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Project Gallery

A deep history within a small wetland: 13 000 years of human-environment relations on the East European Plain

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The transition to the Neolithic on the East European Plain was a very different process to the Western model, featuring a long-lasting hunter-gatherer economy and late introduction of agriculture. The authors present results from multiproxy research on a 13.5m-deep core of organic deposits from the Serteya mire as part of an international research project to understand human-environment relations in the Western Dvina Lakeland.

Keywords: Eastern Europe, Late Weichselian, Holocene, palaeoecology, palaeoeconomy, organic deposits

Introduction

Archaeological research in the Western Dvina Lakeland has recorded over 60 archaeological sites, including seasonal and permanent Stone Age settlements, Early Iron Age fortified sites, and more-or-less permanent occupation dating from the Middle Ages (Figure 1). The earliest sites are Mesolithic, although stray finds from the Late Palaeolithic Sviderian Culture found in later archaeological contexts indicate that small groups penetrated into this area as early as the Younger Dryas. Hunter-fisher-gatherer strategies persisted within the surveyed territory up until *c.* 4000 cal BP (Kittel *et al.* 2021; Wieckowska-Lüth *et al.* 2021).

The beginning of the Neolithic in Eastern Europe corresponds with the rapid spread of a single component of the Neolithic package—pottery—during the early Atlantic period, *c.* 6000–5600 BC (Mazurkevich & Dolbunova 2015). This period can be referred to as

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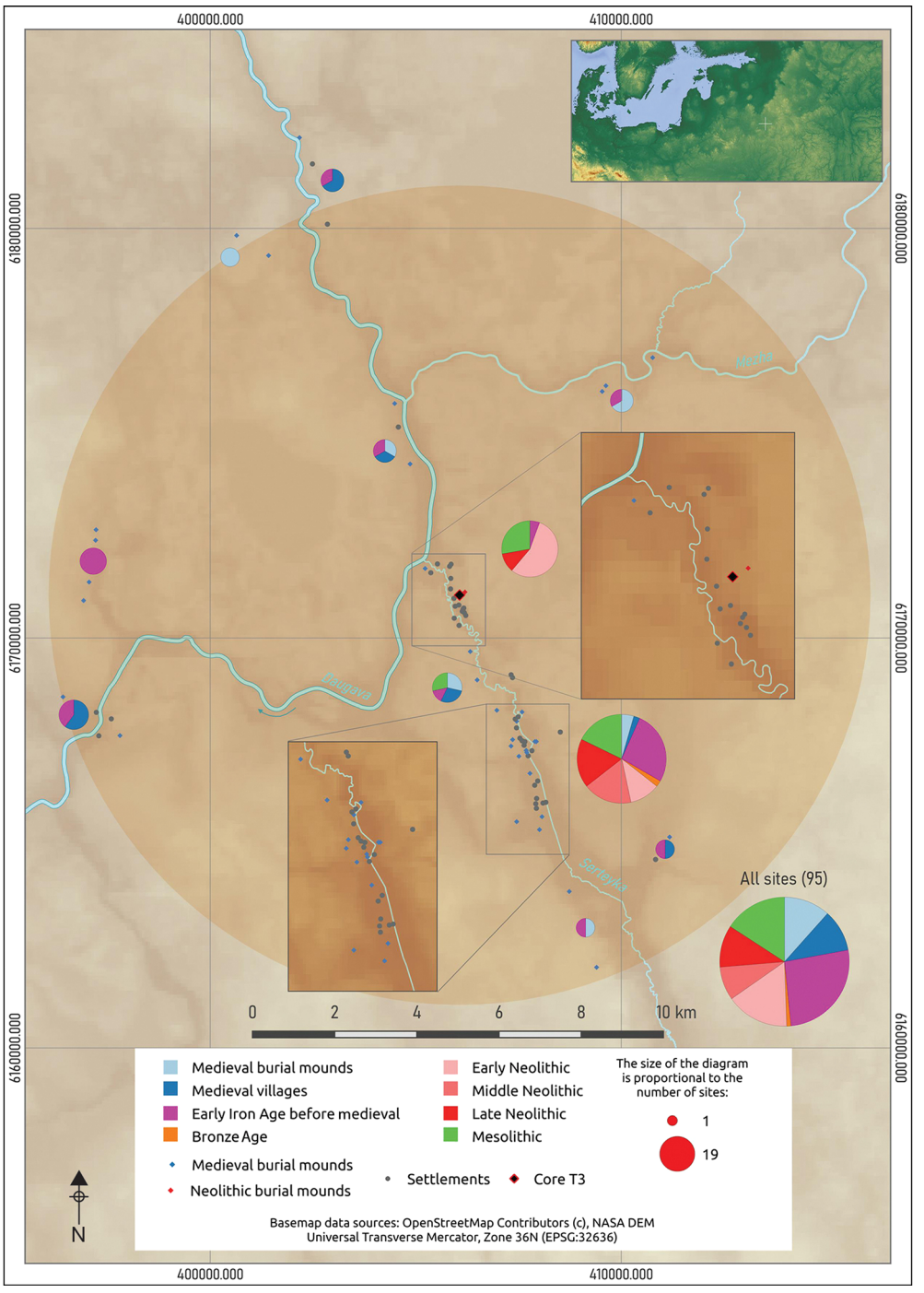

Figure 1. Map of the Serteya micro-region, including archaeological site distribution (drawn by V. Filippova and A. Mazurkevich).

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the Early Neolithic, Pottery Mesolithic, Sub-Neolithic or Forest Neolithic. Different regional hunter-gatherer traditions also emerged, with pottery serving as an important adaptive mechanism and innovation in some areas, and perhaps a non-utilitarian element in others (Courel *et al.* 2020). Indeed, one of the earliest ceramics in Eastern Europe, attributed to the Sub-Neolithic Serteya Culture (dated to the end of the seventh/early sixth millennia BC; Kittel *et al.* 2021), was found in the Western Dvina Lakeland. Early Neolithic immigration may relate to palaeoenvironmental changes resulting from the 8200 BP cooling event (Kul'kova *et al.* 2015), while southern Eneolithic steppe cultures are dated to the fifth to fourth millennia BC. The most prominent evidence for the Neolithic in the Serteya region, however, comes from well-preserved pile-dwelling settlements found within lacustrine deposits. These date to the third millennium BC (Mazurkevich *et al.* 2009) (Figure 2) and existed during (or until) the 4200 BP cooling event (Kittel *et al.* 2021).

The continuation of the hunter-gatherer settlement model *vs* the introduction of agriculture thus appears to have been strongly dependent on climatic fluctuations (Kul'kova *et al.* 2015), as well as hydrological changes and local landscape diversity (Kittel *et al.* 2021), and remains a much-discussed phenomena (e.g. Mazurkevich *et al.* 2009; Tarasov *et al.* 2019; Mazurkevich *et al.* 2020; Kittel *et al.* 2021; Wieckowska-Lüth *et al.* 2021). These detailed palaeo-reconstructions are primarily intended to demonstrate the ecological and economic potential of the forested areas of Eastern Europe, where immigration from the southern regions took place during the Neolithic Transition. It is important, therefore, to define local, regional and global drivers of palaeoenvironmental change, which forms the main aim of our current project, entitled *A Great History in a Small Wetland: Sophisticated*

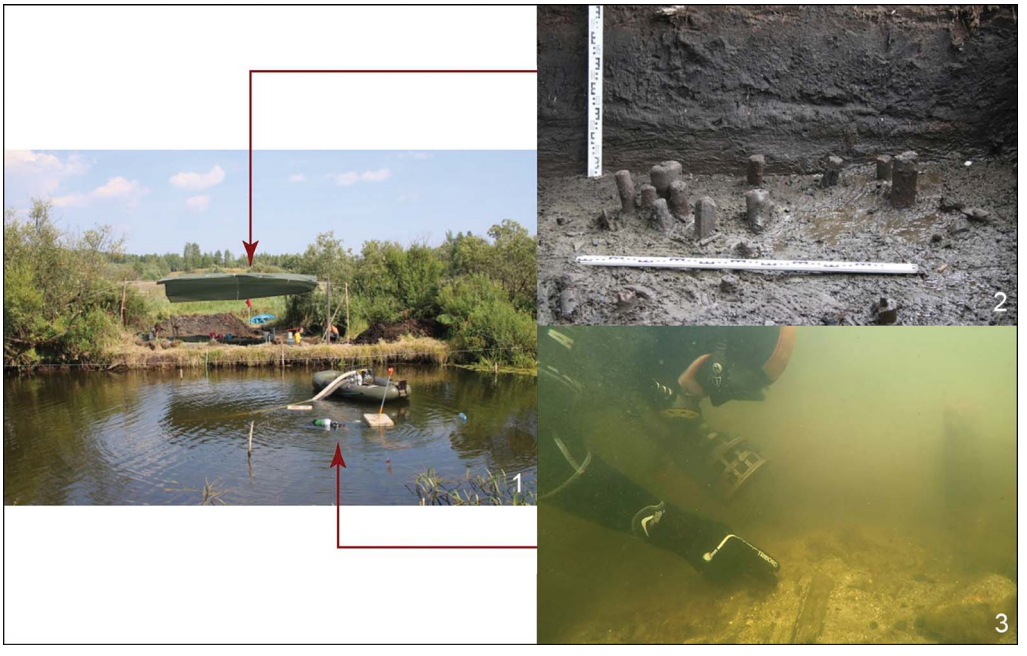

Figure 2. Pile-dwelling at Serteya II (photographs by A. Mazurkevich).

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Human-Environment Relationships on the East European Plain in the Last 13 000 Years. To date, however, few quantitative palaeoecological reconstructions have been produced based on modern summer temperature calibration sets for the Late Weichselian and Holocene of the East European Plain (cf. Nazarova *et al.* 2015; Nosova *et al.* 2019). Here, we present a detailed reconstruction of human-environment relations over the last 13 000 years, based on multi-proxy analyses of a 13.5m-deep core collected from the central part of the small (approximately 7ha) Serteya kettle hole mire (55°40′33.7″N, 31°30′32.1″E) (Figure 3).

Material

The core comprises the following organic deposits: sand and sand with organic mud (13.5–13.22m); basal peat (13.22–13.19m); clayey gyttja (13.10–11.89m); gyttja (11.89–4.20m); and *Sphagnum* peat (above 4.20m below ground level) (see Figure S1 in the online supplementary material (OSM)). As confirmed by the primary radiocarbon data set, these deposits present an uninterrupted record of palaeoenvironment changes and human-environment relations over the last 13 000 years, with the mean rate of accumulation being approximately 1m every 1000 years.

Methods

Detailed multi-proxy palaeoecological analyses of the organic deposits are supplemented with geochronometrical determinations, mainly comprising AMS radiocarbon dating of selected terrestrial plant macrofossils and tephrochronology. Pollen and non-pollen palynomorphs (NPP) allow for the study of regional and local plant communities, which mark climate fluctuations and anthropogenic impacts. Coprophilous fungal spores, derived from fungi that grow on animal dung, are used to identify the presence of wild and domesticated herbivores. Macro-charcoal analyses indicate local burning episodes and the use of wood as a raw material. Plant macrofossils and phytolith analyses also provide information concerning human impacts on the lake and the peat ecosystem. Palaeozoological examinations comprise an assessment of the thanatocoenoses of Chironomidae and Cladocera, which primarily contribute to a detailed understanding of palaeohydrological conditions, as well as palaeoclimate reconstructions. Water-level fluctuations during the mire phase are reconstructed based on diatom and testate amoebae assemblages. In concert with a detailed spatial analysis of archaeological and historical data within the study area (Figure 1), the development of human inhabitation of the lower Serteyka River Valley, the neighbouring Western Dvina River Valley and the surrounding area can be reconstructed.

Results and discussion

Preliminary pollen analysis indicates a clear Late Weichselian/Holocene transition in the palaeobotanical record. The surrounding tree stand during the Holocene included pine, spruce and birch, as well as other deciduous trees (see the OSM). NPPs highlight human activity and grazing pressures related to domestic or wild herbivores. *Characeae* oospores evidence the occurrence of algae meadows. The abundance of littoral and pelagic forms, along with the variable presence of subfossil Cladoceran (water flea) remains, suggests distinct water-level fluctuations

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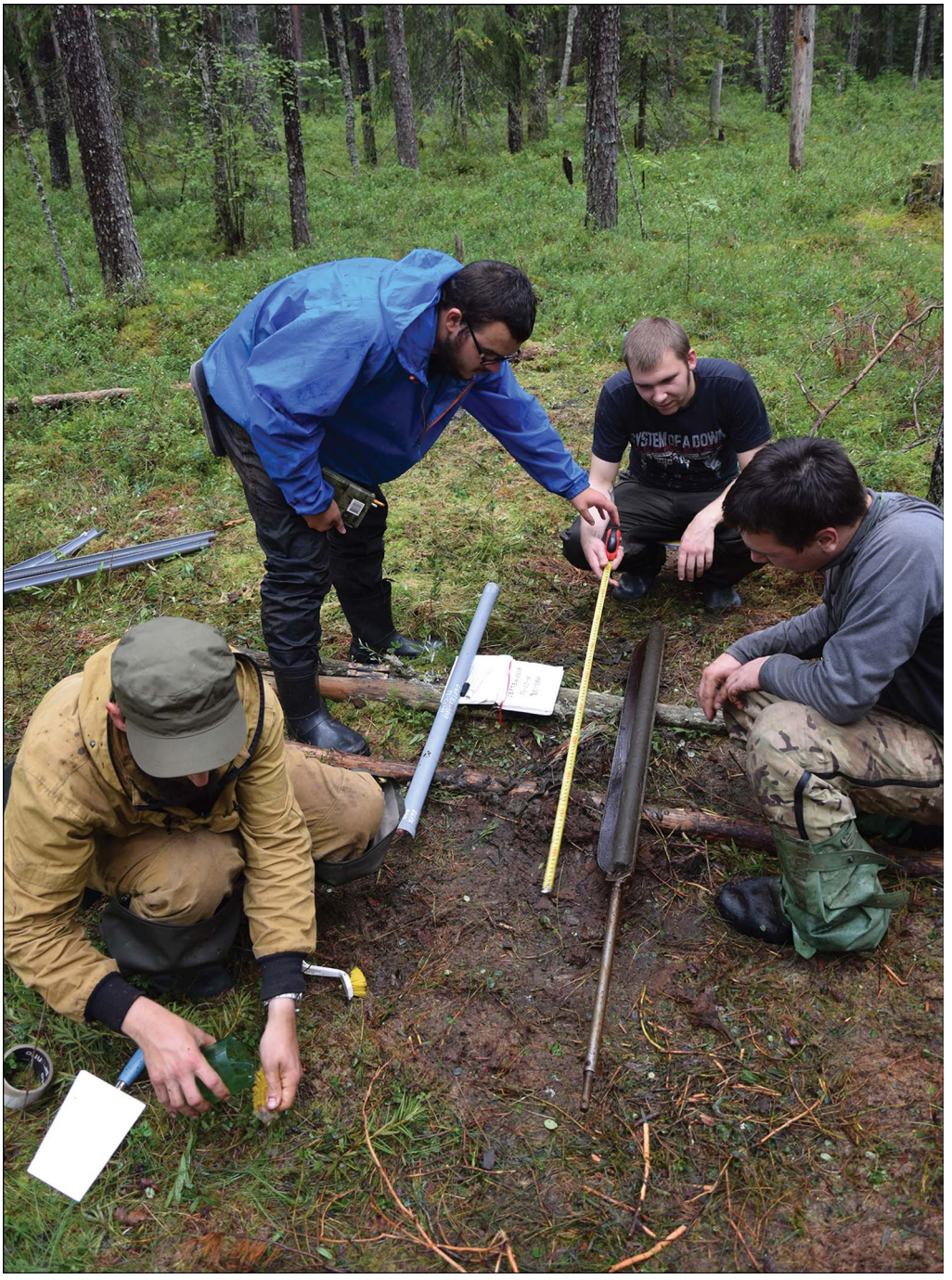

Figure 3. Extraction of the Serteya mire core (photograph by P. Kittel).

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Figure 4. Pottery from the Serteya II: 1, 4 & 7) Zhizhitsa Culture; 2 & 5–6) Eneolithic 'Serteya VIII' ceramics; 3) Usviaty Culture; scale in cm (prepared by E. Dolbunova).

Figure 5. Wooden artefacts from the Western Dvina Lakeland. Naumovo: 1) fragment of a wooden dish. Serteya II: 2) bottom of a small bast basket; 3) bast bow/float; 4) undiagnostic wooden object; 7–11) mallets; 12) spatula; 13) bow fragment; 14) float; 15) paddle. Usvyaty IV: 5–6) net sinkers; scales in cm (prepared by E. Dolbunova).

related to palaeoclimatic shifts, which may have involved the appearance of annual wetland herb communities—similar to that seen in the present-day *Rumicetum maritimi* association. These changes in water level and trophy, as well as in the pH of the palaeolake, are confirmed by

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preliminary results from the diatom analysis, which demonstrates that periphyton and benthic diatoms are the dominant species in the basin.

Detailed archaeological survey and excavation in the immediate vicinity of the Serteya mire has allowed various settlement types and their relative chronologies to be recognised (Figure 1). More than 20 Stone Age sites and eight from the Middle Ages have been identified within a 1km radius. These indicate occupation in the Early Neolithic (seventh to sixth millennia BC) and episodically throughout the Middle and Late Neolithic (Figures 4 & 5), as well as the Bronze Age, when a 'ritual' place was established nearby on a high shore of the kettle hole (Mazurkevich *et al.* 2018).

This combination of data suggests that global climatic conditions were the main factor in the development of Serteya mire over the last 13 000 years. In the Middle Holocene, the climate of the Western Dvina Lakeland appears more oceanic than in the Early and Late Holocene (see the OSM). Simultaneously, Holocene cooling events resulted in periodic increases of the water level of lakes and mires (cf. Płóciennik *et al.* 2022). This created successively favourable and less favourable conditions for human settlement (Kittel *et al.* 2021; Wieckowska-Lüth *et al.* 2021). Palaeoecological changes may therefore have influenced the development of varied economic strategies, with both long term and transitory visits recorded in the archaeological data (Mazurkevich *et al.* 2020). On the other hand, Neolithic hunter-gatherer-fisher strategies, which followed multiple economic pathways, may have influenced the ecosystems of small water bodies during phases of more stable settlement, as confirmed by Kittel *et al.* (2021) and Wieckowska-Lüth *et al.* (2021). At the same time, these strategies significantly limited the demographic growth of ancient populations. An increase of geo- and biodiversity of the natural landscape during the Late Holocene (Meghalayan) favoured the persistence of this subsistence economy until *c.* 3600 BP (Figure 3).

Conclusions

The Serteya mire core provides a reference point for both environmental history and human-environment relations over the last 13 000 years in North-east Europe. Its palaeoecological record presents a reliable, unobscured climatic and palaeohydrological reference that may be extended to the Western Dvina Lakeland. These data will provide a clearer picture of the natural mechanisms that shaped environmental changes in the Late Weichselian and Holocene, and will increase our understanding of human activity, land management conditions and anthropogenic impact on the environment within the poorly researched East European Plain.

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Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.15184/aqy.2022.156.

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