

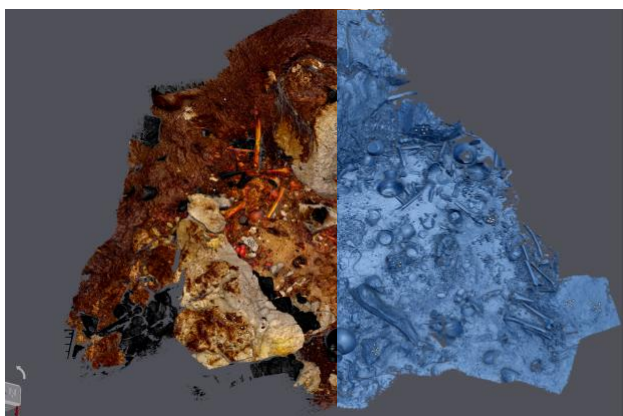
## Summary (Stage I 2025)

### ***Project Ancient Biomolecules Crossing Cave Deposits: deciphering ecosystem evolution across space and time (ABC Deposits)***

During the first implementation stage of the ABC Deposits project, activities carried out in 2025 aimed to achieve all planned objectives through an integrated and multidisciplinary approach that combined archaeology, bioanthropology, paleogenomics, geoarchaeology, and 3D digital technology. Fieldwork focused on the Iz buc ul Topli Ței de Vida karst system and adjacent areas, with particular attention to investigating complex funerary contexts and recovering biological and geological archives preserved in sediments.

Systematic excavations were completed in the Topli Ța de Vida Cave, where eight anatomically positioned human individuals, along with numerous faunal remains and artifacts, were documented. Samples collected - including human, animal, and plant remains, as well as sediments - are intended for multiproxy analyses (ancient DNA, radiocarbon and uranium-series dating, stable isotopes, pollen, and coprophilous spores), contributing to the reconstruction of funerary behavior and surrounding environmental conditions. Additional research was initiated in the “Dry Cave,” located within the same karst system, and on the R ȃca Ț Plateau, where a burial mound (tumulus) was investigated to assess potential chronological and cultural links with the subterranean funerary context.

In parallel, an innovative technological component was implemented through the use of specialized equipment (ASIO-X drone, LiDAR and optical scanners) to generate 3D models of the caves, artifacts, and archaeological contexts. This digital documentation was designed to ensure a sustainable and minimally invasive research strategy, supporting conservation, analysis, and scientific dissemination.



All performance indicators for Stage I were fully achieved: excavation campaigns were completed; the data management plan was finalized; all necessary samples were collected for the planned analyses; permits and approvals were secured; and preliminary results were presented at six scientific conferences, including an invited keynote at the international level. Stage I successfully lays the foundation for reconstructing past subterranean ecosystems and prehistoric human behavior, demonstrating the potential of modern interdisciplinary research rooted in the ethical protection of natural and cultural heritage.