

## 6 THE PRELIMINARY RESULTS OF THE MYGDONIA BASIN ARCHAEOLOGICAL SURVEY PROJECT, GREECE

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### 6.1 INTRODUCTION

During the past 2 million years, mass dispersal events of mammals from Africa into Eurasia possibly triggered the arrival of early hominins (Bar-Yosef and Belfer-Cohen, 2001; Abbate and Sagri, 2012; Koufos and Kostopoulos, 2016; Muttoni et al., 2018). At Early Pleistocene sites, where rich fauna complements the presence of carnivore and hominin activity, important taphonomic processes further complicate the recovery and interpretation of early human behaviors and remains. Evidence of hominins from this period is sparse and is found at only a handful of locations outside of Africa (Garcia et al., 2013). Even though an obvious gap continues to exist in Greece and the Balkans, this region of Europe is located in the direct path of human migrations out of Africa and Asia. For the Middle Pleistocene, the paleoanthropological, ar-

chaeological, and paleontological records of Greece are currently improving, in large part through the efforts of the ERC projects PaGE and CROSSROADS and the associated MegaPal survey (e.g., Panagopoulou et al., 2015; Harvati et al., 2018; Karkanis et al., this volume; Tourloukis et al., this volume; Athanassiou et al., this volume; Konidaris et al., this volume; Thompson et al., this volume), therefore starting to fill this research gap of Eastern Europe during this crucial period of hominin migrations.

CROSSROADS aimed to continue to fill this gap in the Early to Middle Pleistocene record by conducting multidisciplinary systematic fieldwork to locate stratified dateable contexts that promote the construction of a chronostratigraphic framework for this region of Eurasia. The Mygdonian Basin archaeological survey was therefore part of this effort and was conducted in 2019, 2021 and



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2022 by the Aristotle University of Thessaloniki, in collaboration with the University of Tübingen Paleoanthropology team, in the framework of CROSSROADS. The survey was a direct target-oriented double-intensive archaeological investigation of Pleistocene sediments, aiming to identify traces of human activity by systematically surveying exposed section profiles and by collecting lithic artifacts from stratified dateable contexts.

## 6.2 PREVIOUS RESEARCH

Whereas the Mygdonia Basin of Central Macedonia and Chalkidiki is well-known for its fossiliferous localities, such as Apollonia (Koufos et al., 1992, 1997; Kostopoulos, 1997; Konidaris et al., 2020; Gkeme et al., 2021), Tsiotra Vryssi (Konidaris et al., 2015, 2021; Koufos et al., 2018; Giusti et al., 2019), and Kalamoto (Tsoukala and Chatzopoulou, 2005) to name a few, the archaeology of the basin is less known, even though the Petralona cranium, discovered in the early 1960s in Chalkidiki, is probably one of the most famous and best-preserved Middle Pleistocene paleoanthropological findings from Greece (see Harvati et al., 2009; Harvati, 2022). The Petralona cave, located circa 30 km to the southeast of our project area is where speleothems surrounding the cranium were dated by U-series and revised Electron Spin Resonance analyses to 150–250 ka (Grün, 1996). Study of the Petralona cranium, e.g., as conducted by Harvati (2009), has determined the remains to represent *Homo heidelbergensis*, considered ancestral to Neanderthals. Nevertheless, the original stratigraphic position of the cranium is unknown, and it cannot be correlated with any geological layers, lithics or fauna; furthermore, the artifactual status of the published lithic material has been questioned (Harvati et al., 2009; Tourloukis and Harvati, 2018).

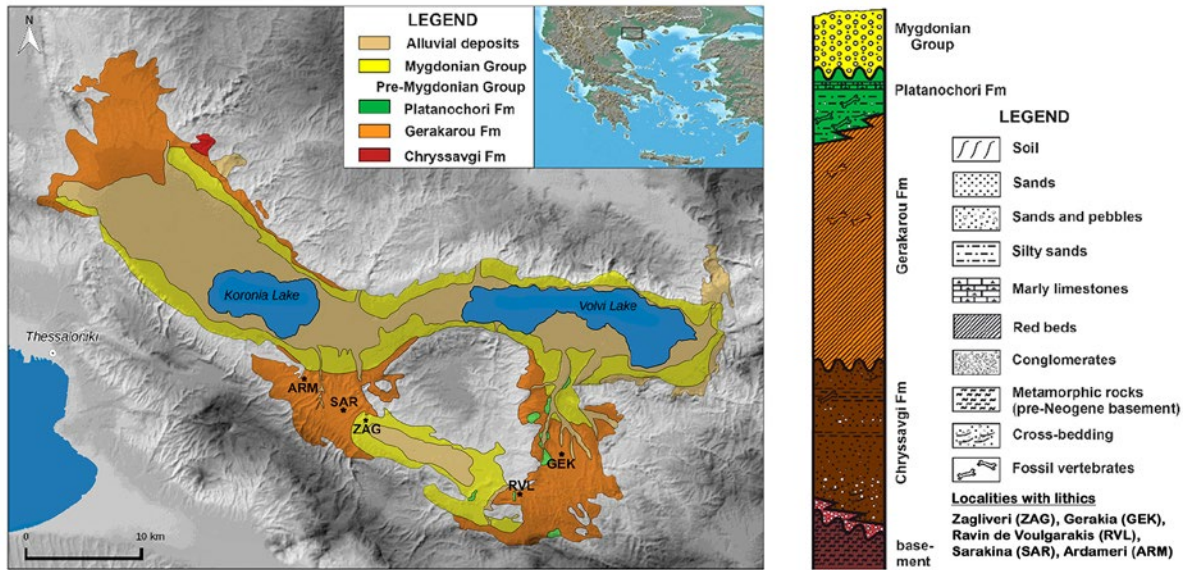
The lithics from the cave, according to Darlas

(1995), consist mainly of quartz and occasionally bauxite, with rare pebble tools and no handaxes. Instead, side scrapers, notches and denticulates are frequent (Darlas, 1995), whereas the poor choices in raw materials is due to the lack of flint from this region of Macedonia (see Litsios, 2012, for sources of flint to the west of the Axios river valley).

The Langadas Archaeological Survey Project was the first systematic archaeological research conducted in the Mygdonia Basin, by Kotsakis and colleagues who identified Middle Palaeolithic surface lithic scatters at Zagliveri, Doumbia and Sarakina (Andreou and Kotsakis, 1994; Papagianni, 2000). To date, those Palaeolithic results remain unpublished (see Andreou and Kotsakis, 1999; Kotsakis and Koliopoulos, 2007; for results from later periods). Whereas that project was a diachronic multi-period survey, our more recent research instead focused mainly on the Early to Middle Pleistocene sediments and aimed to locate lithic artifacts from stratified contexts.

## 6.3 GEOLOGY

The Neogene to Quaternary sedimentary sequence of the basin consists of the Mygdonian and Premygdonian Group (Koufos et al., 1995). The oldest Chryssavgi Formation (Fm) dates to the Middle Miocene and overlies the basement of the basin. Of interest to us were the Early Pleistocene Gerakarou and Platanochori Fm's and the Pleistocene sediments of the Mygdonian Group. Because the deposition of the basin occurred over a period of 2 million years, this is an ideal region to locate the earliest presence of hominins from this part of Europe. The Gerakarou Fm (over 100 m thick) is represented by red-bed sediments consisting of unconsolidated gravels, sand, silt, and clay, accumulated in a fluvio-torrential environment (Koufos et al., 1995). The overlying Platanochori Fm is 10–20 m thick and formed in a fluvial, fluvio-la-



**Figure 1:** Geological map of the Neogene and Quaternary lithostratigraphic units of the Mygdonia Basin with composite stratigraphic column and the localities with lithic finds (modified from Koufos et al., 1995 and Konidaris et al., 2015). The name for the locality of Ravin de Voulgarakis is adapted from the palaeontological site (Kostopoulos and Koufos, 2007) because there are no toponyms available for this region of the basin.

custrine depositional environment. It represents the transition between the Gerakarou Fm and the overlying lacustrine sediments of the Mygdonian Group that was deposited during the Middle Pleistocene to Holocene (Koufos et al., 1995; Maravelis et al., 2022). On the geological map of the region (Fig. 1), the localities where lithics have been recovered are designated accordingly.

#### 6.4 SURVEY METHODS

The survey areas were designated by locality and survey unit (SU) number. A SU is an arbitrary unit of observation developed to record and document archaeological phenomena on a dynamic landscape (Touroloukis et al., 2016; Thompson et al., 2018). Because our survey is target-oriented or otherwise referred to as deposit-centered (see Holcomb et al., 2020 for a recent review of this survey approach in Greece), the two main groups targeted for survey are stratigraphic profiles (vertical exposures) and fields (horizontal exposures). For stratigraphic profiles, intact stratified lithic remains can be po-

tentially placed in a chronostratigraphic sequence, and therefore constitute the main targeted group of this survey. At exposed section profiles even though there is typically better preservation of artifacts, there were also limitations of survey, such as restricted access due to the size of the section profiles, difficult terrain, and occasional disturbances like slope wash and slumping. As for fields, some benefits include easy access to large survey areas of exposed ancient sediments, typically with good seasonal visibility, but also with mixed assemblages that are exposed to weathering and possible plow damage or trampling.

Therefore, proper field documentation was essential to verify the geological context, especially for the low-density lithic scatters that are associated with the sandy fluvial depositional contexts. Consequently, finds were either recorded as ‘surface’ or ‘stratified’, photographs were taken both close up and at a distance to record the context, and field forms were employed to document not only the survey areas, but to also record essential geoarchaeological phenomena such as geomorphological setting, disturbances, surface visibility, and

GIS spatial data (Tourloukis et al., 2016; Thompson et al., 2018).

## 6.5 RESULTS

The survey area encompassed Early–Late Pleistocene sediments of the Mygdonia Basin, northern Greece, where the total area surveyed was 52.3 ha (Table 1), representing 17 SUs from 9 localities (11 targets inspected were section profiles, and 8 fields). In total, more than 200 lithics were recovered from 10 SUs (lithic counts are preliminary as the analysis is on-going; 1 SU with lithic artifacts collected from stratified contexts and 9 SUs with lithics recovered as isolated surface finds or from lithic scatters).

In general, the survey focused on inspecting the exposed section profiles to the south of Lake Volvi and Lake Koronia because this is where the major drainage systems of the region occur. This

gently sloping, incised region of the basin stands in stark contrast to the northern part of the basin that is affected more extensively by tectonics, uplift and alluviation from present-day rivers. To the west, near the Lagkadikia drainage system, are the localities of the Gerakarou Fm. These SUs occurred at the localities of Lagkadikia, Sarakina and Ardameri (a fossiliferous locality also known as Vassiloudi; Koufos et al., 1995), whereas the SU of Zagliveri is located in Pleistocene gravel deposits of the Mygdonian Group (I.G.M.R. 1978, Mountrakis et al., 1996). At the Megalo Rema drainage system to the east, are the localities of Ravin de Voulgarakis located in the Platanochori Fm, whereas Gerakia, Krimni and Riza consisted mainly of the Gerakarou Fm with limited exposures of the Platanochori Fm (Mountrakis et al., 1996) that were typically inaccessible due to the steep landscape and the position of this Fm in the uppermost part of the section profiles. Overall, the Platanochori Fm is patchier on the landscape, while the older red-

SITES	SUS	SU AREA		LITHICS		ELEVATION	GEOLOGICAL Fm
		(HECTARES)	TARGET	STRAT.	SURFACE	MASL	
Zagliveri	1	0,3	section	3	16	196	Pleistocene gravels
Sarakina	1, 2	4,1	field	0	169	212	Gerakarou

LOCALITIES/ FINDSPOTS	SUS	SU AREA		LITHICS		ELEVATION	GEOLOGICAL Fm
		(HECTARES)	TARGET	STRAT.	SURFACE	MASL	
Ravin de Voulgarakis	1-3	5,8	field	0	7	182	Platanochori
Riza	1, 2	1,6	section	0	0	350	Platanochori, Gerakarou
Gerakia	1, 2	3,3	section	0	0	135	Gerakarou
Krimni	2	0,8	section	0	6	180	Gerakarou
Megalo Rema	7	21,5	section, field	0	5	194	Gerakarou
Ardameri	1-4	14,3	section, field	0	4	203	Gerakarou
Lagkadikia	1	0,6	section	0	0	120	Gerakarou

**Table 1:** List of sites and findspots by locality and SU number.

bed sediments of the Gerakarou Fm are the most obvious of the survey area, due to the thickness of this formation and by the distinctive runnels that form on the section profiles from erosion and exposure to the elements. The systematic study of the collected lithics is ongoing; therefore, any mention hereafter is based on observations that were made in the field. In total, 188 lithics were recovered from sites and 22 from findspots.

## 6.6 FINDSPOTS

The four localities with findspots are Ravin de Voulgarakis, Krimni, Megalo Rema and Ardameri, where lithics were identified either as isolated surface finds, or low-density lithic scatters (Tab. 1).

At Ravin de Voulgarakis we conducted three SUs, all in fields, where calcareous calcitic nodules resembling marl from the fluvio-lacustrine Platanochori Fm produced a white chalky texture and color that was visible on the ground surface. At this locality, lithics were collected as surface finds and consisted of undiagnostic quartz artifacts of unknown age, with the exception of a possibly

Middle Palaeolithic quartz core from SU 2. Overall, the findspots consisted of low-density lithic scatters, none of which have been found in direct association with the fossiliferous site of Ravin de Voulgarakis.

To the east of Megalo Rema, we conducted one SU in fields located above the floodplain, bordered by large, steep, and occasionally heavily eroded section profiles ranging in height from 8 to 40 m of Gerakarou and Platanochori Fm's. In the foothills above the drainage to the east of these sections, four quartz lithics were collected on the surface of a plowed field, including a possible core. On the geotectonic map of Langadhas (Mountrakis et al., 1996), the sediment from this area is designated as Gerakarou Fm, although the red colored sediment of the field where lithics were found appears to be a possible paleosol that caps the Gerakarou Fm. Lastly, a Middle Paleolithic heavily rolled and battered radiolarite lateral scraper was found in the modern Megalo Rema riverbed during reconnaissance.

Near the known fossil locality of Krimni, a SU was conducted along a dirt road where exposed sections 1-4 meters in height were inspected. The



**Figure 2:** Pedestrian surface survey in field of more recent sediments capping the thick Gerakarou Fm at Ardameri SU 3. Note the density and various sizes of quartz visible on the ground surface, ranging from boulders to pebbles in size (for scale, the hammer is 30 cm in length). In the image to the right, a quartz flake was recovered on the section profile. Insets of the lithic on the right as recovered and on the left in dorsal, right lateral, ventral, and left lateral views.

sediments of this SU consisted mainly of the Gerakarou Fm, with an isolated section of possibly more recent Pleistocene sediments, located near the top of a hill. To the north of the uppermost road, ~40 m from the edge of a field near the end of the SU, five possible flakes and a core were found on the surface near a possible reddish paleosol about a meter thick located on the western edge of the road cut. All finds were recovered in a 15 m area, either close to the low-lying section, or in a gully of the dirt road. All finds are of quartz, whereas one large, isolated flake of limestone or andesite was also recovered on the surface of a gully to the southeast of the quartz lithics.

At the locality of Ardameri where numerous section profiles of the Gerakarou Fm were surveyed, we conducted four SUs and collected quartz lithic artifacts from the surface of fields and section profiles at SUs 1, 2 and 3. Unfortunately, even though artifacts were recovered on the section profiles, they were not found in-situ. Therefore, when steep vertical section profiles are overlain by younger sediments, it is important to be particularly cautious when designating finds as stratified (Fig. 2). Also, because stratified artifacts from this survey have so far been recovered from sandy fluvial depositional contexts, where the finds tend to

be low in density, hence the importance of being overcritical of context when trying to correctly identify paleosols or remnants of intact ancient terraces that may preserve in-situ remains.

## 6.7 SITES

As a general rule of our survey approach, sites were designated when surface lithic scatters with a find density of >10 lithics per 10 sq. m were identified or when lithic artifacts were recovered from stratified contexts (Tourloukis et al., 2016). In total, two localities were designated as sites. At Zagliveri, the lithics were recovered from both stratified and surface contexts, and at Sarakina, the finds were collected from dense surface lithic scatters (Tab. 1).

At the locality of Sarakina, two SUs were conducted, both in fields. In total, 169 lithics were recovered at both SUs. This locality is by far the densest scatter of artifacts in the project area with mainly quartz lithics, a possible radiolarite flake and two patinated pieces of flint. In general, the finds appear to be a mix of older and younger remains possibly spanning from the Palaeolithic to the Mesolithic, with diagnostic tools such as possible scrapers, perforators, and microliths. Overall,



**Figure 3:** The site of Zagliveri looking to the northeast. The inset shows a stratified quartz lithic artifact and the location in the gravels where it was discovered.

even though only two SUs were conducted in this region, the area is vast and, in all likelihood, contains additional lithic surface remains.

At Zagliveri (Fig. 2), we conducted one SU at a large section profile exposed as a road-cut where a mix of surface and stratified finds were recovered from a gravel layer mapped as Middle–Late Pleistocene sediments of the Mygdonian Group (Mountrakis et al., 1996). Three stratified lithics were recovered from the lowermost gravel layer of the section profile and 16 lithics from the surface. All finds were made of quartz.

## 6.8 CONCLUDING REMARKS

In conclusion, after three field seasons of survey, sporadic stratified quartz artifacts were collected from gravel deposits at Zagliveri. However, the predominance of surface finds complicates assigning temporal periods to the artifacts based solely on typology. The study of the collected assemblage is ongoing, and we anticipate that it will facilitate a better understanding of the core and flake technology from the Early–Middle Pleistocene including information on younger periods that has until recently gone unnoticed from this region of Greece.

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