The Relationship Between the Middle Palaeolithic Sites in the Zadar Hinterland and the Zadar Islands

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This paper explores possible connections between the Middle Palaeolithic open air sites in the Zadar hinterland, which have been referred to in the literature by the general term ‘Ražanac’, and the sites on the islands of Dugi Otok and Molat. These sites correspond closely according to raw material choice, as well as typological and technological characteristics. All of them are open-air sites near raw material sources. Relations among the sites indicate a wide area of mobility, with findspots that should not be studied as a series of separate sites, but as a system (or several systems) of interrelated sites, consisting of hunting camps, raw material procurement camps and base camps.

Keywords: Middle Paleolithic, Mousterian, open air sites, Ražanac, Veli rat, Zadar

Introduction

The Zadar region, which provides geographical framework for this paper, is situated in the center of the Croatian coast. Its southern boundary consists of an archipelago of islands, while the plains of Ravni Kotari and a number of ridges arranged within a relatively small area between Ražanac, Ljubač, Poljica and Slivnica constitute its hinterland.

This region is exceptionally rich in Middle Palaeolithic finds, which have been recovered from the area between Ražanac, Nin and the Zadar islands (Dugi otok, Molat and Pag). Field surveys were carried out more than once, revealing many open-air sites, none of which were excavated systematically. Finds from the Zadar hinterland were published on several occasions, grouped under the general term ‘Ražanac’, but without comprehensive analyses results (Batović 1965, 1973, 1988; Malez 1967; Chapman et al. 1996). Finds from the island of Dugi otok are much better known, as Šime Batović and Mirko Malez wrote several articles about them (Batović 1973, 1988, 1993; Malez 1967, 1975). A number of new sites have been discovered recently, mainly thanks to amateur archaeologists who have been systematically collecting material from those sites for years. Because of that situation, sites were surveyed on several occasions and amateur collections were analysed (Martinov 2006; Vujević 2007).

Like the rest of the eastern Adriatic coast, in geological terms, the Zadar hinterland consists mainly of limestone rock and different flysch deposits (Roglić 1962: 5). It comprises an interchange of parallel synclines and anticlines, as a part of the regional complex of Istriand-Dalmatian folds, consisting of a series of gently undulated deposits extending in the direction of the Dinaric strike (NW-SE), with a general decline towards the north-west (Magaš 1999: 19). Ridges are usually low, with only a few peaks rising above 200m, though their width is relatively small.

Islands have similar geological structure as the mainland. Limestone and dolomites have been shaped into different relief forms by karstification processes and sea abrasion. Just like the mainland, they extend in the direction of the Dinaric strike (NW-SE). Channels and straits were formed by post-Pleistocene sea transgression, so that the islands stand out as series of parallel ridges forming a unified region (Džaja 2003: 7).

The island of Dugi otok is the largest of the Zadar islands and the richest in archaeological sites. Its backbone is a characteristic longitudinal spur, with the highest peak at Vela straža (338m a.s.l.). It forks and bifurcates into several parallel spurs, valleys and peninsulas, especially at its south-eastern end. At both ends, there are deep bays between these spurs (Batović 1993: 93-94; Džaja 2003: 13). The island’s flanks are quite steep, and the sea is relatively deep around almost the entire island.

Exact information about this region’s climate during the Middle Palaeolithic is not available, but the existing research indicates that climatic conditions were favourable even during the coldest periods. One of the indicators supporting such an assumption is an uninterrupted formation of dripstones, which depends upon the existence of running water and corresponding plants on the surface (Surić 2006: 171-172). Such climatic conditions would
have made this region habitable for human populations throughout the Middle Palaeolithic.

Currently, about thirty Middle Palaeolithic sites are known in the Zadar region, most of them located in the wider area of Radovin, Ljubač and Nin (Figure 1). I believe that these sites are not unrelated. Rather, they are parts of one or several mobility systems of the Middle Palaeolithic hunter-gatherer groups, extending from the Velebit Mountain to the islands. Some of them were campsites, others were temporary hunting camps, and still others were located at the sources of raw material where some of the tools were made, which is attested by flint knapping waste. Mainly, these are open-air sites, situated close to raw material sources, and containing artefacts that are typologically and technologically similar. Distances between them are not great and they correspond to distances related to local material procurement in other European regions. That suggests even more strongly the possibility of their being a part of a single mobility system.

So far, only open-air sites are known. Not a single cave has yielded Middle Palaeolithic finds, but we expect that to change in the future. The nearest cave with Middle Palaeolithic finds is Velika pećina in Kličevica near Benkovac, the excavation of which has started only recently (Karavanić and Čondić 2006). Mala pećina, situated next to it, has not been excavated, but surface finds suggest that it may have been used during the Palaeolithic. Finds from the cave Vlakno on the island of Dugi otok are also promising. Recent excavations revealed Upper Palaeolithic tools dated to 20,000 years BP, but according to Zdenko Brusić, lower layers may yield Middle Palaeolithic findings (Brusić 2005). If it reveals Middle Palaeolithic finds, it may provide answers to many questions about relations among sites on the Zadar islands. Besides this one, there are several other caves on the islands that may have been visited by humans (Batović 1973: 8).

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Chert is the type of raw material that was used most often
at all sites. Considerable part of the artefacts were made of chert pebbles that can be found in conglomerates of the Promina deposits, which are easily observable in the region between Posedarje and Slinvica, and also can be found in numerous gullies. Groups that inhabited the region preferred small pebbles, although bigger packages of chert and limestone were used as well. The rest of the artefacts were made of low-quality raw materials, such as inferior kinds of chert or chert replacements, characterized by light yellow colour, sometimes with visible fossil foraminifera.

Besides the source of raw material at Mataci, discovered by the Neothermal Dalmatia Project (Chapman et al. 1996: 18), most of the sites are situated in areas with great concentration of raw material. They include Radovin – Debelo brdo, Radovin – Trodrage, Podvršje – Šibenicka glava, Kneževići – Bojana, Veršići, Viskočane – Vlačine and Pajići – Krug (Vujević 2007: 44). Some of them were recognized as prehistoric sites because they yielded some retouched flakes in addition to the raw material, although the amount of raw material is always much greater than the number of obvious artefacts.

A high percentage of raw material used is of poor quality, but that did not prevent production of almost all types of tools, although simpler tool types predominate. Package size of the raw material, including that of good quality, limits the size of the object, so that only a small number of tools exceed 5 centimetres in length. Only sites of Veršići, Kneževići, Beretini and Podvršje-Šibenicka glava yielded some larger finds (Vujević 2007).

Finds from other European regions show that local low-quality raw material, which is usually represented by a great number of cores and cortical flakes, was usually used for denticulate tools. Better quality imported material was transported in the form of Levallois flakes and usually shaped into different types of scrapers. Larger, uniform flakes were usually used for making scrapers whereas smaller flakes were not retouched (Dibble 1991: 34). Denticulates and notches are usually of the same size as unretouched flakes and, as previously mentioned, they were made of low-quality or waste material.

When better quality raw material was not accessible, scrapers were made of raw material of smaller dimensions (Dibble 1991: 34; Dibble and Rolland 1992: 11). That is exactly the case in the region of Zadar, where scrapers made of local raw material absolutely dominate at most of the sites. Side scrapers and transverse scrapers are the most common, while other subtypes appear less often (Vujević 2007). Raw material was easily accessible and was used in great quantities, which is obvious from the waste material consisting of cores and numerous flakes. Cores were discarded at an early stage of knapping.

Lithic assemblages from the Zadar hinterland sites share very similar technological characteristics. Almost all tools were made on flakes, almost half of them being cortical, which is a consequence of accessible raw material. Tools were regularly retouched on dorsal side, usually only along the edges, but there are some examples with retouch covering the entire dorsal side. Most of those can be classified as limaces or bifacial foliates. All usual platform types are represented: flat, dihedral, cortical and faceted. Flat platforms are the most numerous, and presence of cortical platforms depends on usage of small pebbles on specific sites. The percentage of faceted platforms is usually small. Typical types of Mousterian retouch, stepped and scaled, are both represented.

Four sites yielded micro-Levallois cores, which shows that Neanderthal groups were able to adjust and apply a complex technique to low-quality raw materials of small dimensions. Such cores were found at the sites of Veršići, Kneževići, Grgurice, and Viskočane-Vlačine. Other information on Levallois industry is scarce, in my opinion, due to the selective way of collecting artefacts, rather than the actual situation at the sites (Vujević 2007: 80).

Small micro-Mousterian artefacts represent the main technological characteristic of the assemblages. This corresponds to the general situation known from Middle Palaeolithic sites of the eastern Adriatic coast (Malez 1979a; Basler 1983; Karavanić 2000, 2003, 2004; Vujević 2007) (Figure 2). This phenomenon is somewhat less emphasized at the sites of Podvršje, Beretini, Veršići and Kneževići, where bigger tools were more numerous, more carefully retouched, and made of better quality raw material (Figure 3).

Many authors place the micro-Mousterian at the end of the Middle Palaeolithic and the beginning of the Late Palaeolithic. There are different theories about the micro-Mousterian (Basler 1983: 25; Kuhn 1995; Kujundžić-Vežagić 2001: 49), but regarding Dalmatia, I would agree with Karavanić (2000: 777-778), who believes that it is a consequence of the characteristics of the locally accessible raw materials – small pebbles in the first place, but also their poor quality. Consequently, even the larger pieces of chert rarely could be worked into large tools, and even if they could, retouching the edge would usually break the tool in two or more pieces. Cores show that pebbles were sometimes so small that it was impossible to remove their cortex. Tools were made by splitting pebbles in two or three smaller flakes, the edges of which were then retouched with several blows.

Scrapers and denticulate tools dominate at all sites. The former are dominant at most sites and their percentage reaches up to 75 %. Notches and denticulates are numerous at some sites (Podvršje and Viskočane), although some of the denticulates probably are accidental results of the applied technology and the poor quality of raw material, rather than intentional products (Vujević 2007: 140). The resulting cumulative diagrams for sites with adequate number of
finds show correspondence with Charentien Mousterian in France, primarily its Quina subtype, or typical Mousterian (Bordes 1961; Debénath and Dibble 1994: 175) (Figure 4). I would like to emphasize once again that these diagrams may reflect selective collection of finds, through which large and more characteristic types (primarily scrapers) are overrepresented, while small notches and denticulates are underrepresented.

The Zadar Islands

Finds from the Zadar islands were recovered from seven sites on the islands of Dugi otok and Molat. A scraper was also found at the seabed near Povljana on the island of Pag (Batović 1990: 29), and another one was recovered from Stara Povljana (Z. Brusić, pers. comm.).

Two of the sites on islands are situated at raw material sources and both were used during the Middle Palaeolithic. A lithic workshop from Mousterian and Aurignacian periods was discovered in the area of Veli rat (Panderovica) (Figure 5). Another similar workshop was situated in the area of Zapuntela field on the island of Molat, although most of the material from Molat shows Upper Palaeolithic characteristics. Malez (1967: 282) mentions that he collected several dozen tools and hundreds of unretouched flakes at Veli rat on the island of Dugi otok. Batović (1973: 52) states that on the island of Molat one can find "...mostly
Figure 3. A selection of tools from Beretini (top), Veršići (middle) and Kneževići (bottom).
flakes and scarce cores, and only rarely retouched objects’. Besides Veli rat, Batović also gathered a small number of Middle Palaeolithic finds from Krševanje polje, a site near the village of Sali, situated at the ideal communication line along the island of Dugi otok. These finds show the same characteristics as the ones from Veli rat, and although Krševanje polje is not located at a raw material source, numerous flakes testify of knapping at this location (Batović 1973: 45-50). In addition to these, Batović mentions that Mousterian artefacts were found at four other sites on the island of Dugi otok (Staro selo, Okljug, the area from the Bay of Darstalo to Meje, and the area from Vrh kosa to Kuk and Martinova glava) (Batović 1988: 11).

The raw material that was used for making tools is almost identical to the one from the Zadar hinterland. Tools were made of white, grey, and yellow chert that is present in the form of concretions in the Upper Cretaceous deposits of the islands (Malez 1967: 282; Batović 1983: 44). Small pebbles were usually used, which affected the size of the objects that usually are 3 to 5 centimetres long and identifiable as micro-Mousterian. Raw material of better quality is somewhat more frequently represented on the islands then in the hinterland, but despite that fact, retouch is poor. It is usually stepped or scaled, quite sloppy, and a great number of tools have denticulate edges. Tools were retouched as little as possible in order to be made suitable for the simplest activities. Most of the tools can be classified as scrapers, with the dominance of side-scrapers. The rest of the tools (approximately one quarter of all tools) are denticulates. Unfortunately, cumulative diagrams for the island sites are not available, but it is more than likely that they would be very similar to those from the sites in the Zadar hinterland.

Discussion

The arising questions are whether it is possible to find relations among the sites in this spacious region, and is possible that they were formed during approximately the same period, which would suggest that they were created by only a few human groups.

Distances between the sites are the first thing to consider. Judging by the analysis of raw material procurement at other European Mousterian sites, most connections suggest regular seasonal trips between different points of territories with areas of about 10,000km² on the average, for the purpose of exploiting different resources available at different times of the year (Feblot-Augustins 1993: 248). It seems unlikely that a group would travel across such distances only because of flint. The observed patterns
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should be seen as a result of constant mobility of groups that included individuals who carried with them the best quality raw material or finished products. If we consider that these groups were capable of crossing such great distances, then the relations between the islands and the Zadar hinterland become more convincing, because the distances rarely exceed 50km. Considering the characteristics of the terrain, those distances could have been crossed in several days by Middle Palaeolithic hunter-gatherers. This also applies to the area of today’s archipelago, which was connected to the mainland during the time of the formation of the above mentioned sites, and there were no obstacles for travel.

There are numerous reasons for group mobility. Sally and Lewis Binford argued that mobility was crucial for the survival of Middle Palaeolithic populations. Mobility is important because it allows sustainable exploitation of natural resources, allowing a region to regenerate before people return to it after a certain period of time (Binford and Binford 1966; 1969). Mobility through different regions at different times of the year provides an opportunity to exploit seasonal environmental variability to a maximum degree.

Two models of mobility seem to be plausible for the Zadar hinterland region, one based on a smaller area, the other on a larger area. Mobility within a smaller area would mean that this region was a territory shared by several groups within which they circulated, returning to familiar spots after a certain period of time. Mobility within a much larger area is also plausible. In his articles, Gamble (1986: 374-381; 1999: 229) pointed out that unfavourable climate influences group mobility. According to his *ebb and flow model*, during periods of difficult climatic conditions, Middle Palaeolithic groups deserted certain regions and searched other regions with more favourable climate. Szmidt (2003: 47) supports this opinion and believes that Neanderthals abandoned parts of Central Europe because of unfavourable conditions and moved to southern France because of its more favourable and diverse environment and climate, but she also believes that they returned when circumstances changed.

In our region, Middle Palaeolithic groups could have crossed the Velebit Mountain, the only natural barrier, over the relatively low passes such as Mali Halan, and arrive to a region with a milder climate and a more diverse and favourable environment. From this region, they could have moved further in different directions. When circumstances allowed, they could have continued to the region of what is today the Apennine peninsula. I do not claim that such mobility was related only to climate, because Neanderthals adjusted successfully to many different climates, nor do

Figure 5. A selection of tools from Veli rat (after Malez 1979b: Plate 21).
I believe that Middle Palaeolithic groups moved only towards the Apennine peninsula. However, it is reasonable to suppose that the Zadar region had a transit character in wider movements of Middle Palaeolithic groups.

During the Pleistocene, river Zrmanja streamed southward and joined river Krka (Fritz, 1972). About 40,000 years ago, the amount of Late Pleistocene uplift increased inland, eventually causing Zrmanja to change its course toward west and flow through what today is Novigrad Sea and the narrows of Maslenica, entering the Velebit Channel near the region where our sites are located (Roglič 1962: 7, Fritz 1972; Surić 2006: 177; Marjanac and Marjanac 2000: 78). Velebit Channel thus became a valley of Zrmanja, irrigated with abundant water from the icebound Velebit. Such a big river would have had many tributaries, which would have run through the Zadar hinterland. Judging by the distribution of sites in other regions, water was an important factor for the Neanderthals. Regions with abundant water resources revealed more sites (Szmidt 2003; Papagianii 2000). Abundant water is another aspect that would make the Zadar hinterland a very favourable place for Palaeolithic hunter-gatherers. Some of the Zrmanja’s tributaries probably ran between the ridges on which the Neanderthal groups created campsites, but all that is left today are small creeks and water-worn ravines. One such streambed, which is occasionally still active, passes between the two ridges on which most of the sites are situated. Probably, the stream existed during the Middle Palaeolithic, providing a natural formation around which the Neanderthal campsites were formed.

If we look at the distribution of the sites, and compare technological and typological characteristics of the finds, we can conclude that the wider area of Zadar was a unified territory within which Middle Palaeolithic groups moved freely, with relatively short-term stays that probably were seasonal, at specific locations where food and raw materials were obtained.

Another important question regarding the relations between various regions is chronology. Unfortunately, as none of the open-air sites in the Zadar region have been excavated, they cannot be firmly dated. The only dated sites on the eastern Adriatic coast are Velika pećina near Benkovac (Beta-228733: 39,240 ± 740 BP [Karavanić et al. 2006: 347]) and Mujina pećina near Trogir (five radiocarbon dates from GrA-9635: 45,170 ± 2780/2060 BP to GrA-9633: 39,200 ± 1230/1060 BP [Rink et al. 2002: 949]). There are some elements, however, that may provide general chronological framework for Zadar region. Typological and technological characteristics offer important information, although they cannot provide the final answer to the complex question of chronology. Both the island and the hinterland sites show almost identical typological and technological characteristics. This situation can be related to the west-central Italy in the Middle Palaeolithic, where assemblages with a series of specific characteristics are referred to under the name Pontinien. In that region as well, the only stones suitable for knapping within a 50-km radius are small pebbles (generally, smaller than 10 centimetres), which can be found in scattered deposits along the coast. Small package size and scattered distribution of raw material sources made Neanderthal groups develop techniques that maximize tool size and optimize their efficiency (Stiner and Kuhn 1992: 316; Kuhn 1995). In both regions, similar raw material choice led to similar tools and corresponding typological characteristics. Like in Pontinien culture sites, at the sites in the Zadar region the raw material packages were so small that cortex was not removed from the pebble. Flakes retained more or less of the cortex, and were shaped into tools. Small dimensions of raw material package resulted in small tools. In both cases, scrapers are the dominant tool type (over 60%). All of the mentioned characteristics could have appeared independently in different regions, but considering the relatively small distance between the two Adriatic coasts, and the aforementioned mobility of the groups across large areas, these common characteristics may serve as a general chronological indicator, pointing to the final phases of the Mousterian culture, i.e. the period after 60,000 years before present, which coincides with dates from Velika pećina i Mujina pećina (Karavanić et al. 2006: 347; Rink et al. 2002: 949).

Relations between the sites on the islands and the sites on the mainland open the question of geographical connections within the territory that would have ensured group mobility across the entire region. There is no evidence for navigation during the Mousterian, although there are some indications for it, related primarily to the finds from Cephalonia (Bednarik 2003). Unfortunately, as these finds are not related to a chronologically determined context, they need further scientific evaluation (Broodbank 2006: 205). On the other hand, even if Neanderthals were capable of a short crossing to the islands, the sea would be an obstacle for animal herds. On the other hand, the wide region of the Zadar hinterland made transfer to the islands unnecessary. The islands were relatively small and isolated, and they could not provide adequate resources for Neanderthal groups. All of the discussed information points to the conclusion that the sites on the islands could not have been formed during periods when the islands were separated from the mainland. Rather, that must have happened when the Zadar archipelago formed a compact whole with the mainland. Since we know that the sea level changed over the course of time, that provides us with chronological limits for the formation of the island sites.

In the last Riss/Würm interglacial, the global sea level was several meters higher than today (Šegota 1982: 100). With the beginning of the last glacial, the sea level began to fall. Analyses have shown that it was not falling continuously, but was oscillating. During the initial cold periods (OIS-5d and OIS-5b), the sea level would have fallen on the average some 50-60 m below the current level, and it would have
risen to 10-20 m below the current level in warmer periods. During the OIS-4, the sea level fell to 60-80 m below the current level, and during OIS-3 there were several minor oscillations (Mellars 1996: 29-30).

Recent research in the Adriatic region corrected this global sea level curve locally, so that we now have more accurate information for our region (Surić 2006). Sites from the island of Dugi otok are of exceptional importance, because the sea level had to fall for at least 60m to make this island connected with the other islands and the current mainland. As the curve indicates (Figure 6), that happened on several occasions. Shorter periods of low sea level occurred between 120,000 and 100,000 years BP, but a longer period of low sea level started only 60,000 years BP. This is not sufficient for firm chronological determination, and it remains only a hypothesis, but it corresponds well with the general impression that the sites were formed in the final phases of Mousterian, as the technological and typological characteristics of the finds already have suggested.

Conclusion

We have seen that, during the Middle Palaeolithic, the regions of Zadar hinterland and the Zadar islands should not be observed separately. They functioned as a whole during much of the Pleistocene, which becomes obvious when geographic characteristics of the region are considered. Even superficial look will detect resemblances in the usage of raw material, as well as in the typological and technological variation of the finds. Minor variations noticeable at certain sites are a consequence of different character of those sites, rather than different chronological determination. The sites at Veršići, Kneževići, Beretini and Podvršje yielded artefacts of somewhat larger dimensions, i.e. microlithism is less emphasized compared to other sites. Retouch is deeper and finer, which is most noticeable on Mousterian points and convergent scrapers. Cores were recovered confirming knapping at these sites, but raw material is not as abundant as at other sites, which may suggest that these were food procurement camps or, possibly, base camps.

On the other hand, the other sites abound in raw material, i.e. small pebbles and larger chert pieces. Their assemblages consist of a small number of retouched tools and many flakes, which shows that knapping took place at those sites. All of the tools have similar characteristics: they are simple, with high percentage of tools on corticated flakes. Scrapers are the dominant tool type, but denticulate tools are also worth mentioning, although it seems that denticulation is more a consequence of raw material characteristics and technology than of actual intention to make denticulate tools. Taking into consideration that the entire reduction sequence is present at specific sites, together with the small number of retouched tools, we can conclude that these sites served mostly for raw material procurement, together with in situ lithic production activities.

Distances between the sites are small and correspond to other European regions where Neanderthal groups moved over distances of about 50km, which in turn was related to herd movements (Feblot-Augustins 1992: 243-248.). It is not likely that those groups used the entire area at once. They probably preferred to stay at one place for a certain period of time and moved radially, crossing smaller distances in order to get back to the camp within the same day. For that reason, we can consider that groups of sites clustering in certain areas reflect mobility patterns, e.g. movement from the Posedarje area over the wider areas of Radovin and Ljubač to the wider area of Nin and from there to the Zadar islands, with seasonal stays at specific sites or caves that were used as base camps.

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