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OSTRIV CEMETERY HIGH PRECISION RADIOCARBON DATING (AMS 14C) AND STABLE ISOTOPES ANALYSIS PRELIMINARY RESULTS

1. AMS radiocarbon dating

AMS 14C dating of Ostriv skeletal samples was used in order to establish the absolute chronology of the studied region and to synchronize Viking Age archaeological sites in countries of the "Baltic migrants in Kyiv Rus'. Comparative study of the 11th century Ostriv cemetery in Ukraine" pilot-study: Ukraine, Lithuania, Latvia, Poland and Kaliningrad region of Russia). The Ostriv data allows: a. to compare 14C and typological dates of the same sealed deposits (in sufficient statistical sequence); b. to synchronize 14C dates of graves with similar/identical artefacts in a vast geographical area, with a distance of more than 1000 km. between sites. To identify the most probable cultural and geographical origin of Ostriv paleo-population and to synchronize it with the Viking Age Baltic region

chronological data AMS radiocarbon dating of Ostriv human remains, sampled in 2018 and 2019, was used with several aims:

– to obtain a precise absolute chronology for the site and other connected sites in the region and East Baltic area,

– to identify compatibility of Ostriv radiocarbon samples dates to the historical periods they could represent,

– to estimate the possibility of "reservoir effect" in human bones samples, which, according to the stable isotope data would allow 14C dates on human remains to be corrected,

– to compare Ostriv wood, charcoal and other organic samples 14c dates with human bones 14C dates.

– to select in advance datable and not datable samples (lack of collagen).

AMS14C dating of Ostriv 8 skeletal remains samples and 1 wood sample gives a systematic sequence of calibrated dates, obtained in Leibniz Laboratory for Radiometric Dating and Stable Isotope Research of CAU (KIA) by Dr. Christian Hamann and Dr. John Meadows. All 8 dated individuals bone samples datesbased on simple calibration can be attributed to the 10th-12th centuries, representing wide period, starting around 900 AD and ending about 1160 AD, A date given by a fragment of wooden coffin (Gr.46) – 893–991 AD (95,4%), can offer potentially a significant wood-age offset to the tree-fall date, causing the "old wood effect" (Fig. 1). As the pine plank of the coffin (visually) belonged to a rather old tree.

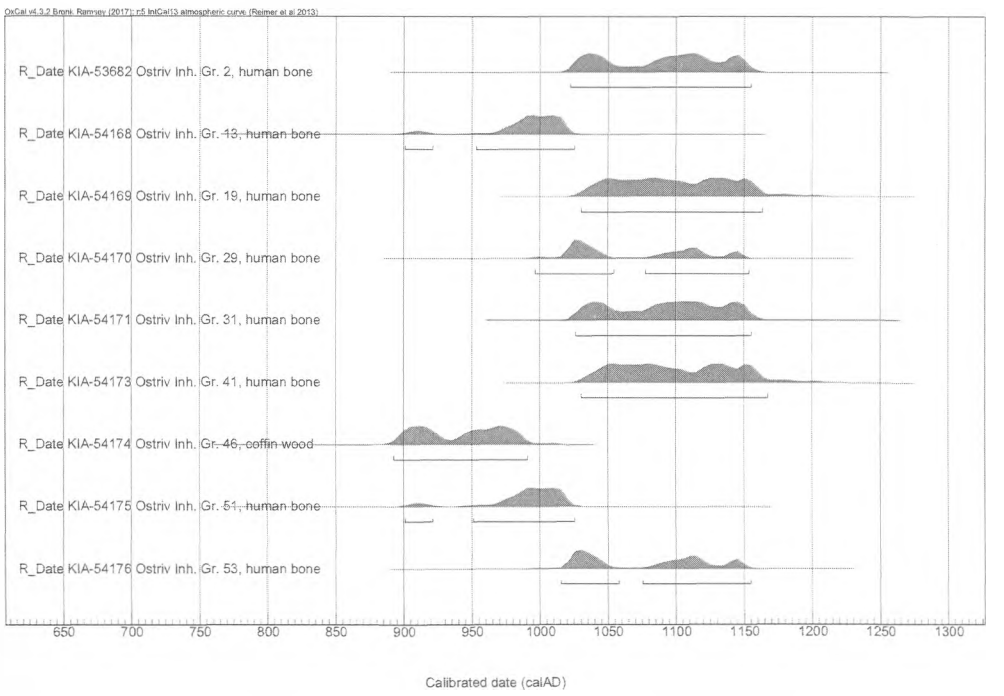

Fig. 1. Calibrated AMS radiocarbon dates of Ostriv cemetery

Theoretically it is possible highlight two visible chronological groups within a sequence: Graves 13 and 51, dated by the 901-1025 AD (95,4%) or 982/983-1018 AD (68,2%); and other 6 graves dated mainly from the 1015/1020-1030 AD to the around 1155/1165 AD (95,4%). Despite theoretical possibility of the appearance of the 12th century graves at the cemetery, the finds specific to this period are absent in Ostriv. So, the preference is still given to the end of the 10th – first half of the 11th centuries. If to decide that all 14C dates of Ostriv belong to the one period, using the R_Combine function, the curve peaks on 1020-1045 AD (62-73% probability) (Fig. 2).

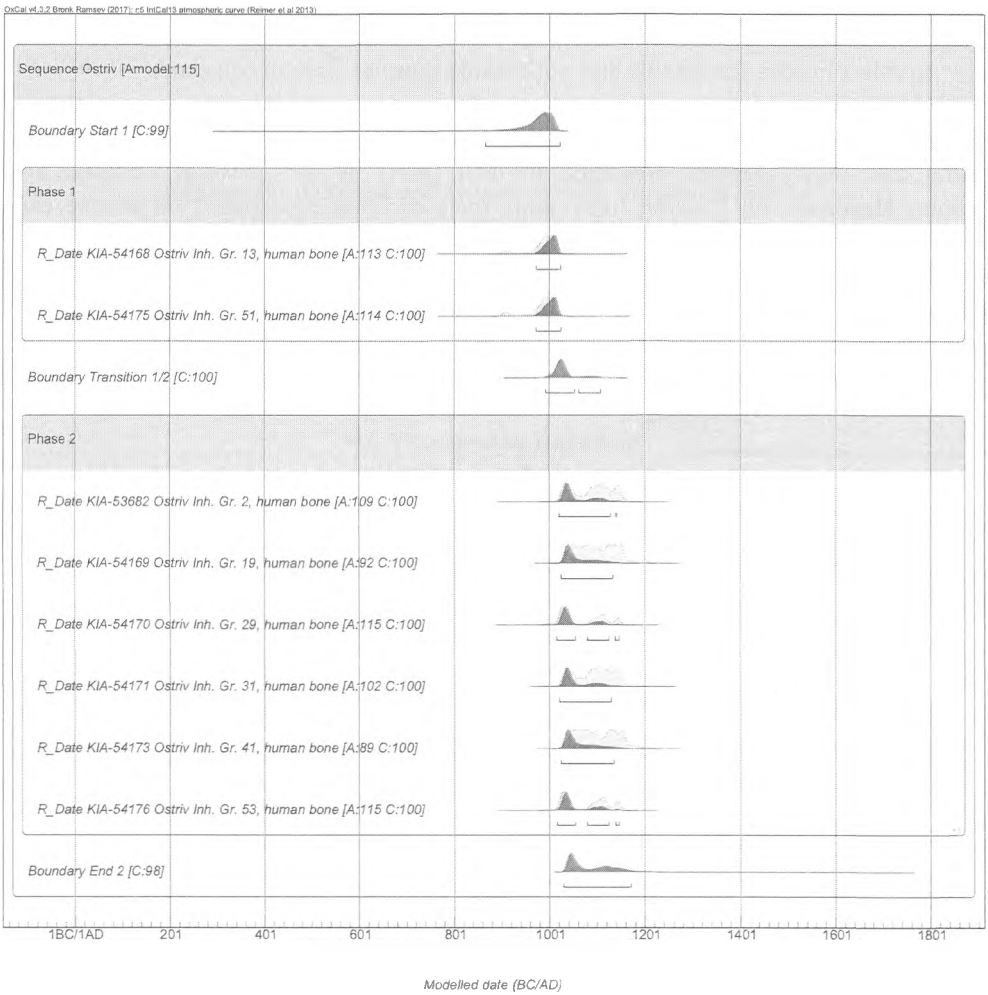

Fig.2. Two phases Ostriv AMS 14C dates distribution model

Similar results are obtained with OxCal Phasing Function. Because of the visible difference of the graves 13 and 51 radiocarbon curves to other 6 graves, we consider to use OxCal 2-phases model. Thus the 1st phase with graves 13 and 51 is dated about 980-1020 AD, and the phase 2 with graves 2, 19, 29, 31, 41 and 53 around

1010–1040 AD. This model works if we consider that two phases of the cemetery are strictly connected. In case of acceptability of 2 phases OxCal Ostriv model, the phase 1 correspond to the typo-chronology and absolute chronology of such Western Balts cemeteries as Viešvilė and Linkuhnen of Scalvians (Lithuania and Kaliningrad region of Russia), and the phase 2 to the "classical" Curonian cremation cemeteries as Palanga and Ranku Kapenieki, as well as to the curonized Semigallians cemetery Pavirvytes Gudai, Livs cemetery Laukskola and Selonian cemetery Lejasdopeles (all Lithuania and Latvia).

The simulated Phase 1 could correspond to the first wave of migrants and associated with time of reign of Vladimir the Great (980 to 1015 AD). Phase 2 correspond in this case to the short time of Svyatopolk I of Kyiv and Yaroslav the Wise rivalry (1015–1019 AD) and the long reign of Yaroslav (1019-1054 AD), associated with several historical events which could be connected to the Ostriv cemetery: war with Poland (1031) and several military campaigns on the Western Balts tribe of Jatvingians (1038), Lithuanians (1040) and Masovians (1041). This connects such East Baltic artefacts as penannular and flat ladder brooches to Kyiv Rus' written sources for the first time, and widens the geographical perspective of all interpretations.

All these issues were stated using only 8 14C samples from Ostriv. To build a convincing radiocarbon absolute chronological scale juxtaposed to the historical sources dates pattern, it'splanned to make the dating of at least 150 14C samples (75 from Ostriv and 75 from the Baltic region) during the upcoming project implementation.

2. Stable Isotopes analysis

During the AMS 14C dating of 8 Ostriv human bone samples, the three stable dietary isotopes: δ15N, δ13C and δ34S values were measured. The study of stable isotopes is necessary in order to compare East Baltic and Ostriv diets and to establish the possible freshwater-and/or marine reservoir effects, which can influence the 14C dates.

The stable isotopes research demonstrated the similarity of Ostriv and selected Baltic population values, to some extent. Nitrogen δ15N (15N/14N) values of Ostriv are between 7,28-9,31 and of the 4 selected East Baltic samples between 8-12, being slightly different in a case of each culture: 7,82–7,96 (Samogitians), 8,39–9, 19 (Semigallians), 10,53-11,85 (Curonians) and 12,85 (Livs, 1 sample). Higher d15Ns (above 9-10) can reflect fish consumption, but also manuring of crops and (for young children) consumption of breast milk. Livs sample from Doles Vampinieši is just represented by the tooth of a young child/baby. The samples of Curonian Palanga (a seaside cemetery) are a bit higher than 10, which is logical. Ostriv individuals δ15N is below «marine» level. The carbon δ13C (d13C/12C) values of Ostriv population are between -21,18 and -16,63, and of East Baltic population between -21,37 and -19,36 (excluding Livs: -21,37/20,11). Higher d13Cs (above -20 in humans) can indicate a partly marine diet, possible consumption of a C4 plant or rarely freshwater fish consumption. In both cases of Ostriv and Baltic population samples, stable isotope data give no obvious evidence of aquatic diet. The corellation of ratios of δ15N and δ13C isotopes in cases of both populations demonstrate mainly the terrestrial diet. But the values of δ15N and δ13C in both cases are slightly different: Ostriv population is more inclined to terrestrial diet, the Baltic population, especially in case of 2 Curonian samples gravitates to the marine dietary habits. But, again, the difference of δ15N and δ13C ratios of two groups are not significant.

Slightly different results are obtained with sulphur isotope analysis. δ34S range for Ostriv population is 4,74-6,32, and of East Baltic group - 6,89-11,54. Sulphur isotopic ratios are mainly influenced by the local environment, predominantly by geology and hydrology. Usually δ34S values reflect the local geology, representing the averaged isotopic composition of human diets. The δ34S values of two populations fall within the inland and partly fresh/rainwater (δ34S = 0‰–10‰) range (Fig.3).

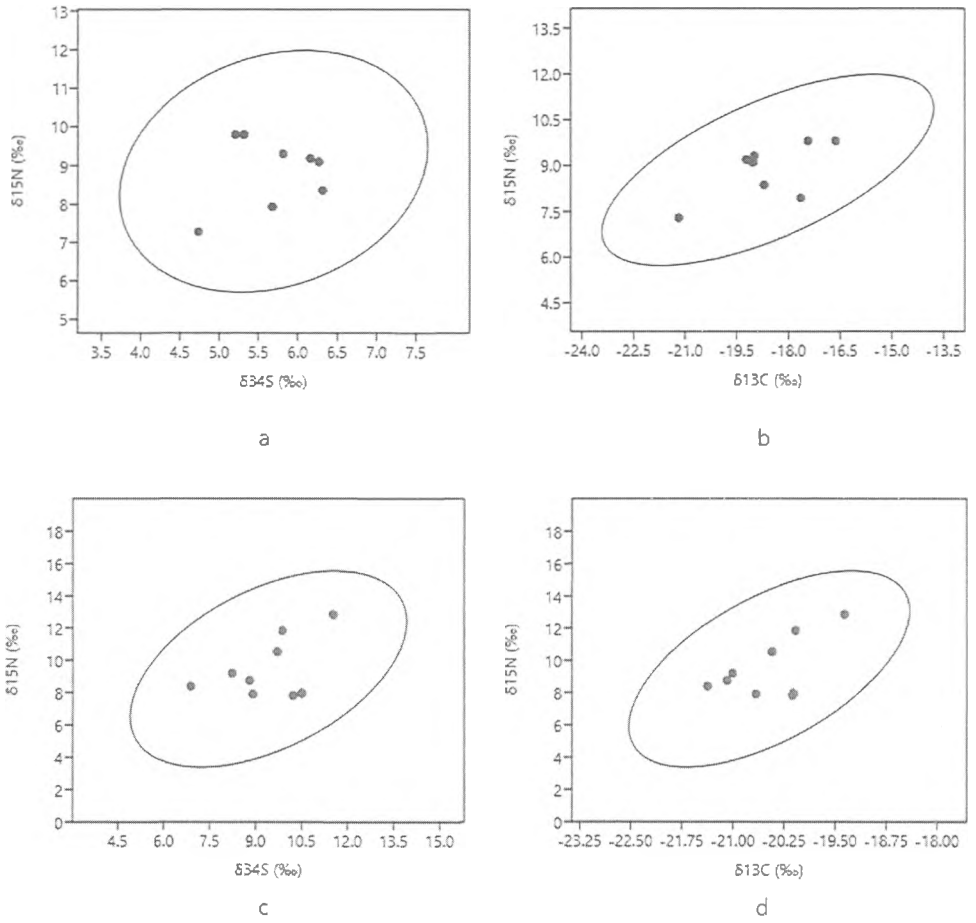

Fig.3. The correlation of ratios of δ15N/δ34S and δ15N/δ13C isotopes values of 8 samples of Ostriv (a, b) and 9 samples of the Eastern Baltic archaeological cultures (c, d)

Nitrogen and carbon (δ15N and δ13C) stable isotopes, reflecting the type of diet, proves the close similarity of Ostriv and East Baltic population values. The indicators of sulphur (δ34S) of two distanced populations are somewhat different, which requires additional study of the material from Ukraine Kyiv region paleo-populations. In a case of success of the ZBSA and IA NASU project application, the analysis of three mentioned isotopes