

Short scientific report

Inferring spatio-temporal palaeodynamics: from ancient biomolecules to organismal (overviews on cave sediment sequences) - aDNA history - PN-III-P4-ID-PCE-2020-0518

The first phase of the project included extensive field work campaigns in the study areas represented by two caves (Western Apuseni Mountains) and their surroundings (closest watersheds) aiming to: *i*) identify and document the potential zones for excavations; *ii*) evaluate the sediment accumulations and prepare digital databases using last generation surveying tools – the 3D scanning; *iii*) collect sediments and other materials (organic material, seeds) for detailed archeological, paleogenomics, paleobiological and sedimentological analysis. The members of the team visited the caves to identify and discuss about zones, mainly characterized by different sedimentation processes, which have a high potential for being explored. Before excavating the zones, a detailed (3D) surveying was performed using DistoX2 resulting in high-detailed topographic mapping.

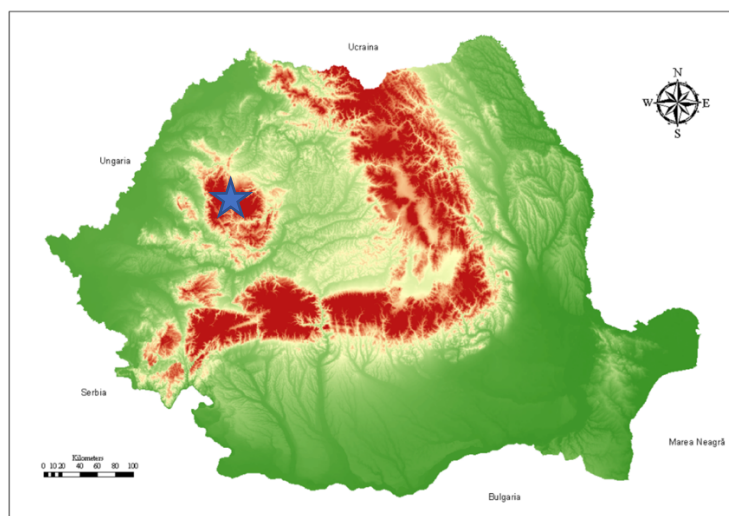


Figure 1: Study area (blue star) on the topographic map of Romania.

In Ciur Izbuca cave, two sedimentary profiles of 130 cm and respectively, 22 cm and one archeological sedimentary box (of 17 cm) were opened following the standard procedure: cleaning the oxidation layer, lithological and archeological description, 3D scanning and acquiring photos followed by sequential sampling at 2 cm resolution for more detailed sedimentological and mineralogical analysis and lower resolution sampling for ancient DNA analysis. The sedimentological analysis included loss-on-ignition, rock magnetism, geochemistry applied on each sample collected to obtain information about changes in the depositional environment. To better characterize the sediment composition mineralogical analyses (X-ray diffraction - XRD) were applied on samples coming from each lithological unit which showed that our profiles are mainly composed of quartz and calcite minerals (highly abundant in such environments). Organic material of terrestrial origin (mainly charcoal pieces) and bulk sediment samples were collected along the sedimentary profiles and sent to a dating laboratory. Samples were also collected for ancient DNA analysis. In addition, to identify the source/origin of the sediments, eight samples including soil and rocks were collected from Ponorul Tinoasa watershed. For a detailed description of the environmental cave context and the status of the cave habitat, ecological samples were collected and analysis with the aim to identify the impact of current research as well as to monitor the underground fauna.

In the other cave, Izbucul Toplitei de Vida, a preliminary archeological survey (inside and outside the cave) was undertaken aiming to document the zones of interest and collect samples (seeds and charcoal) for ^{14}C dating for defining the chronological context. The detailed archeological survey performed outside the cave showed overlaying information (artefacts) from different historical periods starting with Late Neolithic and Bronze Epoch to the Modern and present-day ones. The preliminary results were presented at the symposium “Recovering aDNA from sedimentary archives” which took place at Uppsala (Sweden).



Figure 2 The lithological schema of the 130-cm long sedimentary profile (Profile 1). The white zones indicate the sub-sampling interval whereas letters indicate the position of the samples collected for ^{14}C dating and numbers represent the samples collected for ancient DNA.



Figure 3 Sediment sampling from one of the studied profiles.

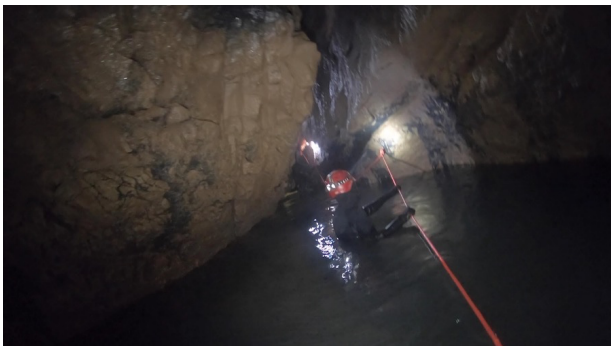


Figure 4 Accessing one of the studied sites.