The DFG research programme “ Functional variability in the Late Middle Paleolithic of the Crimea Peninsula, Ukraine” (1999-2006)

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Project overview compiled by Guido Bataille

Introduction

From 1999 to 2006 the Deutsche Forschungsgemeinschaft (DFG) provided generous funding for the research programme “Funktionale Variabilität im späten Mittelpaläolithikum auf der Halbinsel Krim, Ukraine“. Within the frame of this project, new investigations were undertaken at both recently discovered as well as at previously excavated sites; Middle Palaeolithic assemblages were analysed with respect to both their function and their position within Middle and Upper Pleistocene land use systems; and new investigations concentrated on aspects of chronology, palynology, micro- and macro faunal remains, and site formation. Participating institutions comprised the Crimean Branch of the Ukrainian Academy of Science in Kiev, the Southern Methodist University, Dallas and the Institute of Prehistoric Archeology, University of Cologne. Natural science contributions were undertaken by different researchers from institutions in Russia, Ukraine, Poland, France, Belgium, Great Britain, USA, Canada and Germany.

The Crimean Peninsula is situated in the northern part of the Black Sea. The present-day peninsula is situated between 32° 30’ and 36° 40’ longitude and 44° 23’ and 46° 10’ latitude, and covers an area of 25.727 km2 (FERRING 1998, 17). It is connected with the Ukrainian mainland by the small land bridge Perokop. The peninsula is the anticline of a tectonic uplifted land mass where the Eurasian and the Southwest-Asian continents collide. While two thirds of the land mass are flat with maximum elevations rarely exceeding 180 m a.s.l., the southern part of Crimea is dominated by the Crimean Mountains which reach their highest elevations in the southwest near Yalta. The Crimean Mountains in the south rise from the third ridge in the north to the main ridge in the south from approximately 300 m to more than 1500 m above sea level. The bulk of Palaeolithic sites is situated within the second ridge at an average height of 500 m a.s.l

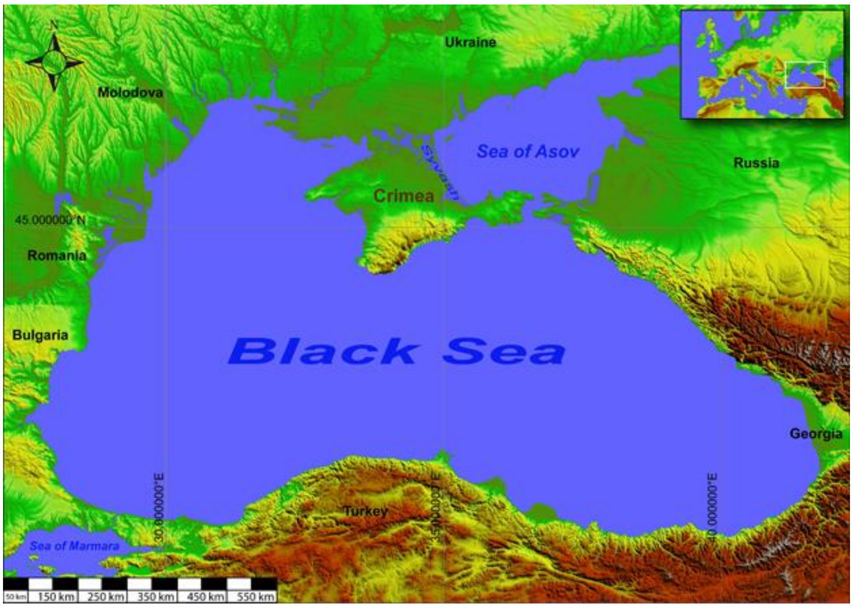

Fig. 1: The Crimean Peninsula.

Crimea comprises three geographical zones: to the north there extends an area of steppe, part of the southern Ukrainian steppe zone; to the south is the Crimean Mountain chain; and in the east lies the small Peninsula Kertsch which separates the Black Sea from the Sea of Azov, an area dominated by low hills with maximum elevations of 200 metres. Crimea is characterised by two dominant ecological zones: whereas in the northern lowland and Kertsch there is a dry temperate zone dominated by Artemisia steppe, along the southern littoral there prevails a subtropical Mediterranean zone with mild winters and dry summers. This zone is protected from the influence of continental climate by the interconnecting, up to 60 km wide Crimean mountain range which extends from the western shore eastwards for over 160 km. The currently prevailing natural vegetation in the region has been heavily modified by modern agriculture. However, original vegetation can be reconstructed on the basis of average annual temperature and precipitation values. The steppe region is today covered by grass vegetation. The third mountain ridge in the north is covered by broad leaved forests. The second ridge shows forest steppe at lower and grass steppe vegetation at higher elevations. The summits, the so called 'Yailas', are covered by grassy vegetation (FERRING 1998, 17 ff.).

A lot of information concerning the history of research of the Crimean Middle Palaeolithic presented in the following, comes from the up to now most complete synopsis of that topic published in English language by V. P. CHABAI (CHABAI 1998, 1-15). Crimea is after a more than 100 year long history of research a key region for Middle Paleolithic investigations. At present, around 35 stratified and 76 non-stratified sites are known. With only a few exceptions these sites are all situated within the second ridge of the Crimean Mountain chain. In the early 1990s four Middle Paleolithic industries were known (KOLOSOV, STEPANCHUK, CHABAI 1993): Ak-Kaya industry, Starosele industry, Kiik-Koba industry and Western Crimean Mousterian. Today researchers agree that Ak-Kaya, Starosele and Kiik-Koba industries are functional facies of the Crimean Micoquian, which is itself part of the greater Eastern Micoquian complex. The Crimean Middle Paleolithic sites seem to show a geographical and typological dichotomy: a Western Group associated with the Western Crimean Mousterian (WCM) and the Starosele industry, and an Eastern Group with the Ak-Kaya and the Kiik-Koba industry. The border is marked by the River Salgir which flows through the province capital Simferopol. Whereas the Western Group is characterised by more or less ephemeral stations and camp sites in accordance with the specialised hunt on cold adapted quarry, like wild ass (Equus hydruntinus) and Saiga Antelope (Saiga tatarica), the Eastern Group shows a combination of more diverse hunting fauna with intensively used camp sites and displaying such features as fire places and pits. Remarkably, new investigations at sites such as Kabazi II, Kabazi V and Karabi Tamchin have demonstrated that the spatial distinction previously considered charcacteristic of the different industries cannot be upheld; for example, Ak-Kaya assemblages are now known from Western Crimea (Kabazi II and V) and WCM assemblages from Eastern Crimea (Karabi Tamchin). Nevertheless, functional differences can be observed, possibly due to different seasonal occupations of the sites within land use systems and to varying distances of the sites to raw material sources (UTHMEIER 2006).

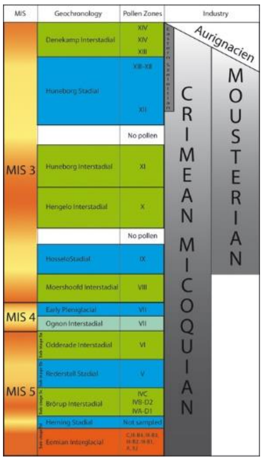

Fig. 2: Investigated archaeological sites and their location.

Research into the Middle Palaeolithic in Crimea commenced in 1879 with the investigations of K. MEREJKOWSKI, a young student from St. Petersburg. His excavations at Volchi Grot and Siuren 1 and 2 led to the recovery of Palaeolithic stone artefacts which he correlated with the Mousterian finds known at that time from France and Spain. Unfortunately, MEREJKOWSKI died, and this early, fruitful phase of research in Crimea came to a temporary end.

Research was not continued until the 1920s when G. A. BONCH-OSMOLOWSKI investigated important Middle Paleolithic sites at Volchi Grot, Kiik-Koba, Chokourcha, Shaitan-Koba, as well as the Upper Palaeolithic sites at Siuren 1 and 2. Especially Kiik-Koba was of importance, it yielding two archeological horizons with Micoquian assemblages associated with Neanderthal fossils and numerous fire places and pits. His investigations at altogether 10 Palaeolithic sites cumulated in a first chronological division of Crimean Paleolithic industries comprising three early stages (early amorph stage with irregular flakes, notches and denticulates; late Acheuléen/ Micoquien with regular flakes, points and bifacial tools; late Moustérien/ Abri-Audi with blades, end scrapers, burins and parallel cores) and two late stages (early Upper Paleolithic/ Aurignacien with carinated end scrapers and Dufour bladelets; Late Paleolithic/ Azilien with backed pieces/ “Federmesser”) (G.A. BONCH-OSMOLOWSKI 1934, cited after CHABAI 1998).

Following the Second World War the archeologist A. A. FORMOZOV continued Palaeolithic research in Crimea. Surveys led to the discovery of Kabazi I, Kholodnaya Balka, as well as the famous site at Starosele. In only five field campains FORMAZOV carried out extensive excavations at all these sites. Between 1952 and 1956 he excavated in just a few months in each field season an area of 250 m2 at Starosele, in doing so identifying two Middle Palaeolithic levels which yielded a total of 12.000 artefacts, 60.000 faunal remains, and 15 fire places. The discovery of the so called “child of Starosele” that FORMOZOV interpreted as Pleistocene remains, caused a scientific controversy. On the grounds of stratigraphical uncertainties FORMOZOV’s taxonomical classification was already being criticised in the 1950s by S. N. ZAMYATNIN, and in the course of new excavations under the direction of A. E. MARKS and V. P. CHABAI between 1993 and 1995 it could be shown that these remains in fact stemmed from a medieval cemetery (see below).

During the 1950s the view was established that different “archaeological cultures” persisted within a given region that were characterized by a specific style concerning lithic artifacts and which underwent a single chronological development. As a result “archaeological cultures” were understood as ethnic cultural traits. In this context FORMOZOV proposed a simple model of two ethnic units: one characterized by the presence of bifacial tools, another by the presence of simple tools with just a modification of the working edges (FORMOZOV 1954). In search of an appropriate descriptive system the type-list of F. BORDES (1961) was applied to the Palaeolithic of the Russian plain. KLEIN (1965) and GLADILIN (1966) emphasized that assemblages of the Crimean Middle Paleolithic were not in accordance with Western European typology due to the presence of deviating Eastern European point types. Thus, GLADILIN (1976) established a modified typology on the basis of the BORDES type list. He proposed altogether six middle Palaeolithic industries in accordance with the ratio of bifacial and denticulated tools, and the presence and absence of different core types (CHABAI & DEMIDENKO 1998, 35-38). This approach was broadly accepted by Eastern European scientists.

In the meantime, between 1969 and 1974, further Palaeolithic field work was undertaken in Crimea by Y. G. KOLOSOV. By concentrating on the upper slopes of the second ridge of the Crimean Mountains KOLOSOV discovered and partially excavated the abris Prolom I, Prolom II and Zaskalnaya IX, the collapsed rock-shelters Ak-Kaya III, Ak-Kaya IV, Zaskalnaya

III, Zaskalnaya V and Zaskalnaya VI, as well as the open-air sites Sary-Kaya and Krasnaya Balka. All these sites yielded stratigraphic sequences with archeological horizons characterised by bifacial tools (UTHMEIER 2006, 99 ff.). In layers III and IIIa of Zaskalnaya VI a total of five Neanderthal burials could be documented. At Zaskalnaya V Homo neanderthalensis remains were also found. These anthropological remains showed without any doubt that the Crimean Middle Palaeolithic, at least the Crimean Micoquian, was the product of Neanderthal groups.

From the 1980s KOLOSOV supervised new technological and typological investigations of assemblages from old excavations. Additionally, new excavations and surveys were undertaken which led to the discovery and partial excavation of such key sites as Kabazi II. In the 1980s some 100 sites were already known, among them multi-layered sites like Chokourcha 1, Zaskalnaya V and VI, and Kabazi II.

From the tail end of the 1980s the political change that swept eastern parts of Europe finally made possible collaborations with researchers from the USA and Western Europe. These culminated in new investigations in Western Crimea at such multi-layered sites as Kabazi II, Starosele and the newly discovered site Kabazi V. The result was a detailed revision of Middle Palaeolithic industries of the Crimean Peninsula (KOLOSOV, STEPANCHUK & CHABAI 1993). According to techno-typological criteria the Middle Paleolithic of Crimea has been attributed to three different Micoquian industries with bifacial tool types: Ak-Kaya, Starosele and Kiik-Koba. A fourth industry characterised by the absence of bifacial types and the presence of the Levallois method was defined as Western Crimean Mousterian (WCM). By the end of the 1990s, after new investigations in western Crimea, it became clear that Ak-Kaya, Starosele and Kiik-Koba were only facies of the same Micoquian industry; differences are due to different stages of reduction and the average ratio of different tool types (CHABAI 2004). A further industry is characterised by the absence of both bifacial technology and Levallois concept. It exhibits thick flakes which are the result of the exploitation of cores similar to discoidal cores. Up to now it is only known from level 3 of Starosele: the Starosele-level-3 industry.

Between 1993 and 1995 new excavations at Starosele directed by A. MARKS, and in association with M. OTTE, were undertaken to provide a reevaluation of the results from 1950s excavations. KOLOSOV's interpretation of the sediments as one geological unit bearing two archaeological horizons were shown to be incorrect. Altogether four archaeological horizons could be documented (levels 1-4) which could be attributed to the Starosele facies of the Eastern Micoquian (levels 1, 2, 4) and to the above mentioned Starosele-level-3 industry (level 3).

In the second half of the 1990s the focus of research turned to Eastern Crimea. The three multi-stratified Middle Palaeolithic sites Buran-Kaya III, Karabi Tamchin, and the already known site Chokourcha I, were investigated.

In 1990 first test pits were excavated at the rock shelter Buran-Kaya III by A. A. YANEVICH who had originally discovered the site. The excavations continued in 1996, 1997 and 2001 in a joint Ukrainian/ American project under the supervision of A. E. MARKS and A. A. YANEVICH, and in collaboration with M. OTTE from the Université de Liège (MONIGAL 2004). The stratigraphy of Buran Kaya III contains six archeological horizons (levels A, B, B1, C, D, E) that show interstratifications of both Middle and early Upper Paleolithic assemblages, and further layers most probably attributed to the Epi-Gravettian (levels 6-1, 6-2) (DEMIDENKO 2008). The Eastern Szeletian/ Streletskayan assemblage of level C, up to now the only known example in Crimea, is situated below an archeological horizon containing an assemblage that is attributed to the Kiik Koba facies of the Crimean Micoquian (layer B1).

In 1996 V. P. CHABAI and A. I. YEVTUSHENKO discovered the Middle Paleolithic site Karabi Tamchin, with Kiik-Koba, Kosh-Koba and Adji-Koba, one of the few sites situated in the third ridge of the Crimean Mountains (YEVTUSHENKO 2004, MARKS & CHABAI 2006). In the same field season they could detect the presence of in situ Pleistocene sediments at Chokourcha I.

Between the years 1999 and 2006 further investigations at Chokourcha I, Kabazi II, Kabazi V, Starosele, Karabai, Karabi-Tamchin etc. were undertaken in collaboration with the Academy of Science Kiew (Ukraine), the Southern Methodist University, Dallas (USA) and the Institute for Prehistoric Archaeology of the University of Cologne (Germany) in the course of the research project “Funktionale Variabilität im späten Mittelpaläolithikum auf der Halbinsel Krim, Ukraine” financed by the DFG (Deutsche Forschungsgemeinschaft). The field work was undertaken by the Ukrainian team under the supervision of V. P. CHABAI and A. I. YEVTUSHENKO.

In the course of the DFG research program assemblages from Kabazi II, Kabazi V, Starosele, Buran-Kaya III, Chokourcha 1 and Kiik-Koba were analysed according to functional and technological issues by the Cologne team under the supervision of J. RICHTER and T. UTHMEIER, the basis for the investigation of lithic assemblages being newly developed methodical approaches. In the course of Transformation Analysis the on-site transformation of different imported lithic raw material units (such as original cores or raw nodules) which constitute a given lithic assemblage is reconstructed. By means of the Analysis of Operational Chains the technological repertoire within a given industry is investigated. While the Transformation Analysis focuses on the on-site transformation of whole artefact assemblages, the Analysis of Operational Chains deals with the transformational changes within the biography of individual stone artefacts (for further methodological information please go to the page ‘Methods’).

After the Second World War the dichotomy of Moustérien and Micoquien industries in Western and Central Europe was explained as the material expression of two distinct cultural entities which were interpreted as different ethnic groups (BORDES 1961, BOSINSKI 1967). In the late 1960s this cultural view was rejected by L.R. BINFORD and S. BINFORD (1966) who proposed a functional explanation for the coexistence of different typological complexes of the French Moustérien. They assumed the distinctions between different industries as the result of different activities which resulted in the production of different tool types. In the 1990s RICHTER (1997) was able to attest the interstratification of both Mousterian and Micoquian assemblages in the upper layers ("G-Komplex") of the Sesselfelsgrotte in Southern Germany (Altmühltal, Bavaria). He gave a functional interpretation for the coexistence of Mousterian and Micoquian inventories due to the time of occupation and the resulting reduction of lithic artefacts.

The target aim of the DFG-research project was to cope with functional variability of the Crimean Middle Palaeolithic. This question is due to investigations of the last fifteen years that lead to the conclusion of the high variability of Middle Paleolithic inventories which is in parts the result of time and season of occupation and the function of a given site. Different parameters of the natural environment and the cultural behavior of the concerned Neanderthal groups have been taken into consideration to develop models of late Middle Palaeolithic land use strategies.

Guido Bataille

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Objectives of the research programme

Crimea is an exceptional region for the investigation of late Neanderthal behaviour. Together with Southern Spain it is the region with the youngest Middle Palaeolithic sites: the Middle Palaeolithic of Crimea finds its end during Denekamp Interstadial (e.g. Buran-Kaya III, Level B/B1, Kabazi II, Level A3A) parallel to the occurrence of early Aurignacian occupations in the same region attested at the multi-layered site Siuren 1. The research programme's aim was not only to describe and compare these late Middle Palaeolithic assemblages which span a time from the Eemian Interglacial till Denekamp Interstadial, but also to reconstruct and explain the evolution of specific types of assemblages (CHABAI ET AL. 2002, 442 ff.). Between 1999 and 2006 the German Research Foundation (Deutsche Forschungsgemeinschaft / DFG) brought forward the research programme *"Functional Variability in the late Middle Palaeolithic at the Crimean Peninsula, Ukraine"* which was carried out in cooperation between the Institute of Prehistoric Archaeology of the University of Cologne and the Crimean Branch of the Ukrainian Academy of Sciences in collaboration with the Southern Methodist University in Dallas (Prof. A. E. Marks).

The research programme, targets to focus on the functional variability of the 'material culture' of late Neanderthals. Research over the last 15 years has emphasized the high variability of Middle Palaeolithic assemblages which is due to the time of occupation, the site function and the annual season. The fundamental cultural interpretation of Middle Palaeolithic variability ("Inventartypen sind Einheiten in Raum und Zeit"; "techno-complexes are temporal and special" units / Bosinski 1967) during the second half of the 20th century produced in many cases contradictions. Before this background, research not only has to describe and to compare the evolution of different techno-complexes, but also to explain it as detailed as possible. By reclining concepts of Systems Theory, the research programme was targeting to put into context all measureable parameters determined by culture and environment. The research programme is not only focused on regional studies of a key area of Palaeolithic research. On a bigger scale it is aiming to point out new perspectives for the Palaeolithic Archaeology. *(research aim of the research programme quoted after the application in 1999)*

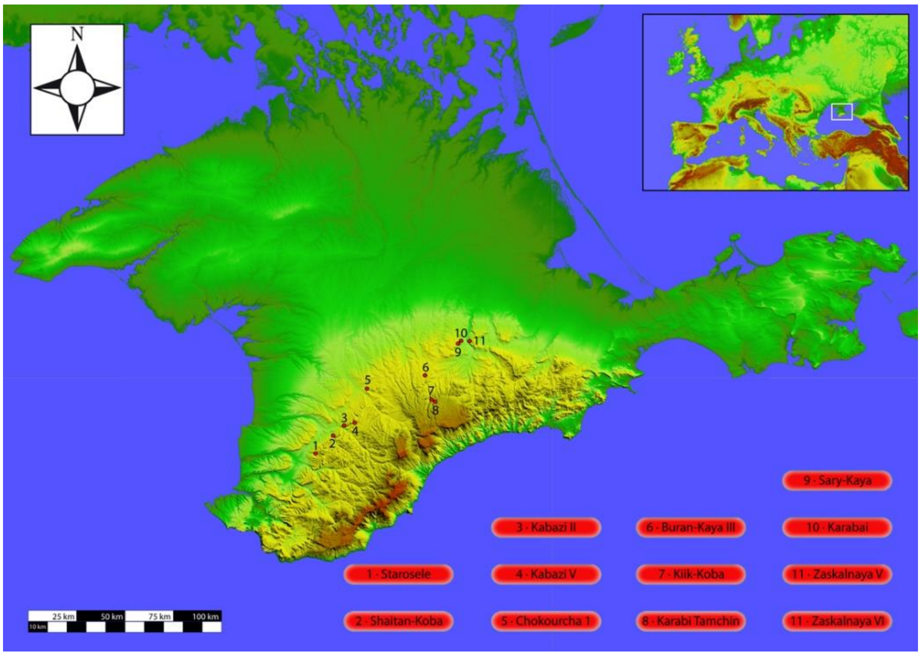

Fig. 1: Map of Crimean Middle Palaeolithic sites of Crimea mentioned in this text (BATAILLE 2010).

There are excellent archaeological, environmental and topographical conditions on the Crimean Peninsula to follow the research aim. Not at least, since more than 100 sites with assemblages of late Neanderthals are known until today. On one hand, those sites are distributed over approximately the same height, within the internal second ridge of the Crimean Mountain Massif which falls in southeast-northwest direction from more than 1545 m a.s.l. to only 200 m a.s.l. On the other hand, these sites cluster in two regional "groups" west and east of the river Salgir which crosses the Province capital Simferopol in north-south direction. The "eastern group" is characterized in most cases by a divers hunting fauna whereas the "western group" shows in most cases a limited fauna with a specialized hunt on wild ass (*Equus hydruntinus*) and Saiga antelope (*Saiga tatarica*). These palaeo-environmental conditions enable the researchers to obtain information by investigating significant sites of both "regional groups" in order to find answers to the above mentioned research target. Within the research programme those sites were investigated which represent the different cultural entities, the different environmental zones and the resulting ecological areas (eastern and western group) of Crimea (CHABAI ET AL. 2002, 442). At some of those sites excavations were conducted under the direction of V. P. CHABAI and A. I. YEVTUSHENKO. The methods of the research programme had a twofold aim: 1) excavations of new and old sites and 2) analyses of the archaeological material to describe the functional variability of these assemblages by means of attribute analysis carried out by the Ukrainian team and of the new methodological approaches Transformation Analysis and Reconstruction of Operational Chains ('Arbeitsschritt-Analyse') carried out by the German team (Methods).

Excavations in the course of the research programme (1999-2006)

The basis of information concerning activities conducted in the course of the DFG-research programme reported in the following, is the unpublished *"Final Report 2006"* of the research programme written by Th. Uthmeier (2007) and is in parts quoted as literal translation not further indicated by citations.

Excavations were conducted at the six Middle Palaeolithic multi-layered sites Kabazi V, Kabazi II, Chokourcha 1, Sary-Kaya, Karabai I and Karabi Tamchin. Altogether 109 archaeological assemblages embedded in these sequences were excavated during the summer campaigns between June and September of every year (**Fig. 1**).

Sites	**Excavation Area in m^2**	**Number of archaeological horizons**	**Number of excavated artefacts**
Sites of the "Western Group"			
Kabazi V	34	21	308.396
Kabazi II	22	36	1.355
Sites of the "Eastern Group"			
Chokourcha I	12	20	9.089
Sary-Kaya	6	6	586
Karabai 1	70	16	3.177
Karabi-Tamchin	24	10	22.829
Total		**109**	**345.432**

Tab. 1: Excavation activities in the course of the research programme "Functional variability in the late Middle Paleolithic of Crimea Peninsula, Ukraine" financed by the German Science Foundation (DFG) (after UTHMEIER 2007).

Sondages and more extensive excavations were carried out according to lithological layers. Additional, geological and archaeological layers were subdivided. The excavated sediment was sieved with 5 mm and 1.5 mm screens. All artefacts, pebbles, faunal remains and rock slabs bigger 3 cm were measured three-dimensionally. Together with structures like pits, fireplaces or discolourations those pieces were drawn in a scale of 1:10 in surface and profile maps.

Sites of the 'Western Group'

In the course of the research programme excavations were carried out at two important multi-layered sites of the 'Western Group': Kabazi II and Kabazi V. Both sites are situated at Kabazi Mountain, only 200 m away from each other. Kabazi II and V exhibit stratigraphies which inherit Micoquian and Mousterian occupations (Fig. 1). In Kabazi II Micoquian archaeological layers can be found in the lower units (Unit IIA/4 – VI) and Mousterian archaeological layers in the upper units of the sequence (Units II - IIA). In contrast to that, in Kabazi V interstratifications of Micoquian (Sub-Units III/5, III/2, III/1) and Mousterian (Sub-Unit III/3, Unit IV) archaeological layers could be observed.

Kabazi V

The rock-shelter site Kabazi V is situated above the Kalinovaya Balka, a tributary of the river Alma at the eastern part of the Kabazi Massiv. In 1983 the site, which was exposed in the course of construction works, was discovered by Yu. ZAITSEV. In 1986 a test pit and following excavations of 12 m^2 dimensions were carried out under the direction of Yu. KOLOSOV and V. CHABAI without reaching whether the rock-shelter's back wall neither the bed rock (YEVTUSHENKO 1998). In the course of the excavations a 1 m grid-system was established and orthogonally oriented towards the visible wall of the cliff. During the 1990 excavation campaign the grid system had to be changed since it became clear that the back wall of the rock-shelter, which was localized about two meters away from the original test pit, was oriented in an angle of 90° to the cliff (CHABAI 2007).

During the campaign of 1986 the sequence was separated within four geological units which were separated from each other by layers of debris from different rock fall episodes. Within these units few horizons with Middle Palaeolithic artefacts were recognized. According to their setting within the geological units these horizons were separated into four archaeological horizons. According to the Middle Paleolithic nomenclature of this time the three upper layers were associated with the Starosele industry (today Starosele facie of the Crimean Micoquian). The assemblage of the lowest recognized layer was too small for a secure techno-typological assignment.

In 1990 the excavations were continued under the direction of V. P. CHABAI and A. I. YEVTUSHENKO. The presence of four geological units could be verified. The both upper units (Units I and II) were further separated and supplemented by horizons I/A and II/A. Unit II was subdivided in accordance with different lenses of stone artefacts and faunal remains into different archaeological levels which were subdivided by sterile strata from each other (sub-units II/3, II/4, II/4a). Due to the presence of different structures like fire places and pits these sub-units were interpreted as *in situ* (YEVTUSHENKO 1998, 273). In the course of the same campaign the rock shelter's back wall and the bed rock were reached.

In the years 1993 and 1995 the excavations were continued under the direction of A. I. YEVTUSHENKO (YEVTUSHENKO 1998a, 274). During these field seasons the trench of the

1990 campaign was deepened in order to properly document the known lower Units II and III and to collect samples in order to achieve material for age determination. Furthermore, a small area of the 1986 campaign was excavated. Altogether seven additional archaeological horizons were exposed (Sub-Units II/4a, II/7, III/1, III/1a, III/2, III/3 and III/4). In contrast to earlier assumptions, some archaeological layers were recognized as the result of post-sedimentary processes. The layers of Units I, I/A and II/A as well as the upper section of Unit II (Sub-units II/1 and II/2) within the main excavation area were disturbed by slope erosion.

In the course of the DFG-research program further excavations were carried out between 2002 and 2003 in cooperation between the Crimean Branch of the Academy of Sciences of Ukraine and the Institute of Prehistoric Archaeology of the University of Cologne. The excavations were directed by V. P. CHABAI and A. I. YEVTUSHENKO. The excavation target in the course of the DFG-research program was the exposure of bigger connected excavation surfaces and artefact clusters. Altogether, 34 m^2 were opened and excavated down to the bed rock at a depth of 7 m.

The geological and lithological history can be summarized as follows. The site formation was strongly influenced by two phases of rock fall. Before the first rock fall episode the natural inclination was too steep for anthropogenic usage. After a first phase of accumulation of collapsed rocks and debris a part of the surface was levelled – afterwards it transformed into the intensely frequented area in front of the rock-shelter. The roof of that rock-shelter collapsed and a second phase of deposition of debris destroyed this area. Archaeological horizons with artefacts deposited in primary position were solely found between those later on partially altered boulders of those two phases of rock fall. The lower section below the debris of the first rock fall episode was sterile. In the upper section of the stratigraphy 10 lithological layers could be determined consisting of colluvial sediments and thus bearing only re-deposited artefacts. 21 of the archaeological horizons have a thickness between 10 and 12 cm and stretch across the complete area in front of the rock-shelter (AH III/1B, III/1, III/1A, III/2, III/5-3B1, III/5-B2).

Those sediments bear between 6.000 and 47.000 artefacts. Fireplaces were fed by wood or mammoth bones. Another important class of features are pits. The high number of artefacts and the presence of latent structures speak for intensive occupational occurrences. In comparing those observations with detailed archaeozoological investigations at least a part of the excavated horizons more rich in archaeological finds turned out to be palimpsests of several occupations. For instance, diverging states of preservation and times of death for the two most numerous taxa of Level III/2 *Saiga tatarica* and *Equus hydruntinus* could be attested (PATOU-MATHIS 2007, 105f.). This evidence proves two different hunting events during two different annual seasons – one in connection with hunt on Saiga antelope and another event connected with the hunt on Equides. Archaeozoological investigations were conducted on inventories of Units III and

IV which inherit assemblages of both Crimean Micoquian and Western Crimean Mousterian industries (PATOU-MATHIS 2007, 97ff.). To shortly summarize the results, usually the body parts of high nutritional value stemming from animals killed and butchered pre-site were brought to Kabazi V.

It is likely that the more thick archaeological layers are the result of recurrent occupations, while thin artefact lenses represent single events which were separated from each other by thin sterile sediments (UTHMEIER 2007). These small lenses are characterized by clear borders of artefact distribution and a weak thickness (1-2 cm). Nevertheless, pits were features of those ephemeral artefact clusters. The pit of Level III/4-2 is very particular: the remains from the production of a bifacial tool were found here. A nearly complete refitting of the production process consisting of numerous chips and flakes was undertaken by A. VESELSKY. This refitting made possible a replica of the missing foliate (VESELSKI 2008a).

In Kabazi V archaeological horizons bearing assemblages attributable whether to Crimean Micoquian or Western Crimean Mousterian industry are interstratified: Crimean Micoquian assemblages occur within Sub-units III/1, III/2 and III/5, while Western Crimean Mousterian inventories were localized in Sub-unit III/3 and in Unit IV (Sub-units IV/1, IV/2, IV/3 and IV/4) (VESELSKY 2008b, CHABAI 2008c, DEMIDENKO 2008, YEVTUSHENKO 2008, CHABAI 2008b). At the same time most archaeological horizons of Sub-Units III and IV of Kabazi V show affinities with both industries. In many archaeological horizons both techno-complexes occur at the same occupational surface (e.g. Sub-units III/7, Unit IV) (VESELSKY 2008c, 391 ff., CHABAI 2008b, 421f.). This led to the conclusion that some of these layers are the result of palimpsests by Mousterian and Micoquian occupations (CHABAI 2008b, 421f.). Other archaeological horizons, like the two layers of Sub-unit III/6 were exposed to natural taphonomical processes which caused vertical mixing. The co-occurrence of Mousterian and Micoquian attributes was interpreted as “the remnants of a number of eroded Micoquian and WCM occupations” (CHABAI 2008a, 374 f.).

First absolute dates have been obtained in 1996/8: RINK ET AL. measured samples by ESR and MSUS and McKINNEY measured samples by U-series. RINK ET AL. gave age determinations for horizon III/1 of 26-32 ka BP (94301 IIA, 94303 IIA, 94303 IIIA) and for the stratigraphical lower horizon III/1A of <41 ka BP (94301 IIIA) (RINK ET AL. 1998, 339). In contrast to these dates, McKINNEY’s age determinations of four tooth enamels coming from layer III/1 obtained by Uran-Thorium gave a much older age: 73.3±6.0 ka BP (59-300-E-1; 210-300-E-3; 64-304-E-3; 214-312-E-3; 202-311-E3) (McKINNEY 1998, 351). During field campaign 2004 a series of samples was taken for OSL, TL and AMS determination in the course of the Natural Environment Research Council’s EFCHED initiative which gave different results (HOUSLEY ET AL. 2007, 51 ff.). In general, Luminiscence data for Unit III gave ages between 60 ka and 100 ka BP, the ages for Unit IV range around 200 ka BP.

The dating of the site can be summarized as follows (UTHMEIER 2007):

- The sedimentation of most archaeological horizons occurred under Stadial conditions which encompass a phase with Interstadial conditions (AH Level III/5-3B1).
- Absolute dates correlate the warm phase with Hengelo-Interstadial.

Archaeological Horizon (AH)	Number of Artefacts	Geological Horizon (GH)	Classification
Level III/1B	10.555	Geological Horizon (GH) 12	Crimean Micoquian
Level III/1	47.884		
Level III/1A	22.668		
Level III/1C	4.173		
Level III/2	10.046		
Level III/2A	2.786		
Level III/3-1	4.032		Western Crimean Mousterian
Level III/3-1A	2.108		
Level III/3-1B	260		
Level III/3-1C	232		
Level III/3-1D	226		
Level III/3-2	1.990		
Level III/3-2A	612		
Level III/3-3	2.653		
Level III/3-3o	188		
Level III/3A	3.666		
Level III/4-1	13.094		Crimean Micoquian / Western Crimean Mousterian
Level III/4-2	10.779		
Level III/4-3	5.911		
Level III/4-4	5.851		

Level III/4-5	7.646		
Level III/4-6	5.119		
Level III/5	619		
Level III/5-1A	9.745		
Level III/5-1	10.236		
Level III/5-1B	5.702		
Level III/5-2-1	1.808	Geological Horizon (GH) 12A	Crimean Micoquian
Level III/5-2	15.154		
Level III/5-3	25.801		
Level III/5-3B	18.247		
Level III/5-3B1	3.465		
Level III/5-3B2	14.135		
Level III/6-1-2	7.740	Geological Horizon (GH) 14	
Level III/6-3	1.474		
Level III/7-1	3.809		
Level III/7-2	4.264		
Level III/7-3	250		
Level 3RF	1.006		
Level IV/1	12.994	Geological Horizon (GH) 14A	Western Crimean Mousterian
Level IV/2	5.488		
Level IV/3	3.808		
Level IV/4	172		
	Total 308.396		

Tab. 2: Kabazi V. Summary of artefacts in archaeological horizons (AH) and their classification (after UTHMEIER 2007).

Kabazi II

The open-air site Kabazi II is situated at a height of 90 m a.s.l. at the right bank of the Alma River at the southern slope of the Kabazi Massive. This cuesta belongs to the second ridge of the Crimean Mountains. "The site is on the upper part of the slope, 90 m above the Alma River channel, and 70 m from a limestone cliff which towers 33 m over the site" (Chabai 2005, 1f.).

Its stratigraphy, which is the longest Upper Pleistocene one in Eastern Europe, was accumulated by series of rock-falls, alluvial and pedogenic processes. During the Last Interglacial a nearly 12 m high limestone block collapsed from the towering rock wall. This boulder was deposited outside the southernmost edge of the later accumulated artefact concentrations where it functioned as sedimental trap. Due to that, between rock wall and bolder a 14 m deep stratigraphy of sediments was preserved (CHABAI 2005, 4ff.). At a height of 280 m and 270 m a.s.l the remnants of a third terrace of the Pleistocene Alma River could be determined, while the lowest occupation of Kabazi II, which was not affected by natural dislocation processes, was discovered at an elevation of 290.9 m (Chabai 2005, 1f.). The lowermost archaeological horizons (Unit VI) could be found in sediments belonging to Eemian Intarglacial (MIS 5d). Due to its high temporal depth (Eemian Interglacial till Denekamp Interstadial), the deposition of various in-situ assemblages and the good preservation of faunal and palynological remains Kabazi II is among the most instructive Middle Palaeolithic sites in Europe. The stratigraphy has its base within the fluvial sediments of the Alma in a depth of minus 14 m. Within 26 lithopedological strata 76 archaeological levels could be determined, 55 of them in primary position (CHABAI 2005, CHABAI 2006).

First sondages were carried out in 1986. The following excavation campaigns were continued until 1994 by the Academy of Sciences of Ukraine in cooperation with different partners. In the course of the excavation campaigns 1993 till1995 the surface was expanded to 22 m^2. In the course of the research program new excavations started in 1999. At this point of time the upper section with geological horizons 2 till 10 had already been excavated over 60 m^2. 22 archaeological horizons were embedded within those geological strata. Except few layers, which were classified as belonging to the Crimean Micoquian situated in the lower section of Unit IIA, all discovered assemblages of Units II and IIA were attributed to the Western Crimean Mousterian. Additionally, some test-pits were dug up-slope in order to clarify the situation of the youngest layers.

The excavations done in the course of the research program led to the following results (after UTHMEIER 2007):

1. The archaeological sequence ends with Denekamp Interstadial. Younger Pleistocene colluviums could not be trapped anymore by the now completely covered limestone block.

2. The archaeological sequence starts at the end of the last Interglacial.

3. Altogether 31 archaeological horizons in primary position could be documented within Units III, IV, V and IV (Tab. 3).

4. A change is attestable within the archaeological sequence of Kabazi II: unifacial assemblages of the Western Crimean Mousterian are represented in the upper section of the sequence – this facie first occurs in Kabazi II during Hosselo Stadial before 45.000 uncal. BP (Level IIA/2). The older assemblages of the lower section can be attributed to the Crimean Micoquian characterized by bifacial technology – in Kabazi II this facie starts in Eemian Interglacial and ends in Moershoofd Interstadial.

5. Most of the archaeological layers yield the remains of killing-butchering sites for the dismemberment of hunted Equus hydruntinus individuals. During the glacial periods complete family herds were killed and meat bearing parts were exported to near-by residential camps. Beside traces of dismemberment of hunting fauna only the oldest layers in the Eemian period militate in favour for the on-site consumption of parts of wild ass individuals. For the Western Crimean Mousterian Level II/8 (Hengelo Interstadial) the presence of a fireplace beside the excavated area was assumed – this could indicate on-site consumption of game (PATOU-MATHIS 2006, 37ff.).

Archaeological Horizon (AH)	**Number of Artefacts**	**Pollen**	**Classification**
Level III/4	47	Rederstall (?), Pryluki $_{\text{pl1b2-b1}}$	Crimean Micoquian
Level III/5	70		
Level III/6	90		
Level III/7	79		
Level III/8	55		
Level III/8A	57	Brörup, Saint-Germain I, Pryluki $_{\text{pl1b1}}$	
Level III/8B	51		
Level III/8C	41		
Level III/8D	34		
Level III/8E	33		

Level IV/1	redeposited		not classifiable
Level IV/2			
Level IV/3			
Level IV/4			
Level IV/5			
Level V/1	268	Tyasmin, Herning Stadial	Crimean Micoquian
Level V/2	87		
Level V/3	17	Eemian (E6b)	
Level V/4	10		
Level V/5	17		
Level V/6	28		
Level VI/1	17	Eemian (E6a), Kaydaky $_{kd3b2+c}$	
Level VI/2	15		
Level VI/3	21		
Level VI/4	13		
Level VI/5	10		
Level VI/6	39		
Level VI/7	17		
Level VI/8	25		
Level VI/9	35		
Level VI/9A	30		
Level VI/10	13		
Level VI/11-14	124		
Level VI/15	7		
Level VI/16	3		

Level VI/17	2		
	Total 1.355		

Tab. 3: Kabazi II. Number of artefacts within the archaeological horizons (AH), and their temporal and vegetational classification (After Uthmeier 2007).

Sites of the 'Eastern Group'

Four Middle Palaeolithic sites investigated in the course of the research program belong to the 'eastern group': Chokourcha I, Sary-Kaya, Karabai and Karabi Tamchin. Due to economical and ecological questions the multi-layered site Karabi Tamchin is of special interest, since it belongs to the few examples of sites situated within the main ridge of the Crimean Mountains at an altitude of around 750 m a.s.l. Moreover, this site is quite remote from water and lithic raw material sources what has implications on the composition of lithic and faunal assemblages.

Chokourcha I

The rockshelter site Chokourcha I is situated in the north-eastern suburbs of the Crimean provincial capital Simferopol. It is located at the foot of a 20 m high limestone cliff in the Second Ridge of the Crimean Mountains. The rockshelter faces to the north about 8 m above the present level of the Malyi Salgir, a small tributary of the River Salgir which crosses Simferopol. A relatively large area of 30 x 40 m is located in front of the rockshelter. The rock shelter's back wall is situated approximately 75 m away from the present river (CHABAI 2004, 343ff.).

Intensive excavations have already been carried out in the first half of the 20th century by N. L. ERNST and by B. I. TATARINOV. The site was first investigated by the local amateur archaeologist S. I. ZABNIN in 1927. He excavated a test pit in which he found archaeological remains (ZABNIN 1928, after CHABAI 2004, 344f.). The excavation of 1928-31 carried out under the direction of N. L. ERNST showed intensive occupations in the area in front of the cave entrance. He distinguished five archaeological horizons with altogether three Middle Palaeolithic horizons (Layers 2, 3, and 4). The upper layer contained Holocene Sediments with four archaeological horizons attributed to Bronze Age and the medieval time. The layer below the Bronze Age layer and the uppermost Middle Palaeolithic horizons of Layer 2 was sterile. ERNST subdivided four Pleistocene layers (Layers 2-5). The diverging degree of ashy remains within layers 2, 3 and 4 was the base for the subdivision of those layers which were all separated by sterile deposits of "cemented silt" (CHABAI 2004, 344f.). The lowermost Layer 5 was described as free of artefacts. Outside the rock shelter area more pronounced numbers of big limestone blocks could be documented. *"One of them, found 'on the border between Layers 3 and 4', which covered about 50 square meters of the site area (Ernst 1934:189, 190). (...) Based on the 50 m^2 block and the cliff wall configuration, Ernst decided that the Chokourcha I shelter had a* *quite different shape before the series of rockfalls which destroyed it"* (CHABAI 2004, 344f.). Due to that, ERNST concluded that the site originally must have been a cave.

Unfortunately, apart from the preliminary report mentioned above, nothing is known about these extensive excavations since the documentation as well as all faunal remains and most of the lithic artefacts got lost during the Second World War (CHABAI 2004, 343f.). However, the schematic profile drawings of the three Pleistocene layers subdivided by ERNST (1934) indicate features like fireplaces and lenses that have not been recognized during the excavation. Due to that, in 1996 a test pit with an extension of 12 m^2 was established within the preserved sediments. During this campaign, only the lowermost layer of Ernst's excavations was still preserved. During the following excavation campaign, this profile section could be subdivided into 24 geological layers, bearing 21 archaeological horizons (Tab 4). The high stratigraphical resolution is due to recurrent flooding events by the nearby situated river, which caused a regular covering of the area in front of the cave with fine-grained sandy sediments. At the same time, the presence of numerous fireplaces with preserved charcoal remains speaks for a low current velocity. Due to that, most of the horizons could be found in primary position. All assemblages can be attributed to the Crimean Micoquian. The lithic raw material was brought to the site from sources of 30 km distance. Level IV-O delivered a radiocarbon age of (OxA-10877) > 45.500 BP. The analysis of faunal remains indicates at least one occupation during springtime. The presence of individual game of Saiga tatarica and Equus hydruntinus implies a specialized hunting strategy well known for other sites of Crimea. Nevertheless, important differences can be seen. Saiga antelopes and wild ass show unusual low individual numbers per archaeological layer. At the same time, old animals are overrepresented. Moreover, the preserved skeletal elements of mammoth, red deer and bovid emphasize scavenging of already dead animals as additional nutritional resource.

Archaeological Horizon (AH)	**Number of Artefacts**	**Classification**
Level IV-A	79	Crimean Micoquian
Level IV-A2	82	
Level IV-B	442	
Level IV-D	52	
Level IV-F	908	
Level IV-G	264	
Level IV-I	2.144	

Level IV-I2	264	
Level IV-K	89	
Level IV-L	88	
Level IV-L2	166	
Level IV-M	1959	
Level IV-N	95	
Level IV-O	2.038	
Level IV-P	15	
Level IV-Q	123	
Level IV-S	104	
Level IV-T	8	
Level IV-U	128	
Level IV-V	41	
	Total 9.089	

Tab. 4: Chokurcha I. Overview of artefacts in archaeological horizons (AH) and their vegetatio-historical classification (After Uthmeier 2007).

Sary-Kaya

The open-air station Sary-Kaya is situated at the feet of a steep rock wall. This cliff is part of the Second Ridge of the Crimean Mountains and closes the escarpment (cuesta) to the south. In the course of first excavations under the direction of Y. G. KOLOSOV between 1976-1977 and 1985-1986 a surface of 300 m^2 was excavated. In order to test the few unpublished informations concerning stratigraphy and archaeological horizons in summer 2004 a sondage of 6 m^2 extension was deepened till a depth of 5 m. Thus, the stratigraphical resolution could be improved. Instead of two, five archaeological horizons could be determined (Tab. 5). The oldest layers (AH Level III, Level IV and Level V) are embedded in sediments, which were exposed to soil formation processes. Probably we are dealing here with the end of the Last Interglacial (MIS 5a). The two younger archaeological horizons (AH Level I and II) were embedded in Loesses, most probably from the beginning of the Last Glacial.

Archaeological Horizon (AH)	Number of Artefacts	Datation
Level 0	5	Holocene
Level I	247	1. Glacial Maximum
Level II	164	
Level III	103	Eemian Interglacial
Level IV	14	
Level V	53	
	Total 586	

Tab. 5: Sary Kaya I. Overview of artefacts in archaeological horizons (AH), their datation and classification (After Uthmeier 2007).

Karabai I (Kara-Bey)

The site Karabai I is situated approximately 2 km south-east of the small village Mironovka in the northern part of the second chain of the Crimean Mountains. At the upper border of a dry valley, which today seasonally drains the precipitations from the plateau into the river Bijuk-Karasu, a sequence with Palaeolithic finds was cut by heavy rain falls in 2001. First sondages gave sight onto a spacious area (Karabai I) in front of a big partially collapsed rock shelter (Karabai II). The area in front of the rock shelter was excavated during three summer seasons under the direction of A. I. YEVTUSHENKO and V. P. CHABAI. Due to its wide extension Karabai I can be understood as an open-air site. Two trenches were excavated. The first one, situated in the southern area of a fireplace, was excavated till a depth of -4 m on a surface of altogether 56 m^2. A second trench was dug with a maximum depth of 4.5 m and an extension of 14 m^2 in the west. The oldest archaeological assemblages were found in Last Interglacial sediments. They are covered by numerous soil horizons alternating with Aeolian deposits. Those altogether 11 archaeological horizons (AH's Level 2 till 7-29) embedded in Last Interglacial sediments, which are separated by sterile deposits from each other, are of special interest (Tab. 6). The more comprehensive assemblages of Levels 3-2, 4-1, 4-2, 4-3 and 5-1 are characterized by bifacial tools and belong to the Crimean Micoquian. We can assume the same for the smaller assemblages with less numerous surface shaped tools. Where those pieces are missing, the waste of surface shaping gives distinct hints on the presence of bifacial technology. The bifaces were either transported to a not excavated part of the site or exported off-site. Only the assemblages of AH Level 2 can be attributed to the Western Crimean Mousterian.

Archaeological Horizon (AH)	**Number of Artefacts**	**Excavated area (each level)**	**Datation**	**Classification**
Level 0	7	56 m^2	Holocene	n.a.
Level 1	8		Glacial	
Level 1A	10			
Level 2A	21			
Level 2	131		Archaeological horizons in primary position: Eemian Interglacial	Western Crimean Mousterian
Level 3-1	184			Crimean Micoquian
Level 3-2	287			
Level 4-1	571			
Level 4-2	767			
Level 4-3	331	40 m^2		
Level 5-1	474			
Level 6-1	210	33 m^2		
Level 6-2	142			
Level 7-1	15	6 m^2		
Level 7-2	14			
Level 7-3	5			
	Total 3.177			

Tab. 6: Karabai I. Diagram showing the sizes of investigated excavated surfaces of archaeological horizons (AH), the numbers of artefacts, the classification and dating of these horizons (After Uthmeier 2007).

Karabi Tamchin

Karabi Tamchin is with 740 m a.s.l. the most elevated Middle Palaeolithic site of Crimea known today. It was discovered by A. I. YEVTUSHENKO and V. P. CHABAI in 1996. There is only one other highland site, admittedly with Palaeolithic artefacts in mixed stratigraphic context: the cave site Adji-Koba. “All other known highland locations are open air find-spots near the meteorological station on Karabi Yaila, and on Yaltinskaya Yaila” (Yevtushenko et al. 2004, 278 f.). Karabi Tamchin is situated at the north-eastern edge of the Karabi Yaila, the largest Plateau of the Main Ridge of Crimean Mountains which is located 30 km east of the Crimean provincial capital Simferopol. Karabi Tamchin is a collapsed rock shelter with original dimensions of 18 m to 6 m. The rock shelter opens to the northwest in the direction of the Adijiskli Valley which is crossed by the Tamchin, a tributary of the Burulcha River. This canyon-like valley is cut into the plateau. The nearest known raw material sources are situated more than 30 km away from the site.

In the same year of discovering, a first sondage of 2 x 1 m extension was dug which brought to light first Middle Palaeolithic artefacts. The sediments could be separated into five lithological strata in which four archaeological horizons were embedded with Middle Palaeolithic and faunal remains (YEVTUSHENKO ET AL. 2004, 278). Between 1999 and 2001 a trench with the extension of altogether 27 m^2 was opened in the central part of the site. Thus, most of the formerly rock shelter area could be investigated and a stratigraphy of 1.5 m thickness was recovered.

The stratigraphy bears 10 archaeological horizons, which are usually separated from each other by thin sterile layers of limestone debris. Irrespective the Holocene finds from the recent humus of AH Level 0 there are some small assemblages which, due to processes of mechanical mixing and displacement, cannot be interpreted (Levels I/A, I, II/1 and II/2) (YEVTUSHENKO ET AL. 280ff.). On the contrary, five archaeological horizons gave enough data. Archaeological horizons Level V and Level IV/2 are characterized by bifacial tools and typologically are associated with the Crimean Micoquian industry. Level IV/A, which is embedded between the lowest horizons with artefacts of the Crimean Micoquian, exhibits an assemblage that is attributed to the Western Crimean Mousterian. At the top of the sequence there are inventories belonging to the Western Crimean Mousterian, as well (Levels II/2 and III) (Tab. 7). After Kabazi V, also Karabi Tamchin inherits interstratifications of both important Middle Palaeolithic entities. At Karabi Tamchin we are dealing with functional identical or similar occupations in greater distance to raw material sources. The weak artefact densities in all layers and the composition of the hunting fauna in different horizons, which is characterized by a high diversity in connection with a small number of individuals, militate in favour for small functional differences between these layers. This is interpreted as a result of ephemeral occupations, in connection with the opportunistic hunting events on single animals in the vicinity of the site. The following dismemberment and consumption took place *on-site*.

The stone artefacts of the undisturbed Levels II/2, III, IV, V/1 and V/2 show similarities concerning the small sizes of blank products and cores. Another common feature is the nearly complete absence of primary cortical flakes and only a few examples of blank product partially covered by cortex (CHABAI ET AL. 2002, 446 ff.). At the same time many tools and resharpening flakes could be observed within all mentioned assemblages. Due to that, it is obvious that at least a part of the tools was produced pre-site, imported and rejuvenated on-site. The similarities between these assemblages can be explained by raw material scarcities – the imported raw material of Karabi Tamchin derives from a source which is located 20-25 km away from the site (CHABAI ET AL. 2002, 446).

Environmental reconstructions by the analysis of molluscs and small mammals indicate a mixed vegetation of open steppe and forest-steppe around the plateau. Different from deeper elevated areas of the Crimean Mountains, the grasses, which were the preferred diets of the herbivores, were, due to the high elevation, present later in the year. Following this argument, occupations more likely occurred at the end of the warm season. Although environmental data show chronological differences, climatic oscillations did never cross the border of the climatic tolerance of the big mammals. For instance, Levels III and IV were deposited under warm Interstadial conditions while Level II/2 was accumulated in a much colder environment. The absolute dating of the archaeological horizons is problematic. Due to the unpronounced thickness of the sediments, data based on ESR and Uran-Thorium could not be obtained. Thus, only ^{14}C dates are available (YEVTUSHENKO ET AL. 2004, 281ff):

AH Level III	(OxA-10883)	>42,400 uncal BP	($\delta^{13}C$ = -19.8%)
AH Level IV/2	(OxA-10884)	>41,200 uncal BP	($\delta^{13}C$ = -20.1%)
AH Level V	(OxA-11387)	>29,800 uncal BP	(δ^{13C} = -21.2%)
AH Level II/2	(TO-10990)	26,640±210 uncal BP	($\delta^{13}C$ = -25%)
AH Level II/2	(TO-10991)	28,720±240 uncal BP	($\delta^{13}C$ = -25%)

Due to the low degree of collagen of the bone samples, the dates obtained for Level II/2 are considered as minimum ages. Sediments, molluscs and small mammals speak for an accumulation of Levels II/2, III and IV/2 under Interstadial conditions. For Level II/2 a chronological setting in the Arcy (Denekamp) Interstadial seems to be most appropriate. Respecting sedimentology, Levels III and IV/2 do not belong to the same Interstadial. Nevertheless, the represented small mammal taxa speak for a comparably contemporary deposition of those Levels, possibly during Hengelo Interstadial. In contrast to that, Level V is possibly much older, though it gave a quite young radiocarbon-age: the presence of the primitive small mammal *Ellobius talpinus* gives hint to a hiatus within the sequence, which possibly reaches the Last Interglacial. Such a long hiatus is indicated by the presence of the weathered surface between the breccias-like horizon 7c, which yields Level V, and the upper layers. Level V can be best settled in a broader time range between the Last Interglacial and one of the Early Glacial Interstadials (Amersfoort, Brörup, Odderade) (YEVTUSHENKO ET AL. 2004, 282f.).

With the Western Crimean Mousterian layers III and IVA, which are dated older 41 ka BP and that fore are chronologically associated with Moershoofd Interglacial or even older, these assemblages possibly represent the oldest known representatives of the Mousterian industry in Crimea - in Kabazi II the WCM starts during the Stadial between Moershoofd and Hengelo Interstadial. The association of the lowest archaeological horizons, belonging to the Crimean Micoquian, is in accordance with the earliest occurrence of this industry in the Kabazi II sequence. Nevertheless, this chronological position has to be verified. Due to its setting within the Crimean highland region Karabi Tamchin is of special importance for Middle Palaeolithic settlement studies.

Archaeological Horizon (AH)	**Number of Artefacts**	**Datation**	**Classification**
0	82	Holocene	mixed / small amount of artefacts
IA	4		
I	78		
II/1	56		
II/2	1.028	Denekamp	Western Crimean Mousterian
III	1.825	Stadial	
IV/1	583	Moershoofd	small amount of artefacts
IV/2	4.918		Crimean Micoquian
IV/A	1.035		Western Crimean Mousterian
V	13.220	Eemian Interglacial	Crimean Micoquian
	Total 22.829		

Tab. 7: Karabi Tamchin. Diagram showing the sizes of investigated excavated surfaces of archaeological horizons (AH), the numbers of artefacts, the classification and dating of these horizons (After Uthmeier 2007).

Analyses of artefacts: Attribute Analysis, Transformation Analysis ('Transformations-Analyse' & Reconstruction of Operational Sequences ('Arbeitsschritt-Analyse')

Altogether 345.432 stone artefacts stemming from 109 archaeological horizons were excavated in course of the research program. These artefacts were investigated according to attribute analysis: besides the classification of blank products and tool classes qualitative and quantitative features were taken into consideration (V. P. Chabai, A. I. Yevtuchenko, Y. E. Demidenko 2004, 2005, 2006, 2007, 2008). Additionally, for answering technological questions refittings were made (V. I. Usik 2006 and A, P. Veselsky 2008a). In another analytical step the impact of dynamic processes on the production and discard of stone artefacts was reconstructed by new methodological approaches. This mentioned dynamic has impact on the analysis of stone artefacts on three levels:

1. Assemblages: there composition is a result of the transport of artefacts and raw material between the raw material sources, the camp sites of the "group" and the places of hunt and collection.

2. Operational Sequences: the operational sequences of the transformation of raw material, of which all artefacts are part of.

3. Formal Tools: the tools are not only the result of the intended end-product. Furthermore, they are intensely used artefacts, which are the result of a complex process of different steps of rejuvenation. Those rejuvenations change shape, thickness and the state of the (working) edges, especially of surface shaped (bifacial) tools.

Thus, central aim of interest of the analyses is not the classification of states of deposition, but the causal concepts of land use, raw material transformation and tool use. Methods that help to understand these concepts are Transformation Analyses, Reconstruction of Operational Sequences for raw material transformation and the Reconstruction of Operational Sequences of surface shaped tools (Methods).

Altogether 61 assemblages were analyzed according to these methods. These assemblages stem from the sites Kabazi V, Kabazi II, Starosele, Chokourcha 1, Buran-Kaya III and Kiik-Koba. A general assumption of the results will be given below.

Sites investigated by technological analysis

Selected assemblages of three further sites were investigated in the course of the research program: Buran-Kaya III rock-shelter, Starosele rock-shelter and Kiik-Koba cave. The results obtained by Transformation Analysis and the reconstruction of operational sequences were introduced in the Habilitation of Th. Uthmeier (2006) and the Master work of M. Kurbjuhn (2003).

Starosele

The rock-shelter site Starosele is situated in the south-west of Crimea near the city Bakchisaray. It is located at the entrance of the steep and narrow, about 1 km long Kanly-Dere Canyon, which cuts into the soft limestone in southward direction. It opens to the bigger west-east directed Bakchisaraiskaya Valley.

This site obtained international attention in the context of the excavations that were conducted by A. A. Formozov between 1952 and 1956 (DEMIDENKO 1998). Altogether 12000 artefacts, 60000 faunal remains and 15 fire places could be observed (CHABAI ET AL. 2002, 464f.). The remains of a Homo sapiens sapiens individual ('child of Starosele') found in Middle Palaeolithic context led to a controversial dispute. New excavations between 1993 and 1995 by a joint Ukrainian-American team under the direction of A. E. Marks brought new light on the stratigraphy and the archaeological context. Instead of only two archaeological horizons altogether four could be observed (level 1 at the top till level 4 at the bottom of the sequence). Two further burials of Homo sapiens within level 1 gave way to the intuition, that all finds of human remains belonged to a medieval cemetery which has been deepened into the Pleistocene sediments.

In the course of the new excavations, instead of the two archaeological horizons postulated by FORMOZOV altogether 12 geological layers (Geological Horizons A till F) could be observed which inherited four archaeological horizons (Levels 1 till 4).

The lithic artefacts of Starosele, Levels 1, 2 and 3 were subject to new investigations by the means of Transformation Analysis and the Reconstruction of Operational Chains ('Arbeitsschritt-Analyse'). Level 1 assemblage was dealt with in the Master thesis of M. KURBJUHN (2003) while the results of Levels 2 and3 were presented in the State Doctorate of Th. UTHMEIER (2006). The results of Level 3 shall be summarized here in short, since only this assemblage could not be associated with one of the known Crimean Middle Palaeolithic industries. The 2337 of this archaeological horizon artefacts stem from an excavation surface of 48 m^2 (CHABAI ET AL. 2002, 464 ff.). The good preservation of the associated faunal remains and the presence of different concentrations of lithic artefacts led to the conclusion that the material of Level 3 was deposited in primary position (MARKS &MONIGAL 1998, quoted after CHABAI ET AL. 2002, 464 f.). Chronologically this layer is today attributed into the context of an Early Glacial Stadial ("Frühwürm") (CHABAI, MARKS &MONIGAL 1999). However the faunal remains are quite diverse, the taxa Equus hydruntinus and Equus caballus are dominating the assemblage. Also Saiga tatarica, Vulpes Crocuta, and Ursus are present. Cervus elaphus, Bos sp., Sus sp. and Rangifer tarandus are represented in only small numbers. The carnivores' impact on the composition of the faunal assemblage is estimated as low. The high share of horse long bones was that fore interpreted as a result of anthropogenic activities (CHABAI ET AL. 2002, 464).

In order to understand and describe the blank production of Siuren 1, Level 3, which had already been estimated as not classifiable by MARKS and MONIGAL (1998, cited after CHABAI ET AL. 2002, 466), the methodological aims 'reconstruction of operational chaines' ('Arbeitsschrittanalyse') and Transformation Analysis helped to understand the technological concept of this assemblage (see Methods). The results of the reconstruction of operational chains gave way to the assumption that a special variant of the discoidal method is present. This variant is probably due to the lack of round raw nodules which would deliver enough raw volume to strictly follow this concept. As a result, from some of these raw nodules the discoidal sequences could only be produced at one platform. In other cases flakes were used as cores for a secondary blank production. Investigations of A. BONCH-OSMOLOWSKI lead to the assumption that a similar system of blank production is also present within the lower layer of Kiik-Koba (CHABAI ET AL. 2002, 466f.).

Results of the Transformation Analysis (CHABAI ET AL. 2002, 466-470)

In Level 3 among 481 stone artefacts bigger 3 cm, 48 raw material units (RMUs) could be observed. With help of literature the origin of a part of the raw material could be estimated at the base of varieties.

1. Local origin: the rock walls below the rockshelter inherit small round nodules with black coarse grained cleavage plains with numerous white inclusions. A brownish-white chalky cortex of 1 cm thickness is characteristic.

2. Local origin: about 500 m away from the entrance of the Kanly-Dere Canyon nodules are inherited within the rock walls which feature light brown cleavage plains.

3. Regional origin: about 7 km west of the Starosele site a secondary raw material source is located. The fine grained honey coloured flint can be collected from the river gravels.

4. Regional origin: Approximately 7 km away of Starosele is the village Partisanskoje, where flint of grey-blue colour can be found. Probably raw material units (RMUs) 12, 26 and 29 derive from this source.

5. Supra-regional origin: dark grey flat flint nodules with white cortex resemble the Kabazi II raw material. According to the thickness of these plaquettes the might derive either from Alma or Bodrak Valley. In both cases the raw material sources are located about 20 km away from Starosele.

A methodological problem of the Transformation Analysis is the account for complete assemblages. The lithics of Starosele which were analyzed according to this method derive from the 1993-1995 excavations in which course only an incomplete section with the extension of 47 m^2 has been excavated. The biggest part (250 m^2) has been excavated by A. A. FORMOZOV during the 1950s (DEMIDENKO 1998, after CHABAI ET AL. 2002, 466). Admittedly, the lithic artefacts and faunal remains of the excavations 1993-1995 were gathered around a fire place. According to the excavators' opinion, the assemblage is the result of one single occupation (MARKS &MONIGAL 1998, after CHABAI ET AL. 2002, 467). Obviously, a concentration of finds has been uncovered. Taking into consideration what is known about the distribution of finds on the surface of the old excavations, similar concentrations might have been present there, as well.

In order to receive an impression on the completeness of workpieces, artefacts belonging to one RMU were mapped horizontally. In cases that artefacts belonging to one RMU are clustering in one concentration of the incomplete excavation surface in combination with the representation of a reasonable operational chain they are assumed as complete units. According to this assumption, 18 of the 48 workpieces and single pieces can be interpreted as complete. For 15 workspieces consisting only of a few pieces, which exhibit no technologically reasonable context, it is possible that further belonging artefacts can be found within the not excavated area (RMU 1, 3, 7, 11, 17-21, 25, 27, 30, 44, 58).The same can be assumed for some of the 'single pieces'; probably some of the belonging pieces might be found within the material excavated by FORMOZOV. This is especially likely for the unmodified artefacts introduced as 'single pieces' (RMUs 55, 57-64).

Differences between those workpieces interpreted as units are refer to the state of the imported nodules. A combination of the distances to raw material sources and the quality of the raw material seems to be an important factor. Beside the workpiece of RMU 5 of less good quality which was collected below the site, also fine grained workpieces deriving from the Kacha Valley 7 km away have been brought to the side as raw nodules (RMUs 35-42). In the course of the reduction according to the above mentioned variant of the discoidal method, in an advanced state the lateral and distal convexities were produced by steep blows in order to obtain last thick flakes with crested remnants.

Such a way of exploitation is lacking within workpieces imported as already decorticated (RMUs 6, 8, 15, 23, 28, 31) or partially reduced (RMUs 10, 14, 16, 22). In spite of the fact that that raw material is of higher quality than for instance RMU 5 these workpieces have not been reduced completely. Most of those RMUs might probably explained by deriving from a remote source, what is indicated by the higher degree of reduction when imported to the site.

In general, nearly all bigger flakes resulting from blank production were modified. The high share of formal tools ("W" = "Werkzeug") speaks for an intensive usage of the assemblages. This can be investigated by workpieces of 'good' and 'bad' raw material quality (e. g. RMU 5). The distinct differences in raw material treatment between archaeological assemblages like Kabazi II, Unit III/1 and Starosele are best explained from the point of view of the Transformation Analysis as the result of a longer sojourn at Starosele, Level 3. In this context, the diverging states of imported lithic artefacts may indicate peripheral activities of different durations in the nearer and broader surrounding area:

1. Not decorticated nodules are brought without an intermediate sojourn from the source to Starosele.

2. Partially decorticated nodules indicate a stay at the raw material source.
3. Reduced cores and single pieces derive from stations where blanks were produced and used.

The results of the Transformation Analysis give confirmation to the assumption that Starosele, Level 3 was occupied for a longer time span than the levels of Kabazi II (CHABAI ET AL 2002, 470). In the context of blank production the quality of the used raw material was only one among other criteria. It is possible that simply the need for flakes at a specific point of time was more important than the quality convenient for reduction.

Kiik-Koba

The site Kiik-Koba was discovered within the internal range of the Crimean Mountains by G. A. BOCH-OSMOLOWSKI (1934) in 1924. The rockshelter is located about 25 km east of Simferopol near the small settlement Taou-Kiptshak. At this point a small valley is connected to the entrance of the wider Zouia Valley. By the Zouia Valley the Crimean Mountains are connected with the northern steppe zone stretching only 3 km away. The rockshelter which was formed by erosional processes caused by changing atmospherique conditions faces to the south.

Excavations took place between 1924 and 1926. For the first time, human fossils could be discovered at the territory of the former Soviet Union. Moreover, altogether 15.000 unretouched blanks, 2000 tools, 50 retouchers, dozens of faunal remains with use traces and 680 faunal remains belonging to 27 different taxa were found in the course of these campaigns (UTHMEIER 2006, 203f.).

According to BONCH-OSMOLOWSKI (1940, 177; after UTHMEIER 2006, 205) the only 1 m deep stratigraphy of the rockshelter contained 6 archaeological layers, which could easily be separated from each other. In reality BONCH-OSMOLOWSKI recognized two geological horizons which were further subdivided by archaeological horizons of darker colour: one clayish Holocene stratum with archaeological layers Couche I, Couche IIa and Couche II and one Pleistocene stratum consisting of yellowish debris with archaeological layers Couche III, Couche IV, Couche V and Couche VI (UTHMEIER 2006, 205). Layers IV and VI are of importance for Middle Paleolithic investigations.

Layer VI ('couche à foyers inférieur') is the lowest archaeological layer directly covering the bedrock. It extended over 70 m^2 within the rockshelter and was also found on the area in front of the rockshelter. This layer contained many lithic artefacts, but badly preserved faunal remains. The upper archaeological layer IV ('couche à foyers supérieur') is separated from layer VI by layer V ('entre foyers') which contained some displaced artefacts of layer VI.

Layer IV of Kiik-Koba was investigated in the course of the research programm. Due to stratigraphical uncertainties caused by the mixing of artefacts belonging to the upper and lower layer no 'Transformation Analysis' was carried out. But workpieces realized as conform with that layer were interpreted as belonging to one assemblage and operational sequences of bifacial pieces were reconstructed ('Arbeitsschrittanalyse') (UTHMEIER 2006, 210 ff.).

Buran-Kaya III

The collapsed rockshelter Buran-Kaya III belongs to a group of four rockshelters and caves located at the right bench of the Burulcha River. All sites are situated at a distance of only a few meters from each other. Buran-Kaya III is situated abaout 20 km northeast of Simferopol and 4 km southwest of the small town Aromatnoye. The Burulcha River, which drains in northern direction into the steppe zone, has cut here deep into the Crimean Mountains. The site was occupied approximately 4 meters behind the drip line of the rock shelter's roof. During time of occupation the roof must have been 3 till 4 meters high. Originally, the rock shelter opened to the 10 m distant located steep river bank (UTHMEIER 2006, 212 f.).

The stations Buran-Kaya I, Buran-Kaya II and Kilse-Kobe have already been discovered in 1936 by O. N. BADER. At these stations first excavations were conducted between 1957 and 1958 and brought to light Mesolithic and Neolithic finds (MONIGAL 2004a, 3, cited after UTHMEIER 2006, 212). In 1990 A. A. YANEVICH discovered Buran-Kaya III. In the same year he carried out first sondage excavations which were continued from 1994 in cooperation with M. YAMADA (YANEVICH, STEPANCHUK &COHEN 1996; YANEVICH 1998; YAMADA 1996; after UTHMEIER 2006, 212). This test pit was enlarged to an extension of 4 m^2 and dug till the bed rock in a depth of 3.5 m. In 1994 a 1 m grid-system was established and the excavations were carried out according to artificial spits of 5 till 10 cm. More extensive excavations were carried out under cooperation with A. E. MARKS and M. OTTE in the years 1996, 1997 and 2001 (MARKS &MONIGAL 2000; MONIGAL 2004a, 2004b, 2004c; after UTHMEIER 2006, 212). In 1996 the new excavators changed then excavation method: archaeological horizons were not excavated anymore according to artificial spits. Instead, the sediment was excavated in 1 m grids according to natural strata. The soil was screened with 5 mm screens. All finds bigger 1 cm were measured three-dimensionally and drawn into maps with a scale of 1:10. Find bearing layers were denoted by the letters A till E. On the contrary, sterile strata were not denoted. Since there is no reliable correlation of the layers of the 1990-1996 excavations with the layers of the 1996-2001 campaigns, these assemblages have to be investigated separately (UTHMEIER 2006, 213). Between 1996 and 2001 five layers were excavated: Layers A, B/B1, C, D, and E.

The stratigraphy can be described as follows:

Layer 1

Middle Ages
Layer 2
Middle Ages
Layer 3
Bronze Age
Layer3a
Neolithic (5.070±40, 5.180±50)
Layer 4
Late Palaeolithic: Swidrien
Layer 4a
Late Palaeolithic: Swiderian (5.070±40, 5.180±50)
Layer 5 – 6-2
"Epi-Gravettian"
Layer 6-3 – 6-5
Aurignacian / Gravettian? (30.740±460; 11.900±150; 11.950±130; 28.700±620; 34.400±1.200)
Layer A
unknown Middle Palaeolithic with bifacial pieces
Layer A1
sterile
Layer B
Middle Palaeolithic: Kiik-Koba facie of Crimean Micoquian
Layer B1
Middle Palaeolithic: Kiik-Koba facie of Crimean Micoquian (28.840±460; 28.520±420)
Layer B2
sterile
Layer C
“Initial Upper Palaeolithic”: "Eastern Szelettian" (32.350±700; 32.200±650; 36.700±1.500)
Debris of collapsed rockshelter roof
Layer D
unknown non-Levallois flake-based Middle Palaeolithic assemblage
(post-depositionally disturbed)
Layer E
unknown blade-based Middle Palaeolithic assemblage

While Layer D shows signs of post-depositional disturbance, all other archaeological layers were found in primary position. The 4.5 m deep stratigraphy of Buran-Kaya III is composed of limestone debris which is whether embedded within sandy and silty sediments in the lower section (layers E till 5) or in argil and loam in the upper section (layers 4a till 1). Only the lowest sediments deposited at the bed rock are composed of thin layers of fluviatile sands of orange and yellow-orange colour.

Due to the presence of the Early Upper Palaeolithitc Level C situated below the Middle Palaeolithic Level B/B1 the stratigraphy of Buran-Kaya III is of high importance for the interpretation of the Middle to Upper Palaeolithic Transition. For the first time in Europe, a secure interstratification of Middle and Early Upper Palaeolithic / Transitional industries is attested. While the lower Middle Palaeolithic occupations D and E are too small and at the same time lacking diagnostic for a secure attribution to one of the known Eastern European Middle Paleolithic industries, the assemblage of Level C was paralleled with the Streletskaya industry known from Kostenki 1, Layer 5 (YANEVICH, STEPANCHUK & COHEN 1996; MARLS &MONIGAL 2000; MONIGAL 2004; CHABAI, MARKS &MONIGAL 2004). Furthermore, Level D is not in primary deposition. Contrary to that, the artefacts of Level C come from a thin in-situ surface. The assemblage is characterized by flat bifacial tools, most of the time shaped on plaquettes. The blanks which were used for edge modified pieces are most of the time blanks from surface shaping. A peculiarity are bifacially shaped edge modified trapezoidal microliths (MONIGAL 2004,). Absolute C14-dates for that layer range between 36 ka BP and 32 ka BP. According to pollenanalytical studies Level C can be settled within the Stadial between Hengelo and Denekamp Interstadial.

In the course of the research program Level B1 was investigated by Transformation Analysis (UTHMEIER 2004). The assemblage of this layer is attributed to the Kiik-Koba facie of the Crimean Micoquian (DEMIDENKO 2004). The archaeological horizons Level B and B1 are separated from upper Level A and lower Level C by the sterile strata A1 and B2. Levels B and B1 can be distinguished from each other by the dark, nearly black colour of Level B1 which is interpreted as the remains of a former fireplace. Due to the lack of visible artefact concentrations, DEMIDENKO (2004, 115) assumed that we are dealing in both layers with former occupational surfaces, in combination with latent structures destroyed in the course of intensive occupational activities. In contrast to that, KURBJUHN (2004) and UTHMEIER (2004; 2006, 216 f.) draw the attention on the presence of different concentrations which were indicated by the mapping of artefacts bigger 3 cm belonging to different workpieces. For a primary position of the artefacts speaks the good preservation of lithic artefacts and faunal remains, as well. The results of the pollen-analysis which settles Levels B and B1 within Denekamp Interstadial are confirmed by two C14 dates of (OxA-6673) 28.840±460 BP and (OxA-6674) 28.520±420 BP (GERASIMENKO 2004, Fig. 2-2; MONIGAL 2004a, Tab. 1-1). Accordingly, Levels B and B1 are among the latest known Middle Palaeolithic assemblages in Europe.

Results: the explanation of the functional variability in the late Middle Palaeolithic of Crimean according to Uthmeier (2007) (translated by G. Bataille)

The project's aim of interest was traced by Th. UTHMEIER in the course of his state doctorate (UTHMEIER 2006). The results introduced in the following were presented in this not yet published State Doctorate. The terminus 'concept reservoir' ("Konzeptreservoir") introduced by the German archaeologist W. WEISSMÜLLER is the key term in this context (WEISSMÜLLER 1995). It addresses the knowledge of a group, which was delivered from generation to generation. In context of Palaeolithic research 'concept reservoirs' is looked after in lithic production processes. Since in Middle Palaeolithic context no division of labour transcending small family groups and larger aggregations of such family groups is likely, it is assumed that nearly every Middle Palaeolithic adult was firm with the group's concept reservoir. According to Uthmeier (2006) three concept reservoirs can be distinguished for the Crimean Middle Palaeolithic:

Concept reservoir A: plano-convex surface shaped blanks with symmetric shapes. The assemblages of Kabazi II, Units V and VI belong to concept reservoir A. Plano-convex surface shaped foliates are characteristic. During processes of rework and rejuvenation the shape of the primary tool is preserved. Despite of surface shaping no other concept of blank production could be determined. For the production of simple tools waste from surface shaping/ surface shaping flakes are modified.

Concept reservoir B: Levallois and blade concept, plano-convex surface shaped blanks with asymmetric shape. The assemblages of "Kiik-Koba-industry", "Ak-Kaya-industry" and "Starosele-industry" that together form the Crimean Micoquian and the assemblages of the Western Crimean Mousterian belong to concept reservoir B. Blank products which derive from cores of Levallois concept or of uni- and bipolar blade concept occur beside plano-convex surface shaped blank products. Among the simple tools according to blank type simple and transversal side scrapers are most common. In the course of advancing time of usage it is possible that simple side scrapers are transformed into double and déjeté side scrapers. The group of surface shaped tools can be summarized in two classes:

1. Surface shaped tools of different sizes, depending on the sizes of the used raw nodules; often produced on thin plaquettes

2. Standardized surface shaped items, which are produced on plaquettes, round flat nodules and flakes.

Artefacts of the first group involve 'backed knives' and different foliate pieces, including Faustkeilblätter' and 'Halbkeile'. These pieces are often discarded in an early stage of reduction. Another possibility is that during reduction processes the smaller secondary forms repeat the primary form – in that way the shape of the initial form is conserved. In context of the second group of hafted items, the conservation of the function over a long time-span is intended. In this context, the pieces are treated similar to flakes with edge modification: after the production of a blank, despite of the ventral thinning all edge modifications are solely made on the artefact's dorsal surfaces. Since most of the time the right edge is in use and thus asymmetrically reworked, secondary and tertiary forms clearly differ from each other. It can be concluded that at the beginning of a reduction sequence 'Halbkeile' are produced which are transformed to 'blattförmige Schaber' and 'Fäustel'.

Concept reservoir C: Here a variant of the discoidal concept for blank production but no concept of surface shaping is present. Up to now, concept reservoir C is only known from

Starosele, Level 3. Features are the discoidal concept and an edge modification which is more or less dependent from the blank's shape (see Industries').

Concept reservoirs A and C only represent small sections of the former land use spectrum. Up to now, it is not possible to establish a reliable picture about the nature of this segment of the Crimean Middle Palaeolithic land use system. The majority of assemblages investigated in the course of the research program belong to *Concept Reservoir B*. In that latter case the reconstruction of land use patterns was possible:

1. *Summer months*. During the warm season mainly wild ass was hunted in the region of the second range of the Crimean Mountains. Since these animals are increasingly dependent from water sources with increasing draught, there was a good opportunity to predict their presence at specific times. Since places of nutritional resources were easy to estimate, a stabile system of longer frequented camp sites was established, in connection with stations which had the function of resource acquisition by task-groups. It is not out of the question and from a logistical point of view it is sensible that due to the good supply with meat during the warm season two or more core families temporarily spent the time at such a place. The stations were situated either in direct vicinity of the camp site or in a distance of few kilometres. Depending on how many stations in the direct vicinity to the camp could (recurrently) deliver nutrition, the time of occupation of such camp sites probably was up to several weeks. A second limiting factor was the natural carrying capacity of the environment. Probably, there was the need to leave a logistical range and enter into another, after having hunted or banished whole wild ass families (and other taxa). Depending to the distance to the main camp, field camps (*Außenlager*) can be understood as ephemeral camps with occupations of some hours to maximum few days duration.

2. *Winter months*. During wintertime several taxa were hunted in the vicinity of the first mountain range and at the border of the plain extending north of the Crimean Mountains. Reason might be the seasonal migration behaviour of the animals and the worse food supply. It is assumed, that migratory game / steppe species aggregated in lower levels of the Crimean Mountains and at the border to the steppe plain, to survive the winter. But, also the presence of Equus hydruntinus throughout the whole year within the Second Ridge is assumed (BATAILLE 2010). Wild ass, Saiga antelope and in case of nutritional shortages steppe bison were hunted while Mammoth obviously was added to the nutrition by scavenging activities of already dead animals. Generally, it is assumed that during the cold period of the year a similar land use system existed as in summer, with residential camps (Hauptlager) for the whole group and field camps (*Nebenlager*) respectively locations (Stellen) which were used by task groups for resource acquisition.

3. *Spring / autumn*. During spring time people tried to capture herds of migratory game while migrating to their summer ranges. In this course everything in need was transported over greater distances, possibly as long as groups encountered hunting game. Target of such behaviour was not only to overpass the critical time of herd migration but also to reach the summer ranges of the main hunting game Equus hydruntinus. In case it was possible to delay the decampment into early summertime, predominantly *Saiga tatarica* was hunted shortly after the time of calving. For sure, spring time was from an economical point of view the most critical time; also resources of less quality like old animals and carrion were supplied to diet.

Stone artefacts were preserved in good condition during all annual cycles: at residential camps and most other site types stone artefacts were produced, changed or prepared for usage. In cases that no local raw material was at hand, lithic material was brought to the sites. This is an important observation: stone material was not a limiting factor for the choice of a specific location to establish a camp site. Short termed activities near raw material sources show only scarce or no record of bifacial tools and belong to the Western Crimean Mousterian. Nevertheless, unifacial surface shaping is present and attestable in undisputed Western Crimean assemblages (e. g. Kabazi II, Level II/8) (BATAILLE 2006b, 2010). Occupations without local raw material procurement belong to the Crimean Micoquian, even in cases of only short-term activities.

The land use pattern equates during summer and winter months to the behaviour of modern hunter-gatherers with a logistical pattern ("collectors"). In the past such a pattern was accepted for Upper Palaeolithic modern humans but refused for Neanderthals. First hints for such 'modern' behaviour of Neanderthals were known from Southern Germany and gave confirmation that their underestimation in that regard was unjustified (RICHTER 1997). With help of the extraordinary good data base of the Crimean Middle Palaeolithic it is possible to illustrate that much of the innovations attributed to the Upper Palaeolithic already existed and were well-established in the Middle Palaeolithic. Differences existed in part in the kind of equipment that was needed for the land use patterns. Concepts and methods of stone production are of Middle Palaeolithic type in Crimea; no tendency to an Upper Palaeolithic development is observable.

Besides these main results of the research program, which makes Crimea to a case study for the meaning of cultural entities of Neanderthals and its relation to land use patterns, numerous further results and features could be added, which have in parts already been published. Particularly, features like the numerous pits in the main archaeological horizon of Kabazi V are to mention. The site Buran-Kaya III which was accessible for the research program by cooperation with A. A. Yanevich and A. E. Marks an interstratification of an Early Upper Palaeolithic "Streletskaya" horizon with a Kiik-Koba horizon at the top of the sequence was attestable (MONIGAL 2004a, 8f.; MONIGAL 2004b, 57ff.; DEMIDENKO 2004, 113ff.). The Micoquian assemblage (layer B) is comparable with the one of the upper horizon of the eponymous site Kiik-Koba, only 8 km away, which yielded a Neanderthal burial. At several sites the series of TL-dates could be expanded by new datings conducted by the British colleagues D. Sanderson, Ch. Burbidge and R. Housley, financed by the NERC (Natural Environment Research Council). Furthermore, in the lower units of Kabazi II and in the lower layers of Sary-Kaya, Karabi-Tamchin and Karabai I for the first time Last Interglacial occupations could prove evidence in Crimea.

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Methods: Transformation Analysis

The **Transformation Analysis** has been established as consequent methodical approach by the German archeologist W. WEISSMÜLLER (1995). His aim was to reconstruct operational sequences of flint stone artefact reduction by sorting the lithic material of Middle Paleolithic levels back to raw material varieties and further to original nodules. This idea was first tested by H. LÖHR (1979) in the 1970s and in the 1980s by K. H. RIEDER (1981/82), W. ROEBROEKS (1988) and J. HAHN (1988). WEISSMÜLLER developed this approach systematically on the lower levels of the Middle Palaeolithic Sesselfelsgrotte sequence. By sorting flint artefacts to different *varieties* of raw material sources and *workpieces* at the basis of raw nodules he was able to reconstruct import and export activities of those resources.

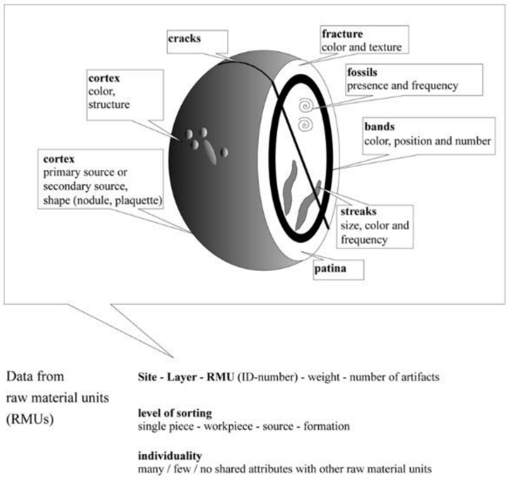

Fig. 1: Sortation of flint artefacts - macroscopic features which are criteria for sorting flint artefacts to raw material units (RMUs) (after Uthmeier 2004).

In a first step lithic artefacts are sorted to groups of macroscopic visible similarity. Important macroscopic criteria are color and texture of the matrix and the cortex, fossil inclusions, cracks and fissures of the matrix - the regular presence of a combination of those features on different lithic artefacts indicates different varieties or even raw nodules (raw material units) **(Fig. 1)**. In this context, WEISSMÜLLER (1995) distinguishes between workpieces and single pieces. Artefacts that exhibit the same variety of macroscopic features are interpreted as "members" of the same *raw material unit*. Four different categories of raw material units are possible. Artefacts of an assemblage which show no macroscopic similarities with other artefacts are interpreted as *"Single Pieces"* **(Fig. 2)**. RMUs are regarded as *workpieces* if two or more artefacts belong to a single nodule. If two or more artefacts belong to different nodules but derive from the same raw material source those artefacts are classified as variant. If two or more artefacts can only be traced back to their geological genesis they are attributed to their original formation (UTHMEIER 2004a, 176).

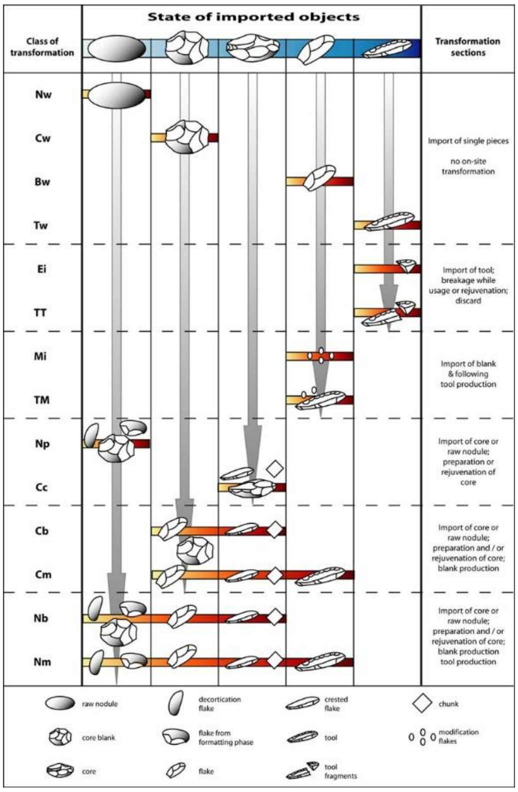

Fig. 2: Transformation Class and Transformation Section – the composition of specific artefacts at the site which belong to one raw material unit (RMU) gives information about on-site transformation and reduction processes (BATAILLE 2010).

Actually, such a sortation is only possible with flint material, due to its high macroscopic variety and thus individuality – the higher the variability within a given flint assemblage the higher the possibility to recognize a set of special macroscopic features which are typical for a specific raw material variety or even a nodule. Pieces altered by patination or thermal influences cannot be analyzed by this approach and are thus filed under the category 'remaining pieces' ('Sortierrest').

In a *second step* artefact groups are categorized according to their reconstructed *on-site* transformation. This means that the functional position within the possible transformational chaine (*chaîne opératoire*) of every raw material unit is determined **(Fig. 2)**. For instance, this can be the correction of cores, indicated by the presence of correction blanks like crested blades etc.

It has to be differentiated between 'static' and 'dynamic' objects. By-products that fell to the ground in the course of core reduction or tool modification (e. g. chips from edge retouch or crested blanks from core rejuvenation) are regarded as 'static objects' (WEISSMÜLLER 1995, 45 f.). On the contrary, artefacts that move in the course of transformation processes within one site ('intra-site') or between different sites ('inter-site') regarded as 'dynamic objects' (WEISSMÜLLER 1995, 46 f.). This especially concerns tools and cores which were produced and modified at different sites, but also blank products modified and reworked at different locations (e. g. Kombewa cores).

WEISSMÜLLER developed a catalogue of criteria which describes the possible import state, the on-site transformation and at the end the discard and / or the possible evacuation of lithic artefacts belonging to different workpieces. Those criteria are indicated by the degree of cortical remains at the artefact surfaces, by the presence or absence of preparatory flakes (e.g. crested flakes, decortications flakes) and by the presence or absence of different artefact categories like cores, bifacial or unifacial preforms, blanks and tools.

Since the transformation of Middle Palaeolithic stone artefacts was conducted temporally and spatially staggered, different stages can be distinguished: (0) Initializing of raw nodule, (1) preparation of core, (2) blank production, (3) core correction, (4) tool modification (according to GENESTE 1985, 178-182). In the context of the Transformation Analysis, every transformation section evaluated by raw material sorting might represent such a stage:

The significance of the raw material units for functional interpretation varies with the level of resolution reached in the sorting. Because they consist either of single artifacts or contemporaneous pieces, the categories “single pieces” and “workpieces” are regarded as the shortest temporal activities that we are able to recongnize and explain in a broader context (...). In general, Paleolithic assemblages are seen as an accumulation of such short-term events. Single pieces, for example, were manufactured elsewhere, imported and-either after being used or not being used at all-discarded. Workpieces, on the other hand, went through either some or all phases of the chaîne opératoire at the site*(UTHMEIER 2004, 177-178)*

Taking into account different possible transformation sections, WEISSMÜLLER established fourteen transformation classes (WEISSMÜLLER 1995, 46 ff.):

Catalogue of Transformation Classes:

Objects imported as isolated “Single Pieces” without any on-site transformation:
Nw
nodules
Cw
cores
Bw
blank products
Tw
Tools

Static objects that indicate the on-site transformation of tools:
Ei
isolated tool tip
TT
discarded remnants of an isolated broken tool

Mi
isolated modification flakes/ chips from tool preparation
TM
isolated tool with its belonging modification flakes/ chips

Objects that indicate the import of raw nodules/ blanks and their on-site transformation:
Np
preparation of imported raw nodules
Cc
correction/ rejuvenation of cores/ preforms
Cb
flaking from imported cores
Cm
flaking and tool production from imported cores
Nb
flaking from imported raw nodules
Nm
flaking and tool production from imported raw nodules

The Transformation Analysis was developed by WEISSMÜLLER on the base of Levallois dominated assemblages of the lower layers of the Middle Palaeolithic cave-site Sesselfelsgrotte (Southern Germany). These assemblages exhibit only a small share of surface shaped artefacts. Due to that, unifacial and bifacial surface shaped artefacts were not taken into consideration. The Crimean Middle Palaeolithic consists of two techno-typological entities: the Levallois based Western Crimean Mousterian and the Crimean Micoquian which is characterized by the presence of bifacial tools. Due to that, the catalogue of criteria, established by WEISSMÜLLER to describe transformation processes, was extended by the Cologne team in order to additionally describe the on-site transformation and production of surface shaped artefacts. In case of attestable surface shaping (*fa?onnage*) within a given RMU, e. g. the presence of bifacial tools, the suffix '/f' ('facial') is attributed to the above mentioned transformation classes (e. g. Nm/f) (**Fig. 2**). The length of a transformation section is detected by the first and the last transformation stages. For instance, the modification of a flake, which was detached from an imported raw nodule, is indicated by a high degree of cortical remains and the presence of a formal tool. This would suggest transformation section Nm.

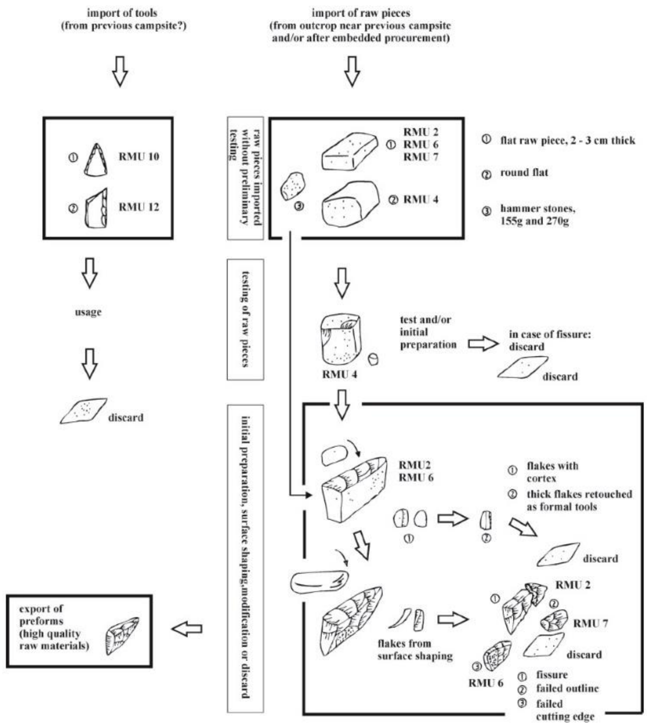

Fig. 3: Kabazi II, level III/1: Results of the transformation analysis (after Uthmeier 2006, Fig. 14-14).

By sorting artefacts back to original raw nodules one has to deal with the obvious incompleteness of those RMUs. WEISSMÜLLER (1995) proposed the neutral term 'evacuation' for the process of dislocation of artefacts by natural or anthropogenic influence. The verification of the intended export of lithic artefacts is an important challenge. In order to determine whether missing artefacts are the result of anthropogenic export activities, processes of natural dislocation have to be excluded.

As a consequence, this approach is applied as methodological instrument in order to reconstruct the import state of lithic artefacts and their on-site transformation (**Fig. 3**). Furthermore, the possible mode of stone artefact's evacuation can be evaluated. Thus, insights into technological issues concerning the production of stone artefacts are possible. In a broader sense the reconstruction of import and export activities helps to better understand Palaeolithic land use strategies and the function of sites within postulated land use systems (UTHMEIER 2004b, 228 ff.).

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Methods: Operational Chains

The present adaption of this principle of analysis was developed by J. RICHTER (1997) and A. PASTOORS (2001, 2000a, 2000b) in order to reconstruct the internal history of surface shaped pieces. PASTOORS additionally applied this approach to the investigation of

Levallois cores of the Middle Paleolithic site of Salzgitter-Lebenstedt in Niedersachsen (Germany).

The Analysis of Operational Chains is based on the chronological order of the ventral negatives at the dorsal faces of bifacial and unifacial tools or at the flaking surfaces of cores. In general, the biography of a lithic artefact is reconstructed on the basis of negatives of detachment “that together form (1) the upper (dorsal) face of a flake, (2) the overall flaking surface of a core, and (3) one or two surface(s) of a foliate piece” (RICHTER 2004, 234 f.).

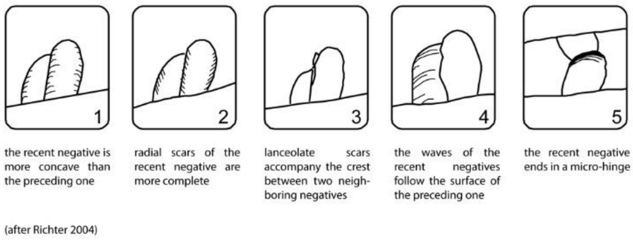

Fig. 1: Time relations-operational steps (after Richter 2004).

One important problem in the context of investigating cores or bifacial surface shaped pieces is the increasing incompleteness of intersecting or adjacent negatives in the course of the production or the reduction processes. E. g. a negative on the upper and one negative on the opposing lower surface of a foliate piece may meet on the intersecting edge. While the more recent negative exhibits all features of the process of detachment (i. e. the negative of the butt etc.) those attributes lack on the preceding negative, since “its basal part served as a striking platform for the more recent flake” (RICHTER 2004, 234). Thus, the chronological succession of both surfaces of the foliate piece is indicated by the more recent negative showing all attributes of detachment, which must be younger than the opposing negative lacking these features. Adjacent negatives on one and the same surface show the internal chronological succession on one of the surfaces. The completeness of negatives on a given surface decreases from the most recent negative to the oldest negative. Features that indicate the chronological order of negatives on ventral surfaces are listed in the following (after RICHTER 1997) (**Fig. 1**):

1. The more recent negative shows a stronger lateral concavity than the preceding adjacent negative.

2. The younger negative shows lateral fissures at the ridge to the adjacent older negative; that preceding adjoining negative mostly lacks this feature.

3. The fissures of the younger negative are commonly occurring together with lanceolate and scaled splinters covering the crest between adjoining negatives.

4. The shape of the younger negative follows the shape of the older one.

5. At the terminal end of the younger negative waves are present; the concavity is more emphasized than at the surface adjoining the common ridge of the more recent and the preceding negative.

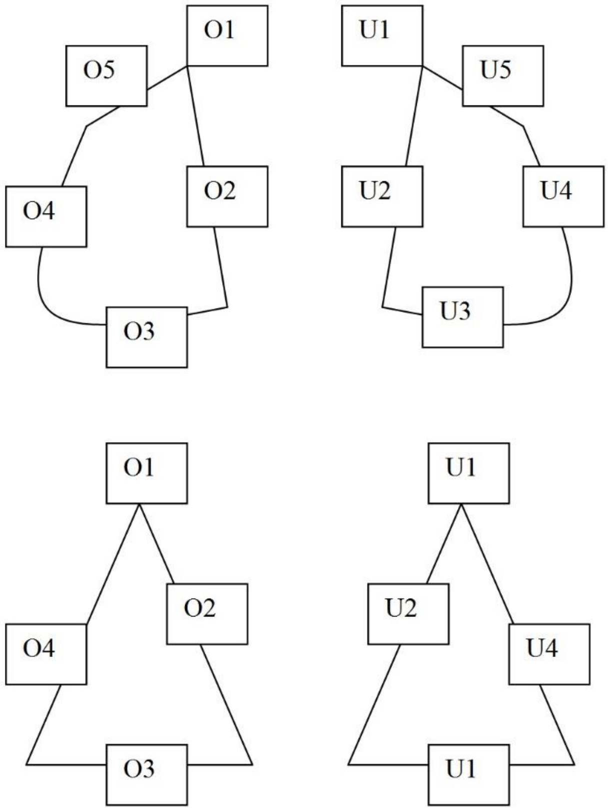

Fig. 1: The different places of operational steps on a foliate piece (clockwise labels). Different areas on the upper face (O1-O5) and on the lower face (U1-U5) of a bifacial knife (*Keilmesser*) (top) and of a triangular foliate (*Dreieckiges Faustkeilblatt*) (bottom) (after Richter 2004).

Taking into account the above described attributes, operational steps are defined. In cases where two or more negatives of adjacent detachments on one surface of a lithic artefact display the same direction of percussion and belong to the same technological unit, those negatives are regarded as belonging to **one operational step**, (e. g. convex or flat surface shaping, edge retouch, ventral thinning) (RICHTER 2004, 235 f.). Accordingly, the negatives of one operational step are the result of an intended aim and were applied in direct subsequent steps.

The internal order between the negatives belonging to one and the same operational step is not evaluated, since these negatives are interpreted as the result of one operational step conducted by a series of detachments. The border of the operational step at the artefact surface coincides with the outer ridges of the belonging negatives. Consequently, the chronological succession of two or more adjacent operational steps is reconstructed by evaluating the chronological order of negatives belonging to one operational step which is adjacent to another. Every operational step forms a data set and is attributed by the features *contour line, origin, order, state of the edge and position* (**Fig. 2**) (RICHTER 2004):

TABLE 13-2
Foliate production: modes of origin of operational steps

Original state	11 cortical surface 12 broken part 13 exploitation edge of core (non-Levallois) 14 exploitation edge of core (Levallois)
Surface shaping	21 flat surface shaping 22 convex surface shaping
Retouch of edges	31 flat retouch 22 semi-steep retouch 23 steep retouch 34 Quina retouch
Preparation	40 preparation of exploitation face for thinning or for sharpening spall
Thinning	51 lateral thinning 52 distal thinning
Sharpening spall	61 lateral sharpening spall 62 terminal sharpening spall
Use wear traces	71 traces of utilisation 72 splintered edge 73 small Clactonian notch 74 irregular denticulation
Fragmentation	81 latitudinal 82 diagonal 83 longitudinal
Thermic alteration	90 crackled

Fig. 3: Modes of origin of operational steps on the example of foliate production (after Richter 2004, Tab. 13-2).

1. **Contour Line:** the contour line of negatives belonging to a single operational step is described by the features (1) concave-convex, (2) concave, (3) straight, (4) convex, and (5) convex-concave. Every feature is labeled by a specific code between 1 and 5.

2. **Origin:** the mode of every operational step's origin is distinguished according to the following criteria which describe different stages within the preparation and reduction of a surface shaped tool (**Fig. 3**).

3. **Order:** This attribute describes the regularity of the negatives belonging to one operational step (**Fig. 4**):

    1. 3.1 Parallel order of adjoining negatives

    2. 3.2 Regular but not parallel

   3. 3.3 Irregular adjoining negatives

   4. 3.4 Isolated, disconnected negatives

4. **State of the Edge:** This feature describes the state of abrasion of a given edge segment:

   1. 4.1 Sharp

   2. 4.2 Still sharp, but used

   3. 4.3 Heavily used or not intended for cutting

5. **Position:** with this feature the chronological position of one operational step in relation to other adjoining operational steps is indicated. The relations of the different positions can be evaluated in a Harris diagram (e.g. O21 > O22; O21 < U2 etc.) (**Fig. 3**).

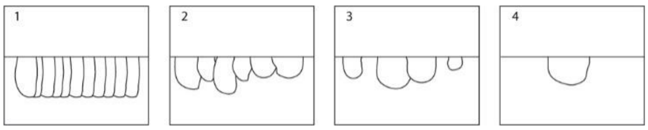

Fig. 4: Order among negatives (according to Kurbjuhn 2005, Fig. 15-3).

Every single operational step is described within a strict terminological framework and a special code indicates the exact place of the operational step on the surface of a foliate. *(RICHTER 2004, 236)*

In this regard RICHTER (1997) established a system to describe the position of every operational step within the operational sequence of a given artefact. The upper, more convex surface of a bifacial tool is labeled by the character ‘O’ (*‘Oberseite’*) and the lower surface is indicated by the character U (*‘Unterseite’*) (RICHTER 2004, 236 ff.). Following, the artefact has to be oriented according to its longitudinal axis: pointed pieces are oriented with their point up, while artefacts with convergent edges are oriented with the angle of intersection up. Pieces with plano-convex section are oriented with their flat face as their lower face, while artefacts with bi-convex section are oriented with their retouched edge to the right. The chronological description of operational steps on one surface follows the principal operational stages of their origin (e. g. original state → preparation → surface shaping → edge retouch etc.). In order of the traceability of different operational steps the artefact is oriented as described above and every edge is labeled by numbers (Fig. 2). The ‘addresses’ of the operational steps of the upper surface of a bifacial point are labeled in a clock-wise order and those of the lower surface counterclockwise:

Upper surface:
distal edge (O1)
right edge (O2)

proximal edge (O3)
left edge (O4)

Lower surface:
distal edge (U1)
left edge (U2)
proximal edge (U3)
right edge (U4)

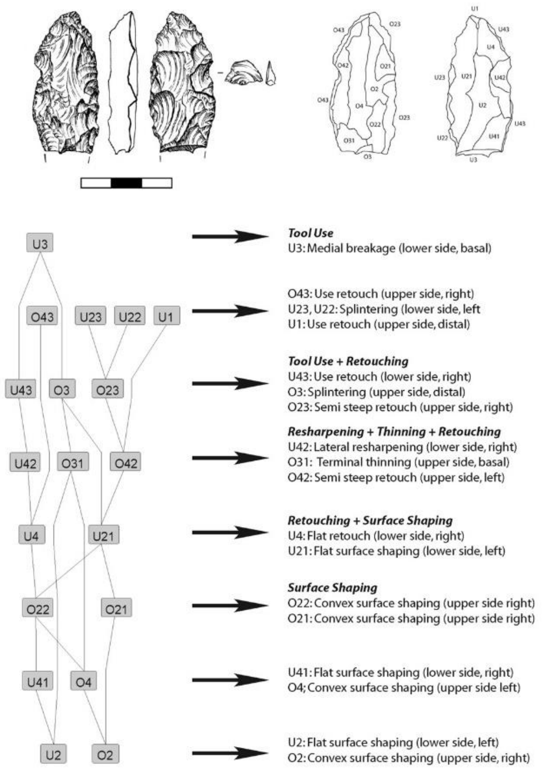

Fig. 5: Result of the analysis of work steps for a plano-convex leaf-shaped point (Kabazi II, Level V/3, RMU2) (after Kurbjuhn 2005, Fig. 15-4).

Every feature that describes a surface shaped piece is encoded by Arabic numerals (**Fig. 3**). The operational steps are finally described by a code which inherits information about the lower or upper surface ('O' or 'U'), the position from which the belonging negatives were detached (e. g. 'O1') and descriptive features like *contour line, origin, order, state of the edge and position*.

The *Analysis of Operational Chains* enables us to reconstruct the biography and thus the different functions of surface shaped pieces and cores (**Fig. 5**). This is of special importance since bifaces and cores sometimes undergo several changes during their biography and are repeatedly rejuvenated. Moreover, working edges are retouched according to different functions.

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Western Crimean Mousterian

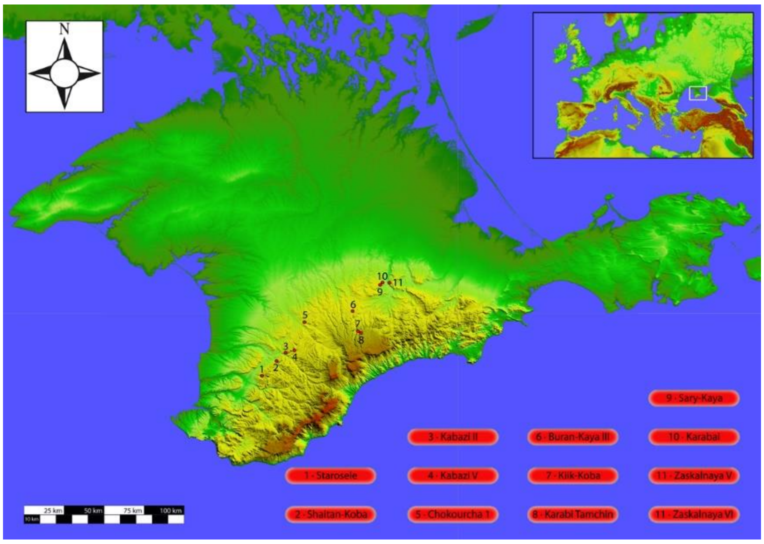

Fig. 1: Crimean Middle Palaeolithic sites (Bataille 2010).

The Western Crimean Mousterian industry was defined on the assemblages of Unit II of the Western Crimean site Kabazi II (CHABAI 1998b, KOLOSOV ET AL. 1993). Aside from Kabazi II, with its important archeological sequence, it is known from three further stratified sites: Shaitan-Koba, Karabi Tamchin and Kabazi V **(Fig. 1)**.

The Western Crimean Mousterian has been put into the context of the Eastern European Levallois Mousterian which is known from three regions: Prut and Dniester and the Crimean Peninsula. The earliest occurrence of the Levallois Mousterian industry is known from the river valleys of Prut and Dniester; those assemblages are attributed to the Eemian Interglacial (CHABAI ET AL. 2004). This variant of Eastern European Levallois Mousterian is alternatively called 'Molodova-Mousterian culture'. It is represented by stratified sites like Yezupil, layer III, Molodova I, layers I-IV and Molodova V, layers 11-12 (SITLIVY & ZIEBA 2006, 370 f.). According to SYTNIK it is characterized by the Levallois method and in addition to that the production of blades; knives, points and side-scrapers are the prevailing tool classes, while bifacial tools are missing completely (SYTNIK 2000, after SITLIVY & ZIEBA 2006, 370).

The Eastern Micoquian which appears during the Last Interglacial in Crimea (Kabazi II, Units V and VI) is, if in stratigraphical context with the Western Crimean Mousterian, always found below the Mousterian occupations. Exceptions are interstratifications between both industries in the Kabazi V sequence (CHABAI, RICHTER & UTHMEIER 2008). The Western Crimean Mousterian is not present in Crimea before the second half of MIS 3 (Fig. 2). Its eldest inventories occur within Hosselo Stadial (Kabazi II, level IIA/2). The youngest assemblages are attributed to the Denekamp / Arcy Interstadial (Kabazi II, levels II/IA, A3A-A4) (CHABAI 2006, GERASIMENKO 2005). In Crimea, if stratified with Micoquian sequences, it always overlays the latter. Absolute dates and pollen analysis indicate a later appearance of the Western Crimean Mousterian in Crimea than the Crimean Micoquian. Nevertheless, starting from Hosselo Interstadial both industries coexisted (see below): the Western Crimean Mousterian spans a time range between appr. 45 ka uncal. BP and 30 ka uncal. BP. The meaning of the coexistence of both Middle Palaeolithic entities is not satisfactorily explained until today. Ukrainian researchers tend to interpret this phenomenon as the co-occurrence of 'two different traditions' of 'distinct social units' which produced different sets of artefacts but shared similar land use and hunting strategies (e. g. CHABAI & UTHMEIER 2006, 357 f.). In contrast to that, Th. UTHMEIER (2006, 397 ff.) introduced a more functional explanation for the coexistence of both industries in the same geographic region. He assumes that the bearer of both techno-complexes share the same knowledge about lithic technology ('concept reservoir B'). Following his arguments the differences between both industries are the result of seasonality and time of occupation (UTHMEIER 2006, 451 ff.).

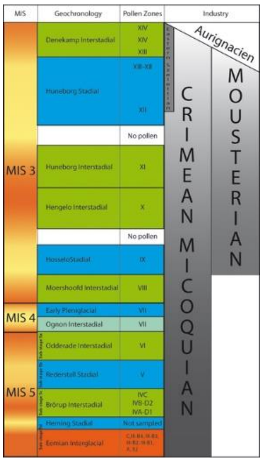

Fig. 2: Chrono-stratigraphy of Crimean Middle and Early Upper Palaeolithic industries (Bataille 2010, after dates of Chabai 2005, Tab. 1-1 and Chabai 2006, Tab.1-1).

The Western Crimean Mousterian is characterized by the presence of the Levallois concept, the production of blades from volumetric cores and the nearly complete absence of bifacial technology **(Fig. 3)**. The unifacial façonnage is present but rare in Western Crimean Mousterian context (e.g. Kabazi II, level II/8). CHABAI (1998a, 2004) sub-divided this industry in an early stage with Levallois concept and a late stage with predominant uni- and bipolar volumetric blade concept. The early stage commences in the Hosselo Stadial and ends in the Huneborg Interstadial. It includes levels IIA/2 till II/7 of the Western Crimean site Kabazi II which exhibits twenty Mousterian levels (CHABAI 2004). The late stage reaches from the Stadial preceding Arcy (Denekamp) Interstadial through the whole Denekamp Interstadial. It is attestable in the uppermost archeological layers of Kabazi II (levels II/6-II/1A). In the early stage the preferential and the recurrent Levallois method for the production of Levallois flakes but also Levallois blades is present. The exploitation of uni- and bipolar volumetric cores during the late stage resulted in the production of blades which were struck by direct hard hammer technique. It has to be mentioned that this subdivision is not the result of a cultural evolution, since the reduction of volumetric blade cores is also known from Yezupil, layer III in the Prut/ Dniester region which dates to the last Interglacial (CHABAI ET AL. 2004, 444).

Simple flakes are dominating the Western Crimean Mousterian assemblages, often with elongated shapes. The latter were preferred for the modification of working edges.

The tool assemblages are dominated by simple side-scrapers with up to 60 % of all tools. In most cases different scrapers were produced on elongated flakes and blades, among them Levallois products. Another important feature is the presence of points with an average share of around 20 % and of converging scrapers which have an average share of up to 15 % of all tools (CHABAI 2004).

Irrespective the Upper Levels of Shaitan Koba, Kholodnaya Balka and Sub-unit III of Kabazi V most of the known Western Crimean Mousterian layers exhibit no features that speak for longer occupations, like fire places or pits (DEMIDENKO 2008a, CHABAI & UTHMEIER 2006). In nearly all cases we are dealing with ephemeral stations for the butchering of wild ass and Saiga antelope and the preparation of lithic raw material (Kabazi II).

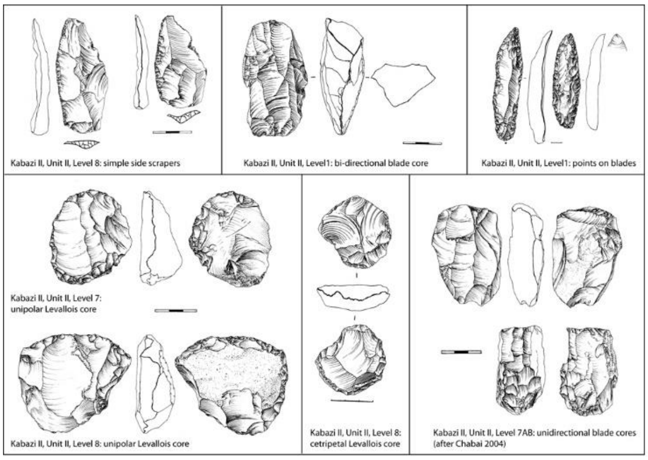

Fig. 3: Artefacts of Kabazi II, Unit II, Levels 1, 7, 7AB, 8 – Western Crimean Mousterian (modified after Chabai 2004).

Crimean Micoquian

The Crimean Micoquian is part of the Eastern Micoquian (EM) that can be traced all over the Eastern European distribution of Middle Palaeolithic evidence. It is present in a wide belt of sites known from a vast area reaching from the Prut and Dniester region in the West to the Northern Caucasus in the East (CHABAI ET AL. 2004). Its most striking characteristics are the presence of bifacial technology and the exploitation of unifacial discoidal cores while Levallois method and blade production are more or less absent. Like in Middle Europe, bifaces were regularly produced in plano-convex manner. In comparison to the Mousterian industries of Eastern Europe the Eastern Micoquian shows a wider distribution, since it is known from more or less all Eastern European regions were Middle Palaeolithic investigations have been carried out. The Eastern Micoquian is known from the Prut and Dniester region, Donbass-Azov region, the Lower Volga, the Northern Caucasus and the Crimean Peninsula (CHABAI ET AL. 2004).

The bearer of the Micoquian inhabited a forest-steppe and meadow steppe habitat. Comparable to the faunal assemblages known from Western Crimean Mousterian layers Neanderthals associated with Crimean Micoquian assemblages conducted specialized hunts on the small steppe adopted species wild ass (Equus hydruntinus) and Saiga antelope (Saiga tatarica). These taxa dominate most faunal assemblages in Western Crimea. In contrast to that, in Eastern Crimea the hunting fauna is more diverse (CHABAI ET AL. 2004).

The eldest representatives of the Crimean Micoquian are known from Unit VI of Kabazi II which is attributed to the end of the Eemian interglacial (MIS 5d). Earliest evidence outside Crimea is known probably from Ilskaya 1 near the Kuban River in the Northern Caucasus and layer 1 from Belokuzminovka 1 in the Donetsk Basin. The Micoquian sequence of the latter site has been dated by palynological studies to the Last Interglacial (Chabai et al. 2004, 427). In the Lower Volga Valley the first and most reliable evidence for the Micoquian industry, also attributed to Eemian Interglacial, is known from the open-air site Sukhaya Mechetka showing the presence of plano-convex bifacial pieces. In the course of the following early glacial period, the number of sites and regions showing assemblages of the Eastern Micoquian increases. During Moershoofd Stadial Micoquian occupations are securely detected in the Prut-Dniester region (Yezupil, layer II), in the Donets region (Nosovo I) and probably in the Middle Don area and the Northern Caucasus. The youngest dates are settled in Denekamp Interstadial (Buran-Kaya III, level B1) (CHABAI ET AL. 2004). In Crimea, the Micoquian industry is subdivided into three facies, whose main differences are the average share of different tool types and further the reduction state and due to that the different sizes of lithic artefacts. Those facies are named after eponymous sites: Ak-Kaya, Starosele and Kiik-Koba.

In contrast to the Western Crimean Mousterian, according to MARKS and CHABAI (2006, 121) the Crimean Micoquian “exhibited only limited mobility” with territories usually not expanding across the borders of Crimea. While the Mousterian occupations are ephemeral camps (Kabazi V) and butchering stations (Kabazi II) the Micoquian occupations show both ephemeral and longer occupied camp sites. These camp sites show features like fireplaces, pits and burials (CHABAI & UTHMEIER 2006). While from a technological point of view, the lithic assemblages of Micoquian and Mousterian sites show clear differences, the adaptation to the natural environment does not seem to deviate: e. g. sites of both industries are known from the same geographical and topographical situations, the same taxa were hunted, and the same flint raw material sources were exploited. In three of four stratified sites the Crimean Micoquian occupations regularly underlay the Western Crimean Mousterian occupations. On the contrary, in Kabazi V interstratifications of both industries could be attested, partially in one and the same archaeological layer. The latter was interpreted as mechanical mixture of occupations of distinct archaeological ‘groups’ (e. g. CHABAI 2008, VESELSKY 2008).

Ak-Kaya facie

This facie is known from a number of Crimean sites, like Ak-Kaya III, Zaskalnaya III, V, VI, Sary-Kaya, Chokourcha I, Kabazi II and Prolom II. Kabazi II yields the longest sequence of Ak-Kaya assemblages reaching from the end of the last interglacial (MIS 5d) until the Hosselo Stadial (MIS 3). The latest known evidence is attested in layer II of Zaskalnaya VI with an uncalibrated AMS-age of 35.000 ± 900 BP (CHABAI 2004).

Technologically and typologically Ak-Kayan is defined by the presence of bifacial technology and a small share of blades. Typical for all Crimean Micoquian facies, bifacial tools regularly show a plano-convex cross-section **(Fig. 4)**. They are produced on thin plaquettes from flint and chert (DEMIDENKO 1996; CHABAI 1998b). Side scrapers account for up to 50 % of all tools, among them uni- and bifacial surface shaped pieces. On the contrary, points amount to only 10 % of all tools while convergent scrapers sum up to 35 % of all tools (CHABAI 2004, 301f.). Typical attributes are backed knives (Keilmesser) of the types ‘Bockstein’, ‘Klausennische’ and ‘Pradnik’ / ‘Ciemna’ according to BOSINSKI (1967) and RICHTER (1997). Due to the small amount of facetted striking platforms and the rarity of preferential Levallois cores it is assumed that the Levallois concept is generally missing in the Ak-Kaya inventories, though in Zaskalnaya V (layers III and IV) Levallois cores are present. This occasional occurrence was interpreted as the result of mechanical mixture of Western Crimean Mousterian and Micoquian occupations (CHABAI, MARKS & MONIGAL 2004). As mentioned above, this view was rejected by UTHMEIER who proposed the idea of the Levallois concept as part of a common ‘concept reservoir’ of Micoquian and Mousterian industries (UTHMEIER 2006). The association of the Ak-Kaya facie with Homo neanderthalensis is evident since nine Neanderthal fossils could be documented in direct context with Ak-Kaya assemblages.

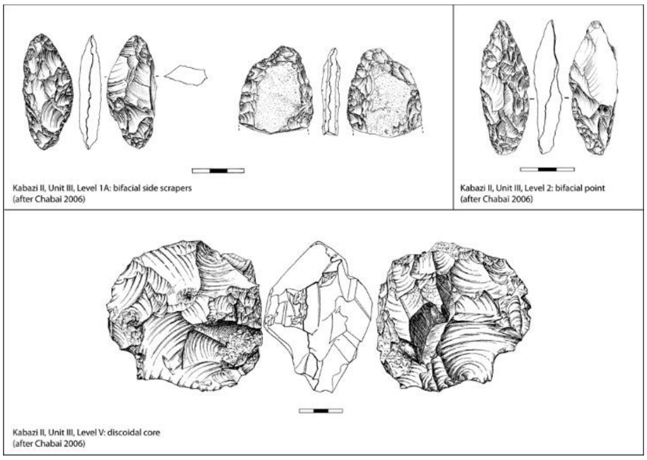

Fig. 4: Artefacts of Kabazi II, Unit III, Levels 1A, 2, 5 – Eastern Micoquian, Ak-Kaya facie (modified after Chabai 2006).

Kiik-Koba facie

This facie is known from three rock-shelters: the eponymous site Kiik-Koba (upper level), Buran-Kaya III (layer B) and Prolom I (upper and lower level) (DEMIDENKO 2002, 140 ff.). All of those sites show low sedimentation rates with occupations that are “densely packed by artefacts and bones palimpsests” (CHABAI 2004, 302). Additionally, artefacts of Kiik-Koba type could be found within the lower layer of the 1920’s excavations of Siuren 1 and within their in the 1990’s excavated pendants Units “H”-“G” (BONCH-OSMOLOVSKI 1934; DEMIDENKO 2003). Pollen and micro-faunal analysis temporarily connects the Buran-Kaya III assemblage with Denekamp (Arcy) Interstadial. This chronological assignment confirms the very late absolute dates of Prolom I and Buran-Kaya III. Uncalibrated AMS dates of Buran-Kaya III, layer B are 28.840±460 ka BP and 28.520±460 ka BP. Radiocarbon dates of Prolom I are 30.510±580/500 ka BP and 31.300±630/580 ka BP (CHABAI 2004).

In general, the Kiik-Koba facie is characterized by small sized stone artefacts, most of the time not longer than 4-5 cm (CHABAI 2004) **(Fig. 5)**. Flakes were struck from discoidal, radial and unidirectional cores. The same tool types as in the Ak-Kaya facie are present. The lithic assemblages of Kiik-Koba levels only deviate in the different share of those tool types. Points have a share of up to 40 % of all tools. Those points are composed of simple pieces with only edge modification and in plano-convex manner surface shaped tools (STEPANCHUK 2002, after UTHMEIER 2006). Bifacial tools have an average share of 15 %, but deviating from Ak-Kaya assemblages, only few backed knives occur. The common convergent and simple side scrapers have been produced on flakes with lateral point of percussion and thus have a triangular shape.

In the last decades the 'Kiik-Kobian' was understood as an isolated industry. Since the 1990's a view has been put forward, that understands Kiik-Koba assemblages as facie of the Crimean Micoquian industry (DEMIDENKO, 2003, 2004; CHABAI 1998). This facie is characterized by small sizes of stone artefacts and a high degree of rework. This can be explained by a long time of usage and following a pronounced stage of reduction, what can especially be seen on the typical bifacial points of this industry.

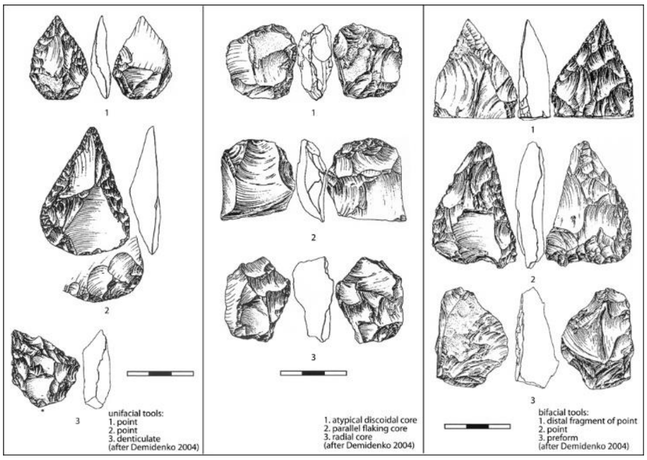

Fig. 5: Artefacts of Buran-Kaya III, Level B1 – Eastern Micoquian, Kiik-Koba facie (modified after Demidenko 2004).

Starosele facie

This facie is known from the Middle Palaeolithic sites Kabazi V, GABO, Zaskalnaya V (layers I and IV), Zaskalnaya VI, (layers IV and V); Prolom II (layers II and III), Chokourcha I (level IV-O), Karabi Tamchin (levels IV/2 and V) and the lower units of Formozow's excavations of the eponymous site Starosele (level 1).

The oldest assemblage is probably Karabi Tamchin, level V which is attributed latest to "one of the Early Glacial Interstadials (Amersfoort, Brörup, Odderade)" (YEVTUSHENKO ET AL. 2004). Level 2 of Starosele is attributed to the Moershoofd Interstadial of the early MIS 3, but it has no clear affinity to the Starosele facie. The youngest inventory is Layer I of Zaskalnaya V which is attributed to the Arcy/ Denekamp Interstadial (CHABAI 2004).

The differences between Ak-Kaya facie and Starosele facie are of statistical nature, concerning the average presence or absence of different tool types. Typical features are bifacial points and side scrapers as well as bifaces ('Halbkeile') **(Fig. 6)**. Bifacial points and side scrapers have an average share of 15 % of all tools. Unifacial convergent side scrapers and points have an average share of up to 45 % of all tools. Backed knives (Keilmesser) are in contrast to the Ak-Kaya facie underrepresented (up to 10 % of all tools). The average tool sizes are smaller than in Ak-Kaya assemblages, probably due to a more pronounced state of reduction. Concerning the tool sizes, Starosele lies in between Ak-Kaya assemblages with biggest average tool sizes and Kiik-Koba inventories with smallest sizes, what is possible due to different stages of reduction.

Two Neanderthal fossils could be documented in Prolom II in association with Starosele assemblages.

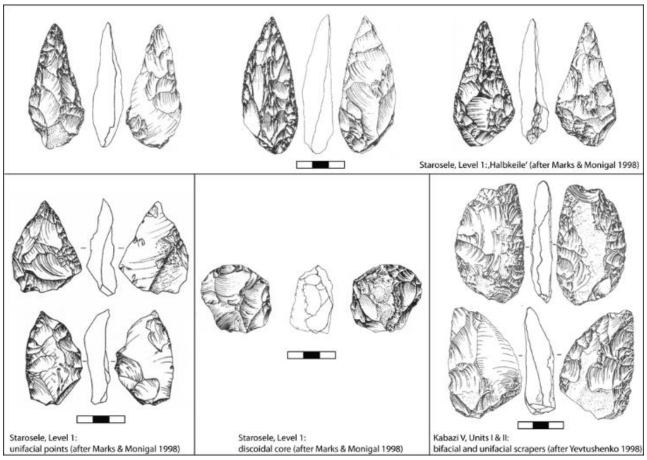

Fig. 6: Artefacts of Starosele, Level 1 and Kabazi V, Units 1 & 2 – Eastern Micoquian, Starosele facie (modified after Marks & Monigal 1998 and Yevtushenko 1998).

Starosele Level 3-Industry

This industry exhibits a flake industry which is up to now only known from Level 3 of the eponymous site of Starosele. Excavations were undertaken in the years 1993-1995 under the direction of A. E. MARKS. While an attribution of this industry to the Hengelo Interstadial (MIS 3) was assumed by RINK ET AL. (1998), today it is geo-chronologically settled within the Early Weichselian Ognon Stadial (MIS 4) (CHABAI & UTHMEIER 2006). Due to the presence of a fire place and the distribution of lithic artefacts, which show clear bordered concentrations a primary context of the Level 3 assemblage was suggested (MARKS & MONIGAL 1998).

The main features are thick flakes that suggest a variant of the discoidal concept in which only one flaking surface of the cores was exploited **(Fig. 7)**. CHABAI ET AL. (2002) postulated that the main reason for this specific variant of core exploitation was the usage of flat raw nodules. Marker pieces for a discoidal exploitation are Pseudo-Levallois points and Pseudo-Levallois flakes as well as asymmetric points. At the end of the chaine opératoire thick flakes with crested remnants were struck from cores whose convexities were produced by steep retouch. Levallois method and bifacial technology lack completely.

In comparison to other Middle Paleolithic sites of Western Crimea, a longer occupation at Starosele Level 3 was suggested due to the intensity of the occupational surface and the high amount of imported unprepared raw nodules and their intense on-site exploitation (CHABAI ET AL. 2002).

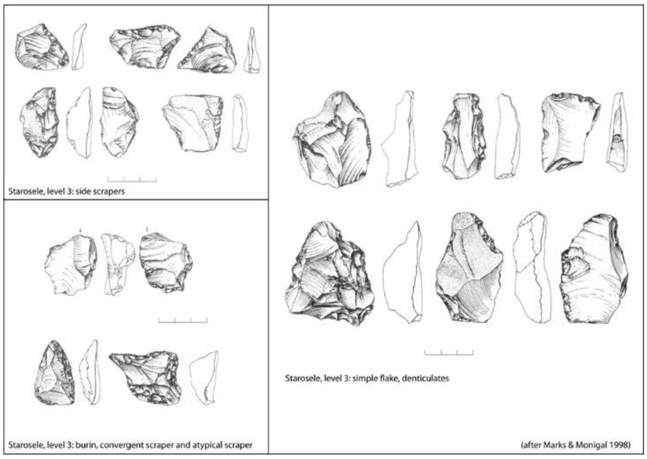

Fig. 7: Artefacts of Starosele, Level 3 – Starosele Level 3-industry (modified after Marks & Monigal 1998).

"Eastern Szeletian" / "Streletskaya Industry"

This industry is only known from level C of the partially collapsed rock shelter Buran-Kaya III. It is described as early Upper Paleolithic industry, for which a resemblance is seen with the Kostenki-Streletskaya industry of Kostenki 1 (layer V), Kostenki 12 (layer III) in the Mid Don region and Biryuchiya Balka 2 at the Lower Don river (MONIGAL 2004a, 2004b, DEMIDENKO 2008b). Buran-Kaya III, Level C shows a mixture of Middle and Upper Paleolithic features, but with no clear relations to Crimean Middle Paleolithic industries. Like the Crimean Micoquian bifacial surface shaping occurs. Admittedly, deviating from Micoquian bifaces, the pieces are manufactured in bi-convex manner. This assemblage is the only Crimean and at the same time very rare example from the whole European perspective of an early Upper Palaeolithic industry in an interstratified position, situated below a Middle Palaeolithic archeological layer (Level B1/ Kiik-Koba facie). Buran-Kaya III, Level C has been attributed to the Stadial between Hengelo and Denekamp/ Arcy Interstadial with uncalibrated AMS-dates between 32 ka B.P. and 36 ka B.P (MONIGAL 2004a).

The presence of geometrical microlithes and biconvex leaf points deviate the level C assemblage from all other known Crimean Middle Paleolithic industries **(Fig. 8)**. The foliates of Buran-Kaya III have a certain similarity to those known from the Streletskayan levels of Kostenki 1, but in most cases still differ in shape and thickness. The trapezoidal microlithes differ from those known from the Middle Don Region, which feature triangular shapes, as well. The discrepancies between microlithes of the Mid-Don region and Crimea have been explained as adaptation to different environmental conditions in those regions (MARKS & CHABAI 2006). While in the Mid Don region Streletskayan “groups” were adopted to a taiga forest habitat they had to cope with steppe conditions in Crimea (CHABAI 2004; CHABAI ET AL. 2004). Among the bifacial tool types backed knives are the most common ones and resemble the ‘Königsaue Typ A Keilmesser’ but are thinner in cross-section and more finely worked (MONIGAL 2006). A further peculiarity of this industry is the presence of so called ‘bone tubes’ which resemble pieces from the Western European Châtelperronian and Aurignacian context but are absent in ‘Streletskaya’ assemblages of Kostenki (D’ERRICO & LAROULANDIE 2000, 237 ff.) **(Fig. 9)**. Those tubes were made of long-bones of hare, wolf and probably horse and are interpreted as handles hafted with stone tools (LAROULANDIE & D’ERRICO 2004).

Like in the Don region, no human fossil remains are associated to that industry in Crimea – thus a secure attribution of Streletskaya/ Eastern Szeletian industry to whether modern human or Neanderthal is not possible.

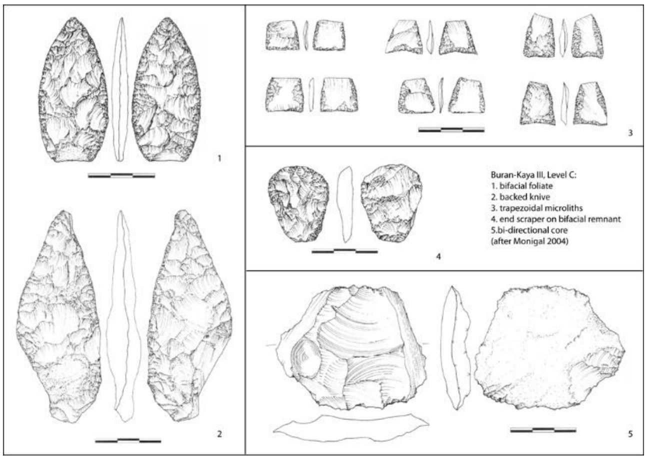

Fig. 8: Flint artefacts of Buran-Kaya III, Level C – Eastern Szelettian / Streletskaya industry (modified after Monigal 2004b).

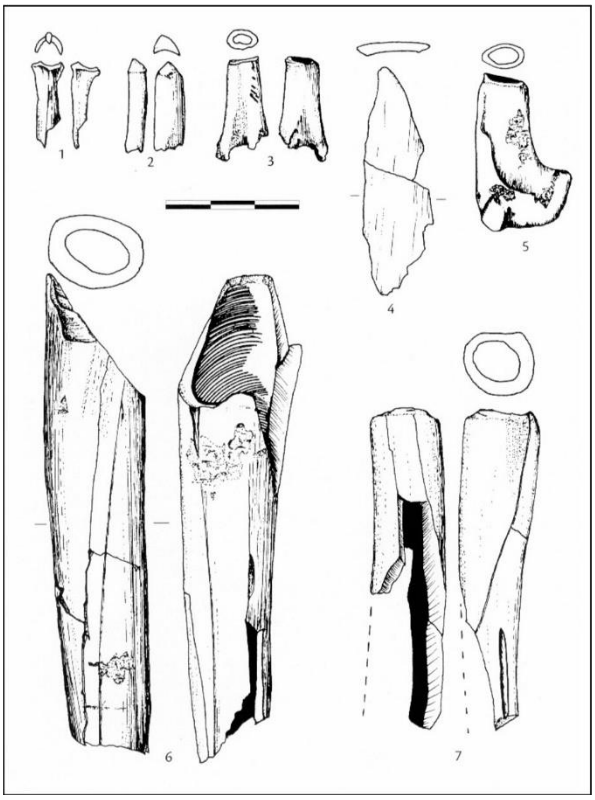

Fig. 9: Bone artefacts of Buran-Kaya III, Level C – Eastern Szelettian / Streletskaya industry (modified after Monigal 2004b, 75 / Fig. 5-19).

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List of Data

Introduction

The data sets listed below comprise the raw material description of every Raw Material Unit (RMU) (excel-sheet *'Rohmaterial'* / raw material), the transformation analysis of every RMU (excel-sheet *'Transformation'*), the longest possible measurement in mm of every artefact (excel-sheet *'Maß'*/ longest possible measurement), a grouped description of the artefacts belonging to one RMU (excel-sheet *'Werkstück'* / workpiece) and the attribute analysis of every artefact (excel-sheet *'Werkstück ausführlich'* / workpiece, detailed). The different features listed in the excel data base are encoded by numbers which are listed below.

Since RMUs are understood and treated as “sub-assemblages”, attributes were counted and measured within each unit in respect to the potential level of sorting, which are single pieces, work-pieces, raw material sources or geological formations (Uthmeier 2004a, 187). Due to that, after sorting artefacts of a specific archaeological layer to different Raw Material Units those units were identified by an individual number. Further denotations are the name of the site, the year(s) of excavation and the name of the archaeological layer.

Due to methodological reasons only lithic artefacts with longest possible measurements bigger 3 mm were analyzed in the course of the Transformation Analysis. Exceptions are retouch chips of tool modification etc. The artefacts were described both on quantitative and on qualitative scales.a

Quantitative data in metrical categories are the total weight (01) and the total number of all artefacts (02) belonging to one RMU (excel-sheets *‘Werkstück’* and *‘Transformation’*), and the maximal length of every artefact in mm (04) (excel-sheets *‘Werkstück ausführlich’* and *‘Maß’*).

Qualitative data on ordinal scale are: blank type and dorsal cortex remains (nodule, core, cortical blank, partly cortical blank, blank without cortex, blank type not identified (unclassified fragment, chunk) (1-6; excel-sheets *‘Werkstück’* and *‘Werkstück ausführlich’*).

Further qualitative attributes in nominal categories are: blank types for technological analysis (7-23 / excel-sheets *‘Werkstück’* and *‘Werkstück ausführlich’*), preservation of modified pieces (24-29 / excel-sheets *‘Werkstück’* and *‘Werkstück ausführlich’*), and modified pieces, typology (30-50 / excel-sheets *‘Werkstück’* and *‘Werkstück ausführlich’*).

Raw Material (‘Rohmaterial’): raw material description (♣)

The macroscopic features of every RMU were described. The raw material description comprises qualitative data on nominal and on ordinal scale. Ordinal features are: raw material source (primary, residual, pebble, not recognizable), and the reconstructed shape of a given raw material (nodule, plaquette, flat nodule, not recognizable). General observations on nominal scale, like features of the matrix (colour, texture, hinges, fractures, fossils, streaks, and bands), features of the cortex (colour, structure), and the presence or absence of patina have been described individually.

Transformation (‘Transformation’): classification of Transformation Sections (♠)

After sorting every artefact to different RMUs, in a next step the transformation section of every RMU according to the given stage within the *chaîne opératoire* is established. Here RMUs are described according to different transformation classes which derive from their attestable on-site reduction: e. g. the on-site production of blades and tools, indicated by the presence of modified blades which belong to one and the same work piece. The state of cortical remains can give further information about the import state of the work piece. The absence of cortex on artefacts belonging to one work piece might argue for the import of a nodule that already was prepared pre-site. In this example we would deal with the import of a blade core, the on-site production of blades and the modification of working edges. The given transformation class is denoted by a key. For example, Cb encodes on-site blank production from an imported core, or Nb stands for on-site blank production from an imported raw nodule. In our example the key Cm (on-site reduction of a core and the modification of on-site produced blanks) would describe our RMU. You can find the keys on the page Transformation Analysis. The transformation data set comprises quantitative and qualitative data. Quantitative data are the total number of artefacts and the total weight of artefacts of every RMU. Qualitative data on ordinal scale are artefact categories (raw nodule, core, flake, blade, chip, preparation flake, formal tool) and the state of dorsal cortical remains on the dorsal face of blank products and the reduction face of cores (complete cortical, partial cortical, without cortex). Finally, the on-site transformation is described (e. g. import of core, production of flakes, and edge modification of flakes and discard of the on-site produced tools).

Grouped Attribute Analysis ('Werkstück'): description of RMUs (♦)

In the excel-sheet *'Werkstück'* ('workpiece') a grouped description of artefacts bigger 3 cm belonging to one and the same RMU can be found. The total weight of all artefacts (01) and the total number of artefacts belonging to one Raw Material Unit (02) is indicated. The belonging artefacts are summarized under the categories of dorsal cortex remains: 1. nodule (completely covered by cortex), 2. core (partly covered by cortex or without cortex), 3. cortical flake or blade, 4. flake or blade, partly covered by cortex, 5. flake or blade without cortex, 6. blank type not identified (unclassified fragment, chunk) (1-6). Like in the excel-sheet *'Werkstück ausführlich'* blank types and tool types are indicated in hierarchical order (7-50) (see below).

Attribute Analysis ('Werkstück ausführlich'): description of single artefacts (†)

An attribute analysis was undertaken for every individual artefact. The attributes listed below were published by Uthmeier (2004, 175 ff.). Every Raw Material Unit is identified by an individual number. Further denotations are the name of the site and the name of the archaeological horizon. Every artefact bigger 3 cm is labeled by an individual number (01). Moreover, the quadrant where the artefact was found (02) and the artefact's longest possible measurement in mm are indicated (03).

The attribute analysis of artefacts was undertaken in hierarchical order. The Arabic numbers 01-03 and 1-50 are identical with the numbers of the excel-sheet *'Werkstück ausführlich'*:

1. Blank type and frequency of cortex: number of artefacts in ordinal categories

   1. Nodule, completely covered by cortex
   2. Core, partly covered by cortex or without cortex
   3. Cortical flake or blade
   4. Flake or blade, partly covered by cortex
   5. Flake or blade without cortex
   6. Blank type not identified (unclassified fragment, chunk)
2. Data taken from all artefacts belonging to blank type 3-5: number of artefacts in nominal categories
   1. Flake, simple
   2. *Couteau à dos naturel*
   3. Flake, crested
   4. Flake, lateral remnant of crest
   5. Flake, pseudo-Levallois point
   6. Flake, Levallois
   7. Flake, Levallois point
   8. Blade, Levallois
   9. Blade, simple
   10. Blade, crested
   11. Flake, transverse (*Breitabschlag*)
   12. Flake, Kombewa
   13. Chunk
   14. Chip
   15. Bladelet
   16. Flake, surface retouch
   17. Flake, resharpening
3. Preservation of modified pieces: number of artefacts in nominal categories
   1. Modified piece, surface shaping, proximal fragment

    2. Modified piece, surface shaping, distal fragment
    3. Modified piece, surface shaping, complete
    4. Modified piece, retouch of simple blank, proximal fragment
    5. Modified piece, retouch of simple blank, distal fragment
    6. Modified piece, retouch of simple blank, complete
4. Modified pieces, typology: number of artefacts in nominal categories
    1. Point
    2. Sidescraper, simple
    3. Sidescraper, double
    4. Sidescraper, convergent
    5. Sidescraper, *déjété*
    6. Sidescraper, transverse
    7. Sidescraper, more than 2 working edges
    8. Endscraper
    9. Burin
    10. Borer
    11. Backed piece
    12. End retouch
    13. Notch
    14. Denticulate
    15. Bec
    16. Pebble tool
    17. Piece > 3 cm with use retouch
    18. Piece < 3 cm with use retouch
    19. Modified piece, surface shaping, 1 working edge
    20. Modified piece, surface shaping, 2 or more working edges

21. Biface, remnant

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Catalogue

Legend

- WCM Western Crimean Mousterian
- CM Crimean Micoquian
- SL3 Starosele-Level 3-industry
- ♠ Transformation
- ♣ Raw material
- ♥ Longest possible measurement in mm of individual artefacts
- ♦ Grouped attribute analysis per Raw Material Unit
- † analysis of individual artefacts

1. Kabazi II

Level	Industry	Feature
II/6	(WCM)	♠♣♥♦†
II/7	(WCM)	♠♣♥♦†
II/7AB	(WCM)	♠♣♥♦†
II/7C	(WCM)	♠♣♥♦†
II/7D	(WCM)	♠♣♥♦†
II/7E	(WCM)	♠♣♥♦†
II/7F	(WCM)	♠♣♥♦†
II/8 (II/8AB, II/7F)	(WCM)	♠♣♥♦†
II/8C	(WCM)	♠♣♥♦
IIA/1	(WCM)	♠♣♥♦†
IIA/2	(CM)	♠♣♥♦†
III/1	(CM)	♠♣♥♦
III/1A	(CM)	♠♣♥♦
III/2	(CM)	♠♣♥♦†
III/2A	(CM)	♠♣♥♦†

III/4	(CM)	♠♣♥♦†
III/5	(CM)	♠♣♥♦†
III/6	(CM)	♠♣♥♦†
III/7	(CM)	♠♣♥♦†
V/1	(CM)	♠♣♥♦†
V/2,2A	(CM)	♠♣♥♦
V/3	(CM)	♠♣♥♦
V/4	(CM)	♠♣♥♦
V/5	(CM)	♠♣♥♦
V/6	(CM)	♠♣♥♦
VI/1	(CM)	♠♣♥♦
VI/2	(CM)	♠♣♥♦
VI/3	(CM)	♠♣♥♦†
VI/4	(CM)	♠♣♥♦
VI/5	(CM)	♠♣♥♦
VI/6	(CM)	♠♣♥♦
VI/7	(CM)	♠♣♥♦†
VI/8	(CM)	♠♣♥♦
VI/9	(CM)	♠♣♥♦
VI/10	(CM)	♠♣♥♦
VI/11	(CM)	♠♣♥♦
VI/12	(CM)	♠♣♥♦
VI/13	(CM)	♠♣♥♦
VI/14	(CM)	♠♣♥♦†
VI/15	(CM)	♠♣♥♦
VI/16	(CM)	♠♣♥♦
VI/17	(CM)	♠♣♥♦

2. Kabazi V

Level	Industry	Feature
III/1C	(WCM)	♠♣♥†
III/2A	(WCM)	♠♣♥†
III/3-1B	(WCM)	♠♣♥†
III/3-1C	(WCM)	♠♣♥†
III/3-1D	(WCM)	♠♣♥†
III/3-3A	(WCM)	♠♣♥†
III/5	(WCM)	♠♣♥†
IV/2	(CM)	♠♣♥†
IV/3	(CM)	♠♣♥†

3. Staroselje

Level	Industry	Feature
1	(CM)	♠♣♥♦†
2	(CM)	♣♥♦

3	(SL3)	♣♥♦
4	(CM)	♣♥♦

4. Chokurcha 1

Level	Industry	Feature
1	(CM)	♠♣♥♦
M	(CM)	♠♣♥♦
O	(CM)	♠♣♥♦

5. Buran-Kaya III

Level	Industry	Feature
B1	(CM)	♠♣♥♦