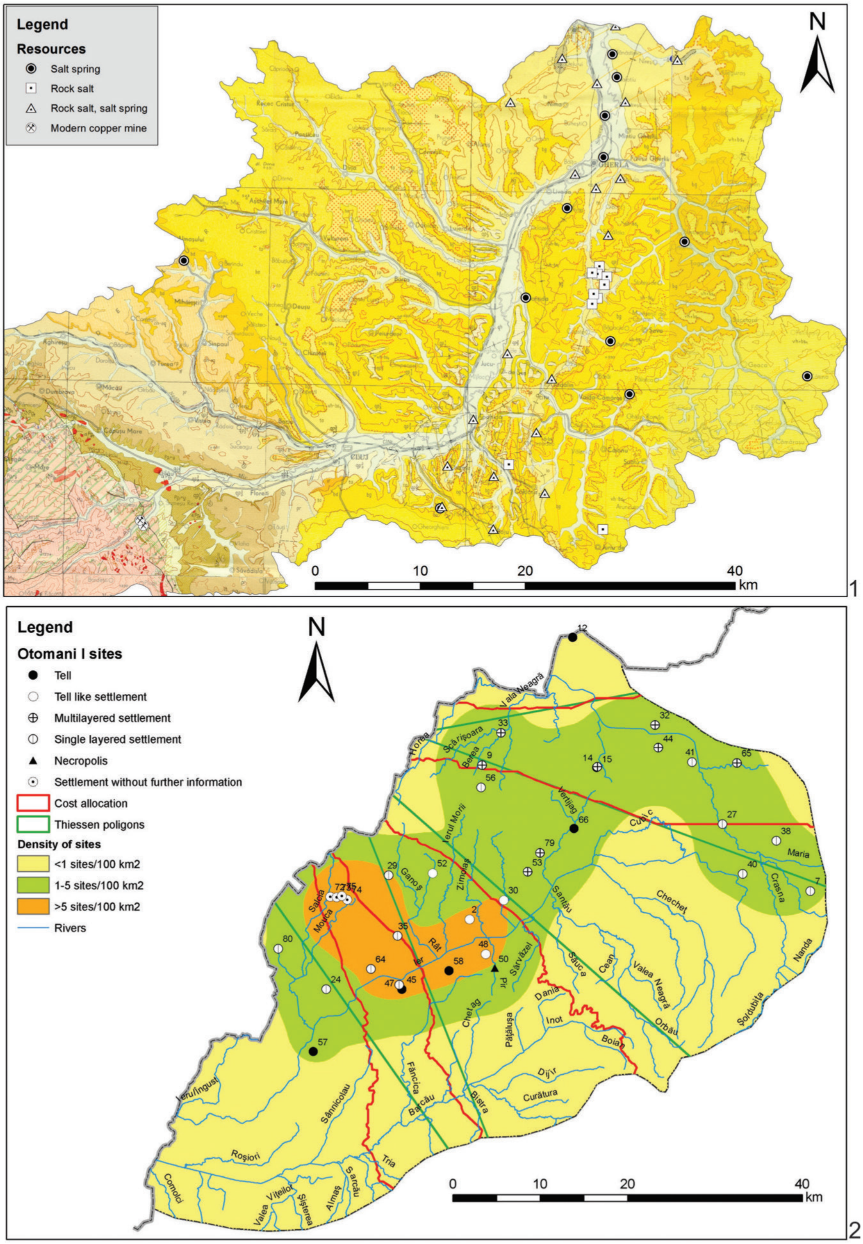

Fig. 5. 1 — Geological map of the Someşul Mic Basin (after R ă i l e a n u et al. 1968); 2 — Density, Thiessen-polygons and Cost surface analysis of the MB I sites from the Carei-Plain and the Eriu Rivers Valley; drawn by Authors.

accidental (Wittenberger 2008, 14ff.)[41]. Salt deposits are significant in the area investigated here, the area of contact between the Apuseni Mountains, Transylvanian Plateau and Someş Plain[42]. Mines in the area were worked both for local daily consumption and long-distance exchange[43].

The economy of communities of the Someşul Mic Basin is agro-pastoralist. Analysis of animal bone assemblages from central Transylvania documents specialization of large-scale animal husbandry[44]. The cattle which had a high economic value may have had a status role as well[45]. The complex relationship between agriculture and animal husbandry is proved by the fact that a gradual transition from arable agriculture and livestock increase happened in parallel[46]. The soils of the region could have been excellent crop land according to that period (Răileanu et al. 1968; Jakab 2004, 164ff.). "Multi-pronged" agricultural activities (Gyulai 2001, 92f; Gyulai 2008, 125) are evidenced by the use of bone tools in land cultivation, quern-stones and charred cereal grains[47]. The economically exploited "collection areas" adapted to the local geographic environment, mostly irregular in shape (Binford 1982, 6f; Kuna 1991, 332f; Renfrew, Bahn 1999, 242; Sümegi 2009, 474) must be sought within

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[41] Salt is one of the main resources available and easy to exploit, in the form of springs, wells, saline streams overlying salt deposits, many of which are exploited nowadays: Valea Florilor, Cojocna, Corpadea, Căianu Mic, Boju, Morişti, Iuriu de Câmpie, Pata, Sântioana, Cătina, Dâmbu, Şărmăşel, Vaida-Cămăraş, Şomcutu Mic, Bonţida, Mănăstirea, Codor, Buneşti, Mănăşturel, Tăuşeni, Silivaş, Gheorghieni-Valea Mare, Bonţ-Fântâna Sărată (Wittenberger 2008, 14).

[42] Found at Cara, Cojocna, Ocna Dejului, Pata, Valea Florilor, Sic, Nireş-Unguraş, Gheorghieni-Dealul Curmătura, Nicula, Bonţ, Săcălaia, Petreşti-Salatiu, Jucu de Sus, Corpadea, Boju, Pintic, Dezmir, Apahida, Mica, Gădălin, Băiţa, Nima, Sânmarghita, Gherla (Drăgănescu 2006, 13; Wittenberger 2008, 14).

[43] Salt exploitation seems trans-cultural as demonstrated by the technological similarity and discontinuity of archaeological remains in the salt mine area. During the Late Bronze Age the Wietenberg (IV) and the Noua cultures exploit the Transylvanian salt resources (Wittenberger 2008, 21ff.; Cavruc 2010, 28). Gáva culture communities took control during the Late Bronze Age and at the onset of the Early Iron Age (Cavruc 2010, 8). Salt was transported from the Transylvanian Plain and the Plateau west down the Someş and Mureş rivers (Cavruc 2010, 10, 13ff.).

[44] Animal husbandry economy of Wietenberg communities is evidenced by finds from Derşida, Mintiu Gherlii Cluj-Napoca, Oarţa de Sus and Peştera Cauce (Meşter, Lazarovici 2000, 191ff.; Meşter, Pop, Lazarovici, Bindea 2005, 115ff.; Bindea 2005, 64, El Susi 2005, 95ff.; Bindea 2008, 85ff.). The wild animal bone variation rate attests the decline of foraging and hunting and its complementary role occupied in the economy of the Bronze Age communities (Bindea, Kelemen 2011, 66).

[45] Given examples from history and ethnography it is possible that in the period cattle stealing was considerable (Comaroff 1992, 108ff.; Wright 2004, 74; Szabó 2004, 151; Thrane 2009, 18).

[46] An important criterion of the transition to arable agriculture is to ensure an appropriate number of draft animals and winter feeding. The possession of a great herd of livestock is essential to ensure soil fertility of cultivated areas (Sheratt 1997, 74f, 219; Reményi 2003, 53).

[47] Archaeobotanical data from the area: einkorn (*Triticum monococcum*), bread wheat (*Triticum aestivum sp. vulgare*) and rye (*Saecale cereale*) also occurs at other Wietenberg sites (Cârciumaru 1996, 144ff.), from the Cluj-Napoca Str. Banatului site, however in the G1 pit sesame (*Sesanum indicum*), chickpeas (*Cicer arietinum*) and buckwheat (*Fagopyrum sagitattum*) were discovered as well (Rotea, Wittenberger 1999, 9ff.; Ciută 2009, 72, 104).

a maximum radius of a day's walking (5–6 km) close to the central settlement[48]. Chisholm's economic land use model localizes the agriculturally used lands within a 700 m/1–2 km radius circle from the central settlement (Chisholm 1979, 47ff.)[49]. Members of the community who engaged in agriculture carried out their daily activities and then returned to their place of residence.

In both micro-regions their social and economic base unit consists of cooperating multi-family household units[50]. The cooperative system of the domestic units could have been the basic level of decision-making for the course of everyday life[51]. At this level enough sufficient labour and means of production can be mobilized for the implementation of larger scale activities, possibly to perform more work taking place at the same time[52]. The central and northern-western Transylvanian Bronze Age communities gradually transiting to arable agriculture take in possession new economically exploitable land. Behind the economic changes are hidden the general social and structural transformations of the Middle Bronze Age (Brück 2000, 275ff.).

THE SETTLEMENT SYSTEM IN CENTRAL AND NORTH-WESTERN TRANSYLVANIA

A common feature of these micro-regions is that they have excellent soil and vegetation conditions. The settlements of Middle Bronze Age communities made excellent use of the natural environment of the Carei Plain, the Eriu River region, as well as the Someşul Mic Valley, colonizing both the geomorphological formations safe from flooding rising island-like from their mosaic-like floodplain environment, and the river terraces[53]. The sites are concentrated along the

[48] The "community area" term and theory (Neustupný 1991, 326) found in the literature — based on the prehistoric social and economic theories — attributes to the cultural landscape a mosaic spatial structure. The common economic space theory highlights the economic and social system characteristics of the studied population and the community behaviours in this direction.

[49] For application of the ethno-archaeological model and critique, see: Stone 1991, 343ff.

[50] For the concept of subsistence and political economy, see: Johnson, Earle 2000, 23ff.

[51] A review paper on the subject of households and household archaeology: Kalla 2013, 9ff. The cooperation of domestic units goes beyond the co-ordination of daily living practical activities (Padder 1993, 114; Brandon, Braile 2004, 4ff.). For small-group dynamics and task-oriented decision-making mechanisms and benefits, see: Johnson 1982, 392ff., Figure 21:2–3.

[52] Ploughing, sowing is a time and labour intensive activity. The intensive cultivation of "in-field" growing areas (manuring, horticulture) located in the immediate vicinity of the settlement and in parallel "outfield" area extensive farming calls for more and more invested work and manpower (Bintliff 2013, 65; Godsend 2013, 115). With the Bronze Age "transversal ploughing" regularly shaped plots could be economically cultivated. Estimates found in the literature on the size of plots worked by each individual household unit of 600 m^2 seem to be acceptable (Lindquist 1974, 29; Bradley 1978, 267, 270; Wright 2004, 74; McIntosh 2006, 119ff.; Earl, Kolb 2010, 64).

[53] Most sites in the two micro-regions are located on good quality mollisoils and hydromorphic soils excellent for agriculture (Fig. 2:2; 3:1–2).

larger rivers (Eriu, Someş) and their tributaries in case of both territories rich in water networks (Fig. 2:1; 4:1). These rivers also served as routes of information flow and goods exchange, the regional boundaries of social interaction and spatial reference points for the communities (O'Shea 2011, 162ff.). In addition to particular social and economic processes, the natural environment and its spatial organization also had a decisive role in the emergence of central places and the pattern of the settlement network (Sümegi, Kertész, Rudner 2003, 56)[54]. The creation of enclosures, or other forms of barrier, is a special way of defining space. Strongly connected to the more general question of the creation of landscape[55], its causes are social, political and economic. The existence of fortifications is linked to the creation of formalized territorial units of a quasi-political nature (Harding 2006, 97, 107)[56]. In various geographic regions, besides the tells or fortified settlements conventionally treated as "power centres" and the surrounding "satellite-settlements" definitely forming a common economic unit with these, we have found chains of scattered, open settlements (Fig. 5:2; 6:1–2; 14:1–2)[57]. These settlement chains can be regarded as "social units" of the age[58]. However, beyond these general statements — at the present state of research — it cannot be proved that the multi-layer, sometimes fortified settlements within the scattered settlement chains in the area of

[54] The tell settlements in the Carpathian Basin — with a long and deep stratigraphic sequence — were spread within a well-defined ecologic zone (on eco-zones see also Sümegi, Bodor 2000, 87, Fig. 3–4, 6; Daróczi 2012, 44f, Plate 3, 5). The distribution range of tells takes in the part of the Great Hungarian Plain with sufficient geographic conditions for long term inhabitation. The environment was waterlogged and the existing drier areas do not permit to extend the settlements horizontally. As a result, the environment "forced" the emergence of multi-layer settlements (Fischl, Reményi 2013, 728, Fig. 2, 731).

[55] On this topic see: Tilley 1994; Darvill 1997; Chapman 1997; Neustupný 1998; Johnston 1998; Ashmore, Knapp 1999 (eds.); Meier 2006 (ed.); Arnoldussen 2008.

[56] The ambition to exclusively control the economically exploited region, the defence of the territory is an organic part of human behaviour. The complex-function fortifications are also boundary markers, elements of territorial behaviour, in the sense that they marked those parts of the land for which special treatment was intended from those parts that were in a broad sense unmodified. Rather than a well-defined demarcation a prehistoric border more likely had the form of a "no-man's land" bordered by rivers, swampy floodplains or marshes (Sahlqvist 2001, 89; Harding 2006, 112; Thrane 2009, 13ff.).

[57] It is an interesting idea that when landscape is colonized the first pioneer community exploits the full catchment area (with 5 km radius) and as population grows new colonists enter the region and the initial settlement network would enlarge. In the second phase, if the population of each village is low and the logistic capacity is poor a further demographic growth will result in a series of interstitial settlements filling the territory with daughter-settlements. In each generation the living area of the community was shared between old and newly established daughter-settlements. In conclusion the integrative settlement units (clusters or a supercluster) with their smaller territories (5 km, 3.5, 2.5 km radius catchments) represent an agro-pastoral settlement network stabilised at one of the modular scales of its territorial development (Bintliff 2013, 64).

[58] In her analysis of Wietenberg settlement system in inner Transylvania Laura Dietrich suggests that a single settlement unit contained several fortified and open settlements (Dietrich 2010, 202).

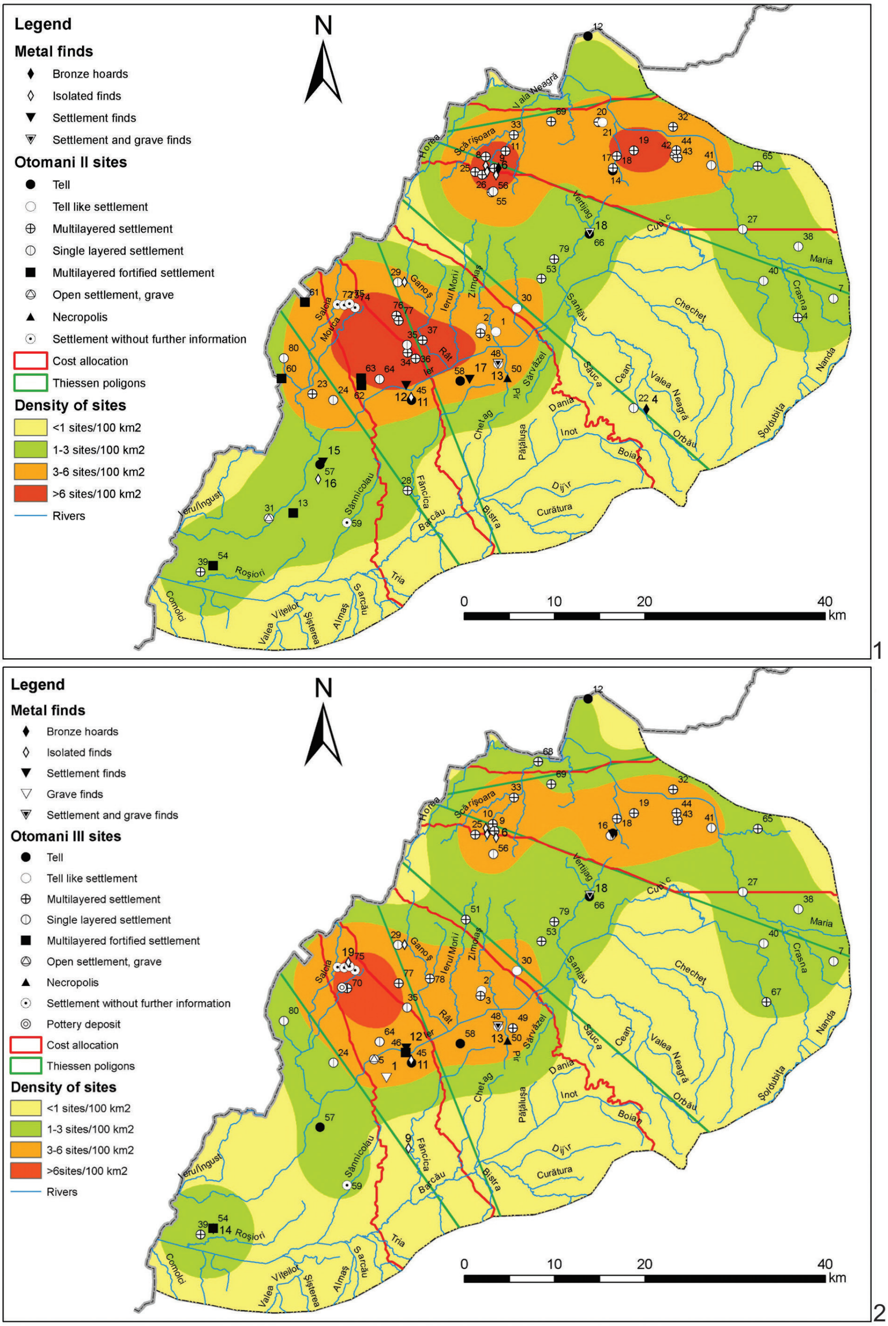

Fig. 6. 1 — Density, Thiessen-polygons and Cost surface analysis of the MB II sites from the Carei-Plain and the Eriu Rivers Valley; 2 — Density, Thiessen-polygons and Cost surface analysis of the MB III sites from the Carei-Plain and the Eriu Rivers Valley; drawn by Authors.

a central settlement would have acted as local, micro-regional centres. In most cases, the data are insufficient, since our knowledge is limited to information acquired from separate episodes of field research. If any archaeological research was made, it only comprised smaller settlement parts. Therefore we can only undertake a macro-level study of the settlement network.

In the Carei Plain and the Eriu Valley the builder of the Middle Bronze Age civilization and the founders of tells as well were the bearers of the Otomani Culture. Using the data from the undertaken fieldwork we developed a settlement catalogue with entries on 80 discoveries. To our current knowledge, 10 settlements of the Middle Bronze Age settlement network of the region definitely contain a culture deposit with Otomani I pottery, and one more settlement probably does too. Finds of Otomani II culture have been discovered at 36 sites. Probably 10 other sites can be classified to the same period. Twentyone sites belong in Otomani phase III, and seven others possibly belong in this phase as well. For 24 other sites which appear in the bibliography we have no reliable data[59].

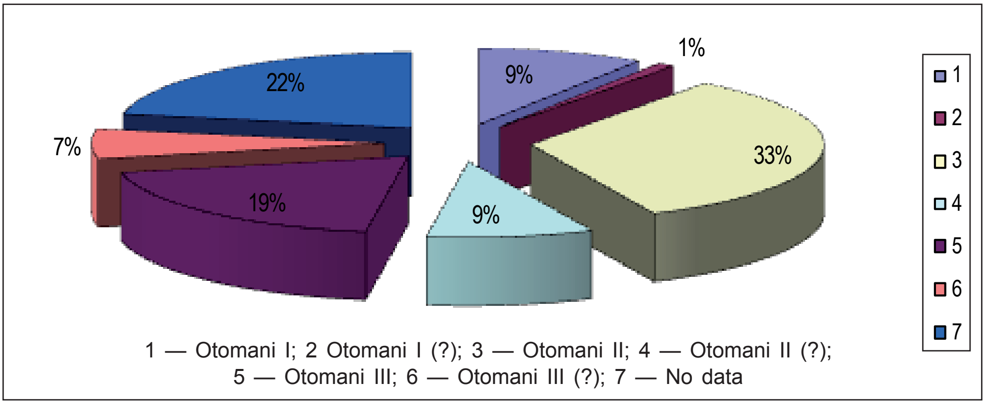

Chart 1. Distribution of Otomani sites by phase; drawn by Authors.

The analyses sites fall into the following groups: tells (7), tell-type (6), multi-layer (44), and single-layer sites (6)[60]. Two and ten settlement sites respectively probably are multi-layer and single-layer. Reliable data is lacking for about five settlements (6.25%).

[59] Unfortunately certain parts of the analysed territory (Carei Plain) are better known than others from an archaeological point of view. In consequence the image of the settlement system which results from our survey reflects the current stage of the research.

[60] On terminological problems regarding tells see Gogâltan 2002, 11ff., Gogâltan 2008, 40ff., Fig. 1; Dani, Fischl 2009, 103ff.; Horváth 2009, 159ff.; David 2010, 563ff.

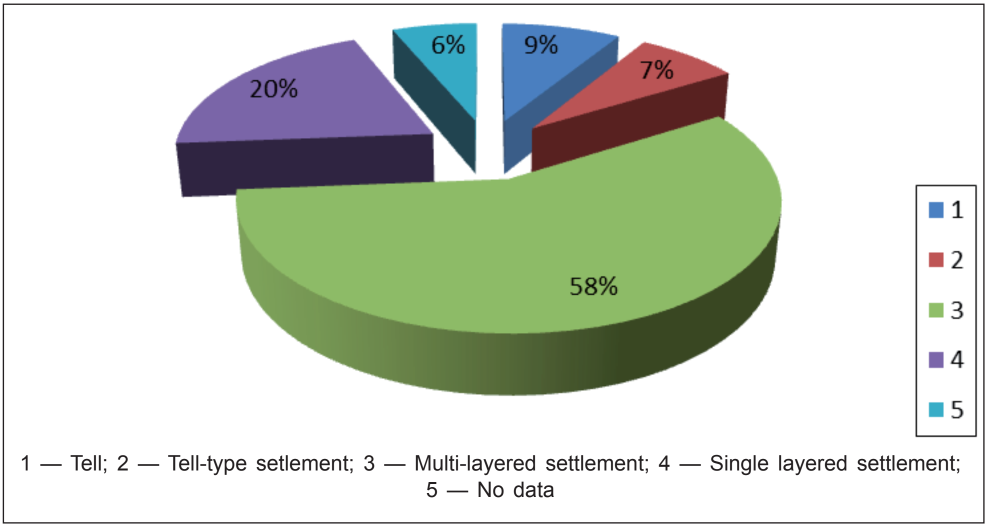

Chart 2. Distribution of Otomani settlements by type; drawn by Authors.

From the point of view of their geographic placement, 12.5% of the settlements cannot be identified on location. 26.25% of the examined 80 sites were founded on sand dunes and islands rising from the river floodplain, 61.25% established on river terraces. Thus, the percentage of settlements founded on islands and higher-lying areas within the floodplain is smaller than the percentage of settlements occupying terrace sites.

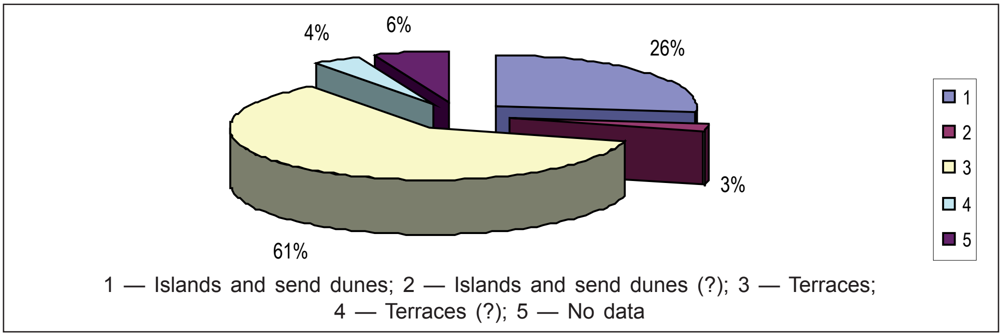

Chart 3. Middle Bronze Age settlements in the Carei Plain and the Eriu Valley. Topography; drawn by Authors.

According to our data 14 (17.5%) sites were definitely and 7 (8.75%) probably fortified. Next to these, there are 43 (53.75%) open and 11 (13.75%) probably open sites. These data are approximate, only rarely based on observations from regular archaeological research.

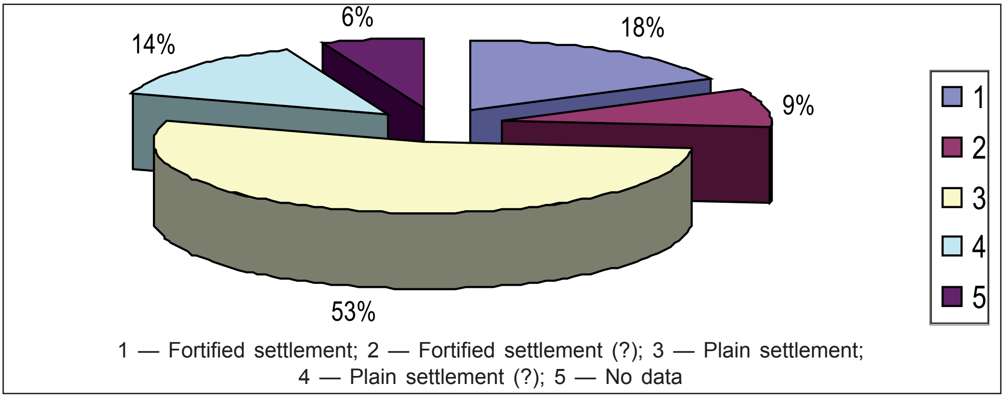

Chart 4. Middle Bronze Age fortified and open settlements in the Carei Plain and the Eriu Valley; drawn by Authors.

Looking at the map, even at a first glance, we could distinguish two major settlement groups, one of them in the Carei Plain and the other in the Eriu Valley (Fig. 5:2; 6:1–2). The map of the density clusters of Otomani I settlement system in the Carei Plain and the Eriu Valley reveals two smaller Bronze Age settlement clusters, each with approximately three units (Fig. 5:2)[61]. At the present stage of research it appears that during this phase individual settlements were scattered across the landscape and there is no conclusive evidence on more complex structures. During Otomani phase II, the number of settlements increased and the settlement network of the region also shows a more complex image. In the central area of Eriu Valley a Bronze Age supercluster took form comprising four settlement clusters and a smaller unit[62]. In

[61] The Otomani–Sălacea–Valea lui Mihai axis based cluster contains two relatively small units; the Middle Bronze Age settlement cluster around Valea lui Mihai may be counted as a third unit. The identification of the exact location and chronology of the latter is uncertain: 1. the area around Otomani, with the centre at Otomani-Cetăţuie tell (no. 45), with three annex settlements of uncertain classification: Otomani-Înainte de insulă (no. 47); Tarcea-Holmul mare tell-type settlement (no. 64), and Galoşpetreu-La vii (no. 35); 2. the area around Sălacea, with the centre at Sălacea-Dalul Vida tell (no. 58) and its annex settlement of Pir-Cetate (no. 48) and the multi-layer settlements of Andrid-Curtea CAP (no. 2), with the uncertainly classified Pir-Roszgáz (no. 50). 3. The unit with the centre at Valea lui Mihai is quite uncertain since we do not know its chronology and exact location. The following may be included here: Valea lui Mihai-Groapa cu lut (no. 70–71); -Grădina lui Dienes (no. 72); -La păşune (no. 73); -La izvoare (no. 74); -La vii (no. 75). Three more loosely-structured units on the Carei Plain are conceivable: two found near Carei–Moftinu Mic, and another similar small unit found on the edge of the Carei Plain, in the area of Berea–Sanislău–Foieni. All three are characterized by a small number of settlements, and the chronology of the sites is also problematic at times. The existence of units around Berea–Sanislău–Foieni and Moftinu Mic is definitely questionable. There is archaeological evidence only to confirm the existence of Carei-Bobald tell (no. 14) and the adjoining open site Carei-Bobald I2 (no. 15).

[62] The Otomani–Sălacea–Valea lui Mihai axis-based supercluster contains four larger settlement clusters. 1. the surroundings of Otomani, with the centre at Otomani-Cetăţuie tell (no. 45), and three annex settlements of uncertain classification: Otomani-Înainte de insulă (no. 47); Cheşereu-Viezurişte (no. 24), Tarcea-Holmul mare tell-type settlement (no. 64), and Tarcea-

the southern part of Eriu Valley there are two smaller settlement units, one central, and one consisting of an open site. These smaller units probably had their centre in the fortified settlements at Cadea-Dealul chel and Roşiori-Cetatea de pământ[63]. In the immediate vicinity of Săcuieni-Cetatea Boului tell no other settlement can be found. The case is the same for Tiream-Holmul cânepii tell[64]. Two larger settlement clusters were then taking shape in the Carei Plain. The first comprises eight open settlements on the Sanislău-Berea-Foieni axis[65], while the second, somewhat larger cluster, on the Carei-Căpleni-Moftinu Mic axis, with twelve sites, may be divided into three distinct sub-groups (Fig. 6:1)[66].

In Otomani phase III, with the decreasing number of settlements, the integrative units of the settlements are much more clearly outlined. In the central part of Eriu Valley the Bronze Age supercluster of four settlement clusters is preserved[67]. On the southern part of Eriu Valley there is only a smaller settle-

Dealul Mare (no. 62) and Tarcea-Dealul de mijloc (no. 63) multi-layer settlements, and two bronze findings; 2. the neighbourhood of Sălacea, with the centre at Sălacea-Dealul Vida tell (no. 58) and the adjoining Pir-Cetate (no. 48) and Andrid-Dealul taurilor (no. 1), Andrid-Curtea CAP (no. 2) and Andrid-Sub Holmul Mare (no. 3) multi-layer settlements, and the uncertainly classified Pir-Roszgáz (no. 50). 3. The Valea lui Mihai centre unit is quite uncertain because its timing and exact location is unknown. The followings can be included here: Valea lui Mihai-Groapa cu lut (nos. 70–71); -Grădina lui Dienes (no. 72); -La păsune (no. 73); -La izvoare (no. 74); -La vii (no. 75). 4. the Galoşpetreu-Văşad axis-based settlement cluster, including Galoşpetreu-Pădurea Frater (no. 34), Galoşpetreu-La vii (no. 35), Galoşpetreu-Podul cu cinci găuri (no. 36), Galoşpetreu-Malul Ganaşului (no. 37), and two other settlements difficult to localize, Văşad (no. 76) and Văşad-Dealul Viilor (no. 77).

[63] The first unit is the Cadea-Dealul chel (no. 13) fortified settlement, and the Diosig-Colonie (no. 31) open site.

[64] A similar phenomenon is found in the neighbouring valley of Barcău, where there are also no open sites connected to a tell (Dani 2009, 18; Dani, Fischl 2009, 108ff.).

[65] The cluster comprises: Ciumeşti-Via Veche (no. 25); Ciumeşti-La păşune (no. 26); Sanislău-La hârburi (no. 55); Sanislău-Lângă Heleşteu (no. 56); Berea-Grădina Florilor (no. 8); Berea-Pârâul Turcului (no. 9); Berea-Togul Evreului (no. 11); Foieni-Lângă podul peste canal (no. 33).

[66] The first sub-group includes: Carei-Bobald tell (no. 14) and multi-layer open sites Carei-Bobald I2 (no. 15), Carei-Bobald II (no. 17), Carei-Bobald VI (no. 18) and Carei-Spitz (no. 19). The second sub-group consists of the fortified, tell-type, site Căpleni-Drumul Căminului (no. 21), and the attached open site Căpleni-Malul canalului de irigaţie (no. 20). Sub-group three contains the single- or multi-layer open sites of Domăneşti (no. 32), Moftinu Mare-Gădina lui Bota (no. 41), Moftinu Mic-Curtea parohiei reformate (no. 42), Moftinu Mic-Hanul Messzelátó (no. 43) and Moftinu Mic-Ograda sediului fostei CAP (no. 44).

[67] The supercluster on the Otomani–Sălacea–Valea lui Mihai axis comprises four larger settlement clusters: 1. the neighbourhood of Otomani, with the centre at the fortified site Otomani-Cetăţuiea de pământ (no. 46), the "afterlife" of Otomani-Cetăţuie tell (no. 45), and the attached Tarcea-Holmul Mare tell-type settlement (no. 64); 2. the neighbourhood of Sălacea, with Sălacea-Dalul Vida tell (no. 58) and the multi-layer settlements Pir-Cetate (no. 48), Andrid-Curtea CAP (no. 2) and Andrid-Sub Holmul Mare (no. 3), and the vaguely classified Pir-Roszgáz (no. 50); 3. no conclusions can be drawn on the basis of the vaguely classified settlements of the Valea lui Mihai unit, we have listed unchanged the sites marked in the bibliography for all three periods. 4. Galoşpetreu-Văşad axis-based settlement cluster, including Galoşpetreu-La vii (no. 35), Văşad-Dealul Viilor (no. 77) and Văşad-Cartierul Ţiganilor (no. 78).

ment unit, consisting of the fortified settlement of Roşiori-Cetatea de pământ and an open site[68]. We find no other settlement in the immediate vicinity of Săcuieni-Cetatea Boului tell in this period either. The case is similar for the Tiream-Holmul cânepii tell. The two former larger settlement clusters of Carei Plain somewhat transformed. The first, on the axis of Sanislău–Berea–Foieni, comprises eight open sites[69], while the second, larger settlement cluster on the Carei-Moftinu Mic axis, containing eight sites, may be divided into two well defined sub-groups (Fig. 6:2)[70]. These can be regarded as the social and economic integrative units of the analyzed territory.

The "tell society" in the Carei Plain and the Eriu Valley is made of hierarchical communities with a sedentary life and a rural economy. The settlement system is structured on sites of various sizes and well organized from a social point of view. The tells could be considered power and economical centres. In the investigated area of the Carei Plain and the Eriu Valley we have six tell settlements: Berveni-Halmos, Carei-Bobald, Tiream-Holmul cânepii, Sălacea-Dealul Vida, Otomani-Cetăţuie, Săcuieni-Cetatea Boului[71]. Analysing the settlement system we used the XTENT model[72]. If we accept the hypothesis that the tells represent social, economic and political centres of a region then the settlements positioned outside the inland territory of their areas of influence must be considered relatively independent from a "political" point of view. In the opinion of C. Renfrew and P. Bahn the XTENT model is the first representation of a political reality[73]. Fully aware that to use the XTENT model and to assume the existence of local hierarchies without having a very solid archaeological base is to engage in a controversial scheme we controlled the results from the first model using the Thiessen polygons and cost surface analysis. In all three cases the control-areas of the tells contain the same settlements.

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[68] The small unit could be formed of the fortification of Roşiori-Cetatea de pământ (no. 54) and the settlement of Mihai Barvui (no. 39), known only from the bibliography.

[69] The cluster includes: Ciumeşti-Via Veche (no. 25); Sanislău-Lângă Heleşteu (no. 56); Berea-Pârâul Turcului (no. 9); Berea-Togul Sf.Gheorghe (no. 10); Foieni-Lângă podul peste canal (no. 33).

[70] The first sub-group includes: the Carei-Bobald tell (no. 14) and the multi-layer open sites of Carei-Bobald I 2a (no. 16), Carei-Bobald VI (no. 18) and Carei-Spitz (no. 19). The second sub-group contains the open sites of Domăneşti (no. 32), Moftinu Mare-Gădina lui Bota (no. 41), Moftinu Mic-Hanul Messzelátó (no. 43) and Moftinu Mic-Ograda sediului fostei CAP (no. 44).

[71] The Berveni-Halmos tell was investigated by T. Kienlien and L. Marta. The results of the geomagnetic surveys are encouraging, but — for the moment — do not lend themselves to define using XTENT modelling the control area of the Berveni-Halmos tell positioned on the bank of the former Ecedea marsh. For this reason it is left out from our maps. For the other five tells the extent of the settlements are well known because of regular archaeological excavations. In their case an XTENT modelling is possible.

[72] Broadly speaking under the XTENT model the size of the spheres of influence is assumed as directly proportional to the surface of a settlement. For applied methodology see: Molnár, Imecs 2006, 30.

[73] Renfrew, Bahn 1999, 172ff. On socio-political models see: Renfrew 1981, 269ff.

We used mathematical calculations to outline potential areas of influence of settlements Carei-Bobald and Tiream-Holmul Cânepii (Fig. 7:1–2; 8:1)[74]. The territory of the Tiream tell merges into the influence area of Carei-Bobald, so these settlements, according to theory, cannot be regarded as "politically" independent units. On the basis of settlement archaeology data and theoretical models it seems that there was a hierarchically structured chiefdom consisting of several regional units in the Carei Plain. The real power centre of the area is the Carei tell surrounded by its satellite-settlements. In Otomani phase II the influence area of Carei tell[75] contained two tells[76], a single-layer open settlement[77], seven multi-layer open settlements[78], one multi-layer fortified settlement[79], and three other sites only known from bibliography[80]. These are complemented by multi-layer sites (3) about which we do not know if they were fortified (Fig. 7:2)[81]. The number of settlements decreases in Otomani phase III, next to the central site we are aware only of two tells[82], two multi-layer open settlements[83], two single-layer open settlements[84] and two settlements known only from literature (Fig. 8:1)[85]. In Eriu Valley there are two territorial units. The area centred on Sălacea-Dealul Vida is situated in the central and northern part of the river valley. The second sub-unit, centred on Săcuieni tell, occupies the central and southern (towards Barcău river) part of Eriu Valley. The two areas of influence intersect at the central part of the river valley. The settlements in the intersection area were considered to belong to the first or second centre depending on their position[86]. Thus the area of

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[74] Carei-Bobald (R = 12310 m), Tiream-Holmul Cânepii (R = 3692 m). The scale of Berveni-Halmos tell is unknown, therefore it is impossible to specify its possible area of influence. For a detailed presentation of the issue see Molnár, Imecs 2006, 29ff.; Németi, Molnár 2007, 22ff.

[75] The sites Berea-Grădina cu flori (no. 8), Berea-Togul Evreului (no. 11), Ciumeşti-Via Veche (no. 25), Ciumeşti-La păşune (no. 26), Sanislău-La hârburi (no. 55), Urziceni-Vatra satului (no. 68) in the immediate neighbourhood of the circle we outlined, but just outside it were, in our opinion, also subordinated to Carei-Bobald tell.

[76] Tiream-Holmul cânepii (no. 66), Berveni-Halmos (no. 12) (?).

[77] Urziceni-Drumul Careiului (no. 69).

[78] Berea-Grădina cu flori (no. 8), Carei-Bobald I.1b (no. 15), Carei-Bobald II (no. 17), Carei-Bobald VI (no. 18), Carei-Spitz (no. 19), Căpleni-Malul canalului de irigație (no. 20), Sanislău-La hârburi (no. 55).

[79] Căpleni-Drumul căminului (no. 21).

[80] Berea-Togul Evreului (no. 11), Urziceni-Vatra satului (no. 68), Moftinu Mic-Hanul Messzelátó (no. 43).

[81] Ciumeşti-Via Veche (no. 25), Ciumeşti-La păşune (no. 26), Moftinu Mic-Curtea parohiei reformate (no. 42).

[82] Tiream-Holmul cânepii (no. 66), Berveni-Halmos (no. 12) (?).

[83] Carei-Bobald VI (no. 18), Carei-Spitz (no. 19).

[84] Carei-Bobald I.2a (no. 16), Urziceni-Drumul Careiului (no. 69).

[85] Urziceni-Vatra satului (no. 68), Moftinu Mic-Hanul Messzelátó (no. 43).

[86] The settlements Şimian-Locul grădinilor (no. 61), Tarcea-Dealul Mare (no. 62) and Tarcea-Dealul de Mijloc (no. 63) in the intersection area belong to the influence area of the Sălacea tell, while Cheşereu-Dealul Episcopului (no. 23) and Cresturi-Cetate (no. 28) to the area of influence of Săcuieni tell.

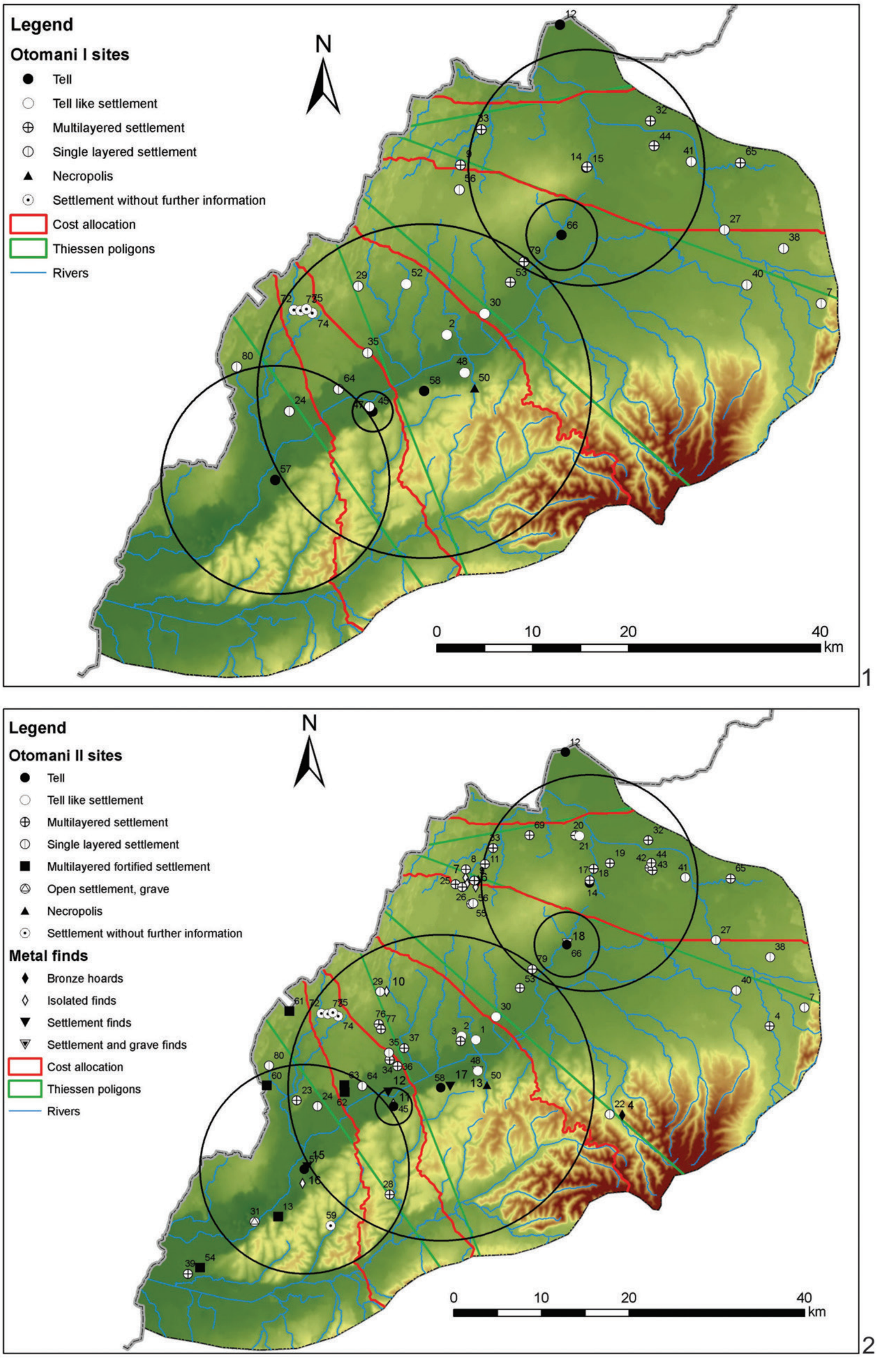

Fig. 7. 1 — Thiessen-polygons, XTENT and Cost surface analysis of the MB I sites from the Carei-Plain and the Eriu Rivers Valley; 2 — Thiessen-polygons, XTENT and Cost surface analysis of the MB II sites from the Carei-Plain and the Eriu Rivers Valley; drawn by Authors

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