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CONTRASTING SUBSISTENCE STRATEGIES IN THE EARLY IRON AGE? – NEW RESULTS FROM THE ALFÖLD PLAIN, HUNGARY, AND THE THRACIAN PLAIN, BULGARIA

Summary. *What can students of the past do to establish the predominant land-use and settlement practices of populations who leave little or no artefactual discard as a testament to their lifeways? The traditional answer, especially in Eastern Europe, is to invoke often exogenous nomadic pastoralists whose dwelling in perpetuo mobile was based on yurts, minimal local ceramic production and high curation levels of wooden and metal containers. Such a lacuna of understanding settlement structure and environmental impacts typifies Early Iron Age (henceforth 'EIA') settlements in both Bulgaria and eastern Hungary – a period when the inception of the use of iron in Central and South-East Europe has a profound effect on the flourishing regional bronze industries of the Late Bronze Age (henceforth 'LBA').*

The methodological proposal in this paper is the high value of palynological research for subsistence strategies and human impacts in any area with a poor settlement record. This proposal is illustrated by two new lowland pollen diagrams – Ezero, south-east Bulgaria, and Sarló-hát, north-east Hungary – which provide new insights into this research question. In the Thracian valley, there is a disjunction between an area of high arable potential, the small size and short-lived nature of most LBA and EIA settlements and the strong human impact from the LBA and EIA periods in the Ezero diagram. In the Hungarian Plain, the pollen record suggests that, during the LBA–EIA, extensive grazing meadows were established in the alluvial plain, with the inception of woodland clearance on a massive scale from c.800 cal BC, that contradicts the apparent decline in human population in this area. An attempted explanation of these results comprises the exploration of three general positions – the indigenist *thesis, the* exogenous *thesis and the* interactionist *thesis. Neither of these results fits well with the traditional view of EIA populations as incoming steppe nomadic pastoralists. Instead, this study seeks to explore the tensions between local productivity and the wider exchange networks in which they are entangled.*

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INTRODUCTION

Our aims in this article are threefold: first, to challenge the basis for existing models for an EIA past in Central and South-East Europe; secondly, to illustrate another approach to EIA subsistence practices and link this to local and regional settlement structures; and thirdly, to develop alternative views of EIA lifeways in these areas. We consider this to be a liberation movement – to free the EIA in Thrace from the prison of the Thracians of the Late Iron Age and to liberate the communities termed 'Pre-Scythian' and 'Scythian' from the overpowering weight of steppe nomadism. In other words, it is our intention to write about the EIA for its own sake – not as a precursor of something else (Thrace) nor as the pale reflection of a mounted extra-regional nomadic glory (eastern Hungary). This approach is based upon palynology and plant macrofossil analysis; the study is based upon new cores taken from the Ezero reed-swamp, next to the well-known prehistoric tell, near Nova Zagora, southern Bulgaria, and the infilled palaeo-channel of Sarló-hát, in County Hajdú-Bihar, north-east Hungary.

EXISTING MODELS OF THE EIA IN CENTRAL AND SOUTH-EAST EUROPE

The EIA in Central and Eastern Europe has attracted a mixed reception in European Iron Age studies, treated simultaneously as a receptor zone for innovations and cultural developments made elsewhere and as a transmission zone for passing these innovations on to voracious but rather uninventive Western European communities (Collis 1997; Kristiansen 1998; Wells 1984). Located north of the Aegean world and at the westernmost extent of the world of the steppe nomads (Fig. 1), EIA communities in the Balkans and Hungary clearly played an important part in the inter-regional exchange networks of metal (Kristiansen 1998; Pare 2000) and prestige ceramics (e.g. the Gáva black burnished fine wares that provided a direct link between the Alföld and Thrace at this time: Hänsel 1976; Kemenczei 1984; Toncheva 1980). However, these regions rarely displayed patterns of conspicuous consumption such as characterized the preceding LBA (e.g. the Vulchitrun treasure: Mikov 1958; Bonev 1977; the Hajdúböszörmény hoard: Mozsolics 1985). In both cases, it is our impression that the local EIA is viewed down the wrong end of the telescope, seriously distorting our perception of the related phenomena (for absolute chronologies in our two study areas, see Fig. 2).

There is a perception that the people who lived during the twelfth–sixth centuries BC in Bulgarian Thrace have always been overshadowed by the 'glory' of their 'Thracian' descendants, best known from their unique funerary architecture and their sets of gold and silver vessels but with a wide range of material culture and extensive historical sources. Most archaeologists look backwards through their civilized Thracian telescope to an earlier, less evolved period where origin myths could be created for the 'inevitable' rise of quasi-statehood.

Far from there being a consensus view, studies of the EIA in Bulgaria can be divided into two tendencies. The first approach focuses on more general issues like the emergence of the Thracian diaspora within the context of the fall of the Hittites and Mycenae (Sandars 1983). While some researchers more readily accept the notion of migrations (Toncheva 1980; Kristiansen 1998), current interpretations dwell more on more limited movements of people in combination with local development (Gotsev 1994) or the transfer of ideas (Taylor 1989; 1994). The second approach is concerned with the specifics of the EIA culture in different regions, including studies of artefacts, burial rites and, more recently, pit sanctuaries. It is still rare to find

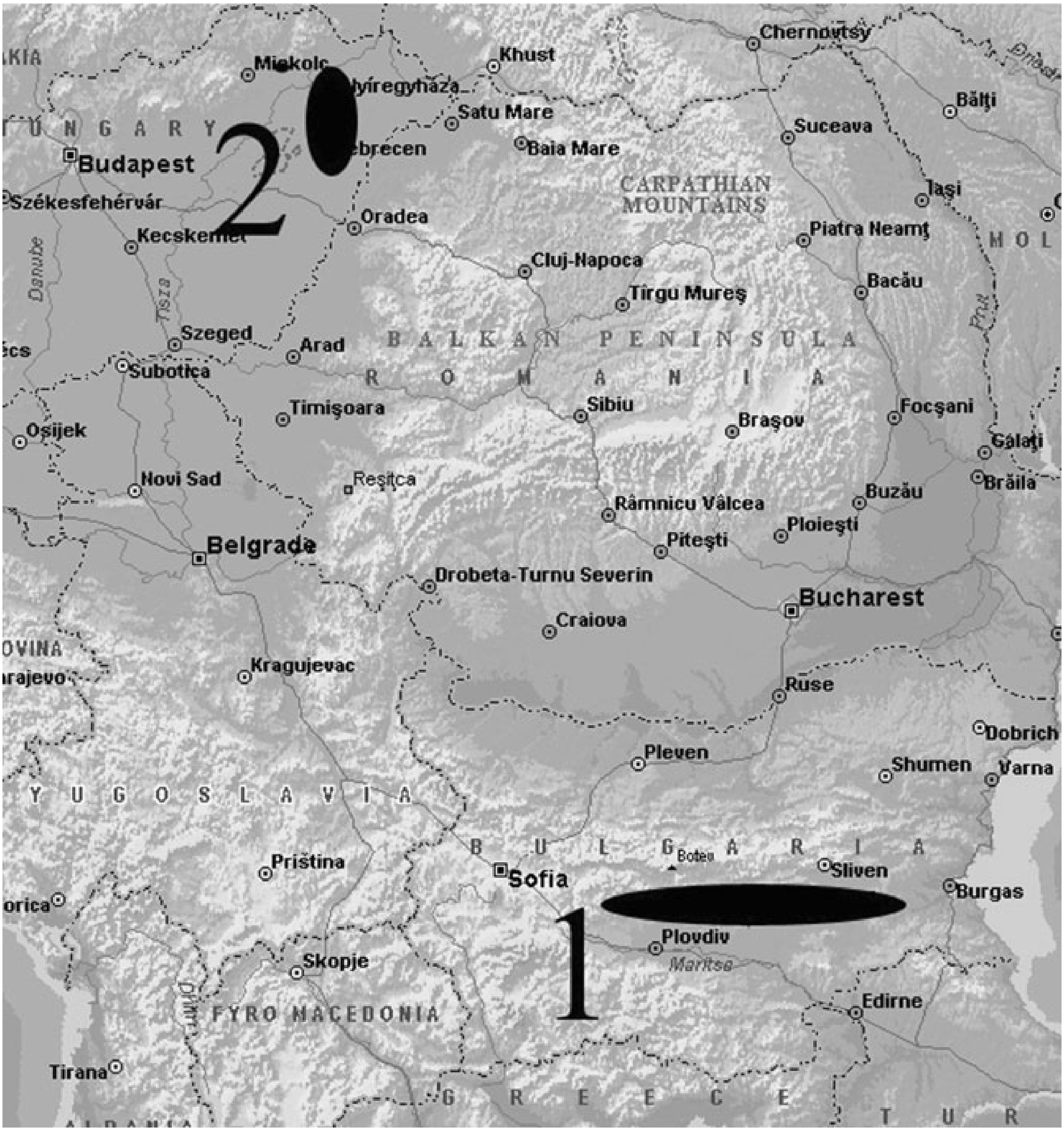

Figure 1
Location of the study sites and other sites mentioned in the text in Europe.

research such as that of Taylor's, who identifies a change in the locus of ethnic identity from pottery to personal fashion accessories in steppe nomad communities (Taylor 1994, 379; cf. Wells 2001, 93). Settlement investigations remain marginal, only to be considered important in discussions of site hierarchy or inter-regional comparison. Those few discussions of subsistence practices are usually general comments on the introduction of iron technology or the presumed practices of mixed farming.

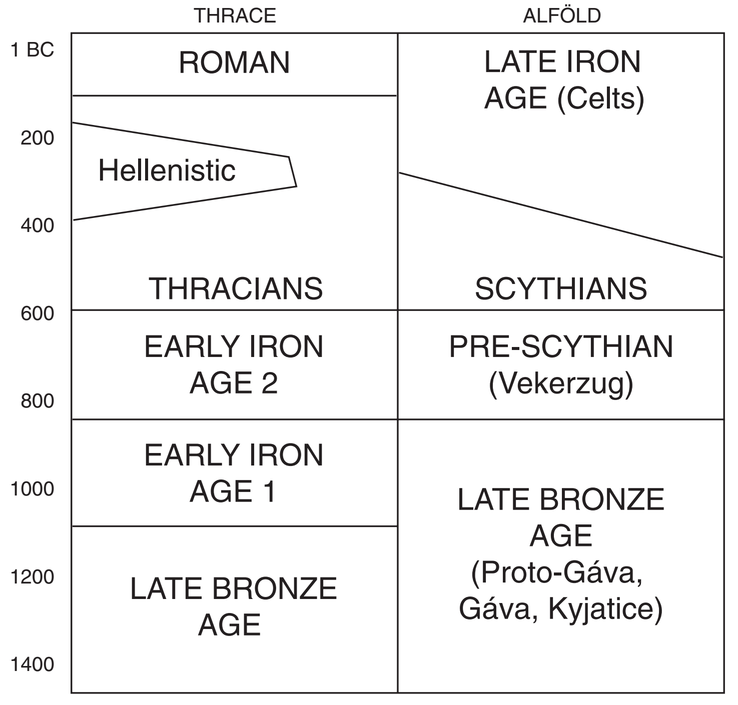

Figure 2
Absolute chronology of archaeological periods in south-east Bulgaria and eastern Hungary.

In summary, the present perception of the Thracian EIA is very much artefact-based, whilst being enlivened with lengthy discussions of Thracian orphism and alleged ritual practices. However, very little is known about their lifestyles.[1]

The metaphor of the telescope in Hungarian EIA studies concerns the use of historically attested medieval events to explain an earlier development. In eastern Hungary, the dominant model for cultural change has always been the movement of steppe nomads from the East across the Carpathians into the fertile lowlands of the Alföld Plain. This is the historically attested model for the Roman period (the Sarmatians and Vandals), the 'Coming of the Hungarians' in the ninth century AD (Kalmár 1971) and especially the early medieval period – the former 'Volkswänderungszeit' – in which successive waves of mounted warriors (Goths and Avars) forced themselves upon the local populations, bringing new genes, new weapons, new ornaments and sometimes new tools (Bóna 1991; Németh 1988). For the EIA, M. Szabó (1997, 74) summarizes it as follows: 'Following a series of as yet unknown events in the 8th–7th centuries BC, the peoples in Northeast Hungary first appeared in the annals of history with the appearance of the Scythians in the mid-6th century BC.' In other studies, these 'unknown events' turn out to be no less than another wave of steppe influences, bringing iron-working, horse trappings and

1 An exception for the EIA of south-east Romania is Taylor's (1989) interesting model linking the exploitation of local iron and salt sources to an intensification of sheep transhumance.

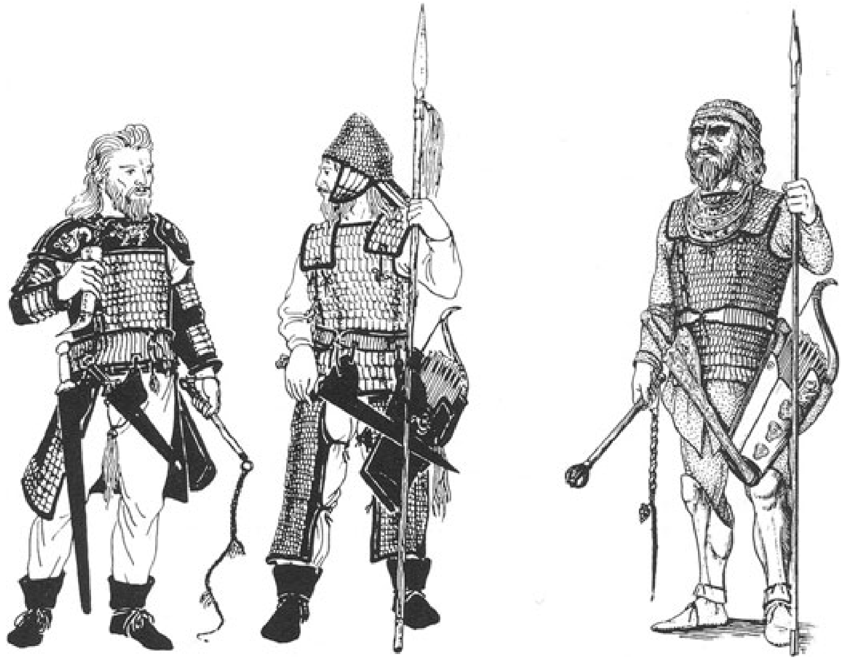

Figure 3
Imaginative reconstruction of Scythian warriors (source: Kromer 1986, Abb. 47).

other innovations from the core areas of the steppe world into its westernmost periphery (Kemenczei 1984; Kristiansen 1998, 192–5) (for a common archaeological perception of Scythian warriors, see Fig. 3). For Kristiansen (1998, 195), there is ‘no question that Cimmerians were expanding their activities westwards’; what is important is the diagnosis of the nature of interaction, whether migration, conquest or trade. This view ignores the convincing evidence from Romania of iron-working that pre-dates the alleged ‘pre-Cimmerian horizon’ by several centuries (Stoia 1989; Taylor 1989). Indeed, even Kristiansen (1998, 193) has to admit that it is not possible to identify the Cimmerians archaeologically!

Detailed fieldwalking projects in the Hungarian Archaeological Topography programme (Jankovitch *et al*. 1989; Laszlovszky 2003; Laszlovszky and Siklodi 1991), as well as in the multi-disciplinary Upper Tisza Project (1991–9: Chapman *et al*. 2003), have demonstrated the extremely low level of EIA ceramic discard. Large-scale motorway rescue excavations confirm the insubstantial nature of settlement traces (Raczky *et al*. 1997; Istvánovits 1997), leading to a scarcity of both archaeobotanical and archaeozoological results. There is self-reinforcing tendency to these points, so that minimal discard is equated with short-lived, temporary settlement, in turn linked to nomadic peoples, who in turn carry little material culture for discard and rarely stop for long enough to deposit their goods or indeed consumption refuse from food and drink.

While these views may perhaps verge on a caricature of the EIA of our two study regions, the opinions on which they are based are widespread in the literature and probably constitute, despite challenges and disagreements, a majority viewpoint. The paucity of EIA settlement evidence in these areas makes it hard to contemplate a deeper understanding of settlement and subsistence processes in the future. The opportunity to use palynology and plant macrofossil analysis to provide an alternative data set for these issues opens up new and different interpretative possibilities for EIA societies in both Hungary and Bulgaria.

PALYNOLOGICAL METHODOLOGY

Pollen records can be used to detect human impact on the environment in several ways (Birks and Birks 1980). Declines in arboreal pollen frequencies may hint at woodland clearances if accompanied by microscopic charcoal peaks and/or spread of the disturbance indicator herbs (Behre 1981); crop fields may be inferred from the occurrence of cereal pollen and important weeds of arable lands, such as Corn cockle (*Agrostemma githago*) and Cornflower (*Centaurea cyanus*); while grazing pressure on a land may show up as an increase in disturbance indicator pollen types (*Rumex acetosa*, *Plantago lanceolata*), along with a general increase in herbaceous pollen diversity (Birks and Line 1992). Moreover, simultaneous increases in unpalatable herb pollen frequencies, like many Sagebrush species (e.g. *Artemisia santonicum*) can further assist the detection of grazed meadows.

The area represented by a pollen spectrum depends on the size of the sedimentary basin. In general, small lakes and mires collect pollen grains from a relatively small area (e.g. a lake with a radius of 10 m collects pollen from within a radius of 50–100 m), and with the increase of lake-size, the pollen catchment area also increases, even if the relationship is non-linear (Jacobson and Bradshaw 1981). Results from modelling and empirical studies (Sugita 1994; Condera *et al*. 2006; Soepboer *et al*. 2007) suggest that lakes similar in size to our two study sites (viz., 3–5 ha) will have their relevant pollen source areas (beyond which the correlation between pollen loading and vegetation does not improve) between 400 and 600 m, while the background pollen (the regional component, coming from beyond 600 m and up to tens of kilometres) takes up a considerable amount, approximately 45 per cent of the total pollen load (Soepboer *et al*. 2007). Accordingly, the pollen in our sediment cores is expected to originate mainly from extra-local to regional sources (Jacobson and Bradshaw 1981; Prentice *et al*. 1987). Therefore, the two pollen diagrams reported in this study reflect the vegetation of the floodplain and the surrounding terrace zone.

THE NEW RESULTS

The Ezero pollen and macrofossil record

Next to the long-lived settlement of Ezero-Dipsis, a large reed-swamp appears in the landscape today (Fig. 4), but as we know from local people, not long ago this wetland still formed a chain of seven spring-fed pools, attracting people's attention by the special two-day cycle of its water (Gaydarska *et al*. 2006). Sediment has been accumulating in these pools for millennia, albeit with interruptions. Thus, pollen and macrofossils preserved in them provide an essential record of the former vegetation and land-use strategies (Magyari *et al*. 2008). Following the Early and Mid-Holocene, when these pools were probably much restricted in size, and oak trees grew around them, a rapid increase in the water-level took place and resulted in the accumulation of organic-rich sediments from *c*.1000 cal BC onwards.

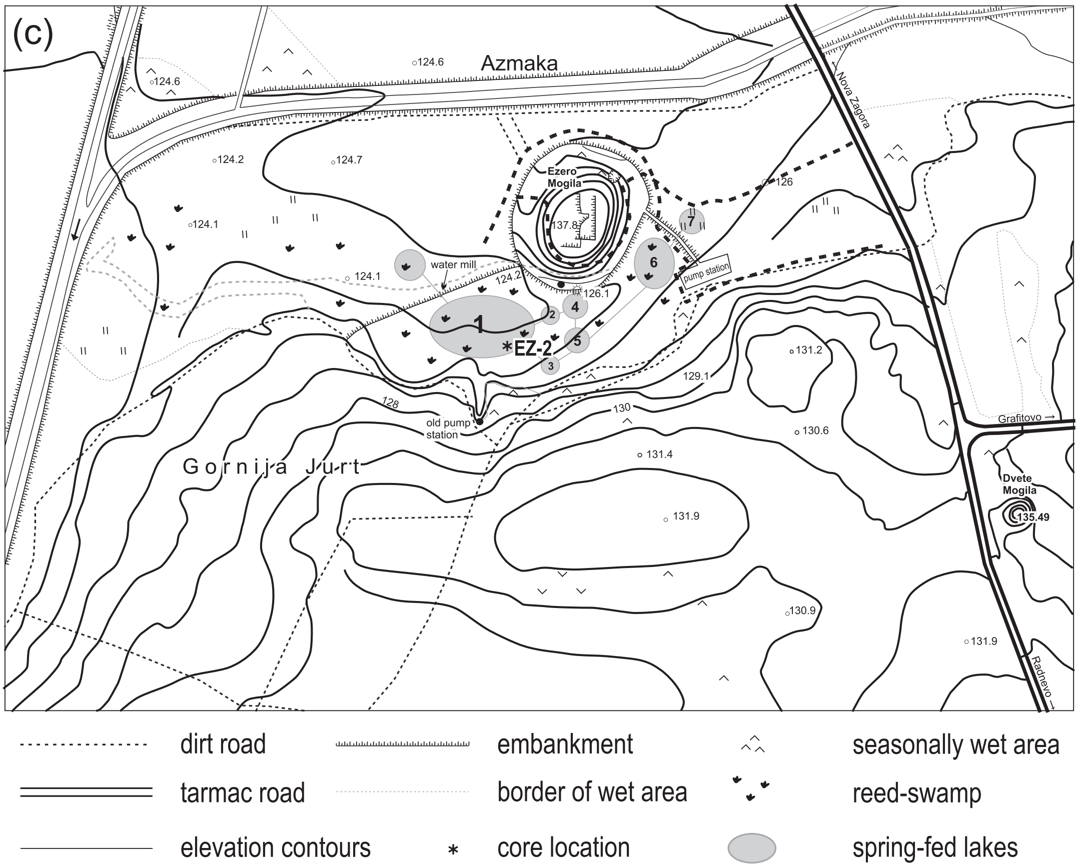

Figure 4
The Ezero lake, with the location of the tell, the springs and the coring sites.

Pollen and macrofossil spectra from the LBA part of the sediment (290–278 cm in depth) suggest that arable farming was practised by the tell's inhabitants: abundant wheat (*Triticum*) and rye (*Secale*) pollen, emmer wheat grains (*Triticum* cf. *T. dicoccum*) and a diverse weed flora both in the macrofossil and pollen records (Figs. 5–6A) attested to intense occupation. Extensive pastures in the LBA landscape are indicated by high pollen frequency of grasses (Gramineae), as well as steady occurrences of grazing indicator herbs, such as Ribwort plantain (*Plantago lanceolata*) and Sagebrush (*Artemisia*), in the pollen spectra. Moreover, the great number of ruderal herbs in the macrofossil record suggested that, in the vicinity of the tell settlement, which was otherwise walled in the Early Bronze Age (Georgiev *et al*. 1979; Dennell 1978), ruderal herb communities and Elder (*Sambucus nigra*) prevailed, probably in response to the intense human disturbance. There is evidence in the archaeobotanical record of Ezero tell (Dennell 1978; Georgiev *et al*. 1979) that, apart from Common vervain (*Verbena officinalis*), all of these ruderal plants and Elder (*Sambucus*) were exploited by the Early Bronze Age people. Common vervain (*Verbena officinalis*) is a sub-Mediterranean medicinal plant growing on wasteland (Kereszty 2004). Since it produces small, elongated seeds, it was probably missed

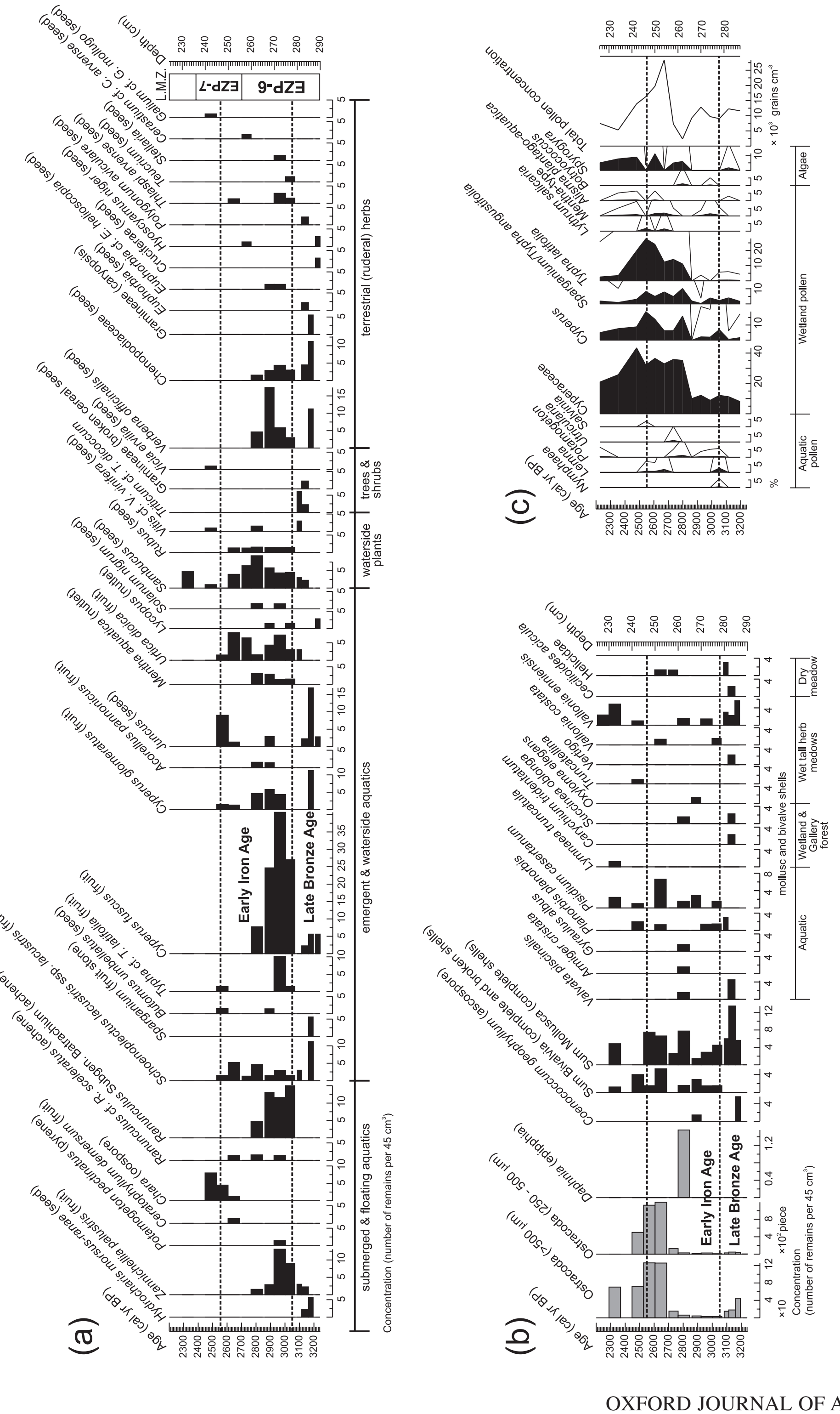

Figure 5

Late Holocene macrofossil and pollen diagram for the EZ-2 sediment core, Ezero wetland, Thracian Plain, Bulgaria. (a) Aquatic, wetland and terrestrial plant macrofossils; (b) Animal remains and fungal spores; (c) Main aquatic and wetland pollen types, algae and total pollen concentration. Concentration values for macrofossil components are plotted against calibrated BC/AD timescale (left scale) and depth (right scale). Wetland macrofossil assemblage zones (L.M.Z.) are indicated at the right of diagram 'a'. Note different scales on diagram 'b'. The position of samples from which radiocarbon age estimates were obtained, and their ages in calibrated years BC, are shown alongside the timescale on diagram 'a'. For details of the coring, macrofossil and pollen preparation techniques see Magyari *et al.* (2008).

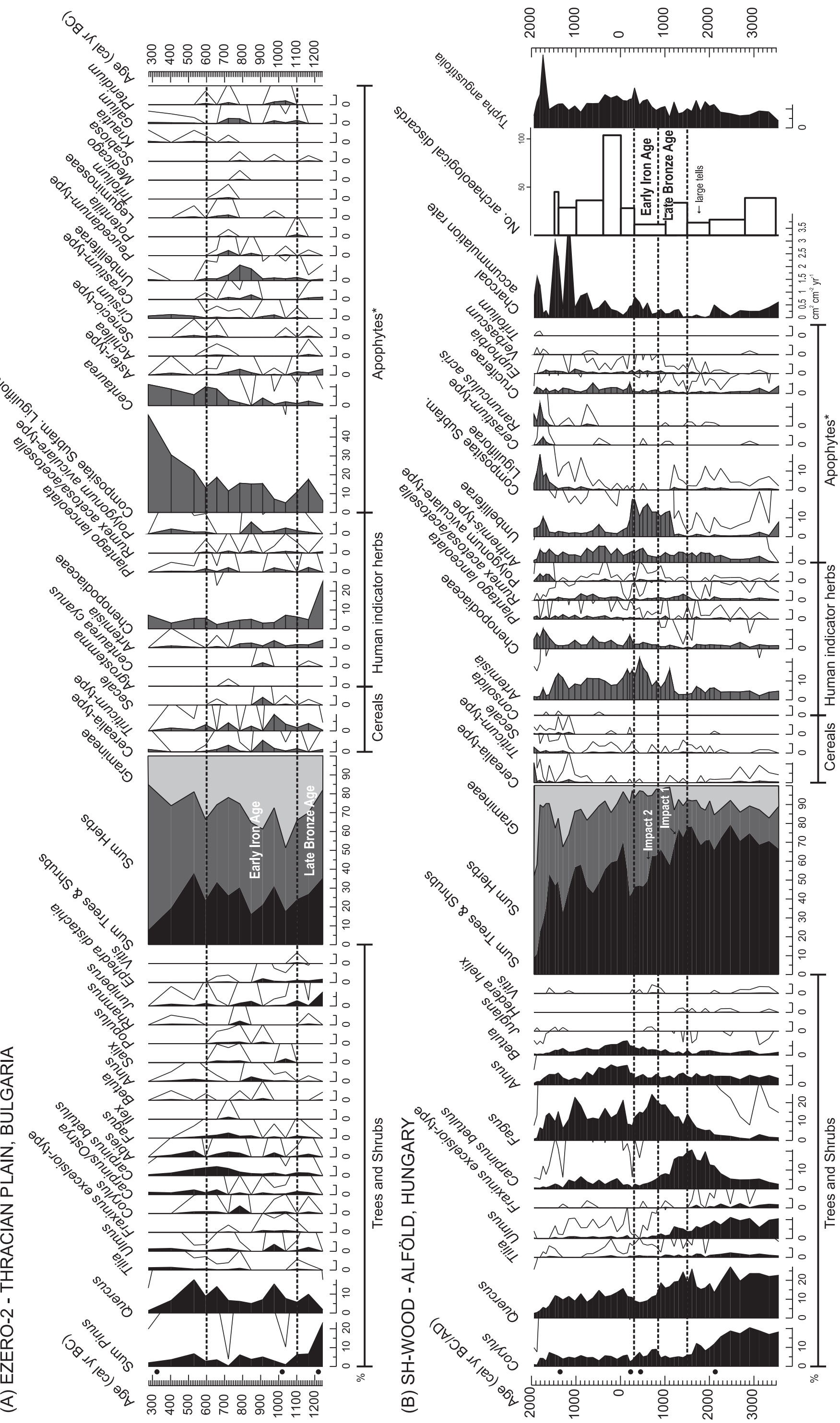

Figure 6

Pollen frequency diagrams of selected pollen types from core EZ-2, Ezero wetland, Thracian Plain, Bulgaria (A) and SH-WOOD, Tiszagyulaháza, Hungary (B) plotted against calibrated BC/AD timescale. The position of samples from which radiocarbon age estimates were obtained is shown alongside the timescale. On the right of the SH-WOOD (B) diagram charcoal accumulation rates and the number of archaeological discards in the study region are shown. * Apophytes are native herb taxa that are permanently established on man-made habitats. For details of the coring and pollen preparation techniques see Magyari *et al.* (2008) and Magyari *et al.* (in press).

during the archaeobotanical analyses (Dennell used 500 micron mesh), but it is also likely that it grew as a weed only and was not utilized by the LBA people.

Grape (*Vitis* cf. *V. sylvestris*) seeds were occasionally recovered from the LBA sediment (Fig. 5a). Detailed morphological analysis suggested that they belong to Wild grape and therefore probably grew along the pools on Elder bushes (*Sambucus*), just as they do today. Recoveries of Wild grape seeds from the Early Bronze Age tell layers (Hopf 1973) suggest that the local people utilized Wild grape that must have been common in the pools' environment at that time.

Low arboreal pollen frequencies (Sum AP on Fig. 6A) suggested that, by the LBA, the Upper Thracian lowland landscape was largely open, though patches of xero-mesophilous oak woodland may have survived, as the relative abundance of woody taxa still attained 20–30 per cent. Their characteristic canopy trees were probably Oak (*Quercus*), Elm (*Ulmus*) and Ash (*Fraxinus*). Charcoal analysis of the Early Bronze Age cultural layers at Ezero tell (Hopf 1973) provided further evidence for the species present in the lowland woodland and exploited by the earlier settlers. In agreement with our pollen record, Oak (*Quercus*) was by far the dominant genus encountered, followed by Elm (*Ulmus*), Ash (*Fraxinus*), Turkish hazel (*Corylus colurna*) and Sweet chestnut (*Castanea sativa*). Steady, but relatively low, pollen frequencies of mesophilous deciduous and evergreen woody taxa, such as Beech (*Fagus*), Hornbeam (*Carpinus betulus*), Oriental hornbeam (*Carpinus orientalis*) and Fir (*Abies*), suggest that they were probably growing in the nearby Sveti Ilija Hills. This inference is further supported by the lack of their macrofossils both in the Ezero sediment and in the tell's charcoal record.

The wetland macrofossil diagram from Ezero (Fig. 5a–c) records a series of wetland vegetation changes. This record is unique for this dry lowland area of Bulgaria (Bozilova *et al*. 1996) since the lack of suitable sedimentary records has restricted our knowledge of the Holocene vegetation succession to biogeographical inferences from the upland areas (Peev and Delcheva 2007; Meshinev 2007). The diverse macrofossil assemblages of Ezero contribute towards our understanding of the floristic diversity of the last 3000 years.

The wetland macrofossil assemblages (Fig. 5a) suggest that the Late Bronze Age was characterized by shallow, eutrophic water and marked fluctuations in the water depth. The abundance of mud-flat sedge species, like Brown galingale (*Cyperus fuscus*) and submerged aquatics of shallow brackish waters, such as Horned pondweed (*Zannichellia palustris*), suggested that, during the Late Bronze Age, the lake level underwent strong seasonal fluctuations in addition to the characteristic diurnal cycle (Gaydarska *et al*. 2006). The wetland flora pointed to the prevalence of a marked drought period during the summer. This fluctuation in the water depth became probably even more enhanced in the first part of the EIA, between *c*.1100 and 900 BC, as the concentration of the aforementioned species increased in this period. A general decrease in the water depth may be inferred from the disappearance of the submerged aquatic plant, Frog bit (*Hydrocharis morsus-ranae*). The core location probably represents the marginal zone of the lake in this period.

In the composition of the wetland macrofossil assemblages, a striking change commenced around 850 BC, in the early part of the EIA. As shown in Figure 5, ostracods, aquatic molluscs and bivalves appeared or increased in abundance along with reed-swamp components and algae in the microfossil spectra (Fig. 5c). These data point to a general increase in water depth and, more importantly, less severe lake level fluctuations.

At the same time, minor increases were found in several woody taxa requiring a more humid climate than Oak (*Quercus*): for example, Hornbeam (*Carpinus betulus*), Beech (*Fagus* *sp.*) and Fir (*Abies sp.*). Although low pollen frequencies suggest a regional source, nonetheless they support a generally moister climate in the region. Another conspicuous feature of the pollen record is the sustained occurrence of cereals – both wheat (*Triticum*) and rye (*Secale*) – and the high frequency of disturbance indicator herbs, such as Sorrel (*Rumex acetosa/acetosella*) and Knotweed (*Polygonum aviculare*). Apart from arable fields, grazing meadows were probably the most important landscape components around the Ezero wetland, as evidenced by high frequencies of grasses (Gramineae), Sagebrush (*Artemisia*), Knapweed (*Centaurea*) and members of the daisy family (Compositae Subfamily Liguliflorae). Gradually intensifying anthropogenic disturbances towards 600 BC are suggested by the increasing frequencies of Knapweed (*Centaurea*) and Compositae Subfamily Liguliflorae.

The terrestrial plant macrofossil record (Fig. 5a) suggested that, in the EIA, ruderal communities were similar to those of the LBA. The most prominent feature was probably the spread of Elder (*Sambucus*) and Bramble (*Rubus*) shrubs in accordance with the abandonment of the tell; but still the sustained abundance of ruderal herbs, like Common Vervain (*Verbena officinalis*), attested to intensive anthropogenic disturbance in the wetland.

In summary, the EIA is characterized by strong continuity in land use from the LBA. Areas of pastureland for stock-raising are seen as a more important landscape component than arable fields in the lowlands around Ezero.

Settlement structure in the Nova Zagora area

The Thracian Plain was densely settled from the Neolithic (Todorova and Vajsov 1993). This is particularly valid for the region around the present town of Nova Zagora, where human occupation was relatively continuous until the late medieval period with some minor gaps (e.g. some periods are missing from some of the sites) and major interruptions (e.g. so far, there is no evidence for Middle Bronze Age occupation). A crucial factor for settlement choice is the subsistence potential of the study area, often confirmed by the length of the human occupation. Sustainable local resources and subsistence traditions would clearly have influenced and facilitated the long settlement record in the Nova Zagora micro-region. For the purposes of the current study, we shall focus only on the LBA and EIA evidence. However, it should be underlined that the human presence in the area was much more extensive than is partially demonstrated below (Fig. 7).

The LBA evidence derives from three tell-settlements (Ezero, Nova Zagora and Diadovo) (Kunchev 1984), three flat settlement sites (Nova Zagora, Assenovets and Tsenino) (Kuncheva-Russeva 1999) and one cemetery near Nova Zagora (Kunchev and Kuncheva 1990) (Fig. 7). During the EIA, most of the old settlements are resettled at some time in the period,[2] thus demonstrating a very strong pattern of dwelling repetition not found later on in the Late Iron Age. In addition, six new settlements (one with an adjacent cemetery) (Kuncheva-Russeva 1999) diversify the EIA settlement pattern and contribute to a local peak in human occupation of the area (Fig. 7). All but one of the sites (Assenovets) are believed to be short-lived settlements. Despite the scarce evidence, there is a clear pattern not of settlement continuity but of the reuse of previously occupied sites during the LBA, when three ancestral tells were resettled, one

2 There is some uncertainty about the exact location of one of the EIA sites in the town of Nova Zagora. This, however, does not diminish the importance of reoccupation, since the site is in the same general area.

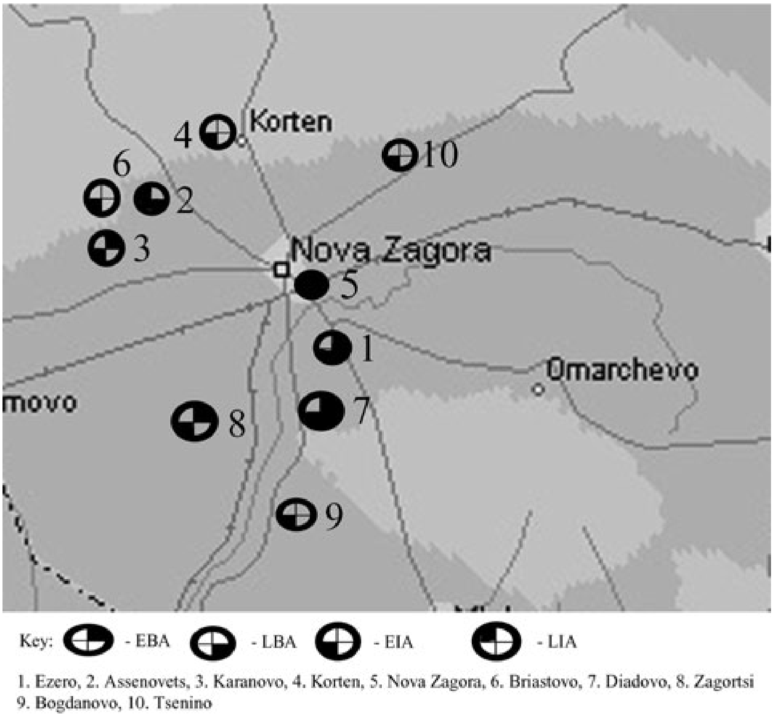

Figure 7
Distribution of archaeological sites in the Ezero micro-region.

settlement was located in the vicinity of an earlier tell and only two new sites emerged some distance from an existing site. The micro-regional approach to the data contradicts Lam Thi Mi Zung's (1989) conclusions that tell reoccupation is an exception for the LBA. It also raises the importance of the social choice of a settlement for which the ancestral place-value is a key factor (Chapman 1998). The same pattern of returning to previously occupied sites is valid for the EIA, when, again, most ancestral sites are resettled on a far smaller scale than in the Neo-Chalcolithic.

Thus, there is a disjunction between an area of high arable potential, the small size and short-lived nature of most LBA and EIA settlements and the strong human impact from the LBA and EIA periods in the Ezero diagram. Such a discrepancy may possibly be explained by site taphonomy and the scale of excavations, which have failed to provide sufficient evidence for the type of dwelling practices that took place in the study area. But the model of long-term settlement that, in the Neo-Chalcolithic periods, would be expected at times of high human impact on the environment is not found in these periods.

The Sarló-hát pollen record

In the northern part of the Great Hungarian Plain (Fig. 8), the meandering channel of the Tisza River was bordered by extensive floodplains until the mid-nineteenth century, when regulation of its water-courses wedged the floodplain into a narrow zone restricted by embankments. One of these extensive floodplains is the Upper Tisza Plain, the northern part of which preserves signs of human occupation since the early part of the Middle Neolithic (Chapman 1994). A sediment core taken from an infilled palaeo-channel of the floodplain gave us a complete record of Holocene vegetation changes (Magyari *et al.* in press). Attention is placed in this section on the LBA–EIA time section of this record that, on the Alföld, falls between 1450–300 BC.

Pollen spectra from the LBA (Fig. 6B) reveal a more forested landscape in the northern Alföld than in the Thracian Plain but still with a substantial share of steppe vegetation, as reflected by the pollen percentages of steppic forbs and graminoids (Fig. 6B). The pollen diagram records a series of related woodland compositional changes during the LBA (1500–850 BC): high pollen frequencies of Hornbeam (*Carpinus betulus*) until 1200 BC suggested the importance of this tree in the floodplain woodlands and also on those parts of the Pleistocene loess-covered lag surfaces (Sümegi *et al.* 2005) with sufficient ground water supply. The pollen spectra suggest that, during the early part of the LBA, the floodplain area was partially forested by mixed Oak–Hornbeam–Elm woodlands and Alder carrs, while Beech (*Fagus sylvatica*) was also present in these woodlands. The elevated lag surfaces were in all probability partially treeless, either used as arable fields or pastures. We assume that some of the Oak (*Quercus*), Elm (*Ulmus*) and Hornbeam (*Carpinus betulus*) pollen originated from this lag surface zone, and thereby indicates the presence of dry and mesic Oak-dominated woodland stands. By 1200 BC, Hornbeam has gradually been replaced by Beech (*Fagus sylvatica*), most probably in the floodplain zone. Together with this woodland compositional change, a massive decline in the total woodland cover was indicated by the decreasing AP (total arboreal pollen) curve. It is notable that the stepwise decrease in AP was accompanied by increasing charcoal accumulation rates (Impact 1 on Fig. 6B). Considering the poor flammability of the LBA woodland, in which the proportion of shade-tolerant, moist-requiring species such as Hornbeam (*Carpinus betulus*) and Beech (*Fagus sylvatica*) increased, it seems reasonable to assume that woodland stands were cleared by anthropogenic burning. There are two herbaceous taxa that show massive increases along with the arboreal pollen decline and inferred woodland burning: Sagebrush (*Artemisia*) and Umbelliferae. For the latter plant family, a summary curve is given that includes three pollen morphological groups: *Apium*-type, *Pastinaca*-type and *Peucedanum* (Fig. 6B). Several species belong to these groups that could equally originate from wet meadows, lakeshore tall herb communities and, to a lesser extent, from dry loess-steppes (Fekete *et al.* 1997; Simon 2000). Out of the eight native *Artemisia* species of Hungary, *A. vulgaris* and *A. absinthium* can appear in the floodplain zone; both are weeds today, common on forest clearances, fallows, pastures, along paths and disturbed wet meadow communities (Újvárosi 1957; Soó 1973). The remaining six species are all typical dry steppe elements (Simon 2000). Although identification of the *Artemisia* pollen to species-group level has not yet been attempted, the negative correlation of the *Artemisia* pollen frequency curve with mesic woodland arboreal taxa (*Carpinus betulus* at Impact 1 and *Fagus sylvatica* at Impact 2) suggests that the *Artemisia* pollen increase may be indicative of its spread in the cleared floodplain areas that were turned into floodplain pastures. However, we cannot exclude that some of the *Artemisia* pollen has originated from the dry loess-covered lag surfaces, and so indicates woodland clearance in this ecozone. This is especially possible as *Artemisia* is well known as a rich pollen producer, often over-represented in the regional pollen rain (Liu *et al.* 1999). Nonetheless, the joint pollen frequency increase of Umbelliferae and *Artemisia* supports clearance predominantly in the floodplain woodlands, and exploitation of the land for pastures.

These signs of increased anthropogenic disturbance are well matched by the increase in settlement numbers in the LBA, whether defined by discard of Gáva fine wares or other LBA ceramics. Towards the end of the LBA, a short-term expansion of the woodland was suggested by the arboreal pollen increase, between *c*.1000 and 850 cal BC (Fig. 6B, see the AP curve between Impact 1 and 2). The only arboreal taxa increasing in this short period was Beech (*Fagus sylvatica*), suggesting its spread in the alluvial plain, but probably also regionally. Anthropogenic indicator herbs remained present (e.g. *Triticum*-type, *Polygonum aviculare*, *Plantago lanceolata* and *Rumex acetosa/acetosella*), supporting the interpretation of sustained human activity in the floodplain zone and also on the loess-covered lag surfaces. Altogether, the short-term and small-scale spread of Beech suggests a temporarily less intensive exploitation of the land around Sarló-hát.

There is quite a different picture, however, for the subsequent EIA. At the transition from the LBA to the EIA (between *c*.850 and 600 cal BC – the Pre-Scythian period), increasing charcoal accumulation rates are again associated with decreasing AP frequencies, altogether pointing to woodland burning on an even larger scale than in the LBA. The associated changes in the herbaceous pollen flora are the same as in the case of the anthropogenic LBA impact (Impact 2 on Fig. 6B). However, the woodland clearance in the EIA affected a woodland with a different canopy composition than in the LBA. As indicated by the pollen spectra, the proportion of Beech (*Fagus sylvatica*) was much higher, while Hornbeam (*Carpinus betulus*) was subordinate, and the most radical decline took place in the Beech population as a result of the EIA woodland clearance (Impact 2). As Beech is a mesic tree species (Májer 1980), it is likely that the EIA people cleared the woodlands in the floodplain zone as well as the remaining woodland stands in the lag surface zone. The latter is indicated by the massive increase in Sagebrush (*Artemisia*). As we discussed above, the spread of this herb is likely to indicate human impact both in the floodplain and drier lag surface zones. A closer look at the herbaceous pollen flora suggests that arable fields were probably not placed in the vicinity of the oxbow lake in the LBA and EIA. Cereal pollen types are weakly represented in both periods, with scattered wheat (*Triticum*) pollen grains appearing in the LBA and becoming even less frequent in the EIA. Reliable arable field indicator pollen types, such as *Centaurea cyanus* and *Consolida regalis*, are also missing. On the other hand, increasing pollen frequencies of grazing and disturbance indicator herbs (e.g. *Artemisia*, Chenopodiaceae and *Polygonum aviculare*) suggest that the main land-use practice was probably grazing in both periods. In this respect, it is notable that a decline of grasses (Gramineae) in the pollen diagram (Fig. 6B) accompanies the first woodland clearance around 1100 BC. The low frequencies of grass (Gramineae) pollen during the entire LBA–EIA period can be interpreted in two different ways. First, we need to take into account that the grass (Gramineae) pollen curve includes many species living in different habitats. There is a great number of dry and wet meadow species (e.g. *Festuca rupicola*, *Calamagrostis epigeios*) and a few wetland species, most importantly the Common reed (*Phragmites australis*). Therefore, the decline in grass pollen can either reflect increased grazing pressure on the floodplain meadow that hindered the flowering of meadow grasses, or a considerable decline in the lakeshore reed-swamp. In the latter case, the pollen frequencies of other characteristic reed-swamp components would be expected to decline as well; however, the pattern in Figure 6B shows that this does not happen. Bulrush (*Typha angustifolia*) frequencies show little change apart from a small increase towards the end of the EIA, while Purple Loosestrife (*Lythrum salicaria*) and Willow herb (*Epilobium*) are present throughout (not shown on the diagram). It is therefore more likely that increasing grazing pressure accounted for the decreasing grass pollen frequencies.

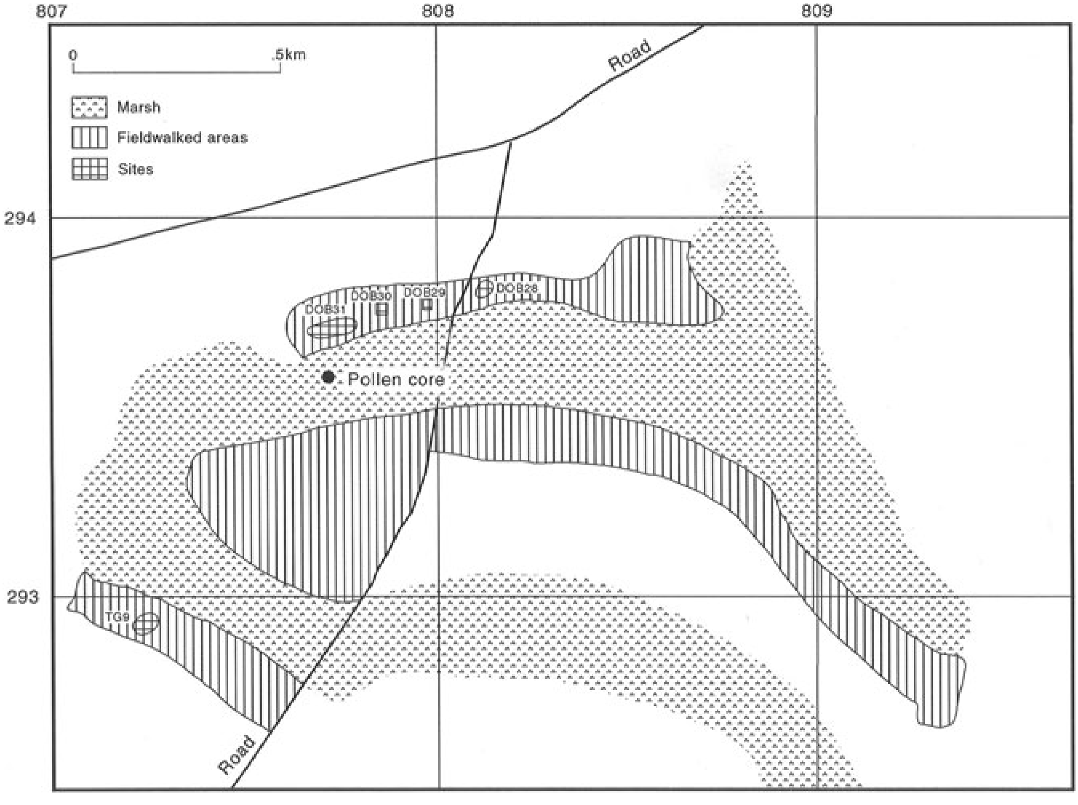

Figure 8
Distribution of surface artefact scatters, Sarló-hát area.

Overall, the pollen record suggests that, during the LBA–EIA, extensive grazing meadows were established in the alluvial plain around Sarló-hát. The woodland clearance on a massive scale that started from *c*.1200 BC and 850 BC is at strong variance with the apparent decline in human population in this area.

Settlement structure in the EIA in the Polgár area

We begin at the micro-level with a consideration of the seven sites around the Sarló-hát lake, where intensive, systematic fieldwalking was completed in 2002 (Fig. 8). The fieldwalking revealed the plentiful occurrence of pottery from the Middle Neolithic and Earlier Bronze Age and less common discard from the Earlier Copper Age, LBA and historic periods (Fig. 9). Despite the pollen evidence for strong human impact, the survey recovered not a single sherd from either Early or Late Iron Age discard and relatively few LBA sherds. It is evident that there is a major disjunction between this result and the pollen data, especially in the EIA.

In the wider context of the Polgár Block, there is a distinctly low ceramic discard rate in both the Early and the Late Iron Age (Fig. 10; Chapman *et al*. 2003, Part 2/I/5). There is a decline in raw site counts (viz., the number of pottery scatters for the entire period in question)

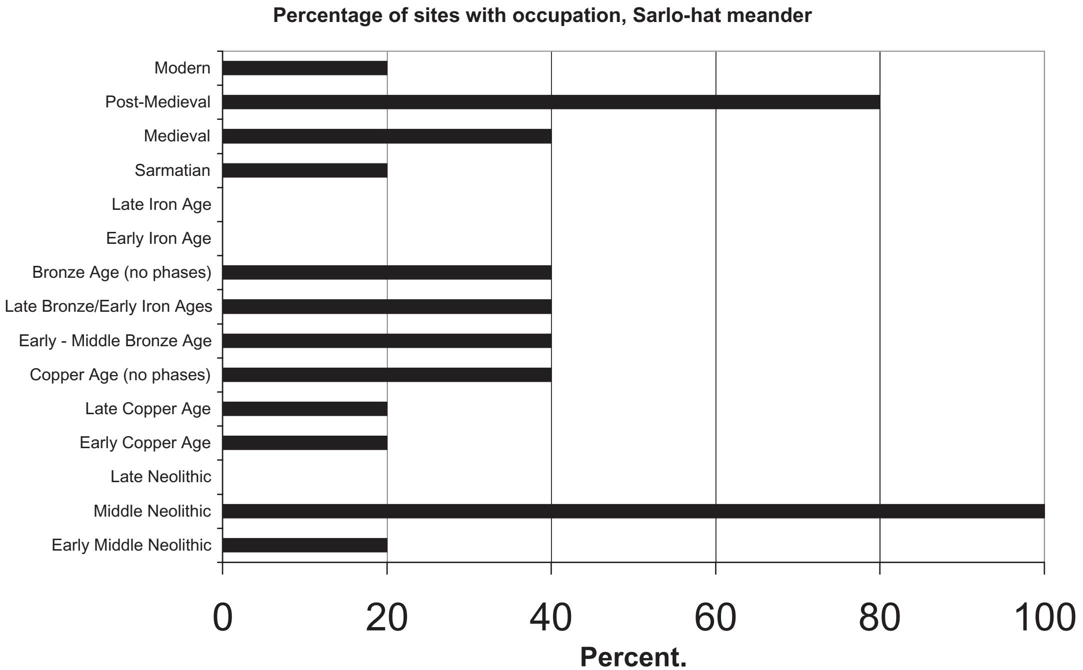

Figure 9
Surface pottery densities by period, Sarló-hát area.

TABLE 1
Site counts for selected Multi-Community Zones, Polgár Block, north-east Hungary

Multi-Community Zone	LBA	EIA	LIA
South Polgár Lowlands	3 (2)*	3 (1)*	1
Csőszhalom Terrace	4 (0)	1 (0)	–
Tiszagyulaháza Lowlands	4 (1)	1 (0)	1
Tiszadada Sandhills	1 (1)	1 (0)	–

* number in brackets = number of sites reoccupied in next phase.

from the LBA minor peak (Fig. 11a) – a result that is not changed by the site numbers corrected for the length of the phase in question (viz., site numbers divided by centuries per phase) (Fig. 11b). In each of the four Multi-Community Zones selected for detailed study (Table 1), there is lower-level discard of EIA pottery than of LBA ceramics, with only a few sherds at the Tiszagyulaháza site and only undifferentiated Iron Age sherds at the Tiszadada site. However, we should not ignore the evidence for local LBA metal production, in the form of moulds for swords and axes, found at the M3-site 1 near Polgár (Szabó, G. 2004).

There is thus reasonably strong fieldwalking evidence for moderate discard in the LBA, followed by a low level of discard, if not a complete absence of discard, for the EIA in one region

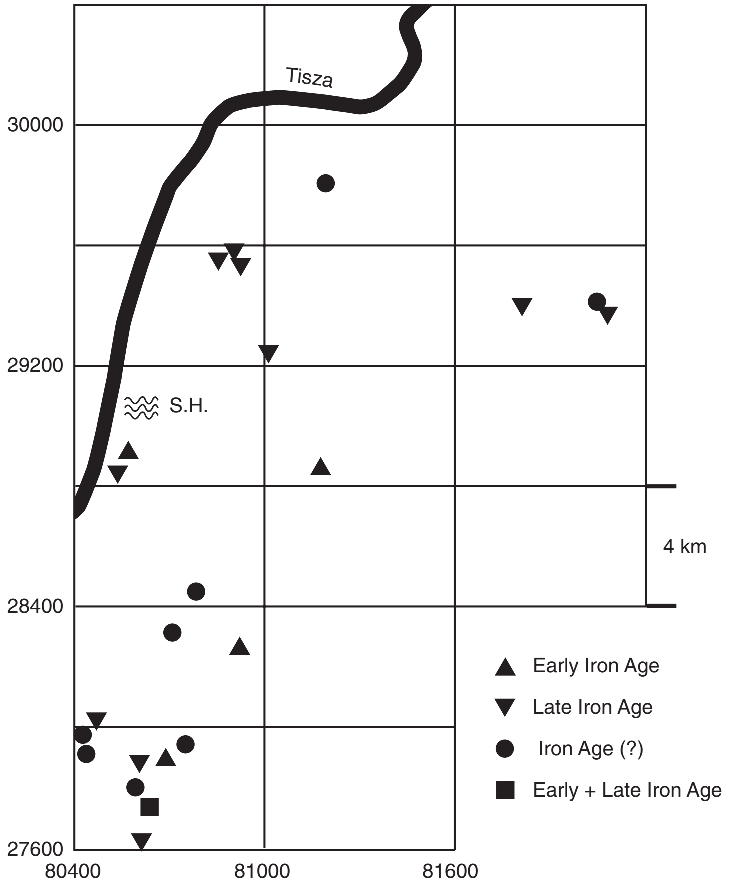

Figure 10
Settlement patterns in the Polgár Block.

of north-east Hungary. The conclusion is that LBA settlement comprised a network of widely dispersed farmsteads in the Polgár area, even if the discovery of large, nucleated LBA communities in other parts of Hungary (e.g. Poroszló-Aporhát, in the Middle Tisza valley (Kemenczei 1984); Baks-Temetőpart and the enclosed sites of Nagytatársánc and Pusztaföldvár, in the southern Alföld (Szabó, G. 1996)), means that we should not rule out the possibility of future discoveries of such sites in this area, especially given the importance of the LBA metal-working centres of north-east Hungary. This area was relatively empty in the period 900–300 BC, with a possible complete absence of settlement in the period 1000–850 BC. It is the only period of apparent settlement abandonment that shows up in the pollen record as a phase of renewed forest growth. However, the resumption of low-level settlement discard after 850 BC is accompanied by massive forest clearance (Impact 2) on the floodplain woods and the high loess-covered lag surfaces – a massive discrepancy between the pollen results and the archaeological settlement data not only for the Sarló-hát micro-zone but also at the regional level.

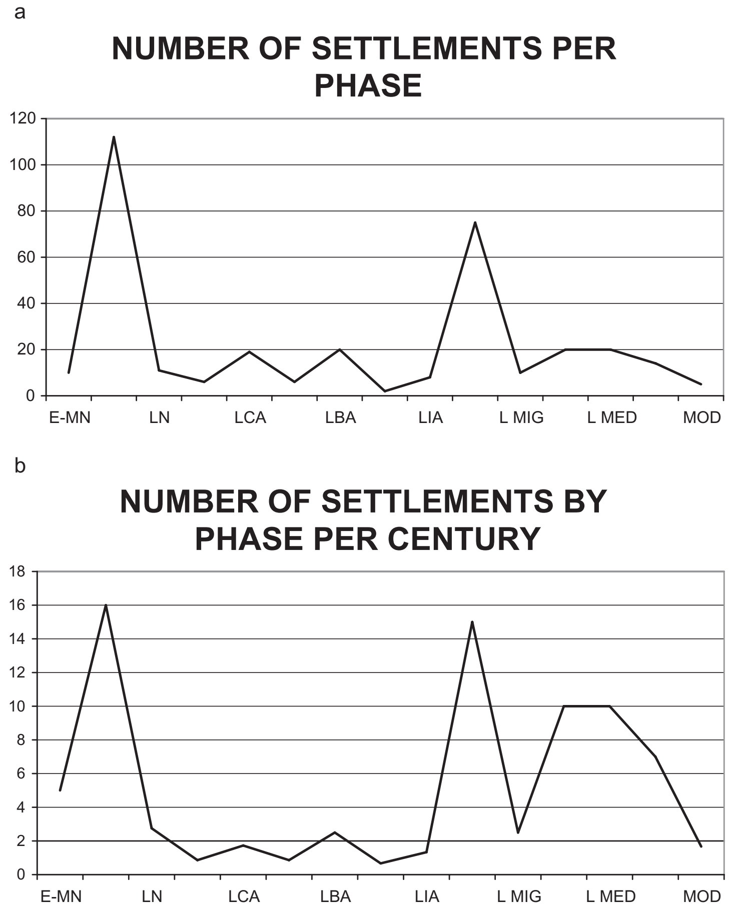

Figure 11
Site frequencies in the Polgár Block: (a) raw site counts; (b) counts corrected by length of phase (in centuries).

DISCUSSION

The results from the two pollen diagrams, from Ezero and Sarló-hát – WOOD (henceforth, SH-WOOD), indicate the probability of two contrasting types of subsistence strategy in the two different lowland valleys of the Maritsa and the Tisza. How do these results compare with what little is known of EIA lifeways in the two regions?

Before turning to a general review of the settlement data in EIA Bulgaria, two very important points should be made. First, the very few discussions of the EIA settlement pattern in Bulgaria are based on inconsistent field surveys, stray finds and relatively few excavations. Therefore, the proposed models, such as the 'mobile settlements' model for the first period of the EIA (coinciding with the 'dark ages': Sandars 1974: 1983), followed by settlements of hillfort type during the second period (Spiridonov 1979) should be read with caution (see critique by Popov 2005). The following summary of settlement patterns is based on very patchy and very often non-comparable data, consisting of site reports/publication, general overviews and summary articles. Secondly, the EIA chronology in Bulgaria is a relative chronology based on pottery (Toncheva 1980) or ornaments (Gergova-Domaradska 1977) – typologies that hinder the attempt to relate the available evidence to the more precise AMS dating of the Ezero pollen core.

Depending on the preferred model, those rare studies of the EIA settlement patterns recognize continuity with the LBA settlement system or claim shift in settlement organization in the EIA on the basis of limited topographical continuity and significant changes in settlement location. Furthermore there are differences in the EIA settlement density in different regions (e.g. there are an estimated 100 EIA settlements in south-east Bulgaria but only 40 in north-east Bulgaria: Gotsev 1992). There are also regional variations in comparison with the LBA settlement density: fewer EIA sites in south-west Bulgaria, more EIA settlements in north-east Bulgaria (Gotsev 1994). At present, it is difficult to say whether these settlement estimates correspond to the 'reality' of settlement densities during the EIA, or whether it is a function of the state of the research in the different areas. In addition, most of the excavated sites from that period suffer from poor preservation or severe destruction either by later occupation or by present cultivation. Thus, most of the known settlements are identified on the basis of pottery scatters or the presence of other datable material (e.g. fibulae). Site differentiation was never a strong point in Bulgarian archaeology (cf. Gaydarska 2007, 12–14) and EIA sites are no exception. What probably can be seen as an attempt to introduce some kind of site hierarchy is the identification of production centres that were surrounded by other less economically engaged settlements (Toncheva 1980, 71–3). Chronological differences in the type of occupation were suggested on the basis of the appearance of fortified settlements broadly dated to the seventh century BC (Dremsizova-Nelchinova 1984). In the last 15 years, a new type of site was recognized that has slowly become the dominant type of human occupation, at least in south-east Bulgaria. These are the so-called pit-sanctuaries, consisting of pits ranging in number from a few up to several hundred. It has been suggested that this new type of evidence should dramatically change the picture of EIA settlement system (Georgieva 2001) (e.g. some earlier 'settlements' may become pit-sites, while other pit-sites may present traces of settlement activities) but regrettably such a redrawing of the EIA settlement map has yet to be made. A scatter of excavations has produced an uneven pattern of EIA settlements, containing between six (Vishegrad) (Dremsizova-Nelchinova 1984) and 15 houses (Shumenska krepost) (Antonova and Popov 1984). Locations were often selected for their naturally defended positions near water sources. The houses were rectangular, wattle and daub constructions with very few examples of the use of stone. Subsistence strategies were claimed to be related to arable cultivation and stock-breeding with the prevalence of the latter practice in the upland areas, but no evidence was provided to support such a hypothesis.

The implications of the above overview are that we are faced with an interesting phenomenon hardly recognized in previous research. EIA communities were undoubtedly visible in the social landscape of the twelfth–sixth centuries BC in Thrace rather than the well-attested burials of the later period. They were related to other contemporary societies either through migrations or exchange networks, one prominent indication of which is the presence of the very characteristic Gáva pottery style, whose origins are to be found in north-east Hungary (Kemenczei 1984). But, at the same time, there are few signs of a permanently settled landscape. To be more precise, a comparison with the ancestral tell landscape and the succeeding Classical model of urban–rural landscape shows profound differences in dwelling processes in the EIA, with its more dispersed, less intensive remains of pottery scatters and pit fields. This must have important implications for both social organization and lifeways. While taphonomic processes, site preservation and research priorities can be put forward as reasons for the present picture, they do not explain the rarity of more permanent settlement structures. Such a landscape – if not devoid of people, then hardly densely peopled – looks even more problematic, given the widespread belief that these people had created antecedent social arenas for the emergence of stone tombs (e.g. Sveshtari) and Thracian cities (e.g. Sevtopolis). However, there may be some signs of groups ancestral to the communities forming Taylor's (1994, 390–1) 'Scythian–Thracian' model for the fifth century BC, based largely on the writings of Herodotus, in which exogenous mobile elites with laterally constituted ethnic groups were the dominant political formation over local kin-based and production-based subordinate ethnic groups. The question remains – what are the underlying social processes leading towards more differentiated and more complex societies? We can contribute to this question by a consideration of the implications of the results of the Ezero pollen and plant macrofossil records.

This record demonstrated that during the LBA–EIA transition, a major vegetation reorganization commenced in the hills north of the Thracian Plain; the spread of Beech (*Fagus sylvatica*), Hornbeam (*Carpinus betulus*) and Fir (*Abies* sp.) in these areas suggested a shift in climate towards increasing moisture availability, and coupled with it, probably towards decreasing temperatures during the summer months. Changes in the wetland vegetation and the inferred increase in water depth also supported a significant change in climate that must have affected local people in many ways, but most importantly their subsistence strategies. We pointed out that the wettest period started *c*.850 BC in the Ezero area, and many other proxy records support the regionality of the climate change in this time period. For example, the majority of *Sphagnum* peat bogs in the Central Rhodopes and Sredna Gora Mountains started to develop from around 1000–800 BC (Lazarova 2003; Filipovitch *et al*. 1998; Stancheva and Temniskova 2004) pointing to increasing moisture availability in the mountains. The formation of the famous riparian forest communities on the Bulgarian Black Sea coast (longoz forests) is also dated to around 1410–1000 BC and interpreted as a signal for a wetter climate in the coastal area (Bozilova and Beug 1994). In south-west Bulgaria, the advance of Silver fir (*Abies alba*) was dated to 1400–700 BC by Tonkov and Marinova (2005) and explained by increasing humidity and decreasing summer temperatures. These are only selected examples of the numerous signs of a LBA–EIA climate change, and similar studies from Romania and Hungary attest to the synchroneity of the climatic change in a wider region (Farcas *et al*. 1999; Tantau *et al*. 2003; Schnitchen *et al*. 2003; Feurdean 2005; Magyari *et al*. 2006).

Overall, the Ezero area must have been a landscape in flux during the EIA. The water-level of the spring-fed pools would have undergone a gradual increase, leading to the seasonal inundation of a considerable part of the Bronze Age arable fields (Dennell 1978). The change in trees and shrubs dominant in the woodland canopy would have led to changes in gathering practices, while, last but not least, the tell mound had probably become less attractive for permanent settlement due to the ongoing rise in the ground water table (Dennell 1978).

There are few other well-dated pollen sequences in lowland Bulgaria for comparison with the Ezero results. The EIA sequence in each of the four Durankulak diagrams is poorly dated but also attests to intensifying human impact in a changing environment. Arboreal pollen frequencies show an increase at the onset of the EIA accompanied by declining grass (Gramineae) and increasing Sagebrush (*Artemisia*) frequencies (Marinova 2003; Marinova and

Atanassova 2006). This compositional change in the pollen flora has been interpreted by Marinova (2003) as indicative of the expansion of the local woodland along the lakeshore and rivers. Marinova (2003) did not ascribe any importance to the increase in Sagebrush (*Artemisia*) pollen frequencies but, taking into account the synchronous decline in grass pollen, we can either infer increasing grazing pressure or a change in the composition of the steppe flora, as Sagebrush species are more frequent in cold continental steppes, while grasses dominate in warm continental steppes. It is notable that the EIA human impact is relatively weak in the Durankulak diagrams; only a small increase in secondary human indicator pollen types (*Plantago lanceolata*, *Polygonum aviculare* and *Rumex*) is signalled, although archaeologists found a Thracian settlement and sanctuary on the Big Island in Durankulak Lake (Todorova 1989)! Overall, comparison of the pollen diagrams suggests that, in the Ezero area, woodland cover was considerably lower than around Durankulak. The evidence for grazing and arable farming is much stronger at Ezero, suggesting intensive mixed farming of the lowlands just as in the LBA.

Another striking feature of the Ezero and Durankulak pollen diagrams is the low relative frequency of cereal pollen in the Bronze Age layers (*c*.1–1.5 per cent at Durankulak and 2–3 per cent at Ezero). For this period, both the Durankulak and Ezero archaeological excavations provided ample evidence for intensive cereal cultivation in the vicinity of the settlements (Dennell 1978; Todorova 1989). As the settlements were located on the shores of the wetlands examined, we can infer that cereal pollen is seriously under-represented in both pollen records and consequently the increasing cereal pollen frequencies at EIA Ezero (up to 6 per cent, see Fig. 6A) may be interpreted as evidence for arable farming of the same magnitude as during the LBA. One further implication is that the higher frequency of cereal pollen in the Ezero record probably indicates larger areas of arable fields in the environment of Ezero than at Durankulak or their location close to the wetland.

In eastern Hungary, the wider settlement context of the EIA is clarified by the examination of one of the Hungarian Archaeological Topography's study regions – the Szarvas district in Ko. Békés (Jankovitch *et al*. 1989). This survey is broadly comparable in methodology to that of the Upper Tisza Project, viz., intensive, systematic fieldwalking over several seasons. The simple site count for the three relevant settlement periods was calibrated by dividing the number of settlements by the centuries of occupation of each period. Settlements listed as 'settlements' counted as 1, while possible settlements were counted as 0.5; graves, cemeteries and stray finds were omitted from the statistics (Fig. 12).

The results show a settlement peak in the Scythian EIA, with large numbers of small artefact scatters, while the lowest settlement numbers occur in the Pre-Scythian EIA, representing a decline in site numbers from the LBA. There is held to be a degree of settlement nucleation in the Celtic Late Iron Age, which was aided by the widespread production of iron tools after 300 cal BC (Szabó, M. *et al*. 1997, 86). Nonetheless, Szabó admits that it is not until the first century BC that the agricultural system of the Celts in Hungary can be assessed (Szabó, M. 1971, 35). The close resemblance of this diachronic pattern to the results from the Upper Tisza Project suggests that these settlement trends are relatively robust.

In a reassessment of the archaeobotanical remains from the LBA, Gyulai (1993; 2001) bases his discussion of Gáva agriculture practices (1993, 30–3, 46) on one nucleated settlement in the Middle Tisza valley (Poroszló-Aporhát) and one nucleated site – Feudvár – in the north Vojvodina (Kroll 1990). He concludes that LBA communities practised large-scale and diversified land cultivation, as well as horticulture, with a greater emphasis on legumes than

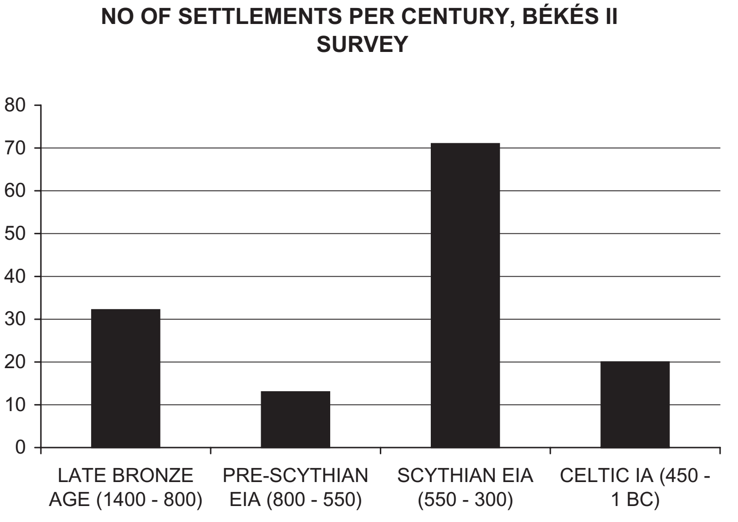

Figure 12
Settlements per century by period, Ko. Békés II survey (source: data in Jankovitch *et al*. 1989, 489–90 and map 3).

previously and probable hay production for fodder. He argues that similarly to the MBA, cereals (*Triticum dicoccum* and *T. monococcum*) were mainly sown in autumn together with legumes. In addition, the abundance of weed assemblages (Polygeno-Chenopodieta) suggesting spring sowing is indicative of the increasing importance of millet (*Panicum miliaceum*) and two-row barley (*Hordeum vulgare* ssp. *distichum*) cultivation. Gyulai's understanding is that cereals were cultivated on the nutrient-rich calcareous loess areas and to a lesser extent on sandy soils during the LBA. This would support the siting of arable fields in the flood-free loess-covered Pleistocene lag-surface zone (Sümegi *et al*. 2005; Sümegi 2005) in the Sarló-hát area as well. Our pollen record with evidence for arable farming in the region, but possibly not in the floodplain zone, concurs with Gyulai's views.

As mentioned before, EIA sites are exceptionally rare in the northern Alföld and consequently EIA archaeobotanical studies are scanty. The only available record slightly post-dates the earliest period of the EIA and comes from a Scythian site – Rákoskeresztúr-Újmajor (Gyulai 2001, 124). Here two cereals dominate the macrofossil assemblages collected from the house floor and hearths: six-row barley (*Hordeum vulgare* ssp. *hexastichum*) and millet (*Panicum miliaceum*). As both of them are fast-growing, spring-sown cereals typically cultivated by nomadic pastoral communities, Gyulai (2001) takes them as supporting evidence for a changing lifestyle (shifted emphasis on animal husbandry) and exogenous influence during the Scythian period. A contrasting view, relating the adaptiveness of these species to a cooler climate, is taken by Bottema and Ottoway (1982) (see below) *re* Gomolava.

If we look at the Vojvodina, then a slightly different picture emerges. As one of the few nucleated EIA settlements in the Middle Danube Basin that has undergone extensive excavation, the tell settlement of Gomolava attests to a different type of land use from that in the northern Alföld (van Zeist 1975; Bottema and Ottoway 1982). Although the same species are discussed in the two reports, van Zeist's (1975) preliminary report gave a qualitative comparison of the species cultivated in the EIA (800 – 400 BC) and the Late Iron Age (400–1

BC), while Bottema and Ottaway (1982) produced a more quantitative estimate of species' importance with data from a sieved 2×2 m sonda. In both periods, cultivation was dominated by high levels of millet (*Panicum miliaceum*), einkorn wheat (*Triticum monococcum*) and barley (*Hordeum vulgare*), with a diversification of arable practices into the Late Iron Age with the addition of emmer wheat (*Triticum dicoccum*), bread wheat (*Triticum aestivum*) and lentils (*Lens culinaris*) and the collection or cultivation of many fruit seeds. The two periods also show contrasting records of charcoal deposition. While the EIA was characterized by a rapid increase in the density of carbonized seeds, the weight of charcoal fell equally dramatically, whereas, in the Late Iron Age, both charcoal weights and the density of carbonized seeds increased in tandem. This would suggest increased anthropogenic burning in the Late Iron Age in comparison with the Early period. There is also a large faunal sample from the EIA, dominated by domestic mammals, in particular cattle and pigs but also with caprines, horses and dogs, and supplemented by the hunting of red deer and wild boar (Blažić 1988). Gomolava is therefore one site in the Middle Danube catchment with reliable evidence for mixed farming throughout the Iron Age. Furthermore, the dominant use of more resistant cereal types (millet, einkorn and barley) in the early part of the long-lived EIA tell occupation at Gomolava is in line with the inferences drawn from the Sarló-hát and Ezero pollen and macrofossil records, according to which EIA summers were in all probability cooler and more humid in this area.

Other pollen diagrams that are comparable to the SH-WOOD diagram derive from the north-eastern corner of the Hungarian Plain, from the Bereg Plain (Sümegi 1999; Magyari 2002). In line with the Sarló-hát pollen record, the pollen diagrams from this region (Báb-tava, Nyíres-tó) suggest intensifying human impact–woodland clearance for grazing at the onset of the EIA, *c.*850 BC. The weakness of archaeological evidence for settlement in the Bereg Plain is comparable to that of the Sarló-hát area (Fig. 8), indicating the same discrepancy between land use inferred from palynological evidence and archaeological discard. The terrestrial vegetation undergoes similar changes as recorded for the Ezero area (the spread of Beech matched by a decline in Hazel and Elm) but a considerable difference is the existence of large floodplain woodlands in the Hungarian sites, especially on the Bereg Plain. The sharply decreasing arboreal pollen frequencies (AP on Fig. 6B) indicate that EIA people started to clear these woodlands on a massive scale, while the increasing microcharcoal accumulation rates at Sarló-hát (Fig. 6B) show that the predominant method was burning.

These pollen records and several others from Transdanubia (Medzihradszky and Járai-Komlódi 1996; Juhász *et al*. 2001) all point to the increasing importance of grazing in the EIA. Cereal pollen types retain moderate values, pointing to the ongoing importance of arable farming but there are clear signs of an emphasis on pastoralism in the mixed farming regime, as shown by the increase in grazing indicators (e.g. Gramineae, *Artemisia*, *Cirsium*, *Ranunculus acris* type, *Plantago lanceolata*, Asteraceae, Cichorioideae and *Lotus* type). However, the population signalled by the pollen records is higher than in the LBA and the applied clearance technology is more developed.

Few authors besides Bökönyi (1974) have sought to quantify the Iron Age animal economy in this so-called nomadic pastoralist period. In her summary of archaeo-zoological assemblages from north-east Hungary, Gál (2005) mentions only one settlement not reported on in Bökönyi (1974) – the Scythian site of Salgótarján Industrial Park II (2005, 170). Here, a large assemblage of >4000 bones is dominated by domesticates, especially cattle, then caprines, then pigs and lastly horses. There are 13 wild species present, with more red deer than other wild species, as well as minimal birds and fish. This is the first large Scythian faunal assemblage excavated in Hungary and of great importance. It partially compensates for Bökönyi's (1974, 34) comment that 'unfortunately, we have but scanty settlement remains from this period'. He claims that there was a great change in animal keeping first with the Scythians and later with the Celts (1974, 34) – but the recent evidence suggests the opposite, with the Salgótarján stock-raising pattern comparable to that of the LBA (Gál 2005, 168–9). This would appear to be another example of looking down the telescope the wrong way, since, for Bökönyi, it was in these periods 'that the basis of present-day animal keeping came to be formed'. In his discussion of specific species, Bökönyi uses morphological data to link Thracian horses to the Scythian type from Eastern Europe (1974, 250–5: cf. 1993), while relating the two breeds of Iron Age cattle – the horned and the hornless – to well-known East European types (1974, 126). What he fails to do is to document or discuss the mechanisms whereby these breeds came to be found in Hungary and Thrace (Bökönyi 1993).

CLOSING DISCUSSION AND CONCLUSIONS

This survey of LBA and EIA subsistence practices in the Alföld and the Thracian valley indicates three principal results, each of which requires an explanation:

- A strong element of continuity in land use between the LBA settlers and the EIA communities, based upon both agricultural *and* pastoral practices.
- A greater intensity of human impacts in the EIA, implying a more effective forest clearance technology.
- The tension between pastoral strategies and agricultural strategies, swinging towards the pastoralist end of the spectrum in the EIA.

In this closing discussion, three general positions are explored – the *indigenist* thesis, the *exogenous* thesis and the *interactionist* thesis. The continuity in land use between these two periods is, in many ways, the simplest to explain, since there is a ready mechanism – namely, the *indigenist* model of continued settlement of both areas in the EIA by communities descended from those of the LBA. These descendants benefited from the knowledge of the environment and the farming strategies that would be most successful in those local environments, which was accumulated from generations of local farming stock. However, the indigenist model has one major challenge in the Alföld Plain of Hungary (less so in Thrace) – to explain the radical decrease in artefact production and discard in the EIA and the absence of 'clusters' denoting settlement locales.

What the land-use continuity thesis excludes is an *exogenous* model of wholesale population replacement by incoming steppe pastoralists: the palynological evidence simply does not support this possibility, even with the reafforestation phase attested between 1000 and 850 BC, because of the similarities in land use either side of this period of forest recovery. However, there is no barrier to the arrival of small numbers of non-locals whose expertise in pastoralist strategies and techniques was turned to good account by local communities – viz., a model based on *interactions* between locals and incomers. A point on which most scholars are agreed is the introduction of new elite objects, whether horse-trappings or weapons, to both regions in the EIA, although the mode of transmission is still hotly debated. If they became settlers, the additional labour of these incomers may well have been valuable at harvest time, while they may also have introduced new animal breeds, such as the small steppe horse. It is also possible that the incomers had a major impact on the lifeways of the local mixed farmers, prompting less settled lifeways and more reliance on metal prestige goods than fine wares. It should be emphasized that this is more of an issue in the Alföld Plain than in the Thracian Plain, with the latter's EIA 'settlement' discard of locally-produced ceramics as well as Gáva fine wares from Hungary. This possibility prompts a rephrasing of the major issue for the EIA in the Alföld: how is a mobile lifestyle leaving few settlement traces compatible with major agricultural intensification?

The motivations behind agricultural intensification should be considered against a backdrop of settlement dispersion with a small number of nucleated settlements in any one region and a predominance of individual farmsteads (Thrace) or yurt clusters (Alföld) linked in a breeding and exchange network for long-term survival. Moreover, the degree of dispersion probably increases in the EIA in Hungary, if farmers began to adapt the lifestyle of yurts, though possibly not in the Thracian valley, with its growing numbers of pit-sites with their impressive range of structured deposition. We understand the LBA and EIA social networks to consist of spatially nested, hetararchical levels of social relations, in which participation in the higher exchange levels, involving access to elite goods, depends upon the mobilization of surplus goods. There is no evidence in our two study areas for elite centres such as are known from the Hallstatt D phase in Western Hallstatt, with their exotic, Mediterranean prestige goods (Frankenstein and Rowlands 1978; Gosden 1985). Where there may be a parallel with Western Hallstatt developments was in the expansion of the scale of social networks, through changes in bronze-based exchange networks and linkages with new people with attractive and different material culture. But the question remains: how was it possible, in Thrace and the Alföld, for individual farmsteads to gain access to the desirable elite goods of the expanded exchange network?

One practice, well attested in the LBA of eastern Hungary, was the creation of local workshops producing bronze objects of extremely high quality and desirability. Thus, the bronzes typified by the Hajdúböszörmény-type sheet-metal cauldrons and body armour were so desirable that they made their way to Scandinavia, ending their lives in hoards or graves (Kristiansen 1998). Gáva fine wares were presumably produced in ceramic workshops but their locations have still not been identified (Kemenczei 1984). But there are no signs of the existence of such workshops in the EIA in either Thrace or the Alföld.

An alternative way to gain access to exchange networks was by agricultural intensification, in which local farms used burning to clear the forests for larger arable fields and broader pastures, exchanging the increased surplus products for prestige goods. The limiting factor on major arable expansion was probably labour, since all the cultivators in a local network of 10–20 farms would need labour for harvesting and grain production at a broadly similar time in the agricultural calendar – exactly the summer months when at least part of the farmstead group could well be absent in the Rhodopes or other parts of the Alföld with their flocks and herds. The labour force required for intensification of pastoralism would of necessity be more restrained, although the 'farmhouse' labour of both meat and dairy production should not be under-estimated. However, the high exchange requirements for areas without local salt resources to expand meat conservation and make tasty cheeses (Chapman and Gaydarska 2003) may well have introduced a feedback loop into pastoral expansion for exchange – salt for dairy products and meat.

There were thus costs attributable to agricultural intensification, whether arable or pastoral, which required co-ordination of local farmstead practices as well as widespread contacts enabling access to more inclusive exchange networks. Any differential rate of intensification among lowland dispersed farms could have led to productive specialization – some farms/yurt clusters with more arable than pastoral as well as the reverse. Pastoral expansion meant a spatial extensification as well as a productive intensification, probably leading to disputes over territories, or between farmers and herders. This scenario would have increased the status of mediators who could settle inter-farm disputes and larger-scale conflicts over animal movements. Thus, the main route for accessing the upper echelons of the prestige goods network led to the unintended consequence of the favouring of those well-integrated farm/yurt networks who managed to overcome the tensions between farmers and herders and develop inter-site production strategies which, for the most part, benefited these leaders. However, these strategies met with only limited success, judging by the overall paucity of exotic prestige goods deposited in mortuary contexts and the limited political group consolidation in either area until 500 BC (Thrace) or 300 BC (the Alföld).

The third conclusion from our studies concerns the preference for pastoral over arable intensification, partly discussed above in terms of labour requirements, exchange goals and inter-group negotiations. This preference is probably more strongly expressed in the Alföld than in south-east Bulgaria. There is, however, one additional factor to examine before we can account for this development – environmental fluctuations.

There is a widespread acceptance of environmental change in the first millennium BC, with claims for cooler, wetter climatic fluctuation and rising water-tables in both study areas (Lamb 1982). The environmentally determinist view suggests that the resulting abandonment of areas of flooded arable land created substantial advantages to an increased scale of animal-keeping (Bökönyi 1974). However, not only does this correlation fail to explain the ‘yurtification’ of the farmers and the minimal artefact discard but the ecological interactions between forest clearance and flooding are more complex. There are two characteristic results of large-scale deforestation (cf. the Ystad Project: Berglund 1991). The first is an increase in run-off, with resultant higher water-tables and greater risk of flooding. The second is increased soil erosion, with deposition in floodplains further increasing the risk of flooding. This means that the changes in plant associations found in both pollen diagrams may be as much related to unintended anthropogenic effects as to uncontrollable climatic fluctuations. As another feedback loop, the preference for pastoral over arable land use would have had a stabilizing effect on grass-covered pastures, reducing soil erosion and increasing that part of the floodplain available to productive human usage.

For the Alföld Plain, we propose a complex story of interactions between three potential causative factors – the relations between locals and incomers, climatic fluctuations and their local effects, and the results of massively increased human impact on local hydrology – to create a more likely scenario for the stronger preferences expressed for pastoralist lifeways. It is clear that neither climatic fluctuations nor increased human impact could explain the dramatic shift in discard strategies nor the paucity of structural remains. The embedded notion of the farmhouse as the centre of social life does not continue from the LBA on throughout the Iron Age in the Alföld, as is found, e.g., in the North European Plain in the form of monumental timber-framed long-houses (Harding 2000; Kristiansen 1998). These changes are primarily questions of materializations of ideology (DeMarrais *et al*. 2004). But a cooler and wetter climatic fluctuation would have acted in concert with an exogenous ideological shift towards the advantages of dwelling mobility, minimal material production and discard and a higher value on animal products to engender a shift towards pastoralist practices. The same process could have occurred with local, indigenist changes in material symbolism but the 'yurtification' of the local communities would seem a step too far without serious, medium- to long-term interactions between incoming pastoralists and local farmers. The motivation for dramatic reductions in forest cover may well have been surplus production in either the arable or the pastoralist sector but the unintended ecological side-effects of this forest clearance would have further favoured a preference for animal-keeping, with renewed validation of animal products as high-quality foodstuffs for preferential feasting consumption. The foregrounding of mobile lifeways was exaggerated still further by what could be read as a deliberate cultural rejection of fixed, permanent (farm)house and home in favour of the complex symbolism of the yurt.

What is similar in both study areas is the massive human impact on the first millennium BC forests, brought about by scattered farming communities who surely suffered from the unanticipated ecological effects brought in its train. But the story for the Thracian Plain is rather different, in at least three key respects. There is no need to invoke the 'yurtification' of the local populations, since 'settlements' have been identified from surface pottery scatters and confirmed by excavation. Secondly, the increasing scale of structured deposition at pit-sites indicates that a new arena of social power (Chapman 1994) has been developed, generally between individual farmsteads, as places where group political and exchange relations can be negotiated – a differentiation of place not yet found in the Alföld. Thirdly, the influence of Pontic steppe nomads hardly reaches further into Bulgaria than the Black Sea zone, in such elite burials as Belogradets (Toncheva 1980; Gergova 1986). A major issue in Thrace concerns the gap between the low-level differentiation of the EIA and the far greater social complexity and monumentality of the Thracian period in the fifth century BC and after.

We have alluded earlier (see above, p. 174) to Tim Taylor's (1994) 'Thracian–Scythian' model of fifth century society, in which exogenous mobile elites with laterally constituted ethnic groups were the dominant political formation over local kin-based and production-based subordinate ethnic groups. Three key material changes marked the social transformations of this century: the monumentalization of the mortuary domain, the emergence of coinage, and the deposition of gold and silver feasting hoards. There are two factors in the EIA that may be relevant to the potential emergence of such social complexity. First, agricultural intensification could have led to the differential development of some groups with better co-ordinated labour forces for both pastoralism and arable farming, as well as access to the higher levels of broad-ranging exchange networks and more subtle negotiating skills to defuse potential tensions and disputes. It is likely that some of the other groups with less organized internal integration and external relations would become subordinate to the better-led groups, with the possibility of patron–client relationships. Secondly, the emergence of the possibility of separate sectors for agriculture and pastoralism could lead to variations in the social values placed upon such products and varying status for the people associated with each of these products. The continued dominance of animal products over cereal- and pulse-based foodstuffs could lead, in time, to developments that would have contributed to the emergence of Thracian social differentiation on which Taylor's model is based. It could be argued that agricultural intensification was one of the necessary but insufficient causative factors contributing to the social changes of the fifth century BC in Thrace.

In summary, we set out with three aims in this paper: to challenge the existing consensus of views on EIA communities in the Thracian valley and the Alföld Plain; to develop a different approach to these issues; and, using this approach, to develop alternative views on the lifeways of these communities.

As far as the first aim is concerned, we have demonstrated that the pattern of changes at the LBA–EIA transition in Central and South-Eastern Europe is too complex to be encompassed by traditional modes of explanation. We have fulfilled the second aim by using a combination of archaeological science and social theory to shed new light on the traditional problem of cultural identities at the time of the coming of iron. We have created the alternative interpretation for EIA communities, as highlighted in the third aim, from an exploration of three models for their diachronic development. The pure *exogenous* model of population replacement from the Pontic steppe zone is contradicted by most of the palynological evidence and part of the settlement data in the two study areas of Thrace and the Alföld Plain. The pure *indigenist* model of continuity of dwelling practices by local communities from the LBA into the EIA also fails to address critical issues of changing discard practices and the paucity of house structures in eastern Hungary. Only a modified *interactionist* model, expanded to include the significance of palaeo-environmental changes and climatic fluctuations, is able to encapsulate the full complexity of the changes that we have identified in the early centuries of the first millennium BC.

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