

# CURRENT RESEARCH ON THE MIDDLE PALEOLITHIC CAVE, OPEN-AIR AND UNDERWATER SITES IN DALMATIA, CROATIA

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## INTRODUCTION

Paleoanthropological, archeological, and genetic evidence from Croatian Middle Paleolithic sites (Fig. 1) plays an important role in numerous scientific debates about human evolution, the adaptation of Neanderthals, and the origins of early modern humans (Cartmill and Smith 2009; Janković et al. 2011). Human fossil remains and Paleolithic industries from Krapina and Vindija (situated in NW Croatia) have been analyzed and described in many publications (Frayer et al. 2007; Janković et al. 2011 and reference therein). In contrast, much less is known about the cultural and paleoecological situation of the same period on the Adriatic coast and its hinterland. Several years ago, the Middle Paleolithic was discovered at two sites (Romualdova pećina and Campanož) in the Croatian part of Istria (Komšo 2008; 2011). In recent years, work on Mousterian sites in Dalmatia (south Croatia) has been intensified and in 2013 a three-year research project was initiated, financed by the Croatian Science Foundation, and focusing on the Middle Paleolithic of Dalmatia. It focuses on several cave sites, one open air, and one underwater site, as well as on a systematic survey of the region. This paper presents the available data for the aforementioned project, as well as a summary of previous research into the Middle Paleolithic of Dalmatia.

## CAVES

### *Velika pećina in Kličevica*

Velika pećina is located in the canyon surrounding Kličevica creek near the town of Benkovac. Some 30 years ago M. Savić

collected several lithics from the cave and its surroundings. M. Malez visited the site, collected several artifacts and did a small-scale excavation in the cave (M. Savić personal communication). I. Karavanić and N. Čondić (Karavanić et al. 2007) visited the site with a small team in 2003 and collected several artifacts from the cave floor, and in 2006 a test excavation was conducted. In a small trench (1 x 2 meters, later expanded in order to reach the cave wall) several Mousterian levels were established. A total of 105 finds were discovered *in situ*, among which stone artifacts dominated, while animal bones and teeth were less abundant. Alongside these, a number of items were found during sieving. An animal bone from Level D was dated by radiocarbon AMS about to 39 ky BP (Karavanić et al. 2007). The tools are small (and bear resemblance to those of the so-called Micromousterian) and made on local chert. Based on typology (most tools are scrapers, some of which are transversal), the artifacts are classified as Late Mousterian (or Balkan Charentian according to the terminology of J. Kozłowski).

Systematic excavation of the site started in 2012 and continued in 2013 (Figs. 2 and 3). During the field seasons, the test pit from 2006 was expanded (Fig. 2) and the basal rock was unearthed. Three additional trenches were opened, one of which has not yielded any finds. Numerous Mousterian lithic specimens have been found, as well as some animal remains. Half of an animal bone from Layer D was sent to be dated by the standard AMS radiocarbon technique, while the other half was dated using the ultrafiltration procedure. The date obtained for the first specimen (Beta-372935) is  $35,110 \pm 310$  BP, and the date for the second (Beta-372934) is  $32,520 \pm 240$  BP (Karavanić et al. 2014). Further work on the site is planned.

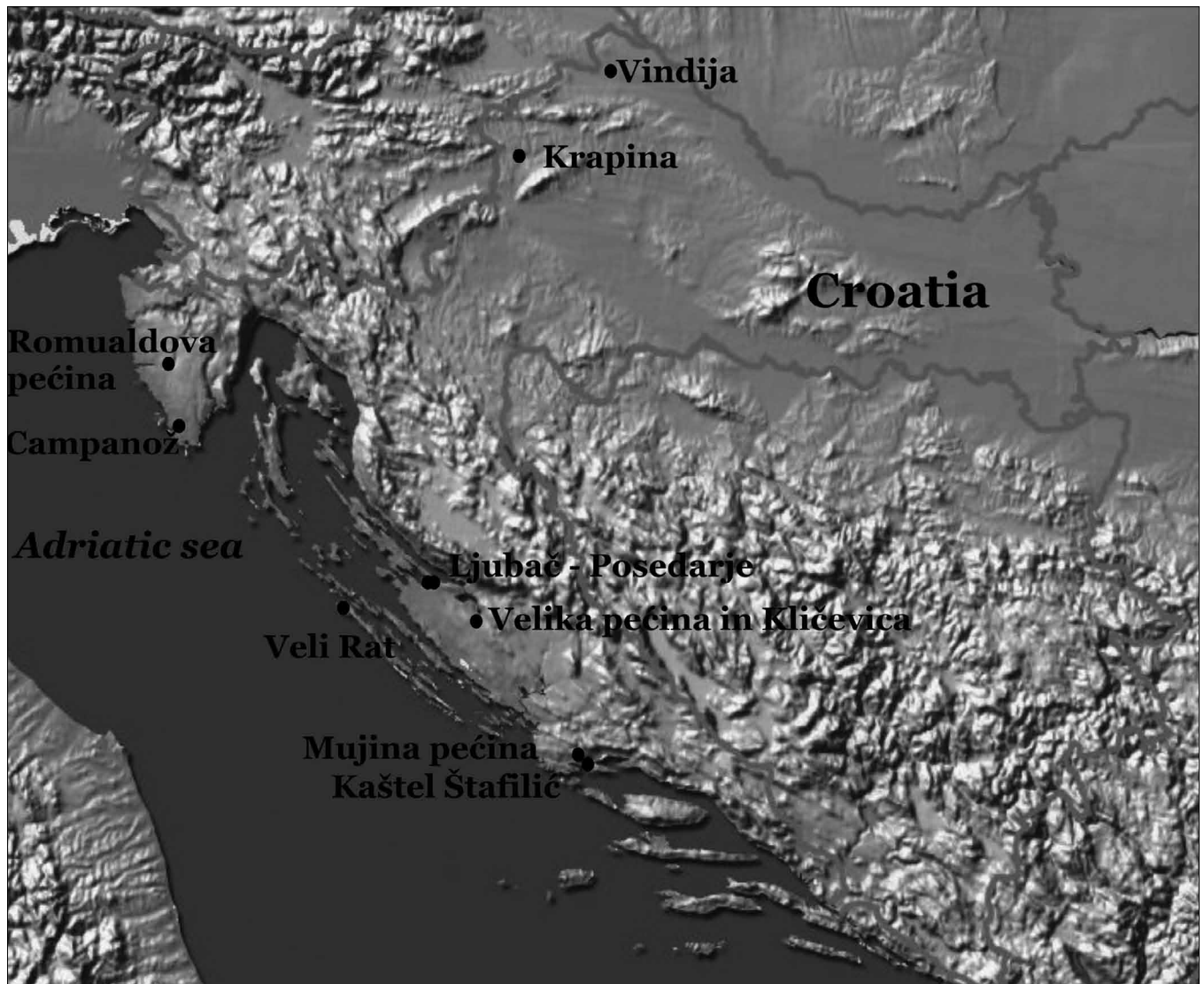


Figure 1. Map with the most important Croatian sites mentioned in the text.

### *Mujina pećina*

The only site in Dalmatia with a clear and homogenous Mousterian stratigraphic sequence that was excavated systematically is Mujina pećina near the city of Kaštela. The cave is situated in the hills north of Trogir and west of Split. The cave is about 10 m deep and 8 m wide, located approximately 280 m above sea level. Finds were initially collected in 1977 from the surface inside and outside the cave (Malez 1979), and the first test excavation took place in 1978 (Petrić 1979). Systematic excavations started in 1995. The last year of excavation was 2003. The northern stratigraphic profile inside the cave is only about 1.5 m deep and is comprised of poorly sorted Quaternary sediments composed of large fragments of carbonate rock, gravel and sand grains, rarely silt, and some clay (for the stratigraphic sequence of the site see Rink et al. 2002). AMS radiocarbon and ESR dates have been obtained for the Mousterian layers of the site (Rink et al. 2002). The interface between Level E2 and E1 was dated by

AMS to 45 ky BP, while the AMS age of overlying levels, calculated as the mean of five dates from these levels, was about 39 ky BP (for discussion and ESR dates see Rink et al. 2002). All lithic finds are attributable to the Mousterian industry (Karavanić et al. 2008). No human skeletal remains were recovered, however, given the nature of the lithic assemblage and the radiometric dates, it is assumed that Neanderthals were responsible for the evidence of human occupation at the site. A significant presence of Levallois debitage, was detected in Levels D1 and D2 (about 20%). In contrast, the frequency of such finds in Level B is not as high. The most frequent tool types in levels B and C are denticulates and notched pieces. Tools are mostly smaller in size (about 3 cm in length) and strongly resemble those from the so-called Micromousterian. The most frequent tool types in Levels D1 and D2 are simply retouched flakes made on local chert nodules which are often small. It seems more probable that the expedient use of small nodules available near the cave, as



Figure 2. Excavation at Velika pećina in Kličevica in the 2013 season. Work in expanded test pit from 2006. Photo I. Karavanić

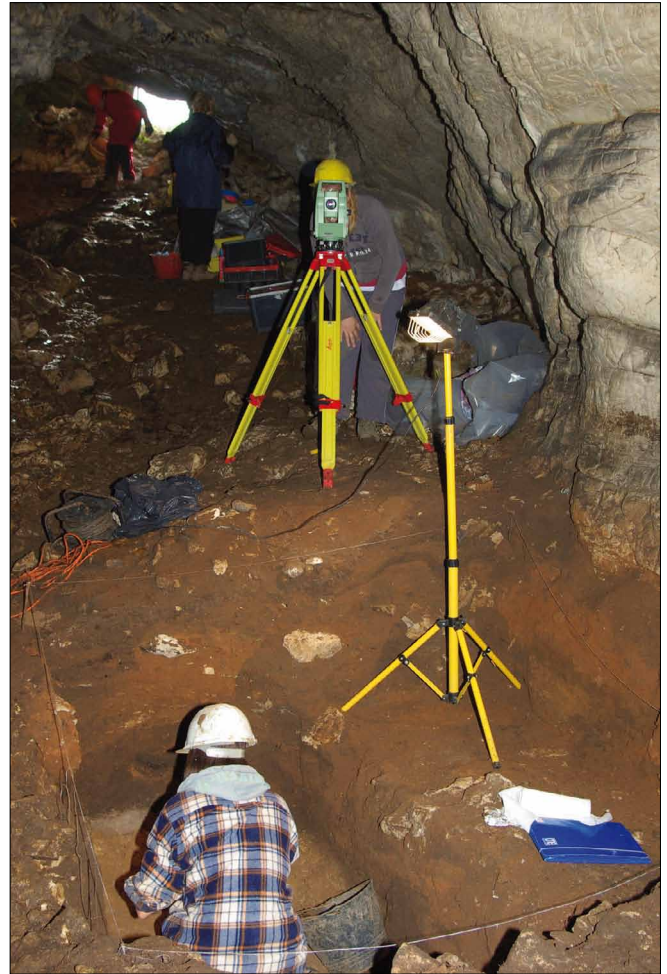


Figure 3. Excavation at Velika pećina in Kličevica in the 2013 season. Work in the trench opened in 2012. Photo I. Karavanić

well as the low flaking quality of larger pieces of some local cherts, limited the tool size in the Mousterian of Dalmatia, rather than the intentional selection of small nodules for the production of small tools (Karavanić et al. 2008).

Faunal remains from Mujina pećina also show differences in the dominance of animal species between the two stratigraphic complexes, especially in their frequency. The relative frequency of chamois/ibex, equids, and large carnivores increases dramatically from Levels D1 and D2 to Levels B and C, while the relative frequency of hare and red deer decreases significantly (Miracle 2005). Two localized areas of burning, probably representing open, unconstructed and unpaved Mousterian hearths, were found in the occupation level D2. Anthracotomical analysis shows that *Juniperus* sp. was used for fuel at both hearths (M. Culiberg personal communication; Karavanić et al. 2008). There is strong evidence that people used Mujina pećina during the autumn throughout the sequence (at least in the analyzed layers), as well as for spring visits in Level B (Miracle 2005). There is no evidence for human activity in Mujina during the sum-

mer and winter, and bears were active in the cave during the winter in Level B. These observations bring up the question of where the Mujina pećina people lived during the summer and the winter. One distinct possibility is that they were closer to the coast during the winter to take advantage of seasonally migrating game and relatively warmer and more sheltered locations (Karavanić et al. 2008). If so, such locations are most likely under sea level at the present time, or were damaged and washed away by subsequent changes in sea level.

The oldest levels (E3, E2, E1) at Mujina pećina are the richest in finds, indicating a much higher intensity of human activity than in more recent levels. Analysis of lithics and animal remains from lower levels is in progress.

Test excavation of another potentially interesting site, Matatina pećina situated about 7 km southeast of Mujina pećina, was undertaken in 2013 but unfortunately did not yield positive results. The further survey of caves in the Kaštela Bay hinterland pinpointed several sites of potential interest for further archeological research (Karavanić et al. 2014).

## OPEN AIR SITES

*Open air sites north of Zadar*

An extensive series of scientifically valuable sites are known to exist in the area north of the town of Zadar and south of Ražanac village, between the bay of Ljubač and the village of Posedarje. Unfortunately, private collectors and looters have also been aware of the existence of the sites (Vujević 2007). Š. Batović (1965) collected numerous artifacts, mainly Mousterian, on the surface of these open-air sites. These Mousterian artifacts were sometimes found in mixed cultural contexts and fortunately are marked according to the actual site from which they were collected (e.g. Radovin, Slivnica, Jovići). Some of the sites noted as a single locality actually consist of several distinct find spots (Radovin-Paljež, Radovin-Dračice, Slivnica-Bili brig, Slivnica-Bojana). Part of the material found south of Ražanac was probably also collected by M. Malez (1979) who most likely used the term 'Ražanac' to mark a wider area south of the village, which includes several find spots.

The survey of a section of Ravni Kotari under the direction of J. Chapman (Chapman et al. 1996) resulted in the identification of 44 Paleolithic localities organized in two clusters: Mataci-Stoići Ride and the Bay of Ljubač. Five percent of the assemblages represented retouched pieces and are all attributed to the Middle Paleolithic. Local low-quality pebble flint and chert were exploited for tool production. Although no finds were discovered in 80 percent of the surveyed area, Chapman and colleagues (1996: 61) note that: "*Large areas of the Dalmatian lowlands would have been at least potential settlement zones for migratory hunter-gatherers*".

D. Papagianni, N. Čondić and I. Karavanić conducted a brief survey with students from Zadar in 2002, and more recently D. Vujević (2007, 2009, 2011) analyzed the material from approximately fifteen sites in this area. Superficial artifact collections from these sites enabled a lithic analysis based on technology and typology. Generally, these finds are attributable to Mousterian industry. Based on the typology, some of the assemblages may represent the Charentian type (Vujević 2007). The industries from these sites are similar to other Mousterian sites of the Eastern Adriatic region. The tools are usually small, as in the so-called Micromousterian, and denticulates and notched pieces are frequent.

Nosed endscrapers, which D. Mustač (personal communication) found not far from the small Church of St. Peter are particularly important, however, for they indicate the existence of the early Upper Paleolithic (Aurignacian) in Dalmatia (Karavanić and Janković 2008). Although sites from this period are very rare in the eastern Adriatic region (see Karavanić 2009), there is at least one other site with Aurignacian tools in the same area north of Zadar. At least five nosed and/or carinated endscrapers were present in the lithic assemblage which Š. Batović collected in 1965 from the surface of the Radovin-Dračice site. Generally speaking, the area north of Zadar is rich in Middle Paleolithic sites, while material from the Upper Paleolithic is quite rare. A survey of the area north of Zadar is planned for 2015.

*Veli Rat*

A large number of stone artifacts and chunks were collected near the lighthouse on the Veli Rat in the northern part of Dugi otok (Malez 1979; Batović 1988). Malez (1979) refers to this site as Panjorovica, and Batović (personal communication) uses the local name Pandėrovica. The material was collected on the surface where it was directly exposed to weathering. Many pseudoartifacts, pseudotools and naturally fragmented pieces were therefore found together with artifacts and tools. Malez (1979) attributed the lithics to the Mousterian and Aurignacian. The Mousterian attribution is correct, but the Aurignacian attribution is questionable, because typical Aurignacian tools were not found during more recent analysis (Hinić 2000; Karavanić and Janković 2008). Mousterian artifacts were also found at other places on Dugi otok, as well as on the island of Molat (Batović 1973).

*Karanušići*

In the valley approximately 1km southeast of Mujina pećina, near the abandoned village of Karanušići, M. Katić reported surface finds of lithics that were later collected by I. Šuta (70 pieces). Among the finds, naturally broken lithic pieces, debitage items, and pseudotools, as well as defined artifacts can be identified. The artifacts can be attributed to the Mousterian culture. A test excavation of the site is planned for 2014.

## UNDERWATER SITES

*Resnik - Kaštel Štafilić*

The site of Resnik is a well-known locality from the Hellenic and late Roman periods, and finds have been collected both on land and under water (Brusić 2004). Neolithic finds also have been collected from an underwater site, but in a different location than the Hellenic and late Roman finds (Brusić 2004). Of particular importance is the discovery of an underwater site that yielded Paleolithic artifacts. The site is at a depth of about 4m and the discovery was reported by I. Svilan.

A small scale excavation using a grid at the site of Kaštel Štafilić was conducted in 2008 (Karavanić et al. 2009) and continued in 2010, 2011, 2012 and 2013 when only surface finds were collected over a larger area. The locality itself represents an open air site dating to the time when the sea level was much lower than today. Although the finds are somewhat disturbed (due to the action of waves and other factors) it seems that their accumulation is not a result of displacement from another locality as was reported earlier (Karavanić et al. 2009).

Several pseudotools and numerous naturally broken pieces of chert were found among the tools. The excavations confirmed that the artifacts (side scrapers are most abundant) belong to the Mousterian industry, as well as the presence of the Levallois method. Available finds are not numerous enough to allow a more detailed determination of the type of Mousterian, and the question of whether the site is contemporaneous to, or older than, the occupation at nearby Mujina



pećina remains open. A grant was obtained for field work at the site, planned in 2014 and 2015.

#### *Problems and perspectives of underwater sites*

So far, the only underwater site that can be securely attributed to the Middle Paleolithic in Dalmatia is Resnik- Kaštel Štafilić. However, the first probable Paleolithic underwater site to be discovered in Dalmatia is located near the islet of Stipanac in Prokljansko Lake near Skradin (Brusić 1977; Malez 1979). Z. Brusić (1977) collected a number of lithic artifacts at a depth of 3 m, assigning them to the Mousterian industry, but the lack of attributable elements indicates more a general determination to the Paleolithic period. Further research of the site is needed to collect more diagnostic finds.

One major problem we are faced with when searching underwater for Paleolithic sites is the difficulty in telling artifacts apart from other stones. It is therefore of crucial importance to start with a partial collection of material from potential localities. Pleistocene sediment from numerous caves that might have contained Paleolithic material has often been washed away by the action of waves, however, this is not necessarily so, if the cave entrance was sealed by collapsing (T. Šegota personal communication). Needless to say, we will have a great difficulty in finding such sites. That said, it is of a great importance to continue with underwater research in order to get a more complete picture of the area occupied by the Paleolithic groups and thus get a clearer insight into their mobility patterns. This will allow us to compare the sites on land with those now under water, reconstruct the formation processes of underwater sites, and further improve the methodology of research on such sites.

#### CONCLUSION

Mousterian sites in Croatia can provide considerable insight into the adaptational flexibility of Mousterian people in Central Europe and the Mediterranean. Although no diagnostic fossil hominid remains have so far been found in Dalmatian Middle Paleolithic sites, the archeological assemblages (Mousterian industry) and results of chronometric dating place their sequences alongside the late Neanderthals and the earliest known anatomically modern human groups in Europe. These factors strongly indicate that Neanderthals accumulated archaeological material at these sites, as there is no evidence of early Upper Paleolithic components (just a few finds from the surface of open air sites). The results of analyses of the material from Mujina pećina and other sites from the region suggest that its Neanderthal inhabitants practiced a broad exploitation of lithic and faunal resources available to them in Dalmatia (Karavanić et al. 2008). Current research in Dalmatia includes systematic excavations of cave and open-air sites, and the collection of material from underwater sites. This current research is aimed at revealing yet another ecological and geographical region inhabited by Middle Paleolithic Europeans, a region quite different from that of their better-

known counterparts in northwestern Croatia. Comparison of the results with other Mousterian sites in the Adriatic region and Central Europe can establish and explain similarities and differences between Neanderthal behavior in two different environmental zones (Mediterranean and continental). We also hope that the current research will, in addition to providing a chronology, industrial variability and basic paleoecology of Middle Paleolithic Dalmatia, also improve our understanding of the lifestyles and mobility patterns of Middle Paleolithic hunters, and provide further evidence of Neanderthal adaptation in Europe.

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