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ATTILA GYUCHA, PAUL R. DUFFY, WILLIAM A. PARKINSON

PREHISTORIC HUMAN-ENVIRONMENTAL INTERACTIONS ON THE GREAT HUNGARIAN PLAIN

ABSTRACT: Changes in settlement patterns in the later prehistory of Southeastern Europe historically have been attributed to shifts in climate, hydrology, and subsistence. This paper evaluates the importance of different human-environmental relationships on the Great Hungarian Plain from the Neolithic through the Bronze Age. To model these relationships in a way amenable to archaeological investigation, we frame the discussion according to different spatial and social scales. Based on systematically collected data at various geographic scales in and around the Körös Basin, we suggest that changes in settlement distribution and organization were determined by a dynamic interaction between environmental factors, social concerns, and cultural preferences. Our results imply that at the regional scale certain hydrological features strongly influenced the settlement distribution, but did not prompt changes in their locations over time. At the local scale, environmental differences in micro-zones seem largely responsible for subsistence variability between individual settlements. Yet in between these two resolutions, at the micro-regional scale, settlement location in the Körös Basin was strongly and consistently influenced by social concerns. Long-term stability of environmental patterns at one scale and variation at another contributed to a wide range of dynamic human-environmental relationships shaping the transition from small egalitarian Neolithic villages to larger, more economically complex polities on the Great Hungarian Plain during the Bronze Age.

KEY WORDS: Körös Basin – Great Hungarian Plain – Prehistory – Environment – Settlement organization

Researchers often have attributed a decisive role to climatic and environmental factors in explaining change or continuity in the cultural practices of communities on the Great Hungarian Plain during prehistory. In the Anglo-American archaeological tradition, attributing culture change to environmental forces is strongly rooted in the environmental-functionalist framework of pioneering anthropologists such as Julian Steward, Leslie White and the proponents of the New Archaeology (Trigger 1989: 326–328). In Central Europe during the

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later half of the twentieth century, the source of the environmental approach was somewhat different. Following the end of the Second World War, Hans Jürgen Eggers, and others emphasized the "value-free" ecological and economic dimensions of prehistory, replacing the specific identification of ethnic groups that characterized Kossina's approach (Härke 1991, Trigger 2006: 258). Attributing archaeological phenomena to changes in subsistence or environment often was explicit in the Anglo-American tradition, but in the Central European tradition, the relationship was regularly implied. Arguments that draw upon environmental and subsistence causes for culture change usually are based on regional-scale settlement studies. The spatial distribution of archaeological complexes, such as the Körös Culture's restriction to the Great Hungarian Plain south of an agro-ecological line (Kertész, Sümegi 2001, Sümegi 2003), or the spread of the Late Copper Age/Early Bronze kurgans on the Plain (Ecsedy 1974, Gerling *et al.* 2012) overwhelmingly have been explained by evoking the underperformance of prehistoric subsistence strategies outside of their observed distributions. The nucleation and dispersal tendencies in other prehistoric settlement patterns, such as the highly dispersed settlement organization that emerged during the beginning of the Bronze Age (Csányi 1996, Tóth 2004) or the clustering of Early Iron Age sites (Gyucha 2001) have been attributed to similar causes. In this article, we examine long-term changes in prehistory by focusing on human-environmental relationships and patterns observable in settlement data from the Great Hungarian Plain. Our studies suggest that the social dynamics of prehistoric groups of the Plain were not invariably governed by macro-regional climatic and subsistence patterns, although their importance is notable at specific scales and in particular contexts. Based on systematically collected data from a well-defined region of the Plain, the Körös Basin, we argue that changes in settlement distribution and organization were determined by a dynamic interaction between both environmental factors and social concerns, and strongly conditioned by local factors.

SCALES OF ANALYSIS

The tradition in archaeology of using multiple scales of analysis for studying problems in antiquity assumes that different kinds of human experiences and behaviors are embedded in different spatial scales, and events and processes may have different explanations depending on the scale of the pattern or analysis (see, Duffy *et al.* 2013, Gyucha 2009, Parkinson 2006a, Parkinson, Galaty 2009). Different archaeological scales often describe different "units of society" (such as activity areas, household clusters, and regional networks), and understanding these units together helps provide a rich and nuanced description of human behavior and cultural process. In this article, we investigate the importance of environmental and subsistence parameters at different scales on the Great Hungarian Plain.

The northern part of Békés County, in the southeastern portion of the Great Hungarian Plain, provides a unique opportunity to study settlement changes over long periods of time at various geographical scales. Both the Lower Körös Basin and its adjacent region, the northern segment of the Maros Fan, were field surveyed during the Hungarian Archaeological Topography project (henceforth MRT; see, Ecsedy *et al.* 1982, Jankovich *et al.* 1989, 1998). During the intensive program several thousand archaeological sites were mapped in an area of nearly 3800 km² (*Figure 1*).

In addition to the MRT project, during the past 15 years the region has been subject to numerous regional, microregional, and local scale prehistoric research projects, ranging from the Early and Late Neolithic (e.g., Gyucha, Parkinson 2012, Parkinson, Gyucha 2012, Salisbury 2010, 2012, Sarris *et al.* 2013, Whittle 2007), through the Copper Age (e.g., Giblin 2009, Giblin *et al.* 2013, Gyucha 2009, Gyucha *et al.* in press, Hoekman-Sites 2011, Parkinson 2006a, Parkinson *et al.* 2004a, 2010, Parsons 2011, 2012, Yerkes *et al.* 2007), the Bronze Age (e.g., Duffy 2008, 2010, Duffy *et al.* 2013) and the Iron Age (Gyucha 2001). Owing to the interrelated and collaborative nature of the majority of these projects, they have produced highly comparable as well as complementary results.

In chronological terms, this article deals with three specific time periods, the Late Neolithic, the Early Copper Age, and the Middle Bronze Age. Recent research on these periods has resulted in datasets that are sufficient for and relevant to the topic of the current article. In geographic terms, we investigate factors governing settlement location and size by using a multi-scalar approach. The first scale is regional, confined to the boundaries of the MRT survey project in Békés County. Using a recent environmental reconstruction underlying settlement changes in prehistory, we argue that at this scale environment and subsistence practices did shape where people settled. We explore settlement variability at the micro-regional level using specific case

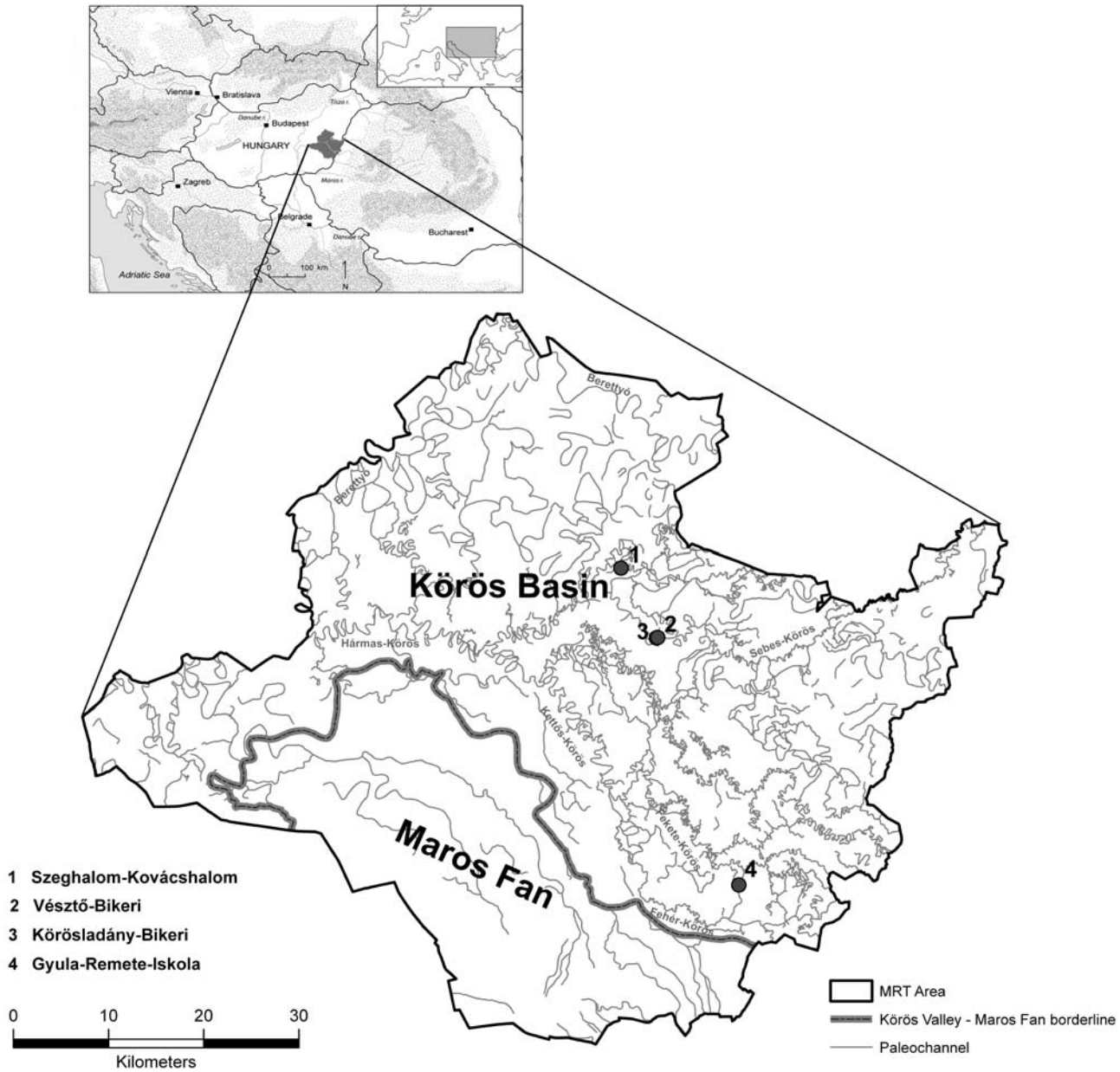

FIGURE 1. The study area boundary of the MRT project. Major regions, paleohydrological features, and archaeological sites mentioned in the paper are illustrated.

studies from our focus periods. At this scale, we argue that social factors such as kinship, trading alliances, and warfare are vital for understanding settlement distribution in the landscape. Finally, we present the results of subsistence studies from individual settlements. At the local scale, we argue again that settlement location and resource accessibility and availability were important forces shaping subsistence practices and settlements. We believe that this multi-layered perspective provides a more textured understanding of the relationship between local-scale communities, their immediate environment, and their greater regional contexts.

LANDSCAPE AND HYDROLOGY: THE REGIONAL SCALE

The regional scale is defined by the MRT study region in Békés County and captures the paleoenvironmental elements of the Körös Basin and a dissimilar neighbouring geomorphological unit, the Maros Fan. Until recently, geomorphologists have interpreted the Holocene hydrological landscape of the Körös Basin prior to the large-scale river regulation campaigns during the 19th century as constantly fluctuating, meandering river channels that frequently were cut off and jumped beds during the Holocene (e.g., Dóka 1997, Pécsi, Sárfalvi 1960). A recent paleohydrological reconstruction of the region, based on historic and modern cartographic sources, aerial photos, as well as soil profiles, overlaid with the MRT archaeological survey data, has given rise to a substantially different conclusion (Gyucha *et al.* 2011, Gyucha, Duffy 2008). Contrary to previous accounts, and likely due to the relatively low energy hydrological environment of the Hungarian Körös Basin, the river network appears to have been considerably stable during the Holocene with very slow rates of channel migration and meander formation. Archaeological settlement data indicate permanent occupation of nearly all major rivers and their tributaries for the past 8000 years. Apart from detecting paleochannels, ancient permanent or seasonal marshlands of various extents also were identified in the study region. The flatness of the region and its poor drainage nevertheless mean that the soils of the area, typically different variants of meadow clay, are of low quality for food production. Much of the variation within soil quality for agriculture is determined by elevation.

Once overlaid with the paleohydrological reconstruction, the MRT archaeological survey data of each period indicate that nearly all of the settlements were established along water courses, usually at the highest points in the landscape (*Figures 2–4*). However, it was not the major rivers but rather their tributaries, or other smaller channels, and the immediate surroundings of marshy territories that were the most common locations for occupation (Gyucha *et al.* 2009, Gyucha, Parkinson 2008).

Since the MRT project in Békés County included ca. 940 km² of the Maros Fan directly south of the Körös Basin, the relationship between environment and settlement network could be explored in relation to these two significantly different landscapes as well. In this context environmental differences were major influences on population movements and boundaries.

The Maros Fan is the alluvium of the Pleistocene Maros river, a fertile grassland with productive chernozem soils a few meters higher than the Körös Basin. The region lacked permanent rivers in the Holocene (*Figure 1*). Survey data indicate that, in contrast to the Körös Basin, the northern segment of the Maros Fan was very sparsely inhabited from the Neolithic to the Middle Bronze Age (*Figures 2–4*). The sharp contrast between the density of population in the Körös Basin with the scarcity of occupation on the Maros Fan can be attributed to the very different environments and a specialization in floodplain subsistence that was not easily modified to accommodate environments without a network of rivers and rich marshland resources. Permanent rivers as major communication and transportation routes also might have been of importance. At the same time however, there is no discernable change in the region's hydrological dynamics during this phase, suggesting that changes between phases within the occupied Körös Basin are more likely attributable to other causes.

Settlement patterns in the Körös Basin and the Maros Fan suggest that social groups were strongly tied to some specific environmental conditions and avoided others, largely as a product of subsistence strategy. From the Neolithic to the Middle Bronze Age settlements rarely extend into the Maros Fan, and other lines of evidence suggest that this corresponds to broad similarity in diet and subsistence practices (Duffy 2008, 2010, Gyucha *et al.* in press, Nicodemus, Kovács in prep.). It was only when a large scale change to animal husbandry in the Late Bronze Age might have occurred, indicated by a major break in the zooarchaeological record (Bökönyi 1974: 35, Szabó 1996: 46), that settlements first appeared in considerable numbers on the Northern Maros Fan (Gyucha 2001).

SETTLEMENT GROWTH AND DISTRIBUTION: THE MICRO-REGIONAL SCALE

The second scale focuses on settlement density and distribution within the occupied area of the MRT study region. Frequent settlement relocation was a general initial characteristic of sedentism and food production, which was introduced to the Great Hungarian Plain during the Early Neolithic Körös phase (e.g., Anders, Siklósi 2012, Kosse 1979, Kutzián 1944, Sherratt 1983). At the end of the Middle Neolithic a tendency towards nucleation emerged in the region, when the first tell settlements were formed in the Szakálhát phase (e.g., Goldman 1984, Horváth 1989, Makkay 1982). During

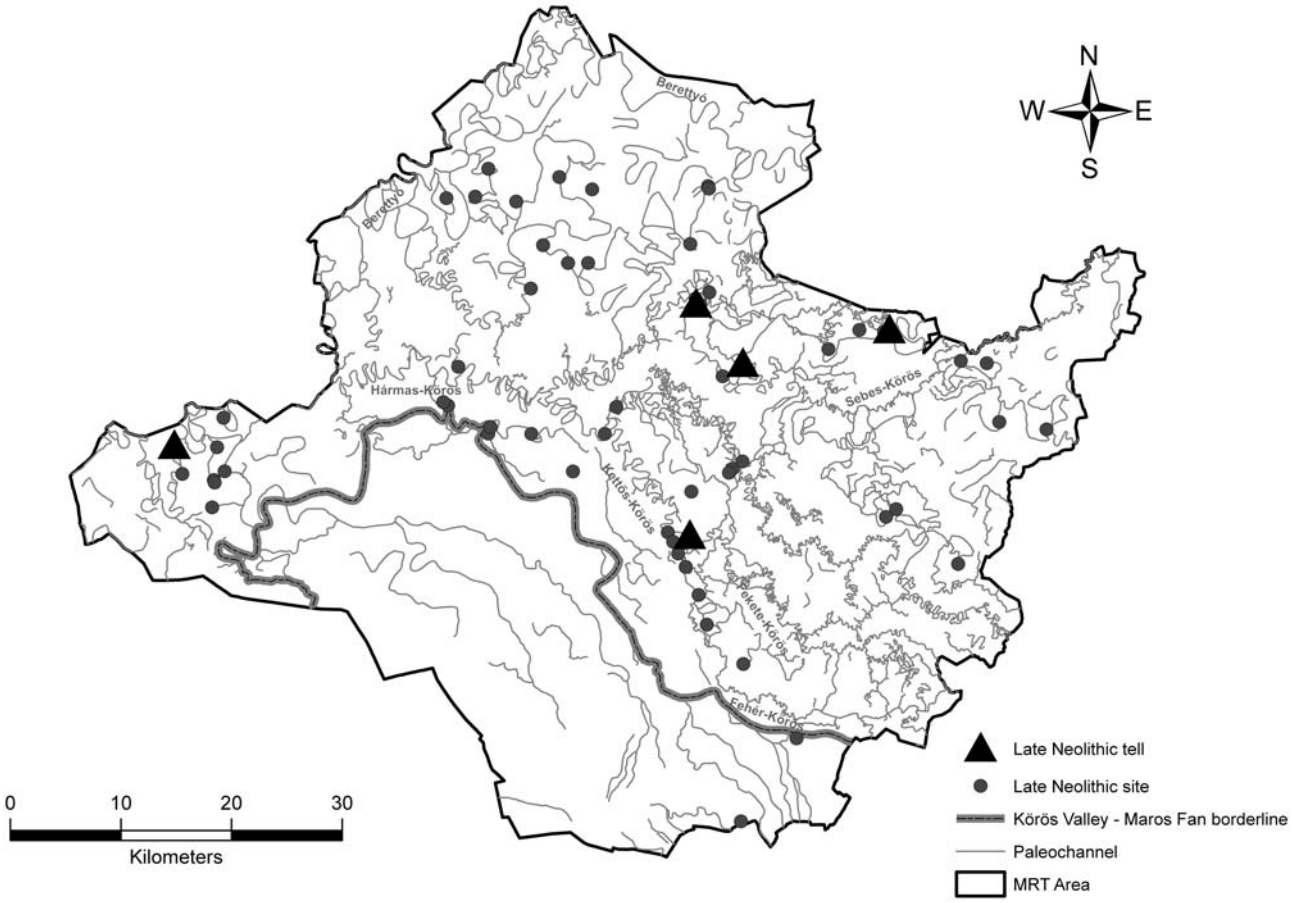

FIGURE 2. The distribution of Late Neolithic sites in the study area.

the Late Neolithic the pattern of a tell and a surrounding large external settlement occurred for the first time on the Plain, in addition to large population nucleation without the development of tell deposits (e.g., Füzesi 2009, Kalicz 2001, Kalicz, Raczky 1987, Raczky 1995). Smaller settlements in the adjacent microregions presumably became associated with these central nodes of settlement networks (Parkinson 2006a, 2006b, Parkinson, Gyucha 2012). There is little evidence of ascribed social inequality at this time (Siklósi 2013), and these site hierarchies more likely imply only long-term kinship-based social integration. We have recently explored this pattern at the site of Szeghalom-Kovácshalom (Bakay 1971), where the small tell is bounded by a large and intensively occupied flat settlement and numerous scattered farmsteads (Gyucha, Parkinson 2012) (see, *Figure 1*).

Discernable settlement clusters are found in the Late Neolithic Körös Basin, with empty zones between them ranging from 6 to 20 kilometers in width (Gyucha, Parkinson 2008, Gyucha *et al.* 2009, Parkinson 2006a, 2006b; see, *Figure 2*). Several clusters are identifiable because marshes that would have prevented habitation occur between settlements. In some cases these empty zones are not uninhabitable. Thus, these latter uninhabited areas may be the result of actively maintained boundaries between larger-scale social and political units. These patterns indicate that within certain elevation and environmental parameters, settlement also followed the logic of social, rather than environmental concerns. Trends towards increasing regionalization and territorial demarcations through more active maintenance of social boundaries are indicated by the more discrete patterning of material culture throughout the Plain in the Late Neolithic as well (i.e., the Tisza-Herpály-Csőszhalom complex; see, Kalicz, Raczky 1987).

The spatial distribution of Tiszapolgár sites in the Körös Basin indicates that a fundamentally different

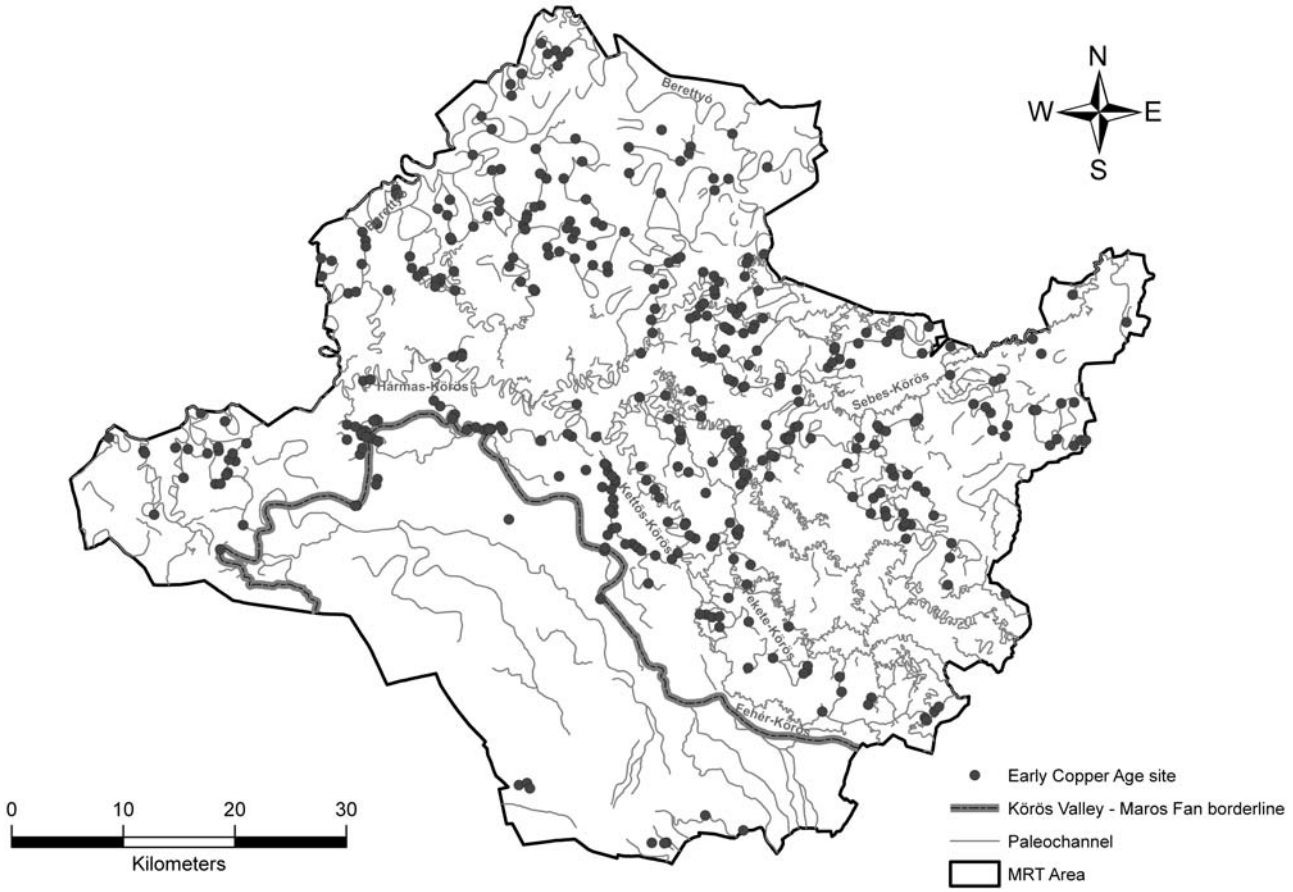

FIGURE 3. The distribution of Early Copper Age sites in the study area.

settlement organization occurred during the Early Copper Age on the Great Hungarian Plain. By the end of the Late Neolithic, habitation of tell-sites ended and nucleated settlements dissolved in the Körös Basin. The significant increase in the number of sites, from 62 to 391, by the Early Copper Age is the most visible shift in settlement organization in our study area (Gyucha *et al.* 2009, Parkinson, Gyucha 2007; see, *Figure 3*). At the same time, settlement size also decreased dramatically. In addition, a large number of sites emerged in previously uninhabited areas of the Körös Basin by the Early Copper Age. Although this process indicates the dissolution of the previous aggregated settlement organization, and implies the establishment of more permeable and modifiable social boundaries, the persistence of some spatially discrete settlement clusters suggests that some areas experienced continuity of more coherent micro-regional groups (Gyucha, Parkinson 2008, Parkinson 2006a, 2006b; see, *Figure 3*). The smaller Early Copper Age communities also were integrated into larger social units, several of which might have had roots in the Late Neolithic, and these ties commonly influenced their locations in the Körös Basin.

By the transitional period between the Early and Middle Bronze Age, nearly 2500 years after the breakdown of the Late Neolithic settlement network, a site size hierarchy with tells and large flat sites recurred on the Great Hungarian Plain and in the Körös Basin (Duffy 2010, 2013, Parkinson 2002; see, *Figure 4*). Fortified tells and flat, open Middle Bronze Age Gyulavarsánd sites in the region are similar in size range. Though denser and less fragmented, settlement clusters in the Gyulavarsánd phase settlement organization also bore a remarkable similarity to that of the Late Neolithic (see, *Figure 1*).

A study of arable land available in the Middle Bronze Age also suggests that social considerations were more influential than environmental requirements at this scale,

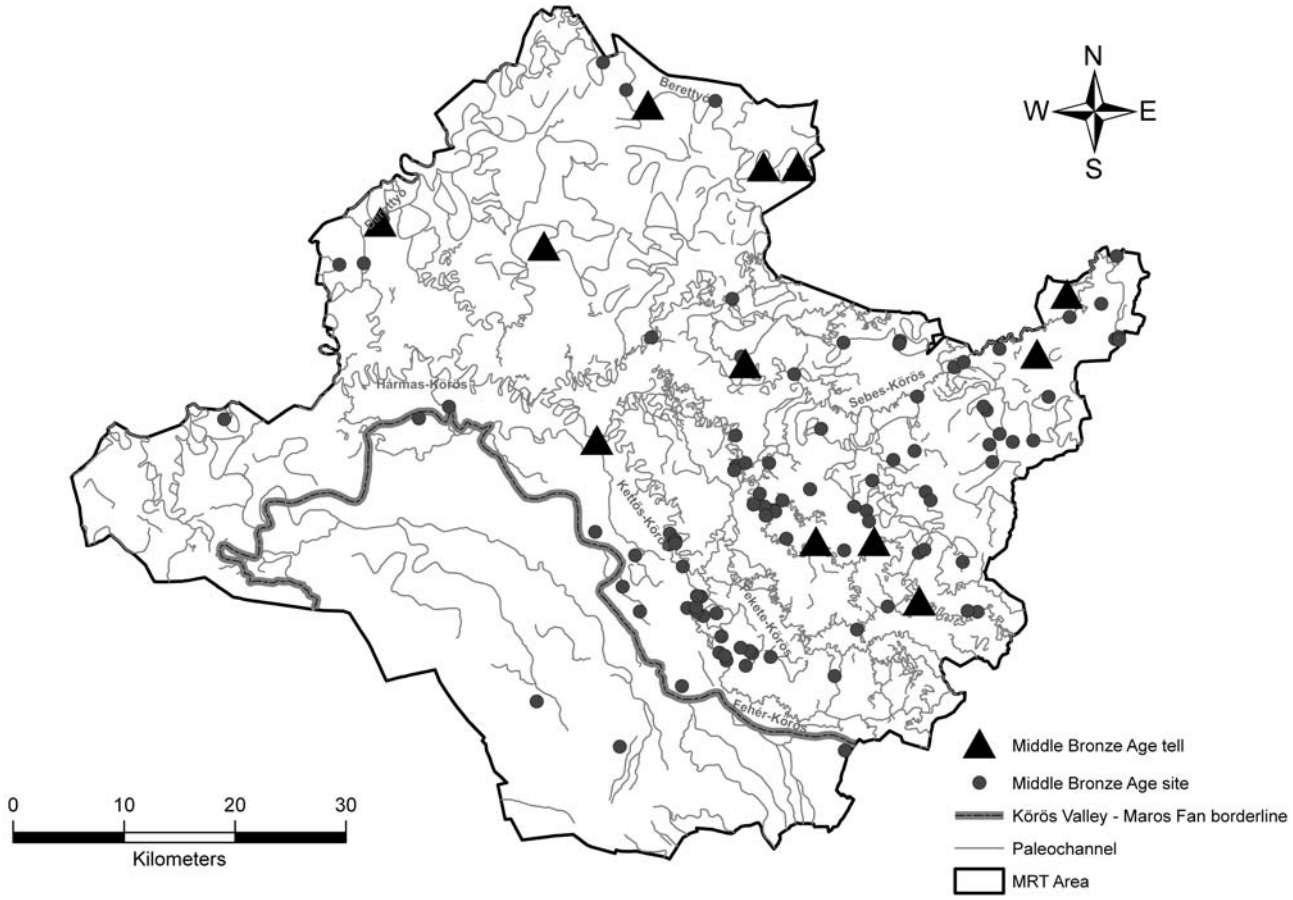

FIGURE 4. The distribution of Middle Bronze Age sites in the study area.

because only 14 percent of the region's most productive land would have been under cultivation at one time. This study, based on variation in elevation, drainage and soil quality, confirmed that cultivation of lower quality soils and areas at lower elevations would not have been required to meet the agricultural demands of aggregated communities with populations around 500 in either the Late Neolithic or Middle Bronze Age (Duffy 2010). These calculations also indicate that grazing lands in most parts of the region would have been more than abundant, even considering large herds.

VARIATIONS IN SETTLEMENT SUBSISTENCE PRACTICES OVER TIME: THE LOCAL SCALE

The third and final scale is that of the individual settlement. While studies of paleolandscape, regional settlement network, and micro-regional clusters shed light on settlement decisions and land-use at larger scales of social integration, variation in settlement data across the study region provides a critical, complementary, local scale, perspective.

Faunal and floral data from excavated contexts are an important source of information on settlement variation. Although no statistically relevant faunal data are available for Late Neolithic groups in the studied part of the Körös Basin (Bökönyi 1974: 357, Bökönyi 1987), the results of analyses on animal bone assemblages from systematically investigated Early Copper Age settlements in the region can be compared to those of Late Neolithic sites from other parts of the Great Hungarian Plain.

To get an insight into the subsistence practices of the typically small scale communities living in the Körös Basin during the Early Copper Age, large faunal assemblages recovered from three sites, Körösladány-Bikeri (n = 12,617), Vésztő-Bikeri (n = 22,618), and

Gyula-Remete-Iskola (n = 4,299), were analyzed (Gyucha 2009, Gyucha *et al.* in press, Nicodemus, Kovács in prep., Parkinson *et al.* 2004b; see, *Figure 1*). Vésztő-Bikeri and Körösladány-Bikeri were established ca. 60 meters apart in the central part of the Lower Körös Basin, and based on thorough chronological investigations, these fortified settlements were occupied partially simultaneously during the initial phase of the Early Copper Age (Parkinson *et al.* 2010, Yerkes *et al.* 2009). The settlement of Gyula-Remete-Iskola is located along the southern edge of the Körös Basin, only a few kilometers north of the Maros Fan, in an environment that was completely different from that of the Vésztő microregion. The locations of the three sites represent well the various paleo-ecozones of the Körös Basin available for communities during prehistory.

The analysis of the faunal assemblages from these Tiszapolgár sites indicates that by the beginning of the Early Copper Age the role of animal husbandry in subsistence intensified throughout the Great Hungarian Plain (Bartosiewicz 2005, Gyucha *et al.* in press). While the frequency of wild mammals at the Late Neolithic Tisza settlements typically ranges between 30–40%, and it exceeds 75% at the Herpály sites of the Berettyó Valley (Vörös 2005: Tab. 4), located only ca. 50 kilometers north of the Vésztő microregion, wild mammal species in Tiszapolgár contexts are less than 10% of assemblages of the Körös Basin. The absolute chronological data of Körösladány-Bikeri and Vésztő-Bikeri are remarkably similar to those of the final Neolithic phase of the Berettyóújfalu-Herpály tell (Yerkes *et al.* 2009).

The available data from the Körös Basin do not indicate an overall shift towards a pastoral economy or increased reliance on cattle herding during the Early Copper Age, as other models posited for the Great Hungarian Plain (e.g., Bognár-Kutzián 1972, Horváth 2005, Siklódi 1983). Recent studies using stable isotope ratios, and lipid residue analysis of potsherds from the Great Hungarian Plain do not suggest an increase in mobility or growing consumption of secondary animal products during the Copper Age (Giblin 2009, Hoekman-Sites 2011, Hoekman-Sites, Giblin 2012). Furthermore, compared to the Late Neolithic, the proportion of cattle among domesticates was lower by the Early Copper Age. The marked differences in the composition of animal bone assemblages from Late Neolithic settlements in various parts of the Great Hungarian Plain, as well as from Early Copper Age sites in the Körös Basin is indicative of subsistence strategies influenced primarily by variation in local environmental conditions and cultural preferences at the level of individual small-scale communities. By the Middle Bronze Age the horse had been introduced to the domesticate mix, but comparison of faunal assemblages within broad ceramic traditions such as the Ottomány group demonstrate continued variation based on the ecological idiosyncracies of micro-regions across the Körös Basin (Nicodemus n.d.).

Macrobotanical remains from the Late Neolithic to the Middle Bronze Age indicate a broad selection of cereal species, such as einkorn, emmer, barley, and common millet, as well as legumes such as lentil and grass pea. Wild nuts and fruits were gathered and weeds were used as fodder and medicine throughout the Great Hungarian Plain and in the Körös Basin as well (e.g., Berzsényi n.d., Gyulai 2005, Hartyányi 1989, Hartyányi *et al.* 1968, Kasper 2003, Yerkes, Kasper in prep.). Overall, floral data for the Plain suggest that intensive gardening and possibly extensive food production practices established during the Neolithic persisted into the Copper and Bronze Ages as well (Bogaard 2007, Duffy 2010). However, sample sizes for macrobotanicals remain small and unsystematically collected. Our sense of variation is therefore extremely limited.

The above data indicate that communities living in the study region from the Neolithic to the Bronze Age developed subsistence strategies governed by locally available environmental resources. The landscape in the Körös Basin, characterized by a mosaic environment of alternating wetlands and higher drylands, soils and vegetation, inherently required these communities to apply various strategies in their subsistence.

CONCLUSIONS: LONG-TERM HUMAN-ENVIRONMENTAL RELATIONSHIPS

Previous models often assumed that major climate and hydrological changes and shifts in subsistence strategies were the crucial forces underlying changes in prehistoric socioeconomic systems on the Great Hungarian Plain. However, a multi-scalar, diachronic study of human-environmental relationships in the Körös Basin challenges this view. Our results imply a remarkably complex interaction between culture and environment, resulting in settlement patterning both within and between periods. At the scale of major geomorphological regions, hydrological differences between them do serve to demarcate boundaries for subsistence practices and settlement. At the same time, however, the stability of hydrological regimes in the Körös Basin itself suggests that changes in hydrology were not dramatic enough over time to be responsible

for changes in material culture and settlement pattern. At the micro-regional scale, the clustering and growth of settlements within the Körös Basin seem to relate to micro-regional histories of occupation and shifts in the social boundaries with neighbors. Finally, at the smallest scale, that of the settlement itself, subsistence practices clearly demonstrate that conditions for domestic and wild fauna around the settlement were a strong regulator of diet. Although several broad trends in food consumption are notable from the Late Neolithic to the Middle Bronze Age, dietary variability continues to be high in each subsequent period because of the continued variability in underlying ecological conditions. These variables and their modifications over time could have been responsible for the development of settlement networks in the Körös Basin from the Late Neolithic to the Middle Bronze Age.

The first major break in subsistence pattern for the prehistory of the study area may have been the intensive occupation of the Maros Fan, corresponding to the introduction of a large-scale pastoral economy during the transition from the Bronze Age to the Iron Age. The supposed fundamental change in subsistence strategy and the habitation of this wide open, grassy region may have been related to social transformations towards a more complex political organization as well. This hypothesis, in turn, requires evaluation of archaeological data at multiple scales.

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Attila Gyucha
Center for National Heritage Protection
Hungarian National Museum
Múzeum krt. 14–16
1088 Budapest
Hungary
E-mail: attila.gyucha@mnm-nok.gov.hu

Paul R. Duffy
Department of Anthropology
University of Toronto
19 Russell St.
Toronto, ON
Canada M5S 2S2
E-mail: paulregisduffy@gmail.com

William A. Parkinson
Field Museum of Natural History
1400 S Lake Shore Drive
Chicago, IL 60605
USA
E-mail: wparkinson@fieldmuseum.org