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The Quaternary of the Urals: Global trends and Pan-European Quaternary records

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The book presents the proceedings of the International Conference INQUA-SEQS 2014 held in Ekaterinburg, Russia. Reports concern a wide spectrum of issues connected to the study of the Quaternary Epoch (2.6 Ma) in Europe and Asia. Based on the results of local and regional Quaternary studies the authors focus on Quaternary stratigraphy and correlations across the Ural region and Europe and discuss the integration of pan-European and pan-Eurasian stratigraphical frameworks. The special attention is given to palaeontological, palaeoclimatological and palaeoenvironmental issues from the Quaternary of Europe and Asia.

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with small mammal materials can help with the distinguishing of the age of the localities. The morphological diversity of *Allophaiomys* teeth which widely used by Western and Eastern European palaeontologists is very important. However sometimes the localities with very few remains of this species compared against each others what could be resulted in wrong conclusions.

Analysis of Early — Middle Pleistocene small mammal remains, particularly Arvicolinae, gives the unique material, which helps to elucidate the evolution in different phylogenetic lineages, to date the deposits which includes the bone localities (what is very important to this interval for which practically unknown absolute dates), to compare the faunas from the different region of Europe and also to help to reconstruct the paleoenvironments.

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SMALL MAMMALS AS INDIRECT BIOTIC MARKERS FOR CLIMATE DYNAMICS ASSESSMENT IN THE CENTRAL PART OF NORTHERN EURASIA

Key words: Micromammals, palaeoecology, Late Pleistocene, Holocene

We summarize the clues which the micromammal fossil record offers to climate-driven biotic shifts in the central part of northern Eurasia during the Late Pleistocene — Holocene and give some results of neontological studies aimed to increase the quality of palaeoecological reconstructions based on small mammals. Spatial and temporal dynamics of environmental conditions in the central part of northern Eurasia from the Late Pleistocene to the present day is considered on the basis of the analysis of micromammal assemblages from about 60 cave sites in the Polar, Northern, Middle and Southern Urals (see Borodin et al., 2013 for the list of localities). Comparisons to the present-day fauna are made using the zoological specimen database (museum of the Institute of Plant and Animal Ecology UrB RAS). In this study we primarily focus on arvicoline rodents because of their wide distribution, high abundance and the most complete fossil record in the study area (as compared to other micromammal groups).

During the time span chosen for analysis the arvicoline fauna of the study area has been represented by living species. To establish ecological groups of arvicolines (17 species known in the study area from the Late Pleistocene to the present day) we undertake an analysis of ecological requirements across the species' ranges (thermoneutral temperature intervals, dietary adaptations, and habitat requirements for nesting, breeding, survival and dispersal — based on published data) and compare the results to the existing classifications of arvicolines used for palaeoecological purposes. Physiological data suggest that intraspecific variability of thermoneutral zones, effectiveness of thermoregulatory mechanisms and similarity of critical temperatures among the arvicoline species make it not possible to use temperature features for palaeoecological inferences. Ecological data suggest that across the modern ranges the most stable (conservative) requirements of arvicolines are the characteristics of nesting and breeding microhabitats, which could be described in terms of humidity and vegetative cover. For some species, dietary adaptations might be used to specify the vegetative cover (when a particular plant group is known to limit the distribution or seasonal survival of a species). The 17 arvicoline species might be considered as indicators of 10 types of microhabitat, which differ by humidity, openness and vegetative cover (Fig. A8, Appendix 7).

To reveal the spatio-temporal variability of the microhabitat conditions in the Southerm, Middle, Northern and Polar Urals we calculate the occurrence of the microhabitat groups of arvicolines in the fossil datasets (divided into the Early, Middle and Late Holocene subsets) and in the modern dataset represented by the live trapping data for the last 50 years (about 350 capture locations). Only presence-absence data are used for analysis; relative frequencies and repeated sampling data are excluded from consideration to avoid biases related to sampling effort.

The figure shows that in the Urals from the Early Holocene to the present the proportion of mesophyte habitats (the species of both open (groups 4–5) and closed habitats with arboreal vegetation (groups 6–7)) has significantly increased. The proportion of species related to open wet habitats (group 1) shows a slight increase towards the present day, whereas the proportion of the inhabitants of open xeric habitats (groups 8–10) has drastically decreased. The figure also illustrates a steep decline in the abundance of the species related to moss-cover (group 3).

The results presented here confirm that arvicoline rodents may serve as indirect markers of climate-driven biotic shifts in time and space and clarify the biotic parameters, which might be reconstructed based on the ecological requirements of the modern species. Novelty of the approach is determined by setting the classification criteria narrower than usual. Biome affinities (e.g. 'tundra species', 'steppe species') and direct interpretations of the preferred climatic variables (e.g. 'cold-loving species') are excluded from the classification in favor of the direct microhabitat characteristics related to a combination of

humidity and vegetative land cover, which limits the present-day distribution or survival of a particular species.

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REFERENCES

Borodin A., Markova E., Zinovyev E., Strukova T., Fominykh M., Zykov S.V., 2013. Quaternary rodent and insect faunas of the Urals and Western Siberia: connection between Europe and Asia. Quaternary International. Vol. 284. P. 132–150.

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STRATIGRAPHY OF THE LAST PLEISTOCENE GLACIAL PERIOD IN POLAND

Key words: Weichselian, climate, ice wedges, Glacial episodes, loess, Poland

Interpretation of climate change during the last glacial stage of Late Pleistocene in Poland has been mostly focused on glacial/periglacial phases and intervening warmer episodes (interstadials) indicated mostly by fluvial deposits or rarely, by biogenic sediments. Much less climatic information has been known for the most severe episodes of Early and Middle Vistulian (Weichselian) in a non-glacial area. It has not been until recently when this information gap started to be partly filled up with substantial data. In general, the last glacial stage in Poland has been traditionally subdivided into two cold intervals (Lower and Upper Plenivistulian, roughly corresponding to MIS 4 and 2), preceded by Early Vistulian (MIS 5d-a) and separated by Interplenivistulian (MIS 3), the last one characteristic for its milder but instable climatic conditions.

The most complete sequence of deposits of the last glacial stage is best known from the Lower Vistula valley region that is a type area of the Weichselian in Europe. In this region the Eemian marine deposits (MIS 5e) are overlain by 4–5 tills that have been ascribed to different glacial phases within the last cold period. Based on recent investigations most widespread of these glacial episodes were correlated with Late Weichselian Glaciation, comprising Leszno (Brandenburg), Poznań (Frankfurt) and Pomeranian ice sheet advances and dated at 24, 20 and 16 ka BP respectively (Marks, 2012). They were preceded by

Appendix 7

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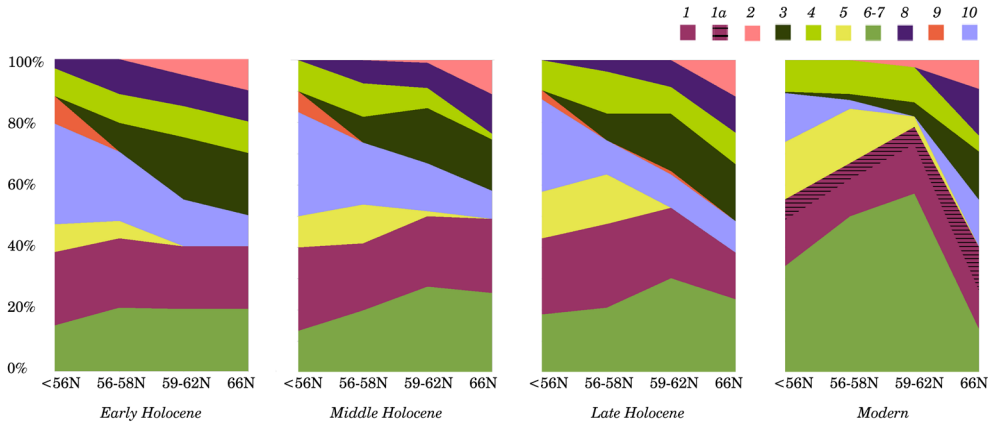

Fig. A8. Latitudinal and temporal occurrence (in percentage) of the microhabitat groups of arvicoline rodents in the Ural Mountains based on the analysis of the databank of fossil assemblages from the cave sites (see Borodin et al., 2013 for the list of localities) and the database of modern arvicolines captured during the last 50 years (zoological museum of IPAE UrB RAS). Latitudes: 51–56° N — Southern Urals, 56–59° N — Middle Urals, 59–62° N — Northern Urals, 66–68° N— Polar Urals. Radiocarbon dates: Early Holocene — 8100–10600 years BP, Middle Holocene — 7380–3060 years BP, Late Holocene —1470–612 years BP). 1–10 — microhabitat groups according to humidity/openness/vegetative cover: 1. Wet to wet-mesic (intrazonal)/open to semi-open/ herbaceous cover (1 — native species *Arvicola terrestris* and *Microtus oeconomus*, 1a — *Ondatra zibethicus* introduced in 20th century); 2. Wet-mesic to mesic/open to semi-open/herbaceous cover (*M. middendorffi*); 3. Wet to mesic/open to closed/moss cover (*Lemmus sibiricus, Myopus schisticolor*); 4. Mesic to wet-mesic/open to semi-open/swardy or tussocky herbaceous cover (*M. agrestis*); 5. Mesic/open to semi-open/ herbaceous cover (*M. arvalis obscurus, M. rossiaemeridionalis*); 6. Mesic/closed or semi-closed/woody cover (*Clethrionomys rutilus, C. glareolus*); 7. Mesic to dry-mesic/closed or semi-closed/woody cover (*C. rufocanus*); 8. Xeric to mesic/open to semi-open/ grass-and- shrub cover (*Dicrostonyx torquatus*); 9. Xeric to mesic/ open to semi-open/ sagebrush cover (*Eolagurus luteus*); 10. Xeric/open/herbaceous cover (*Ellobius talpinus, M. gregalis, Lagurus lagurus*)