

# The Early Upper Paleolithic of Croatia

by Ivor Karavanic

## Contents

Introduction  
Background  
Radiocarbon Chronology  
Industries  
Fauna and Hominids  
Discussion and Conclusion  
Acknowledgements  
References

**Abstract:** Early Upper Paleolithic industries from Vindija and Velika Pecina caves in Hrvatsko Zagorje (northwestern Croatia) are discussed together with their chronological and paleontological framework. The Early Upper Paleolithic in this region begins with a warm oscillation within the last glaciation, dated between 34 and 33 ka. At Vindija and Velika Pecina the earliest Upper Paleolithic follows Mousterian occupations and differs significantly from the Western European Aurignacian. It is also different from the Central European Aurignacian, but is quite similar to industries from the Slovenian Alpine sites of Potocka Zijalka and Mokriska Jama. In Vindija the Early Upper Paleolithic is possibly associated with late Neanderthals, while in Velika Pecina it is preceded by a level that contained a bone of an early modern human.

**Keywords:** Upper Paleolithic, Neanderthals, early modern humans, Vindija, Velika Pecina, Croatia

**Date of Submission:** 12th October 1998; **Date of Uploading:** 22nd December 1998.  
First published in the *Proceedings of the XIII International Congress of Prehistoric and Protohistoric Sciences (Forlì, Italy), 8 - 14 September 1996*. Volume 2, pp. 659 - 665.

---

## Introduction

The sites of Croatia especially the region of Hrvatsko Zagorje (northwestern Croatia), are known world wide in archaeology and paleoanthropology because of important finds of fossil

hominids (Smith 1994; Wolpoff 1996a) and their material cultures (Karavanic 1995; Malez 1978; Montet-White 1996; Simek & Smith 1997). The most important Mousterian sites in this area include Krapina, Vindija, Velika Pecina and Veternica. Besides containing Mousterian assemblage, both Vindija and Velika Pecina (Figure 1, nos. 1 and 2) also have the Upper Paleolithic industries associated with fossil human remains. The Early Upper Paleolithic of Hrvatsko Zagorje begins with a warm oscillation within the last glaciation ("Würm 2/3") between 34 and 33 ka according to present radiocarbon evidence. The initial Upper Paleolithic industry of these sites is different from the Western and Central European Aurignacian and will be briefly discussed in this paper together with its chronological and paleontological framework. The later phase of the Early Upper Paleolithic industry of Vindija (27 ka) which could represent a regional variant of Central European Aurignacian, will also be described.

The third important Croatian Upper Paleolithic site is Sandalja II in Istria (southwestern Croatia), near Pula (Figure 1, no. 3). The Upper Paleolithic of this site starts later (around 27 ka) than in Hrvatsko Zagorje and may well be attributed to the Aurignacian. The Sandalja II belongs to Adriatic region and will not be discussed in detail in this paper.

## **Background**

Vindija cave is situated in Hrvatsko Zagorje 2 km west of the village of Donja Voca, and 20 km west of the center of Varazdin. The cave is more than 50m long, maximally 28m wide, and more than 10m high. S. Vukovic (1950), who visited the cave in 1928, first published the tools and animal remains from this site. At that time Vindija was the second Paleolithic site to be discovered in Hrvatsko Zagorje (the first one was Krapina), although the cave itself had been long known and visited. For more than thirty years with some interruptions, Vukovic excavated inside and in front of the cave, mostly in the uppermost levels. Croatian scientist M. Malez started systematic excavations at Vindija in 1974. Throughout the years of excavation (until 1986) he collected much paleoanthropological, archaeological and paleontological material. Although large amount of sediment was dug from the cave, careful digging, dry screening, and water screening were applied on only a very limited part of the sediment. Unfortunately only the profiles and very limited amount of sediment were left in the cave. More than 9m of deposits were present, and the stratigraphic profile comprises about twenty strata. M. Malez and D. Rukavina (1979) attributed the established sequence of Vindija stratigraphy to a time span from the onset of so-called Riss glaciation (oxygen isotope stage 6 or earlier) to the end of the Holocene.

Another site, Velika Pecina is situated near the village of Goranc on Ravna Gora, above the valley Velika Sutinska about 12 km from Ivanec. The cave is 25m long. M. Malez conducted the first excavation of this site in 1948. The next excavation started in 1957 and, with short interruptions, lasted until 1970. The stratigraphic profile comprises 16 levels and it is over 10m deep. Similarly as in Vindija, the span of the stratigraphic sequence of Velika Pecina has been established from the end of so-called Riss glaciation (oxygen isotope stage

6) to the end of the Holocene (Malez 1974).

### **Radiocarbon Chronology**

The first Upper Paleolithic level of Vindija cave is *G1*. A cave bear long bone from this level has been dated by AMS radiocarbon to  $33,000 \pm 400$  B.P. (ETH-12714) (Karavanic 1995). This is the only sample from either Vindija or Velika Pecina that has been dated by AMS. Long bones from next younger level (*Fd/d*) have been dated by radiocarbon to  $26,600 \pm 900$  B.P. (Z-2443) (Obelic et al. 1994), while a sample of charcoal from level *F/d* yielded an age of  $27,000 \pm 600$  B. P. (Z-551) (Srdoc et al. 1979).

Velika Pecina level *J*, which yielded a hominid frontal bone, has not been dated so far, but the next younger level, *I*, yielded an age of  $33,850 \pm 520$  B.P. (GrN-4979) (Malez & Vogel 1970). Level *H* has not been dated, while level *G* produced a date of  $27,300 \pm 1200$  (Z-189) (Srdoc et al. 1973).

### **Industries**

*G1* is the first Vindija level, which can be attributed to the Upper Paleolithic, according to its bone tools. This is a distinctive stratum, formed by red-brown clay sediment, 8-20cm in thickness. Chronostratigraphically it correlates to Würm 2/3 interstadial in the French version of the Alpine terminological scheme (Malez & Rukavina 1979). The lithic assemblage consists of 56 chipped stone items, of which 15 are tools (see Karavanic 1994, 1995). Four denticulated pieces (e.g. Figure 2, nos. 2 and 3) and five sidescrapers (e.g. Figure 2, no. 1) display Middle Paleolithic traits. A leaf-shaped bifacial point (Figure 2, no. 7), thin and very finely worked, also derived from this level. The other significant tools, which display Upper Paleolithic traits, are: an endscraper on flake (Figure 2, no. 5), an endscraper on Aurignacian blade (Figure 2, no. 6), a burin (Figure 2, no. 4) and a fragment of retouched blade. A rabot has also been found. The bone industry includes a split-base point (Figure 3, no. 1), three massive-base (Mladec) points (e.g. Figure 3, nos. 2 and 3), several fragments and a bear baculum with carved circular decoration (Figure 3, no. 4). Although the bear baculum has been attributed to level *G1* (Malez 1988), a note associated with this specimen suggests that it may in reality come from Mousterian level *G3*. A so-called "bone button" was also found in the same level, but it was probably produced by cave bear activity or another natural process.

While sidescrapers and denticulated pieces from level *G1* suggest continuation of the Mousterian technological tradition, the bone points are unquestionably Upper Paleolithic.

There are 77 stone tool items, which came from the interface of the *G* and *F* complexes at Vindija (see Karavanic 1994, 1995). They are marked as *G/F*, *F/G*, *Fd/G* or *Fd/d+G1*. The tools account for 25 items. Four of them are shown on Figure 4 (nos. 1-4). Retouched blades,

endscrapers, and burins are frequent. The keeled endscraper, the flat-nosed endscraper (Figure 4, no. 3), the endscraper on an Aurignacian blade (Figure 4, no. 1) are all typical of the Aurignacian. The bone points with massive bases are also present (e.g. Figure 4, no. 5). Differently from level G1, the presence of few Aurignacian stone tool types and of blade technology at the G/F interface may suggest a regional variant of what is generally called Central European Aurignacian.

Level Fd/d contains 89 lithic items, of which 30 are tools. Most numerous are 9 denticulated pieces (e.g. Figure 4, no. 8), 5 notched pieces, 5 burins and 4 endscrapers. Two bone points with massive bases and broken distal ends (Figure 4, nos. 6 and 7) have also been found.

Another level at Vindija cave is Fd. It yielded 147 lithic items, of which 28 are tools. The most numerous are 5 denticulated pieces, 5 endscrapers and 4 burins. Bone items include several medial point fragments.

Several Aurignacian tool types are marked only with the designation of stratigraphic complex F; but it is probable that most of them originate from the lowest level (Fd/d) of complex F. Bearing this fact in mind, as well as the lack of more Aurignacian tool types in levels Fd/d and Fd, the industrial affiliation of these levels cannot be determined reliably, but it is possible that they, like the G/F interface, represent a regional variant of Central European Aurignacian (cf. Karavanic 1995; Kozłowski 1996; Montet-White 1996). If this is the case and if the radiocarbon dates of levels Fd/d ( $26,600 \pm 900$ ) and F/d ( $27,000 \pm 600$ ) are correct, the basal complex F would represent the end of the Aurignacian industry in Central European area. Furthermore, the level Fd/d also yielded 2 blades with an oblique retouched truncation (e.g. Figure 4, no. 9), generally typical of the Gravettian which may indicate some mixing of the Gravettian and Aurignacian items in this level.

Only one stone tool (a blade with two continuously retouched edges with a notch on the left side) has been found in Velika Pecina level J (Figure 5, no. 1, see also Malez 1967). Level I yielded a core, sidescrapers, an endscraper on (broken) blade with a notch (Figure 5, no. 3), a notch, a burin and a drill (Figure 5, no. 2) together with three broken bone points which probably had split bases (Figure 5, nos. 4-6) and one massive-base bone point (Figure 5, no. 7). Originally Malez (1967) attributed base fragment of bone point to level H, but it fits with a point tip from level I (Figure 5, no. 7). Bone points have been also found in level G and F, but the lithic industry from all mentioned levels does not contain Aurignacian stone tool types.

### **Fauna and hominids**

Among the Upper Pleistocene fauna of Vindija and Velika Pecina, cave bear is dominant. The presence of ecologically mixed faunas, which vary by level depending on climatic fluctuations, has been noted (Malez & Rukavina 1979). However, the recent revision of Vindija fauna, made by D. Brajković (pers. com), suggests some changes in the published species determinations (i. e., the absence of *Saiga tatarica* and the rare presence of

*Rangifer tarandus*). Therefore it seems that representatives of distinctive cold climate are relatively rare. It also seems that there is no significant difference between the fauna of the Early Upper Paleolithic and that of later industries. Along with the review of published data, a new analysis of complete faunal material would be of great importance indeed.

However, the hominid finds and their association with different industries pose the most interesting problems of these sites. The hominid remains from first Upper Paleolithic level (G1) of Vindija are controversial (Smith 1984; Wolpoff et al. 1981) but according to the latest evidence it is very probable that they represent Neanderthals (Karavanic & Smith 1998; Smith & Ahern 1994; Wolpoff 1996a, 1996b). These remains in G1 include: a right ramus and a posterior mandibular corpus, teeth, an anterior superior fragment of a left parietal, a zygomatic and a supraorbital torus. Three isolated teeth derived from level Fd, while a posterior fragment of parietal came from the contact of levels Fd and Fd/d. The posterior fragment of a left parietal at lambda belongs more probably to an early modern human than to Neanderthal (Smith, Boyd & Malez 1985) while three isolated teeth of possible Neanderthal morphology are debatable.

Only one hominid remain was found at Velika Pecina. It derives from level J and is a frontal fragment with early modern human morphology (Smith 1976).

## **Discussion and conclusion**

The initial Upper Paleolithic industry at Hrvatsko Zagorje appears after the late Mousterian (Vindija level G3), between 34 and 33 ka, according to presently available radiocarbon evidence. This industry was often described as Aurignacian because it contains typical bone tools as in the Western and Central European Aurignacian (Karavanic 1994, 1995; Malez 1978; Malez et al. 1980; Smith 1984; Smith & Ahern 1994). Level G1 of Vindija yielded one split-base bone point, three massive-base (Mladec) bone points, several bone fragments and an engraved bear baculum bone. The lithics from the same level include both Middle Paleolithic (sidescrapers, denticulated) and also some Upper Paleolithic tool types. One leaf-shaped bifacial point on a non-local stone is also present (Montet-White 1996). The stone industry is not very typical. For J. K. Kozłowski (1996) it represents a Mousterian, which would fit well and traditionally with the Neanderthal remains from the same level. Following this scenario; it has been proposed that the bone tools were intrusive from the younger level (Kozłowski 1996), or similarly that the unusual association of Neanderthals and Upper Paleolithic at Vindija has been caused by cryoturbational mixing (Stringer 1982; d'Errico et al. 1998), described by Malez and Rukavina (1975), by stratigraphic gap (Allsworth-Jones 1986), or by bioturbation (d'Errico et al. 1998). There is, however, also evidence, which does not support such *post hoc* accommodative explanations. The part of the cave where the split-base point and fossil hominid bone (ramus) were found shows undisturbed stratigraphic layering. Furthermore, both pieces have been found one close to another at the same depth within the level. J. Radovčić and D. Rukavina, who were members of Malez's research team, have given this information to me. Recent analysis of the artefacts from Mousterian level G3 at Vindija Cave, and revision of the artefact analysis of Vindija level G1 and Velika Pecina

levels J and I, did not show any modification of stone tools (e.g. nibbled, rounded edges; see Laville, Rigaud & Sackett 1980:Fig. 3.12), which would suggest mixing by cryoturbation (Karavanic & Smith 1998). Furthermore, Vindija level G1 contains three virtually complete bone tools and several fragments which lack abrasion and battering expected on the material which was disturbed by cryoturbation (for more arguments against mixing see Karavanic & Smith 1998). Although these factors do not prove total absence of mixing, the evidence against mixing is at least as strong as the evidence favoring the mixing explanation. Recently, the mandible fragment and split base point from Vindija level G were directly dated by non-destructive spectrometry method, but unfortunately it is not possible to make any firm conclusion based on these results (see Karavanic et al. 1998). This question could finally be solved by direct radiocarbon AMS dating of the fossil human sample and split base bone point (Stringer & Gamble 1993). Currently available radiocarbon dates indicate that Neanderthals (Vindija level G1) and early modern humans (Velika Pecina) were penecontemporaneous in this region at ca. 33 ka. Therefore it is possible that some Upper Paleolithic tools associated with the Vindija G1 Neanderthals, such as bone tools, may result from imitation of or trade with early modern people (Karavanic & Smith 1998).

However, it is still questionable as to whether the industry of Vindija level G1 represents the Aurignacian or some other manifestation, as was recently proposed by P. T. Miracle and T. L. Crummett (1995; Miracle 1998). Even the older levels of the Central European Aurignacian show Mousterian elements (Valoch 1968), so the lack of typical Aurignacian stone tools in both Vindija level G1 (except one endscraper on the Aurignacian blade) and Velika Pecina level I are notable. Both levels yielded bone tools like the Slovenian Alpine Paleolithic sites of Potocka Zijalka and Mokriska Jama (Brodar & Brodar 1983; Brodar & Osole 1979). For the denomination of the Early Upper Paleolithic industry from the above-mentioned Croatian and Slovenian sites, A. Montet-White (1996) resurrected the term "Olschewian". Thus she distinguished this industry from the Western or Central European Aurignacian. Differently from Vindija level G1 and Velika Pecina level I, the industry of Vindija lower F complex (27 ka) and its interface with complex G, yielded a few typical Aurignacian stone tools (nosed and keeled endscrapers, blades) and may represent a regional variant of what is generally called Central European Aurignacian (cf. Karavanic 1995; Kozlowski 1996; Montet-White 1996).

If this is the case and if the radiocarbon dates of the levels Fd/d ( $26,600 \pm 900$ ) and F/d ( $27,000 \pm 600$ ) are correct, the basal complex F at Vindija could represent the end of the Aurignacian, not only in Hrvatsko Zagorje, but also in the Central European area. However, it should be mentioned that the industries of Vindija level G1 and Fd/d, based on the important proportion of notched, denticulated pieces and sidescrapers, display some similarities to the lower Aurignacian stage at Malomerice-Obciny, Krepice and Barca II (see Valoch 1968), the Chatelperronian of Arcy-sur-Cure and the Aurignacian I of La Ferrassie (Montet-White 1996).

There are notable differences between the Early Upper Paleolithic of Hrvatsko Zagorje and the Early Upper Paleolithic industry of Sandalja II cave in Istria, which belongs to the Adriatic region. The Upper Paleolithic of Sandalja II starts later (about 27 ka) and it contains carenated and nosed endscrapers, as well as blade technology. This association

could well represent the Aurignacian (Malez 1987). Only one split-base point has been found in Sandalja II and there are no massive base points in bone assemblage from the Aurignacian levels of this site. While the raw materials in Sandalja II include chert (about 96%) and tuffs (Zupanic 1975), the other rocks of lower quality (e.g. white quartz, sandstone) were also used for the Vindija tools (Kurtanjek & Marci 1990). The differences between Hrvatsko Zagorje and Istria are not only in the Early Upper Paleolithic industries, but also in fauna. In autochthonous fauna, cave bear is dominant in Hrvatsko Zagorje and horse in Sandalja II (Miracle 1991).

However, returning to Hrvatsko Zagorje, we can conclude that the small number of finds in particular Early Upper Paleolithic levels of both Vindija and Velika Pecina, suggest occasional occupation for short periods. While it seems there is some evidence for brief contemporaneity between Neanderthals (Vindija level G1) and early modern humans (Velika Pecina level J) in this area (see Karavanic & Smith 1998), the Early Upper Paleolithic assemblages of both sites display regional characteristics which, in initial phase, do not expose Aurignacian character.

### **Acknowledgements**

Lawrence G. Straus, Fred H. Smith, Marinella Fabro, Laia Colomer, Jacqueline Balen and Daniel Garreta provided various forms of assistance with respect to this paper. Maja Paunovic allowed me to study Vindija and Velika Pecina collections and to publish drawings (Figure 5) from the Institute archives. The paper also benefited from the comments of Scientific Committee of the Mediterranean Prehistory Online. Financial support was received from: Ministry of Science and Technology of the Republic of Croatia, University of Zagreb, Department of Archaeology and Institute of International Education (Fulbright Scholarship). To all of these individuals and agencies I extend my gratitude.

### **References**

ALLSWORTH-JONES, P. (1986). *The Szeletian and the transition from Middle to Upper Paleolithic in Central Europe*. Clarendon Press. Oxford.

BRODAR, S. & BRODAR, M. (1983). *Potočka Zijalka*. Slov. akad. znan. umjet. Ljubljana.

BRODAR, M. & OSOLE, M. (1979). "Paleolitske i mezolitske regije i kulture u Sloveniji", in Benac, A. (ed) *Praistorija jugoslavenskih zemalja* (1), Svjetlost. Sarajevo. pp. 159-194.

D'ERRICO, F., ZILHÃO, J., JULIEN, M., BAFFIER, M. & PELEGRIN, J. (1998). "Neanderthal acculturation in western Europe? A critical review of the evidence and its interpretation", *Current Anthropology*, 39, Supplement, pp. 1-44.

KARAVANIC, I. (1994). "Gornjopaleolitické kamene i kostane rukotvorine iz spilje Vindije", *Opuscula Archaeologica*, 17, pp. 53-163.

KARAVANIC, I. (1995). "Upper Paleolithic Occupation Levels and Late-Occurring Neandertal at Vindija Cave (Croatia) in the Context of Central Europe and the Balkans", *Journal of Anthropological Research*, 51(1), pp. 9-35.

KARAVANIC, I. & SMITH, F. H. (1998). "The Middle/Upper Paleolithic interface and the relationship of Neanderthals and Early Modern Humans in the Hrvatsko Zagorje, Croatia" *Journal of Human Evolution*, 34, pp. 223-248.

KARAVANIC, I., PAUNOVIC, M., YOKOYAMA, Y. & FALGUÈRES, C. (1998). "Néandertaliens et Paléolithique supérieur dans la grotte de Vindija, Croatie: controverses autour de la couche G1", *L'Anthropologie*, 102(2), pp. 131-141.

KOZLOWSKI J. K. (1996). "Cultural Context of the last Neanderthals and Early Modern Humans in Central-Eastern Europe", in Bar-Yosef, O., Cavalli-Sforza, L. L., March & Marcello Piperno, R. J. eds) *The Lower and the Middle Palaeolithic* (5), Int. Union Prehist. Protohist. Sci, Forli, pp. 205-218

KURTANJEK, D., & MARCI, V. (1990). "Petrografska istrazivanja paleolitskih artefakata spilje Vindije", *Rad Jugosl. akad. znan. Umjet*, 449(24), pp. 227-238.

LAVILLE, H., RIGAUD, J-PH. & SACKETT, J. (1980). *Rock Shelters of the Perigord*. Academic Press. New York.

MALEZ, M. (1967). "Paleolit Velike pecine na Ravnoj gori u sjeverozapadnoj Hrvatskoj", *Arheoloski radovi I rasprave Jugosl. akad. znan. Umjet*, 4-5, pp. 7-64.

MALEZ, M. (1974). "Noviji rezultati istrazivanja paleolitika u Velikoj pecini, Veternici I Sandalji" *Arheoloski radovi I rasprave Jugosl. akad. znan. Umjet*, 7, pp. 7-44.

MALEZ, M. (1978). "Novija istrazivanja paleolitika u Hrvatskom zagorju", in Rapanic, Z. (ed) *Arheoloska istrazivanja u sjeverozapadnoj Hrvatskoj*, Izdanja Hrv. arheol. drustva 2, Hrv arheol. drustvo Zagreb, pp. 6-69.

MALEZ, M. (1987). "Pregled mezolitickih i paleolitickih kultura na podrucju Istre", in Jurkic, V. (ed) *Arheoloska istrazivanja u Istri i Hrvatskom Primorju*, Izdanja Hrv. arheol. drustva 11(1), Hrv. arheol. Drustvo, Pula, pp. 3-47.

MALEZ, M. (1988). "Prehistorijske kostane rukotvorine iz spilje Vindije (Hrvatska, Jugoslavija)", *Radovi Zavoda za znanstveni rad Jugosl. akad. znan. umjet*, 2, pp. 217-252.

MALEZ, M. & RUKAVINA, D. (1975). "Krioturbacijske pojave u gornjopleistocenskim naslagama pecine Vindije kod Donje Voce u sjeverozapadnoj Hrvatskoj", *Rad Jugosl. akad.*



*znani. Umjet*, 371(17), pp. 245-265.

MALEZ, M. & RUKAVINA, D. (1979). "Polozaj naslaga spilje Vindije u sustavu clanjena kvartara sireg podrucje Alpi", *Rad Jugosl. akad. znan. Umjet*, 383(18), pp. 187-218.

MALEZ, M., SMITH, F.H., RADOVICIC, J. & RUKAVINA, D. (1980). "Upper Pleistocene Hominids from Vindija, Croatia, Yugoslavia", *Current Anthropology*, 21(3), pp. 365-367.

MALEZ, M. & VOGEL, J.C. (1970). "Die Ergebnisse der Radiokarbonanalysen der quartären Schichten der Velika Pecina in Nordwest-Kroatien", *Bull. Scient. du Conseil des Acad. des Sci. et des Arts de la RSF Yougoslavie, Section A*, 15 (11-12), pp. 390-391.

MIRACLE, P. T. (1991). "Carnivore Dens or Carnivore Hunts? - A review of Upper Pleistocene mammalian assemblages in Croatia and Slovenia", *Rad Jugosl. akad. znan. umjet*, 458(25), pp. 193-219.

MIRACLE, P. T. (1998). "The spread of modernity in Palaeolithic Europe", in Omoto K. & Tobias P. V. (eds) *The Origins and Past of Modern Humans - Towards Reconciliation*, World Scientific, Singapore, pp. 171-187.

MIRACLE, P. T. & CRUMMETT, T. L. (1995). Just who were those Aurignacians? Vindias place in the Central European Early Upper Paleolithic. Paper presented at the Sixtieth Annual Meeting of the Society for American Archaeology, Minneapolis, MN, May 3-7.

MONTET-WHITE, A. (1996). *Le Paléolithique en ancienne Yougoslavie*, Jérôme Millon, Grenoble.

OBELIC, B., HORVATINCIC, N., SRDOC, D., KRAJCAR-BRONIC, I., SLIEPCEVIC, A. & GRGIC, S. (1994). "Rudjer Boskovic Institut Radiocarbon Measurements XIII", *Radiocarbon*, 36(2), pp. 303-324

SIMEK, J. F. & SMITH, F. H. (1997). "Chronological changes in stone tool assemblages from Krapina (Croatia)", *Journal of Human Evolution*, 32, pp. 561-575.

SMITH, F. H. (1976). "A Fossil Hominid Frontal from Velika Pecina (Croatia) and a Consideration of Upper Pleistocene Hominids from Yugoslavia", *American Journal of Physical Anthropology*, 44, pp. 127-134.

SMITH, F. H. (1984). "Fossil Hominids from the Upper Pleistocene of Central Europe and the Origin of Modern Europeans", in Smith, F.H. & Spencer, F. (eds) *The Origins of Modern Humans: A World Survey of the Fossil Evidence*, Alan R. Liss, New York, pp. 137-209

SMITH, F. H. & AHERN, J. C. (1994). "Brief Communication: Additional Cranial Remains from Vindija Cave, Croatia", *American Journal of Physical Anthropology*, 93, 275-285.

SMITH, F. H., BOYD, C. D. & MALEZ, M. (1985). "Additional Upper Pleistocene Human

Remains from Vindija Cave, Croatia, Yugoslavia", *American Journal of Physical Anthropology*, 68, pp. 375-388.

SRDOC, D., SLIEPCEVIC, A., PLANINIC, J., OBELIC, B. & BREYER, B. (1973). "Rudjer Boskovic Institut Radiocarbon Measurements II", *Radiocarbon*, 15(2), pp. 435-441.

SRDOC, D., SLIEPCEVIC, A., OBELIC, B. & HORVATINCIC, N. (1979). "Rudjer Boskovic Institut Radiocarbon Measurements II", *Radiocarbon*, 21(1), pp.131-147.

STRINGER, C. B. (1982). "Comment on Upper Pleistocene Evolution in South-Central Europe: A Review of the Evidence and Analysis of Trends", *Current Anthropology*, 23(6), pp. 690-691.

STRINGER, C. B. & GAMBLE, C. (1993). *In Search of the Neanderthals: Solving the Puzzle of Human Origins*. Thames and Hudson. New York.

VALOCH, K. (1968). "Evolution of the Palaeolithic in Central and Eastern Europe", *Current Anthropology*, 9(5), pp. 351-390.

VUKOVIC, S. (1950). "Paleolitska kamena industrija spilje Vindije", *Historijski zbornik* 1-4, pp. 241-256.

WOLPOFF, M. H. (1996a). *Human Evolution*. The McGraw-Hill Companies. New York.

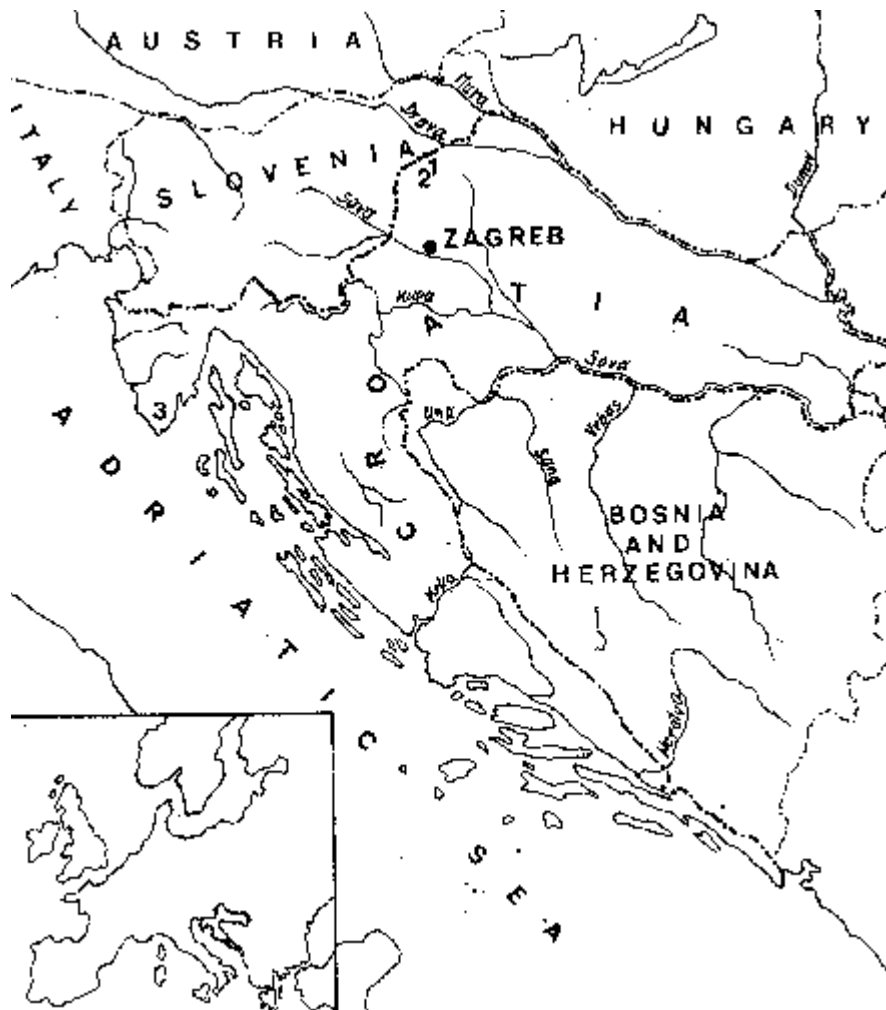
WOLPOFF, M. H. (1996b). "Neandertals of the Upper Paleolithic", in Carbonell, E. & Vaquero, M. (eds) *The Last Neanderthals, the First Anatomically Modern Humans*, Fundacio Catalana per la Recerca, Barcelona, pp. 51-76.

WOLPOFF, M. H., SMITH, F. H., MALEZ, M., RADOVICIC, J. & RUKAVINA, D. (1981). "Upper Pleistocene Human Remains from Vindija Cave, Croatia, Yugoslavia", *American Journal of Physical Anthropology*, 54, pp. 499-545.

ZUPANIC, J. (1975). "Petrografske karakteristike paleolitskih artefakata iz Sandalje II kod Pule I porijeklo kamene sirovine za njihovu izradbu", *Rad Jugosl. akad. znan. Umjet*, 383(18), pp. 187-218.

## The Early Upper Paleolithic of Croatia

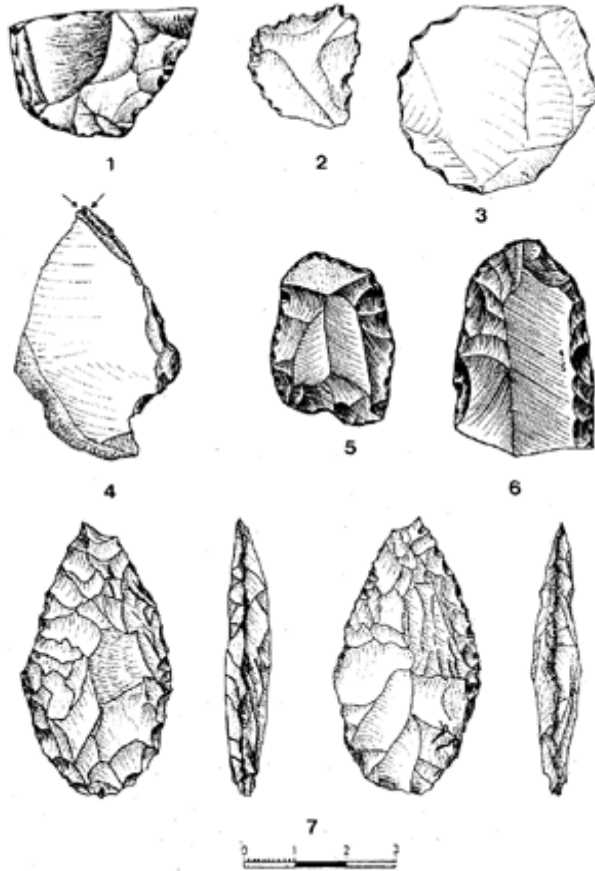
Figure 1. Important Early Upper Palaeolithic Sites of Croatia



1. Vindija, 2. Velika Pecina, 3. Sandalja II.

## The Early Upper Paleolithic of Croatia

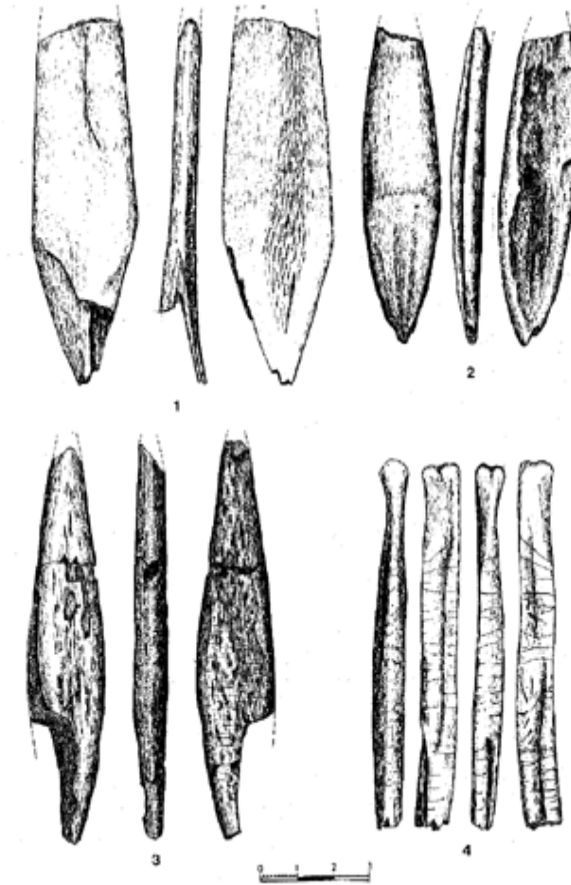
Figure 2. Selected Tools from Level G1, Vindija Cave



1. sidescraper, 2 and 3. denticulated pieces, 4. straight dihedral burin, 5. endscraper on flake, 6. endscraper on an Aurignacian blade, 7. leaf-shaped bifacial piece (modified after Karavanic 1994).

## The Early Upper Paleolithic of Croatia

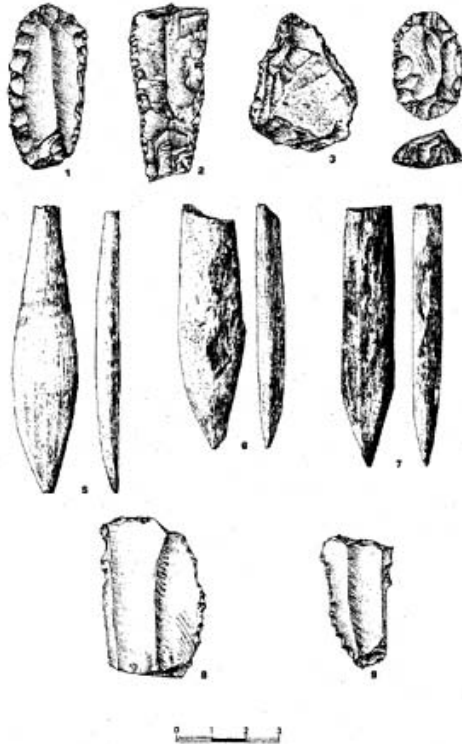
Figure 3. Selected bone Artefacts from Level G1, Vindija Cave



1. split-base bone point, 2 and 3. massive-base bone points, 4. bear baculum bone with carved circular markings (modified after Malez 1988).

## The Early Upper Paleolithic of Croatia

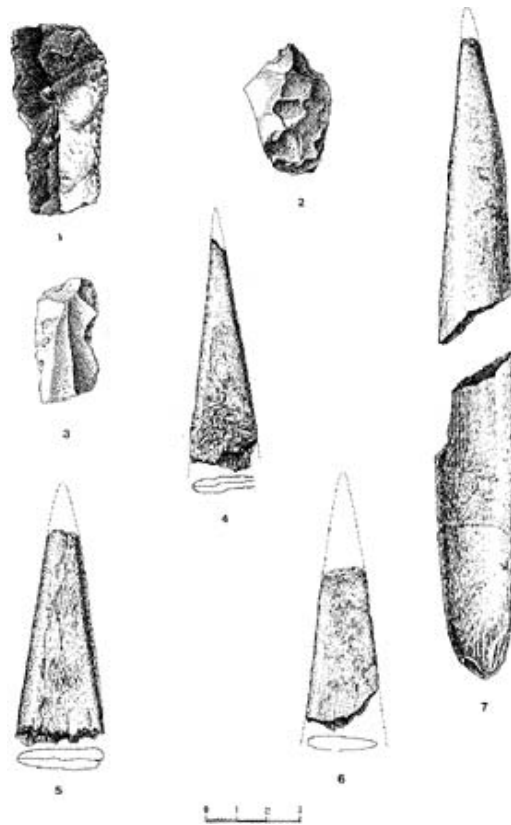
Figure 4. Selected Tools from Vindija Cave



Border of Complex F and Complex G: 1. endscraper on an Aurignacian blade, 2. Aurignacian blade, 3. flat-nosed endscraper, 4. double-ended endscraper, 5. massive base bone point; Level Fd/d: 6 and 7. massive-base bone points, 8. denticulated piece, 9. blade with an oblique retouched truncation (modified after Karavanic 1995).

## The Early Upper Paleolithic of Croatia

Figure 5. Selected Tools from Velika Pecina



Level J: 1. blade with two continuously retouched edges (with notch on left side); Level I: 2. drill, 3. endscraper on (broken) blade with a notch, 4-6. bone points (probably split-base). 7. massive-base bone point.