Research Article

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Main problems of the research on the Palaeolithic of Halych-Dnister region (Ukraine)

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Abstract: The article presents the results of the Palaeolithic loess sites studies in the Halych-Dnister region. It is an area in the Dnister River basin (Ukraine) with a large number of Middle and Upper Palaeolithic sites (Yezupil I, Halych I, Halych II, Mariampil I, Mariampil V, Mezhyhirtsi, Kolodiiv, Hannusivka, etc.), which have been discovered and studied including multilayered ones. It is open-air Palaeolithic sites related to widespread distribution in the region Pleistocene loess-palaeosol sequence reaching up to 30 m thickness, sometimes even more. Palaeolithic sites have been investigated using various field and laboratory archaeological and natural science research methods. Defined cultural horizons of the sites are stratified and dated by luminescent and radiocarbon methods, and their cultural identity is characterized. In the Halych-Dnister region, the most developed are the Middle Palaeolithic (Levallois, Micoquian) cultural horizons as well as the Gravettian techno-complexes of the Upper Palaeolithic. During our research, some scientific problems have been identified in studying the Palaeolithic sites of Halych-Dnister region. They are described in the article. As our practice has shown, issues such as the interpretation of the taphonomy and chronology of archaeological artefacts, the determination of the cultural identity of the archaeological site or particular cultural horizons, the underestimation of the redeposition of cultural layers, the role of palaeorelief and the deluvial–solifluction processes in it, the incompleteness of geological sections of archaeological sites are often debatable among researchers. In the light of the increasing anthropogenic impact on the environment, the issue of rationale, certification and protection of Palaeolithic sites is becoming more urgent. The main purpose of the article is to analyse these issues and find ways to resolve them.

Keywords: Pleistocene, loess-palaeosol sequence, archaeological sites, Palaeolithic, taphonomy, geochronology, Eastern Europe

1 Introduction

A lot of Palaeolithic sites are concentrated in Halych-Dnister region (Figure 1), a number of which were discovered by the authors and studied by stationary methods. First of all, it is a multilayered Palaeolithic, sites Yezupil I, Yezupil II, Yezupil III, localities Halych I, Halych II, Mezhyhirtsi, Mariampil V and others [1]. The sites of prehistoric settlers of Middle Dnister region were the main sources of information obtained through methods of archaeological science.

All sites are related to the Pleistocene loess-palaeosol sequence. We underline that they were studied comprehensively and interdisciplinarily with the participation of archaeologists, palaeogeographers, geomorphologists, stratigraphers, geophysicists, palaeobotanists, palaeozoologists and others. Geological sections and cultural horizons of archaeological sites were dated by radiocarbon and different luminescent methods. During the study of the sites, great attention was paid to the analysis of both palaeo and modern relief [2–4], the natural living conditions of the ancient man in the territory of Halych-Dnister region [5–9], the conditions of preservation and redeposition of cultural horizons, etc. [3,10,11]. During our research, we faced a number of challenges that complicate the interpretation of the obtained factual material. These problems deserve detailed discussion and further consideration. Analysis

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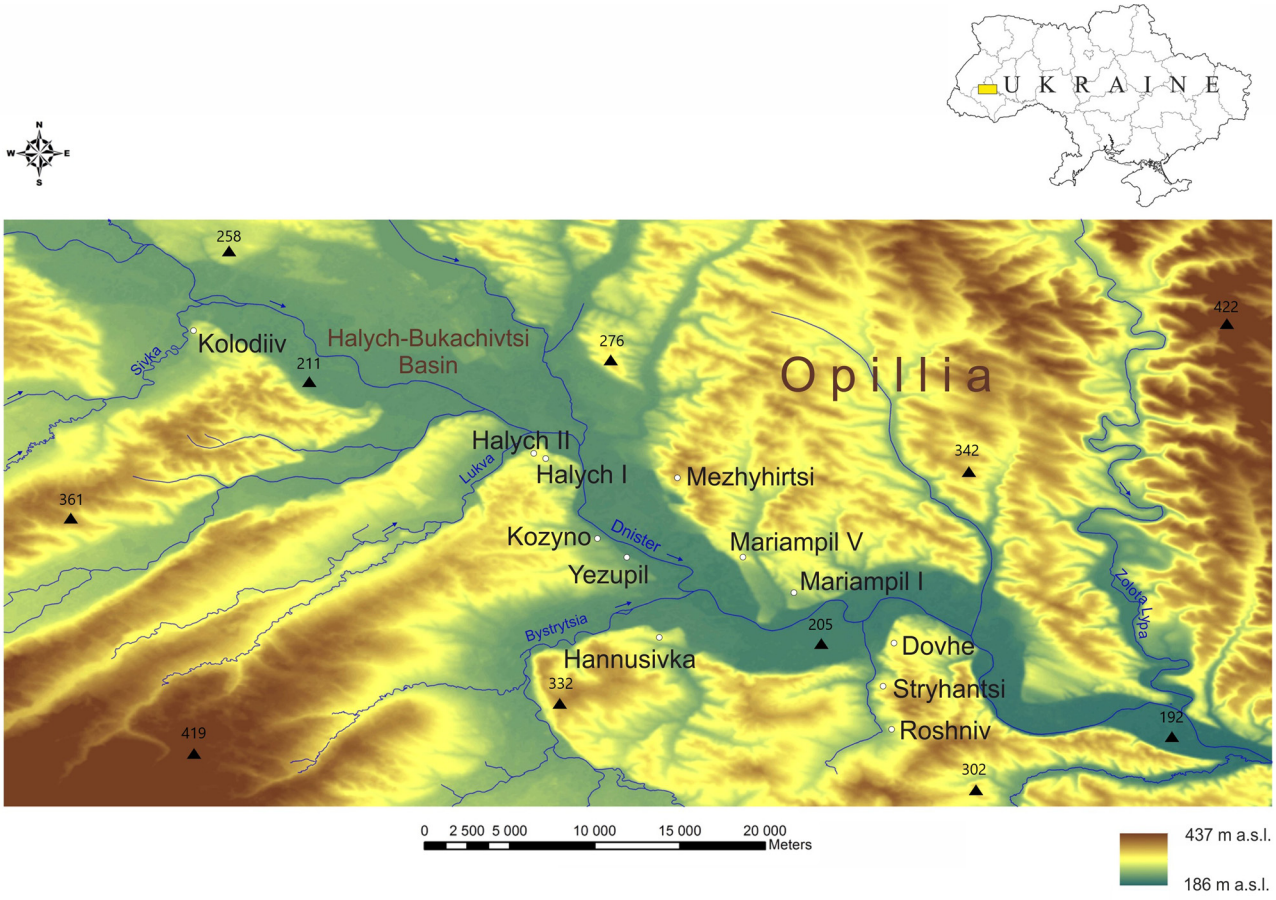

Figure 1: Palaeolithic sites of Halych-Dnister region (cartographic basis after [1]).

of these problems is the main purpose of the article. Most of them should be considered not only by scientists studying the Palaeolithic of Halych-Dnister region but also by researchers of other open-air sites of Palaeolithic settlers.

Based on many years of our experience in the study of Palaeolithic sites, we took into account the broad time frames of the Middle and Upper Palaeolithic periods as well as the complexity of problems under study. The last one includes, for example, the interrelations of prehistoric collectives that differed in material culture and sometimes in physical appearance. Therefore, it has appeared the need to use problem-chronological method to distinguish separate problems and their consistent solution.

Among the outlined problems are an explanation of the widespread distribution of Palaeolithic sites in the region, taphonomy of archaeological artefacts, problems of chronology, determination of the cultural identity of the archaeological site or particular cultural horizons; rationale, certification and protection of Palaeolithic sites; redeposition of cultural layers, the role of deluvial–solifluction processes in it; incompleteness of geological sections, insufficient study of palaeorelief, etc. These main problems are far from covering every possible detail in the list of important research issues that arise in the process of studying a particular cultural layer at a certain archaeological site or in the cultural and historical comparison of complexes of different geographical regions. The next sections of the article will discuss the following issues and possible solutions.

2 Study area

Halych-Dnister region is a terrain mainly in the Ivano-Frankivsk region and partly in Ternopil region of Ukraine (Figure 1). Its area is over 3,000 km^2. Halych-Dnister region is an area in the Dnister River basin that is located near the town of Halych, Ivano-Frankivsk region and includes some parts of such geomorphological units as Halych-Bukachivtsi basin, the Prednisterian Opillia, Prylukvynska, Krasnianska and Tlumach Uplands, etc.

The maximum points of absolute relief reach here 300–350 m a.s.l. and sometimes more. The amplitude of relative relief is 100–150 m and even more. In this region, the Dnister River forms a deep but not canyon-like valley, with a sizable wide multilevel floodplain, on which the large ample meanders are observed (Figure 2). Speed of the Dnister is considerable and often exceed 1 m/s.

The slopes of the Dnister valley are terraced [12]. Besides floodplain levels, all terraces have loess-palaeosol coverings of varying thickness, which are often well-stratified into separate loess and palaeosol

Figure 2: The Dnister River in the Halych-Dnister region: (a) a straight section of the river channel in a wide floodplain in the vicinity of Mariampil village (2015); (b) a meandering section of the river channel in a wide floodplain in the vicinity of Dovhe village (2011). Photos by O. Tomeniuk.

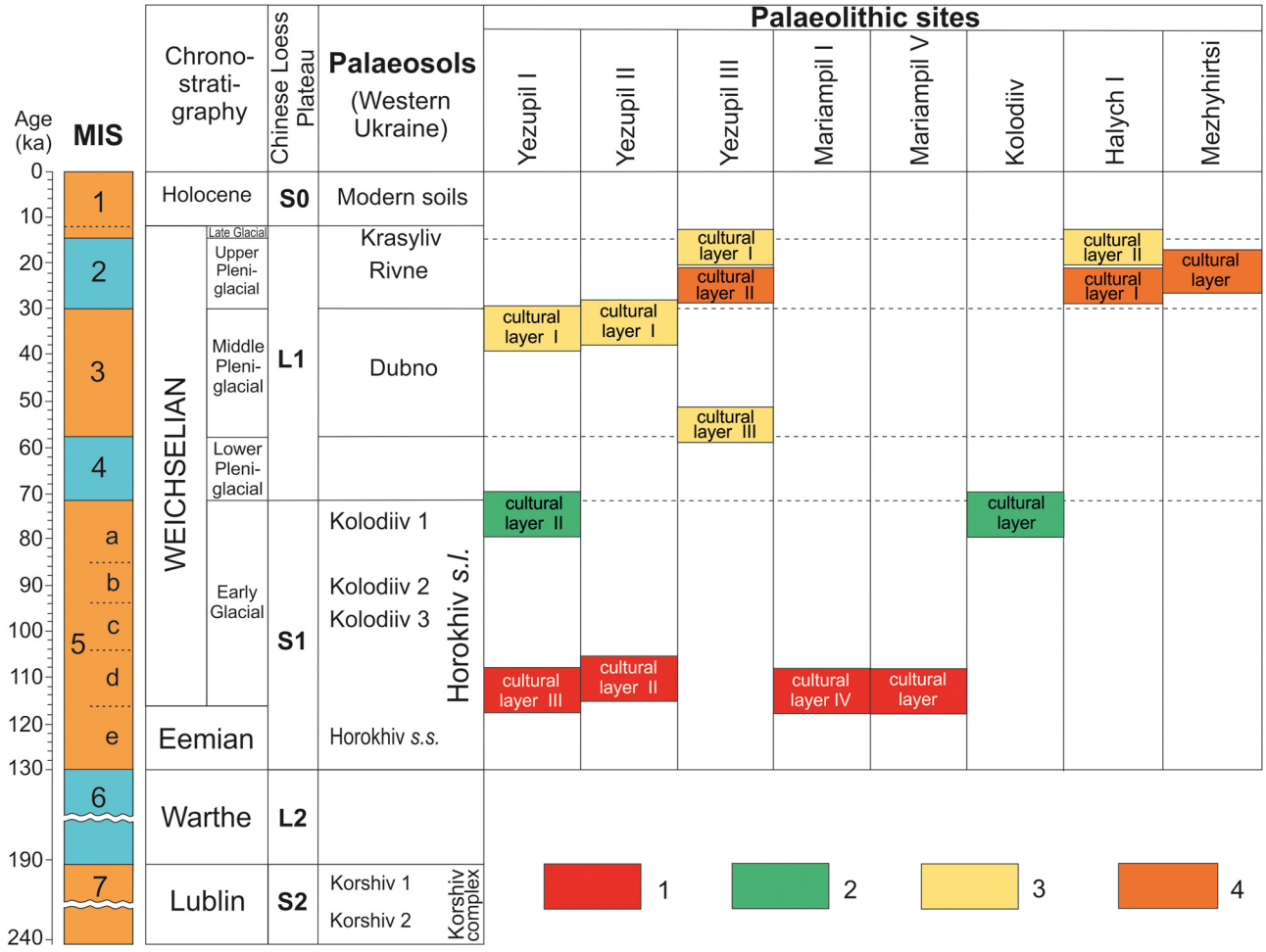

Figure 3: Palaeolithic sites of Halych-Dnister region: chronostratigraphy and cultures. 1–2 – Middle Palaeolithic (Mousterian: 1 – Levallois; 2 – Micoquian), 3–4 – Upper Palaeolithic (3 – Upper Palaeolithic undifferentiated; 4 – Gravettian).

horizons. The palaeosol horizons are sometimes combined into palaeosol complexes, including Horokhiv (MIS 5) and Korshiv (MIS 7) ones. For example, the Horokhiv palaeosol complex (Horokhiv *sensu lato*) is composed of a series of Kolodiiv stadial palaeosols and Eemian (Horokhiv *sensu stricto*) interglacial soil (Figures 3 and 4). Palaeosol horizons tend to have distinct genetic profiles. The loess horizons of the Pleistocene covers of Halych-Dnister region are often featured by substantial thicknesses, namely, the Middle Pleistocene Dnipro loess horizon is reaching the maximum (about 14 m) values within Ukraine in the Halych section [5]. Horizons of Upper Pleistocene loesses (sections Mariampil I, Halych IIC) are also very substantial (up to 20 m) [2,5]. It should also be noted that in the Halych section, the total thickness of the Pleistocene deposits is about 50 m, which is one of the largest for Volhyn-Podillia and adjacent areas of the Forecarpathians.

It is important that many of the loess sections of the Pleistocene of Halych-Dnister region contain one or more Middle and Upper Palaeolithic cultural horizons (Palaeolithic sites Yezupil I–X [6,10], Halych I–II [3,13,14], Mariampil I, V [2,4,15], Kolodiiv [16], Kozyno, Mezhyhirtsi [17], Hannusivka, Dovhe, Stryhantsi, Roshniv, etc. [18,19], see Figure 3). It suggests that Halych-Dnister region is one of the richest Palaeolithic centres of Ukraine. According to the available data, the settlement of this region by ancient people began more than 100 thousand years ago, which was contributed by the temperate climate and numerous river valleys. The last ones served as a path of migration for not only humans but also animals, which were relatively easy prey for Palaeolithic hunters.

Figure 4: Geological section of the Mariampil I Palaeolithic site (a) with the detailed structure of MIS 5 represented by Horokhiv fossil pedocomplex (b): 5a–c – Kolodiiv soils; 5e – Horokhiv *s.s.* (Eemian) soil. Photos by O. Tomeniuk.

3 Materials and methods

In the process of study sites of prehistoric settlers of Middle Dnister region, we pointed out several stages. During the first stage of surveys and stationary excavations, methods of field archaeology were used. Exploration of the sites was carried out by survey pits (or trenches) as well as by wide excavation areas. Our important task at this stage was to specify geographically the location of the identified sites and to define their outlines. We also conducted a detailed fixation of stationary objects (remains of hearths and stone knapping workplaces) as well as stone products, debris, osteological fragments, etc. Fixation was performed graphically and using photo and video equipment.

During the next stage of cameral processing of collected flint artefacts, we used formal-typological, statistical and comparative-typological methods [13,19]. The first two methods we applied for the creation of classification, detecting the most important and characteristic features of artefacts and to filter irrelevant ones. Subsequently, we used comparative-typological method for the cultural-chronological interpretation and searching for analogies.

During the study of geological sections of Palaeolithic sites in Halych-Dnister region, a number of natural science methods of research were applied for the complex characterization of the natural conditions of habitation of ancient people. Among them are lithological, stratigraphic, palaeontological (palaeozoological, palynological, palaeomalacological, ostracodological), geophysical (palaeomagnetic, electrical resistivity tomography), micromorphological, palaeocryogenic, geochemical, engineering geological, absolute dating methods (radiocarbon, different luminescence dating methods) and others [3,5–10,15,20–22].

A very important methodological aspect of our research is the comprehensive study of Palaeolithic sites by archaeologists and natural scientists using the geoarchaeological approach.

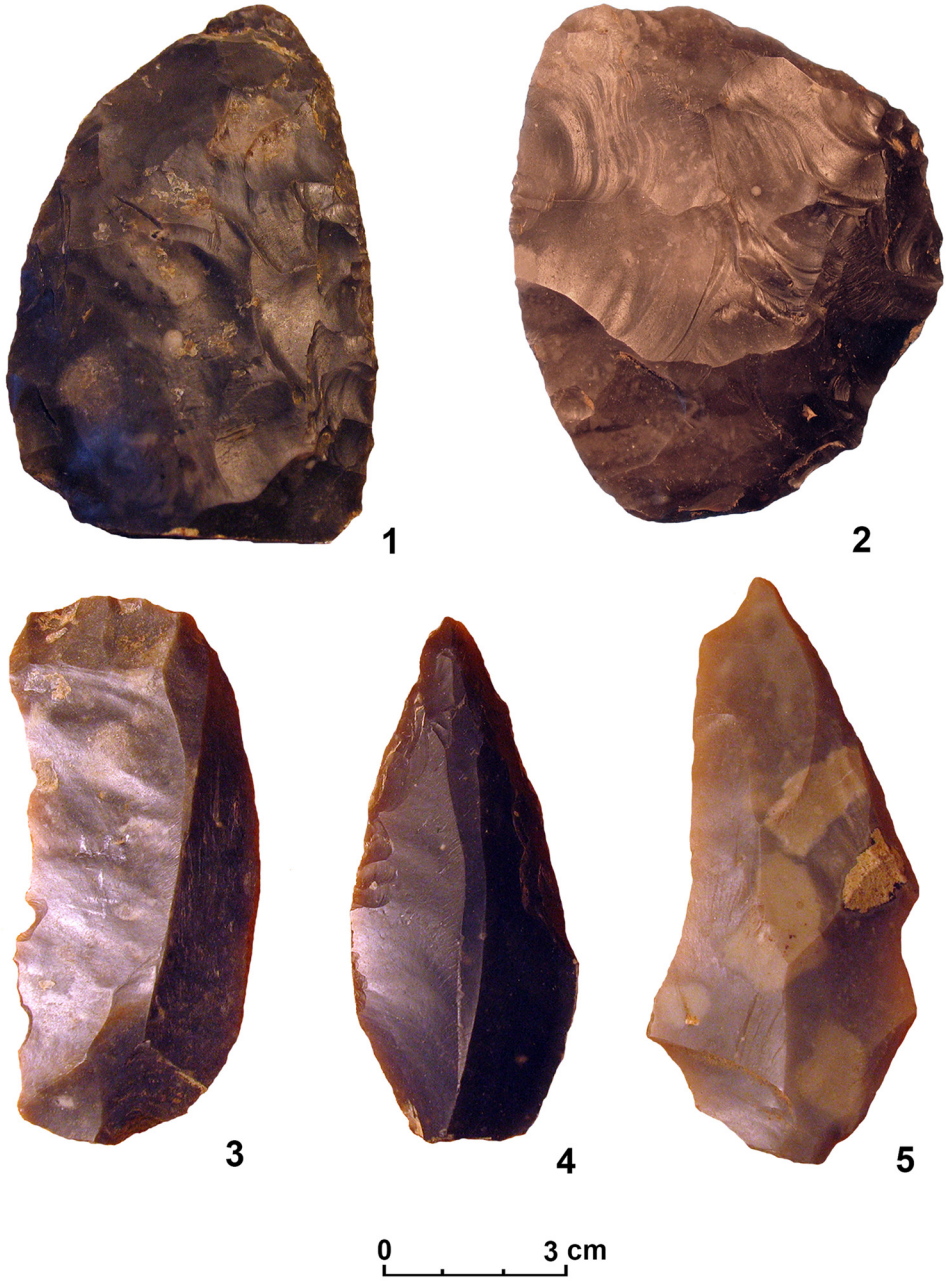

Figure 5: The Yezupil I site. Middle Palaeolithic. Artefacts: 1–2 – cultural layer II (Micoquian), 3–5 – cultural layer III (Levallois).

4 Results

In cultural and historical terms, Halych-Dnister region is located on the edge between Central and Eastern Europe, in close proximity to the Carpathians, which is very important for understanding the oldest settling of Eastern Europe, studying the migration routes of the Palaeolithic population, etc.

The oldest cultural horizons of the Palaeolithic sites of the region (see Figure 3) are Mousterian (Levallois, Micoquian). Stratigraphically, they are revealed in the sediments of the Horokhiv palaeosol complex (MIS 5), which has a complicated structure and is represented by a series of Kolodiiv stadial soils (5a–c) and Horokhiv *s.s.* (Eemian) interglacial soil (5e). This complex is most noticeably represented in the outcrop of Mariampil I site (see Figure 4), where almost all its components occur. The loess deposits of the Lower Pleniglacial (MIS 4) with a thickness of up to 2 m overlie the Horokhiv palaeosol complex. Artefacts of the Middle Palaeolithic (Micoquian)

are found only in the lower part of this loess deformed by deluvial–solifluction processes. Obviously, they are redeposited from the Horokhiv palaeosol complex.

In Halych-Dnister region, most of the Upper Palaeolithic cultures are still undifferentiated. Only the Gravettian sites are clearly identified (see Figure 3). Aurignacoid industries are found only in the Yezupil II site (cultural layer I), and Szeletoid ones are found in the Palaeolithic sites of Stinka I, II [19]. The Upper Palaeolithic cultural horizons of Yezupil I, II, III are associated with the Dubno palaeosol (MIS 3) and partly with loess overlying it (MIS 2). Gravettian cultural horizons are developed within the Rivne stadial soil at the sites of Yezupil III, Halych I and Mezhyhirtsi. The Final Palaeolithic artefacts have been discovered in the upper part of the loess MIS 2, just below the recent topsoil on the sites of Halych I and Yezupil III. Most likely, they are related to the Krasyliv sub-horizon, which was formed under conditions of the final Pleistocene active layer [23].

A number of traditions of flint-knapping were developed here (flake Levallois, blade Levallois, Eastern Micoquian – in the Middle Palaeolithic (Figure 5) [19]; Aurignacoid Eastern European industries, Eastern Gravettian – in the Upper Palaeolithic). In the Middle Palaeolithic on the territory of Halych-Dnister region, we can state the fact that a new centre of Mousterian sites has appeared. Two ways of development of the archaeological industries are outlined: unifacial Levallois (Yezupil I, cultural layer III; Mariampil I, cultural layer IV; Mariampil V) and bifacial Eastern Micoquian (Yezupil I, cultural layer II; Kolodiiv; possibly Bukvina V).

Investigated cultural horizons of the sites of the Middle and Upper Palaeolithic periods of Halych-Dnister region are characterized (see Figure 3). Middle Palaeolithic cultural layers were discovered on such sites as Yezupil I, Yezupil II, Mariampil I, Mariampil V, Kolodiiv. They represent Levallois and Micoquian flint-knapping technique.

The oldest cultural layers of Middle Palaeolithic (Levallois) are associated with the eluvial horizon of Eemian soil. Their age is determined by luminescent methods. On Yezupil I site, cultural layer III is dated to 108 ± 17 ka BP, 112.0 ± 11.2 ka BP [6]; on Yezupil II site, cultural layer II – to 120 ± 21 ka BP; on Mariampil I site, cultural layer IV – to 102 ± 16 ka BP [5]; the cultural layer of Mariampil V site is dated to 112 ± 13 ka BP [4].

The younger Middle Palaeolithic layer (Micoquian) was associated with the upper part of Horokhiv palaeosol complex *s.l.*, which is often solifluctionally deformed, and the lower part of loess L1 (MIS 4). On Yezupil I site, Micoquian is represented by cultural layer II that is dated to 78 ± 11 ka BP, 82.6 ± 9.0 ka BP [6], and on Kolodiiv site – to 92 ± 14 ka BP [9,16,24].

The earliest Upper Palaeolithic cultural layer related to the lower part of Dubno palaeosol (MIS 3), which is highly disturbed by deluvial–solifluction processes. The collection of artefacts is not numerous. On the base of its stratigraphic position, this horizon is dated in general to the initial phase of Upper Palaeolithic. Its age is 66 ± 7 ka BP [5]. Probably, it is significantly overestimated.

Upper Palaeolithic cultural layers of sites of Yezupil I (cultural layer I) and Yezupil II (cultural layer I) related to the upper part of Dubno palaeosol and partially to the bottom part of a MIS 2 loess. They are dated to 40 ± 5 ka BP, 39.7 ± 4.9 ka BP [6] and 36 ± 4 ka BP [25], accordingly.

Gravettian Palaeolithic horizons of the sites of the examined region are quite characteristic. They were revealed on such sites as Yezupil III, Halych I, Mezhyhirtsi and associated with Rivne stadial soil in a MIS 2 loess. For example, cultural layer II of Yezupil III site is dated to 27 ± 4 ka BP [26]; for cultural layer I of Halych I site 4, TL-dates were obtained in the range from 17.7 ± 2 to 20.1 ± 3 ka BP and 5 dates by ^{14}C method in the range from 23.5 ± 0.6 to 25.1 ± 0.45 ka BP [14]. For the main cultural layer of Gravettian site of Mezhyhirtsi, the following dates were obtained by ^{14}C method: 17.56 ± 0.27, 17.2 ± 0.25 [27], 20.36 ± 0.2 ka BP [17].

On the sites of Yezupil III and Halych I, Upper Palaeolithic horizons were discovered in the Upper Pleistocene loess directly under the recent topsoil. For this horizon (cultural layer II) of Halych I site, two dates were obtained: 13.4 ± 1.4 ka BP and 17.4 ± 2.6 ka BP [19].

5 Discussion

Based on many years of our experience in the study of Palaeolithic sites, the main problems of the research on the Palaeolithic of Halych-Dnister region are the following.

Explanation of the widespread distribution of Palaeolithic sites in the region and the need for their further study. A very interesting and problematic issue is the large accumulation of Palaeolithic, especially Upper Palaeolithic, sites in Halych-Dnister region. Indeed, only by our research in the vicinity of the locality of Yezupil (Tysmenytsia district, Ivano-Frankivsk region), ten Palaeolithic sites (Yezupil I-X) have been discovered on a small area of the fluvial terrace of Dnister. Why so? It

seems that the territory around Yezupil in the Dnister valley, at the confluence of the Dnister and Bystrytsya Rivers, played the role of a kind of transitional camp, where a large number of Upper Palaeolithic settlers clustered. Obviously, apart from the favourable climatic and geomorphological factors, which certainly influenced the settlement of the Palaeolithic communities, it is necessary to take into account the fact that not all the regions have been studied in the same detail. Future research will help clarify this issue. Furthermore, in addition to the new sites, we should also pay attention to previously discovered but not enough investigated ones. This is especially true of promising multilayered archaeological sites such as Mariampil I, which was discovered by Ukrainian geologist and archaeologist Yuriy Polańskyj in the 1920s [2,4,18].

Taphonomy of archaeological artefacts is the primary source of all the following problems related to the historical reconstruction of the original settlements and palaeolandscapes. The homogeneity of the complex of artefacts and accordingly their interpretation depend on the conditions for the conservation of cultural remains. The state of homogeneity (integrity or mixing of alien cultural components) affects the objectivity of the proposed historical reconstruction.

In situ (non-disrupted) nature of the cultural remains is a quite rare phenomenon for the Palaeolithic, especially for open-air sites on the slopes of river valleys and small flat-bottom valleys [19]. Some scientists suppose that there are no absolute *in situ* cultural layers of the Palaeolithic sites in the primary context at all. Even in stable complexes (for instance, caves), one way or another artefacts changed their original place of occurrence under the influence of gravity, flowing water, larger and smaller animals, etc. [28].

Regarding the Palaeolithic, the evidence of the partial *in situ* position of the cultural layer is the presence of remnants of the hearth – the lens of compressed ash (for example, the cultural layer III of the Yezupil I site [6]). It is also the presence of manufacturing centres – places of accumulation of a large number of flints and faunistic remains in artificially assembled complexes (for example, cultural layer I of the Halych I site [14]). Thus, at the investigated area of the cultural layer I of the Halych I site (Figure 6), more than 500 chaotically amassed different bones, which were preserved in whole or in a fragment, were revealed. These are mainly ribs, vertebrae, limbs of the young mammoth (at least five individuals), several reindeer bones and other Pleistocene fauna [29,30]. However, even in these rather unique *in situ* cases, special

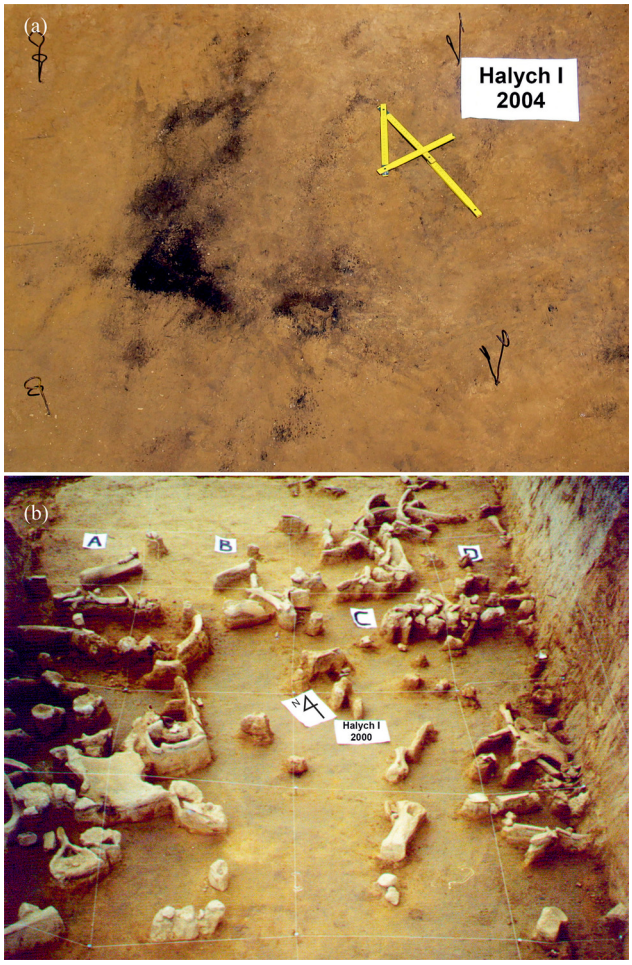

Figure 6: Palaeolithic site Halych I. The evidence of the *in situ* position of the cultural layers: (a) remnants of the hearth; (b) accumulation of a large number of flints and faunistic remains in artificially assembled complexes. Photos by O. Sytnyk.

attention should be paid to "extraneous admixture". They are artefacts that could get into the non-disrupted cultural layer as a result of the next stage of settlement or the occasional short-stay at the place of an already abandoned archaeological site [19].

Problems of chronology are in determining the exact time of existence of a Palaeolithic settlement/site. The dating of cultural horizons is complicated not only by the incompleteness of geological sections, their partial denudation or redeposition of some layers but also by the absence of methods of absolute dating of artefacts. Unfortunately, we are not able to date the flint items themselves in accordance with the time they were made. There are also problems with the dating of sediments containing Palaeolithic artefacts. For this purpose, radiocarbon and luminescence dating methods are most often used. As known, the use of the radiocarbon method is limited by the lower age line of approximately

50 thousand years, and the presence of organic residues in the cultural horizon is required. Luminescent (TL, OSL, IRSL) method date sediments, which contain cultural remains, do not always coincide with the time of the archaeological site's existence. Moreover, the accuracy of these dates depends largely on the natural factors of the sediments' formation. The problem is also that the results of dating the same samples in different laboratories or even in the same laboratory do not always coincide. As described earlier, a number of absolute dates were obtained for the cultural layer I of the Halych I site. ^{14}C-Dating of charcoals and bones was performed at the Kyiv Radiocarbon Laboratory (analyst: M. Kovaliukh), and five dates in the range from 23.5 ± 0.6 to 25.1 ± 0.45 ka BP were obtained. TL-dating was fulfilled at the Lublin laboratory (analyst: J. Kusiak), and the age of the cultural horizon varies from 17.7 ± 2 to 20.1 ± 3 ka BP. The "rejuvenation" of TL-dates compared to ^{14}C ones can be explained by the conditions of loess sedimentation. TL-dates outline the time of covering of artefacts with the following layer of loess dust [14]. In other words, using absolute dating requires careful analysis and correlation of data from different laboratories.

In the recent past, archaeologists have often used a comparative historical method of dating by leading types of inventory, which were specific for a particular chronological segment of the Palaeolithic [31]. However, today we are convinced of the unreliability and relativity of this method, which has been transferred from well-studied territories to the under-researched ones. Relative geological dating has a very wide time spectrum, but even it cannot be applied to the sites with redeposited cultural layers (unfortunately, which are prevailing).

We consider that the way of solving this problem is to extend comprehensive studies of Palaeolithic sites, attract highly qualified specialists from various fields of knowledge and cooperate based on the exchange of experience at the international level [3,6]. Equally important in resolving this problem is the improvement of techniques of absolute dating of the sediments as well as the parallel dating of samples in different laboratories.

Another important problem of Palaeolithic research is the *determination of the cultural identity of the archaeological site or particular cultural horizons*. Rejecting the term "archaeological culture" as a concept that included cultural (mainly technical and typological) features of sites in a particular chronological period in a certain territory, Ukrainian Palaeolithic archaeologists use Western European forms – the terms Levallois, Micoquian, Szeletian, Aurignacian, Gravettian, etc. without territorial-chronological restrictions, in a very broad conceptual context. In our opinion, this situation in the Palaeolithic is caused by the complexity of the concept of "culture" in relation to our distant ancestors, as well as the huge diversity of multicultural elements, often combined in one archaeological complex. Insufficiently developed (and most importantly – uncoordinated and unacknowledged) terminology and conceptual apparatus supplement this misunderstanding. Most of the technical and typological terms are subjectively applied; therefore, "cultural inferences" are predominantly subjective. Sometimes, it can be observed that one authoritative researcher attributes the same Palaeolithic complex to the Solutrean-Szeletian, the second one (no less respectful) – to the Aurignacian, and the third one – to the Gravettian. For instance, it regards the cultural layer X of the Molodovo V site.

The Palaeolithic sites of Halych-Dnister region provide material for discussing the genesis of bifacial flint-knapping industries in the region. Bifacial tools as an echo of ancient technical traditions often occur in the Upper Palaeolithic Dnisterian techno-complexes. Kulakovska [27] has noted that "the presence of bifacial tools in the Upper Palaeolithic of Dnister region is a widespread phenomenon that has not been clearly explained yet". In Ivano-Frankivsk region, bifacial tools are known at such localities as Mezhyhirtsi, Roshniv III, Horodnytsia, Hannusivka, Nezvysko, Unizh, Dubivtsi II, Havryliak, etc. [27]. The new Mousterian complexes of the Forecarpathian region confirm G. Grigorieva's view [32] that the bifacial points in the Upper Palaeolithic of Dnister region have a local genetic background dating back to the Middle Palaeolithic.

Rationale, certification and protection of Palaeolithic sites of Halych-Dnister region. In as much as the national regulations for the protection of archaeological sites in Ukraine are imperfect, a number of sites have been damaged or even completely ruined due to human economic activity. An example of a negative attitude towards the historical and cultural heritage is the Upper Palaeolithic site Mezhyhirtsi, which was rich in artefacts and fauna of vertebrates but was completely damaged by the quarry works carried out by PJSC "Ivano-Frankivsk Cement". One more example of disrespectful attitude to the archaeological heritage is the Halych I site, which was partially destroyed by the quarry of the brick factory and within which a "Kyivstar" mobile communication tower was built, etc. These and other Palaeolithic sites could have supplemented the list of tourist objects of the National Reserve "Ancient Halych".

One way or another, all the above-mentioned problems are based on a small number of well-preserved

and comprehensively studied sites and on the inconsistency of conceptual and terminological content, which provokes a different understanding of the same features and phenomena or the confusion of various technical, typological and cultural elements.

The natural scientists who study Palaeolithic sites together with archaeologists have no fewer problems (and they are not simpler). After all, a lot depends on the study of sediments containing cultural remains. In Halych-Dnister region, natural scientists have done a lot, but the difficulties and problems still remain. We will describe several of them and try to outline some aspects of their scientific solution.

Redeposition of cultural layers, the role of deluvial–-solifluction processes in it [11]. This problem is that there are essentially no cultural horizons left *in situ*. Deluvial–solifluction processes played a particularly important role in the redeposition of artefacts. They often took place in several phases; therefore, the deluvial–solifluction strata sometimes have a compound structure.

One of the examples of this problem is the redeposition of the artefacts on the Palaeolithic site Halych II, where Upper Palaeolithic artefacts sometimes lie directly on the surface of the Korshiv palaeosol complex (MIS 7), i.e., with a long-lasting break in sedimentation (see Figure 3). On this site, the lateral and vertical redeposition of the artefacts is so intense that it is difficult to associate them with specific cultural horizons. We are of the opinion that ancient people lived mainly during the warm periods, and the artefacts found in the deluvial–solifluction strata indicate their secondary (disrupted) position. When did this happen? New data on the almost complete structure of the Horokhiv palaeosol complex (MIS 5: a, b, c, d (?), e) in the excavation pit 6 of the Proniatyn site [33] and in the profile of the Mariampil I site (see Figure 4) [2] were obtained during our research. Also, the almost *in situ* Korshiv palaeosol complex (MIS 7) containing Middle Palaeolithic cultural layer on the Velykyi Hlybochok site [34] was discovered. All of this brings us closer to solving the problems of redeposition of cultural horizons because it allowed detailing its age.

As already mentioned, the problem of dating of cultural horizons is complicated not only by the absence of methods of absolute dating of artefacts but also by *the incompleteness of geological sections* (for example, as already noticed in the Halych II site [3]). The preservation of all stratigraphic horizons within the sections is an exception rather than the rule. Generally, scientists encounter stratigraphic breaks in sections, which in the case of a non-professional approach may lead to the false dating of the archaeological cultural horizons. In Halych-Dnister region, there is an uneven thickness of the same geological horizons in different profiles, even within the same archaeological site. For example, on the Mariampil I site, the Middle Palaeolithic cultural horizon is revealed in the eluvial horizon of the Eemian palaeosol that occurs at a depth of about 15 m, and the coeval cultural layer of the Mariampil V site, which is 2 km away, is at a depth of about 3.5 m. It should also be taken into account during the study of the Palaeolithic sites.

Another notable problem is *the insufficient study of palaeorelief*, which undoubtedly played a substantial role in the settlement of ancient people. Palaeorelief determined the development of deluvial–solifluction processes that influenced the location and preservation of cultural horizons. During the study of various Palaeolithic sites of Halych-Dnister region, we detected that ancient people, in choosing settlement place, preferred the terraced river valleys. These valleys provided access to water and served as routes for the migration of ancient people and animals. The presence of terraces elevated above the bottom of the valley was one of the factors in the selection of places – positions for monitoring animals. This fact facilitated the hunting, especially of large animals, what the palaeontological materials of the Halych I (see Figure 6), Mezhyhirtsi and other sites evidenced about. The climatic conditions within the river valleys were milder than on the watersheds. Enclaves of woody vegetation that could serve as protection against wind and so on often occurred here [35]. During the research of the Proniatyn Palaeolithic site on Podillia, we tried to show the importance of palaeorelief studying according to the setting problem [33].

Undoubtedly, these problems are the most pressing, but, in general, there are many more issues that are debatable. Evidently, all researchers of the Palaeolithic from different countries are facing some of the highlighted problems [28,36–38]. We believe that understanding these issues and taking them into account during the research will facilitate a more complete analysis of the obtained materials and bring researchers closer to solving them.

6 Conclusions

As a result of diverse analyses, cultural and historical comparison, we may conclude the originality of historical

Table 1: Main problems of the research on the Palaeolithic of Halych-Dnister region and possible ways of their solving

Main problems of the research on the Palaeolithic of Halych-Dnister region	Possible ways of solving these problems
Archaeological problems	
Explanation of the widespread distribution of Palaeolithic sites in the region	Solving this problem requires further study of new Palaeolithic sites in the region. This will allow reconstructing its settlement network and outlining possible ways of migration of the Palaeolithic population.
Taphonomy of archaeological artefacts	The solution to this problem is in a detailed assessment of the degree of homogeneity of cultural horizons. First of all, it includes the study of hearths, manufacturing centres, collections of faunistic remains, the presence of extraneous admixture, etc.
Problems of chronology	The interdisciplinary study of the Palaeolithic sites, the involvement of a large number of sediment dating methods and the use of its latest techniques are ways to resolve the problem.
Determination of the cultural identity of the archaeological site or particular cultural horizons	In Halych-Dnister region, the cultural horizons of the Middle Palaeolithic (Levallois, Micoquian) and the Gravettian ones are clearly identified. The issue of identification of other Upper Palaeolithic industries, in particular, Szeletian, Aurignacian, etc., some features of which are found in the cultural layers of the study area sites, remains problematic. Further research is needed.
Rationale, certification and protection of Palaeolithic sites of Halych-Dnister region	The solution to this problem is to cooperate with local governments and state institutions involved in the protection of historical and cultural heritage in order to give the Palaeolithic sites the status of natural and historical monuments.
Natural science problems	
Redeposition of cultural layers and the role of deluvial–solifluction processes in it	The solution to this problem is in determining the stages of development of geomorphic processes that caused the disturbance of Palaeolithic cultural horizons. Reconstruction of the palaeoenvironment will help to reconstruct the settlement phases on a particular site and allow avoiding mistakes in the interpretation of the *in situ* position of artefacts.
Incompleteness of geological sections	A detailed study of the Pleistocene cover of the region will allow correlating the stratigraphy of sections of various Palaeolithic sites and consequently their cultural horizons.
Insufficient study of palaeorelief	Little attention is currently devoted to this issue. However, the reconstruction of the palaeorelief will help in the study of slope processes that could affect the circumstances for the preservation of Palaeolithic cultural layers.

processes in Halych-Dnister region and, in general, in the Forecarpathians during the Palaeolithic period. This originality (autochthonous development) can be noticed since the Middle Palaeolithic when a single (presumably genetic) development of the Levallois communities existed, which was interrupted at the turn of formation of the Upper Palaeolithic tradition – 30–40 thousand years ago. Later, the Gravettoid, Aurignacoid and Szeletoid industries coexisted here. Subsequently, a distinct Gravettian techno-complex developed in the Dnister region.

A number of Middle and Upper Palaeolithic sites, including multilayered, have been comprehensively studied. For each cultural horizon, a stratigraphic position is determined, absolute age and cultural identity are given. In Halych-Dnister region, the most common are Levallois, Micoquian and Gravettian traditions of flint-knapping. The age of the oldest Palaeolithic (Levallois) cultural horizons in the region ranges from 102 ± 16 ka BP to 120 ± 21 ka BP. Micoquian is dated from 78 ± 11 ka BP to 92 ± 14 ka BP, and the Gravettian is varied from 17.2 ± 0.25 ka BP to 27 ± 4 ka BP.

The extensive experience of common archaeological and natural studies of Palaeolithic sites and Pleistocene sediments of Halych-Dnister region has made it possible to crystallise the following main problems of Palaeolithic research. They can be conditionally divided into two basic groups: archaeological and natural science (geological and geomorphological) (see Table 1).

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