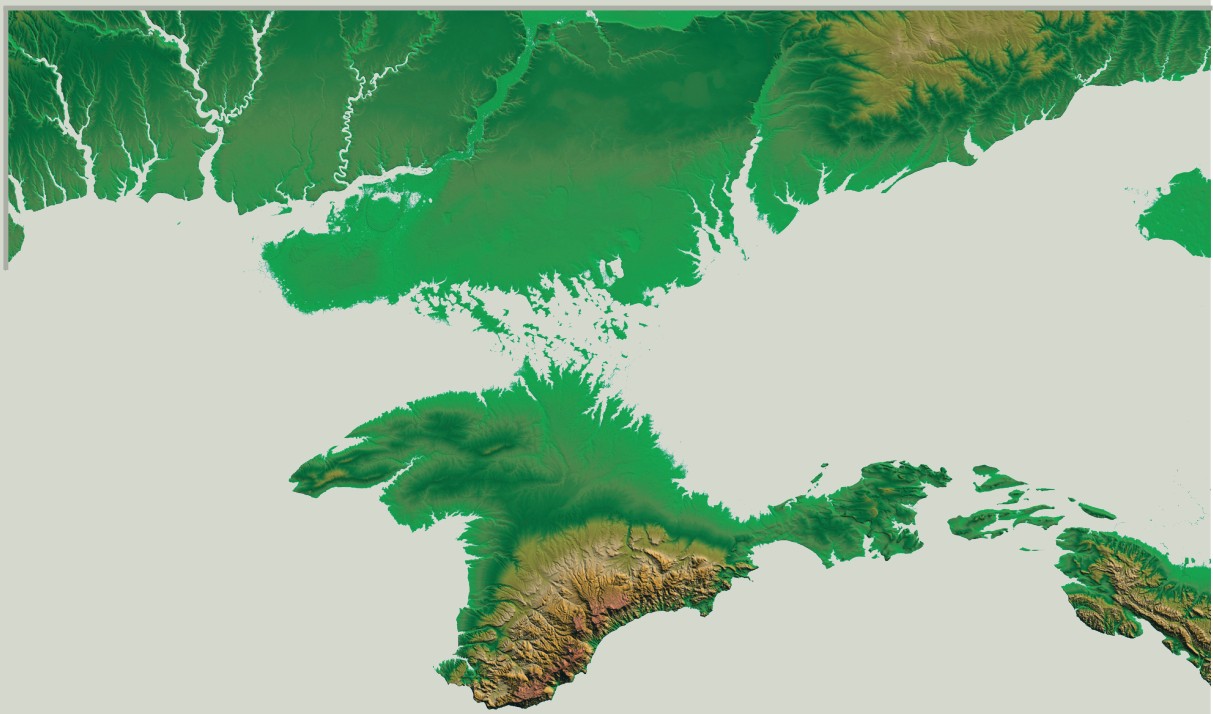
Palaeolithic Sites of Crimea · Vol. 1

KABAZI II:
LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE



Edited by

Victor Chabai, Jürgen Richter and Thorsten Uthmeier

KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК УКРАИНЫ
ИНСТИТУТ АРХЕОЛОГИИ
КРЫМСКИЙ ФИЛИАЛ

КЁЛЬНСКИЙ УНИВЕРСИТЕТ
ИНСТИТУТ ДО- И ПРОТОИСТОРИИ

Палеолитические стоянки Крыма,
Том 1

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2005

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INSTITUTE OF ARCHAEOLOGY
CRIMEAN BRANCH

UNIVERSITY OF COLOGNE
INSTITUTE OF PREHISTORIC ARCHAEOLOGY

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2005

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Preface

This publication is the first volume in a series devoted to the multidisciplinary studies of the International Crimean Paleolithic expedition in the framework of the international DFG project "Funktionale Variabilität im späten Mittelpaläolithikum auf der Halbinsel Krim, Ukraine" (RI 936/3-3). Over the last five years, a large team of specialists from Germany, Ukraine, France, Moldavia, Belgium, the United States and Russia have all made contributions to multidisciplinary research of the Crimean Paleolithic. The results from earlier field work and analytical investigations have already been published in two previous volumes (Chabai et al. eds., 2004, Demidenko ed., 2004), as well as in a number of national and international archeological journals.

During the 2000-2001 field seasons the Last Interglacial soil complex was found and excavated at the Kabazi II open-air Middle Paleolithic site. The environmental and artefact studies are due to be completed over the next several years, and to some extent, the results published in this volume might be viewed as a halfway station in our investigations. The entire - circa 14 m - sequence of sediments at Kabazi II has now been exposed, and different methods of environmental, radiometric and archeological investigations have shown that the site is the longest and the most complete Middle Paleolithic sequence not only in the Crimea but also in Eastern Europe. Certainly, more investigations are needed, and different dating methods and geological studies might be employed either to confirm or to disprove the results obtained so far. However, our present knowledge concerning the chronology and geological processes, as well as the archaeological and environmental characteristics of the site serves as the background for our forthcoming investigations.

This volume is devoted to the analysis of the lowest part of the Kabazi II sequence, and focuses on the environmental features, the faunal assemblages, and upon the artefacts recovered from the sediments comprising the Last Interglacial soil complex.

The authors of the following chapters were actively involved in both fieldwork campaigns (2000-2001) and in the ensuing laboratory investigations. They would like to express their sincere gratitude to all those colleagues and friends who contributed to the Kabazi II investigations:

G. Bataille, S. Bergmann, Dr. Yu. Demidenko, K. Fedorov, Dr. V. Golenko, K. Grüner, S. Ickler, A. Karpechenkov, C. Kempcke-Richter, O. Mouzichuk, Dr. D. Nuzhnyi, I. Pistruil, S. Scherm, A. Shpak, O. Shpak, M. Skrypnyk, D. Stupak, A. Veselsky, Dr. A. Yanevich, N. Yatsyshin, L. Yatsyshina, Dr. A. Yevtushenko. Special thanks also to Dr. L. Kulakovska (Archaeological Museum of the Institute of Archaeology in Kiev), who kindly and repeatedly made available laboratory facilities to Dr. M. Patou-Mathis for the study of the faunal material. Furthermore, the sampling of 14 metres of profile would have been practically impossible to achieve without the help of A. Lysenko. Lee Clare polished earlier versions of all chapters of the present volume and Guido Bataille prepared most of the figures for publication. The DFG (Deutsche Forschungsgemeinschaft) financed the publication of this book. Thank you all.

J. Richter
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ВВЕДЕНИЕ

Данное издание является первым томом серии публикаций посвященных междисциплинарным исследованиям международной Крымской палеолитической экспедиции в рамках Deutsche Forschungsgemeinschaft проекта “Funktionale Variabilität im späten Mittelpaläolithikum auf der Halbinsel Krim, Ukraine” (RI 936/3-3).

За последние пять лет группой специалистов из Украины, Германии, Франции, Молдовы, Бельгии, США и России был сделан значительный вклад в изучение среднего палеолита Крыма. Некоторые результаты данных исследований были опубликованы в двух сборниках (Chabai et al. eds., 2004, Demidenko ed., 2004), а также в статьях ряда национальных и международных археологических журналов.

Полевые сезоны 2000-2001 годов были посвящены раскопкам интергляциальной почвы, обнаруженной в нижней пачке отложений стоянки под открытым небом Кабази II. Комплексные междисциплинарные исследования интергляциальной почвы будут завершены через несколько лет. В данном томе предложены промежуточные результаты изучения окружающей среды и артефактов интергляциального комплекса Кабази II.

В настоящее время стратиграфический разрез Кабази II составляет около 14 м и является наиболее длинной и полной стратиграфической последовательностью не только в Крыму, но и в Восточной Европе. Данный разрез был изучен при помощи многочисленных палеогеографических, радиометрических и археологических методов. Безусловно, комплексное изучение Кабази II будет продолжено. Применение различных радиометрических и геологических методов поможет уточнить результаты нынешних исследований. Вместе с тем, полученная в настоящее время информация о хронологии, геологических процессах, палеогеографических и палеоэкономических характеристиках поселений Кабази II является основанием для дальнейших исследований.

В данном томе опубликованы результаты палеогеографических и археологических исследований нижней части разреза Кабази – комплекса интергляциальной почвы. Авторы глав этого издания были активно вовлечены в полевые исследования сезонов 2000-2001 годов и последующие лабораторные исследования и считают своим долгом выразить искреннюю признательность всем друзьям и коллегам, которые также внесли значительный вклад в изучение Кабази II: А. Бардадыму, Г. Батали, С. Бергман, С. Брусиловской, А. Весельскому, В. Голенко, М. Голенко, К. Грюнеру, Ю. Демиденко, А. Евтушенко, С. Иклер, А. Карпеченкову, К. Кемпке-Рихтер, О. Музычук, Д. Нужному, И. Пиструилу, Д. Ступаку, К. Федорову, С. Шерну, А. Шпаку, О. Шпак, А. Яневичу, Н. Яцышину, Л. Яцышиной. Особая благодарность Л. Кулаковской (археологический Музей Института археологии, Киев) за предоставленную М. Пату-Матис возможность использовать лабораторные помещения Музея для изучения фаунистических коллекций Кабази II. Отбор образцов с 14-метрового разреза Кабази II был произведен А. Лысенко. Ли Клер отредактировал английскую версию данного издания, а Г. Батали подготовил большую часть иллюстраций. Фонд Deutsche Forschungsgemeinschaft профинансировал издание данного тома. Спасибо всем!

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Chapter 1

Kabazi II: Stratigraphy and Archaeological Sequence

Victor P. Chabai

Kabazi II, which is one of four Middle Palaeolithic open-air sites located in the Crimea, is of particular importance as it is home to the longest stratigraphical sequence of Upper Pleistocene sediments thus far discovered at any Crimean or Eastern European site.

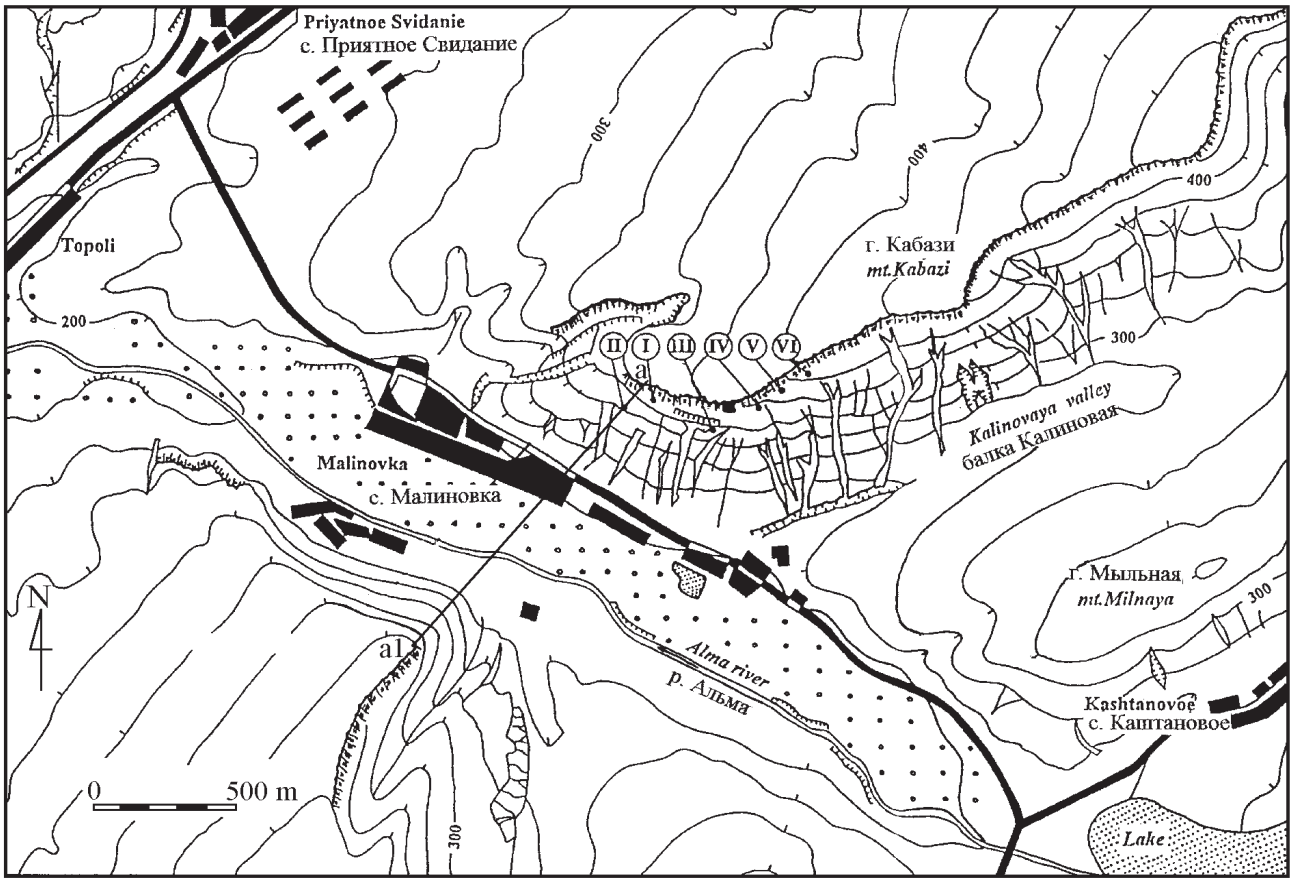
Setting

Kabazi II is situated on the right bank of the Alma River, on the southern slope of the Kabazi Mountain, a cuesta belonging to the second (internal) ridge of the Crimean Mountains. The site lies 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. (Fig. 1-1, *1, 2*). The elevation of Kabazi II is 302.14 m above sea level. In two parts of the site the remnants of a third river terrace were uncovered. Whilst these are situated at an elevation of between 280 m and 270 m above sea level, the lowermost *in situ* occupation of Kabazi II was discovered at an elevation of 290.9 m above sea level. Naturally, this topographical situation has contributed greatly to the geological history of the site which has witnessed a series of rock-falls, as well as colluvial, alluvial and pedogenetic processes.

Five further Middle Palaeolithic sites (Fig. 1-1, *1*) were investigated on the slopes of the Kabazi cuesta. These comprise two collapsed rock-shelters (Kabazi I and Kabazi V) and three locations with surface scatters (Kabazi III, Kabazi IV and Kabazi VI).

Excavation Strategy

The excavation of the site began with a sondage on squares 10*ИКЛ* and 11*ИКЛ*, whereby the one square metre grid was adopted. During the second field season (1987), and parallel to the sondage excavation, the bigger area on square lines 4, 5, 6, 7 and 8 was opened (Fig. 1-2, *1*). A sondage which was undertaken in the same field season exposed more than 10 m of sediments. After 1987, the sondage was refilled with back dirt. In the following seasons, two areas were excavated: first, on the square lines 4, 5,



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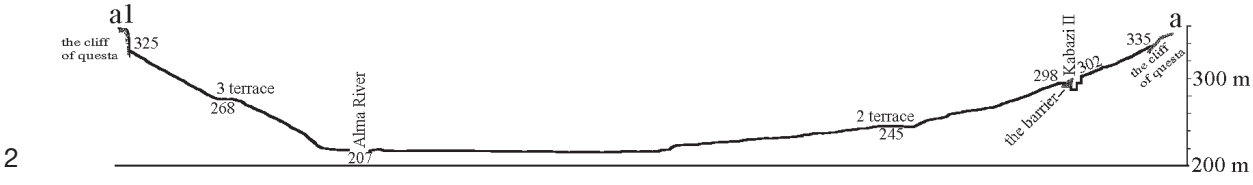

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Fig. 1-1 Kabazi II, topography: 1 – map of the Alma River Valley near the Kabazi group of sites, Roman numerals indicating the archaeological sites, a – a1 location of topographic cross-section across Alma River Valley; 2 – topographic cross-section across Alma River Valley and through Kabazi II site.

6, 7 and 8; and second, on square lines 10 and 11. The first area measures roughly 60 m² on the surface and 20 m² at its base (-11,5 m elevation on Fig. 1-2, 2). The lowest point of the first area is 14,10 m on the squares 4H, 4O and 4П. The second excavation area consists of 12 m² both on the surface and at the base of the pit.

All archaeological levels were excavated following the angle of inclination of the exposed sediments. The most common type of occupation to be observed in Kabazi II is the co-called "carpet floor" or "carpet level" which is characterised by a thin level of archaeological material (usually with the thickness of a single bone or artefact). The "carpet levels" are subdivided by sterile sediments of varying thickness. The excavation of "carpet" levels in lithologically monotonous sediments requires an exact documentation of elevation. No less than 10

elevations were taken in each square metre excavated. All finds, including the limestone blocks, were mapped at a scale 10:1. The faunal remains and the limestone blocks were plotted in the same scale and actual shape. Artefacts were mapped in conventional signs according to class or tool type. The sediments surrounding fauna or artefact clusters were sieved using a 1,5 mm screen. Additionally, water screening was employed for selected squares to recover snails and the rests of rodents.

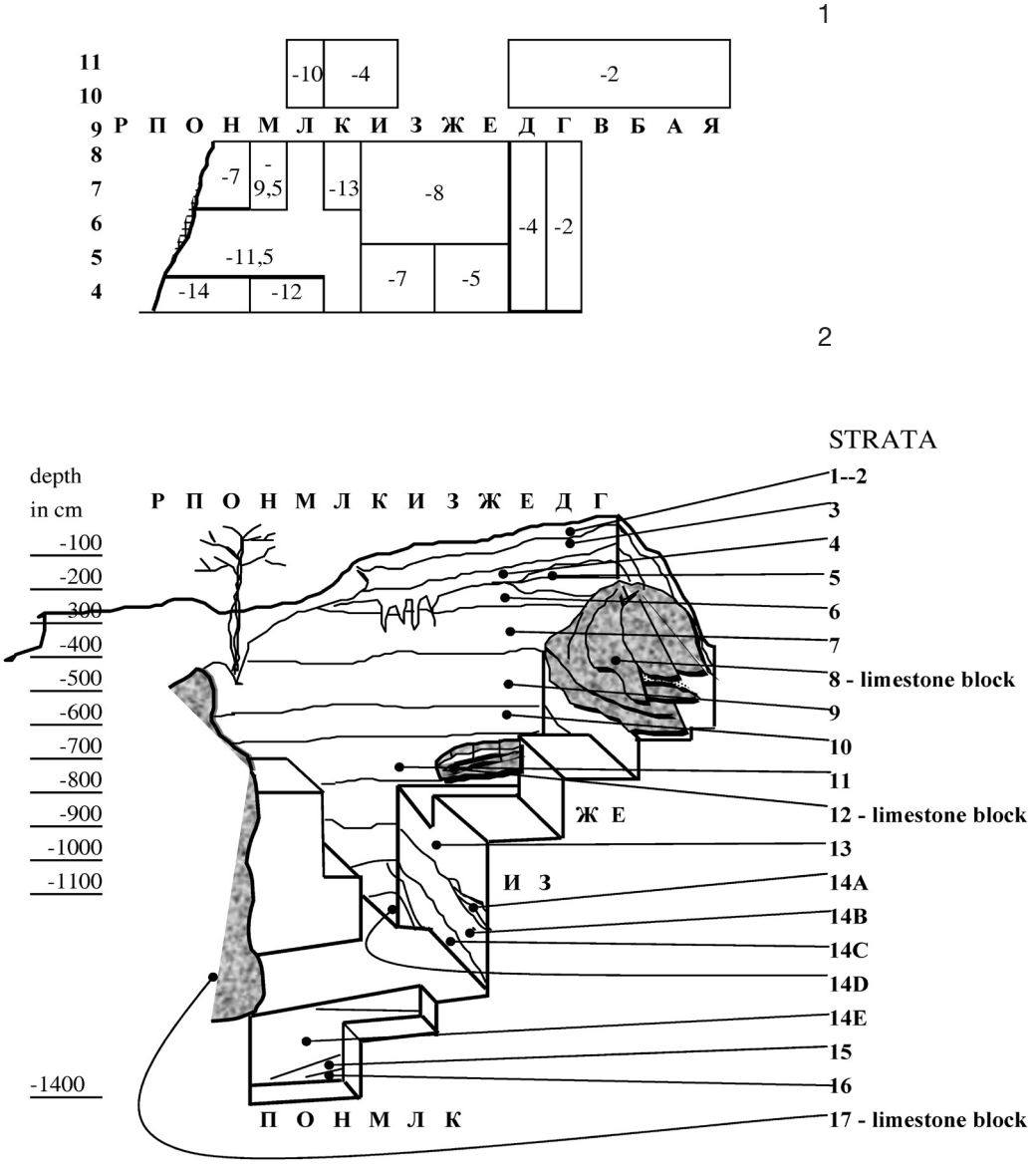

Fig. 1-2 Kabazi II, excavated area: 1 – plan of excavated area; 2 – layout of excavated area, square lines 4, 5, 6, 7 and 8.

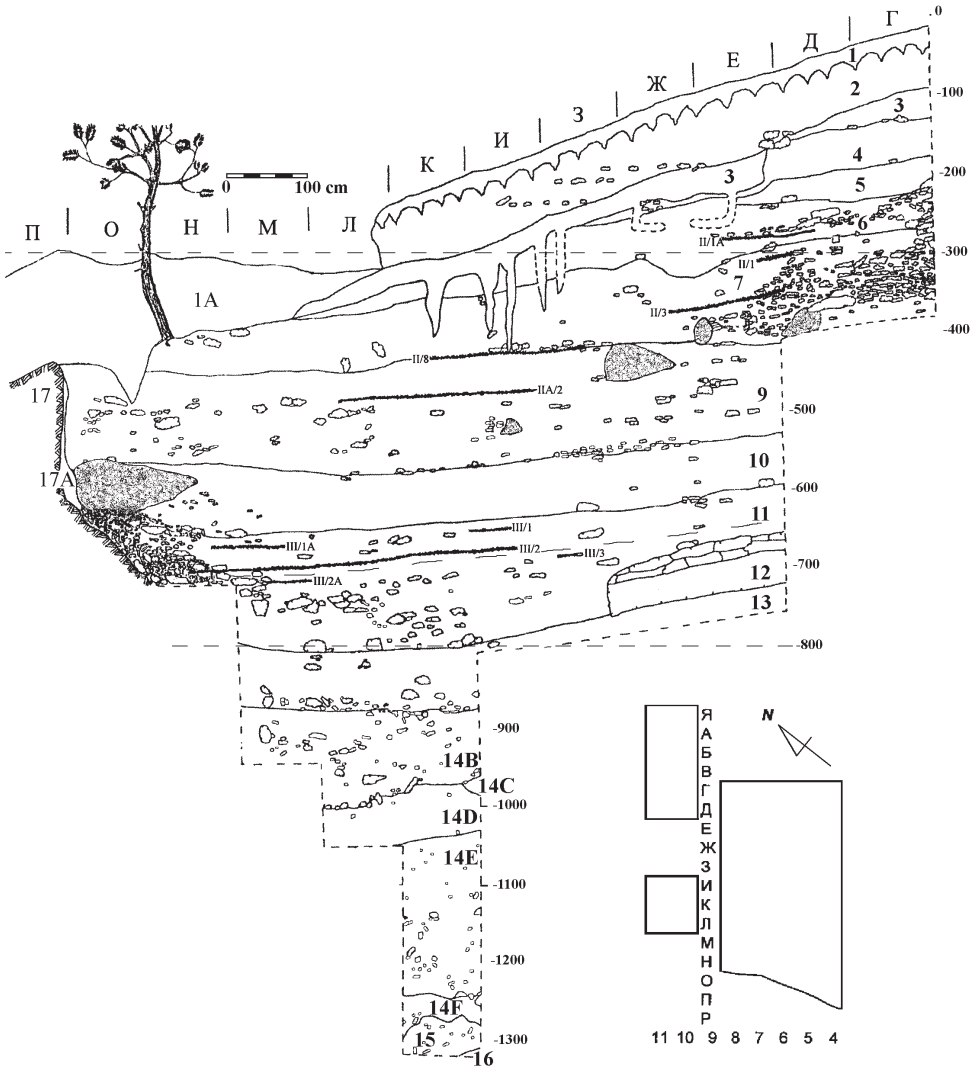

Fig. 1-3 Kabazi II, section along the line of squares 8 / 9: Arabic numerals indicate strata, combined Roman and Arabic numerals indicate archaeological levels.

Stratigraphical Sequence

The stratigraphical sequence of Kabazi II is contained in about 14 m of sediments comprising 26 lithopedological Strata (Fig. 1-3 and 1-4). There follows a general description of the lithopedological events observed at Kabazi II based on the studies conducted by R. Ferring which focused on the upper part of the sequence, and the descriptions provided by N. Gerasimenko for the lower part of the profiles (Ferring 1998a, 1998b, Gerasimenko, Chapter 2, this volume).

Stratigraphy

Stratum 1A – modern and Pleistocene sediments re- deposited by present day human activity.

Strata 1 and 2 – modern soil formed in colluvial sediments and represented by granular silt with angular to sub-angular limestone debris. The lower boundary is clear (Fig. 1-3, 1-4 and 1-5).

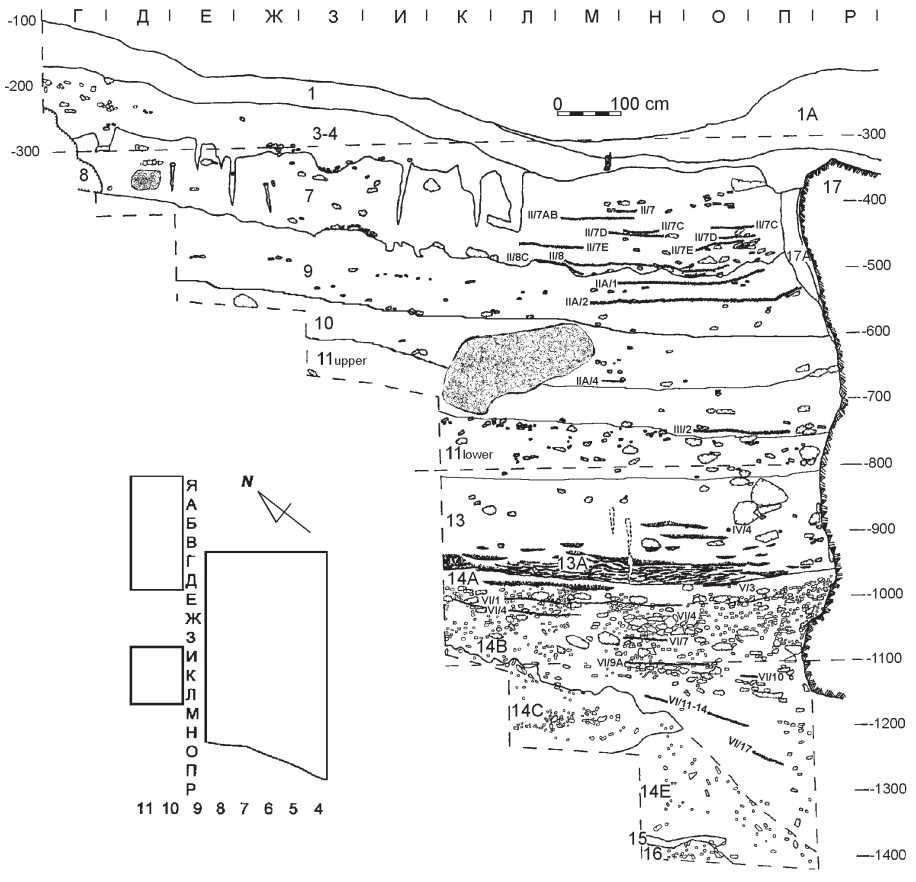

Fig. 1-4 Kabazi II, section along the line of squares 3 / 4: Arabic numerals indicate strata, combined Roman and Arabic numerals indicate archaeological levels.

Stratum 3 – a yellowish granular loam fill with angular and sub-angular limestone cobbles with carbonate coasts and soft carbonated masses, penetrated by root channels reaching down into the lower strata. The gradient of this stratum corresponds to that of the modern slope surface. Stratum 3 is clearly distinguishable and - on square lines 11 through to 6 - is separated from Stratum 4 by a clear boundary (Fig. 1-3 and 1-5). Such a boundary was, however, not observed on square lines 5 and 4 (Fig. 1-4).

Stratum 4 – loose light grey loam filled with weathered limestone debris. Stratum 4 is truncated by colluvium from Stratum 3 on the squares 7E, 8E and 9E (Fig. 1-3). The gradient of Stratum 4 closely resembles that of both Stratum 3 and the modern slope. Its lower boundary is clearly visible.

Stratum 5 – grey-brown, compacted silty loam with granular structure and fine debris. The upper boundary is truncated by the colluvuim of Stratum 4 (Fig. 1-3). On the squares 10-11В, 10-11Г and 10-11*Д* the deposits of Stratum 5 are disturbed by erosion (Fig. 1-5). The lower boundary is clear and roughly horizontal. The undisturbed deposits of Stratum 5 were found on the squares 10-11Я, 10-11А, 8Г, 8*Д*, and partially on square lines 7Г and 7*Д*. The gradient of the undisturbed deposits of Stratum 5 is more or less horizontal.

Stratum 6 – light-brown, silty loam, compacted with a large amount of angular and sub-angular limestone *éboulis* which is concentrated on square lines Г, *Д* and E (Fig. 1-3 and 1-5). The gradient of Stratum 6 is circa 7° from north to south. Both upper and lower
boundaries show evidence of erosional disturbance. Stratum 6 was found on square lines 11 to 7, and to a certain extent on square line 6.

Stratum 7 – light-grey loam compacted with large angular limestone cobles and sub-rounded *éboulis*

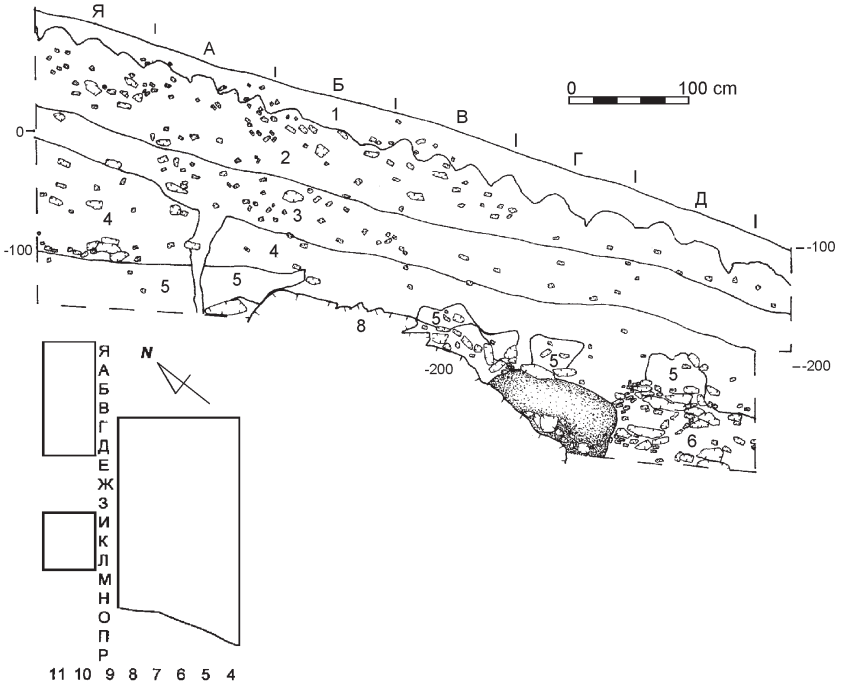

Fig. 1-5 Kabazi II, section along the line of squares 9 / 10: Arabic numerals indicate strata.

lenses. The limestone debris is concentrated on square lines Г, Д, Е and Ж (Fig. 1-3). On square lines Д, Е and Ж the sediments of this stratum are disturbed by animal tunnels (Fig. 1-3 and 1-4). The gradient of Stratum 7 is 5-6° from north to south. The upper boundary of Stratum 7 was truncated by latter erosion. Whilst the lower boundary of Stratum 7 is clear and runs horizontally on square lines 8, 7, and for part of square line 6 (Fig. 1-3), it exhibits the pronounced traces of earlier erosion on square lines 4, 5, and - to a certain degree - also on square line 6 (Fig. 1-4). Stratum 7 covers the entire excavation.

Stratum 8 comprises the limestone block which was found on squares 11Б, 10Б, 11В, 10В, 11Г, 10Г, 8Г, 7Г, 6Г, 5Г, 4Г, 7Д, 6Д, 5Д, 7Е and 6Е (Fig. 1-2, 1-4 and 1-5). Taking into account the unexcavated line of squares 9, the total area covered by the limestone block is about 20 m^2. The surface of this block is heavily weathered and dissolute. This block was the source of angular and sub-angular limestone cobbles and *éboulis* found in Strata 6 and 7 on square lines Г, Д, Е and Ж. The visible lower boundary of this block corresponds to the boundary between Strata 8 and 9 (Fig. 1-4).

Stratum 9 – a light-yellow loam compacted with a large amount of fine debris. A few angular limestone boulders are concentrated on the square lines О and П near the limestone barrier – Stratum 17 (Fig. 1-3). The gradient of Stratum 9 is about 5-7° from north to south. Evidence of some animal disturbance was found on square lines Ж, З and И. The lower boundary is clear, roughly horizontal and is marked by lenses of limestone *éboulis* (Fig. 1-3 and 1-4). Stratum 9 covers the entire excavation.

Stratum 10 – a yellowish-brown / pale compacted loam filled with fine limestone debris. The limestone angular boulders are concentrated on the square lines closest to the limestone barrier – Stratum 17 (Fig. 1-3). The gradient of Stratum 10 is about 7° from north to south. There is evidence of animal activity crossing the entire excavation from east to west from the squares 4К and 4Л (Fig. 1-4) to squares 8Н and 8О (Fig. 1-3). The lower boundary is clear and roughly horizontal. Stratum 10 covers the entire excavation.

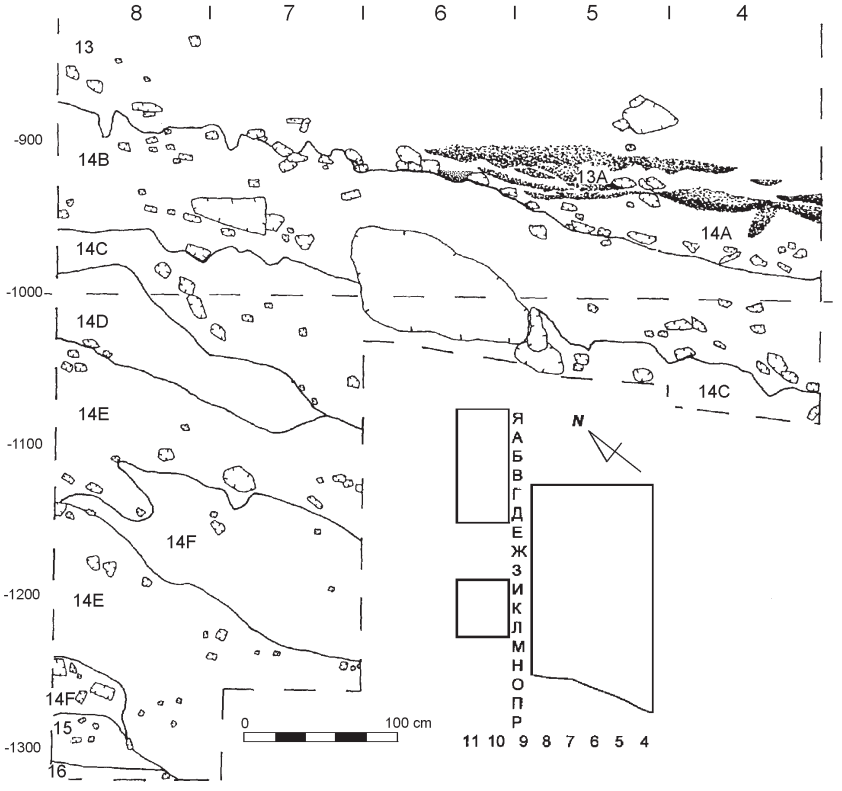

Fig. 1-6 Kabazi II, section along the line of squares И / K: Arabic numerals indicate strata.

Stratum 11 (upper) – a dark-grey-brown silty loam with limestone debris and limestone angular boulders near the limestone barrier – Stratum 17 (Fig. 1-4). The gradient of Stratum 11 (upper) is about 5-6, 5° from north to south. The lower boundary is horizontal and clearly visible on square lines 4 and 5 (Fig. 1-4). On square lines 8, 7 and 6 the lower boundary is, however, not pronounced (Fig. 1-3).

Stratum 11 (lower) – a light grey-brown loose loam filled with fine limestone debris and angular limestone boulders which are mainly concentrated on square lines П, O, H, M, Л and K located near the limestone barrier – Stratum 17 (Fig. 1-3 and 1-4). The gradient of Stratum 11 (lower) is circa 5-6,5° from north to south. The lower boundary of Stratum 11 (lower) is gradual.

Stratum 12 – this stratum comprises the limestone block found on the squares 8E, 8Ж and 8З. The surface of this block is angular and shows no traces of weathering. The visible lower part of this block probably corresponds to the boundary between Strata 11 lower and 13 (Fig. 1-3).

Stratum 13 – a light grey-brown loose loam with fine limestone debris, a small clay component and carbonate filaments. Stratum 13 is not so densely filled with limestone debris as Stratum 11 (lower), but shows evidence of carbonate filaments. These were the reasons for the subdivision of Stratum 13 and 11 (for more detailed discussion: Gerasimenko, this volume). Stratum 13 covers the entire excavation. The gradient of Stratum 13 is about 6,5° from north to south. The lower boundary of Stratum 13 which is to be observed on square lines 4, 5 and partially on square line 6, is gradual and contains sand and clay lenses of the underlying Stratum 13A (Fig. 1-4). The lower boundary of Stratum 13 on square lines 7, and to a certain extent on square lines 8 and 6, is wavy (Fig. 1-6).

Stratum 13A – this stratum is represented by alternations of horizontal thin coarse sand lenses and thin lenses of brown clay of clear alluvium genesis. Stratum 13A is found in the lowest southern part of the excavated area on square lines 4, 5 and partially on square line 6 (Fig. 1-4 and 1-6).

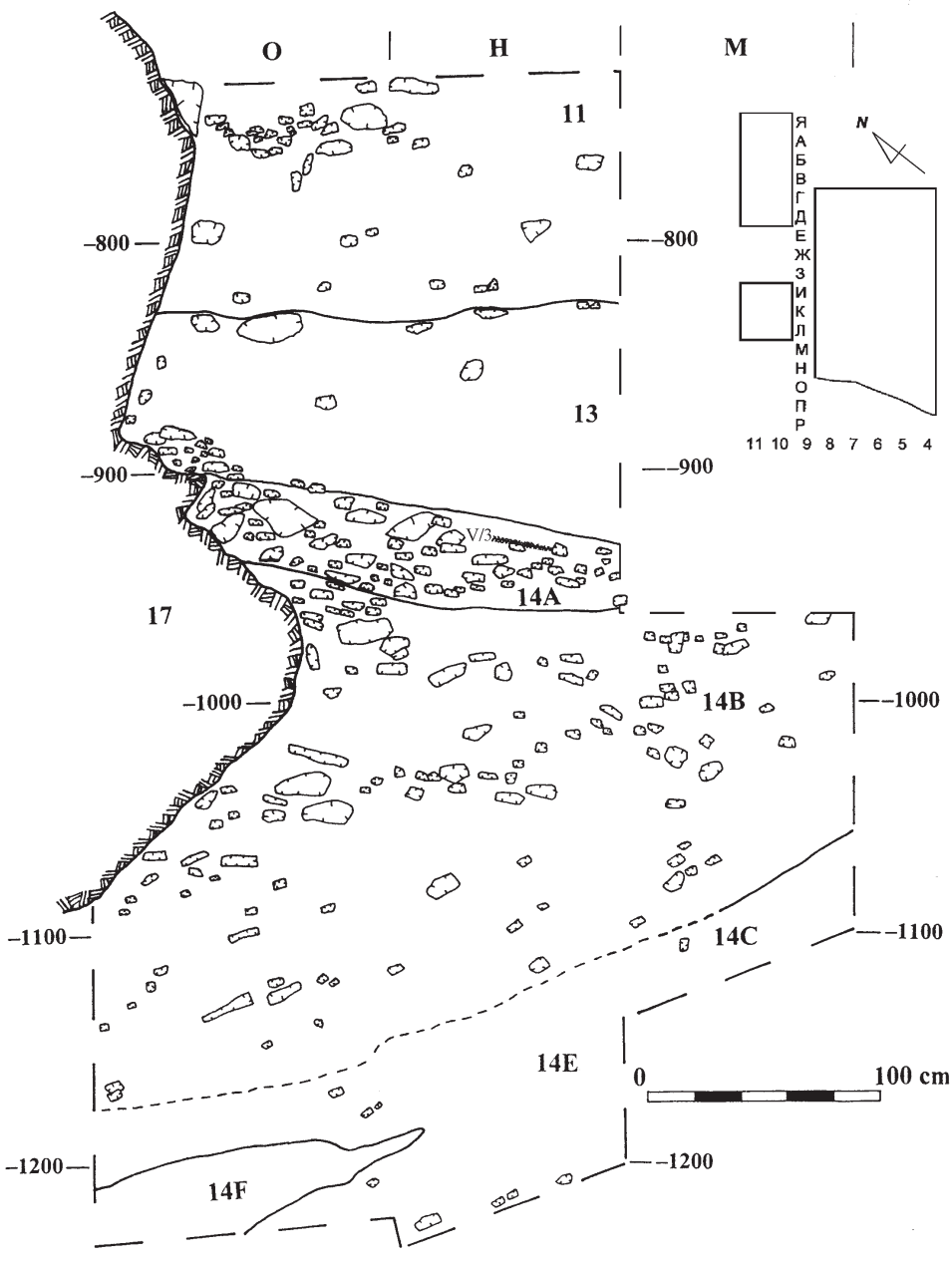

Fig. 1-7 Kabazi II, section along the line of squares 6/7: Arabic numerals indicate strata, combined Roman and Arabic numerals indicate archaeological levels.

Stratum 14A – a dark-grey compacted loam with a granular structure containing large and small pieces of angular limestone gravel concentrated mainly near the limestone barrier – Stratum 17. Stratum 14A was found on square lines 4, 5, and partially on 6, 7, and 8 (Fig. 1-4 and 1-6). The upper part of Stratum 14A on square lines 4, 5 and to a certain extent on square line 6, was truncated by alluvium from Stratum 13A. On the squares 6M, 6H, 6O, 7M, and partially on 7K and 7Л, Stratum 14A underlies Stratum 13 (Fig. 1-7). On the mentioned squares the boundary between Strata 13 and 14A is clear. The boundary between Strata 14A and 14B is also evident (Fig. 1-4, 1-6 and 1-7). The gradient of Stratum 14A is roughly 8-10° from north to south.

Stratum 14B – a light-grey compacted loam with a granular structure and filled with different size

pieces of angular limestone gravel in its upper part, and with rare sub-rounded and rounded limestone debris in its lower part (Fig. 1-3, 1-4, 1-6 and 1-7). Furthermore, the gravel from the lower parts of Stratum 14B lies at different gradients. The gradient of the over-lying gravels is circa 11° from north to south. On the other hand, the gradient of the lower-lying debris in the same direction is about 35° (Fig. 1-4 and 1-7). However, the boundary between the lower and upper parts of Stratum 14B is not only evident in the varying gradients and density of limestone debris, but also in their relationship to the base of limestone barrier – Stratum 17 (Fig. 1-4 and 1-7). The lower boundary of Stratum 14B on square lines K, Λ, M, and partially H, is wavy, on the square lines Π, O and partially H is not distinguishable (Fig. 1-3, 1-4, 1-6 and 1-7).

Strata 14C, 14D, 14E, 14F, 15, 16 – these strata are represented by whitish (14C), greyish (14D), greyish-green (14E), green (14F), yellow (15) and white (16) clayey and sandy loams with rounded limestone gravel. Some of these strata even cover the entire excavation: strata 14E and probably 15 and 16. Others were observed clustered on particular squares: strata 14C, 14D and 14F. All of them have gradients ranging from 25° to 45° depending on their position within the excavated area. The boundaries between these strata are of irregular character (Fig. 1-3, 1-4, 1-6 and 1-7).

Stratum 17 – this stratum comprises a limestone block (Fig. 1-3 and 1-4), the visible parameters of which are: height – about 8 m, length – at least 12 m, thickness – no less than 10 m. The block was found on square lines O, Π, P. The visible part of its base lie in Stratum 14B (Fig. 1-4 and 1-7). The elevation of the barrier base is about 290 m above sea level. It should be borne in mind that the elevation of the present day surface of the 3rd Alma River terrace is 268 m above sea level.

Stratum 17A – the dissolute part of the limestone block – Stratum 17 (Fig. 1-3 and 1-4).

Formation processes

At least 4 natural processes were responsible for the deposition of the stratigraphical sequence of Kabazi II:

1. Colluvial processes are apparent in each of the strata, this is evidenced by the varying size of sub-rounded and rounded limestone debris, sandy, silty and clayish sediments, as well as larger limestone blocks as characterised by Strata 8, 12 and 17.

2. Pedogenetic processes which are the most pronounced in the formation of Strata 14A, 14B, 11 upper, 7, 5, and certainly in the modern soil of Strata 1 and 2.

3. Alluvial processes produced the alternated sandy and clayish lenses of Stratum 13A.

4. Exfoliation of the limestone blocks from Strata 17 and 8 which produced a large amount of angular and sub-angular gravel in Strata 6 to 14B.

The geological history of Kabazi II might be described in the following terms. The huge limestone block (Stratum 17), which obviously originates from the cliff of the cuesta, fell onto the relatively eroded slope bench which more or less corresponds to the river terrace, it being about 20 m above the surface of the present day remnants of the 3rd terrace of the Alma River (Fig. 1-1, 2) . This block which creates a barrier that trapped colluvium behind it, led to the series of lithopedological events. The beginning of the stratigraphical trap at Kabazi II starts with the deposition of soil, colluvium and limestone debris from barrier exfoliation – Strata 14 upper and 14A (Fig. 1-3, 1-4 and 1-7). By the deposition of Stratum 14B, the relatively horizontal surface had formed behind the limestone barrier. The accumulation of Stratum 14A was interrupted and partly eroded by alluvium from Stratum 13A (Fig. 1-4 and 1-6). This alluvium is also seen during the beginning of formation of Stratum 13. The alluvial deposits of Stratum 13A might be the result of seasonal flooding. The absence of large pebbles in Stratum 13A suggests a low-energy mode of alluvium. At the same time, alluvium made the platform behind the barrier more horizontal. The gradients of the strata before and after alluvium differ in about two times. The combination of colluvial sediments and barrier exfoliation are responsible for deposition of Stratum 13 and lower part of Stratum 11 (Fig. 1-3 and 1-4). While, in the upper part of Stratum 11 this combination was added by soil formation process. During Stratum 13 accumulation one more big limestone slab (Stratum 12) fell on the site area (Fig. 1-3). Colluvial sediments and limestone gravel from barrier exfoliation are responsible for Strata 10 and 9 accumulations. At the end of Stratum 9 deposition, the soil formation process becoming more pronounced and one more limestone slab (Stratum 8) fell on the site area (Fig. 1-2, 2). At the same time, the end of Stratum 9

accumulation was characterised by the surface erosion (Fig. 1-4). The formation of Stratum 7 was cased by the number of agents: the colluvial from up-slope area, the soil formation process and the exfoliation of limestone blocks (Strata 17 and 8). During Stratum 7 formation these limestone blocks (each about 1 m high and more than 10 m long) create the horizontal platform between them, which might be the most comfortable place on the slope of cuesta at that time. However, the stratigraphical trap was filled to capacity by sediments. The accumulation of the next Strata 6 and 5 was opened to the slope erosion. These Strata were found in a more or less preserved condition behind and near the limestone block (Stratum 8), which was the last Pleistocene sediments trap in Kabazi II geological history (Fig. 1-3 and 1-5). The Strata 4 and 3 are represented by the transported from up-slope Pleistocene deposits, while Strata 2 and 1 is the result of modern soil formation process (Fig. 1-3, 1-4 and 1-5).

Archaeological Sequence and Occupation Characteristics

However, there was also a fifth process responsible for the formation of the Kabazi II stratigraphical sequence – human activity. The sediments of Kabazi II contain the remains of 55 in situ human occupations and 21 further levels comprising re-deposited and transported artefacts (Table 1-1). The archaeological material was found in all strata, except in Strata 14C, 14E, 15 and 16. The *in situ* occupations are represented by 20 archaeological levels with Western Crimean Mousterian (WCM) industry and 35 archaeological levels with Crimean Micoquian. The archaeological levels constitute 8 Units. Unit I includes four archaeological levels: from I/1 to I/3. Unit A is represented by 8 archaeological levels: from A to A4. Unit II comprises 14 archaeological levels: from II/1A to II/8C. Unit IIA includes 8 occupations: from IIA/1 to IIA/4B. Unit III is represented by 15 archaeological levels: from III/1A to III/8E. Unit IV is subdivided into 5 levels: from VI/1 to IV/5. Unit V consists of 7 archaeological levels: from V/1 to V/6. Unit VI is represented by 15 levels: from VI/1 to VI/17.

There follows a brief description of the previously published archaeological sequence from Units I, A, II, IIA and III (Chabai 1998b, 1998c, 1998d, 1999a), and a detailed analysis of the occupation as found in the archaeological levels forming Units IV, V and VI.

The archaeological sequence of Units I, A, II, IIA and III

Levels I/1 and I/2 comprise re-deposited Middle Palaeolithic artefacts found at different elevations in sediments of Stratum 2. No faunal remains were discovered in this stratum. Level I/2A is represented by a small number of re-deposited Middle Palaeolithic artefacts originating from the sediments of Stratum 3. No bones were found here either. Archaeological material from Level I/3 consists of re-deposited bone and artefact material from Stratum 4. The artefacts from levels I/1, I/2, I/2A and I/3 are patinated, and the faunal material heavily weathered. Some bifacial tools, as well as blade cores, were found in these levels.

Whilst bone and artefacts originating from levels A, A1, A2 and A3 were found in the eroded part of Stratum 5, those areas of this stratum undisturbed by erosion contained four *in situ* occupations in levels A3A, A3B, A3C and A4 (Table 1-1). The thickness of these levels is equal to the thickness of one artefact or bone, and in between each of these levels sterile sediments were found. The artefacts from these levels are not patinated, and, although not excellent, bone preservation is good. The artefacts from these levels have been attributed to the WCM industry.

Level II/1A was found in Stratum 6 (Fig. 1-3; Table 1-1). The thickness of this level corresponds to the thickness of a single bone or artefact. The density of artefacts in level II/1A is 112 per m^3. The artefacts show signs of a slight patination. On the whole, bone preservation is good, but some bone surfaces are weathered. The sterile sediments between levels II/1A and II/1 are about 20 cm thick.

Levels II/1, II/2, II/3, II/4, II/5, II/6, II/7, II/7AB, II/7C, II/7D, II/7E, II/8, II/8C were found in deposits belonging to Stratum 7 (Table 1-1). The five upper levels (II/1, II/2, II/3, II/4 and II/5) are concentrated in the northern part of the excavated area (Fig. 1-3). They are separated by sterile sediments, the thickness of which varies from between 10 and 20 cm. The thickness of each of these levels was determined as being equivalent of the thickness of one single artefact or bone. The artefact density in these levels varies from 135 to 150 artefacts per m^3. The next six levels (II/6, II/7, II/7AB, II/7C, II/7D and II/7E) were discovered in the southern part of the excavated area (Fig. 1-4). The thickness of the sterile sediments separating them is in each case roughly 3 cm. The thickness of the individual levels varies in thickness from that of a single find to 5 cm. The density of artefacts varies from 80 to 145 artefacts per m^3. The main

Strata	Levels	Dates, kyr			Pollen zones, #	Marine isotopic scale
		AMS	U-series	ESR		
2–3	*I/1, I/2, I/2A, I/3*					
4–5	*A, A1, A2, A3,*				#XIV, Bug bg_1	Stage 2
5	A3A, A3B, A3C, A4				#XIII, Vytachiv $vt_{3b,}$	
6	II/1A		32,1±6,5	30±2,0	Denekamp Interstadial	
7	II/1	OxA-4770, 31,55±0,6	40,1±5,0		#XII, Vytachiv $vt_{2,}$ Huneborg Stadial	
	II/2	OxA-4771, 35,1±0,85				
	II/3					
	II/4	OxA-4858, 32,2±0,9			Sterile	
	II/5	OxA-4859, 33,4±1,0				
	II/6				#XI, Vytachiv $vt_{1c,}$ Huneborg Interstadial	
	II/7		46,5±8,0			
	II/7AB			36±3,0 38±4,0		Stage 3
	II/7C, II/7D, II/7E					
	II/8			44±5,0	#X, Vytachiv $vt_{1b2,}$ Hengelo Interstadial	
	II/8C					
9	IIA/1					
					Sterile	
	IIA/2				#IX, Vytachiv $vt_{1b2\text{-}b1,}$ Hosselo Stadial	
	IIA/2-3					
	IIA/3, IIA/3A, IIA/3B				#VIII, Vytachiv $vt_{1b1,}$ Moershoofd Interstadial	
10	IIA/4					
	IIA/4B				#VII, Uday ud	Stage 4
11, upper	III/1A, III/1				#VII, Pryluky $pl_{3,}$ Ognon Interstadial	Stage 4-5 transition
	III/2		54±3,0	74–85	#VI, Pryluky pl_{1b2} (pl_{1b2+3}), Odderade (Brörup-Odderade) Interstadial	Sub-stage 5a
11, lower	III/2A					
	III/3			82±10	#V, Pryluki $pl_{1b2\text{-}b1}$ (pl_2?), Rederstall Stadial	Sub-stage 5b
	III/4, III/5, III/6, III/7					
	III/8					
	III/8A, III/8B, III/8C				#IVC, IVB-D2, IVA-D1, Pryluki $pl_{1b1,}$ Brörup Interstadial	Sub-stage 5c
	III/8D, III/8E					
13	*IV/1, IV/2, IV/3, IV/4, IV/5*					
13A	*V/1, V/2, V/2A*				???, Tyasmin, Herning Stadial	
14A	V/3, V/4, V/5, V/6				#C, Kaydaky $kd_{3b2+c,}$ Eemian (E6b) Interglacial	
14B	VI/1, VI/2, VI/3, VI/4, VI/5, VI/6, VI/7, VI/8, VI/9, VI/9A, VI/10, VI/11-14, VI/15, VI/16, VI/17				#III-B4, III-B3, III-B2, II-B1, A, Kaydaky $kd_{3b2+c,}$ Eemian (E6a) Interglacial	Sub-stage 5d
					#A, Kaydaky $kd_{3b2\text{-}b1,}$ Eemian (E6a) Interglacial	
14D					???, #II, Kaydaky $kd_{3b2\text{-}b1,}$ Eemian (E6a) Interglacial	??? Sub-stage 5d
14E					???, #I, Kaydaky $kd_{3b1,}$ Eemian (E5) Interglacial	??? Sub-stage 5e

Table 1-1 Kabazi II, stratigraphical, archaeological, chronological and environmental data.

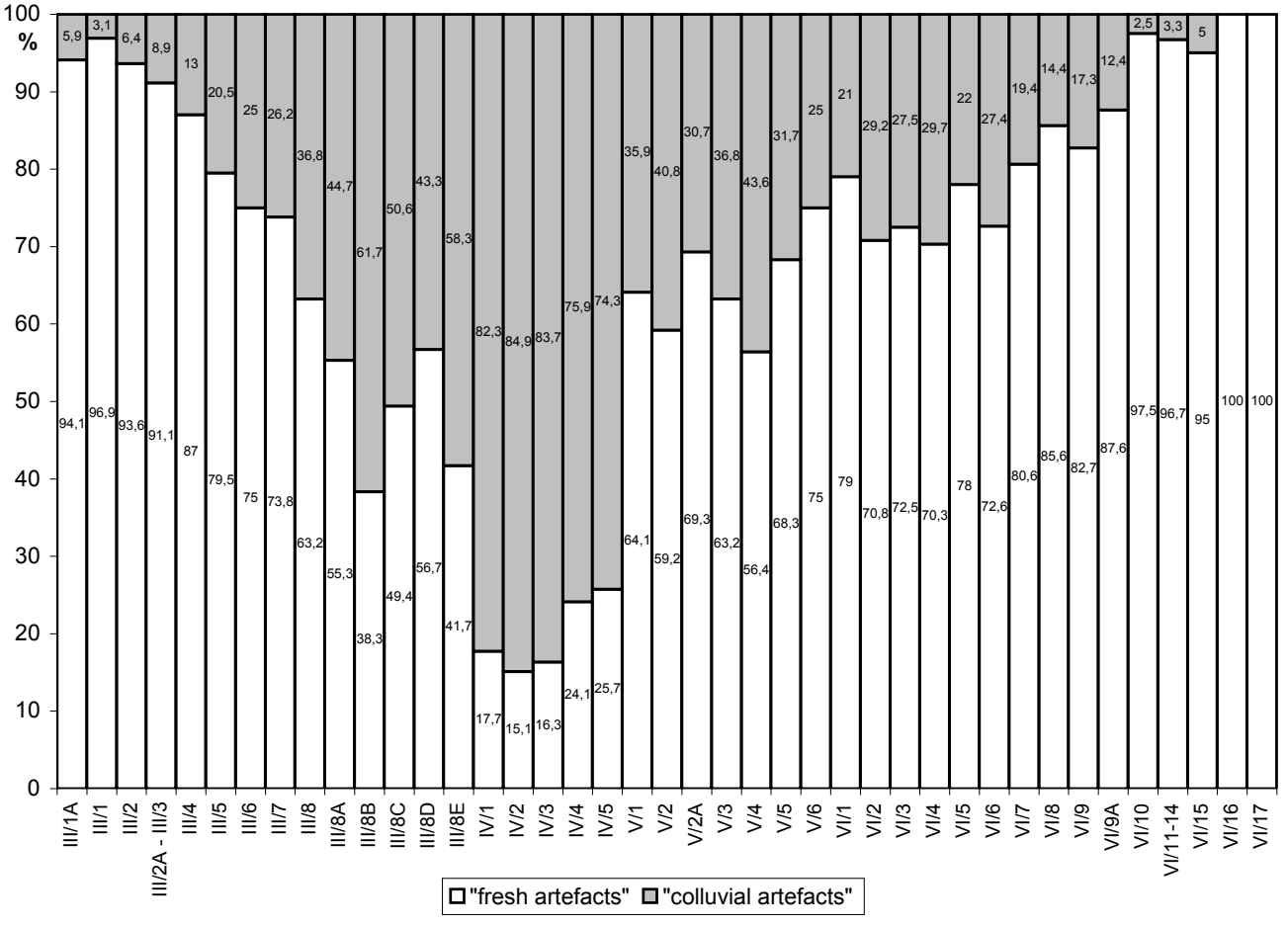

Fig. 1-8 Kabazi II, levels III/1A through VI/17: ratio of "fresh" and "colluvial" artefacts in each level.

concentration of bones and artefacts from level II/8 was found in the centre of the excavation area. The thickness of level II/8 varies from the thickness of a single find on its periphery to 15 cm at the centre of the concentration. The density of artefacts found in level II/8 is 143,1 per m³. Level II/8 is separated from level II/7E by 10-15 cm and from level II/8C by 5 cm of sterile sediment. Level II/8C was found in the southern part of the excavated area. The thickness of this level is, once again, comparable with the thickness of a single bone or artefact. The artefact density for level II/8C is 43,8 per m³. Very rare patinated artefacts were found in Unit II assemblages. The preservation of bone surfaces from Unit II is characterised by some weathering. The artefacts from Unit II levels belong to the WCM.

Levels IIA/1 and IIA/2 are the lowermost of the WCM sequence. These were found in the upper part of Stratum 9 (Table 1-1), in the western / south-western part of the excavation (Fig. 1-3 and 1-4). Level IIA/1 is separated from level II/8C and the underlying level IIA/2 by sterile sediments measuring 15 cm, the sterile sediments separating Level IIA/2 from the underlying level IIA/2-3 measure 10 cm. Levels IIA/1 and IIA/2 vary in thickness from the size of one single bone or artefact on their periphery, and up to 10 cm in the central parts of the concentrations. The artefacts are not patinated, and the bone surfaces are not weathered. The artefact density for levels IIA/1 and IIA/2 are 40 and 19,3 per m³ accordingly.

The artefacts and bone remains in levels IIA/2-3, IIA/3, IIA/3A, and IIA/3B exhibit neither vertical nor horizontal concentrations in the lower part of Stratum 9 (Table 1-1). The vertical spread of archaeological material in these levels fluctuates by about 15 cm in each level. At the same time, the preservation of artefacts and bones corresponds to the situation in the uppermost levels of Units II and the upper part of IIA. The artefact density in these levels is no more than 3-4 per m³. No evidence of artefacts

and fauna transportation was found. It would appear that the levels IIA/2-3, IIA/3, IIA/3A, and IIA/3B represent the extreme periphery of occupational deposits otherwise situated outside of the excavated area. Some bifacial tools and bifacial thinning debitage were found in these levels. It is likely that the artefact assemblages from levels IIA/2-3, IIA/3, IIA/3A, and IIA/3B belong to the Crimean Micoquian.

The assemblages of levels IIA/4 and IIA/4B were discovered in the lower part of Stratum 10 (Fig. 1-4; Table 1-1). Level IIA/4 is separated by about 50 cm of sterile sediment from the lowermost finds of level IIA/3B. The artefacts from level IIA/4 can be termed as the "living floor carpet", which has the thickness of a single bone or artefact. The artefact density is 27 per m^3. The artefacts and faunal material from level IIA/4B is spread vertically through the 10 cm thick sediments of the lowermost part of Stratum 10. The artefact assemblages from both levels are attributed to the Crimean Micoquian.

The upper part of Stratum 11 comprises the occupational deposits from levels III/1A, III/1 and III/2 (Fig. 1-3 and 1-4; Table 1-1). Levels IIA/4B and III/1A are separated by 15-20 cm of sterile sediment. The thickness of the sterile sediment found between levels III/1A, III/1 and III/2 varies from 9 to 18 cm. The central parts of these occupations were found on the excavated area. The thickness of each level varies from that of a single find up to 15 cm on those squares where the concentrations of faunal remains were excavated. The artefact density in these levels is traditionally low – about 12 per m^3. The artefacts from levels III/1A, III/1 and III/2 belong to the Crimean Micoquian.

The fauna and artefact assemblages from levels III/2A, III/3, III/4, III/5, III/6, III/7, III/8, III/8A, III/8B, III/8C, III/8D, and III/8E were found in the lower part of Stratum 11 (Fig. 1-3; Table 1-1). The levels III/2A and III/3 exhibit two pronounced clusters of bones and artefacts in the central and southern parts of the excavated area, and at about the same elevation. It might well be the case that levels III/2A and III/3 are part of the same occupation. Levels III/2A and III/3 are separated by 20 cm of sterile sediments from the overlying occupation of level III/2, and by 5 cm of sterile material from the underlying level III/4. The thicknesses of the sterile sediments between the levels III/4, III/5, III/6, III/7, and III/8 varies from 5 cm up to 20 cm. Characteristic for each of these levels is a thin "carpet" of bones and artefacts. The individual thickness of such "carpets" corresponds to the thickness of a single bone or artefact. The artefact density for levels III/2A, III/3, III/4, III/5, III/6, III/7, III/8 are between 8 and 27 per m^3.

The levels III/8A, III/8B, III/8C, III/8D, and III/8E did not show any vertical and / or horizontal concentrations. These levels were located in the lowermost 35-40 cm of Stratum 11, lower (Table 1-1). Bones are rare, and those discovered are heavily weathered. The artefacts are rounded, naturally damaged and patinated. One of the most peculiar features of Unit III levels is the increasing number of "colluvial artefacts". Such artefacts are represented by relatively small flakes, chips and even tools with patinated surfaces, and rounded and naturally damaged edges. "Colluvial artefacts" are found in all levels and sterile sediments. In Units A, II, and IIA "colluvial artefacts" rarely constitute more than 5% of the assemblages. However, between level III/1 and IV/2 the ratio of "colluvial artefacts" constantly increases (Fig. 1-8). It is probable that the origin of the "colluvial artefacts" can be linked with a further site which was situated above Kabazi II, and was washed down during the accumulation of the Kabazi II sequence. In levels III/8A, III/8B, III/8C, III/8D, and III/8E the amount of "colluvial artefacts" varies from 43,3 % to 61,7 %. In fact, the "fresh artefacts" comprise very limited samples, mainly of flakes and chips. To some extent, the levels III/8A, III/8B, III/8C, III/8D, and III/8E are analogous to levels IIA/2-3, IIA/3, IIA/3A, and IIA/3B, but with the much more pronounced contribution of colluvium.

The archaeological sequence of Units IV, V and VI

Levels IV/1, IV/2, IV/3, IV/4 and IV/5 were found in Stratum 13 (Table 1-1). The artefacts in these levels show neither vertical, nor horizontal concentrations. The "colluvial artefacts" contribute to between 74 % and 84 % of the total artefact number (Fig. 1-8). In fact, Stratum 13 was subdivided using "artificial" (10-14 cm) levels, on the basis of which artefacts, pieces of bone and other samples for environmental studies were collected. However, no faunal remains, including micro-fauna and snails, were discovered. The only exception is the skull of a horse (*Equus hydruntinus*) and a few tube bones from level IV/4, squares 4O and 4П. The human role in the accumulation of this bone assemblage is very problematic. Thus, the assemblages from levels IV/1, IV/2, IV/3, IV/4 and IV/5 are considered to be represented by transported colluvium artefacts.

The levels V/1, V/2 and V/2A were found in the lower part of Stratum 13A and in the upper part of Stratum 14A (Table 1-1). In fact, these levels form the upper part of the soil from Stratum 14A which was disturbed by alluvium from Stratum 13A. Some fauna and artefacts were recovered, as well

as a pronounced component of " colluvial artefacts" (Fig. 1-8).

The levels V/3, V/4, V/5, and V/6 were discovered in Stratum 14A (Fig. 1-4; Table 1-1). Each of these levels is represented by a thin "carpet". The thickness of these "carpets" is - in each of these levels - equal to the thickness of a single bone or artefact (Fig. 1-9 and 1-10). The individual "carpets" are separated from one another by layers of sterile sediments (Table 1-2). The amount of "colluvial artefacts" is still very high (Fig. 1-8). The artefact density for levels V/3, V/4, V/5, and V/6 are among the lowest thus far recorded for the Crimean Middle Palaeolithic (Table 1-3). The main concentrations of artefacts and bones for these levels were found on the southern and south-eastern parts of excavated area.

Levels	Sterile, in cm
V/3–V/4	4–7
V/4–V/5	3– 5
V/5–V/6	6–8
V/6–VI/1	4–7
VI/1–VI/2	5–6
VI/2–VI/3	10–11
VI/3–VI/4	5–7
VI/4–VI/5	4–6
VI/5–VI/6	11–15
VI/6–VI/7	14–16
VI/7–VI/8	8–10
VI/8–VI/9	9–11
VI/9–VI/9A	20–25
VI/9A–VI/10	14–17
VI/10–VI/11-14	58–65
VI/11-14–VI/15	15–17
VI/15–VI/16	6–7
VI/16–VI/17	20–23

Table 1-2 Kabazi II, Units V and VI, thickness of sterile sediments between levels.

Level V/3 produces the only fire-place known in Kabazi II (Fig.1-9). The fire-place was found on the squares 6H and 7H. The shape of the fire-place is ovoid, and its maximum dimensions are: length – 30 cm, width – 20 cm, thickness – 2,5 cm. The stratigraphy of the fire-place comprises three horizons: 1 – a dark grey horizon densely packed with ash and small fragments of burned bones (length – 18 cm, width – 8 cm, thickness – 0,5 cm); 2 – a grey horizon, not so intensively filled with ash, burned bones fragments and burned limestone pieces (length – 30 cm, width – 20 cm, thickness – 1.5 cm); 3 – a yellow-red horizon with burnt sediments (length – 25 cm, width – 16 cm, thickness – 0.5 cm).

In addition, four ashy clusters were studied in level V/6, square 4H and 5O (Fig. 1-10). The maximum dimensions of the ashy cluster from square 4H are: length – 38 cm, width – 20 cm, thickness – 0,5 cm. The dimensions of ashy clusters from square 5O vary and fall within the following ranges: length – 15-20 cm, width – 10-16 cm, thickness – 0,5 cm.

Levels	Density of artefacts per m^3
V/3	44,74
V/4	26,32
V/5	44,74
V/6	75,7
VI/1	44,74
VI/2	40,54
VI/3	55,26
VI/4	39,39
VI/5	29,41
VI/6	121,88
VI/7	53,13
VI/8	83,33
VI/9	109,38
VI/9A	142,88
VI/10	68,42
VI/11-14	124,00
VI/15	175,00
VI/16	75,00
VI/17	100,00

Table 1-3 Kabazi II, Units V and VI, density of artifacts per m^3.

Stratum 14B contains the remains of the 15 occupations from Unit VI (Table 1-1). According to stratigraphical peculiarities described above, Stratum 14B is subdivided into two parts: upper and lower. The same is true for the archaeological levels. The levels VI/1, VI/2, VI/3, VI/4, VI/5, VI/6, VI/7, VI/8, VI/9, VI/9A, and VI/10 were found in the upper part of Stratum 14B (Fig. 1-4). The levels VI/11-14, VI/15, VI/16, and VI/17 comprise the lower part of Stratum 14B. With the exception of level VI/11-14, each of these levels is represented by a thin "carpet" of finds no thicker than a single artefact or bone (Fig. 1-11, 1-12 and 1-13). Level VI/11-14 is represented by a dense concentration of bones on the square lines O and П (Fig. 1-14). The thickness of the bone concentration on square 6O is about 20 cm. At the

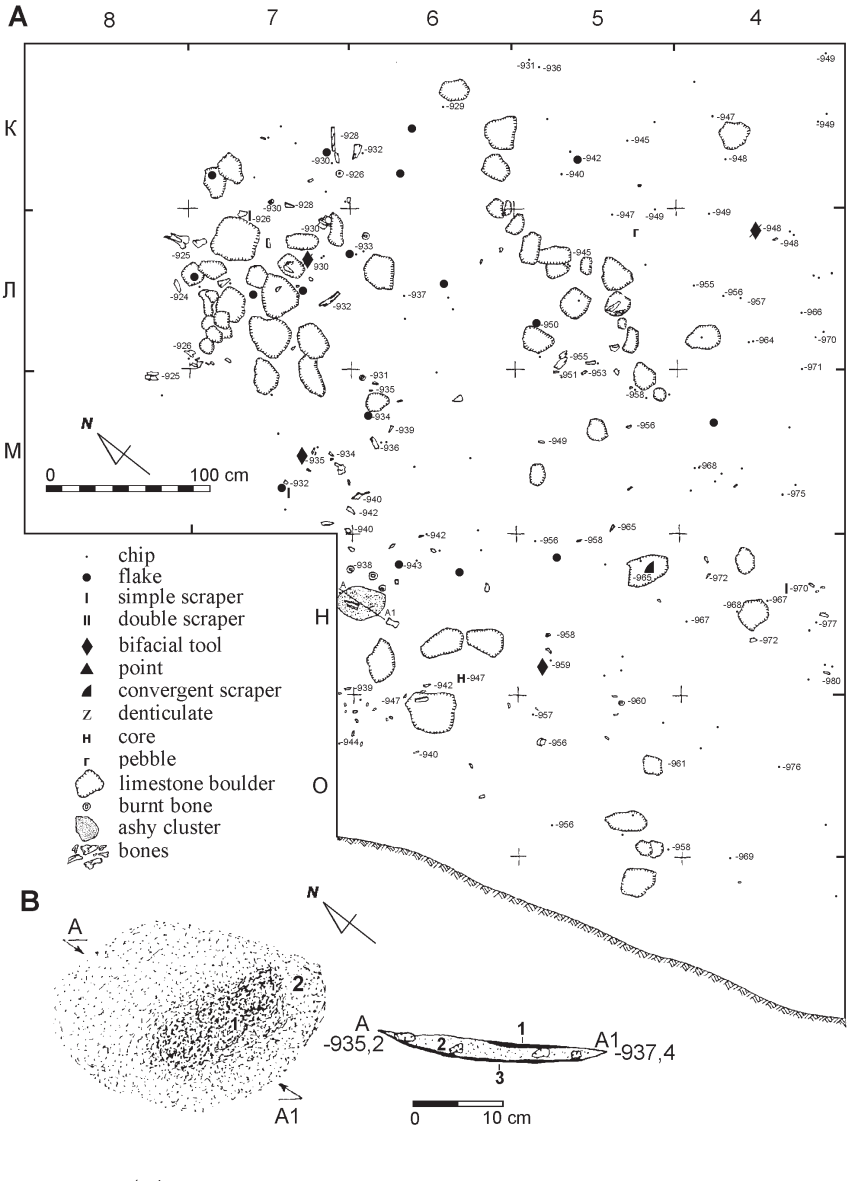

Fig. 1-9 Kabazi II, level V/3: A – site plan; B – detail of site plan and section of fire-place from squares 6H and 7H, Arabic numerals indicate horizons: 1 – dark gray horizon, densely packed by ash and small fragments of burnt bones; 2 – gray horizon less intensively filled by ash, fragments of burnt bones and burnt pieces of limestone; 3 – yellow-red horizon of burnt sediments.

same time, the thickness of level VI/11-14, located on the periphery of occupation (square lines M and H), is equal to the thickness of a single bone or artefact. Additionally, there is a pronounced difference in the gradients of the archaeological levels forming the upper and lower part of Stratum 14B. The gradients of levels VI/1, VI/2, VI/3, VI/4, VI/5, VI/6, VI/7, VI/8, VI/9, VI/9A, and VI/10 vary from 8° to 10° from north to south. On the other hand, the gradients observed for levels VI/11-14, VI/15, VI/16, and VI/17 increases to 35° (Fig. 1-4). The latter would suggest the transportation of archaeological material along the slope. However, the amount of "colluvial artefacts" sharply decreases in the lower part of Stratum 14B (Fig. 1-8), and the preservation of bone in the archaeological sequence is much better than in the upper part of the stratum. Sterile sediments were found in between all levels of Unit VI (Table 1-2). The most pronounced sterile sediment is encountered between levels VI/10 and VI/11-14. In other words, the thickest sterile layer

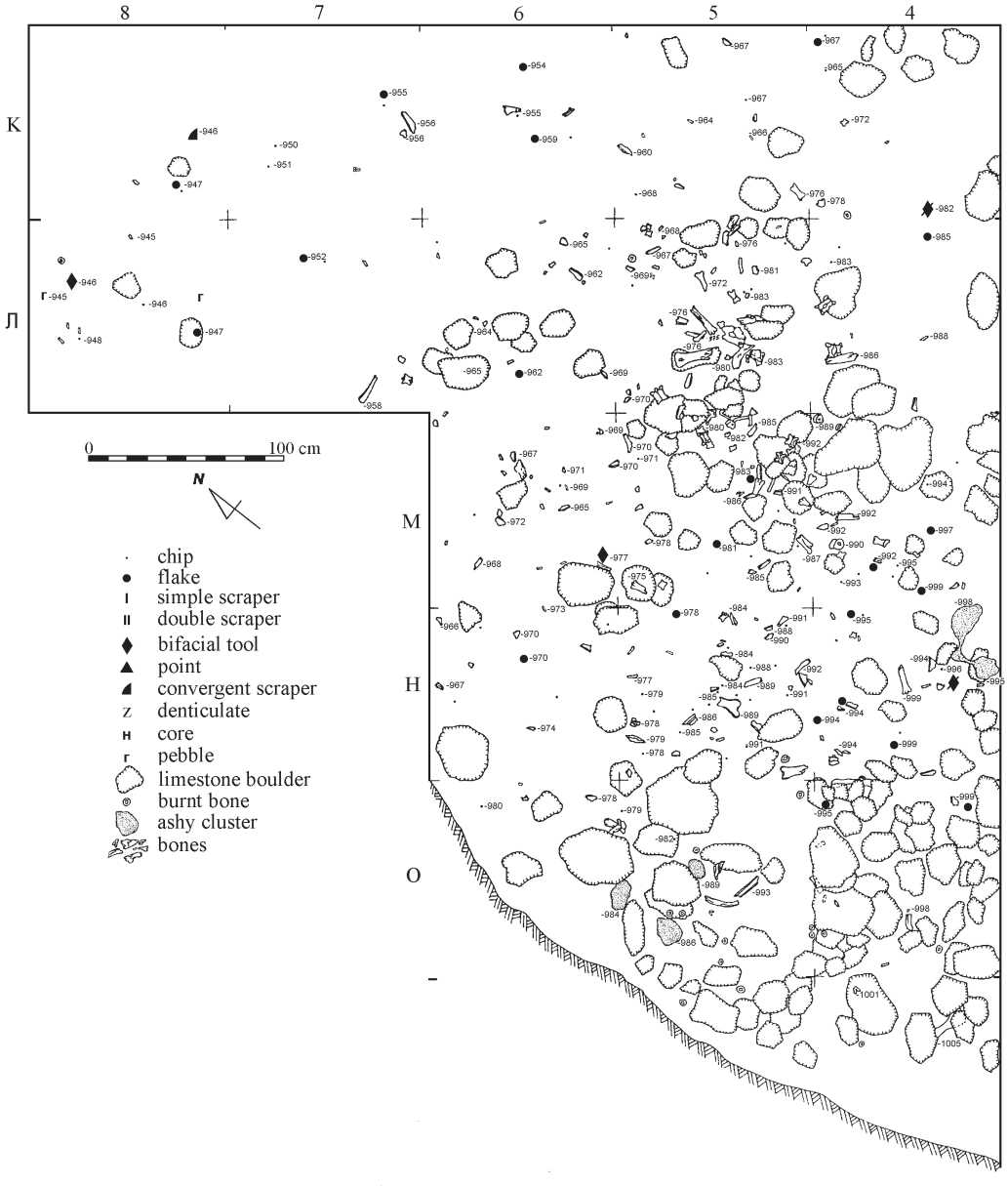

Fig. 1-10 Kabazi II, level V/6: site plan.

is located between the levels of the upper and lower part of Stratum 14B.

The distribution of archaeological material in the archaeological levels of Unit VI corresponds to the area covered by Stratum 14B, which reduces sharply towards the south. The upper archaeological levels were found on nearly all squares of the excavated area (Fig. 1-11 and 1-12), although the lowermost are present only on the most southern squares (Fig. 1-13 and 1-14). The artefact densities in all levels of Unit VI are low, but traditional for Kabazi II occupations (Table 1-3).

Therefore, taking into account the stratigraphical and occupational characteristics proposed for Units IV, V and VI, it is possible to make several conclusions:

1. The artefact assemblages from levels IV/1, IV/2, IV/3, IV/4 and IV/5 are not homogeneous. These assemblages are the result of the colluvial transport of occupational deposits which were situated above Kabazi II.

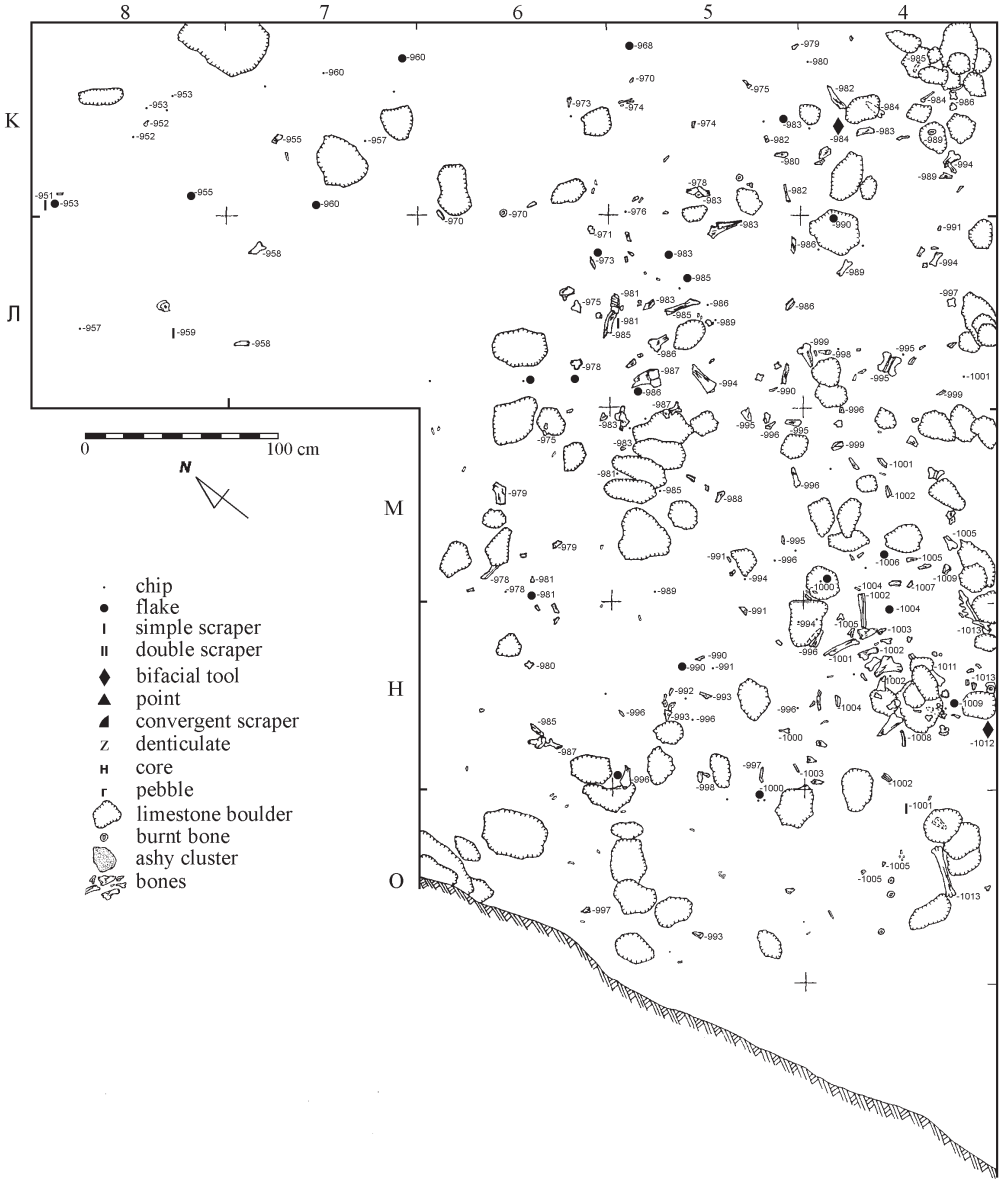

Fig. 1-11 Kabazi II, level VI/1: site plan.

2. The artefacts and faunal assemblages from levels V/1, V/2 and V/2A were found in a secondary context. These levels were significantly disturbed by alluvium from Stratum 13A.

3. The artefacts and faunal assemblages from levels VI/1, VI/2, VI/3, VI/4, VI/5, VI/6, VI/7, VI/8, VI/9, VI/9A, and VI/10 were found in a primary context.

4. The artefacts and faunal assemblages from levels VI/11-14, VI/15, VI/16, and VI/17 were found in a secondary context. These levels were transported along the existing slope, although transportation was not significant, i.e. it did not cause any damage to the surface of bone or to the edges of artefacts. At the same time, level VI/11-14 might well be the palimpsest of several occupations which were transported periodically onto the excavated area from neighbouring areas of the slope.

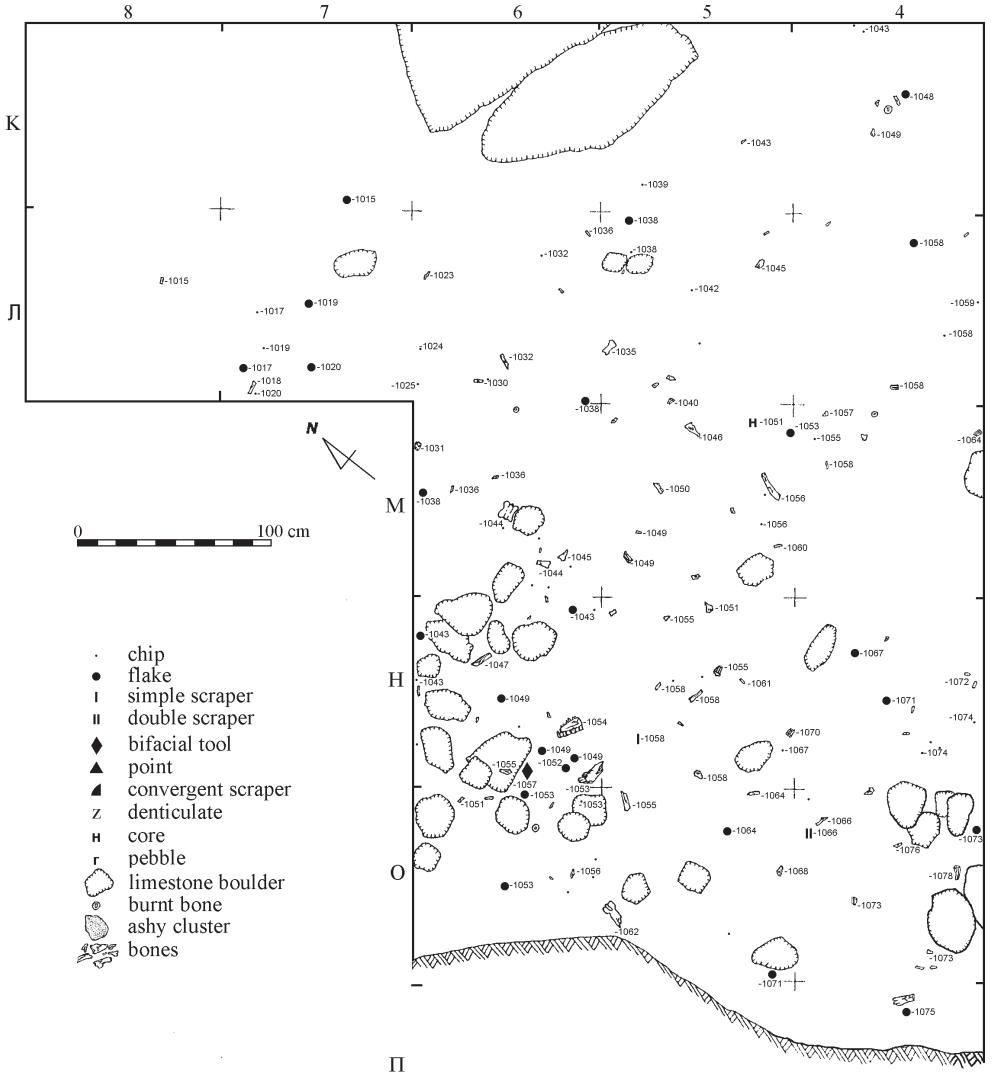

Fig. 1-12 Kabazi II, level VI/8: site plan.

Chronology

The chronological investigations of Kabazi II are based on the radiometric methods of datation and on extensive environmental studies (Hedges et al. 1996, Pettitt 1998, Rink et al. 1998, in press, McKinney 1998, Gerasimenko 1999, Chapter 2, this volume, Markova 1999, Chapter 3, this volume, Mikhailesku 1999, Chapter 4, this volume, Chabai et al. 1998, 1999).

One bone sample taken from deposits of Stratum 4 (level I/3) was dated by AMS: OxA-4135, 34940±1020. Taking into account the secondary context of this sample, this date is of little significance.

Unfortunately, no dates exist for Stratum 5, although two samples of tooth from Stratum 6 (level II/1A) were dated by U-series and ESR methods (Table 1-1). According to the results from the pollen analysis conducted by Gerasimenko, both Strata 5 and 6 accumulated under the climatic conditions of Vytachiv vt_{3b} (Denekamp Interstadial). The U-series date mentioned above can, however, neither prove nor disprove this conclusion, owing to the extremely

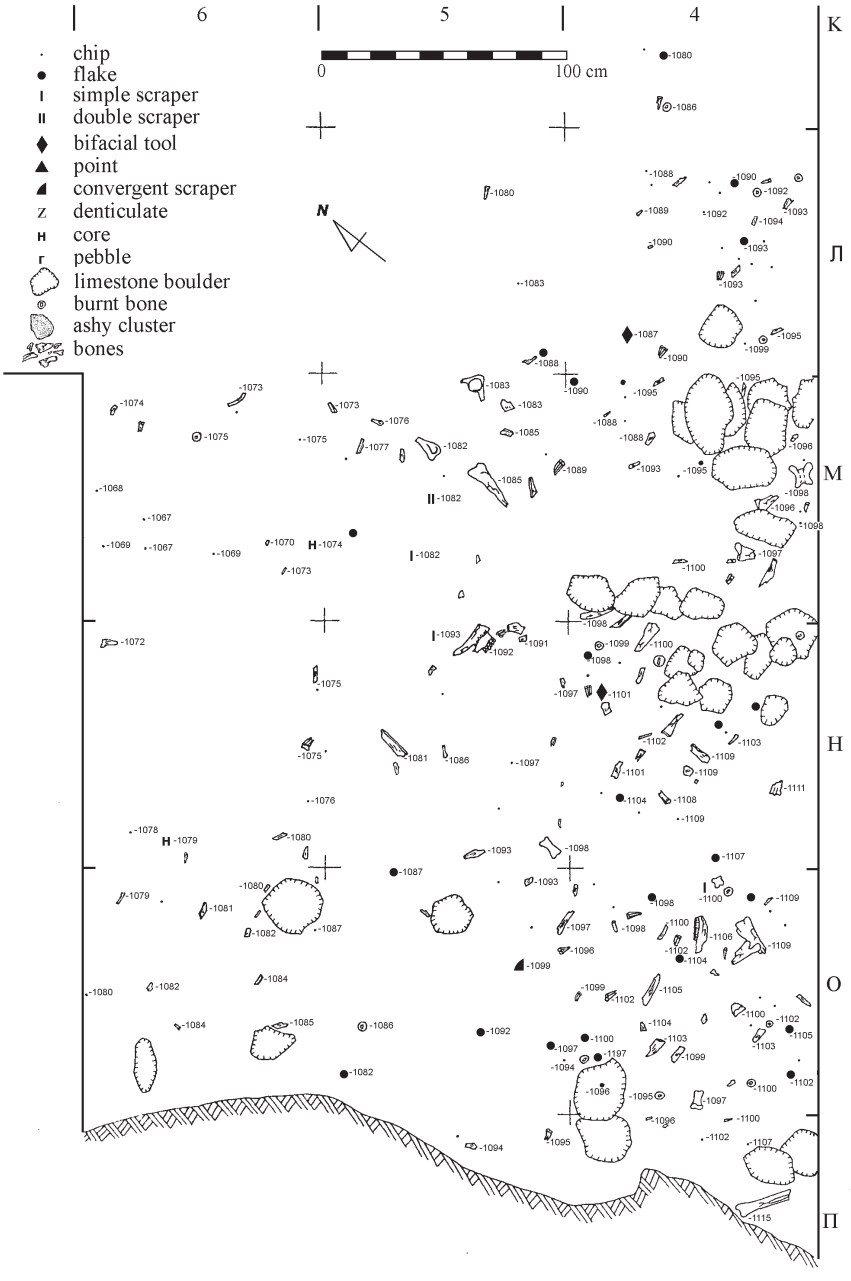

Fig. 1-13 Kabazi II, level VI/9A: site plan.

large standard deviation. The ESR date is the average result of samples taken from three teeth. These samples were treated twice. The first mean ESR date is 32±6, the second is 30±2 (Rink et al. 1998, in press). If the first ESR date is very close to the U-series date and does not give sufficient information regarding the age of the level II/1A sample, the second more or less corresponds to the commonly adopted age of the Denekamp Interstadial (Table 1-1). Additionally, the lower deposited occupations (levels II/1 – II/5) were dated by AMS to 30 – 35 ka BP. One might consider this an additional, but indirect argument dating levels II/1A – A3A to the Denekamp period (Table 1-1).

The sediments belonging to Stratum 7 accumulated under the climatic conditions prevailing in Vytachiv vt_2 (Huneborg Stadial), Vytachiv vt_{1c} (Huneborg Interstadial) and Vytachiv vt_{1b2} (Hengelo Interstadial). Furthermore, a gap was observed in the pollen spectrum in the middle part of Stratum 7 (Table 1-1). AMS dates were made on bone samples from levels II/1, II/2 (Vytachiv vt_2 – Huneborg Stadial) and II/4, II/5 (pollen gap). According to P. Pettitt's

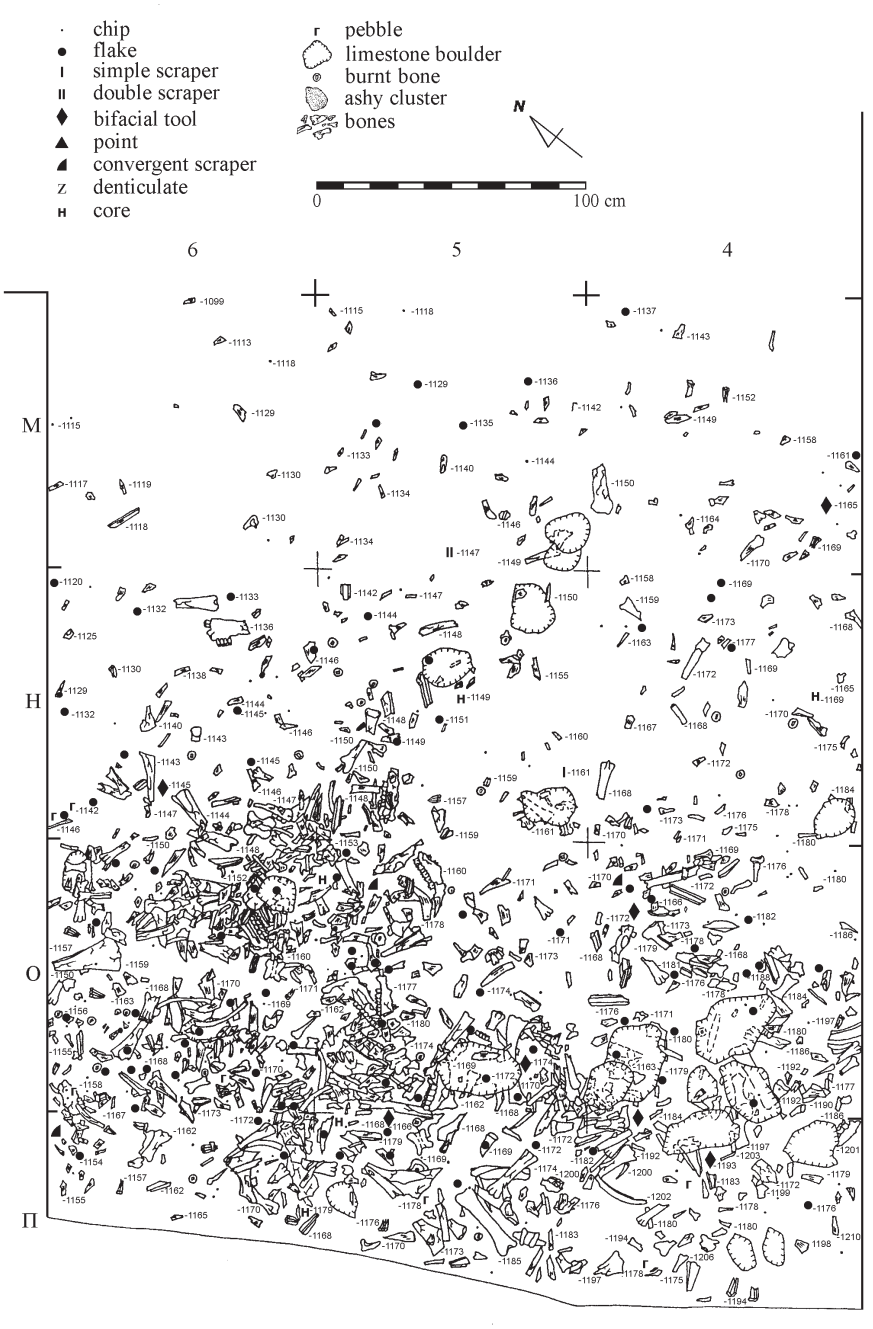

Fig. 1-14 Kabazi II, level VI/11-14: site plan.

analysis of the AMS chronology from the upper part of Stratum 7, all dates are statistically identical, and the levels II/1 to II/5 can be dated to between 31 and 36 ka BP (Table 1-1). If we disregard the date from level II/2, this time period then shrinks to between 31 and 34 ka BP (Pettitt 1998: 334). J. Rink's analysis of all the available dates from Kabazi II has led him to the conclusion that levels II/1 down to II/5 fall within the 30 – 35 ka BP range (Rink et al. 1998: 336, Rink et al. in press).

There were two attempts to date samples of tooth taken from the lower part of Stratum 7 using the ESR method. The levels II/7AB-II/8 accumulated under the climatic conditions of Vytachiv vt_{1b2} (Hengelo

Interstadial) (Table 1-1). A first attempt to date two samples from level II/7AB produced two ESR, LU ages: 34±2 and 29±3 ka BP (Rink et al. 1998: 333-334). Meanwhile, the same teeth have been analysed again, which has resulted in new ESR, LU results: 38±4 and 36±3 ka BP (Rink et al. in press). The single tooth from level II/8 has been analysed twice. The first ESR, LU result is 39±3, while the second is 44±5 ka BP (Rink et al. 1998: 333-334, Rink et al. in press).

There are also two U-series dates from levels II/1 and II/7 (Table 1-1). Unfortunately, both have considerable standard deviations making them quite useless in furthering our understanding of the chronological position of these levels. Nevertheless, C. McKinney who has analysed the U-series chronology *"of Unit II as a single unit"*, decided that its U-series age is 39,8±5 ka BP (McKinney 1998: 348).

In sum, the conclusions made by Pettitt, Rink and McKinney concerning the AMS, U-series and ESR ages of the samples from Strata 6 and 7 are not in contradiction with the results obtained from the pollen studies (Table 1-1).

There are no radiometric dates for the levels from Strata 9, 10, and the uppermost part of Stratum 11 which accumulated under the climatic conditions of Vytachiv vt_{1b2} (Hengelo Interstadial), Vytachiv $vt_{1b2\text{-}b1}$ (Stadial), Vytachiv vt_{1b1} (Moershoofd Interstadial), Uday Stadial and Pryluky pl_3 (Ognon Interstadial) (Table 1-1).

Samples of tooth taken from level III/2, in the upper part of Stratum 11 (Pryluky pl_{1b2} – Odderade Interstadial) have been dated by U-series and ESR methods. Three teeth from level III/2 have produced an average U-series age of 60±3, but using the average error of the samples, it *"is equivalent to an age of 54,000±3,000 years BP"* (McKinney 1998: 348). Another three samples of tooth taken from the same level have produced U-series ages from 41,1±2 to 117±12/13 (McKinney 1998: 347). More successful were the attempts to date three further samples of tooth from level III/2 by ESR method. The average result of these is as follows: ESR, EU, 51±3 and ESR, LU 61±1 ka BP (Rink et al. 1998: 334-335). These same samples have since been reanalysed, and Rink is of the opinion that the best age for level III/2 is 74 – 85 ka BP (Rink et al. in press). This age is not contradict the commonly adopted ages of Pryluky pl_{1b2} – Odderade Interstadial and the assumed chronological boundary between isotopic Stages 4 and 5 (Table 1-1).

At least three attempts have been made to date a single tooth from level III/3 using the ESR method. This level was found in the deposits of Stratum 11, lower (Pryluky $pl_{1b2\text{-}b1}$ (pl_2) – Rederstall Stadial – isotopic sub-stage 5b). A first attempt resulted in a date of 82±6,4 ka BP (McKinney, Rink 1996). A few years later the same sample have produced two further dates: ESR, EU, 53±4 and ESR, LU 69±5 (Rink et al. 1998: 333, 335). A final variant is: ESR, EU, 61±6 and ESR, LU, 82±10 (Rink et al. in press). The oldest dates, such as 82±6,4 and 82±10, are close to the commonly adopted age for isotopic sub-stage 5b (Table 1-1).

The lower part of the Kabazi II sequence, which is represented by the deposits from Strata 11/lower, 13, 13A, 14A and 14B, and were accumulated under the climatic conditions of isotopic sub-stages 5c and 5d (Table 1-1), have still not been dated by radiometric methods. Therefore, the chronological investigations of the Kabazi II sequence are still quite far from reaching its conclusion. The present day version might be viewed as the intermediate version of the Kabazi II chronology. At the same time, and taking into account the completeness of the pollen record (Gerasimenko, Chapter 2, this volume) and its good correlation with lithopedological, microfauna (Markova, Chapter 3, this volume) and malaco-fauna (Mikhailesku, Chapter 4, this volume) data, as well as the absence of dramatic contradiction between environmental and radiometric data, it is possible to state the main temporal framework of the Kabazi II archaeological sequence:

1. The earliest occupations of Units VI and V (Strata 14B and 14A) accumulated in Eemian soil under Interglacial climatic conditions of isotopic sub-stage 5d.

2. The next soil formation process, as seen in the formation of the upper part of Stratum 11, corresponds to the isotopic sub-stage 5a and has been dated using the ESR method to between 74 and 85 ka BP (level III/2).

3. A further period of soil formation in the lower part of Stratum 7 (levels II/7AB-II/8) corresponds to Vytachiv vt_{1b2} – Hengelo Interstadial, and has been dated by ESR to 44±5 ka BP.

4. The last Pleistocene soil accumulated in Stratum 5, under the climatic conditions of Vytachiv vt_{3b} – Denekamp Interstadial. This period comprises the archaeological levels A3A – A4.

Discussion

It can be concluded that the actual sedimentation rates which led to the accumulation of the entire Kabazi II sequence were not very impressive. Over a period of roughly 90 thousand years, only eight metres of in situ sediments accumulated, four metres of which were deposited during Stage 5, one metre formed in the course of Stage 4, and three metres accumulated during Stage 3. However, even this gradual accumulation of sediments still prevented bone material from weathering and artefacts from becoming patinated. At the same time, the human visits to the site were not frequent, and the intensities of the visits were extremely low. Layers comprising human occupation are separated by pronounced sterile sediments, which often, but not always (Patou-Mathis, Chabai 2003), prevent the appearance of palimpsests. The number of levels was the result of single economic (hunting) episodes (Patou-Mathis 1999).

The industrial variability of Kabazi II is represented by Western Crimean Mousterian and Micoquian. The former was found in the deposits of Stage 3, while the latter was discovered in the sediments of Stages 3, 4 and sub-stages 5a, 5b, 5c and 5d. Some time ago, it was claimed that "Taubachian" industry was present in Unit IV (Stepanchuk 1994a, 1994b, 1998). However, it would now appear that Unit IV "Taubachian" is actually a redeposited collection of naturally damaged artefacts.

During the time of Units A, II, IIA and III accumulation, that is, from the end of the sub-stage 5d to the end of Stage 3, the site area was used as a butchering station. No traces of any other kind of fauna exploitation were observed. During the same time, the patterns of raw material exploitation differ significantly. On-site flint reduction was characteristic in levels A3A to IIA/1, while during the earlier period of the same Stage 3, the pattern of flint exploitation was based on off-site reduction with further import of tools and blanks to the site area. In other words, the Western Crimean Mousterian sequence is represented by 20 occupations for butchering: 19 occupations used on-site flint reduction and the inhabitants of one occupation of level IIA/2 preferred to use tools and blanks imported to the site. The 35 occupations with Micoquian assemblages were based on imported tools, preforms and blanks to the site, during the time span from the sub-stage 5d to Stage 3, inclusively. Such a significant change in the raw material supply strategy was due to topographical changes. Stage 4 and the beginning of Stage 3 correlate with the regression of the Black Sea basin, which caused the incision of riverbeds and the erosion of slopes. It is likely that all of these factors resulted in the exposure of the Mount Mylnaya flint outcrop, situated on the same elevation as the 3rd terrace of the Alma River – about 300 m above sea level. According to Gerasimenko the disappearance of the alder at the beginning of Stage 3 (pollen zone VIII) might be connected with the Alma River incision (Gerasimenko 1999, Chapter 2, this volume). Thus, the appearance of the local flint source led to changes in the strategy of raw material supply.

During the most part of sub-stage 5d, the inhabitants of Units V and VI occupations continued to use tools, blanks, preforms and cores imported to the site. However, the pattern of faunal exploitation changes radically. The occupations of Units V and VI show some evidence of primary butchering. The faunal exploitation demonstrates a much more complex character (Patou-Mathis, Chapter 5, this volume). All levels of Units V and VI produce some burnt bones and artefacts. In level V/3 the fire-place was studied, and in level V/6 the ashy cluster was excavated. The site was used as a short-term camp. The environmental studies suggest that this camp was situated in the vicinity of the river bank (Chapters 2, 3, 4, this volume).

To conclude, the occupations of Kabazi II belong to two technologically and typologically different industries which demonstrate two different patterns of raw material supply and two different modes of faunal exploitation. No clear connections can be made between the industrial type, the raw material used and the exploitation of fauna.

Abstract

КАБАЗИ II: СТРАТИГРАФИЯ ГЕОЛОГИЧЕСКИХ И КУЛЬТУРНЫХ ОТЛОЖЕНИЙ

В. П. ЧАБАЙ

Кабази II – одна из четырех крымских среднепалеолитических стоянок под открытым небом. Кабази II расположена на южном склоне горы Кабази приуроченной к правому берегу р. Альма. Гора Кабази – известняковая куэста, относящаяся ко Второй (Внутренней) гряде Крымских гор. Четырнадцать метров отложений Кабази II сохранились на склоне благодаря вертикально стоящей известняковой плите, которая сыграла роль барьера для седиментационной ловушки. Пачка отложений Кабази II подразделяется на 26 геологических слоев, образовавшихся в результате коллювиальных, аллювиальных, педогенетических процессов и разрушения известняковой плиты – барьера. Коллювиальные седименты в виде суглинистых и песчанистых отложений с примесью слабоокатанного известнякового материала присутствуют во всех геологических слоях. Результатом склонового коллювия также являются крупные известняковые плиты – геологические слои 8, 12 и 17. Педогенетические процессы наиболее отчетливо выражены в формировании геологических слоев 14B, 14A, 11 (верх), 7, 5 и, конечно, современной почвы геологических слоев 1 и 2. Аллювиальные отложения соответствуют чередующимся линзам песка и глины геологического слоя 13A и отражают серию сезонных подтоплений стоянки. Угловатый разноразмерный известняковый обломочный материал аккумулировался в геологических слоях 6 – 14B в результате разрушения известняковых плит – геологических слоев 8 и 17. В отложениях Кабази II было обнаружено 55 in situ археологических горизонтов и 21 горизонт в той или иной степени переотложенного кремневого и фаунистического материалов. Все археологические горизонты сгруппированы в 8 культурно-хронологических слоев: I культурно-хронологический слой (горизонты I/1 – I/3); A (A – A4); II (II/1A – II/8C); IIA (IIA/1 – IIA/4B); III (III/1A – III/8E); IV (IV/1 – IV/5); V (V/1 – V/6); VI (VI/1 – VI/17). Соотношение археологических горизонтов и геологических слоев приведено в Таблице 1-1. Материалы всех горизонтов культурно-хронологических слоев I и IV переотложены. Также переотложены горизонты A, A1, A2 и A3 из верхней части культурно-хронологического слоя A. Горизонты V/1, V/2 и V/2A из верхней части V культурно-хронологического слоя частично размыты аллювием геологического слоя 13A. Горизонты VI/11-14, VI/15, VI/16 и VI/17 нижней пачки VI культурно-хронологического слоя претерпели некоторую транспортировку по склону в рамках геологического слоя 14B. В Таблице 1-1 переотложенные археологические горизонты отмечены курсивом.

Археологические горизонты II, IIA, III культурно-хронологических слоев и большинство горизонтов A, V и VI культурно-хронологических слоев обнаружены в первичном залегании. Инситные археологические горизонты представлены тонкими линзами кремня и фаунистических остатков. Их толщина, в основном, не превышает толщину одной кремневой или фаунистической находки. Все археологические горизонты, обнаруженные в первичном залегании, разделены стерильными прослойками разной мощности. Единственный очаг в Кабази II был обнаружен в археологическом горизонте V/3. Несколько аморфных скоплений обожженного костного материала обнаружено.

в горизонте V/6. Также горизонты V и VI культурно-хронологических слоев содержат

обожженные кости. В вышележащих горизонтах свидетельств использования огня не обнаружено.

Хронология отложений Кабази II, приведенная в Таблице 1-1, отличается достаточно высокой степенью согласованности радиометрических дат и биостратиграфических определений.

Скорость аккумуляции отложений вряд ли можно признать очень быстрой. Восемь метров инситных отложений образовались за приблизительно 90 тыс. лет. Почти половина всей пачки Кабази II – около 4 м аккумулировались во время стадии 5 (MIS). Около 1 м приходится на время стадии 4, и три метра отложилось во время стадии 3. С другой стороны, количество посещений стоянки было очень низким и интенсивность использования жилых поверхностей крайне незначительной. Такая комбинация темпов аккумуляции геологических и антропогенных отложений не способствовала возникновению *palimpsest* поселений. Многие из археологических горизонтов Кабази II являются отражением одного хозяйственного эпизода.

Кремневые коллекции Кабази II относятся к двум технокомплексам: леваллуа-мустьерскому (западнокрымская фация) и микокскому (аккайская фация). Выделенная ранее В. Н. Степанчуком «таубахская индустрия» IV культурно-хронологического слоя представлена переотложенным комплексом артефактов, края которых были повреждены в результате их транспортировки по склону. Западнокрымские комплексы обнаружены в археологических горизонтах А3А – IIA/2, которые аккумулировались во время климатических условий стадии 3. Микокские комплексы происходят из горизонтов IIA/2-3 – VI/17, отложившихся во время стадий 5, 4 и 3. Наиболее древние отложения 14В и 14А геологических слоев, содержащие микокские комплексы VI и V культурно-хронологических слоев, аккумулировались во время интергляциальных климатических условий Кайдаки kd_{3b2+c} – Eemian (E6a) – Микулино (M7).

Chapter 2

Vegetation Evolution of the Kabazi II Site

Natalia Gerasimenko

The vegetation history of the sedimentary sequence from Kabazi II was the subject of previous palynological studies published in the 1990s (Gerasimenko 1999). This paper is a summary of former data, and also presents new results obtained from a detailed, high resolution (5 cm) pollen study of the lower part of the sequence (8.0 m – 11.4 m) excavated during the 2000-2001 season.

The geographical setting of the site has been shown in the former publications (Chabai, 1998b; 2004c; Gerasimenko, 1999). The original landscape in the vicinity of the site can be summarised as a cuesta formed in Cretaceous-Palaeogene limestone, with mollic soils ('rendzinas') under steppe and oak forest (Bagrov, Rudenko, eds. 2004). The steppe vegetation consists mainly of Herbetum mixtum (mesophytic mixed herbs) and covers the cuesta plateau. The lower part of the cuesta slope is presently occupied by scrub, whose main components are as follows: oak (*Quercus pubescens* Willd.), hornbeam (*Carpinus orientalis* Mill.), hazelnut (*Corylus avellana* L.), and bloody dogwood (*Cornus sanguinea* L.). Oak and hornbeam also form the first level of mountain forest of the Main Ridge of the Crimean Mountains (below 600 m), and above 600 m, hornbeam and beech forest grow. Patches of pine occur here and there, though pure pine forest occupies the highest parts of slopes. As reported in many sources, in the forest-steppe belt of low ridges of the Crimean Mountains, the areas of forest were larger during the previous intervals of the Holocene. The composition of recent pollen spectra from different vegetation belts of the Crimea is already available (Artyushenko and Mishnev, 1978; Gerasimenko, 1999).

For our pollen study, 89 samples were used, these included 48 samples collected in 1992, and 41 new samples. These were processed using the same technique (treatment with HCl, HF, KOH, Na4P2O7 and flotation in heavy liquid), and in both cases the pollen frequencies and degree of pollen preservation were similar. In the new samples, the highest frequencies appeared at depths between 10.15-11.25 m (Stratum 14B), whereas between 8.0-8.7 m (Stratum 13) the samples contained smaller amounts of pollen. Pollen grains were also better preserved in Strata 14A and 14B than in Stratum 13. The spore-pollen diagram, published in the previous study (Gerasimenko, 1999) was compiled using the Grichuk's count method (percentages of arboreal and non-arboreal taxa were counted from the sums of arboreal and non-arboreal pollen correspondingly). In this paper, this diagram has been reproduced using the count of pollen percentages from the total sum of microfossils (Fig. 2-1). The diagram showing the new results (Fig. 2-2) was compiled in the same way.

Pollen Zones and Lithostratigraphical Succession

Whereas fourteen pollen zones (PZ I-XIV) were recognised in the deposits of Strata 4-14 of the Kabazi II sequence from the 1992 excavations (Gerasimenko, 1999), in the deposits from the lower part of the new sequence (Strata 13-14) four pollen zones (PZ A-D) were observed, two of which (PZ A and PZ C) were not present in the pollen sequence established in the former study. Below we give a short description of those previously published pollen zones, as well as extended descriptions of those recently studied. Pollen zones are given in relation to lithostratigraphical Strata, established by V. Chabai (1996, 1998b, 2004c).

Strata 14F – 14C: at the base of the sequence are non-soil deposits – light greyish-green clayey and sandy loams with rounded limestone debris, underlain by yellow clay with fine limestone debris (Stratum 15). According to V. Chabai (Chapter 1, this volume), Stratum 14E covers the whole area of the excavation, whereas Strata 14F, 14D and 14C are embedded as lenses in the sedimentary sequence. The Strata are bedded parallel to the slope surface, which would suggest that they are of colluvial origin. Pollen samples have been taken from Strata 14E and 14D, and the spectra obtained correlated to the previously

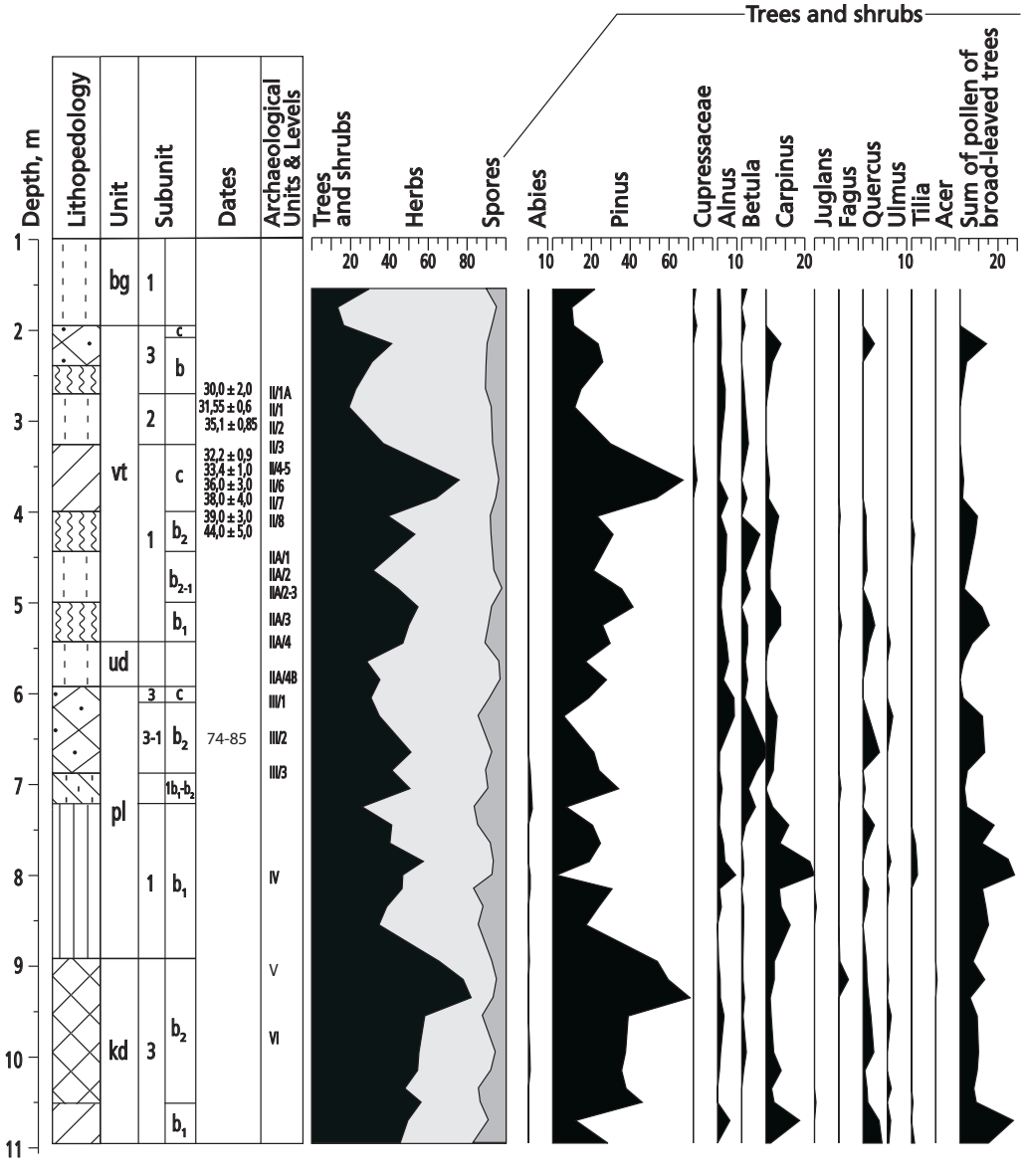

Fig. 2-1 Kabazi II: spore-pollen diagram of the deposits, section 1992 (modified after Gerasimenko, 1999).

established pollen zone I and the lower part of the pollen zone II (Gerasimenko 1999).

Pollen zone I (11.0-10.7 m, Fig. 2-1) corresponds to the greyish-green clayey loam of Stratum 14E. The pollen spectra, which is of a forest-steppe type (46-49 % AP, 38-42% NAP) displays a rather high proportion of broad-leaved taxa pollen (14-27%). The latter is mainly represented by *Quercus* and *Carpinus*, though a few *Ulmus* and *Tilia* also occur. *Alnus* pollen increases upwards together with *Carpinus*. The *Pinus* ratio is lower than its average for the diagram. Herbetum mixtum (mainly Lamiaceae) and Cyperaceae dominate NAP. Spores include Bryales, Filicales and Lycopodiales.

Pollen zone II (10.6-9.5 m, Fig. 2-1) has been recognised by such general characteristics as: 1) forest-steppe type of pollen spectra with predominance of *Pinus* pollen in AP, of Herbetum mixtum and Cyperaceae in NAP; 2) a sharp drop of pollen of broad-leaved taxa (7-9%) compared to PZ I; 3) a decrease in Cyperaceae pollen and an increase of Chenopodiaceae and Poaceae in comparison to PZ I. PZ II corresponds to the two Strata (14D and the lower part of 14B) and can be divided into two sub-zones.

Pollen sub-zone IIA (10.6-10.1 m, Fig. 2-1) is related to the light-grey sandy loam of Stratum 14D. The general composition of AP is the same as in PZ I, though *Pinus* pollen percentages are much higher

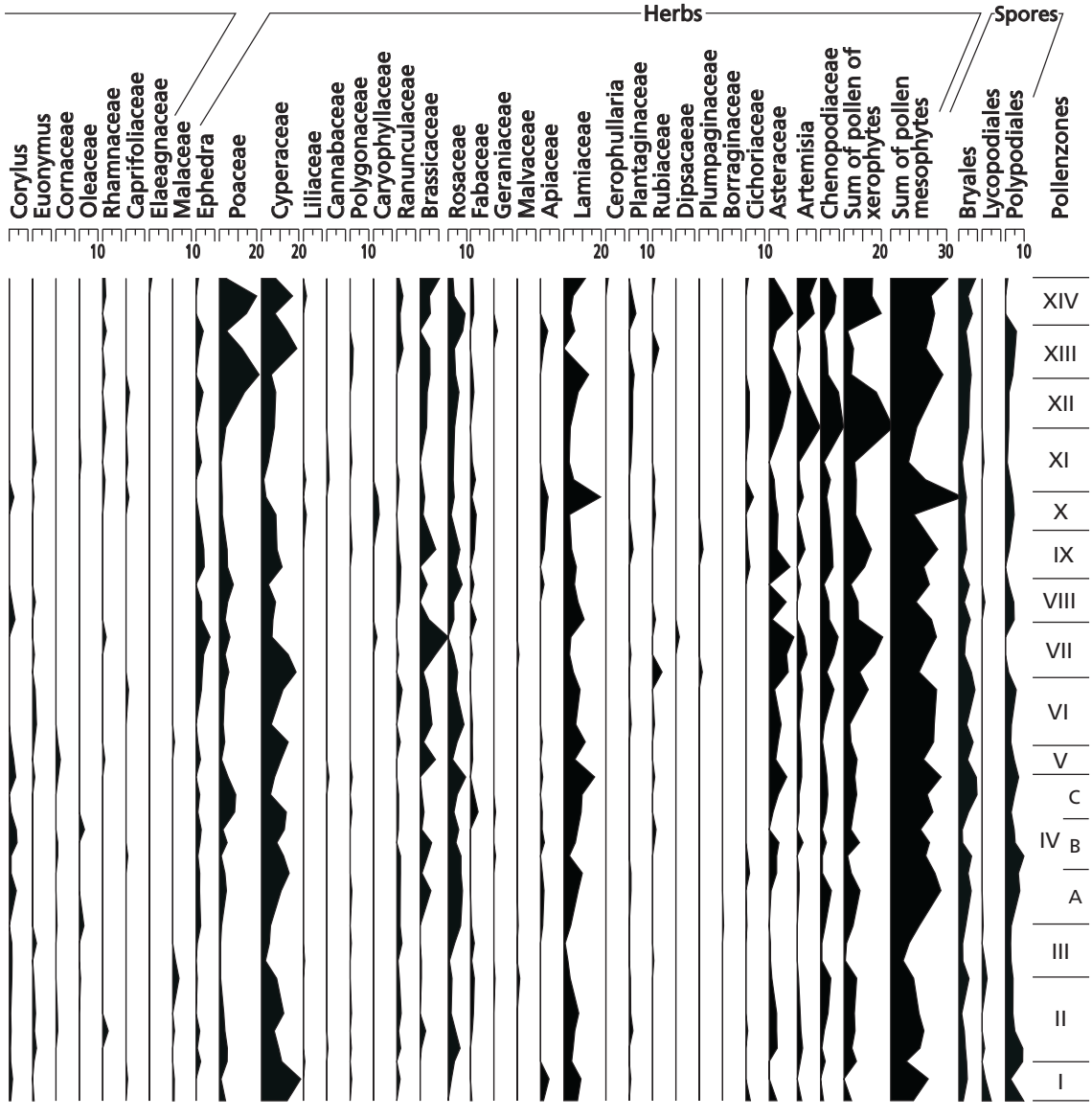

Fig. 2-1 continued. Pollen counts made from the general pollen sum. For lithopedology see Fig. 3.

(37-46%). In the NAP, the ratio of Poaceae increases and xerophytes (*Ephedra, Artemisia*) occur.

Pollen sub-zone IIB (10.0-9.5 m, Fig. 2-1) corresponds to the lower part of Stratum 14B, and is described below. Stratum 14C was not sampled for pollen.

Strata 14A and 14B correspond to the 1.5 m thick, soil genetic horizons of well-developed humiferous soil (mollisol). The soil material includes fine angular limestone debris. Stratum 14A is a humus horizon (A1) truncated by later erosion. It is a dark-grey compacted loam, 0.15-0.20 m thick, with a granular structure and undisturbed downward biogenic transition. Stratum 14B is a humus-transitional horizon (A1B) lighter in colour than the A1 horizon, and comprises a grey compacted clayey loam, with granular-prismatic structure and a distinct, rather sharp downward transition. Down the slope, the thickness of Stratum 14B increases (up to 4 m) at the expense of incorporation of humiferous colluvium. Stratum 14B cuts the underlying deposits. Its sharp lower transition is evidence of an incision at the beginning of the formation of Stratum 14B. Stratum 14B correlates to pollen zones IIB and III (Fig. 2-1), or to pollen zones A and B (Fig. 2-2). Stratum 14A corresponds to pollen zone C (Fig. 2-2), and was not sampled in 1992.

Pollen zone A (11.4-11.3 m, Fig. 2-2) falls in the lowest layer of Stratum 14B (grey loam at the base of A1B horizon of the mollisol). Judging from the pollen composition, this interval was not sampled in 1992. It displays a forest-steppe type of pollen spectra (45-65 % of AP, 22-35% of NAP, and 13-20 % of spores). As opposed to the preceding and following pollen zones, its AP consists almost entirely of *Pinus* pollen (few grains of *Alnus*). NAP is dominated by Herbetum mixtum (9-17%) and Cyperaceae (9-10%). Poaceae and Chenopodiaceae are represented by single pollen grains. Herbetum mixtum includes mainly microfossils of Ranunculaceae, Rosaceae and Lamiaceae. Pollen of Polygonaceae, Apiaceae, Rubiaceae and Asteraceae also occur. Spores include Bryales, Filicales and Lycopodiales. The proportion of the latter is the largest in the diagram.

Pollen zone B (11.3-10.1 m, Fig. 2-2) corresponds to the AIB horizon of the mollisol, and is characterised as follows: 1) forest type of pollen spectra (55-75 % of AP, 10-30% of NAP); 2) a sharp predominance of *Pinus* pollen (50-71%); 3) low percentages of broad-leaved taxa pollen (3-6%); 3) frequent occurrence of *Betula* pollen in small numbers; 4) predominance of Herbetum mixtum in NAP (6-17%); 5) very low percentages of xerophytes and Poaceae pollen, and absence of *Artemisia* (0-3%); 6) relatively low values of Cyperaceae and rather high proportion of Filicales (5-15%). Nevertheless, pollen zone B is not homogenous, and can be divided into distinct sub-zones. These can be correlated with pollen zones II (upper part) and III of the 1992 excavation (Fig. 2-1).

Pollen sub-zone B1 (11.3-10.9 m, Fig. 2-2) displays relatively high percentages of broad-leaved pollen within PZ B, particularly of *Carpinus*, whose pollen appears earlier than *Quercus* pollen. Another peculiar feature is the presence of *Abies* pollen (2%) and one pollen grain of Ericaceae. Microfossils of *Cupressaceae*, *Betula* and *Alnus* occur constantly (0.5-3%, *Alnus* up to 6%). *Corylus* and *Euonymus* pollen are also present in small numbers, and single *Ulmus* and *Tilia* appear at the top of PZ B1. In NAP, percentages of Herbetum mixtum are highest within PZ B (7-17%), and its composition is most diverse: Lamiaceae (dominate), Rosaceae, Ranunculaceae, Apiaceae, Liliaceae, Rubiaceae, Fabaceae and Polygonaceae. A characteristic feature is the permanent presence of Asteraceae and Cichoriaceae pollen (2-7 and 1-2% correspondingly). Among spores, Filicales significantly dominate over Bryales, and Lycopodiaceae are permanently present in small numbers (1-4%).

Pollen sub-zone IIB (10.0-9.5 m, Fig. 2-1) is an equivalent of PZ B1. The latter differs from PZ IIA (Fig. 2-1) by the appearance of *Betula* pollen and the disappearance of xerophytes (*Ephedra, Artemisia*). Both these characteristics are typical for PZ B1. The other common feature of PZ IIB and PZ B1 is the pattern in the occurrence of broad-leaved taxa – primarily only *Carpinus* appear, followed by *Carpinus* and *Quercus*, and *Ulmus* and *Tilia*. *Corylus* and *Euonymus* occur in both PZ. There is no *Abies* and no Ericaceae in PZ IIB. It is evident that these microfossils were wind-blown from the higher mountain belts. In the lower part of PZ B1, the percentage of AP and *Pinus* are higher, and the value of broad-leaved taxa lower than in PZ IIB (Fig. 2-1 and 2-2). This can be explained by the 10-cm sampling interval during 1992. This may have led to mixing with material from PZ IIA which is richer in NAP and broad-leaved taxa pollen. The predominance of Lamiaceae and notable Asteraceae values are characteristics of both PZ IIB and B1.

Pollen zone III (9.4-8.7 m, Fig. 2-1) has been recognised by pollen spectra of forest type (66-82% AP) and by a low proportion of broad-leaved taxa pollen (5-13%). *Pinus* dominated sharply in the AP, and Herbetum mixtum in the NAP. PZ III corresponds to the middle and upper parts of PZ B, and the palynological correlation between the individual spectra of PZ III and pollen sub-zones of PZ B is given below.

Pollen sub-zone B2 (10.9-10.65 m, Fig. 2-2) is

characterised by an increase in *Pinus* pollen (64-69%) and by a drop in the frequencies of broad-leaved taxa pollen (small amount of pollen grains from *Quercus, Carpinus* and *Ulmus*). *Alnus, Betula* and *Corylus* occur in small numbers (0.5-2%, *Alnus* up to 4%). Herbetum mixtum (7-12%), rather rich in composition, and Asteraceae (1.5-8%) still dominate NAP, ant the ratio of Cyperaceae and Chenopodiaceae is low (0-2.5%). Poaceae pollen are now constantly present (1-2%). Bryales, Filicales and Lycopodiales are constant components among spores, but Filicales (7-17%) sharply dominate over Bryales (1.5-2%). Pollen spectra of forest-steppe and forest types alternate throughout PZ B2, with a strong prevalence of forest type in its upper part.

PZ B2 (Fig. 2-2) can be correlated with the pollen spectrum at the base of PZ III (Fig. 2-1). The latter is characterised by an almost complete disappearance of pollen of broad-leaved trees, and a maximum value for *Pinus*, the lowest ratio of Cyperaceae, Chenopodiaceae and Bryales, and a maximum of rich Herbetum mixtum (69% within NAP group). The composition of dendroflora pollen is the same as in PZ B2.

Pollen sub-zone B3 (10.65-10.35 m, Fig. 2-2) displays forest type pollen spectra (60-76% of AP, 10-25% of NAP, 8-18 % of spores). *Pinus* still dominates (50-68%), but less so than in PZ B2. *Betula* is constantly present (1-3%), though the occurrence of *Alnus* has now become less frequent than in the preceding pollen zones. Pollen of broad-leaved species again increases (4-6%). *Quercus* and *Carpinus* are represented by small numbers, but the characteristic feature is a constant presence of *Ulmus* (1-3%), as well as the appearance of *Tilia* (0-3%). As in PZ B1, shrubs include Cupressaceae, *Corylus* and *Euonymus*. The other characteristic feature of PZ B3 is the presence of a small number of *Picea* (0.5-2%) in its lowest part. The NAP ratio increases in the upper part of PZ B3 owing to an increase in both Herbetum mixtum (11-13%) and Cyperaceae (5-7%). Poaceae pollen also appears at this level. Asteraceae pollen is less common in PZ B3 than in the preceding pollen zones, and Chenopodiaceae almost disappear. In the spore group, Bryales has become dominant (with the exception of the lowest part of PZ B3). Samples K and L (from the 2000 excavation) also belong to PZ B3, and their indices have been given above.

PZ B3 (Fig. 2-2) can be correlated with the pollen spectrum in the middle part of PZ III (Fig. 2-1). The percentage of broad-leaved taxa pollen increases at this level, which occurs at the expense of *Pinus* pollen. The floristic composition of tree pollen is similar to that in PZ B3. The only difference is the absence of *Picea* microfossils, though *Fagus* pollen was observed at the similar level in the sequence of the 1992 excavation. *Fagus*, like *Picea*, is an inhabitant of high belts of mountain forests. Although *Picea* pollen is obviously wind-blown, its presence demonstrates the same trend of the downward encroachment of the borders of mountain vegetation belts, which is recorded in Crimea with a lowering of the *Fagus-Carpinus* forest belt. The disappearance of Chenopodiaceae, a drop in Asteraceae values, and predominance of Rosaceae in Herbetum mixtum are common features of NAP of PZ B3 and the middle part of PZ III.

Pollen zone B4 (10.35-10.10 m, Fig. 2-2) is characterised by a drop in both AP (58-65%) and *Pinus* pollen (43-56%) through an increase of NAP (25-32%). The proportion of broad-leaved taxa is the same as in PZ B3, but *Corylus* (2-3%) and *Quercus* pollen become more frequent. *Ulmus* occurs constantly (1-4%), whereas *Carpinus* pollen grains become few. An increase in *Betula* and *Alnus* pollen ratios (1-8% and 2-6% correspondingly) was also observed. The NAP ratio increases owing to an increase in percentages of Poaceae (3-4%), Cyperaceae (4-0%) and Asteraceae (2-6%) pollen. Herbetum mixtum values are the same as in PZ B3, though the composition of mixed herbs is more diverse: Ranunculaceae, Polygonaceae, Liliaceae, Rosaceae, Fabaceae, dominating Lamiaceae, Apiaceae, Plantaginaceae and Cichoriaceae. Filicales and Bryales are represented in equal numbers, and Lycopodiales drop sharply. The samples H, I and J (from the 2000 excavation) also belong to PZ B4 and their indices are included above.

PZ B4 (Fig. 2-2) demonstrates the same trend with a decrease in the AP ratio, which is similar to the upper part of PZ III (Fig. 2-1). On the other hand, the exact equivalent of PZ B4 shown in the pollen diagram for the 1992 excavation is absent. This may be connected with the 'sterile' pollen sample (# 11) included in this diagram. Only the very top of PZ B4 is similar to the pollen spectrum of the sample #12.

Pollen zone C (10.1-9.9 m, Fig. 2-2) lies in the humus horizon A1 of the mollisol (Stratum 14A) and in the top layer of A1B horizon of this soil (top of 14B Stratum). Stratum 14A was absent in the 1992 excavation. The most distinctive feature of PZ C is a sharp drop in *Pinus* pollen (6-22%), which also provokes a general drop of AP (30-49%). NAP goes up significantly (28-60%), and spore values are the same as in PZ B (10-23%). The pollen spectra are of a forest-steppe type. *Quercus, Carpinus, Pinus* and *Alnus* predominate. *Ulmus* and *Betula* occur only in the top layer. Shrubs include *Corylus* and Rhamnaceae. Herbetum mixtum (10-27%) and Cyperaceae (8-27%) prevail in the NAP, though Poaceae (1-6%) and Chenopodiaceae (1-5%) are constantly present.

Asteraceae occur only in the top layer (6%). Herbetum mixtum is as rich in diversity as in PZ B4 (Ranunculaceae and Lamiaceae pollen dominate). Bryales and Filicales are present in equal proportions, and Lycopodiales are absent.

Stratum 13A corresponds to soil colluvium that fills an incision in the underlying beds. It is between 0.4 and 0.5 m thick, and consists of thin coarse sand beds which alternate frequently with thin beds of brown clay. No pollen samples were taken from this Stratum.

Stratum 13 is a slope derivative of a Bt genetic soil horizon of a mountain brown forest soil (luvisol). The A1A2 horizon of the soil corresponds to the base of Stratum 11B (11 lower). Due to the type of pedogenic processes, the transition between A1A2 and Bt soil horizons is always sharp and well defined. On the other hand, the transition between a lighter A1A2 horizon and overlying colluvial deposits is often gradual. It is for this reason that the A1A2 horizon was originally related to Stratum 11A (11 lower). The pollen data indicate that the luvisol derivative includes pedosediments both of the A1A2 horizon (0.3 m thick) and Bt horizon (0.7 m thick). The A1A2 horizon is a light, loose, grey-brown loam with fine limestone debris. Pedogenic clay seldom occurs. The Bt horizon is a dark-brown compacted loam with some pedogenic clay coatings, preserved despite the existence of a colluvial component in the soil material. The lower transition is gradational – the base of the soil is formed on the sediment of Stratum 13A.

Stratum 13 corresponds to pollen sub-zones IVA and IVB (Fig. 2-1), or to pollen zone D (Fig. 2-2). The general characteristics of PZ IV and PZ D are a predominance of forest-steppe type of pollen spectra, as well as a rather high percentage of broad-leaved taxa pollen, particularly of *Carpinus*. Pollen counts of broad-leaved taxa are somewhat lower in PZ C than in PZ IV. On the basis of an increase in *Carpinus* pollen upwards, PZ D is divided into the sub-zones D1 and D2.

Pollen sub-zone IVA (8.6-8.1 m, Fig. 2-1) has equal proportions of AP (35-45%) and NAP (38-50%). *Pinus* pollen counts are very low (18-24%), quite comparable with broad-leaved taxa values (12-13%). Broad-leaved taxa are mainly represented by *Carpinus* (*C. orientalis* Mill. and *C. betulus* L.). *Corylus* is second in abundance. NAP is dominated by Herbetum mixtum and Cyperaceae. Pollen grains of *Ephedra* are present (1-2%). Spores include only Bryales and Filicales.

Pollen sub-zone D1 (8.7-8.3 m, Fig. 2-2) correlates with PZ IVA, and is characterised by a slight predominance of NAP (46-54%) over AP (34-42%). The pollen counts of broad-leaved taxa are 7-11%, and only in the lowest layer are they as low as 3%. *Carpinus, Ulmus* and *Quercus* are represented in that layer, whereas in the rest of PZ D1, there is an absolute predominance of *Carpinus. Corylus* and *Alnus* are represented in the same proportion (1-3%), but in the lowest layer, the *Alnus* ratio is higher (7%), as is the *Betula* pollen count (3%). The proportion of *Pinus* is still low (19-28%). In NAP, Herbetum mixtum (16-34%) dominates over Cyperaceae (8-15%). The counts of Poaceae (1-3%) and Chenopodiaceae (1-3%) are very low, and only a few pollen grains of *Ephedra* were found. Values of Asteraceae pollen

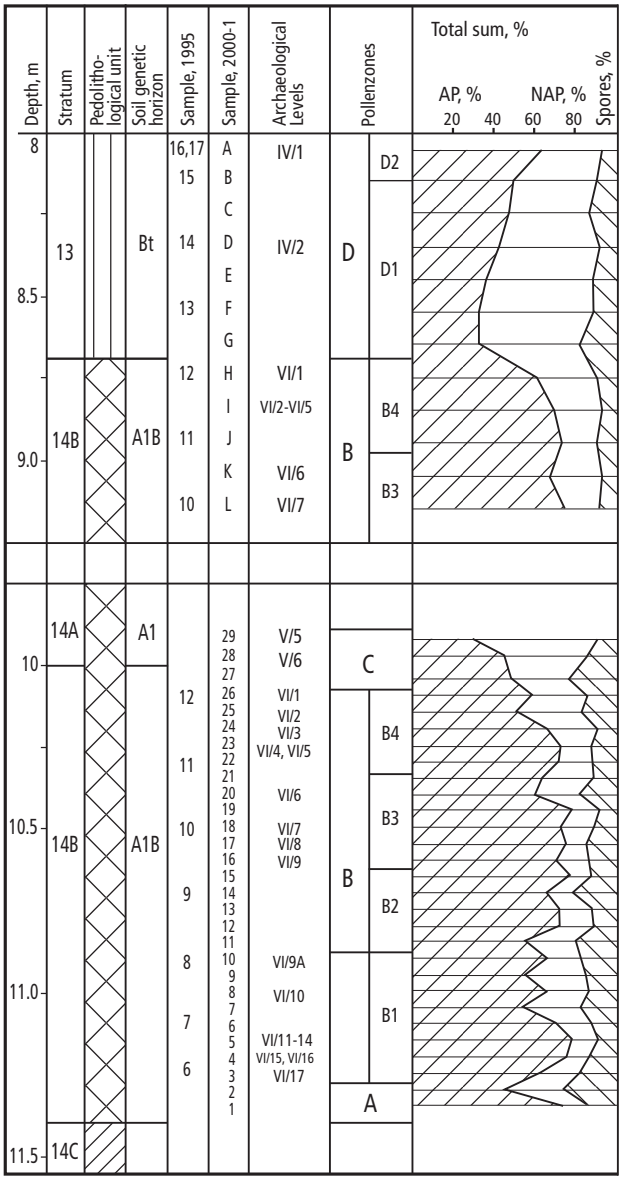

Fig. 2-2 Kabazi II: spore-pollen diagram of the deposits, section 2000-2001.

are 5-7%. Herbetum mixtum includes Brassicaceae, Ranunculaceae, Rosaceae, Fabaceae, Lamiaceae, Apiaceae, Rubiaceae and Cichoriaceae pollen (Rosaceae and Fabaceae dominate). Filicales spores (6-12%) are more abundant than those of Bryales (2-6%) and Lycopodiales are present (3%) only in the lowest layer.

Pollen sub-zone IVB (8.1-7.8 m, Fig. 2-1) differs from PZ IVA by showing a further increase of broad-leaved taxa (up to 25-28%), and particularly *Carpinus* (*Carpinus orientalis* Mill. strongly dominates). The percentage of *Pinus* is slightly higher at the base of the sub-zone (31%), but then sharply drops (2-19%). The occurrence of *Tilia* pollen (3%) is characteristic, as is a rather diverse shrub pollen: *Corylus* (4%), *Cornus* (1%), few Oleaceae and Caprifoliaceae. The top of PZ IVB displays a forest type of pollen spectra. The composition of NAP and spores is similar to that in PZ IVA.

Pollen sub-zone D2 (8.3-8.0 m, Fig. 2-2) is similar to PZ IVB. Such low pollen counts of *Pinus*, as in PZ IVB, have not been observed in PZ D2, and the percentage of broad-leaved taxa pollen is somewhat lower here (10-21%). Due to an increase in *Pinus* pollen (23-27%), the AP is also somewhat higher in PZ D2 (47-62%). *Carpinus orientalis* Mill. dominates

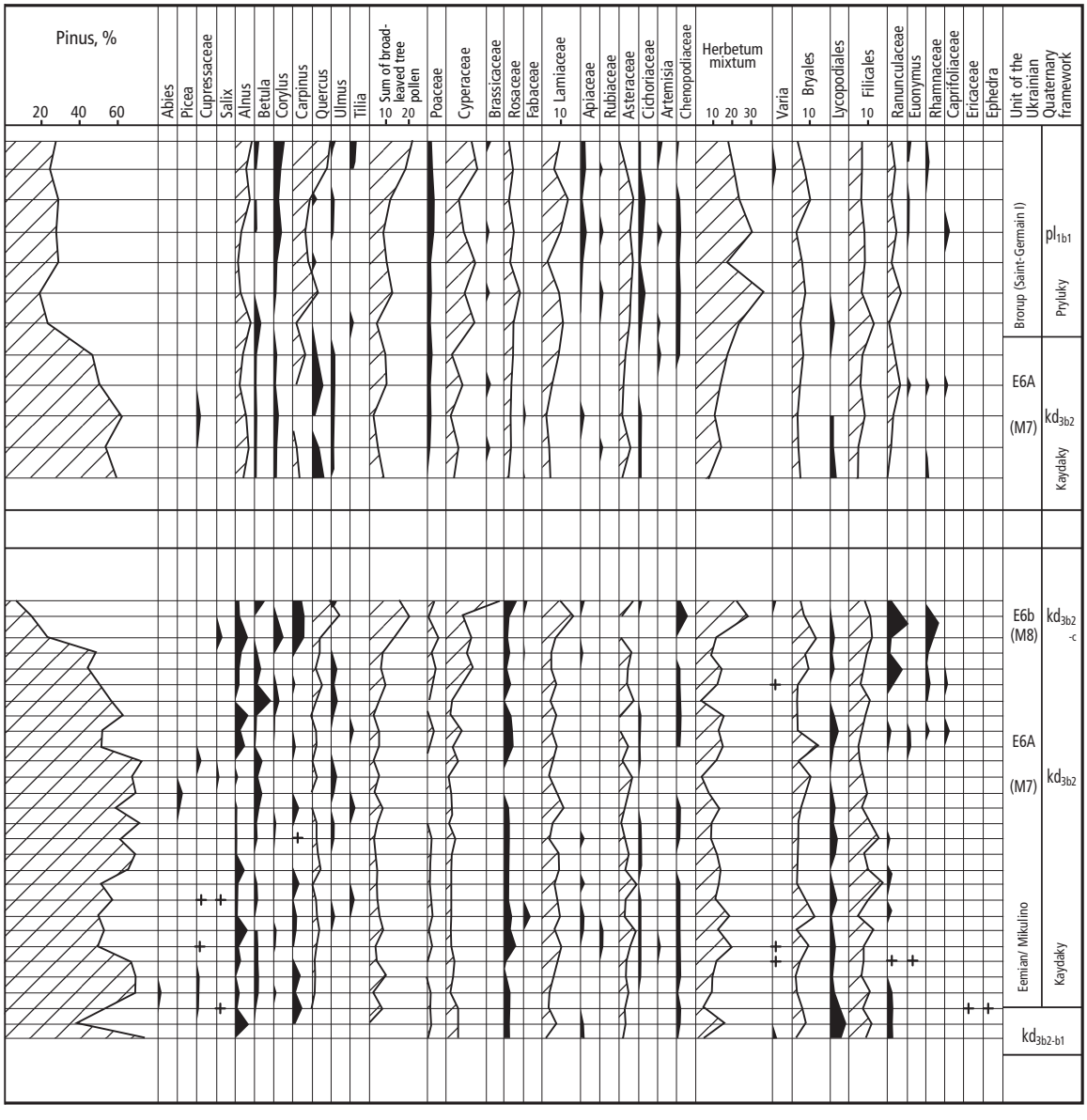

Fig. 2-2 continued. For lithopedology see Fig. 3.

within broad-leaved taxa pollen, and *Tilia* pollen is present in small numbers (1-2%). *Corylus* pollen occur (2-5%), and - as in PZ IVB - a local peak of *Alnus* was discovered (5-8%). Shrubs (*Euonymus* and Rhamnaceae) are represented by few pollen grains. Herbetum mixtum still dominates over Cyperaceae (16-21 and 6-15% correspondingly), and pollen counts of Poaceae and Chenopodiaceae are low (1-3% of each). In comparison to PZ D1 Asteraceae decrease, though Herbetum mixtum is still diverse in composition. The percentages of spores, represented by Bryales and Filicales, are the same as in PZ IVB (8-14%).

Stratum 11A (11 lower) is a light grey-brown loam, 0.9 m thick, loose, with fine limestone debris. Pedogenic features are observed in its lower layer (the A1A2 soil horizon, see above). Colluvial component increases upwards. Stratum 11A corresponds to PZ IVC and PZ V.

Pollen sub-zone IVC (7.7-7.4 m, Fig. 2-1) is characterised by a drop in broad-leaved pollen percentages (11-17%) as compared with PZ IVB. *Carpinus, Quercus* and *Tilia* are represented. The pollen spectra are of a forest-steppe type, with a slightly lesser proportion of AP than in PZ IVB. At the same time, the Poaceae ratio in the NAP is higher. The most characteristic feature of PZ IVC is the appearance of a small number of *Abies* pollen grains. Bryales spores dominate over Filicales.

Pollen zone V (7.3-6.8 m, Fig. 2-1) shows a sharp reduction of broad-laved taxa pollen (2-4%) and a considerable increase of *Betula* pollen (up to 8%). *Pinus* pollen counts slightly increase (up to 35%). The few microfossils of broad-leaved trees include *Carpinus, Quercus* and *Fagus* (the latter being an inhabitant of higher mountain belts). The pollen of shrubs becomes noticeable (*Corylus, Euonymus, Cornus* and Rhamnaceae). Pollen spectra are of forest-steppe type, and NAP composition is similar to that of PZ IV, though the proportion of xerophytes slightly increases (including the appearance of *Artemisia*). Pollen of Asteraceae and Brassicaceae have become consistent.

Stratum 11 corresponds to a soil of a rendzina type (mollic leptosol), 0.7 m thick, dark-grey-brown silty loam, with limestone debris. The upper A1 horizon is the darkest one, enriched with humus. The lower transition is gradational. The Stratum includes PZ VI and the lowest sample of PZ VII.

Pollen zone VI (6.7-6.2 m, Fig. 2-1) is characterised by a renewed increase in broad-leaved taxa pollen (11-13%), though less so than in PZ I and IV. *Carpinus* and *Quercus* dominate the group of broad-leaved taxa pollen. The characteristic features of PZ VI are as follows: 1) very low values of *Pinus* pollen (6-22%); 2) an increase of small-leaved taxa pollen: *Betula* (*Betula pendula* Ehrh.) 6-14%, and *Alnus* (*Alnus glutinosa* Gaertn.) 2-8%; 3) microfossils of shrubs (*Corylus, Euonymus* and Caprifoliaceae) are present in small numbers. A decrease in Cyperaceae pollen is typical of the NAP (5-11%), and Herbetum mixtum strongly dominate and have a diverse composition. The uppermost layer of the rendzina soil has a pollen spectrum which is transitional in its make up between PZ VI to PZ VII (see below).

Stratum 10A is the base of Stratum 10. It differs from the rest in the lighter colour – pale loam with fine limestone clasts. The lower transition is distinct. The Stratum 10A corresponds to PZ VII.

Pollen zone VII (6.1-5.6 m, Fig. 2-1) is the first zone with a distinct predominance of NAP over AP, though spectra are still of a forest-steppe type (28-47% AP and 49-68% NAP). The other characteristic features are a sharp drop in pollen of broad-leaved taxa (leading to their complete disappearance in the middle part of PZ VII), and the highest percentages of *Alnus* in the diagram (6-9%). The share of *Pinus* increases and the proportion of *Betula* drops. A typical feature of NAP is the increase of xerophytes (Chenopodiaceae, *Artemisia* and *Ephedra*, appearance of Plumbaginaceae and Dipsacaceae). Asteraceae and Brassicaceae pollen counts also go up at the expense of pollen of more mesophytic plants. Filicales disappear, and the spore content becomes very low (up to 4%). The lowest sample, which was taken from the rendzina soil, differs by the presence of a few broad-leaved taxa pollen (2% of *Carpinus*) and by much lowers counts of xerophytes. Just at this level, *Alnus* pollen reaches its maximum in the diagram.

Stratum 10 is represented by pedosediments with a strong colluvial component – yellowish-brown loam with fine limestone debris. PZ VIII corresponds to Stratum 10 and to the base of Stratum 9.

Pollen zone VIII (5.5-5.0 m, Fig. 2-1) demonstrates an increase in broad-leaved taxa pollen (6-15%). *Carpinus* and *Quercus* share dominance among these; few *Ulmus, Corylus, Euonymus* are found; and the presence of *Fagus* as a representative of higher forest belts is important. The percentages of *Pinus* and AP (48-58%) increase. The values of xerophytes in NAP decrease, and Herbetum mixtum again becomes diverse (Ranunculaceae, Fabaceae, Lamiaceae, Rosaceae and Brassicaceae). Spores include Filicales and Lycopodiales.

Stratum 9 is a light-yellow compacted loam with a large amount of fine debris and a distinct horizontal lower transition. The main part of the Stratum corresponds to PZ IX. The upper layers are related to PZ X (see below).

Pollen zone IX (4.9-4.6 m, Fig. 2-1) has a forest-steppe type of pollen spectra with a predominance of NAP (54-63%) over AP (31-44%), and with low values of broad-leaved taxa pollen (2-4%). The AP composition is poor: *Pinus* (dominating), *Alnus, Betula* (3-5% each), *Quercus* and *Carpinus* (1-2%). The pollen counts of xerophytes increase (particularly *Artemisia* and Plumbaginaceae), though Herbetum mixtum still prevails. Lycopodiales and Filicales have disappeared.

Stratum 7 consists of two parts. The upper part is a light-grey loam, and the lower part is a pedosediment with strong colluvial component – yellowish-brown compacted prismatic loam. The Stratum includes both fine and large limestone debris. The lower transition is distinct and horizontal. The lower part of Stratum 7 corresponds to PZ X and XI, and the upper part is related to PZ XII.

Pollen zone X (4.3-4.0 m, Fig. 2-1) differs from PZ IX in that it displays a higher proportion both of AP (41-55%) and broad-leaved taxa pollen (8-9%). The AP composition is diverse: *Pinus, Alnus, Betula, Carpinus,* and *Quercus* are constantly present, and *Fagus, Tilia, Corylus, Euonymus*, Rhamnaceae, and Caprifoliaceae occur. The Herbetum mixtum reaches its maximum at this level (mainly at the expense of Lamiaceae pollen). Filicales spores became consistently noticeable again.

Pollen zone XI (3.9-3.6 m, Fig. 2-1) has a forest type of pollen spectra (67-77% AP and 19-26% NAP) with a low proportion of broad-leaved taxa pollen (1.5-2%). The *Pinus* pollen counts are very high (53-67%). Broad-leaved taxa are represented by few *Carpinus* and *Tilia*, whereas *Alnus* counts reaches 5%. The composition of shrubs is very diverse: *Juniperus, Euonymus*, Oleaceae, Rhamnaceae, and Caprifoliaceae. NAP is similar to that in the previous zone in composition, and Lycopodiales appear for the last time in the diagram.

Pollen zone XII (3.3-2.6 m, Fig. 2-1) is notable for the first appearance of a steppe type of spectra (19% AP, 75% NAP). The maximum of xerophytes (both *Artemisia* and Chenopodiaceae), and the maximum of Poaceae in the diagram are observed here. The other characteristic feature is a disappearance of broad-leaved taxa pollen. AP mainly consists of *Pinus* (dominating), *Alnus* and *Betula*. Asteraceae, Cichoriaceae and Plantaginaceae pollen is noticeable in NAP. Bryales prevail strongly over Filicales.

Strata 5 and 6 correspond to the soil genetic horizons of brown rendzina soil (eutric leptosol). Stratum 5 is a humus A1 horizon – grey-brown, silty loam, compacted, with granular structure and fine debris, and 0.3 m thick. The lower transition is distinct. In many places, the horizon is truncated by later erosion. Stratum 6 is the transitional B horizon of the soil – light-brown, silty loam, compacted, and 0.5 m thick. In places, the lower transition is erosional. The lower part of Stratum 5 and Stratum 6 correspond to PZ XIII. The spectrum from the upper layers of Stratum 6 is similar in content to PZ XIV (see below).

Pollen zone XIII (2.4-2.1 m, Fig. 2-1) displays a forest-steppe type of pollen spectra (23-44% of AP, 46-66% of NAP). This is the last appearance of broad-leaved taxa pollen (4-14%) in this zone. These are represented by *Carpinus* and *Quercus*. *Pinus* dominates the AP (25-26%). The characteristic feature of the NAP is a peak both of Cyperaceae and Poaceae, whereas the xerophyte pollen is present in very low numbers. Spores include Bryales and Filicales.

Stratum 4 is related to a light grey loam of colluvial origin – loose, filled with fine and large limestone debris. The lower transition is erosional. It corresponds to PZ XIV.

Pollen zone XIV (2.0-1.5 m, Fig. 2-1) has a steppe type of pollen spectra (13-14% AP, 79-82% NAP), without broad-leaved taxa pollen. This is a maximum of NAP for the diagram. *Pinus* dominates the AP, and some *Betula, Alnus*, Cupressaceae, and Rhamnaceae occur. The presence of Eleaegnaceae pollen – the only case in the section – is noticeable. Herbetum mixtum dominates the NAP, though Poaceae are important (up to 23%). Xerophyte pollen also becomes significant, and Cyperaceae values go down. Counts of spores, represented by Bryales, are low.

The general characteristic of the spore-pollen diagram represented in Fig. 2-1, and the principles of interpretation of pollen diagrams used, have been previously published (Gerasimenko, 1999).

Vegetational and Environmental Evolution

Strata 14E -14C

During deposition of these Strata, pedogenic processes did not develop in the vicinity of the site. Pedogenesis does not transform subaerial sediments, neither under conditions of scarce (or absent) vegetation cover, nor in the case of high sedimentation rates. The Pleistocene stadials were characterised both by cold climate (unfavourable for vegetation) and by intense sedimentation (also partially provoked by poor vegetation cover). Nevertheless, Strata 14E and 14D are rich in well-preserved pollen. Pollen zones I and II indicate the distribution of a hornbeam-oak forest-steppe around the site. This might mean that sedimentation rates were too high on the slope to allow for the existence of a stable surface and the development of soil processes. This can also be proved by the bedding of Strata 14F – 14C at a steep angle (Chabai, 2004c). Pollen re-deposition could be suspected in connection with such a sedimentary environment. On the other hand, the source for pollen re-deposition would have been provided by the Cretaceous-Palaeogene clays, composing the bedrock of the cuesta. However, neither pollen of extinct flora of these ages, nor any other pollen of Neogene or Early Pleistocene floras, has been recovered. Good pollen preservation also contradicts any possibility of its distant transportation. It seems more logical that the local input of pollen into the colluvial deposits comes from the near vicinity.

During the formation of Stratum 14E (*pollen zone I*), the site area was occupied by a hornbeam-oak forest (with admixtures of elm and lime and with a well-developed shrub undergrowth) and by mesophytic steppe. The wetter, lower part of slope provided a home for sedges, whose pollen is abundant in Stratum 14E. The greenish colour of loams is indicative of a reducing sedimentary environment and an excessive ground-moisture. Judging from the broad-leaved taxa percentages, the climate was as warm as that presently prevailing.

During the formation of Stratum 14D (*pollen zone IIA*), the reduction of broad-leaved forest occurred at the expense of a further expansion of steppe vegetation. Xerophytic components appeared in the steppe assemblages, and shrub associations possibly spread separately from trees. The most important change was the spread downslope of the pine forest belt on the northern slope of the Crimean Mountains, which is indicated by a sharp increase in *Pinus* pollen. Birch also began to spread into the mountains at this time. All of these indicate a cooling and some aridification of the climate, which, however, was not dramatic.

Strata 14B and 14A

During the formation of these Strata, the thick mollisol developed. The considerable thickness of the soil might imply a synsedimentary type of soil formation (pedogenic processes developing simultaneously with sediment accumulation). At the beginning of the deposition of Stratum 14B, erosional incision occurred, followed in places by intense colluvial accumulation (Chabai, 2004c). In the section sampled for pollen analysis, the erosional break between Strata 14C and 14B also occurred (as evidenced by the sharp transition), but no colluvial sediments were formed, and the surface remained relatively stable, enabling pedogenesis. This process first started in a rather cool and dry environment (*pollen zone A*). Broad-leaved trees were strongly suppressed, and pine forest encroached down the mountain slopes. The site was occupied by a meadow, consisting of mesophytic mixed herbs and sedges. Mollisols are generally formed under herb vegetation, or under a well-lit forest (with enough light to enable a rich herbal ground cover). During the described time interval, pine evidently grew close to the site. This is also reflected in the high percentages of Lycopodiales, plants which are closely connected with pine stands. The climate was significantly cooler and drier than at present.

During the formation of the main part of the A1B horizon of the mollisol (*pollen zone B*), the forests grew immediately adjacent the site (probably slightly higher on the slope), and were dominated by pine. The rather light colour of the soil indicates that the environment was not too favourable for humus accumulation, either because of relatively humid climate, or because of high sedimentation rate - or, most likely, due to both factors. High sedimentation rates are indicated by the homogeneity of the pollen spectra in the A1B horizon. In Quaternary sediments, low sedimentation rates are normally reflected by sharp changes of pollen contents of subsequent beds. In such cases, climatic changes are not much slower than sediment accumulation. Relatively humid climate can be seen in the prevalence of arboreal pollen in the spectra, though pollen of fully mesophylic dendroflora is not abundant, and pine strongly dominates. At that time, birch was also distributed more extensively in the Crimean Mountains than nowadays. This indicates a cooler environment during the formation of the sediment of pollen zone B. Generally speaking, the climate was less mild than the modern one, but the alternation of a few wetter and drier intervals has been identified.

The environments of these intervals did, however, not contrast strongly, and they were in the same climatic zone - transitional from southern-boreal forest to forest-steppe.

During the formation of deposits of *pollen sub-zones B1 and IIB* (the correlatives in the two different sections of Kabazi II, Fig. 2-1 and 2-2), *pine* forests displayed a considerable admixture of broad-leaved trees. This means that the climate became warmer than at the very beginning of formation of the A1B horizon (pollen zone A). Firstly, hornbeam dominated amongst broad-leaved taxa, and later on, oak was constantly present, whilst elm and lime occurred sporadically. Hornbeam is a more moisture-dependent tree than the others. The higher humidity at the beginning of PZ B1 zone formation is also emphasised by occurrence of pollen of such moisture-loving plants as fir and Ericaceae in the assemblages of this level. At the end of the PZ B1-IIB interval, the forest areas were slightly reduced, and the role of herbal coenoses increased. The first human occupations of the site (archaeological levels VI-14 – VI-17) correspond to the wetter part of the described interval. Occupation of the archaeological levels VI-10 –VI-9A was during the later, drier part of the interval of PZ B1-IIB. Through the whole described period, the site had ground cover of rather diverse mesophytic herbs (Rosaceae and Lamiaceae families dominated) and probably of ferns. In any case, ferns were abundant at that time, together with mosses and (to a lesser extent) club-mosses. All of these could also grow under a transparent pine forest canopy. The role of sedges was less pronounced than during the preceding intervals, which meant that the site became drier and better drained at that time. The permanent presence of a noticeable quantity of Chenopodiaceae, Asteraceae and Cichoriaceae pollen might be evidence that erosion processes continued to develop on the slope, near the site.

The further increase of pine in the vegetation occurred during the formation of the sediments of *pollen sub-zone B2* and *pollen zone III-base*, which can be correlated in the two sections of the site (Fig. 2-1 and 2-2). The admixture both of broad-leaved and small-leaved trees slightly lessened in this period, and broad-leaved taxa were mainly represented by oak. In the arboreal vegetation, oak and pine are more xerophytic components than hornbeam and alder. Pollen of the latter is less in the described interval than in the underlying deposits. The trends to an increase of pine and a decrease of hornbeam and alder in the forests may be traced from the beginning to the end of the described time interval. In the well-lit pine stands, Filicales could grow extensively, whereas Bryales were less abundant than during the earlier times. Some xerophytization of the ground cover on the site is reflected in the noticeable presence of grasses. Judging from the amount of Chenopodiaceae pollen, the rate of erosion near the site slowed down. The climate of the described period was somewhat drier than that of preceding times. It is seen evident in the mollisol profile that humus accumulation became somewhat stronger during the drier period, however, this visual observation is not obvious, and it should be confirmed by chemical analytical data.

During the formation of the deposits of *pollen sub-zone B3* and *pollen zone III-middle part* (the correlatives in the two sections of Kabazi II, Fig. 2-1 and 2-2), pine forest grew around the site. The share both of birches and of diverse broad-leaved trees slightly increased compared to the preceding time interval. The characteristic feature of this period was the constant presence of elm, together with oak. Hornbeam and lime occurred at the beginning and at the end of the interval. It can be seen that at the beginning of the interval, the appearance of these taxa is related with the occurrence of spruce and beech pollen in the spectra. Both spruce and beech are indicators of wet and cool climatic conditions, which could affect the higher mountain vegetation belts. The downward encroachment of the beech forests might have occurred at this time in the Crimean Mountains, and the wind-blown *Picea* pollen could reflect the same process of lowering of forest belts in the southern Carpathians. A small amount of *Picea* pollen is found in the deposits of Saki Lake (Western Crimea) dated to the 'Little Ice Age' of the Holocene (Gerasimenko, in press). During the Late Holocene, spruce is not known to have grown in the Crimean Mountains, but its natural habitat spread extensively in the Carpathians at that time (Bezus'ko *et al.*, 1988). Thus, the very distant transport of Picea pollen to the Crimea does seem to be possible. At the end of the described interval, lime and hornbeam formed an admixture within the pine forest, together with hazel, spindle and Rhamnaceae. This diversification of forest composition might correspond to a slight warming. The role of pine and birch decreased at this time. Occupations of archaeological levels VI/9-VI/7 corresponded to the wetter beginning of the interval, whereas the occupation of archaeological level VI/6 was related to the warmer end of the period.

The ground cover of the site firstly consisted of mesophytic herbs, Filicales and Bryales (in the same ratios), but at the end of the period, the role of Herbetum mixtum increased, and grasses appeared. Generally, during the described time interval, the herbal cover of the site was more hygrophytic than during the preceding period (the role of sedges was

higher and the share of grasses lower). Judging from the percentages of Chenopodiaceae and Asteraceae pollen, erosion near the site was not intense.

The trend to some reduction of pine forest at the expense of distribution of meadow steppe continued during the formation of the sediments of *pollen sub-zone B4* and *pollen zone III-top*, correlated in the two site sections (Fig. 2-1 and 2-2). At that time, pine stands still dominated in the vicinity of the site, and included a noticeable admixture of oak, elm and hazel. At the same time, the admixture of birch and alder also increased in the forests. The role of pine gradually decreased towards the end of the interval. Primarily, ground cover was similar to that of the preceding period, but later the role both of sedges and grasses increased, and mesophytic herbs became more diverse (particularly an increase of Ranunculaceae). Club-mosses practically disappeared from the ground cover. The retreat of the forests demonstrates the increase in climatic aridity, which progressed to the end of the described time interval. Human occupation of archaeological levels VI/5-VI/3 was during the earlier wetter part of the time interval, whereas occupation of the archaeological levels VI/2-VI/1 corresponds to the drier end of the period.

Thus, during the formation of sediments of PZ B, four microcycles can be recognised (pollen subzones B1 – B4). Each of them started with a wetter climate and ended with a drier one. The general trend to some aridification of the climate can be traced through the whole time span of pollen zone B, though cycle B2 was distinguished by a drier environment than in the following cycle B3. The beginnings of the cycles B1 and B3 were the wettest intervals of the whole time period that corresponds to PZ B.

During the formation of the A1 horizon of the mollisol (*pollen zone C*), the trend to climate aridification continued further. At this time, the site surroundings were occupied by forest-steppe with a predominance of meadow steppe vegetation. Judging from the soil profile, the conditions for humus accumulation improved markedly under a drier climate. A drastic environmental change is demonstrated in the almost complete disappearance of pine forest. Arboreal associations were formed by alder, hornbeam and oak. Bushes (hazel and Rhamnaceae) were more extensively distributed locally than during preceding times. This indicates that the time span of PZ C was dry and warm. Mesophytic herbs (Rosaceae and Lamiaceae dominated) alternated in the ground cover with hygrophytic vegetation (sedges and Ranunculaceae) and ferns. Club-mosses did not grow at this time. No erosion occurred near the site earlier in the interval (absence of pollen of Chenopodiaceae, Cichoriaceae and Asteraceae). The appearance of the latter at the top of PZ C might be connected with the general xerophytization of herb coenoses (here pollen types of Asteraceae are different from those represented in the underlying beds, and related to plants of disturbed ground). The high pollen percentages of sedges and Ranunculaceae show that the site was less well-drained than during the previous intervals. The trend to a retreat of arboreal vegetation, followed by an increase in herbal hygrophyte population, indicates the increase of ground moisture caused by poor drainage. Occupation of archaeological levels V/5-V/6 occurred during this period.

Stratum 13A

At the beginning of the formation of Stratum 13, intense erosional incision occurred at the site, followed by quite thick colluvial accumulation (Chabai, 2003b). The colluvial deposits include pedosediments –brown clay beds which are absent in the underlying sedimentary sequence. This might confirm that the sedimentation break could have persisted for a rather long period, and so might correspond to some climatic shift.

Strata 13 and 11B (11 lower-B)

During the formation of these Strata, thick slope derivatives of a luvisol were formed. The genetic type of the sediments indicates that post-sedimentary soil processes (i.e., clay translocation from A1A2 to Bt horizon) developed together with synsedimentary pedogenesis (constant input of sediment on the slope during the whole interval of the soil formation). Luvisols are normally formed under deciduous forest vegetation in conditions of relatively high precipitation. In a forest-steppe belt, luvisols develop in those localities with a better supply of atmospheric moisture. The rock slab behind the site might have trapped much of the water runoff, as well as provided a shadow for arboreal vegetation growth. Generally, the replacement of humus accumulation (the mollisol of Strata 14A and 14B) by forest pedogenetic processes (the luvisol derivatives of Strata 13 and 11A) indicates a regional increase in precipitation. Significant presence of broad-leaved vegetation through the whole period (and particularly during its optimum, sub-zone IVB) indicates a temperate climate, wetter than the modern one.

The derivatives of Bt soil horizon of the luvisol correspond to *pollen zones D* and *sub-zones IVA-B* (the correlatives in both sections of Kabazi II, Fig. 2-1 and 2-2). During the formation of this soil material (Stratum 13), a forest-steppe environment existed in the site vicinity. The site area was obviously occupied by hornbeam forest, mainly by low stands of *Carpinus orientalis* Mill. Hazel and alder were also rather abundant. The site surroundings were covered by meadow steppe (diverse mesophytic mixed herbs in combination with sedges). Xerophytic components of the ground cover were very infrequent. Erosive processes occurring near the site are reflected in the constant and noticeable presence of Asteraceae and Cichoriaceae pollen.

From the beginning of the formation of the Bt horizon (*pollen sub-zones D1* and *IVA*), the role of broad-leaved taxa, and particularly of hornbeam, gradually increased, and a few other broad-leaved trees and bushes started to appear (oak, elm and spindle). Thus, during the described times, there was a trend to a further climatic improvement. This reached its peak during the formation of the upper part of Bt horizon (*pollen sub-zones D2* and *IVB*). At that time, low stands of hornbeam forest were at their maximum distribution in the vicinity of the site. Hazel and alder population increased parallel to hornbeam, and lime appeared. The climate was wetter than at present. Soil weathering, argillisation and lessivage processes could develop in such an environment. Human occupation of archaeological level IV/2 occurred immediately before the climatic optimum of the period, and occupation of the archaeological level IV/1 was analogous to this optimum.

During the formation of the A1A2 soil horizon of a luvisol, leaching and clay translocation normally occur under a sufficient supply of moisture. A small number of clay coatings in the Bt horizon of the Kabazi II luvisol are an indication of downward clay translocation from the A1A2 horizon (Stratum 11B). During the formation of the A1A2 horizon (*pollen sub-zone IVC*), the vegetation was similar to that of the preceding time interval. However, the role of broad-leaved trees in the forest, particularly of hornbeam, considerably decreased. Hazel also disappeared from the undergrowth. The appearance of fir pollen in the spectra is an indicator of a downhill encroachment of mountain forest belts. All of this is the evidence of a wet but relatively cool climate. *Artemisia* started to grow near the site. The human occupations observed in the archaeological levels III/8E – III/8A occurred during this period.

Stratum 11A (11 lower-A)

During the formation of this Stratum, the input of colluvial silt to the site increased considerably. A drastic environmental change occurred, which can be seen in the sharp reduction of broad-leaved trees (*pollen zone V*). Once again, pine dominated in the forest, and the role of birches was also more pronounced. The temperate forest-steppe which existed during the formation of Stratum 13 was replaced firstly by a southern-boreal one (Stratum 11B), and, finally, by the establishment of a boreal forest-steppe (Stratum 11A). The presence of beech pollen indicates the downward migration of the mountain forest belts. The climate became significantly cooler, but was rather wet. The meadow steppe was still present with a relatively high ratio of sedges, though the participation of Brassicaceae and Asteraceae families in the herbal coenoses became stronger at the expense of a decrease in mesophytic herbs. *Artemisia* grew in small numbers. Such environments are characteristic of Early Glacial stadials. Human occupation of archaeological levels III/8-III/2A occurred at this time.

Stratum 11

The time period corresponding to Stratum 11 was marked by the formation of a rendzina type soil (mollic leptosol). Such soils, connected with limestone rocks, are rather rich in humus, and develop under herbal vegetation (or sparse woodland). During this soil formation, broad-leaved trees re-appeared in the forest-steppe around the site (*pollen zone VI*). Oak appeared, and was followed later by hornbeam and elm. The significant role of birch is a characteristic feature of the period. Toward its end, alder also became important. At no other time were these small-leaved trees so wide spread in the area. This indicates that the climate was much cooler than today. Broad-leaved species began by occupying environmentally protected habitats, and later on, during the optimum, were distributed rather more extensively. The pine disappeared at this time. During this period, forest areas became reduced, and meadow steppe dominated the landscape. Shrubs were also widespread. The site itself was occupied by mesophytic herbs and grasses, and xerophytes also increased during this period. The climate changed from cool and wet to dry and warm. This combination of boreal and temperate floristic elements is typical for an interstadial. Human occupation of archaeological level III/2 occurred around the climatic optimum of the period.

The environment of the final phase of soil formation (top soil layer) differed from those existing before, and was actually transitional to the next developmental stage. The disappearance of broad-leaved trees indicates a cold climate at this time. Only hazel occurred sporadically in the pine stands of this boreal forest-steppe. The characteristic feature of the period is the extensive distribution of hygrophytic vegetational components: alder and sedges. It is possible that decreasing evaporation (caused by the cooling) led to the development of an excessive moisture supply at the site and in the Alma valley. Human occupation of archaeological levels III/1A and III/A correspond to this time span.

Stratum 10A

During the formation of this Stratum, pedogenetic processes ceased, and the light colluvial material accumulated. It was a cold and dry spell (absence of broad-leaved trees in the area, prevalence of steppe over woodland). Forests were dominated by pine (a few Rhamnaceae occurred in the undergrowth), though alder was still abundant in patches wetted by ground water (*pollen zone VII*). The characteristic feature of this period is the distinct xerophytization of the former meadow-steppe. A role of mesophytic herbs decreased at the expense of distribution of diverse xerophytes: *Ephedra*, Chenopodiaceae, Plumbaginaceae, Dipsacaceae, and to lesser extent *Artemisia*. Filicales disappeared from the ground cover, which is indicative of a cold and dry environment of a stadial. Human occupation of archaeological levels II/A/4B occurred at this time.

Strata 10 – 9(base)

Pedosediments were formed here during a climatic warming and there was an increase in precipitation. The regional landscapes were forest-steppe (*pollen zone VIII*), and the most important feature of this time span was the re-appearance of broad-leaved trees (hornbeam and oak), despite the fact that pine still dominated the forest. Presence of beech pollen indicates that the climate was cooler than the modern one, and the high mountain forest belts came lower. This corresponds well with appearance of Lycopodiales and the re-establishment of ferns in the ground cover. Mesophytication of herb cover occurred again, and xeric plants lost their position (with exception of *Ephedra*). These environments are typical for an interstadial. The disappearance of alder might be connected with a new incision in the Alma valley and, correspondingly, on local slopes. This is confirmed by the formation of pedosediments instead of soils. Human occupation of archaeological levels IIA/3, IIA/3A and IIA/3B correspond to this time.

Stratum 9

During the formation of the main part of Stratum 9, pedogenetic processes ceased, and the light colluvial material was accumulated. The area was occupied by forest-steppe with a prevalence of meadow-steppe associations (*pollen zone IX*). The role of xerophytes (and particularly of *Artemisia* and Plumbaginaceae) increased considerably, whereas Filicales and Lycopodiales disappeared. This indicates climatic aridification. Cooling also occurred (retreat of broad-leaved trees, re-appearance of birches), but not as significant as that during formation of Stratum 10A. This arid interval with strong colluviation evidently corresponds to a stadial. Human occupation of archaeological levels IIA/2-3 and IIA/2 were found here.

Strata 9 (top) – 7 (base)

Pedosediments with strong colluvial components were formed at the site during this interval. Environments changed through the period, from southern-boreal forest-steppe (*pollen zone X*) to boreal forest (*pollen zone XI*). During the first developmental phase, pine forest dominated, with small admixtures of birch and alder. Hornbeam occupied environmentally protected habitats, and a small number of oak, elm, lime, hazel and spindle-tree also grew there. The climate was relatively warm, and characteristic of an interstadial. The very high proportion and great diversity of mesophytic herbs were typical for the steppe vegetation of the period. This, as well as the wider distribution of arboreal vegetation and ferns, indicates an increase in precipitation during the interstadial. Human occupation of archaeological levels IIA/1, II8/ and II/8C belong to this phase.

During the second development phase, broad-leaved trees practically disappeared from the forest, indicating significant cooling. Light pine forest surrounded the site. Diverse bushes occurred in the undergrowth, or could have formed separate stands down the slope. Juniper and Lycopodiales appeared, and this is usually connected with pine forests. The ground cover of the forests consisted of mesophytic herbs. The phase corresponds to a transition from interstadial to stadial environments. Human occupations of archaeological levels II7E – II/6 fall in this period.

Stratum 7

During the accumulation of this Stratum, no pedogenetic features were formed, and colluviation developed intensely. The typical grassland has become established locally for the first time in the vegetational history of the area (*pollen zone XII*). The role of mesophytic herbs declined profoundely, as did their diversity. There also occurred an extensive distribution of Poaceae, Asteraceae and xerophytes (*Artemisia*, Chenopodiaceae). The arboreal vegetation reduced drastically from the beginning to the end of the period. Initially, there were pine groves with an admixture of birch and Rhamnaceae, but later on the whole area was deforested. A few alder were able to grow along the Alma River. The absence of broad-leaved trees indicates the cold climate of this very dry stadial. Human occupations of archaeological levels II/3-II/1 correspond to this time span.

Strata 5-6

During the formation of these Strata, a brown rendzina soil developed. Humus accumulation in this soil type is less than in typical rendzina soils. At this time, the site's environments were dominated by south-boreal forest-steppe (*pollen zone XIII*). Broad-leaved trees (hornbeam and oak) reappeared indicating interstadial conditions. Their participation in the vegetation cover increased from the beginning of the interval (B soil horizon) to its optimum (A1 soil horizon). Steppe associations consisted of grasses and mesophytic mixed herbs. Immediately around the site, sedge and ferns grew. Xerophytes almost disappeared from the ground cover. The very top of the soil was formed under transitional conditions to the next stadial. Broad-leaved stands disappeared, but small-leaved trees (alder and birch) were still relatively abundant, as was juniper. Xerophytes had already increased in number, but the composition of Herbetum mixtum still was diverse. Human occupation of archaeological levels II/1A and A4 – A3A occurred at this time.

Stratum 4

The time which saw the formation of Stratum 4 was marked by strong colluviation and a complete suppression of pedogenic features. Typical grassland occupied the vicinity of the site during this period, with a noticeable presence of *Artemisia* (*pollen zone XIV*). The amount of hygrophytes in the area decreased, whereas ferns completely disappeared. This indicates a dry climate. Arboreal vegetation was drastically reduced: alder, birch and Rhamnaceae obviously grew near the Alma River. The appearance of Eleaegnaceae, which are drought-resistant, and heliophytic plants also indicates the existence of a vast open landscape during this pronounced stadial. Human occupations of archaeological levels A3 – A occurred at this time.

The environmental history of the Kabazi II site can be divided into two main parts. In the lower part of the sequence (Strata 14-11/base), soil processes dominated, and, on the evidence of pollen data, environments mainly fluctuated between temperate and southern-boreal ones. In the upper part of the sequence (Strata 11-4), a cyclic pattern of change occurred, which can be seen in alternation of pedogenetic and colluvial processes, as well as in the alternation of southern-boreal and boreal environments. A general trend - which saw a decrease in the broad-leaved flora and mesophytic components of herb assemblages - was pronounced from the beginning to the end of the described period. This indicates the advance of a cooler and more continental climate developing in an oscillatory pattern.

Climatostratigraphy and Correlations

The first approach to the stratigraphical division of the Kabazi II sedimentary sequence was made during the first pollen investigation of the site (Gerasimenko, 1999). Deposits attributed to both the Last Interglacial and the Last Glacial were recovered; and five stadials and four interstadials were determined within the Last Glacial. The Last Glacial part of the sequence was recorded *in situ* during the field trip (Strata 11-4).

Two pronounced markers within the pedological stratification of the section are humiferous soils at the base and at the top of the excavated facies in 1992. The lowest (Stratum 11, the upper part) has been morphologically correlated with the upper humiferous soil of the Pryluki unit elsewhere in the Ukraine. The second (Stratum 5-6) has been considered an equivalent of the upper rendzina soil of the Vytachiv unit in the forest-steppe belt of Ukraine. In the Ukrainian Stratigraphical Framework for the Quaternary (Veklitch (eds.), 1984; 1993), the Pryluky unit has been correlated primarily with the Mikulino Stage (Eemian, Substage 5e), and the Vytachiv unit has been related to the Substages 5c and 5a of the marine isotope-oxygenic Stage 5. Nevertheless, the TL-dates demonstrate the ages of the Vytachiv unit within 35-45 kyr, and the ages of Pryluky unit to 100-115 kyr (Shelkoplyas et al., 1986). The beginning of the typical Mikulino (Eemian) pollen succession has been found at the base of Kaydaky unit (Gerasimenko, 1988). The latter has been primarily related to Stage 7 (Veklitch (eds.), 1984, 1993). Based on pollen, pedo- and magnetostratigraphic correlations, recent publications (Rousseau et al., 2001; Gozhik et al., 2001; Gerasimenko, 2002; Haesaerts and Gerasimenko, 2002) have proposed that the Kaydaky unit correlates to the Mikulino (Eemian, Substage 5e), and the Pryluky unit is analogous to Substages 5c and 5a of MIS 5. However, another opinion states that the Kaydaky unit should be correlated with Stage 7, and the Pryluky unit with the whole of Stage 5 (Boguckyj and Lanczont, 2002; Lindner et al. 2002). In all the forenamed recent publications, the Vytachiv unit is related to Stage 3.

The "absolute" dates obtained from Kabazi II (Hedges et al., 1996; Pettitt, 1998; Rink et al., 1998; in press; McKinney, 1998) have clearly demonstrated that the upper Vytachiv rendzina was formed immediately after 32-30 kyr, i.e., at the end of Stage 3; and the humiferous Pryluky soil was formed in the interval between 117-81 kyr, i.e., in the second half of Stage 5. In the latter case, most of the dates are fall between 74-107 kyr, i.e., within the Substages 5c – 5a (the Early Glacial). The humiferous Pryluky soil is morphologically correlated with the Krutitsa soils of the Russian Plain, which are also related to the Early Glacial interstadials (Velichko, 1988; Bolikhovskaya, 1995). Thus, the succession between the top of the Pryluky rendzina soil (Stratum 11) and the top of upper Vytachiv soil (Stratum 5) fall in the interval of Stages 4 and 3.

Three main interstadials have been recovered within the pollen succession of Strata 10 – 4. Their correlation with the three Middle Valdai interstadials of the Russian Plain (Bolikhovskaya and Pashkevich, 1982; Bolikhovskaya, 1995) has been published (Gerasimenko, 1999). The first Vytachiv interstadial (pollen zone VIII) has been correlated with the Baylovsky (Krasnogorsky, Moershoofd) interstadial, the second Vytachiv interstadial (pollen zone X) corresponds to the Molodovsky (Kashinsky, Hengelo) interstadial, and the third Vytachiv interstadial, detected from the rendzina soil (pollen zone XIII), has been correlated to the Dnestrovsky (Dunaevsky, Arcy) stadial. In the field (the access, kindly provided to the Molodova V section by P.Haesaerts), the close morphological similarity of the rendzina, related to the Dnestrovsky interstadial in Molodova, and to the upper Vytachiv rendzina elsewhere, was recognised. In the Kabazi II section, the two lower Vytachiv interstadials correspond in most parts to the more strongly weathered, brown colluvial deposits (pedosediments). In the loess section of the forest-steppe belt of the Ukraine, the equivalents of the two lower Middle Valdai (Middle Pleniglacial) interstadials are found in the two boreal brown forest soils vt_{1b1} and vt_{1b2}. These soils are separated by a loess-like loam bed whose pollen content corresponds to a stadial (vt_{1b1-b2}). The loess bed which separates the brown soil vt1b1 and the upper Vytachiv rendzina is always better pronounced morphologically and, by pollen content, reflects harsher stadial conditions than those of the vt_{1b1-b2} stadial. Judging from this fact, the status of a loess subunit had been given to this second Middle Pleniglacial stadial – vt_2, instead of formerly to vt_{b2-b3}. Correspondingly, the two lower Vytachiv interstadials, with similar environments, have been related to subunit vt1, and the upper rendzina soil has been regarded as the soil subunit vt_3, instead of vt_{b3}.

Most of "absolute" dates obtained from the Vytachiv unit at the Kabazi II is related to the vt_2 sub-unit, and fit within the interval 31-35 kyr (Chabai *et al.*, 1999). Thus, the ages of the second Vytachiv stadial (*pollen zone XII*) correspond to the Huneborg stadial of Western Europe (Hammen, 1995). Thus, the interstadial above this unit should

indeed correspond to the Denekamp (Arcy) interstadial. The recent ^{14}C-dates from the top soil of the Vytachiv alluvial suite of the Dnieper River terrace are between 28 and 27 kyr (Stepanchuk *et al*., 2004) that fall at the end of last interstadial of the Middle Pleniglacial. The environment of the 28-27 kyr interval in the lower Dnieper valley was cool and similar to the transitional phase detected at the top of the Vytachiv rendzina at Kabazi II – vt_{3c} phase.

Judging from the dating of the vt_2 sub-unit, the positions of the two previous interstadials should correspond to the Hengelo and Moershoofd interstadials, though the few dates available for them indicate older ages. The transitional phase vt_{1c} (*pollen zone XI*), between the interstadial vt_{1b2} and the stadial vt_2, is dated to the Hengelo (36, 38 kyr), and the full interstadial vt_{1b2} deposits date to about 44 kyr (the age of the latest of the Moershoofd interstadials). On the other hand, Hengelo is known as the warmest interstadial of the Middle Pleniglacial, and that does not fit close to boreal environments detected in the vt_{1c} phase. Before high resolution data is available for this interval, we consider that the two main vt_1 interstadials (vt_{1b1} and vt_{1b2}) are equivalents to the two main Middle Pleniglacial interstadials. In the Middle Dnieper area, the interstadials of the vt_{1b1} and vt_{1b2} soils have been dated correspondingly and precisely to the Moershoofd and Hengelo.

The stadials after the last Vytachiv interstadial (*pollen zone XIV*) are related to the Bug unit (from the beginning of the Late Pleniglacial), and the stadial to before the first Vytachiv interstadial (*pollen zone VII*) corresponds to the Uday unit (the Early Pleniglacial). The pollen data on wetter environments of the Uday unit and the drier climate of the Bug unit (Gerasimenko, 1988) correspond totally to the characteristics obtained from these two intervals in the Kabazi II section.

Thus, the stratigraphy of the upper part of the Kabazi II sequence is generally confirmed by "absolute" dating, as well as by pollen and palaeopedological correlations. The lower part of the sequence (Strata 14 – 11 lower) has been firstly divided biostratigraphically solely on the basis of pollen data from the samples taken in the narrow sondage. The lithology and lateral relations of the Strata were not clearly known, and continuous sedimentation in the trap behind the fallen slab barrier was suggested and used for the interpretation of the pollen data. The base of the barrier in this part of the section was exposed during later excavation, when revealed new soil types, as well as an obvious discontinuity in the sedimentary record. Several erosional breaks were discovered (Chabai, 2003b), which make a reconstruction of the vegetational evolution and climatostratigraphical interpretation of the sequence much more complicated.

Below the humiferous Early Glacial soil (Stratum 11), two intervals of temperate climate have been discovered which correspond to high pollen percentages of broad-leaved trees. The lower optimum for broad-leaved trees (*pollen zone I*) was formed both by oak and hornbeam, and the upper optimum of broad-leaved taxa (*pollen zone IV*) by hornbeam. The cooling, documented by strong reduction of broad-leaved trees and extensive pine distribution (*pollen zones II and III*), is located between them. The two optima for broad-leaved vegetation have been correlated with two temperate climate stages during the Last Interglacial: namely, with the earlier xerothermic (mesocratic) stage of the Mikulino/Eemian, dominated by Quercetum mixtum, and with the later hygrothermic (telocratic) stage of the Mikulino/Eemian, dominated by *Carpinus* (Grichuk, 1972; Zagwijn 1961; 1992). The endothermal cooling between the two interglacial optima has been shown to occur in the Mikulino (Bolikhovskaya, 1982; 1995; Yelovicheva, 2001) and it has been suggested for the Eemian (Guiot et al., 1993; Field et al., 1994). The appearance of pollen of *Abies* at the end of hygrothermic stage (*pollen zone IVC*) is also indicative for the Last Interglacial. The thickness of the Mikulino deposits seemed to be too great, as compared with the deposits of the Early Glacial interstadials (*pollen zone IV*), but this could be explained by essentially higher depositional rates at the very beginning of the sedimentation in the trap behind the barrier.

All pollen counts made during the first study have been confirmed in recent research, and correlation between the sediments in the two excavations is clear (Table 2-1). However, it has been shown that a different interpretation of the data is equally possible, owing to the following points: 1) the hiatuses discovered in the sedimentary record of Kabazi II; 2) the change in the recent years of the stratigraphical position of the Last Interglacial within the Ukrainian loess-soil succession (Gerasimenko, 2001; 2002; Rousseau et al., 2001; Shovkoplyas et al., 2003); 3) the details in the pollen zonation recovered through high resolution data (frequent sampling), as well as through the counting of large pollen grain numbers (up to 500 grains per sample). The latter enables pollen of taxa to be found which only occur in a sample at very low frequency.

Thus, the recent field investigation has shown that Stratum 13 is a derivative of the Bt horizon of luvisol. This fits well with the pollen content of these deposits, which reflects the occurrence of hornbeam growth (the upper maximum of the broad-leaved flora). Stratum 14, which formerly (in sondage)

Strata	Lithopedological units	Pollen samples, 1992	Pollen samples, 2000-2001	Pollen zones, 1992	Pollen zones, 2001	Archeological levels	Vegetation	Ukrainian stratigraphical units	Correlation with European frameworks	Correlation with marine isotopic scale
4	Non-soil colluvium	48, 47		XIV		A, A1, A2, A3	Boreal grassland	Bug loess unit bg_4	Upper Pleniglacial, Upper Valday	Stage 2
5	Rendzina soil A1 horizon	46		XIV			Boreal grassland (with *Juniperus* and *Betula*)	Vytachiv soil unit vt_{3c}	The end of Middle Pleniglacial, the end of Dniester (the III Middle Valdai) Interstadial	Stage 2-3 transition
	Rendzina soil A1 horizon	45		XIII		A3A, A3B, A3C, A4	South-boreal forest-steppe	Vytachiv vt_{3b}	Middle Pleniglacial: Denecamp, Dniester (the III Middle Valdai) Interstadial	Stage 3
6	Rendzina soil B horizon	44		XIII-XII			South-boreal to boreal forest-steppe			
		43				II/1A				
7	Non-soil colluvium	42		XII		II/1	Boreal xeric grassland	Vytachiv vt_2	Huneborg Stadial, the III Middle Valdai Stadial	
		41				II/2				
		40				II/3				
		39				II/4, II/5	No pollen			
	Grey-brown pedosediment	38		XI		II/6	Boreal to south-boreal forest	Vytachiv vt_{1c}	Huneborg Interstadial, the end of Molodova (the II Middle Valdai) Interstadial	
		37				II/7				
				X		II/7AB-II/7E	South-boreal forest-steppe	Vytachiv vt_{1b2}	Hengelo, Molodova (the II Middle Valdai) Interstadial	
		36				II/8, II/8C				
9	Brown pedosediment	35				IIA/1				
		34					No pollen			
	Non-soil colluvium	33		IX		IIA/2	Boreal to south-boreal forest-steppe with	Vytachiv vt_{1b2-b1}	Hosselo, the II Middle Valdai Stadial	
		32				IIA/2-3				
	Brown pedosediment	31		VIII		IIA/3-IIA/3B	South-boreal forest-steppe	Vytachiv vt_{1b1}	Moershoofd, Baylovo (the I Middle Valdai) Interstadial	
		30								
10		29				IIA/4				
10A	Non-soil colluvium	28		VII		IIA/4B	Boreal forest-steppe	Uday loess unit ud	Early Pleniglacial, the I Middle Valdai Stadial	Stage 4
		27								
11	Rendzina soil A1 horizon	26				III/1A, III/1	Boreal to south-boreal forest-steppe	Pryluky soil unit: pl_3	Ognon Interstadial	Stage 4-5 transition
11	Rendzina soil	25		VI			South-boreal forest-steppe	Pryluky pl_{1b2} (pl_{1b2+3} ?)	Early Glacial: Odderade (Brörup-Odderade?), Saint-Germain II, the II Ealry Valdai Interstadial	Stage 5: Substage 5a (5a-b?), GRIP 21
		24				III/2				
		23								
11A	Non-soil colluvium	22		V		III/2A-III/3	Boreal to south-boreal forest-steppe	Pryluky pl_{1b2-b1} (pl_2?)	Rederstall (?), Melisay II, the II Ealry Valdai Stadial	Sub-stage 5b (GRIP 21-22 or 22-23?)
						III/4-III/6				
		21				III/7				
		20				III/8				
11B	Pedosediment (A1A2 horizon of luvisol)	19		IVC		III/8A-III/8E	South-boreal forest-steppe	Pryluky pl_{1b1}	Brörup, Saint-Germain I, the I Ealry Valdai Interstadial	Substage 5c
		18								
13	Pedosediment (Bt horizon of luvisol)	17	A	IVB	D2	IV/1	Forest-steppe of temperate climate			
		16								
		15	B	IVA	D1		South-boreal forest-steppe			
			C							
		14	D			IV/2				
			E							
		13	F			IV/3, IV/4				
			G			IV/5				
13A	Pedosediment & gully colluvium	Not sampled				V/1,V/2A		Tyasmin loess unit (?)	Herning, Melisay I, the I Ealry Valdai Stadial	Substage 5d
14A	Meadow-chernozem soil (Mollisol) A1 horizon				C	V/3	Forest-steppe of temperate to south-boreal climate	Kaydaky soil unit: kd_{3b2+c}	Eemian (E6b), Mikulino (M8)	
						V/4				
			XXIX			V/5				
			XXVIII			V/6				
			XXVII							
14B	Mollisol A1B horizon	12	XXVI, H	III	B4	VI/1	South-boreal forest to forest-steppe		Eemian (E6a), Mikulino (M7)	
			XXV			VI/2				
			XXIV, I			VI/3				
			XXIII			VI/4, VI/5				
		11	XXII, J							
			XXI		B3		South-boreal forest			
			XX, K			VI/6				
			XIX							
		10	XVIII, L			VI/7				
			XVII			VI/8				
			XVI			VI/9				
			XV		B2		Boreal to south-boreal forest			
		9	XIV							
			XIII							
			XII							
			XI							
		8	X	II	B1	VI/9A	South-boreal forest to forest-steppe			
			IX							
			VIII			VI/10				
			VII							
		7	VI							
			V			VI/11-14				
			IV			VI/15, VI/16				
		6	III			VI/17				
			II		A		Boreal forest-steppe	Kaydaky kd_{3b2-b1}		
			I							
14D	Non-soil colluvial deposits	5		II			South-boreal forest-steppe	Kaydaky kd_{3b2-b1} (?)	Eemian (E6a), Mikulino (M7) (?)	Substage 5d (?)
		4								
		3								
14E	Non-soil colluvial deposits	2		I			Forest-steppe of temperate climate	Kaydaky kd_{3b1} (?)	Eemian (E5), Mikulino (M6) (?)	Substage 5e (?)
		1								

included three pollen zones, really appears to be of a complex structure, but the connection of pollen data with the lithology is somewhat controversial. A pollen zone which indicated cooling actually corresponds to the well-developed humiferous soil (mollisol), whereas the first maximum of a broad-leaved flora is related to non-soil deposits (hillwash loam and clay, steeply bedded along the slope). The pollen data indicate that the mollisol clearly cannot correspond to the interglacial optimum of the broad-leaved vegetation. It can be related to the endothermal cooling within an interglacial - which is what the author considered this pollen zone to be in the former publication, - to the beginning of an interglacial, or to the end of an interglacial. Judging from the newly discovered erosional break and intense colluvial accumulation between the mollisol (Strata 14A-B) and luvisol (Stratum 13), the suggestion that the mollisol formation occurred during an endothermal cooling does not seem realistic. This single event could not include both the thick mollisol formation and the later erosion and colluviation. Thus, the opinions on the origin of the mollisol during an early interglacial or a late interglacial period need to be considered further.

The arguments which favour the formation of the mollisol during the beginning of the Last Interglacial are as follows. The trend to an increase in broad-leaved trees in the vegetation is seen from the beginning to the end of the time of mollisol formation, primarily by comparison of pollen content of Strata 14B and 14A. Pollen of *Quercus* dominates in the group of broad-leaved taxa, and *Ulmus* pollen is rather noticeable. These two trees appear first among broad-leaved species during the evolution of interglacial vegetation. It should be mentioned that *Carpinus* pollen has also been discovered, and is particularly pronounced in the first pollen sub-zone of zone B (Stratum 14B). This can only be explained by the specific character of vegetational evolution of the Crimean Mountains, which provided the refugia for all the species of the broad-leaved flora. In the Crimean Mountains, the extensive distribution of *Carpinus* during the Alleröd has been proven (Cohen et al., 1996; Cordova and Lehman, 2003), whereas in the whole plain area of the Ukraine, hornbeam was absent both in this time interval and also much later, during the Early Holocene. Generally, the suggestion for the early Mikulino age for the mollisol can only be accepted if one admits that the M1 zone of the Mikulino – wet and cool climate with extensive spruce distribution in the Russian Plain – could be correlated with the B1 sub-zone of Kabazi II – wet and relatively warm climate with other moisture-loving trees: hornbeam and some fir. Furthermore, it must be concluded that the forest soils characteristic for the first Quercetum mixtum optimum of the Mikulino in the forest-steppe belt of Ukraine was replaced in the Crimean low mountain ridges by humiferous soils (Stratum 14A). In the soil cover Mikulino, connected with the Mikulino Stage, such a phenomenon can be observed within the area of the modern steppe belt of Ukraine (Sirenko and Turlo, 1996).

Facts which also favour an early Mikulino age for the mollisol are both the absence of pollen of broad-leaved trees at the beginning of the soil formation (PZ A), and erosional incision at this time. If we accept an early Mikulino age for the mollisol, it becomes necessary to admit that there was a redeposition of all pollen in Strata 14D and 14 E. The incision and colluviation observed in Stratum 13A could then be related to the endothermal cooling of the Mikulino, and the *Carpinus* peak (luvisol derivatives of Stratum 13) could be regarded as the hygrothermal stage of the Last Interglacial, as it was suggested in the former publication. In the loess-soil series of the plain area of Ukraine, the forest soil corresponds to the hygrothermal stage of the Mikulino (Gerasimenko, 1988; 2001; Rousseau et al., 2001).

The second interpretation for Kabazi II is based on the recent detailed pedo- and palynostratigraphy of the Pryluky-Kaydaky soil complexes as an equivalent of MIS 5 (Rousseau et al., 2001; Haesaerts and Gerasimenko, 2002; Gerasimenko, 2002). According to this data, three forest soils could have developed during the Pryluky-Kaudaky pedogenesis, and three forest soils have been discovered in the Western European loess-soil sections, assignable to the time interval of Stage 5 (Haesearts et al., 2000; Antoine et al., 2003). In Ukraine, the highest of these soils belongs to the Pryluky unit (pl_{1b1}) and is characterised by a high proportion of pollen of broad-leaved taxa, including *Carpinus*. The difference for the Kaydaky forest soils encompasses the absence of a pollen succession typical for the Mikulino interglacial. All broad-leaved species appeared at the same time, as it has been shown to be characteristic for an interstadial (Zagwijn, 1992). The Mikulino pollen succession is shown to end at the top of the Kaydaky unit. Thus, the cold Tyasmin unit is related to the first stadial of the Early Glacial (Substage 5d), and the Pryluky unit corresponds to the Early Glacial. In the Stage 5 pedocomplex of Western Europe, the upper forest

◀ **Table 2-1** Kabazi II: vegetational succession and its relation to stratigraphy, lithopedology and archaeological levels.

soils have been primarily correlated with Early Glacial interstadials (Haesearts et al., 2000; Antoine et al. 2003). In such a way, the luvisol of Strata 13-11B might be correlated principally with the first Early Glacial interstadial, Substage 5c. The problem is that, in the plain area of the Ukraine, the pollen content of the pl1b1 soil has never been shown to be so strongly dominated by *Carpinus*, in spite of hornbeam pollen always being present in the soil. Here, the distinct prevalence of *Carpinus* is characteristic only in the upper forest Kaydaky soil – hygrothermical stage of the Mikulino. In the reference section of Grand Pile, France (Woillard, 1978), the pollen percentages of hornbeam are much higher in the Eemian than in the Saint-Germain I interstadial – Substage 5c.

On the other hand, the most environmentally similar sites to those of the foothills of Crimean Mountains could be the Southern European reference section with it high resolution record at Tenagi Philippon, northern Greece (Wijmstra, 1969; 1976). A high resolution record has been obtained from lacustrine deposits, accumulating with constant sedimentation rates, which enable the establishment of a time-depth relation for the sequence. The pollen contents of the upper Eemian/Pangaion (zones O2b and Q) and Brörup/Drama (pollen zone S) are rather similar to the corresponding pollen zones from Strata 14 and 13. Zone O2b corresponds to the appearance of hornbeam during the Eemian (hygrothermal stage), but in this southern area it is represented by oak forest with *Carpinus betulus*. Actually this vegetation type (with maxima of *Quercus* and *Carpinus* pollen) corresponds to pollen zone I at Kabazi II (Stratum 14E). The beginning of pollen zone Q (Tenagi Philippon) is marked by a rise in *pine* pollen and a decrease in *Quercus*, as well as by an increase in pollen percentages of *Artemisia* and Chenopodiaceae (Wijmstra, 1976). This corresponds well to the changes observed in pollen zone II (Stratum 14D). Further, at both the zones BII at Kabazi II and QI at Tenagi Philippon, pollen percentages of *Betula* and *Alnus* start to rise, *Carpinus* is quite noticeable, a few *Tilia* appears, and, most remarkably, the pollen of *Abies* occurs. It is known that in the late Eemian, a *Carpinus* zone was followed by an *Abies* pollen zone. It is not realistic to expect that fir would be extensively distributed in the low mountains of Southern Europe, but the simultaneous appearance of *Abies* pollen in both sections could be a reflection of the spread of fir in the other areas or in the higher mountain belts. In pollen zones Q2 (Tenagi Philippon) and B2 (Kabazi II), the further increase of *Pinus* pollen occurred together with a drop in pollen of broad-leaved taxa. In the pollen zones Q3 (Tenagi Philippon) and B3 (Kabazi II), pollen of *Ulmus* and *Corylus* became more important, *Tilia* re-appeared, and a few *Picea* occurred. A *Picea* pollen zone follows an *Abies* pollen zone in the Eemian sequences of Western and Central Europe. Appearance of *Picea* in both southern sections could be an important indication of the spread of spruce in more northern and western areas at the end of Eemian. All the similar, aforementioned changes occurred against the background of a constant higher ratio of arboreal pollen, particularly of oak, in the Greek section. This could easily be explained by its southerly position, as well as by its location in the lake depression.

It appears rather puzzling that pollen zones I and II, displaying a temperate vegetation, are discovered in non-soil deposits (Strata 14D and 14E), whereas pollen zone 14B, reflecting southern-boreal vegetation, belongs to the soil. Judging from the bedding of Strata 14D and 14E, the suggestion of pollen re-deposition is possible. Still, neither the pollen frequency and preservation, nor the pollen composition of these Strata indicates re-deposition. Pollen of specific taxa which are absent in the overlying Strata were not discovered. On the other hand, interglacial and interstadial pollen zones have previously been established within non-soil deposits in erosional depressions in the sections of the loess-soil series of Russian Plain (Bolikhovskaya, 1995; Bolikhovskaya and Pashkevich, 1982). In such sections, sedimentation rates were evidently much greater than the intensity of pedogenic processes.

In the next pollen zones, R1 (Greece) and B4 (Crimea), the fall in arboreal pollen amount, and particularly of *Pinus* pollen, at the expense of an increase of herb pollen, is observed. The difference is that at Tenagi Philippon, a proportion of broad-leaved trees also decreased, whereas at the Kabazi II, it is the same as in the preceding zone. Pollen zone R1 has already been related to the first Early Glacial stadial. In the recent publications (Kukla et al., 1997; 2003; Sanches Goni et al., 2001, Shackleton et al., 2003), the end of the classical Eemian pollen succession is also related to Substage 5d. In Eemian reference sections in France, an increase in herbs is related to dates of 114-110 kyr (Kukla et al., 2003), and broad-leaved trees are shown to have grown at this time. The reason for their sharp reduction in Greece was probably a more pronounced increase in aridity there – the lake dried up and took on the form of a peat-bog (Wijmstra, 1969). In pollen zone R2, an increase in broad-leaved pollen content (*Quercus, Carpinus, Ulmus* and *Tilia*) is observed, and this might possibly correspond to pollen zone C at Kabazi II. Pollen percentages of *Pinus* and *Betula* were lower in both of these zones than the pollen contents of broad-leaved taxa. An increasingly warmer and dryer trend is shown to mark the

last phase of Eemian times around 110 kyr, during the Substage 5d (Sanches Goni et al., 2001).

In the Kabazi II section, the pessimum of Substage 5d (the first stadial of the Early Glacial) could correspond to the erosional break and colluvial sediments of Stratum 13A, whereas in Tenagi Philippon, it might be represented by pollen zone R3 (with predominance of non-arboreal pollen and low counts for both pine and broad-leaved trees). In Greece, pollen zone S is located above pollen zone R and correlated with Brörup (Wijmstra, 1969; 1976). The characteristic features of this zone are as follows. High pollen percentages of broad-leaved trees are observed. During the optimum they are higher than those of *Pinus*. Three maxima of broad-leaved tree pollen can be seen, separated by phases with some increase in *Pinus* pollen. The pollen percentages of *Carpinus* are the highest through the Upper Pleistocene and the Holocene, particularly at the middle optimum of broad-leaved vegetation (zones IVB, D2). Pollen of *Quercus* increased at the first and the last optimum, and *Juniperus* was most noticeable at the beginning of the zone. *Alnus* produced a peak together with *Carpinus*. Pollen of *Abies* appeared during the main peak of *Carpinus* and reached it maximum shortly afterwards. All these features can also be distinctly traced in pollen zone IV at Kabazi II.

Such a close similarity of two sets of pollen records constrain us rather to accept the second interpretation of the data, outlined for the lower part of the Kabazi II sequence, and correlate Strata 13-11B with the first Early Glacial interstadial (Substage 5c). It differs strongly in its environmental characteristics from the classical Brörup, as well as from the Saint-Germain I interstadial (Woillard, 1978). One may accept that contrasting relations of temperature and moisture in the different areas caused the difference. During this time span, it was probably too cool even in central France for an extensive distribution of the hornbeam. In southern Europe, the interstadial climate could not have been so cool, but still cool enough to decrease evaporation and to provide favourable moisture regime for *Carpinus*. It has been shown (Kukla et al., 1997; 2003; Sanches Goni et al., 2001; Shackleton et al., 2003) that even in the wet Western European area during the Eemian, the maximum distribution of hornbeam did not correspond to the thermical optimum.

The cool period depicted in pollen zone V (Stratum 11A) could possibly be correlated with the second stadial of the Early Glacial (Substage 5b), and with the pollen zone T at Tenagi Philippon. In the latter section, the next pollen zone U (Odderade, Substage 5a) has a complex structure, and such a complexity is also typical of the upper part of the Pryluky unit and it is represented in the stratigraphically complete sections (Rousseau *et al.*, 2001; Heasaerts *et al.*, 2002; Gerasimenko, 2002). It includes a very characteristic humiferous soil, pl_{1b2}, as well as the boreal brown forest soil, pl_{3b1}, and a set of later initial soils (all of them separated by thin loess beds). Such a detailed record does not exist in the Kabazi II sequence, and only the soil pl_{1b2} (Stratum 11) has been morphologically determined. A high resolution pollen sampling for this soil has not been undertaken, and this makes it difficult to determine the part of pollen zone U (Tenagi Philippon) with which the pl_{1b2} soil can be correlated. It seems that a large part of the Odderade and the later Early Glacial interstadials (Ognon I-III) are missing at Kabazi II, as it is frequently the case for sections of the loess-soil series of the Ukraine.

Conclusion

The palynological and pedostratigraphical study of the sequence at the Middle Palaeolithic site of Kabazi II shows the complicated environmental evolution which was taking place during the Late Pleistocene. The results of litho-pedological and pollen investigation usually correspond well. They enable the establishment of the main stages and their correlation with the wider Upper Pleistocene stratigraphical frameworks. On the other hand, the discontinuous sedimentary record represented in the lower part of the section requires the control of climatostratigraphic results constrained by "absolute" dating. Correlation with reference sections in the long continuous pollen records deposited in similar environmental conditions to the studied sequence is another useful tool.

According to the discovered environmental evolution, the sedimentary record of Kabazi II comprises the time interval from the second half of the Last Interglacial up to the first half of the Late Pleniglacial. The stratigraphical units of the Ukrainian Framework for the Quaternary (Veklitch, 1993) have been established at Kabazi II, starting from the Kaydaky unit and ending with the Bug unit (Fig. 2-3). The correlation of these stratigraphical units with the West European glaciochronology for the Late Pleistocene, as well as with the global marine oxygen-isotopic stages, has been proposed. For the upper part of the sequence, it corresponds completely to the previously published correlation (Gerasimenko, 1999).

The cool and relatively wet stadial of the Uday unit is related to the Early Pleniglacial (Stage 4). Three south-boreal interstadials of the Vytachiv unit (vt_{1b1}, vt_{1b2} and vt_{3b}) are correlated with the Middle Valdai interstadials of the Russian Plain, established by N.Bolikhovskaya and G.Pashkevich (1982), as well as with the Middle Pleniglacial interstadials of Moershoofd, Hengelo and Denekamp (Stage 3). Correspondingly, the stadials between them (vt_{1b1-b2} and vt_2) are correlated with the Hasselo and Huneborg stadials of the Middle Pleniglacial established by Hammen (1995). The two transitional boreal phases are distinguished at the end of the second and the third Vytachiv interstadials (vt_{1c} and vt_{3c}). The cold and dry stadial of the Bug unit is correlated with the first half of the Late Pleniglacial. These correlations are confirmed by "absolute" dates (Hedges et al., 1996; Pettitt, 1998; Rink et al., 1998; in press; McKinney, 1998), though the dating of the vt_{1b2} soil appeared to be older than the Hengelo; a fact which is discussed in this paper.

The lithostratigraphy of the lower part of the sequence, which have been only recently exposed, (Chabai, 2003b), has demonstrated a discontinuity of the sedimentary record, which required a new pollen study based on high frequency sampling. The new approach to correlation of the Ukrainian stratigraphical framework with other regional and global scales for the Quaternary (Rousseau et al., 2001; Haesearts and Gerasimenko, 2002; Gerasimenko, 2002) has been used in the interpretation of the sequence. According to the new results, the Last Interglacial is related to the Kaydaky unit. Previously, the Mikulino interglacial was correlated with the whole Kaydaky unit and the lower forest soil of the Pryluky unit (Gerasimenko, 1988; 1999).

The long continuous pollen record at Tenagi Philippon, northern Greece (Wijmstra, 1969; 1976), located in an environment similar to that of the Kabazi II site, has been used in the correlation and interpretation of the pollen data recovered. The pollen diagram of deposits, sampled at high frequency at Kabazi II, corresponds to the part of sequence below the pl_{1b2} soil (Fig. 2-2), which is dated to the Early Glacial. This diagram has been compared to the Early Glacial-Last Interglacial interval for the Tenagi Philippon diagram, and this showed the close similarity in pollen zonation, including the consequence of the appearance of arboreal taxa and the extent of their distribution. In the Tenagi Philippon diagram, a *Carpinus* peak is shown for the Brörup interstadial, whereas in the diagrams for northern and western Europe, the *Carpinus* pollen zone is characteristic of the hygrothermic stage of the Eemian. This fact makes a correlation of the *Carpinus* pollen zone in the pl_{1b1} soil at Kabazi II with the Brörup interstadial of the Early Glacial (Saint-Germain I, Substage 5c) possible. The correlation of the soil pl_{1b1} with Substage 5c has been proven for other areas of the Ukraine using different environmental indicators (Rousseau *et al.*, 2001; Haesaerts and Gerasimenko, 2002; Gerasimenko, 2002). Thus, the revision of position of the pl_{1b1} soil to Substage 5c in the Kabazi II sequence makes the inter-regional correlations coherent.

In both the sequences of Kabazi II and Tenagi Philippon, the detailed pollen zonation of the deposits below the Brörup interstadial also correlated well. Based on this, the following conclusions are proposed. The sampled part of the sequence began with deposits from the second half of the Eemian (a transition from a temperate environment to a southern-boreal one, the end of phase M6/E5, kd_{3b1-b2}), represented by the hillwash facies. The erosional pulses and the accumulation on the slope might correspond to the alluvial erosion and accumulation in the Alma valley. The southern-boreal environment (light *pine* forest with an admixture of broad-leaved trees, and mollisol formation) existed at the end of Eemian (kd_{3b2}). The presence of pollen of *Abies* and *Picea* allows one to suggest a correlation of the A1B horizon of the mollisol mainly with the phase M7/E6a. The phase of dry *Pinus* forest M8/E6b (established in the northern sections), in the south could possibly correspond to the phase of reduction of forest areas and distribution of steppe vegetation. Humus accumulation increased at this time, and the A1 horizon of the mollisol was formed. In the marine oxygen-isotopic record, the south-boreal environments at the end of Eemian have already been related to the Substage 5d (Kukla et al., 1997; 2003; Shackleton et al., 2003).

At the first Early Glacial stadial (pessimum of Substage 5d, the Tyasmin unit), erosional incision and later colluvial accumulation occurred at Kabazi II. Erosional breaks and colluviation are commonly described for this time interval in Western European loess-soil sections (Heasaerts et al., 2000; Antoine *et al.* 2003). At the first Early Glacial interstadial (Brörup, Saint-Germain I, the phase pl_{1b1}), an oceanic climate pattern existed with cool and wet summers and rather mild winters (luvisol formation processes under the hornbeam forest above the site area). It should be mentioned that at Kabazi II *Carpinus* was mainly represented by *Carpinus orientalis* Mull. This species is a more drought-resistant plant than *Carpinus betulus* L., but, on the other hand, requires warmer temperatures. *Carpinus orientalis* Mull. is the species which is presently growing in the Alma valley at the same altitudes as those of Kabazi II. Cooling occurred at the end of the phase, as indicated by the arrival of fir pollen. The further strong

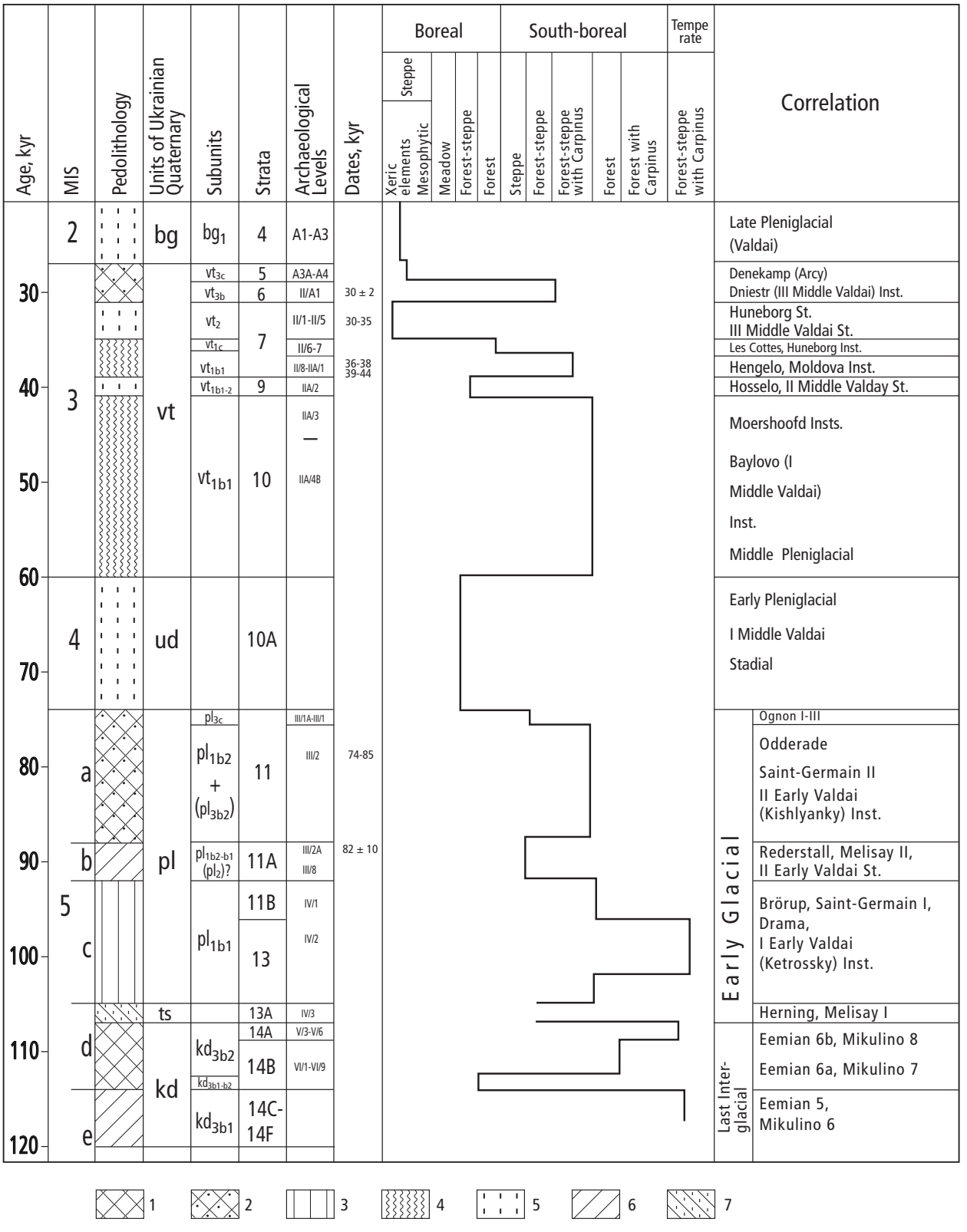

Fig. 2-3 Kabazi II: environmental dynamics during the Late Pleistocene. The lithopedology: 1 – meadow soil (mollisol), 2 – rendzina soil (leptosol and eutric leptosol), 3 – brown forest soil / luvisol (slope derivatives), 4 – brown forest soil / cambisol (pedosediments), 5 – non-soil light-yellow loam, 6 – non-soil light-grey loam, 7 – strongly bedded colluvial pedosediment.

reduction in arboreal pollen, as well as in pollen of broad-leaved taxa, coincides with an increase of colluviation (the second stadial of the Early Glacial, the phase pl_{1b1-b2}, or pl_2). The profile of humiferous soil pl_{1b2} (or pl_{1b2} +pl_{3p2}?) was mainly formed under the southern-boreal climate of the next Early Glacial interstadial. The transitional northern-boreal environment existed during the accumulation of the top layer of the soil (the Substage pl_3). There was no high resolution pollen sampling in this part of the Kabazi II sequence which would enable an accurate correlation with the later interstadials-stadials of the Early Glacial (Odderade/Saint Germain II/Substage 5a and Ognon I-III/ transition to Stage 4).

The other possible correlations for the lower part of the sequence were discussed above. The sedimentary breaks below and above the mollisol, as well as the absence of any 'absolute' dating, give ground to uncertainty. Nevertheless, the correlation, described in the conclusions, is presently more logical and coherent for the authors.

At the Kabazi II site, a cyclic pattern of environmental evolution occurred during the Late Pleistocene. This happened against the background of a general trend to a drop in temperatures and an increased aridity from the Last Interglacial and the beginning of the Early Glacial towards the Late Pleniglacial (Fig. 2-3). These regularities are clearly traceable elsewhere in Late Pleistocene sequence and provide the possibility of a correlation, based on the pattern of environmental changes. Nevertheless, each area has its own individual features. For the western foothills of the Crimean Mountains, they are as follows. The best pronunciation of environmental cyclicity can be seen in the alternation of expansions and retreats of broad-leaved woodlands. This reflects the oscillations of warm and cool intervals, mainly interstadials and stadials. The alternation of humid and arid time spans was not so well marked, and forest-steppe environments mainly dominated in Kabazi II. A steppe type of vegetation appeared much later than in the other areas of the Ukraine. It was established only from the last stadial of the Middle Pleniglacial, whereas in the forest-steppe belt of Ukraine, it recurrently occurred from the first Early Glacial stadial. A subtype of xerophytic steppe has not been discovered within the investigated interval. During the stadials and cool phases of the interglacial, the climate was constantly wetter than in the plain areas of the Ukraine. During the interstadials and warm phases of the interglacial, the climatic humidity was similar to that in the forest-steppe belt (an increase in precipitation was obviously compensated by an increase of evaporation). No periglacial floristic components were discovered in the vegetation of the stadials, and during the interstadials, broad-leaved species were much better represented in the Crimean forests than in the other areas of the Ukraine. Thus, during the Late Pleniglacial, the Western Crimea provided favourable conditions for the existence of refugia for a broad-leaved flora, as well as for permanent human occupation.

Abstract

КАБАЗИ II: ДИНАМИКА РАЗВИТИЯ РАСТИТЕЛЬНОСТИ

Н. П. ГЕРАСИМЕНКО

Палинологические и педостратиграфические исследования отложений стоянки Кабази II отображают динамику развития природной среды в позднем плейстоцене. В отложениях лугово-черноземной почвы kd_{3b2} в основании разреза (культурно-хронологический слой VI) установлена палинозона сосны с примесью широколиственных пород, сопоставляемая со второй половиной последнего межледниковья. В конце этого интервала расширялись площади лугово-степных ландшафтов (культурно-хронологический слой V).

Первый стадиал раннего валдая обозначен фазой эрозионного вреза и интенсивного коллювирования (ts), а I-ому межстадиалу раннего валдая (брерупу) соответствует аккумуляция склонового деривата бурой лесной почвы (pl_{1b1}), сформированной под лесостепью с широким распространением грабинника (культурно-хронологический слой IV). На II стадиале раннего валдая в условиях бореальной лесостепи накапливался непочвенный делювий (pl_{1b1-b2}), а на II-ом межстадиале (оддераде) под лесостепью с участием широколиственных пород формировалась дерново-карбонатная почва pl_{1b2-3} (культурно-хронологический слой III).

Выше в разрезе прослеживается чередование педоседиментов и непочвенных отложений (культурно-хронологические слои IIA и II), для которых установлена следующая последовательность природных событий: бореальная лесостепь с ксерофитными элементами, ud, III стадиал раннего валдая; южно-бореальная лесостепь, vt_{1b1}, I межстадиал среднего валдая, моерсхоофд; бореальная лесостепь с ксерофитами, vt_{1b1-b2}, I стадиал среднего валдая; южно-бореальная лесостепь, vt_{1b2}, II межстадиал среднего валдая, хенгело; фаза сосновых лесов бореального/южно-бореального климата; vt_{1c}, прохладный интерстадиал Хунеборг / Ле Кот; бореальная степь с ксерофитными ценозами, vt_2, II стадиал среднего валдая. Выше залегает почва vt_{3b-c}, переходная от бурой насыщенной к дерново-карбонатной (культурно-хронологический слой A), сформировавшаяся под южно-бореальной лесостепью (III стадиал среднего валдая, денекамп), а в кровле разреза – непочвенный делювий (культурно-хронологический слой I), накопившийся в условиях бореальной ксерофитной степи.

На фоне цикличных изменений ландшафтов прослеживается тренд к аридизации климата от конца последнего межледниковья к началу позднего валдая.

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НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК УКРАИНЫ
ИНСТИТУТ АРХЕОЛОГИИ
КРЫМСКИЙ ФИЛИАЛ

КЁЛЬНСКИЙ УНИВЕРСИТЕТ
ИНСТИТУТ ДО- И ПРОТОИСТОРИИ

Палеолитические стоянки Крыма,
Том 1

КАБАЗИ II:
ПРИРОДА И ЧЕЛОВЕК ВРЕМЕНИ ПОСЛЕДНЕГО ИНТЕРГЛЯЦИАЛА

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В. П. ЧАБАЙ, Ю. РИХТЕР, Т. УТМАЙЕР

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Chapter 3

Small Mammals from the Palaeolithic Site of Kabazi II, Western Crimea

Anastasia K. Markova

The unique multi-layered open Middle Palaeolithic site Kabazi II is situated on the Second (Internal) Ridge of the Crimean Mountains (44° 50′ N; 34° 02′ E), on the right bank of the Alma River, in a belt of low mountain forest-steppe. Dr. Victor Chabai investigated the archaeology of the site, and has organised the complex study of the deposits, which include six archaeological units with numerous levels (Chabai 2003b; 2004c; Chabai et al., 2002; 2004.). Furthermore, the investigations at Kabazi II have incorporated several palaeontological methods, including palaeobotanical, malacological and theriological studies (Gerasimenko 1999; Patou-Mathis 1999; Mikhailesku 1999). The results from environmental studies, and the results obtained from a number of dating methods (AMS, U-series and ESR) have shown that humans occupied the site over an extremely long period of time, which stretches from the Mikulino / Eemian Interglacial until the second part of the Valdai Glaciation. Thus, the duration of human occupation encompasses about 90,000 years (5 – 3 MIS stages), and covers periods with varying climatic conditions (Mikulino interglacial, Valdai glaciation, and different Stadials and Interstadials of the Last Glaciation).

Material

In the upper part of the stratigraphical sequence at Kabazi II, small mammal bones were very rare. Only a few remains were recovered from the sterile strata between Units III and IV, and included only one species, northern mole-vole *Ellobius (Ellobius) talpinus* (Markova 1999).

However, during the campaigns undertaken in 2000/2001, new rich materials were collected, and small mammal remains were recovered from the archaeological Units VI, V, IV and III. These archaeological units comprise a number of separate levels. This stratigraphical subdivision forms the basis for this study of the micro-mammalian material (see Tables 3-1, 3-2, 3-3, 3-4).

Generally speaking, the bone material from the site is well preserved. Teeth were often complete and undamaged, and several mandibles with teeth were recovered. Whereas some of the mammal bones were deposited directly (possibly in borrows), others show traces of digestion, which

TAXA	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7	VI/8
Insectivora – insectivores								
Crocidura leucodon Herm. – white-tooth shrew	–	–	1	–	1	–	1	–
Rodentia – rodents								
Spermophilus pygmaeus Pallas – little suslik	–	3	–	–	–	–	1	1
Spalax microphtalmus Güldenstaedt – Russian mole rat	–	–	2	2	–	2	–	2
Ellobius talpinus Pallas – northern mole-vole	–	9	–	–	–	6	–	–
Dryomys nitedula Pallas – tree dormice	–	–	–	–	–	–	–	2
Apodemus (Sylvimus) flavicollis Melch. – yellow-necked mouse	–	–	–	–	–	–	–	–
Cricetulus (Cricetulus) - migratorius Pallas	–	–	–	–	–	–	–	3
Eolagurus luteus Eversmann – yellow steppe lemming	–	8	–	–	–	–	–	2
Lagurus lagurus – steppe lemming	–	–	–	–	–	–	–	–
Arvicola terrestris L. – water vole	2	5	9	2	4	6	–	5
Microtus (Stenocranius) gregalis Pallas – narrow-skull vole	–	–	–	–	–	–	–	1
Microtus (Microtus) obscurus Eversmann – "obscurus" vole	20	62	56	15	20	51	42	50
Total species:	**2**	**5**	**4**	**3**	**3**	**4**	**3**	**8**

Table 3-1 Kabazi II, Unit VI: species composition of small mammals, by level.

indicates that the material was deposited by predators (birds and animals). The majority of bones are of a light yellow or orange colour.

The saturation of bones in the deposits is rather high. About two thousand bones were recovered, of which 911 were identified on the species level (Tables 3-1, 3-2, 3-3, 3-4, 3-5).

The richest material was found in the levels of Unit VI. From this unit, more than five hundred (518) bones were identified on the species taxonomical level. This was also achieved for a further 159 bones from Unit V, for 195 bones from Unit IV, and for 39 bones from Unit III (Level III/8E). Naturally, these results also reflect the quantity and quality of material collected from the different layers.

According to the results from the complex archaeological, palynological and geochronological studies, the small mammal assemblages from Units VI to IV must correspond to the different stages of the Mikulino Interglacial. On the other hand, the material from Unit III would appear to correspond to one of early interstadials of the Valdai Glaciation (Chabai et al. 1999; 2004).

Small Mammals from Kabazi II, Unit VI

Small mammals were collected from 16 levels of Unit VI (Table 3-1). The 518 identified bones from this unit comprise twelve different species of small mammals, these include one insectivore (*Insectivora*) and eleven rodents (*Rodentia*). The "obscurus" vole *Microtus obscurus* is dominant in all levels (Fig. 3-1; 3-4, *1, 2, 3, 4, 5, 6, 7, 8*; 3-5, *2, 3, 5, 6*; 3-6, *2, 3, 4*; 7, *1, 2*; 3-8, *3*). This species is common to steppe and meadow landscapes, and is also the dominant species at Kabazi V (Markova 1999), and is numerous in Buran-Kaya III, Karabi – Tamchin and Chokurcha I (Markova 2004a; 2004b; 2004c). The water vole *Arvicola terrestris* is also a mammal which is common to Unit VI (Fig. 3-5, *4, 7*; 3-6, *1*; 3-7, *4*). This species inhabits the banks of water basins, and the Alma River running near the site would have been a favourable environment for this mammal. The absence of water vole remains from levels VI/12-VI/15 is surprising, and is probably attributable to the very small amount of material which was recovered from these levels. The presence of the tree-doormouse *Dryomys nitedula*, which lives in broadleaved and mixed forests, as well as in bushes on plains and in mountainous regions, in levels VI/8 and VI/9a (Fig. 3-2, *6*) indicates that forested areas must have existed nearby at the time in which these levels were deposited. Its favourite foods include the seeds and fruits of broadleaved and fruit trees, berries, young sprouts and leaf-buds. The tree-doormouse is no longer indigenous to the Crimea (Ognev 1947).

The tooth of yellow-necked mouse *Apodemus flavicollis* was found in level VI/9a (Fig. 3-2; 3-4). The

VI/9	VI/9a	VI/10	VI/11	VI/12	VI/13	VI/14	VI/15
–	–	–	–	–	–	–	–
4	1	3	–	–	–	–	1
–	1	–	–	–	–	–	–
–	4	–	–	–	–	–	–
–	1	–	–	–	–	–	–
1	–	–	–	–	2	–	–
–	1	–	–	–	–	–	–
1	–	–	–	–	–	–	–
1	–	–	–	–	–	–	–
–	2	4	2	–	–	–	–
–	–	–	–	–	–	–	–
2	20	49	24	11	4	11	9
3	**7**	**3**	**2**	**1**	**2**	**1**	**2**

Table 3-1 continued.

remains of this species also indicate that a nemoral forest and/or bushed areas were located near the site. The seeds of broadleaved trees (*Fagus, Quercus, Corylus, Tilia, Acer*) and bushes (Celastraceae, Rosaceae etc.) are the preferred food of this animal. The cold and snow-free winters are the most dangerous for the yellow-necked mouse.

The majority of mammals identified in the levels of Unit VI still inhabit open steppe and semi-desert landscapes (Fig. 3-8, 3-9). They include the little suslik *Spermophilus pygmaeus* (Fig. 3-6, *7*), the Russian mole rat *Spalax microphtalmus* (Fig. 3-2, *5a, 5b*; 3-3, *1*; 3-4, *9*; 3-5, *1*); the grey hamster *Cricetulus migratorius* (Fig. 3-6, *6*), the northern mole-vole *Ellobius talpinus* (Fig. 3-2, 1-3; 3-4, *10, 11*), the yellow steppe lemming *Eolagurus luteus* (Fig. 3-7, *3*; 3-8, *2*), the steppe lemming *Lagurus lagurus* (Fig. 3-8, *1*) and the white-tooth shrew *Crocidura leucodon* (Fig. 3-2, *7*; 3-3, *3*).

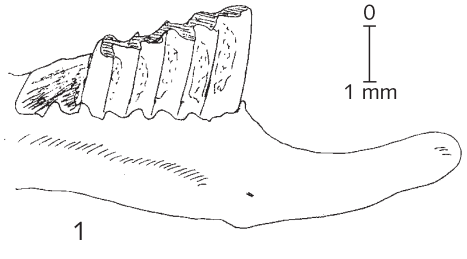

Fig. 3-1 Kabazi II, level VI/14: 1 – low mandible with m1 of *Microtus obscurus.*

The little suslik is found in a variety of habitats. These include the very different biotopes which not only prevail in deserts, but also in semi-deserts (sand, clay-sand and loess semi-deserts), and in dry arid steppes with wormwood. The little suslik is also known to inhabit low mountain steppes, but only in regions not exceeding 400 to 500 m above sea level.

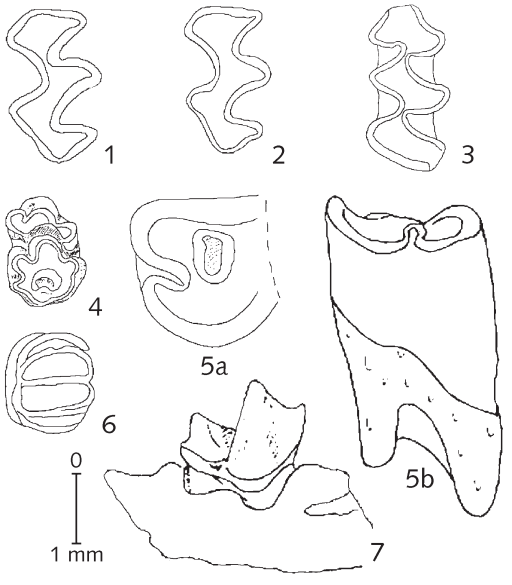

Fig. 3-2 Kabazi II, level VI/9a: 1 and 2 – M2 *Ellobius talpinus*, 3 – m2 *Ellobius talpinus*, 4 – M1 *Apodemus (Sylvaemus) flavicollis*, 5a and 5b – m3 *Spalax microphtalmus*, 6 – m2 *Dryomys nitedula*; 7 – m2 *Crocidura leucodon.*

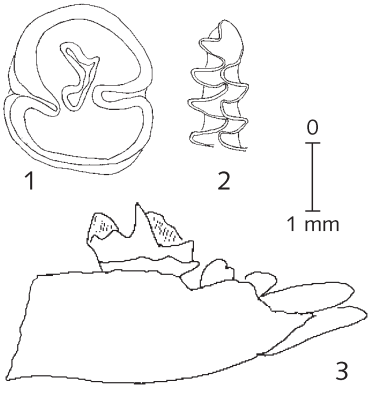

Fig. 3-3 Kabazi II, levels VI/8 (1, 2) and VI/7 (3):1 – m1 *Spalax microphtalmus*, 2 – m1 *Microtus (Stenocranius) gregalis*, 3 – fragment of lower mandible of *Crocidura leucodon*.

TAXA	V/1	V/2	V/3	V/4	V/5
Insectivora – insectivores					
Crocidura leucodon Herm. – white-tooth shrew	–	–	–	–	1
Lagomorpha – lagomorphes					
Lepus europaeu s L. – European hare	–	2	–	–	–
Rodentia – rodents					
Marmota bobac Müller – bobac marmot	–	–	–	1	–
Spermophilus pygmaeus Pallas little suslik	–	–	6	4	–
Spalax microphtalmus Güld. – Russian mole rat	–	–	4	–	2
Apodemus (Sylvimus) flavicollis Melch. – yellow-necked mouse	–	–	–	1	–
Ellobius talpinus Pallas – northern mole-vole	1	2	6	3	2
Cricetulus (Cricetulus) migratorius Pallas – grey hamster	–	2	–	–	–
Eolagurus luteus Eversmann – yellow steppe lemming	–	4	19	7	4
Arvicola terrestris L. – water vole	–	–	–	–	4
Microtus (Microtus) obscurus Eversmann –"obscurus" vole	–	15	7	–	57
Total species:	**1**	**5**	**5**	**5**	**6**

Table 3-2 Kabazi II, Unit V: species composition of small mammals, by level.

The mammals of genus *Spalax*, which includes several species, inhabit plain-, mountain- and forest-steppes. Their preferred habitat is to be found on the slopes of valleys and other depressions with chernosem, brown soils and rich grass cover. Russian mole rat *Spalax microphtalmus* was identified in Kabazi II. Nowadays, this mammal is absent in the Crimea, and it is the first time that its remains have been identified at a Middle Palaeolithic site. Its presence in Unit VI is therefore indicative for the presence of rich soils near the site.

The grey hamster *Cricetulus migratorius* is found in a variety of landscapes: in open plains, in mountainous regions, in forest-steppe, steppe, semi-desert and even in desert. Its favourite habitats are, however, plain and mountain steppes.

Northern mole vole *Ellobius talpinus* prefers the open landscapes, mostly steppes and forest-steppes with rich soils. This species constructs deep borrows. Some of the remains of this mammal display archaic features, such as the so-called "prismatic" fold on the anterior loop (Fig. 3-4, *11*). This characteristic was also identified on the first lower molar of an *Ellobius talpinus* from the fifth layer at Karabi Tamchin (Markova, 2004b). Thus, this archaic characteristic also supports the early age of Unit VI.

Nowadays, the distribution of the yellow steppe lemming *Eolagurus luteus* is limited to regions of Central Asia, Mongolia and China. It prefers open landscapes, and is found in semi-deserts, dry steppes and even in deserts. During the Valdai

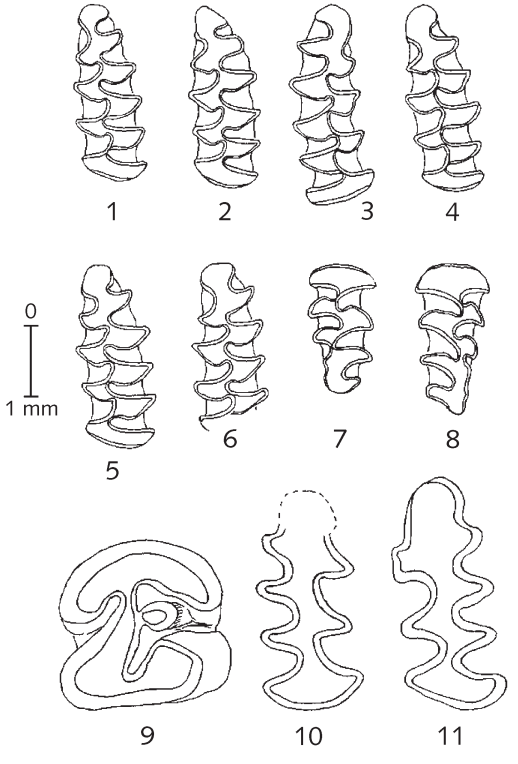

Fig. 3-4 Kabazi II, level VI/6: 1, 2, 3, 4, 5, 6 - m1 *Microtus obscurus*, 7 and 8 – M3 *Microtus obscurus*, 9 – M2 *Spalax microphtalmus*, 10 and 11 – m1 *Ellobius talpinus.*

TAXA	IV/2	IV/3	IV/4
Lagomorpha – lagomorphes			
Lepus europaeus – European hare	1	–	–
Rodentia – rodents			
Spermophilus pygmaeus – little suslik	–	–	2
Allactaga major Kerr – great jerboa	–	1	–
Ellobius talpinus Pallas – northern mole-vole	3	10	35
Eolagurus luteus Eversmann – yellow steppe lemming	29	4	38
Lagurus lagurus Pallas – steppe lemming	–	–	10
Arvicola terrestris L. – water vole	1	–	4
Microtus (Microtus) obscurus Eversmann – "obscurus" vole	20	23	15
Total species:	**5**	**4**	**6**

Table 3-3 Kabazi II, Unit IV: species composition of small mammals, by level.

Glaciation, *Eolagurus luteus* was indigenous to many areas, which included the Central and Southern Russian Plain and the Crimea. This species was not only typical for the so called "mixed" or "non-analogue" periglacial faunas of the Valdai Glaciation, but also of earlier glaciations of Eastern Europe, such as the Dnieper, Oka and Don Glaciations (Markova 2004). Yellow lemmings - at different evolutionary levels (species) - are also known from the interglacial periods, and from the Holocene period. Even as late as the 19th century, the yellow steppe lemming was still to be found in the Lower Volga River drainage basin and in the deserts of Kazakhstan. Thus, the remains of this animal are definitely indicative of open landscapes near the site.

The remains of steppe lemming *Lagurus lagurus* were found in Layer VI/9 (Fig. 3-8, *1*). This species is a typical inhabitant of an open landscape, and was indigenous to the Eastern European steppes and forest-steppes both during the Pleistocene interglacials and glacial periods (Markova 2004). During the last glaciation it was also common to the West European periglacial steppes and forest-steppes.

The narrow-skull vole *Microtus (Stenocranius) gregalis* has been identified only in level VI/8 (Fig. 3-3, *2*). Its preferred habitat comprises open landscapes of different types, and it is now found in regions with tundra and steppe. This animal is practically indifferent to low temperatures, and, at the time of the Valdai Glaciation, was very common. Indeed, *M. gregalis* is one of the characteristic elements of the "Mammoth assemblage" (Smirnov 1992; Agadjanian 2001; Markova 1982; Baryshnikov and Markova 1992; 2002). After the retreat of the Valdai ice-sheet, the population split into two branches: one which became specialised in a tundra environment, and a second which adapted to the steppe. The narrow-skull voles from Kabazi II and Buran-Kaya 3 display a simple teeth morphology, which is now characteristic of the steppe population of the modern *M. gregalis*. Such a morphology is also similar to that

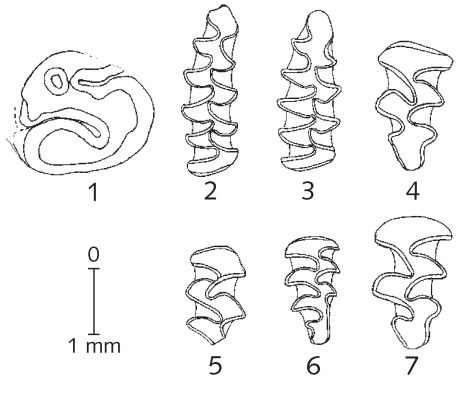

Fig. 3-5 Kabazi II, levels VI/3 (1, 2, 3, 4, 5, 6) and VI/5 (7): 1 – M2 *Spalax sp.* (fragment), 2, 3 – m1, 4 – M3 *Arvicola terrestris*, 5 – M2, 6 – M3 of *Microtus obscurus*, 7 – M3 *Arvicola terrestris*.

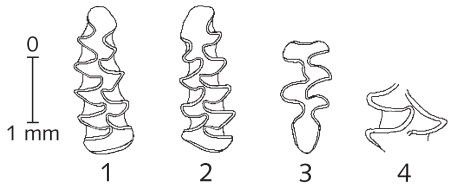

Fig. 3-7 Kabazi II, level VI/1: 1, 2 – m1 *Microtus obscurus*, 3 – M3 *Eolagurus luteus*, 4 – m1 (fragment) of *Arvicola terrestris.*

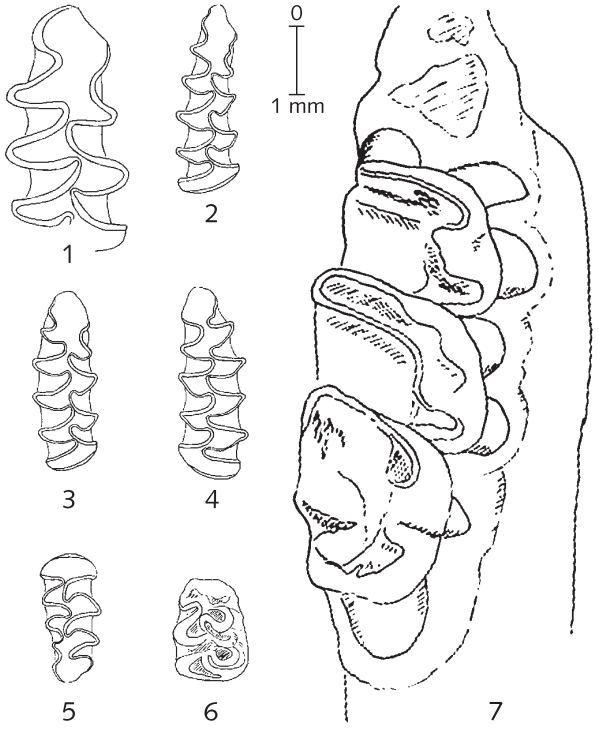

Fig. 3-6 Kabazi II, level VI/2: 1 – m1 *Arvicola terrestris*, 2, 3, 4 – m1 *Microtus obscurus*, 5 – M3 *Microtus obscurus*, 6 - m2 *Cricetulus migratorius*, 7 – lower mandible of *Spermophilus pygmaeus* with m1-m3.

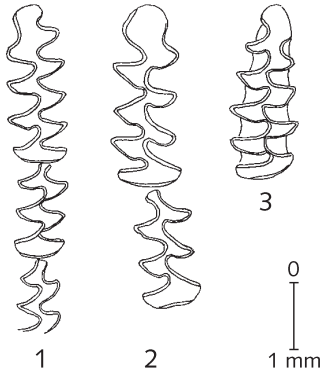

Fig. 3-8 Kabazi II, level VI/9: 1 – m1-m3 *Lagurus lagurus*, 2 – m1-m2 *Eolagurus luteus*, 3 – m1 *Microtus obscurus.*

TAXA	III/8E
Rodentia – rodents	
Ellobius talpinus Pallas – northern mole-vole	1
Eolagurus luteus Eversmann – yellow steppe lemming	17
Arvicola terrestris L. – water vole	10
Microtus (Microtus) obscurus Eversmann – "obscurus" vole	11
Total species:	**4**

Table 3-4 Kabazi II, Unit III, level III/8: species composition of small mammals.

of yellow steppe lemmings from the late Middle Pleistocene. Thus, the narrow-skull voles from the Crimean Palaeolithic sites were possibly more accustomed to steppe environments.

The only insectivore identified at Kabazi II, Unit VI is a white-tooth shrew *Crocidura leucodon*. This animal now inhabits open landscapes such as forest-steppe, steppe and semi-desert. Its modern distribution includes the Crimean Peninsula.

The species composition of small mammals from all levels of Unit VI is shown in Fig. 3-9 and in Table 3-1.

The diagram (Fig. 3-10) shows the distribution of ecological groups of small mammals in different levels of Unit VI. Steppe, semi-desert, and meadow-steppe species prevailed in all levels of the Unit VI. Water vole, which is connected with subaquatic landscapes, is also present in the majority of levels. Indeed, they are only absent in levels VI/13-VI/15. However, this might be explained by the fact that only a small amount of material was recovered from these levels. The remains of forest species have been found in levels VI/8, VI/9a and VI/13. Their presence is indicative of a forested and bushed areas in the vicinity of the site during the deposition of these levels.

TAXA	VI	V	IV	III	Small mammal fauna, currently found in the Crimea
Insectivora					
Erinaceus europeaus L. – European hedgehog	–	–	–	–	+
Crocidura leucodon Herm. – white-toothed shrew	+	+	–	–	+
Crocidura suaveolens Pall – lesser white-toothed shrew	–	–	–	–	+
Sorex minutus L. – pigmy shrew	–	–	–	–	+
Sorex araneus L. – Eurasian common shrew	–	–	–	–	+
Neomys fodiens Pennant – Eurasian water shrew	–	–	–	–	+
Lagomorpha					
Lepus europeus Pallas – European hare	–	+	+	–	+
Rodentia					
Sciurus vulgaris L. – red squirrel	–	–	–	–	+
Marmota bobac – bobac marmot	–	+	–	–	–
Spermophilus pygmaeus Pallas – little suslik	+	+	+	–	–
Allactaga major Kerr – Great gerbil	–	–	+	–	–
Spalax microphtalmus Güldenstaedt – Russian mole rat	+	+	–	–	–
Ellobius talpinus Pallas – northern mole-vole	+	+	+	+	+
Dryomys nitedula Pallas – tree dormice	+	–	–	–	–
Sicista subtilis	–	–	–	–	+
Apodemus (Sylvimus) flavicollis Melch. – yellow-necked mouse	+	+	–	–	+
Rattus norvegicus Berc. – common rat	–	–	–	–	+
Rattus rattus L. – roof rat	–	–	–	–	+
Mus musculus L. – house mouse	–	–	–	–	+
Cricetus cricetus L. – common hamster	–	–	–	–	+
Cricetulus (Cricetulus) - migratorius Pallas – grey hamster	+	+	–	–	+
Eolagurus luteus Eversmann – yellow steppe lemming	+	+	+	+	–
Lagurus lagurus Pallas – steppe lemming	+	–	+	–	+
Arvicola terrestris L. – Water vole	+	+	+	+	+
Microtus (Stenocranius) gregalis Pallas – narrow-skull vole	+	–	–	–	–
Microtus (Sumerionys) socialis Pallas – social vole	–	–	–	–	+
Microtus (Microtus) obscurus Eversmann (=*M. arvalis obscurus*) – "obscurus" vole	+	+	+	+	+

Table 3-5 Kabazi II and composition of modern Crimean small mammal species.

Small Mammals from Kabazi II, Unit V

A total of eight species of rodent, one species of insectivore and one lagomorph species have been identified in the material from Unit V (Table 3-2). The ecological preference of the most of these small mammals has been described above. Only one additional species was found in Unit V – bobac marmot *Marmora bobac*. This species inhabits steppes and forest-steppes of plains and low mountains. Its favorable biotopes are the forbs and feather-grass steppes, and it avoids wet areas with a high level of subsoil waters.

The distribution of small mammal remains of different ecological groups in the levels of Unit V (Fig. 3-11) implies that the landscape near the site was dominated by steppe and semi-desert conditions. Such species as yellow steppe lemming *Eolagurus luteus* (Fig. 3-13, *3, 4*; 3-14, *1*; 3-15, *4, 5*; 3-16, *3*), Russian mole rat *Spalax micropthalmus* (Fig. 3-13, *2a, 2b*; 3-15, *2*), northern mole vole *Ellobius talpinus* (Fig. 3-13, *5*; 3-15, *3*; 3-16, *1, 2*), small suslik *Spermophilus pygmaeus* (Fig. 3-15, *1*), grey hamster *Cricetulus migratorius* (Fig. 3-16, *4*), and white-teeth shrew *Crocidura leucodon* (Fig. 3-13, *1*) all belonged to this group. It is interesting that the m1 of an *Ellobius talpinus* from Unit V/1 (Fig. 3-16, *1*) also displays the archaic feature (the "prismatic" angle on the anterior loop) mentioned above. This feature is no longer found in modern northern mole-vole teeth, nor in other Crimean Late Pleistocene *Ellobius* remains, and therefore confirms the antiquity of the fauna from Units V and VI.

Meadow steppes also existed in the vicinity. This is indicated by the strong presence of *Microtus obscurus* (Fig. 3-12, *1, 2, 3, 4*; 3-16, *5, 6*). The bones belonging to water vole *Arvicola terrestris*, found in Level V/5, are also a clear sign that water was also to be found nearby. The remains of yellow-necked mouse in Level V/4 (Fig. 3-14, *2*) would suggest bushed or forested areas.

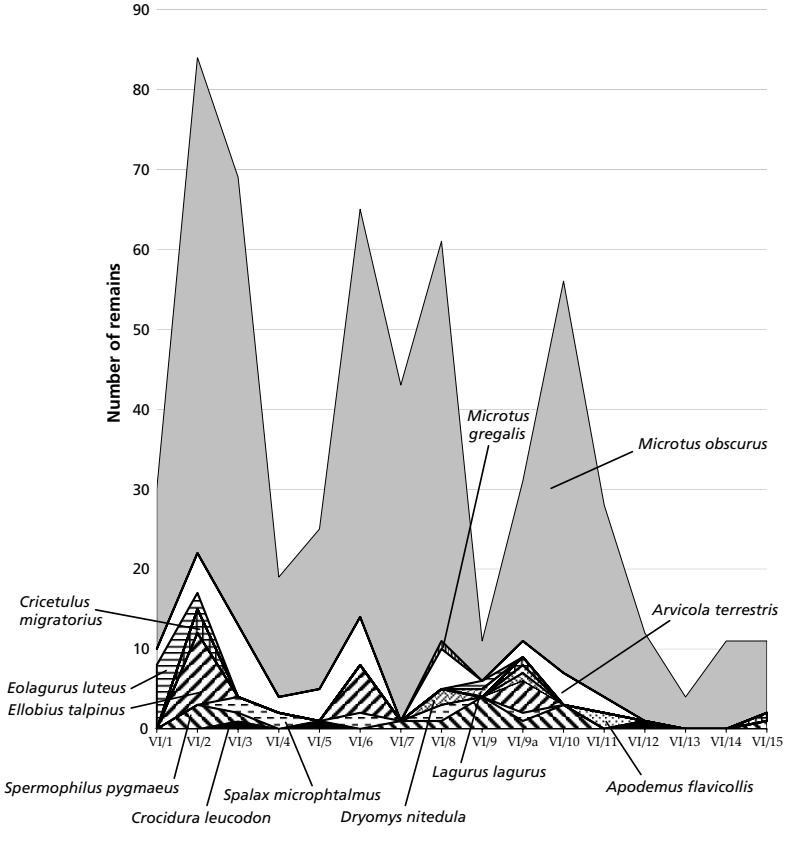

Fig. 3-9 Kabazi II, Unit VI: species composition of small mammals.

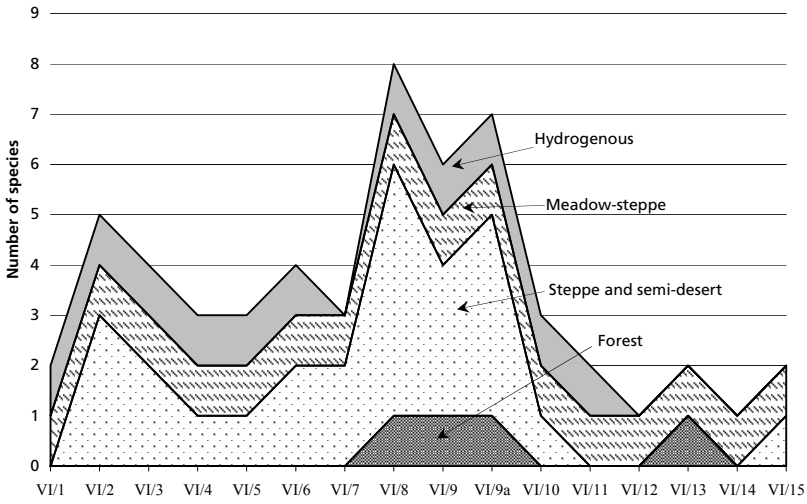

Fig. 3-10 Kabazi II, Unit VI: ecological groups of small mammals.

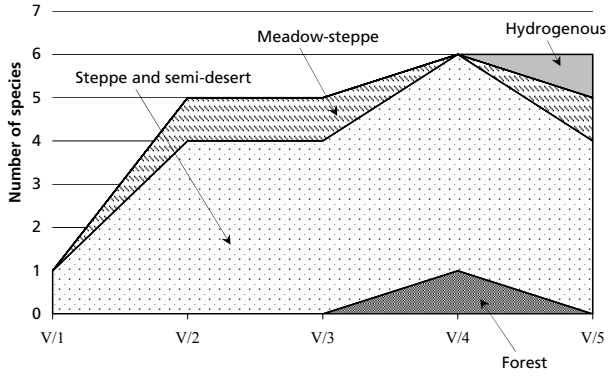

Fig. 3-11 Kabazi II, Unit V: ecological groups of small mammals.

Small Mammals from Kabazi II, Unit IV

More than 400 bones were collected from the three levels of Unit IV, of which a total of 195 were identified on the species taxonomical level. These were assigned to seven small mammal species (Table 3-3).

Most of these species were also found in Units VI and V. Their ecology and modern distribution have been described above, and include *Microtus obscurus* (Fig. 3-17, *2, 3*; 3-19, *4, 5, 6*; 3-20, *4, 5, 6, 7*) *Eolagurus luteus* (Fig. 3-17, *4, 5, 6*; 3-19, *3*; 3-20, *1, 2, 3*); *Ellobius talpinus* (Fig. 3-18, *1, 2, 3*; 3-19, *2*; 3-20, *9, 10*), *Arvicola terrestris* (Fig. 3-20, *8*). Two further species were recovered from Unit IV. The bones of a great jerboa *Allactaga major* were found in Level IV/3 (Fig. 3-19, *1*). This animal is typical for steppe, forest-steppe and semi-deserts; it occurs in the south of the Russian Plain, in the Crimea, and in West Siberia. Steppe lemming *Lagurus lagurus* remains were recovered from Level IV/4 (Fig. 3-17, *1*). The modern habitat of steppe lemming includes steppe, southern forest-steppe and semi-desert. Thus, these two species also indicate open arid landscapes, possibly a steppe. The close ecology has yellow steppe lemming, northern mole-vole, little suslik, and European hare, the remains of which were found in the Unit IV.

Microtus obscurus is indicative of meadow-steppe conditions. Water vole *Arvicola terrestris* shows that water was also to be found near the site. The absence of forest species permits a reconstruction of an arid steppe-like landscape near the site during the formation of Unit IV (Fig. 3-21).

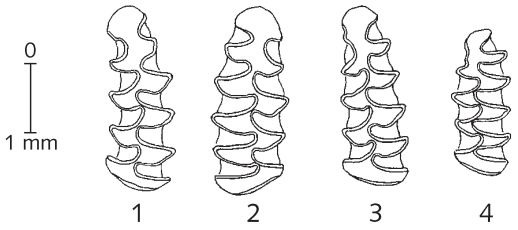

Fig. 3-12 Kabazi II, level V/5: 1, 2, 3, 4 – m1 *Microtus obscurus*; 4 – carries on the juvenile features.

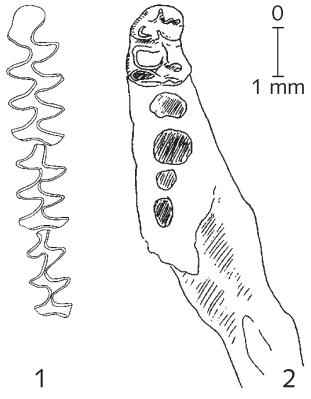

Fig. 3-14 Kabazi II, level V/4: 1 – m1-m3 *Eolagurus luteus*, 2 – lower mandible of *Apodemus flavicollis* with m1.

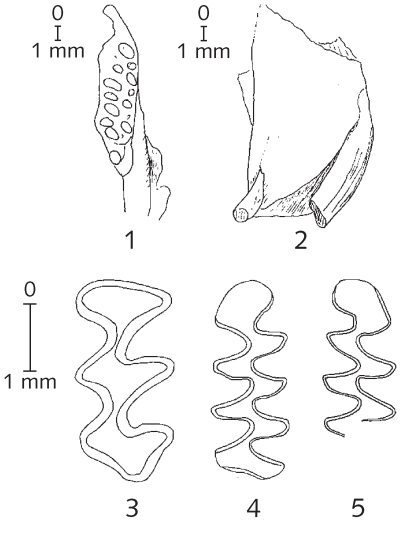

Fig. 3-15 Kabazi II, level V/3: 1 – fragment of maxilla of *Spermophilus pygmaeus*, 2 – fragment of mandible of *Spalax microphtalmus* with incisors, 3 – M1 *Ellobius talpinus*, 4 and 5 – m1 *Eolagurus luteus.*

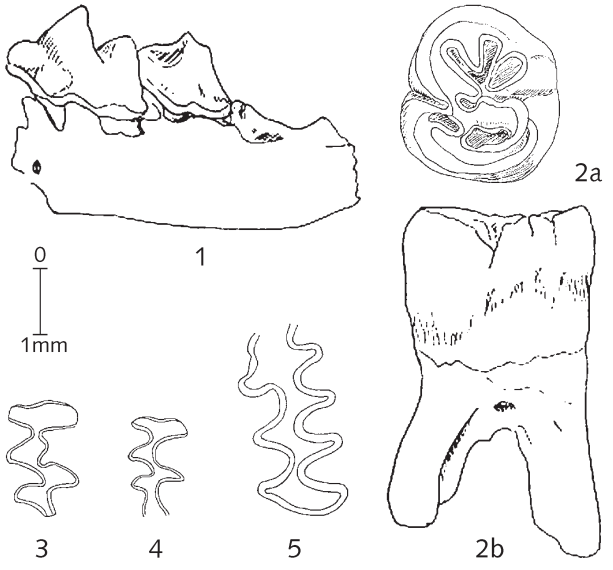

Fig. 3-13 Kabazi II, level V/5: 1 – low mandible with m2-m3 of *Crocidura leucodon*; 2a and 2b – *Spalax microphtalmus*, 3 – M2, 4 – M3 *Eolagurus luteus*, 5 – m1 – *Ellobius talpinus.*

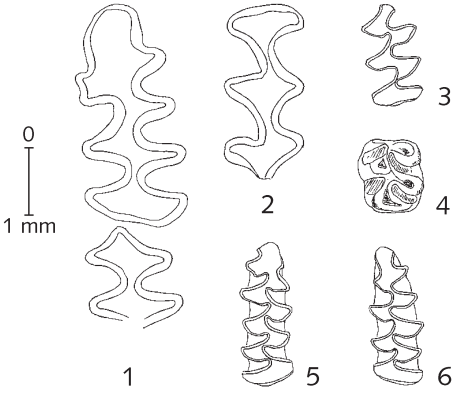

Fig. 3-16 Kabazi II, level V/1: 1 – m1 and m2 (fragment) of *Ellobius ex gr. Talpinus*, 2 – M1 *Ellobius talpinus*, 3 – m2 *Eolagurus luteus*, 4 – *Cricetulus migratorius*, 5 and 6 – m1 *Microtus obscurus.*

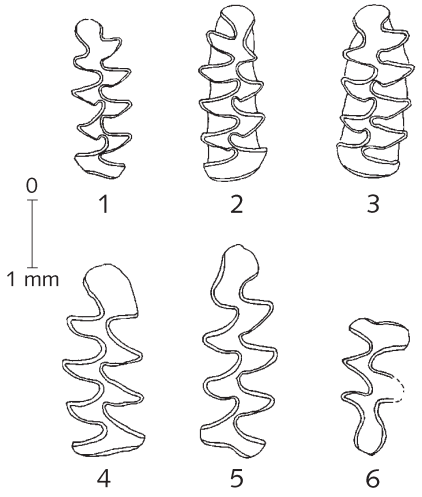

Fig. 3-17 Kabazi II, level IV/4: 1 – m1 *Lagurus lagurus*, 2 and 3 – m1 *Microtus obscurus*, 4 and 5 – m1, 6 – M3 *Eolagurus luteus.*

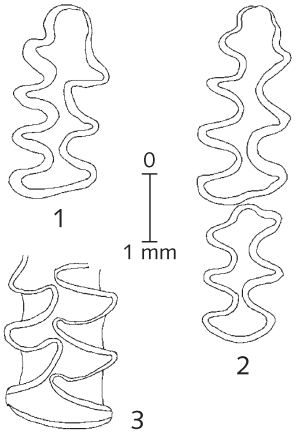

Fig. 3-18 Kabazi II, level IV/4: 1 – m1 *Ellobius talpinus*, 2 – m1 and m2 *Ellobius talpinus*, 3 – m1 *Arvicola terrestris.*

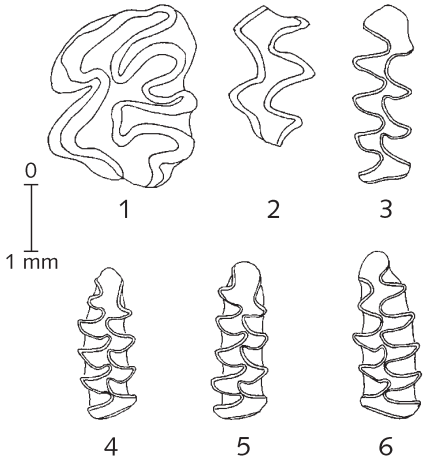

Fig. 3-19 Kabazi II, level IV/3: 1 – M1 *Allactaga major*, 2 – M2 *Ellobius talpinus*, 3 – m1 *Eolagurus luteus*, 4, 5, 6 – m1 *Microtus obscurus.*

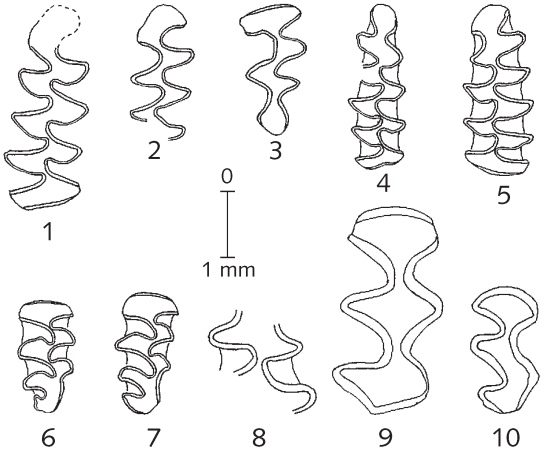

Fig. 3-20 Kabazi II, level IV/2: 1 and 2 – m1 *Eolagurus luteus*, 3 – M3 *Eolagurus luteus*, 4 and 5 – m1 *Microtus obscurus*, 6 and 7 – M3 *Microtus obscurus*, 8 – m1 (fragment) *Arvicola terrestris*, 9 – M1 *Ellobius talpinus*, 10 – M2 *Ellobius talpinus.*

Small Mammals from Unit III

Small mammal remains from Unit III were found only in Level III/8E. The 39 identified bones belong to four different species (Table 3-4).

The northern mole-vole is typical of open arid landscapes (steppes and semi-desert). *Microtus obscurus* occurs in meadow-steppe. Water vole inhabits the banks of rivers and other water reservoir (Fig. 3-22, *1, 2*). Yellow lemmings prefer dry arid landscapes (Fig. 3-22, 3-6).

The ecology of these species would imply that the site was surrounded by an open landscape (Fig. 3-23).

Conclusion

The analysis of the rich bone materials recovered from Units VI, V, IV, and III at Kabazi II has shown that the following environments were prevailing in the vicinity of the site during their deposition. As the majority of small mammals identified from the site are usually found in open environments, open steppe-like landscapes must have been dominant during the formation of all four archaeological units. The concentrations of small mammal remains discovered in the cultural layers are probably associated with the hunting activities of owls, which were nesting in the rocks and rock-shelters. The indirect evidence of the presence of these birds, which hunt small mammals found mostly in open areas, serves to confirm the small mammal composition of the Kabazi II fauna. As owls can have a hunting radius of several kilometres (Gromov 1961), the fauna identified at Kabazi II is most likely indicative of the natural conditions found in a rather wide area around the site, and includes the fauna from the Kabazi questa. This may explain the contradictions in the results of the palynological, malacological and small mammal studies. Whereas the first two methods reflect the natural environment in the immediate vicinity of the site, the analysis of the small mammals allows us to reconstruct the environments prevailing in a radius of several kilometres around the site.

However, the remains of small mammal from Kabazi II also reflect changes in climatic conditions. For example, the mammal remains found in Units VI and V shows that the climate was more moderate and humid than during the deposition of the later layers (Fig. 3-24). During these temporal intervals, forested or bushed areas were located near the site, a fact which is reflected in the finds of forest species. Later, during the deposition of Units IV-III, only steppe, semi-desert, and meadow steppe were to be found. At such times only a few hydrogenous mammals inhabited the local environments.

Today, 15 species of rodent, 6 insectivores and one lagomorphe species are indigenous to the Crimea (Flint et al. 1970; Gromov and Erbaeva 1995). Some of the rodents (*Rattus rattus, R. norvegicus, Ondatra*) only appeared in the Crimea during the Holocene. The red squirrel *Sciurus vulgaris* became acclimatised to the Crimea in the 1940s (Gromov et al. 1963) (Table 3-5).

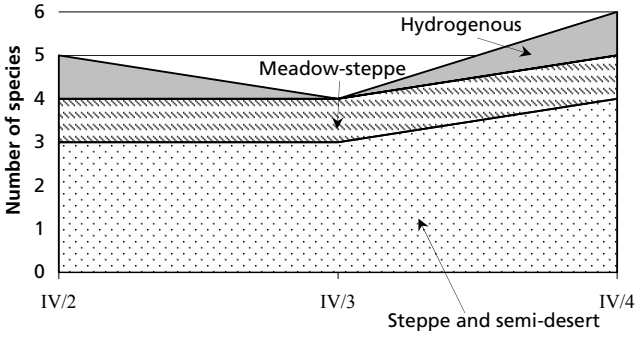

Fig. 3-21 Kabazi II, Unit IV: ecological groups of small mammals.

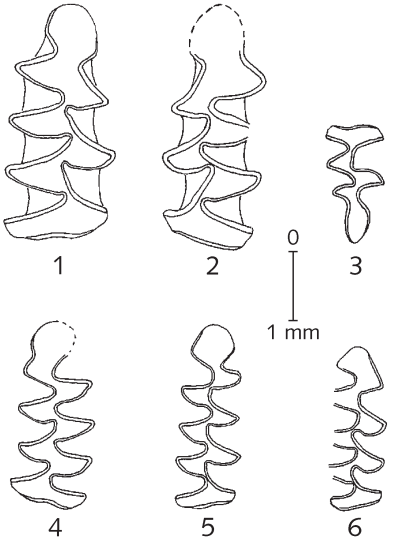

Fig. 3-22 Kabazi II, level III/8E: 1 and 2 – m1 *Arvicola terrestris*, 3 – M3 *Eolagurus luteus*, 4, 5, 6 – m1 *Eolagurus luteus.*

The small mammals, whose remains were found in the layers of Kabazi II, include 13 rodents, 1 lagomorphe and one insectivore. The large list of rodents found in Kabazi II probably includes most of the rodentia which inhabited this region during the Mikulino Interglacial. The diversity of small mammals from Kabazi II is comparable to the modern situation, though the composition has changed greatly (Table 3-5).

Some of the species identified have now disappeared from this region: Yellow steppe lemming is now found only in parts of Mongolia, China, and the Zaisan Depression. Narrow-skulled vole, which was very common during the Pleistocene on the Russian Plain and in the Crimea, now inhabits the Kazakhstan steppes and the tundra zone. Bobac marmot also disappeared from the Crimea and is now found in the easternmost steppe territories only. Due to the fact that the drop in temperature during the Valdai Glaciation did not inhibit them in any way, these animals were able to survive in the Crimea and on the Russian Plain. The different types of open landscapes, with grass cover, represented the only prerequisite to ensure their survival. The restriction and changes in their distribution only occurred after human impact during the Holocene. The habitat favoured by the modern Russian vole rat does not include the Crimea, and the remains of this animal were not found at the Crimean Middle Palaeolithic sites Kabazi V, Starosele, Chokurcha I, Karabi Tamchin, and Buran Kaya III. All mentioned sites correlate with later periods of the Late Pleistocene, and only Units VI-IV at Kabazi II correspond to the Mikulino Interglacial. Therefore, we can conclude that Russian mole rat (which prefers regions with rich soils and grass cover) was only common during the Mikulino Interglacial and then disappeared from the Crimea during the first part of Valdai glaciation, which was characterised by more arid conditions.

According to the dates from the U-series, ESR, and LU methods, the Units VI, V and IV at Kabazi II were formed before the first large-scale Late Pleistocene glaciation of the Eurasian Arctic (Chabai et al. 2004). This first stage of the Valdai / Weichselian glaciation has been dated to 90,000 years ago (OIS-5b) and occurred in Scandinavia and Svalbard (Siegert et al. 2001). Figure 25 shows a curve depicting climate change from the Eemian / Mikulino Interglacial (OIS-5e) until the end of the Valdai / Weichselian Glaciation, as recorded by δ18O records (Mangerud 1989).

If the date for Unit III of between 117 – 81 ka is reliable (see Chapters 1 and 2 for a more detailed discussion), this means that Unit III possibly corresponds to OIS stages -5a – 5d (to the early phase of the last glaciation). This long interval is characterised by noticeable climatic change with several interstadials (Herning correlated with 5d; Amersfoort and Brørupt with 5c) with cool stadial periods. The most pronounced cold period falls in OIS 5b (Siegert et al. 2001; Van Andel and Tzedakis 1996) (Fig. 3-25; 3-26). In this period the World Ocean level was ~50 m lower) (Van Andel and Tzedakis 1996). Therefore, at this time the connection between the Crimean Peninsular and the Russian Plain was significantly more intense than in modern times.

Units VI-V are assigned to the Mikulino / Eem Interglacial (Chabai 2003b; Gerasimenko 1999; Gerasimenko, this volume). In this interval, the Crimean Peninsula was further separated from Eastern Europe, the sea-level in the Karangat Basin of the Black Sea being 5-7 m higher than in modern

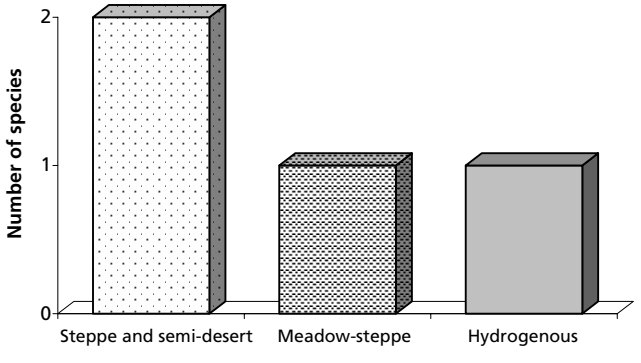

Fig. 3-23 Kabazi II, level III/8E: ecological groups of small mammals.

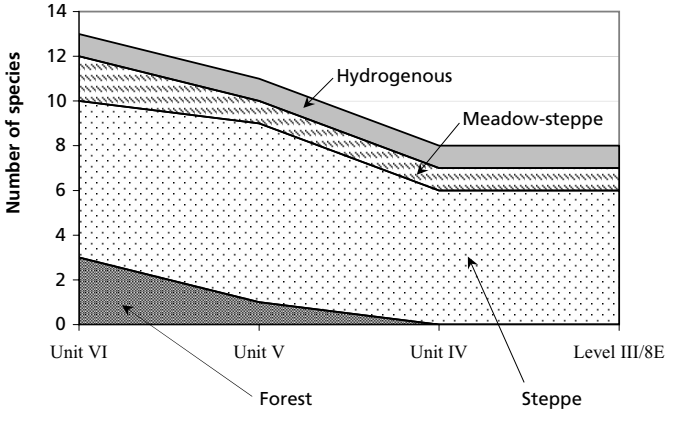

Fig. 3-24 Kabazi II, Units VI, V, IV and level III/8E: ecological groups of small mammals.

times (Chepalyga 2002). However, the species composition of small mammals from Units VI – IV does not differ significantly from those at other Crimean Middle Palaeolithic sites dated to later intervals. The core of small mammal faunas from all of these sites (Kabazi V, Starosele, Buran-Kaya III, Chokurcha I, Karabi-Tamchin) also include open landscape mammals (ground squirrel, northern mole-vole, steppe and yellow lemmings, narrow-skulled vole, "obscurus" vole and others). Boreal and cold-adapted animals were not found as well as in Mikulino layers of Kabazi II (what is understandable), so in later layers of mentioned-above sites, corresponding to the different stages of Valdai glaciation. This fact could be explained by the southern position of the Crimea. The remains of a number of forest mammals recovered from Units VI and V show that numerous local environments found in these low mountains provided habitats for mammals from different ecological groups.

The climatic changes, influenced by the Scandinavian ice-sheet, were smoothed in this region and provided ancient humans with comfortable and rather stable conditions. Forested and bushed areas were distributed in the Crimea, but they alternated with open landscapes which were also very common here during different phases of Mikulino Interglacial, as well during Valdai time.

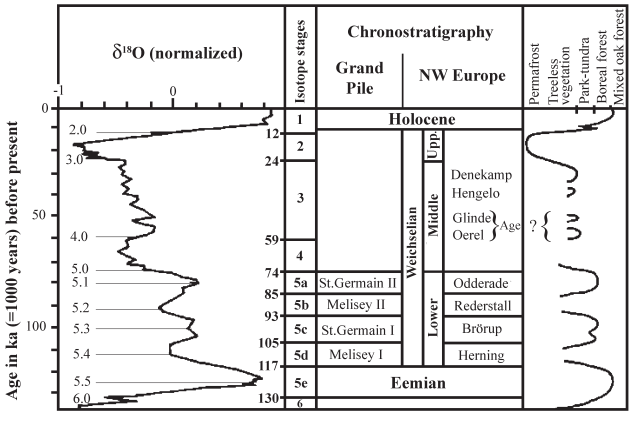

Fig. 3-25 A correlation chart for the deep sea oxygen stratigraphy and the continental stratigraphy in Europe, to the right a curve of environmental changes in Germany/Netherlands (after Mangerud, 1989).

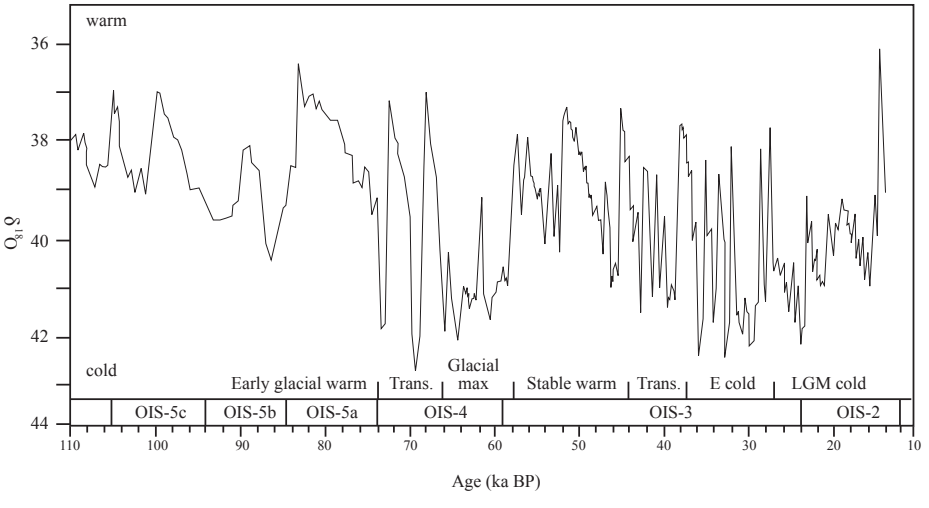

Fig. 3-26 The climatic changes of the Weichselian Glaciation recorded by the δ18O record of the GISP2 Greenland ice-core (Meese et al., 1997; Johnsen et al., 2001; Stuiver & Grootes 2000).

Abstract

ФАУНА МЕЛКИХ МЛЕКОПИТАЮЩИХ КАБАЗИ II, ЗАПАДНЫЙ КРЫМ

А. К. МАРКОВА

Во время раскопок Кабази II в 2000-2001 гг. получен богатый остеологический материал ископаемых мелких млекопитающих (Rodentia, Lagomorpha, Insectivora), включающий около тысячи остатков, определимых до видового уровня. Концентрация остатков мелких млекопитающих в отложениях стоянки связана с охотничьей деятельностью хищных птиц, прежде всего сов, которые охотятся в радиусе нескольких километров. Таким образом, видовой состав мелких млекопитающих позволяет реконструировать окружающие ландшафты достаточно обширной территории вокруг стоянки.

Видовое богатство мелких млекопитающих, обнаруженных в Кабази II, сравнимо с современным видовым богатством микротериофауны Крыма. Однако их видовой состав существенно изменился. Ряд видов, обнаруженных в Кабази II –желтая пеструшка, узкочерепная полевка, байбак, обыкновенный слепыш – полностью исчезли с крымского полуострова. С другой стороны в современной фауне Крыма присутствуют голоценовые вселенцы.

На протяжении формирования слоев Кабази II, судя по микротериологическим данным, вблизи стоянки преобладали открытые ландшафты. Во всех слоях превалируют остатки степных, луговых и даже полупустынных млекопитающих, остатки холодолюбивых видов отсутствуют. Однако некоторые изменения природной среды во время существования древнего человека удается зафиксировать. Фауна мелких млекопитающих наиболее древних культурно-хронологических слоев VI и V дает представление о некоторой облесенности территории вблизи стоянки и включает остатки ряда лесных животных. Фауна из культурно-хронологических слоев IV и III содержит остатки лишь степных, полупустынных и луговых видов. Такие изменения видового состава отражают, вероятно, климатические изменения – переход от условий микулинского межледниковья – к более аридным условиям начала валдайской ледниковой эпохи.

В целом фауна мелких млекопитающих, обнаруженная в культурных слоях Кабази II, позволяет говорить о слабом влиянии Скандинавского ледникового щита, о существовании достаточно стабильных климатических и ландшафтных условий на Крымском полуострове, что определяется его южным географическим положением. Эта стабильность являлась благоприятным фактором для существования древнего человека, как в период микулинского межледниковья, так и в более позднее время, относящееся к началу валдайского оледенения.

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НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК УКРАИНЫ
ИНСТИТУТ АРХЕОЛОГИИ
КРЫМСКИЙ ФИЛИАЛ

КЁЛЬНСКИЙ УНИВЕРСИТЕТ
ИНСТИТУТ ДО- И ПРОТОИСТОРИИ

Палеолитические стоянки Крыма,
Том 1

КАБАЗИ II:
ПРИРОДА И ЧЕЛОВЕК ВРЕМЕНИ ПОСЛЕДНЕГО ИНТЕРГЛЯЦИАЛА

Редакторы:
В. П. ЧАБАЙ, Ю. РИХТЕР, Т. УТМАЙЕР

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Chapter 4

Snail Fauna from Kabazi II

Constantine Mikhailesku

During the excavations at Kabazi II between 1986 and 2001, shells from fossilised snails and freshwater molluscs were recovered. The principal task of the palaeontological investigations of the freshwater and snail fauna is to establish a species composition of mollusc assemblages from each cultural level, as well as to reveal changes and to elucidate the characteristics of the palaeoenvironments surrounding the sites as related to climatic fluctuations. The archaeologists responsible for this site, Drs. V. Chabai, A. Yevtushenko, Yu. Demidenko and A. Veselsky, ensured samples of snails for this study, and I would like to extend my sincere thanks to them for the very hard and accurate work in sample collecting.

During excavations, traditional methods of sample selection were applied. The methods of sampling and the principal ecological groups of Western Crimean Snails, as well as the environmental and morphometrical parameters of the identified species, are described in Chapter 5 of "The Middle Palaeolithic of Western Crimea, Vol. 2" (Mikhailesku, 1999). Additionally, for the identification of the fossil snails and mollusc fauna, descriptions from the following guides were used: I. I. Pusanov (1925, 1926, 1927); V. Lozek (1946); I. M. Likharev and E. S. Rammelmeier (1952); L. A. Nevesskaya (1965); N. N. Akramovski (1976); J. J. Puissegur (1976); Ya. I. Starobogatov & L. A. Kutikov (1977); A. A. Shileico (1978); N. A. Golikov and O. G. Kusakin (1978); V. M. Motuz (1982) and A. V. Grossu (1955, 1981, 1983).

Ecology Of Snails And Methodology Of The Palaeoenvironmental Reconstructions

Snails and fresh water molluscs are mainly sedentary and display very large distributions in diverse types of landscapes. As a rule, the shells of fossil snails and fresh water molluscs are well preserved in sediments (especially in dry areas). For this reason, they are a suitable material for stratigraphical correlations and environmental reconstructions. The distribution of snail fauna associations, as well as the specific composition of each faunal assemblage, closely reflect the local climatic and environmental conditions of its life area. Such particularities have led to an appreciation of their significance for palaeoenvironmental reconstructions and the elucidation of major climatic changes during the Quaternary.

The main environmental factors that determine snail fauna distribution are:

1. Weather and climatic conditions, usually reflected by the average values of the main para-meters: air temperature, atmospheric pressure, precipitation, humidity, predominant direction of the wind, and other meteorological factors.
2. Type of vegetation: as the main source of snail food, an indispensable factor of their life area.
3. Type of relief, type of the soil, and the composition (lithology) of the rocks are also important, especially for the distribution of rocky and soil snail assemblages. Very favourable conditions for such assemblages are the calcareous soils which predominate on the Crimean Peninsula. These soils have a porous structure and contain the main useful elements for cockleshell construction and snail nutrition.
4. Presence of a water source: an indispensable condition for the distribution of some groups of snails, especially for the hydrophiles and rocky and soil species.

A more detailed description of the ecology of Crimean snails and their ecological classification is published in Mikhailesku (1999, pp. 99-114). For the palaeoenvironmental reconstructions, I follow the ecological classification made by the French researcher Jean-Jaques Puissegur (1976, p. 16), who classifies the distribution of fresh water molluscs and snail assemblages according to the main types of vegetation and landscapes. According to this classification, the Crimean species may be attributed to the following seven ecological groups.

I. Fresh water fauna: *Valvata piscinalis, Limnaeapygmaea, Pisidium casertanum, Theodoxus fluviatilis, Theodoxus transversalis, Lithoglyphus naticoides.*

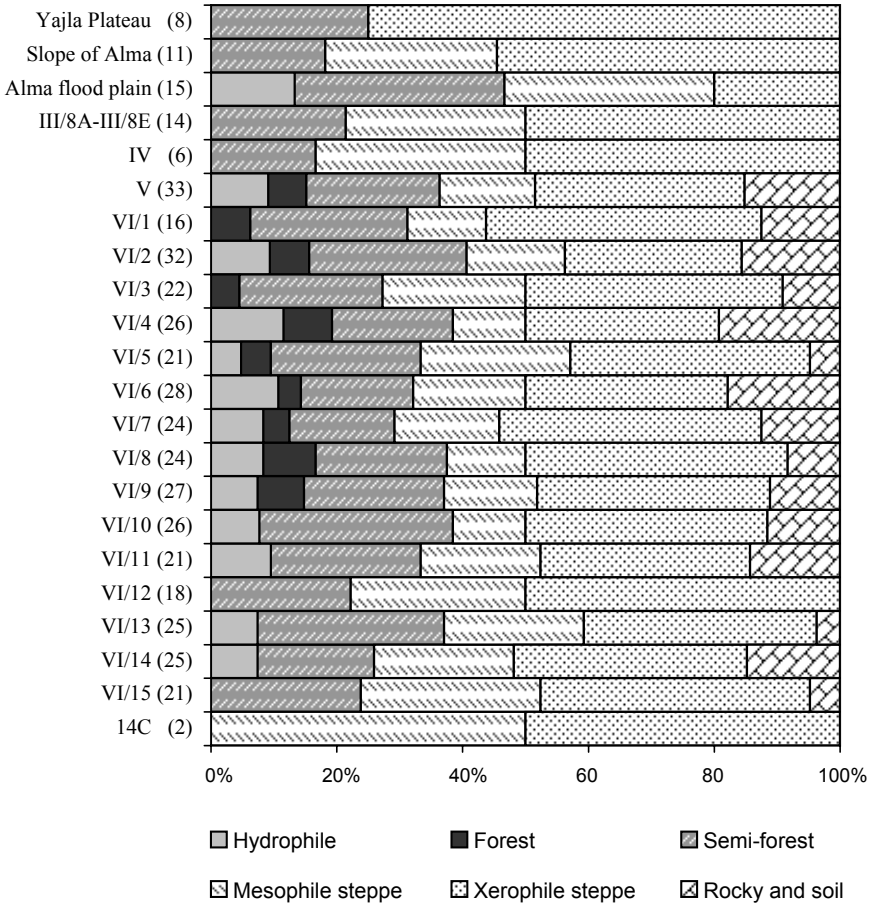

Fig. 4-1 Kabazi II, level III/8, Units IV, V, VI, Strata 14C, modern Alma flood plaine, slope of Kabazi cuesta and Yajla plateau: cumulative percentages of shells of modern and fossil snails.

II. Hydrophile fauna: *Vallonia pulchella, Vallonia costata, Columella edentula, Cochilicopa lubrica, Succinea elegans, Carichium minimum*
III. Fauna of humid forest areas: *Acantinula aculeate, Vitrea diaphana, Vitrea iphigeniae, Eucomulus fulvus, Punctum pygmaeum, Columella columella, Retinella radiatula.*
IV. Fauna of semi-forest areas: *Clausilia gracilicosta, Clausilia canalifera, Clausilia laminata, Oxychillus deilus, Oxchyllus diaphanelus, Vitrea pygmaea, Vitrea subeffusa.*
V. Fauna of mesophitic (meadow) steppes with small trees, bushes & shrubs: *Helix lucorum taurica, Helix vulgaris, Theba carthusiana, Zebrina cylindricus, Chondrula tridens, Chondrula tetrodon.*
VI. Fauna of xerophitic steppes (xerotermic): *Helicella dejecta, Helicella striata, Helicella gireiorum, Helicella Retowski, Helicella filimargo, Helicella Krinickii, Zebrina subulata, Chondrus bidens, Truncatellina cylindrical, Truncatellina costulata.*
VII. Rocky and soil fauna: *Caecilioides acicula, Caecilioides raddei, Pyramidula rupestris, Pupilla muscorum, Pupila gallae.*

The ecological distribution presented above was used in turn to compose diagrams showing the ecological niches of snails in modern samples and in the archaeological levels at Kabazi II (Fig. 4-1 and 4-2). Using these diagrams, I have attempted to show the main changes in the ecological composition of the investigated samples on both an individual- and specimen-level. This allows the reconstruction of the main environmental fluctuations caused mainly by climatic changes. Some snails are ecologically specialised and occur only in certain habitats. This group includes most hydrophilic species and some rocky and soils species, which are dependent mostly on the presence of a water source and have an intrazonal distribution.

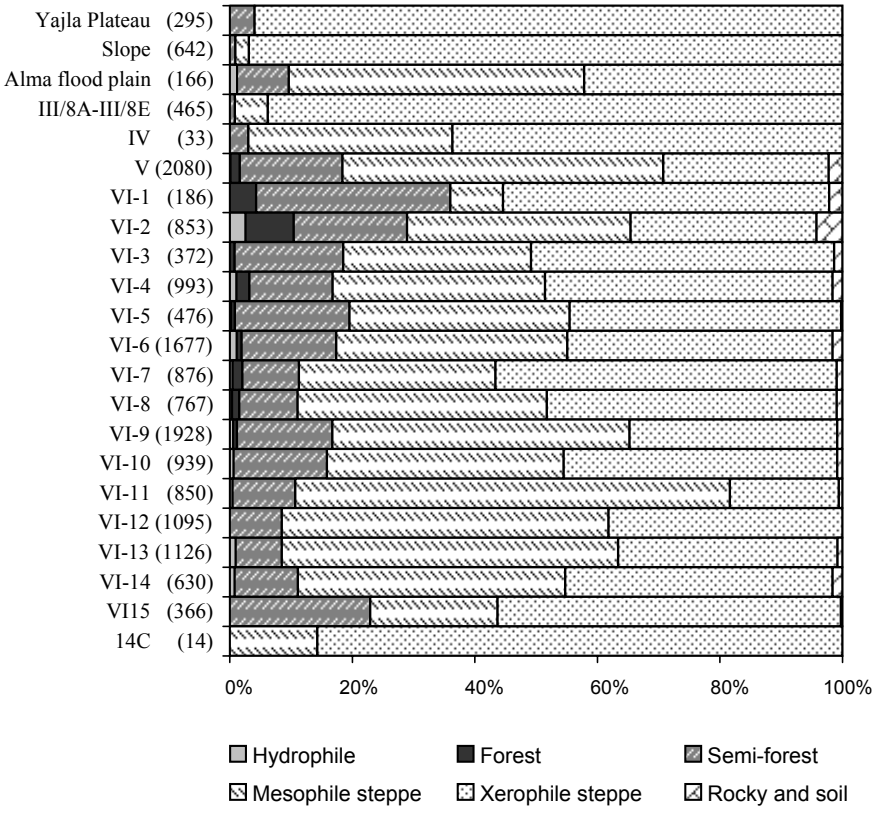

Fig. 4-2 Kabazi II, level III/8, Units IV, V, VI, Strata 14C, modern Alma flood plaine, slope of Kabazi cuesta and Yajla plateau: cumulative percentages of specimens of modern and fossil snails.

Kabazi II Snail Assemblages

The fossil snail fauna from the lower part of the Kabazi II section is both diverse and numerous. The samples collected during the excavations in 2000/2001 alone, comprise 16,814 shells, appertaining to 35 species belonging to seven ecological groups (Table 4-1, Fig. 4-1 and 4-2).

Strata 11 (lower part), 13, 14A, 14B and 14C contain 19 comparable complexes of snail fauna which correspond to the main archaeological units and levels. Thus, these snail assemblages represent all investigated cultural bearing deposits of the lower part of the Kabazi II sediments. In an earlier publication, 21 samples from the sondage, and 3 samples of the modern fauna collected from different landscapes around the site were also described (Mikhailesku 1999).

The following analysis begins with the oldest assemblage, which corresponds to Stratum 14C. The description of archaeological units at Kabazi II and their subdivision into levels can be found in Chapter 1 of this volume.

At the time of sedimentation of the upper part of Stratum 14C, only a steppe snail fauna was present at the site. *Helix (Helicogena) lucorum taurica* (2) and *Chondrus bidens* (12) serve as good indicators of relatively humid and warm climatic conditions, characteristic of meadow and xerophytes steppes. The sample is very poor and homogenous; involving only 14 shells of the two species mentioned. Therefore, it is not definite whether this small

Species/Units	Ecological groups	III/8	IV	V	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7	VI/8	VI/9
Vallonia pulchella (Mull.)	Hydrophile	–	–	1	–	5	–	2	1	4	2	–	6
Vallonia costata (Mull.)	Hydrophile	–	–	1	–	8	–	3	–	8	2	1	5
Columella edentula (Drap.)	Hydrophile	–	–	1	–	9	–	6	–	7	–	2	–
Euconulus fulvus Mull.	Forest areas	–	–	1	–	3	–	2	–	–	–	2	–
Punctum pygmaeum (Drap.)	Forest areas	–	–	30	8	64	3	19	3	14	14	7	12
Theba fruticola (Kryn.)	Semiforest areas	–	–	–	–	1	–	–	–	–	–	–	2
Oxychillus (Schistophalus) deilus (B.)	Semiforest areas	–	–	3	–	1	–	–	–	–	–	–	–
O. (Oxichillus) diaphanellus (Kryn.)	Semiforest areas	–	–	14	–	1	–	–	–	–	–	–	–
Vitrea pygmaea Bttg.	Semiforest areas	–	–	10	2	17	4	28	5	16	5	7	10
Vitrea subeffusa Bttg.	Semiforest areas	–	–	5	–	6	1	7	3	6	–	1	2
Clausilia (Mentissa) gracilicosta Rssm.	Semiforest areas	1	–	47	3	14	3	7	4	7	10	1	34
Cl. (M.) canalifera Rssm.	Semiforest areas	2	1	240	42	107	42	85	59	180	60	54	237
Clausilia (Mentissa) sp.	Semiforest areas	1	–	30	12	11	16	8	18	50	6	10	15
Chondrula tridens Mull.	Mesophile steppe	1	–	2	–	6	5	3	1	1	1	–	1
Ch. tetrodon (Mort.)	Mesophile steppe	11	–	3	5	–	3	–	1	1	–	–	–
Helix (Helicogena) lucorum taurica (Kryn.)	Mesophile steppe	7	9	954	11	275	95	335	148	592	258	296	892
H. (H.) vulgaris Rssm.	Mesophile steppe	6	2	126	–	24	5	6	19	36	17	15	37
Theba carthusiana Mull	Mesophile steppe	–	–	–	–	2	–	–	–	2	–	1	5
Zebrina (Buliminus) cylindrica Menke.	Mesophile steppe	–	–	4	–	4	6	–	2	–	5	–	–
Zebrina (Buliminus) subulata (Rssm.)	Xerophile steppe	–	–	1	–	–	–	–	–	–	–	–	–
Helicella (Helicopsis) dejecta Cr. et J.	Xerophile steppe	78	–	74	18	27	28	35	36	69	43	33	50
H. (H.) striata (Mull.)	Xerophile steppe	158	3	48	9	31	21	26	23	18	47	24	19
H. (H.) gireorum Lindh.	Xerophile steppe	2	–	2	–	–	1	–	–	–	2	1	1
H. (H.) retowski Clessin.	Xerophile steppe	8	–	5	–	1	2	–	–	1	4	4	4
H. (Xeropicta) krynickii (Kryn.)	Xerophile steppe	166	9	82	26	28	39	12	21	42	48	46	40
Truncatellina cylindrica costigrella Lindh.	Xerophile steppe	–	–	112	18	114	2	43	7	42	14	33	33
T. costulata (Nilss.)	Xerophile steppe	–	–	16	–	22		14	2	9	2	12	8
Chondrus (Buliminus) bidens (Kryn.)	Xerophile steppe	17	9	185	2	30	53	74	84	257	224	96	280
Ch. (B.) bidens natio pygmaea (Kryn.)	Xerophile steppe	7	–	18	16	4	32	193	31	138	77	51	116
Ch. (B.) bidens attenuatus Kryn.	Xerophile steppe	–	–	18	10	2	6	69	7	150	27	63	103
Pyramidula rupestris (Drap.)	Rocky and soil	–	–	9	–	25	2	7	–	10	3	5	5
Caecilioides acicula nodosaria Bttg.	Rocky and soil	–	–	11	1	3	–	1	–	2	4	–	–
C. raddei (Bttg.)	Rocky and soil	–	–	12	–	4	–	3	–	2	–	–	–
Pupilla gallae Tzv.	Rocky and soil	–	–	12	–	2	–	2	–	4	–	–	2
P. muscorum L.	Rocky and soil	–	–	3	3	2	3	3	1	9	1	2	9
Total number of shells:		**465**	**33**	**2080**	**186**	**853**	**372**	**993**	**476**	**1677**	**876**	**767**	**1928**

Table 4-1 Kabazi II, level III/8, Units IV, V, VI, Stratum 14C fossil snails and modern snails from the Yajla Plateau, the Kabazi questa slope and Alma flood plaine.

sample accurately represents the prevailing climatical conditions specific to Strata 14C.

Stratum 14B contains archaeological Unit VI. In comparison to the fauna from Stratum 14C, and to that observed in the vicinity of the site today, the snail fauna from this Unit is much more diverse and abundant. It involves 13,134 shells, representing 35 species from 6 ecological groups (Table 4-1). Unit VI is subdivided into 15 levels, each of which is represented by a separate sample. As the fauna from each level is very reach and diverse, each sample will be described separately.

The snail fauna from Level VI/15 comprises 366 shells, representing 25 species. Of these, 5 species are characteristic of semi-forest areas, 6 of mesophytic steppe, and 9 of xerophytic steppe. One further species is typical of faunas found in rocky and soily conditions. As may be observed in the diagrams, on an individual level, the snails belonging to the xerophytes steppe fauna dominate. These constitute about 60% of the total number of shells. The remaining 40% comprises roughly equal numbers of snails belonging to semi-forest and mesophytic steppe faunas. The rocky and soil inhabitants are represented by only one cockleshell from *Pyramidula rupestris*. The absence of hydrophytes and forest species is a clear indication that warm and dry conditions were prevalent, a fact which is also confirmed by the abundance and large diversity of xerophile forms.

VI/10	VI/11	VI/12	VI/13	VI/14	VI/15	14C	Yajla plato	Kabazi slope	Alma flood plaine
4	3	–	3	2	–	–	–	–	1
2	1	–	8	3	–	–	–	–	1
–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–
1	–	1	1	1	3	–	11	2	6
1	–	–	2	–	–	–	–	4	1
1	–	–	7	–	–	–	1	–	3
2	5	–	23	6	2	–	–	–	2
3	4	–	7	–	–	–	–	–	–
25	28	9	5	20	3	–	–	–	–
87	46	65	36	36	68	–	–	–	2
23	4	18	4	2	8	–	–	–	–
–	–	5	5	6	2	–	–	1	–
–	–	6	2	1	2	–	–	1	3
345	579	534	552	229	48	2	–	–	21
16	19	21	36	24	9	–	–	–	12
2	2	–	4	6	12	–	–	–	18
–	3	18	19	9	3	–	–	12	26
–	–	3	13	–	–	–	–	–	–
72	4	54	44	28	18	–	6	223	–
27	–	23	27	16	17	–	–	–	–
2	–	1	–	2	–	–	–	5	22
4	–	5	4	5	4	–	24	16	32
94	6	65	32	32	24	–	2	102	–
7	16	–	112	53	7	–	–	–	–
32	8	–	16	24	2	–	–	–	–
128	83	133	67	58	92	12	243	272	16
32	5	92	18	23	37	–	6	4	–
21	29	42	70	34	4	–	2	–	–
1	3	–	–	5	1	–	–	–	–
–	–	–	–	–	–	–	–	–	–
–	–	–	–	1	–	–	–	–	–
2	1	–	–	1	–	–	–	–	–
5	1	–	9	3	–	–	–	–	–
939	**850**	**1095**	**1126**	**630**	**366**	**14**	**295**	**642**	**166**

Table 4-1 continued

Evidently more humid conditions were prevailing during the sedimentation of level VI/14. At this time, the fauna became more diverse and numerous (630 shells). Two species of hydrophytes (*Vallonia pulchella and Vallonia costata*) appear, and there is a significant increase in the diversity of rocky and soil inhabitants (4 species). An increased humidity is also suggested by the predominance of mesophytic *Helix lucorum taurica* (229 shells), and by the general decrease in the number of xerophytes, which now only constitute about 30% of the total number of species. These changes indicate that the climate had become more humid, and that trees and bushes had appeared near the site. An increased diversity of rocky and soil inhabitants may indicate that the ground-water level had at this time risen very close to the surface. There was probably a temporal spring in the vicinity, because such species as *Caecilioides raddei* prefer the calcareous humid soils found near fresh water sources.

The sample from Level VI/13 is extremely large, containing 1126 snail shells from 25 species and 5 ecological groups. As in the previous sample, the mesophytic *Helix lucorum taurica* predominate, representing about 45% (522) of the total number of shells. Despite the fact that this sample contained fewer shells belonging to semi-forest inhabitants, the diversity of this type of fauna clearly increases. On the specimen level they represent about 30% of the total number of species. Both these facts serve as reliable indicators that meadow steppes and semi-forest areas predominated during the sedimentation of this level. An increasing number of hydrophytes, semi-forest-, and mesophytic forms probably means that climatic conditions were much more favourable than in the previous horizon.

The sample taken from Level VI/12 shows an increasing number of steppe xerophyte forms, e.g., *Helicella dejecta, H. striata, H. retowski, H. krynicki* and *Chondrus bidens*. As may be observed from the diagrams (see Fig .1-2), the xerophytes now constitute roughly 50% of the total number of species, and

about 40% of the total number of shells. The hydrophytes disappear, and the diversity of semi-forest forms decreases significantly. Such a composition indicates that - at the time of sedimentation - steppe landscapes and dry climatic conditions predominated. Both the smaller dimensions of *Helicella*, and the dominance of small and very thin *Chondrus* (*Buliminus*) *bidens natio atteenuatus*, show that the climate was drier and colder than at present. Furthermore, both rocky and soil fauna disappear completely, a sure sign that the ground-water level had dropped.

The sample from Level VI/11 involves 850 shells, assigned to 21 species from 5 ecological groups. This sample is much more diverse than the previous one, and contains two species of hydrophytes and 3 species of rocky and soil fauna. The number of Xerophytic forms decreases, which implies that there was an increase in semi-forest type areas. On the individual level, the inhabitants of meadow steppes predominate: *Helix lucorum taurica* (579 shells). The general composition of fauna indicates that the climatic conditions had now become much more humid and favoured a meadow steppe with bushes and small trees. The presence of both hydrophytes and of a rocky and soil fauna indicate that either a water source or humid conditions were to be found close to the site.

The same kind of fauna was still predominant during the sedimentation of Level VI/10. This sample comprises 939 shells from 26 species, representing 5 ecological groups of snails. Semi-forest and xerophyte steppe assemblages are very diverse on the specimen level, more so than in the previous sample. The same type of meadow and xerophyte steppes with small areas of bushes and small trees probably predominated. In fact, the climatic conditions may have been a little more favourable than during the deposition of the previous level. This may be indicated by a slightly increased number of hydrophytes, semi-forest and rocky and soil forms. The large diversity of *Clausiliidae* and *Vitrinidae* serve as good indicators of shrubs and bushes in the adjacent areas. This is confirmed by a few shells of *Oxichillus deillus, Oxichillus diaphanellus* and *Theba fruticola.*

Similar, relatively humid and warm conditions persisted during Level VI/9. This sample is, however, much larger, and consists of 1928 shells comprising 27 specimens from the same 6 ecological groups. New to this sample is the forest inhabitant -*Punctum pygmaeum* (12 shells) , and – in comparison to the previous level - there is a slight increase (from 40% to 47%) in the ratio of meadow steppe inhabitants. The number of steppic xerophyte and semi-forest inhabitants remains more or less constant, and constitutes 35% and 15% of the assemblage respectively (Fig. 4-1 and 4-2).

The sample from Level VI/8 is evidently smaller and more homogenous. It encompasses 767 shells from 24 specimens belonging to 6 ecological groups. The number and ratio of snails from this level differs only slightly from the previous sample. The inhabitants of open, steppe landscapes still predominate, and constitute about 90% of the total number of shells. The climate had become slightly colder as only a few shells of *Columella edentula, Euconulus fulvus* and *Vallonia costata* were found in this horizon. These forms prefer relatively humid conditions found in forest and semi-forest landscapes.

The sample from Level VI/7 involves 876 shells, representing 24 specimens and 6 ecological groups. Although the same kind of open landscapes characteristic of the previous layer still predominated, the climate had probably turned slightly drier. Only one of the forest species identified in the previous layer is still present in this sample. Furthermore, there was a continual increase in the ratio of xerophytes (55%).

The sample from Level VI/6 is both very large and representative. It involves 1677 shells and 28 specimens. Although the number of xerophyte specimens remains high (30%), there is an evident increase in the number of hydrophytes (10%), semi-forest (20%), mesophyte (20%) and rocky and soil species (18%). Characteristic for this sample are the extended number of hydrophytes and rocky and soil assemblages. The composition of this assemblage is indicative of warmer and more humid conditions than those presently prevailing.

The fauna from Level VI/5 is less diverse (21 species) and less numerous (476 shells), though the same ecological groups of snails still predominate. In comparison to the previous sample there is, however, an increase in the total amount of steppe forms, and a slight decrease in the number of rocky and soil, hydrophile and forest inhabitants. These changes in the snail fauna composition suggest a slight aridisation and degradation of the climatic conditions.

The sample VI/4 is much more diverse (26) and numerous (993). At the specimens level there occurs an evident increase in the diversity of hydrophile, forest, and rocky / soil forms. Although the steppe inhabitants still predominate on the individual level, the climatic conditions of this level would appear to be more humid in comparison to those previous.

A renewed deterioration of climatic conditions, accompanied with the extension of steppe forms can be observed in the sample from Level VI/3. At this time, the number of hydrophiles, forest and rocky / soil inhabitants drops. The situation described above

is also confirmed by the increased homogeneity of the snail assemblage and the decrease in the total number of shells in the sample (372).

Very favourable climatic conditions persisted during the deposition of Level VI/2. This is reflected in the greater diversity (32 specimens) and abundance (853 shells) of the fauna from this sample. The amount of xerophytes evidently diminishes, and there is an increase in the number of hydrophiles, forest, semi-forest and rocky / soil types. This snail complex would appear to be of an interglacial type, and is indicative of climatic conditions which are more humid and warmer than those currently prevailing.

Relatively dry and slightly worsening climatic conditions were prevailing during the sedimentation of Level VI/1. This is indicated by an increase in the number of xerophytes, which now constitute about 45% of the assemblage. Nevertheless, there are still high ratios of semi-forest and forest forms. For this reason, I consider that the fauna from this level does not differ very much from that of the previous sample. As such, it may correspond to the end of the very same warm phase encountered in Level VI/2.

The biggest (2080 shells) and most diverse (33 specimens) sample was collected from Unit V, Levels V/3, V/4, V/5 and V/6. There is again a decrease in the number of xerophytes, and an increase in hydrophiles, mesophiles, forest, semi-forest and rocky / soil inhabitants. This sample would appear to be a typical interglacial type assemblage, characterised by humid and very warm climatic conditions. Judging from its composition and morphometrical parameters, this fauna is evidently warmer and older than the fauna from Level 4 at Starosele. Therefore, it may correlate with the very end of the Last Interglacial. A huge number (954) of *Helix lucorum taurica*, which display large morphometrical parameters, would appear to confirm such a conclusion. The large number of *Caecilioides acicula nodosaria, C. raddei, Punctum pygmaeum, Pyramidula rupestris, Pupilla galae* and *P. muscorum* indicate that semi-forest and forest areas were located near the site, and that the ground-water level had risen very close to the surface. As was probably the case during the sedimentation of Level VI/2, these conditions, which were characterised by more humid conditions than at present, led to the reactivation of the spring.

A very small and homogenous sample was collected from Unit IV. It comprises 33 shells belonging to 6 specimens and 3 ecological groups. A total of 97% of shells appertain to mesophile (11) and xerophile (21) steppe-types. Only one shell of a semi-forest inhabitant *Clausilia* was identified. If this sample is complete it gives the impression of a glacial type assemblage, which would denote much drier and colder climatic conditions than at present. Thus, this fauna may correlate to the first cooling phase of the Early Glaciation.

A very similar, relatively dry and moderate fauna was also collected from the lower part of Unit III, Levels III/8A to III/8E. This sample comprises 465 shells, representing 11 steppe and 2 semi-forest types. According to previous collections taken between 1995 and 1997, a similar steppe fauna is still predominant in the upper part of Unit III (samples a, b, c, d and e). However, the increasing number of mesophiles *Helix lucorum taurica* and *H. vulgaris* serve as a reliable indicator that – in comparison to the previous sample - more favourable climatic conditions prevailed. This relatively more humid and warm climate is characterised by the appearance of *Vitrea subeffusa* in the upper part of this Unit, this snail being typical for humid locations in forests with a nearby water course. The fauna from Unit III may be attributed to an interstadial type, and probably corresponds to one of the interstadials of the Early Glaciation: Amersfoort-Brörup or Odderade.

Specific to the snail fauna from Unit II is that steppe xerophytes forms, such as: *Helicella dejecta, H. retowski, H. krynicki* and *Chondrus bidens* are predominant. Such a composition denotes that the steppe landscapes were very arid at the time this second cultural unit was formed. The very small dimensions of *Helicella*, and the very fragile shells of *Chondrus bidens* natio attenuatus are typical for a much drier and colder climate than that presently prevailing. The presence of semi-forest and mesophile forms, such as *Vitrea pygmaea, Chondrula tridens* and *Helix vulgaris*, shows that small areas of bushes and small trees were located around the site.

Conclusion

The results of investigations of Quaternary snails and freshwater fauna from Eastern- (Russia, Ukraine, Moldavia, Romania), Central- (Poland, Germany, Chech Republic, Slovakia) and Western Europe (France) have demonstrated that during the last million years the evolution of snails and freshwater molluscs has taken place predominantly on the morpho-, natio- and subspecies levels. The analyses of the systematic composition of the Crimean assemblages of fossil snails, as well as their comparison with the

composition of modern fauna, serve to confirm this conclusion. The main changes in the Crimean snail assemblages during the Upper Pleistocene mainly reflect changes to the palaeoenvironment (firstly the changes of climatically conditions) and less the evolutional transformation of fossil species.

During the Würmian, in southeastern Europe and the northwestern coast of the Black Sea, a number of interstadials or short phases of warming may be distinguished, e.g., Krutitsa/Amersfoort-Brörup, Odderade, Moershoofd, Bryansk/ Hengelo, Arcy/ Denecamp, Tursac, Laugerie/ Lascaux, Bolling and Alleröd. Their number and names, as well as their geochronological terms differ very much from region to region. For this reason, it is very difficult to make a reliable regional or interregional correlation using only malacofaunal data. Due to the fact that during the Late Pleistocene the mollusc assemblages tend to reflect mostly environmental changes and less evolutionary ones, all the investigated assemblages may be subdivided into three categories: glacial, interstadial and interglacial. Furthermore, any correlation must be undertaken properly, and should be founded on an adequately large and representative sample. Despite the fact that the Crimean snail assemblages comprise an extremely large number of fossil cockleshells (more than 20,000), many samples are very homogenous and not sufficiently representative.

Peculiar to the composition of Crimean snail and fresh water fauna is that during the warm (interglacial and interstadial) phases the number of cryophilic species evidently decreases, and there is a significant increase in warm elements. In addition to the freshwater assemblages, which react only to changes in temperature, the Crimean snail fauna is also very sensitive to changes in humidity. Consequently, in order to distinguish correctly the type of snail assemblage (glacial, interstadial or interglacial), the number of hydrophiles and the deferring ratios of the main ecological groups should be considered. For example, for interglacial and interstadial snail assemblages, not only is a larger ratio of termophiles characteristic, but an increase in the number of hydrophiles and a reduced ratio of xerophiles is also typical. The fact that this method enables us to determine and evaluate changes in humidity is extremely important for the palaeoenvironmental reconstruction of the Crimean, particularly as during the last glaciations, this region - due to its geographical location - experienced temperature variations which were not as significant as those in periglacial areas.

Most of the snail assemblages identified in Layers from Unit VI at Kabazi II can be attributed to interglacial types of faunas. The general compilation of these faunas gives reason for us to assume sufficiently warm and mainly dry climatic conditions, which may correspond to the last interglacial of the Late Pleistocene. The fauna from this Unit comprises 15 assemblages, one from each level. Considering the frequent changes in the composition of specimens and in the environmental groups of snails from one sub-horizon to another (Fig. 4-1 and 4-2), one may propose that there was a certain degree of climatic fluctuation during the last Interglacial. On the basis of these 15 assemblages, the following stages of snail fauna evolution can be distinguished for this period:

a) Assemblages VI/15, VI/14 and VI/13: In comparison to the older and very dry assemblage observed in Stratum 14C, this sample witnesses the appearance of some hydrophiles, semi-forest and rocky / soil elements. Such a composition is indicative of the establishment of more favourable, warmer, however not necessarily drier conditions. These assemblages may correspond to the beginning of the last interglacial.
b) Assemblages VI/12, VI/11 and VI/10: In these layers there is a continual increase in the ratio of mesophile and xerophile steppe types. This is characteristic of a period in which a temporary aridisation, and a general degradation of climatic conditions occurs.
c) Assemblages VI/9, VI/6, VI/4, and VI/2: In these levels a number of forest specimens appear, e.g., *Euconulus fulvus* and *Punctum pigmaeum*. Furthermore, there is an increased ratio and diversity of hydrophiles, forest, semi-forest and rocky / soil elements. Such a composition with a high diversity of fauna attests to short phases with more favourable climatic conditions. The dimensions of many shells in these samples are also indicative of optimal climatic conditions during this stage.
d) Assemblages VI/8, VI/7, VI/5, VI/3 and VI/1: These samples, which display more homogenous xerophytic faunas, are characteristic of phases which experienced temporary climatic deterioration. Despite a reduction in the diversity of specimens, these assemblages are still more diverse than the homogenous fauna observed in samples from cooler interstadial phases.

Fauna from Unit V indicates a return to more favourable climatic conditions. Once again, there is a marked decrease in the number of xerophytes, and an increase in hydrophiles, mesophiles, forest, semi-forest and rocky / soil inhabitants. This assemblage

may be attributed to interglacial faunas indigenous to relatively humid and very warm climatic conditions. Judging from its composition and morphometrical parameters, this fauna is evidently warmer and older than the fauna from level 4 at Starosele. Consequently, it may be analogous to the end of the last interglacial. An extremely high number of *Helix lucorum taurica* and *Clausilia canalifera*, both displaying large morphometrical parameters, also serves to confirm such a conclusion. It is supported also by a big diversity of forest, semi-forest and rocky and soil specimens.

A glacial fauna may be observed in the very homogenous assemblage from Unit IV. Here, there is a clear increase in the ratio of xerophytic steppes and a drop in the ratio of all other components. Such faunas are indicative of a dryer and colder climate than that presently prevailing. This assemblage may be correlated with one of the cooling phases of the early glacial period.

The fauna from the lower part of Unit III is a typical interstadial type assemblage, in which a larger number of semi-forest and mesophile species are present. Previous collections made between 1995 and 1997 have shown that a similar steppe fauna also predominates in the upper part of Unit III (samples a, b, c, d and e). However, an increase in the number of mesophiles *Helix lucorum taurica* and *H. vulgaris* probably signifies slightly improved climatic conditions. This is also indicated by the appearance - in the higher part of this horizon - of *Vitrea subeffusa*, which pertains to humid conditions in forests and in bushed areas in the proximity to water. The fauna from Unit III may be correlated with one of the interstadials of the Early Glacial.

Characteristic of the snail fauna from Unit II is the predominance of steppe xerophyte forms. These are indicators of steppe landscapes and arid climatic conditions. The extremely small dimensions of *Helicella*, and the very fragile shells of *Chondrus bidens natio attenuatus* denote an evidently drier and colder climate than at present. For this reason, this unit may correspond to one of the cooling phases associated with the last glacial period.

Abstract

ФАУНА МОЛЛЮСКОВ ПАЛЕОЛИТИЧЕСКОЙ СТОЯНКИ КАБАЗИ II

К. МИХАЙЛЕСКУ

Раскопки Кабази II проводились в 1986-2001 годы и включали сбор раковин пресноводных и наземных моллюсков. Основные задачи палеонтологических исследований состояли в выявлении видового состава ассоциаций моллюсков каждого культурного уровня и в реконструкции основных климатических колебаний и палеогеографических условий обитания древнего человека. Фоссильная фауна наземных моллюсков палеолитической стоянки Кабази II очень богата и разнообразна. Только во время раскопок полевых сезонов 2000-2001 было собрано 16814 раковин, принадлежащих 35 разновидностям и 7 экологическим группам. Результаты исследований четвертичных наземных и пресноводных моллюсков Восточной, Центральной, и Западной Европы показали, что изменения фауны происходили, в основном, на уровне видов, подвидов и региональных

морф. Главные изменения в составе изученных крымских фаун наземных моллюсков отражают, прежде всего, изменения состояния среды обитания – изменения климатически условий в доисторические времена и в меньшей степени эволюционные преобразование новых видов и разновидностей моллюсков.

В экологическом аспекте, среди изученных фаун можно выделить три основные типы моллюсковых ассоциаций:

а) межледниковый – очень теплый и относительно влажный;

б) интерстадиальный – менее теплый и относительно сухой;

в) ксерофильный или перигляциальный – умеренно холодный и очень сухой.

К межледниковому типу фауны может быть отнесена большая часть образцов из культурно-хронологических слоев VI и V стоянки Кабази II. Общий фон этой фауны, позволяет реконструировать достаточно теплые, но не очень влажные климатические условия, которые могут соответствовать последнему межледниковому периоду.

К ксерофильному типу фауны может быть отнесена очень однородная фауна культурнохронологического слоя IV, где очевидно увеличивается доля ксерофитных степных форм и уменьшается доля всех других компонентов. Такой состав фауны указывает на более сухой и более холодный климат, чем настоящий. Эта фауна может соответствовать одной из ранних фаз похолоданий последнего оледенения.

К интерстадиальным фаунам может быть отнесена фауна нижней части культурнохронологического слоя III, где возрастает число видов предпочитающих мезофитные степи и лесостепные ландшафты. Подобная фауна разнотравных степей и кустарников преобладает и в верхней части культурно-хронологического слоя III (образцы a, b, c, d, e 1993-97 гг.). Возросшее число *Helix lucorum taurica* и *H. vulgaris* является надежным индикатором более благоприятных условий климата сравнительно со временем образования культурно-хронологических слоев II и IV. На относительно более влажный и теплый климат указывает также появление в верхней части III культурно-хронологического слоя *Vitrea subeffusa*, которые предпочитают леса и кустарники влажной зоны или фации вблизи водных бассейнов. Данная фауна может соответствовать одному из интерстадиалов последнего оледенения Русской Равнины.

В составе фауны II культурно-хронологического слоя явно доминируют ксерофитные формы, которые указывают на преобладание ландшафтов сухих степей и аридные условия климата. Маленькие размеры *Helicella* и очень хрупкие раковины *Chondrus bidens natio attenuatus* свидетельствуют о более сухом и холодном климате по сравнению с настоящим. Вероятно, данная фауна может соответствовать одной из холодных фаз последнего ледникового периода.

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KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

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Chapter 5

Analyses Archéozoologiques des Unités V et VI de Kabazi II

Marylène Patou-Mathis

Que ce soit dans l'unité V ou l'unité VI, l'espèce dominante est un petit équidé: *Equus hydruntinus*. D'après A. Burke et V. Eisenmann (2003), *Equus hydruntinus* serait proche des hémiones asiatiques (*Equus hemionus*, sous-espèce inconnue). Les caractères adaptatifs de son squelette (protocône court, os des membres graciles, segments distaux relativement longs, large sole plantaire, Eisenmann, 1984), c'était un coureur qui aimait les sols durs non montagneux et les espaces ouverts. De fait, les hémiones, en général, apprécient les collines, un climat semi-aride et supportent mal la neige glacée. Elles sont inféodées à la présence d'eau et aux pâturages. Elles se réfugient dans les vallées durant les périodes hivernales. Il est difficile de retrouver avec exactitude l'éthologie d'une espèce disparue. Cependant, comme nous l'avons mentionné précédemment, *Equus hydruntinus* serait proche des hémiones asiatiques. Nous avons donc recherché les données éco-éthologiques de ces animaux. Celles-ci diffèrent de celles des «grands» chevaux comme *Equus przewalski* par exemple. Les hémiones, en général (légères variations de comportements selon les sous-espèces), sont des animaux rapides à la course (60-70 Km/H sur de courtes distances, 40 à 50 Km/H sur de plus longs parcours). Ils vivent en petits groupes de 5 à 15 individus ou de 10 à 15 selon les sous-espèces. La composition de ces hardes, là encore, varie en fonction des sous-espèces, mais, généralement, elles sont composées de quelques étalons, de juments accompagnés de leurs jeunes (jusqu'à 2 ans). À proximité de ces hardes mixtes, vivent des petits groupes de femelles accompagnées de jeunes mâles (âgés entre 2 et 4 ans). Cette structure sociale se rencontre principalement en périodes estivales. Chez d'autres sous-espèces, à peu de distance des hardes mixtes (de 10-15 individus), pâturent des mâles solitaires expulsés par l'étalon conducteur. Durant l'hiver, les hémiones se rassemblent en grand troupeau de plusieurs centaines de têtes. Les femelles peuvent se reproduire dès l'âge de 3 ans et les mâles de 4. La période du rut et celle des naissances varient légèrement d'une région à l'autre, elles ont lieu généralement à la fin du printemps. La gestation dure 11 mois ; les femelles donnent naissance le plus souvent à un seul petit. Les hémiones vivent, en moyenne, jusqu'à 10-12 ans. Leur ennemi naturel est le loup qui s'attaque surtout aux poulains durant l'hiver. D'autre part, n'ayant pas de références détaillées concernant l'attribution des âges dentaires chez les *Equus hydruntinus*, nous avons, pour effectuer nos mesures, utilisé les données relatives aux «grands» chevaux fournies par P. Fernandez et S. Legendre (2003). Cependant, les jugales d'*Equus*

hydruntinus ayant une hauteur moins élevée que celle des dents des grands chevaux, nous avons apporté un indice correcteur de + 5 mm pour les P2 et + 20 mm pour les autres jugales (cet indice a été calculé d'après la hauteur de jugales définitives non usées que nous possédions). D'autre part, d'après la longévité de ces animaux, nous avons également modifié les limites des classes d'âges. Nous proposons les classes suivantes : 0-2 ans (jeunes), 2-4 ans (sub-adultes pour les mâles et adultes jeunes pour les femelles), 4-6 (adultes jeunes), 6-8 (adultes dans la force de l'âge), 8-10 (adulte âgé), 10-12 (adultes très âgés). Par contre l'interprétation des profils des courbes de mortalité ne change pas ; nous nous sommes référée aux travaux de M. Levine (1979, 1982, 1983).

L'Unité V

L'unité V est subdivisée en en 6 niveaux (V/1 à V/6). Les trois premiers niveaux a livré très peu de matériels archéologiques. Un foyer et 72 pièces lithiques ont été retrouvés associés à quelques ossements. Nous n'avons pas étudié les quelques ossements issus de ces niveaux.

Notre étude concerne les ossements de grands mammifères découverts dans les niveaux VI/4 à V/6. Compte tenu du faible nombre de restes osseux et d'individus estimés pour chacun des niveaux, nous avons réalisé une analyse comparative des ossements de grands mammifères de ces 3 niveaux.

Le niveau V/5 est le plus riche en restes osseux mais, le nombre de restes déterminés est plus important en V/6 (Tableau 5-1) qui a également la densité en ossements la plus élevé, 31,7 par m³ (V/4 ayant la densité la plus faible, 10,3 par m³). La densité du matériel lithique est également plus élevée en V/6 (4,85), mais contrairement à la faune, la densité dans le niveau V/4 est plus élevée qu'en V/5.

Il y a peu de taxons surtout en V/6 (Tableau 5-3, Fig. 5-1). *Equus hydruntinus* et un lagomorphe sont présents dans les trois niveaux. Le cerf est absent de V/4 et le rhinocéros de V/6. Le renard indéterminé est présent en V/4 et un mustélidé indéterminé en V/5. En nombre de restes, *Equus hydruntinus* domine en V/4 et en nombre d'individus en V/6. Des coquilles d'escargots ont été découvertes en V/4. De même que, dans tous les niveaux, des os de petits oiseaux et de petits rongeurs.

Le climat apparaît relativement humide surtout dans les niveaux V/5 et V/6 (*cf. infra*). Le paysage était mixte avec des espaces ouverts (sur la colline et le plateau) et plus forestier dans la vallée.

Analyse taphonomique

Le déficit en ossements de grands mammifères est élevé notamment en V/4. Des restes fragiles, comme les labiales ou les os juvéniles, sont présents. Les épiphyses d'os longs sont également bien conservées (respectivement 42,8, 50 et 52,17 % pour V/4, V/5 et V/6). Le matériel présent est donc relativement bien conservé, surtout en V/6 et V/5. Des marques de weathering, à un stade relativement élevé (présence d'esquilles effilées), ont été observées (Tableau 5-2). Elles sont plus abondantes en VI/4. Des altérations causées par les eaux de ruissellement sont plus fréquentes sur les ossements de V/5 (Tableau 5-2). Les vermiculations dues aux radicelles de plantes sont présentes sur des os de V/5 et V/6 (Tableau 5-2). Aucune trace du passage de carnivores n'a été identifiée. Par contre, des os brûlés ont été découverts dans les trois niveaux. Ils sont plus nombreux en V/6. En outre, 6 os en V/5 portent des stigmates correspondant à une action anthropique (Tableau 5-3).

Le degré de fragmentation des os est élevé (Tableau 5-1). Les esquilles indéterminées très abondantes, surtout en V/5, ont majoritairement une longueur maximale inférieure ou égale à 2 cm (respectivement 92, 85,2 et 90,3 % pour V/4, V/5 et V/6). C'est une fragmentation post-dépositionelle (action du weathering et/ou du piétinement) sur du matériel déjà fracturé probablement par l'homme. Plusieurs fragments d'esquilles indéterminées, découvertes en petits tas dans un même carré, remontent. En outre, deux éclats typique d'une percussion ont été reconnus parmi les esquilles indéterminées de V/5. Parmi les os déterminés, seul 15 % en V/4, 32 % en

Niveaux	NRDt	NRDa	NRI	NRT	% NRI	Densité/m³	m³ fouillés
V/4	33	2	99	134	73,9	10,3	13
V/5	95	5	603	703	85,8	28,12	25
V/6	153	7	507	667	76	31,76	21

Table 5-1 Dénombrement du matériel faunique des niveaux V/4 à V/6 de Kabazi II.

V/5 et 40 % en V/6 sont entiers, parmi eux aucun os long. Cette fragmentation est globalement plus importante en V/4, ce qui confirme une action du weathering plus intense dans ce niveau.

L'ensemble de ces résultats permet de constater: que les carnivores n'ont joué aucun rôle dans l'histoire de ces assemblages, que le climat était plus humide en V/5, que le matériel du niveau V/4 est resté plus longtemps à l'air libre que ceux des deux autres niveaux, et ce sous un climat plus sec, et que l'action anthropique a été plus importante en V/5 et V/6.

Acquisition et traitement des *Equus hydruntinus*

Globalement, on remarque un déficit en ossements très important dans les trois niveaux, surtout en V/5. Exceptés pour la partie supérieure des membres et l'autopode en V/6, les autres ossements sont très mal représentés, même les restes dentaires. Ce constat s'explique à la fois par l'action conjuguée des agents climato-édaphiques (weathering et ruissellement) et de l'homme.

En V/4

Un *Equus hydruntinus*, adulte dans la force de l'âge, été identifié dans le niveau V/4. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, un déficit en ossements, l'absence de la scapula et du coxal, et la faible dominance des os de la partie supérieure des membres postérieurs et de l'autopode.

En V/5

Deux *Equus hydruntinus*, un jeune de 20-26 mois et un adulte dans la force de l'âge, probablement une femelle, ont été reconnus en V/5. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, un fort déficit en ossements, la rareté des restes dentaires et du squelette axial et une faible dominance des os de la partie supérieure des membres antérieurs. Deux fragments de diaphyse d'os longs portent des stries de décharnement et trois restes diaphysaires présentent des stigmates de percussion sur os frais (extraction de la moelle).

En V/6

Trois *Equus hydruntinus*, un jeune (de moins de 12 mois), un sub-adulte (3-4 ans) et un adulte dans la force de l'âge ont été estimés dans le niveau V/6. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, un déficit en ossements, la dominance des os des membres antérieurs et la rareté des restes dentaires et du squelette axial.

Les Néandertaliens ont chassé, probablement en une seule fois pour chacun des niveaux, quelques *Equus hydruntinus* issus de petits groupes composées essentiellement de femelles accompagnées de leurs jeunes. Ils ont dépecé les carcasses sur place et en ont transporté une grande partie dans leur habitat. Quelques morceaux de viande et la moelle des os longs ont été consommés sur place.

Agents/Niveaux	V/4	V/5	V/6
Weathering	15,62	2,3	1,67
Ruissellement	0,78	1,73	0,3
Percolation	–	–	–
Végétaux	–	1,01	0,6
Carnivores	–	–	–
Porc-épic	–	–	–
Anthropique	1,56	1,58	1,97

Table 5-2 Caractères extrinsèques observés sur les ossements des niveaux V/4 à V/6 de Kabazi II.

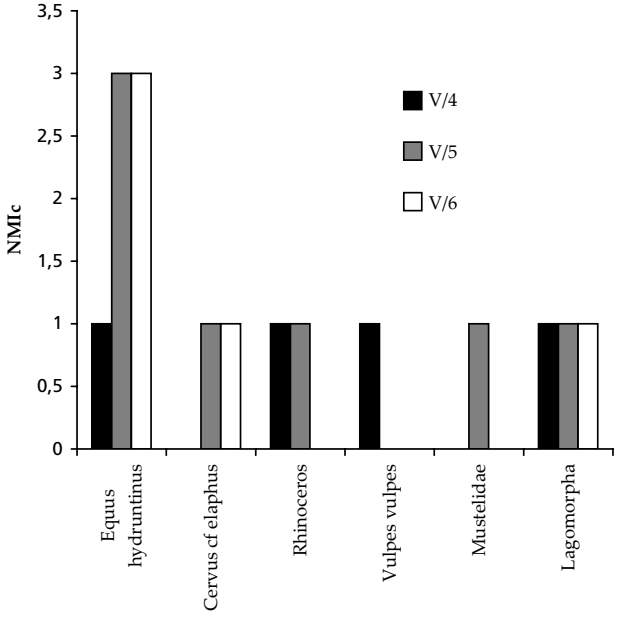

Fig. 5-1 Répartition des taxons des grands mammifères dans les niveaux V/4 à V/6 de Kabazi II.

Types de marques/Niveaux	V/4	V/5	V/6
Stries	–	0,29	–
Impacts de percussion	–	0,58	–
Brûlures	1,56	0,72	1,97

Table 5-3 Marques anthropiques observées sur les ossements des niveaux V/4 à V/6 de Kabazi II.

Statut des autres espèces

Pour les autres espèces, qui sont, en nombre de restes encore plus rares que ces petits équidés, il est très difficile d'expliquer leur présence sur le site.

Le cerf (*Cervus cf.elaphus)*, un jeune en V/5 et un adulte au sens large en V/6, n'est représenté que par respectivement 5 et 10 ossements, en V/5 et V/6. Ce sont des dents et des os de l'autopode. On note toutefois la présence en V/6 d'un fragment d'humérus. Le rhinocéros n'est représenté que par deux fragments de dents (un en V/4 et un en V/5) et une phalange proximale en VI/6. L'âge n'a pu être estimé. Pour ces deux espèces, le rôle de l'homme ne peut pas être précisé.

Discussion

Les Néandertaliens ont chassé des *Equus hydruntinus* qu'ils ont dépecés sur place. Ils ont transporté des quartiers de viande vers leur habitat. L'exploitation de ces animaux semble avoir été maximale. La présence d'os brûlés dans tous les niveaux, indique la présence d'au moins un foyer à proximité de la zone de fouille. Sur place, ils ont consommé la moelle de certains os longs. Durant la formation des niveaux V/4 à V/6, le site de Kabazi II peut-être considéré comme un lieu d'abattage et de boucherie. Les occupations ont été de très courte durée et probablement unique pour chacun des niveaux.

L'Unité VI

L'unité VI est subdivisée en 15 niveaux: onze de VI/1 à VI/10, VI/11-14 et trois de VI/15 à VI/17.

Les niveaux VI/1 à VI/10

Compte tenu du faible nombre de restes osseux et d'individus estimés pour chacun des niveaux, nous avons réalisé une analyse comparative des ossements de grands mammifères des onze niveaux de VI/1 à VI/10 (le niveau 9 étant séparé en 9 et 9A).

Le nombre de restes, déterminés et indéterminés, est plus élevé en VI/3, VI/1 et VI/9A (Tableau 5-4 et Fig. 5-2). Les densités en matériel osseux les plus fortes se situent en VI/9A, VI/3 et VI/1 (Fig. 5-3). Ce résultat n'est qu'en concordance partielle avec la densité du matériel lithique (qui est dans son ensemble très faible). Les densités les plus fortes se retrouvent en VI/9A (6,6), VI/1 (4,9), VI/6 (4,7), VI/10 (4,3), VI/9 (4,2) et VI/7 (4,15) et VI/8 (4).

Il y a peu de diversité spécifique (entre 5 et 2 taxons de grands mammifères). Elle est un peu plus élevée en VI/5, VI/7 et VI/ 9A. À la différence des autres espèces, *Equus hydruntinus* est présent dans tous les niveaux (Fig. 5-4). On note l'absence du cerf (*Cervus cf.elaphus)* en VI/3, VI/8 et VI/10 et la présence: d'un rhinocéros en VI/2 et VI/5, d'un grand bovidé en VI/3, VI/5, VI/7, VI/8, VI/9 et VI/9A, d'un loup en VI/3 et VI/9A et d'un renard en VI/7. En outre, un petit mustélidé a été identifié en VI/1 et des lagomorphes (probablement du lapin) en VI/2, VI/6, VI/7, VI/8, VI/9, VI/9A et VI/10.

Analyse taphonomique

Les rapports entre les NME et les NMIc mettent en évidence un fort déficit en ossements, entre 14,8 (VI/1) et 4 (VI/7) ossements par individus (Tableau 5-4). D'après les pourcentages d'esquilles indéterminées, la fragmentation du matériel a été importante surtout en VI/6, 4, 10, 9A et VI/8 (Fig.5-2). La majorité des esquilles, quel que soit le niveau, ont entre 2 et 5 cm de longueur maximale. Tous les os longs sont fracturés exceptés deux en VI/1 et 1 en VI/4.

Des marques de weathering sont présentes sur du matériel issu de tous les niveaux, à l'exception de VI/5; elles sont plus fréquentes en VI/1, VI/10 et VI/9 (Tableau 5-5). Les marques de l'action des eaux de ruissellement et de percolation ont également été observées sur des os provenant de tous les niveaux; elles sont plus fréquentes en VI/9A et VI/10 (Tableau 5-5).

Les radicelles de plantes ont laissé leurs empreintes sur des ossements dans tous les niveaux

Niveaux	NRDt	NRDa	NRI	NRT	% NRI	Densité/m³	m³ fouillés
VI/1	120	14	418	552	75,7	29,05	19
VI/2	68	–	248	316	78,5	16,63	19
VI/3	139	16	398	553	71,97	29,1	19
VI/4	96	16	184	296	62,16	15,57	19
VI/5	60	6	191	257	74,32	13,52	19
VI/6	92	2	138	232	59,48	12,2	19
VI/7	57	2	227	286	79,37	15,05	19
VI/8	71	–	164	235	69,78	12,36	19
VI/9	74	1	269	344	78,19	18,1	19
VI/9A	149	5	293	447	65,54	29,8	15
VI/10	58	–	118	176	67,04	19,56	9

Table 5-4 Dénombrement du matériel faunique des niveaux VI/1 à VI/10 de Kabazi II.

et plus particulièrement en VI/9A, VI/1 et VI/10 (Tableau 5-5). L'humidité était plus importante lors de la formation des niveaux VI/9A, puis 10 (Tableau 5-5).

Dans le niveau VI/1, un radius d'*Equus hydruntinus* porte l'empreinte d'un croc de grand carnivore et un ulna de petit carnivore. Ce sont les seuls témoins du passage des carnivores sur le site (Tableau 5-5). En VI/10, un os a été rongé par un porc-épic (Tableau 5-5). Les os portant des marques de découpe bouchère ne sont présentes qu'en VI/3, VI/6 et VI/8 (Tableau 5-4). Ceux portant des marques de percussion sur os frais sont plus abondants en VI/9A et VI/4 (Tableau 5-6). Des os brûlés ont été retrouvés dans tous les niveaux, ils sont plus fréquents en VI/9A, VI/10, VI/8, VI/6 et VI/9 (Tableau 5-6). Globalement, l'action anthropique sur les ossements est plus importante dans les niveaux VI/9A, VI/10, VI/8 et VI/6 (Tableau 5-5).

Ces résultats mettent en évidence: que les occupations apparaissent peu intensives et de courtes durées, que les carnivores ont joué un rôle mineur dans l'histoire des assemblages osseux, que le matériel est resté en sub-surface durant un certain temps, relativement long en VI/1, VI/10 et VI/9 et que le climat était particulièrement humide en VI/9A, VI/10 puis en VI/6 et VI/5 et tempéré en VI/10. Le climat s'est aridifié durant la formation des niveaux VI/8 et VI/7, puis de nouveau au cours de la formation des niveaux VI/4 à VI/1.

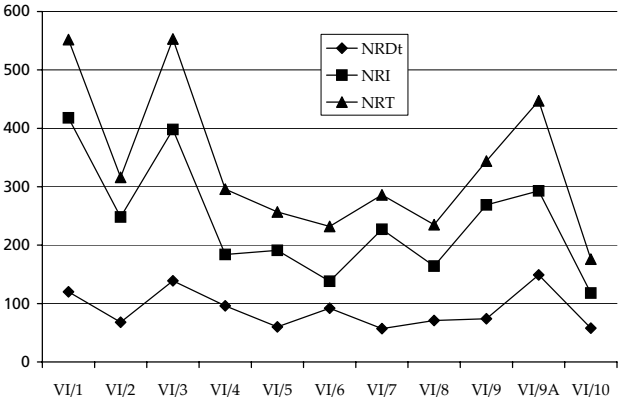

Fig. 5-2 Dénombrement du matériel faunique des niveaux VI/1 à VI/10 de Kabazi II.

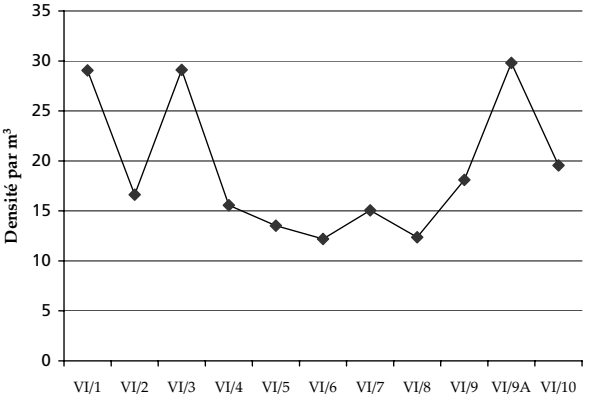

Fig. 5-3 Densité du matériel faunique dans les niveaux VI/1 à VI/10 de Kabazi II.

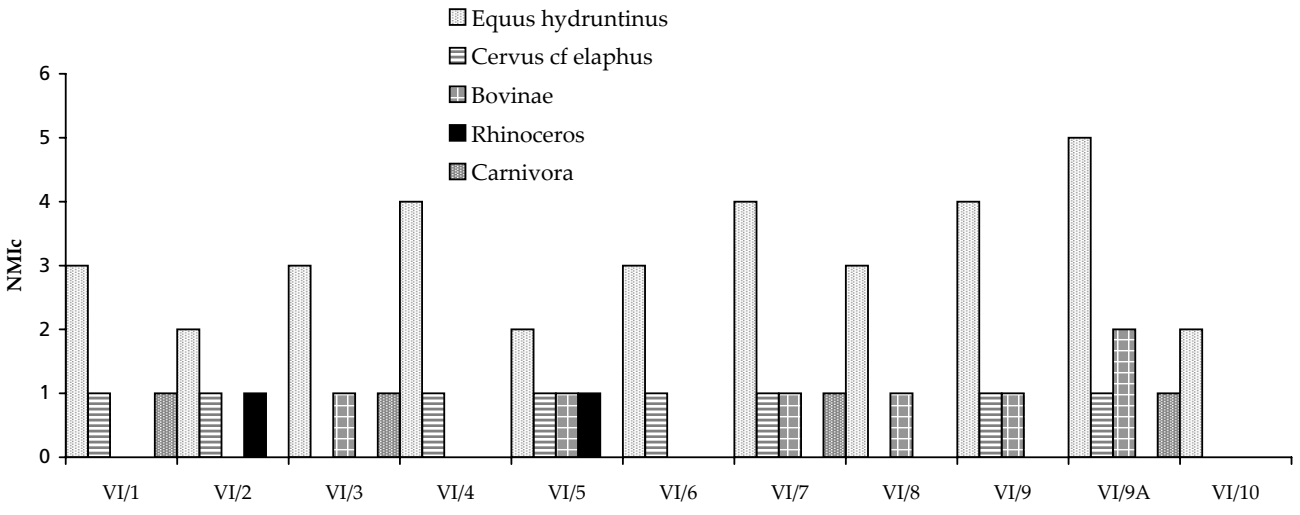

Fig. 5-4 Répartition des taxons des grands mammifères dans les niveaux VI/1 à Vi/10 de Kabazi II.

Acquisition et traitement des *Equus hydruntinus*

Globalement, on remarque un déficit en ossements très important dans tous les niveaux. Il est un peu moins fort en VI/1, VI/3, VI/5, VI/2 et VI/6. Exceptés pour la partie supérieure des membres antérieurs, les autres ossements sont très mal représentés, même les restes dentaires. Ce constat s'explique à la fois par l'action conjuguée du climat (perte par ruissellement) et de l'homme.

En VI/1

Trois *Equus hydruntinus*, un jeune (mort au printemps), un sub-adulte et un adult âgé, probablement un mâle, ont été identifiés dans le niveau VI/1. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence de la scapula, la dominance des os de la partie supérieure des membres antérieurs et la rareté des restes dentaires et du squelette axial. Un radius a été fracturé pour en extraire la moelle.

En VI/2

Deux *Equus hydruntinus*, un jeune et un adulte âgé, probablement une femelle, ont été estimés dans le niveau VI/2. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, la dominance des os de la partie supérieure des membres antérieurs et la très grande rareté des restes dentaires et du squelette axial.

En VI/3

Trois *Equus hydruntinus*, un adulte dans la force de l'âge et deux adultes âgés ont été reconnus, dont probablement au moins un mâle et une femelle, dans le niveau VI/3. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, la dominance des os des membres antérieurs et la rareté des restes du squelette axial. Un ulna porte des stries résultant de la désarticulation entre l'humérus et le radius-ulna. Deux radius et deux métapodiens principaux ont été fracturés pour en extraire la moelle.

En VI/4

Quatre *Equus hydruntinus*, un jeune (1,5-2 ans), un sub-adulte (3-3,5 ans), un adulte dans la force de l'âge et un adulte âgé ont été identifiés dans le niveau VI/4. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, la dominance des os de la partie supérieure des membres antérieurs et la très grande rareté des restes dentaires et du squelette axial. Deux radius et un métatarsien principal ont été fracturés pour en extraire la moelle.

En VI/5

Deux *Equus hydruntinus*, un jeune de 2 ans et une femelle gravide dans la force de l'âge (morte au printemps) ont été estimés dans le niveau VI/5. On note un très fort déficit des ossements. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence de la scapula, la faible dominance des os des membres antérieurs et la très grande rareté des restes dentaires et du squelette axial. Un humérus a été fracturé pour en extraire la moelle.

En VI/6

Trois *Equus hydruntinus*, un sub-adulte (mort en été), un adulte dans la force d l'âge et un adulte âgé ont été identifiés dans le niveau VI/6. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence de la scapula et du coxal, la faible dominance des os de la partie supérieure des membres antérieurs et la très grande rareté des restes du squelette axial.

En VI/7

Quatre *Equus hydruntinus*, un jeune d'environ deux mois (mort en été), un jeune, un adulte dans la force de l'âge et un adulte âgé ont été reconnus dans le niveau VI/7. On note un très fort déficit des ossements. On remarque l'absence des os de la partie supérieure des membres postérieurs

En VI/8

Trois *Equus hydruntinus*, un jeune (de mois de 26 mois), un adulte dans la force de l'âge et un adulte âgé ont été estimés dans le niveau VI/8. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence du coxal, la faible dominance des os de la partie supérieure des membres antérieurs et la rareté des restes du squelette axial et de l'autopode. Un métapodien vestigial porte une strie résultant de la désarticulation entre le métapodien et le carpe ou le tarse.

En VI/9

Quatre *Equus hydruntinus*, un jeune (de mois 15 mois), un sub-adulte (d'environ 4 ans), et deux adultes jeunes, dont un mâle ont été estimés dans le niveau VI/9. On note un fort déficit des ossements. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, la dominance des os de la partie supérieure des membres antérieurs et la très grande rareté des restes du squelette axial. Un radius a été fracturé pour en extraire la moelle.

En VI/9A

Cinq *Equus hydruntinus*, un jeune de moins de 15 mois, un jeune de 28-34 mois, deux adultes dans la force de l'âge et un adulte âgé ont été identifiés, dont un mâle, dans le niveau VI/9A. On note un fort déficit des ossements. Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence de la scapula, la faible dominance des os de la partie supérieure des membres antérieurs et la rareté des restes du squelette axial. Cinq os longs dont un humérus, un radius et un métatarsien principal, ont été fracturés pour en extraire la moelle.

En VI/10

Deux *Equus hydruntinus*, un jeune et un adulte dans la force de l'âge ont été reconnus dans le niveau VI/10. On note un fort déficit des ossements. Des

Agents/Niveaux	**VI/1**	**VI/2**	**VI/3**	**VI/4**	**VI/5**	**VI/6**	**VI/7**	**VI/8**	**VI/9**	**VI/9A**	**VI/10**
Weathering	7,8	1,62	1,13	0,35	–	2,6	0,35	3,98	5,23	4,28	5,7
Ruissellement	0,72	0,32	1,7	1,73	2,35	2,16	0,71	0,44	1,74	10,81	3,98
Percolation	–	–	–	–	–	–	–	–	–	0,9	0,57
Végétaux	1,81	0,97	0,94	0,35	0,78	1,3	0,72	0,44	0,29	2,93	1,7
Carnivores	0,36	–	–	–	–	–	–	–	–	–	–
Porc-épic	–	–	–	–	–	–	–	–	–	–	0,57
Anthropique	2,17	1,62	1,99	2,8	1,76	3,03	1,42	3,49	2,32	5,18	5,11

Table 5-5 Caractères extrinsèques observés sur les ossements des niveaux VI/1 à VI/10 de Kabazi II.

Types de marques/Niveaux	**VI/1**	**VI/2**	**VI/3**	**VI/4**	**VI/5**	**VI/6**	**VI/7**	**VI/8**	**VI/9**	**VI/9A**	**VI/10**
Stries	–	–	0,18	–	–	0,43	–	0,44	–	–	–
Impacts de percussion	0,18	0,65	0,72	1,04	0,39	–	–	0,44	0,29	1,35	0,57
Brûlures	1,99	0,97	1,08	1,73	0,78	2,6	1,42	2,9	2,03	3,83	4,54

Table 5-6 Marques anthropiques observées sur les ossements des niveaux VI/1 à VI/10 de Kabazi II.

éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence du coxal, la dominance des os de la partie supérieure des membres antérieurs et la très grande rareté des restes dentaires, du squelette axial et de l'autopode. Un métapodien principal a été fracturé pour en extraire la moelle.

L'ensemble de ces résultats attestent de l'intervention de l'homme sur des carcasses d'animaux qu'il aurait lui-même abattus ou, comme pour les jeunes et les adultes âgés, qui seraient morts «naturellement» ou tués par d'autres prédateurs. Il est difficile de choisir entre ces hypothèses. Par contre, il est clair qu'une grande partie de ces carcasses a été transportée ailleurs par les Néandertaliens.

Statut des autres espèces

Pour les autres espèces, dont les ossements sont encore plus rares que ceux de ces petits équidés, il est très difficile d'expliquer leur présence sur le site. Le cerf, excepté pour les niveaux VI/1 et VI/2, n'est présent que par des restes dentaires et/ou de l'autopode. On note que ce sont surtout des individus dans la force de l'âge qui sont morts. Leur chasse par l'homme ne peut donc être totalement exclue. Ce dernier aurait, comme pour les *Equus hydruntinus* emporté des morceaux de carcasses de ces cervidés en dehors du site. Signalons, en VI/9A, la présence d'une phalange distale brûlée. Le rhinocéros n'est représenté que par quelques dents juvéniles. Le grand bovidé, comme le cerf n'a été identifié que par quelques restes dentaire et/ou de l'autopode, excepté en VI/8 et VI/9, où une vertèbre a été déterminée. Les individus correspondent majoritairement à des individus âgés sauf en VI/9A où un jeune et un adulte jeune ont été identifiés. Dans ce niveau, la chasse par l'homme ne peut être exclue; là encore, il aurait transporté le reste de la carcasse en dehors de la zone fouillée.

Discussion

Les Néandertaliens ont principalement chassé des *Equus hydruntinus* et en ont charognés d'autres. Ils ont dépecé ces animaux sur place et transporté des quartiers de viande vers leur habitat. Dans les niveaux VI/1 et VI/5 les hommes sont venus au printemps et en VI/6 et VI/7 en été. L'exploitation de ces animaux semble avoir été maximale. La présence d'os brûlés dans tous les niveaux, indique qu'à proximité de la zone de fouille, les Néandertaliens avaient allumé un feu. Sur place, ils ont consommé la moelle de certains os longs. Le site durant la formation des niveaux VI/1 à VI/10 a fonctionné comme un site d'abattage ou de charognage et de boucherie. Il est intéressant à noter que cette pratique a perduré durant un long laps de temps. Les occupations sont en effet multiples, de courte durée et récurrentes.

Le Niveau VI/11-14

Le matériel osseux découvert dans le niveau VI/11-14 comprend 2682 restes dont 63,9 % d'indéterminées (Tableau 5-7). La fouille a été réalisée sur 12 m2. Par rapport au matériel lithique, la densité du matériel osseux est élevée (respectivement 25,16 et 223,5 par m³ fouillé).

Les ossements déterminés totalement (35,65 % du NRT=Nombre de Restes Total) appartiennent pour la plupart (86,5 % du NRDt=Nombre de Restes Déterminés totalement) à un petit équidé: *Equus hydruntinus* (Tableau 5-7). Les autres espèces sont, par ordre décroissant du nombre de restes: le cerf (*Cervus cf elaphus*), le cheval (*Equus sp*. de type caballin), le lapin (*Oryctoloagus cuniculus*), le renard commun (*Vulpes cf vulpes*), un boviné (*Bos* ou *Bison sp.*) et un canidé (*Canis* ou *Cuon sp.*), le rhinocéros de prairie (*Dicerorhinus cf hemitoechus*) et un petit mustélidé (Tableau 5-7). En nombre d'individus, le petit équidé est toujours dominant (56,66 % du NMIcT= Nombre Minimal d'Individus Total obtenu par combinaison); les autres espèces sont, à l'exception du cerf, du renard et du lapin, en proportion égale (3,33 % pour chacune, Tableau 5-7).

D'après les données du spectre faunique, l'environnement était de type prairie-steppe, avec dans les vallées des espaces boisés développés, notamment le long des cours d'eau. Le climat était frais l'hiver et plus tempéré l'été et relativement humide notamment durant la période estivale. Cette hypothèse est confirmée par l'analyse taphonomique du matériel (*cf. infra*). Lors de notre étude par sous-niveaux, nous avons constaté que la base du remplissage (sous-niveaux 13 et 14) étaient plus humides et plus tempérés que le sommet.

ESPÈCES	NR	NME	% NME	NMIc	% NMIc
Equus hydruntinus	827	456	84,45	17	56,66
Equus sp. (Caballus)	32	10	1,85	1	3,33
Dicerorhninus cf hemitoechus	2	2	0,40	1	3,33
Bovinae	7	3	0,55	1	3,33
Cervus cf. elaphus	39	25	4,30	3	10,00
Artiodactyla	1	1	0,20	–	–
Sous-Total Ongulés	**908**	**497**	**91,75**	**23**	**76,65**
Vulpes cf vulpes	15	12	2,25	3	10,00
Canis/Cuon sp.	7	7	1,30	1	3,33
Small *Mustelidae*	1	1	0,20	1	3,33
Sous-Total Carnivores	**23**	**20**	**3,75**	**5**	**16,66**
Oryctolagus cuniculus	19	18	3,35	2	6,66
Vulpes/Oryctolagus sp	1	1	0,20	–	–
Vulpes/Mustelidae/Oryctolagus sp	5	4	0,75	–	–
NRDa	13	–	–	–	–
Total Grands Mammifères	**969**	**540**	**99,8**	**30**	**99,95**
NRI	**1713**	–	–	–	–
TOTAL :	**2682**	**> 540**	–	**30**	–

Table 5-7 Spectre faunique du niveau VI/11-14 de Kabazi II (NR=Nombre de Restes; NMIc=Nombre Minimal d'Individus obtenu, par combinaison; NME=Nombre Minimal d'Éléments NRDa=Nombre de Restes Déterminés anatomiquement; NRI=Nombre de Restes Indéterminés).

Analyse taphonomique

Conservation

Le pourcentage des os déterminés (36,13 %) est relativement élevé ce qui attestait d'une conservation relativement bonne du matériel. Cependant, d'après le rapport entre le nombre d'éléments anatomiques et le nombre estimé d'individus (qui est égal à 17,42), le déficit en ossements est très élevé. Deux hypothèses peuvent expliquer ce déficit. Des agents taphonomiques (climato-édaphiques ou carnivores par exemple) auraient fortement altéré le matériel entraînant la disparition d'une grande partie des ossements. La seconde hypothèse suggère que cette absence est due au rôle de l'homme. Ce dernier aurait emporté les éléments anatomiques manquants (en totalité ou en partie) en dehors de la zone fouillée. Les résultats de l'analyse des caractères extrinsèques observés sur les ossements (*cf. infra*), la présence d'os fragiles, comme les os de fœtus, de très jeunes individus, les os hyoïdes, les cartilages costaux, nous conduit à choisir la seconde hypothèse tout en considérant, bien entendu, que certains ossements ont pu disparaître à cause d'autres agents taphonomiques.

Fragmentation

Les 1713 esquilles indéterminées appartiennent pour la plupart, d'après leur morphométrie et les ossements déterminés, aux *Equus hydruntinus.* Nous en avons tenu compte lors de nos interprétations taphonomiques et palethnographiques. D'après leur répartition par classe de taille, nous constatons, avec plus de 92 % des esquilles, une prédominance de la classe II (longueur maximale supérieure ou 2 cm et inférieure à 5 cm). Les esquilles de longueur maximale comprise entre 5 et 10 cm représentent 6,65 %. Par contre, la classe I (longueur maximale inférieure à 2cm) et la classe IV (longueur maximale supérieure à 10 cm) sont très rares. La fragmentation des ossements a donc eu lieu en deux temps, une première fracturation des os par les hommes puis une seconde fragmentation post-dépositionnelle de ceux-ci. D'autre part, parmi les os longs des mammifères étudiés, seuls cinq ont été découverts entiers (deux radius, dont un de juvénile, deux métapodiens principaux et un métatarsien vestigial d'*Equus hydruntinus*). Soulignons que les dents, notamment les jugales d'équidés, sont relativement peu fragmentées.

Caractères extrinsèques

L'état se surface des ossements est, pour l'ensemble du matériel osseux, relativement bon. Cependant, 377 ossements (14,05 % du NRT) présentent une surface altérée par un agent taphonomique (Tableau 5-8).

Des marques caractéristiques de l'action d'agents climato-édaphiques (marques de desquamation, dissolution, corrosion et présence de fissurations longitudinales et d'esquilles effilées) ont été observées sur 120 d'entre eux (Tableau 5-8). Leur pourcentage relatif met en évidence que ces altérations sont principalement dues à l'action d'un climat humide sur un matériel resté relativement longtemps en surface. Le fait que les autres ossements ne soient pas altérés par ce phénomène, nous conduit à suggérer que l'assemblage ne s'est pas mis en place en une seule phase. Ces os altérés se répartissent indifféremment sur toute la surface fouillée avec cependant une action plus intensive sur les os de la bande 4 et en 6Π (la plupart des esquilles effilées y ont été découvertes).

D'autre part, la présence, sur 159 esquilles réparties sur toute la zone fouillée, de vermiculations, qui témoignent de l'action des radicelles de plantes, atteste d'un recouvrement d'une partie de cet assemblage par une couche peu épaisse de sédiments et confirme l'humidité relative du climat d'alors (Tableau 5-8).

Dix-huit os, répartis sur huit carrés, présentent des traces de rongements dues à des porcs-épics. Ils attestent de la présence de ce gros rongeur dans l'environnement du site. Cet animal vit sous des climats tempérés ce qui confirme que, lors de la formation de cet assemblage, le climat n'était pas rigoureux.

Les carnivores n'ont laissé que deux marques de leur passage (en 6O). Une épine vertébrale d'*Equus hydruntinus* et une partie distale de tibia de renard portent chacun une perforation correspondant à la morsure, d'après le diamètre du trou, probablement un petit canidé (Tableau 5-8). Leur role dans l'origine et l'histoire de cet assemblage est donc mineur. Ceci est confirmé d'une part par la taille des fragments osseux (*cf. supra*) et d'autre part par le faible nombre de restes qui leur a été attribué.

Enfin, la présence, sur 78 restes osseux, de marques d'origine anthropique, confirme l'intervention de l'homme sur ce matériel (Tableau 5-8). Des stries, des impacts de percussion, des marques de calcination et un retouchoir ont en effet été observés (Tableau 5-9). Nous détaillerons les différents types d'activités qui en découlent dans le paragraphe consacré au traitement du gibier.

Analyse des ossements d'*Equus hydruntinus*

Ce petit équidé représentant la quasi-totalité du matériel étudié (Tableau 5-7), nous avons donc axé notre étude sur l'analyse de ses ossements.

Étude de la conservation

Le nombre d'ossements déterminés rapportés à cette espèce est relativement élevé (Tableaux 5-7 et 5-10). Cependant, par rapport au nombre estimé d'individus, on remarque un déficit élevé, notamment des os (on a au maximum 26 restes par individus).

Le squelette crânien est conservé à peu près dans les mêmes proportions que le squelette post-crânien (Tableau 5-10). Si les jugales sont mieux conservées que les labiales, on constate que ces dernières sont bien représentées. Globalement, on remarque que les dents inférieures sont mieux conservées que les dents supérieures. Les dents juvéniles, malgré leur fragilité, sont relativement bien conservées. D'après l'ensemble de ces restes céphaliques, en tenant compte de l'âge, 17 individus ont été estimés.

Les os du squelette axial sont, exceptés les coxaux et l'atlas, mal conservés (Tableau 5-10). Les vertèbres thoraciques et lombaires sont extrêmement rares (13 au total), l'atlas est relativement bien représentés (5). Trois vertèbres caudales sont présentes. Par contre, les sternèbres et les vertèbres sacrales sont absentes. Nous avons déterminé quatre cartilages costaux. Les côtes sont rares et très fragmentées. Par contre, bien que fragmentés, les coxaux sont relativement bien représentés.

La partie supérieure des membres antérieurs est l'unité squelettique la mieux conservée (Tableau 5-10). Les trois types d'éléments qui la composent ont une conservation assez similaire. Le radius-ulna est légèrement plus abondant. La scapula est surtout représentée par des fragments de cavité glénoïde (partie la moins fragile). Pour l'humérus, on note un fort déficit des extrémités, notamment proximale (totalement absente). Pour le radius-ulna, c'est la partie distale qui est la moins bien conservée. Un humérus et un radius appartenant à un fœtus (ou nouveau-né) ont été déterminés.

La partie supérieure des membres postérieurs est moins bien conservée que l'unité précédente (Tableau 5-10), l'écart se réduit si l'on ne prend en compte que les os longs (dans ce cas MAU = 5,5). Le tibia est légèrement mieux conservé que le fémur. La patella n'est représentée que par une seule pièce. La partie proximale du fémur est la mieux conservée (aucune extrémité distale n'a été identifiée), alors que le tibia est surtout représenté par son extrémité distale.

L'unité squelettique, correspondant aux os de l'autopode, est moins bien représentée que les deux précédentes (Tableau 5-10). Cependant, les métapodiens principaux sont les os longs les mieux conservés et les plus abondants des éléments de l'autopode. Le métatarsien III est mieux représenté que le métacarpien III. L'extrémité proximale est, pour les deux types, mieux conservée que la distale. Les métapodiens vestigiaux, antérieurs et postérieurs, sont relativement abondants. Les os du carpe sont très rares; on note l'absence du semi-lunaire. Les os du tarse, les phalanges et les sésamoïdes sont moyennement conservés. Parmi les tarsiens, le grand cunéïforme est légèrement domiannt. Les phalanges distales sont mieux conservées que les autres.

L'étude des os du squelette post-céphalique a permis d'estimer à 16 le nombre minimal d'*Equus hydruntinus* présents dans le niveau VI/11-14 de Kabazi II.

Étude de la fragmentation des os longs

Globalement le matériel osseux est assez fragmenté, notamment si l'on prend en compte les esquilles indéterminées qui, d'après le rapport entre le nombre de restes déterminés de cet équidé et celui des autres espèces, appartiennent pour la plupart à des os longs d'*Equus hydruntinus*. Les os des ceintures (à l'exception de 4 scapulas à peu près complètes) et de la colonne vertébrale sont fragmentés. De même, seuls quatre os longs (deux radius, un métatarsien III et un métacarpien III) et un métatarsien IV ont été retrouvés entiers. Plus de 65 % des phalanges sont intactes. Par contre, les sésamoïdes, les os du carpe et du tarse sont, à l'exception de 4, entiers. Dans la plupart des cas, la percussion a eu lieu sur la diaphyse médiane vers les métaphyses, proximale ou distale, des os longs entraînant ainsi la fragilisation de ces parties. On observe également la conservation totale ou partielle d'une seule face de l'os et beaucoup plus rarement de deux. D'après les indices NR/NME (Tableau 5-10), de chacun des os longs, les tibias puis les radius-ulnas, enfin, les humérus et les fémurs apparaissent comme étant les plus fracturés et les métapodiens principaux les moins.

Modes d'acquisition et de traitement des *Equus hydruntinus*

Composition des populations abattues

D'après l'étude de l'éruption et de l'attrition dentaire, ainsi que des dates d'épiphysation des os longs d'équidés, la présence d'au moins 17 individus a été estimée.

Agents	Nombre d'os	% / N. d'os altérés	% / NRT
Climato-édaphique	120	31,83	4,47
Végétaux	159	42,17	5,93
Carnivores	2	0,53	0,07
Porc-épic	18	4,77	0,67
Anthropique	78	20,70	2,91
Total:	377	100	14,05

Table 5-8 Caractères extrinsèques observés sur les ossements du niveau VI/11-14 de Kabazi II.

Types de marques	*Equus hydruntinus*	*Equus sp.*	*Bovinae*	Esq. indéterminées	Total	%
Stries	8	1	–	1	10	12,80
Impacts de percussion	21	4	1	3	29	37,20
Brûlures	–	–	–	38	38	48,70
Retouchoir	1	–	–	–	1	1,30
Total:	30	5	1	42	78	100

Table 5-9 Marques anthropiques observées sur les ossements du niveau VI/11-14 de Kabazi II.

ELEMENTS ANATOMIQUES	NR	NME	MAU	MNIf	NMIc	
Os du Crâne	30	5	5	5	5	
Stylohyoïde	1	1	0,50	1	1	
Hémi-Maxillaire	23	6	3	4	6	
Hémi-Mandibule	58	14	**7**	7	9	
Jugales Supérieures définitives	27	27	2,25	4	9	
Jugales Inférieures définitives	36	35	2,83	4	8	
Labiales supérieures définitives	7	7	1,16*	3	4	
Labiales inférieures définitive	18	18	3*	5	7	
Déciduales supérieures	7	7	1,16	2	2	
Déciduales inférieures	11	11	1,83	2	4	
Labiales supérieures lactéales	4	4	0,66	2	2	
Labiales inférieures lactéales	6	6	1	2	4	
Hémi-Maxillaire ou Hémi-Mandibule	1	–	–	–	–	
Jugales Indéterminées	17	9	–	–	–	
Labiales indéterminées	13	13	–	–	–	
Sous-Total Crânien	**259**	**163**	**2,23****	**14**	**17**	
Vertèbres	50	20	0,54***	5	5	
Côtes	41	21	0,58	1	2	
Cartilages costaux	4	4		1	1	
Coxal	33	12	**6**	6	7	
Sous-Total Squelette Axial	**128**	**57**	**0,82******	**6**	**7**	
Scapula	29	12	**6**	6	7	
Humérus	26	11	5,5	6	6	
Radius-Ulna	44	14	**7**	7	7	sans Pa = 5,5
Sous-Total Partie Supérieure M.A.	**99**	**37**	**6,16**	**7**	**7**	
Fémur	27	11	**5,50**	5	7	
Patella	1	1	0,50	1	1	
Tibia	40	11	**5,50**	8	8	
Sous-Total Partie Supérieure M.P.	**68**	**23**	**3,83**	**8**	**9**	
Partie Supérieure M. I.	**14**	–	–	–	–	
Carpiens	11	11	0,78	2	3	
Métacarpien III	35	17	**8,50**	10	10	
Métacarpiens II et IV	19	19	4,75	5	5	
Tarsiens	22	22	1,83	4	5	
Métatarsien III	45	22	**11**	12	15	
Métatarsiens II et IV	17	17	4,25	5	5	
Carpiens ou tarsiens	5	5	–	–	–	
Métapodiens Indéterminés	23	–	–	–	–	
Métapodiens vestigiaux indéterminés	39	20	–	–	–	
Phalanges Proximales	10	10	2,50	3	4	
Phalanges Intermédiaires	4	4	1	1	2	
Phalanges Distales	12	12	3	3	4	
Sésamoïdes	17	17	1,41	2	3	
Sous-Total Autopode	**259**	**176**	**3,52**	**12**	**16**	
Sous-Total Post-crânien	**568**	**> 293**	**2,18**	**12**	**16**	
TOTAL	**827**	**> 456**	**2,21**	**14**	**17**	

Nous avons utilisé deux méthodes pour tracer la courbe de mortalité, l'une (Fig. 5-5) prend en compte le nombre de dents par classe d'âges et la seconde (Fig. 5-6), le nombre minimal d'individus estimés par classe d'âges. Les profils ne correspondent pas au «attritional death model». Cependant, deux «sous-profils» se dégagent. Le premier met en évidence la mort d'animaux dans la force de l'âge (4-8 ans), l'homme en est probablement le responsable. Le second souligne l'abondance des jeunes et des vieux, qui sont morts, soit abattus par l'homme, soit «naturellement», soit tués par des carnivores.

On note par ailleurs, l'absence de jeunes de moins de 5 mois et la présence d'une femelle gravide (présence d'os d'un fœtus). D'autre part, la morphométrie de plusieurs os et la présence de deux canines bien développées attestent de la présence d'au moins un étalon.

Les indices définis par R. Potts (1984) permettent de savoir si les animaux ont plutôt été chassés ou qu'au contraire, ils proviennent de récupérations de carcasses (charognages). Les indices A et B (A = NME squelette axial/NME de la partie supérieure des membres et B = NME de la partie supérieure des membres antérieures/NME de la partie supérieure des membres postérieurs. Pour cet auteur, si A<1,3 (valeur pour les Équidés) et B>1,1 (valeur pour les Équidés), la chasse est attestée, par contre, si A>1,3 et B<1,1, la pratique du «charognage» est à envisager) que nous avons calculé sont respectivement égal à 0,43 et 0,97. L'indice A indiquerait l'hypothèse de chasse, alors que le B nous orienterait plutôt vers le charognage (avec accès rapide à la carcasse car l'indice est proche de 1,1).

Les Néandertaliens du niveau VI/11-14 de Kabazi II ont probablement chassé une grande partie de ces petits équidés, mais ils ont également profité de carcasses fraîches (accès rapide aux carcasses). Ce qui semble confirmer nos hypothèses, ci-dessus énoncées, concernant la mortalité des *Equus hydruntinus* présents dans cet assemblage.

D'après l'âge des jeunes et la présence d'un fœtus, ces équidés sont morts au cours de deux saisons différentes, le printemps, avant la mise bas, et l'automne. Les hardes à ces saisons ne devaient pas comporter plus d'une quinzaine d'individus. On peut envisager que la vallée était un lieu de migration par où passaient régulièrement ces équidés pour se rendre soit dans leur «Summer Range», soit dans leur «Winter Range» (ils ont un comportement social de type: «*Resource defense territoriality*», A. Burke et V. Eisenmann, 2003). Les Néandertaliens connaissaient bien les mœurs de leur gibier, ils ont profité de ces passages réguliers pour se procurer aisément de la viande en chassant en particulier les femelles accompagnés de leurs jeunes.

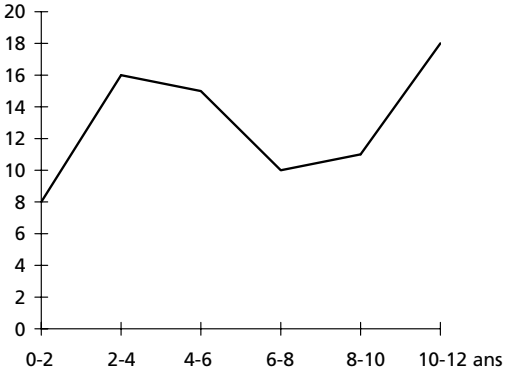

Fig. 5-5 Courbe de mortalité des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II (en nombre de dents).

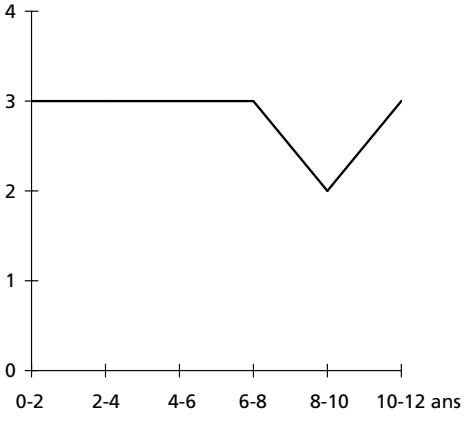

Fig. 5-6 Courbe de mortalité des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II (d'après le NMIc estimé à partir des dents).

◀ **Table 5-10** Dénombrement des ossements des Equus hydruntinus du niveau VI/11-14 de Kabazi II (Abréviations voir légende Table 5-au I; NMIf= Nombre Minimal d'Individus de fréquence; MAU=NME/Qsp (coefficient spécifique de l'élément considéré), M.A.=Membre Antérieur; M.P.=Membre Postérieur, M.I.=Membre Indéterminé; *sur un Qsp sans les canines; ** sur un Qsp = 73; *** sur un Qsp sans les vertèbres caudales; **** sur un Qsp sans les vertèbres caudales, sans les cartilages costaux et avec sternum=1 et sacrum =1.

Traitement des carcasses

À partir, des indices de quantification et des résultats des analyses de la conservation, de la fragmentation, des caractères extrinsèques d'origine anthropique et de la répartition spatiale des ossements, nous avons essayé de restituer les modalités du traitement des hydruntiniens par les Néandertaliens de Kabazi II.

La morphologie des plans de fracture de nombreuses esquilles et les stigmates observés (point d'impact, esquillements interne et externe) sur 21 os longs (2,54 % du NRT=Nombre Total de Restes *d'Equus hydruntinus*) attestent d'une fracturation par percussion sur os frais.

La tête

D'après l'analyse de la conservation de la partie supérieure du squelette crânien (présence en autres de cinq os pétreux) on peut envisager que des crânes entiers étaient présents sur le site et qu'ils ont été fracturés, probablement pour en extraire la cervelle (Tableau 5-10). Ainsi fragilisés, ils ont été altérés et réduits à l'état d'esquilles dont la plupart ont disparu. Les maxillaires sont assez mal représentés, alors que les dents isolées supérieures sont relativement abondantes. Ce constat confirme l'hypothèse précédente.

Par contre, les mandibules sont relativement bien conservées, l'os mandibulaire est intrinsèquement plus résistant que le maxillaire. Les mandibules sont toutes fracturées, notamment au niveau du canal mandibulaire, sans doute pour en extraire la substance nutritive. Les branches montantes sont rares, elles ont probablement été altérées lors de la désarticulation entre la partie supérieure et la partie inférieure du crâne. La langue a probablement été retirée, on note la présence d'un stylohyoïde. Une longue strie a été observée sur la face vestibulaire d'une hémi-mandibule gauche complète d'un adulte (en 6O). Elle a été faite lors du retrait de la peau.

Le thorax

La désarticulation tête/rachis vertébral a probablement eu lieu entre l'atlas et l'axis. Les atlas sont restés sur place, avec les crânes, alors que les autres vertèbres et les côtes ont été pour la plupart transportées ailleurs. La partie thoracique (vertèbres et côtes) correspond à une région extrêmement riche en viande. Ceci peut suggérer que les hommes ont transporté dans un autre endroit ces quartiers de carcasses non désarticulés. L'absence des sternèbres, des vertèbres sacrales et la rareté des cartilages costaux et des vertèbres caudales confirment cette hypothèse. On note cependant qu'au moins pour un individu adulte, le thorax a été dépecé sur place ou n'a pas été traité par l'homme (en 6H, 6O et 4Π).

Les ceintures

Les coxaux, relativement abondants (Tableau 5-10), sont représentés essentiellement par leur cavité cotyloïde (souvent fragmenté). Le déficit important des autres parties de cet élément, qui sont entourées de viande, suggère que lors du dépeçage celles-ci sont restées dans la viande et ont été transportées ailleurs. L'état fragmentaire des cavités cotyloïdes, la relative bonne conservation des extrémités proximales et la mauvaise des métaphyses proximales des fémurs conduisent à proposer une désarticulation, sur place, dans cette zone anatomique par percussion. Ce que semble confirmer la présence, sous la cavité cotyloïde d'un fragment de coxal (découvert en 5H), à la fois d'impacts de percussion et de stries de désarticulation.

La scapula, relativement bien conservée (Tableau 5-10), est essentiellement représentée par sa cavité glénoïde, rappelons que 4 scapula sont à peu près complètes. L'aile est la partie la plus fragile et peut, fragmentée, se retrouver à l'état d'esquilles indéterminées ou être totalement détruite. Cependant, on peut également avancer l'hypothèse d'une fracturation, lors de la désarticulation, au niveau du col, laissant ainsi l'aile dans la masse musculaire qui entoure la scapula. La cavité glénoïde est souvent altérée ce qui peut s'expliquer par une désarticulation par percussion, hypothèse apparemment confirmée par l'absence de l'extrémité proximale des humérus.

Les pattes antérieures

La conservation des humérus est proche de celle des scapulas (Tableau 5-10). Ils sont tous fracturés, la récupération de la moelle a été systématique. On observe que l'extrémité distale des humérus et l'olécrâne des ulnas d'adultes font défaut, alors que les métaphyses, distale d'humérus et proximale de radius, sont abondantes. Ce constat pourrait attester d'une désarticulation humérus/radius-ulna par percussion. Ce qui semble être confirmé par la présence sur la face latérale d'une métaphyse distale d'humérus (découverte en 6O) d'un impact de percussion (esquillement externe) et de stries de désarticulation.

La conservation des radiu-ulna est bonne (Tableau 5-10). Deux radius ont été découverts entiers, un d'adulte en 5O et un de jeune en 5Π. Pour les douze autres, l'extraction de la moelle a été systématique. On a observé sur un fragment de face latérale ou médiale de métaphyse de radius (découvert en 4Π) l'impact d'une percussion (esquillement interne). D'autre part, des stries obliques ont été également déterminées sur un autre fragment de diaphyse de radius (en 6O). Elles résultent de l'action de décharnement.

Les métacarpiens sont bien conservés (Tableau

5-10). On note un léger déficit de la partie distale par rapport à la partie proximale, ce qui est courant. Les épiphyses, proximale et distale, sont peu altérées (79,4 % sont entières). Un seul métacarpien est entier (en 6O), les autres ont été fracturés pour extraire la moelle. Sept fragments de diaphyses proximales de métacarpiens portent des marques de percussion sur os frais, dont 6 de type «bec de flûte».

Les pattes postérieures

Le fémur est relativement bien conservé (Tableau 5-10). Aucun n'a été retrouvé entier, la fracturation pour extraire la moelle a été systématique. L'extrémité distale est absente, ce qui attesterait peut-être d'une désarticulation fémur/tibia par percussion, d'autant que l'extrémité proximale du tibia est mal conservée.

La conservation des tibias est identique à celle des fémurs (Tableau 5-10). Nous n'avons retrouvé aucun os entier. L'extraction de la moelle a été systématique. En 6Π et en 5H, une métaphyse proximale de tibia et une diaphyse médiane portent des stigmates de percussion anthropique (un esquillement externe sur les faces postérieures de ces fragments). Seule une patella a été déterminée (en 6O). Ont-elles été perdues lors de la désarticulation entre le fémur et le tibia? D'après les données fournies par les fémurs et les tibias, la désarticulation fémur/tibia semble avoir eu lieu majoritairement en dehors de la zone fouillée. La partie, englobant l'extrémité distale du fémur, la patella et la partie proximale du tibia, de certaines carcasses aurait donc été transportée ailleurs.

Les tarsiens sont relativement mal conservés (Tableau 5-10). Ils sont pour la plupart entiers. On n'a retrouvé que 4 associations, ce qui souligne une forte dispersion de ces os. Sur un cuboïde droit d'adulte (en 6H), des stries ont été identifiées sur la face dorsale. Elles résultent de la désarticulation du tarse.

Le métatarsien principal est l'élément anatomique le mieux conservé (Tableau 5-10). Ils sont, à l'exception d'un, tous fracturés. Quatre fragments de diaphyses proximales de métatarsiens portent des marques de percussion sur os frais, dont 2 de type «bec de flûte». Un fragment de métatarsien III (découvert en 6Π), ayant conservé son extrémité distale, porte des petits sillons parallèles entre eux et perpendiculaire au grand axe de l'os. Il a été considéré comme retouchoir. D'autre part, un fragment de diaphyse présente sur la face médiale des stries. Leur interprétation est délicate, elles peuvent résulter d'un grattage de l'os. Signalons que quatre fragments de diaphyses médianes ou distales de métapodiens indéterminés portent également des marques de percussion sur os frais, dont 3 de type «bec de flûte». Comme pour les métacarpiens, on note un léger déficit de la partie distale par rapport à la proximale. Par contre, les extrémités ici sont légèrement plus altérées que celles des métacarpiens (63,6 % sont complètes).

Les métapodiens vestigiaux

Les métapodiens vestigiaux, antérieurs et postérieurs, sont bien conservés, surtout si l'on prend en compte l'ensemble des fragments déterminés, le MAU s'élève alors à 7 (Tableau 5-10).

Les phalanges et les sésamoïdes

Les phalanges, notamment les intermédiaires, sont assez mal conservées (Tableau 5-10). Plus de 65 % d'entre elles sont entières. La moelle qu'elles contiennent n'a pas été systématiquement récupérée. Les restitutions articulaires entre phalanges sont très rares, seulement deux (les deux entre une phalange intermédiaire et une phalange distale). On note également un déficit relativement important des sésamoïdes (Tableau 5-10) qui peut s'expliquer soit, par leur perte lors des désarticulations soit, plus probablement, par leur dispersion post-dépôt. Ce qui témoigne d'un transport et/ou d'une dispersion importante des extrémités des pattes. Alors que les extrémités distales des métapodiens principaux et les phalanges proximales ont été retrouvées dans les mêmes carrés.

D'après les pourcentages de survie des ossements (Fig. 5-7), il manque, à l'exception des métapodiens, plus de 50 % du matériel. Deux hypothèses peuvent être avancées: (1) destruction naturelle due à des agents taphonomiques autres que l'homme, (2) action anthropique, les hommes auraient emporté ailleurs les parties manquantes. D'après nos

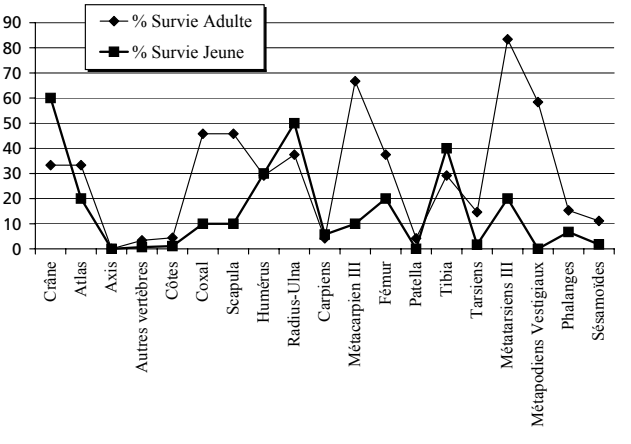

Fig. 5-7 Pourcentages de survie des ossements des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II.

résultats (*cf. supra*), il y a probablement eu la conjonction de plusieurs actions. Des Néandertaliens ont en effet joué un rôle important, mais des carnivores et des porcs-épics ont également consommé et vraisemblablement emporté des morceaux de carcasses (notamment les extrémités de pattes).

Des chevaux entiers ont été dépecés sur le lieu même de leur abattage. Le crâne a été séparé de la colonne vertébrale au niveau de l'atlas. Pour séparer le membre antérieur de la région thoracique, les Néandertaliens ont fracturé le col de la scapula. Pour le membre postérieur, ils ont fracturé l'ilion et l'ischion du coxal. Les désarticulations, entre les coxaux et les fémurs, les scapulas et les humérus, les humérus et les radius-ulnas, les fémurs et les tibias, ont été réalisées par percussion. La séparation entre la partie supérieure des membres antérieurs et les autopodes s'est faite au niveau du carpe, de même, pour les membres postérieurs, au niveau du tarse. La désarticulation entre les métapodiens et les phalanges a été fréquente.

La cervelle, la langue et la substance nutritive du canal mandibulaire ont été prélevées. Des morceaux de carcasses ont été emportés ailleurs (notamment le thorax). La question d'un transport possible de la partie correspondant au grasset («genou») se pose. La viande a été prélevée sur certains os non transportés et les os systématiquement fracturés pour en extraire la moelle. Ils ont récupéré la peau d'au moins un animal et ont utilisé comme retouchoir un fragment de métatarsien.

D'après la répartition spatiale des ossements d'*Equus hydruntinus* (Fig. 5-8), leur traitement a eu lieu principalement en 6O et 5O. Proportionnellement (par carré, nombre d'ossements de l'unité considérée/nombre total d'ossements) les restes crâniens sont plus abondants en 5H et 5O, ceux du squelette axial en 6M, 5O et 6H, les os des membres en 5M, 4M, 5Π, 4H et 6M et ceux de l'autopode en 6O, 4Π, 4O, 4H et 4Π. Les ossements avec marques de boucherie sont proportionnellement plus abondants en 6Π, 6O et 5H. Le dépeçage a principalement été réalisé en 5O et les autres phases du traitement en 6O, 6Π et 5H.

Évaluation des apports nutritifs

Trois os entiers nous ont permis d'estimer la hauteur au garrot de trois individus: 1m28, 1m33 et 1m42 (Auguste 1995, Patou-Mathis 1999). Le poids de ces petits équidés varie entre 180 et 200 Kg pour un adulte (Auguste 1995, Patou-Mathis 1999). Nous avons calculé le poids de viande apporté par l'abattage des 12 adultes (poids de viande par adulte environ 60 % du poids total) à environ 1 400 Kg. À celui-ci, s'ajoute la part fournie par les cinq jeunes, environ 300 Kg. Près de 1 700 kg de viande ont pu avoir été récupéré. Ce résultat confirme la pratique de chasses récurrentes.

D'après les travaux de A. Outram et P. Rowley-Conwy (1998), nous avons corrélé les taux de conservation des différents éléments anatomiques et leur valeur nutritive. Le FUI (*Food utility Index*) a été

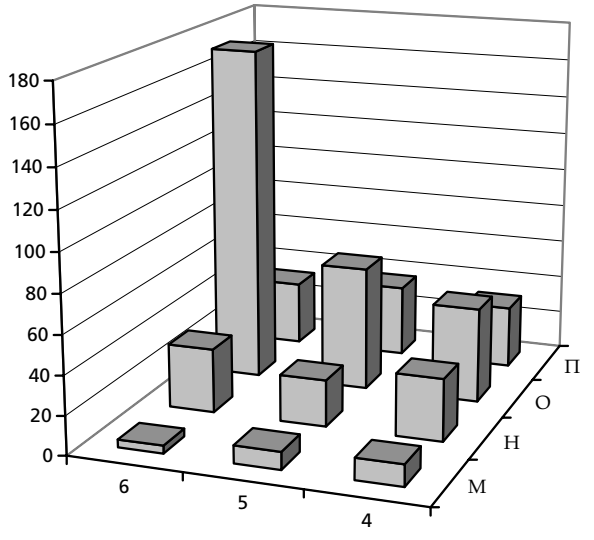

Fig. 5-8 Répartition horizontale des ossements déterminés des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II (par densité/carré).

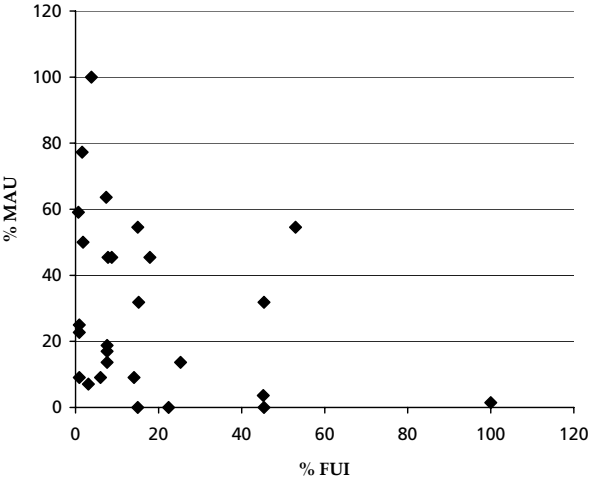

Fig. 5-9 Relation entre l'indice de richesse nutritive (FUI) et le MAU des os des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II (Food Utility Index, d'après Outram et Rowley-Conwy, 1998).

préféré au GUI (*General Utility Index*) car cet indice tient compte de la densité (Metcalfe et Jones 1988). Cette analyse met en évidence une mauvaise conservation pour les éléments les plus nutritifs et une bonne pour les éléments peu nutritifs, cela indépendamment de la densité des ossements (Fig. 5-9). Ce qui correspondrait à une stratégie nutritive dite inverse, stratégie qui caractérise les sites de boucherie (Binford 1978, Lyman 1994). D'autre part, les taux de conservation de la plupart des éléments anatomiques sont relativement élevés ce qui résulte d'un traitement peu intensif (et non systématique de tous les os) et correspondrait à la stratégie nutritive dite de gourmet (donc, ici, «gourmet inverse»). La figure 5-10 confirme ces résultats, on note en effet, un fort déficit de la plupart des os riches en viande. Comme nous l'avons précédemment suggéré, certains morceaux, particulièrement nutritifs, de carcasses ont été emportés, en dehors du site. La qualité semble avoir prévalue sur la quantité. Par contre, le profil de la courbe de la figure 5-11 met en évidence l'abondance relative de certains os riches en moelle. Les os longs demeurés sur place, à l'exception de deux radius, deux métapodiens principaux et de sept phalanges proximales, ont été fracturés sur place, pour extraire la moelle.

Statut des autres espèces

Les autres espèces déterminées, excepté le cerf, le renard et le lapin, ne sont représentées que par quelques ossements (Tableau 5-7). Bien qu'un peu plus nombreux, les restes appartenant à ces trois espèces sont rapportés, au nombre d'individus estimés, peu abondants (fort déficit). Dans ces conditions, il nous est très difficile de proposer une hypothèse concernant leur origine. On remarque, que seuls, un cerf mâle, un boviné et deux renards communs, sont des adultes dans la force de l'âge, les autres animaux étant des jeunes (un cerf, un renard) ou des vieux individus (un cerf, un cheval, un rhinocéros de prairie, un loup ou cuon). Dans les cas du cerf, du cheval, du renard et du lapin, toutes les grandes unités squelettiques sont représentées par au moins un reste. Cependant, si l'on tient compte du nombre d'individus estimés ce n'est plus le cas que pour le cheval. Quatre fragments d'os long de cheval portent des stigmates de percussion d'origine anthropique, en outre une diaphyse de fémur ou d'humérus présente des stries résultant d'un décharnement intentionnel. De même, le fragment diaphysaire du tibia du boviné a été fracturé par percussion. On peut donc suggérer que l'homme est intervenu sur deux carcasses, une de cheval et une de boviné. Ces animaux étaient probablement déjà morts, d'après l'âge, «naturellement» (le cheval) ou tué par un grand carnivore (le boviné). Soulignons que trois os appartenant à ces deux espèces ont été rongés par des porcs-épics. De même, un os de renard porte une empreinte de croc de petit canidé. L'ensemble de ce matériel est dispersé, aucune concentration particulière n'a été constatée excepté pour le renard (uniquement en 6O et 4O). Ces ossements se répartissent dans les mêmes carrés que ceux d'*Equus hydruntinus.*

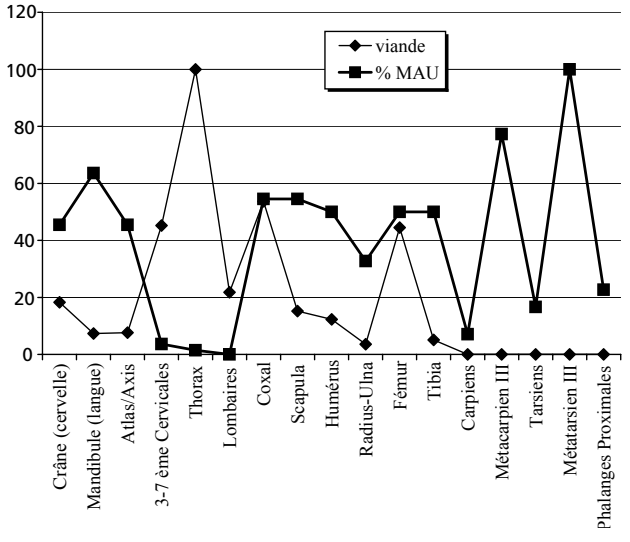

Fig. 5-10 Relation entre l'indice de viande et le MAU des os des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II (Meat Index d'après Outram et Rowley-Conwy, 1998).

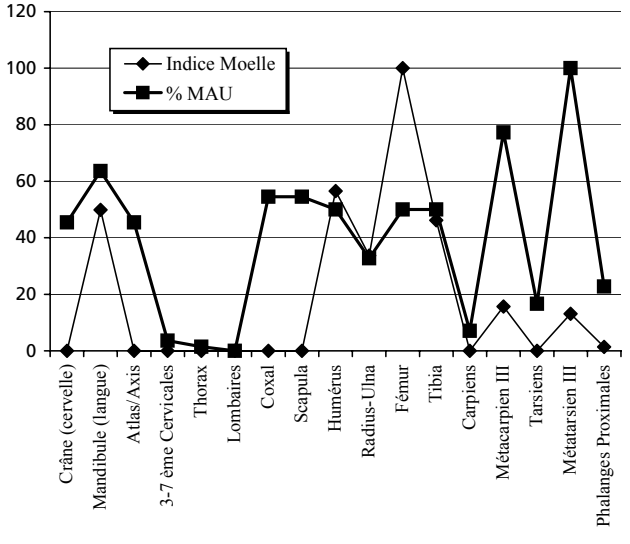

Fig. 5-11 Relation entre l'indice de moelle et le MAU des os des *Equus hydruntinus* du niveau VI/11-14 de Kabazi II (Marrow Index d'après Outram et Rowley-Conwy, 1998).

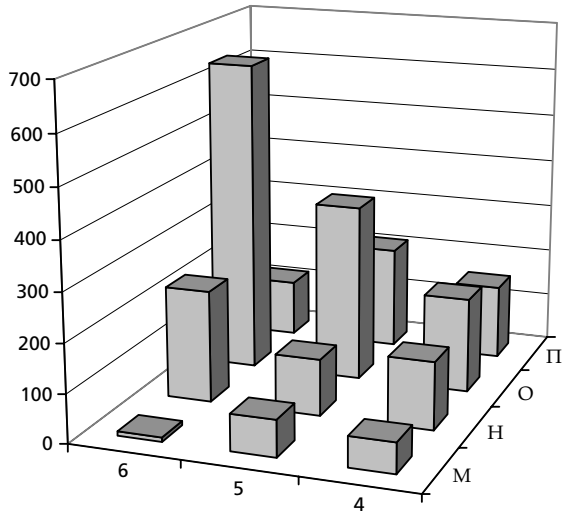

Fig. 5-12 Répartition horizontale de tous les ossements (déterminés et indéterminés) du niveau VI/11-14 de Kabazi II (densité/carré).

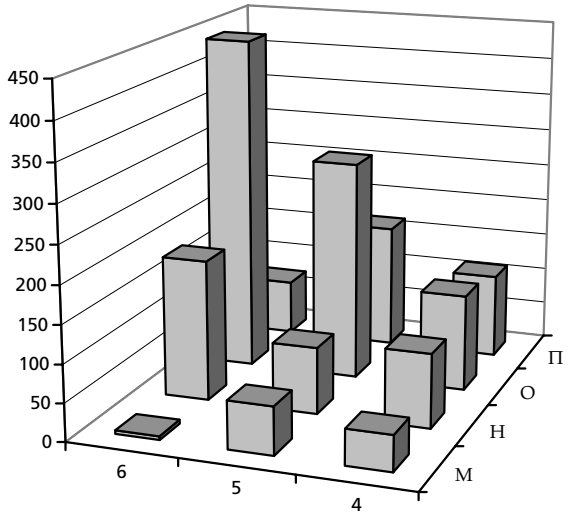

Fig. 5-13 Répartition horizontale des esquilles indéterminées du niveau VI/11-14 de Kabazi II (densité/carré).

Répartition spatiale

En prenant en compte l'ensemble du matériel osseux, restes déterminés et non déterminés, les carrés où la densité est la plus forte sont 6O puis 5O, 6H et 5П (Fig. 5-12).

L'étude de la répartition des ossements des espèces déterminées, dominée par le nombre élevé de restes d'*Equus hydruntinus*, met en évidence une forte densité dans les carrés 6O puis 5O et 4O. Les esquilles indéterminées ont une répartition proche de celle des ossements déterminés (Fig. 5-13). Cependant, on observe proportionnellement plus d'esquilles indéterminées en 6H et 5П. Ces secteurs pourraient correspondre, soit à une zone de déchets, soit au lieu de fracturation des os, notamment des os longs. Les esquilles brûlées sont dispersées sur 8 carrés, elles sont un peu plus nombreuses en 5H.

Discussion

Les Néandertaliens du niveau VI/11-14 de Kabazi II ont occupé le site durant une période relativement tempérée et humide. L'environnement correspondait alors à une prairie-steppe avec aux abords des cours d'eau des zones boisées bien développées.

L'assemblage osseux d'*Equus hydruntinus* est majoritairement d'origine anthropique. Les Néandertaliens ont pratiqué des chasses récurrentes et spécialisées sur cet équidé. D'après la composition de la population abattue, des femelles, accompagnées de leur jeune, ont été préférentiellement chassées sur la colline de Kabazi, probablement à l'affût. Ils ont été tués durant le printemps et l'automne lors de leurs migrations saisonnières. Les Hommes ont immédiatement dépecé les animaux, prélevé la cervelle, la langue et la moelle des os longs. D'après les résultats relatifs aux modes d'acquisition et de traitement des *Equus hydruntinus*, (notamment, l'absence de très jeunes animaux, une sélection des animaux «gras», une stratégie nutritive de type «gourmet inverse») nous pouvons avancer l'hypothèse d'une période de relative abondance du gibier durant la fréquentation de Kabazi II par les Néandertaliens. Ils ont également prélevé des morceaux de viande sur des carcasses fraîches de quelques *Equus hydruntinus*, d'un cheval et d'un boviné. Ils ont utilisé un os d'*Equus hydruntinus* comme retouchoir et récupéré la peau de ces petits équidés. La présence d'os brûlés atteste de la présence à proximité de la zone fouillée d'au moins un foyer.

D'après nos résultats, la relative pauvreté du matériel lithique (Chabai 1996) et l'absence de structure d'habitat, nous suggérons que le niveau VI/11-14 de Kabazi II correspond à un site d'abattage et de boucherie ayant fonctionné à plusieurs reprises.

Les Niveaux VI/15 à VI/17

Compte tenu du très faible nombre de restes osseux et d´individus estimés pour chacun de ces niveaux, nous avons réalisé une analyse comparative (Tableau 5-11). Les fouilles n´ont été réalisées que sur 9 m² en VI/15 et VI/16 et sur 6 m² en VI/17.

Le nombre de restes, déterminés et indéterminés, est plus élevé en VI/15 (Tableau 5-11). La densité la plus forte en matériel osseux se situe également dans ce niveau (17,1). Ce résultat est en concordance avec la densité du matériel lithique (qui est dans son ensemble extrêmement faible).

Il y a très peu de diversité spécifique: trois taxons en VI/15, 2 taxons en VI/16 et VI/17 (Tableau 5-12). *Equus hydruntinus* est présent dans tous les niveaux. On note la présence d'un cervidé indéterminé (probablement du cerf) en VI/17, d'un renard commun en VI/15, d'un petit mustélidé en VI/16 et d'un lagomorphe (probablement du lapin) en VI/15.

D'après l'analyse taphonomique des ossements du niveau VI/15, on peut émettre les hypothèses suivantes: le climat qui régnait lors de la formation de ce niveau était relativement humide (il a altéré 4,37 % du matériel) et tempéré (4 os portent des marques de rongements dus à des porcs-épics, soit 2,5 % du matériel); la fragmentation du matériel a une double origine, une première fracturation d'origine anthropique et une seconde post-dépositionnelle (les esquilles indéterminées dépasse les 64 % et la plupart ont une longueur maximale de 2 cm, Tableau 5-11). Nous n'avons retrouvé aucune marque d'origine anthropique ou dues à des carnivores. Pour les deux autres niveaux: en VI/16, un fragment de métapodien principal *d'Equus hydruntinus* porte un impact de percussion d'origine anthropique (fracturation de type «bec de flûte») et une esquille est effilée (action du weathering); en VI/17, trois os portent des vermiculations (attestant de l'action des radicelles de plantes).

En VI/15, trois *Equus hydruntinus*, un jeune (de mois de 10-12 mois ou de 20-26 mois), un jeune adulte et un adulte dans la force de l'âge ont été estimés (Tableau 5-11). Parmi les deux adultes, un mâle a été identifié. On note un très fort déficit en os (au plus 12,3 ossements par individus). Des éléments de chaque grande unité squelettique ont été déterminés. On remarque, l'absence de la scapula, la faible dominance des os de la partie supérieure des membres postérieurs et la rareté des restes dentaires et du squelette axial. L'homme est intervenu sur des carcasses d'animaux qu'il a chassés ou sur celles d'individus déjà morts. Aucun indice ne nous permet de choisir entre ces deux hypothèses. Il a probablement transporté en dehors du site des quartiers entiers. On remarque une forte concentration du matériel osseux dans trois carrés (159/160 restes en 4O, 4Π et 5Π).

En VI/16, un *Equus hydruntinus*, mâle adulte jeune, a été identifié. Il y a trop peu de restes (Tableau 5-12) pour avancer une hypothèse palethnographique. Il en est de même pour le niveau VI/17 où seuls deux os, un fragment d'humérus et un autre de tibia, d'*Equus hydruntinus*. ont été identifiés.

Le fait remarquable à Kabazi II est la permanence des comportements de subsistance des Néandertaliens. Ils sont venus, à de multiples reprises, durant des phases climatiques froides et tempérées, chasser quasi exclusivement des *Equus hydruntinus*. Ce gisement a fonctionné durant plusieurs milliers d'années comme un site d'abattage et de boucherie.

Niveaux	NRDt	NRDa	NRI	NRT	% NRI	Densité/m³	m³ fouillés
VI/15	57	–	103	160	64,37	17,7	9
VI/16	22	–	49	71	69,01	7,9	9
VI/17	3	2	13	18	72,22	3	6

Table 5-11 Dénombrement du matériel faunique des niveaux VI/15 à VI/17 de Kabazi II.

Niveaux	*Equus hydruntinus*	*Cervidae*	*Vulpes vulpes*	*Mustelidae*	*Lagomorpha*
VI/15	51//3	–	3//1	0	1//1
VI/16	20//1	–	–	2	–
VI/17	2//1	1//1	–	–	–

Table 5-12 Spectre faunique du niveau VI/15 à VI/17 de Kabazi II (NR//NMIc).

Abstract

Kabazi II, Units V and VI: the Archaeozoological Analyses

Marylène Patou-Mathis

In Unit V, levels V/4 to V/6 the Neanderthals hunted *Equus hydruntinus* which was then butchered on site. The parts rich in meat were transported to their camp site. Obviously, a maximum degree of exploitation of the animals was affected. As burnt bone is present in all levels of Unit V, at least one fire place must have been present close to the excavated area. On the site, people consumed the marrow won from long bones. During the formation of levels V/4 to V/6 the site must be considered as a place for slaughter and butchering. The occupations were of short duration, and there might have been only one occupation per level.

In Unit VI, levels VI/1 to VI/10 the Neanderthals hunted mostly *Equus hydruntinus* and scavenged other species. They were disassembled on site, and pieces rich in meat were then transported to the camp site. In level VI/1 and VI/5 humans were present at springtime, and in VI/6 and VI/7 they came during the autumn. Again, animal exploitation was maximal. The repeated presence of burnt bone in all levels indicates a nearby hearth. On site, the marrow of long bones was consumed. During the formation of layer VI/1 to VI/10 the site served as a location for slaughtering, scavenging place, and repeated butchering. It is interesting that the same practice was maintained for a long time, with multiple, repeated short term occupations.

The Neanderthals of levels VI/11-14 of Kabazi II occupied the site during a relatively moderate and humid time period. The environment corresponded to a grassland-steppe with gallery forests along the river courses. The bone assemblage of *Equus hydruntinus* is mainly based on human action. The Neanderthals practised repeated and specialized hunting of these animals. The population of slaughtered animals implies that females accompanied by their young were the preferred prey. They were hunted, probably from an ambush, in the Kabazi Mountain area. They were killed during their seasonal migrations, in spring and autumn. The humans immediately butchered the animals, consuming the brain, the tongue, and the marrow of long bones. When compared with other data, the mode of acquisition and treatment of *Equus hydruntinus* allows for the hypothesis of a period of relative abundance of prey during the stays of Neanderthals of Kabazi II, especially as very young individuals are absent, fat animals were preferred and a nutrition strategy of the „gourmet inverse". They also cut some pieces of meat from fresh carcasses of *Equus hydruntinus*, a horse and a bovid. They use one of the *Equus hydruntinus* bones as a retoucher and they exploited the skin of these small Equides. The repeated presence of burnt bone in all levels indicates a nearby hearth. The archaeozoological evidence, the scarcity of lithic artefacts and the absence of a habitation structure, suggests level VI/11-14 of Kabazi II having repeatedly served as a slaughtering and butchering site.

The particular value of Kabazi II is the continuity of nutritional behaviour of the Neanderthals. They repeatedly came during cold and moderate periods, almost exclusively for *Equus hydruntinus* hunting. For thousands of years, this site served as a site for slaughtering and butchering animals.

Abstract

КАБАЗИ II, КУЛЬТУРНО-ХРОНОЛОГИЧЕСКИЕ СЛОИ V И VI: АРХЕОЗООЛОГИЧЕСКИЙАНАЛИЗ

М. ПАТУ-МАТИС

Стоянки горизонтов V/4, V/5 и V/6 связаны с первичной разделкой туш гидрунтиновых лошадей, которые составляли охотничью добычу неандертальцев. Части туш богатые в мясном отношении были унесены в лагерь. Несомненно наличие высокой степени утилизации туш животных. Обожженные кости указывают на присутствие очага вблизи раскопанного участка. На стояке неандертальцы потребляли костный мозг, добытый из некоторых крупных костей. Стоянки горизонтов V/4, V/5 и V/6 носили кратковременный характер и, вероятно, каждая из них является отражением одного хозяйственного эпизода.

На стоянках горизонтов VI/1 – VI/10 представлены результаты, как охотничьей деятельности неандертальцев, в основном, на гидрунтиновых лошадей, так и свидетельства собирания падали. На территории стоянок производилась первичная разделка туш животных. Наиболее богатые в мясном отношении части туш были унесены в лагерь. Стоянки горизонтов VI/1 и VI/5 связываются с весенней охотой, тогда как стоянки горизонтов VI/6 и VI/7 функционировали осенью. Как и в случае с вышележащими комплексами, на стоянках горизонтов VI/1 – VI/10 отмечается максимальная степень утилизации фауны. Наличие обожженных костей во всех горизонтах указывает на использование огня на данных поселениях. На территории стоянок их обитатели потребляли в пищу костный мозг из расколотых длинных костей. Интересно то, что этот тип хозяйственной деятельности повторялся длительное время и отразился в многочисленных кратковременных поселениях.

Стоянки археологических горизонтов VI/11-14 существовали во время умеренно теплого и влажного климата. Луговые ландшафты соседствовали с лесами в долине реки. Фаунистические коллекции представлены, главным образом, остатками гидрунтинусов, которые составляли основу повторяющихся специализированных охот неандертальцев. Встречаются кости быка и других животных. Неандертальцы отдавали предпочтение самкам и молодым особям, что может свидетельствовать об использовании засад в качестве основного метода охоты. Гидрунтиновые лошади были добыты весной и осенью во время их сезонных миграций. На территории стоянки происходила первичная разделка туш животных и потребление мозга, языков и костного мозга. По сравнению с другими горизонтами, модель добычи и разделки гидрунтиновых лошадей горизонтов VI/11-14 свидетельствует об относительном обилии фаунистических ресурсов. Среди добычи отсутствует молодняк, предпочитались наиболее жирные особи. Только наиболее мясистые части были отделены от туш животных. Вид стратегии питания определяется, как *„gourmet inverse“*. Наличие обожженных костей предполагает использование очагов за пределами раскопанной площади. В одном случае кость гидрунтинуса была использована в качестве ретушера. В целом, археозоологические данные свидетельствуют о повторяющемся использовании поселений горизонта VI/11-14 в качестве стоянок по первичной разделке.

Особое значение Кабази II состоит в неизменности пищевого поведения неандертальцев, которые посещали это место, как во время холодных, так и умеренных климатических периодов, с единственной целью – охота на гидрунтинусов. Многие тысячелетия это место использовалось для добычи и первичной разделки животных.

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НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК УКРАИНЫ
ИНСТИТУТ АРХЕОЛОГИИ
КРЫМСКИЙ ФИЛИАЛ

КЁЛЬНСКИЙ УНИВЕРСИТЕТ
ИНСТИТУТ ДО- И ПРОТОИСТОРИИ

Палеолитические стоянки Крыма,
Том 1

КАБАЗИ II:
ПРИРОДА И ЧЕЛОВЕК ВРЕМЕНИ ПОСЛЕДНЕГО ИНТЕРГЛЯЦИАЛА

Редакторы:
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Chapter
6

Kabazi II, Units V and VI: Artefacts

Victor P. Chabai

The artefacts presented in this chapter have been classified following the principles of Gladilin classification which was adopted by Chabai and Demidenko for stone assemblages of Crimean Middle Palaeolithic (Gladilin 1976, Chabai, Demidenko 1998). The artefacts of Units V and VI were recovered from a total of 19 archaeological levels, all of which are separated by sterile sediments and should be regarded as discrete archaeological assemblages (see Chapter 1). In this chapter an attempt is made to place these individual assemblages within the context of the Crimean Middle Palaeolithic period.

Structure of Artefact Assemblage

The artefact assemblages of Units V and VI comprise a total of 1378 items (Table 6-1). With the exception of two bone retouchers (level VI/11-14) and one pebble tool (level VI/9), all were made on flint. The dominant category is chips (<3 cm), followed by flakes, tools, and chunks (Table 6-1). In contrast, blades, preforms, cores and unfinished bifacial tools are rare, and in each case do not exceed 1 % of the total number of artefacts. Generally speaking, whilst flakes and tools represent the most important pieces of the assemblages, the remaining artefact categories are not statistically pronounced. Additionally, there are no significant statistical differences in the composition of the artefact assemblages from the different levels. To sum up, the structure of each of the artefact assemblages is characterised by the dominance of debitage, a relatively high component of tools, and the presence of preforms, cores and unfinished bifacial tools. In addition, the sandstone pebbles and fragments of sandstone pebbles should also be mentioned at this point. These were found in each level, although none of them exhibit any evidence of exploitation either as hammer-stones or retouchers. The only modified sandstone pebble is the chopper from level VI/9.

The composition of the assemblages very closely resembles assemblages from Kabazi II, levels III/1-III/3, Sary Kaya, and Chokurcha, Unit IV (Chabai 1998d, 2004b, Veselsky 2003), all of which are characterised by a high amount of tools contrasting a low quantity of cores and preforms. At the same time, of all the complexes mentioned, the assemblages of Kabazi II, Units V and VI demonstrate the lowest percentages of tools.

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Chunks	2	·	·	3	3	2	2	7	2	5	7
Chips	53	30	51	72	74	29	40	32	28	56	54
Flakes	10	5	13	18	12	9	14	8	6	20	13
Blades	·	·	·	4	·	·	2	·	·	1	·
Preforms	·	1	1	·	·	·	·	·	·	·	1
Cores	·	·	·	·	·	·	1	1	1	2	·
Unfinished bifacial tools	1	·	·	2	·	1	·	1	·	·	·
Tools	6	4	4	4	5	5	4	3	3	6	4
Total	72	40	69	103	94	46	63	52	40	90	79

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total:	%	% ess
Chunks	3	2	3	3	9	·	1	1	55	*3,99*	
Chips	48	45	66	24	170	12	4	2	890	*64,59*	
Flakes	17	19	13	9	79	2	3	1	271	*19,67*	*62,59*
Blades	·	5	2	·	4	2	·	·	20	*1,45*	*4,62*
Preforms	·	·	·	1	4	·	·	·	8	*0,58*	*1,85*
Cores	1	1	2	·	2	1	·	·	12	*0,87*	*2,77*
Unfinished bifacial tools	2	1	1	·	2	·	·	·	11	*0,79*	*2,54*
Tools	5	9	12	2	32	2	·	1	111	*8,06*	*25,63*
Total	76	82	99	39	302	19	8	5	1378	*100,00*	*100,00*

Table 6-1 Kabazi II, levels V/3-VI/17: artefact totals.

Chunks

The chunks – pieces of raw material without pronounced traces of flaking - were found in all levels of Units V and VI with exception of the levels V/4, V/5 and V/15. These pieces rarely exceed 4 cm in maximum dimensions. The only exception is a single piece of flint plaquette (6,2 x 3,5 x 2,1 cm) from level VI/10. This flint plaquette may constitute the only example of raw material storage brought onto the site area.

Preforms

Preforms are tested flint plaquettes or big primary flakes which might be modified into either core or bifacial tools (Fig. 6-1, *3*). They are represented in a total of five levels (Table 6-1). The biggest preform was found in level VI/7 (13,0 X 6,3 X 4,9 cm), and the smallest in level VI/11-14 (5,2 X 5,3 X 4,2 cm). With respect to raw material supply the evidence for flint storage is not very pronounced, but nevertheless existent. One relatively big flint plaquette which was identified as a chunk and seven preforms comprise about 0,5 – 2 % in both total and essential accounts (Table 6-1). In other words, evidence for flint storage is rare and was only found in 5 of 19 levels.

Cores

Cores were found in a total of nine levels (Table 6-1). The cores are represented by relatively big (no less than 6 cm in maximum dimension) and not exhausted items (Fig. 6-2, *1, 2*). The small number of cores makes it difficult to define the dominant types. The single-platform and multi-platform cores are more or less equally represented (Table 6-2). The flaking surfaces of both single- and multi-platform cores

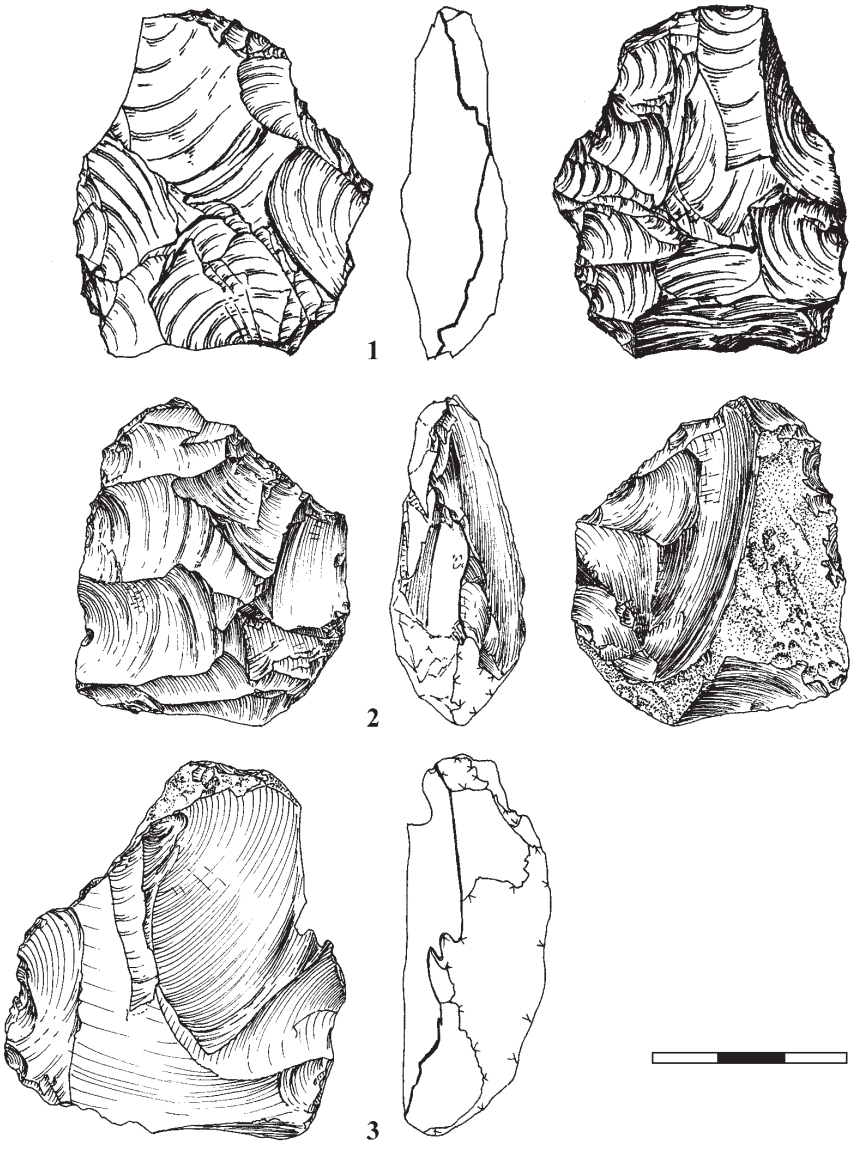

Fig. 6-1 Kabazi II, levels V/3 (1), V/5 (3) and VI/8 (2). Unfinished bifacial tools – 1, 2. Preform on flake – 3.

	VI/3	VI/4	VI/5	VI/6	VI/8	VI/9	VI/9A	VI/11-14	VI/15	Total
Parallel, transverse	1	·	·	·	·	·	·	·	·	1
Parallel, narrow flaked surface	·	·	1	·	·	·	·	·	·	1
Parallel	·	·	·	1	·	·	2	·	·	3
Bi-directional	·	·	·	·	·	1	·	·	·	1
Bi-directional, conjoined	·	·	·	·	·	·	·	·	1	1
Orthogonal, alternative	·	·	·	1	·	·	·	·	·	1
Unsystematic, cubic	·	1	·	·	1	·	·	1	·	3
Unidentifiable	·	·	·	·	·	·	·	1	·	1
Total	1	1	1	2	1	1	2	2	1	12

Table 6-2 Kabazi II, levels V/3-VI/17: cores.

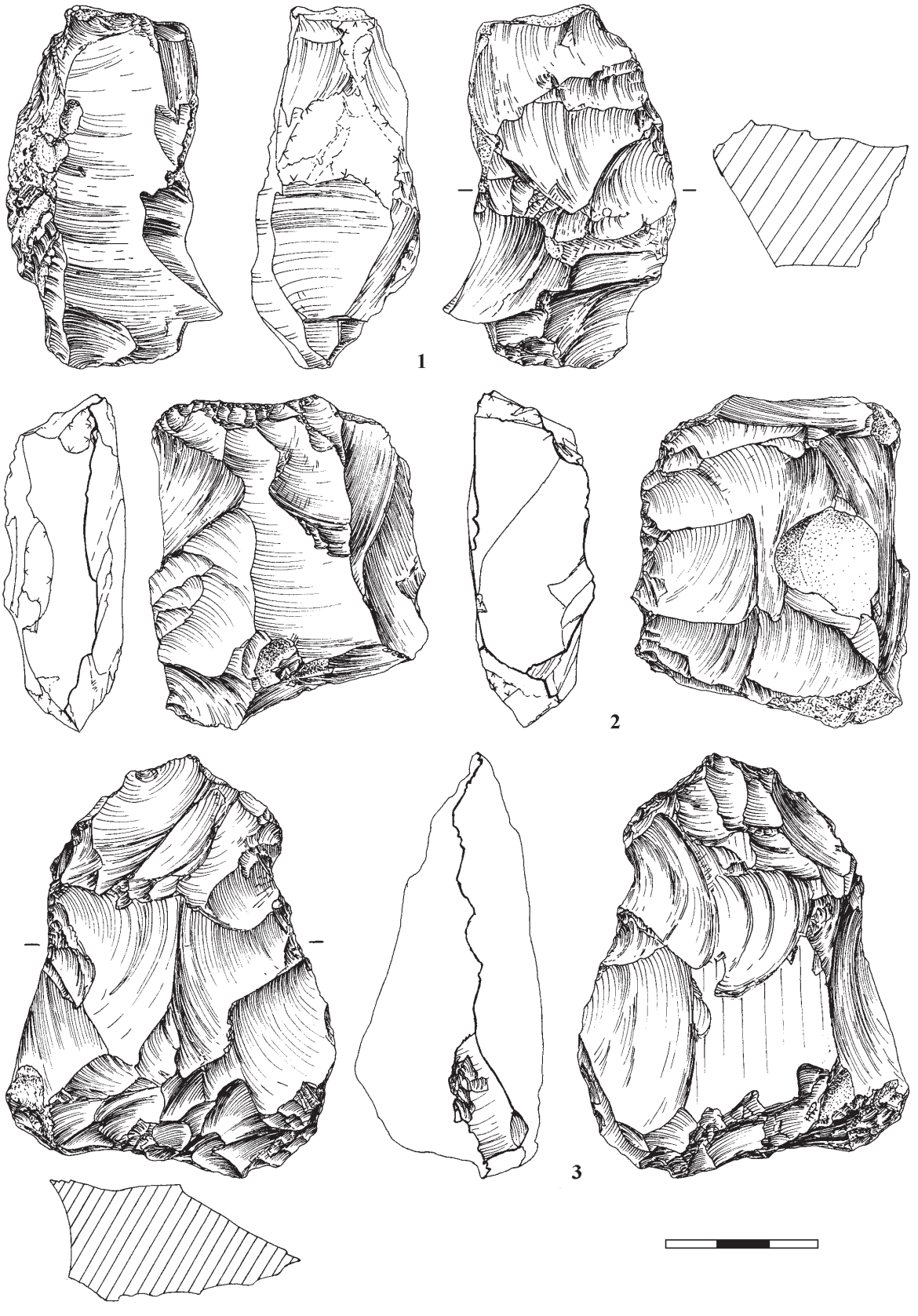

Fig. 6-2 Kabazi II, levels V/6 (3), VI/6 (2) and VI/15 (1). Cores: 1 – bidirectional conjoined; 2 – orthogonal alternative. Unfinished bifacial tool – 3.

often exhibit a series of parallel negatives. The dominant feature of the core assemblage is the absence of supplementary platforms, as well as the scarcity of faceted main platforms. It would appear that the makers of these assemblages did not practice any specific methods of striking platforms and of flaking surface preparation. In other words, core reduction tends to be of "situational" or "badly controlled" character when the change of removal directions and striking platforms was caused by the appearance or disappearance of convexity in one or another part of core flaking surface. Taking into account the parallel character of removals, this core reduction strategy has been termed parallel "primitive" flaking (Chabai, Sitlivy 1993). Such core treatment usually results in a number of hinge fractures on the dorsal surface, short proportions of flakes, incurvate lateral profiles and hinged distal ends.

Unfinished Bifacial Tools

Unfinished bifacial tools were found in eight levels (Table 6-1), and represent one of the most peculiar categories of artefacts (Fig. 6-1, *1, 2*; 6-2, *3*). On the one hand, they are very closely related to cores, especially when they are broken. On the other hand, they show significant similarities to bifacial tools. Unfinished bifacial tools are in fact raw material pieces which were given a plano-convex shape. They differ from finished tools by the absence of retouch on their edges. In addition, unfinished bifacial tools differ from cores by the absence of pronounced striking platforms. A further problem is encountered in the identification of the stage of bifacial tool transformation. This could either represent the first stage of bifacial tool manufacture, or equally, a stage of bifacial tool reshaping. In the assemblages, the maximum dimensions of unfinished bifacial tools vary from 8 cm to 4 cm. Only in four cases does the size of an unfinished bifacial tool fall within the range of complete bifacial points and scrapers (Fig. 6-3; 6-4), a possible indication of bifacial tool reshaping.

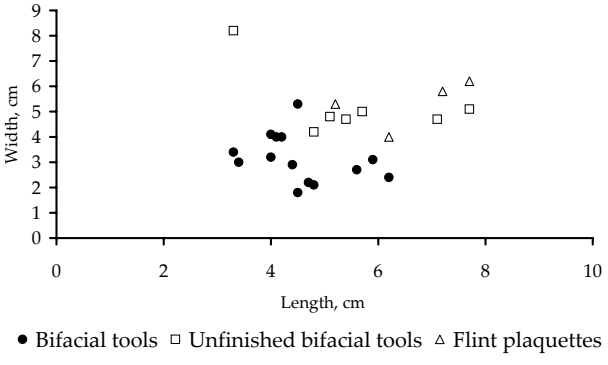

Fig. 6-3 Kabazi II, levels V/3-VI/17: length/width scatterplot for bifacial tools, unfinished bifacial tools and tested flint plaquettes.

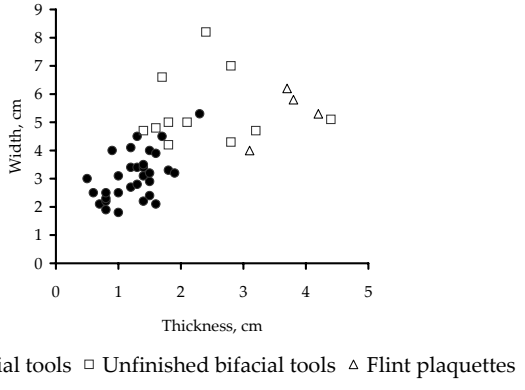

Fig. 6-4 Kabazi II, levels V/3-VI/17: width/thickness scatterplot for bifacial tools, unfinished bifacial tools and tested flint plaquettes.

Blank Variability

The dominant category of blanks is chips, followed by flakes and bifacial thinning chips. The remaining categories of blanks are only present in very small percentages (Table 6-3). The total percentage of bifacial thinning debitage (including chips, flakes and blades) lies at 12,75 %. Compared to such sites as Chokurcha I, Unit IV, Buran Kaya III, Starosele, level 1 and Kabazi V, Unit III (Chabai 2004b, Demidenko 2004a, Marks and Monigal 1998, Yevtushenko 1998b), this is the lowest percentage of bifacial thinning debitage. Usually, the amount of bifacial debitage is twice the size. This may be evidence for the comparatively small role of bifacial tool utilisation at the site.

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Chips**	48	27	41	60	60	24	34	27	24	51	46
Flakes**	11	6	16	19	16	10	13	11	8	21	12
Blades**	·	·	·	3	·	·	·	·	·	1	·
Bifacial thinning & rejuvenation chips	5	3	10	12	14	5	6	5	4	5	8
Bifacial thinning & rejuvenation flakes	1	·	1	2	·	·	4	·	·	2	4
Bifacial thinning blades	·	·	·	1	·	·	1	·	·	·	·
Total	65	36	68	97	90	39	58	43	36	80	70

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Chips**	43	36	61	22	142	11	4	1	762	*60,73*
Flakes**	20	24	20	9	89	3	3	2	313	*24,94*
Blades**	·	5	3	·	5	3	·	·	20	*1,59*
Bifacial thinning & rejuvenation chips	5	9	5	2	28	1	·	1	128	*10,19*
Bifacial thinning & rejuvenation flakes	2	1	2	1	10	·	·	·	30	*2,39*
Bifacial thinning blades	·	·	·	·	·	·	·	·	2	*0,16*
Total	70	75	91	34	274	18	7	4	1255	*100,00*

*including tools and preforms **including "regular" and one with broken butts

Table 6-3 Kabazi II, levels V/3-VI/17: blank variability*.

Chips

Chips are subdivided into three groups: "regular" – 222 pieces; bifacial thinning chips – 128 pieces; and unidentifiable fragments of chips (distal parts) – 540 pieces. Thus, bifacial thinning chips comprise 36,57 % of all identifiable items, and were found in all levels except in level VI/16. Three bifacial thinning chips were obtained from bifacial tool tips. Two of them are typical Prondnik para-burin spalls (Fig. 6-5, *4, 7)*. The remaining bifacial thinning chips were taken from the edges of bifacial tools (Fig. 6-5, *10*). In fact, the role played by the rejuvenation of bifacial tips at the site is relatively small in comparison to other Crimean Micoquian assemblages, e.g. at Starosele, level 1 and Buran Kaya III, layer B where the ratio of rejuvenation chips from bifacial tips is several times higher. Yu. Demidenko (2003b) sees the reason for this anchored in a more intensive bifacial tool reduction at the site.

Additionally, the chips were subdivided into three metric groups: 0,1 – 0,9 cm; 1,0 – 1,9 cm; and 2,0 – 2,9 cm. The first group comprises 12 % of the "regular" and 16,8 % of the bifacial thinning chips, the second group – 50,2 % and 49,6 %, and the third group – 37,8 % and 33,6 % respectively.

Flakes and Blades

Blades, which are rare and not standardized, were found in seven of the 19 levels (Bordian Index lam=6,03). Two of the 22 blades exhibit pronounced features of bifacial debitage (Fig. 6-5, *2*). Therefore, there is no reason to suggest the presence of any kind of blade technology. On the other hand, the evidence for the application of bifacial technology is more pronounced: bifacial thinning blanks comprise 15,9 % of all flakes and blades with preserved platforms (Fig. 6-5, *1, 3, 5, 6, 8, 9, 11, 12, 13, 14*). However, this said, the ratio of bifacial thinning blanks at the site still appears to be the smallest among all Crimean Micoquian assemblages.

Dimensions

The average dimensions of all types of blanks are: length – 3,89 cm, width – 2,86 cm, thickness – 0,69 cm. At the same time, the "regular" blanks are somewhat larger (av. length – 3,95 cm, av. width – 3,32 cm, av. thickness – 0,73 cm), while the bifacial thinning blanks are somewhat smaller (av. length – 3,33 cm, av. width – 3,11 cm, av. thickness – 0,46 cm). In fact, the majority of "regular" blanks, bifacial thinning blanks and unifacial tools demonstrate about the same dimensions (Fig. 6-6; 6-7). The exceptions are those very few big flakes and tools on flakes whose dimensions are beyond the metric clusters of bifacial thinning debitage (Fig. 6-6; 6-7). The nature of such debitage metrics might be the result of a technologically different origin of "big" and "small" blanks. The "small" blanks might be the result of the shaping of cores, preforms and bifacial tools, while the

Fig. 6-5 Kabazi II, levels V/3 (1), V/4 (12), V/6 (13), VI/1 (14), VI/2 (4), VI/3 (2, 9), VI/7 (3), VI/9 (7), VI/9A (8), VI/11-14 (5, 6, 10, 11). Bifacial thinning debitage: 10 – overpassed chip; 2 – blade; 1, 5, 6, 8, 9, 11, 12, 13, 14 – flakes. Bifacial rejuvenating debitage: 4, 7 – Prondnik para-burin spalls on chip, 3 – flake from bifacial tool tip. Retouched piece: 8 – bilaterally inversely retouched bifacial thinning flake.

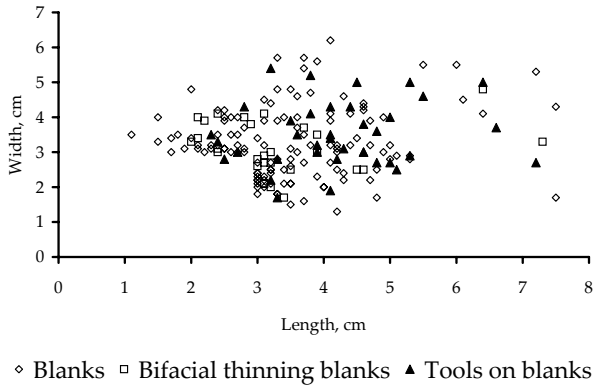

Fig. 6-6 Kabazi II, levels V/3-VI/17: length/width scatterplot for different kinds of blanks and tools on blanks.

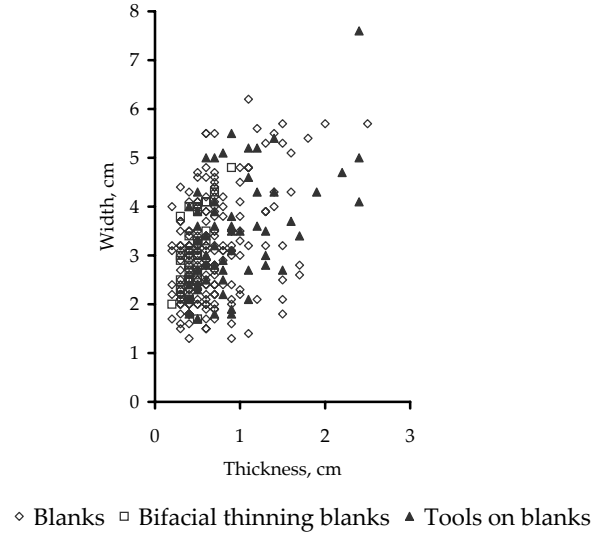

Fig. 6-7 Kabazi II, levels V/3-VI/17: width/thickness scatterplot for different kinds of blanks and tools on blanks.

"big" blanks originate from the initial stage of flint plaquette reduction and, therefore, might be linked with off-site raw material exploitation.

Surface Cortex

More than a half (60,77 %) of all blanks demonstrate some cortex on the dorsal surface, and 14,79 % exhibit dorsal surfaces completely covered by cortex. The abundant corticated debitage might be viewed as the result of intensive on-site raw material reduction. At the same time, the proportion of corticated debitage stemming from flint plaquettes, which were relatively thin and corticated on both sides, is very high. In the Crimean Micoquian, flint plaquettes usually serve as the most frequent blank for core, bifacial tool and preform production. Neither a specific pattern in the position of cortex on dorsal surfaces, nor any indication of any differences in the cortex of "regular" and bifacial thinning debitage could be observed.

Dorsal Scar Patterns

The dominant types of dorsal scars are the uni-directional and 3-directional flakes and blades with no or little cortex (Table 6-4). These comprise more than half (55,07 %) of all types of dorsal scar patterns. Additionally, primary debitage is common to all Units V and VI assemblages. The types of dorsal scar patterns mentioned are characteristic for both "regular" and bifacial thinning debitage. The same, or roughly the same, patterns of dorsal scars have been noted at a number of Crimean assemblages with pronounced amounts of bifacial tools and a rarity – or even absence – of cores (Kolosov 1983, Chabai 1998d, 2004b, Yevtushenko 1998b, Marks, Monigal 1998, Demidenko 2004a).

Axes

On-axis blanks prevail among both "regular" and bifacial thinning debitage (Table 6-5). Altogether they comprise about 60 % of all kinds of blanks.

Shapes

There are no differences in shape type representations between "regular" and bifacial thinning blanks. Trapezoidal shapes are dominant among both "regular" and bifacial thinning blanks (Table 6-6). These are followed by rectangular and irregular forms. The remaining shape types are relatively rare. Blanks tend to be short and wide, or even transversal, elongated shapes are seldom represented. No differences were found in the distribution of shape types between "regular" and bifacial thinning debitage. It should be noted that the dominance of trapezoidal shapes is more characteristic to Micoquian assemblages (Chabai 2004b), while the Levallois-Mousterian blank collections demonstrate a dominance of elongated rectangular shapes of both flakes and blades (Chabai 1998c). Such a difference might be explained by the technologies employed: on the one hand, the plano-convex bifacial method of flaking adopted by Micoquian, and, on the other, the blade and Levallois Tortoise core flaking methods used in the Levallois-Mousterian.

Lateral & Distal Profiles

Three types of lateral profiles dominate in roughly

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Radial	·	·	·	1	1	1	·	·	·	·	·
Radial with cortex	·	·	·	·	·	·	·	·	·	1	·
Lateral	·	·	1	·	·	·	·	·	·	1	1
Lateral with cortex	·	·	·	1	1	·	·	·	1	·	·
Bi-lateral	·	·	·	2	1	·	·	·	·	1	·
Bi-lateral with cortex	·	·	·	·	·	·	·	·	·	1	·
Uni-directional	2	1	4	2	1	·	3	·	1	1	3
Uni-directional with cortex	4	1	·	3	3	1	4	1	·	2	1
Bi-directional	·	·	·	1	·	·	·	·	2	1	·
Bi-directional with cortex	·	1	1	2	2	1	·	·	1	1	1
3-directional	2	1	1	·	2	2	2	1	1	6	·
3-directional with cortex	2	·	1	4	1	2	1	3	1	3	2
4-directional	·	·	·	·	·	·	·	·	·	·	2
4-directional with cortex	·	·	·	·	·	·	·	·	·	2	·
Cortex	1	1	5	3	3	3	4	4	·	1	2
Total	11	5	13	19	15	10	14	9	7	21	12

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Radial	·	·	·	·	·	·	·	·	3	*0,97*
Radial with cortex	·	·	·	·	·	·	·	·	1	*0,32*
Lateral	2	·	·	·	3	·	·	·	8	*2,57*
Lateral with cortex	3	2	2	·	8	1	2	·	21	*6,75*
Bi-lateral	·	·	·	·	1	·	·	·	5	*1,61*
Bi-lateral with cortex	·	·	1	·	3	·	·	·	5	*1,61*
Uni-directional	3	1	4	1	6	·	·	1	34	*10,93*
Uni-directional with cortex	3	10	4	1	10	1	1	·	50	*16,08*
Bi-directional	1	·	1	·	3	·	·	·	9	*2,89*
Bi-directional with cortex	·	2	·	1	4	·	·	·	17	*5,47*
3-directional	1	5	4	·	18	1	·	·	47	*15,11*
3-directional with cortex	2	3	2	3	9	1	·	·	40	*12,86*
4-directional	1	·	1	·	6	·	·	·	10	*3,22*
4-directional with cortex	1	·	·	·	5	1	·	·	9	*2,89*
Cortex	1	2	3	3	10	·	·	·	46	*14,79*
Crested, secondary	1	1	1	·	3	·	·	·	6	*1,93*
Total	19	26	23	9	89	5	3	1	311	*100,00*

Table 6-4 Kabazi II, levels V/3-VI/17: blank dorsal scar patterns.

equal ratios: twisted, flat and curved in the medial part (Table 6-7). Furthermore, three types of distal profiles are dominant: feathered, hinged and blunt (Table 6-7). No differences were identified in the profile type proportions of "regular" and bifacial thinning blanks. On the whole, the assemblages discussed here are based on curved blanks with either blunt or hinged distal extremities. The flat blanks with feathered distal end comprise barely 20 % of both "regular" and bifacial thinning blanks. Such blank profile patterns are characteristic for Micoquian assemblages, being based predominantly on the implication of bifacial plano-convex technology. The Crimean Levallois-Mousterian assemblages demonstrate a dominance of laterally flat and distally feathered profiles (Chabai 1998c).

Cross-sections at Midpoint

Blanks with triangular and trapezoidal cross-sections at mid-point are represented in about equal proportions and comprise more than two thirds of all cross-section types studied (Table 6-8). There then follow the blanks with lateral steep and convex cross-sections. The remaining mid-point,

		V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
On-axis	Blanks	6	1	5	13	8	5	10	4	3	13	4
	Bifacial thinning blanks	1	·	1	2	·	·	4	·	·	2	4
Off-axis	Blanks	3	·	5	4	3	3	2	5	3	5	5
	Bifacial thinning blanks	·	1	·	1	·	·	1	·	·	·	·
	Total	10	2	11	20	11	8	17	9	6	20	13

		VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
On-axis	Blanks	8	18	9	4	46	3	2	2	164	*53,42*
	Bifacial thinning blanks	1	1	·	1	3	·	·	·	20	*6,51*
Off-axis	Blanks	9	7	13	3	36	3	1	·	110	*35,83*
	Bifacial thinning blanks	1	·	2	·	7	·	·	·	13	*4,24*
	Total	19	26	24	8	92	6	3	2	307	*100,00*

Table 6-5 Kabazi II, levels V/3-VI/17: blank axis.

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Trapezoidal	1	1	7	6	3	3	7	5	5	9	4
Rectangular	4	1	1	4	3	4	5	1	·	6	3
Treangular	·	·	·	·	1	·	·	·	1	2	·
Crescent	1	·	1	3	·	·	·	·	·	·	1
Ovoid	1	·	·	1	1	·	·	·	·	·	·
Leaf shaped	·	·	·	·	·	·	1	·	·	·	·
Irregular	1	1	·	3	2	1	3	·	·	1	3
Total	8	3	9	17	10	8	16	6	6	18	11

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Trapezoidal	9	6	7	5	37	3	1	1	120	*43,17*
Rectangular	4	11	6	1	16	1	2	·	73	*26,26*
Treangular	1	3	·	·	1	·	·	·	9	*3,24*
Crescent	·	2	6	·	7	1	·	·	22	*7,91*
Ovoid	·	1	·	2	4	·	·	·	10	*3,59*
Leaf shaped	·	·	·	·	1	·	·	1	3	*1,08*
Irregular	1	2	3	1	19	·	·	·	41	*14,75*
Total	15	25	22	9	85	5	3	2	278	*100,00*

Table 6-6 Kabazi II, levels V/3-VI/17: blank shapes.

cross-section types are represented by insufficient numbers of blanks. There are no differences in cross-section type percentages of "regular" and bifacial thinning blanks.

Platform Preparation

The platform preparations encountered on "regular" and bifacial thinning debitage are quite different (Table 6-9). Among "regular" blanks the plain and dihedral platforms dominate, while the different types of facetted platforms are represented only by insufficient percentages. At the same time, the facetted straight and facetted convex platforms comprise about half of the total number of butts of bifacial

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Flat	2	1	4	5	3	·	6	3	3	9	2
Incurvate medial	2	1	2	8	2	4	7	2	2	4	1
Incurvate distal	2	·	1	3	7	·	1	2	1	2	3
Twisted	3	3	3	6	2	6	3	2	·	2	8
Convex	1	·	2	1	1	1	1	·	1	4	2
Total	10	5	12	23	15	11	18	9	7	21	16

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Flat	4	3	3	1	28	1	·	·	78	*23,10*
Incurvate medial	5	6	3	3	18	1	1	·	72	*21,30*
Incurvate distal	3	2	4	3	15	1	·	·	50	*14,80*
Twisted	5	15	7	2	27	3	2	1	100	*29,60*
Convex	4	2	6	·	11	·	·	1	38	*11,20*
Total	21	28	23	9	99	6	3	2	338	*100,00*

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Feathering	1	2	3	5	4	5	5	4	2	7	·
Blunt	1	·	3	6	7	2	3	1	3	5	4
Overpased	·	·	·	1	1	·	1	·	·	·	1
Hinged	5	2	4	3	2	1	4	·	·	6	3
Retouched	·	·	·	1	1	1	2	·	·	1	2
Total	7	4	10	16	15	9	15	5	5	19	10

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Feathering	5	8	8	3	33	3	1	·	99	*35,10*
Blunt	4	9	5	3	16	·	·	1	73	*25,90*
Overpased	·	·	3	·	4	·	1	·	12	*4,30*
Hinged	7	8	4	3	27	1	1	1	82	*29,10*
Retouched	·	·	2	·	6	·	·	·	16	*5,60*
Total	16	25	22	9	86	4	3	2	282	*100,00*

Table 6-7 Kabazi II, levels V/3-VI/17: blank lateral & distal profiles.

thinning debitage (Fig. 6-5, *1, 2, 5, 13, 14*). Such a difference in platform preparation resulted in rather different indexes of facetting for "regular" (Ifl=45,8; Ifs=15,8) and bifacial thinning (Ifl=62,8; Ifs=48,6) debitage. The same indexes for both "regular" and bifacial thinning debitage are: Ifl=49,7; Ifs=23,2. The last values are characteristic for a number of Crimean Micoquian assemblages where "regular" and bifacial thinning debitage were studied as a combined complex of blanks.

Platform Lipping & Platform Angles

The difference in the platform lipping of "regular" and bifacial thinning debitage is very pronounced, and is obviously caused by the definition of bifacial thinning flakes and blades (Table 6-10). At the same time, it must be noted that so-called "regular" debitage also demonstrates very high percentages of lipped and semi-lipped platforms.

Bifacial thinning debitage demonstrates the dominance of obtuse platforms angles, this is also due to the definition of bifacial thinning flakes and blades (Table 6-11). Platforms with obtuse and semi-obtuse angles are very pronounced among "regular" debitage.

Platform Dimensions

The platform metrics of bifacial and "regular" debitage compose - with very few exceptions – a rather dense cluster (Fig. 6-8). The average dimensions of

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Triangular	5	1	3	8	5	3	4	1	·	8	9
Trapezoidal	4	1	5	8	2	4	8	3	4	9	4
Polyhedral	·	·	1	1	·	·	·	1	·	·	·
Convex	2	2	2	2	·	1	3	3	·	1	2
Lateral steep	·	·	·	3	3	1	3	·	1	2	·
Irregular	·	·	2	1	3	·	·	·	·	·	·
False burin	·	·	·	·	·	·	·	·	·	1	·
Total	11	4	13	23	13	9	18	8	5	21	15

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Triangular	6	5	7	2	35	·	1	1	104	*32,10*
Trapezoidal	9	13	8	3	32	·	1	1	119	*36,70*
Polyhedral	·	·	1	·	1	1	·	·	6	*1,90*
Convex	2	4	2	2	10	·	·	·	38	*11,70*
Lateral steep	1	3	6	1	13	4	1	·	42	*12,90*
Irregular	1	·	·	2	1	·	·	·	10	*3,10*
False burin	1	3	·	·	·	·	·	·	5	*1,60*
Total	20	28	24	10	92	5	3	2	324	*100,00*

Table 6-8 Kabazi II, levels V/3-VI/17: blank cross-sections.

all striking platforms are: thickness – 0,54 cm; and width – 1,41 cm. The average dimensions of "regular" blank platforms are somewhat larger: thickness – 0,57 cm; and width – 1,47 cm. In contrast, the average dimensions of bifacial thinning blanks platforms are somewhat smaller: thickness – 0,34 cm; and width – 1,18 cm.

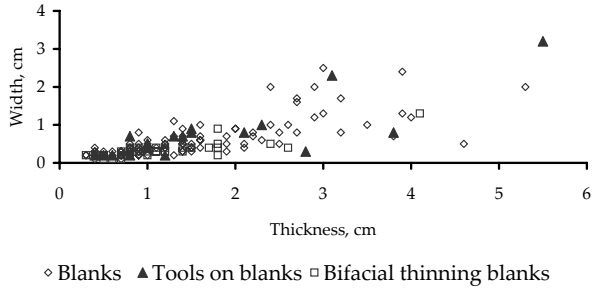

Fig. 6-8 Kabazi II, levels V/3-VI/17: width/thickness scatterplot for striking platforms of different kinds of blanks and tools on blanks.

General Characteristics of Debitage

Taking into account all attributes thus far described, it is possible to conclude that the most common piece of debitage is a short and relatively thin flake with a somewhat obtuse, lipped and mainly plain platform which is much thinner and narrower then the same flake dimensions. Furthermore, this flake tends to be of trapezoidal shape, with a fairly curved lateral profile, a hinged or blunt distal extremity and a mid-point cross-section which is either triangular or trapezoidal. Often, the flake is partially covered by cortex, while the non-corticated part of the dorsal surface demonstrates uni-directional or three-directional negatives from previous removals. Such features are in a good agreement with a reduction of available cores, preforms and bifacial tools as proposed above. Taking into account the number of cores and bifacial tools at different stages of reduction, it is reasonable to suggest that the majority of flakes result from bifacial reduction. Statistics have shown that there are no differences between the attributes of formally determined bifacial thinning pieces and co-called "regular" blanks. At the same time, the ratio of defined bifacial thinning debitage in Kabazi II, Units V and VI (Table 6-3) is about two times lower than in the assemblages from sites such as Chokurcha I, Unit IV and Buran Kaya III, layer B, where bifacial debitage comprises about a quarter of all blanks (Chabai 2004b, Demidenko 2004a). Also, in Kabazi II, Units V and VI the unifacial tools made on bifacial thinning blanks are extremely rare. In fact, there were very few retouched pieces made on bifacial thinning flakes (Fig. 6-5, *8*). In contrast, at

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Blanks											
Cortex	·	·	1	3	1	1	·	·	·	·	·
Plain	3	1	2	3	4	3	1	3	1	6	·
Dihedral	·	·	1	·	1	·	1	3	3	3	·
Multihedral	1	·	·	·	·	·	·	·	·	·	·
Faceted straight	·	·	2	·	1	1	2	1	·	1	·
Faceted convex	1	·	·	·	·	·	·	·	·	·	1
Faceted concave	·	·	·	·	·	·	·	·	·	·	1
Retouched	·	1	1	·	·	·	1	·	·	·	·
Unidentifiable	1	·	1	3	2	1	2	·	1	3	6
Total	6	2	8	9	9	6	7	7	5	13	8
Bifacial thinning blanks											
Plain	·	1	·	2	·	·	·	·	·	2	3
Dihedral	·	·	·	·	·	·	2	·	·	·	·
Multihedral	1	·	·	·	·	·	·	·	·	·	·
Faceted straight	·	·	1	1	·	1	1	·	·	·	1
Faceted convex	·	·	·	·	·	·	2	·	·	·	·
Total	1	1	1	3	·	1	5	·	·	2	4

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Blanks										
Cortex	·	·	·	·	8	·	·	·	14	*7,60*
Plain	5	7	6	2	16	2	·	·	65	*35,10*
Dihedral	2	2	2	2	12	1	1	1	35	*18,90*
Multihedral	·	·	·	·	·	·	·	·	1	*0,60*
Faceted straight	1	·	·	·	3	·	·	·	12	*6,50*
Faceted convex	·	1	·	·	2	·	1	·	6	*3,20*
Faceted concave	·	·	·	·	·	·	·	·	1	*0,60*
Retouched	2	3	5	·	5	·	·	·	18	*9,70*
Unidentifiable	3	·	2	·	8	·	·	·	33	*17,80*
Total	13	13	15	4	54	3	2	1	185	*100,00*
Bifacial thinning blanks										
Plain	1	·	·	·	4	·	·	·	13	*37,10*
Dihedral	·	·	·	·	2	·	·	·	4	*11,40*
Multihedral	·	·	·	·	·	·	·	·	1	*2,90*
Faceted straight	1	1	2	·	3	·	·	·	12	*34,30*
Faceted convex	·	·	·	1	2	·	·	·	5	*14,30*
Total	2	1	2	1	11	·	·	·	35	*100,00*

Table 6-9 Kabazi II, levels V/3-VI/17: blank platform types.

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Blanks											
Unlipped	5	1	2	5	4	2	1	1	·	5	·
Semi-lipped	1	·	2	·	2	2	2	2	1	4	1
Lipped	·	1	2	4	2	2	1	4	3	2	1
Total	6	2	6	9	8	6	4	7	4	11	2
Bifacial thinning blanks											
Semi-lipped	·	·	·	·	·	1	1	·	·	·	2
Lipped	1	1	1	3	·	·	4	·	·	2	2
Total	1	1	1	3	·	1	5	·	·	2	4

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total	%
Blanks										
Unlipped	1	1	3	·	4	2	·	·	37	*25,40*
Semi-lipped	4	7	5	1	19	·	1	1	55	*37,70*
Lipped	3	2	1	3	20	1	2	·	54	*36,90*
Total	8	10	9	4	43	3	3	1	146	*100,00*
Bifacial thinning blanks										
Semi-lipped	·	1	·	·	5	·	·	·	10	*28,60*
Lipped	2	·	2	1	6	·	·	·	25	*71,40*
Total	2	1	2	1	11	·	·	·	35	*100,00*

Table 6-10 Kabazi II, levels V/3-VI/17: blank platform lipping.

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7
Blanks											
Right, 90	3	1	6	4	1	3	·	1	3	3	·
Semi-obtuse, 90-110	·	·	1	3	2	3	2	3	1	3	·
Obtuse, <110	2	·	1	2	4	·	2	3	·	5	2
Total	5	1	8	9	7	6	4	7	4	11	2
Bifacial thinning blanks											
Obtuse, <110	1	1	1	3	·	1	5	·	·	2	4

	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/16	VI/17	Total:	%
Blanks										
Right, 90	2	2	2	1	7	2	1	·	42	*28,9*
Semi-obtuse, 90-110	3	3	4	2	13	·	·	·	43	*29,7*
Obtuse, <110	3	5	3	1	23	1	2	1	60	*41,4*
Total	8	10	9	4	43	3	3	1	145	*100,00*
Bifacial thinning blanks										
Obtuse, <110	2	1	2	1	11	·	·	·	35	*100,00*

Table 6-11 Kabazi II, levels V/3-VI/17: blank platform angles.

Chokurcha I, IV bifacial thinning blanks were used for the production of about 14 % of unifacial tools (Chabai 2004a).

It is important to note that a number of flakes and tools on flakes do not correspond very well to the spectrum of attributes mentioned, and can barely be linked to the available preforms, cores and bifacial tools. For example, there are the relatively big flakes and tools on flakes whose length and/or width dimensions exceed 5 cm, with a thickness of more than 1 cm (Fig. 6-6; 6-7). Such tools and blanks might well be imported to the site area.

Tools

Tools were found in 18 of 19 levels of Kabazi II, Units V and VI. Not a single retouched item was found in level VI/16. The tool kits of Units V and VI comprise the following classes of tools: points – 2,7 %, scrapers – 25,21 %, denticulates – 3,6 %, scaled pieces – 3,6 %, bifacial points – 1,8 %, bifacial points / scrapers – 6,32 %, bifacial scrapers – 13,52 %, bifacially retouched flint plaquette – 0,9 %, bifacial reutilised and heavily exhausted tools – 5,4 %, chopper – 0,9 %, retouched pieces – 24,32 %, thinned pieces – 0,9 %, unidentifiable unifacial tools – 5,42 %, unidentifiable bifacial tools – 4,5 % and bone retouchers – 1,8 %. The bifacial tools comprise 31,54 % of all tool kits.
In essential count (which exclude retouched pieces, thinned pieces, unidentifiable tools and the bone retouchers) the ratio of the different tool classes is as following: points – 4,28 %, scrapers – 40,01 %, denticulates – 5,72 %, scaled pieces – 5,72 %, bifacial points – 2,86 %, bifacial points / scrapers – 10,0 %, bifacial scrapers – 21,42 %, bifacially retouched flint plaquette – 1,43 %, bifacial reutilised and heavily exhausted tools – 7,13 %, chopper – 1,43 %. In this case, bifacial tools comprise 42,84 %. In both total and essential counts the ratio of bifacial tools is one the highest thus far observed in any Crimean Micoquian assemblage. Such a high amount of bifacial tools might well be explained by the impressive number of reutilised bifacial tools – these accounts for 1/6 of all identifiable bifacial tools, which is most unusual for the Crimean Micoquian. The bifacial tools were found in 15 of 18 levels of Units V and VI of Kabazi II. The relative absence of bifacial tools was noted for levels VI/4, VI/15 and VI/17, where the total number of tools varies from one to three pieces. Another feature specific to tool kits from Units V and VI is the wide implication of different kinds of thinning on the ventral surfaces of unifacial tools. A total of 21 of the 39 unifacial tools exhibit traces of ventral thinning. The closest analogy to Kabazi II, Units V and VI is to be found in the Sary Kaya assemblage excavated in 1985-86 field seasons, and which belongs to the Ak Kaya facies of the Crimean Micoquian (Kolosov et al. 1993, Chabai 2003b). At the same time, only very few unifacial tools from the mentioned Sary Kaya assemblage display any signs of ventral thinning.

Points

Points were found in three levels: V/6, VI/8, VI/11-14 (Table 6-12). One point takes the form of a semi-leaf item (Fig. 6-9, *3*), while two others are semi-crescents with a thinned back (Fig. 6-9, *1, 2*). In fact, morphologically, the semi-crescent points are very close to the leaf shaped pieces, the only difference being the shape of the retouched edges. The leafed shaped point exhibits two symmetrically convex retouched edges, while the semi-crescent points display one edge which is slightly more convex than the other. The points were made by flat / semi-steep scalar retouch.

Scrapers

Scrapers were found in 11 levels (Table 6-12), and are subdivided into 5 morphological groups: transverse, simple, double, convergent and core-like scrapers. The most representative are the simple (9 items) and convergent (10 items) scrapers, followed by the double (5 items), transverse (2) and core-like scrapers (2). The scrapers were made by scalar semi-steep / steep retouch. Half of the scraper-assemblage demonstrates either a base or back thinning of the ventral surface. In most cases, ventral thinning preceded the dorsal retouch. On the one hand, such methods of tool production, especially on convergent scrapers, might be seen as an analogy of the plano-convex method of bifacial tool production. On the other hand, the ventral thinning accompanied by invasive retouch might be evidence for a high degree of scraper assemblage reduction and / or utilisation.

Transverse Scrapers

Two transverse scrapers originate from levels VI/1 and VI/5 (Table 6-12). In both cases the retouched edges are straight. The proximal part of a transverse scraper from level VI/5 was thinned from the ventral surface (Fig. 6-9, *4*).

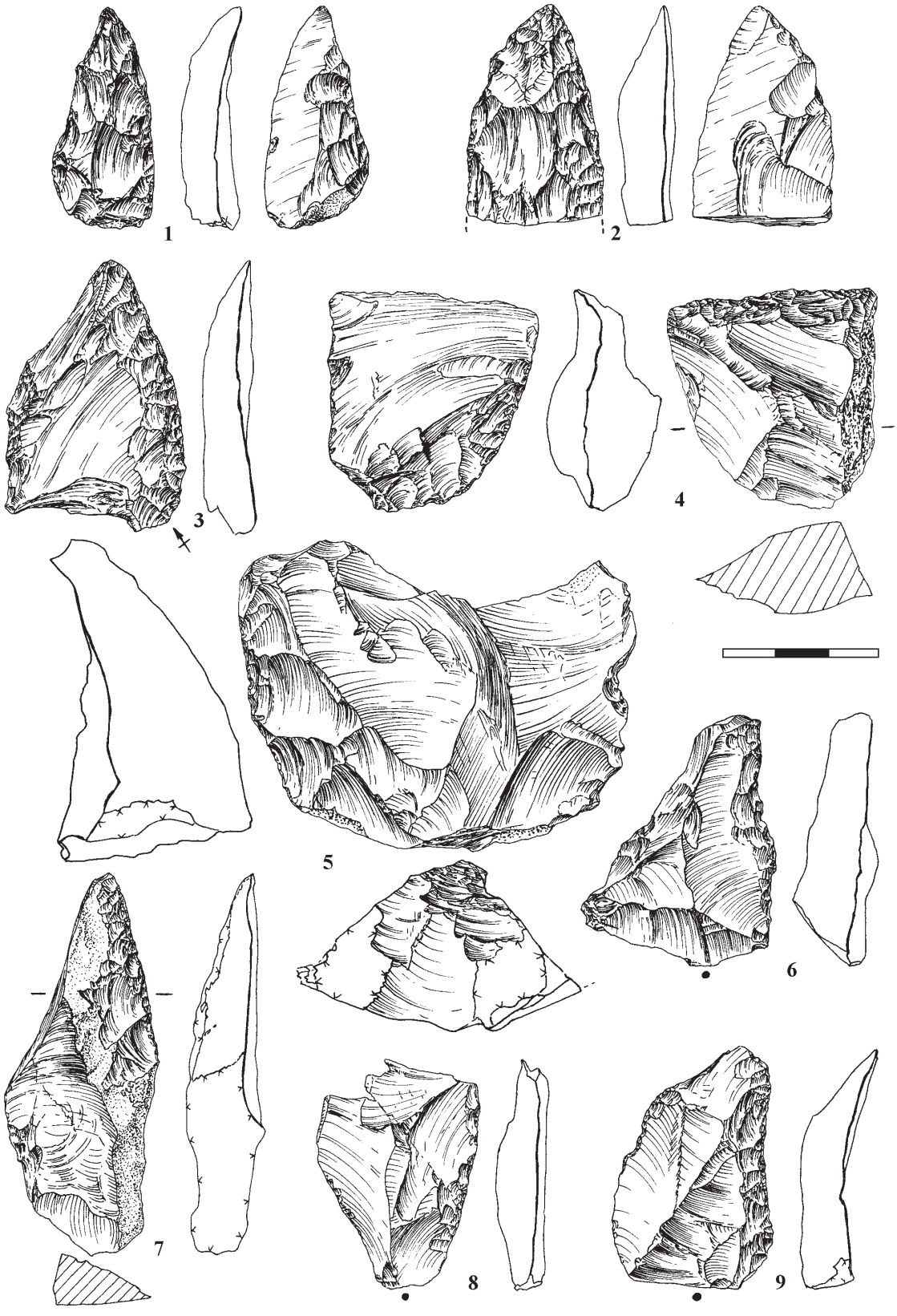

Fig. 6-9 Kabazi II, levels V/6 (2), VI/1 (8), VI/5 (4), VI/6 (6), VI/8 (3), VI/9A (9), VI/11-14 (1, 7), VI/15 (5). Points: 1, 2 – semi-crescent, thinned back; 3 – semi-leaf. Scrapers: 4 – transverse-straight, thinned base; 5 – convex; 6 – wavy; 7 – straight, backed; 9 – concave. Retouched piece: 8 – obversely retouched, lateral.

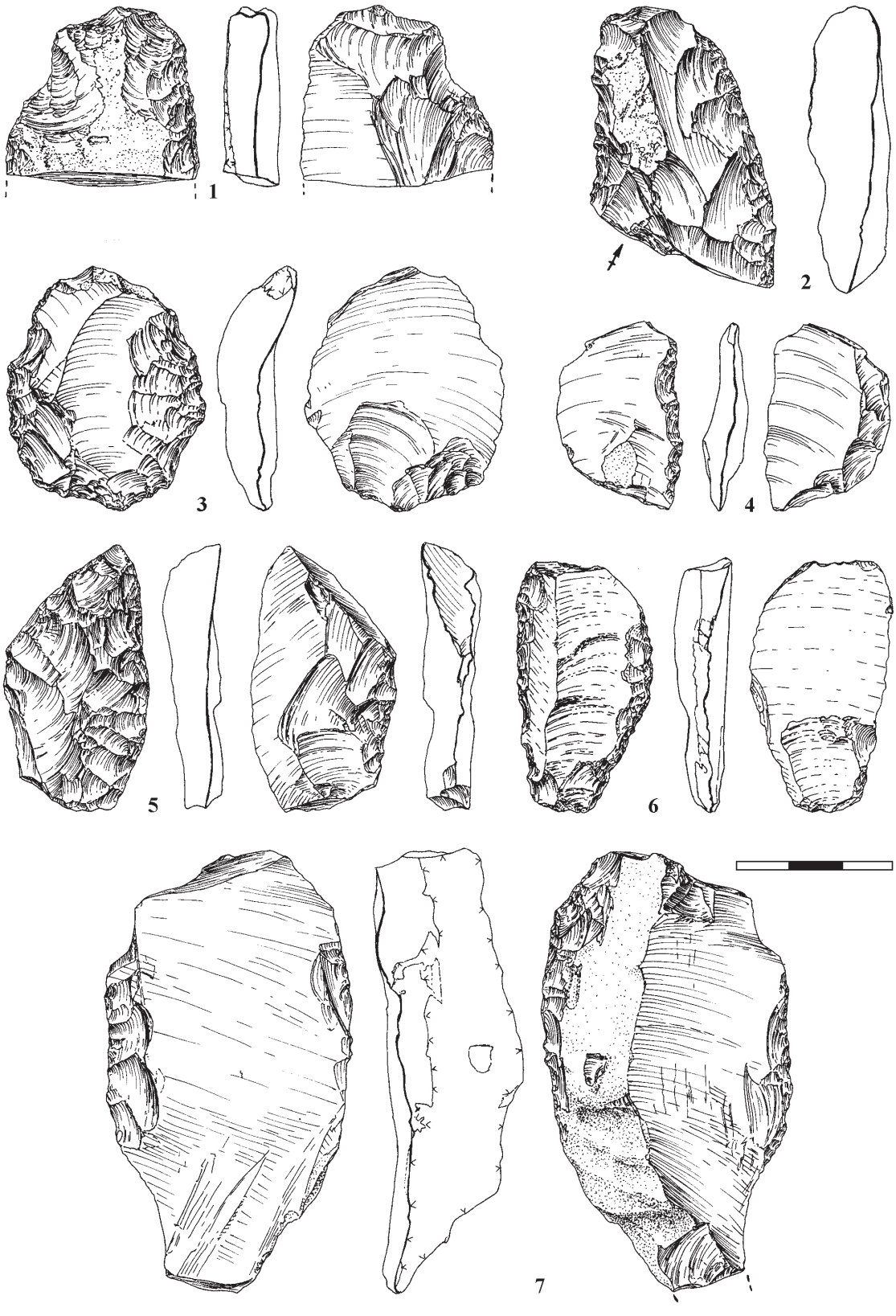

Fig. 6-10 Kabazi II, levels VI/1 (1), VI/9 (2, 3), VI/9A (5, 7), VI/11-14 (4, 6). Scrapers: 1 – straight, thinned back; 2 – convex-concave; 3 – double convex, thinned base; 4 – wavy, ventral, thinned back; 5 – convex, thinned back, backed; 6 – straight-convex, thinned base; 7 – convex, thinned back. Dotted lines on negatives of the straight-convex scraper (6) show patinated areas.

	V/3	V/4	V/5	V/6	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7	VI/8	VI/9	VI/9A	VI/10	VI/11-14	VI/15	VI/17	**Total**	%	*esse %*	Illustrations
Points																						
Semi-leaf	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 9; 3
Semi-crescent, thinned back	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**2**	*1,80*	*2,85*	fig. 9; 1, 2
Scrapers																						
Transverse-straight	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	
Transverse-straight, thinned base	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 9; 4
Straight, backed	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 9; 7
Straight, thinned back	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 10; 1
Convex	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	**1**	*0,90*	*1,43*	fig. 9; 5
Convex, thinned back	·	·	1	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**2**	*1,80*	*2,85*	fig. 10; 7
Convex, thinned back, backed	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*	*1,43*	fig. 10; 5
Concave	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*	*1,43*	fig. 9; 9
Wavy	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 9; 6
Wavy, ventral, thinned back	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 10; 4
Double straight, alternate, thinned back	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*	*1,43*	
Double straight-convex	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	
Double straight-convex, (thinned base)	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 10; 6
Double convex, thinned base	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 10; 3
Double convex-concave	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 10; 2
Triangular, thinned back	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 11; 7
Semi-trapezoidal, alternate	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*	*1,43*	fig. 11; 3
Semi-trapezoidal, thinned back	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	2	·	·	**2**	*1,80*	*2,85*	fig. 12; 1, 3
Sub-trapezoidal, thinned back	·	·	·	·	·	·	1	·	·	·	·	·	·	1	·	·	·	·	**2**	*1,80*	*2,85*	fig. 11; 2, 6
Sub-trapezoidal, thinned back, terminal truncation	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 12; 2
Sub-crescent, bifacially retouched	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*	*1,43*	fig. 11; 5
Leaf-shaped	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 11; 4
Sub-leaf, bi-terminally thinned	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	**1**	*0,90*	*1,43*	fig. 11; 1
Core-like of Chokurcha type	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	2	·	·	**2**	*1,80*	*2,85*	fig. 13; 5, 6
Denticulates																						
Transverse-convex	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	
Diagonal, alternate	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	**1**	*0,90*	*1,43*	
Straight	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	
Concave, thinned back	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 13; 4
Scaled pieces																						
Inverse, bi-terminal	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	2	·	·	**3**	*2,71*	*4,29*	fig. 13; 1
Inverse, radial	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 13; 3
Bifacial points																						
Sub-leaf	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 14; 1
Sub-leaf, thinned base	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*	*1,43*	fig. 14; 4
Bifacial scrapers																						
Convex, backed	·	·	·	1	·	1	·	·	·	1	·	·	·	·	·	·	·	·	**3**	*2,71*	*4,29*	
Straight-convex	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	
Sub-leaf, thinned base	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	1	·	·	**2**	*1,80*	*2,85*	fig. 14; 2
Sub-leaf, unidentifiable	1	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	**2**	*1,80*	*2,85*	fig. 14; 3
Sub-ovoid	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 14; 5
Sub-ovoid, thinned base	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 16; 7
Semi-crescent, truncated-faceted base	·	1		·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 14; 6
Semi-trapezoidal, backed	1	·	·	·	·	·	·	·	·	·	·	·	1	1	·	1	·	·	**4**	*3,61*	*5,71*	fig. 15; 1, 2, 4, 5
Bifacial points / scrapers																						
Sub-leaf (the fragments of proximal parts)	·	·	·	·	1	·	1	·	1	1	·	·	1	1	·	1	·	·	**7**	*6,32*	*10,00*	fig. 16; 1, 2, 4, 5, 6
Bifacially retouched flint plaquette																						
Bi-terminal	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	**1**	*0,90*	*1,43*	fig. 15; 3
Reutilized fragments of bifacial tools & heavily exhausted bifacial tools	1	·	1	·	1	1	·	·	·	·	·	1	·	·	·	·	·	·	**5**	*4,50*	*7,13*	fig. 16; 3
Choppers	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	**1**	*0,90*	*1,43*	
Retouched pieces																						
Blades, obversely retouched, lateral	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	**1**	*0,90*		
Flakes, obversely retouched, lateral	1	·	·	·	1	1	1	2	·	1	1	2	1	·	·	4	·	·	**15**	*13,52*		fig. 9; 8
Flakes, alternatively retouched, lateral	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*		
Flakes, obversely retouched, bi-lateral	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	**1**	*0,90*		
Flakes, obversely retouched, distal	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	1	·	·	**2**	*1,80*		
Flakes, obversely retouched, lateral / distal	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	**1**	*0,90*		
Flakes, inversely retouched, lateral / distal	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*		
Flakes, inversely retouched, bi-lateral	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	**1**	*0,90*		fig. 5; 8
Flakes, obversely retouched, distal	·	·	·	1	·	·	·	·	·	·	1	·	·	·	·	·	·	·	**2**	*1,80*		
Flakes, alternatively retouched, proximal / lateral		1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	**1**	*0,90*		
Chunk	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	**1**	*0,90*		
Thinned pieces																						
Inverse, proximal	·	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	**1**	*0,90*		fig. 13; 2
Unidentifiable tool fragments																						
unifacial	1	·	·	·	·	·	·	·	1	·	1	·	·	·	·	3	·	·	**6**	*5,42*		
bifacial	·	·	·	1	·	·	·	·	·	1	1	·	·	·	·	2	·	·	**5**	*4,50*		
Bone retouchers	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	2	·	·	**2**	*1,80*		fig. 17
Total	**6**	**4**	**4**	**4**	**5**	**5**	**4**	**3**	**3**	**6**	**4**	**5**	**9**	**12**	**2**	**32**	**2**	**1**	**111**	*100,00*	*100,00*	

Table 6-12 Kabazi II, levels V/3-VI/17: tool types.

Simple Scrapers

The simple scrapers were found in a total of six levels (Table 6-12). According to the shape of retouched edges the simple scrapers can be subdivided into four major groups: straight, convex, concave and wavy. The straight scrapers are characterised by backed (Fig. 6-9, *7*) and thinned back (Fig. 6-10, *1*) pieces. The backed piece was made on natural blank. The convex scrapers are represented by convex dorsal (Fig. 6-9, *5*), two thinned back (Fig. 6-10, *7*) pieces, and a backed item with thinned back (Fig. 6-10, *5*). The only concave scraper was made by dorsal retouch without any thinning modifications (Fig. 6-9, *9)*. Additionally, one of two wavy scrapers was produced by obverse retouch without any thinning (Fig. 6-9, *6*), while the other was elaborated by inverse retouch and back thinning (Fig. 6-10, *4*).

Double Scrapers

Double scrapers were found in four levels: V/5, VI/9, VI/9A and VI/11-14 (Table 6-12), and are subdivided into four types: double straight, alternate, thinned back, straight-convex (Fig. 6-10, *6*); double convex, thinned base (Fig. 6-10, *3*); and convex-concave (Fig. 6-10, *2*). One of the two straight-convex scrapers was made on an already patinated and thinned base blank. The fresh retouch on the dorsal surface of this blank was used to shape the straight and convex edges (Fig. 6-10, *6*). Obviously, this piece was already patinated when collected, and then retouched and imported to the site area.

Convergent Scrapers

Convergent scrapers were found in 5 levels: V/3, VI/3, VI/9A, VI/11-14, VI/17. In accordance with the shape of their retouched edges, the convergent scrapers are subdivided into four morphological groups: triangular, trapezoidal, crescent and leaf-shaped (Table 6-12). Due to the number of retouched edges, each of the morphological groups mentioned do tend to display some variation.

The only triangular scraper exhibits three convergent retouched edges and ventral thinning (Fig. 6-11, *7*). The last is the common feature of these artefacts. Triangular scrapers with ventral thinning are common-place in the Crimean Micoquian, and are widely represented in such assemblages as Kiik Koba, upper level, Prolom I and Zaskalnaya V, layer IV (Kolosov et al. 1993). Triangular scrapers are taken to represent the extreme manifestation of scraper reduction (Chabai 2004c: 192).

The semi-trapezoidal alternate scrapers exhibit two convergent retouched edges: inversely and obverse retouched (Fig. 6-11, *3*). The inversely retouched edge was made on the proximal part of the flake. The semi-trapezoidal scrapers with ventral thinning are represented by two pieces, both of which differ one from another in the intensity of their utilisation. This difference is seen in the extent of both the obverse retouch and inverse thinning (Fig. 6-11, *1, 3)*. The intensity of utilisation is most pronounced on the sub-trapezoidal thinned back scrapers (Fig. 6-11, *2, 6*; 6-12, *2*), which exhibit three retouched edges and intensive ventral thinning. According to Yu.G. Kolosov, the semi- and sub-trapezoidal scrapers constitute one of the most characteristic features of the Ak-Kaya "Mousterian culture" (Kolosov 1983, 1986).

The tip and straight edge of the only sub-crescent scraper is retouched from both sides of the blank: ventral and dorsal (Fig. 6-11, *5*). To some extent this kind of elaboration might be termed bifacial retouch.

The leaf shaped scrapes are represented by one sub-leaf, bi-terminally thinned tool (Fig. 6-11, *1*), and one broken piece (Fig. 6-11, *4*).

Core-like Scrapers of Chokurcha Type

In Kabazi II core-like scrapers were found in level VI/11-14 (Table 6-12, Fig. 6-13, *5, 6)*. This type of scraper was previously recognised and defined in the assemblage from Chokurcha I, Unit IV (Chabai 2004b). Refitting from Chokurcha I have demonstrated that core-like scrapers were made on relatively thick flakes whose ventral surface served as the striking platform for the subsequent series of removals. The removal of flakes and the preparation of the striking platform led to the formation of an artefact resembling a pyramidal-shaped core. The ridge between the flaking surface and the striking platform was then elaborated by abrupt retouch. The production of core-like scrapers results in a characteristic by-product: a number of short and relatively thick flakes with wide, thick, obtuse, convex, plain platform. These represent the ventral surface of the initial flake, which is the striking platform of the core-like scraper. A very close analogy of this reduction sequence was studied by J. Jaubert in relation to the Quina method from the Middle Palaeolithic assemblages of the Quercy region (Jaubert 1999). At Chokurcha I, Unit IV the assemblage of core-like scrapers was viewed as evidence for intensive raw material utilisation (Chabai 2004b).

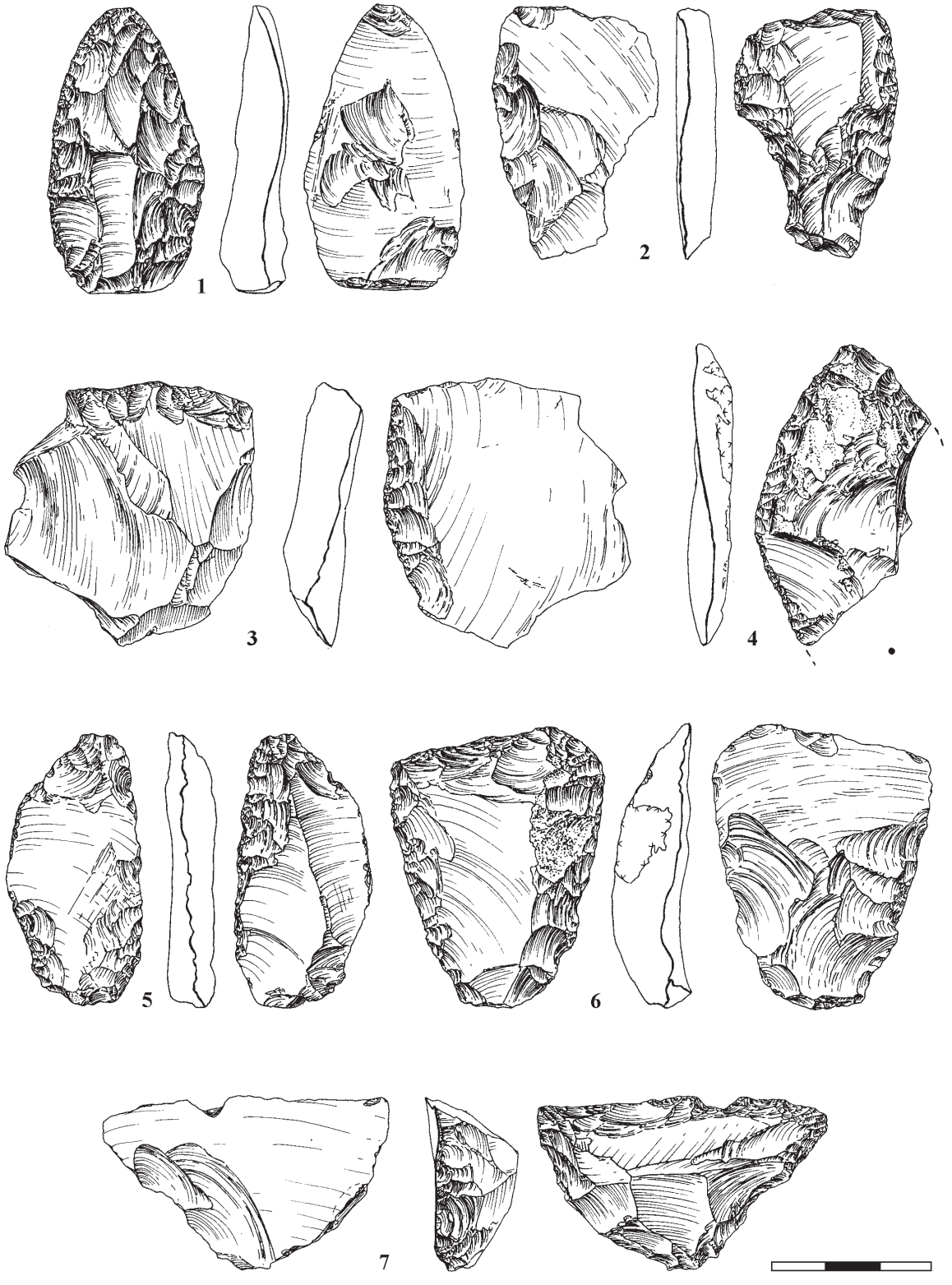

Fig. 6-11 Kabazi II, levels VI/3 (6, 7), VI/9A (2, 3, 5), VI/11-14 (4), VI/17 (1). Scrapers: 1 – sub-leaf, bi-terminally thinned; 2, 6 – sub-trapezoidal, thinned back; 3 – semi-trapezoidal, alternate; 4 – leaf-shaped; 5 – sub-crescent, bifacially retouched; 7 – triangular, thinned back.

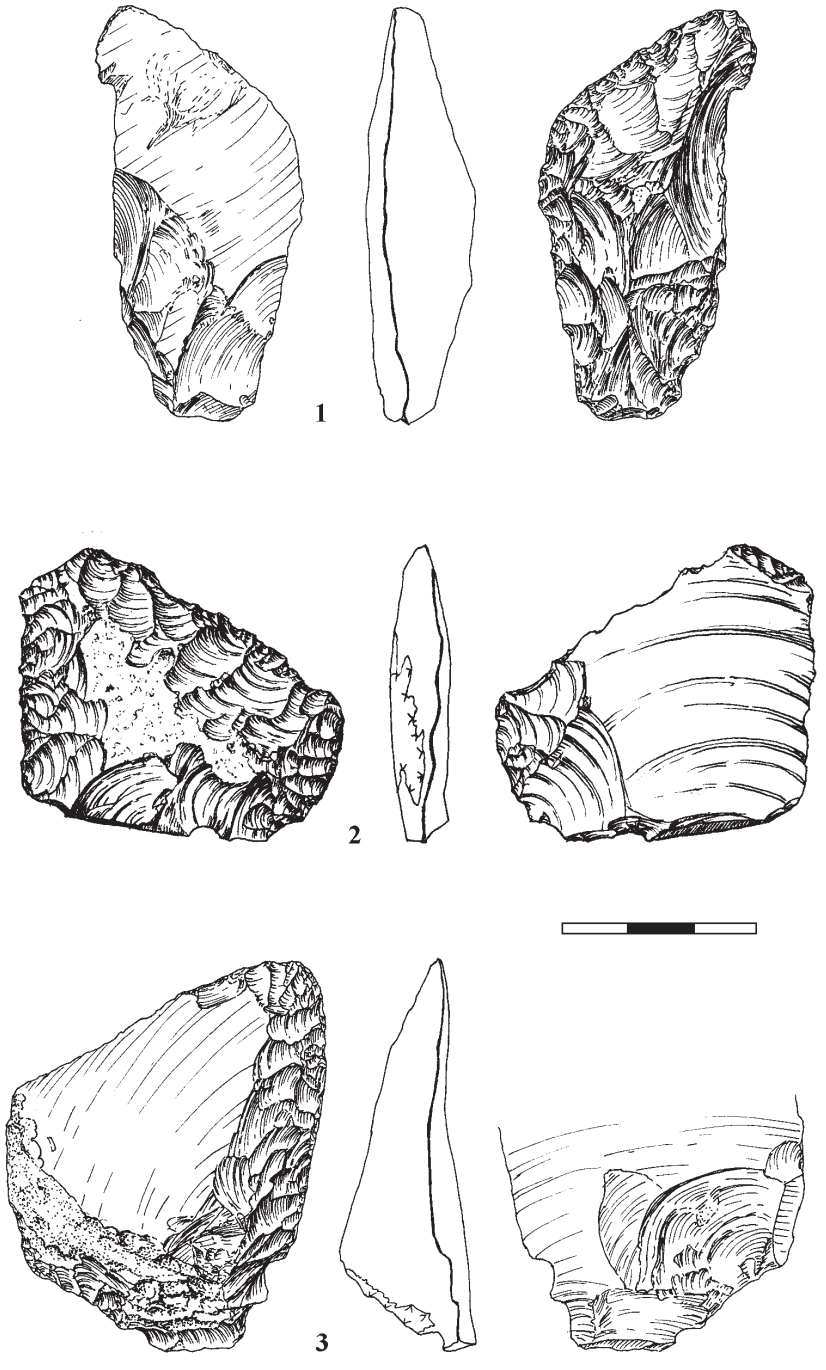

Fig. 6-12 Kabazi II, levels V/3 (2), VI/11-14 (1, 3). Scrapers: 1, 3 – semi-trapezoidal, thinned back; 2 – sub-trapezoidal, thinned back and with terminal truncation.

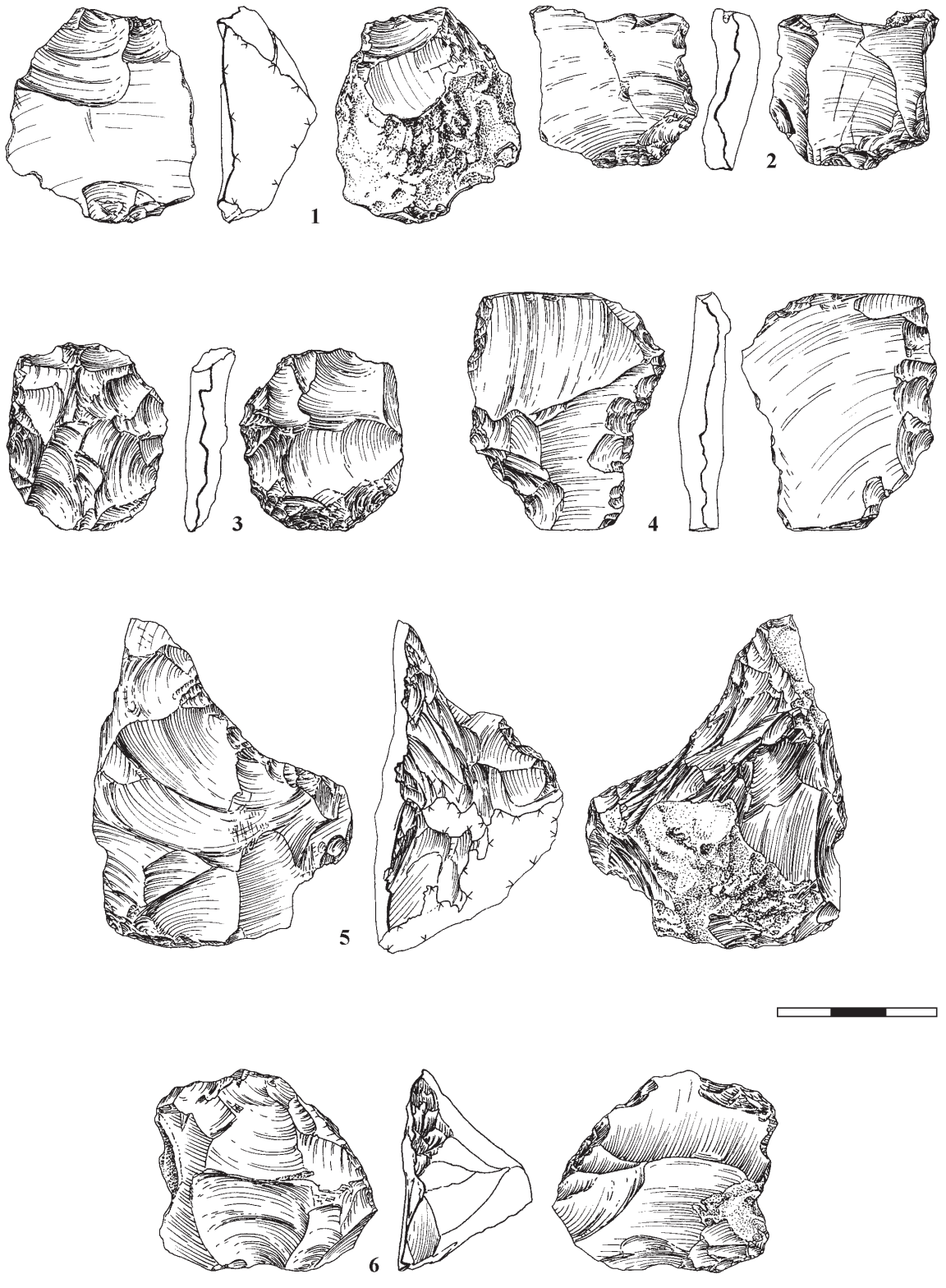

Fig. 6-13 Kabazi II, levels VI/9 (2), VI/11-14 (1, 3, 4, 5, 6). Scaled pieces: 1 – inverse, biterminal; 3 – inverse, radial. Scrapers: 5, 6 – core-like of Chokurcha type. Denticulate: 4 – concave, thinned back. Thinned piece: 2 – inverse, proximal.

Denticulate tools

In Crimean Micoquian assemblages, denticulate tools are usually not numerous (Chabai 2004c). In Kabazi II, Units V and VI the denticulates stem from levels VI/2, VI/9 and VI/11-14 (Table 6-12), and are represented by the same shapes as the transverse and simple scrapers, this even includes such elements as back thinning (fig 13, 3).

Scaled pieces

Scaled pieces were found in two levels: VI/9A and VI/11-14 (Table 6-12), of which there are two types: inverse bi-terminal and inverse radial. The first exhibit opposite negatives on the ventral surface (Fig. 6-13, *1*). The ventral surface of the radial scaled pieces is completely covered by differently oriented negatives (Fig. 6-13, *3*). Radial scaled pieces are also common but are not always numerous at other Eastern European Micoquian sites and Crimean Micoquian assemblages (Gladilin 1976, Marks, Monigal 1998).

Bifacial points

There are two bifacial sub-leaf points, both from level VI/11-14 (Table 6-12). One was made on transversal flake (Fig. 6-14, *1*). The blank used for another point remains unknown, but it exhibits the traces of base thinning (Fig. 6-14, *4*). The production of bifacial points on transversal flakes is common for Crimean Micoquian industries. Such tools were also found in the assemblages from Starosele, level 1 and Kabazi V, levels II/4a and III/1a (Kolosov et al. 1993, Marks, Monigal 1998, Yevtushenko 1998b).

Bifacial scrapers

Bifacial scrapers are one of the most representative tool classes in the assemblages of Units V and VI (Table 6-12). They were found in a total of nine of 18 levels. The bifacial scrapers comprise two main morphological groups: simple and convergent. The group of simple scrapers consists of tools with one or two retouched edges which do not converge. The second group is represented by a variety of shapes which are formed by at least two converging retouched edges. Both the bifacial scrapers and the bifacial points were made in a bifacial plano-convex and sometime in a bifacial plano-convex alternating manner.

Simple Bifacial Scrapers

This group is subdivided on two types: convex backed and straight-convex (Table 6-12). The convex backed bifacial scrapers exhibit one convexly retouched edge and an opposing unretouched back. The straight-convex bifacial scrapers exhibit edges which do not converge: straight and convex. The straight convex and two convex backed (levels V/4 and V/6) bifacial scrapers were made on flakes. A further convex backed bifacial scraper (level VI/6) was made either on flake or on a plaquette.

Convergent Bifacial Scrapers

Convergent bifacial scrapers are represented by sub-leaf (4 items), sub-ovoid (2 items), semi-crescent (1 item) and semi-trapezoidal (4 items) shapes (Table 6-12). Two sub-leaf scrapers have a thinned base (Fig. 6-14, *2*). The proximal part of two scrapers of the same type was broken (Fig. 6-14, *3*). In fact, there is no great difference between leaf-shaped bifacial points and scrapers. The only attribute which serves to subdivide bifacial leaf-shaped tools is the sharpness of the tip. For the bifacial point it needs to be sharper both in plan and profile. This attribute is of course very subjective, and in fact the leaf-shaped bifacial tools comprise one morphological group. Furthermore, the bifacial leaf-shaped tools have often been recognised as an indicator of the relatively late chronological position of some Micoquian assemblages (Bosinski 1967, Yevtushenko 1999). As for Crimean Micoquian, the leaf-shaped tools are to be found in almost all assemblages, and are not characteristic of any particular chronological position (Chabai 2003b).

Semi-trapezoidal bifacial scrapers are represented by the backed tools: three broken and one complete (Fig. 6-15, *1, 2, 4, 5*). Morphologically speaking, this tool type is closely related to the better known *Keilmesser of Klausennische type* of the Central European Micoquian. The tip of the single complete sub-trapezoidal backed bifacial scraper was shaped by a flat Prondnik-like para-burin spall, while the blanks for this tool were made in a *trifacial* manner (Fig. 6-15, *1*).

The sub-ovoid bifacial scrapers are represented by two pieces: one regular (Fig. 6-14, *5*), and one with a thinned base (Fig. 6-16, *7*). The single semi-crescent bifacial scraper displays a truncated-faceted base (Fig. 6-14, *6*).

The determination of the blanks used for the production of convergent scrapers is problematic owing to the invasive retouch and *faconnage*.

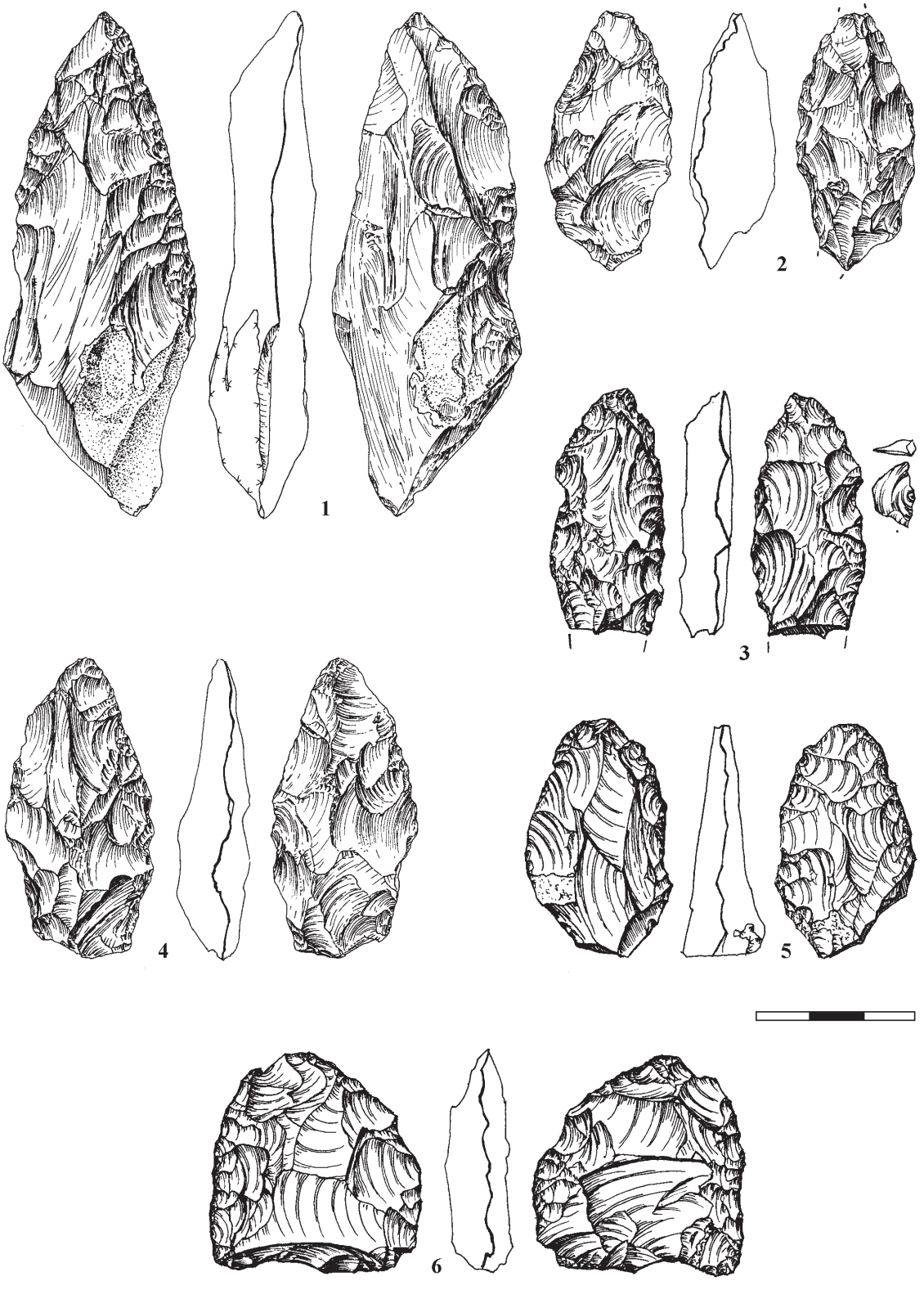

Fig. 6-14 Kabazi II, levels V/3 (3), V/4 (5, 6), VI/11-14 (1, 2, 4). Bifacial points: 1 – sub-leaf; 4 – sub-leaf, thinned base. Bifacial scrapers: 2 – sub-leaf, thinned base; 3 – sub-leaf, unidentifiable; 5 – sub-ovoid; 6 – sub-crescent, truncated-faceted base.

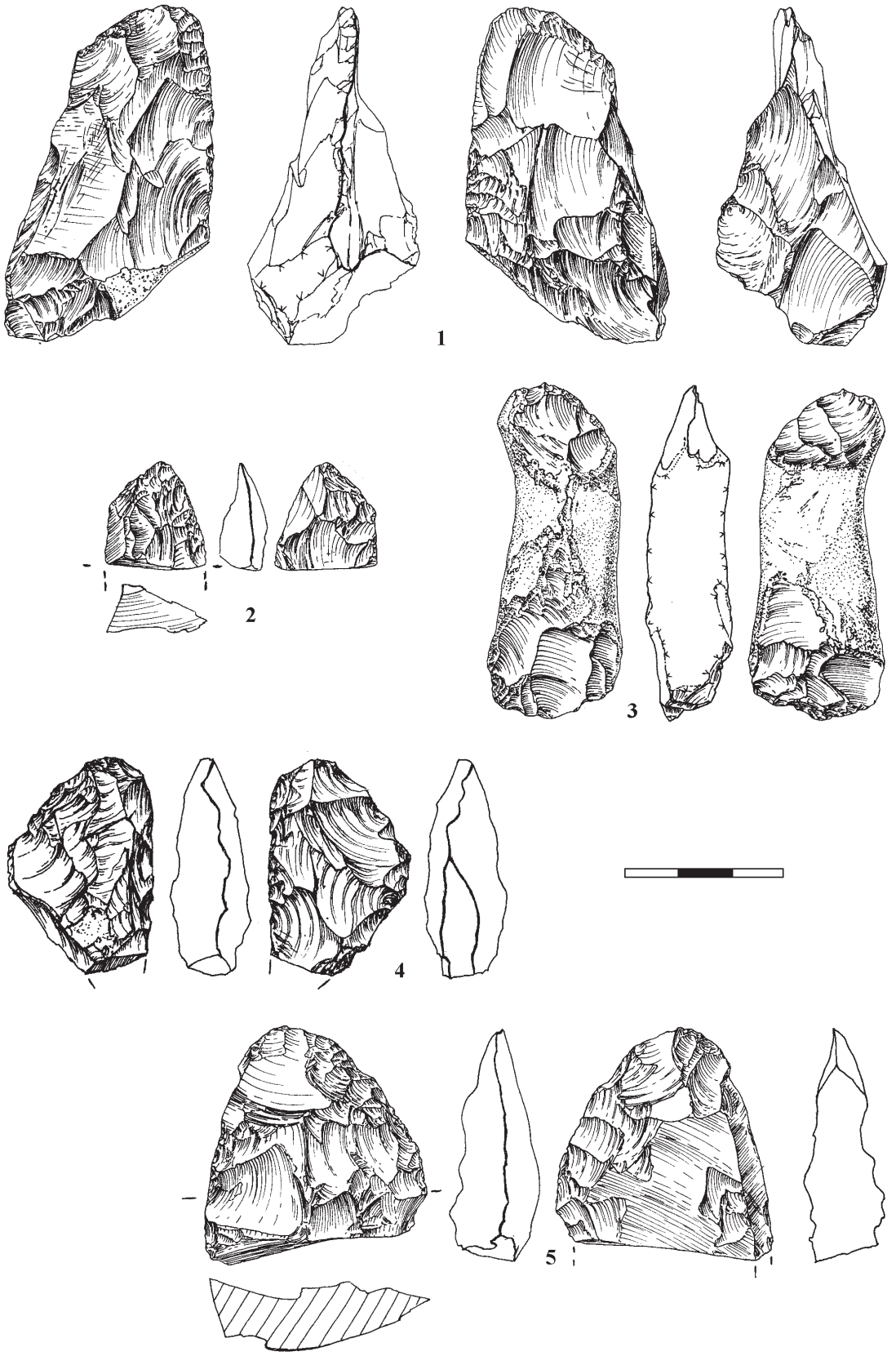

Fig. 6-15 Kabazi II, levels V/3 (4), VI/6 (3), VI/9 (2), VI/9A (1), VI/11-14 (5). Bifacial scrapers: 1, 2, 4, 5 – semi-trapezoidal, backed. Bifacially retouched flint plaquette: 3 – bi-terminal.

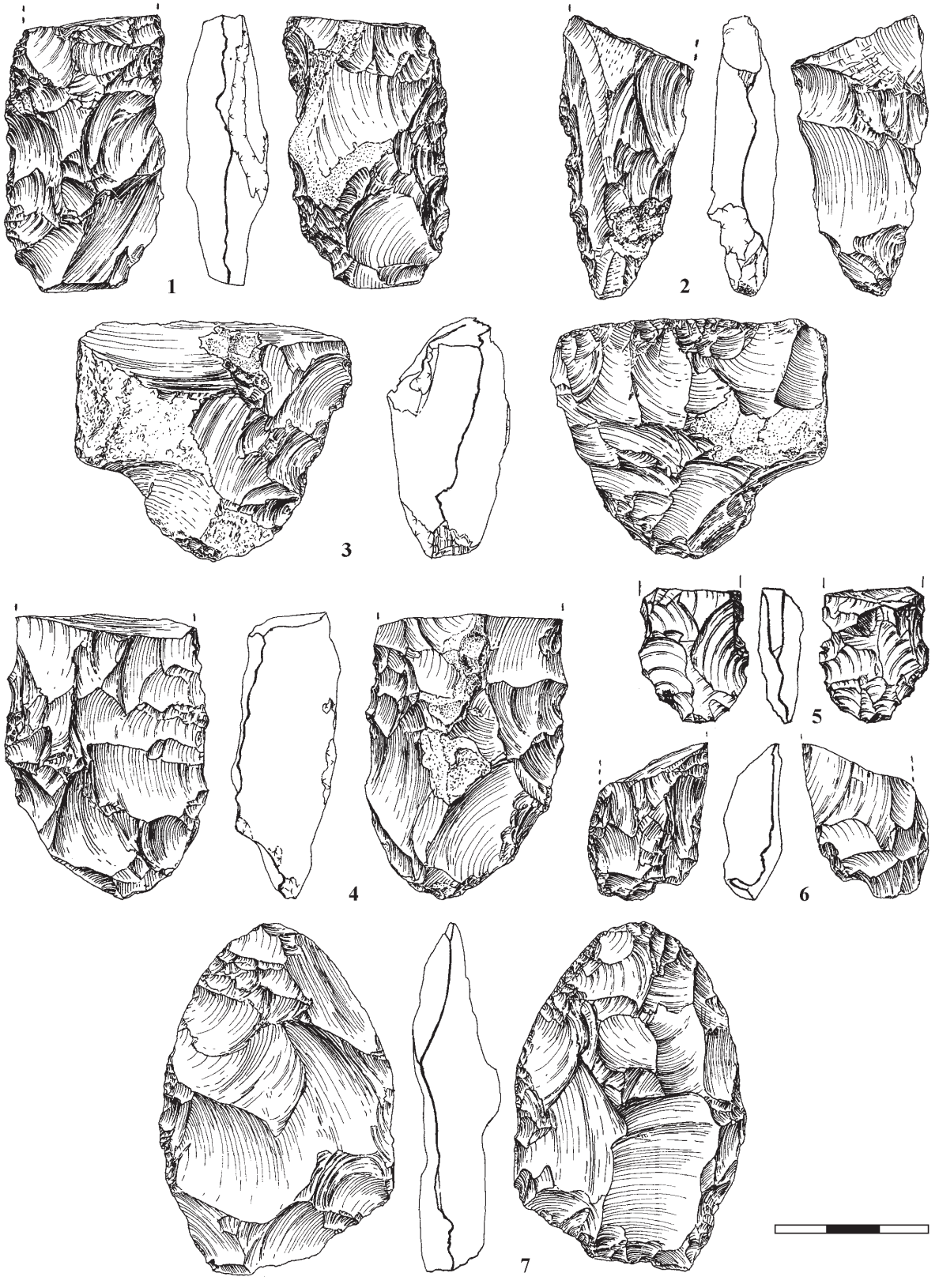

Fig. 6-16 Kabazi II, levels V/3 (5), V/5 (2, 7), VI/2 (3), VI/6 (1), VI/9 (4), VI/9A (6), Bifacial scrapers / points: 1, 2, 4, 5, 6. Reutilized fragments of bifacial tools: 3. Bifacial scraper: 7 – sub-ovoid, thinned base.

Bifacial points / scrapers

This class of tool was found in seven of 18 levels (Table 6-12). The bifacial points / scrapers are represented by relatively large proximal fragments of tools which do not exhibit any traces of reutilisation (Fig. 6-16, *1, 2, 4, 5, 6*). All have slightly convex edges and might well be the fragments of bifacial sub-leaf points or scrapers.

Heavily exhausted bifacial tools and reutilised fragments of bifacial tools

These tools were found in five of 18 levels (Table 6-12). They are mainly represented by shapeless fragments of bifacial tools with intensive traces of reutilisation. Usually, the part of the tool reutilised by retouch also corresponds to the zone of breakage (Fig. 6-16, *3*). The rate of reutilisation of bifacial tools in Kabazi II, Units V and VI are the highest thus far noted for the Crimean Micoquian. In these assemblages reutilised bifacial tools constitute 7.13 % of all tool-kits, or 10 % of tools in essential count, or 16.7 % of all identifiable bifacial tools. The assemblage from Kabazi II, Units V and VI is followed by that from Chokurcha I, Unit IV where bifacial reutilised tools comprise 2.34 % of all tool-kits, or 4.71 % of tools in essential count, but 18.36 % of all identifiable bifacial tools (Chabai 2004b). Usually, Micoquian assemblages contain a large number of broken bifacial tools; these are, however, rarely reutilised (Kolosov 1983, 1986, Chabai 1998d, 1999a, Marks, Monigal 1998, Yevtushenko 1998a, 1998b, Demidenko 2003a, 2004a).

Bifacially retouched flint plaquettes

This tool originated from level VI/6 (Table 6-12). The opposite sides of a relatively small flint plaquette were retouched, each in a bifacial plano-convex manner (Fig. 6-15, *3*). Such tools often occur in the assemblages of the Ak-Kaya facies of the Crimean Micoquian where they are known as *"knives with handles"* (Kolosov 1978).

Pebble macro-tools

The only pebble macro-tool is chopper from level VI/9 (Table 6-12). It was made on a sandstone pebble. The dimensions are: length – 15,0 cm; width – 6,2 cm; and thickness – 4,2 cm. Choppers are very rare in Crimean Micoquian. The chopper and chopping tools are known from Zaskalnaya VI, layers III and IV assemblages (Kolosov 1986) and unlikely represent either a "cultural" or a temporal indicator.

Retouched & Thinned Pieces

Retouched pieces were found in almost all levels, except V/5, VI/5 and VI/17. The variability of retouched pieces stems from the variety of blank and retouch placement (Table 6-12, Fig. 6-5, *8*; 6-9, *8*). More than half of retouched pieces were made on flakes using lateral obverse irregular retouch (Fig. 6-9, *8*).

The only thinned piece is from level VI/9 (Table 6-12). It is a flake with thinned base (Fig. 6-13, *2*).

Unidentifiable tools

This class of tools is represented by tiny fragments from the edges and proximal / medial parts of both bifacial and unifacial tools (Table 6-12). The fragments of unifacial and bifacial tools occur in roughly equal proportions.

Bone retouchers

Two bone retouchers were found in level VI/11-14 (Table 6-12). Both are on the fragments of tube bones. One piece exhibits two zones with "retoucher traces" on each of its opposing (Fig. 6-17). Another is classed as a "single zone retoucher". No other bone retouchers were found in the Kabazi II archaeological sequence. Bone retouchers are typical finds of the Crimean Micoquian. Whilst at such sites as Prolom II and Chokurcha I, IV bone retouchers are very abundant, at other sites, such as Buran Kaya III, B, this tool class is totally absent (Kolosov 1986, Yevtushenko 1998b, Chabai 2004b, Demidenko 2004a).

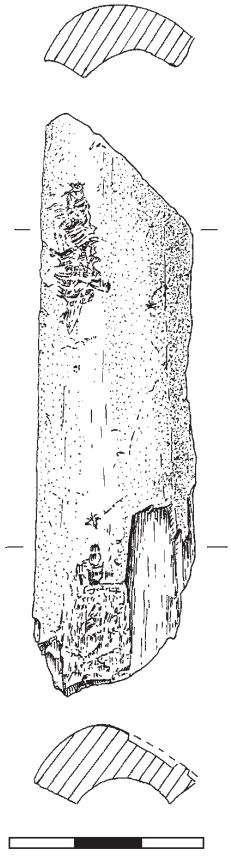

Fig. 6-17 Kabazi II, level VI/11-14. Bone retoucher.

Discussion: Kabazi II, Units V and VI in the Context of the Crimean Middle Palaeolithic

Taking into account the proposed Last Interglacial age of the assemblages from Kabazi II, Units V and VI, one can quite safely assume that these actually represent the oldest manifestation of the Middle Paleolithic in the Crimea. Therefore, the determinations of their typological and technological characteristics, as well as the mode of human activity and the sedimentation processes which resulted in their accumulation, are matters of utmost importance.

Site formation process

The accumulation of Strata 14A and 14B, which envelope the Units V and VI assemblages, was caused by four major agents: the pedogenic process, slope colluvium, limestone barrier dissolution and human activity. These processes led to the accumulation of between 1,5 m and 2,5 m of sediment in various parts of the site. The occupations of levels V/3 through VI/10 were formed in the upper part of Strata 14A and 14B, after the collapse of the limestone barrier (Stratum 17), on a more or less stable surface and covered by sediments in primary context. Whilst the sharp angle of inclination of the lower part of Stratum 14B (levels VI/11-14, VI/15 and VI/16) suggests that some transportation of artefacts and bone material possibly occurred, it would appear that Stratum 14A was initially somewhat thicker, its upper part probably being truncated by alluvium from Stratum 13A. According to N. Gerasimenko (Chapter 2, this volume), Strata 14A and 14B sediments were formed during the OIS 5d, which lasted about ten thousand years. In other words, between 1,5 m and 2,5 m of sediment accumulated in this time period. This rate of sedimentation is not among the most impressive, but at the same time, bone and limestone debris surfaces are not eroded, and flint artefacts are not patinated. Even bone and artefact material from the obviously redeposited levels VI/11-14, VI/15 and VI/16 are not rounded, naturally damaged or eroded. All of these points would suggest relatively favourable conditions and a resulting quick conservation of fauna and artefact assemblages. In spite of the large number of archaeological levels, there are neither signs of intensive occupations, nor of frequently repeated visits. Each occupation is separated by pronounced sterile sediments which can be up to half a metre thick. The density of both bones and artefacts is among the lowest noted at a Crimean Middle Palaeolithic site, and is comparable with such ephemeral occupations as at Sary Kaya, known for its poor preservation of fauna.

Thus, the artefact and bone assemblages from Units V and VI are the result of low intensity occupations which accumulated during favourable environmental conditions, and which were relatively rapidly buried by sediments. This kind of site formation process has no strict analogy in the Crimean Middle Palaeolithic.

		Simple	Convergent	Bifacial
Ak-Kaya facie	Kabazi II, V, VI	26,2	24,6	49,2
	Sary Kaya, 1985-86	35,2	20,2	44,6
	Chokurcha I, IV-I	48,1	15,4	36,5
	Zaskalnaya VI, II	37,8	32,1	30,1
	Chokurcha I, IV-M	30,0	40,0	30,0
	Zaskalnaya V, V	28,2	42,3	29,5
	Kabazi II, III	51,3	20,5	28,2
	Chokurcha I, IV	45,1	26,8	28,1
	Sary Kaya, 1977	58,1	15,3	26,6
	Zaskalnaya V, II	49,9	26,2	23,9
	Zaskalnaya V, III	46,1	30,4	23,5
	Zaskalnaya V, VI	41,7	35,4	22,9
	Zaskalnaya VI, III	53,9	26,1	20,0
Starosele facie	Prolom II, III	48,3	34,8	16,9
	Zaskalnaya VI, V	37,9	45,4	16,7
	Zaskalnaya V, I	33,3	50,8	15,9
	Prolom II, II	43,6	42,6	13,8
	Chokurcha I, IV-O	53,1	34,4	12,5
	Zaskalnaya V, IV	39,9	47,7	12,4
	Starosele, 1	44,3	43,4	12,3
	Zaskalnaya VI, IV	46,9	42,5	10,6
	Prolom II, IV	48,6	44,3	7,10
Kiik-Koba facie	Buran Kaya III, B	36,5	49,1	14,4
	Kiik-Koba, upper	26,9	59,3	13,8
	Prolom I, lower	30,2	59,1	10,7
	Prolom I, upper	30,9	54,4	14,7
	Buran Kaya III, 7-8	37,0	51,9	11,1

Table 6-13 Ratios of morphological toolgroups in the Crimean Micoquian assemblages.

Technology and typology: temporal perspective

The main characteristic features of levels V/3 – VI/17 assemblages are: an abundance of bifacial tools made in a plano-convex manner; the presence of bifacial backed scrapers and bifacial leaf-shaped points and scrapers; and a large number of unifacial scrapers which were made using various kinds of ventral thinning. In addition, two reduction strategies are distinguishable: bifacial plano-convex and parallel "primitive" core flaking. Such typological and technological attributes are common to all Crimean Micoquian assemblages, all of which are part of the Central and Eastern European Micoquian techno-complex (Chabai 2003a, Chabai et al. 2004).

On the basis of the morphological structures of tool-kits, the Crimean Micoquian is subdivided into three facies: Ak-Kaya, Starosele and Kiik-Koba (Chabai 2004c). The assemblages of the Ak-Kaya facie are characterised by a relatively high percentage of bifacial tools and the dominance of simple tools (transverse, diagonal, simple and double scrapers) over convergent tools (convergent scrapers and points) (Table 6-13). The Starosele assemblages display smaller amounts of bifacial tools, and about equal proportions of simple and convergent tools. The amount of bifacial tools in the Kiik-Koba facie assemblages is reminiscent of the Staroselian, while convergent tools clearly outnumber the simple tools. At the same time, there are no tool types which are exclusive to one or two particular assemblages and which are not found in another. In other words, the same tool types are characteristic of all facies, but in different proportions.

The combined assemblages of Units V and VI from Kabazi II correspond well with the Ak-Kaya cluster, this is most evident in the high amount of bifacial tools (Table 6-13, Fig. 6-18), an extreme manifestation of this facie. At the same time, the amount of simple tools in Kabazi II, Unit V and VI assemblages is the lowest among all tool-kits of the

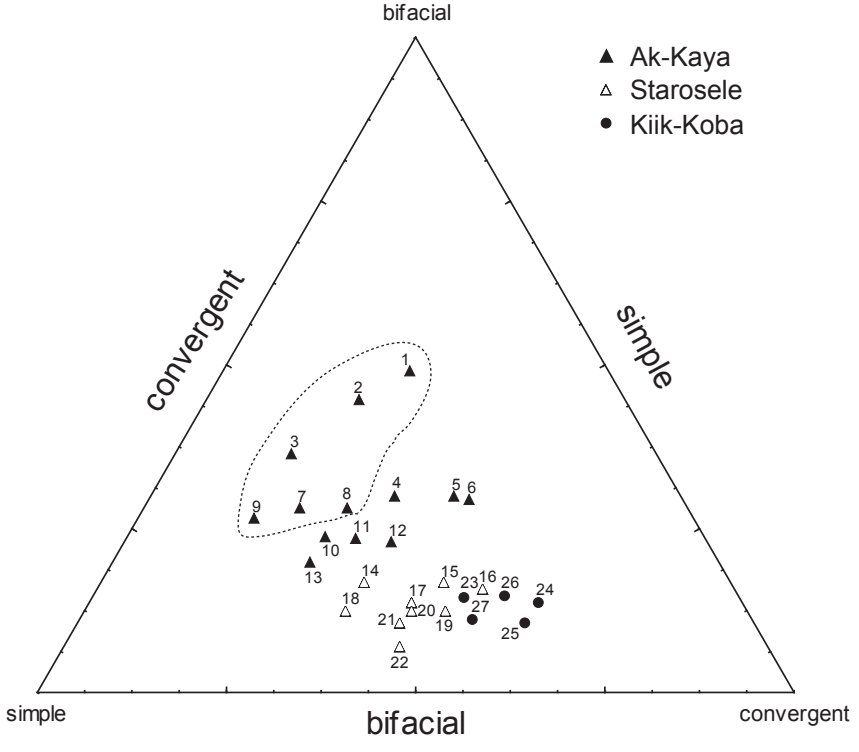

Fig. 6-18 Tripole graph of ratios of morphological toolgroups according to assemblages: 1 – Kabazi II, Units V, VI; 2 – Sary Kaya, 1985-86; 3 – Chokurcha I, level IV-I; 4 – Zaskalnaya VI, layer II; 5 – Chokurcha I, level IV-M; 6 – Zaskalnaya V, layer V; 7 – Kabazi II, Unit III; 8 – Chokurcha I, Unit IV; 9 – Sary Kaya, 1977; 10 – Zaskalnaya V, layer II; 11 – Zaskalnaya V, layer III; 12 – Zaskalnaya V, layer VI; 13 – Zaskalnaya VI, layer III; 14 – Prolom II, layer III; 15 – Zaskalnaya VI, layer V; 16 – Zaskalnaya V, layer I; 17 – Prolom II, layer II; 18 – Chokurcha I, level IV-O; 19 – Zaskalnaya V, layer IV; 20 – Starosele, level 1; 21 – Zaskalnaya VI, layer IV; 22 – Prolom II, layer IV; 23 – Buran Kaya III, layer B; 24 – Kiik-Koba, upper layer; 25 – Prolom I, lower layer; 26 – Prolom I, upper layer; 27 – Buran Kaya III, layer 7-8. The dotted line shows the assemblages which are based on tool import.

Geochronology	Sites, levels / layers	AMS	ESR	Facie
Denekamp	Prolom II, II	Ki-10617, 28,1±0,35		Starosele
	Buran-Kaya III, B	OxA-6674, 28,52±0,46 OxA-6673, 28,84±0,46		Kiik-Koba
	Zaskalnaya V, I	Ki-10891, 28,85±0,4 Ki-10744, 30,08±0,35		Starosele
Stadial	Zaskalnaya VI, II	OxA-4131, 30,11±0,63 Ki-10893, 30,7±0,45 Ki-10607, 30,22±0,4		Ak-Kaya
	Zaskalnaya V, II	Ki-10743, 31,6±0,35	41,8±3,1	
	Prolom I, upper layer	GrA-13917, 30,51±0,58/0,53 GrA-13919, 31,3±0,63/0,58		Kiik-Koba
	Prolom I, lower layer	Ki-10615, 33,5±0,4 Ki-10616, 35,2±0,45		
	Zaskalnaya VI, III	OxA-4772, 35,25±0,9 Ki-10609, 38,2±0,4 Ki-10894, 36,4±0,45		Ak-Kaya
	Zaskalnaya VI, IIIa	OxA-4132, 30,76±0,69 OxA-4773, 39,1±1,5 Ki-10610, 39,4±0,48		
Hengelo	Starosele, 1	OxA-4775, 41,2±1,8 OxA-4887, 42,5±3,6	41,2±3,6	Starosele
Stadial	Prolom II, III	Ki-1061?, 41,6±0,8		
	Chokurcha I, IV-I, IV-M			Ak-Kaya
	Chokurcha I, IV-O	OxA-10877, >45,4		Starosele
	Zaskalnaya V, IV	GrA-13916, >46,0		
	Zaskalnaya VI, IV	Ki-10611, >47,0		
Moershoofd	Kabazi II, IIA/4			Ak-Kaya
Stadial	Kabazi II, III/1A; III/1			
Odderade	Kabazi II, III/2		74-85	
Stadial	Kabazi II, III/2A Kabazi II, III/3		82±10	
Brörup	Zaskalnaya V, V			
Stadial				
Last Interglacial	Kabazi II, V/3-VI/17			

Table 6-14 The chronology of the Crimean Micoquian by facie.

Ak-Kaya facie. None of the tool types identified at Kabazi II, Units V and VI were discovered here for the first time in a Crimean Micoquian context.

The subdivision of tool-kits into bifacial, simple and convergent morphological groups reflects the degree of tool reduction. The most reduced assemblages of Kiik-Koba facie demonstrate high percentages of convergent tools and small amounts of bifacial tools. At the same time, less reduced assemblages of the Ak-Kaya facie display the highest percentages of simple and bifacial tools, and much lower amount of convergent tools. Furthermore, the implication of Dibble's reduction model (Dibble 1984, 1995) is supported by the tool sizes. The biggest tools were found in Ak-Kaya assemblages, while the smallest tools are characteristic for Kiik-Koba assemblages.

There are no time indicative tool types or *Leitformen* which should be used to separate these assemblages from other manifestations of the Micoquian in the Crimea. The chronological frame of the Crimean Micoquian was established on the base of different kinds of radiometric dating systems and environmental studies (Hedges et al. 1996, McKinney and Rink, 1996, Rink et al. 1998, McKinney 1998, Pettitt 1998, Chabai et al. 1998, 1999, Gerasimenko 1999, 2003, 2004, Markova 1999, 2004a, 2004b, 2004c, Mikhailescu 1999, 2004, Stepanchuk et al. 2004, Rink et al. in press). The temporal position of Kabazi II,

Units V and VI assemblages was determined by the environmental studies of the whole stratigraphical sequence of this site (Chapters 1, 2, 3 and 4, this volume). The present day concept of the evolution of the Crimean Micoquian suggests that this technocomplex existed within this territory over a period of roughly 90-100 kyr, from the Last Interglacial up to the Arcy (Denekamp) Interstadial (Chabai 2003a, 2003b). The temporal distribution of Crimean Micoquian assemblages is demonstrated by the chronological interstratifications and the coexistence of the Ak-Kaya, Starosele and Kiik-Koba facies (Table 6-14), all three of which were present in both Stadials and Interstadials. Thus, neither chronological nor environmental factors are explanation enough for the facies variability of the Crimean Micoquian. On the other hand, the Crimean Micoquian, which lasted about 100 kyr, demonstrates both technological and typological stability. There is no evidence for any technological or typological innovations.

Raw material and fauna exploitation

The reasons behind the typological variability within Micoquian assemblages should be sought in the different models of raw material and fauna exploitation, all of which resulted in a different intensity of occupation (Chabai et al. 1995, 2000, Demidenko 1996, Chabai 1999a, 2004c). The less intensive occupations belong to the Ak-Kaya facie, while more intensive on-site exploitation of fauna and raw material is characteristic of the Starosele and Kiik-Koba facies.

On the basis of the raw material supply, the Micoquian occupation of the Crimea can be subdivided into three main groups: occupation based mainly on imported tool-kits; occupation with mainly on-site tool production; and occupation practicing both on-site raw material reduction and using imported tool-kits. The first group is represented by Kabazi II, Units III, V, VI, Sary Kaya, and Chokurcha I, Unit IV assemblages. The remaining Micoquian sites are attributable to the second and third groups. The main characteristic feature of assemblages belonging to the first group is the large number of bifacial tools – the highest ratio among all Crimean Micoquian sites. At the same time, the assemblages of the first group also differ one from another in the ratio of bifacial, simple and convergent tools. Furthermore, it is possible to state that some of the assemblages from the first group comprise a distinct cluster within the Ak-Kaya facie (Fig. 6-18, *1, 2, 3, 9, 7*), while the others are in the frames of average Ak-Kaya morphological proportions (Fig. 6-18, *8, 5*).

The raw material supply groups do not strictly correspond to the distance of the sites from the raw material sources. For example, the inhabitants of sites situated near to flint outcrops, e.g. Sary Kaya, used the imported tool-kit, while the raw material exploitation at the site of Buran Kaya III, B, which lies more than 10 km from the flint sources, was based on both raw material and tools transportation (Richter 2004, Uthmeier 2004a, 2004b). Our present knowledge of the distribution of Micoquian sites and sources of raw material makes it possible to state that such sites as Zaskalnaya V, Zaskalnaya VI and Sary Kaya were all situated at a distance of no more than 2 km from flint outcrops, and that the remaining Micoquian occupation sites are all situated at between 8 and 25 km from located flint sources. Thus, with the exception of Sary Kaya, the occupations of the first supply group are all located at a not inconsiderable distance from flint outcrops.

Micoquian occupation sites also differ according to their mode of fauna exploitation. Kabazi II, Unit III, and probably Sary Kaya, are primary butchering stations only, the remaining sites being either secondary butchering camps (Zaskalnaya V, Zaskalnaya VI, Kiik-Koba, Prolom I), or combinations of the two (Chokurcha I, Prolom II, Buran Kaya III, B).

It is for this reason that the assemblages from Kabazi II, Units V and VI are characterised by high proportion of tools, particularly high percentages of bifacial and bifacial reutilised tools, a rarity of cores and preforms, a low amount of bifacial debitage, and a specific metrical distribution of some flakes and tools. All of these features suggest only very little, or even the absence, of on-site flint reduction and tool rejuvenation. The main human activity which resulted in the accumulation of artefacts at the site was the transportation of tools, mainly bifacial, and sometimes of big flakes, cores and preforms. Therefore, the short term character of the occupations does not lead to the intensive tool rejuvenation and reshaping. At the same time, a quantity of already multiply reshaped unifacial tools was brought to the site. This resulted in a roughly equal proportion of simple and convergent tools. Furthermore, it is likely that some already reutilised tools were also imported to the site.

These "travelling/imported" and already somewhere reshaped convergent and probably bifacial tools are the main distinct feature of Kabazi II, Units V and VI assemblages and set them apart from the same mode of raw material exploitation practiced at Sary Kaya site. Sary Kaya is an open-air site with several ephemeral occupations and situated near a rich flint outcrop. The site was excavated as a one layer site in 1977, however, during the 1985-86 field

season, five occupational levels each separated by sterile sediments were found. Two Sary Kaya assemblages are very closely related in all respects. The amount of tools in all Sary Kaya collections varies from 44 to 77 %. Evidence for on-site raw material reduction, as well as processes of tool reshaping and rejuvenation are only very slight, if at all existent (Veselsky 2003). Thus, complete tools were brought to the site from the closely situated flint outcrop. Compared to Kabazi II, Units V and VI smaller proportions of convergent tools in both Sary Kaya assemblages can be explained by the nearby situated outcrop (no need for a travelling tool-kit). Additionally, butchering activity did not make a long time tool exploitation necessary. On the other hand, due to the nearby flint outcrop the Sary Kaya is deficient in reutilised bifacial tools. This might well be the reason for the smaller proportion of bifacial tools in these assemblages.

Another close analogy to Kabazi II, Units V and VI is the assemblage from Unit III of the same site. Features of the Kabazi II, Unit III assemblages, i.e. the ratio of tools, the rarity or even absence of on-site raw material reduction, and the morphological structure of tool assemblages (Table 6-13), are all very similar to those found at Sary Kaya in 1977. The only kind of activity noted in the occupations at Kabazi II, Unit III was butchering. On the other hand, the distance to the nearest flint outcrop from Kabazi II, Unit III was no less than 8 km. A few reutilised bifacial tools are known from Kabazi II, Unit III (Chabai 1999a).

The Chokurcha I, Unit IV assemblages are based on imported tool-kits which were intensively utilised at the site. The high percentages of tools, bifacial tools and sufficient amount of bifacial reutilised tools are accompanied by an abundant bifacial debitage and unifacial tools on bifacial thinning flakes (Chabai 2004b). Chokurcha I, Unit IV occupations are characterised by a high density of artefacts, an intensive use of fire-places (Chabai 2004a), and a combination of on-site primary and secondary butchering (Patou-Mathis 2004b). Depending on the intensity of the occupations the proportions of morphological groups of tools also varies. Less intensively occupied levels, such as level IV-I, display a high amount of bifacial simple and a low amount of convergent tools (Table 6-13). More intensively occupied levels, such as IV-M, show a dominance of convergent over bifacial and simple tools (Table 6-13).

Thus, with regard to models of raw material and fauna exploitation, the closest analogy to Kabazi II, Units V and VI assemblages is to be found at Chokurcha I, level IV-I. These occupations were based on imported tool-kits. Their inhabitants employed a combination of primary and secondary butchering. The main difference between Kabazi II, Units V, VI and Chokurcha I, level IV-I is in the intensity of on-site raw material utilisation. The Chokurcha I occupants utilised the available flint and bone materials much more intensively, this was probably due to the more abundant fauna resources whose exploitation resulted in a longer stay at the site.

To conclude, the earliest Micoquian assemblages of the Crimea found at Kabazi II, in Units V and VI show neither technological nor typological peculiarities which might be used for a temporal subdivision of the Micoquian in this region. Furthermore, the inhabitants of the Kabazi II, Units V and VI occupations practiced no particular models of raw material or fauna exploitation which were not known to their successors and implied over the next 100 thousand years of Crimean Micoquian evolution. Such an impressive stability assumes at least both well developed and variable adaptive abilities.

Abstract

КАБАЗИ II, КУЛЬТУРНО-ХРОНОЛОГИЧЕСКИЕ СЛОИ V И VI: АРТЕФАКТЫ

В. П. ЧАБАЙ

В 19 горизонтах V и VI культурно-хронологических слоев обнаружено 1379 артефактов. В целом структура комплекса артефактов характеризуется преобладанием дебитажа, высоким процентным выражением орудий, наличием преформ, нуклеусов и полуфабрикатов двусторонних орудий. Преформы являются относительно крупными, протестированными одним - двумя снятиями кремневыми плитками и первичными отщепами. Одно - и многоплощадочные нуклеусы представлены приблизительно одинаковыми пропорциями. Вспомогательные площадки на нуклеусах отсутствуют. Фасетаж ударных площадок не применялся. В целом, нуклеусное расщепление характеризуется как «примитивно параллельное». Полуфабрикаты двусторонних орудий изготовлены в плоско-выпуклой манере и отличаются от двусторонних орудий отсутствием ретуши на лезвиях. Среди сколов достаточно ощутимо представлены чешуйки (36,57 %), отщепы и пластины (15,9 %) снятые с двусторонних орудий. Пластины крайне редки и не стандартизированы (Ilam=6,03). Средние метрические параметры сколов составляют: длина – 3,89 см; ширина – 2,86 см; толщина – 0,73 см. Фасетаж ударных площадок сколов составляет: Ifl=49,7; Ifs=23,2. В целом, наиболее часто встречаемый скол представлен коротким, широким, относительно тонким отщепом со скошенной, lipped, гладкой ударной площадкой. Форма данного скола – трапециевидная, латеральный профиль – изогнут, дистальный профиль – петлевидный или тупой. Зачастую на дорсальной поверхности присутствуют участки желвачной корки и несколько однонаправленных или разнонаправленных негативов. Данные характеристики сколов вполне согласуются с производством имеющихся в коллекции нуклеусов и изготовлением двусторонних орудий.

Орудийный набор представлен следующими классами изделий: остроконечники – 2,7 %, скребла – 25,21 %, зубчатые – 3,6 %, долотовидные – 3,6 %, двусторонние острия – 1,8 %, двусторонние острия / скребла – 6,32 %, двусторонние скребла 13,52 %, двусторонне ретушированные плитки – 0,9 %, двусторонние реутилизированные / сработанные орудия – 5,4 %, чопперы – 0,9 %, сколы с ретушью – 24,32 %, утонченные сколы – 0,9 %, неопределимые односторонние орудия – 5,42 %, неопределимые двусторонние орудия – 4,5 % и костяные ретушеры – 1,8 %. Двусторонние орудия составляют 31,54 % от общего числа орудий и 42,84 % без учета сколов с ретушью, с утончениями, неопределимых орудий и костяных ретушеров. Это одни из самых высоких показателей двусторонних орудий в среднем палеолите Крыма. Второй характерной чертой орудийного набора является широкое распространение приемов вентральных утончений односторонних орудий: на 21 из 39 односторонних орудий обнаружены базальные, тыльные и терминальные утончения. В целом, технологически и типологически индустрии Кабази II, V и VI демонстрируют полный набор характерных черт микокского технокомплекса. Наиболее близкими аналогиями комплексу орудий Кабази II, V и VI культурно-хронологических слоев являются коллекции Чокурчи I, IV и Сары-Каи (1985-86), которые относятся к аккайской фации крымского микока. Более того, Кабази II, V и VI являются древнейшим проявлением микока не только в Крыму, но и на территории Восточной Европы.

Несмотря на достаточно впечатляющую продолжительность крымского микока – около 90 тыс. лет, отсутствуют какие-либо основания предполагать наличие технологических и /

или типологических инноваций. Плоско-выпуклая манера изготовления двусторонних орудий и примитивно-параллельное расщепление нуклеусов существовало на всем протяжении крымского микока без каких-либо существенных изменений. Нет значимых отличий и в типологии орудийных наборов, которые как в наиболее ранних, так и наиболее поздних комплексах основаны на двусторонних листовидных и сегментовидных формах и односторонних простых, трапециевидных и сегментовидных скреблах. Двусторонние и односторонние орудия зачастую оснащались обушками и различными видами утончений.

С точки зрения функциональной вариабельности крымского микока, поселения V и VI культурно-хронологических слоев Кабази II относятся к типу кратковременных лагерей, на которых производилась первичная и вторичная разделка животных, в основном, принесенными на стоянку готовыми орудиями. Изготовление орудий на территории стоянки имело ограниченный характер. Приблизительно такие же модели использования кремневого сырья и фауны характерны для поселений IV культурного слоя Чокурчи I.

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KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Chapter 7

Saving the Stock to be Prepared for the Unexpected. Transformation of Raw Material at the Middle Paleolithic Site of Kabazi II, Level V/1

Thorsten Uthmeier

Stratigraphical Position and Distribution of Finds

Archaeological level V/1 of Kabazi II is embedded in the uppermost part of geological Stratum 13A and consists of a thin, loose scatter of lithics and faunal remains that is separated from the underlying archaeological level V/2, as well as from the overlying level IV/4, by 5 cm to 10 cm thick sterile sediments. The excavated area measures 23 m^2 and is situated immediately behind a huge limestone block that was – for the most part – responsible for the site formation process by trapping colluvial sediments and debris which would otherwise have been transported further down slope. Stratum 14A, below the strata discussed here, is the humus (A1) horizon of a well developed humiferous soil, Stratum 14B. The reddish colour and high clay content of Stratum 14B suggests that the pedogenesis took place under warm, interglacial conditions (Gerasimenko, Chapter 2, this volume). The interglacial age for this soil formation is further strengthened by the presence of *Helix sp.*, and high ratios of boreal pollen (Gerasimenko, Chapter 2, this volume). In Stratum 14B, a vegetation of south-boreal forest type dominates, while Stratum 14A, with a more open forest-steppe vegetation, indicates the end of the interglacial conditions. While the pedogenesis of Stratums 14A and 14B points to an interruption of colluvial sedimentation, Stratum 13A is a soil colluvium which corresponds to a phase of low stability of the slope (Gerasimenko, Chapter 2, this volume). According to pollen analysis, the formation of this colluvium correlates with a severe cooling at the very beginning of the last glaciation.

However, since the last Interglacial, the landscape in the immediate vicinity of Kabazi II has undergone far reaching changes that have also influenced the site formation process. Beneath the site, three terraces belonging to the Alma River document a severe down cutting of the riverbed. The top of the oldest terrace is situated 60 m above the present day valley bottom and only 20 m below the lowermost archaeological levels of the Kabazi II stratigraphical sequence. Geological data suggests that the Alma River did not cut deeper into the landscape prior to OIS 4 (Chabai, Marks and Monigal 1999, 228; Chabai 2004c, 206). This view is supported by the analysis of local malacofauna (Mikhailesku, Chapter 4, this volume) which indicates falling ground water levels at the beginning of OIS 4.

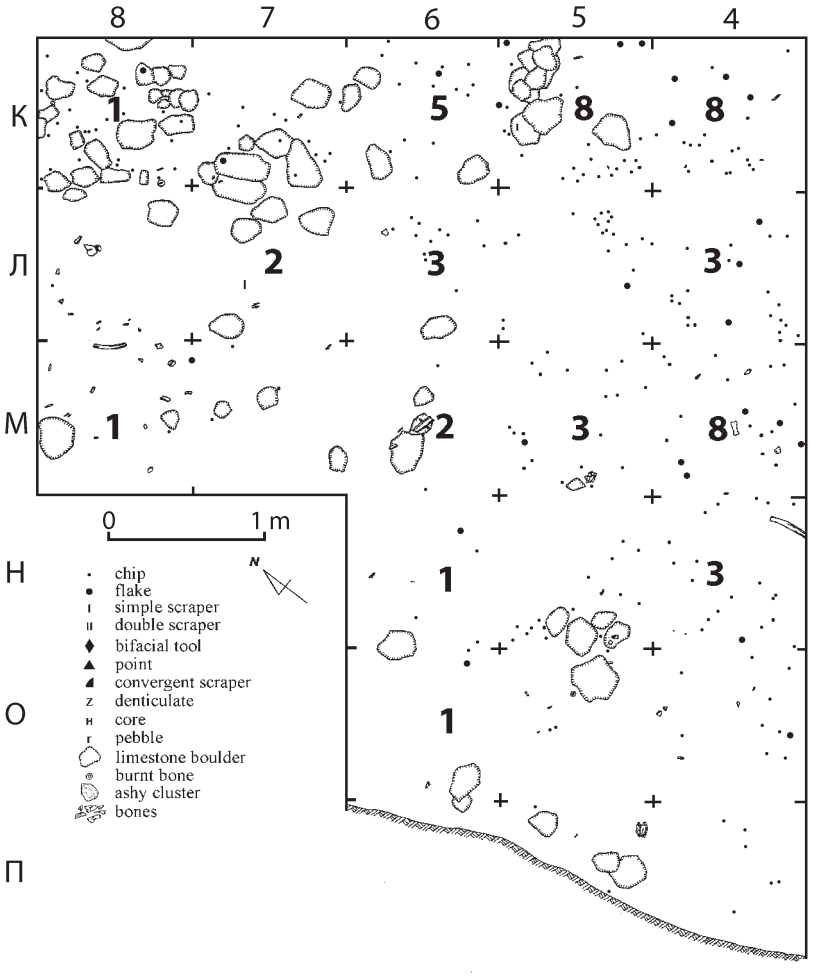

Fig. 7-1 Kabazi II, level V/1: Distribution of faunal remains, limestone blocks and artefacts from 19 workpieces on the living floor.

Consequently, Kabazi II originally was situated near the river bank, and flooding of the Alma could have reached the excavated area. While the lower archaeological levels of Unit V show no sign of activity connected with alluvial dynamics, these were indeed found in level V/1 to V/2A. In some areas of these archaeological levels, surfaces were wavy, and depressions were filled with sandy sediments. Archaeological remains including chips were found mainly in clusters and separated by sterile areas. Although erosion was not strong enough to remove all archaeological remains, any interpretation of the lithic assemblage must consider that finds from some areas may have been washed away, whereas in other parts of the excavated area some lenses have remained more or less untouched.

Artefacts large enough to be sorted into raw material units account for 54 pieces, most of these being larger than chips. In the case of 50 pieces, their exact position was measured (Fig. 7-1). Theses artefacts come mainly from three clusters, one in sq. 5K, one in 4K, and one in sq. 4M. All are situated near the edges of the trench. Rising and falling water levels of the Alma River might be an explanation for the observation that the southern and south-eastern parts of the excavated area, e.g. square lines N and O as well as sq. 8M and 7M, are more or less void of artefacts. Indeed, it is this section of the excavated area that is oriented towards the Alma River. A diagonal line projected from sq. 8K to sq. 4H separates areas with low densities of finds from those with higher amounts of artefacts. This boundary possibly indicates the uppermost shoreline of the river at the time of settlement. Some burnt artefacts found in the assemblage of Level V/1 belong to a fireplace that was situated near the limestone block and destroyed by water, or is still to be found out of the excavated area.

Typological and Technological Features

A total of 54 artefacts were large enough to be included in our investigation of raw materials. Of these, 23 artefacts show a modification of their lateral edges (Fig. 7-2). Taken into account that flooding of the Alma River played an important role in the formation process of Level V/1, it is no surprise that 15 pieces with irregular retouch dominate. In most cases, these modifications are best explained by post-depositional movements (e.g. Fig. 7-3, *7*, Fig. 7-5, *6*, *12*). However, there are others which have a lateral retouch consisting of a line of short, but regular negatives which stretch over a considerable part of their edges. The retouch on these pieces is most probably connected with short-term usage of formerly unretouched blanks (e.g. Fig. 7-3, *5*, *9*, Fig. 7-4, *7*). Among eight formal tools, five are side scrapers with one working edge (Fig. 7-3,*8*; 7-4,*1*,*8*; 7-5,*5*), and three were classified as notches (Fig. 7-5,*1-2*,*13)*. In addition, two artefacts indicate intensive use or rejuvenation of formal tools. In one case, a broken tool tip originates from a scraper formed by ventral retouch (Fig. 7-5,*17*). Another artefact is a rejuvenation flake that removed part of a retouched working edge of a formal tool of unknown shape (Fig. 7-4, *5*). Generally speaking, there is no preference in the selection of blanks for formal tools. With simple flakes, flakes from surface shaping, and crested flakes, a whole variety of blank types was selected for formal tools. At least within the assemblage which has survived the natural site formation process, there would appear to be a considerable shortage of blanks. This assumption is based upon the observation that irregular outlines dominate among formal tools, a flake with Siret (false burin) breakage (Fig. 7-5,*5*) and a crested flake (Fig. 7-4,*8*) were used for the manufacture of formal tools, and – according to use wear retouch – even a broken preform was used (Table 7-1). The preform mentioned above (Fig. 7-3, *1*) shows that surface shaping was known as a concept for blank production. The fact that the surface shaping started with plan negatives on the lower surface is typical for the production of plano-convex bifacial tools of the "Crimean Micoquian". It is likely that the piece was abandoned because the regulation of a lateral breakage (in the course of initial preparation?) of the large cortical flake used as raw piece would not have led to satisfactory results. Judging from numerous flakes with convex lateral profiles, lipped striking platforms, less pronounced or no bulbs, and absence of bulbar scars, surface shaping of raw nodules or partly decorticated preforms took place within the excavated area.

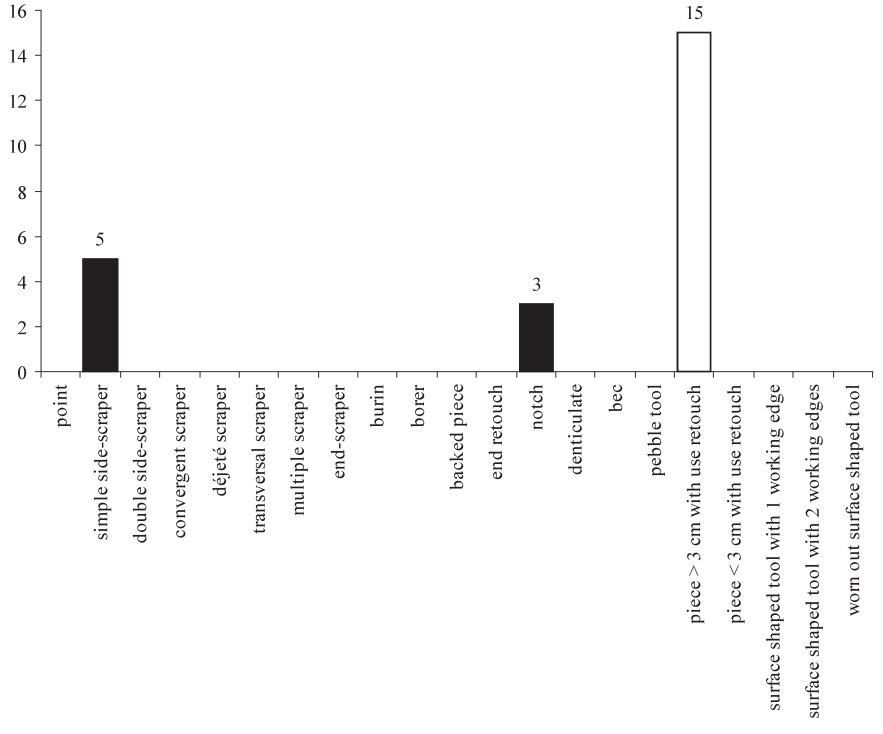

Fig. 7-2 Kabazi II, level V/1: Frequency of tools (black bars indicate formal tool classes).

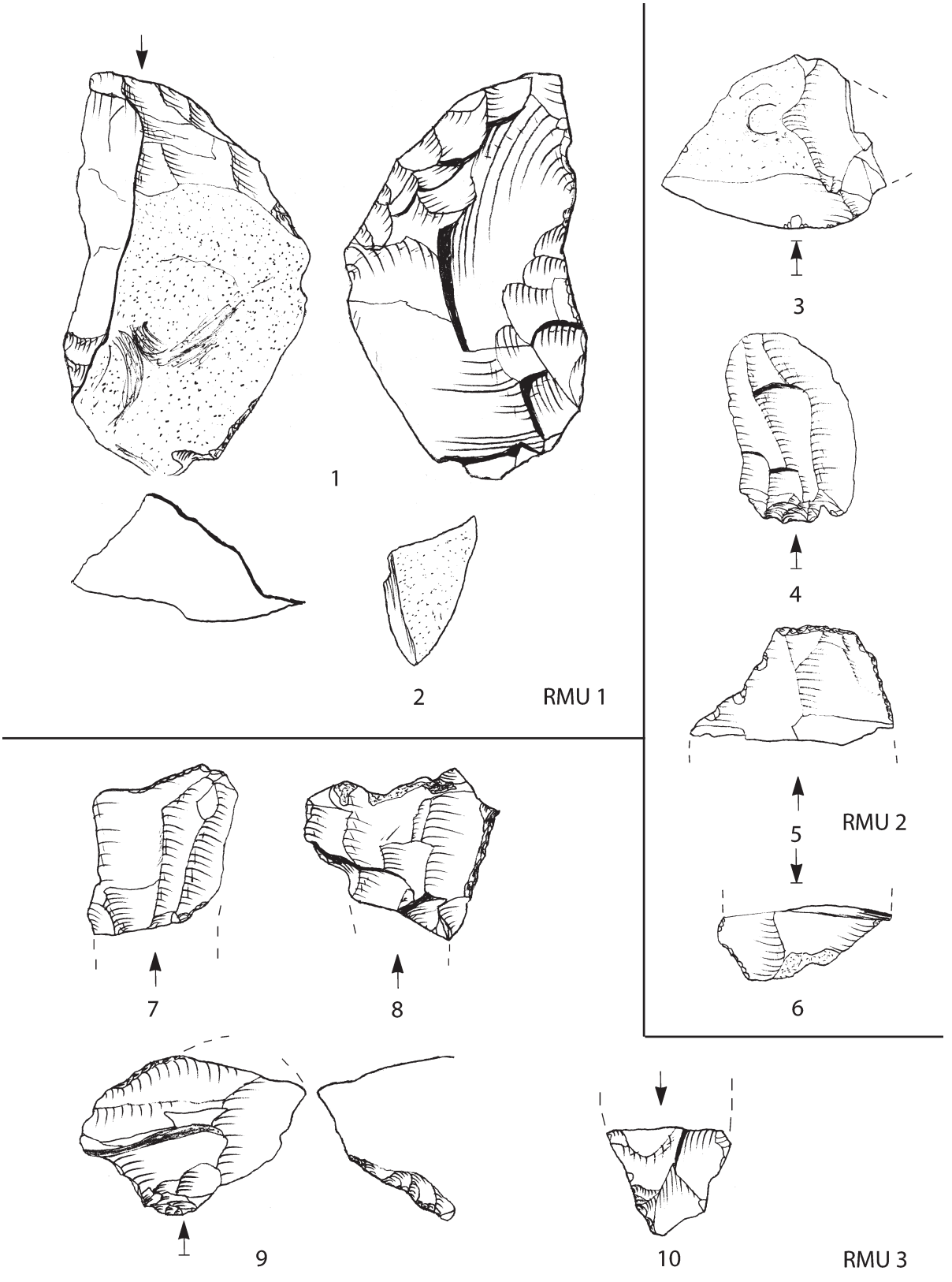

Fig. 7-3 Kabazi II, level V/1: Artefacts in raw material units.

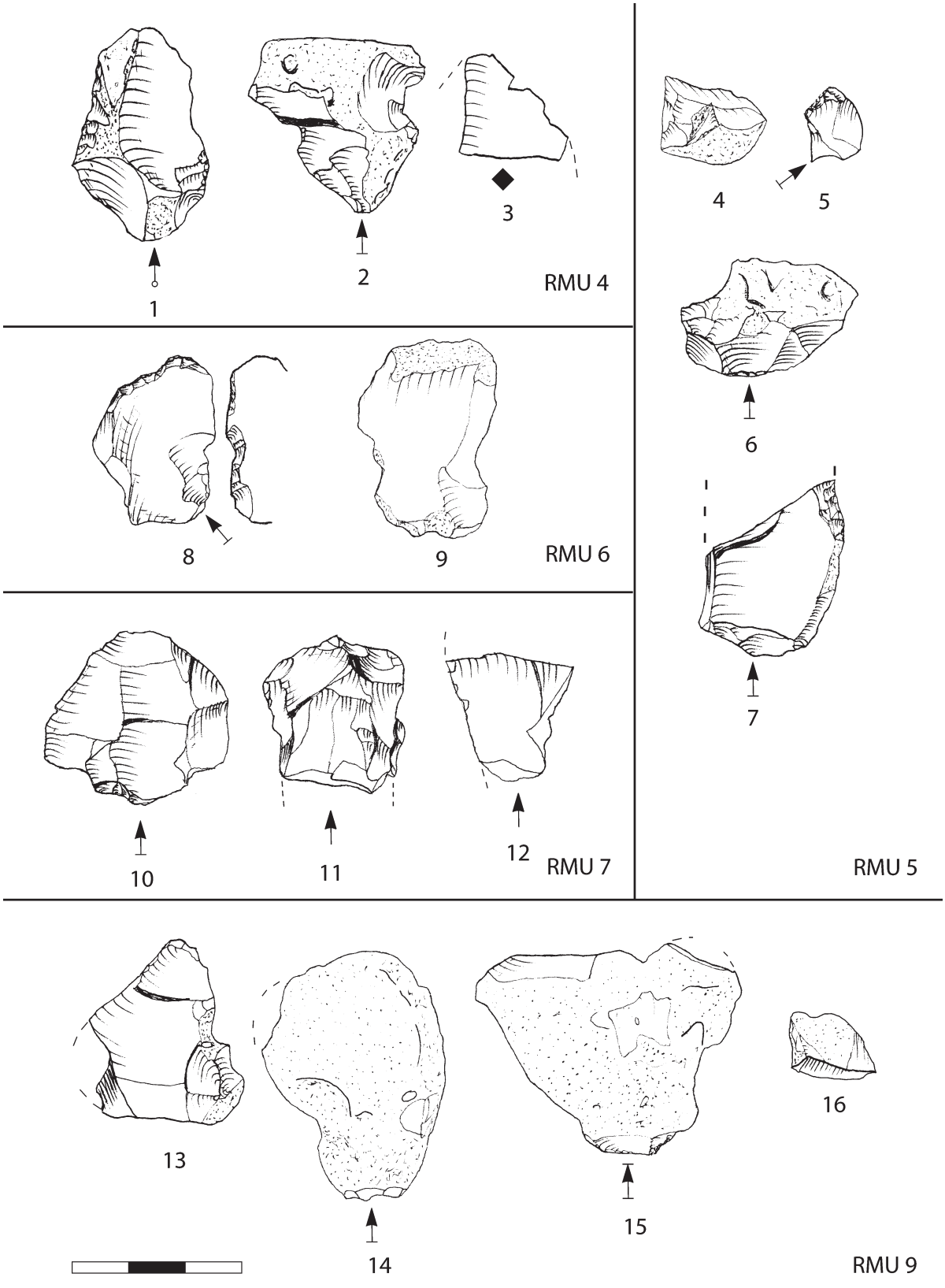

Fig. 7-4 Kabazi II, level V/1: Artefacts in raw material units.

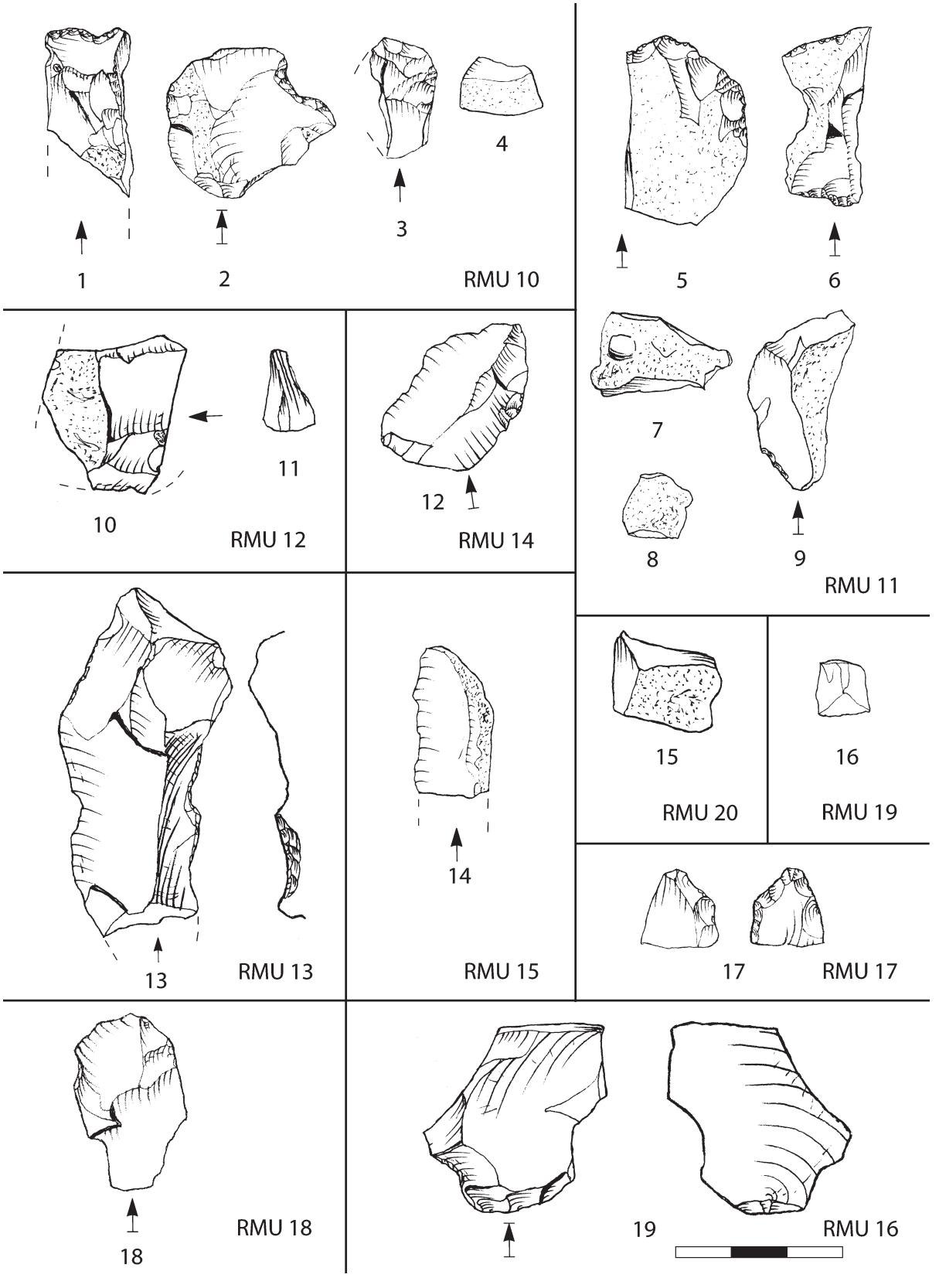

Fig. 7-5 Kabazi II, level V/1: Artefacts in raw material units.

However, there are also flakes with straight lateral profiles and pronounced bulbs and bulbar scars which were detached by direct hard hammer percussion (Fig. 7-6). Although part of them almost certainly stem from initial preparation of surface shaped preforms, a core-like piece (Fig. 7-4, *13*) shows that ad-hoc flaking of simple cores was also practiced. But still, no dorsal scar pattern on flakes was found that would indicate the control of distal and / or lateral convexities. If at all, flaking surfaces of cores were flaked without initial preparation, but not in the frame of any distinct concept or method. Finally, a Kombewa flake (Fig. 7-5, *14*) was struck off-axis from the ventral surface of a large flake. From the same surface, at least one additional large flake had been previously detached, possibly in order to produce a preform for a surface shaped tool. The observation that most blanks used for formal tools are partly covered by cortex again points to surface shaping as the main concept for raw material reduction in level V/1. In contrast to the reduction of true cores, the production of surface shaped tools allows only low frequencies of large flakes. Due to the fact that preforms and surface shaped blanks become thin, and flaking angels tend to become steep, large flakes occur mainly during the initial phase of decortication, often done by direct hard hammer percussion, and initial soft hammer surface shaping. Afterwards, flakes from *façonnage* mainly comprise thin and short flakes with irregular dorsal scar pattern. If there had been a reduction of prepared cores of any kind, one would expect more regular flakes. All in all, the following working steps of raw material reduction were recognised:

1. Detachment of simple flakes by hard hammer percussion;
2. Flaking of the ventral surface of large flakes;
3. Detachment of flakes for the surface shaping of plan-convex bifacial preforms;
4. Modification of blanks produced during working steps 1 to 3;
5. Rejuvenation of formal tools.

Almost certainly, these working steps were all dedicated to the production of surface shaped bifacial tools, some of which were made on large flakes. Except for simple cores, there is no evidence for any other concept or method of flaking.

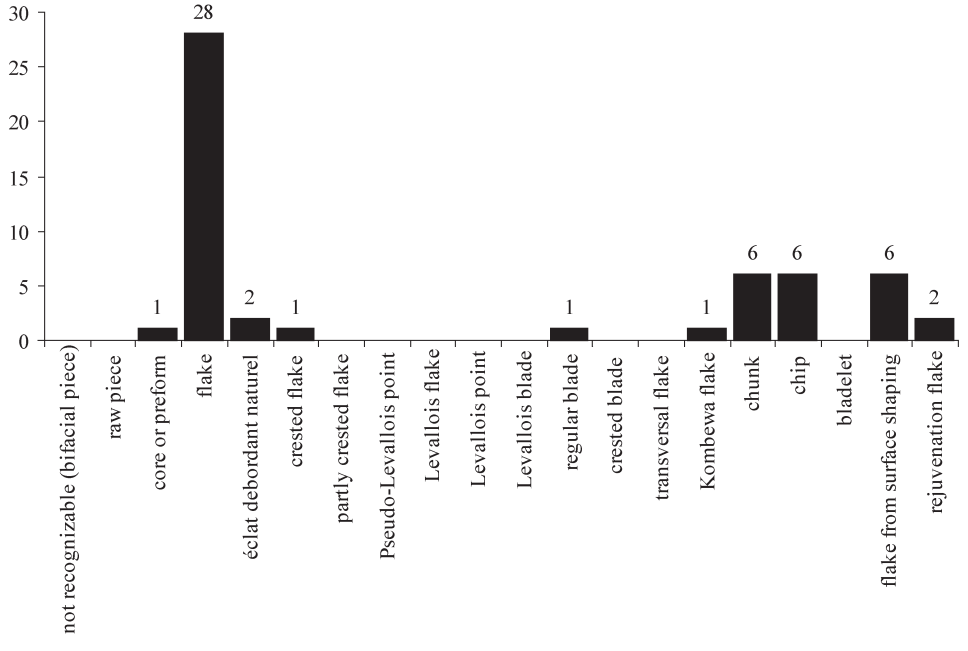

Fig. 7-6 Kabazi II, level V/1: Frequency of blanks.

RMU	tool class	blank
3	1 simple side scraper	flake from surface shaping
4	1 simple side scraper	simple flake
6	1 side scraper	flake detached off-axis along crest of a surface shaped preform
10	2 notches	1 simple flake, 1 flake from surface shaping
13	1 notch	blade-like flake
11	1 simple side scraper	flake with Siret fracture
17	1 tip of a scraper	unknown

Table 7-1 Kabazi II, Level V/1: Blanks selected for the production of tools in raw material units with formal tool classes. According to a continuous retouch that covers only minor parts of the lateral edges, several additional blanks were used, but not transformed into formal tools (e.g. a broken preform from RMU 1: Fig. 7-3, 1).

A Short Introduction into the Methods Applied: Sortation of Raw Material and Transformation Analysis

In general, the analysis of artefacts found at Palaeolithic sites is complicated by the fact that assemblages tend to be incomplete. Natural site formation processes, small excavation areas and the fact that mobile hunter-gatherers took part of their equipment with them to other sites, all contribute to the effect that many assemblages represent only a small part of the objects originally manufactured and used at a single site. Even if artefacts are found *in-situ*, refittings are often not very numerous, and at the same time lack artefacts needed to complete refitted flaking sequences. The number of refittings, as well as the number of artefacts missing to complete nodules can be taken as a scale to judge the degree of incompleteness of a given assemblage. Apart from erosion and small excavation areas, missing cores and tools may be interpreted as indicating human transport of items to other campsites. For many years, the sortation of lithic artefacts into raw material units is a method used to enlarge the data of refittings. A group of artefacts with a unique combination of raw material attributes is defined as being the result of the reduction of the same nodule. In the following chapters of this volume, we have combined a detailed sortation of raw material with a classification of these units referring to the completeness of the *chaîne opératoire* at the site under analysis (Richter 1997; Uthmeier 2004a). From a methodological point of view, all raw material units consisting of two or more artefacts from the same raw piece are treated as equivalent to refittings. These units are called "workpieces", because it is assumed that the discarded artefacts result from flaking activities on the site. They underwent a transformation within the excavated area. The transformation might represent the entire formal *chaîne opératoire* as defined by J.-M. Geneste (1985; 1988; 1990), or to the contrary only isolated work steps, e.g. the modification or the fracture of a tool. A second class of raw material units may consist of pieces without any counterpart with identical raw material attributes within the entire assemblage. These raw material units are called "single pieces". For one reason or another, these pieces were discarded without any transformation. Essentially, the classification of "transformation sections" is based upon the presence or absence of artefacts which are diagnostic for certain steps of the *chaîne opératoire*. The number of steps of the *chaîne opératoire* classified as being conducted within the excavated area results from the most initial and most final work step which is represented by one or more diagnostic artefacts, no matter if artefacts of intermediate work steps are present or not. For example, it is concluded that the combination of a cortical flake and a broken tool in one raw material unit indicates the complete reduction of a raw piece. A list of classes of transformation sections as well as the corresponding diagnostic artefacts is given in Table 7-2 (for raw material units with *debitage* only) and Table 7-3 (for raw material units that include *façonnage*). Table 7-4 gives a correlation between transformation sections and phases of the formal *chaîne opératoire* after J.-M. Geneste (1985; 1988; 1990).

Sortation of Raw Material Units

Among 54 artefacts, 20 raw material units were identified (for a description of the method applied see Uthmeier 2004a). One of these consists of nine patinated or burned pieces and was – together with most of the chips – classified as "sorting rest". This category also includes some "colluvial pieces" that were, according to V. Chabai (Chapter 1, this volume), transported in different quantities into the excavated area by natural processes, possibly from another, older site above Kabazi II. Because nothing can be said about their original fracture planes, these pieces were not included in the following considerations. The remaining 19 raw material units contain small numbers of artefacts, ranging between one piece and five pieces per unit (Fig. 7-7). All comprise artefacts made from Cretaceous flint. The colour of most fracture planes is grey, with differences in detail: while some are light-grey, others are brown-grey, dark-grey, or even brown. Bands parallel to the cortex are rare, as are schlieren, but many fracture planes show white to grey inclusions in different frequencies. Given the low diversity of macroscopic attributes, it was not always easy to distinguish between raw material units. In six cases, transitional combinations of attributes that might link two units were identified. Nevertheless, it was assumed that a distinction would best meet the prehistoric reality, rather than combining these units. Only one unit (RMU 9) with a brown to orange colour is an "exotic" raw material, it being rare in all archaeological levels from Kabazi II studied so far. Consequently, eleven raw material units with two or more artefacts are treated as workpieces (i.e., comprise artefacts originating from one nodule only). It is, of course, difficult to ascertain whether single pieces really had no counterpart in the excavated area, as additional pieces might have been removed in the past by the Alma River during periods of flooding.

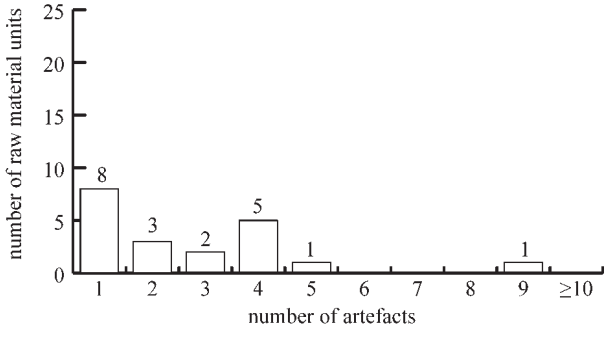

Fig. 7-7 Kabazi II, level V/1: Number of artefacts in raw material units.

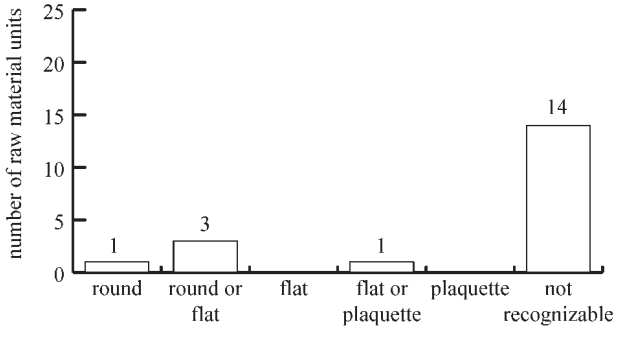

Fig. 7-8 Kabazi II, level V/1: Original shape of raw pieces before the transformation began. Possible shape of raw pieces is based upon cortical flakes and the assumption that each raw material unit represents a distinct nodule (workpiece).

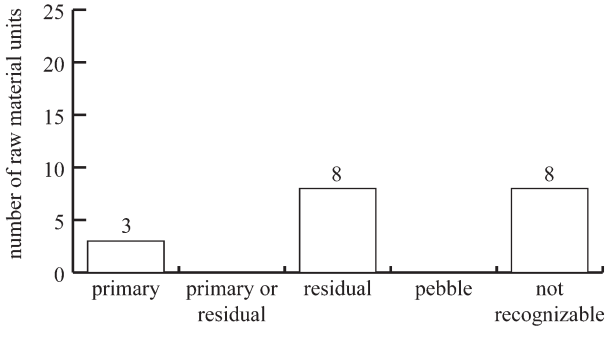

Fig. 7-9 Kabazi II, level V/1: Geological classification of raw pieces. Possible geological provenance of raw pieces is based upon cortical flakes and the assumption that each raw material unit represents a distinct nodule (workpiece).

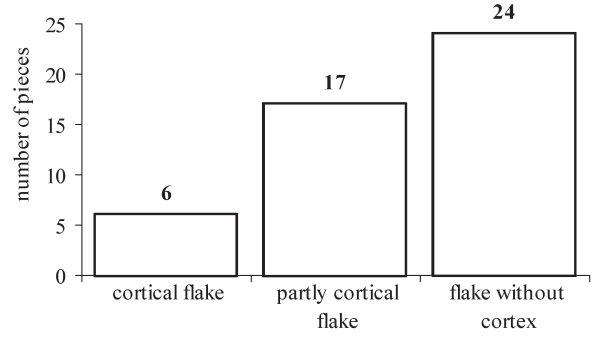

Fig. 7-10 Kabazi II, level V/1: Frequency of cortex on dorsal surfaces of flakes, measured in three broad classes.

N	transformation section	artefacts used as criteria for classification	explanation
1	**Tw** (Tool without transformation)	**formal tool**	dynamic object, imported into the site and discarded
	Bw (Blank without transformation)	**blank**	
	Cw (Core without transformation)	**core**	
	Nw (Nodule without transformation)	**raw nodule**	
	Ei (isolated functional End of a tool)	**flake from rejuvenation** (e.g. lateral sharpening flake), or **broken tool tip**	static object, flaked from or broken off an imported dynamic object, and discarded; the dynamic object (e.g. the tool) was exported
2	**TT** (Tool with corresponding tool Tip)	**flake from rejuvenation** or **broken tool tip**, combined with the corresponding formal **tool**	static object, flaked from or broken off an imported dynamic object, and discarded; the dynamic object (e.g. the tool) was also discarded
2 or more	**Mi** (isolated Modification)	**chips from modification** of working edge(s)	static objects, flaked from an imported dynamic object (e.g. the blank), and discarded; the tool was exported
	TM (Modification with corresponding formal Tool)	**chips from modification** of working edge(s), combined with the corresponding **formal tool**	static objects, flaked from an imported dynamic object (e.g. the blank), and discarded; the tool was also discarded
	Cc (correction of a Core)	fragments of simple **flakes** and/or **chunks**, combined with a core or not; no or **low amount of cortex**	static objects, flaked from an imported dynamic object (e.g. the core), and discarded; the core might have been discarded or exported
	Np (preparation of a Nodule)	fragments of simple **flakes** and/or **chunks**, combined with a tested raw piece or not; **high amount of cortex**	static objects, flaked from a dynamic object (e.g. the raw nodule), and discarded; the flaked raw piece might have been discarded or exported
	Cb (blank production from a Core)	**simple flakes**, **crested flakes**, chunks and/or **target flakes** (e.g. from Levallois or discoidal concept), combined with a core or not; no or **low amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the core); the core and part of the blanks might have been discarded or exported
	Nb (blank production from a raw Nodule)	**simple flakes**, **crested flakes**, chunks and/or **target flakes** (e.g. from Levallois or discoidal concept), combined with a core or not; **high amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the raw nodule); the core and part of the blanks might have been discarded or exported
	Cm (blank production from Core with subsequent modification)	**simple flakes**, **crested flakes**, chunks and/or **target flakes** (e.g. from Levallois or discoidal concept), combined with **flakes from rejuvenation** or **modification** and/or **formal tools**; the core might be present or not; no or **low amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the core), some of which are modified; the core as well as part of the blanks and formal tools might have been discarded or exported
	Nm (blank production from a raw Nodule with subsequent modification)	**simple flakes**, **crested flakes**, chunks and/or **target flakes** (e.g. from Levallois or discoidal concept), combined with **flakes from rejuvenation** or **modification** and/or **formal tools**; the core might be present or not; **high amount of cortex**	dynamic and static objects, flaked from a dynamic object (e.g. the raw nodule), some of which are modified; the core as well as part of the blanks and formal tools might have been discarded or exported

Table 7-2 Classes of transformation sections for raw material units with *debitage*, and their attributes.

N	transformation section	artefacts used as criteria for classification	explanation
1	**Tw/f** (Tool without transformation)	**surface shaped tool**	dynamic object, imported into the site and discarded
	Bw/f (Blank without transformation)	**flake from *façonnage***	
	Cw/f (preform without transformation)	**surface shaped preform**	
	Ei/f (isolated functional End of a tool)	**flake from rejuvenation** (e.g. lateral sharpening flake), or **broken tool tip** from surface shaped tool	static object, flaked from or broken off an imported dynamic object, and discarded; the dynamic object (e.g. the surface shaped tool) was exported
2	**TT/f** (Tool with corresponding tool Tip)	**flake from rejuvenation** (e.g. lateral sharpening flake), or **broken tool tip**, combined with the corresponding **surface shaped tool**	static object, flaked from or broken off an imported dynamic object, and discarded; the dynamic object (e.g. the surface shaped tool) was also discarded
2 or more	**Mi/f** (isolated Modification)	**chips from modification** of working edge(s) of a surface shaped tool	static objects, flaked from an imported dynamic object (e.g. the surface shaped blank), and discarded; the surface shaped tool was exported
	TM/f (Modification with corresponding surface shaped Tool)	**chips from modification** of working edge(s), combined with the corresponding **surface shaped tool**	static objects, flaked from an imported dynamic object (e.g. the surface shaped blank), and discarded; the surface shaped tool was also discarded
	Cc/f (Correction of a surface shaped tool)	**flakes from secondary *façonnage***, (with remnants of former working edge), combined with the corresponding (reduced) surface shaped tool or not; no or **low amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the surface shaped tool), and discarded; the surface shaped blank might have been discarded or exported
	Cb/f (production of a surface shaped blank from a preform)	**flakes from *façonnage***, combined with the corresponding preform or not; no or **low amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the preform); the surface shaped blank and part of the flakes might have been discarded or exported
	Nb/f (production of a surface shaped blank from a raw Nodule)	**flakes from *façonnage***, combined with the corresponding preform or not; **high amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the raw piece); the surface shaped blank and part of the flakes might have been discarded or exported
	Cm/f (production of a surface shaped blank from a preform with subsequent modification)	**flakes from *façonnage***, combined with **flakes from rejuvenation** or **modification** and/or a surface shaped **tool** and/or simple tool; the surface shaped tool might be present or not; no or **low amount of cortex**	dynamic and static objects, flaked from an imported dynamic object (e.g. the preform), some of which might be modified; the surface shaped blank or tool as well as part of the flakes and formal tools might have been discarded or exported
	Nm/f (production of a surface shaped blank from a raw Nodule with subsequent modification)	**flakes from *façonnage***, combined with **flakes from rejuvenation** or **modification** and/or a surface shaped **tool** and/or simple tool; the surface shaped tool might be present or not; **high amount of cortex**	dynamic and static objects, flaked from an dynamic object (e.g. the raw nodule), some of which might be modified; the surface shaped blank or tool as well as part of the flakes and formal tools might have been discarded or exported

Table 7-3 Classes of transformation sections for raw material units with *façonnage*, and their attributes.

		stage 0	stage 1	stage 2	stage 3
		acquisition of raw material	decortification, preparation	production of blanks/ target flakes	modification and use
diagnostic artefacts	blanks from core	raw nodule	indifferent flakes, flakes from the preparation of convexities	flakes removing convexities, crested flakes	resharpening flakes, chips from modification, broken tool tips, fragments of formal tools
	surface shaping		flakes from decortification (struck with hard hammer percussion)	flakes from facial retouch (struck with soft hammer percussion)	
Tw					
Bw					
Cw					
Nw					
Ei					X
TT					X
Mi					X
TM					X
Cc				X	
Np		X			
Cb			X	X	
Nb		X	X	X	
Cm			X	X	X
Nm		X	X	X	X

Table 7-4 Classes of transformation sections and their position within the formal *chaîne opératoire (*after Geneste 1985; 1988; 1990).

Some General Remarks on the Transformation of Raw Material

According to transformation analysis, eleven units with artefact frequencies between two and five pieces allow the reconstruction of the production of (surface shaped) blanks and/or modification (for information about the method of transformation analysis see Uthmeier 2004a). On the other hand, eight single pieces were discarded without any or with only minor flaking. Only four raw material units comprised artefacts with cortex that allowed the reconstruction of the original shape of the raw piece (Fig. 7-8). Prior to flaking, one raw piece had been round, three were round or round flat, and one was probably a plaquette. According to the preservation of cortex, three raw pieces came from primary raw material sources, while eight units were collected from residual sources (Fig. 7-9). At present, primary and secondary sources of Cretaceous flint are known from nearly every major river valley in the second range of the Crimean Mountains. Furthermore, one must assume that during the Pleistocene there were even more outcrops of primary or residual materials along the so called "flint belt", still undiscovered by ourselves or destroyed after changes in the landscape. Nevertheless, the raw material flaked in level V/1 is probably not local. Outcrops along the Alma Valley are situated near today's valley bottom and were not accessible at the time of settlement. Instead, it is more likely that part of the raw material used in level V/3 comes from the Bodrak valley, where the river had already cut deep into the landscape prior to interglacial times, and primary raw material sources were accessible at the time. We are not entirely certain whether the same applies for raw material units classified as coming from residual sources. Outcrops of residual raw materials are known predominantly from the eastern part of the Crimean Mountains,

some 60 km from the Alma River (Uthmeier 2004a, Fig. 11-13). However, as previously mentioned, our present knowledge of the distribution of raw material sources is still somewhat limited, and given the abundance of raw material within the Crimean "flint-belt" (Demidenko 2004a, 115), it is perhaps more convincing to assume that residual raw pieces were collected from less distant sources.

At least a part of the material reached the excavated area as raw pieces, and underwent a phase of decortication. This is indicated by six cortical flakes and twelve flakes partly covered by cortex on their dorsal surface (Fig. 7-10). As it cannot be ruled out that artefacts might be missing due to the character of the natural site formation process, it is difficult to interpret conventional data when it comes to the amount of flaking that was done in the excavated area. A total of 24 flakes without any cortex show that flaking began after decortication, or indicate long reduction sequences reaching into the inner part of raw pieces. In this regard, transformation analysis enables a more precise estimation of flaking activities. However, single pieces, as well as raw material units only consisting of flakes from long transformation sections, but lacking the corresponding core and/or additional flakes, must be approached with caution. Again, it cannot be ruled out that the incomplete record of artefacts is due to the natural site formation process, rather than to human artefact transportation.

Transformation Analysis

In level V/1 of Kabazi II, three broad classes of transformation sections dominate the assemblage of single pieces and workpieces (Fig. 7-11; for basic data see Table 7-5):

1. Blanks and tools discarded without flaking (Bw, Tw: six cases);
2. Simple tools and surface shaped tools that were rejuvenated (Ei and Ei/surface, one case each);
3. Raw material units that represent the flaking of raw pieces (Nb, Nm: two cases) and preforms, cores or surface shaped blanks (Cc, Cb, Cm: nine cases).

Within this last group, which is predominant in the assemblage, there are only two units which comprise the inner part of a nodule: in RMU 9, a core-like piece (Fig. 7-4, *13*) attests the flaking of a simple flake core, whereas in RMU 1, a surface shaped

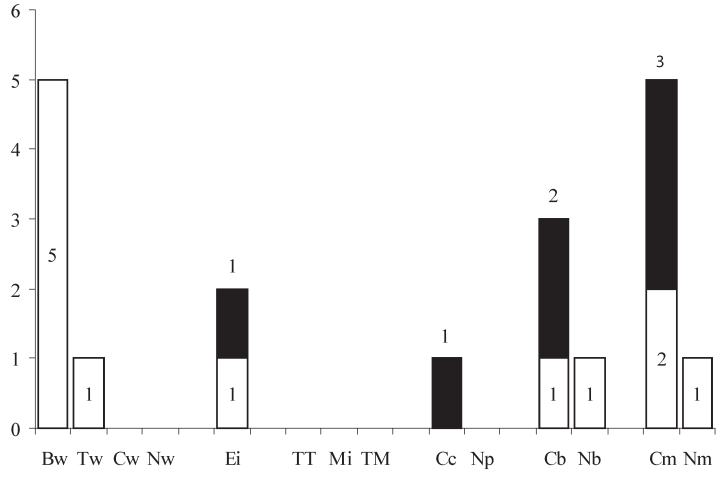

Fig. 7-11 Kabazi II, level V/1: Frequency of transformation sections (Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); white bars: *debitage*, black bars: */f = *façonnage*, indicated by flakes from *façonnage* and/or surface shaped tools).

blank (Fig. 7-3, *1*) points to surface shaping. According to the presence/absence of blank types from soft hammer percussion, surface shaping was the main focus of flaking activities and occurs in total in six units. The flaking of the remaining five units with hard hammer percussion only probably where also dedicated to the production of surface shaped preforms, but stopped after initial preparation. Speaking in terms of simple numbers, raw material units with blank production are small (Table 7-6): relatively long reduction sequences that include blank production (Cc/*, Nb/*, Cb/*, Cm/*, Nm/*) were reconstructed on the basis of two to five artefacts only. Without discussing raw material units in greater detail, it is difficult to judge whether this is the result of only minor flaking activities within the excavated area, or the result of an incomplete set of data due to the site formation process. Thus, for a better understanding of the classification of transformation sections, some raw material units will be described in greater detail below (compare also Fig. 7-12 and Fig. 7-13).

assemblage			data related to identification of imported item							on-site transformation and/or discard)												
Kabazi II, Unit V, Level 1			raw piece: phase 0		initially prepared or flaked piece: phases 1 or 2		inner part of flaked piece			production of blanks: phases 1 and 2					indifferent	modification and usage: phase 3				early discard		
raw material unit	weight (in g)	N	raw piece or chunk	cortical flake	flake partly covered by cortex	flake without cortex	core/preform/initially surface shaped blank	unknown blank (bifacially surface shaped piece)	imported item	flake	blade	trimming flake	core/preform/initially surface shaped blank	chunk	chip	simple tool	surface shaped tool	chip from modification	flake from rejuvenation or broken tool tip	raw piece	transformation section	evacuation > 3 cm
14	5	1				1			simple blank	1											Bw	
15	2	1			1				simple blank	1											Bw	
16	5	1				1			simple blank	1											Ei/f	
18	3	1				1			simple blank	1											Bw	
19	1	1				1			chunk					1							Bw	
20	3	1		1					simple blank	1											Bw	
13	21	1				1			simple tool							1					Tw	
17	2	1				1			simple tool										1		Ei	simple tool
2	27	4			2	2			preform	4											Cb	core
12	5	2			1	1			preform	1					1						Cb	preform
1	59	2	1	1					flake				1	1							Cb/f	
7	13	3				3			initially surface shaped blank	3											Cb/f	surface shaped blank
9	56	4	1	1	1		1		raw nodule	2			1	1							Nb	
3	22	4			1	3			preform	3						1					Cm	core
5	13	4	1		2	1			preform	1				1		1			1		Cm	core + simple tool
6	10	2			1	1			preform	1						1					Cm	core
4	11	3			2	1			preform	2						1					Cm/f	initially surface shaped blank
10	10	4			3	1			initially surface shaped blank	1				1		2					Cm/f	surface shaped blank
11	19	5		2	3				raw nodule	3					1	1					Nm	preform
8	25	9	1		1	2	5		sorting rest	3				2	4							
N 20	312	54	4	5	18	21	6	0		29	0	0	2	7	6	8	0	0	2	0		

Table 7-5 Kabazi II, Level V/1: Data relevant for transformation analysis. The classification of transformation sections is conducted on the "workpiece-level". As workpieces are considered as refits, two or more artefacts made on the same piece of raw material and recovered from the excavated area are taken to represent the transformation of this raw material on site. For each raw material unit the most initial and the most final work step in the formal *chaîne opératoire*, as highlighted by the artefacts, are used to define the boundaries of a transformation section (an explaination of the different classes of transformation sections can be found in Fig. 7-13).

Initial preparation of raw nodules (Nb or Nm): RMU 9, RMU 11

RMU 9 consists of four artefacts (Fig. 7-4, *13-16*). Whereas a chunk (Fig. 7-4, *16*) comes from the regulation of the raw piece or was unintentionally detached in the course of flaking, two large flakes (Fig. 7-4, *14-15*) are covered by cortex on their dorsal surface. One of these (Fig. 7-4, *14*) shows small negatives from the preparation of the striking platform, while the other (Fig. 7-4, *15*) has an additional negative which was struck from a striking platform situated upon the opposite lateral edge of the raw piece. While the flakes point to the decortication of a raw piece, the core-like piece (Fig. 7-4, *13*) indicates that the reduction process went further, although no additional flakes were found in the excavated area. Conversely, the reduction of RMU 11 (Fig. 7-5, *5-9*) ended after initial preparation. All five artefacts that make up this unit are partly covered by cortex on their dorsal surfaces. A crested flake (Fig. 7-5, *6*) indicates that the raw piece was prepared at least on one lateral edge after part of the cortex had been removed. The removal of cortex itself is documented by two chunks (Fig. 7-5, *7-8*) and a cortical flake that was modified into a simple side scraper (Fig. 7-5, *5*).

Surface shaping from partly decorticated preforms (Cb/surface or Cm/surface): RMU 4; RMU 5

In RMU 4 (Fig. 7-4, *1-3*), two flakes are partly covered by cortex. One of them (Fig. 7-4, *2*) points to surface shaping. The other one, struck with hard hammer percussion, shows that the reduction began with initial preparation (fig. 7-4, *1*), while a small fragment without any cortex might stem from a later stage of surface shaping when cortex had already been completely removed (Fig. 7-4, *3*). The only piece with a regular outline was modified into a simple side scraper (Fig. 7-4, *1*). RMU 5 (Fig. 7-4, *4-7*) shows a comparable reduction sequence. As the aim of raw material sortation was to distinguish individual nodules, it is not accidental that RMU 5 includes not only a simple flake (Fig. 7-4, *6*) and a chunk (Fig. 7-4, *4*), but also a basal fragment of a formal tool (scraper) (Fig. 7-4, *7*) and a rejuvenation flake (Fig. 7-4, *5*). According to the logics of flaking, the rejuvenation flake was struck from the lost distal part of the latter formal tool, which therefore must have been a convergent scraper.

Surface shaping of surface shaped blanks (Cb/surface or Cm/surface): RMU 3, RMU 7

In some raw material units, e.g., RMU 3 (Fig. 7-3, *7-10*) and RMU 7 (Fig. 7-4, *10-12*), all artefacts can be explained as resulting from surface shaping of pieces without cortex and which, at the same time, had undergone a previous facial retouch. Some of the large flakes from surface shaping (Fig. 7-3, *9*; Fig. 7-4, *11*) were used to remove deep hinges which had occurred during previous working steps of the *façonnage*.

Correction of surface shaped blanks (Cc/surface): RMU 1

In RMU 1 (Fig. 7-3, *1-2*), the correction of a surface shaped blank is the only flaking activity that can be reconstructed. A chunk (Fig. 7-3, *2*) covered by cortex stems from the same nodule as a surface shaped blank (Fig. 7-3, *1*). The latter is a cortical flake with negatives of surface shaping on the ventral surface

Number of artefacts in raw material unit	RMU	transformation section
2	1, 6, 12	Cc/f, Cb/f, Cb
3	4, 7	Cm/f, Cb/f
4	2, 3, 5, 9, 10	Cb, Cm, Cm/f, Nb, Cm/f
5	11	Nm

Table 7-6 Kabazi II, Level V/1: Frequency of artefacts in raw material units (RMU) classified by transformation analysis as covering steps of the formal operational chain that are dedicated to the production of blanks (Cc = correction of core, Cb = blank production from decorticated piece, Cm = blank production from decorticated piece and modification of blanks, Nb = blank production from raw nodules, Nm = blank production from raw nodule and modification of blanks, */f = production of surface shaped tools by *façonnage*).

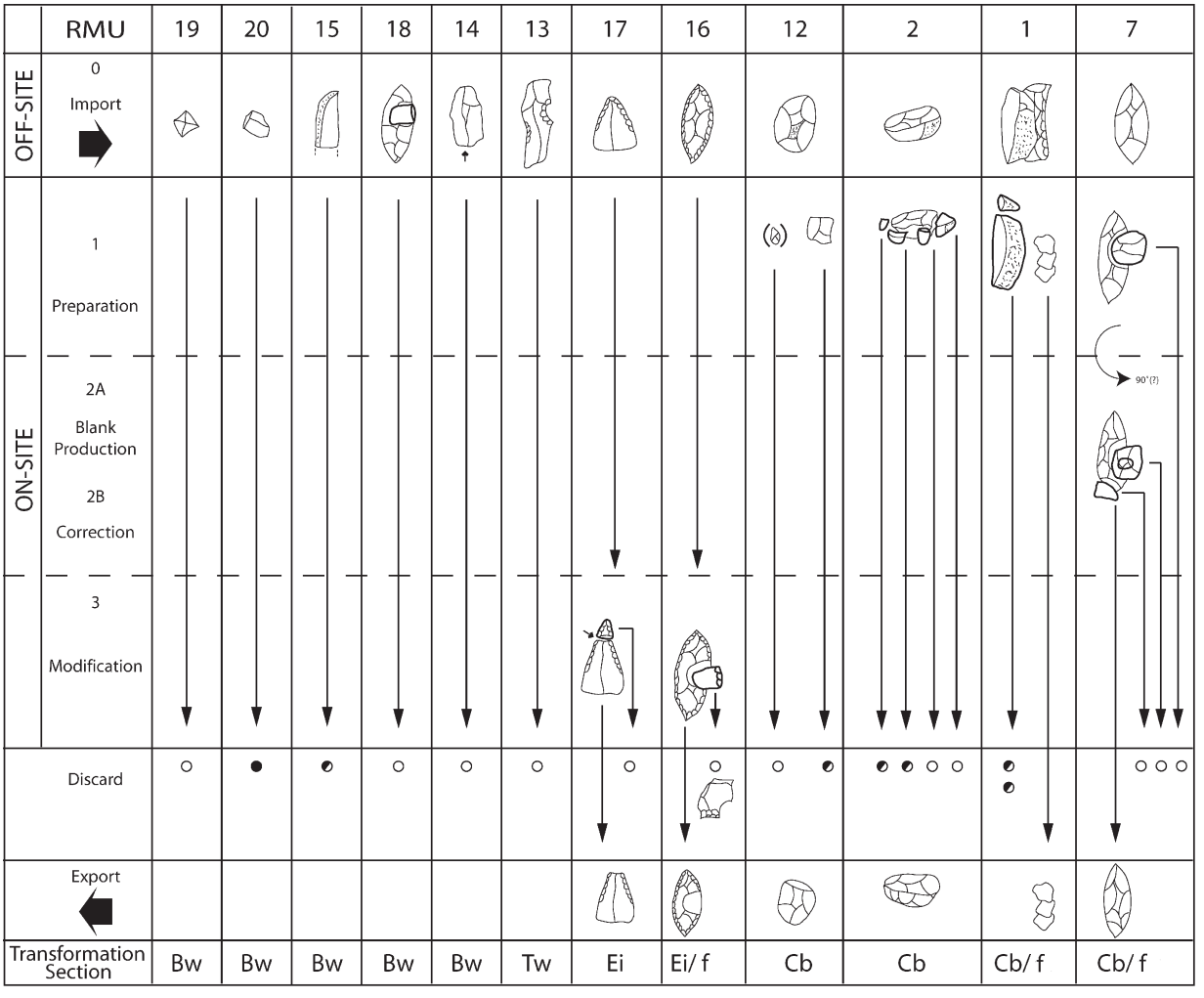

Fig. 7-12 Kabazi II, level V/1: Flow chart of the results of transformation analysis. For every raw material unit, the part of the *chaîne opératoire* reconstructed with the help of the discarded artefacts (transformation section) is depicted as conducted within the excavated area. Import and export refer to phases of the lithic reduction which left no traces among the lithic discard, or to artefacts missing in between the transformation section (abbreviations of classes of transformation sections are explained in Fig. 7-11; steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

that were struck from a decorticated dorsal striking platform. The lateral break most probably occurred during initial preparation, and the point of breakage was used as a striking platform for the production of further negatives on the ventral side. At the same time, the fracture plane of the breakage cuts some negatives on the distal part of the dorsal surface. With the combination of an unfinished surface shaped blank and a chunk, RMU 1 fulfils the criteria for the transformation section "Cc/surface" ("correction of a core/a surface shaped blank). The origin of the chunk might go back to a regulation of the base of the surface shaped blank, at a time when a direct blow led to an uncontrolled break. However, since the pieces do not fit together, it must be assumed that additional flakes and/or chips were removed.

Rejuvenation of surface shaped tools: RMU 16

Due to the fact that the flake removed part of a lateral, bifacially retouched working edge as well as a considerable amount of a convex facial retouch, it is concluded that the only artefact of RMU 16 (Fig. 7-5, *19*) represents the resharpening of a bifacial surface shaped tool, or the usage of a bifacial tool as a core.

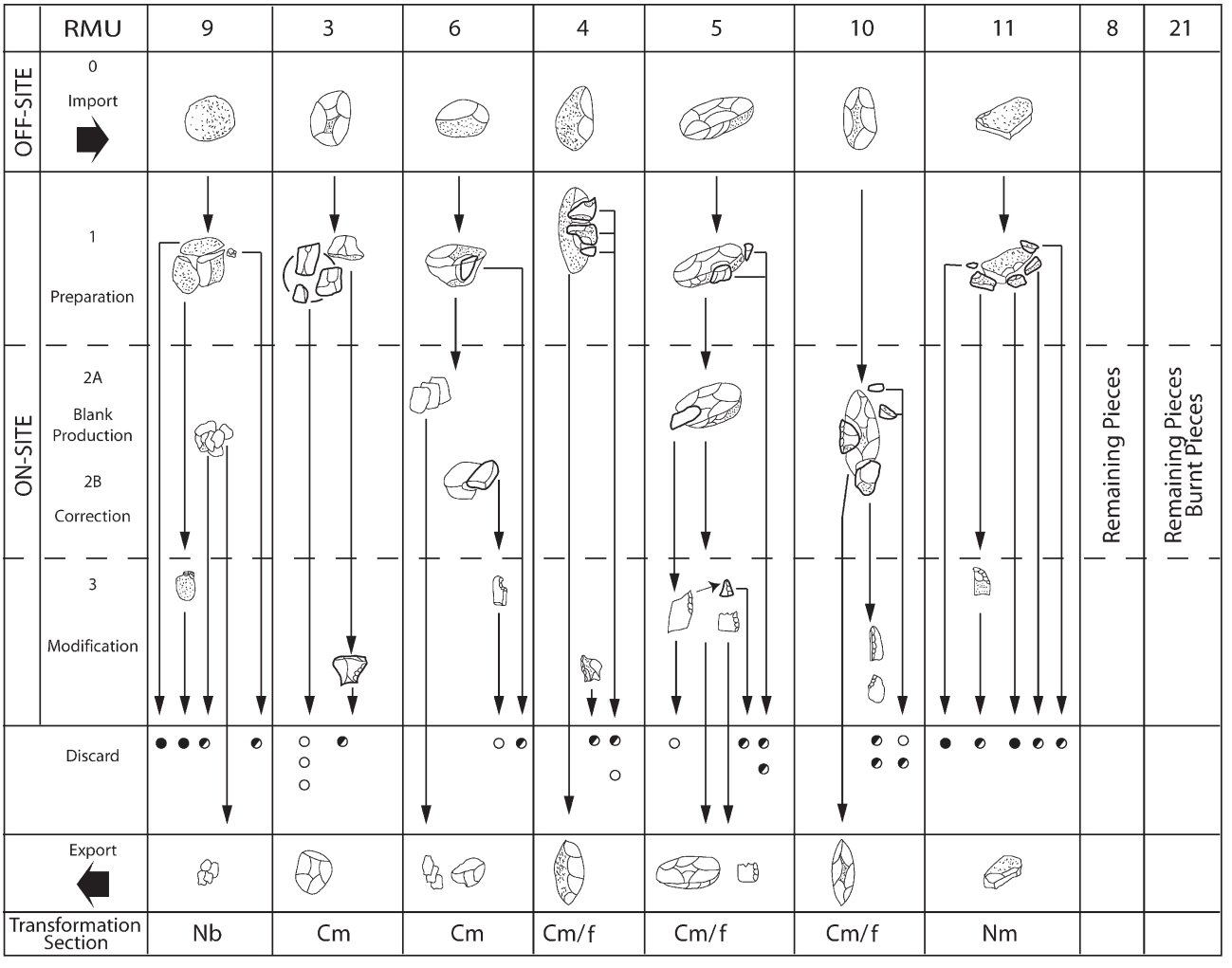

Fig. 7-13 Kabazi II, level V/1: Flow chart of the results of transformation analysis (cf. of Fig. 17-12; abbreviations of classes of transformation sections are explained in Fig. 7-11).

Concluding Remarks on the Transformation Analysis

According to the transformation analysis of 19 raw material units (Fig. 7-12 and Fig. 7-13), raw material units indicating blank production dominate the assemblage. Among these, surface shaping slightly exceeds raw material units that were classified as being related to the very initial preparation of raw nodules or the reduction of (simple) cores.

However, if surface shaping (Cc/surface: one case, and Cb/surface or Cm/surface: four cases) is seen as the main goal of flaking in level V/1, it becomes clear that transformation sections at Kabazi II in most cases do not cover initial or final phases of the operational chain. Within the excavated area, reduction processes usually started with decorticated raw pieces or big flakes, and ended with the modification of simple flakes. With exception of RMU1, which is a surface shaped blank that was flaked again after lateral breakage, there are no fragments of preforms or surface shaped tools, nor are there many chunks which would point to failed initial preparation or surface shaping, e.g. interrupted by fissures or cracks. Instead, flakes often tend to be large (struck from raw nodules: RMU 9, RMU 11; detached from preforms: RMU 3, RMU 4). Despite the fact that the low quantities of pieces allocated to individual raw material units calls for cautious interpretations, transformation analysis would still appear to lead to reliable results. Seeing as qualitative attributes are correlated with the logics of flaking, it is highly probable that reduction sequences were stopped after initial flaking

of raw pieces, preforms or surface shaped blanks. If this is true, then the hypothesis that preforms or surface shaped tools were taken out of the excavated area after minor flaking is more probable than the assumption that failed preforms were discarded on site and remain as yet undiscovered due to the limited trench size or as a result of the site formation process. This is strengthened by the fact that with one exception (RMU 1), artefacts which indicate the modification, use or discard of surface shaped blanks are missing. There are no lateral sharpening flakes or broken tool tips from bifacial tools, nor are there any discarded surface shaped tools. Instead, most flakes of considerable size were used and ended up as formal tools or flakes with irregular retouch. The only rejuvenation flakes found belong to simple tools, one of them probably made on a flake from surface shaping (RMU 5). The lack of any item that could prove the modification of surface shaped blanks (and the subsequent use of surface shaped tools), and the fact that only one preform was found, can be interpreted in different ways:

1. The main focus of flaking activities was not the production of finished surface shaped tools, but the flaking of preforms and decorticated raw pieces, and the use or retouch of flakes from surface shaping according to immediate needs; therefore, the surface shaping often did not exceed the phase of a preform;

2. If originally present at all, surface shaped tools were used extensively;

3. Preforms and/or surface shaped tools were taken to other sites;

4. Preforms and/or worn out surface shaped tools as well as rejuvenation flakes and broken tips were discarded either out of the area covered by our trench, or were deposited in areas since destroyed by flooding.

In cases where no signs of surface shaping were found, raw material units were classified as deriving from core reduction (Cb, Nb: five cases). However, in most if not all of these cases the flaking was focused on the rough primary preparation of preforms for surface shaped tools rather than the flaking of simple cores. Again, with one exception, cores or preforms are missing.

Although assemblages of raw material units tend to be incomplete, they seem to be representative for flaking activities according to the logics of reduction sequences. Thus, an interpretation of units with long reduction sequences as a stock of raw material, carried around in different, yet initial phases of the production of surface shaped tools, would be most appropriate. If simple blanks were needed, surface shaping was continued, or was started, but only the flakes (and not the surface shaped tools themselves) were used. The flakes often show traces of usage, either as formal tools or as pieces with irregular retouch. It seems as if flakes for use were selected according to size only, and not on the basis of their specific outline, thickness or lateral section. In most cases, surface shaped preforms in varying initial states of production were taken out of the excavated area. This interpretation of the data would not only be in concordance to most hypothesis suggested above (1. to 3.), but would also explain best the general structure of the (micro-)assemblages, with nearly no performs, some flakes from initial preparation or surface shaping, no specific criteria for the selection of blanks for formal tools, and a high percentage of irregular retouch that again speaks for an ad-hoc selection of more intensively used blanks.

Single pieces produced on site were classified as resulting from the rejuvenation of surface shaped tools (Ei/surface: one case) or breakage of simple tools (Ei: one case). In both cases, the tools themselves were not discarded, but taken out of the excavated area. Obviously, surface shaped bifacial tools were only randomly needed at the site, and it was sufficient to use and rejuvenate already existing items. Six single pieces were discarded without flaking in the excavated area. These fall into two categories, blanks (Bw: five cases), and tools (Tw: one case). It is difficult to judge whether these single pieces reflect off-site blank production.

Blanks that were, according to transformation analysis, not manufactured at Kabazi II comprise a *couteaux à dos naturel* (RMU 15), two formal tools (RMU 13, RMU 17), a surface shaped tool (RMU 16), and one large flake (RMU 14). The impression that blanks which were produced and modified on-site were selected randomly, whereas imported single pieces listed above show a preference of large pieces and tools, might be seen as a strong argument for the assumption that these were taken from reduction sequences conducted at other sites. Otherwise, one would expect a less sophisticated selection of blanks. The latter is true for a chunk (RMU 19), a small fragment (RMU 20), and a flake from surface shaping, which might indicate on-site reduction sequences incomplete due to post-depositional processes which occurred during site formation.

Reconstruction of Moves

The results of transformation analysis enable us to state that at minimum eleven items were carried into the excavated area and there underwent some measure of reduction which was, by and large, dedicated to the production of surface shaped tools (Fig. 7-12 and Fig. 7-13). Despite the fact that artefacts might be missing due to flooding having affected the south-western part of the trench, the transformation of those raw material units recovered still speaks in favour of the same pattern: depending on the state of reduction, only some flakes were removed either by direct hard hammer percussion, or by direct soft hammer percussion. The near lack of bifacial rejuvenation flakes or tool tips clearly speaks against the assumption that numerous surface shaped tools were originally present in the excavated area. At the same time, the short-term character of all occupations in Unit V, including level V/1, makes it highly unlikely that there was an enlarged area of activities, with numerous spots of subsequent knapping and/or special toss zones. Instead, it seems likely that most raw material units saw minor flaking only, and that this ended with the production of surface shaped blanks or even preforms. In many cases, flakes from the initial preparation or from the first working steps of plan-convex surface shaping show modifications of lateral edges. In general, flakes were used regardless of their outline, the amount of dorsal cortex or their thickness; it seems as if size was the only criteria for the selection of intensively used blanks. The frequency of formal tools is low, but there are many pieces with irregular retouch. As for the mode of production, there is also a clear pattern visible for the export of artefacts out of the excavated area (Table 7-7). In nine cases, the inner part of the worked piece was missing. According to transformation analysis, they did not reach a final state of surface shaping and, therefore, were not ready for modification or use. Thus, it does not seem probable that the pattern of discard can be explained exclusively by natural site formation processes. Instead, it seems as if a good portion of preforms and/or surface shaped blanks was transported out of the excavated area, and even out of the site. For single pieces, no secure interpretation can be offered. While the import of formal tools, sometimes rejuvenated on the site and exported afterwards, makes sense, little can be said about isolated blanks discarded in the excavated area.

To summarise, Neanderthals came to Kabazi II, level V/1 at a time when the site was situated near the river bank. The climate at the beginning of the last Glacial still favoured forest steppe type vegetation, with trees in the immediate vicinity of the limestone block. It is not entirely clear if the assemblage is the result of a single visit, or a palimpsest of several visits. Nevertheless, transformation analysis shows a recurrent pattern of import, on-site flaking, and probably also export. In general, the Neanderthals were content with using raw material from primary sources as well as from outcrops where residual material could be collected from the surface. They were equipped with some tools, a number of which were surface shaped, several surface shaped blanks and previously flaked preforms (from past campsites), and a few raw nodules (possibly taken from outcrops they passed by). Only when necessary, were reduction sequences continued which had begun elsewhere. These, however, were stopped when demand was satisfied by local supply. The Neanderthal mode of planning (Fig. 7-14) was geared towards preparation for unforeseen periods rather than

	import	**on-site discard**	**export**
simple blank	5	37	
simple tool	2	8	1
surface shaped tool	1		
(initially) surface shaped blank	2	1	3
preform or core	6	1	6
raw piece or chunk	3	7	
sum	19	54	10

Table 7-7 Kabazi II, Unit V/1: Summary of pieces that, according to transformation analysis, were imported into, discarded in, and exported from the excavated area.

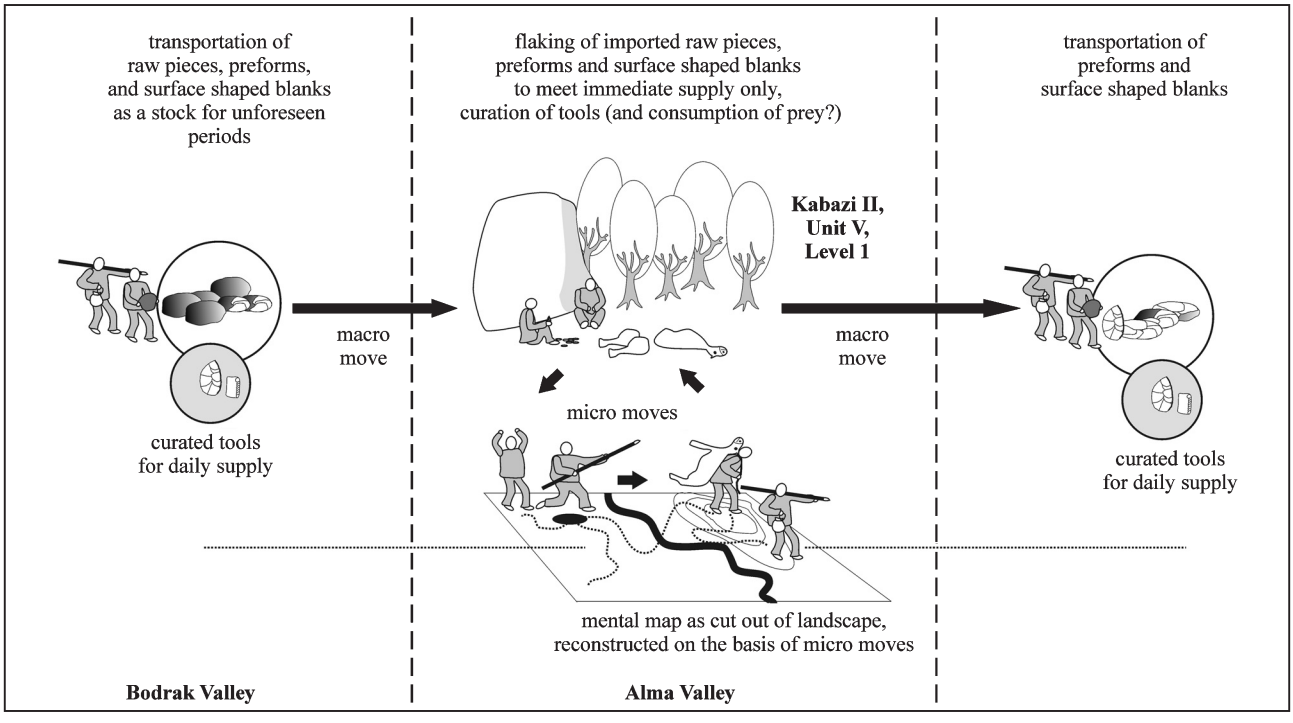

Fig. 7-14 Kabazi II, level V/1: Hypothetical reconstruction of moves. It is assumed that incomplete *chaînes opératoires* on the level of raw material units are the result of moves: some artefacts might have been left at previous camps or transported to future camps (macro moves), while others might have been taken to contemporaneous sites (micro moves).

focusing on preparation for anticipated activities. Most tools were produced *ad hoc* from blanks struck from a stock of raw material that mainly consisted of already flaked items. Although the technique of lateral sharpening flakes was generally known, there is little evidence for the curation of tools. Furthermore, one has the impression that the Neanderthals tried to restrict the consumption of lithics at Kabazi II to a minimum, possibly because raw material sources in areas of future macro moves were still unknown. It seems as if mental maps represented cut outs of the landscape only. Triggered by immediate needs, the knowledge of resources was possibly more the result of moves within the logistical territory around the site, rather than resulting from storing of places in the memory of the group, and long-term planning.

Abstract

КАРМАННЫЙ ЗАПАС НА ВСЯКИЙ НЕПРЕДВИДЕННЫЙ СЛУЧАЙ: ТРАНСФОРМАЦИОННЫЙ АНАЛИЗ КРЕМНЕВОГО СЫРЬЯ НА ПОСЕЛЕНИИ КАБАЗИ II, ГОРИЗОНТ V/1

Т. УТМАЙЕР

Специфика аккумуляции артефактов данного горизонта состоит в том, что во время их отложения площадь поселения подвергалась временным сезонным подтоплениям. Исходя из отсутствия в отложениях крупного обломочного материала, можно предположить слабую энергию аллювиальных процессов, которые не привели к серьезным вертикальным и горизонтальным перемещениям артефактов.

Технико-типологический анализ артефактов указывает на их принадлежность к микокским индустриям. 54 артефакта, обнаруженные в данном горизонте, подразделяются на 20 сырьевых групп. Только одна сырьевая группа состоит из “экзотического” кремня, тогда как все остальные сырьевые группы представлены обычным бодракским кремнем. В соответствии с проведенным трансформационным анализом, реконструированы следующие действия, приведшие к образованию данного комплекса артефактов:

1. на стоянке оставлена часть импортированного орудийного набора и сколов;
2. на стоянке были переоформлены некоторые из принесенных орудий;
3. на стоянке имело место ограниченное расщепление импортированных желваков, преформ, нуклеусов и обработка двусторонних орудий и их полуфабрикатов.

Не исключено, что большинство сырьевых групп связано с оформлением двусторонних орудий. В то же время, операционные ряды очень коротки – после снятия нескольких отщепов преформа или полуфабрикат двустороннего орудия транспортировались на другую стоянку. Зачастую отщепы, полученные на поселении горизонта V/1, несколько модифицировались маргинальной ретушью.

Таким образом, большая часть отщепов и орудий происходит из “карманного запаса”, которые транспортировались от стоянки к стоянке. Причем, снятие сколов с артефактов “карманного запаса” было крайне лимитированным. Похоже, что основной чертой отношения обитателей поселения горизонта V/1 к “карманному запасу” преформ и полуфабрикатов было его сохранение на случай непредвиденных обстоятельств, нежели получение морфологически завершенных двусторонних орудий.

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KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Thorsten Uthmeier

Stratigraphical Position and Distribution of Finds

Archaeological materials excavated from Levels V/2 and V/2A include lithic artefacts, a sandstone pebble, and faunal remains. The archaeological remains are embedded in geological Stratum 13A, which is described as being partly of alluvial genesis, and partly deriving from colluvial sedimentation. The alluvial component consists of "horizontal thin coarse sand lenses", while the colluvium is described as "thin lenses of brown clay of clear colluvial genesis" (Chabai, Chapter 1, this volume). Sediments of Stratum 13A cut into the underlying Stratum 14A, a "humus horizon, A1, truncated by later erosion" (Gerasimenko, Chapter 2, this volume). With a thickness of between 0,15 cm and 0,20 cm, Layer 14A overlies geological Layer 14B, which is "a humus-transitional horizon A1B" (Gerasimenko, Chapter 2, this volume). The site formation process began with the deposition of colluvial sediments filling a gap that occurred between a 14 m high limestone block that had fallen from the top of the Questa of Kabazi Mountain on the third, uppermost terrace of the Alma river (Chabai, Chapter 1, Fig. 1-1, this volume), and the steep slope. During this phase, the angle of the slope behind the block changed from 35° to approximately 5°. Only after the surface behind the limestone block had become more or less horizontal, pedogenetic processes occurred, which then resulted in the formation of the fossil soil identified as geological Layers 14A and 14B in the upper part of the colluvial sediments. Pollen samples (Gerasimenko, Chapter 2, this volume) suggest that colluvial sedimentation took place during the Eemian sub-stages E5 and E6a, whereas the soil formation, indicated by the humus A1 horizon, dates to sub-stage E6b at the end of the last Interglacial. It is likely that earlier Eemian soil formation processes were hindered by the steepness of the slope.

As previously mentioned, the development of archaeological levels V/2 and V/2A was connected with the genesis of geological Layer 13A. Environmental data suggests that during this phase alluvial sedimentation contributed to the site formation process. The fact that the third terrace of the Alma is situated immediately below the site (Chabai, Chapter 1, this volume), the composition of the snail fauna (Michailesku, Chapter 4, this volume), and the existence of water vole *arvicola terrestris* among the rodents of Unit V, are "a clear sign that water was […] to be found nearby" (Markova, chapter

3, this volume). Thus, the presence of coarse sand in Stratum 13A can be explained by flooding of the excavated area. Additionally, Layer 13A consists of very thin lenses, distributed mainly in square lines 4, 5, and partly 6. This, and both the fact that most artefacts are fresh, and faunal remains were preserved, suggests that flooding was connected with low dynamics, and affected only certain parts of the site. It is possible that the artefacts found in levels V/2 and V/2A were discarded on the surface of the humus A1 horizon of Stratum 14A, and were only partly altered by later low energy flooding events. This would mean that at least part of the lithics was found upon the very spot of original discard, or not far away from it, whereas others may have been washed away. In addition, artefacts might have been transported from more distant areas of the slope into the excavated area during alluvial and / or colluvial sedimentation. It is difficult to distinguish which one of these processes was the more important, and which part of the assemblages corresponds to a specific process of the natural site formation. Therefore, levels V/2 and V/2 were treated as an entity.

It is a reasonable assumption that pieces ≥ 3 cm secure better results when it comes to a detailed sortation of raw material. For this reason, transformation analysis is based mainly upon 63 lithic items ≥ 3 cm - rather than upon chips - which were excavated from an area of 24 m² (Fig. 8-1). The only exception made applies to chips with modifications to their edges, e.g. lateral sharpening flakes, or broken tool tips. For 60 pieces, data for mapping is available. The distribution of 59 lithics made from Cretaceous flint, and a sandstone pebble, shows a concentration of finds along two square lines (K and Λ) in the northern part of the excavated area. These contain 43 artefacts (Fig. 8-1), which is more than two thirds (= 72 %) of all lithics. Conversely, the densities of finds in the southern part of the excavated area, along square lines H, O and Π, often do not exceed one piece per square metre, and some square metres are even void of artefacts (M/6, O/6, Π/5, Π/6). Given the fact that lenses of coarse sands deriving from flooding, as well as those indicating colluvial processes, were not found in all parts of the excavated area, but mainly along square lines 4, 5, and partly 6 (Chabai, Chapter 1, this volume), the following conclusion can be drawn from the spatial distribution of artefacts:

1. Due to the fact that densities of finds were, generally speaking, significantly higher in the northern part of the excavated area, and geological traces for the activities of water and erosion were only found in the western part of the trench, post depositional processes mainly affected the south-western (lower) part of the site (e.g. squares M/6, M/5, M/4, and square lines H, O, and Π).

2. Two squares in the north-western corner of the trench, Λ /8 and K/8, comprise nearly two thirds of all artefacts used for transformation analysis. Even if all artefacts in square lines K and Λ were found in a more or less original position, possibly due to the slightly higher elevation of this part of the excavated area, it has to be assumed that only a part of the former concentration was excavated.

From the point of view of transformation analysis, the combined artefacts from levels V/2 and V/2A represent a somewhat problematic sample. At least part of the material was not found *in-situ* (due to alluvial processes in the south-western part of the excavated area), and the original concentration was not excavated in its entirety (because the density of finds is increasing towards the northern border of the trench). Therefore, any interpretation of transformation analysis must bear these obstacles in mind, and results must be treated with caution.

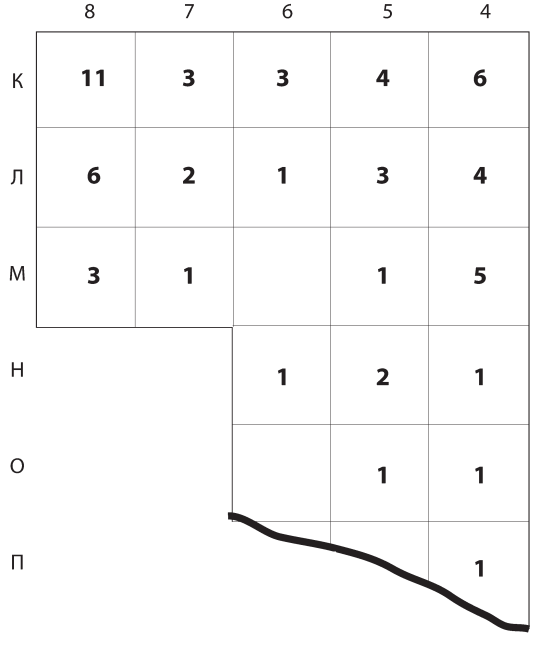

Fig. 8-1 Kabazi II, Levels V/2-2A: Distribution of artefacts used for transformation analysis (N = 60 artefacts, most of them ≥ 3 cm).

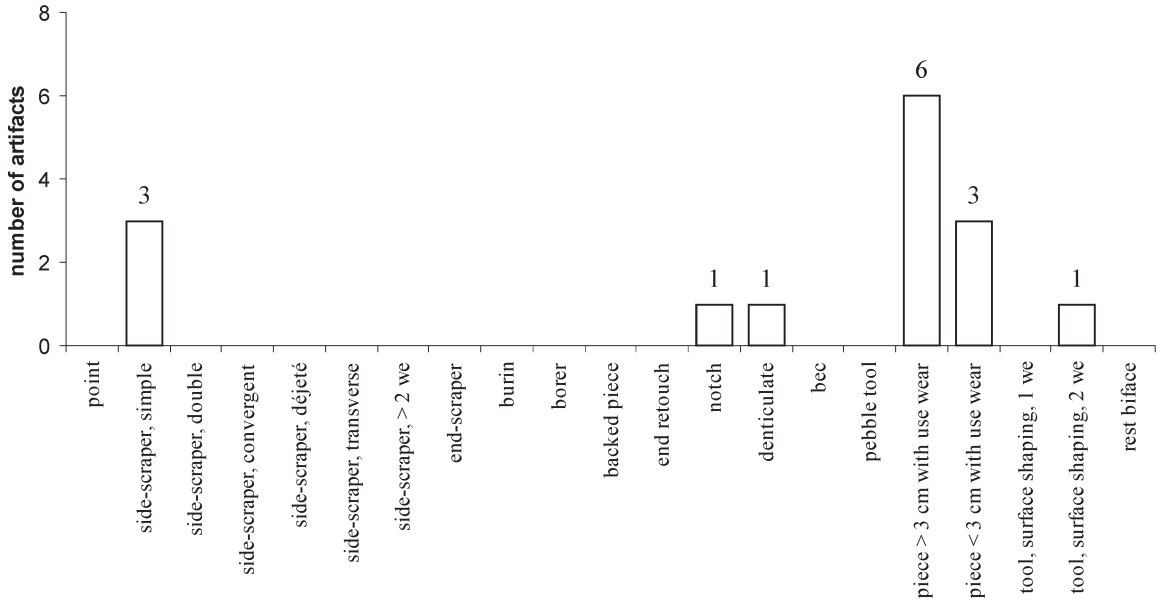

Fig. 8-2 Kabazi II, Levels V/2-2A: Frequency of tools (1we= one working edge, 2we=two working edges; note: pieces with use wear are not regarded as formal tool classes).

Typological Features

All in all, 15 retouched blanks were found (Fig. 8-2), though only six items were classified as formal tools. The remainder comprises flakes (6 pieces) or chips (3 pieces) with irregular, marginal retouch that covers only parts of the lateral edges and is the result of either use or damage caused by post-depositional movements. Among formal tools, three simple side scrapers dominate over notches, denticulates and surface shaped tools with two working edges, which all account for one piece each. The extremely small number of formal tools renders a typological classification of the assemblage increasingly difficult. The only diagnostic attribute is the presence of a bifacial surface shaped tool. Since assemblages of the Western Crimean Mousterian (WCM: Chabai 1998a) do not include bifacial surface shaped tools, a typological classification of levels V/2 and V/2A as "Crimean Micoquian" (in the sense of Chabai, Chapter 6, this volume) makes more sense.

Sortation of Raw Material Units

Within the combined sample of levels V/2 and V/2A, 31 raw material units were identified. For the purpose of transformation analysis, three of them had to be excluded from further investigations. One unit (RMU 13) consists of eight patinated pieces, which belong to the "colluvial artefacts" described by V. P. Chabai (Chapter 1, this volume). A second unit (RMU 30) comprises six burned pieces, suggesting the existence of a fireplace in neighbouring, but yet unexcavated parts of the site. A third unit consists of a single sandstone pebble. Despite the fact that it must have been brought into the site as a manuport, it shows no traces of use (Chabai, Chapter 1, this volume). Owing to its uncertain character as an artefact, the piece was expelled from further analysis. In total, 15 pieces from the original sample were not suitable for transformation analysis. The remaining 48 pieces were sorted into 28 raw material units. All artefacts are made from Cretaceous flint. Although some units show black or brownish fracture planes, the colour of raw pieces ranges predominantly from light-grey to dark-grey. Whilst most of the raw pieces have numerous inclusions, examples for the existence of bands parallel to the cortex, or schlieren, are rare. Each unit is defined by an exclusive combination of macroscopic attributes, and therefore

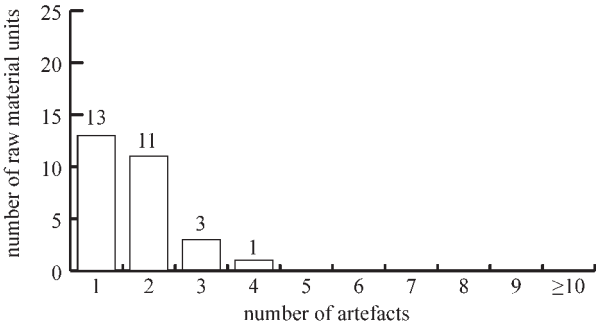

Fig. 8-3 Kabazi II, Levels V/2-2A: Number of artefacts in 28 raw material units. The sample is biased towards single pieces, which occur 13 times, and eleven raw material units with two artefacts only.

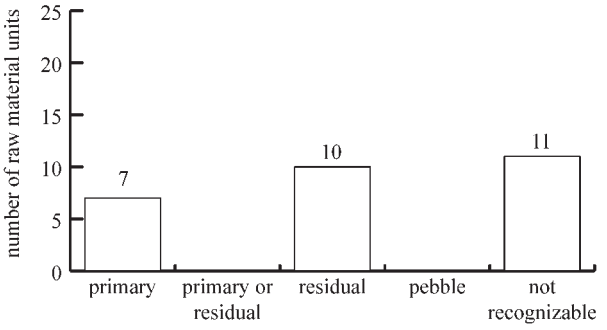

Fig. 8-4 Kabazi II, Levels V/2-2A: Geological classification of raw pieces. Hypotheses are made for 28 raw material units that represent distinct raw nodules ("workpieces"); classification of shape is based upon raw pieces, cortical flakes and / or blanks partly covered by cortex.

represents the remains of a single nodule. Depending on the number of items, these units are either classified as "single pieces", or as "workpieces" which comprise two or more artefacts (an explanation of the terminology applied, and the method of sorting applied, is found in Uthmeier, Chapter 7). Most raw material units (13 cases) are single pieces (Fig. 8-3) or pairs of artefacts with identical raw material attributes (11 cases). Units containing higher frequencies of artefacts are rare. Only two units consist of three pieces each, and one has four artefacts. The high frequency of single pieces and small raw material units must be seen in the context of the site formation process and trench size. Further artefacts might have been washed away by flooding, or may have remained unexcavated in the northern part of the concentration. Thus, it is highly likely that additional pieces with corresponding raw material attributes to the identified single pieces and small raw material units were originally discarded at Kabazi II, but did not find their way into the present sample.

The designation of raw material units to distinct nodules allows estimates to be made as to the number of raw pieces which were flaked to produce an assemblage. In levels V/2-2A, lithic artefacts are the result of the reduction of a total of 28 raw pieces. Some of these contained blanks with a sufficient amount of cortex to formulate a hypothesis with regard to the geological provenance (Fig. 8-4), and original shape (Fig. 8-5). In seven cases, remnants of cortex are thick and chalky, indicating a raw material procurement from primary sources. Another ten units include blanks with a cortex reduced by weathering. This is interpreted as indicative of an acquisition of raw pieces from residual resources. No more than six raw material units allow the reconstruction of the original shape of the raw pieces (Fig. 8-5). It is difficult to decide whether the dominance of round flat shapes reflects preferences in raw material procurement, or results from incomplete data. At present, the nearest known outcrop with similar macroscopic attributes which was accessible at the time of settlement of levels 2 and 2A is situated in the valley of the Bodrak River, some six kilometres from the site.

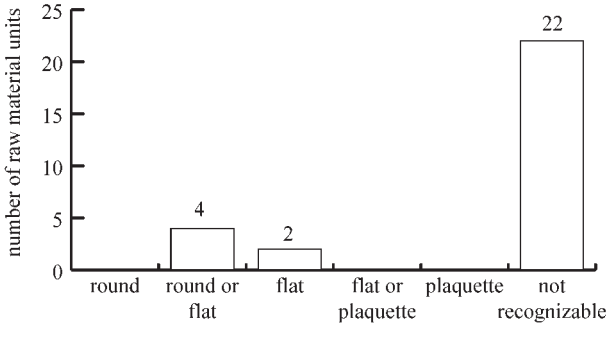

Fig. 8-5 Kabazi II, Levels V/2-2A: Original shape of 28 raw pieces before transformation began (e.g. when collected from the outcrop). Hypotheses are made for raw material units that represent distinct raw nodules ("workpieces"); classification of shape is based upon raw pieces, cortical flakes and / or blanks partly covered by cortex.

Transformation Analysis

In contrast to conventional analysis that basically sees individual artefacts as the most important source of information (for measurements, attribute analysis etc.), transformation analysis concentrates on two or more artefacts struck from the same nodule (Uthmeier, chapter 7, this volume). Thus, the attempt is made to analyse securely linked reduction sequences. In the past, this attempt has often been confined to refittings. However, even if no refittings are found, a detailed sortation of raw material enables the isolation of artefacts that, like refittings, belong to the same nodule. Together with "single pieces" that share no raw material attributes with any other piece of the studied assemblage, it is mainly this class of "workpieces" with two or more artefacts that is analysed by transformation analysis. Judging from the presence or absence of artefacts characteristic for specific work steps (e.g. decortication, preparation or modification), transformation analysis classifies the part of the formal *chaîne opératoire* conducted on-site. Due to the high mobility of hunter gatherers, it is assumed that in many cases only part of an entire reduction sequence was ever conducted at one site. Instead, is expected that the production of lithic artefacts from one nodule stretched over a considerable number of places, and varied according to given demands (of blanks, tools), different availabilities of raw materials, and the time of activity spent at a site. Consequently, this may lead to incomplete reduction sequences at the site under analysis, possibly correlating with its function as workshop, extraction camp, aggregation camp, etc. By classifying the number of work steps (as "transformation sections"), transformation analysis attempts to elucidate the temporal and spatial dynamics of artefact manufacture. Before moving on to a detailed description of the results of the transformation analysis of levels V/2-2A, some introductory remarks are required:

1. The existence of work pieces shows that part of the assemblage was not affected by flooding and / or erosion to such an extent that the entire original context was destroyed. Therefore, workpieces still permit an insight into parts of a given *chaîne opératoire*. Despite the scarce data, some units even allow for conclusions relating to an entire reduction sequence, or important parts of it, which were originally conducted on the site.

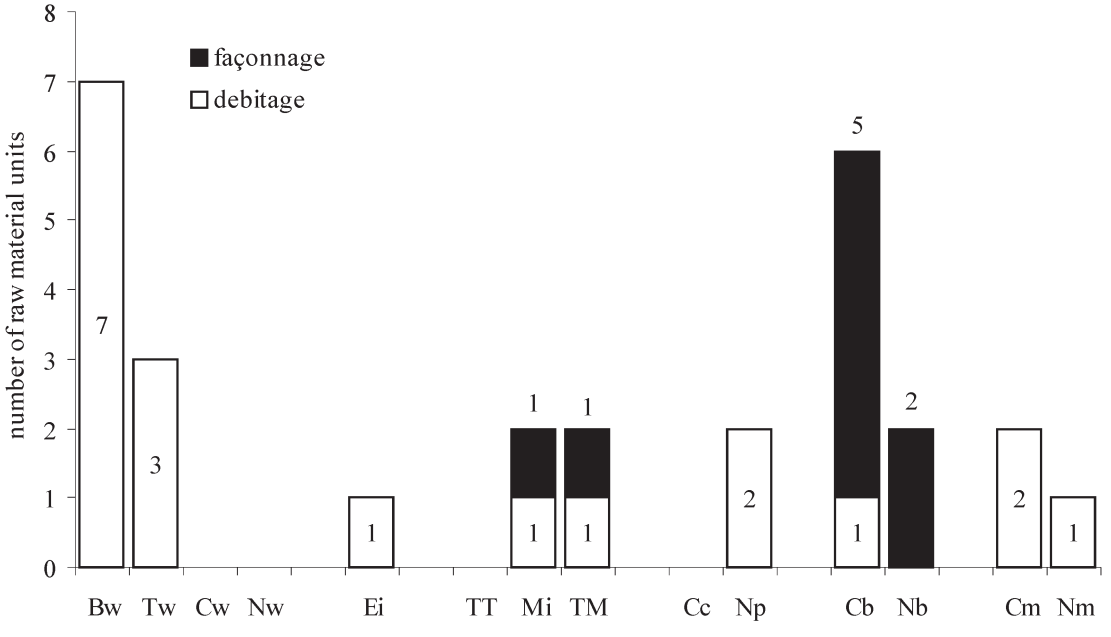

Fig. 8-6 Kabazi II, Levels V/2-2A, frequency of transformation sections: Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); */f = *façonnage* is indicated by flakes from *façonnage* and / or surface shaped tools

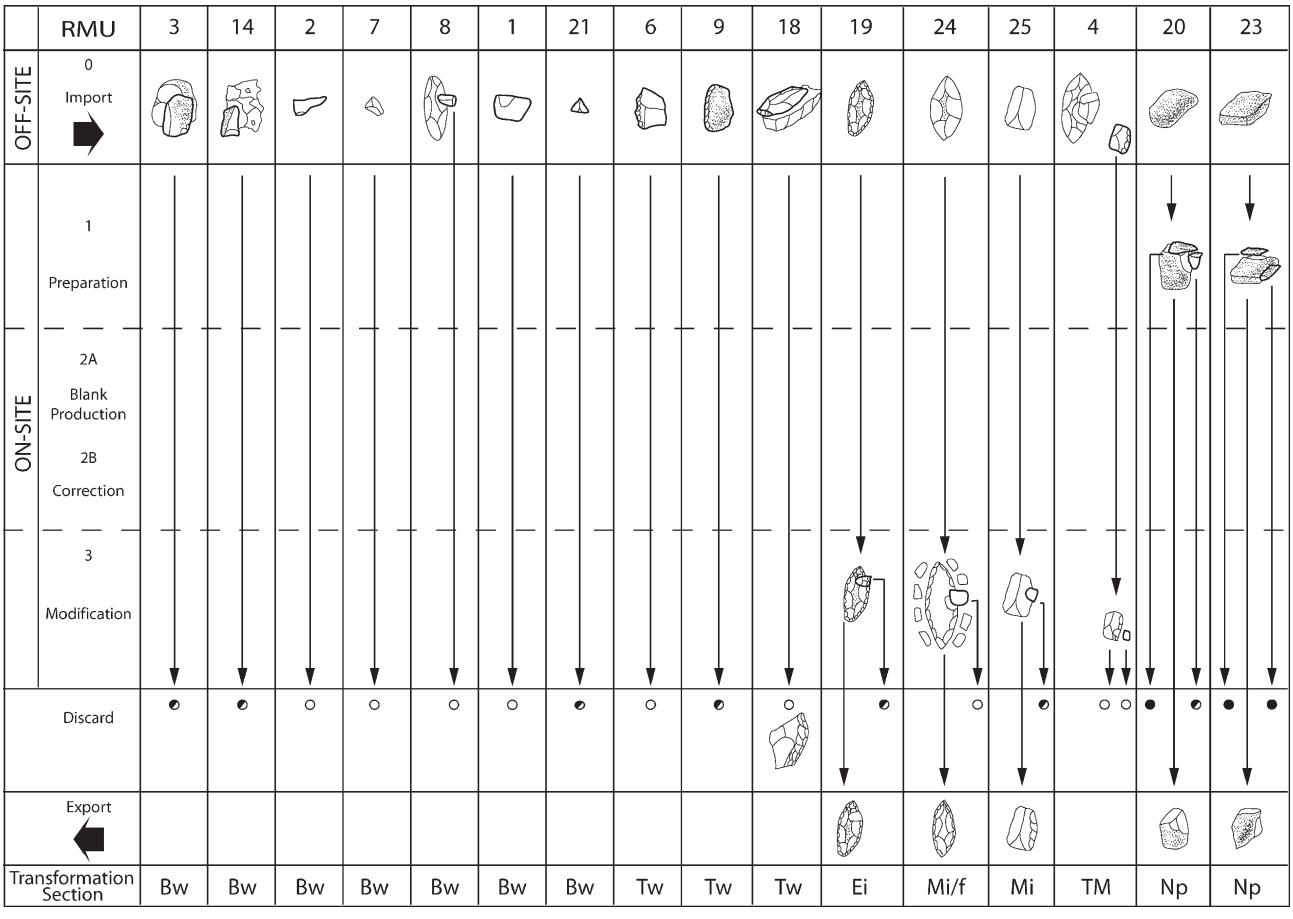

Fig. 8-7 Kabazi II, Levels V/2-2A: Flow chart depicting the results of the transformation analysis. For each raw material unit, hypothesis are made about the phases of the formal chaîne opératoire (after Geneste 1985; 1988; 1990conducted within the excavated area (transformation section); classification of transformation sections are based upon the presence and absence of indicative blank classes (abbreviations see Fig. 8-6).

2. In many cases, lithic items must have been flaked on site according to the logics of transformation analysis, but were not found during the excavation. Whether this indicates human import and export, or is the result of post depositional transport and / or due to the limited excavated area, is often difficult to determine. Only recurrent patterns of import and export may be interpreted as results of human activities.

3. Both post-depositional processes and the limited size of the excavations led to an incomplete assemblage. Consequently, the focus of discussion lies on more complete reduction sequences, e.g. long transformation sections.

The results of the transformation analysis are presented in a diagram showing the frequencies of transformation sections (Fig. 8-6), and in a flow chart depicting the position of every artefact of a raw material unit within the formal *chaîne opératoire* (Fig. 8-7; 8-8; 8-9).

Short transformation sections

As previously stated, single pieces are predominant (Fig. 8-6). Among these, seven are unmodified blanks (Fig. 8-6: Bw; 8-7: RMU 1, RMU 2, RMU 3, RMU 7, RMU 8, RMU 14, RMU 21), and three are simple side scrapers (Fig. 8-6: Tw; 8-7: RMU 6, RMU 9, RMU 18). The many different types of blanks include cortical flakes (Fig. 8-7: RMU 3, RMU 9), flakes from surface shaping (Fig. 8-7: RMU 2, RMU 8), simple flakes of considerable size (Fig. 8-7: RMU 1, RMU 6), and even small flakes (Fig. 8-7: RMU 7, RMU 21). Their selection appears to be random, rather than following a strategy that could be explained by human decisions

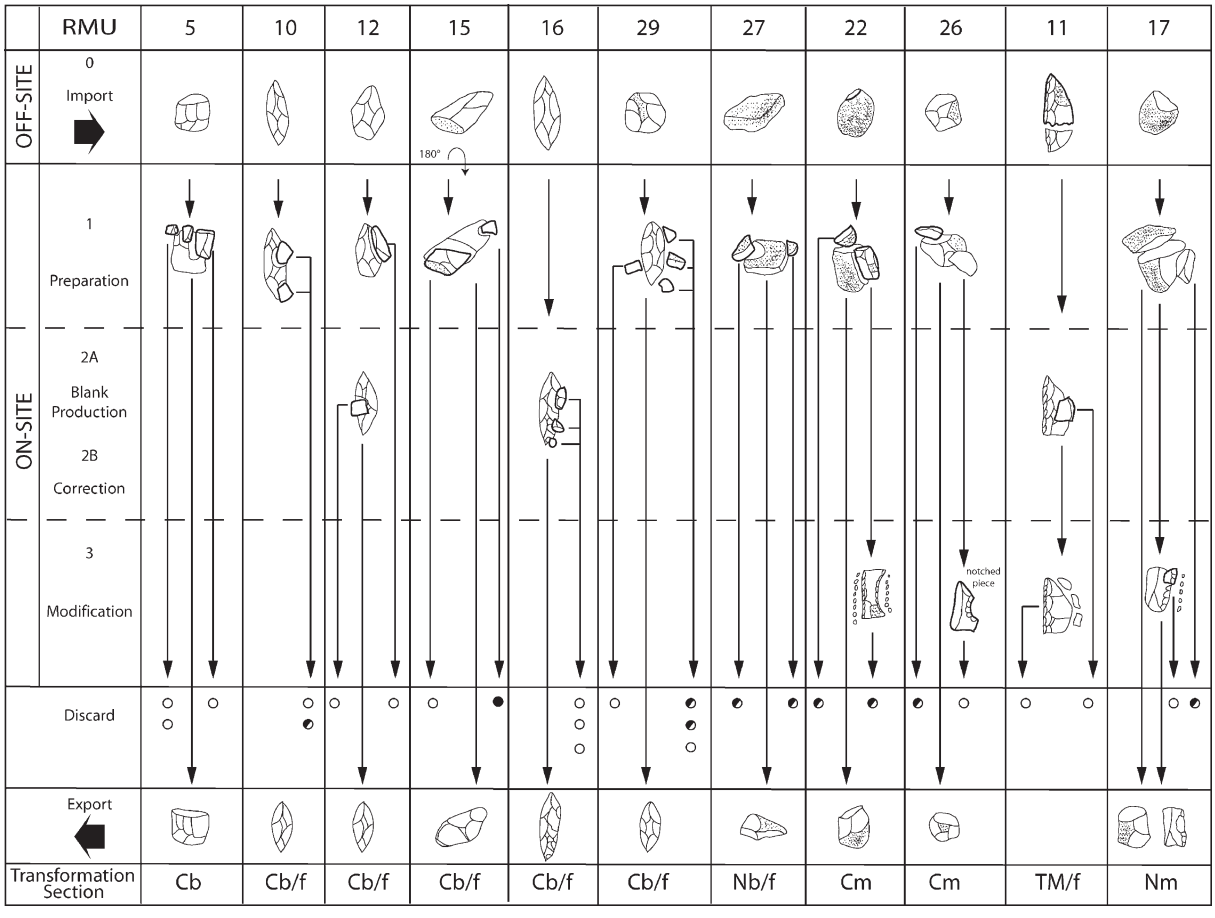

Fig. 8-8 Kabazi II, Levels V/2-2A (continued from Fig. 8-7): Flow chart depicting the results of the transformation analysis.

and planning. Thus, single pieces most probably can be regarded as parts of reduction sequences which originally occurred on site; afterwards, their discard was filtered by natural site formation processes or trench size.

One lateral sharpening flake struck from an unifacial tool (Fig. 8-7: RMU 19), and an isolated chip from the modification of a working edge (Fig. 8-7: RMU 25), are more informative in that they are indicative of the former presence of tools not found amongst the discarded pieces. Due to the fact that they left traces of their manufacture (Fig. 8-6: Mi) or rejuvenation (Fig. 8-6: Ei), their modification has to be added to the over all record of flaking activities in level V/2-2A. Again, little can be said about the whereabouts of the tools. Another two raw material units are also connected with the modification of already existing tools which were transported into the excavated area (Fig. 8-6: TM). They not only include the discard from retouch, but also the formal tools themselves (Fig. 8-7: RMU 4; Fig. 8-8: RMU 11). Whereas RMU 11 (Fig. 8-8) saw the rejuvenation of a surface shaped tool, followed by its discard after medial breakage, transformation analysis of RMU 4 (Fig. 8-7) suggests that a flake from *façonnage* arrived at the excavated area and was later modified.

The last category of short transformation sections, covering one step of the formal *chaîne opératoire* only, is dedicated to the initial preparation of raw pieces (Fig. 8-6: Np; 8-7: RMU 20, RMU 23).

Long transformation sections

According to transformation analysis, less than one third of all raw material units resulted in the manufacture of blanks on the site, some of which were modified (Fig. 8-8; 8-9). In terms of concrete num-

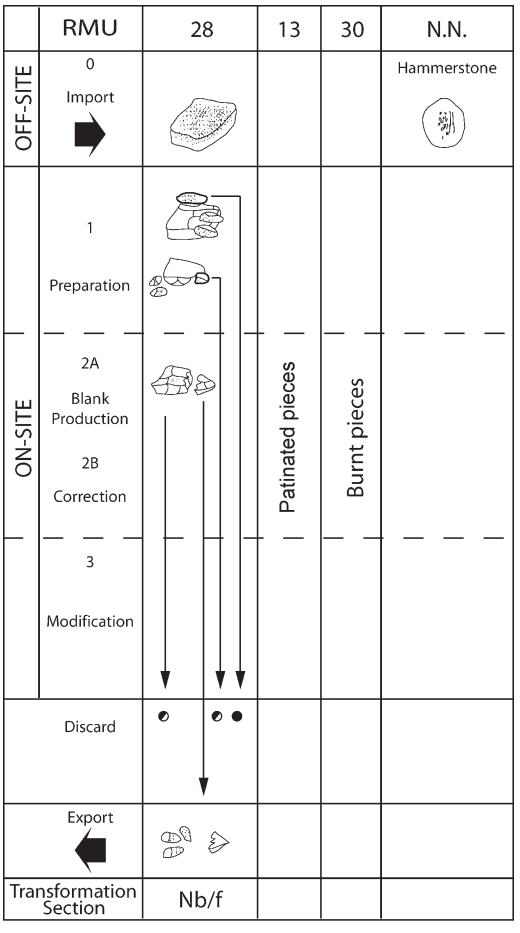

Fig. 8-9 Kabazi II, Levels V/2-2A (continued from Fig. 8-7): Flow chart depicting the results of the transformation analysis.

bers, the production of surface shaped blanks from partly or completely decorticated preforms is the most common, and was documented in five cases (Fig. 8-6: Cb/f). Nevertheless, surface shaping also started from two round flat raw pieces (Fig. 8-6: Nb/f; 8-8: RMU 27; 8-9: RMU 28). For four raw material units, a reduction of simple cores was observed. The flaking began either after some cortex was removed (Fig. 8-6: Cb or Cm; 8-8: RMU 5, RMU 22, RMU 26), or with a raw nodule (Fig. 8-6: Nb or Nm; 8-8: RMU 17). Three of these units (Fig. 8-6: Nm or Cm; 8-8: RMU 17, RMU 22, RMU 26) included the subsequent modification of flakes. Only in one of the cases, which indicates on-site production of surface shaped blanks, was a corresponding surface shaped blank or (bifacial) tool found (Fig. 8-9: RMU 28). Usually, the inner part of the raw pieces was missing. It is only among the discard resulting from the reduction of partly decorticated nodules (Fig. 8-8: RMU 22), or simple cores (Fig. 8-8: RMU 26), that modified flakes were found among the pieces of the same raw material unit. Perhaps, the high number of missing surface shaped blanks reflects their high value, being transported to other areas of the site or carried to other, yet more distant places of activity. On the other hand, one simple tool manufactured on the site also left the trench and was only recognized by the presence of a lateral sharpening flake (Fig. 8-8: RMU 17).

Concluding Remarks

To conclude, the results of the transformation analysis of levels V/2-2A do not differ too much from those obtained from level V/1 (Uthmeier, Chapter 7, this volume). Whereas single pieces are most probably explained by the fact that part of the assemblage was altered by post-depositional movements of artefacts, long transformation sections may add to our knowledge of human activities at the site:

1. A good portion of on-site flaking was dedicated to the production of surface shaped blanks. However, according to the lack of chips from modification, flakes from rejuvenation and broken tips, many of them were not modified within the excavated area, nor were they used at the place of their manufacture.

2. Parallel to surface shaping, some raw pieces were prepared, and some simple cores were reduced. Modification of blanks is more common among these reduction sequences, rather than in raw material units dedicated to surface shaping.

3. In comparison to the overall number of formal tools, rejuvenation of simple and bifacial tools through lateral sharpening flakes, as well as via resharpening by more or less complete facial retouch, occurs quite often. As many surface shaped blanks were produced, but not modified, it would appear that curation was restricted mainly to already existing tools.

Abstract

КАБАЗИ II, ГОРИЗОНТЫ V/2 И V/2A: ТРАНСФОРМАЦИОННЫЙ АНАЛИЗ

Т. УТМАЙЕР

Археологические материалы горизонтов V/2 и V/2A, представленные кремневыми артефактами, песчаниковой галькой и фаунистическими остатками, были обнаружены в геологическом слое 13A. Геологический слой 13A состоит из перемежающихся линз коллювиальных и аллювиальных седиментов. Наибольшее скопление артефактов было обнаружено в северной части раскопа, тогда как южная и юго-западные части исследованной площади подверглись наибольшему воздействию эрозионных процессов. Исходя из распространения находок на площади раскопа, можно утверждать, что была исследована только часть поселения. Трансформационный анализ 28 сырьевых групп показал, что определенное количество преформ было изготовлено на стоянке. При этом данные преформы не были найдены в ходе раскопок. Данный факт может быть свидетельством экспорта / импорта преформ, указанием на транспортировку артефактов в пачке отложений, или все гораздо проще и объясняется тем, что был исследован периферийный участок поселения. Параллельно с изготовлением преформ, было расщеплено несколько желваков и нуклеусов. Сколы, полученные в результате расщепления нуклеусов, гораздо чаще модифицировались ретушью, чем сколы, снятые с преформ. Также достаточно часто происходило переоформление при помощи ретуши и латеральных утончений одно- и двусторонних орудий.

В целом на поселениях данных горизонтов преформы были изготовлены, но не модифицированы ретушью, тогда как уже существовавший орудийный набор был интенсивно модифицирован ретушью и латеральными утончениями.

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KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Chapter 9

Carefully Planned or Confronted with the Unknown? Transformation of Raw Material at the Middle Palaeolithic Site of Kabazi II, Level V/3

Thorsten Uthmeier

Stratigraphical Position and Distribution of Finds

At Kabazi II, level V/3, finds come from an excavated area measuring 19 m^2 immediately behind the limestone block that was, at the time of settlement, eight meters high. On a living floor that was embedded in a 2 cm thick archaeological level, lithic artefacts and faunal remains were found concentrated around a small fireplace in sq. 6H-7H (Fig. 9-1). During excavations, the fire place was indicated by a 2,5 cm thick and 30 cm wide lens of burned bones and ash. Burned sediments immediately below the fire place show not only its *in-situ* preservation, but at the same time speak for a considerable time of heating. Most of the 72 lithics from level V/3 were chips which are not suitable for a sortation of raw material that is supposed to result in units as small as single nodules. Only 29 artefacts show fracture planes that were considered to be large enough for such a detailed examination. Together with the above mentioned 43 small chips as remnants of intense preparation and modification activities, these 29 artefacts witness the production, use and discard of blanks within the excavated area. Given the size of the trench, it cannot be excluded that there were more concentrations other than the one analysed. However, because the distribution of artefacts is fairly restricted, and because the lithics comprise a functional unit together with the fireplace, one has the impression that the find scatter was not much larger than the clear concentration found in sq. 7Л, 6M to 8M, 6H and 5H (Fig. 9-2). At best, the artefacts under discussion are all that remained after a short term, single visit on the paleo-surface of level V/3 (see also Patou-Mathis, Chapter 5, this volume); they definitely belong to a separate zone of activity. Whether there were more zones of activity is open to speculation, but if there were others, it is most likely that they had little to do with the one excavated. At the moment, arguments for the datation of archaeological level V/3 are mainly based upon the pedogenesis of the sediments, the results of recent pollen studies (Gerasimenko, Chapter 2, this volume), and absolute dates from the overlying Unit III. Level V/3 was found in Stratum 14A which is described as the humus (A1) horizon of a well developed humiferous soil (Gerasimenko, Chapter 2, this volume). Numerous pollen samples show that the pedogenesis took place under interglacial conditions, with a south-boreal forest vegetation surrounding the site. Absolute ESR-dates from Unit III which fall between 74.000-85.000 BP and 82.000±10.000 BP suggest a

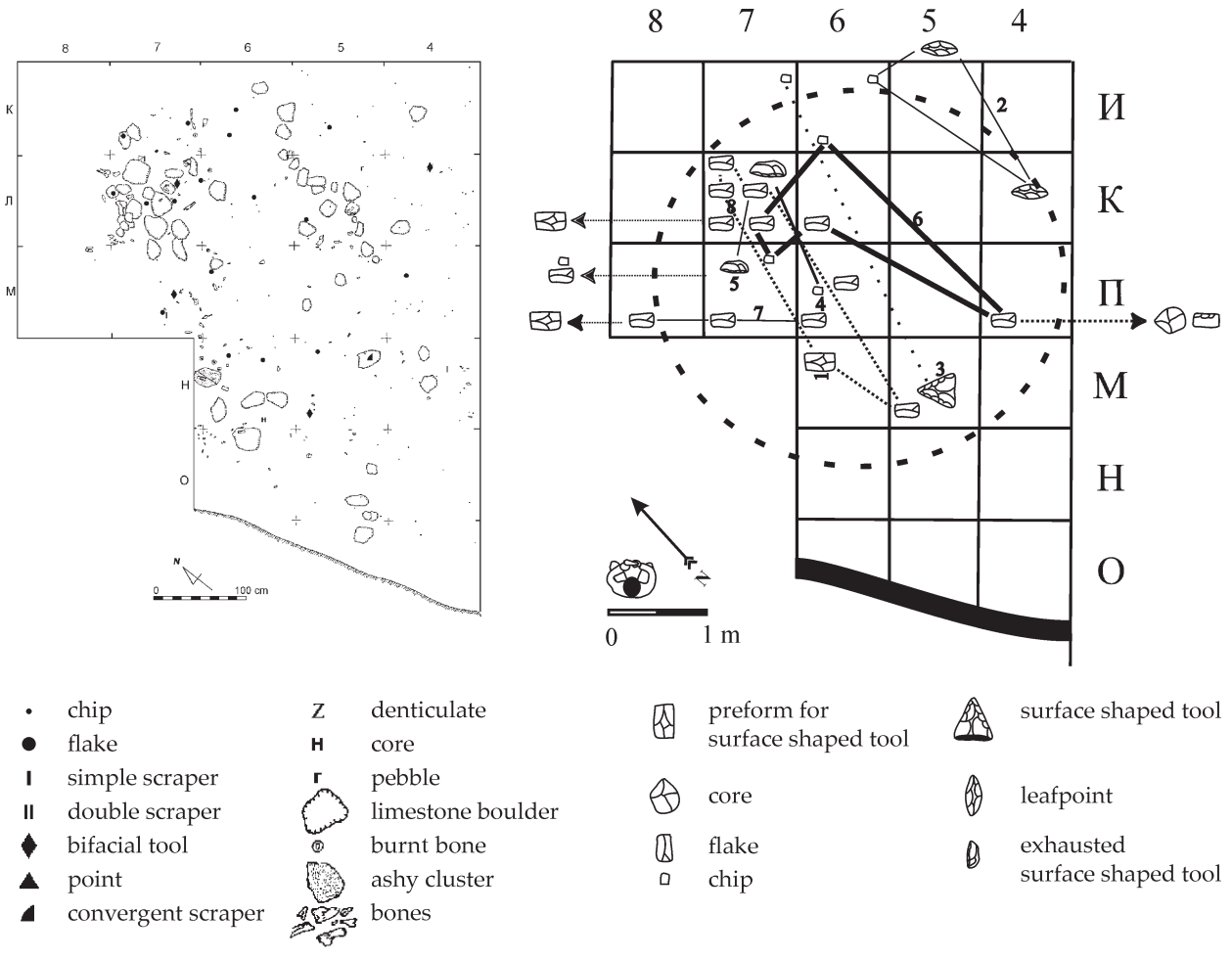

Fig. 9-1 Kabazi II, level V/3: Left – faunal remains, lithic artefacts and limestone blocks on the living floor. Right – distribution of artefacts from 8 workpieces with three-dimensional measurements. Because raw material units defined as workpieces are thought to represent distinct nodules, lines were used to link artefacts that belong to the same raw material unit; numbers correspond to numbers of raw material units in the text an tables.

chronological position of the underlying sediments at the end of OIS 5 (Chabai, Chapter 1, this volume). At the momentary state of knowledge, it appears most reasonable to argue for a (late) Eemian age of level V/3 ("Eemian 6b" or "Mikulino 8" according to Gerasimenko, Chapter 2, this volume).

Typological and Technological Features of Kabazi II, Level V/3

As previously mentioned, the majority of the assemblage consists of chips. Owing to the small size of their facture planes that might represent only a limited, yet probably not representative cut-out of the original raw pieces, they were excluded from the following analysis. Thus, the sample described here contains 29 artefacts only, of which six were classified as formal tools (Fig. 9-3). Additionally, there is a bifacial blank (Fig. 9-4, *5*) and a piece with discontinuous retouch (Fig. 9-5, *11*) that, although showing modifications of their edges, cannot be counted as formal tools *sensu stricto*. While the basal fragment of a simple side scraper (Fig. 9-5, *7*) is not diagnostic, there are five formal tools which belong to the class of surface shaped tools typical for assemblages of the "Crimean Micoquian". These are considered to be "surface shaped" because their outline and cross section was altered by soft hammer facial retouch (*façonnage*) either on the dorsal, ventral, or on both sides. One of these pieces is a small

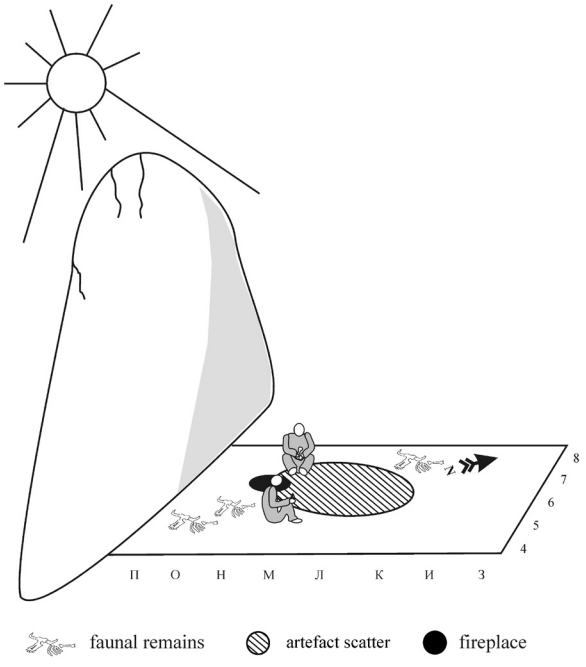

Fig. 9-2 Kabazi II, level V/3: Illustration of the main features found in the excavated area. The existence of one small fireplace, the low density of artefacts, and the analysis of faunal remains speaks for a single, short-term occupation.

bifacial leaf-scraper (Fig. 9-4, *8*). To judge from the remnants of some large negatives situated on both sides of the piece which were struck from striking platforms located at some distance from the preserved lateral edges, this piece must originally have been much larger before a repeated cycle of usage and resharpening began. The hypothesis that it is a worn out piece, discarded at the very end of its lifetime, is supported by the observation that the dorsal negatives of the retouch of the working edge often end in a hinge: after several phases of rejuvenation, the angle between the dorsal and ventral surface had become quite steep. The basal fragment of a second surface shaped tool (Fig. 9-4, *7*) is nearly identical in width and thickness, assuming that it represents the remnant of a second bifacial (leaf-)scraper that had the same function and underwent a similar reduction process. Two other surface shaped tools were also identified as being bifacial. These were, however, so heavily reduced at the point of discard that a clear typological classification is practically impossible (Fig. 9-5, *4*; 9-6). Nevertheless, one of these shows a lateral fracture that forms a back opposite to a straight, bifacial working edge (Fig. 9-5, *6*). It is not entirely clear whether the back is the consequence of a terminal breakage of a larger tool during usage or rejuvenation, or a remnant of the original shape of the raw piece. In typological sense, the latter would

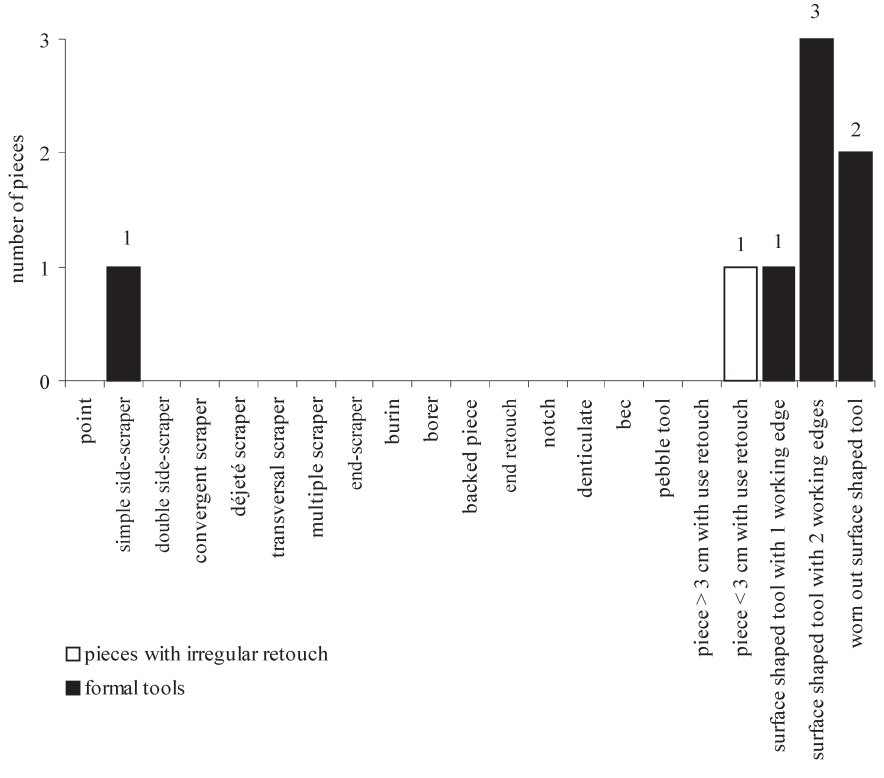

Fig. 9-3 Kabazi II, level V/3: Frequency of tools.

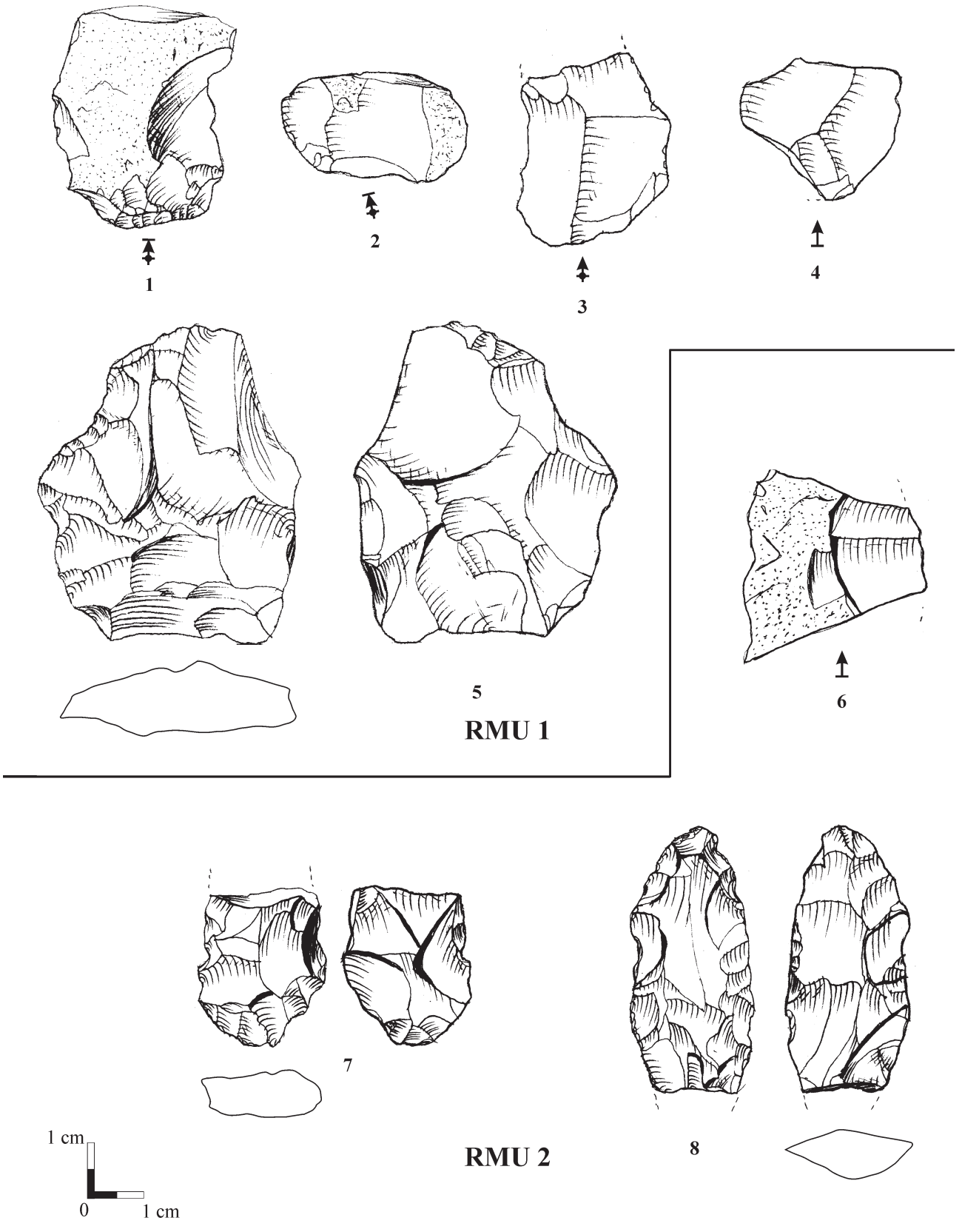

Fig. 9-4 Kabazi II, level V/3: Artefacts of RMU 1 and RMU 2.

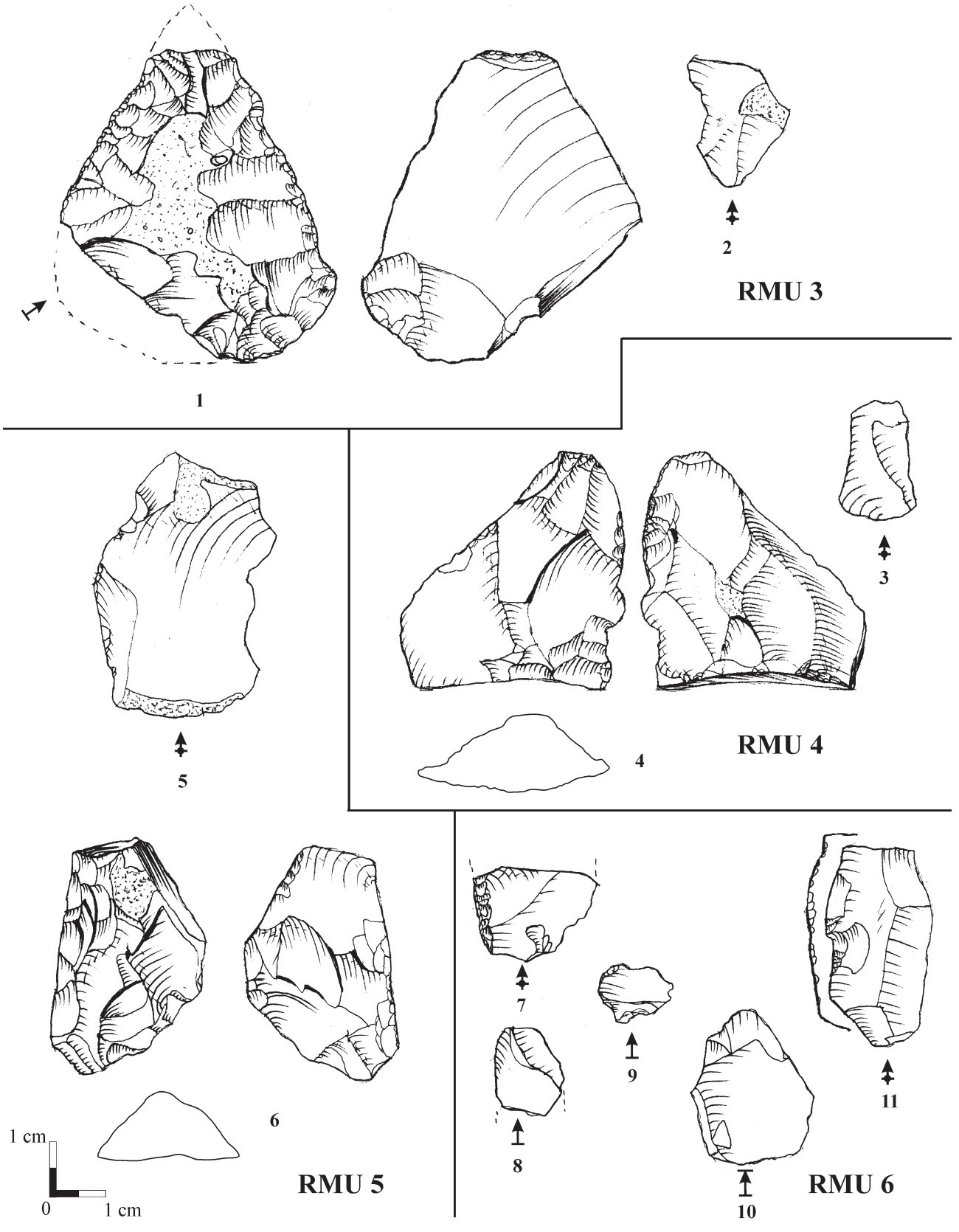

Fig. 9-5 Kabazi II, level V/3: Artefacts of RMU 3, RMU 4, RMU 5 and RMU 6.

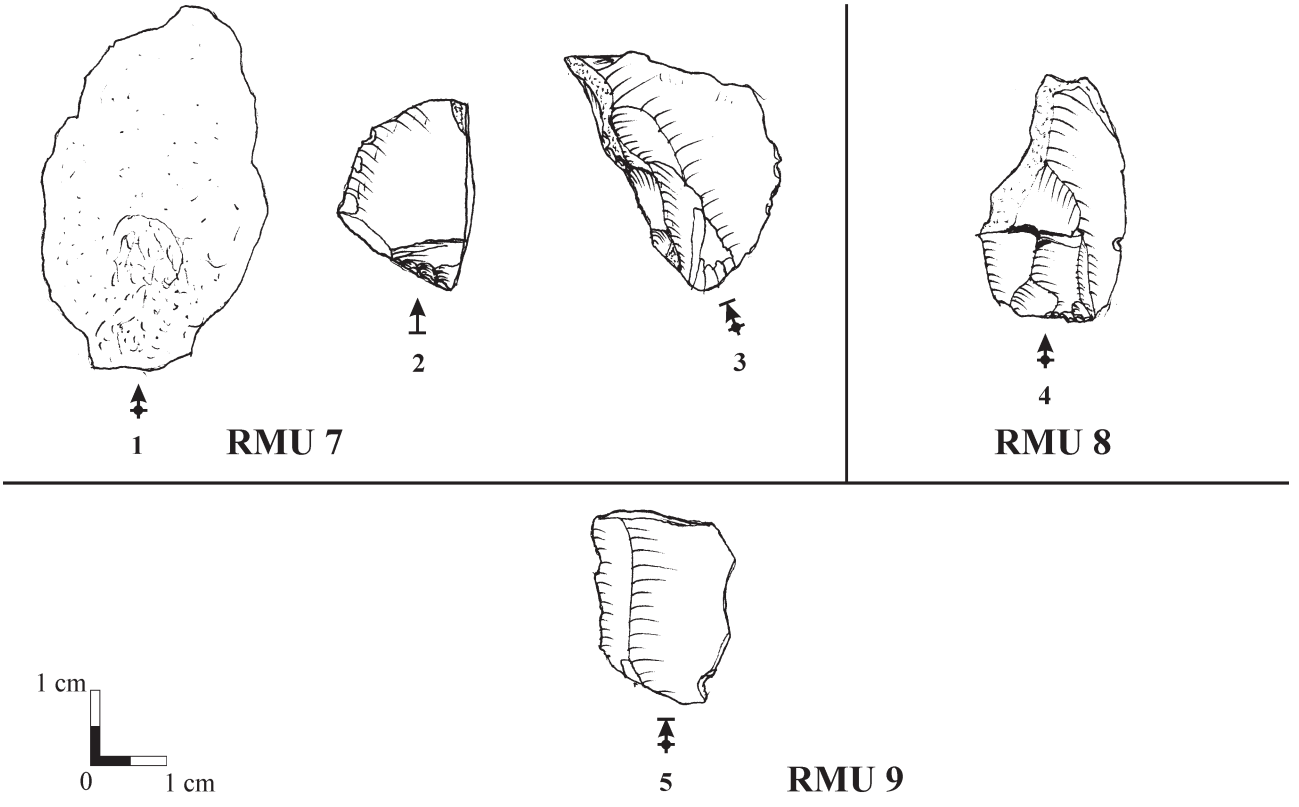

Fig. 9-6 Kabazi II, level V/3: Artefacts of RMU 7, RMU 8 and RMU 9.

imply that the piece was a naturally backed bifacial scraper (or: "Keilmesser") before reduction started. Most other colleagues would probably classify another formal tool as a simple convergent scraper (Fig. 9-5, *1*). But in our opinion, the fact that the artefact is not entirely covered by negatives does not necessarily mean that it is a simple unifacial tool. The focus of the oldest work steps visible on the dorsal surface was a correction of the cross section by facial retouch, followed by a ventral thinning at the right lateral side of the flake. Only the last work steps are dedicated to the modification of the working edges. Consequently, we consider the piece a surface shaped tool, which not necessarily has to be bifacial. Fine negatives along a terminal fracture plane – either from modification or usage – suggest that it was used even after the tip broke off. Finally, there is a bifacially worked preform (Fig. 9-4, *5*). Although at an early stage of surface shaping, it was already quite small, which was probably the reason for it being repudiated.

Generally speaking, the primary goal of all flaking activities which could be reconstructed from the discarded artefacts was the production of surface shaped blanks and tools of plan-convex cross section. This generalisation is based upon the fact that there are six surface shaped blanks, some of which are modified, and eight flakes almost certainly struck by direct soft hammer percussion. Conversely, there are no blanks that could be explained by the reduction of prepared cores, e.g., crested flakes (*éclats débordants*) or Levallois flakes (Fig. 9-7). Nevertheless, the focus on surface shaped tools does not necessarily mean that there are no flakes struck by direct hard hammer percussion. Indeed, eight flakes show indicative signs of a direct, hard hammer blow, e.g. a pronounced bulb, a bulbar scar, a straight (and not curved) length section, and deep dorsal negatives (Fig. 9-7). Furthermore, some of these pieces were used to an extent that they show either an irregular retouch (1 case among discard), or were retouched into a simple side scraper (1 case among discard). In cases were bifacial surface shaped blanks were produced, the facial retouch commenced on the lower (ventral) surface. Only after its completion did the facial retouch of the upper (dorsal) surface begin. In most cases, working steps that were dedicated to rejuvenation are found on the upper surface, whereas the lower surface remains more or less untouched by work steps being late within the entire *chaîne opératoire*.

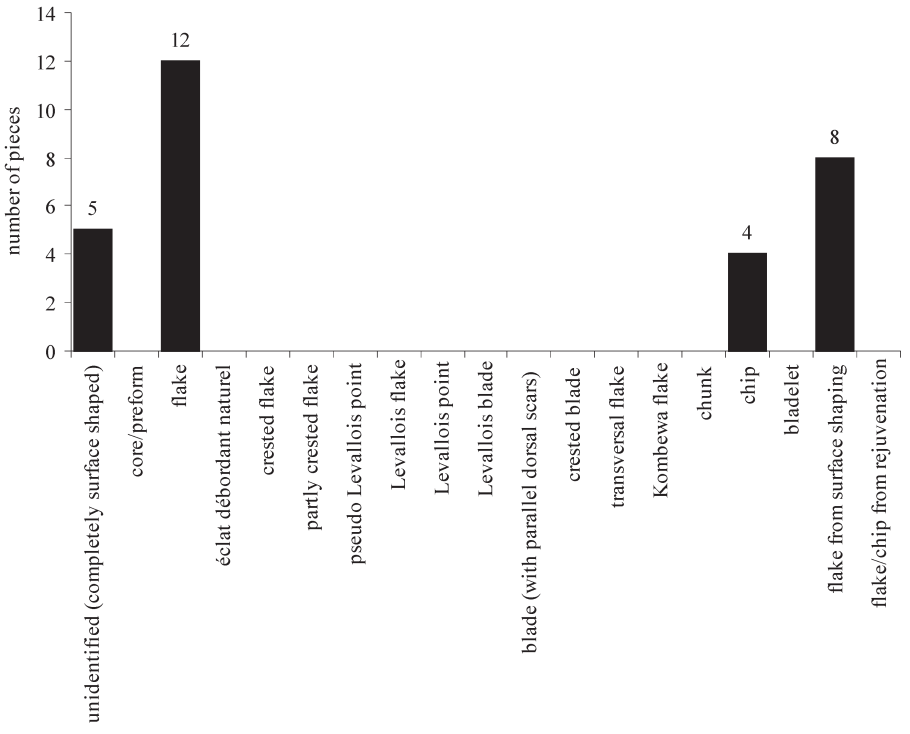

Fig. 9-7 Kabazi II, level V/3: Frequency of blanks.

Sortation of Raw Material Units

Because the fracture planes of most chips were too small to represent a reliable cut-out of the nodules defined, the sample sorted into raw material units consists of 29 artefacts (for a description of the method, and especially the attributes used, compare Uthmeier 2004a). All in all, 10 raw material units were recognised, but one unit with five artefacts which were either patinated or showed evidence of being subject to burning had to be excluded from further analysis. It is this unit that includes rolled and / or patinated pieces ("colluvial artefacts" according to Chabai, Chapter 1, this volume). Of the remaining 24 artefacts, nine raw material units were identified (Fig. 9-8), ranging from one single piece per unit (2 cases) up to five artefacts per unit (3 cases). Thus, it is clear that these units are very small – but are they too small to be plausible? At least four non-exclusive explanations are feasible: first, the distinction between the raw material units might have been too strict, thus dividing artefacts into several units that in reality belong together, second, raw material units tend to be incomplete because of post-depositional natural site formation processes or the restricted size of the excavated area, third, most artefacts that seem to be missing can be found among those pieces smaller 3 cm which were not further considered, or, fourth, the low frequency of artefacts in raw material units possibly indicates only minor flaking of each item brought into the excavated area. The raw material that was used to produce the artefacts found in level V/3 is Cretaceous flint. The colours of most fracture planes are either light-grey, grey or dark-grey, but some artefacts have a greenish or brownish colour. In addition, many – but by far not all – pieces show black schlieren and white or grey intrusions, while others have striking black needle-like inclusions. As far as the distinction between raw material units is concerned, it is important to mention that it is not a single attribute alone, but a combination of attributes that leads to their definition. Within the small assemblage of Kabazi II, level V/3, this attributes show a considerable variation, especially when it comes to combinations. To conclude, we are quite sure that the identification of raw material units ended up on the level of single pieces or workpieces. The question to what extend the other hypotheses listed above contributed to the characteristics of the assemblage can only be discussed in the light of the results of the transformation analysis.

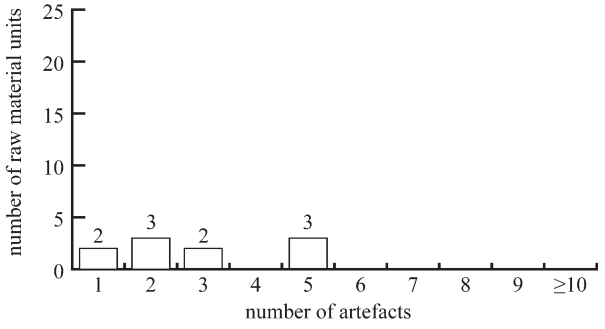

Fig. 9-8 Kabazi II, level V/3: Number of artefacts in raw material units.

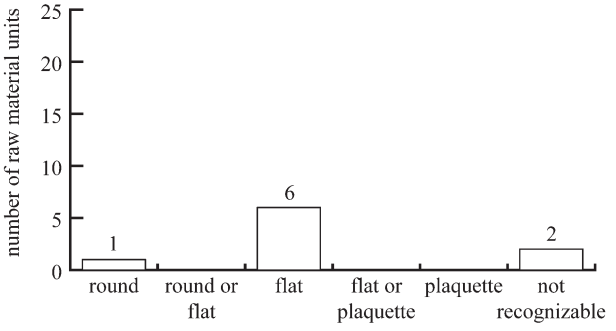

Fig. 9-9 Kabazi II, level V/3: Original shape of raw pieces before the transformation began. Hypothesis on the shape of raw pieces are based upon cortical flakes and the assumption that each raw material unit represents a distinct nodule (workpiece).

Some General Remarks on the Transformation of Raw Material at Kabazi II, Level V/3

The analysis of raw material resulted in nine units, each comprising either a single piece that had a unique combination of raw material attributes, or several artefacts coming from the same nodule. The low overall frequency of artefacts larger than chips seems to suggest the presence of raw material units that underwent short or incomplete reduction sequence within the excavated area, as underlined by the presence of single pieces. The fact that the blanks from seven raw material units exhibited enough cortex to reconstruct the shape of the raw nodule shows that part of the reduction started with raw nodules or only partly decorticated pieces (Fig. 9-9). In six cases, nodules originally had a flat shape before their reduction started. In attempt to pinpoint the geological provenance of raw nodules, the degree of weathering of the cortex was broadly classified into "chalky", "weathered", or "rolled", assuming that these classes reflect procurement from primary sources, secondary residual sources or river terraces (Fig. 9-10). As in the case of the reconstruction of the shape, the result is clear: from seven units with cortex, six were classified as "weathered". This points to outcrops where the nodules were in a residual position or areas were nodules could be collected from the surface. The fact that one unit still shows a chalky cortex would point more to the latter hypothesis. It is likely that the raw material derives from a primary source were nodules had fallen from their surrounding limestone bed after weathering or chemical dissolution. Raw material surveys (Chabai 2004c, Fig. VI-2; Demidenko 2004a, 115; Uthmeier 2004a, Fig. 11-3) suggest that the grey to dark-grey Cretaceous flint used in level V/3 was collected in the Bodrak valley, some 6 kilometres to the southwest of Kabazi II. The assumption that the raw material is local can almost certainly be ruled out. Geological analysis of the river terraces (Chabai, Marks and Monigal 1999, 228) has demonstrated that the river system of Crimea did not begin to cut deeply into the landscape before the beginning of OIS 3. It follows that outcrops of primary Cretaceous flints, which today can be seen in the immediate vicinity of the site, were still located below the surface at the time when Neanderthals occupied level V/3. At the Bodrak valley we observed a considerable diversity of raw nodules ranging mainly from round to flat pieces. The fact that flat nodules dominate at Kabazi II, level V/3 suggests a clear preference for raw volumes that were suitable to the production of surface shaped tools. The many chips found indicate the preparation of striking platforms, as well as the retouch of lateral edges. At the same time, the dorsal surfaces of the flakes found at Kabazi II, level V/3 often removed cortex when struck from the nodule or preform (Fig. 9-11). There are two cortical flakes and ten flakes partly covered by cortex on their dorsal surfaces, but only ten flakes that exhibit no cortex at all. Thus, on grounds of conventional data, it can be argued that in some cases the flaking started with a raw nodule, that in these cases blanks removed by direct hard and soft hammer percussion were actually manufactured inside the excavated area, and, finally, that in most cases the reduction did not proceed deep enough into the nodules to produce a considerable number of blanks without cortex.

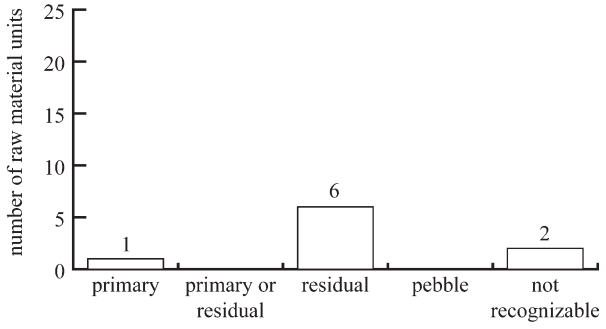

Fig. 9-10 Kabazi II, level V/3: Geological classification of raw pieces. Hypothesis on the geological provenance of raw pieces are based upon cortical flakes and the assumption that each raw material unit represents a distinct nodule (workpiece).

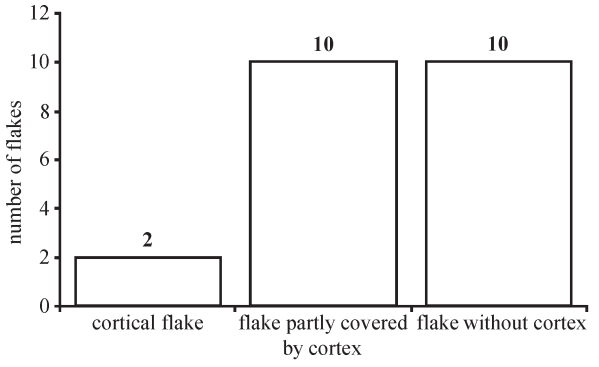

Fig. 9-11 Kabazi II, level V/3: Frequency of cortex on dorsal surfaces of flakes, measured in three broad classes.

Transformation Analysis

Transformation analysis provides a more detailed insight into the history of single nodules (data is listed in Table 9-1; for a description of the method see Uthmeier, Chapter 7, this volume). Surprisingly, all artefacts were produced within the excavated area. Whereas this simply results from the methodological premises of classification for units with two or more artefacts, it is quite astonishing when units with single pieces are concerned. One (RMU 8) is a thin, small flake from surface shaping (Fig. 9-6, *4*). In contrast to larger and thicker pieces, such a fragile flake from facial retouch is assumed to be a static object that one would not expect to be moved after its detachment. Instead, it is more likely that it is part of the waste that remains at the place of knapping. Therefore, it is concluded that RMU 8 was an initially prepared preform which was transported into the excavated area and, after minor additional surface shaping, taken out again. The second single piece (RMU 9) falls into a similar category (Fig. 9-6, *5*). It is a short, straight flake from surface shaping (of the lower surface of a plano-convex biface?) that ended in a hinge. It is likely that it belongs to a more advanced stage of manufacture, at a time when the preform was given its final form. Again, the remaining inner part of the nodule, in this case a bifacial tool, is missing. For a number of other raw material units, the transformation sections reflect reduction sequences that are only slightly longer. RMU 3 (Fig. 9-5, *1-2*) and RMU 4 (Fig. 9-5, *3-4*), for example, both contain a small chip from surface shaping or modification, and the corresponding surface shaped tool. Speaking in terms of raw material transformation, the only flaking exhibited by the discarded artefacts was the final modification of a surface shaped preform. After usage, the surface shaped tools were discarded. In another case, RMU 7 (Fig. 9-6, *1-3*), a cortical flake and two simple flakes resulted from the initial preparation of a raw nodule into a preform, which is missing. Only in four from nine cases were transformation sections long enough to cover the production of (surface shaped) blanks with subsequent modification. In some cases, the reduction started with raw nodules (RMU 1: Fig. 9-4, *1-5*, RMU 2: Fig. 9-4, *6-8*), in other cases the decortication happened elsewhere and on site flaking began with a partly decorticated preform (RMU 5: Fig. 9-5, *5-6*, RMU 6: Fig. 9-5, *7-11*). In the majority of cases, surface shaped tools, produced and used in the excavated area, were discarded. Only on one occasion, RMU 6 (Fig. 9-5, *7-11*), is a core (or initially prepared preform) missing, which, judging by the facture planes of two flakes and two chips, should have also been there.

To summarise, the transformation analysis has shown that in some cases the reduction sequence was much longer than previously suggested by the conventional data (Fig. 9-12). Despite the low overall frequency of artefacts in the assemblage, four raw material units were dedicated to the manufacture of surface shaped tools or preforms. Starting with a raw nodule or an initially prepared piece, and ending with the modification of formal tools, their transformation sections cover all or almost all phases of the formal *chaîne opératoire*. The remaining units reflect short transformation sections from either the

	assemblage			data related to identification of							on-site transformation (as indicated by discard)												
	Kabazi II, Unit V, Level 3			raw piece: phase 0		initially prepared or flaked piece: phases 1 or 2		inner part of flaked piece			production of blanks: phases 1 and 2					indifferent	modification and usage: phase 3				early discard		
	raw material unit	weight (in g)	N	raw piece or chunk	cortical flake	flake partly covered by cortex	flake without cortex	core/preform	unknown blank (bifacially surface shaped piece)	imported item	flake	blade	trimming flake	core/preform	chunk	chip	simple tool	surface shaped tool	chip from modification	flake from rejuvenation or broken tool tip	raw piece	transformation section	evacuation > 3 cm
	7	3	19		1	2				raw piece	3											Np	preform
	8	1	2			1				raw piece	1											Np/surface	surface shaped blank
	1	5	56			2	2		1	raw piece	4							1				Nm/surface	
	2	3	23			1			2	raw piece	1							2				Nm/surface	
	6	5	12				5			core	2					2	1					Cm	core
	5	2	27			1			1	preform	1							1				Cm/surface	
	3	2	23			2				flake						1		1				TM/surface	
	4	2	23				1		1	surface shaped tool						1		1				TM/surface	
	9	1	1				1			surface shaped tool									1			Mi/surface	surface shaped tool
	10	5	16	2	1	1	1			sorting rest	3				2								
sum	10	29	202	2	2	10	10	0	5		15	0	0	0	2	4	1	6	1	0	0		

Table 9-1 Kabazi II, Level V/3: Data relevant for transformation analysis. The classification of transformation sections is conducted on the "workpiece-level". As workpieces are considered as refits, two or more artefacts made on the same piece of raw material and recovered from the excavated area are taken to represent the transformation of this raw material on site. For each raw material unit the most initial and the most final work step in the formal *chaîne opératoire*, as highlighted by the artefacts, are used to define the boundaries of a transformation section (an explaination of the different classes of transformation sections can be found in Fig. 9-13).

beginning of the *chaîne opératoire* (initial preparation), or from the very end (modification of tools). At the same time, it can be stated that in four of six cases where nodules or preforms were flaked in the excavated area, a raw nodule stood at the beginning of the reduction sequence. Thus, the analysis uncovered the following aspects of raw material transformation at Kabazi II, level V/3 (Table 9-2):

1. Final modification of existing surface shaped preforms, use and discard;

2. Production of surface shaped tools, use and discard;

3. Initial preparation of raw pieces, sometimes decorticated.

Discard on the one hand, and export of preforms or surface shaped tools out of the excavated on the other, were each observed in four cases.

It has been stressed more than once that – with the exception of Unit IV – the preservation of archaeological remains in almost all archaeological levels of Kabazi II is good or excellent. In this regard, level V/3 is no exception. There is no evidence for the activity of post-depositional natural site formation processes that severely altered the original context of archaeological finds. Except for some "colluvial artefacts", lithics are not patinated, with sharp lateral edges. If at all, it is assumed that erosion or other post-depositional processes during site formation may have led to minor changes in the position of small items only. In most cases, large pieces like cores, preforms or tools should not be affected. With regards to the size of the excavated area, two things seem to be important. Given the nature of Kabazi II as a kill and butchering site visited for short periods of time, a single visit may not have required more space than represented by the trench actually excavated. This

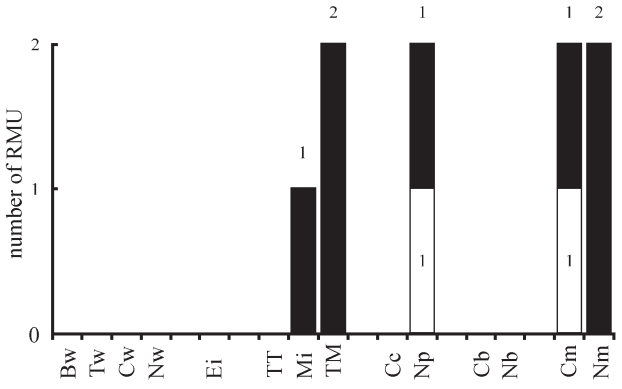

Fig. 9-12 Kabazi II, level V/3: Frequency of transformation sections – Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); black bars: */f = *façonnage*, indicated by flakes from *façonnage* and / or surface shaped tools).

picture of a short-term stay is supported by the restricted distribution of artefacts around a fireplace near the limestone block. On the other hand, some raw material units are incomplete to such an extent that they might be taken as a strong argument for the assumption that important parts of the assemblage have not yet been excavated. RMU 2 (Fig. 9-4, *6-8*), for example, consists of a flake partially covered by cortex, and two bifacial tools. Although only a few artefacts were band together, the story told by this unit, when read in terms of transformation analysis, is quite long: the flake must have been struck from a partly decorticated flat nodule, as probably were the blanks of the bifacial tools. Alternatively, the latter might also have been manufactured from pieces that resulted from an intentional breakage of the raw piece. Afterwards, the two blanks (or broken parts of the nodule) were surface shaped and modified into bifacial leaf-scrapers and then, according to the differing sizes of the dorsal and ventral negatives, largely reduced on site before discard. The hypothesis that the pieces were rejuvenated within the excavated area is strongly supported by the refitting of a chip on the lower surface of one of the bifacial leaf-scrapers (Fig. 9-4, *8*). Due to its small size, we were not able to sort this chip (Chabai, Chapter 6, Fig. 14-3, this volume) into one of the raw material units. It is not so much the presence of the two bifacial scrapers in one unit that call for a classification as a long transformation section. As an exception to the rule (Uthmeier 2004a), they also could have been imported. However, the presence of an additional

phase 0: discarded after testing (unit contains chunks and/or nodules)	**phase 1: initial preparation** (unit contains cortical flakes)	**phase 2: production of blanks** (unit contains flakes partly with and/or without cortex)	**phase 3: modification** (unit contains chips from modification and/or formal tools)	number of cases
	surface shaping: 1			**2**
	surface shaping: 2			**2**
		surface shaping: 1		**2**
			surface shaping: 3	**3**

Table 9-2 Kabazi II, Unit V, Level 3: Overview over the frequency of transformation sections, projected onto the scale of the formal *chaîne opératoire*.

flake, that obviously came from the initial preparation of a raw nodule and which was very unlikely to have been moved between sites, inevitably calls for a classification as an item that underwent a considerable amount of flaking on the site. As a result, all flakes from surface shaping, retouch of the working edges and rejuvenation would be missing, and possibly also a core-like piece (if the blanks for the bifacial points were flakes). But even if most flakes from the production of bifacial tools fall into the category of chips (which had to be excluded from raw material sortation), one would still expect some more flakes larger than 3 cm in length. Thus, it can not absolutely be excluded that single artefacts ≥ 3 cm produced on site are missing, most probable in connection with the material uncovered at the edge of the concentration at Kabazi II, where the trench ends and the paleo-surface inclines towards the slope. Nevertheless, it is assumed that mistakes caused by the effects of erosion tend to be restricted to smaller artefacts, such as chips or flakes, and only randomly affect bigger objects like cores or preforms. Additionally, even if some artefacts were deposited outside of the excavated area, it does not hinders the recognition of valid patterns of raw material transformation at the site. In those cases where cores, preforms or tools are missing – which according to the logics of transformation analysis should have been there – it is concluded that their absence is – in most cases better explained by cultural site formation processes, in this case import and / or export by Neanderthal individuals.

Reconstruction of Moves

The results of the transformation analysis can be depicted in a table (Fig. 9-13), showing a reconstruction of the condition in which single pieces and workpieces were brought into the excavated area ("import"), the reduction that occurred on the site on the basis of discarded pieces found during excavations, and a reconstruction of the artefacts that are missing in between or at the end of the transformation process ("export"). In general, flaking activities were mainly dedicated to:

1. Initial preparation of raw nodules and subsequent transport of preforms out of the excavated area;

2. Transformation of raw nodules or preforms into surface shaped tools that were used and discarded;

3. Transportation of surface shaped preforms or surface shaped tools into the excavated area where they were, if necessary, modified, used, and – sometimes after rejuvenation – discarded.

Neanderthals coming to Kabazi II were obviously carrying some readymade surface shaped tools with them, combined with cores, preforms and raw nodules (Table 9-3). Looking at the colour and the shape of the nodules, it is most probable that the raw material originates from the rich outcrops of the Bodrak valley, some 6 km southwest of Kabazi II. The flakes that were discarded at Kabazi II show that all objects produced on the site were related to the production of surface shaped blanks or tools. After their stay in Kabazi II, the Neanderthals left with two initially prepared, largely unfinished preforms, one surface shaped blank that still needed lateral retouch to produce working edges, and a finished surface shaped tool of unknown shape. Because the raw material outcrops are not very far, two scenarios can be considered to explain the results of the transformation analysis. First, Neanderthals knew that there was a lack of raw material in the Alma valley. Therefore, they started from their previous campsite (near the outcrops of the Bodrak valley?) equipped with some surface shaped tools for immediate use, and a number of preforms as a stock to replace worn out tools. In addition, they carried with them some raw nodules, probably intended for stays in the nearer and more distant future, or for otherwise unforeseen needs. For some reason or another, the lithic reserves had to be used during their stay at Kabazi II. This scenario would best explain the graded stage of preparation of raw material at the beginning of the reduction sequences carried out at Kabazi II.

On the other hand, another interpretation might be equally plausible. Neanderthals were not aware of the lack of local raw material at Kabazi II, and arrived at the site with some surface shaped tools. These tools (possibly hafted) were long-life parts of their all-day equipment, carried around during daily trips as well as during residential moves. They do not indicate a pronounced amount of planning depth. After having realised that there were no local raw material sources, the Neanderthals then proceeded to the Bodrak in the search for suitable flint outcrops along river valleys. They collected raw nodules and some tested blocks, and returned to Kabazi II for further flaking and subsequent usage.

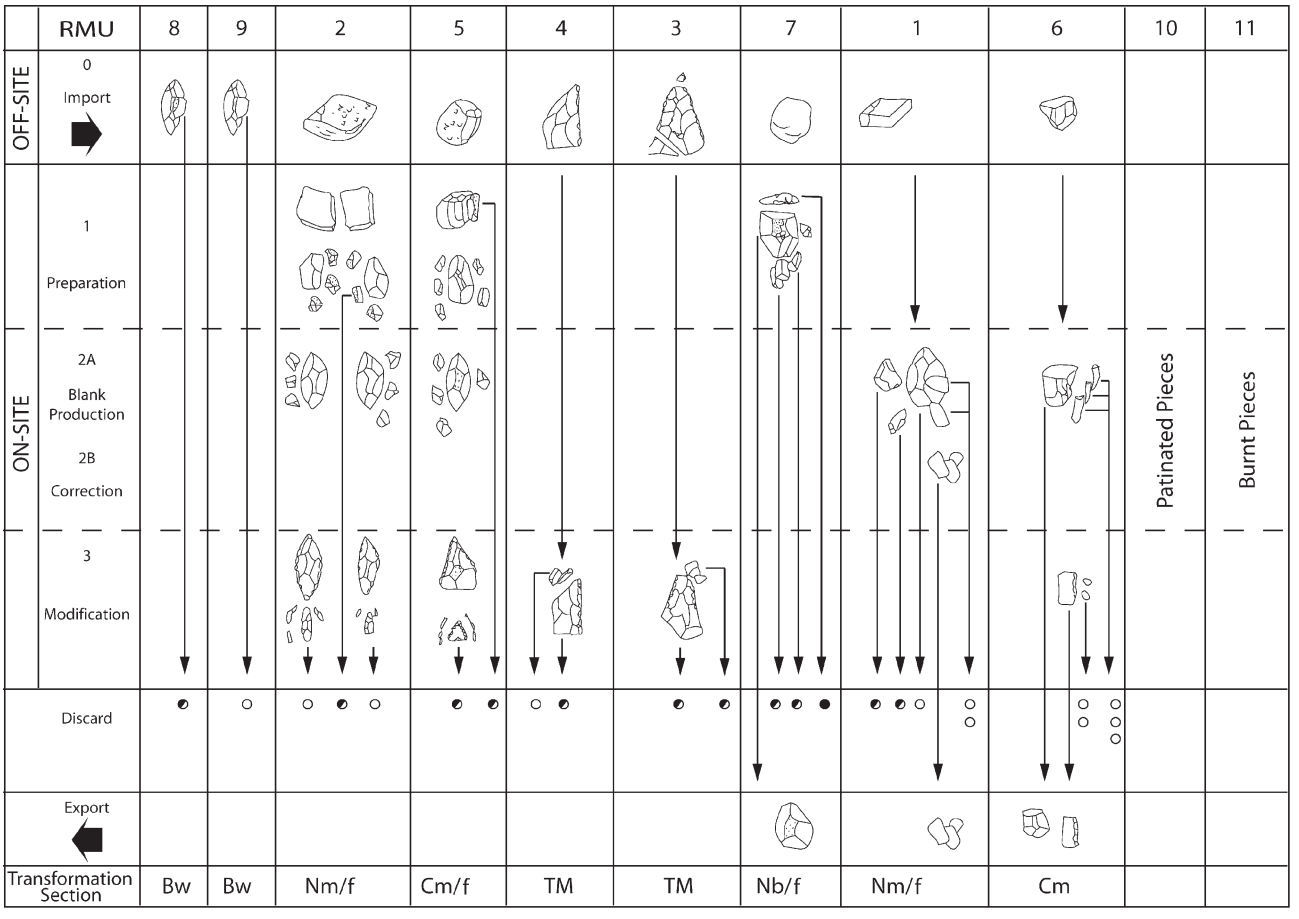

Fig. 9-13 Kabazi II, level V/3: Flow chart of the results of the transformation analysis. For every raw material unit, the part of the *chaîne opératoire* reconstructed with the help of the discarded artefacts (transformation section) is depicted as conducted within the excavated area. Import and export refer to phases of the lithic reduction which left no traces among the lithic discard, or to artefacts missing in between the transformation section (abbreviations of classes of transformation sections are explained in Fig. 9-12, steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

	import	on-site discard	export
simple blank	1		
simple tool			
surface shaped tool	2	5	1
preform or core	1	24	2
surface shaped blank	1		1
raw piece	4		
sum	**9**	**29**	**4**

Table 9-3 Kabazi II, Unit V, Level 3: summary of pieces that, according to transformation analysis, were imported into discarded in and exported from the excavated area.

While the first scenario sees Neanderthals as humans who carefully coordinated their activities on the basis of a mental map that had stored the spatial and temporal availability of key resources, the second scenario is consistent with a view on Neanderthals as humans that merely acted in a simple stimulus-and-response modus: only broadly prepared for a wide range of possible future activities, they were not equipped with curated tools or raw material reserves. Instead, they were searching for basically known resources in unknown territories, and did not store information about past successful attempts that would have helped to minimise future efforts. In the case of Kabazi II, Level V/3, Neanderthals were manufacturing surface shaped performs at the outcrop in the Bodrak valley. The

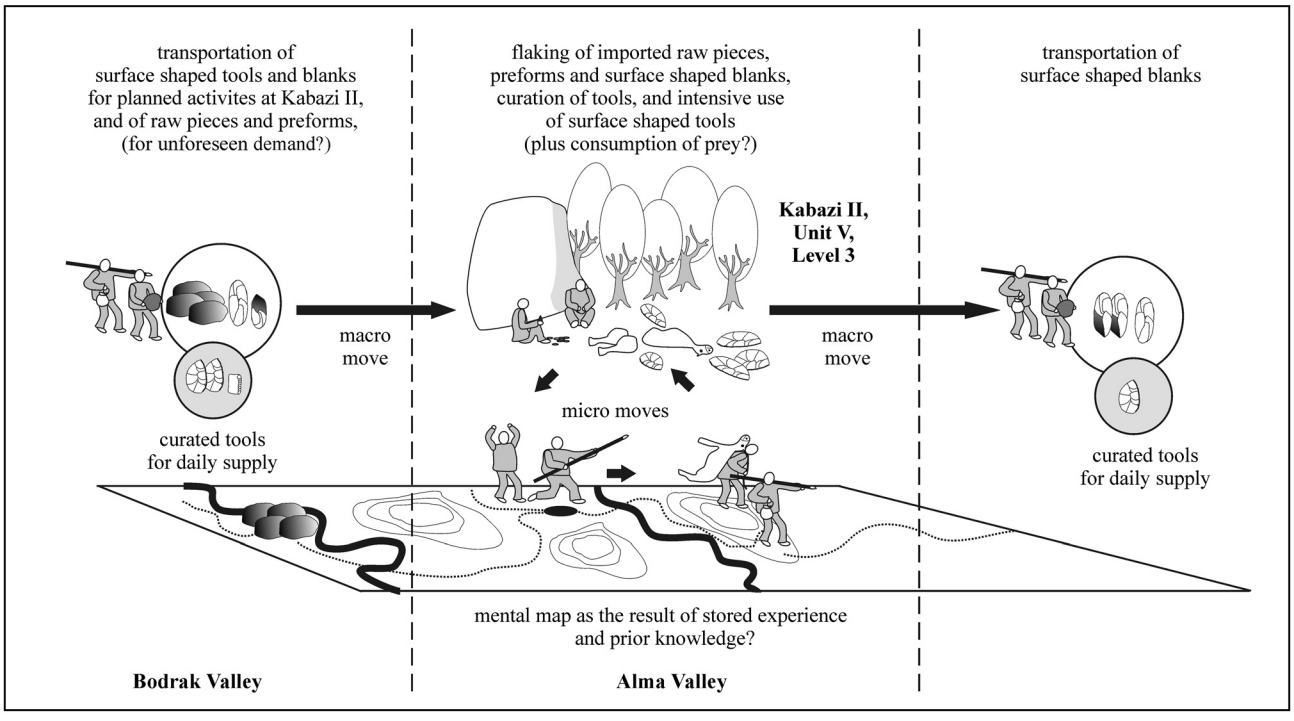

Fig. 9-14 Kabazi II, level V/3: Hypothetical reconstruction of moves. It is assumed that the artefacts discarded represent a single occupation that was excavated more or less completely. Therefore, it is expected that incomplete *châines opératoires* on the level of raw material units are the result of moves: some might have been left at previous camps or transported to future camps (macro moves), while others might have been taken to contemporaneous sites (micro moves).

high amount of cortex discarded in level V/3 certainly has to do with the short distance from the raw material outcrop, but at the same time suggests that raw nodules were produced exclusively for the stay at Kabazi II, rather than dedicated to subsequent use at several sites in the past. The latter mode would have resulted in a much lower amount of cortex. It follows that the results of the transformation analysis show a basic "gearing up" of equipment and raw material supply for periods in the near future (Fig. 9-14). So far, all archaeological levels from Kabazi II which have been investigated in regard of their faunal remains are from archaeological Units II and III. They are dominated by small Equides (*Equus hydruntinus*) that were killed nearby, transported to the site and butchered behind the lime stone rock (Patou-Mathis 1999; Patou-Mathis & Chabai 2003). As a rule, meat bearing parts were taken to other places. After first analysis, it is most probable that also during the last interglacial Neanderthals came to Kabazi Mountain to hunt *Equus hydruntinus* in the valley of the Alma River (Patou-Mathis, Chapter 5, this volume). In contrast to archaeological units that date to the interpleniglacial of the last glaciation (OIS 3), only single individuals or small numbers of animals were killed. This might be explained by a different pattern of land use, and / or with smaller group sizes of Neanderthal humans. While it has been suggested for Unit II that equids were killed by chasing them over the cliff of the questa above Kabazi II, the few *Equus hydruntinus* found in level V/3 might have been killed at the valley bottom. Especially during dry periods in summer, when this species needed daily water supply, it was most promising to lie in wait near the river. In preparation for the hunting and butchering, the Neanderthal humans carried with them specific lithic resources (e.g. the bifacial tools and preforms) for anticipated situations, and unspecific lithic resources (e.g. raw nodules) that most probably had the function of a raw material stock for unexpected situations (at Kabazi II), or, more likely, for future activities (Fig. 9-14). Perhaps they already knew that their moves would lead them to other regions in the second chain of the Crimean Mountains – and not back to the Bodrak valley where the transformation of raw material started.

Abstract

ГЛУБОКОЕ ПЛАНИРОВАНИЕ ИЛИ ПРОТИВОСТОЯНИЕ НЕВЕДОМОМУ? ТРАНСФОРМАЦИЯ КРЕМНЕВОГО СЫРЬЯ НА ПОСЕЛЕНИИ КАБАЗИ II, ГОРИЗОНТ V/3

Т. УТМАЙЕР

На поселении горизонта V/3 был исследован очаг, который, судя по всему, был центром стоянки. Общее количество обнаруженных артефактов невелико – 72 изделия. Технология обработки кремневого сырья базируется на плоско-выпуклом двустороннем расщеплении. Микокский орудийный набор представлен двусторонними листовидными формами и скреблами с обушками. Настоящий анализ артефактов был проведен в два этапа:

1. распределение артефактов по сырьевым группам;

2. анализ трансформации артефактов в каждой из групп.

Второй этап предполагает выводы о том, какая часть производственной цепи связана с территорией поселения, какие возможные операции были проделаны с артефактами до и после того как они аккумулировались в отложениях данного горизонта.
Кремневое сырье, обнаруженное в горизонте V/3, изначально было собрано на месте его вторичного залегания, скорее всего, в долине реки Бодрак. Трансформационным анализом на основании оставшихся на территории стоянки артефактов была установлена следующая цепь их утилизации:

1. на стоянке были использованы и оставлены импортированные двусторонние орудия;

2. на стоянке были изготовлены, использованы и оставлены двусторонние орудия из импортированных кремневых желваков;

3. на стоянке производилась обработка преформ, которые были импортированы в виде фрагментов сырья с уже снятой желвачной коркой.

Часть, приготовленных на стоянке преформ и двусторонних орудий, не была обнаружена. Хотя, на основании трансформационного анализа можно утверждать, что они были произведены или переоформлены на территории стоянки. Следовательно, остается предположить, что данное поселение посетила группа неандертальцев, которой был принесен набор двусторонних орудий для разделки охотничьей добычи, а также запас сырья для планируемых в будущем операций или для непредвиденных обстоятельств.

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Vol. 1

KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Chapter
10

Kabazi II, Unit V, Lower Levels: Lithics from the Pocket

Jürgen Richter

Level V/4: Mixed Equilibrium and Primary Butchering

The small assemblage contains only 40 artefacts, 27 of which can be attributed to 5 raw material units (plus an unclassified unit RMU 6; - note: unit RMU 3 has been omitted). Most of the artefacts were recovered from the north-western part of the excavated area (Fig. 10-1). Compared with small assemblage size, three of the workpieces were quite large (Fig. 10-2). Raw material procurement would appear to have been quite random (Fig. 10-3; 10-4).

Raw material unit imported and discarded as a single object (1)

Only one fragment of a large flake with some retouch on the lower face was introduced as a single object and then discarded (Fig. 10-5, RMU 7).

Workpiece used as a single object, but modified on-site (1)

A large bifacial tool or a partially decorticated preform was brought in to be broken into three parts. One fragment was discarded, the other two fragments were transformed into bifacial tools, one leaf-shaped scraper and one bifacial knife. Both were used, repeatedly retouched and discarded (Fig. 10-5, RMU 1). Thus, RMU 1 was completely consumed on site, and within a very small area of less than one square metre (Fig. 10-1, squares Λ6-Λ7 and K6-K7).

Workpieces imported as raw nodules (1)

One raw material unit (Fig. 10-5, RMU 2) displays a complete transformational sequence. A thick slab was imported and formatted by breakage. Whilst one of the chunks was discarded, the other was used to produce a preform, as is indicated by some cortical flakes. The preform received some surface shaping (as a bifacial tool) and some retouch to its edges, probably during on-site use. The bifacial tool was exported from the site.

Workpieces imported as cores (2)

A preform (or a large bifacial tool?) was introduced and received some surface shaping, probably because some flakes were needed for cutting (Fig. 10-5, RMU 5). The flakes were used and discarded. As the basal parts of these flakes show no traces of any edge retouch, it is more likely that they were taken from an (unretouched) bifacial preform rather than from a finished bifacial tool. The preform was exported from the site.

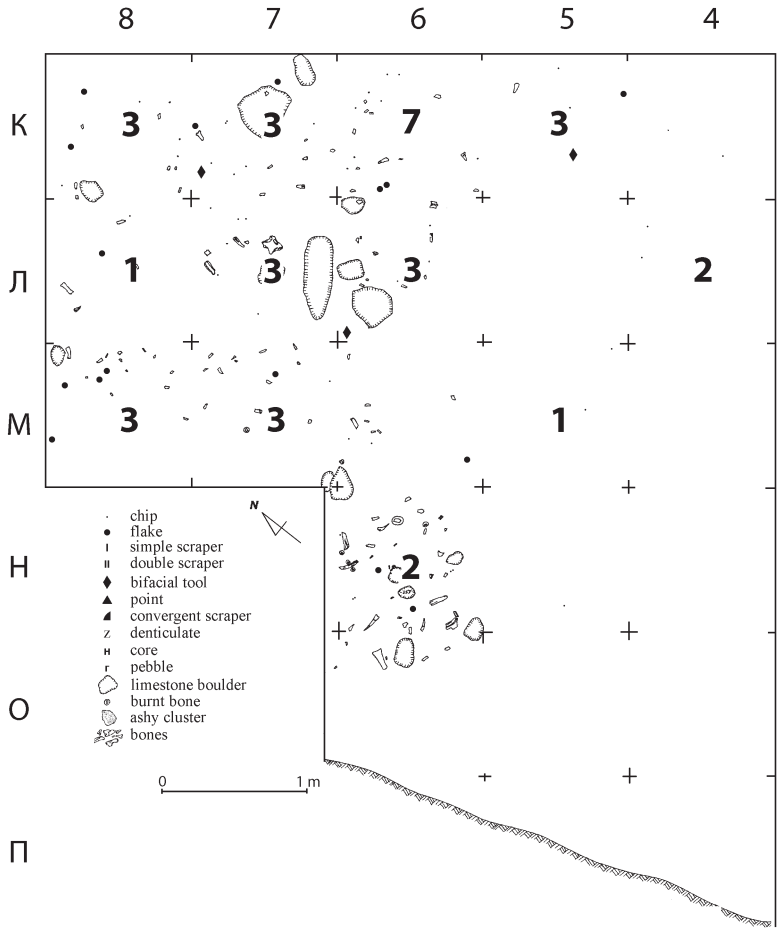

Fig. 10-1 Kabazi II, level V/4: artefact distribution (pieces > 2cm).

A core was brought into the site (Fig. 10-5, RMU 4). Some chips indicate preparation of a striking platform. A preferential flake was taken from the core, used for cutting (?) and discarded. Afterwards, the exploitation surface was rejuvenated by an *éclat debordant* which was discarded. The core was then exported. Both examples of this class show "migrating cores". In the first case, the bifacial preform is regarded as being equivalent of a core.

Conclusion: equilibrium of functions

The level V/4 assemblage indicates one (or more?) short stay(s), probably for primary butchering, within a circulating land-use pattern consisting of very similar, short stays. Raw material units focused on consumption (RMU 1, RMU 7, RMU 2), on exportation (RMU 4, RMU 5) and on production (RMU 2) display an equilibrium of functions which neither decreased nor enlarged the lithic budget of the small human group.

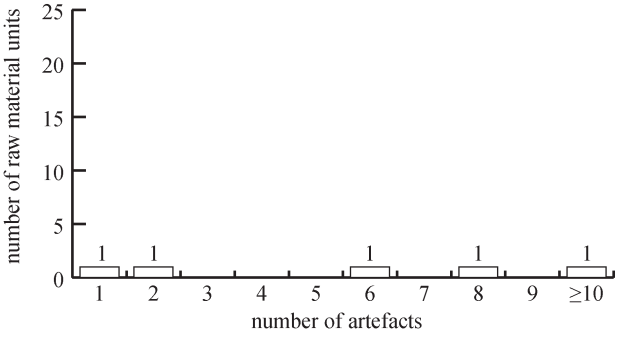

Fig. 10-2 Kabazi II, level V/4: number of artefacts per workpiece.

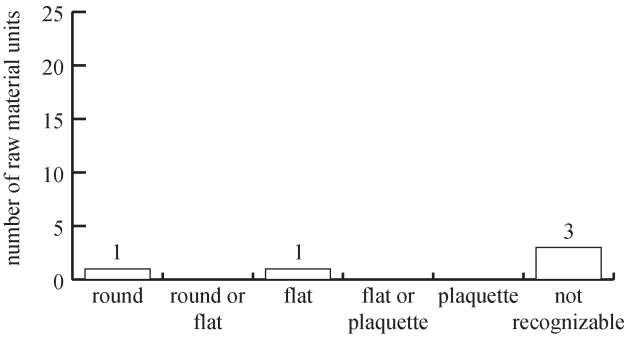

Fig. 10-3 Kabazi II, level V/4: shapes of nodules.

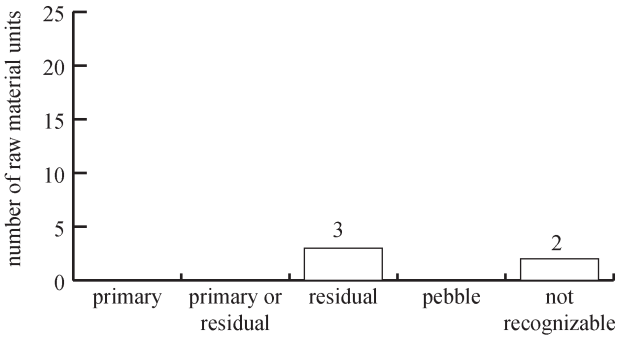

Fig. 10-4 Kabazi II, level V/4: nature of raw materials.

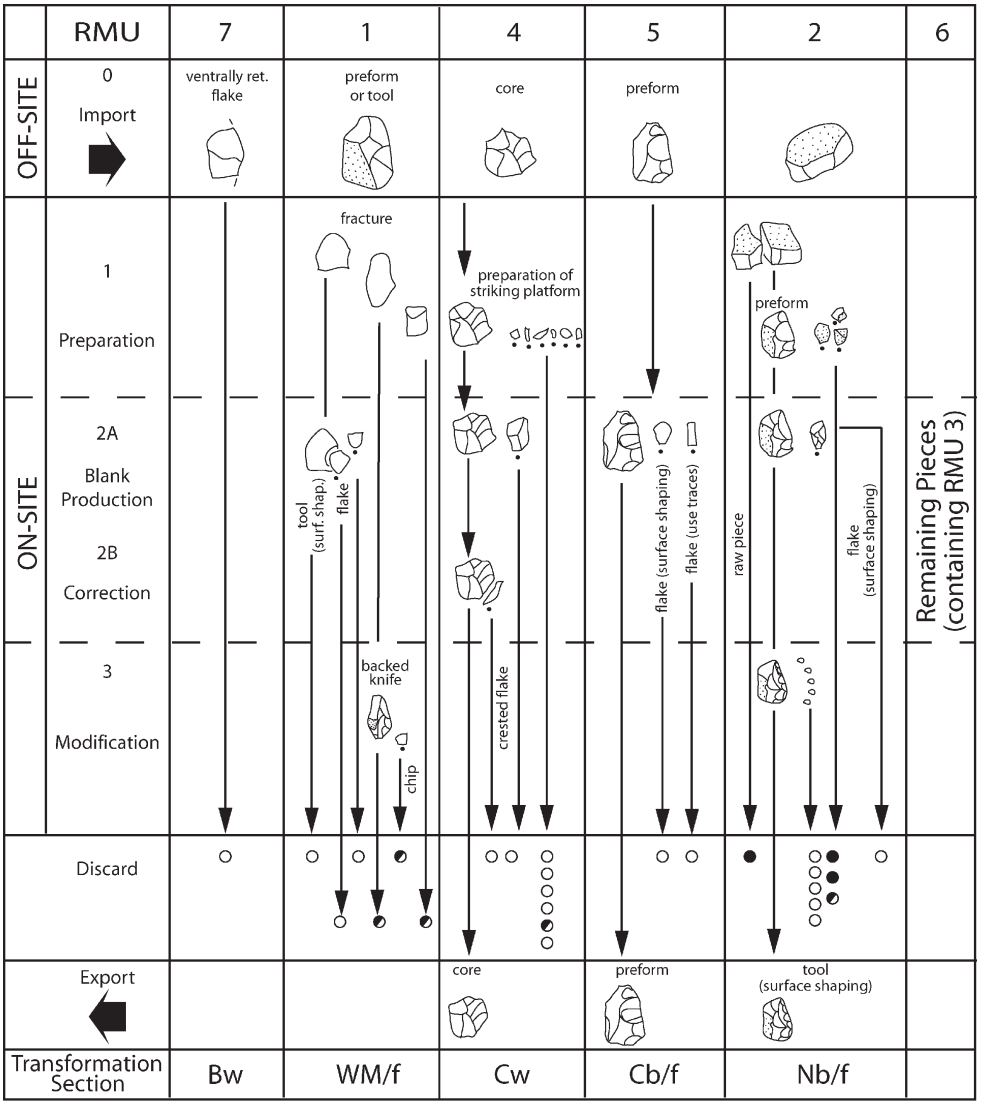

Fig. 10-5 Kabazi II, level V/4: transformation sections of workpieces. Bw = blank without debitage or modification; TM = formal tool with debris of modification; Cw = core without debitage; Cb = blank production from a core; Nb = blank production from a raw nodule; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Level V/5: Only Consumption

The assemblage consists of 11 raw material units (plus one unclassified unit of burnt pieces and one unclassified unit of patinated pieces). A number of 69 artefacts was recovered from this level (Fig. 10-6), 22 of them classified by raw material (Fig. 10-7, 10-8), raw material procurement being quite random (Fig. 10-9).

Raw material units imported and discarded as single flake or tool (3)

Two flakes appear to have been imported as single objects (Fig. 10-10, RMU 2, RMU 8), one of them is however debatable, it being a cortex flake with no sharp edges. On the other hand, the other might have been imported for cutting activities. One side-scraper was brought in, either as a fragment which was then used and discarded, or as a whole piece which broke during use, one piece to be discarded, the other to be exported (RMU 13).

Workpieces imported as single flake/tool, but modified on-site (3)

A double side-scraper was brought to the site and experienced heavy usage leading to a fracture of the distal part into several pieces. These pieces were all discarded (Fig. 10-10, RMU 10), although some fragments are still unaccounted for. A bifacial scraper was brought in, used, rejuvenated and discarded (RMU 12). A large bifacial point was broken and the tip discarded (RMU 9). The basal part was resharpened for export.

	8	7	6	5	4
К	3	1	1	1	1
Л		2	1	1	3
М			1	2	1
Н			2	3	1
О			1		
П					

Fig. 10-6 Kabazi II, level V/5: artefact distribution (pieces > 2cm).

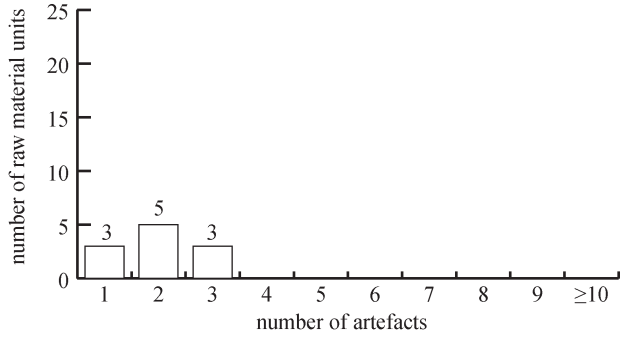

Fig. 10-7 Kabazi II, level V/5: number of artefacts per workpiece.

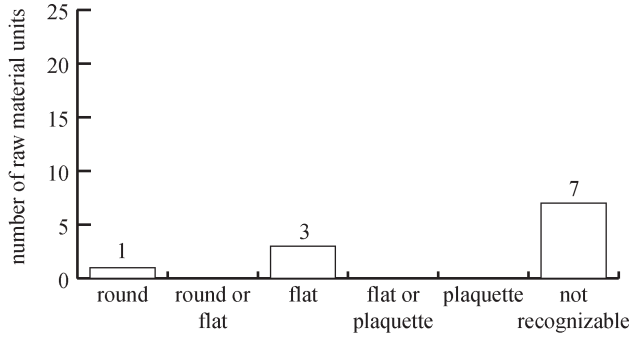

Fig. 10-8 Kabazi II, level V/5: shapes of nodules.

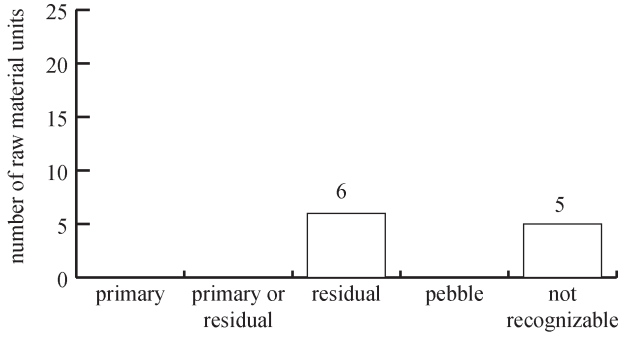

Fig. 10-9 Kabazi II, level V/5: nature of raw materials.

Workpieces imported as raw nodules (3)

A large flint slab was collected, decorticated and transformed into a preform which was immediately discarded (Fig. 10-10, RMU 11) together with a number of cortex flakes. Additional flakes must have been exported. From a similar slab (RMU 6), a preform was produced to be exported. One of the larger decortication flakes was secondarily transformed into a small bifacial tool which was used and discarded on the site.

A small nodule (RMU 3) was decorticated to form a core in order to produce flakes which were immediately used and discarded. The core was removed from the site.

Workpieces imported as cores (2)

Two bifacial tools or preforms were imported, and a number of flakes removed from them. The resulting tools/preforms were again exported (Fig. 10-10, RMU 1, RMU 4). Both pieces have to be regarded as being equivalent of "migrating cores", kept in someone's pocket for occasional flake production.

Conclusion: butchering of a single *Equus hydruntinus?*

The assemblage is characteristic of many small activities. These would appear to have been mostly carried out by work pieces imported from earlier short stays elsewhere. These included either single tools

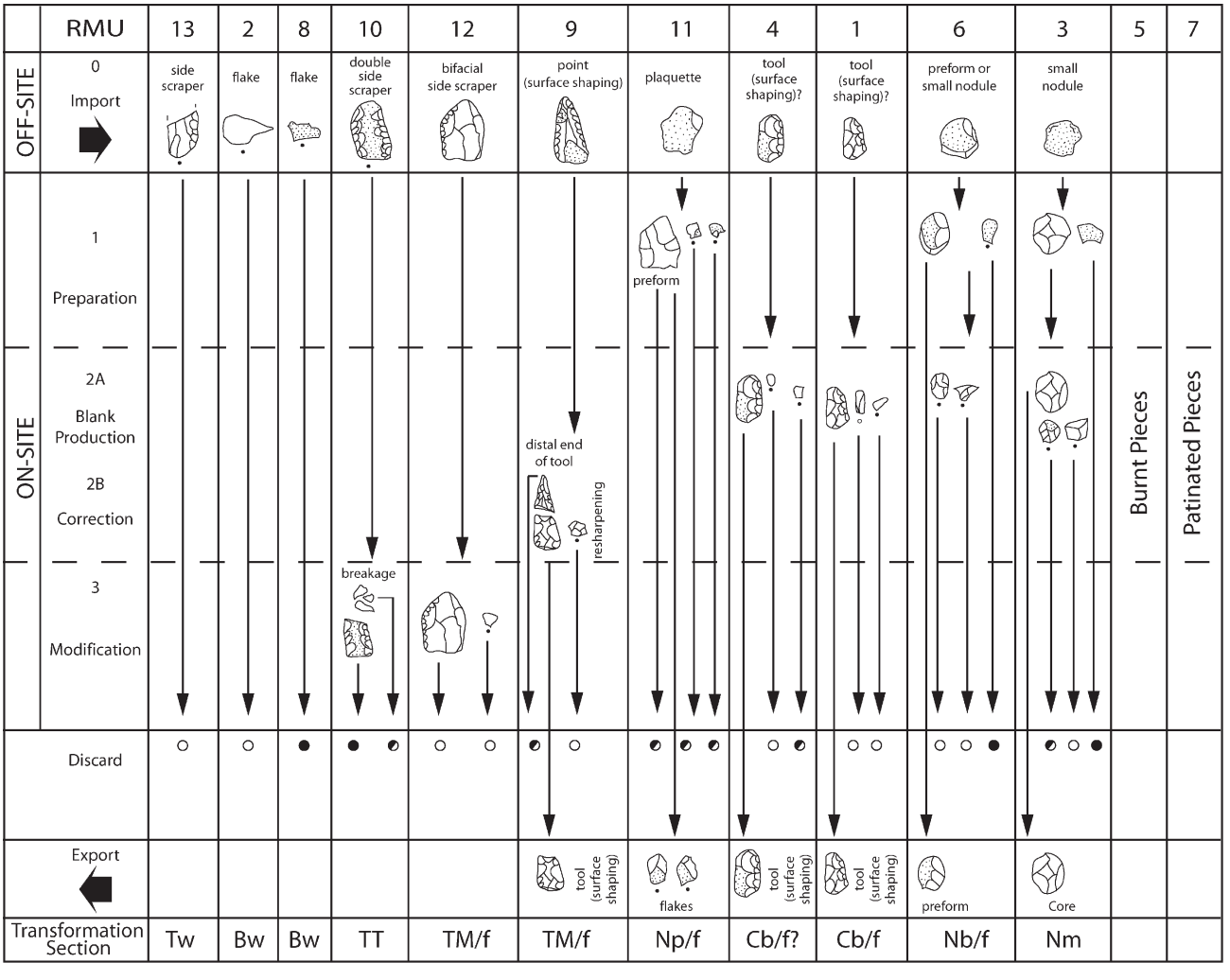

Fig. 10-10 Kabazi II, level V/5: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; TT = fragments of a formal tool, used as a single object; Np = preparation of a raw nodule; Cb = blank production from a core; Nb = blank production from a raw nodule; Cm = blank production from a core with modification of blanks; Nm = blank production from a nodule with modification of blanks; /f = bifacial production or surface shaping (steps of the formal chaîne opératoire after Geneste 1985; 1988; 1990).

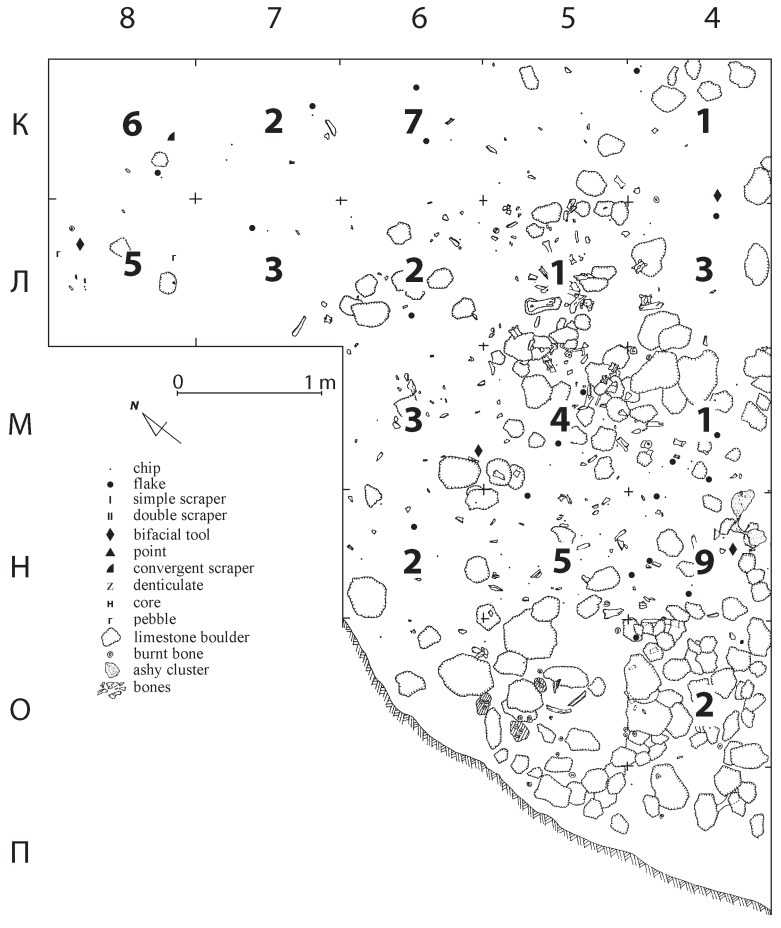

Fig. 10-11 Kabazi II, level V/6: artefact distribution (pieces > 2cm).

or blanks, or very small raw material pieces (obviously "from someone's pocket"). Scrapers represent the most often consumed tool type. The assemblage is suggestive of a site function connected with one short stay within a circulating land-use pattern. The occupation saw the final stage (6 out of 11 cases) or the intermediate stage (3 out of 11) of the transformational biographies of individual workpieces. The production events which have been identified (RMU 3, RMU 6, RMU 11) are of limited scale and were devoted exclusively to the demands encountered at the site. No later demand was anticipated for future visits to other sites. Production for export is totally lacking. By contrast, the assemblage reflects a decrease in the lithic budget at the peoples' disposal, in favour of extraction or maintenance activities. Might this assemblage represent butchering and hide preparation (scrapers!) of a single *Equus hydruntinus*?

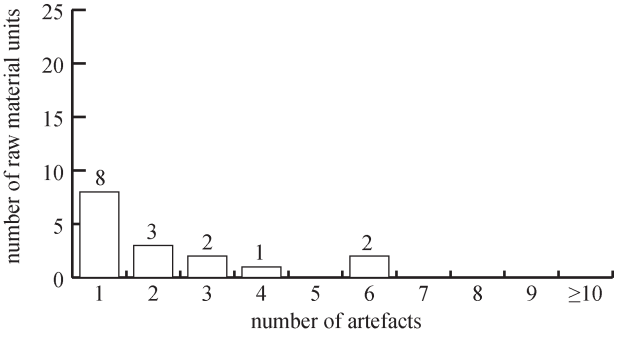

Fig. 10-12 Kabazi II, level V/6: number of artefacts per workpiece.

Level V/6: "Pocket" Tools and Cores

Level V/6 (Fig. 10-11) yielded 103 artefacts, of which 36 are attributable to individual raw material units. The assemblage contains a total 16 raw material units. The units RMU 11, RMU 12, RMU 13 and RMU 16 have been omitted, these being single objects which turned out to be not clearly distinguishable from the other classified groups. Unit RMU 17 contains unclassified pieces only. The number of artefacts per unit is generally very low (Fig. 10-12), raw material procurement, however, being not always incidental, sometimes focused on flat nodules from primary sources (Fig. 10-13, 10-14).

Raw material units imported and discarded as single objects (5)

The imported single tools and blanks fulfilled scraping (Fig. 10-15, RMU 18, RMU 20, RMU 21) as well as cutting functions (Fig. 10-15, RMU 10, RMU 14). One of the scrapers received an additional, burin-like treatment (Fig. 10-16, *11*).

Raw material unit imported as single object, but modified on-site (1)

One bifacial point was brought in, used and resharpened by a lateral sharpening spall ("Prondnik spall"), this resulted in the production of the exported tool (Fig. 10-15, RMU 19; see also Fig. 10-16, *10*).

Workpieces imported as raw nodules (1)

A thick cortical flake was, as an exception to the rule, classified within the "Preparation of a nodule" category, as it is improbable that it was imported as a single flake. It is more likely that a nodule was initially corticated and only then exported (Fig. 10-15, RMU 15).

Workpieces imported as cores (9)

A preform (Fig. 10-15, RMU 22) was brought in and immediately discarded, probably because of a problem in the distal part of the piece (Fig. 10-16, *12*). All the other raw material units of the assemblage also belong to this class. In all these cases, cores had been imported, some flakes had been removed (Fig. 10-16, *1-9*), and the cores exported. Thus, the assemblage attests for eight "migrating cores", one of them being a bifacial preform, in this case used as an equivalent of a core (RMU 5).

Conclusion: an executive inventory

The level 6 assemblage is indicative of short-term consumption during one stay within a circulating land-use pattern. All larger raw material units are represented within an intermediate stage of their biography as transformational sequences, and the smaller units and single objects within a final stage. There are no clues as to the nature of raw material procurement or to the planned production for future demands. With the exception of RMU 15, a nodule which was not used, no raw nodules were brought to the site. In this respect, the assemblage is of a unique character. The activities on the site, at the time of level 6, were all results of earlier planning. The whole lithic assemblage might even derive from the "pockets" of the occupants. The assemblage may be labelled as an "executive inventory" without any additional investment for future activities. The lithic budget is decreased.

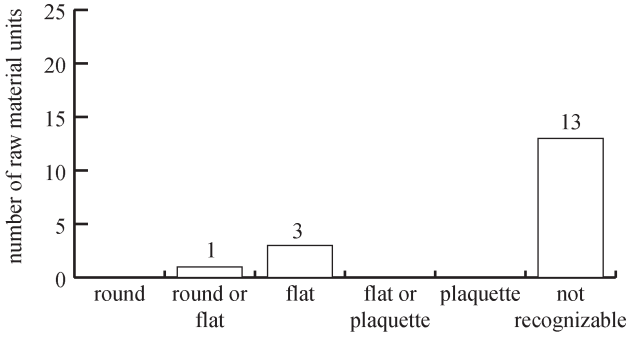

Fig. 10-13 Kabazi II, level V/6: shapes of nodules.

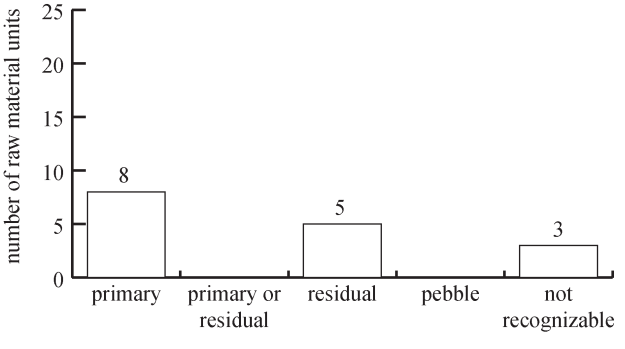

Fig. 10-14 Kabazi II, level V/6: nature of raw materials.

Results: Transformational Processes as Documented in the Lower Levels of Unit V

The lower levels of unit V delivered very small assemblages documenting very short occupations within a circular land use pattern without much planning for future demands. Consumption of lithics dominated over production. On the other hand, much of the lithic material came from the pockets of the people who were always prepared for certain activities and for the specific demand of tools connected with it. Thus, planning was not missing entirely, but, instead of anticipating a particular situation of demand, it aimed at random and unpredictable demands. A minimum of cores and tools was kept available for a whole range of different purposes. Although nodules were not acquired, with some exceptions in level V/6, from particular primary sources of raw materials, procurement was embedded in the general mobility pattern of the group. The unit V/4-6 occupations did not add much to the lithic budget of the group, and consumption was at the expense of earlier procurement.

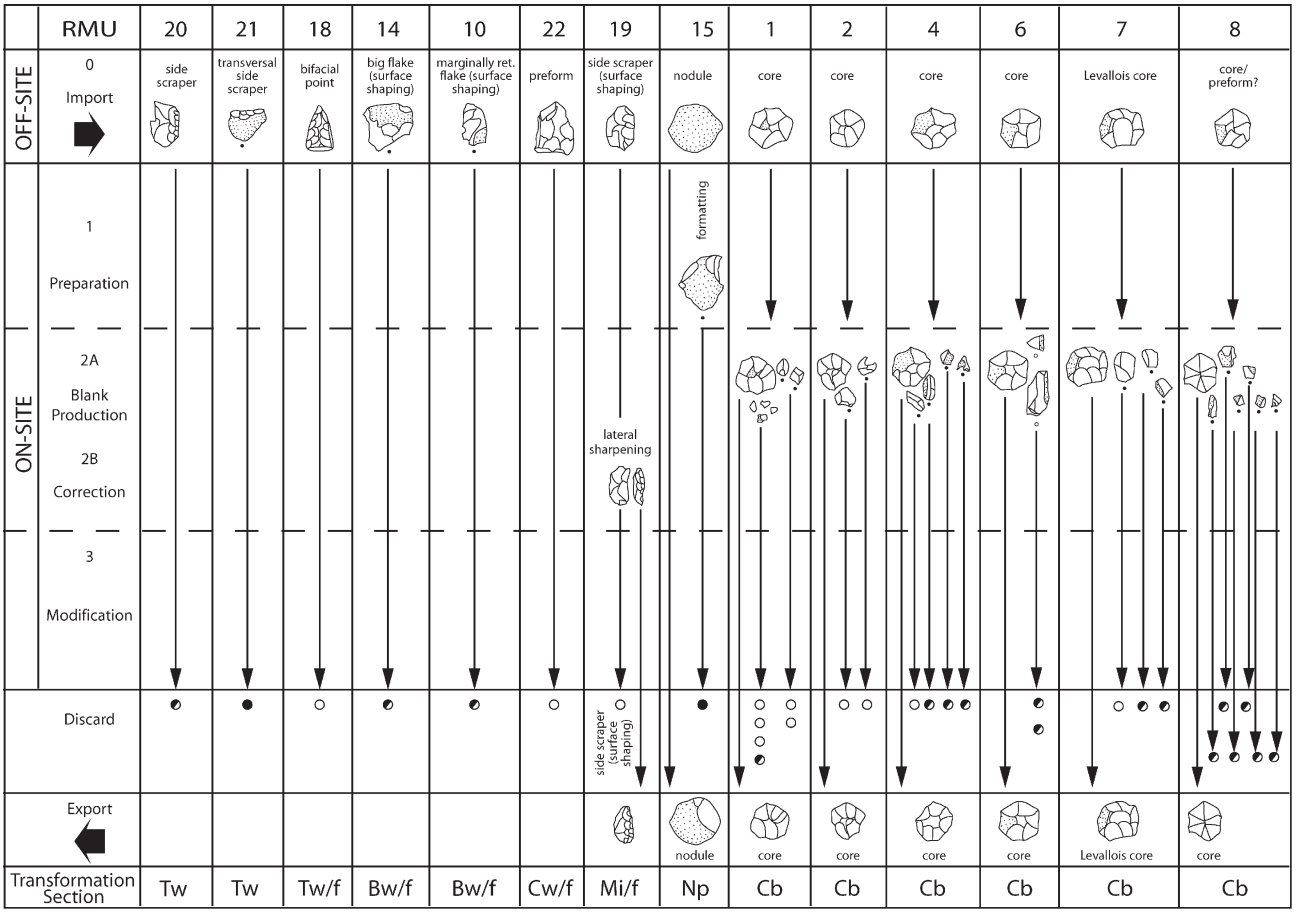

Fig. 10-15 Kabazi II, level V/6: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Cw = core without debitage; Mi = modification debris of a blank or tool, used as a single object; Np = preparation of a raw nodule; Cb = blank production from a core; Cm = blank production from a core with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

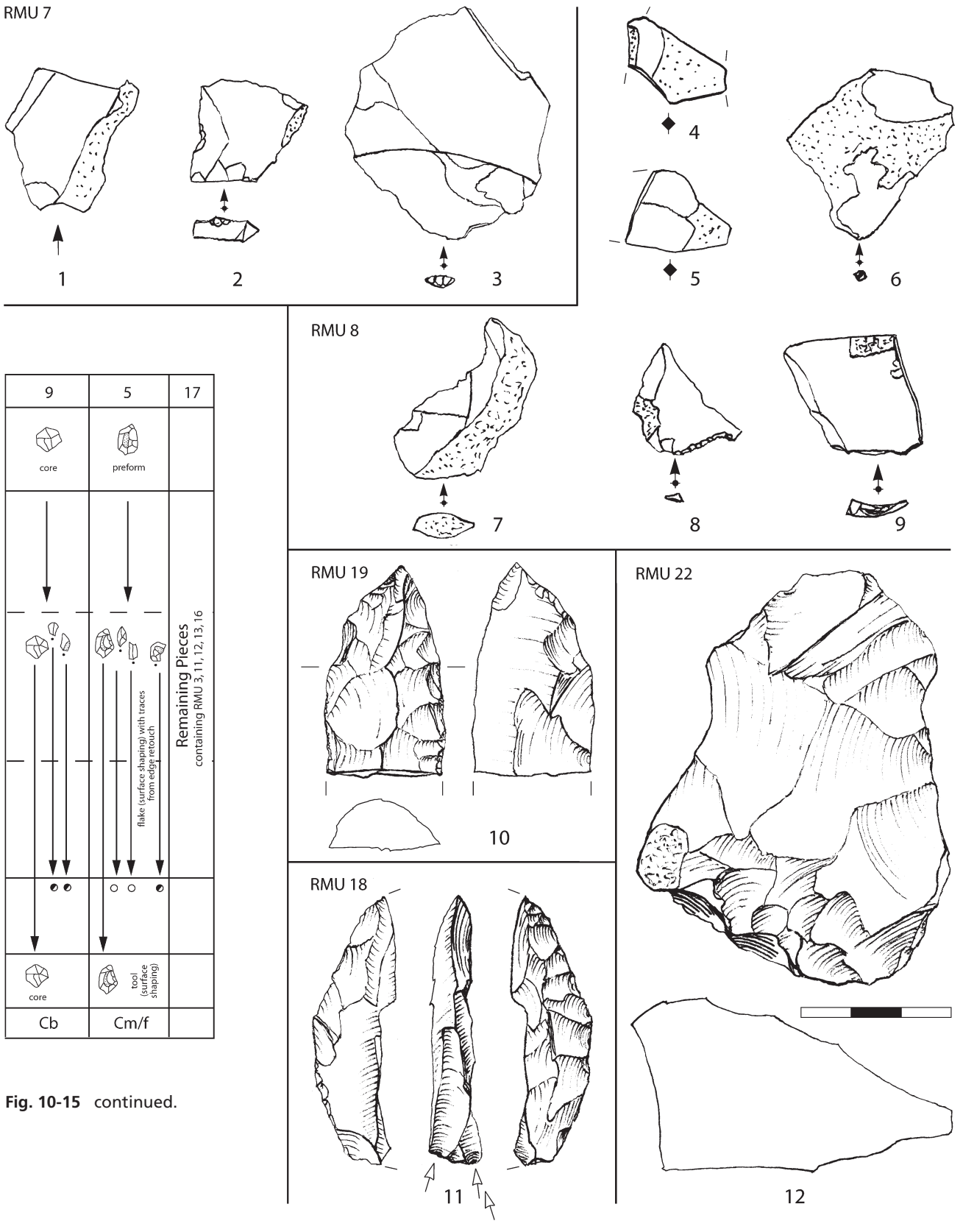

Fig. 10-15 continued.

Fig. 10-16 Kabazi II, level VI/6: selected workpieces.

Abstract

КАБАЗИ II, КУЛЬТУРНО-ХРОНОЛОГИЧЕСКИЙ СЛОЙ V, НИЖНИЕ ГОРИЗОНТЫ: АРТЕФАКТЫ ИЗ КАРМАНА

Ю. РИХТЕР

В нижних горизонтах пятого культурно-хронологического слоя было обнаружено незначительно количество артефактов, которые являются свидетельством очень кратковременного обитания в рамках циркулирующей модели освоения территории. В целом, данная модель не предусматривала особой глубины планирования относительно обеспечения будущих потребностей – утилизация артефактов преобладает над их производством. С другой стороны, основная часть кремневого материала была принесена на стоянку в "кармане". Следовательно, обитатели данных горизонтов каждый раз были подготовлены для определенной деятельности и имели при себе необходимый запас орудий. Таким образом, планирование не было изначально упущено, но вместо планирования предсказуемой деятельности, имело место планирование случайных непредвиденных ситуаций. Минимальное количество нуклеусов и орудий должно было обеспечить весь спектр непредвиденного. Жизнедеятельность на поселениях горизонтов V/4, V/5, V/6 не увеличила, а наоборот, истощила запасы артефактов и сырья групп гоминид. Вместе с тем, утилизация артефактов и сырья на этих поселениях стала возможной благодаря созданию и сохранению кремня в предшествующих посещению Кабази II хозяйственных эпизодах, что свидетельствует о наличии планирования, как составного элемента жизнеобеспечении данных групп неандертальцев.

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Vol. 1

KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
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Chapter 11

Consumption and Production: Transformational Processes in the Upper Levels of Kabazi II, Unit VI

Jürgen Richter

Level VI/1: Tool Consumption and Preparation of Prey

The assemblage of level VI/1 comprises 94 artefacts, 59 of which are assigned to 9 different raw material units. The artefact distribution map lacks any clear patterning (Fig. 11-1), and the work pieces would appear to represent a random collection (Fig. 11-3), mainly from secondary raw material sources (Fig. 11-4). The number of artefacts per raw material unit is very low (Fig. 11-2). The assemblage contains only five tools and 3 utilized pieces.

Workpieces were introduced to the site either as single objects or as cores or preforms.

Single objects (3)

Two flakes with sharp edges were imported and used as single objects (Fig. 11-5; RMU 5 and RMU 1, which is broken) as well as a bifacially worked point with scraping edges (RMU 12).

Imported tools modified on-site (2)

A bifacial tool was imported and then used and modified, and afterwards exported from the site (Fig. 11-5; RMU 3). RMU 10 reflects a similar situation, where a bifacial tool was imported, used, broken and discarded on site.

Workpieces imported as cores (1)

Only one example of a "migrating core" was attested: A core was imported, from which flakes were produced, one of them being modified to become a scraper which was then used and discarded, and the core again exported (Fig. 11-5; RMU 11).

Workpieces imported as preforms (2) and nodules (1)

In two cases, a preform was imported, from which a bifacial tool was produced, used and exported (Fig. 11-5; RMU 7 and RMU 8). In RMU 8, the bifacial tool was broken during use, a fragment was discarded on site, and the rest of the tool was recycled and exported. RMU 6 was a flat nodule or plaquette, also imported for bifacial production.

Conclusion: Consumption of lithics

Unit VI, level 1 delivered a lithic assemblage which was devoted to consumption at the site, scrapers and scraping being the most important activities. The assemblage seems to reflect a short-term occupation, or several short episodes. Only one RMU unit (RMU 6) was designed for production and export. In this single case, a raw piece was introduced to the site and a bifacial tool produced for export.

By contrast, 4 out of 8 RMU units reached their final stage at the site, 3 were "migrating" cores and preforms, and only one (RMU 6) contributed to the enlargement of the post-site raw material budget.

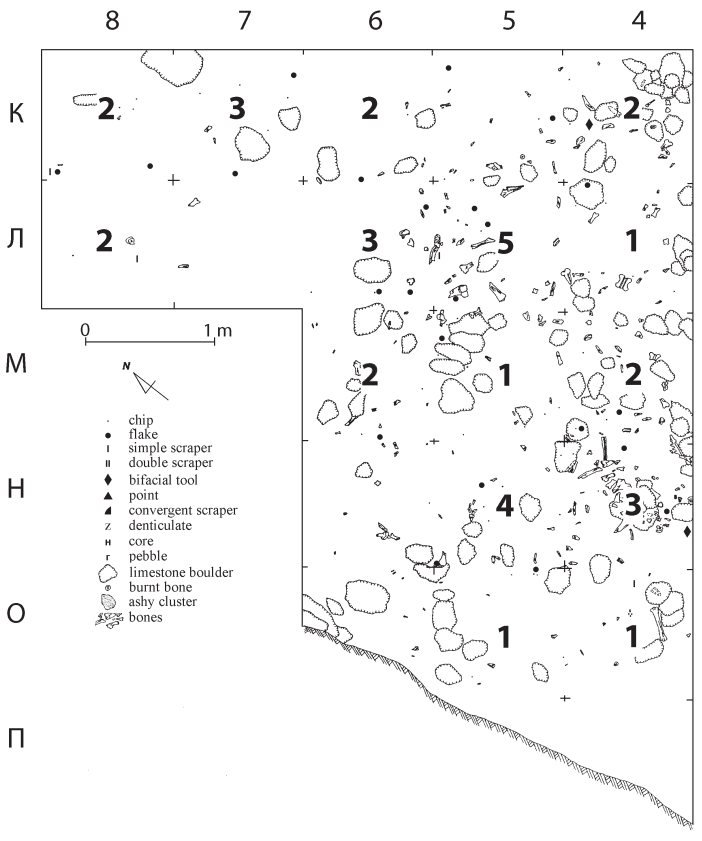


Fig. 11-1 Kabazi II, level VI/1: artefact distribution (pieces > 2cm).

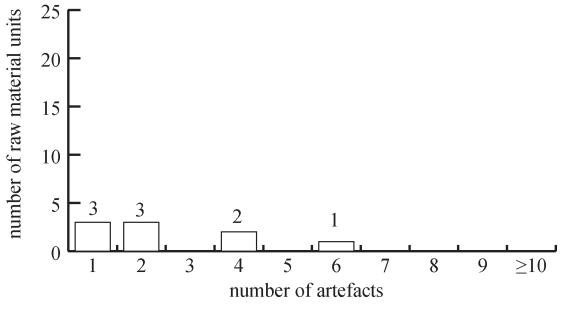


Fig. 11-2 Kabazi II, level VI/1: number of artefacts per workpiece.

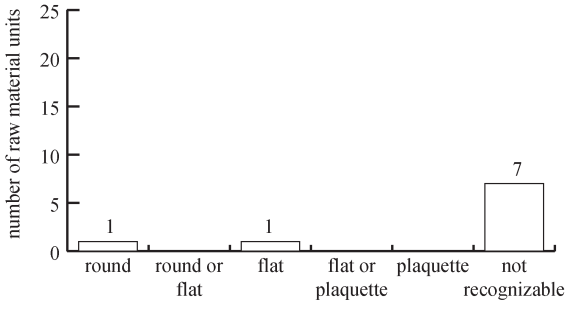


Fig. 11-3 Kabazi II, level VI/1: shapes of nodules.

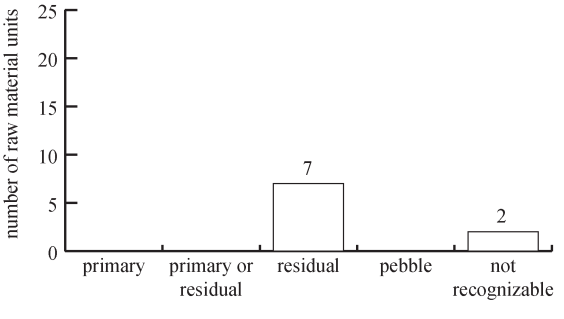


Fig. 11-4 Kabazi II, level VI/1: nature of raw materials.

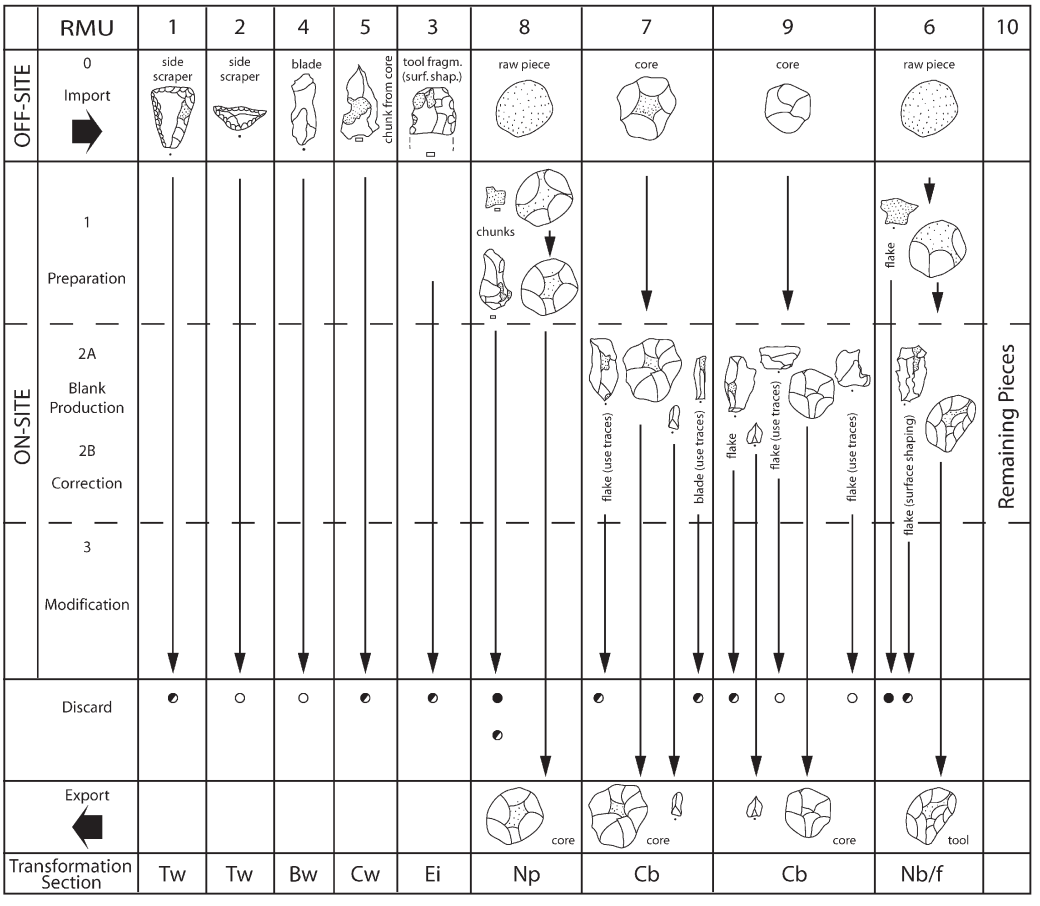


Fig. 11-5 Kabazi II, level VI/1: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; TT = fragments of a formal tool, used as a single object; Cb = blank production from a core; Nb = blank production from a raw nodule. Cm = blank production from a core with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Level VI/2: Consumption of Lithics for Scraping and Cutting

This assemblage consists of only 46 artefacts (Fig. 11-6), mainly chips. Of the larger pieces, 20 were assigned to 11 raw material units, thus each comprising only very few pieces (Fig. 11-7). As in level VI/1, raw material procurement occurred quite randomly (Fig. 11-8, 11-9). Contrasting level 1, some raw nodules were introduced to the site for initial exploitation (Fig. 11-10).

Single objects and imported tools (7)

Four raw material units were imported as single objects, used and discarded without further modification (RMU 4, 7, 12, 15), among them one bifacial point (RMU 7). In three cases, imported pieces consist of tools which were rejuvenated or modified (RMU 6, 5, 8). The imported pieces fulfilled scraping and cutting activities.

Workpiece imported as a preform (1)

One preform was imported (RMU 10) and transformed into a bifacial tool which was exported.

Imported raw nodules (3)

Three raw material units were brought into the site as nodules (RMU 1, 3, 16), one of them having immediately been discarded without any modification (RMU 16). RMU 3 was broken into several chunks, one of them discarded, and at least one other was decorticated and exported as a pre-core (decorticated nodule). RMU 1 was used to produce a bifacial tool which was used and discarded on site.

Conclusion: Consumption and limited production

The level VI/2 assemblage was, in 7 out of 11 cases,

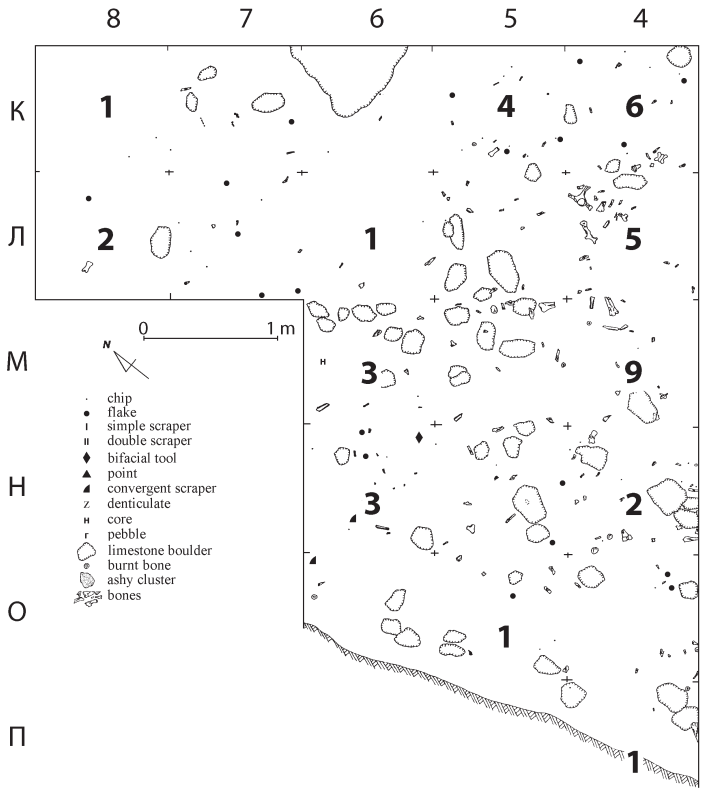


Fig. 11-6 Kabazi II, level VI/2: artefact distribution (pieces > 2cm).

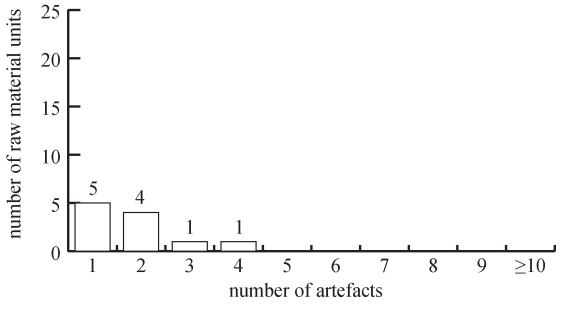


Fig. 11-7 Kabazi II, level VI/2: number of artefacts per workpiece.

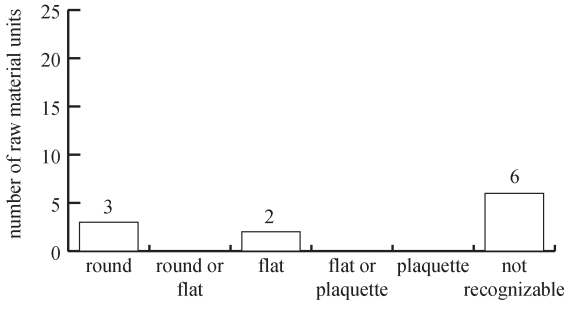


Fig. 11-8 Kabazi II, level VI/2: shapes of nodules.

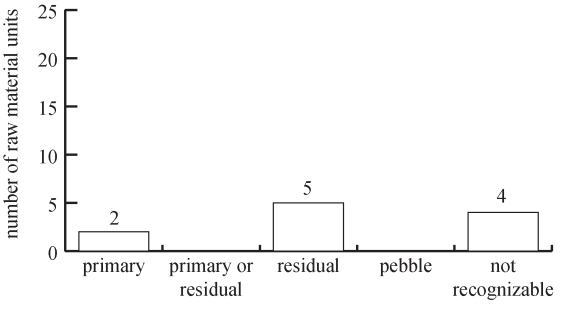


Fig. 11-9 Kabazi II, level VI/2: nature of raw materials.

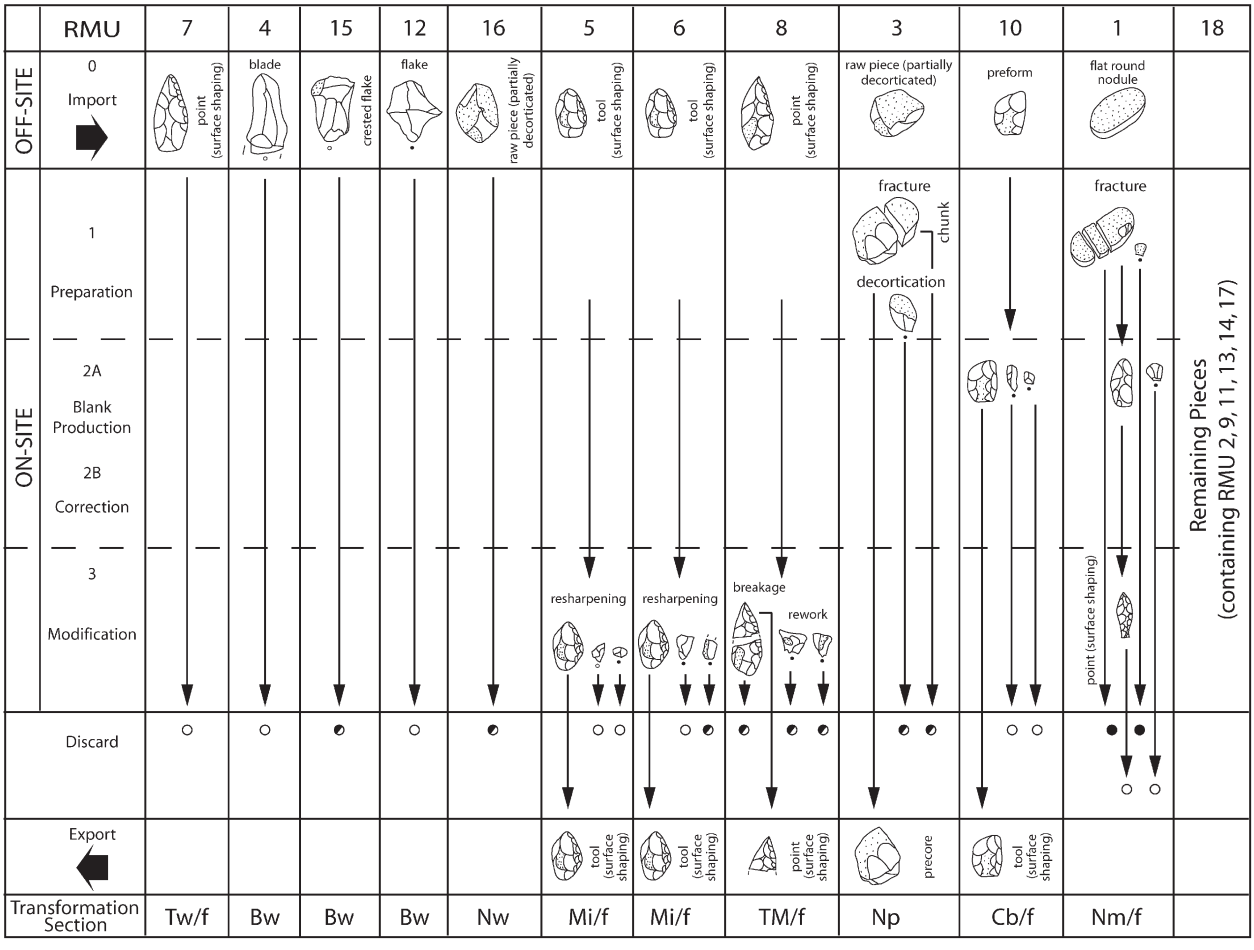


Fig. 11-10 Kabazi II, level VI/2: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Nw = nodule without debitage; Mi = modification debris of a blank or tool, used as a single object; TM = formal tool with debris of modification; Np = preparation of a raw nodule; Cb = blank production from a core; Cm = blank production from a core with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

focused on consumption of imported lithics. Mostly, imported tools were used or consumed and imported nodules were modified for immediate consumption. Only three artefacts were produced on site: One tool was discarded after use, and only one tool and one pre-core were exported.

Level VI/3: Consumption of Hunting Prey?

Of the 63 artefacts found in this level (Fig. 11-11), only 14 pieces were attributed to one of the 9 raw material units (Fig. 11-12). By some contrast to levels VI/1 and VI/2, they came from all kinds of sources except river beds (Fig. 11-13, 11-14).

Raw material units imported and used as single objects (5)

RMU units used as single objects (Fig. 11-15) are used predominantly for scraping activities. Among these, 3 display side-scraper working edges (RMU 1, 2, 3; Fig. 11-16), and another is a blade with a utilized edge (RMU 4). Only one unit is connected with flake production (fragment of a core, RMU 5; Fig. 11-16).

Workpieces imported as raw nodules (2)

Both imported raw material nodules were used for production and export (Fig. 11-15). From RMU 6, a bifacial tool was produced and exported, and a core was prepared from RMU 8 and taken from the site.

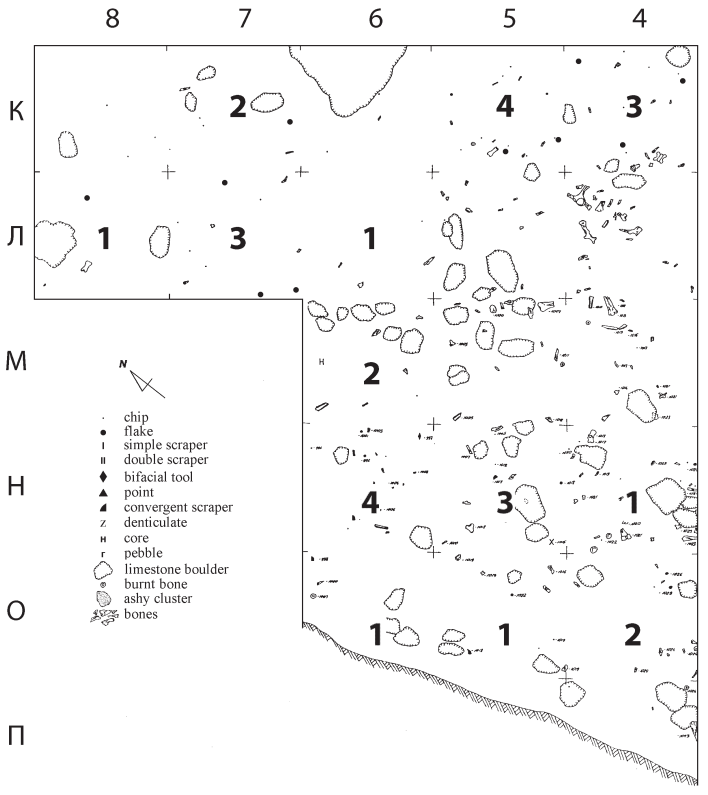


Fig. 11-11 Kabazi II, level VI/3: artefact distribution (pieces > 2cm).

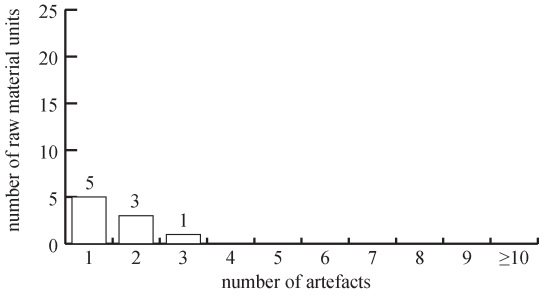


Fig. 11-12 Kabazi II, level VI/3: number of artefacts per workpiece.

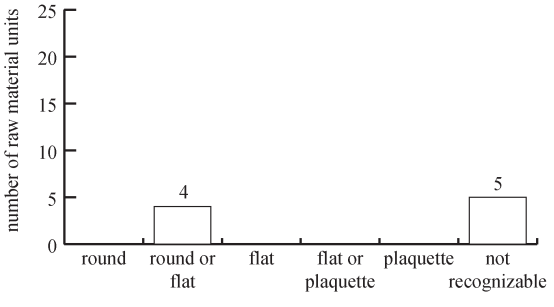


Fig. 11-13 Kabazi II, level VI/3: shapes of nodules.

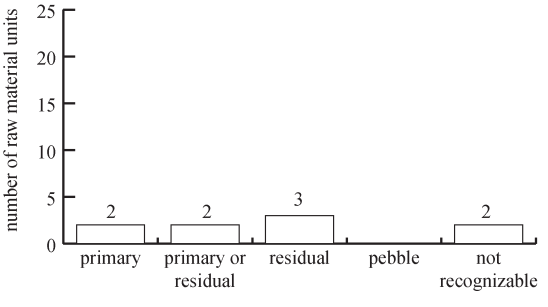


Fig. 11-14 Kabazi II, level VI/3: nature of raw materials.

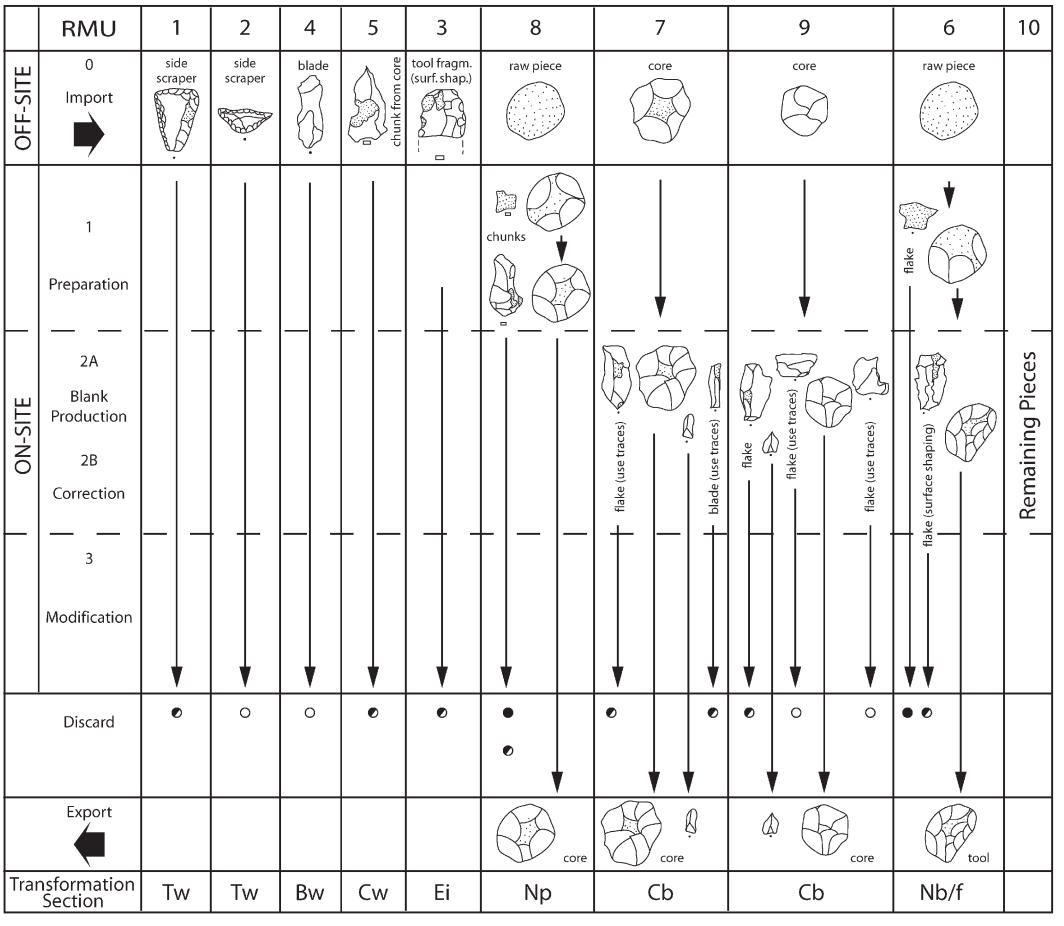


Fig. 11-15 Kabazi II, level VI/3: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Cw = core without debitage; Ei = end or tip of tool, isolated; Np = preparation of a raw nodule; Cb = blank production from a core; Nb = blank production from a raw nodule (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Workpieces imported as cores (2)

Both RMU units of this class represent "migrating cores" which were imported to the site, exploited to a certain degree, and then exported, together with some blanks. Flakes were produced from both cores, some of which were used and discarded on site (RMU 7, 9).

Conclusion

The assemblage of level VI/3 seems to be the result of a very short occupation. Some artefacts were used and discarded, and very limited production took place. Some flakes were made from "migrating cores", and only one core and one bifacial tool were added to the lithic inventory of the occupants.

Level VI/4: Bifacial Production from Preforms for Future Demand

Of the 52 artefacts from level VI/4 (Fig. 11-17), 35 larger pieces were assigned to 13 raw material units (Fig. 11-18). Only one raw material unit contained more than 4 pieces. The nodules used were flat or globular (Fig. 11-19) and came from primary and residual resources (Fig. 11-20). Tools were unstandardized or unfinished.

Raw material units used as single objects (4)

Two of the single objects (Fig. 11-21) were functional artefacts: one flake (RMU 8) and one bifacial point (RMU 5). Two single objects were connected with lithic production, such as an imported raw nodule (RMU 1) and a preform (RMU 3) which were both broken and immediately discarded.

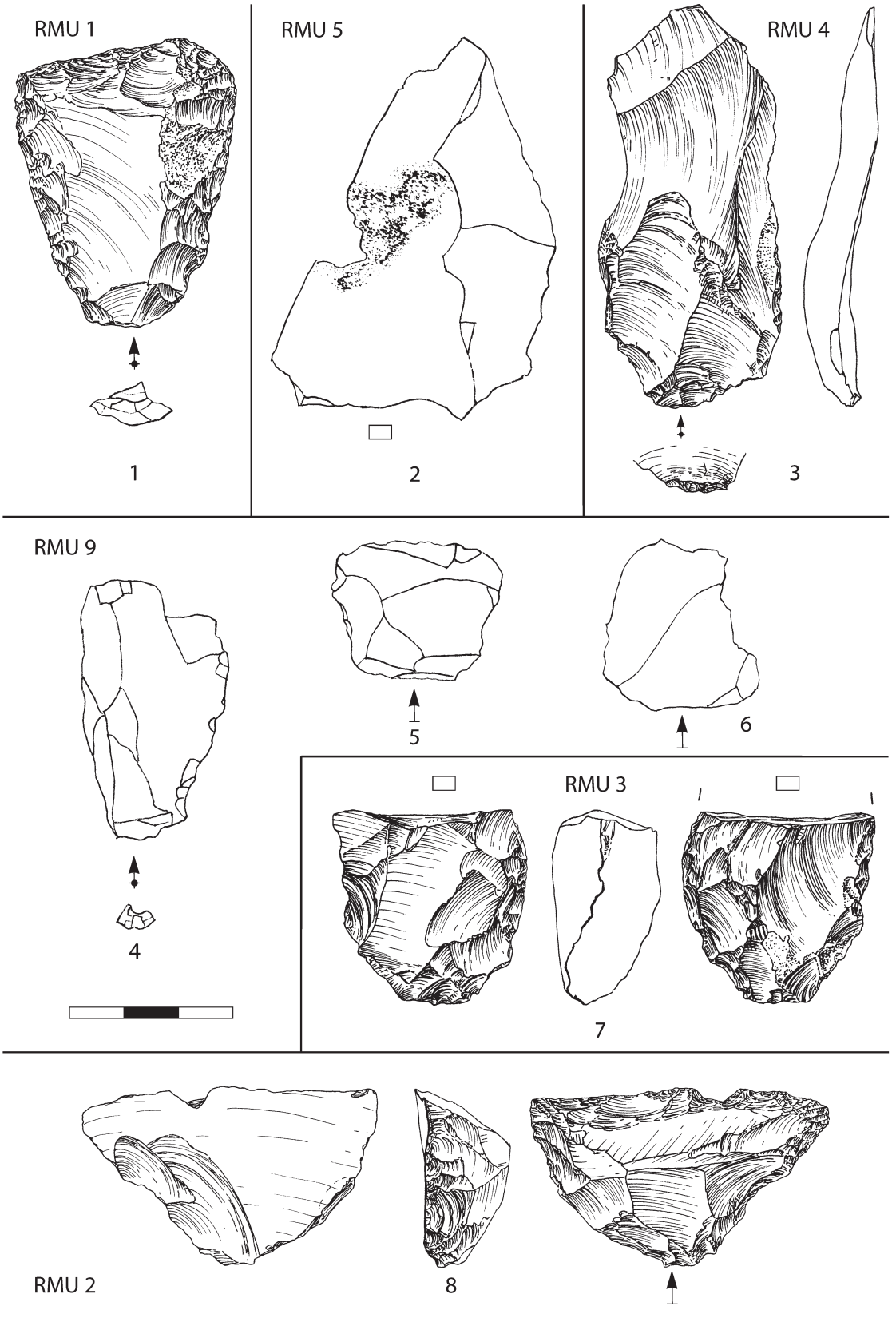


Fig. 11-16 Kabazi II, level VI/3: selected workpieces.

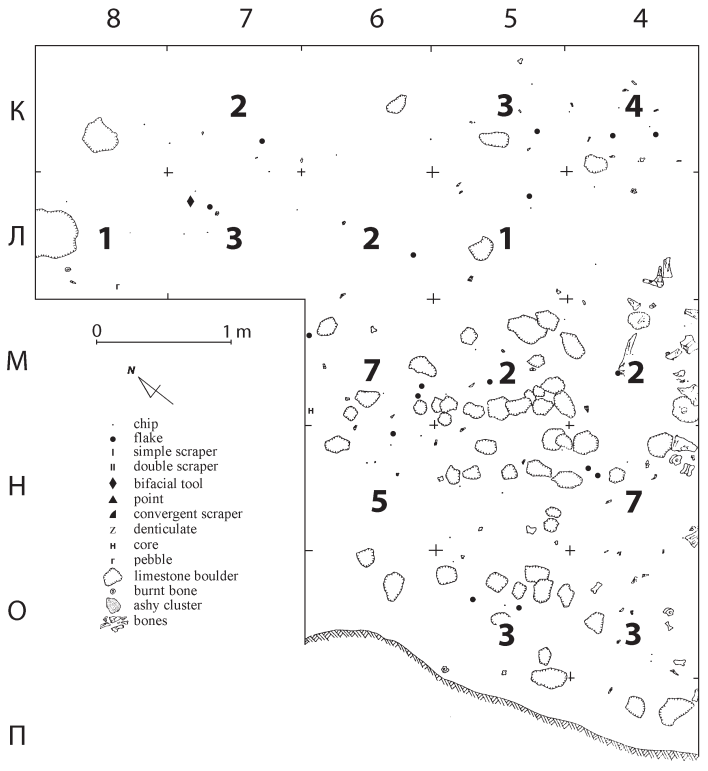


Fig. 11-17 Kabazi II, level VI/4: artefact distribution (pieces > 2cm).

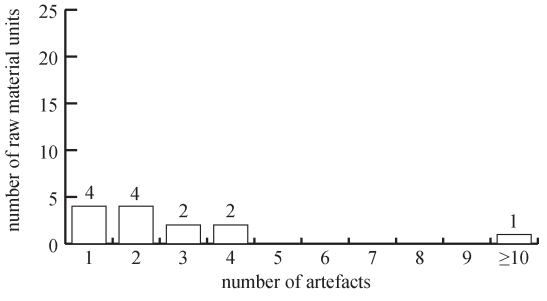


Fig. 11-18 Kabazi II, level VI/4: number of artefacts per workpiece.

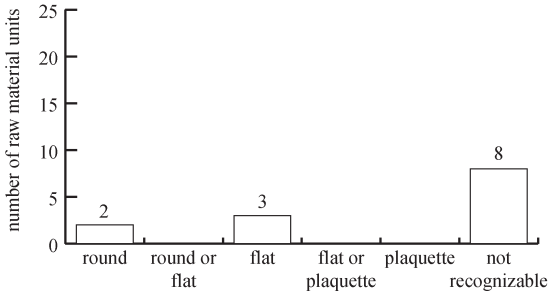


Fig. 11-19 Kabazi II, level VI/4: shapes of nodules.

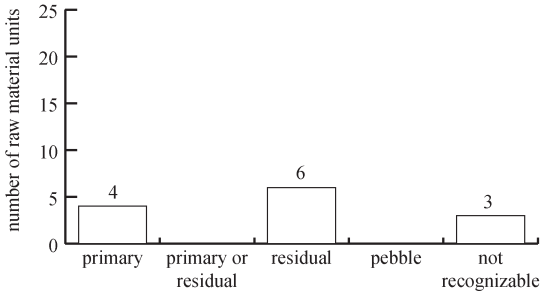


Fig. 11-20 Kabazi II, level VI/4: nature of raw materials.

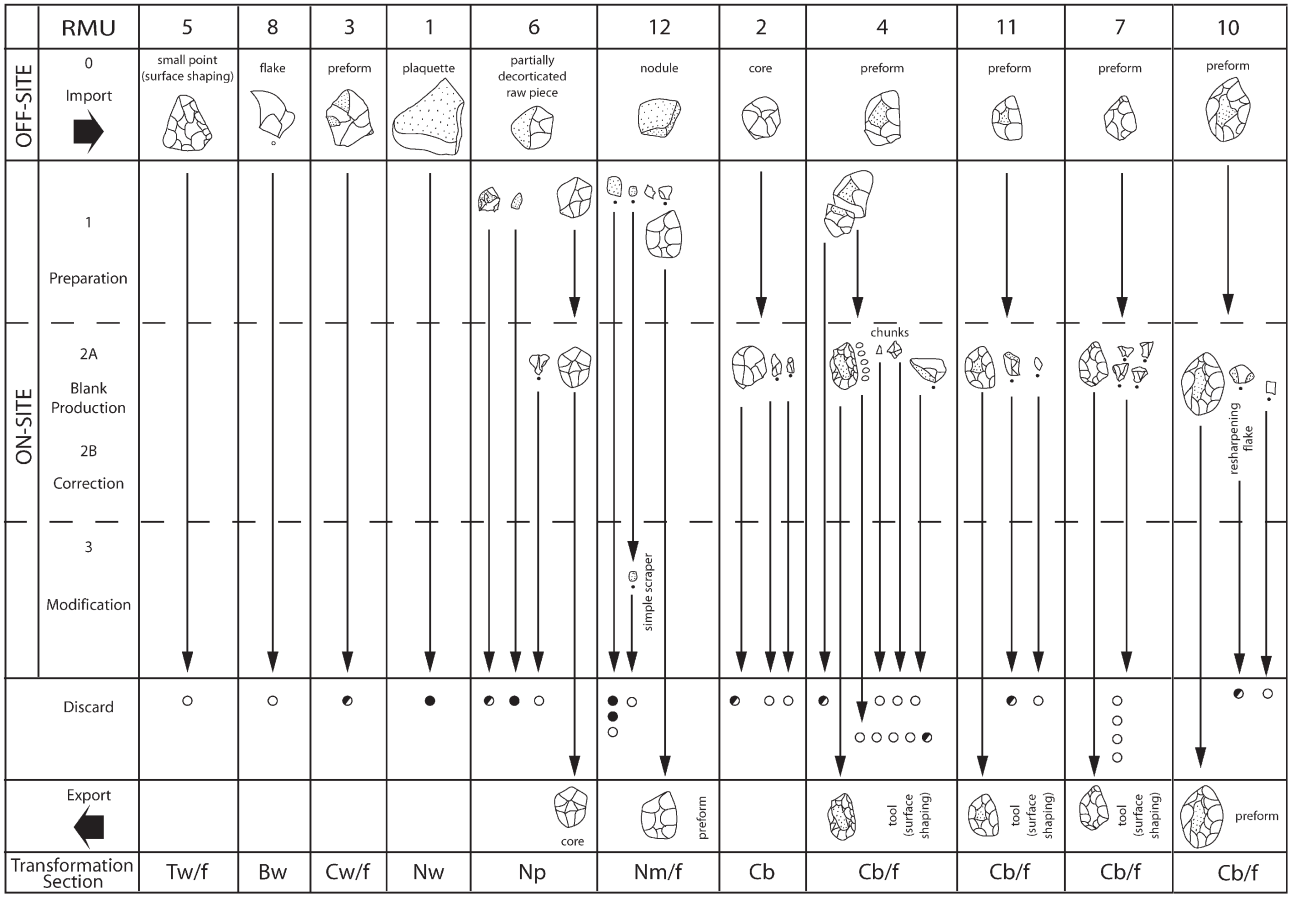


Fig. 11-21 Kabazi II, level VI/4: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Cw = core without debitage; Nw = nodule without debitage; Np = preparation of a raw nodule; Cb = blank production from a core; Cm = blank production from a core with modification of blanks; Nm = blank production from a nodule with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Workpieces imported as raw nodules (2)

Two raw material nodules had been imported for further preparation at the site (Fig. 11-21). One was transformed into a core (RMU 2) for export, and the other was transformed into a preform (RMU 12) for bifacial production elsewhere.

Workpieces imported as preforms or cores (7)

In six cases, raw nodules had been transformed into preforms elsewhere (probably at a workshop site close to the raw material source) and then imported to the Kabazi II site where they were further processed. Predominantly, bifacial tools were finished and exported (RMU 4, 7, 11, 13, 14), but in one case (RMU 10) bifacial production was not entirely performed, and a kind of evolved preform was exported.

Only one example within this group suggests the import of a small core (RMU 2) which was then fully exploited and then discarded together with some of its blanks.

Conclusion

The assemblage attests to an extremely short stay with almost no on-site tool use for consumption or maintenance activities, but with a clear focus on production of bifacial tools which were needed for an anticipated future demand elsewhere.

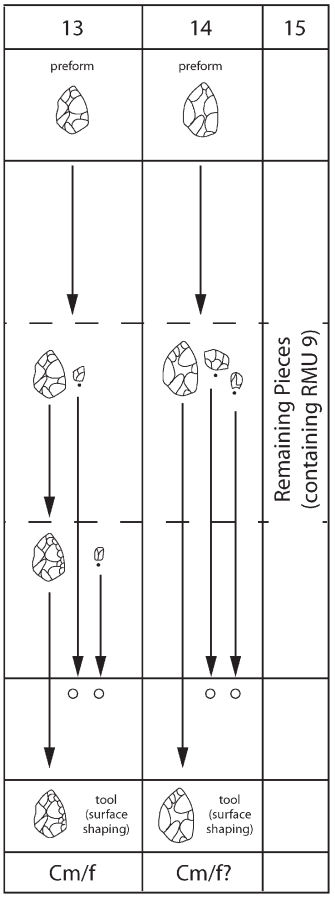


Fig. 11-21 continued.

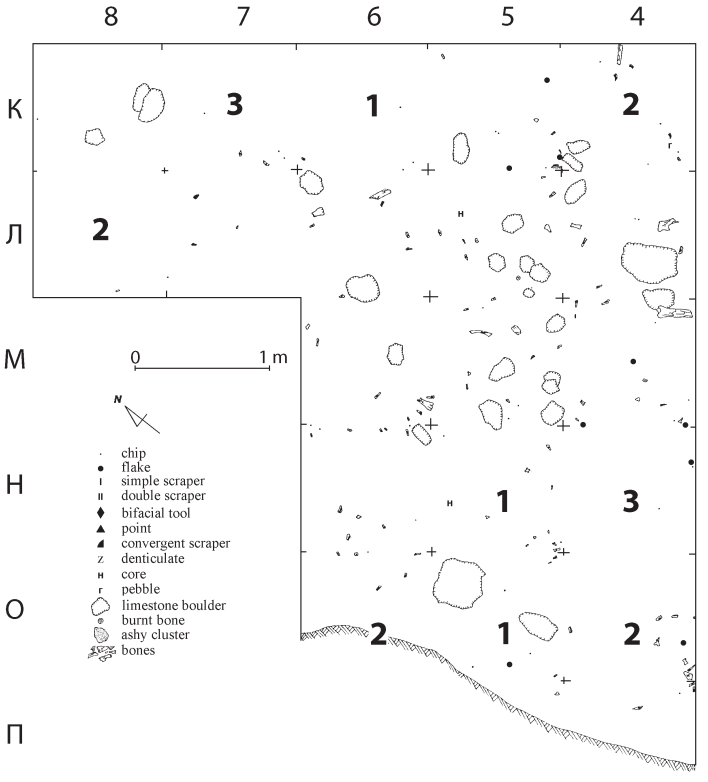


Fig. 11-22 Kabazi II, level VI/5: artefact distribution (pieces > 2cm).

Level VI/5: Mixed Activities

Only 40 artefacts were found in two distinct scatters (Fig. 11-22). Only 10 of these were attributable to one of 6 raw material units (Fig. 11-23). Raw material sources, as far as recognizable, were exclusively primarily, with some plaquettes (Fig. 11-24, 11-25).

Raw material units used as single objects (3)

All imported single objects (Fig. 11-26) had sharp edges and might have been discarded after the edges became blunt (RMU 2, 6, 7).

Workpieces imported as raw nodules (2)

Two flint plaquettes had been imported from a nearby residual source to be formatted (by breakage) and transformed either into a preform for later bifacial production (RMU 3) or into a core (RMU 1) which delivered some flakes on the site, one of which was modified into a transversal scraper. The scraper was used and discarded, but the core was probably exported.

Raw material unit imported as a preform (1)

One preform has been imported, only slightly modified and then exported (RMU 5). Two flakes from the modification of the preform were discarded. It is highly likely that the preform was used in the same manner as a migrating core, to produce blanks required on site.

Conclusion

The level VI/5 assemblage is, in terms of transformation analysis, of mixed character, with consumption and discards as well as production elements. It is well possible that several very short episodes of differing function contributed to this assemblage.

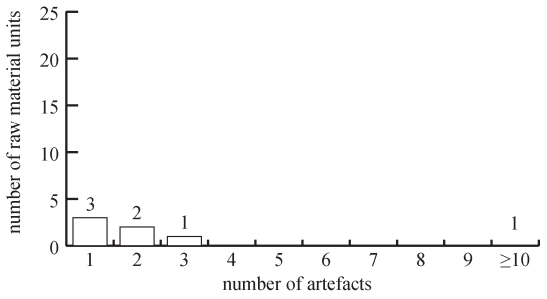


Fig. 11-23 Kabazi II, level VI/5: number of artefacts per workpiece.

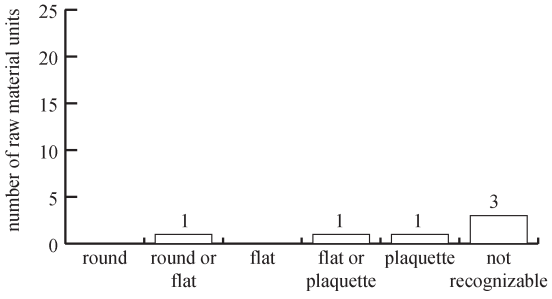


Fig. 11-24 Kabazi II, level VI/5: shapes of nodules.

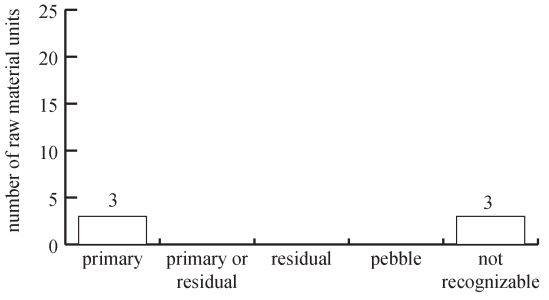
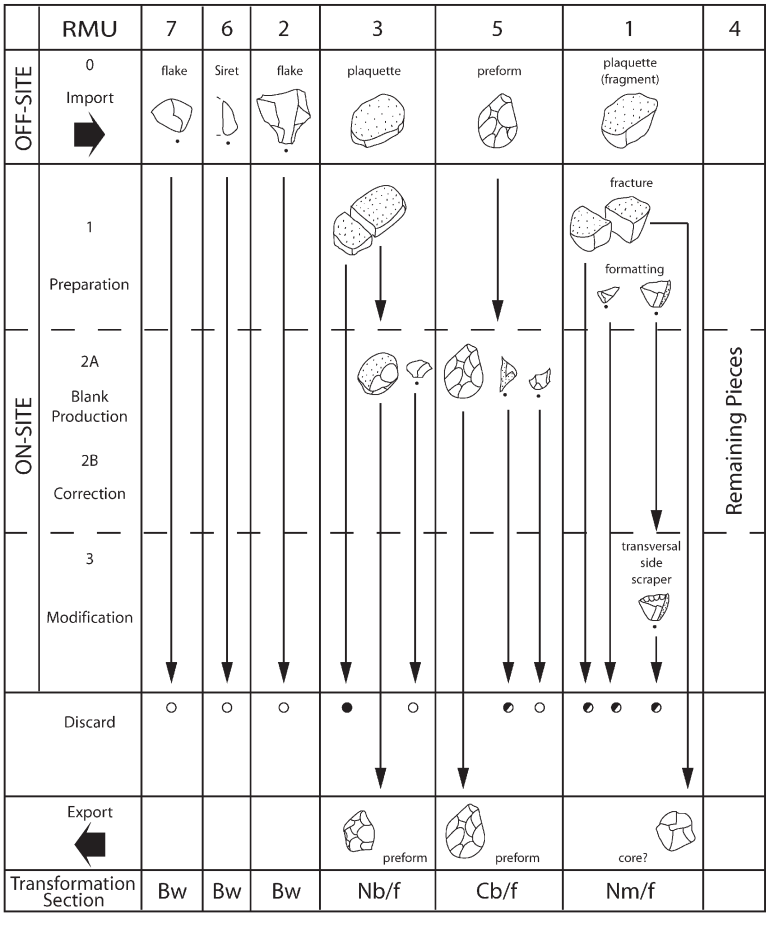


Fig. 11-25 Kabazi II, level VI/5: nature of raw materials.



Level VI/6: Production of Leaf Points from Plaquettes

Level VI/6 (Fig. 11-27) contained 90 artefacts, 61 of these could be attributed to 21 raw material units (plus 2 units with burnt pieces and 1 unit with unclassified artefacts), these included 3 larger units with 12, 9 and 7 artefacts each (Fig. 11-28, 11-29, 11-30). Bifacial production, for the delivery of narrow leaf points, played a major role in this assemblage. Quite rarely, flake production occurs (RMU 4, RMU 14) in this level (Fig. 11-32).

Raw material units used as single objects (8)

Two raw nodules were imported, but immediately discarded (Fig. 11-32; RMU 4, RMU 13). For cutting and scraping activities, flakes (RMU 9, RMU 24), a flat chunk (RMU 23) and side-scrapers (RMU 16, RMU 18) were introduced and used as single objects, one of which may also have been earmarked as a possible preform for a bifacial point (RMU 16).

Raw material units imported as tools, with on-site modification (2)

One scraper was introduced, used, rejuvenated, used again and then discarded (RMU 19). One leaf point or fragment of a leaf point was introduced to receive secondary surface shaping (RMU 5). After additional retouch, it was transformed into a bifacial double side-scraper, which was then used and discarded.

Workpieces imported as raw nodules (6)

All units of this class represent bifacial production sequences. As the imported raw nodules (plaquettes: RMU 2, 6, 22, nodules: RMU 8, 12, 15) were sometimes quite thin and narrow, the focus of production was most probably upon relatively small bifacial tools, such as leaf points. All units of this group seem to have ended as leaf points or preforms for export. In two cases, production was only initial (RMU 6, RMU 15; Fig. 11-32).

Workpieces imported as preforms and cores (5)

Nodules and plaquettes, which had been initially prepared, were imported both for bifacial production (RMU 3, RMU 17) and for flake production (RMU 14, RMU 20). One of the cores was discarded after exploitation (RMU 14; Fig. 11-31), the other was probably exported (RMU 20). The remaining nodule was discarded immediately after import (RMU 10).

Remarks on bifacial production

Often, small plaquettes or nodules were chosen for production. Their weight was mostly between 30 and 40 grams, and on one occasion as little as 25 grams. These raw material volumes allowed solely for the production of small, mostly thin, bifacial pieces. RMU 15 shows the initialisation of a nodule, beginning on both narrow ends of an elongated piece. On one end, preparation was on the upper face, on the other end on the lower face (Fig. 11-32). Bifacial shaping continued in an alternating manner, always producing blanks of a convex longitudinal section. Thus, in this manner, biconvex cross-sections were achieved (RMU 5) with edges following an s-shaped outline. In this context, two different groups of RMU units can be observed: The first group of units reflects situations in which a raw material piece was introduced and processed, but the final product was exported and is now missing from the assemblage (for example RMU 22; Fig. 11-31). The second group of units lacks not only raw material pieces but also all traces of bifacial production. On the other hand, they comprise a number of discarded tools. Complete transformation sequences (Nm) are totally absent from the assemblage which is thus indicative of an arbitrary window within a circulating land use pattern.

Remarks on production of flakes

The production of flakes is almost totally absent from the assemblage. One large nodule (RMU 4) might have been collected for flake production, but its poor quality (with many scars and internal fissures) led to the immediate discard of the piece. Only RMU 14 displays a Levallois blade concept which might have delivered some blades for export. The only standard blank present in the assemblage came in as a single object, an isolated straight side-scraper (RMU 18). The obvious lack of blanks and blades might suggest that an opportunity for flake production was absent from the Kabazi II level VI/6 occupation and from the neighbourhood of the site. At that time, the nearby Kabazi V site was not yet occupied.

◀ **Fig. 11-26** Kabazi II, level VI/5: transformation sections of workpieces. Bw = blank without debitage or modification; Cb = blank production from a core; Nb = blank production from a raw nodule; Nm = blank production from a nodule with modification of blanks; /f = bifacial production or surface shaping (steps of the formal chaîne opératoire after Geneste 1985; 1988; 1990).

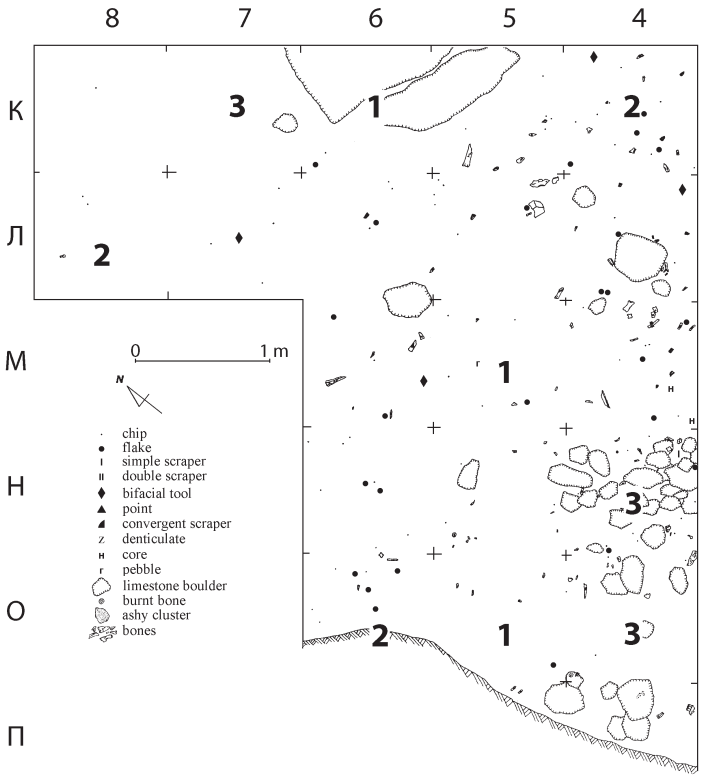


Fig. 11-27 Kabazi II, level VI/6: artefact distribution (pieces > 2cm).

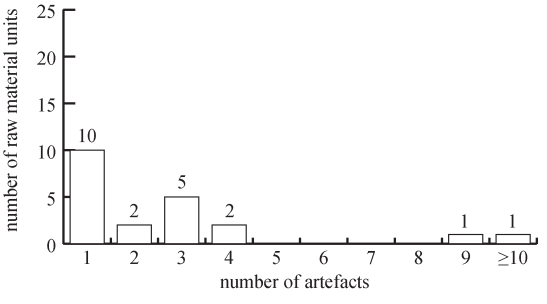


Fig. 11-28 Kabazi II, level VI/6: number of artefacts per workpiece.

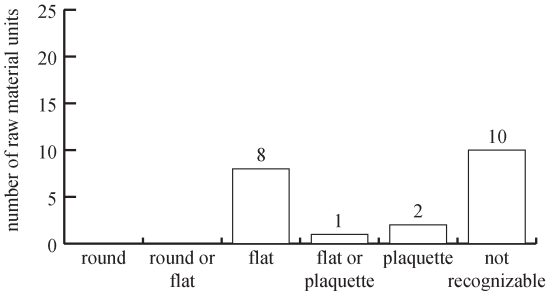


Fig. 11-29 Kabazi II, level VI/6: shapes of nodules.

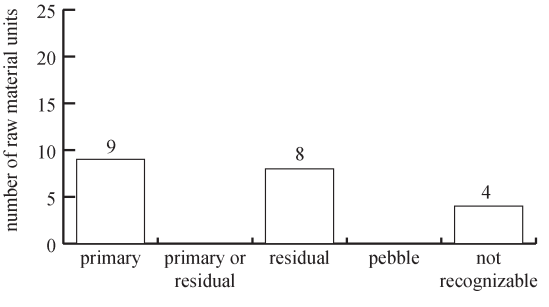


Fig. 11-30 Kabazi II, level VI/6: nature of raw materials.

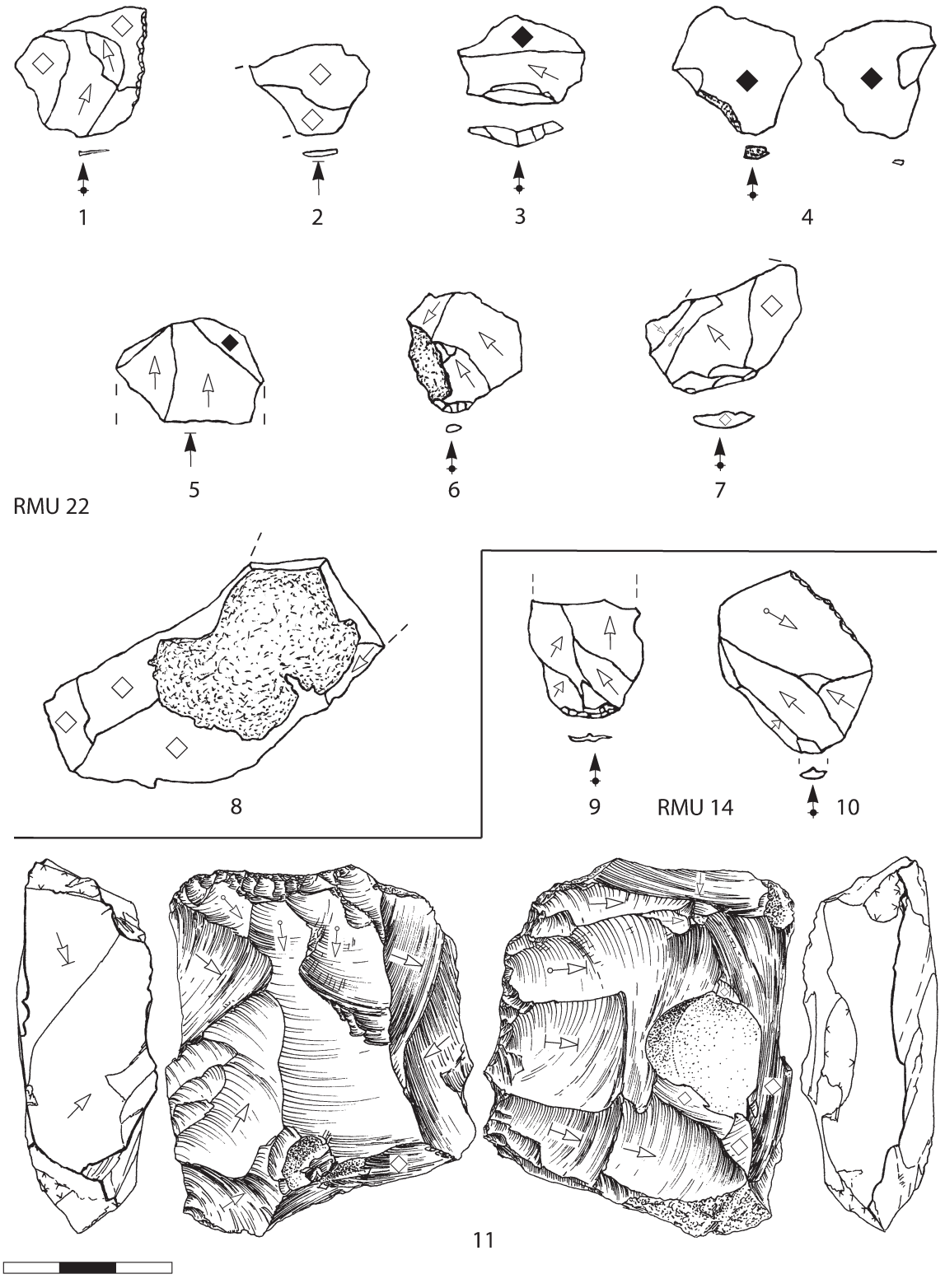


Fig. 11-31 Kabazi II, level VI/6: selected workpieces – core with flakes (RMU 14) and chunk with trimming flakes from bifacial production (RMU 22).

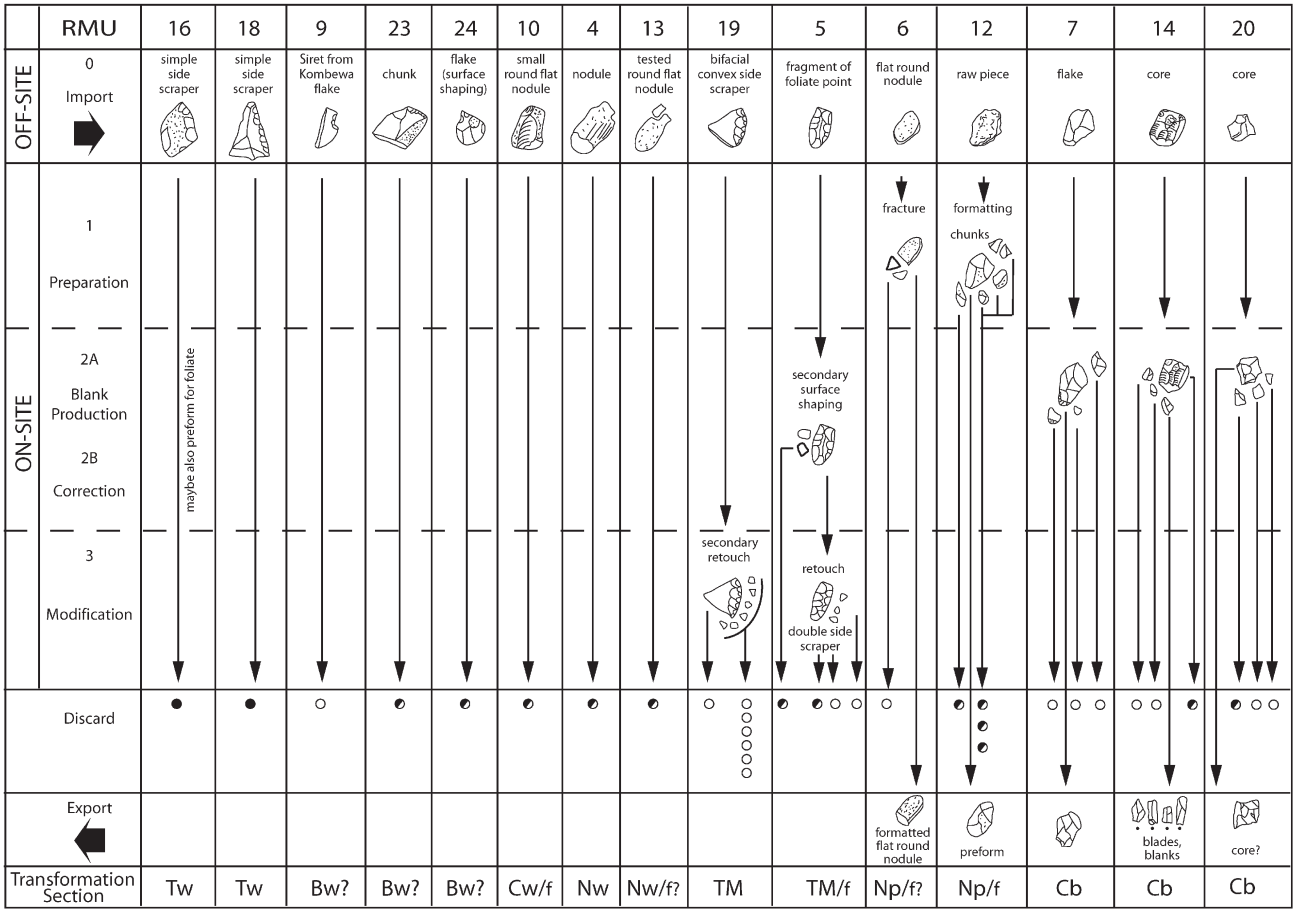


Fig. 11-32 Kabazi II, level VI/6: transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Cw = core without debitage; Nw = nodule without debitage; TM = formal tool with debris of modification; Np = preparation of a raw nodule; Cb = blank production from a core; Nb = blank production from a raw nodule; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Conclusion: Consumption and production

Transformation sequences are very short and never complete (Fig. 11-33). Discarded tools were produced elsewhere and artefacts produced on the site were mostly exported for later use. Raw material volumes were very small. Raw materials occur in many different varieties, obviously taken from a large number of different raw material sources, and are often of poor quality.

The assemblage indicates a number of short occupations. Kabazi II served for repeated stays of only some hours, each within a circulating land use pattern. Comparable sites are probably located only a few kilometres away, and display similar assemblages. Small groups of humans must have been extremely mobile within a micro-move scale. Single horses were hunted, taken to the site, and butchered. A fireplace was installed. In order to butcher and to process their hunting prey, people used a small number of artefacts, including some imported single objects (flakes, tools), some blanks from the production sequences of RMU 14 and RMU 20, and some larger flakes which were randomly available from the preparation of preforms for bifacial production.

Some production of bifacial tools served to substitute discarded tools. Most of the lithic material found at the site is connected with the preparation of preforms and of small bifacial tools, probably leaf points, which were then exported from the site.

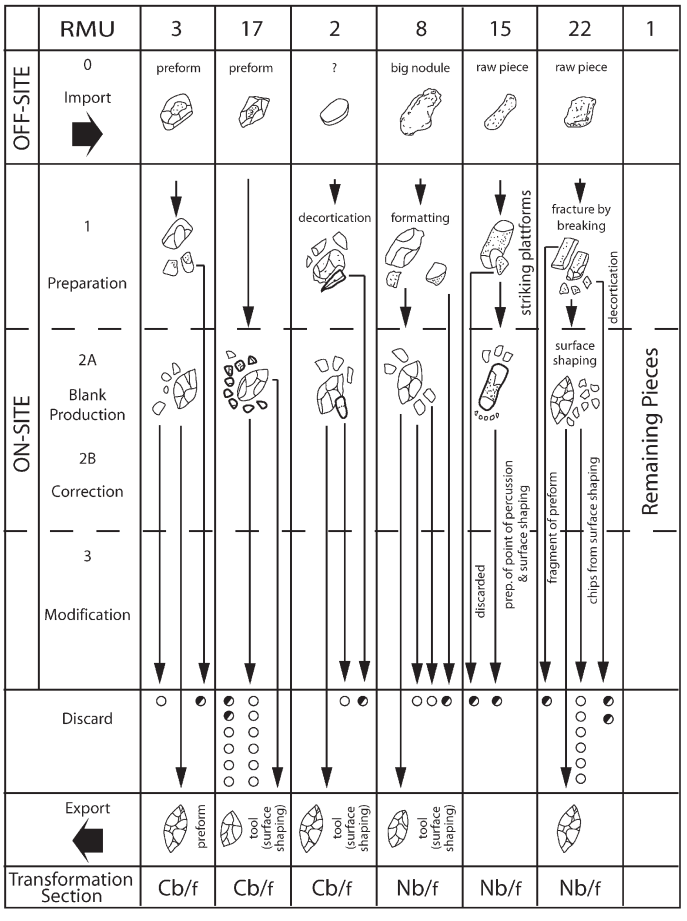


Fig. 11-32 continued.

Results: Transformational Processes as Documented in the Upper Levels of Unit VI

All Unit VI occupations were very short. Activities at the site were connected with the slaughtering and butchering of horses (see Chapter 5, this volume). Many blanks and tools were brought to the site as single objects for cutting meat and scraping hides. Particularly in the upper layers, lithics were consumed rather than produced, and raw material procurement was random. The lower layers, however, yielded additional evidence for the production of blanks and bifacial tools, most of which were probably bifacial points or even leaf points. To fulfil this demand, raw material procurement was, partially, more concentrated on slabs and plaquettes from primary sources. During the earlier occupations of this part of the stratigraphical sequence, namely in levels VI/6 and VI/4, the activities on the site added to the lithic budget, and planning for anticipated demand is visible. During the later occupations, for example in layer VI/1, the lithic budget decreased. Lithic procurement was principally "pocket-based". Faunal analysis (see Chapter 5, this volume) would suggest springtime occupations for layers VI/5 and VI/1, and for an autumn occupation in layer VI/6. which due to its resemblance to layer VI/4, might apply to this layer also.

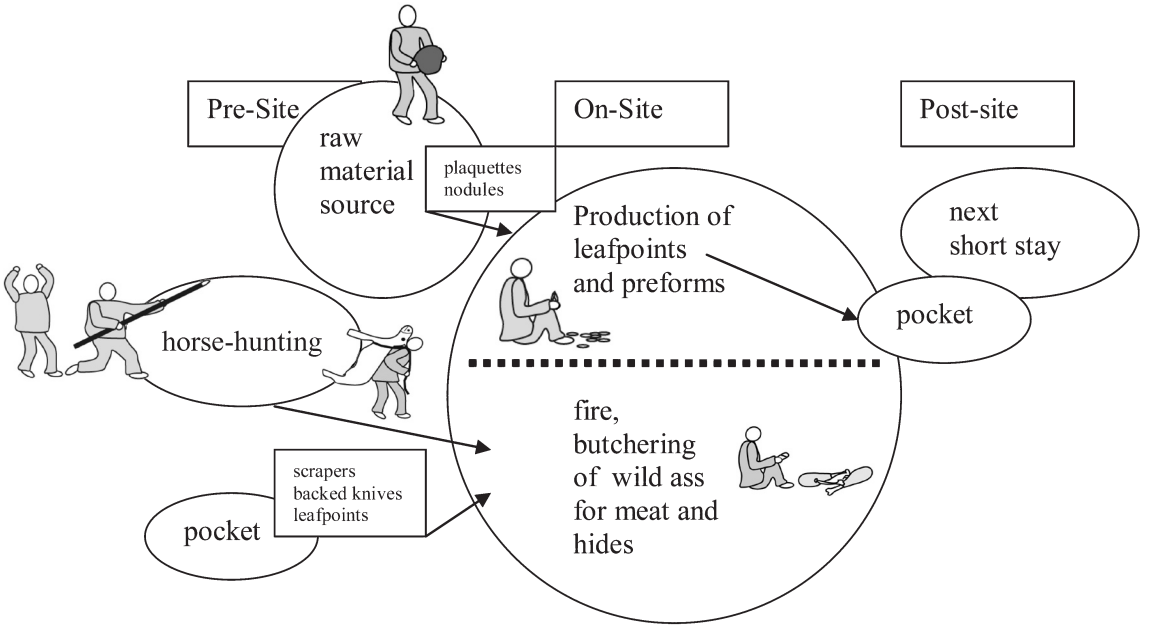


Fig. 11-33 Kabazi II, level VI/6: results of transformation analysis. Consumption of lithics and production of leaf points for later use were equal.

Abstract

КАБАЗИ II: КРАТКОВРЕМЕННЫЕ ПОСЕЛЕНИЯ ГОРИЗОНТОВ VI/1 – VI/6

Ю. РИХТЕР

Поселения горизонтов VI/1 – VI/6 характеризуются очень кратковременным обитанием. Большинство заготовок и орудий были принесены на стоянку как отдельные артефакты для разделки мяса и обработки шкур. На поселениях горизонтов VI/1 – VI/3 артефакты чаще использовались, чем производились. В горизонте VI/1 объем импортированного кремневого сырья незначителен. Отдавалось предпочтение получению заготовок из «путешествующих нуклеусов», а не производству орудий из желваков и плиток. Фактически, основную роль в обеспечении кремнем поселения горизонта VI/1 играл «карманный набор».

Более убедительные свидетельства доставки и обработки сырья были обнаружены в материалах горизонтов VI/4 и VI/6. Из принесенных на поселения желваков и плиток кремня изготавливались заготовки и двусторонние орудия, вероятно, в основном, листовидные острия. Причем, желвачный и плиточный кремень происходил из месторождений. Таким образом, на поселениях горизонтов VI/4 и VI/6 модель использования сырья характеризуется, как импортом готовых изделий, так импортом и последующей обработкой кремневого сырья, что свидетельствует о большей глубине планирования и попытке избежать непредвиденных обстоятельств.

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Palaeolithic Sites of Crimea,
Vol. 1

KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Chapter
12

Consumption of Imported Tools and Cores at Kabazi II, Levels VI/7 & VI/8

Martin Kurbjuhn

Transformation Analysis of Kabazi II, VI/7

The archaeological Level VI/7 which was excavated on 19 m² is separated from Level VI/6 by sterile deposits of 14 to 16 cm thickness. The distribution of artefacts does not display a significant concentration in this area (Fig. 12-1), the highest density of flints being observed in the square metres: 4K, 7Λ, 5Λ, 4Λ and 5M.

The rather small assemblage of this level (Fig. 12-2) comprises 79 flint artefacts, including 7 chunks, 54 chips, 13 flakes, 1 preform and 4 tools: one notched piece, one scraper and two unidentifiable tool fragments (tips). Two other blanks show modification of their edges resulting from usage and/or sedimentation.

Due to the fact that there are very few flakes and no cores in the assemblage, a detailed description of the blank production is not possible. Some flakes might certainly stem from bifacial production, including one rejuvenation flake.

The raw material of Level VI/7 is mostly grey coloured (from light to mid grey) with blurred schlieren and little white dots. The source of this material is most probably the Bodrak valley, 6 kilometres south-west of Kabazi II. Some artefacts were made of brown raw material from river pebbles, possibly from the Kacha valley (Fig. 12-3). In those cases where the shape of the nodules used was identifiable, these were round or flat (Fig. 12-4).

From the entire assemblage, 49 artefacts were examined using transformation analysis. Due to the high degree of patination, 29 pieces could not be assigned to the work pieces. These artefacts were, together with most of the chips, defined as sorting rest. Thus, only 17 artefacts from the assemblage could be designated to individual RMUs. This small number does, however, not mean that the assemblage is less susceptible to transformation analysis, although in some cases it does make some of the results more or less hypothetical.

Eleven pieces were categorised as single pieces, with no equivalent artefact of the same raw material nodule. In only 3 cases were real work pieces, which include more than 1 artefact, identified (Fig. 12-5).

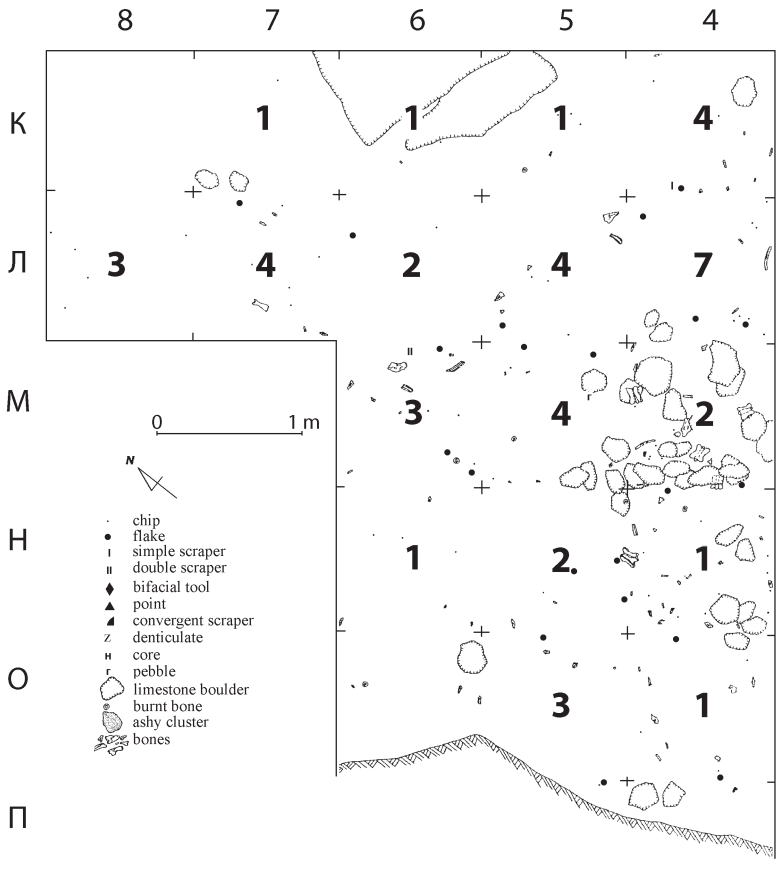

Fig. 12-1 Kabazi II, level VI/7: distribution of all artefacts, which were examined in the transformation analysis.

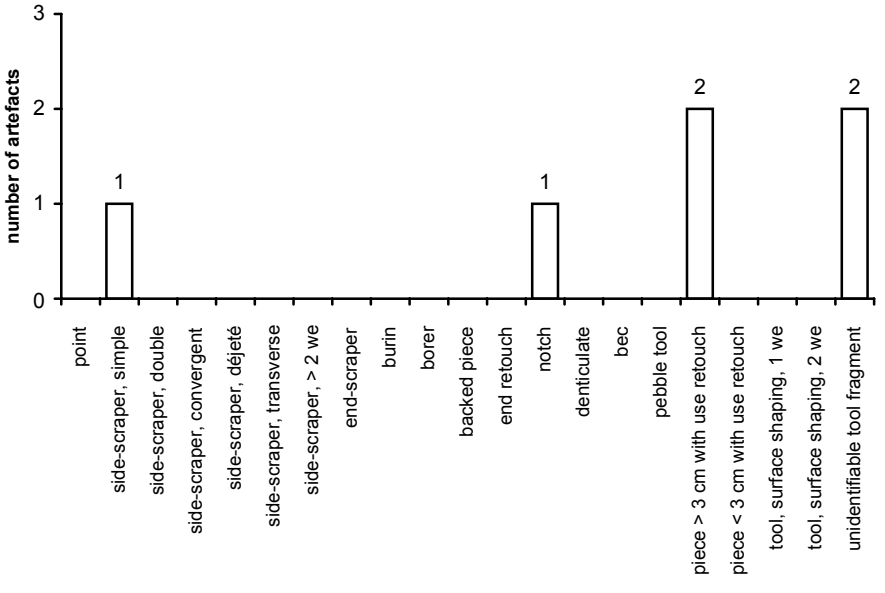

Fig. 12-2 Kabazi II, level VI/7: frequency of tools (note: pieces with use retouch are not regarded as formal tool classes).

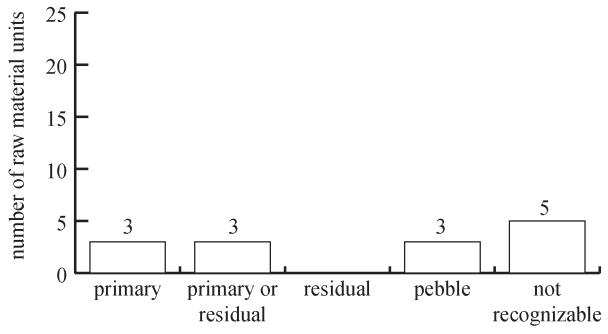

Fig. 12-3 Kabazi II, level VI/7: frequency of workpieces according to the raw material source.

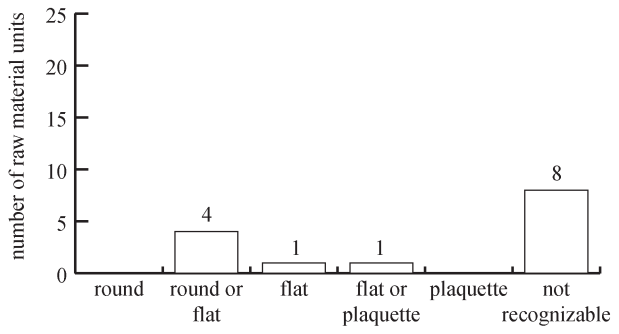

Fig. 12-4 Kabazi II, level VI/7: frequency of workpieces according to the different shape of the used raw material nodule

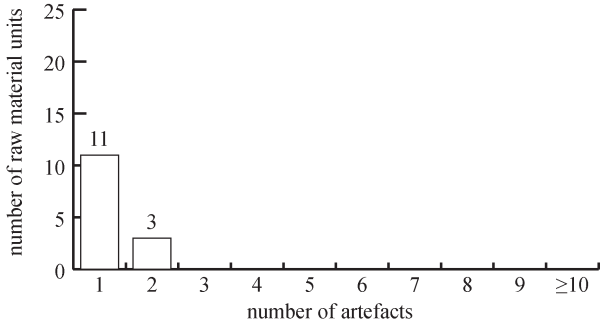

Fig. 12-5 Kabazi II, level VI/7: frequency of artefacts in raw material units.

Single pieces: import of an isolated object

In 5 cases single artefacts were categorised as belonging to the transformation section *Bw* (Fig. 12-6 and 12-7). These pieces are flakes which were produced at other localities and then imported to the site. These blanks were then discarded without any further modification. All these imported flakes, often partly covered with cortex, were produced using the hard hammer technique. Another two single pieces were assigned to the category *Tw*. These imported tools – 1 notched tool and 1 scraper – were also discarded on site without any further modification.

Three single pieces fall into the category *Ei*. In two cases (RMU 6 and 7) a scraper was imported and used on site. During usage, the tips of both tools broke off. The corresponding tools were later exported to another location. The rejuvenation flake from RMU 8 serves as an indication of an imported bifacial tool which was reshaped on site. As in the other cases, the bifacial tool was exported after usage.

Work pieces of the category "C"

Three work pieces were identified as belonging to transformation sections which are indicative of imported cores which underwent further modification on site. In one case (RMU4), a core was imported and blank production took place on site. The actual core was later exported from the site. In RMU 3, a preform was imported and surface shaped on the site. As it was not possible to assign any modification chips to the RMU, it is not clear if the export condition was a finished surface shaped tool or a preform. Also, in the case of RMU 5 a preform was imported to the site. The evidence for further facial shaping on site is lacking, but the piece was corrected by using the hard hammer technique.

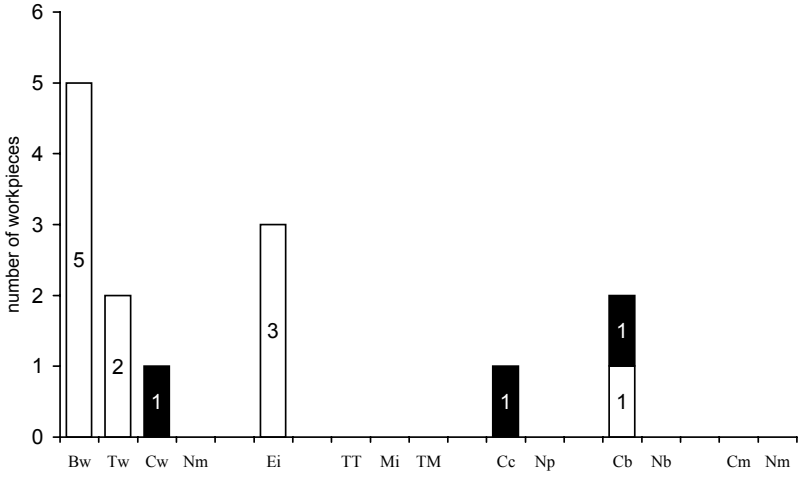

Fig. 12-6 Kabazi II, level VI/7: frequency of transformation sections: Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); black marked – workpieces with flakes from *façonnage* and / or surface shaped tools.

Conclusion

The assemblage of Kabazi II, VI/7 is clearly focused on the import and consumption of formal tools and blanks with sharp edges (Fig. 12-7). All tools and most of the flakes were imported as single pieces with no further modification on site. This is indicative of a very short term occupation of Level VI/7 with a focus on cutting activities (Fig. 12-8). The production of tools on site is totally lacking and only in two cases (RMU 3 and 4) did very limited blank production take place, exclusively for demands on the site. The production of blanks and tools for further, anticipated activities on other sites is lacking. This means that the quantity of artefacts exported is extremely small in comparison to the amount of imported objects (Table 12-1). The artefact kit decreased during this occupation. The very minimal artefact production for future use is possibly attributable to the very short time spent at the site, or it is due the absence of local raw material sources (or the knowledge of them). Nevertheless all activities – most probably those of butchering – could be carried out by means of the imported single pieces.

Transformation Analysis of Kabazi II, VI/8

The archaeological layer VI/8 is separated from level VI/7 by sterile deposits of 8 to 10 cm, and from level VI/9 by sterile sediments of 9 to 11 cm thickness. The excavation area covers approximately 19 m². The distribution of artefacts, with its highest density in square metre 6-H, shows no significant concentration. However, especially in the unexcavated areas in rows 4K to 4O and 7M to 7O, more artefacts belonging to this level must be expected (Fig.12-9).

The artefact assemblage of level VI/8 contains 76 pieces (including 48 chips), of which 30 artefacts were examined using transformation analysis.

The tool assemblage of Level VI/8 comprises two simple side-scrapers, 1 transverse side-scraper and two surface shaped tools (Fig. 12-10). One of these is

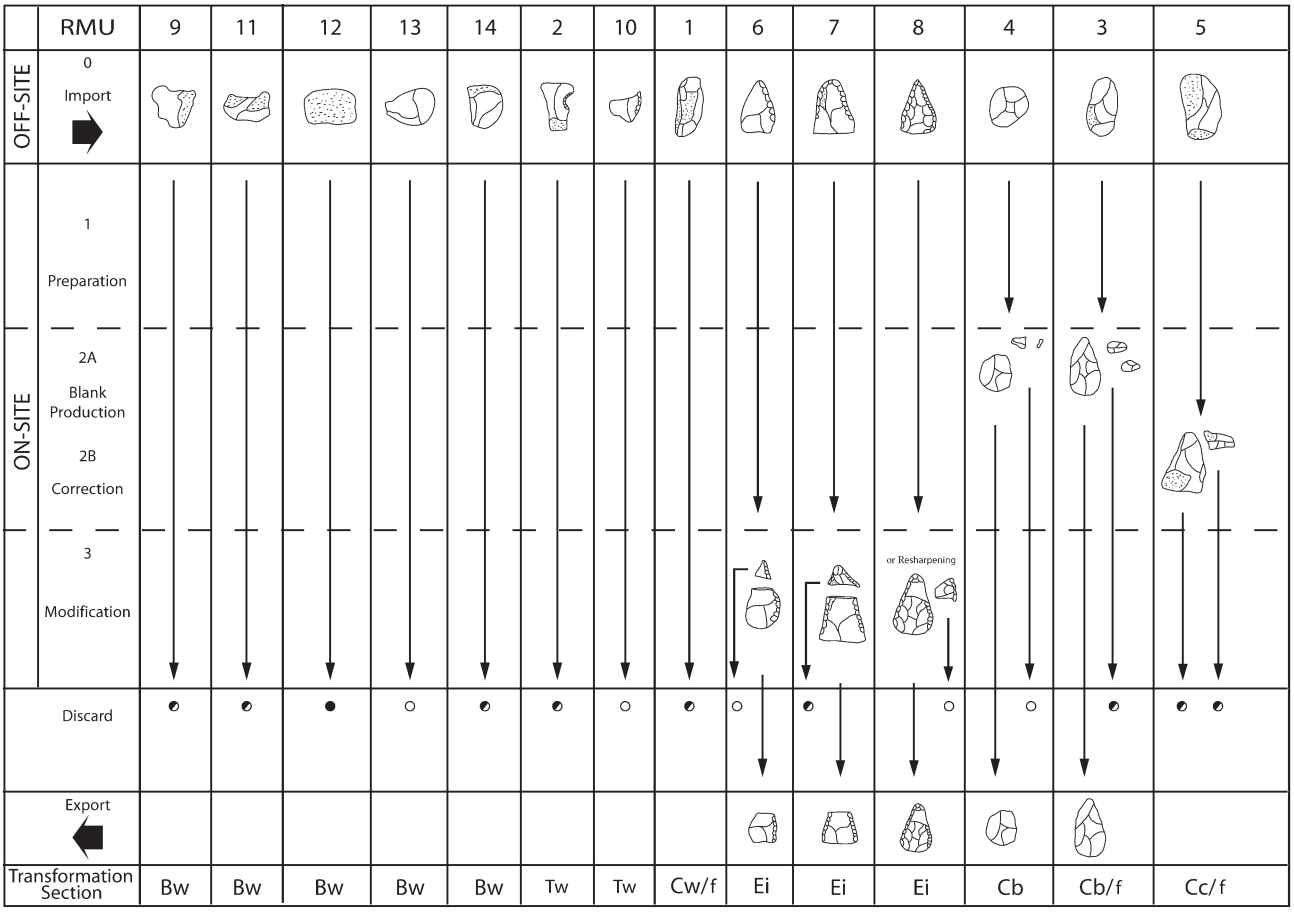

Fig. 12-7 Kabazi II, level VI/7: flow chart depicting the results of the transformation analyses. For each raw material unit, hypothesis are made about the phases of the formal *chaîne opératoire* (after Geneste 1985; 1988; 1990conducted within the excavated area (transformation section); classification of transformation sections are based upon the presence and absence of indicative blank classes (abbreviations see Fig. 12-6); */f = *façonnage* is indicated by flakes from *façonnage* and / or surface shaped tools.

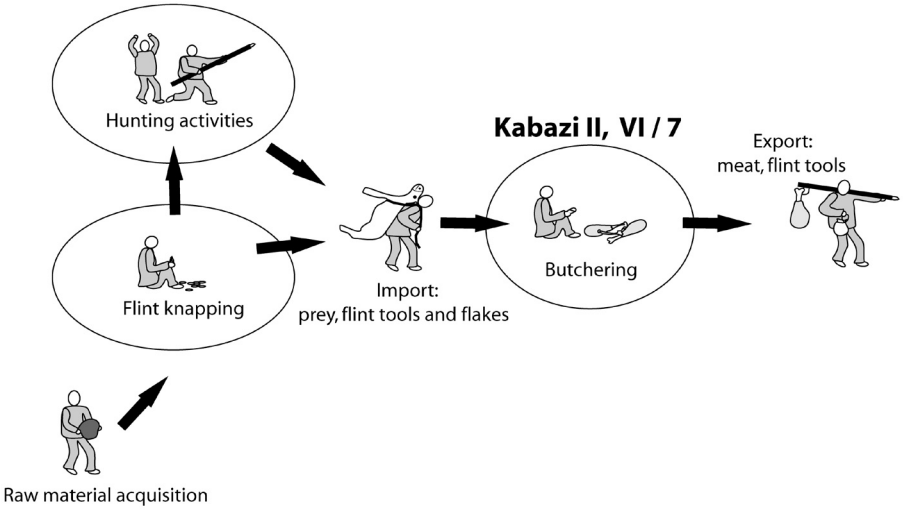

Fig. 12-8 Kabazi II, level VI/7: reconstruction of on-site and off-site activities.

assemblage			data related to identification of imported item							on-site transformation (as indicated by discard)													
Kabazi II, Unit VI, Level 7			raw piece: phase 0		initially prepared or flaked piece: phases 1 or 2		inner part of flaked piece			production of blanks: phases 1 and 2					indifferent	modification and usage: phase 3				early discard			
raw material unit	weight (in g)	N	raw piece or chunk	cortical flake	flake partly covered by cortex	flake without cortex	core/preform	unknown blank (bifacially surface shaped piece)	imported item	flake	blade	trimming flake	core/preform	chunk	chip	simple tool	surface shaped tool	chip from modification	flake from rejuvenation or broken tool tip	raw piece	transformation section	evacuation > 3 cm
9	7	1			1				Flake	1											Bw	
11	10	1			1				Flake	1											Bw	
12	22	1		1					Flake	1											Bw	
13	7	1				1			Flake	1											Bw	
14	9	1			1				Flake	1											Bw	
2	3	1			1				Tool							1					Tw	
10	5	1				1			Tool							1					Tw	
1	409	1			1				Preform				1								Cw/f	
6	2	1				1			Tool										1		Ei	Tool
7	3	1			1				Tool										1		Ei	Tool
8	5	1				1			Tool										1		Ei	Tool
4	9	2			1	1			Core	2											Cb	Core
3	8	2				2			Preform	2											Cb/f	Preform
5	40	2	1		1				Preform			1	1								Cc/f	

Table 12-1 Kabazi II, level VI/7: classification of the transformation sections of RMUs with the decisive features as well as the reconstruction of evacuation/exportation.

a bifacial, heavily exhausted tool. Another is a small triangular scraper (breitdreieckiges Faustkeilblatt, after Bosinski 1967). Three flakes display a modification of their edges caused by use or sedimentation processes. One artefact, classified as a preform, is made on a flake and is already surface shaped. It is, however, still lacking a final edge retouch.

Beside blanks from regular core reduction there are 3 Kombewa flakes in the assemblage which show blank production from a big flake.

The raw material used is rather inhomogeneous. The colour varies between different shades of brown, to shades of grey to black. According to the cortex, primary as well as secondary raw material sources were used (Fig. 12-11). The shape of the nodules (where distinguishable) varies from round and flat. In one case a plaquette was identified (Fig. 12-12)

From the 30 artefacts examined, 26 pieces were assigned to 15 raw material units. A further 4 pieces were allocated to the sorting rest, due to their high degree of patination.

Six RMUs comprise only 1 single artefact, e.g. no other corresponding piece of the same raw material was identified. The remaining RMUs contain a very low number of pieces of between 2 and 4 artefacts (Fig. 12-13). This serves as a first indication that only very small sections of the whole transformation process are present in this level.

Single pieces: Import of an isolated object

One of the single pieces (RMU 8) was identified as belonging to the category *Bw* (Fig. 12-14 and 12-15). It is a rather big flake, nearly fully covered by cortex. The flake shows no traces of use, making the motivation behind the import of the piece rather unclear. Four other single pieces are classified as formal tools (transformation categories *Tw* and *Tw/f)*. These include two simple side-scrapers (RMU 10 + RMU 11). Beside these side-scrapers, two surface shaped tools were imported to the site. One is a bifacial tool which was imported in an already exhausted condition (RMU 2). Another surface shaped tool is a triangular scraper (RMU 15). All these tools were discarded without any further modification (reshaping etc.) on the site. In one case (RMU 5), a preform of a bifacial tool was imported (transformation category *Cw/f*). It had already been surface shaped, but without the final edge retouch. Despite this, it was discarded before it was transformed into a formal tool.

Work pieces of the category "C": Import of a core with further modification on site

In 7 cases an import of a core was attested. Six of these RMUs belong to the transformation category *Cb*. The imported core belonging to RMU 1 was not yet finished and was subsequently prepared on site. After its preparation, blank production took place. In 5 cases (RMU 14, 3, 7, 12 and 13) the imported cores did not require any further preparation, and were used directly for the production of a number of flakes. In the case of RMU 9, the imported core delivered a flake and flakes with 2 ventral sides (Kombewa Flakes) which were struck off on site. In only one case (RMU 13), a further modification of a blank took place and a transversal scraper was produced (transformation category *Cm*). After their exploitation on site, 6 out of the 7 cores were exported to another locality. Only in one case (RMU 14), was the imported core discarded on site.

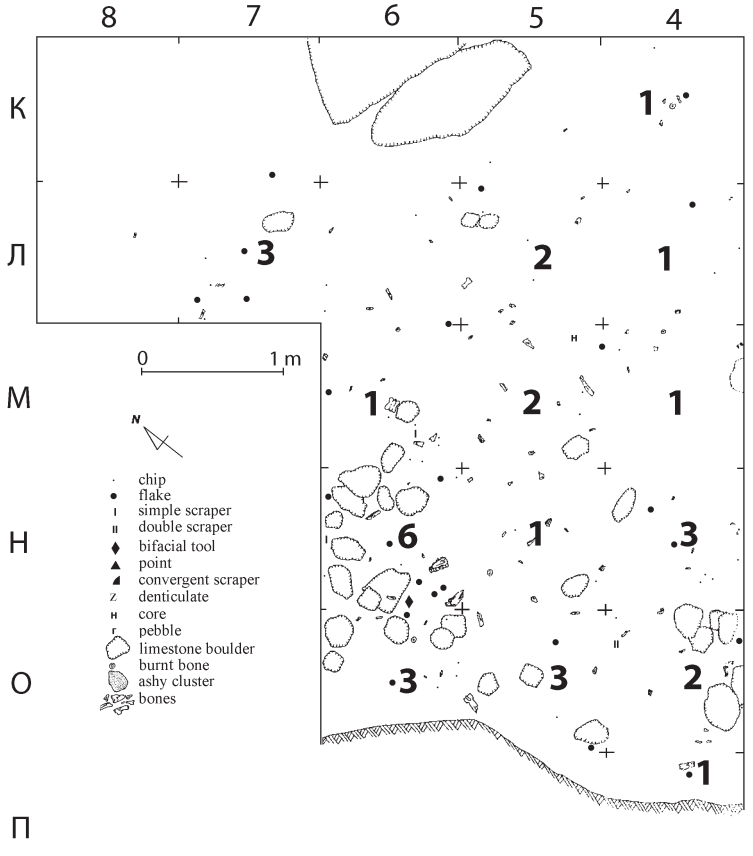

Fig. 12-9 Kabazi II, level VI/8: distribution of all artefacts, which were examined in the transformation analysis.

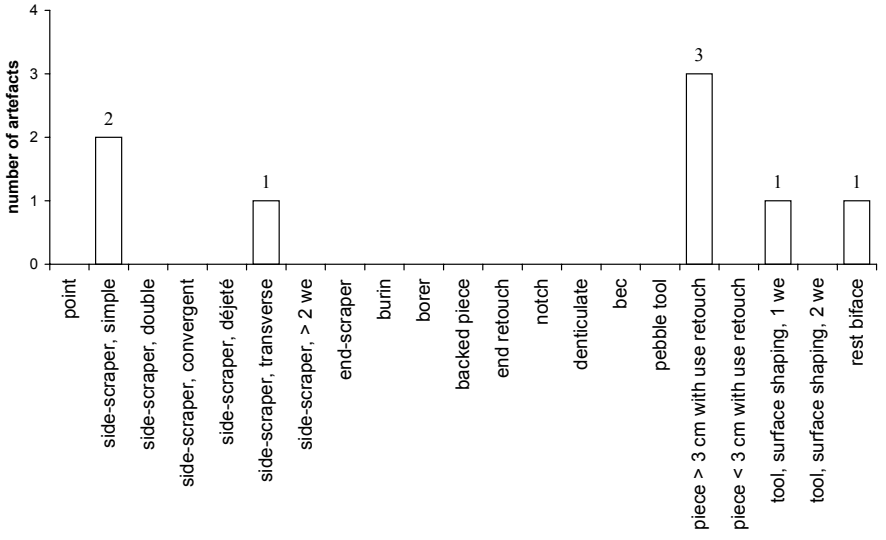

Fig. 12-10 Kabazi II, level VI/8: frequency of tools (note: pieces with use retouch are not regarded as formal tool classes).

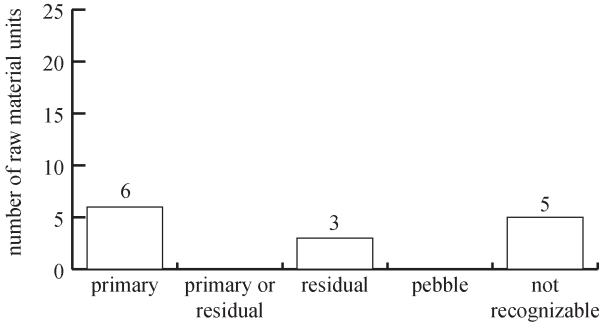

Fig. 12-11 Kabazi II, level VI/8: frequency of workpieces according to the raw material source.

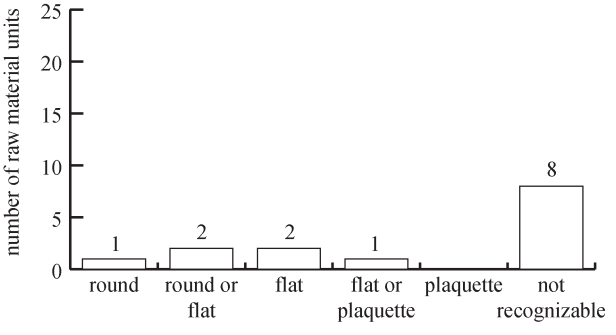

Fig. 12-12 Kabazi II, level VI/8: frequency of workpieces according to the different shape of the used raw material nodule.

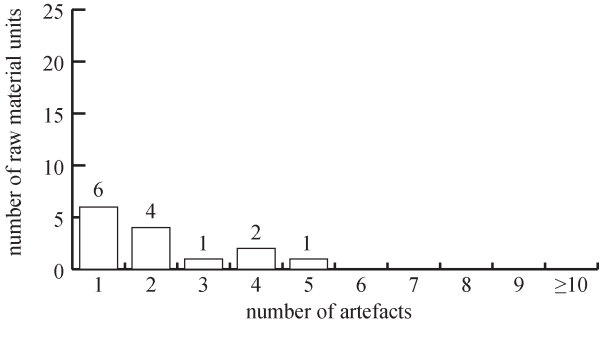

Fig. 12-13 Kabazi II, level VI/8: frequency of artefacts in raw material units

Work pieces of the category "N": Import of a nodule with further modification on-site

In only one case was an imported nodule identified (transformation category *Np*). In RMU 4, a flint plaquette was imported to Kabazi II. Once on site, the plaquette was decorticated and prepared, however, without a subsequent production of regular blanks. The decorticated nodule/core is not present in the RMU, i.e. was exported.

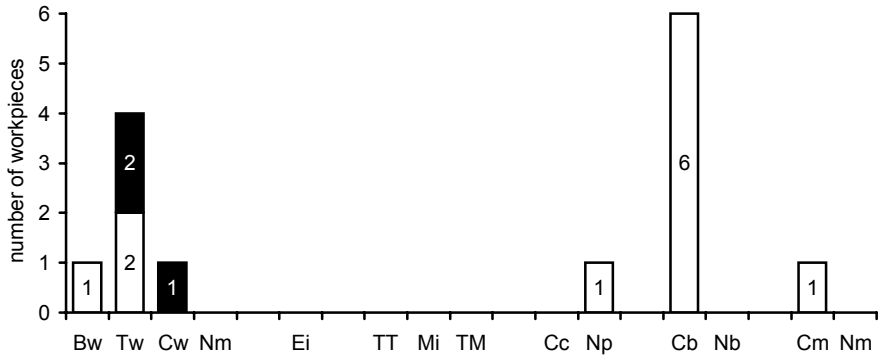

Fig. 12-14 Kabazi II, level VI/8: frequency of transformation sections: Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); black marked – workpieces with flakes from *façonnage* and / or surface shaped tools.

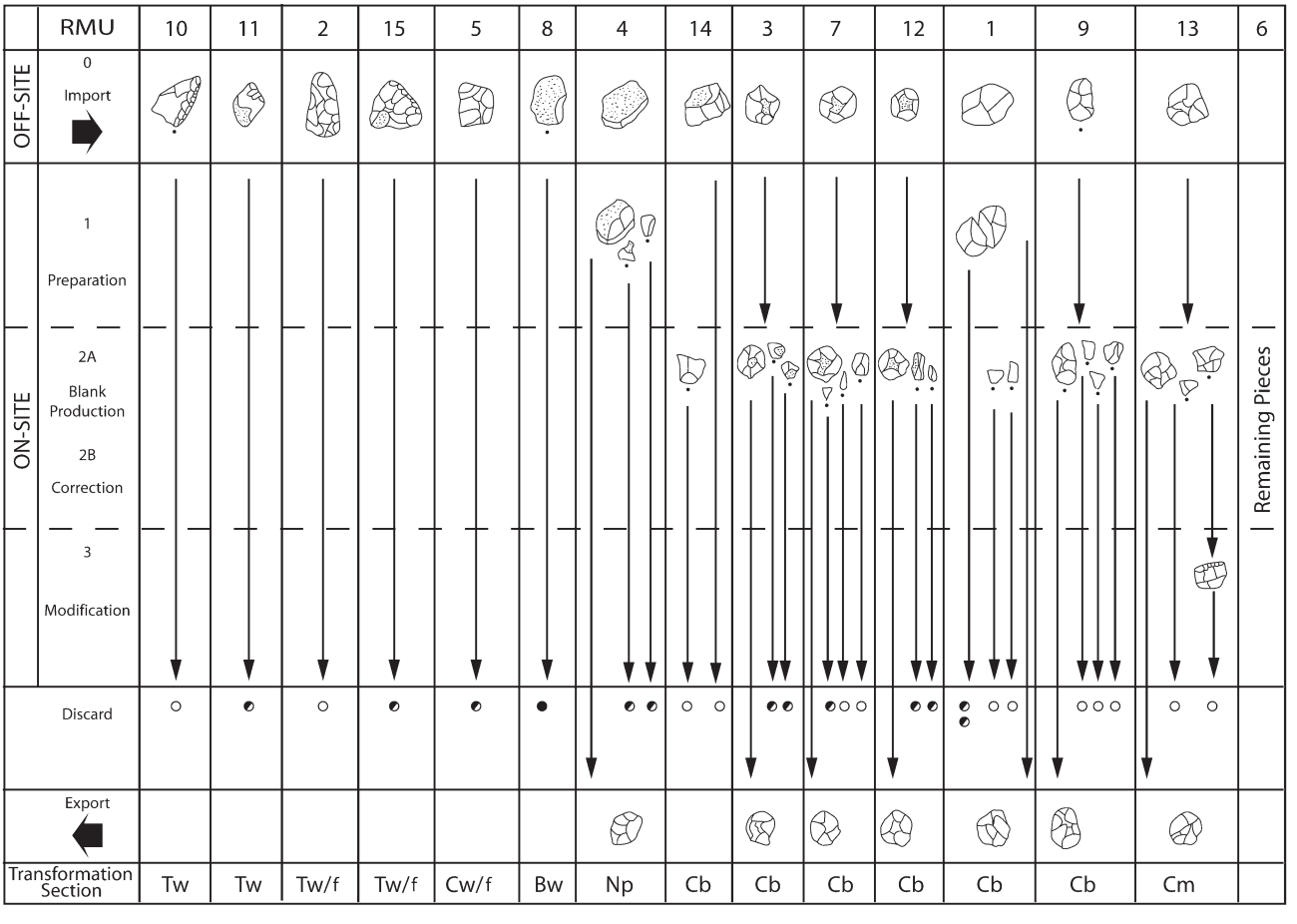

Fig. 12-15 Kabazi II, level VI/8: flow chart depicting the results of the transformation analyses. For each raw material unit, hypothesis are made about the phases of the formal *chaîne opératoire* (after Geneste 1985; 1988; 1990conducted within the excavated area (transformation section); classification of transformation sections are based upon the presence and absence of indicative blank classes (abbreviations see Fig. 12-14); */f = façonnage is indicated by flakes from *façonnage* and / or surface shaped tools).

Conclusion

In general the Raw Material Units of this level can be subdivided into 2 major groups:

1. RMUs which attest the import of a tool without further modification/transformation on site.

2. RMUs which attest the import of a core with a subsequent production of a small number of blanks on site.

The transformation section on site is very limited and is focused on the production of blanks of stage 2a (Geneste 1985) (Fig. 12-15). All other transformation sections, e.g. the decortication of nodules, core preparation and blank modification, are nearly completely lacking. These activities were, in comparison to Level VI/7, carried out at localities other than Kabazi II. The used cores were exported to other sites. This pattern can be explained by a very short occupation where, in addition to the imported tools, only flakes with sharp edges were required. This pattern, as well as the small amount of artefacts, leads to the conclusion that in this level the butchering of animals killed in the hunt took place.

Abstract

УТИЛИЗАЦИЯ ИМПОРТИРОВАННЫХ ОРУДИЙ И НУКЛЕУСОВ НА ПОСЕЛЕНИЯХ КАБАЗИ II, ГОРИЗОНТЫ VI/ И VI/8

М. КУРБЮН

Для трансформационного анализа было использовано 49 артефактов из горизонта VI/7. Семнадцать артефактов подразделяются на 13 сырьевых групп (RMU). Восемь сырьевых групп представлены единичными изделиями, среди которых обнаружено 5 отщепов, 2 орудия, 1 фрагмент дистальной части орудия и 1 скол обработки двустороннего орудия. Три артефакта были определены, как относящиеся к трансформационным рядам, которые предполагают модификацию на стоянке одного нуклеуса и двух преформ. При этом импортированные нуклеус и преформы были затем экспортированы. Все орудия и большинство отщепов были импортированы на стоянку и не подверглись на территории поселения какой-либо обработке. На территории поселения горизонта VI/7 отсутствуют какие-либо свидетельства производства орудий и заготовок для последующей их утилизации на других поселениях. Фактически, это означает, что принесенный на поселение объем артефактов, значительно сократившись после его утилизации, не был восстановлен на территории этого же поселения.

Для трансформационного анализа коллекции горизонта VI/8 было использовано 26 артефактов, которые были подразделены на 15 сырьевых групп. Шесть сырьевых групп представлены единичными артефактами, в основном орудиями, что указывает на их импортный характер. Более того, отсутствуют какие-либо свидетельства модификации данных орудий на территории поселения. Восемь сырьевых групп отражают наличие на стоянке нуклеусов и / или желваков, при расщеплении которых было получено небольшое количество сколов. Только в одном из восьми случаев нуклеус был оставлен на стоянке, тогда как в остальных случаях нуклеусы были экспортированы. Такие трансформационные ряды, как снятие корки с желваков, подготовка нуклеусов и производство заготовок практически не представлены артефактами.

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Palaeolithic Sites of Crimea,
Vol. 1

KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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2005

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Chapter
13

Meat and stones: Kabazi II, levels VI/9 to VI/10

Jürgen Richter

The assemblages from Kabazi II, levels VI/9 to VI/10 are again associated with short hunting episodes. Additionally, production of blanks and nodules played a more predominant role than usual. Many raw material units arrived as nodules from a nearby, primary source. The nodules were initially exploited and then exported from the site. Many tools and blanks, which had probably been used for butchering, were thus produced on-site.

Production for Immediate Consumption: Kabazi II, Levels VI/9 and VI/9A

Although lithological evidence suggests two independent assemblages, levels VI/9 and VI/9A were merged for transformation analysis, as raw material units appeared very similar. Level VI/9 yielded 82 and VI/9A a total of 99 artefacts. The density of artefacts increased towards the southern part of the excavated area (Fig. 13-1). A number of 96 artefacts from both 9 and 9A were assigned to 40 raw material units. Single objects dominate among raw material units. Only three workpieces comprised more than four artefacts (Fig. 13-2). Nodules were often round (Fig. 13-3), and were acquired mainly from primary and residual sources (Fig. 13-4). Single objects came in as scrapers, points, and frequently as flakes from prepared cores (Fig. 13-7). Nodules, cores (Fig. 13-5) and preforms (Fig. 13-6) were usually imported, exploited to some extent, and then exported. Only in four cases (Fig. 13-7; RMU 3, 5, 29, 34) did transformational sequences of larger workpieces end on site. Consumption was based predominantly on production from imported nodules, but also on some tools and cores "carried on one`s person" which were either discarded or again exported. Production of blanks and tools was limited and served to supply immediate demands. The occupants exported the remnants of nodules and cores as a lithic stock for later exploitation. Interestingly, blade production and Levallois-flake production were both skills belonging to the technological abilities of the group.

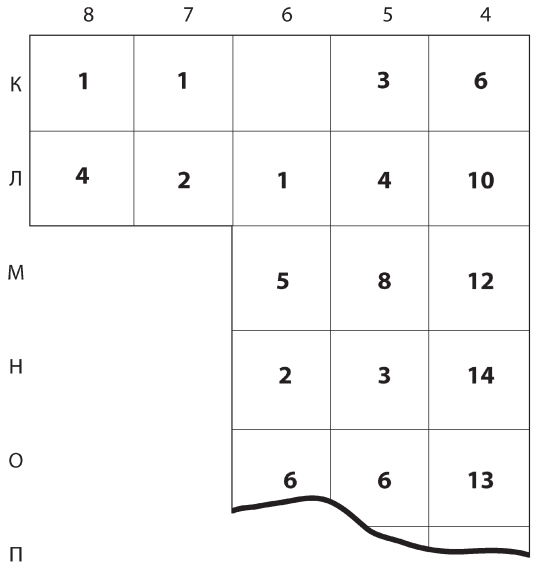


Fig.13-1 Kabazi II, level VI/9-9A: Artefact distribution (pieces > 2cm).

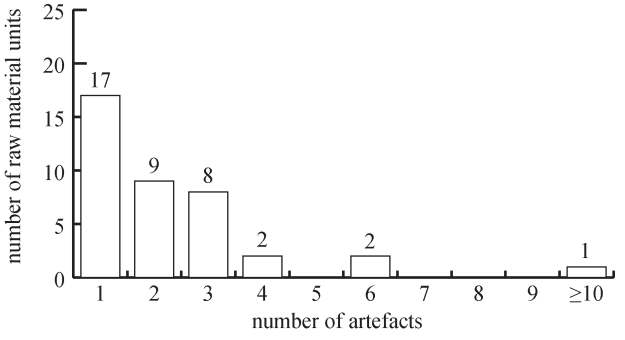


Fig. 13-2 Kabazi II, level VI/9-9A: Number of artefacts per workpiece.

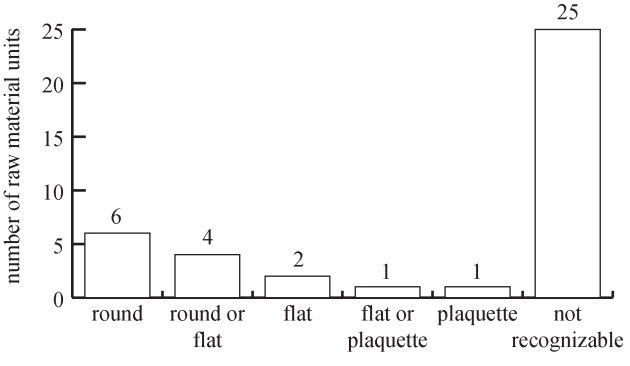


Fig. 13-3 Kabazi II, level VI/9-9A: Shapes of nodules.

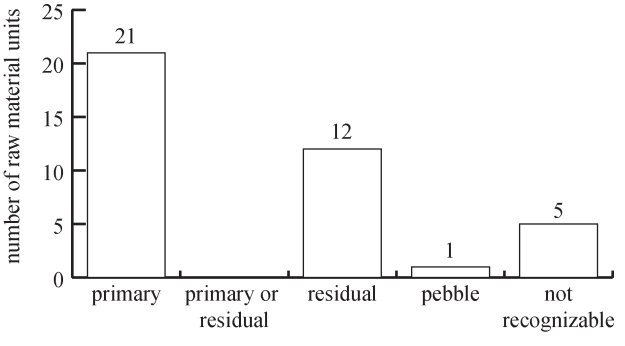


Fig. 13-4 Kabazi II, level VI/9-9A: Nature of raw materials.

Cortical Pieces and Migrating Cores: Kabazi II, Level VI/10

Level VI/10 contained 17 larger artefacts belonging to 9 different raw material units (Fig. 13-8, 13-9). Nodules were of different shapes and came from primary and residual sources (Fig. 13-10, 13-11). The small inventory (Fig. 13-12) consists firstly of three imported blanks, all with some cortex, secondly of two nodules, one of them immediately discarded after importation, the other exploited for blank production, and thirdly, of four "migrating cores", two of which were already in a late stage of exploitation. The presence of some cortical pieces indicates that the occupants had visited a nearby raw material source shortly before they arrived at Kabazi II for a very short stay, during which production efforts were minimal.

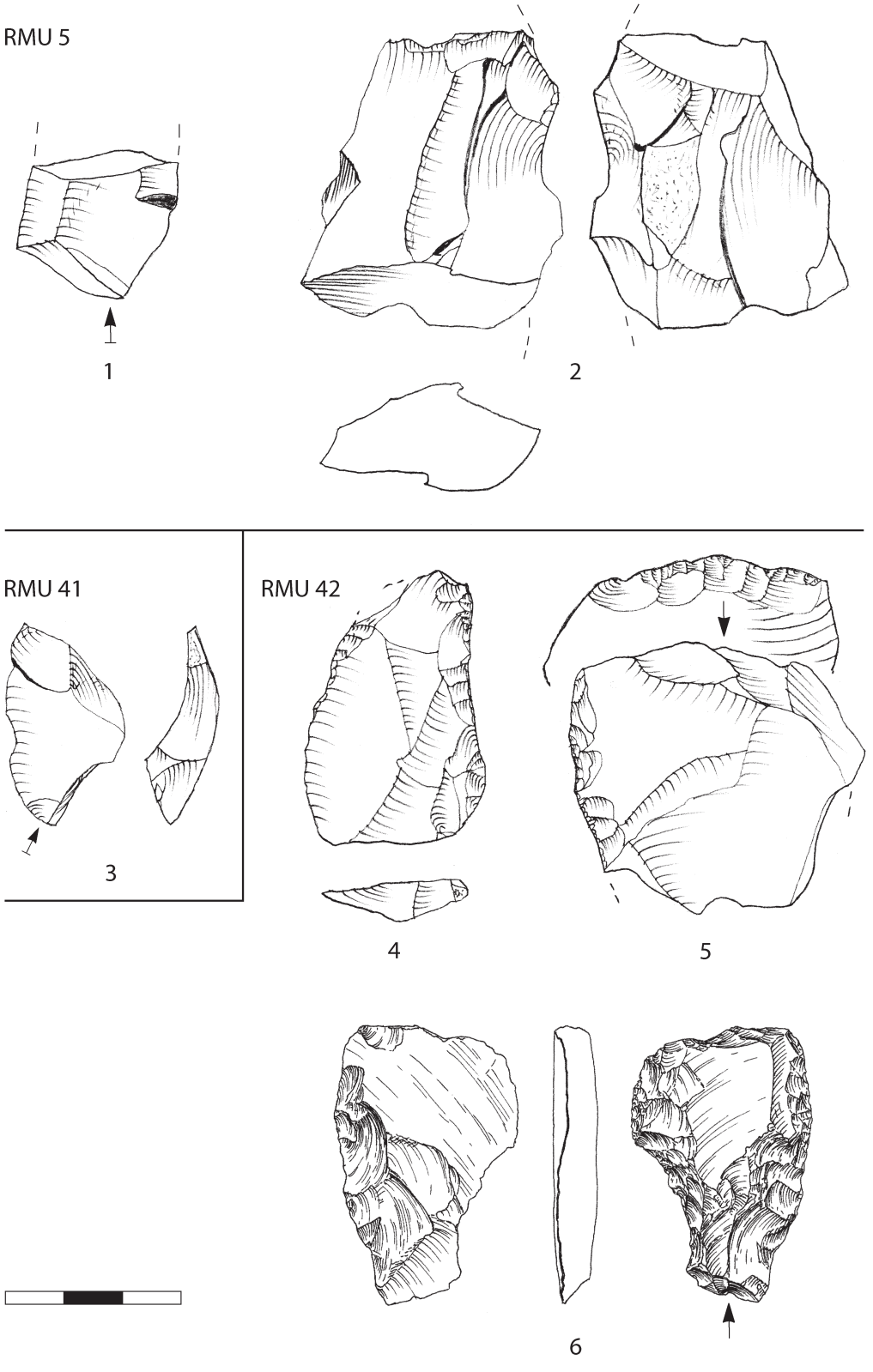


Fig. 13-5 Kabazi II, level VI/9-9A: Selected workpieces (imported as cores).

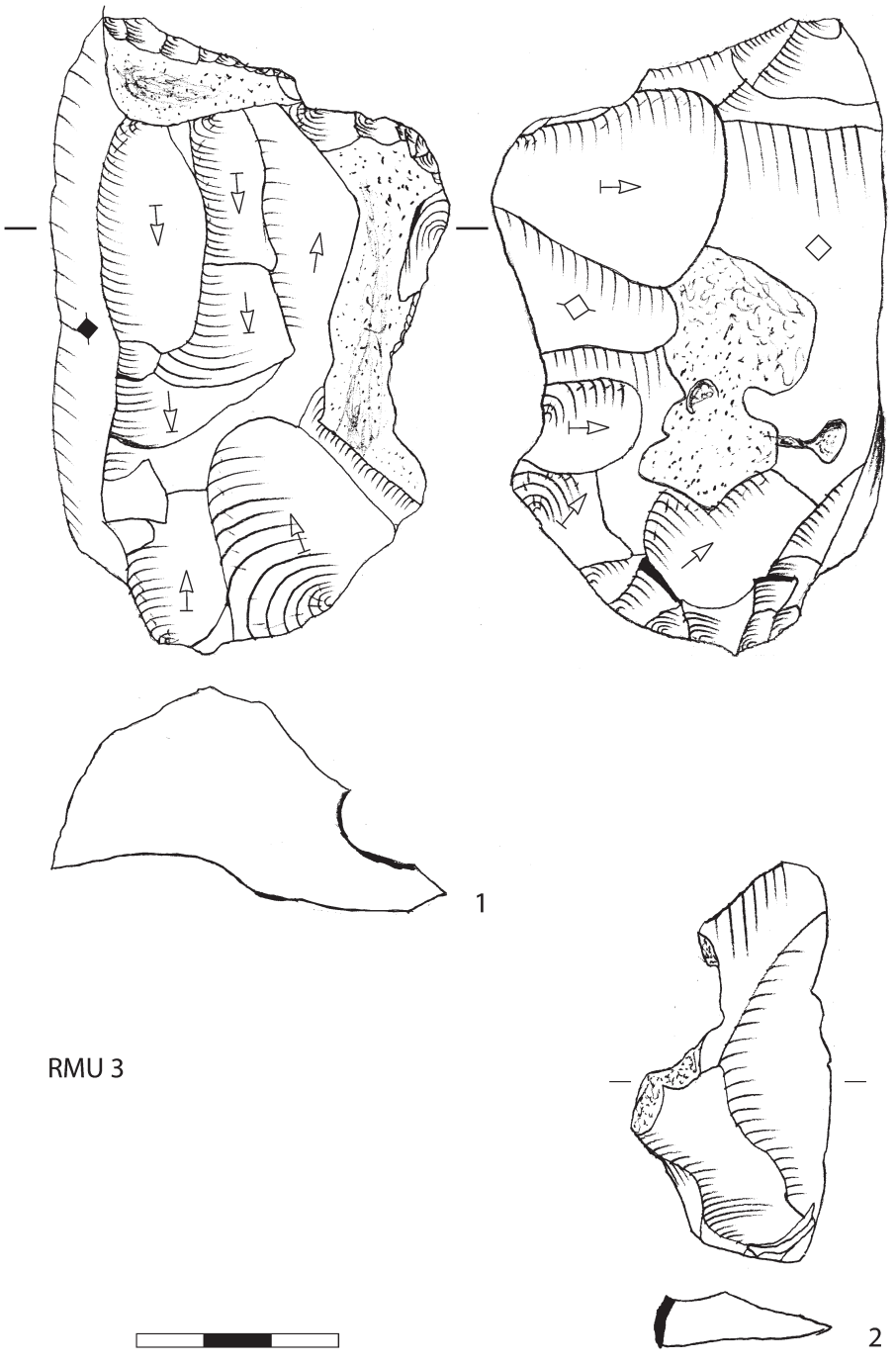
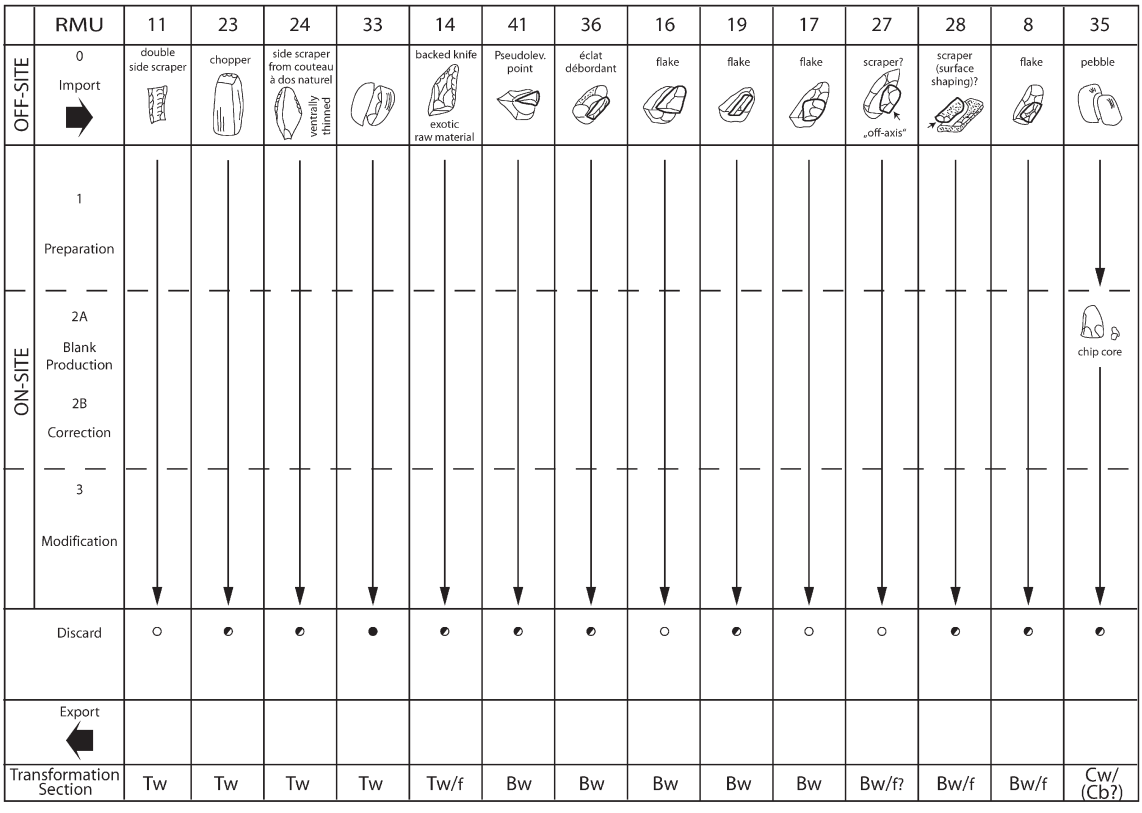


Fig. 13-6 Kabazi II, level VI/9-9A: Workpiece imported and discarded as a preform.

Fig. 13-7 (1)-(4) Kabazi II, level VI/9-9A: Transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Cw = core without debitage; Ei = isolated tip; Cc = correction of a core; TT = fragments of a formal tool, used as a single object; Np = preparation of a raw nodule; Cb = blank production from a core; Nb = blank production from a raw nodule; Cm = blank production from a core with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990). ►



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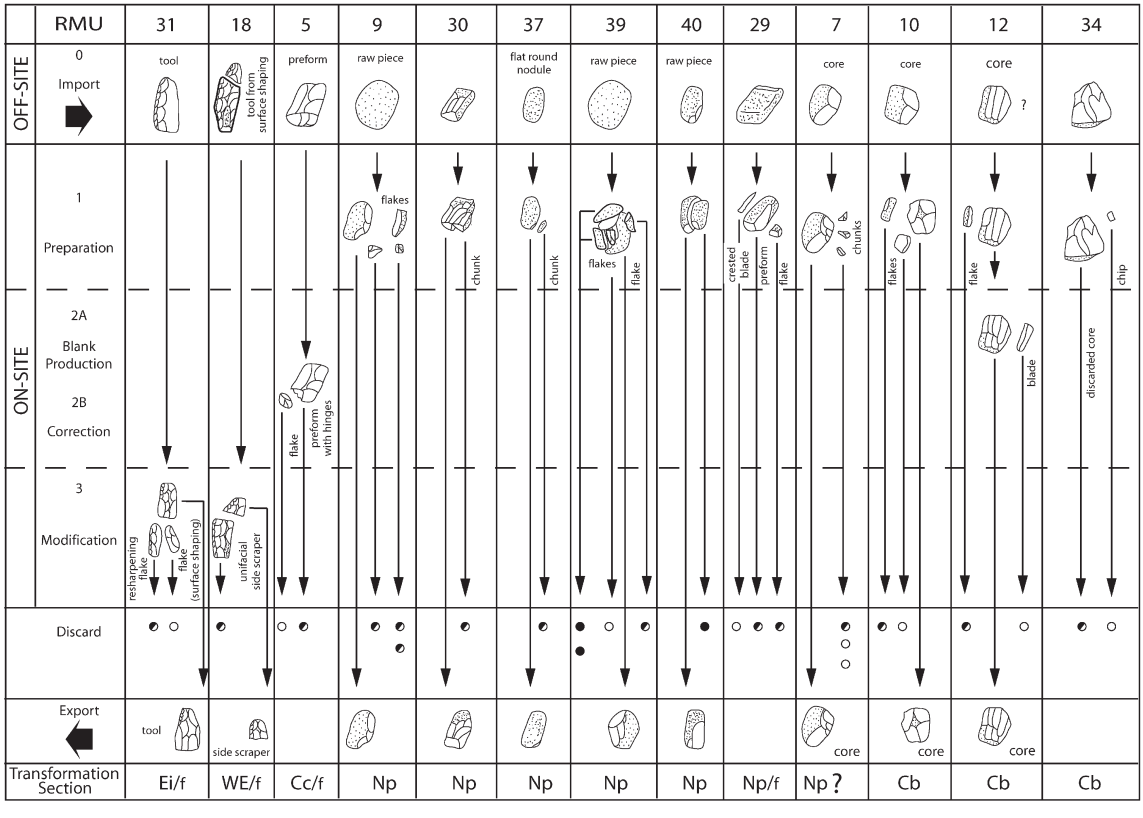

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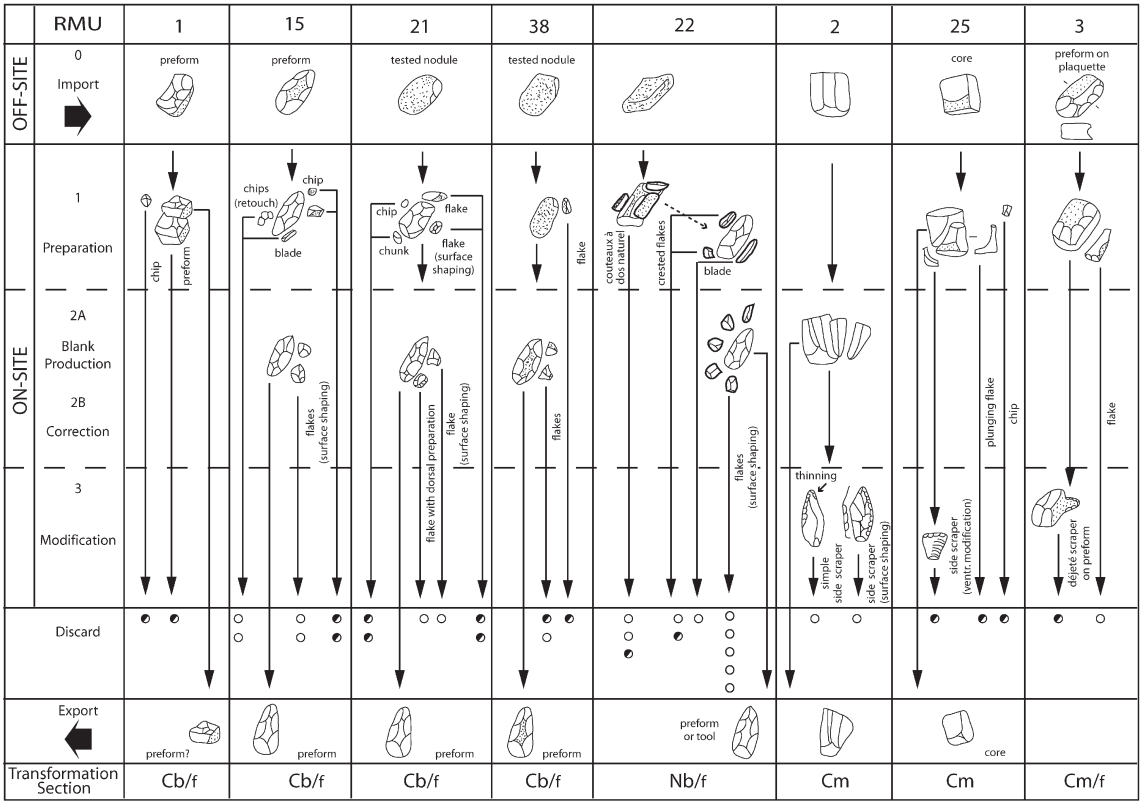

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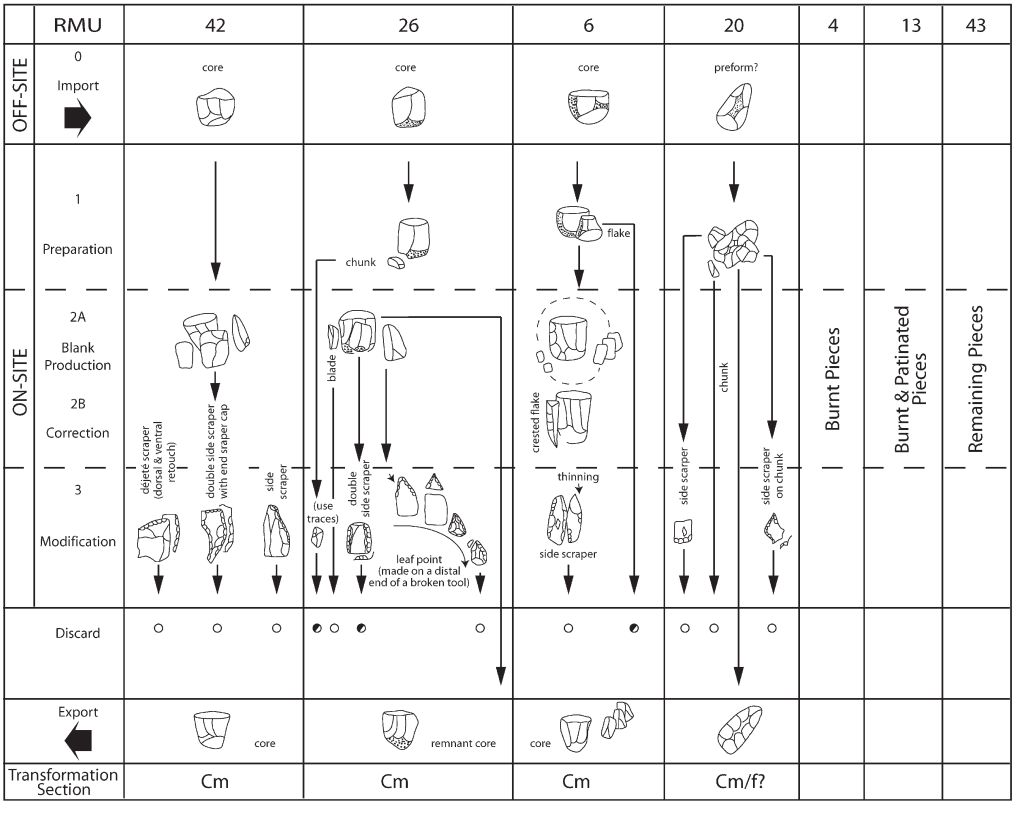

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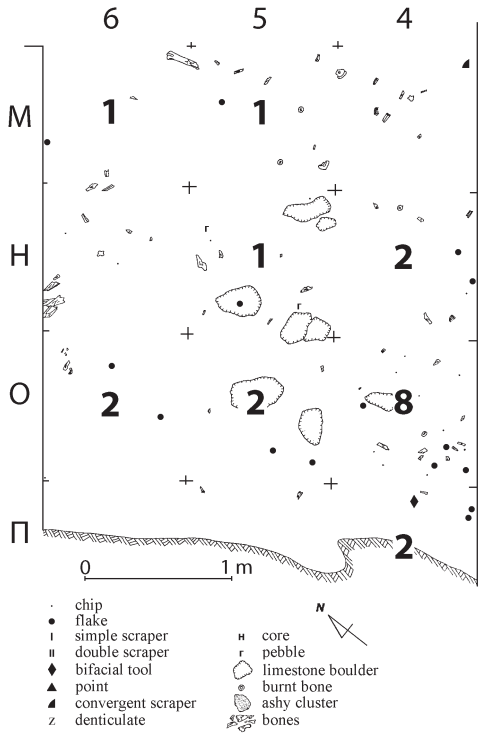

Fig. 13-8 Kabazi II, level VI/10: Artefact distribution (pieces > 2cm).

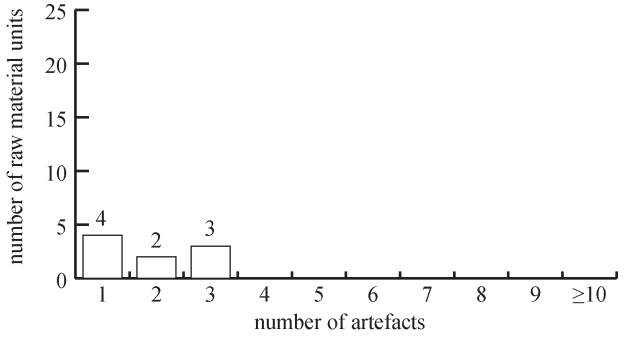

Fig. 13-9 Kabazi II, level VI/10: Number of artefacts per workpiece.

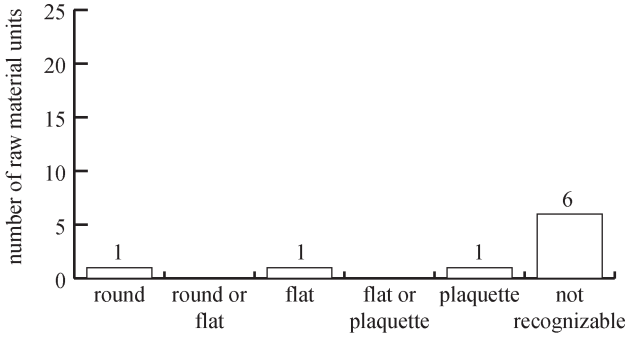

Fig. 13-10 Kabazi II, level VI/10: Shapes of nodules.

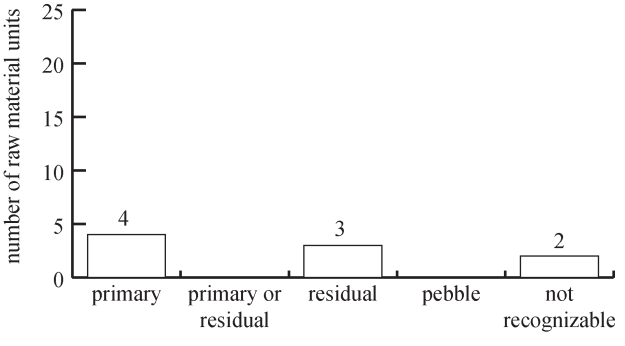

Fig. 13-11 Kabazi II, level VI/10: Nature of raw material.

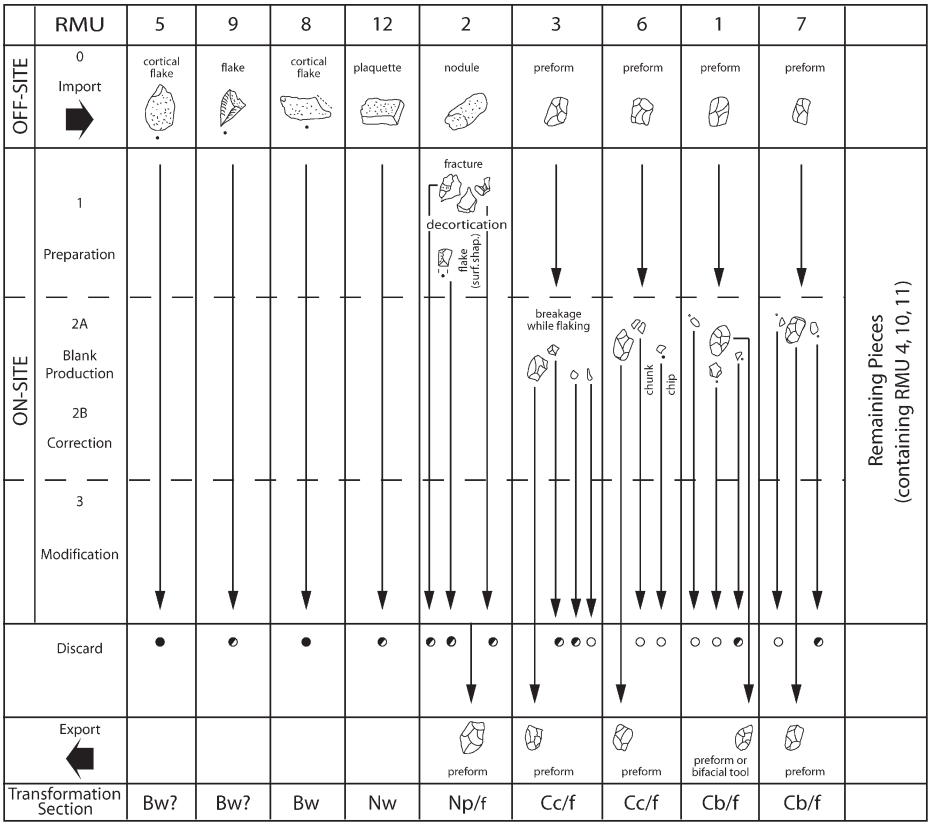

Fig. 13-12 Kabazi II, level VI/10: Transformation sections of workpieces. Bw = blank without debitage or modification; Nw = raw nodule without debitage; Cc = correction of a core; Np = preparation of a raw nodule; Cb = blank production from a core; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Abstract

ОХОТНИЧЬЯ ДОБЫЧА И СЫРЬЁ: КАБАЗИ II, ПОСЕЛЕНИЯ ГОРИЗОНТОВ VI/9 – VI/10

Ю. РИХТЕР

Незначительная по количеству артефактов коллекция горизонтов VI/9 – VI/10 связана с кратковременными хозяйственными эпизодами. Вместе с тем, на поселении горизонта VI/9 производство сколов было более ярко выражено, чем в других горизонтах этого же культурно-хронологического слоя. Большинство сырьевых групп было импортировано на стоянку в виде протестированных желваков. Вероятно, происхождение этих желваков связано с первичными выходами кремневого сырья. Большинство сколов и орудий, использованных для разделки охотничьей добычи, было произведено на стоянке. С другой стороны, обитатели горизонта VI/10 предпочитали приносить на поселение первичные сколы, а не желваки сырья.

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KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Chapter
14

Transformation Analysis at Kabazi II, Levels VI/11-14

Thorsten Uthmeier & Jürgen Richter

Stratigraphical Position and Distribution of Finds

Within the long stratigraphical sequence of Kabazi II, levels VI/11-14 represent one of the lowermost archaeological levels. These deposits were embedded in geological Stratum 14B which, according to the results from the pollen analysis, have been dated to the end of the last Interglacial (OIS 5d, see Gerasimenko, Chapter 2, this volume). Due to the great depth of the trench, archaeological levels at the base of the profile were only excavated in an area covering 12 m^2. According to V. P. Chabai (Chapter 1, this volume), Stratum 14B represents a very early phase in the development of the site when sediments had just started to accumulate behind the block which had fallen to the surface of the 3rd terrace of the Alma river, i.e. before a more or less horizontal surface had formed there (compare Chabai, Chapter 1, Fig. 1-4, this volume). Since the surfaces of the lower part of Unit VI were not horizontal, but formed a slope running towards the Alma Valley with an angle of up to 35°, it is not clear if the artefacts found in levels VI/11-14 were encountered in their primary context (for more details see Chabai, Chapter 1, this volume, and Gerasimenko, Chapter 2, this volume). When mapped in their totality (Fig. 14-1), archaeological finds appear densely packed immediately behind the huge limestone block. From sq. O/5 and O/6, with the highest frequencies of artefacts and faunal remains, the number of finds steadily decreases towards the northern edge of the trench. During excavations, the sloping of sediments presented problems in separating archaeological levels. It is assumed that the levels do not represent single events of artefact discard and sedimentation. Instead, archaeological remains are thought to originate from one ore more concentrations, moved either from more elevated areas or from neighbouring parts of the same site by post-depositional processes down the pronounced slope. Judging from the preservation of archaeological finds, any movement must have been of a short distance only. Lithics are neither rolled nor patinated, and lateral edges look fresh and sharp. The same is true for faunal remains, which show an even better preservation than those deriving from the upper part of layer 14B (see Chabai, Chapter 1, this volume). Even fragile bones, such as "foetal bones, bones of very young individuals, [and] hyoid bones" (Patou-Mathis, Chapter 5, this volume, translation by the author), have survived. In addition, so called "colluvial artefacts", which are a common component of most Kabazi II assemblages, and probably result

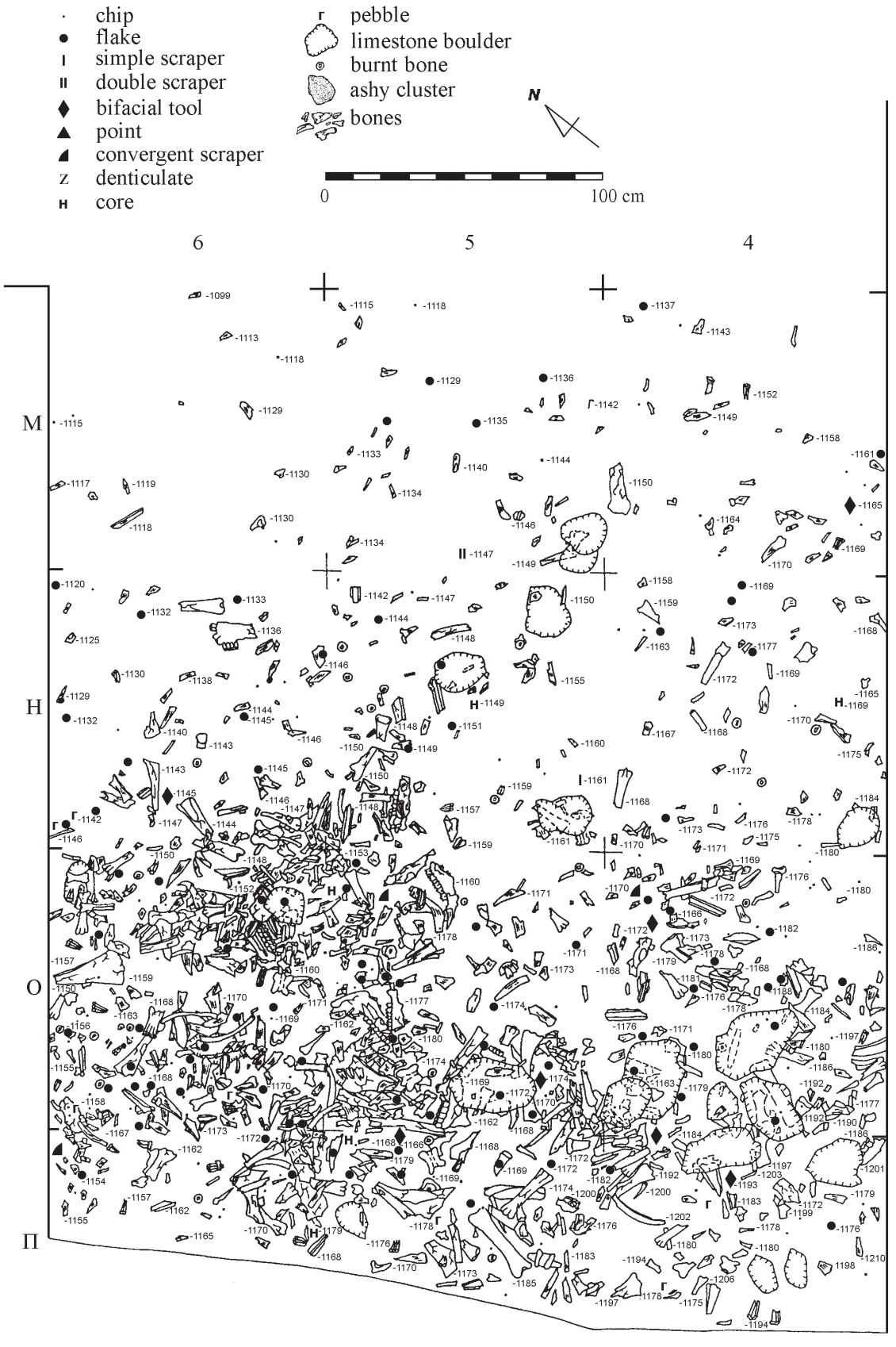


Fig. 14-1 Kabazi II, Levels VI/11-14: map of the excavated area.

from long-time erosional processes that affected more distant parts of the questa, are missing (see Chabai, Chapter 1, this volume). This would point to periodically more stable conditions of the slope. If archaeological remains were transported, then it is most plausible that transportation was caused predominantly by the angle of the surface, and came to a gentle stop in front of the limestone slab. Obviously, movements were restricted to short distances (according to the good preservation of lithics), and finds were quickly covered by colluvium afterwards (as implied by the good preservation of bones).

Some Methodological Reflections on the Transformation Analysis of Incomplete Assemblages

During the excavation the attempt was made to separate levels VI/11 to VI/14 by defining units according to the maximal thickness of the largest find. It is not clear if these excavation units represent several events of artefact discard and deposition, or consist of a mixed palimpsest after a single phase of slope instability. For this reason, artefacts are analysed within the units defined during excavations. Given the good preservation of both lithic and faunal remains, it appears highly unlikely that post-depositional processes cover a long period of time. Therefore, there is a good chance that the assemblages are not the result of a random selection of items (e.g. several concentrations eroding over a long time span), but of natural artefact transportation that affected only a limited area. However, it still cannot be ruled out that parts of each of the assemblages are to be found in other levels. Thus, in this situation it is debatable whether a transformation analysis of the material makes sense, and if applied, which restrictions must be considered in the interpretation of the results (for general information about this method see Uthmeier, Chapter 7, this volume). In other words: Are our methods insufficient, as J. P. Rigaud and J. F. Simek (1987) have resumed for (better preserved?) cases in the Dordogne, or is it possible to extract information from assemblages that underwent a selection of items due to post-depositional processes?

In our opinion, a detailed sortation into raw material units, combined with a transformation analysis of these units, represents an ideal solution. Given an appropriate quality of sortation, transformation analysis treats raw material as equivalents of refits. Even if there are no refits, it is assumed that several artefacts of the same nodule were manufactured on the site. Therefore, when compared to the time span covered by the entire assemblage, they represent a sequence of blows stretched over a short period of time. It follows that the question as to the contemporeneity of artefacts (in the sense of a single visit), is less problematic than in conventional approaches. Instead, every raw material unit is seen as a sub-assemblage, generally embedded in a context of flaking, discard and sedimentation. This context might be strictly local, but can stretch over considerable distances, e.g. between the outcrop and the site, or between original discard and final sedimentation. As a consequence, raw material units analysed from a given assemblage might be – to varying extents – incomplete after N- and C-transformations. By using transformation analysis, it is possible to measure the degree of incompleteness. Therefore, the method provides important information with regard to the natural site formation process and, if artefacts are in their primary context, to the import and export of artefacts by human agents. However, even if the assemblage under study is known to have suffered from, for example, erosion, and artefacts were lost after N-transformations (M. Schiffer 1987), transformation analysis may help to reconstruct the following factors:

1. The minimal number of lithic items brought into the site, according to the frequency of raw material units. As two artefacts produced from the same raw material unit indicate the former presence of either a nodule, a preform or a core which was struck within the excavated area, a better estimation of minimal human transportation of lithics is possible.

2. The minimal number of working steps applied to every raw nodule that was flaked on the site. As an extreme example, a cortical flake combined with a lateral sharpening flake indicates a complete operational chain, starting with the decortication of a raw nodule, continued with the reduction of a core, and ending with resharpening of at least one formal tool. Thus, it is possible to estimate the minimal amount of flaking. At the same time, concepts and methods of the transformation of raw material units may show one pattern, or different, yet recurrent patterns that may help to identify the character of flaking processes. If, for example, a raw material unit combines a core and a surface shaped bifacial tool, it is concluded that flakes produced from cores served as blanks for surface shaped tools.

Or, if a raw material unit includes a bifacial tool and flakes from surface shaping that were modified, it is taken that blanks from the production of bifacial tools were subsequently used for the manufacture of unifacial formal tools. Finally, it has already been proposed that in Crimean assemblages failed or largely reduced bifacial tools were flaked like a core for the final extraction of small flakes and chips (Uthmeier 2004b). This detail has gained increased importance since L. Bourguignon, J.-Ph. Laivre and A. Turq (2004) demonstrated that such "ramifications" of *chaînes opératoires* are an important feature of middle Palaeolithic blank production.

3. The number of missing artefacts. As demonstrated with the examples above, a transformation section might be long, although artefacts were only found that define the most initial and final phase of the formal *chaîne opératoire*. By comparing the length of the transformation sections with the number of artefacts in the raw material units, a better estimation of the amount of missing lithics is possible.

On the other hand, while there is a good chance to formulate a hypothesis of minimal flaking activities occurring on-site, no safe assumptions can be made with respect to the import and export of lithics by humans. All such assumptions are hindered by the fact that short transformation sections may reflect nothing more than post-depositional alterations of artefacts originally discarded. In cases where single artefacts were isolated during the sortation of one archaeological level into raw material units, it cannot be excluded that parts of the same nodule were embedded in other levels. The same applies to artefacts missing from operational chains recognized as having taken place on the site: these might have been taken to other sites, but might also have been lost during natural site formation processes. Therefore, the description of the results of transformation analysis focuses mainly on long transformation sections.

Lithic Production and Limited Use of Curated Tools: Transformation Analysis of Level VI/11

The assemblage of level VI/11 stem from only 12 excavated square metres (Fig. 14-2) and comprises 35 artefacts sorted into 14 raw material units (Fig. 14-3). Flat nodules from primary sources were preferred (Fig. 14-4 and Fig. 14-5). Some foliate points among the single objects were imported to the site (Fig. 14-6, RMU 5, RMU 6, RMU 8). Two of these are attested solely on the basis of remnants of secondary modification, indicating their importance as curated tools. By contrast to level VI/10, levels VI/11 lacks any evidence for "migrating cores", and instead comprises several imported nodules for the production of cores. In one case, the nodule was exploited on the site (Fig. 14-6, RMU 15). Exceptional for unit VI, level VI/11 is that it displays a very clear focus on raw material procurement from a nearby source and subsequent production of prepared nodules, preforms and cores for exportation.

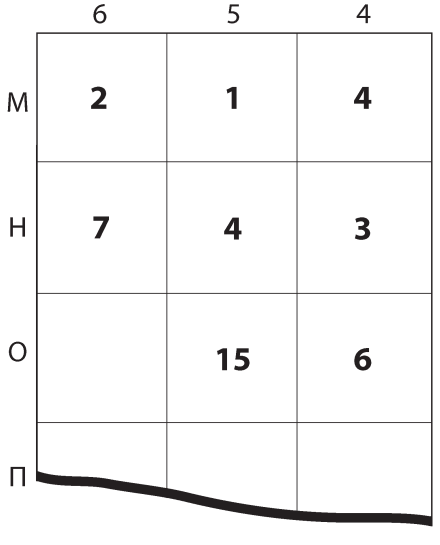


Fig. 14-2 Kabazi II, Level VI/11: artefact distribution (pieces > 2cm).

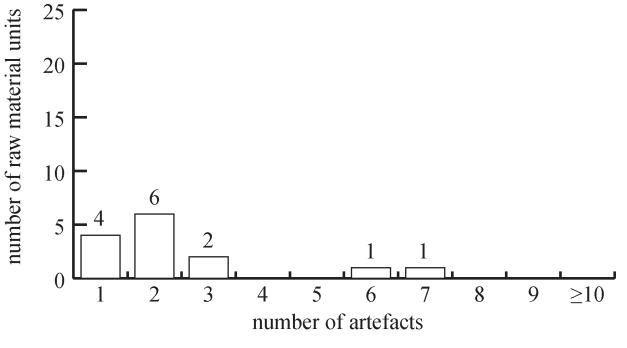


Fig. 14-3 Kabazi II, Level VI/11: Number of artefacts per workpiece.

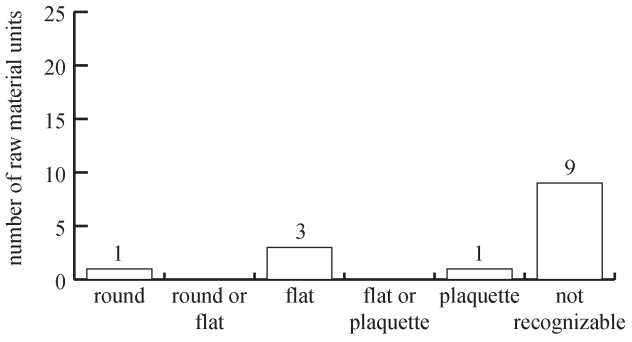


Fig. 14-4 Kabazi II, Level VI/11: Shapes of nodules.

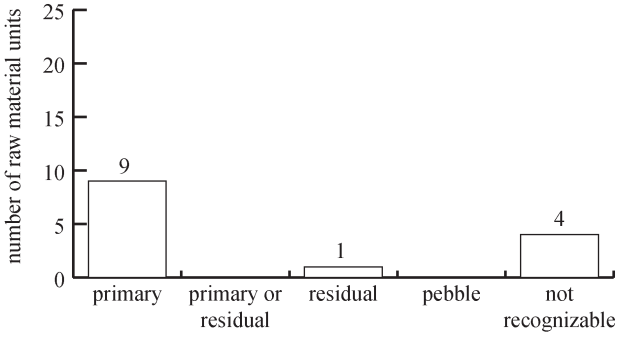


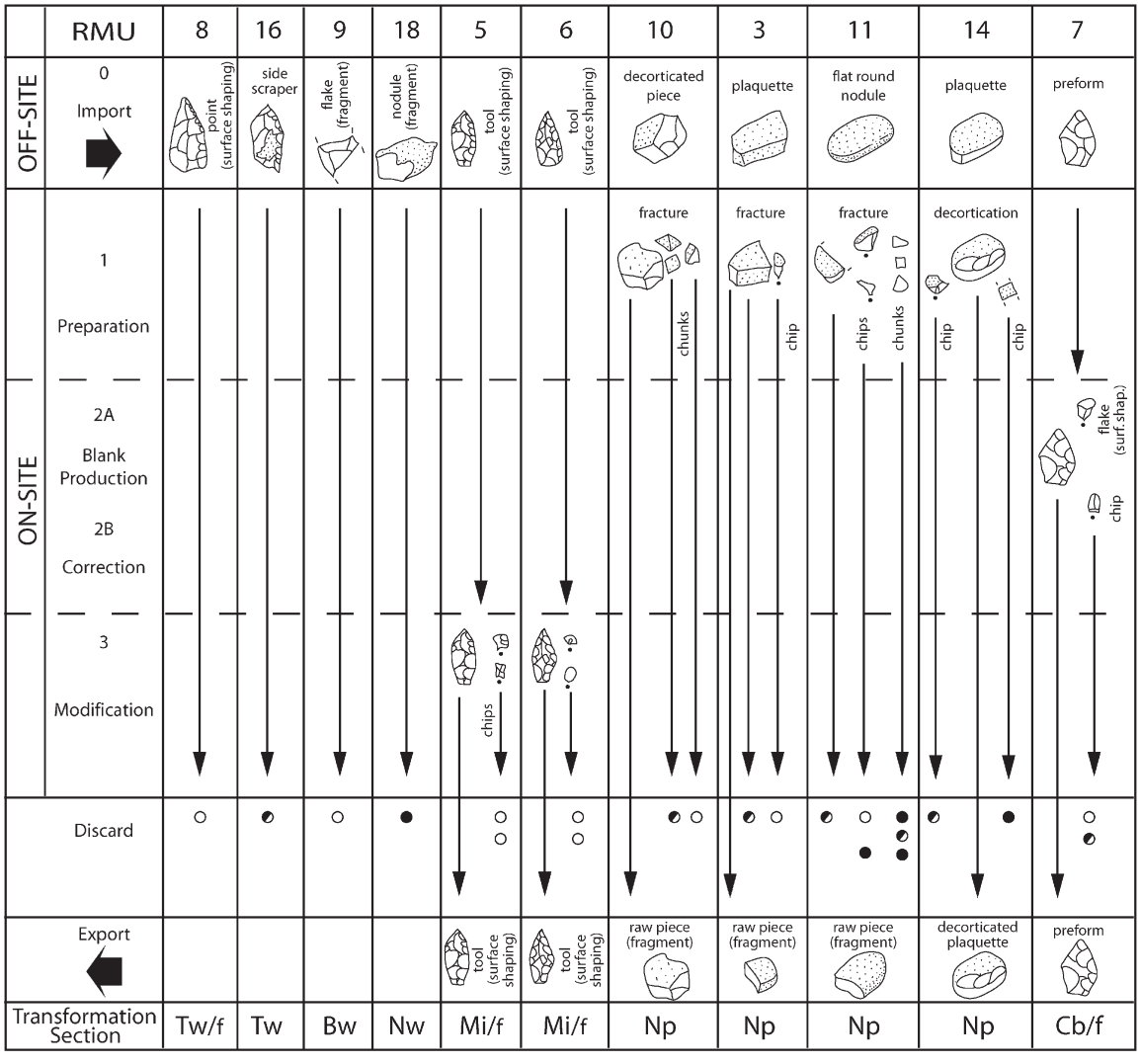
Fig. 14-5 Kabazi II, Level VI/11: Nature of raw materials.

Supply for the Near Future: Transformation Analysis of Level VI/12

Finds from this level were made in the north-western corner of the excavated area (Fig.14-7). Raw material supply seems to have been random, with both round and flat nodules (Fig.14-8) and mainly residual sources (Fig. 14-9). Raw material units are quite small, comprising less than 10 artefacts. Only RMU 1 contains as many as 25 artefacts (Fig. 14-10). The latter displays a complete transformational sequence (Nm/f; Fig.14-11 and 14-12): A raw nodule was brought in and broken into large chunks. Two of these were discarded, and a further three were transformed into preforms for foliates. One preform underwent initial surface shaping only and was soon discarded. The remaining two were transformed into narrow, triangular leaf points, one of which was discarded as a whole after intensive use. The second of the points remained on the site, after medial fracture, as a basal fragment, the distal fragment having been exported. Leaf points were obviously designed for on-site use. Generally, there are three groups of operational chains (Fig. 14-13). Firstly, importation and discard of blanks (RMU 10, RMU 11). Secondly, importation of preforms, initial core-like exploitation (few blanks are produced from surface shaping to be used and discarded on-site), and export of the same preforms (RMU 5, RMU 6, RMU 7, perhaps also RMU 4). Thirdly, importation of raw nodules, production and export of preforms. The operational chains are short and do not result in the production of completed leaf points as, for example, in level VI/6.

The second group (core-like pieces) repeats an observation made previously at other interglacial levels of Kabazi II. Preforms served not only as blanks for foliate pieces, but also as a source of some limited flake production. Thus, preforms were not entirely shaped at one time, but shaping was dispersed over a certain time range and was only carried out when flakes were needed. Only then were they transformed into leaf points. In this level, preforms replace cores. Were concepts for flake production unknown at this time?

To summarize, level VI/12 has extremely short operational sequences. The Kabazi II site must have been a short stop within a circulating settlement pattern. Production for export is very limited (RMU 1, RMU 10, RMU 11 only).



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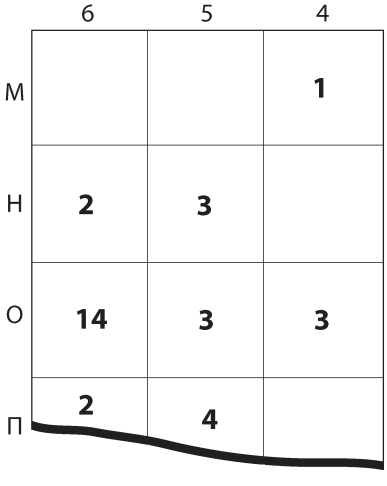


Fig. 14-7 Kabazi II, Level VI/12: artefact distribution (pieces > 2cm).

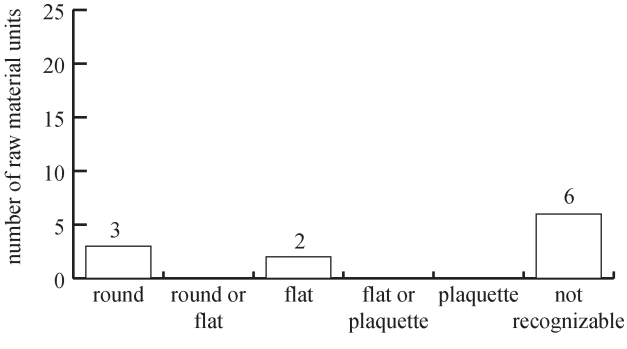


Fig. 14-8 Kabazi II, Level VI/12: Shapes of nodules.

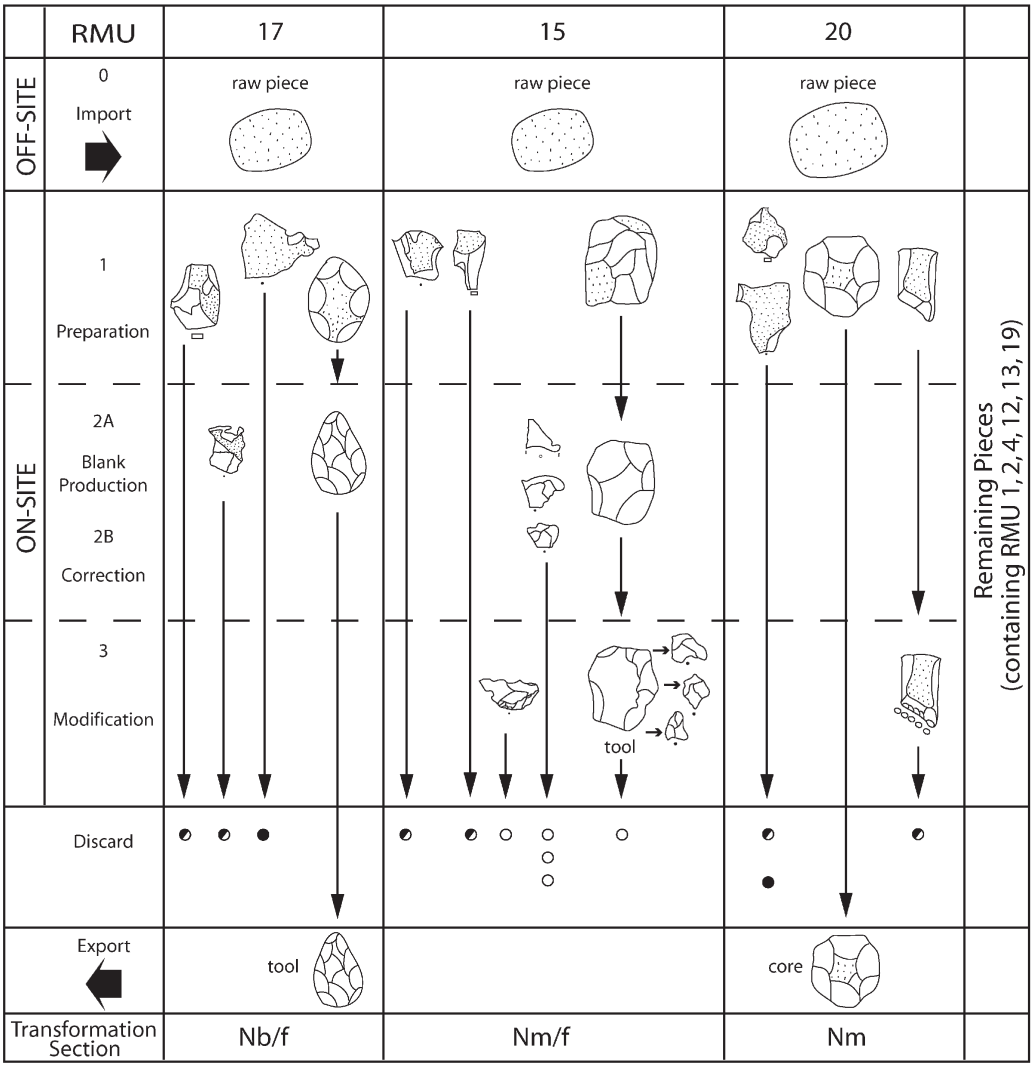


Fig. 14-6 (2)

Fig. 14-6 Kabazi II, Level VI/11, transformation sections of workpieces: Bw = blank without debitage or modification; Tw = tool without debitage or modification; Nw = raw nodule without debitage; Mi = isolated pieces from modification; Np = preparation of a raw nodule; Cb = blank production from a core; Nb = blank production from a raw nodule; Nm = blank production from a raw nodule with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

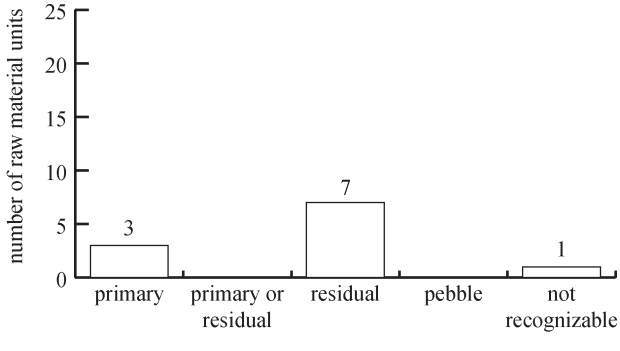


Fig. 14-9 Kabazi II, Level VI/12: Nature of raw materials.

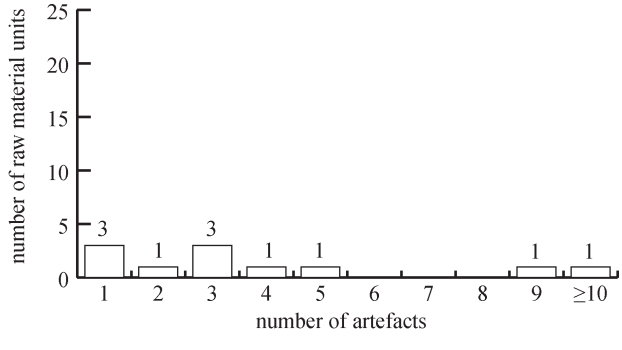


Fig. 14-10 Kabazi II, Level VI/12: Number of artefacts per workpiece.

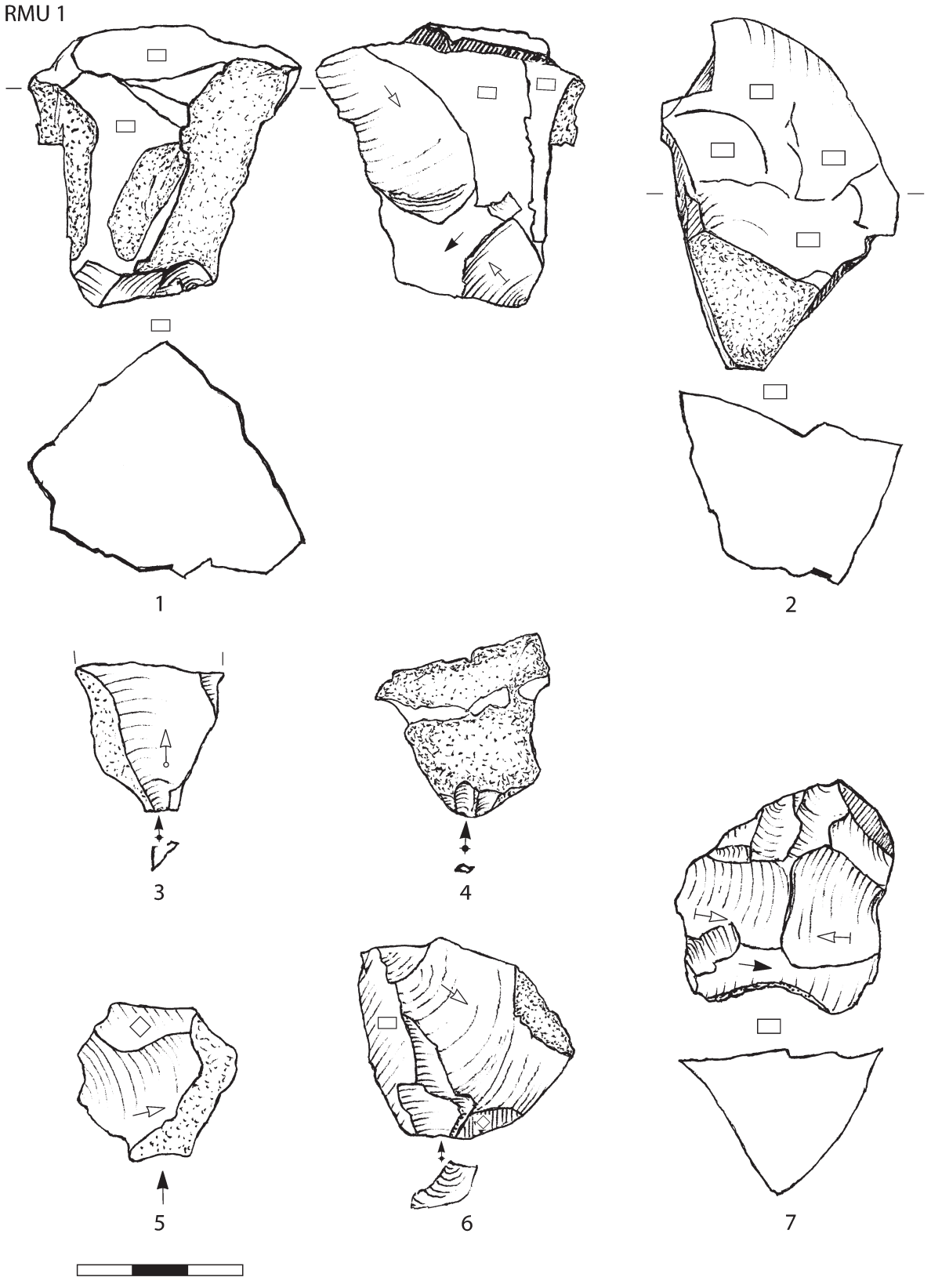


Fig. 14-11 Kabazi II, Level VI/12: workpiece RMU 1. Initial stages of a long operatory sequence. Chunks, cortical flakes and flakes from the preparation of a nodule.

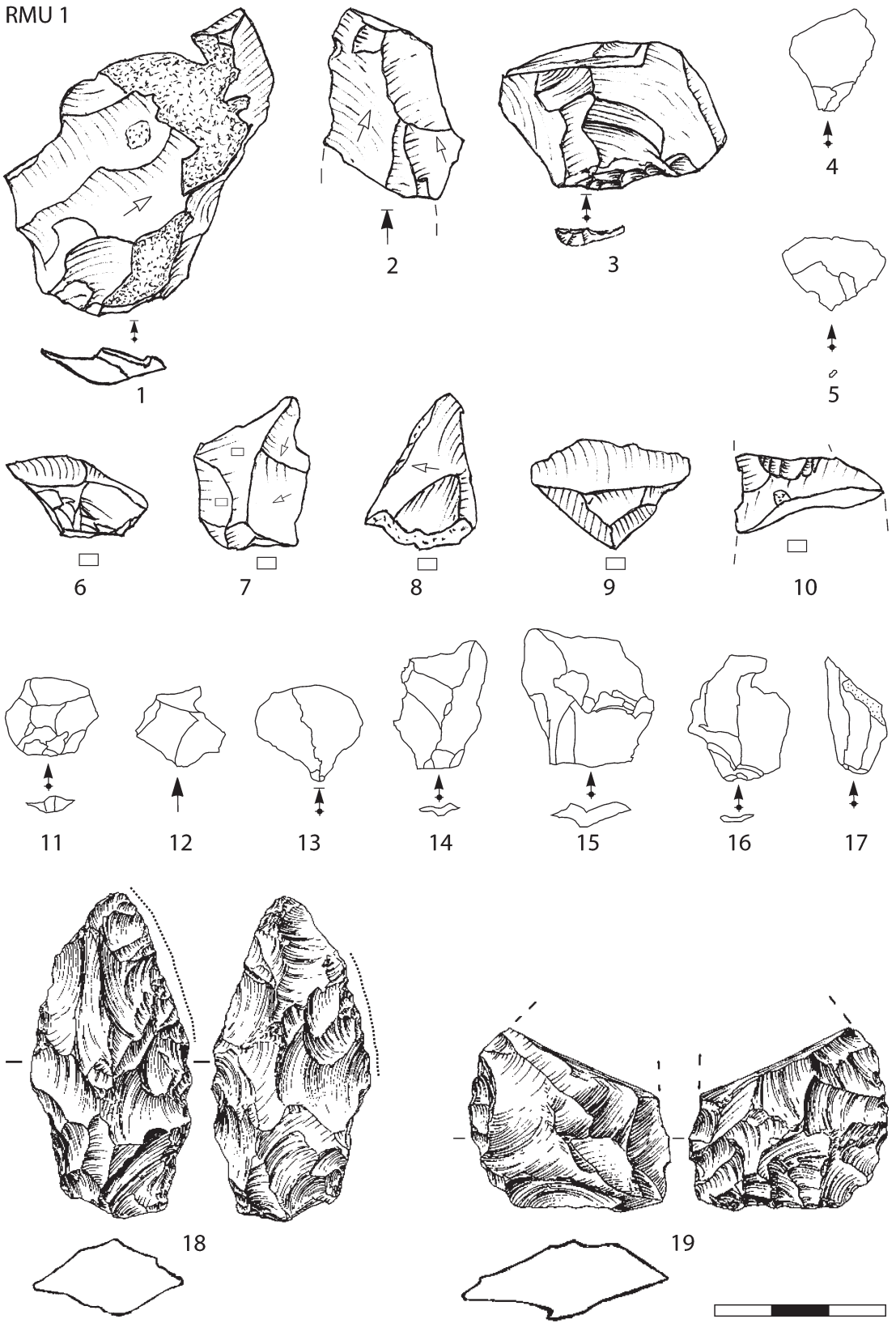


Fig. 14-12 Kabazi II, Level VI/12: workpiece RMU 1. Flakes from surface shaping and preparation of the working edges of a large foliate. Basal fragment (19) and rejuvenated foliate (18).

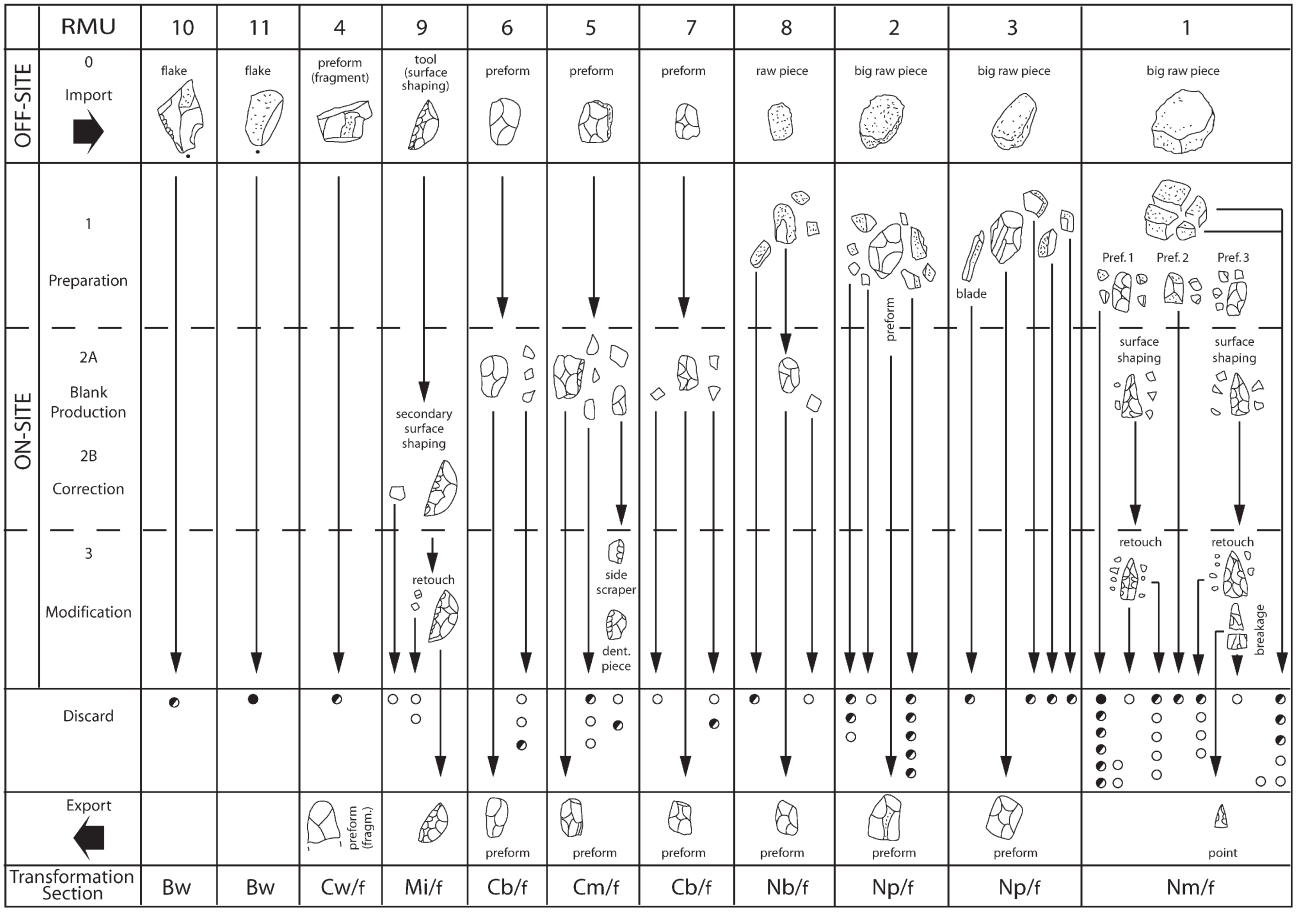


Fig. 14-13 Kabazi II, Level VI/12, transformation sections of workpieces: Bw = blank without debitage or modification; Cw = core without debitage; Mi = isolated pieces from modification; Np = preparation of a raw nodule; Cb = blank production from a core; Nb = blank production from a raw nodule; Nm = blank production from a nodule with modification of blanks; /f = bifacial production or surface shaping (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Reacting to Immediate Demands: Transformation Analysis of Level VI/13

With 51 artefacts, the sample from Kabazi II, level VI/13 analysed here is the largest assemblage from levels VI/11-14. Therefore, it will be described in greater detail. Due to the fact that the excavated area was restricted to 12 m^2, little can be said about the spatial distribution of finds (Fig. 14-14). From sq. O/5 and O/6, in which the highest frequencies of artefacts and faunal remains were observed, the number of finds decreases towards the northern edge of the trench. A total of 9 formal tools were found. In six cases, the lateral edges of blanks were modified. Among these, 5 simple side scrapers dominate (Fig. 14-15, *6*; 14-16, *5*; 14-18, *2*, *6*) over one double side scraper (Fig. 14-18, *7*). Occasionally, the retouch that led to the classification as a simple side scraper does not cover the entire lateral edge of the blank (Fig. 14-18, *6*). Nevertheless, negatives of the retouch are fine and regular, and they produce a straight working edge. In addition, there are three surface shaped tools (Fig. 14-16, *8*; 14-19, *1*, *5*). Modifications were applied on blanks already altered by facial retouch on one or both sides (for more information about this way of classifying surface shaped tools, see Boëda, 1994; Richter, 2004). One of these, a bifacial scraper made on a blank with a ventral surface untouched by facial retouch, is remarkably large (Fig. 14-19, *1*) . In fact, with a maximal extension of 6,7 cm, it is one of the largest artefacts of the entire assemblage. Like the first, the second surface shaped tool – classified as a convergent scraper – was again made from a

flake, but is much smaller (Fig. 14-19, *5*). The third surface shaped tool is a small but thick, plano-convex bifacial convergent scraper (Fig. 14-16, *8*). All surface shaped tools show signs of reduction and/or resharpening. In two cases (Fig. 14-19, *1*, *5*) ventral thinning, as well as incomplete, large negatives of older work steps on the dorsal surfaces, speak for the rejuvenation of parts of the working edges. One piece, however, underwent a second, more or less complete facial shaping, and was rejuvenated by a lateral sharpening flake on its plan (lower) surface (Fig. 14-16, *8*). With the presence of plano-convex surface shaped bifacial tools, the assemblage belongs both typologically and technologically to the Crimean Micoquian (Chabai 2004).

Sortation into raw material units

Among the 51 artefacts larger than 3 cm from level VI/13, a total of 23 raw material units (RMU) were recognized (Table 14-1). With the exception of one unit that consists of five patinated pieces not suitable for transformation analysis (Table 14-1: RMU 17), all raw material units show a unique combination of macroscopic attributes. In these 22 units, the number of artefacts ranges from between one (single pieces) and six pieces (Fig. 14-20). Most of them consist of single pieces (11 cases) or pairs of artefacts (6 cases). Only five raw material units reach numbers of artefacts of between four and six pieces. According to distinctive attributes of raw material, each of the 22 raw material units mentioned above represents the result of the flaking of a single nodule ("workpieces" in the sense of Uthmeier 2004a). Whereas single pieces point to considerable N- and/or C-transformations, others are more complete. Even if the total number of artefacts in these raw material units seems to be (too?) low, they allow a reconstruction of on-site flaking, blank production and, in some cases, tool use. In general, it is not so much the low frequency of artefacts in raw material units that is problematic: formerly, the same observation has been taken as a sign for only minor flaking of a stock of raw material taken from site to site (Uthmeier, Chapter 7, this volume), or as an indication for the transport of lithics out of the site by human agents (Uthmeier, Chapter 9, this volume). However, these assemblages were less affected by post-depositional processes (Kabazi II, level V/1), or they were found in *in-situ* (Kabazi II, level V/3). Level VI/13, on the other hand, is assumed to be in a secondary position. Although artefacts were not transported over long distances, the assemblage might not contain all lithics originally discarded.

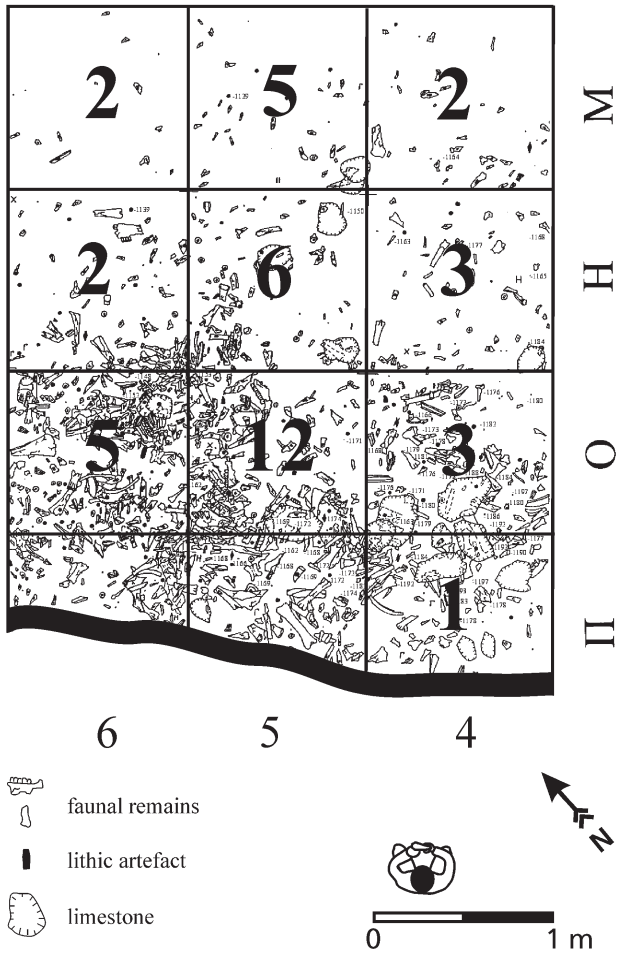


Fig. 14-14 Kabazi II, Level VI/13: distribution of artefacts used for raw material sortation and transformation analysis.

The many single pieces and small raw material units support this hypothesis. It seems highly likely that corresponding artefacts of some single pieces or small raw material units are to be found in levels VI/11, VI/12 and VI/14, respectively. On the other hand, the successful sortation of more than one half of all artefacts (larger than 3 cm) recovered from level VI/13, and the fact that all other levels bared much smaller amounts of artefacts, reveals two things:

1. The transportation down the slope did not lead to a total destruction of the original context. The existence of workpieces shows that artefacts were not moved randomly. It has to be assumed that post depositional processes were not continuously active over a long period, but were short, leaving behind at least remnants of the original context. Archaeological finds were

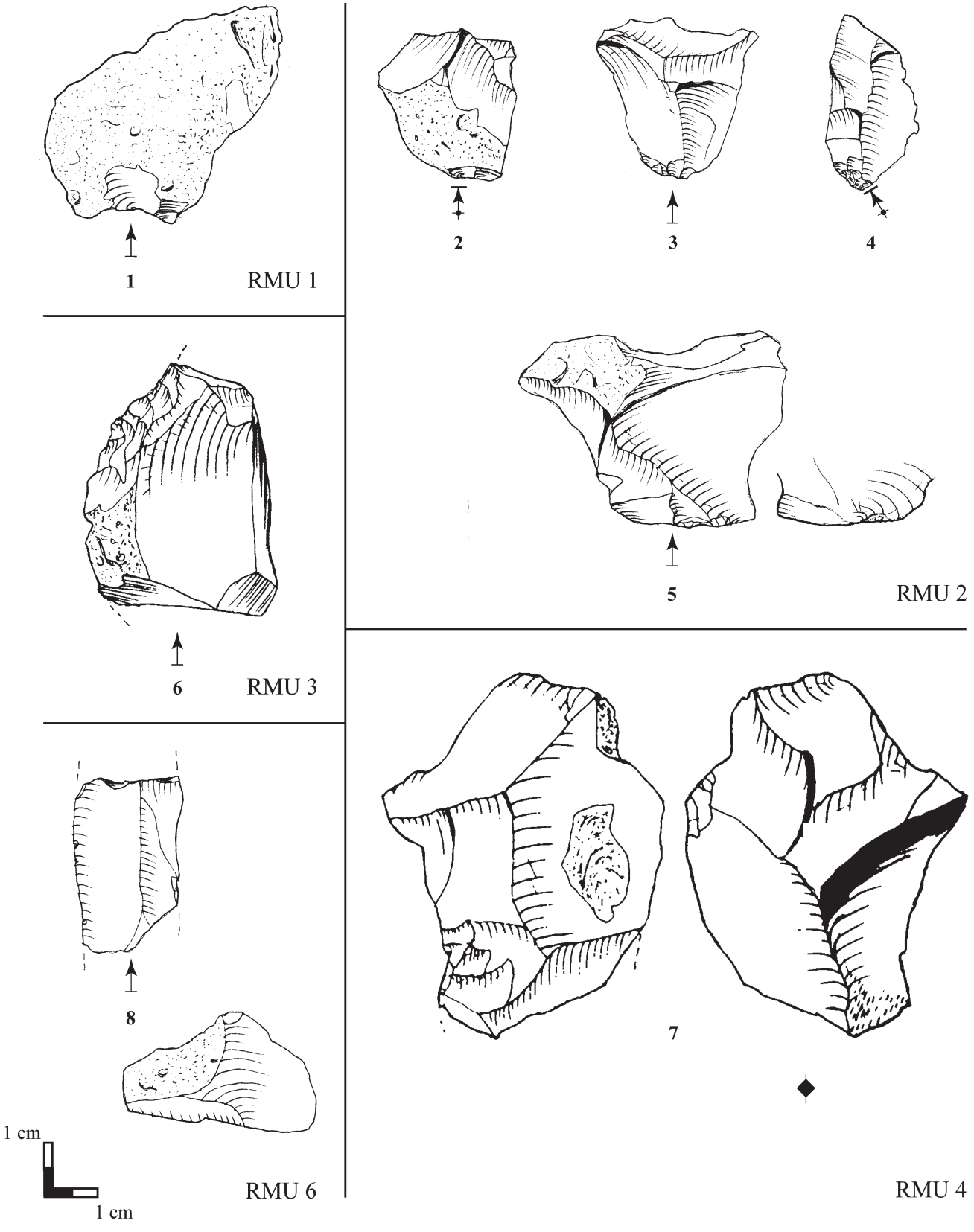


Fig. 14-15 Kabazi II, Level VI/13: artefacts in raw material units.

probably transported while embedded in sediment. On a slope like this, running water after heavy rainfall would have probably had too much energy to be responsible for a transportation that did not severely affect the finds.

2. The assemblage of level VI/13 represents either a short phase of down slope movement, whereas level VI/14 was transported earlier and levels VI/11 and VI/12 later, or consists of the main part of a concentration that was situated some metres above today's topographical position and transported as an entity.

As nearly one half of all flakes were completely (4 cases) or partly (19 cases) covered by cortex on their dorsal surfaces (Fig. 14-21), it is possible to reconstruct aspects of raw material procurement strategies. A total of 14 raw material units include artefacts that display the remains of a chalky cortex originally covering the nodules (Fig. 14-22). This points to primary sources, possibly situated in the Bodrak Valley some 6 km from the site. Local outcrops in the immediate vicinity of Kabazi Mountain which are known today were not accessible at the time level VI/13 accumulated: according to the elevation of the 3rd terrace of the Alma, which is situated some metres below the excavated area, they were covered by sediments until the river cut deeper in the landscape during OIS 3. Four raw material units had a thin, hard cortex before the flaking started, and were taken from secondary sources. As the cortex is not rolled, and therefore not transported by water, the material might have been collected near primary sources after raw material eroded out of the chalky limestone. Finally, there are two raw material units that show an opportunistic raw material procurement strategy. One (Fig. 14-18, *6*) is a single piece that resulted from frost cracking of a thin plaquette. The other item (Fig. 14-16, *7*) is a patinated flake reused by Neanderthals after it had been exposed to sunlight and weathering for some time. For most raw material units, the amount of cortex on the blanks was not sufficient to reconstruct the original shape of raw nodules (Fig. 14-23). For those that allowed hypothesis in this regard, the flaking started with round (1 case), round and flat (3 cases), and flat (2 cases) nodules, as well as with a plaquette. To summarize, no preferences for distinct shapes of raw pieces could be observed, possibly due to the low total number of artefacts in each raw material unit.

Results of transformation analysis: a critical discussion

The results of transformation analysis are presented in three ways: in a diagram showing the frequency of transformation sections (Fig. 14-24), in a table documenting the frequency of blanks in each raw material unit which were used as defining criteria for the classification of transformation sections (Table 14-1), and in a diagram that depicts the *chaîne opératoire* reconstructed for every raw material unit as a flow chart (Fig. 14-25 and 14-26). It has already been mentioned that 11 raw material units were single pieces. Of these, five are blanks (Table 14-1 and Fig. 14-25: RMUs 1, 12, 8, 22, 23 classified as "Bw"), and one is a core (RMU 4, classified as "Cw"). Four tools also proved to be single pieces ("Tw"). Two are simple side scrapers (Table 14-1 and Fig. 14-25: RMUs 3, 16), one is a double side scraper (Table 14-1 and Fig. 14-25: RMU 18), and one is a surface shaped bifacial scraper (Table 14-1 and Fig. 14-25: RMU 19). Another single piece (Table 14-1 and Fig. 14-25: RMU 11) is a ventral lateral sharpening flake that removed the basal part of the left working edge of a quite large unifacial tool. According to the definitions for classes of transformation sections (Uthmeier 2004a), it is the isolated end of a tool ("Ei"), indicating that a modified piece was rejuvenated on the site and then taken out of the excavated area. Once again, it has to be stressed that incomplete raw material units might be the result of natural artefact transport, unsuccessful attempts to separate different archaeological levels, *or* transport by humans. Since the site formation process of level VI/13 was characterised by post-depositional movements of artefacts or sediments, none of these hypotheses can be excluded. As there is no clear pattern visible, but a mixture of cores, blanks, simple tools and surface shaped tools, the authors tend to believe that human transport of ready made tools or prepared cores played only a minor role in the presence of single pieces.

In total, 11 raw material units represent flaking activities conducted within the excavated area, and therefore on the site (Fig. 14-25; 14-26). However, there are still uncertainties to what extent the amount of flaking reconstructed by transformation analysis really correspond to prehistoric reality. This is especially relevant for two short transformation sections (Fig. 14-27) covering only one phase of the formal *chaîne opératoire*. They are suspicious because additional artefacts, probably hidden in other levels, might essentially change the classification of transformation sections. One unit (Table 14-1 and Fig. 14-26: RMU 24) consists of two chips that fulfil the definitions for the correction of a core (or preforms: "Cc").

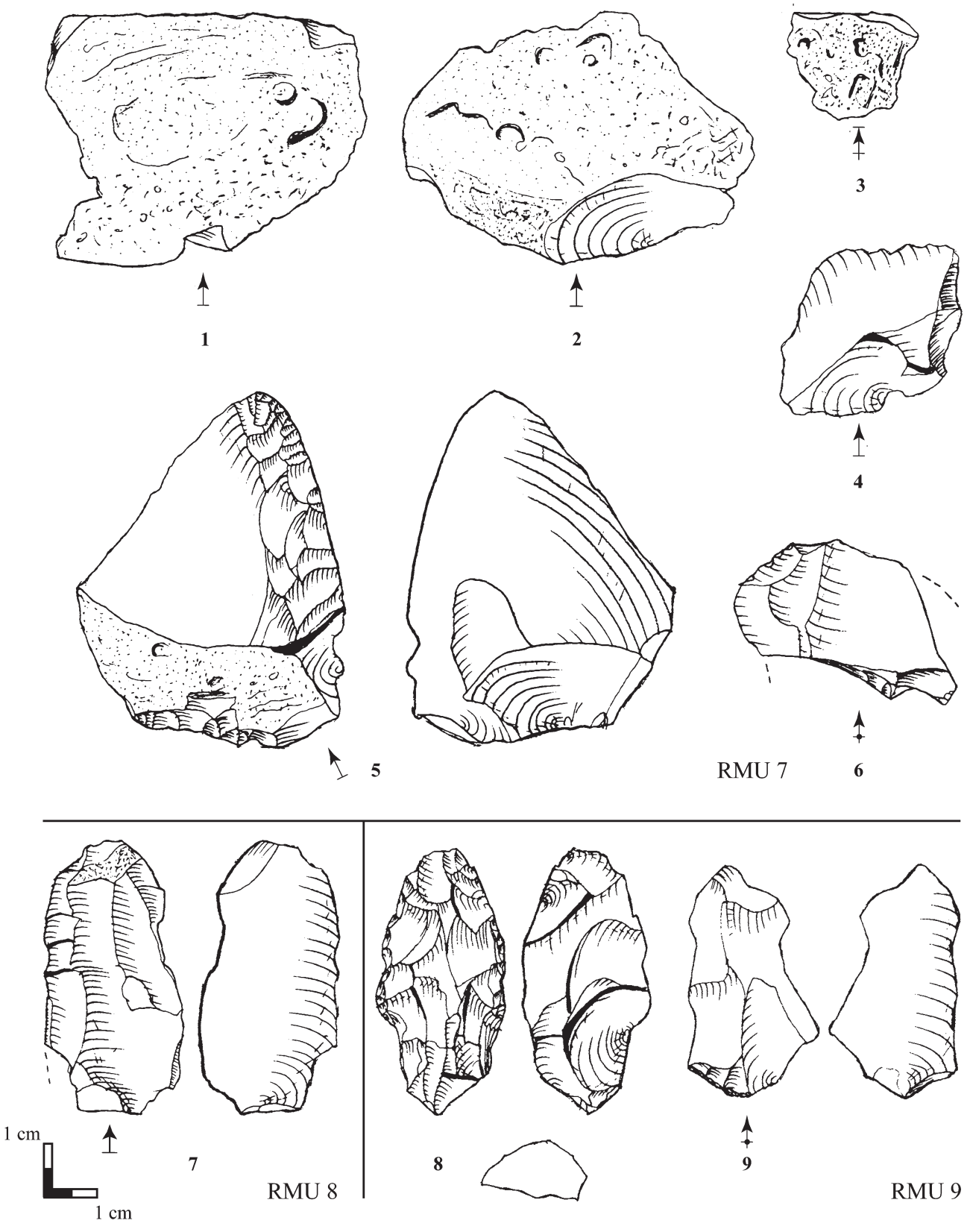


Fig. 14-16 Kabazi II, Level VI/13: artefacts in raw material units.

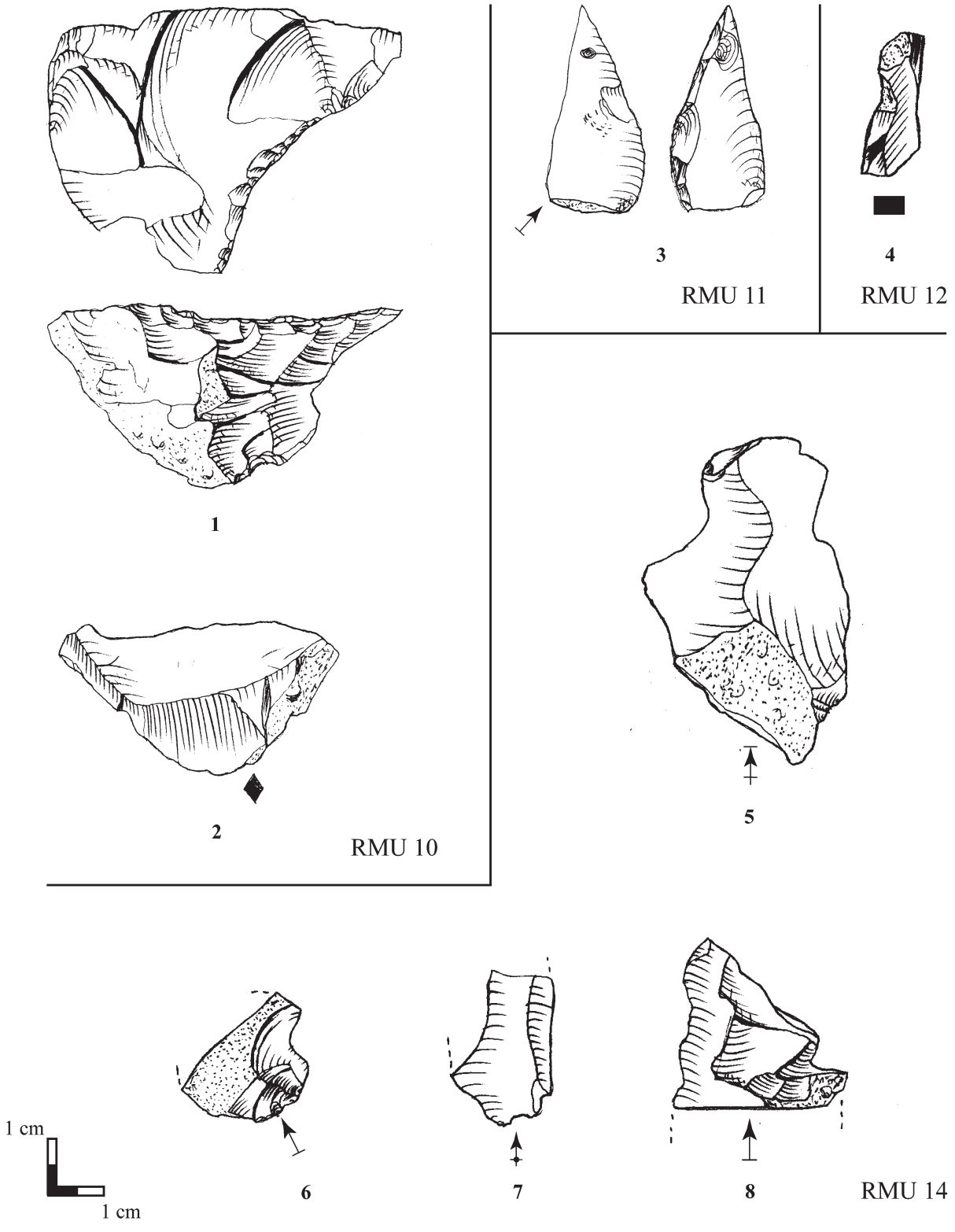


Fig. 14-17 Kabazi II, Level VI/13: artefacts in raw material units.

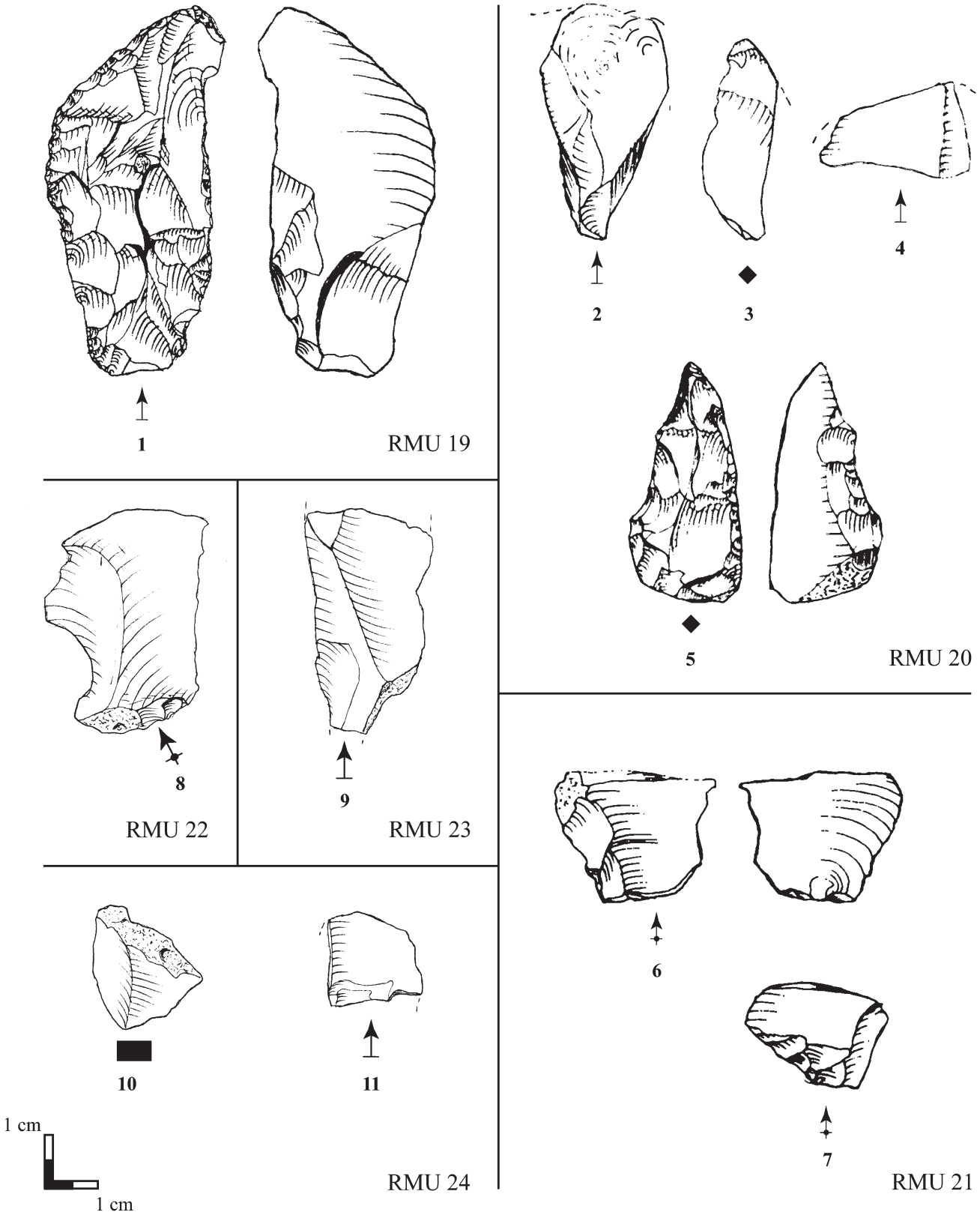


Fig. 14-18 Kabazi II, Level VI/13: artefacts in raw material units.

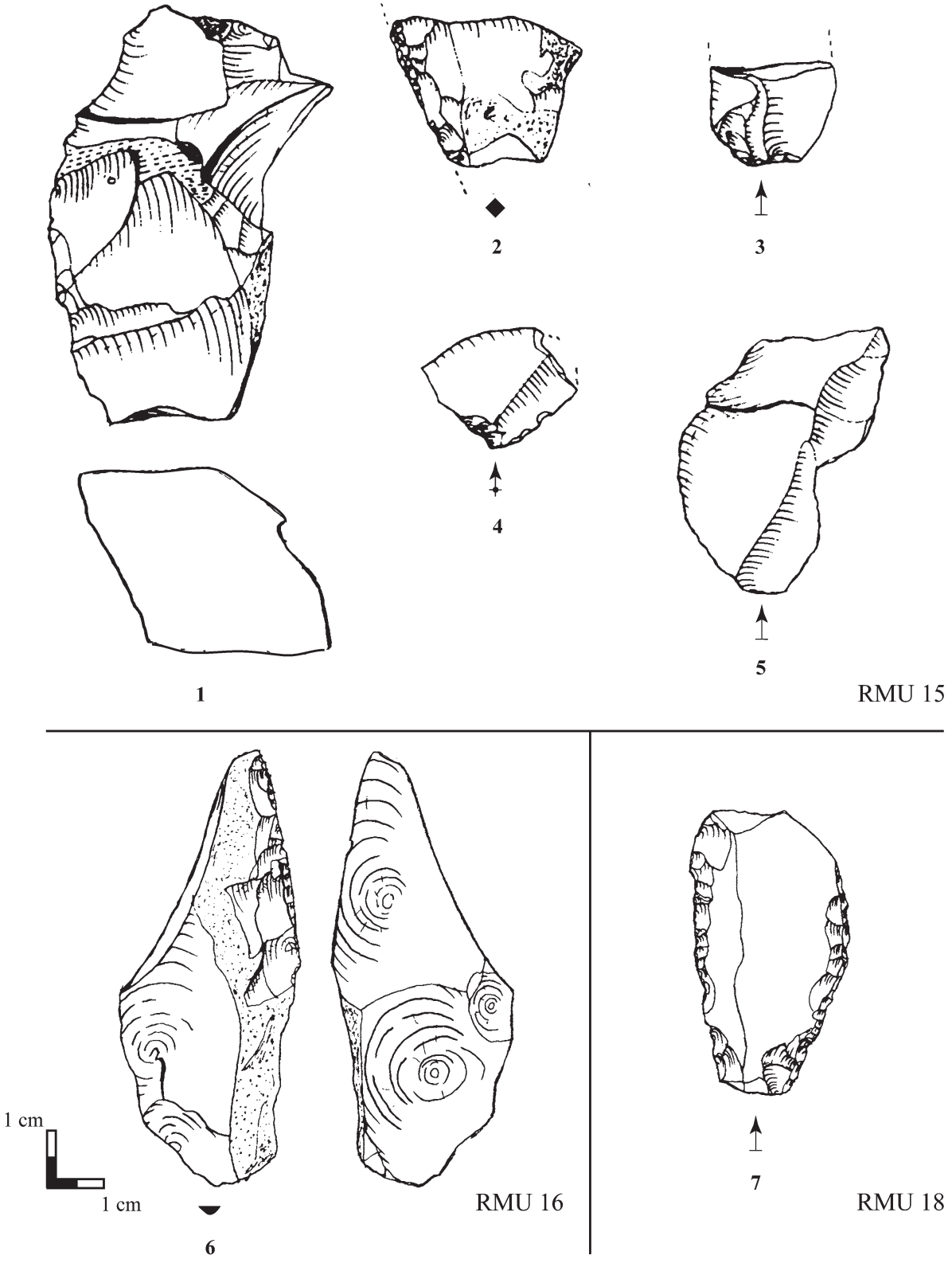


Fig. 14-19 Kabazi II, Level VI/13: artefacts in raw material units.

assemblage			data related to identification of imported item							on-site transformation and/or discard												
Kabazi II, Unit V, Level 13			raw piece: phase 0		initially prepared or flaked piece: phases 1 or 2		inner part of flaked piece			production of blanks: phases 1 and 2					indifferent	modification and usage: phase 3				early discard		
raw material unit	N	weight (in g)	raw piece or chunk	cortical flake	flake partly covered by cortex	flake without cortex	core/preform/initially surface shaped blank	unknown blank (bifacially surface shaped piece)	imported item	flake	blade	trimming flake	core/preform/initially surface shaped blank	chunk	chip	simple tool	surface shaped tool	chip from modification	flake from rejuvenation or broken tool tip	raw piece	transformation section	evacuation > 3 cm
24	2	3			1	1			core						2						Cc	core
2	4	20			2	2			preform	2					2						Cb/f	preform
5	2	7				2			preform	2											Cb/f	preform
21	2	3			1	1			preform						2						Cb/f	core
14	4	15			3	1			preform	2					2						Cb/f	preform
6	2	11			1	1			core	1	1										Cb	core
10	2	73			1		1		core	1			1								Cb	
7	6	129		3	1	2			raw piece	4					1	1					Nm	core
15	5	119			1	3	1		preform	1			1		2	1					Cm/f	
20	4	16				4			preform	2					1		1				Cm/f	
9	2	16				2			tool	1							1				TM/f	
11	1	3				1			tool	1											Ei	tool
19	1	26			1				tool								1				Tw/f	
3	1	20			1				tool							1					Tw	
16	1	20			1				tool							1					Tw	
18	1	11				1			tool							1					Tw	
1	1	15		1					blank	1											Bw	
8	1	8				1			blank		1										Bw	
12	1	2	1						blank					1							Bw	
22	1	4			1				blank	1											Bw	
23	1	5			1				blank	1											Bw	
4	1	73					1		core				1								Cw	
17	5	8			3	2			sorting rest	1					3	1						
Sum	23	51	607	1	4	19	24	3	0	21	2	0	3	1	15	6	3	0	0	0		

Table 14-1 Kabazi II, Level VI/13: Data relevant for transformation analysis. The classification of transformation sections is conducted on the "workpiece-level". As workpieces are considered as refits, two or more artefacts made on the same piece of raw material and recovered from the excavated area are taken to represent the transformation of this raw material on site. For each raw material unit the most initial and the most final work step in the formal chaîne opératoire, as highlighted by the artefacts, are used to define the boundaries of a transformation section (an explaination of the different classes of transformation sections can be found in Fig. 14-24).

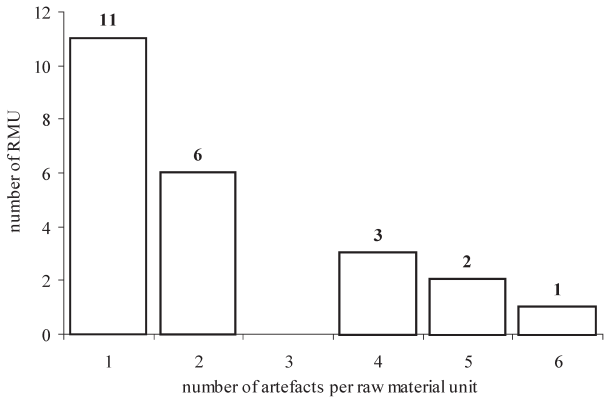


Fig. 14-20 Kabazi II, Level VI/13: number of artefacts in raw material units.

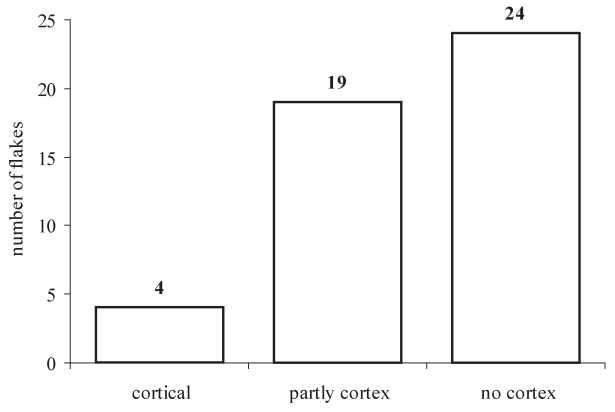


Fig. 14-21 Kabazi II, Level VI/13: frequency of cortex on the dorsal surfaces of flakes.

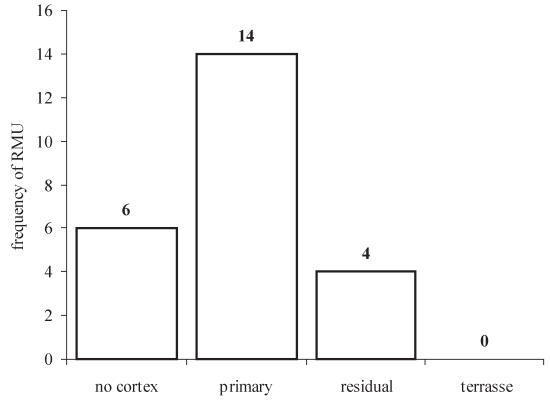


Fig. 14-22 Kabazi II, Level VI/13: geology of raw material units (without sorting rest).

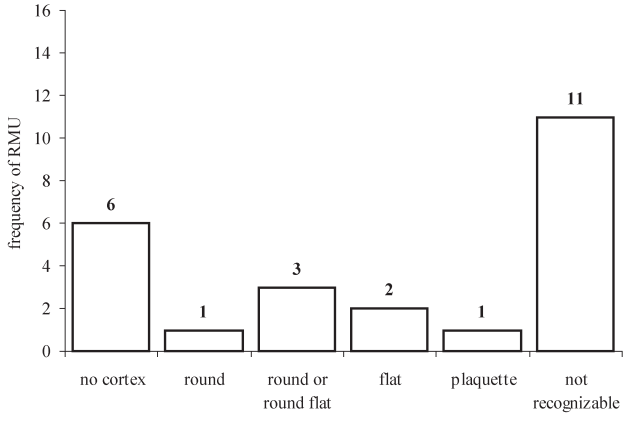


Fig. 14-23 Kabazi II, Level VI/13: original shape of raw pieces (without sorting rest).

The other one is a bifacial convergent scraper, combined with a resharpening flake (Table 14-1 and Fig. 14-25: RMU 9). This leads to a classification of the transformation section as "TM/f" (modification of a surface shaped tool).

The flaking of nine raw material units cover most, if not all, phases of the formal *chaîne opératoire*. Six of them saw the production of flakes (Table 14-1 and Fig. 14-25; 14-26: "Cb") or surface shaped blanks (Table 14-1 and Fig. 14-26: "Cb/f") from already decorticated raw pieces. Two were also dedicated to the production of surface shaped blanks from decorticated pieces, but included the modification of blanks (Table 14-1 and Fig. 14-26: "Cm/f"). Finally, one covers the entire *chaîne opératoire* from decortication to modification (Table 14-1 and Fig. 14-26: "Nm").

To sum up, the reliability of data increases with the length of the transformation sections (Fig. 14-27). Due to the logics of transformation analysis, single pieces and short transformation sections might change essentially upon the addition of only one artefact. If, for example, a single lateral sharpening flake classified as "Ei" (import, rejuvenation and subsequent export of a tool) were combined with a cortical flake, then the transformation section would be classified as blank production from a raw nodule, followed by modification (and rejuvenation) of at least one blank ("Nm"). Therefore, the discussion of transformation sections will use different levels of reliability as a guide line.

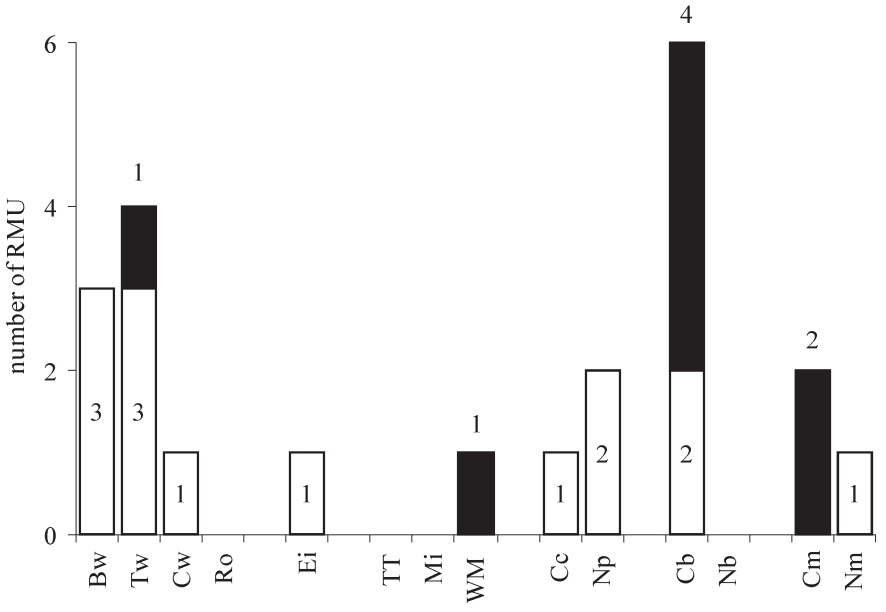


Fig. 14-24 Kabazi II, Level VI/13, frequency of transformation sections: Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); black bars: surface shaping, identified by flakes from *façonnage* and/or surface shaped tools, is indicated by the connotation */f (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

Useful data: Long transformation sections

Production of flakes from cores ("Cb")

Judging from the artefacts discarded, the transformation of two raw material units, RMU 6 (Fig. 14-15, *8-9*) and RMU 10 (Fig. 14-17, *1*-2), started with partly decorticated raw pieces and was focused on the production of flakes. Due to the fact that each raw material unit consists of two artefacts only, nothing can be said about the concept or method of flaking. The core found in RMU 10 (Fig. 14-17, *1*) has a striking platform formed by several radial flakes, most of them ending in a hinge lip. The platform edge was prepared with a line of small negatives, as was the edge of the flaking surface. Despite the cautious treatment of the platform, no control of distal or lateral convexities was observed on the flaking surface. As a consequence, most removals failed, ending in a hinge. Although no remnant of a ventral surface can be found on the striking platform, the cross section of the piece suggests that it was made from a large cortical flake.

Production of flakes from raw pieces with subsequent modification of blanks ("Nm")

The transformation section of RMU 7 (Fig. 14-16, *1-6*) covers the longest sequence possible: a production of blanks from a raw nodule, with one flake modified. Looking at the size of flakes that removed cortex (Fig. 14-16, *1*, *5*), it becomes clear that the raw nodule was considerably large. In RMU 7, a simple side scraper was thinned at its base, possibly for hafting purposes (Fig. 14-16, *5*).

Production of large surface shaped bifacial blanks ("Cb/f")

Three raw material units RMU 2, RMU 14 and RMU 21 consist of flakes that result from surface shaping. In RMU 2 (Fig. 14-15, *2-5*), the largest flake (Fig. 14-15, *5*) shows the remnants of a facial negative on its butt, near the bulb. Obviously, the flake belongs to a final phase of *façonnage* when the preform had already became quite thin, and lateral flaking angles were narrow. Thus, the point of percussion was directly on the lower surface of the bifacially surface shaped preform. The same applies to a flake from RMU 21 (Fig. 14-19, *6-7*).

Production of surface shaped blanks with subsequent modification of simple blanks ("Cm/f")

In RMU 15 (Fig. 14-18, *1-5*), a partly decorticated preform was surface shaped, but discarded after facial retouch ended in deep hinges. Three flakes (Fig. 14-18, *3-5*) show the characteristic attributes of direct soft hammer percussion: no or less pronounced bulbs, no bulbar scars, and curved lateral profiles. One flake, possibly also struck by soft hammer percussion, is fragmented, but must have been much larger than other flakes from this raw material unit (Fig. 14-18, *2*). Partly covered by cortex, it derives from an initial phase of the reduction process and was modified into a simple (?) side scraper.

Ramification of chaînes opératoires: flake production and surface shaping ("Cm/f")

Despite the fact that RMU 20 consists of only four artefacts, its transformation covers most steps of the formal *chaîne opératoire* (Fig. 14-19, *2-5*). Three fragmented flakes go back to the flaking of a core (Fig. 14-19, *2-4*). The fourth piece is a small convergent scraper (Fig. 14-19, *5*). Its dorsal surface is completely covered by soft hammer facial retouch. The left lateral edge of the ventral surface shows a line of negatives classified as ventral thinning. Although the piece is small, it is a surface shaped blank (in the sense of Richter, 2004), modified on the dorsal surface with small, regular retouch of the converging lateral edges. There are different possibilities to explain the small size of the tool. It may have been that the blank was a broken part of a surface shaped tool, or a lateral sharpening flake. In both cases, it would indicate the re-use of a part of a larger tool. However, the fact that the ventral surface exhibits some cortex, as well as the observation that negatives from surface shaping are symmetrical and struck from striking platforms more or less identical to the existing lateral edges, speaks for the selection of a small flake for the manufacture of the surface shaped (bifacial) convergent scraper. RMU 20 clearly shows what L. Bourguignon, J.-Ph. Laivre and A. Turq (2004) call „ramification of *chaînes opératoires*": the flaked product of one *chaîne opératoire* (reduction of a core) is selected as a starting point for a second transformation process that, in this case, is conducted with a different concept (surface shaping), method (plano-convex cross section) and technique (soft hammer percussion).

Problematic data: Short transformation sections

In cases where transformation sections are short, additional artefacts may essentially change the classification. Due to the site formation process of level VI/13, there is a good chance that blanks of the same raw material units are to be found in levels VI/11, VI/12 or VI/14.

Reduction of large surface shaped bifacial tools („WM")

RMU 9 (Fig. 14-16, *8-9*) contains two artefacts, a bifacial convergent scraper and a resharpening flake. A large, yet incomplete negative on the ventral surface of the bifacial convergent scraper (Fig. 14-16, *8*) belongs to an initial work step of surface shaping. The negative of its bulb has been cut by negatives of younger work steps dedicated to a complete second facial retouch of the upper (dorsal) side, and by negatives of basal and terminal thinning. The second item of RMU 9 is a flake from surface shaping (Fig. 14-16, *9*) that fits perfectly into the biography of the scraper reconstructed from the analysis of work steps (see Kurbjuhn, chapter 13, this volume). It is a resharpening flake, showing some splintering after use, which removed a small portion of a working edge. The dorsal scar pattern of the resharpening flake demonstrates that it was struck from the base of a large surface shaped tool. According to the logics of transformation analysis, the convergent bifacial scraper is the remnant of this formerly large surface shaped tool. The resharpening flake was removed in the course of one phase of more or less complete rejuvenation by facial shaping of its ventral and/or dorsal surface.

Correction of a core or a preform ("Cc")

Two chips from the same nodule in RMU 24 result from the preparation of a core or a preform (Fig. 14-19, *10-11*).

Single pieces: Useless data?

Even if the interpretation of single pieces as being imported by humans into the excavated area is problematic after the assemblage was found in a secondary context, they still give relevant information for the understanding of activities connected with the transformation of raw material. In fact, most single pieces discussed below indicate missing sub-assemblages, or shed light on special patterns of raw material use. Single pieces fall into five broad categories: simple flakes (Table 14-1: RMU 1, RMU 8, RMU 12,

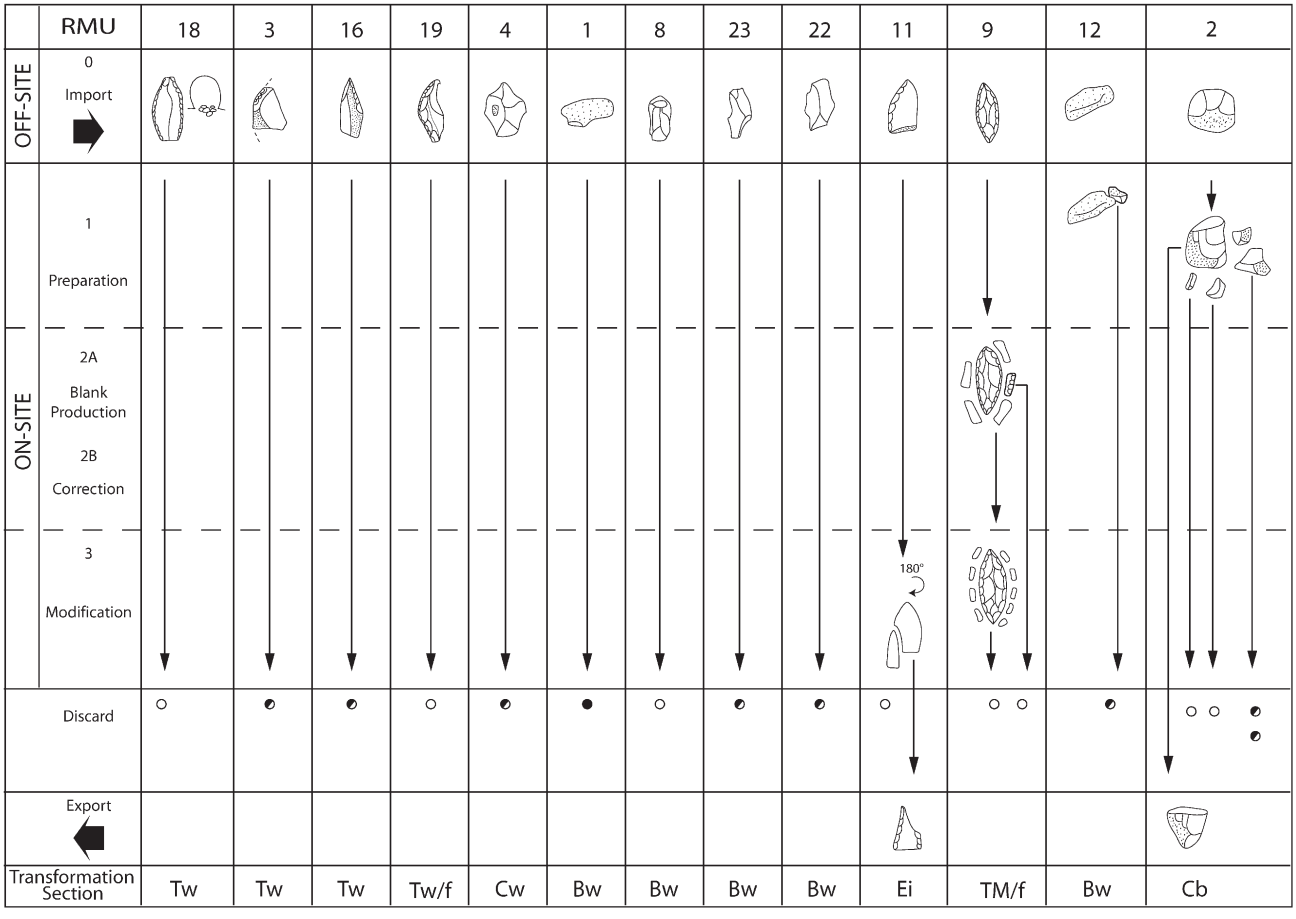


Fig. 14-25 Kabazi II, Level VI/13, flow chart of the transformation of raw material units: Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); surface shaping, identified by flakes from *façonnage* and/or surface shaped tools, is indicated by the connotation */f (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

RMU 22, RMU 23), simple tools (Table 14-1: RMU 2, RMU 16, RMU 18), surface shaped tools (Table 14-1: RMU19), resharpening flakes (Table 14-1: RMU 11), and cores (Table 14-1: RMU 4).

With the exception of a lateral sharpening flake (Fig. 14-17, *3*), all blanks among single pieces most probably do not come from surface shaping, but from the reduction of cores. Arguments for this are not only their length, width and thickness, but also the unidirectional scar patterns on their dorsal surfaces (Fig. 14-15, *1*; 14-16, *7*; 14-19, *8-9*). Probably, they were flaked from simple cores like the one that was sorted into RMU 4 (Fig. 14-15, *4*). It was made from a large, thick cortical flake. A good portion of the ventral surface is still visible on the striking platform, which was prepared by several blows that removed Kombewa-flakes. Blanks were removed without any control of distal and lateral convexities.

Isolated simple tools were produced from relatively large, voluminous flakes. According to remnants of cortex on their dorsal surfaces, most of them come from an initial phase of raw material treatment (Fig. 14-15, *6*; 14-19, *1*). However, there are two exceptions. In RMU 16 (Fig. 14-18, *6*), a blank resulting from frost splitting of a thin plaquette was modified into a simple scraper, and in RMU 18 (Fig. 14-18, *7*) a patinated flake with regular unidirectional dorsal negatives was reused for the manufacture of a double

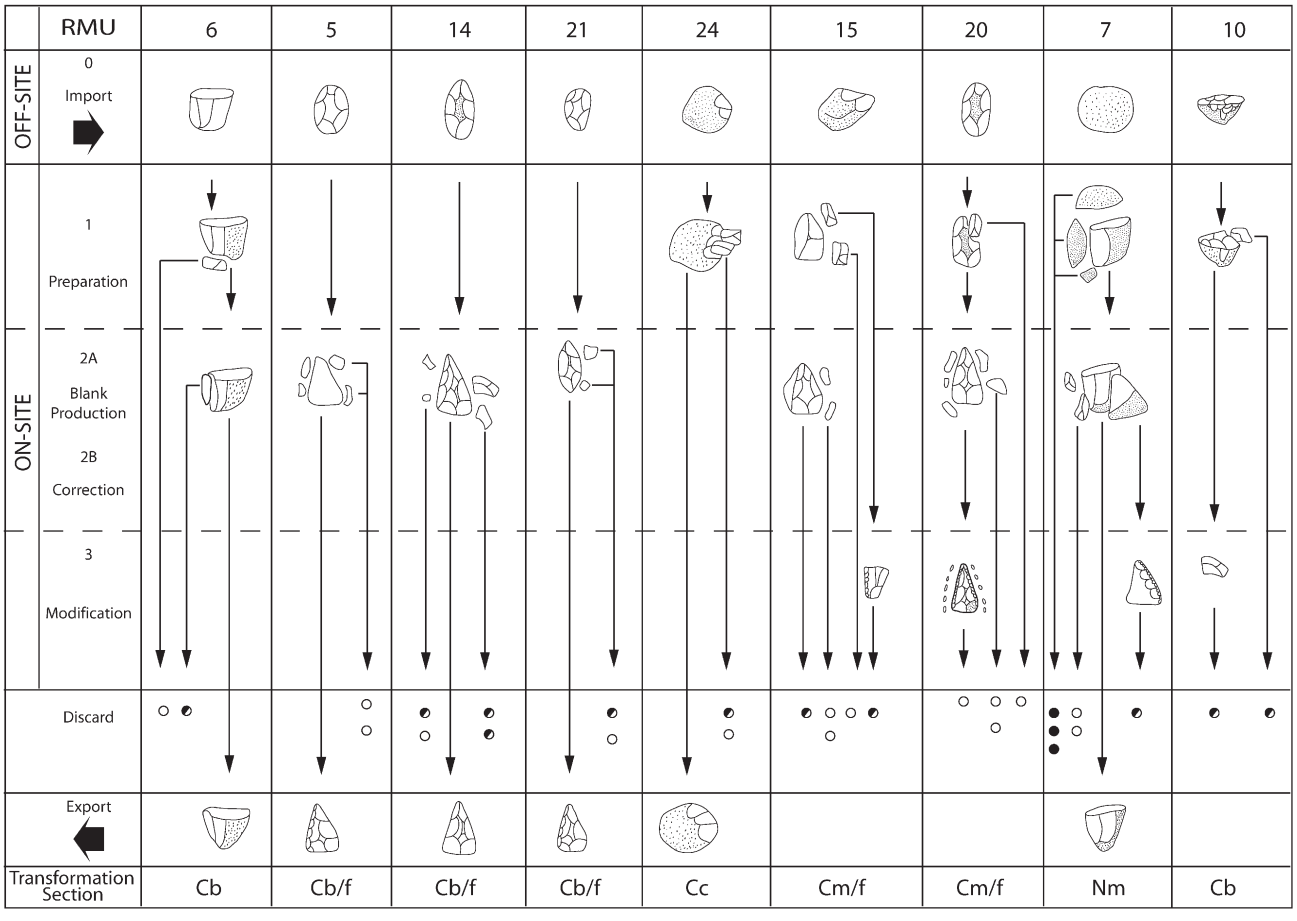


Fig. 14-26 Kabazi II, Level VI/13, flow chart of the transformation of raw material units (continued from Fig. 14-25).

scraper. Because they were not taken out of a reduction sequence, but retouched directly after collection from the Pleistocene surface, these two pieces most probably go back to human transportation, e.g. import to the site. When compared to the dimensions of flakes from workpieces, which were mainly discarded without being retouched, tools among single pieces point to size as the main criteria for the selection of blanks for modifications. The fact that frost cracks and patinated artefacts were used might be seen as a sign for a shortage of blanks of appropriate size and shape. This is in accordance with the fact that no special concept for the production of regular flakes was recognized.

Together with a lateral sharpening flake (RMU 11: Fig. 14-17, *3*) and a single surface shaped tool in RMU 19 (Fig. 14-19, *1*), again made from a large cortical flake, single pieces add the following characteristics to the assemblage of level VI/13: large flakes with straight lateral profiles, often partly covered by cortex on their dorsal surfaces, as well as a core made from a cortical flake, are the result of the reduction of simple cores. In some cases, the flaking did not start with a raw nodule or a roughly decorticated preform, but with a large cortical flake. This means that large nodules were, at least in some cases, broken or flaked into smaller portions before the reduction of cores began. Most probably, the corresponding cores or flakes of this reduction sequences were lost by natural site formation process. In addition, size seems to have been the most important criteria for the selection of blanks for use. Perhaps because no advanced concept or method of core reduction was applied, most blanks for tools were taken out of initial phases of the *chaîne opératoire*, when raw pieces were still covered by some cortex. In addition, there seems to have been a shortage of large flakes, indicated by collected frost cracks or patinated flakes. And, finally, Neanderthals of level VI/13 had the knowledge of rejuvenation by lateral sharpening flakes.

Reacting to Immediate Demands? Information on Activities of Neanderthals during the Formation of Level VI/13

In the course of excavation it was not possible to separate levels VI/11-V/14. However, it still cannot be ruled out that the movement of artefacts occurred within short periods, but several times. The assemblage from level VI/13 includes not only most artefacts, but also consists of a number of raw material units that represent distinct nodules flaked on the site. If only flaking activities are considered, part of the material was preserved in its essential context, as indicated by the presence of long transformation sections. The results of transformation analysis give at least some answers for the questions posed in the introductory part of this article:

1. The minimal number of lithic items brought into the site. For the manufacture of the assemblage a minimum of 22 raw pieces was used. At least two formal tools seem to have been produced elsewhere and brought to Kabazi II by Neanderthals.

2. The minimal number of working steps applied on every raw nodule that was flaked on the site. Taken altogether, all phases of the formal *chaîne opératoire* are present: flaking of raw pieces, reduction of decorticated preforms or cores as well as resharpening or modification of existing tools. In cases where more numerous artefacts were sorted into raw material units, blank production without modification dominates.

3. Concepts and methods of transformation. In level VI/13 two concepts of transformation were observed: plano-convex surface shaping, and the reduction of simple cores sometimes made from large flakes. If single pieces are also considered the production of simple but large flakes clearly dominates over the manufacture of surface shaped tools. However, in some cases a ramification of *chaînes opératoires* was observed when flakes (from cores on flakes?) were used as starting point for surface shaping. In addition, the authors had the impression that blank production did not always meet the criteria of large size for the selection of blanks for tools.

4. The number of missing artefacts. The composition of single pieces seems to be random, leading to the assumption that they, as most of the raw nodules with short transformation sections, were originally flaked on site. In this case incompleteness is not caused by C-transformations, but by post-depositional N-transformations.

The high amount of flakes with cortex, and some cortical flakes, suggests that most pieces from level VI/13 brought to Kabazi II were either not prepared at all, or only roughly initialised. In some cases, the reduction started with large cortical flakes, pointing to a flaking of raw nodules (at the outcrops?) into smaller portions (for more convenient transportation?). In contrast to many other assemblages with surface shaped tools from Kabazi II, most reduction sequences reconstructed by transformation analysis were dedicated to the manufacture of flakes from simple cores. However, the flaking neither went deeply into the raw nodules, nor did it follow a distinct concept or method that would have prevented an early discard of cores by controlling distal or lateral convexities. As a consequence, many large flakes were modified, and two tools were made from blanks picked up directly from the Pleistocene surface. Indeed, one has the impression that the visits to Kabazi II were not carefully planned – possibly as stays were short, incidental or not in a chain of macro moves, but in the course of micro moves within a logistical territory. Raw material procurement and reduction sequences seem to be a reflection of immediate demands only.

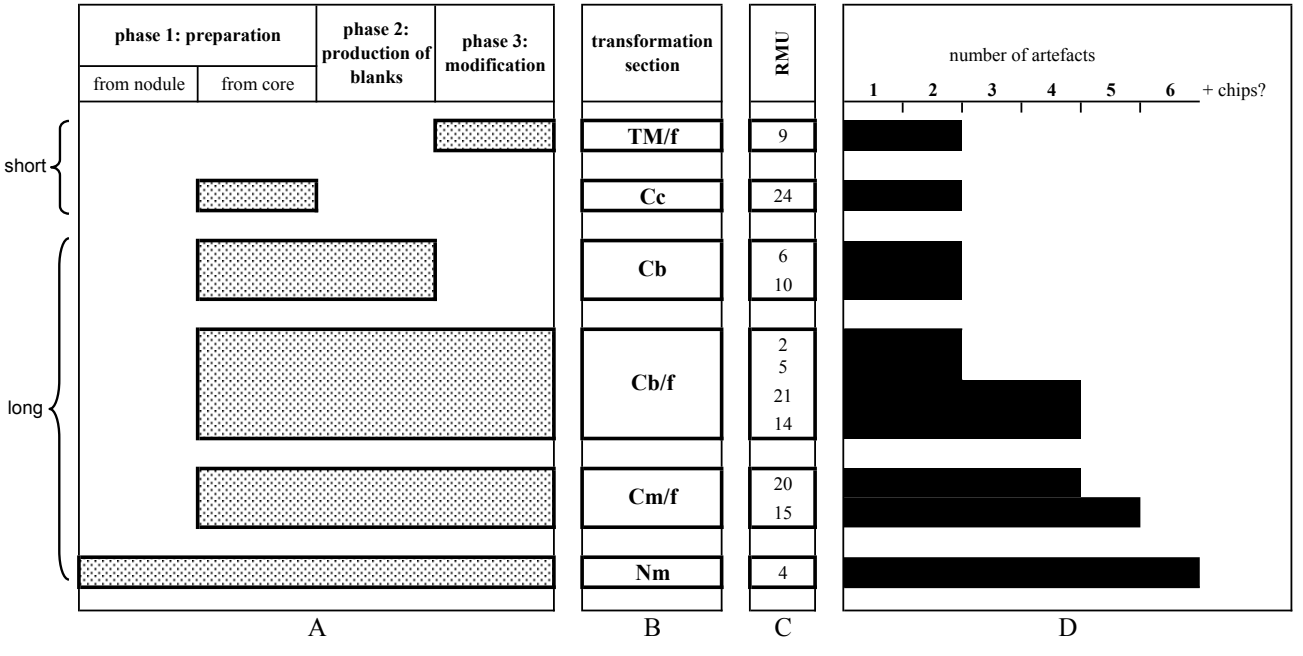
Fig. 14-27 Kabazi II, Level VI/13, overview over the frequency of artefacts in raw material units with transformation sections indicating on-site flaking (N ≥ 2): TM = tool with corresponding chips from its modification, Cc = correction of a core, Cb = blank production from a core, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); surface shaping, identified by flakes from *façonnage* and/or surface shaped tools, is indicated by the connotation */f. ►

Comment on the Transformation of Raw Material in Level VI/14

The total number of artefacts considered in raw material sortation from level VI/14 accounts for 23 pieces. Among these, 11 raw material units with artefact frequencies between one and five pieces were recognized (Fig. 14-28). As in levels VI/11, VI/12 and VI/13, single pieces are numerous. Seeing as four of these (Fig. 14-28: RMU 6, RMU 7, RMU 10, RMU 11) are blanks without retouch, and two are chunks (Fig. 14-28: RMU 6, RMU 8), it seems unlikely that they were brought into the excavated area as manuports by human agents. Given the problematic character of the site formation during the sedimentation of levels VI/11-13 this would be expected for tools or preforms but not for simple blanks. Instead, it has to be assumed that they derive from reduction sequences originally conducted on the site and altered by post-depositional processes. In two units the transformation was dedicated to the production of flakes from raw pieces already decorticated. While one unit includes two modified tools (Fig. 14-28: RMU 3) the other consists of simple flakes only (Fig. 14-28: RMU 5). Both units lack a core. In three units partly decorticated nodules were surface shaped (Fig. 14-28: RMU 1, RMU 2, RMU 4). Judging from the size of the flakes that includes both large and small items, surface shaping resulted in the production of surface shaped blanks. In two units (Fig. 14-28: RMU 2, RMU 4), however, the surface shaped tool itself is missing, leading to a classification as "Cb/f" (production of surface shaped blanks). Only one unit (Fig. 14-28: RMU 1) includes the surface shaped tool. All in all, the transformation analysis of level VI/14 repeats the results obtained for level VI/13: single pieces as remnants of sub-assemblages lost after N-transforms, flake production from simple cores, and surface shaping of decorticated raw pieces. Again, the presence of raw material units as small as distinct nodules points to minor alterations of the original assemblage after N-transforms.

Conclusion

For the purpose of faunal analysis, levels VI/11-14 were treated as an entity (Patou-Mathis, Chapter 5, this volume). With a minimal number of 17 individuals, *Equus hydruntinus* by far dominate the faunal assemblage. Cut marks and the breakage of long bones by percussion, prove that humans were responsible for most part of the disarticulation of *Equus hydruntinus* carcasses on the site. However, the composition of body parts, as well as age profiles at death and some bite marks, suggest that only a part of the *Equus hydruntinus* killed at Kabazi II was securely hunted by Neanderthals. This accounts



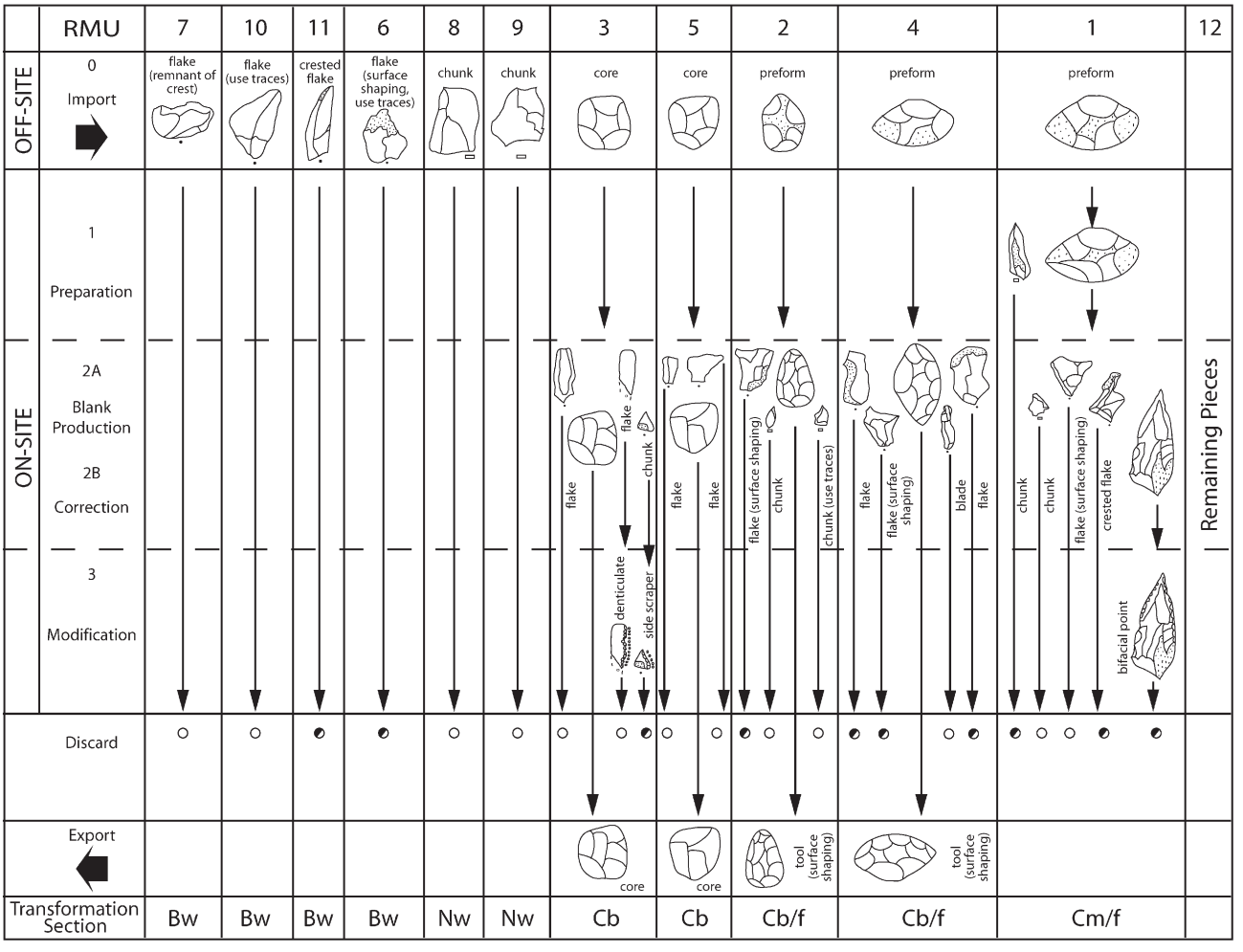


Fig. 14-28 Kabazi II, Level VI/14, flow chart of the transformation of raw material units: Bw = blank without transformation (within the excavated area), Tw = tool without transformation, Cw = core without transformation, Nw = nodule without transformation, Ei = isolated functional part of a tool, including resharpening flake, TT = broken tool with corresponding tip, Mi = two or more isolated chips from modification, TM = tool with corresponding chips from its modification, Cc = correction of a core, Np = preparation of a raw nodule, Cb = blank production from a core, Nb = blank production from a raw nodule, Cm = blank production from a core and modification of blank(s), Nm = blank production from a raw nodule and modification of blanks(s); surface shaping, identified by flakes from *façonnage* and/or surface shaped tools, is indicated by the connotation */f (steps of the formal *chaîne opératoire* after Geneste 1985; 1988; 1990).

mainly for adults, whereas young *Equus hydruntinus* may have been killed by carnivores and, in part, scavenged by humans. The age of young *Equus hydruntinus*, as well as the presence of a pregnant female, shows that the animals died during two seasons, spring and autumn. It is during these periods of the year that herds up to 50 individuals migrate between summer and winter ranges. Obviously, Neanderthals layed in wait of them, and hunted especially females accompanied by their foles. There are no animals younger than 3 months, but many adults between 4 and 8 years of age, indicating that hunting was selective during periods of nutritional abundance.

The lack of nutritional stress might also explain the low amount of planning depth recognized in most levels analysed by transformation analysis. In general, the exploitation of raw material was seldomly exhaustive. Instead, it seems that most raw material units were flaked "on demand". In many cases one has the impression that there was no "gearing up" to be prepared for anticipated periods (e.g. the hunt). Raw material procurement and blank production often seem to be incidental. In this regard the

observation that the production of flakes from simple cores plays an important role in most levels fits to the hypothesis stated above. The production and use of surface shaped tools, to the contrary, is less important, again pointing to less intensively planned and prepared activities. In other assemblages of the Crimean Middle Palaeolithic, e.g. Buran Kaya III, level B (Demidenko 2004; Richter 2004; Uthmeier 2004), surface shaped tools were identified as long lasting tools, especially produced beforehand for deeply planned activities. In levels VI/11-14, surface shaped tools must be seen as a part of a basic equipment, not dedicated to special tasks, but carried around on a daily basis and curated (or rehafted) if necessary.

In levels VI/11-14 both faunal and lithic analysis speak for repeated short term stays at Kabazi II that should probably be seen in a context of longer stays in the region during times of abundance. At Kabazi II Neanderthals were only consuming less perishable parts like brain, tongue, and some marrow (Patou-Mathis, Chapter 5, this volume). Meat bearing parts of the carcasses were carried out of the excavated area, possibly to a camp less exposed to sun, the weather and carnivores. The function of this corresponding camp might have been that of a base camp for a circulating procurement of resources. Many micro moves that pass raw material outcrops, as well as hunting stands, would explain best the lack of planning depth in the acquisition of raw material and the production of blanks. All in all, the transformation of raw material as well as the scavenging of some carcasses, side by side with the hunting of *Equus hydruntinus*, points to a (periodically?) opportunistic exploitation of resources.

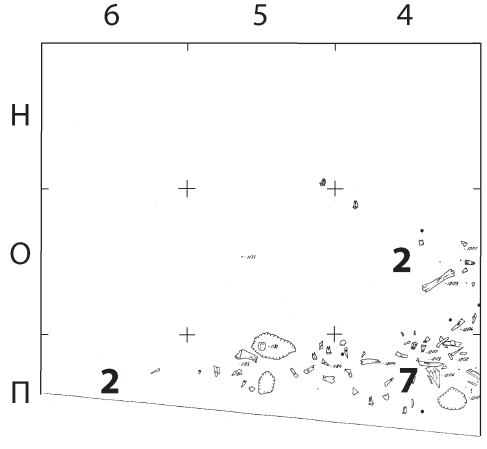


Fig.14-29 Kabazi II, level VI/15: Artefact distribution (pieces > 2cm).

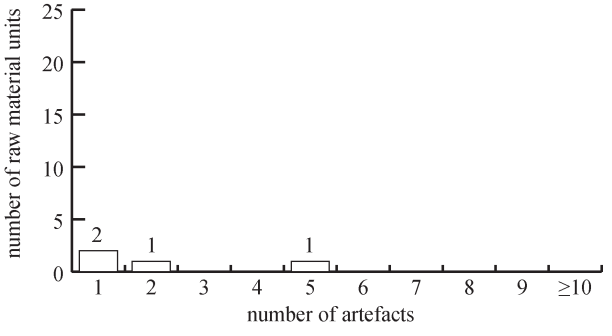


Fig.14-30 Kabazi II, level VI/15: Number of artefacts per workpiece.

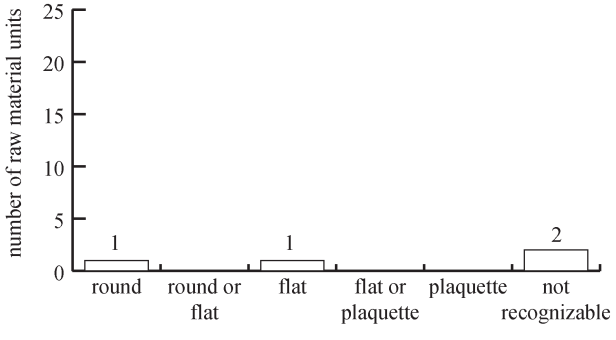


Fig.14-31 Kabazi II, level VI/15: Shapes of nodules.

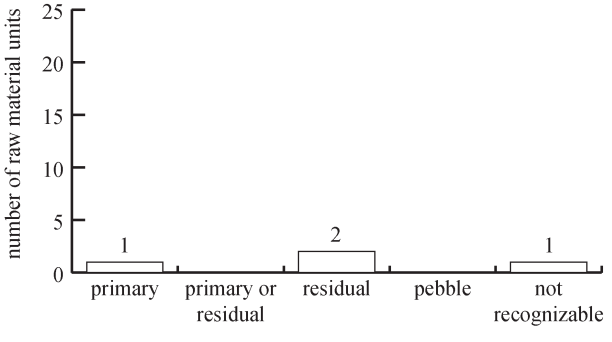


Fig.14-32 Kabazi II, level VI/15: Nature of raw materials.

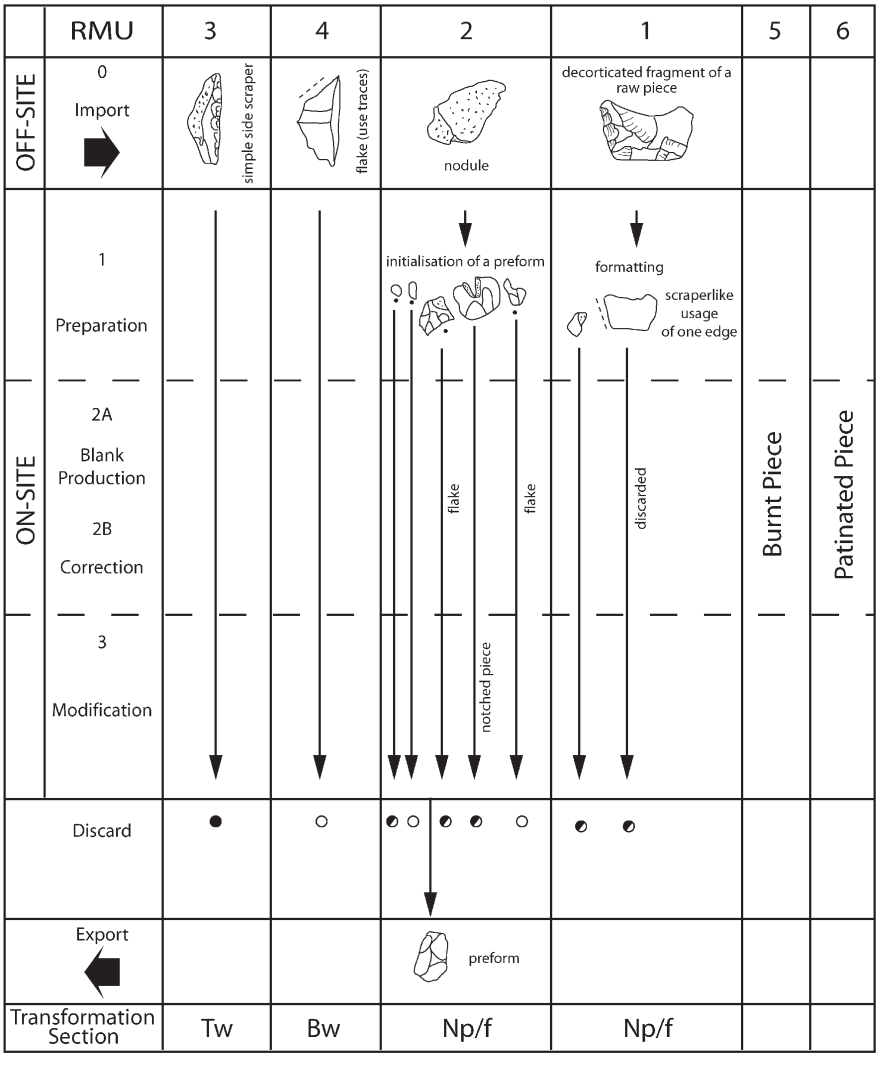


Fig.14-33 Kabazi II, level VI/15: Transformation sections of workpieces. Bw = blank without debitage or modification; Tw = tool without debitage or modification; Np = Preparation of a raw nodule; /f = bifacial production or surface shaping (steps of the formal chaîne opératoire after Geneste 1985; 1988; 1990).

Some Remarks on Kabazi II, Unit VI, Layers 15, 16 and 17

Upon reaching the bottom of the geological sequence at about 14 m under the surface, the excavated area became very small and was, at the end, confined to an extension of about 4 m² (Fig. 14-29, 14-34 and 14-38). The lowermost layers VI/15-17 yielded only 19 artefacts (including 2 tools, VI/15), 8 artefacts (no tool, VI/16) and 5 artefacts (including one tool, VI/17).

Work pieces consisted of single elements or were very small (Fig. 14-30, 14-35 and 14-39). Raw material procurement was from primary and residual sources (Fig. 14-32, 14-37 and 14-41) and nodules were round and flat (Fig.14-31, Fig.14-36, Fig. 14-40). In layer VI/15, the discard of two single pieces is attested, along with preparation of two raw nodules for foliate production (Fig. 14-33).

The artefacts from the lowermost levels of Kabazi II must be looked upon as the oldest dated archaeological objects thus far found in the Crimea.

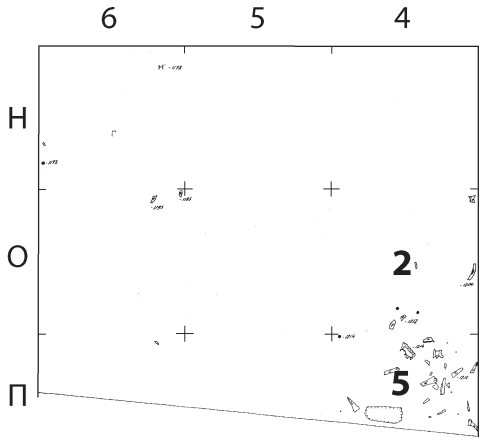


Fig.14-34 Kabazi II, level VI/16: Artefact distribution (pieces > 2cm).

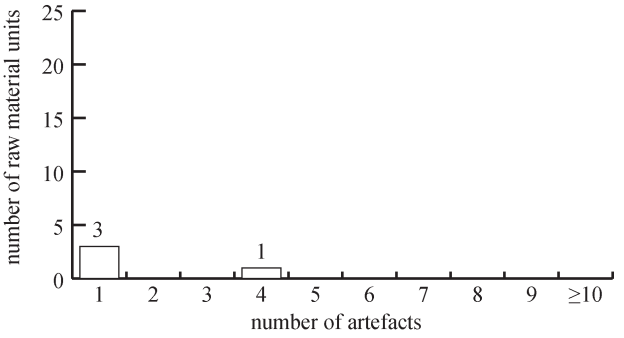


Fig.14-35 Kabazi II, level VI/16: Number of artefacts per workpiece.

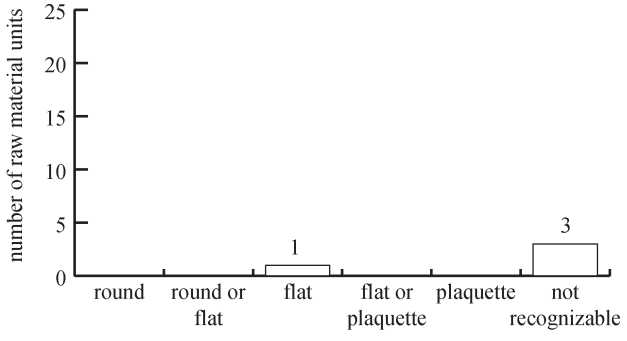


Fig.14-36 Kabazi II, level VI/16: Shapes of nodules.

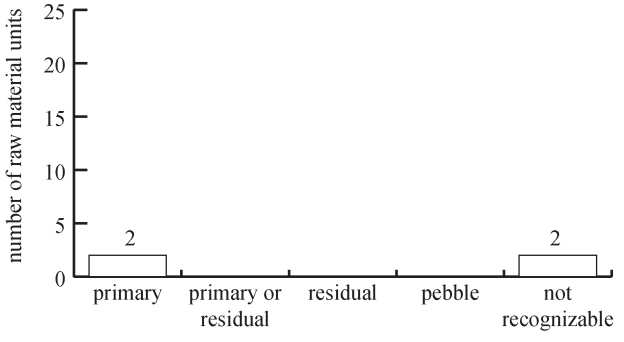


Fig.14-37 Kabazi II, level VI/16: Nature of raw materials.

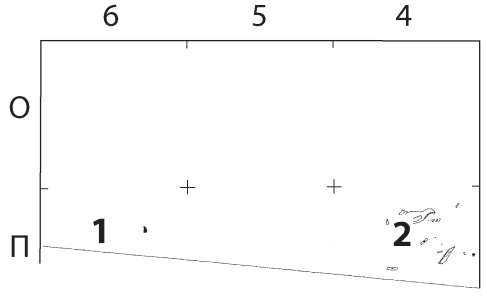


Fig.14-38 Kabazi II, level VI/17: Artefact distribution (pieces > 2cm).

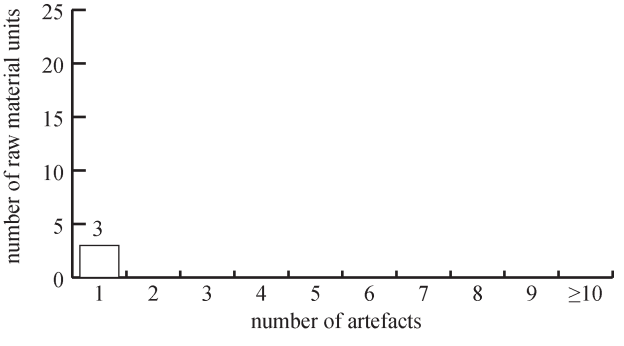


Fig.14-39 Kabazi II, level VI/17: Number of artefacts per workpiece.

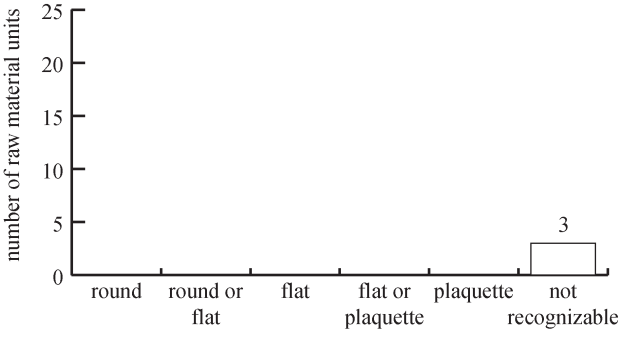


Fig.14-40 Kabazi II, level VI/17: Shapes of nodules.

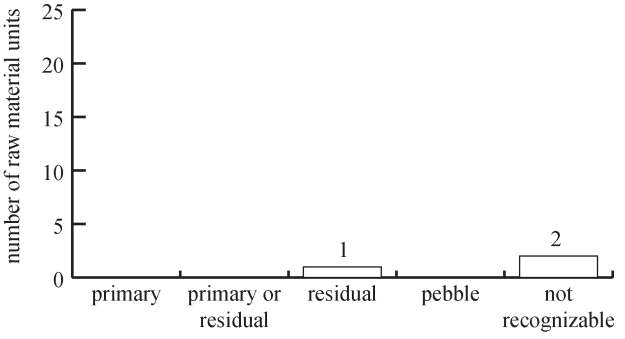


Fig.14-41 Kabazi II, level VI/17: Nature of raw materials.

Abstract

КАБАЗИ II, ГОРИЗОНТ VI/11-14: ТРАНСФОРМАЦИОННЫЙ АНАЛИЗ АРТЕФАКТОВ

Т. УТМАЙЕР, Ю. РИХТЕР

Горизонт VI/11-14 был обнаружен в отложениях 14B геологического слоя, образовавшихся во время последнего интергляциала *sensu lato* (OIS 5d), и является одним из самых ранних в стратиграфической последовательности Кабази II. Скопление фауны и артефактов, составившее данный горизонт, исследовано на площади 12 квадратных метров. В ходе полевых исследований было установлено, что фаунистический материал и кремневые артефакты залегают во вторичном положении, так как претерпели некоторое перемещение по склону. С другой стороны, кремневые артефакты не патинированы, их края и межфасеточные грани не демонстрируют естественных повреждений. Сохранность фаунистического материала – отличная. Данные характеристики свидетельствуют о том, что артефакты и фауна данного горизонта были перемещены по склону на относительно незначительное расстояние по отношению к их первичному залеганию и относительно быстро были погребены в отложениях 14B геологического слоя. Более того, еще одним подтверждением высокой степени гомогенности данной коллекции является подразделение артефактов на сырьевые группы, соотносящиеся с расщеплением нескольких желваков. Как правило, артефакты каждой отдельной сырьевой группы отражают длинные цепи трансформаций. Не исключено, что остатки нескольких кратковременных поселений были снесены и вторично погребены невдалеке от первичного залегания.

Исходя из используемой модели эксплуатации фаунистических ресурсов, функциональный тип поселений данного горизонта – стоянка по разделке охотничьей добычи и / или собранной падали. Данная стоянка связана с последующей транспортировкой частей туш лошадей на территорию охотничьего лагеря, где вероятно, происходило их потребление.

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Palaeolithic Sites of Crimea,
Vol. 1

KABAZI II: LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

Edited by
Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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Chapter
15

Operational Sequences of Bifacial Production in Kabazi II, Units V And VI

Martin Kurbjuhn

The assemblages of Units V and VI contain 25 bifacial tools, including bifacial points, different types of bifacial scrapers, large proximal fragments (classified as either bifacial points or bifacial scrapers), as well as heavily exhausted bifacial tools and reutilised fragments of bifacial tools (Chabai, this volume, Chapter 6). In addition to these "fully" surface shaped tools, there are several artefacts in these assemblages which are only surface shaped on their dorsal side. This was achieved via a facial retouch using the soft hammer method, followed by the modification of the working edges. These tools are assigned to the surface shaped tools, which do not necessarily have to be bifacially retouched.

Former studies of surface shaped tools have shown that these often have a long biography (Boëda, 1995b). Pieces may undergo several changes in their volume and outline owing to reduction sequences, which include secondary surface shaping, rejuvenation, resharpening, etc. (Richter, 1995:203-206). Thus, any comparison of bifacial tools which is made simply on the basis of their shape is less informative.

An alternative method to study surface shaped tools is the so-called "work step analysis". Its aim is the reconstruction of the operational chain of production which is expressed in the rejuvenation and the reutilisation of these tools. In this method the genesis of the tools, as well as their shape and outline, is less important. The emphasis of analysis now lies more on the chronological order and comparison of the individual operational steps (work steps).

Work Step Analysis – The Main Principles

Work step analysis is a method used to reconstruct all visible processes of change through which a stone tool may pass. These processes include not only those connected with the production of the tool, but also encompass any changes in its use, thermal influences, modern damage, etc. (Richter, 2004).
These changes are represented by negatives, natural surfaces (including cortical surfaces), and - if the tool is made on a blank - the ventral surface also. During the analysis, the different types of surface shaping and modification of the working edges, use retouch, as well as splintering, breakage, resharpening spalls, thinning, etc. are noted.

Therefore, the main principle of the analysis is

to identify the various "work steps" involved in the continual change of the artefact in question. One work step, which is normally represented by one or several combined negatives, is classified according to the method of production (be this intentional or unintentional), and with regard to its position on the blank. Each work step involved is then compared and contrasted temporarily with its neighbours (i.e. work step A older/younger than work step B). Ideally, this results in the reconstruction of the chronological chain of all events leading to the formation of the artefact under consideration. Thus, work step analysis is a method which pays less attention to the actual form of the artefact, concentrating more on the processes (work steps) involved in its formation.

The Reconstruction of a Chronology Among Negatives

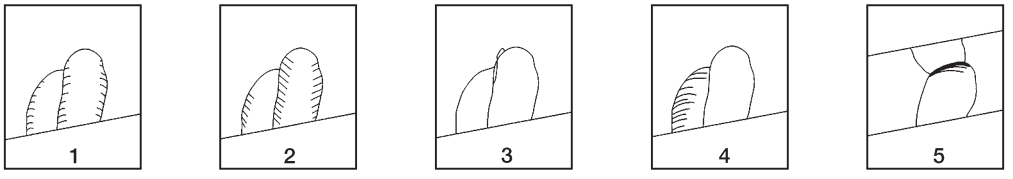


Fig.15-1 Time relations among negatives.

As mentioned above, connected negatives can be assigned to one work step. In such cases, the negatives involved must be located in the same chronological section of the tool, and the intention (e.g., edge retouching) as well as the direction from which they were struck must correlate. Only when these conditions are given, can negatives be considered to represent a single work step. In order that the whole surface be included in the analysis, traces of use and natural surfaces (fissures, cortex, etc.) are also interpreted as work steps.

The decision as to whether a particular work step is younger or older than its neighbour can be made upon five attributes, all of which can be macroscopically detected in the area of the separating ridge between two negatives (Fig. 15-1).

1. The younger negative is both more convex and is situated deeper than the older one.

2. The younger negative displays lateral lances. The majority of lances belonging to older negatives are completely cut off by the younger negative.

3. The lateral lances of the younger negative are often connected with lateral fissures.

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

5. If the two negatives oppose each other, the terminal end of the younger negative displays a concavity with clearly visible Wallner lines.

The dataset

The data compiled for each work step comprise a total of 6 features: 1. address; 2. contour line; 3. origin; 4. order; 5. stage of the edge; 6. microchronology.

1) Address (Fig. 15-2)

In order that each work step on the artefact surface is clearly distinguishable, each is allocated an individual address. To avoid any confusion, each address represents one single work step. The address contains information with regards to the side (upper/lower side of the artefact) and the direction from which it was struck. A comparative analysis of several artefacts is only possible when a standardised orientation of the pieces is observed. As such, the artefact must be oriented upon its longitudinal axis with the tip pointing upwards. Should the tool under examination display convergent working edges, then the assumed point of intersection should be oriented upwards. Pieces with a plane-convex cross section should be laid upon their plane surface, which is then defined as their lower side. Artefacts with a symmetrical cross section should be oriented with their longer working edge to the right. If an artefact shows a symmetrical cross section, as well as two equal working edges, orientation is arbitrary. The upper side of an artefact is indicated in the address with the letter "O"; the lower

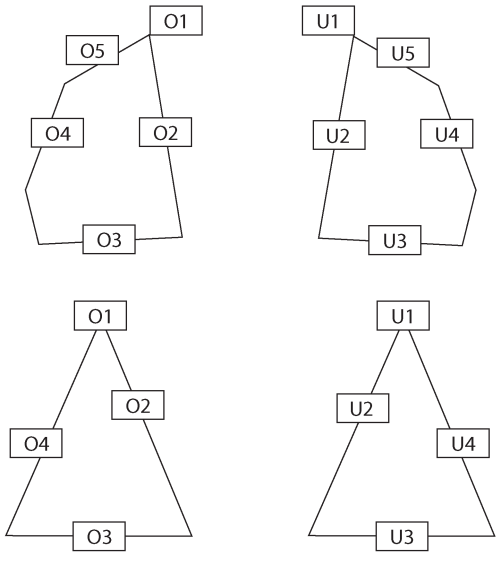


Fig.15-2 Different addresses of work steps on the surface of a bifacial tool, according to the number of edges.

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

Table 15-1 Modes of origin of work steps.

side with the letter "U". The tip or the distal end of the artefact is addressed with the numeral "1". From this position all other edges of the artefact are numbered clockwise from "2" to "4", or, if there are 5 separate edges, from "2" to "5". Work steps that display no connection to an edge (e.g., cortical surface) are addressed with a "0". The work steps of the lower side are numbered anticlockwise, so that the same edges are assigned the same number. If more than one work step is observed in a particular area of the tool's edge, they are then designated a second number (e.g., O21, O22).

2) Contour line

With this feature the specific form of an edge within the area of the work step is categorised using a value between 1 and 5.

1) concave-convex
2) concave
3) straight
4) convex
5) convex-concave

This is not a strict scale, and it is perfectly legitimate to assign a slightly concave working edge with the value 3.5.

3) Origin

With this feature a work step's mode of origin is described and coded with a number as listed in Table 15-1.

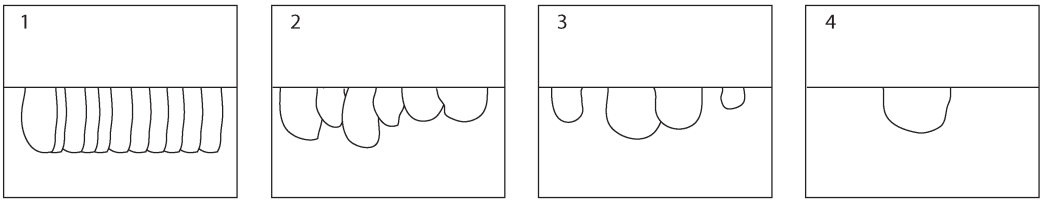


Fig.15-3 Different order among negatives.

4) Order (Fig. 15-3)

The attribute "order" describes the regularity observed among the negatives comprising one work step:

1) parallel order of adjoining negatives
2) regular but not parallel
3) irregularly adjoining negatives
4) isolated, disconnected negatives

5) State of the edge

With this attribute the functional value of the working edge is described:

1) sharp
2) still sharp, but used
3) heavily used or not intended for cutting

This attribute applies only to work steps which are directly connected to the working edge of the tool (e.g. edge retouching, resharpening)

6) Micro-chronology

A meaningful chronological sequence of all observed work steps of a tool can only be achieved when each is compared and contrasted temporarily with its neighbour. Thus, the temporal relation between work steps observed on the surface of the artefact is documented and indicated by logical functions > (older than) and < (younger than), e.g., O21 > O22 and O22 < U2. To reconstruct the whole operational chain, this data is compiled in a Harris-Matrix program (in this case: ArchEd). In this program all work steps are sorted chronologically and are presented in a graphic. This shows the work steps sorted vertically according to their "temporal position". The oldest work steps appear at the bottom of the chart, becoming increasingly younger towards the top, where the most recent work steps are charted. In most cases, these correspond to the usage of the tool in its present form (e.g., use retouch, splintering etc).

One problem encountered when considering the history of an artefact is that younger work steps have often removed fully any evidence of older steps. Consequently, as only visible work steps can be observed and analysed, the resulting diagram is always incomplete. Additionally, it is only possible to define the temporal relationship between neighbouring work steps. This means that a complete linear course of work steps can be rarely reconstructed. Often, several work steps are charted in contemporaneous positions in the diagram, but it must be stressed that these, although temporally very close to each other, are not contemporaneous. At this level of "high resolution" the work step analysis reaches its limit.

Work Step Analyses of 8 Selected Tools

Leaf shaped point from V/3, RMU 2 (Fig. 15-4)

This point shows no visible work steps from the original state of the tool. The oldest observable work steps comprise operational steps attributable to surface shaping. The sequence of surface shaping contains alternating work steps of convex surface shaping (O2, O4, O21, O22) and flat surface shaping (U2, U41, U21). The first operational step, which is attributed to edge modification, is a flat retouch of the right edge of the lower side of the point (U21). This work step is followed by a semi steep retouch (O42), the thinning of the basal end (O31) and lateral resharpening (U42). The preceeding edge modification is a semi steep retouch of the right edge (O23), followed by work steps which are attributed to the usage of the tool, a use retouch (U43) and splintering (O3). The following, younger operational steps – use retouch (O43, U1) and splintering (U23, U22) – were also caused by the usage of the point. The last work step in the chronological sequence is the medial breakage of the basal part (U3).

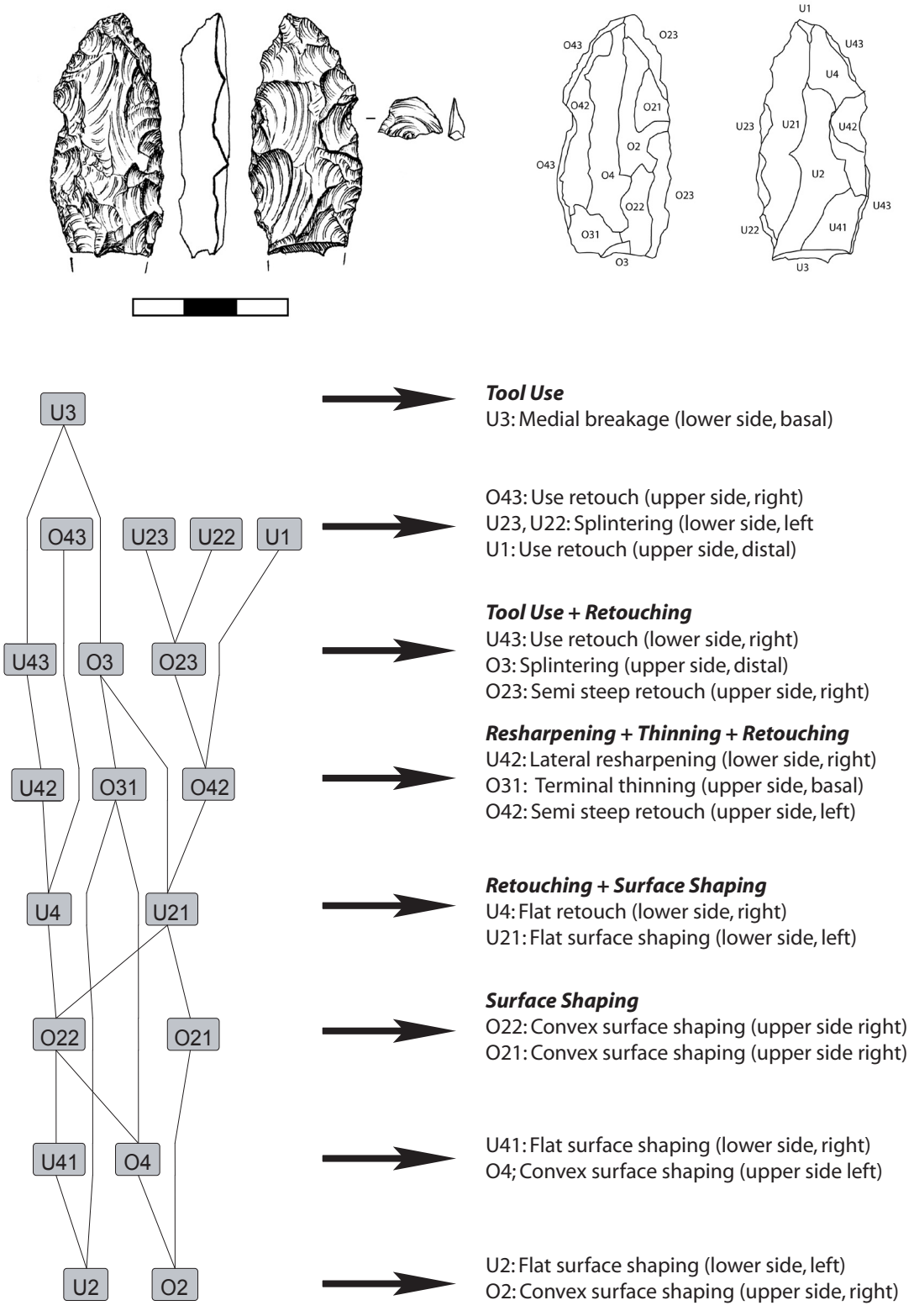


Fig.15-4 Result of the analysis of work steps for a plano-convex leaf shaped point (Level V/3, RMU 2).

Unifacial surface shaped scraper from V/3 RMU 3 (Fig. 15-5)

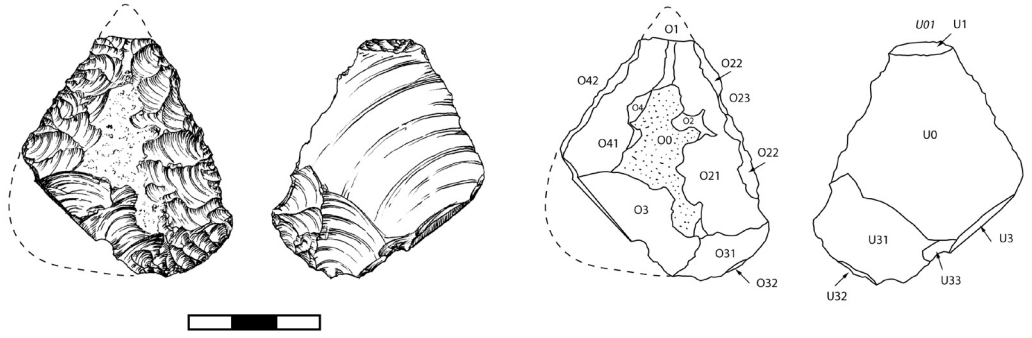
The oldest work steps O0 (cortex) and U0 (ventral surface) show that a flake, partially or fully covered with cortex, was used as a blank. The surface shaping of the flake began with three operational steps of convex surface shaping of its upper side, from the left edge (O4), the right edge (O2), and from the distal part (O1). The following three operational steps of convex surface shaping, from the right edge (O21), the left edge (O41), and the basal part (O3) gave the surface shaped blank its final form. After this sequence of surface shaping the tool was thinned at its base (U31) and its edges modified by means of semi steep retouching (O41, O22). The following work step (O31) comprised a further thinning of the basal part on the convex side of the artefact. After an indefinite period of usage the tip of the tool broke (this work step is marked with U01 in italic letters, as the fracture front is covered entirely by younger work steps). After the breakage of the distal part, the fracture front was semi steep retouched on the lower side of the artefact (U1). The further usage of the tool led to splintering on the lower (U23) and upper side (O32, O23). After a longitudinal breakage (U3) the tool was discarded.

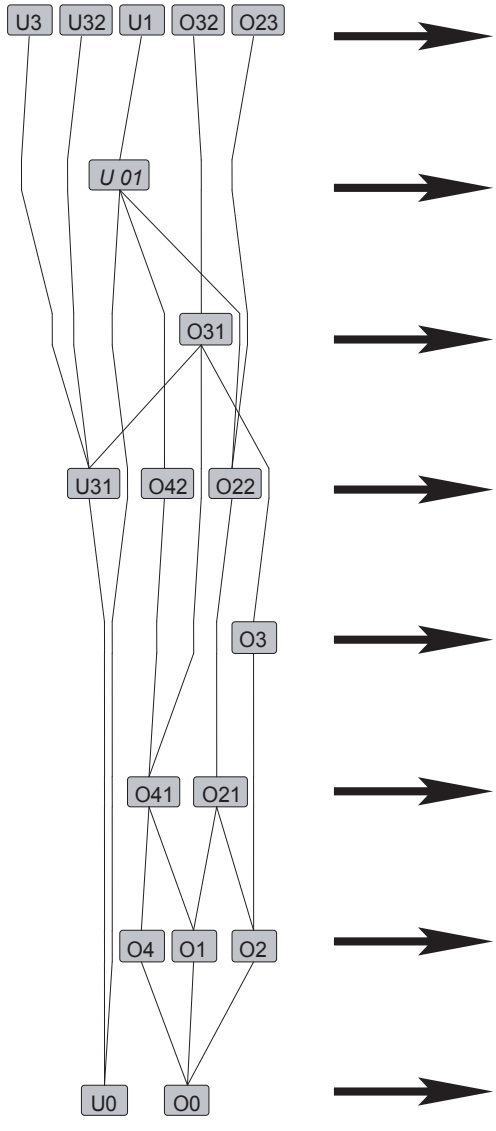
Backed knife from V/3 RMU 4 (Fig. 15-6)

This tool is made of a bifacial fragment which was reutilised for the production of a backed knife. The oldest work step in the observed chronological sequence is the remnant of cortical surface (O0). Further work steps which would have provided information as to the original state of the tool are lacking. Thus, the original state of the blank (whether flake, nodule or plaquette) is unknown. The operational chain of surface shaping comprises six work steps. The sequence began with the flat surface shaping of the tool (U43, U3 U21), followed by two work steps of convex surface shaping (O4, O2) and a further work step comprising flat surface shaping (U31). These operational steps are attributed to the bifacial production of an unknown tool. This biface, which was probably hafted, was used and broke into two or more pieces. After the breakage (O32) the basal fragment was reutilised. The recycling of the fragment began with the lateral and terminal thinning of the convex side (O43, O41, O3), followed by work steps of lateral and terminal thinning of the flat lower side (U1, U41). The next youngest operational step in the chronological sequence is the flat retouching of the left edge (O42). After another work step of lateral thinning (U4), an opposing working edge, on the left side of the lower side, was produced by means of semi steep retouching (U2). The following work steps of splintering (U42, O31), as well as use retouch (O45, U12) show a heavy usage of the tool, which also led to a longitudinal breakage (U22).

Bifacial scraper from VI/1 RMU 12 (Fig. 15-7)

The blank used for the production of this tool was a flake with a hinge fracture. Cortical remnants (O0) show the former coverage with cortex. Six work steps are attributed to the surface shaping of the blank. The work steps of convex surface shaping (O2, O4, O21) and those of flat surface shaping (U2, U4, U41) alternate, beginning with the convex surface shaping of the upper side from the right edge (O2) and completed with the flat surface shaping of the lower side from the right edge (U41). The operational chain of surface shaping did not affect the whole surface of the blank. Besides the remnants of the former ventral surface and cortex, some parts of the former dorsal surface are still visible (O1, O3). After the surface shaping of the blank, the right edge of the upper side was modified with a semi steep retouch (O22). The usage of this working edge is shown by a use retouch (O23), as well as by splintering (U21). The youngest six work steps are all attributed to the usage of the tool. Traces of splintering (O43, U3, O11), a little notch (O24), and finally the break of the basal part (U42, O31) show a heavy usage of the tool, with the main working edge located on the right side.





Tool Use + Retouching
U3: Longitudinal breakage (lower side, basal)
U32: Splintering (lower side, basal)
U1: Semi steep retouch (lower side, distal)
O32, O23: Splintering (upper side, right + distal)

Tool Use
U01: Medial breakage (lower side, distal)

Thinning
O31: Terminal thinning (upper side, basal)

Thinning + Retouching
U31: Terminal thinning (lower side, basal)
O41: Semi steep retouch (upper side, left)
O22: Semi steep retouch (upper side, right)

Surface shaping
O3: Convex surface shaping (upper side, basal)

O41: Convex surface shaping (upper side, left)
O21: Convex surface shaping (upper side, right)

O4: Convex surface shaping (upper side, left)
O1: Convex surface shaping (upper side, distal)
O2: Convex surface shaping (upper side, right)

Original State
U0: Ventral surface
O0: Cortex

Fig.15-5 Result of the analysis of work steps for a unifacial surface shaped scraper (Level V/3, RMU 3).

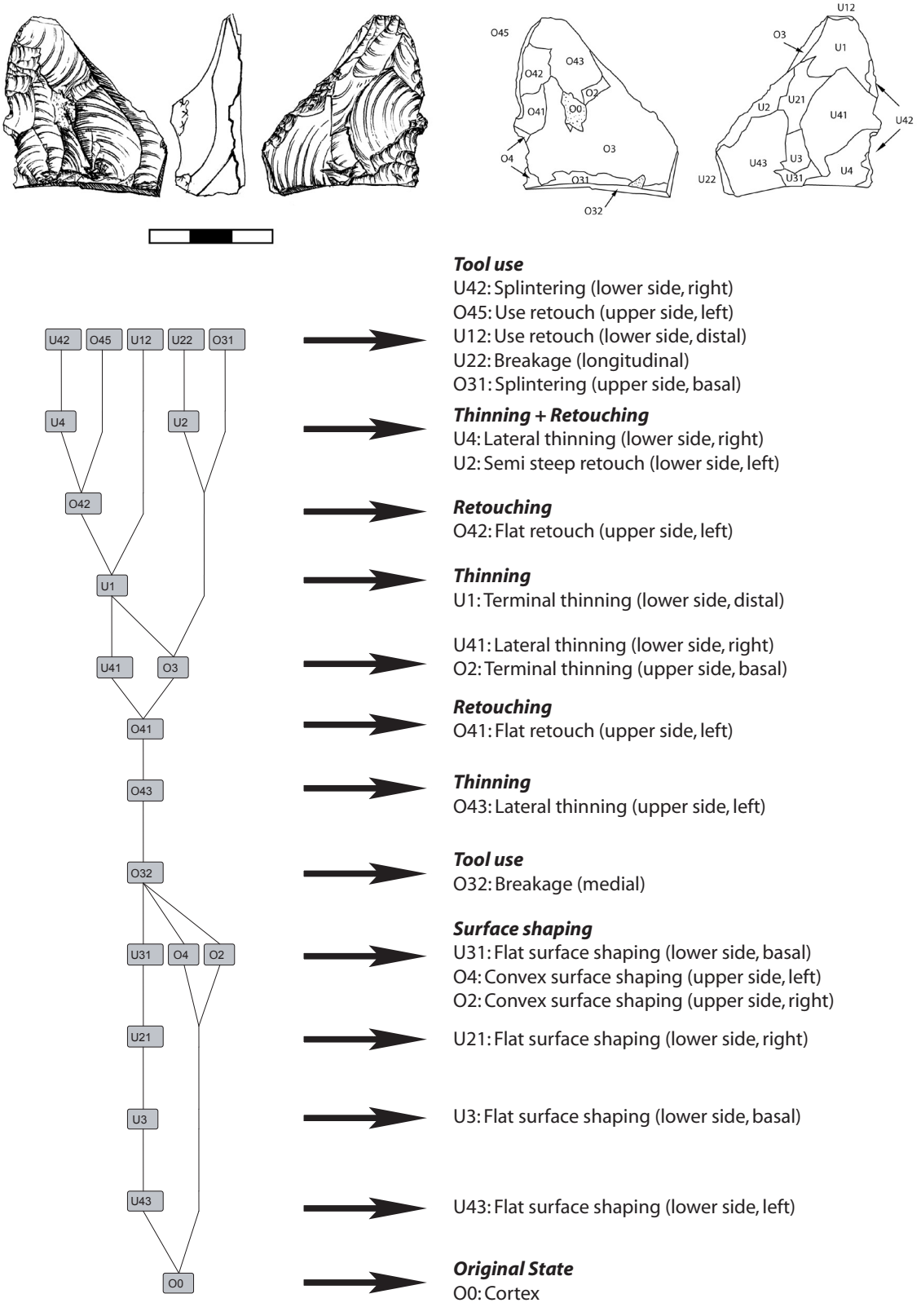


Fig.15-6 Result of the analysis of work steps for a plano-convex backed knife (Level V/3, RMU 4).

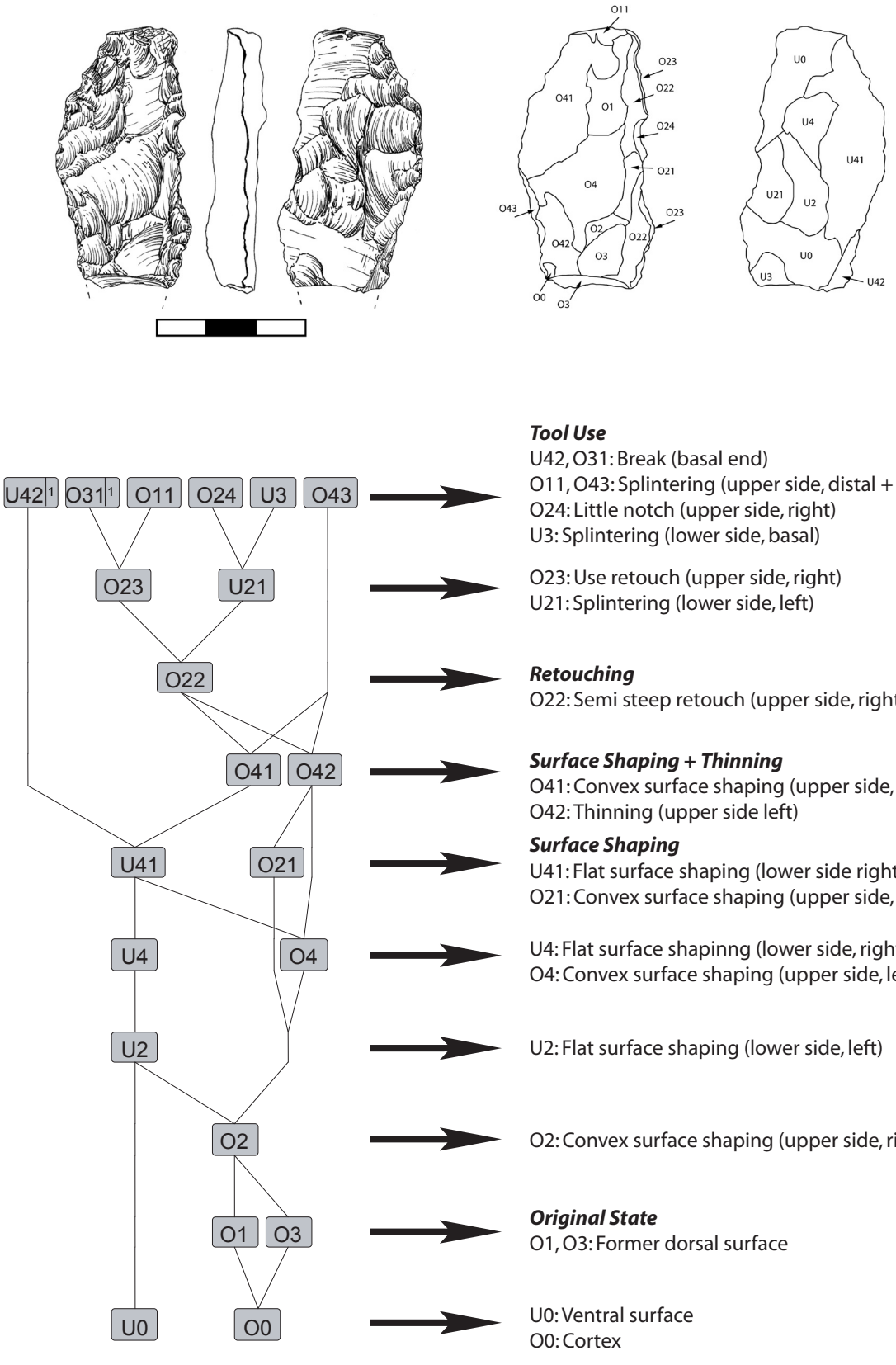


Fig.15-7 Result of the analysis of work steps for a plano-convex bifacial scraper (Level VI/1, RMU 12).

Medial fragment of a bifacial scraper/point from VI/6 RMU 5 (Fig. 15-8)

The work steps O0 and U23 define the original state of the piece. The cortical surface (O0) and the ventral surface (U23) show that the blank used for the bifacial production was a flake struck from a plaquette. The first work step in the operational chain was the convex surface shaping of the blank on the upper left side (O4), followed by a further 10 work steps comprising convex surface shaping. These operational steps occurred alternately from the lower and upper side of the piece, which resulted in a biconvex preform. After surface shaping, two operational steps of retouching occurred. The upper right side was semi-steep retouched (O23). This working edge, which seems to be the main one, is still sharp but shows signs of wear. The other work step of edge modification was a Quina retouch of the upper left side of the artefact (O45). This was necessary because the angle between the lower and upper side was too great. After its production, the tool was heavily used. This is documented by several work steps comprising splintering, which can be found on both the upper (O22, O46) and lower sides of the piece (U45, U22). Finally the tip (U1) and the basal part (U3) broke off, whereby splintering observed on the lower side (U31) is connected with the breakage of the proximal end. Although it is unclear whether the two breakages were simultaneous, the fact that there are no signs of a further usage of the tool after one of the breakages makes a simultaneous damage quite plausible. Working steps of rejuvenation/resharpening not being evident. Only the right working edge was reduced by use and further edge retouch. Upon being damaged, the piece was discarded without any attempt at reutilisation.

Leaf shaped point from VI/12 RMU 7 (Fig. 15-9)

The original state of the blank is represented by the work steps U4 (ventral surface) and O2 (remnants of the former dorsal surface): These indicate that a flake was chosen as a blank for the production of the point. The sequence of surface shaping contains 11 work steps of convex and flat surface shaping. These begin with the convex surface shaping of the flake (O4), followed by alternating work steps of flat (U1, U2, U41, U21) and convex surface shaping (O21, O41, O22, O3, O42, O23). The next youngest operational steps to be observed are attributed to the thinning of the tool – laterally (U42) as well as terminally (O26). Temporally very close to these work steps is the modification of the right edge, a semi steep retouch. The operational sequence ends with five work steps which resulted from the usage of the point. This led to an irregular denticulation (U43) and to splintering (U11, U44, O43, O25) on both edges of the point.

Leaf shaped point from VI/13 RMU 9 (Fig. 15-10)

The oldest work step (U0) is attributed to the original state of the tool. The remnant of the ventral surface shows that a flake was used as a blank for the production of the point. The following seven operational steps are all attributed to the surface shaping of the blank. In a first step, the blank was convex surface shaped on the upper side, alternately from the right edge (O2, O21), the basal end (O3) and the left edge (O4, O41). The last work step of convex surface shaping was applied to the distal end of the tool (O1). Temporally very close to this work step is the flat surface shaping of the lower side of the artefact from the right edge (U4). The next three operational steps are attributed to the basal thinning of the tool (U3, O31) and to the first edge modification – a semi steep retouch at the right edge of the upper side (O22). These work steps are followed by those of semi steep retouching of the upper right edge in the terminal area (O24) and by the lateral thinning of the lower, right side (U41). After a period of usage, the upper left edge shows evidences of use retouch (O43) and was resharpened by means of thinning the lower side of this part of the edge (U2). Finally, the usage of the tool led to the breakage of the tip (U1), and in several areas the edges show traces of splintering – both to the upper (O42, O23, O0) and lower sides (U42, U31).

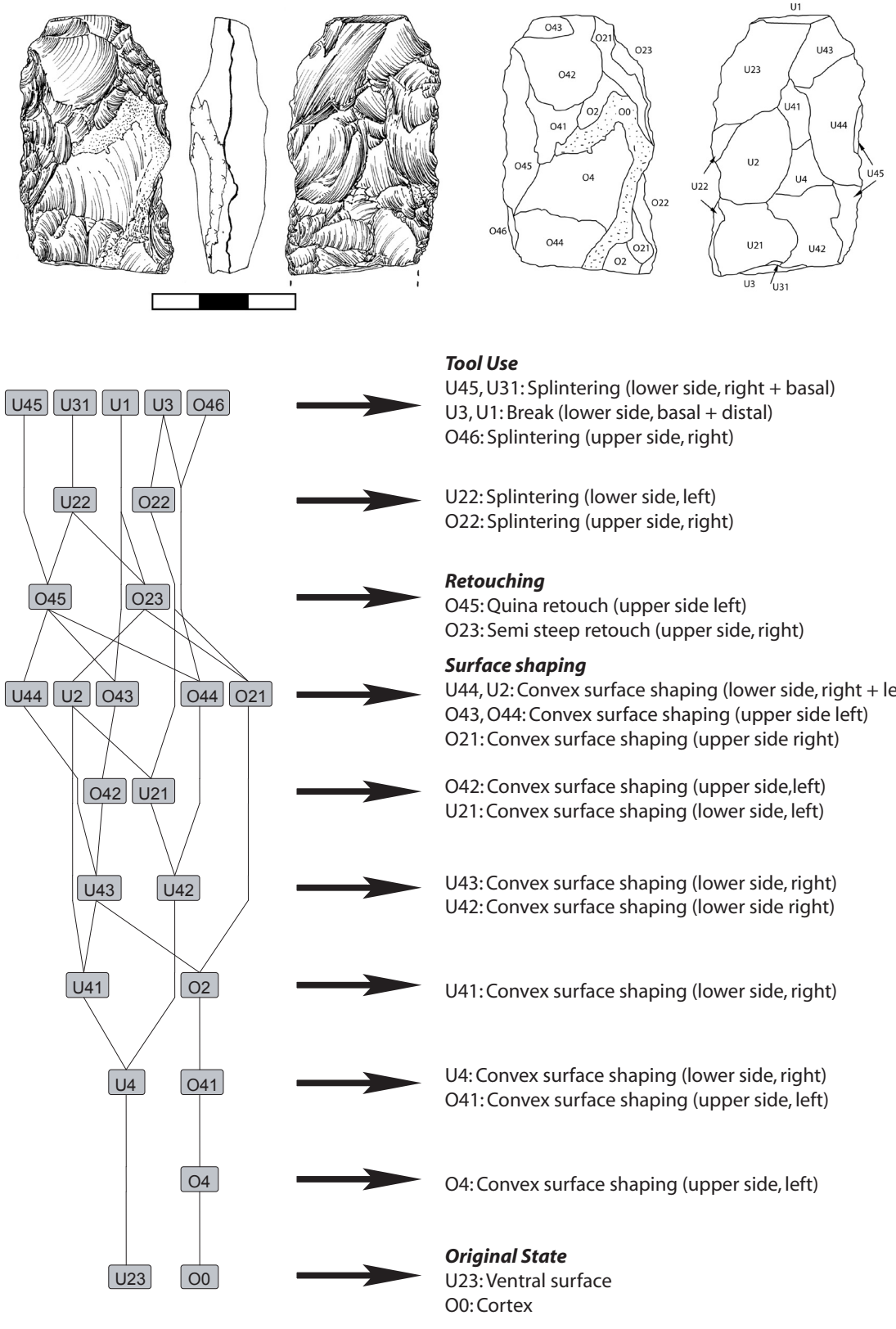


Fig.15-8 Result of the analysis of work steps for a medial fragment of a bi-convex bifacial scraper/point (Level VI/6, RMU 5).

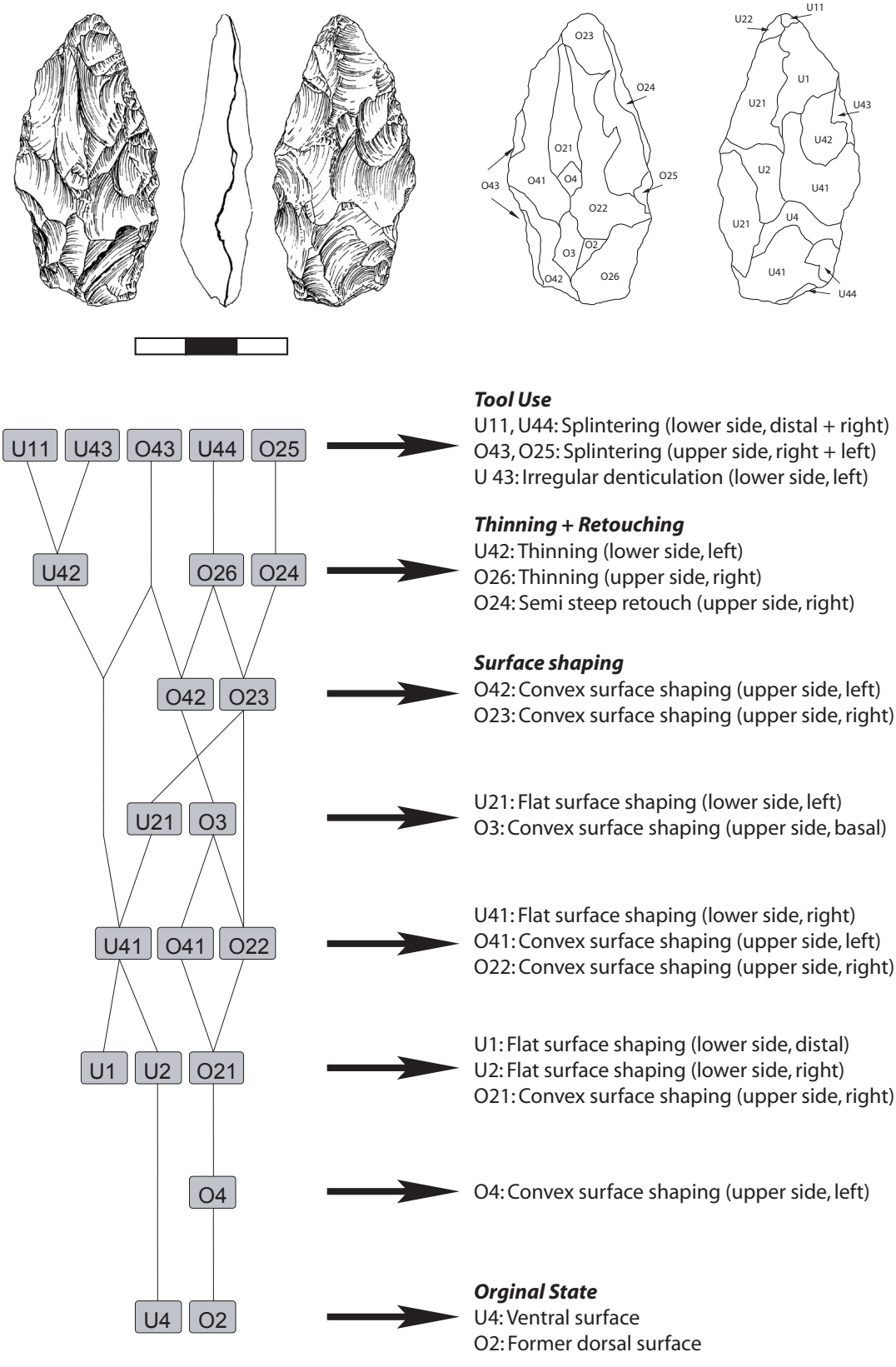
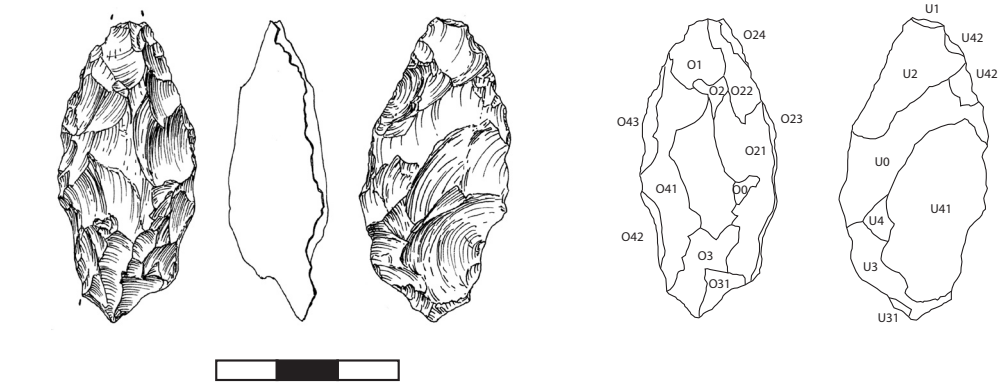
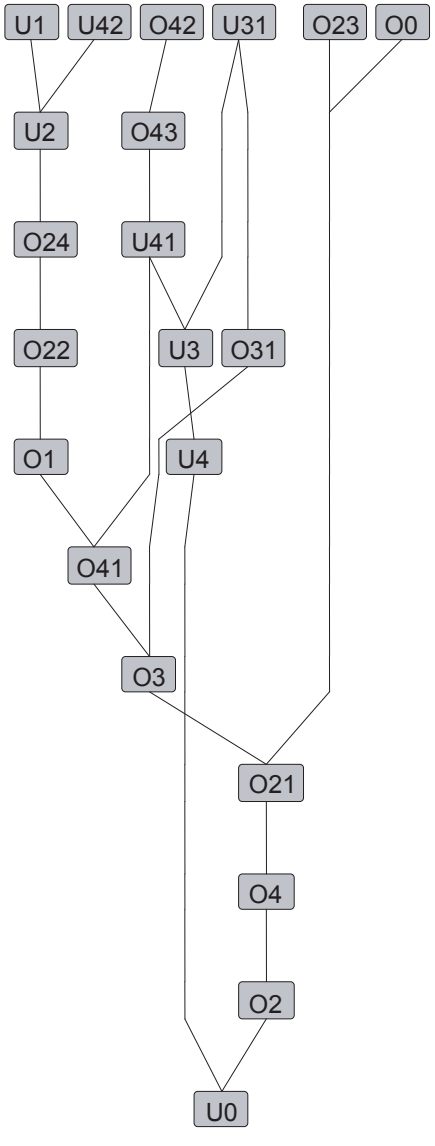


Fig.15-9 Result of the analysis of work steps for a plano-convex leaf shaped point (Level VI/12, RMU 7).





Tool use
U1: Break (lower side, distal)
U42, U31: Splintering (lower side, right + basal)
O42, O23, O0: Splintering (upper side, left + right)

Tool Rejunevation + Use
U2: Resharpening (lower side, left)
O43: Use retouch (upper side, left)

Retouching + Thinning
O24: Semi steep retouch (upper side, right)
U41: Lateral thinning (lower side, right)

O22: Semi steep retouch (upper side, right)
U3: Basal thinning (lower side)
O31: Basal Thinning (upper side)

Surface Shaping
O1: Convex surface shaping (upper side, distal)
U4: Flat surface shaping (lower side, right)

O41: Convex surface shaping (upper side, left)

O3: Covex surface shaping (upper side, basal)

O21: Convex surface shaping (upper side, right)

O4: Convex surface shaping (upper side, left)

O2: Convex surface shaping (upper side, right)

Original State
U0: Vental Surface

Fig.15-10 Result of the analysis of work steps for a plano-convex leaf shaped point (Level VI/13, RMU 9).

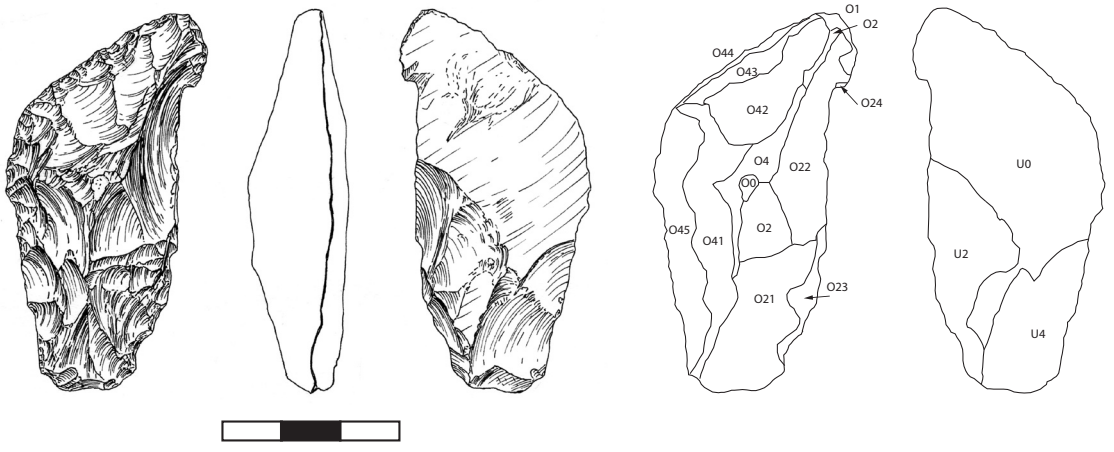
Unifacial surface shaped scraper from VI/13 RMU 19 (Fig. 15-11)

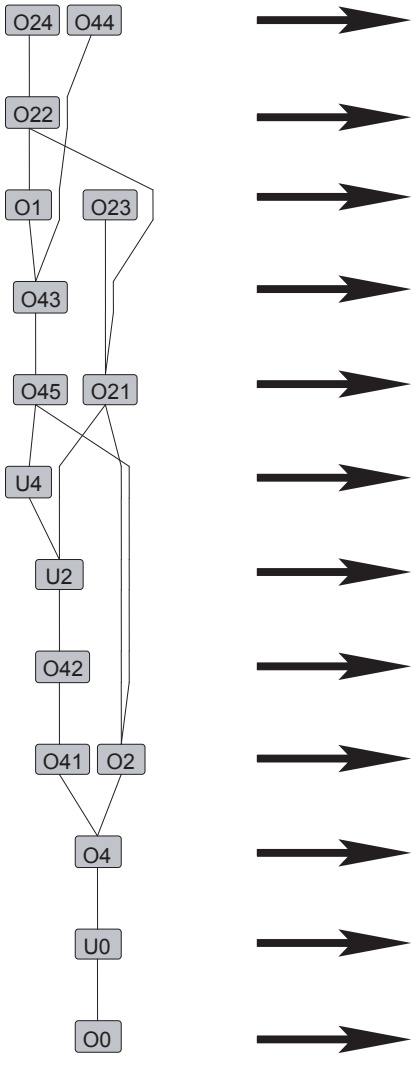
This tool was produced on a flake. The work step O0 indicates that the flake was formally covered with cortex (fully or partially). The following 4 work steps comprised the surface shaping of the upper side of the blank. The first of these work steps was applied from the left side (O4), and was followed by two work steps from the left and right (O41, O2). The fourth and final step came once again from the left side (O42). After the completion of the convex surface shaping, thinning (three work steps) occurred, with one intervening work step of secondary convex surface shaping (O21). Primarily, the tool was thinned at its base on its ventral side. This was achieved in it first being worked from its left (U2) and then right side (U4). After these steps, the artefact was laterally thinned on its convex side (O45). The first visible operational step belonging to an edge modification, was a flat retouching of the upper left edge of the tool (O43), which was followed by two work steps of semi steep retouching of the same edge and of the terminal end (O44, O1). Additionally, the right edge of the artefact also appears to have been retouched, though any evidence of these work steps was fully removed by work step O22, which represents the rejuvenation of the tool by means of lateral resharpening. The two youngest operational steps are attributed to the usage of the tool, which led to a splintering of the right edge (O24, O23).

Production and Reduction of Surface Shaped Tools from Unit V And VI

The conception of the production of surface shaped tools in Unit V - which were all produced in the plano-convex manner – displays no clear characteristics. In many cases, production can be attributed to unsuccessful attempts of surface shaping. This resulted in the edges of the tools being often wavy and splintered. Besides flakes, nodules were also chosen as blanks. The sequences of surface shaping differ between those where alternating work steps of flat and convex surface shaping occur, as is the case of the bifacial point (RMU 2), and sequences where the work steps of convex surface shaping until after the completion of the flat surface shaping (RMU 4) (Fig. 15-12). In some cases the sequence of surface shaping is restricted to the convex side (RMU 3). The differences in these sequences can be explained by the different manner and the degree of reduction of the tools. In the case of the bifacial point (RMU 2), the alternating of flat and convex surface shaping, as shown in the Harris diagram, is a result of secondary surface shaping, which totally removed any evidence of intervening work steps of edge retouch. The tool formed by the reduction process, which affects predominantly the width of the tool and not its length, is a rather narrow leaf shape point. In most of cases, the final edge modification (one or two working edges) of the tools is a semi steep retouch of the upper convex side. In the case of the unifacial surface shaped tool of RMU 3, a retouching on the lower side of the tool was conducted after the tip of the artefact had broken off. One extreme example of reduction and recycling is a backed knife (V/3 RMU 4), which was produced from a bifacial fragment. After the thinning of this fragment, two opposing working edges were retouched. In sum, the degree of reduction, fragmentation and recycling of the surface shaped tools of Unit V is rather high.

The production of surface shaped tools in Unit VI is more homogeneous, with a focus on leaf shape scrapers/points. In most cases, flakes were used as blanks. The surface shaping is sometimes limited to work steps comprising convex surface shaping (VI/13 RMU 9, VI/13 RMU 19). Operational steps of thinning of the lower side, and secondary edge retouching of the convex side lead to a reduction in width (VI 13 RMU 9). The examples VI/1 RMU 12 and VI/12 RMU 7 show alternating work steps of flat/convex surface shaping. In these cases, work steps of flat surface shaping (instead of thinning), with a following secondary edge retouch, lead to a reduction of the tools. One tool – a bifacial scraper (VI/6 RMU 5) - is the only bifacial tool which was produced in a convex/convex manner. As a blank for the production, a small flat nodule was chosen which was then convex surface shaped on both sides. A small preform (Chapter 6, Fig. 6-16, 3), also from this level (VI/6 RMU 15), shows the early stage of this method of bifacial production: The treatment of a small elongated nodule began on the narrow "ends" with a preparation on the end of the upper side, and a further preparation on the opposing end on the lower side. The following surface shaping of the preform occurred alternating in a convex manner. This resulted in a bi-convex cross section of the tool with s-shaped edges (VI/6 RMU 5). This





Tool Use
O24, O23: Splintering (upper side, right)

Tool Rejunevation
O22: Rejunevation (upper side, right)

Retouching
O1: Semi steep retouch (upper side, distal)
O44: Semi steep retouch (upper side, left)

O43: Flat retouch (upper side, left)

Thinning + Surface Shaping
O45: Lateral thinning (upper side, left)
O21: Convex surface shaping (upper side ,right)

U4: Ventral thinning (lower side, right)

U2: Ventral thinning (lower side, left)

Surface Shaping
O42: Convex surface shaping (upper side, left)

O41: Convex surface shaping (upper side, left)
O2: Convex surface shaping (upper side, right)

O4: Conex surface shaping (upper side, left)

Original state
UO: Ventral side

O0: Cortex

Fig.15-11 Result of the analysis of work steps for a unifacial surface shaped scraper (Level VI/13, RMU 19).

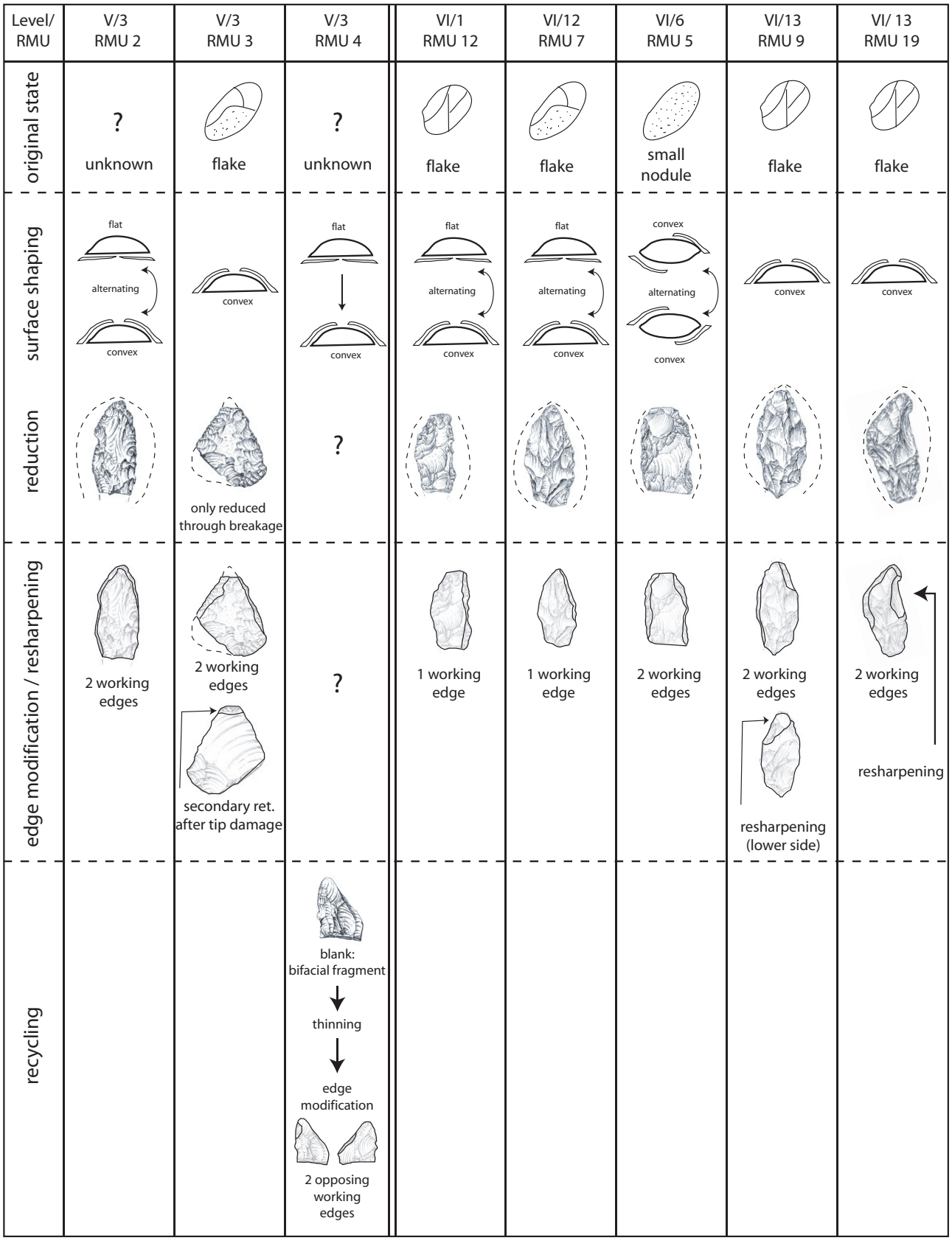


Fig.15-12 Surface shaped tools of Unit V and VI. Production and reduction sequences.

concept of bifacial production, which only occurs in level VI/6, show similarities with the "wechselseitig-gleichgerichteten" method of surface shaping which is well known from inventories of the Western Micoquian. In the assemblages of the Crimean Micoquian, this bi-convex treatment, which also occurs in Kabazi V (Yevtushenko, 1998), is rather rare.

Abstract

КАБАЗИ II, КУЛЬТУРНО-ХРОНОЛОГИЧЕСКИЕ СЛОИ V И VI: ПОСЛЕДОВАТЕЛЬНОСТЬ ОПЕРАЦИЙ ПО ИЗГОТОВЛЕНИЮ ДВУСТОРОННИХ ОРУДИЙ

М. КУРБЮН

Восемь двусторонних орудий было отобрано из коллекций V и VI культурно-хронологических слоев для анализа этапов их изготовления *"work step analysis"*. Этот метод призван описать все изменения морфологии орудий, которые произошли в ходе утилизации, для того, чтобы реконструировать цепь операций по их оформлению, переоформлению и реутилизации. Концепция производства двусторонних орудий V культурно-хронологического слоя – необычна. Во многих случаях попытки снятий с поверхностей орудий были неудачными, что приводило к получению волнистых по форме рабочих лезвий с многочисленными заломами. При этом каждое лезвие изготовлено в плоско-выпуклой манере. Такой характер обработки приводил к получению узких, массивных и относительно длинных листовидных форм.

Двусторонние скребла и острия VI культурно-хронологического слоя изготовлены на отщепах. Основным типом обработки являлся двусторонний плоско-выпуклый метод. Только в одном случае отмечено применение двояковыпуклой манеры изготовления двустороннего орудия.

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