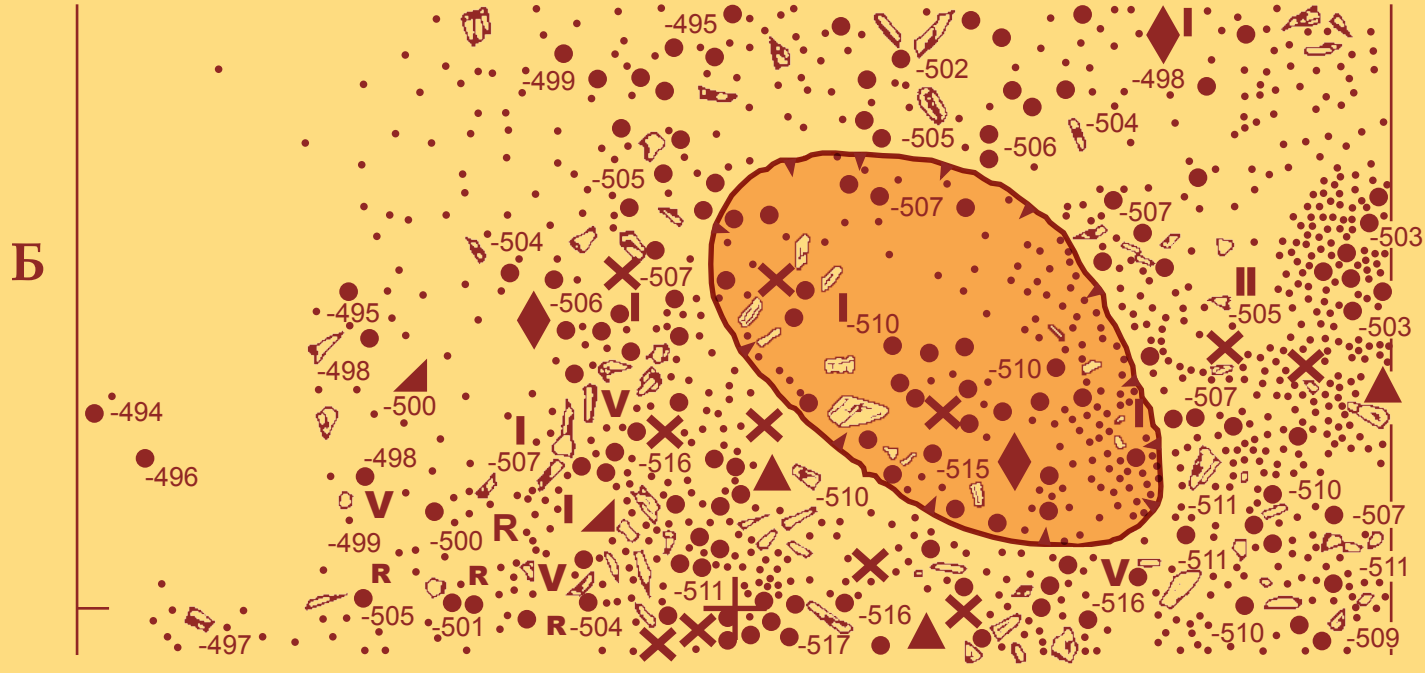
Palaeolithic Sites of Crimea · Vol. 3 · Part 1

KABAZI V:

INTERSTRATIFICATION OF MICOQUIAN & LEVALLOIS - MOUSTERIAN CAMP SITES



Edited by

Victor Chabai, Jürgen Richter and Thorsten Uthmeier

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НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК УКРАИНЫ
ИНСТИТУТ АРХЕОЛОГИИ
КРЫМСКИЙ ФИЛИАЛ

КЁЛЬНСКИЙ УНИВЕРСИТЕТ
ИНСТИТУТ ДО- И ПРОТОИСТОРИИ

Палеолитические стоянки Крыма,
Том 3 · Часть 1

КАБАЗИ V:
ИНТЕРСТРАТИФИКАЦИЯ МИКОКСКИХ И ЛЕВАЛЛУА-МУСТЬЕРСКИХ КОМПЛЕКСОВ

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Preface

Generally speaking, the variability encountered in the Crimean Middle Palaeolithic can be traced back to two distinct techno-complexes: the Eastern European Micoquian and the Levallois-Mousterian. In Eastern Europe, Micoquian assemblages have been discovered in all regions which have seen more or less intensive archaeological investigation – the Prut and Dniester river basins, the Dnieper river basin, the Donbass, the Crimean peninsula, as well as the north-western Caucasus and the Central and Northern Urals. On the other hand, Levallois-Mousterian occupations are known from just two regions: the Prut and Dniester river basins, and the Crimean peninsula. Available chronological data shows that both the Eastern European Micoquian and the Levallois-Mousterian appeared in the Last Interglacial and lasted up to - and including - the Denekamp Interstadial. At the same time, the regional chronological frames of the Micoquian and the Levallois-Mousterian are different. Whereas Micoquian assemblages found in association with MIS 5 deposits are known from the Crimea, the Prut / Dniester region, the Donbass, the Volga basin, and the Ural Mountains, its youngest occurrences (MIS 3) have so far only been detected in the Crimea, in the north-western Caucasus and in the Prut / Dniester region. On the other hand, the Levallois-Mousterian assemblages can be clearly subdivided into two spatio-temporal groups: the Prut / Dniester group and the Crimean group. The former is known from MIS 5 until the beginning of MIS 3, while the latter existed from the beginning until the end of MIS 3. The Levallois-Mousterian assemblages from the Prut / Dniester region have also been termed "Molodova Mousterian Culture"; the Crimean Levallois-Mousterian is referred to as the "Western Crimean Mousterian" (WCM). The WCM occurs as a single facie of the Levallois-Mousterian techno-complex in the Crimea, while the Crimean Micoquian is subdivided into three facies: "Ak Kaya", "Starosele" and "Kiik Koba".

Thus, with regard to the general chronological frames of the Micoquian and the Levallois-Mousterian, the coexistence of both cultural units was certainly to be expected on the Crimean peninsula. However, in the stratigraphies studied until recently, for example at Shaitan Koba, Kabazi II and Karabi Tamchin, WCM occupations have always overlaid levels with Micoquian assemblages. Instead of direct stratigraphical evidence, overlapping radiometric dates were the only argument for the coexistence of both cultural units, which could never be accepted as sufficient proof. Thus, the only way to prove convincingly a coexistence of these two distinct industries was to excavate a site at which interstratification occurred. The cultural deposits to have accumulated in Kabazi V rock-shelter appear to do just that, and so far they are the only example of such a sequence in Eastern Europe.

The significance of this site cannot be overstated. The Kabazi V lithological sequence, which was found in primary context, is relatively small and accumulated towards the end of MIS 3 under alternating stadial and interstadial conditions. Due the relatively restricted time depth involved the environment, and therefore also living conditions, were similar for both Micoquian and WCM occupations. Both would have had access to the same spectrum of raw materials and faunal resources. In this respect, Kabazi V has provided a rare opportunity to undertake complex studies of technologically and typologically distinct industries which coexisted under similar environmental conditions.

The thickness of *in situ* soft deposits comprises about 1,5 metres. Thirty seven archaeological levels, grouped into seven sub-units and one unit, were discovered during the 2002-2003 field

campaigns. The investigations of both lithological and archaeological sequences clearly demonstrate that most of the archaeological horizons are products of palimpsests. These palimpsests were able to develop due to a combination of such factors as frequent human visits, intensive exploitation of living surfaces, and medium to low sedimentation rate. The archaeological occupations are subdivided into two principal groups: those found in primary contexts – sub-units III/1, III/2, III/3, III/5, and Unit IV, and those partially disturbed by erosion – sub-units III/4, III/6, and III/7 (Chapter 1, by Chabai). Most occupation surfaces feature hearths and pits. Mammoth bones (level III/2) and wood (level III/5-3B2) were both used as fuel for fires. All pits were associated exclusively with Micoquian occupations (Chapter 2, by Chabai and Veselsky). Only one pit (level III/4-2) contained intentionally deposited artefacts; this turned out to be an outstanding discovery for the Middle Palaeolithic: refits showed that the artefacts recovered represent the waste from the production of one single bifacial tool (Chapter 16, by Veselsky).

Radiometric investigations have yielded two alternative versions for a chronology of Kabazi V: a short one, and a long one. Whereas the short chronology is based on radiocarbon and ESR measurements, and suggests that the entire Kabazi V cultural sequence dates to MIS 3, the long chronology, which is supported by TL and OSL dates, places the sequence in MIS 4 to MIS 5, or even earlier (Chapter 3, by Housley et al.). The pollen studies and the analysis of microfaunal remains support the short (radiocarbon and ESR) chronology (Chapter 4, by Markova; Chapter 5, by Gerasimenko). Interstadial environments were recognised in sub-units III/5 and III/4 (Hengelo), and in sub-unit III/1 (Denekamp), while Unit IV, sub-units III/3 and III/2 accumulated under stadial conditions (Chapter 4, by Markova).

Repeated changes in climatic conditions do not appear to have affected the choice of species hunted by humans that frequented the site: *Saiga tatarica* and *Equus hydruntinus*. At Kabazi V meat was consumed from a prey that had already been dismembered off-site (Chapter 6, by Patou-Mathis).

Micoquian assemblages were found in sub-units III/1, III/2 and III/5, while WCM artefacts stem from sub-unit III/3 and Unit IV. Micoquian artefacts from sub-units III/1 and III/5 belong to the Starosele facie (Chapter 7, by Veselsky; Chapter 11, by Yevtushenko), whereas assemblages from sub-unit III/2 have been attributed to the Ak Kaya facie of the Crimean Micoquian (Chapter 8, by Chabai). Technologically, both Ak Kaya and Starosele assemblages from Kabazi V stem from plano-convex bifacial tool production; core reduction was insignificant. Bifacial tools account for 10-25 % of the assemblage and are mainly represented by leaf and crescent shapes, often with natural backs. Extensive refittings have provided insights into some of the peculiarities of bifacial tool production processes and re-utilisation (Chapter 16, by Veselsky). Unifacial tools are represented mainly by simple and convergent scrapers, which often show additional ventral thinning. The difference between the Ak Kaya and Starosele assemblages lies in the degree of tool reduction: the tools of the Starosele facie assemblages are more intensively utilised (Chapter 7, by Veselsky; Chapter 8, by Chabai; Chapter 11, by Yevtushenko). WCM assemblages were based on the Levallois and parallel reduction of cores. The WCM tool-kits are mainly represented by simple scrapers and specific types of points, such as distal and lateral points (Chapter 9, by Demidenko; Chapter 14, by Chabai). The most part of tools were made on blades. Finally, another technological difference was discovered between the Crimean Micoquian and the Levallois-Mousterian: bone retouchers were always associated with Micoquian assemblages (Chapter 15, by Veselsky). At the same time, the model of raw material exploitation, which was based on on-site flint reduction and tool production, is equal for both Micoquian and Levallois-Mousterian occupations (Chapter 7, by Veselsky; Chapter 8, by Chabai; Chapter 9, by Demidenko; Chapter 11, by Yevtushenko; Chapter 14, by Chabai). Following a site classification model adopted in Crimean Middle Palaeolithic studies, the features observed at Kabazi V, i.e. on-site tool production and on-site prey consumption, pertain to a camp of type A.

The artefact collections from occupations, which were partially eroded (sub-units III/4, III/6 and III/7), contain both Micoquian and WCM technological and typological features (Chapter 10, by Veselsky; Chapter 12, by Chabai; Chapter 13, by Veselsky).

To profit from the advantageous setting of one site bearing well preserved remains of two industries within a considerable small time depth and, therefore, similar environmental conditions, similarities and differences between the site catchment at Kabazi V, levels III/1A and

III/2 are investigated by means of digital geographical information systems (GIS) (Chapter 17, by Uthmeier, Ickler and Kurbjuhn). However, in spite of similar models of faunal and raw material exploitation, both industries still produced technologically and typologically distinct artefact assemblages and human occupations were organised in quite different ways (Chapter 18, by Chabai).

Fieldwork at Kabazi V and laboratory studies were financed by grants from the *Deutsche Forschungsgemeinschaft* as part of the project "*Funktionale Variabilität im späten Mittelpaläolithikum auf der Halbinsel Krim, Ukraine*" (ZI 276/7-1, ZI 276/7-2, RI 936/3-3, RI 936/3-4). Radiocarbon, OSL and TL dates were produced by R. A. Housley, D. C. W. Sanderson, C. I. Burbidge, D. Richter and T. F. G. Higham in the frame of the project "Environmental Factors in the Chronology of Human Evolution and Dispersal", financed by the UK Natural Environment Research Council (NERC). This volume was written and edited during V. Chabai's stay at Cologne University and at the Royal Museums of Arts and History in Brussels. His visits were supported by the *Deutsche Forschungsgemeinschaft* (grant RI 936/5-1) and by a fellowship of the Belgian Federal Science Policy Office (grant № MO/38/010). The authors of this volume would like to express their sincere gratitude to all friends and colleagues who were involved in the field and in laboratory investigations of materials from Kabazi V: Dr. Ph. Allsworth-Jones, N. Bairamova, G. Bataille, M. Brusilovskaya, S. Brusilovskaya, K. Fedorov, Dr. D. Gaskevich, Dr. I. N. Gavrilenko, I. I. Gavrilenko, L. Golnik, K. Grüner, A. Ivleva, C. Kempcke-Richter, O. Kononenko, I. Krushelnitskaya, A. Lantsov, Dr. K. Mikhailesku, Dr. D. Nuzhnyi, D. Ovcharov, A. Riabchenko, S. Scherm, Dr. V. Sitlivy, D. Stupak, I. Utseha, N. Yatsyshin, L. Yatsyshina, and Dr. A. Zięba. We express our special thanks to Dr. V. Usik, who produced all artefact illustrations and kindly advised A. Veselsky regarding peculiarities of bifacial technology, as well as to Dr. L. Kulakovskaya, who allowed Dr. M. Patou-Mathis to study the faunal assemblages at her office. Lee Clare proofread all chapters and, when necessary, improved the English. A. Rüschmann and H.H. Schluse prepared the layout of this volume. The *Deutsche Forschungsgemeinschaft* financed the printing of this book. Thank you all.

Victor Chabai
Thorsten Uthmeier
Jürgen Richter

ВВЕДЕНИЕ

Вариабельность среднего палеолита Крыма представлена двумя технокомплексами: микокским и леваллуа-мустьерским. В Восточной Европе микокские артефакты были обнаружены во всех более-менее изученных регионах: бассейнах рек Прут, Днестр, Днепр, Волга, на Донбассе, крымском полуострове, северо-западном Кавказе, центральном и северном Урале. Леваллуа-мустьерские коллекции происходят из двух регионов: пруто-днестровского и Крыма. Хронологические рамки восточно-европейского микока и леваллуа-мустье определяются временем от последнего интергляциала до интерстадиала Денекамп, включительно. Вместе с тем, в разных регионах время существования микока и леваллуа-мустье существенно отличается. Микокские индустрии времени MIS 5 обнаружены в Крыму, пруто-днестровском регионе, на Донбассе, в бассейне Волги и на Урале. Наиболее поздние (MIS 3) проявления микокского технокомплекса происходят из пруто-днестровского региона, Крыма и северо-западного Кавказа. На территории Восточной Европы леваллуа-мустьерский технокомплекс представлен двумя территориально-хронологическими группами: пруто-днестровской и крымской. Хронологические рамки пруто-днестровского леваллуа-мустье охватывают время от MIS 5 до начала MIS 3. В Крыму леваллуа-мустье существует на протяжении MIS 3. В пруто-днестровском регионе леваллуа-мустьерские комплексы были названы молодовской мустьерской культурой, а в Крыму – западнокрымским мустье. На территории Крыма западнокрымское мустье является единственной фацией леваллуа-мустьерского технокомплекса, тогда как микокский технокомплекс представлен тремя фациями: аккайской, старосельской и киикобинской.

Учитывая хронологические рамки леваллуа-мустье и микока, их сосуществование на территории Крыма было ожидаемым. В то же время, на ряде стратифицированных памятников, таких как Шайтан Коба, Кабази II, Караби Тамчин, микокские горизонты всегда залегали под горизонтами с леваллуа-мустьерскими артефактами. Иными словами, хронологическое соотношение микока и леваллуа-мустье основывается на радиометрических датировках, что, учитывая постоянно возникающие проблемы в радиометрических исследованиях, вряд ли может быть признано исчерпывающим доказательством для утверждения о сосуществовании данных технокомплексов. Бесспорным доказательством сосуществования микокского и леваллуа-мустьерского технокомплексов является только их интерстратификация в рамках определенной литологической последовательности. Примером такой интерстратификации и, пока единственным в Восточной Европе, стал погребенный грот Кабази V.

Значение интерстратификации микокских и леваллуа-мустьерских горизонтов трудно переоценить. Незначительная по мощности пачка литологических отложений Кабази V аккумулировалась под воздействием чередующихся стадиальных и интерстадиальных циклов финальной части MIS 3. Фаунистические и кремневые ресурсы были в одинаковой степени доступны для микокских и леваллуа-мустьерских поселений. Таким образом, материалы Кабази V представляют редкую возможность для изучения типологически и технологически различных индустрий, сосуществовавших в сходных экологических условиях.

В полутораметровой пачке *инситных* рыхлых литологических отложений, вскрытой в 2002-2003 годах, было обнаружено 37 археологических горизонтов, которые составили

7 пачек горизонтов и один культурный слой. Практически все горизонты представлены палимпсестами. Данные палимпсесты являются результатом комбинации ряда факторов: достаточно частых визитов гоминид, сопровождавшихся интенсивной эксплуатацией жилых поверхностей, и умеренной / низкой скорости аккумуляции рыхлых отложений. Археологические горизонты подразделяются на две основные группы: первую составляют пачки горизонтов III/1, III/2, III/3, III/5 и культурный слой IV, которые были обнаружены в первичном залегании; вторую – частично переотложенные эрозионными процессами пачки горизонтов III/4, III/6, III/7 (Глава 1, Чабай В.П.). На раскопанной площади большей части археологических горизонтов были обнаружены очаги и ямы. Кости мамонта (горизонт III/2) и дерево (горизонт III/5-3B2) служили топливом для очагов. Все ямы ассоциируются только с микокскими горизонтами (Глава 2, Чабай В.П., Весельский А.П.). Преднамеренно «спрятанные» артефакты, представленные отходами производства двустороннего орудия (Глава 16, Весельский А.П.), были найдены в одной из ям горизонта III/4-2.

На основании радиометрических исследований образцов Кабази V были предложены две версии хронологии стоянки: «короткая» и «длинная». «Короткая» версия хронологии базируется на радиоуглеродных и ESR датах, «длинная» – на TL и OSL определениях. Исходя из «короткой» хронологии, вся пачка культурных отложений Кабази V образовалась во время MIS 3. «Длинная» хронология предполагает, что культурные отложения Кабази V аккумулировались во время MIS 4, MIS 5 и даже более ранних стадий (Глава 3, Хёсли Р. и др). Палеоклиматические реконструкции, основанные на изучении пыльцы и фауны мелких млекопитающих, поддерживают «короткую» версию хронологии (Глава 4, Маркова А.К.; Глава 5, Герасименко Н.П.). Интерстадиальные климатические условия были установлены для отложений содержащих пачки горизонтов III/5, III/4 (Хенгело) и III/1 (Денекамп), тогда как культурный слой IV и пачки горизонтов III/3 и III/2 аккумулировались во время стадиальных условий (Глава 4, Маркова А.К.).

Чередование стадиальных и интерстадиальных условий не оказало влияния на состав охотничьей добычи, который, в основном, представлен двумя видами: *Saiga tatarica* и *Equus hydruntinus*. На основании археозоологического анализа сделан вывод о том, что на территории всех горизонтов происходило потребление частей животных, которые были разделаны за пределами стоянки (Глава 6, Пату-Матис М.).

Микокские коллекции были найдены в пачках горизонтов III/1, III/2 и III/5. Западнокрымские комплексы происходят из пачки горизонтов III/3 и культурного слоя IV. Микокские артефакты пачек III/1 и III/5 относятся к старосельской фации (Глава 7, Весельский А.П.; Глава 11, Евтушенко А.И.), а кремневый комплекс пачки III/2 – к аккайской фации (Глава 8, Чабай В.П.). Технологически аккайские и старосельские комплексы основаны на производстве плоско-выпуклых двусторонних орудий. Нуклеусное расщепление занимает явно подчиненную роль. Двусторонние орудия составляют 10-25 % орудийных наборов и, в основном, представлены листовидными и сегментовидными формами, часто с естественными обушками. Имеющиеся случаи ремонтажа раскрывают специфику производства и реутилизации двусторонних орудий (Глава 16, Весельский А.П.). Односторонние орудия представлены, главным образом, простыми и конвергентными скреблами, которые часто содержат разнообразные вентральные утончения. Основное отличие между аккайскими и старосельскими комплексами состоит в степени редукции орудийных наборов – старосельские орудия более редуцированы (Глава 7, Весельский А.П.; Глава 8, Чабай В.П.; Глава 11, Евтушенко А.И.). Технологически западнокрымские комплексы основаны на леваллуазском и параллельном нуклеусном первичном расщеплении. В целом, западнокрымские орудийные наборы представлены простыми скреблами и специфическими типами остроконечников, такими как дистальные и латеральные (Глава 9, Демиденко Ю.Э.; Глава 14, Чабай В.П.). Значительная часть орудий изготовлена на пластинах. Еще одно технологическое различие между микоком и леваллуа-мустье состоит в том, что костяные ретушеры ассоциируются только с микокскими комплексами (Глава 15, Весельский А.П.). В то же время, на микокских и леваллуа-мустьерских поселениях Кабази V использовалась одна модель эксплуатации кремневого сырья – изготовление орудийных наборов из принесенных на стоянку желваков и плиток кремня (Глава 7, Весельский А.П., Главы 8, 14, Чабай В.П.; Глава 9, Демиденко Ю.Э.; Глава 11, Евтушенко А.И.).

В соответствии с принятой функциональной классификацией среднепалеолитических поселений Крыма, полный цикл кремнеобработки и потребление охотничьей добычи составляют основные типы жизнедеятельности на территории лагерей типа А.

Коллекции артефактов, происходящие из частично переотложенных эрозионными процессами пачек горизонтов III/4, III/6 и III/7, содержат микокские и леваллуа-мустьерские технико-типологические характеристики (Главы 10, 13, Весельский А.П.; Глава 12, Чабай В.П.).

Анализ мотивации выбора места для лагерей Кабази V был произведен при помощи цифровой географической информационной системы (Глава 17, Утмайер Т., Иклер С., Курбюн М.).

Таким образом, микокские и леваллуа-мустьерские комплексы, сосуществовавшие в сходных климатических и сырьевых условиях, а также использовавшие одинаковые модели эксплуатации сырьевых и фаунистических ресурсов, производили технологически и типологически различные артефакты и разными способами обустраивали жилые поверхности (Глава 18, Чабай В.П.).

Полевые и лабораторные исследования материалов Кабази V выполнены в рамках проектов "*Funktionale Variabilität im späten Mittelpaläolithikum auf der Halbinsel Krim, Ukraine*" (ZI 276/7-1, ZI 276/7-2, RI 936/3-3, RI 936/3-4) при финансовой поддержке фонда *Deutsche Forschungsgemeinschaft*. Радиоуглеродные, OSL и TL даты были получены Р. Хёсли, Д. Сандерсоном, К. Барбиджем, Д. Рихтером и Т. Хигамом в рамках проекта "*Environmental Factors in the Chronology of Human Evolution and Dispersal*" профинансированного *UK's Natural Environment Research Council* (NERC). Этот том был подготовлен к печати во время визитов В.П. Чабая в Кельнский Университет (*Deutsche Forschungsgemeinschaft*, project RI 936/5-1) и Королевский Музей истории и искусств в Брюсселе (*Belgian Federal Science Policy Office*, project № MO/38/010). Авторы тома выражают искреннюю признательность всем друзьям и коллегам, принявшим участие в полевых и лабораторных исследованиях материалов Кабази V: Байрамовой Н., Баталье Г., Брусиловской М., Брусиловской С.В., Гавриленко И.И., Гавриленко И.Н., Гаскевичу Д.Л., Гольник Л., Грюнеру К., Зебе О., Ивлевой А., Кемпке-Рихтер К., Кононенко О.Н., Крушельницкой И.А., Ланцову А.С., Михайлеску К., Нужному Д.Ю., Овчарову Д.Г., Рябченко А.С., Ситливому В.И., Ступаку Д.В, Уцехе И., Федорову К.Б., Шерму С., Элсворту-Джонсу Ф., Яцышину Н.В. и Яцышиной Л.А. Огромная благодарность В.И. Усику за подготовленные рисунки артефактов и советы, предоставленные А.П. Весельскому, по проблемам двусторонних технологий, а также Л.В. Кулаковской, которая щедро предоставила возможность М. Пату-Матис изучить фаунистические коллекции в своем кабинете. Ли Клер отредактировал английский язык текстов, а А. Рушманн и Х.Х. Шлёзе подготовили компьютерную верстку тома. Фонд *Deutsche Forschungsgemeinschaft* профинансировал типографские расходы. Спасибо всем!

Виктор Чабай
Торстен Утмайер
Юрген Рихтер

Chapter 1

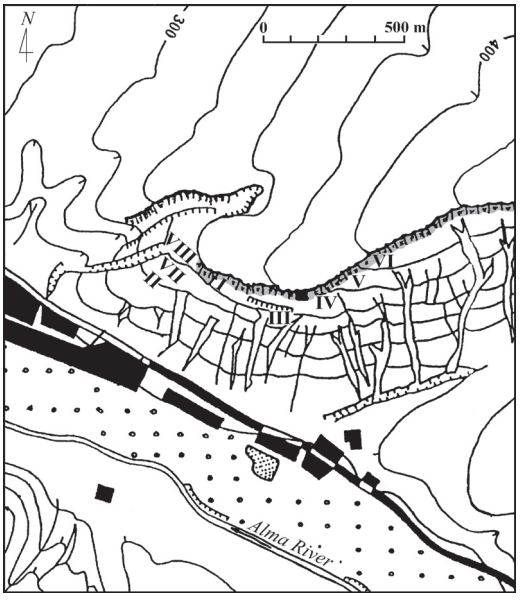


Fig. 1-1 Map of the Kabazi cuesta; Roman numerals indicate archaeological sites: I – Kabazi I; II – Kabazi II; III – Kabazi III; etc.

Kabazi V: The Lithological and Archaeological Sequences

Victor P. Chabai

The Middle Palaeolithic site Kabazi V (44°84′ N; 34°03′ E) is situated at the foot of a limestone cliff, near the peak of the south-west facing slope of Kabazi cuesta, 360 m above sea level, and 150 m above the present day Alma River valley. The site was formed in relatively soft Eocene fossil clay (Eb), which underlies the Eocene nummulitic limestone (Ea). In addition to Kabazi V, the slopes of the Kabazi cuesta have also revealed two further buried rock-shelters (Kabazi I and Kabazi VIII), one open air site (Kabazi II), and four concentrations of surface material (Kabazi III, IV, VI and VII) (Fig. 1-1).

Kabazi V was discovered in 1983 by Yuri Zaitsev, a student of Simferopol secondary school, now a senior scientist at the Crimean branch of the Archaeology Institute. In 1986 an expedition headed by Yu. Kolosov excavated a first test pit and established the grid system at Kabazi V. This system was oriented perpendicularly to the visible limestone cliff, in the hope that the back-wall of the assumed buried rock-shelter would share this orientation. Only later did it become clear that the present day cliff and the back-wall of Kabazi V rock-shelter differ in orientation by about 90°. In the1990 field campaign the back-wall of the rock-shelter was located 2 m from the initial sondage. Accordingly, the excavation area is oriented along the back-wall of rock-shelter. In the 1986, 1990, 1993-1996 and 2002-2003 field campaigns excavations were undertaken along the back-wall of the rock-shelter, as well as on the easternmost part of the rock-shelter platform (Fig. 1-2).

The materials from 1986, 1990 and 1993-1996 field campaigns have already been extensively studied and published (Kolosov et al. 1993, Yevtushenko 1998a, 1998b, McKinney 1998, Rink et al. 1998, Burke 1999, Markova 1999, Mikhailescu 1999).

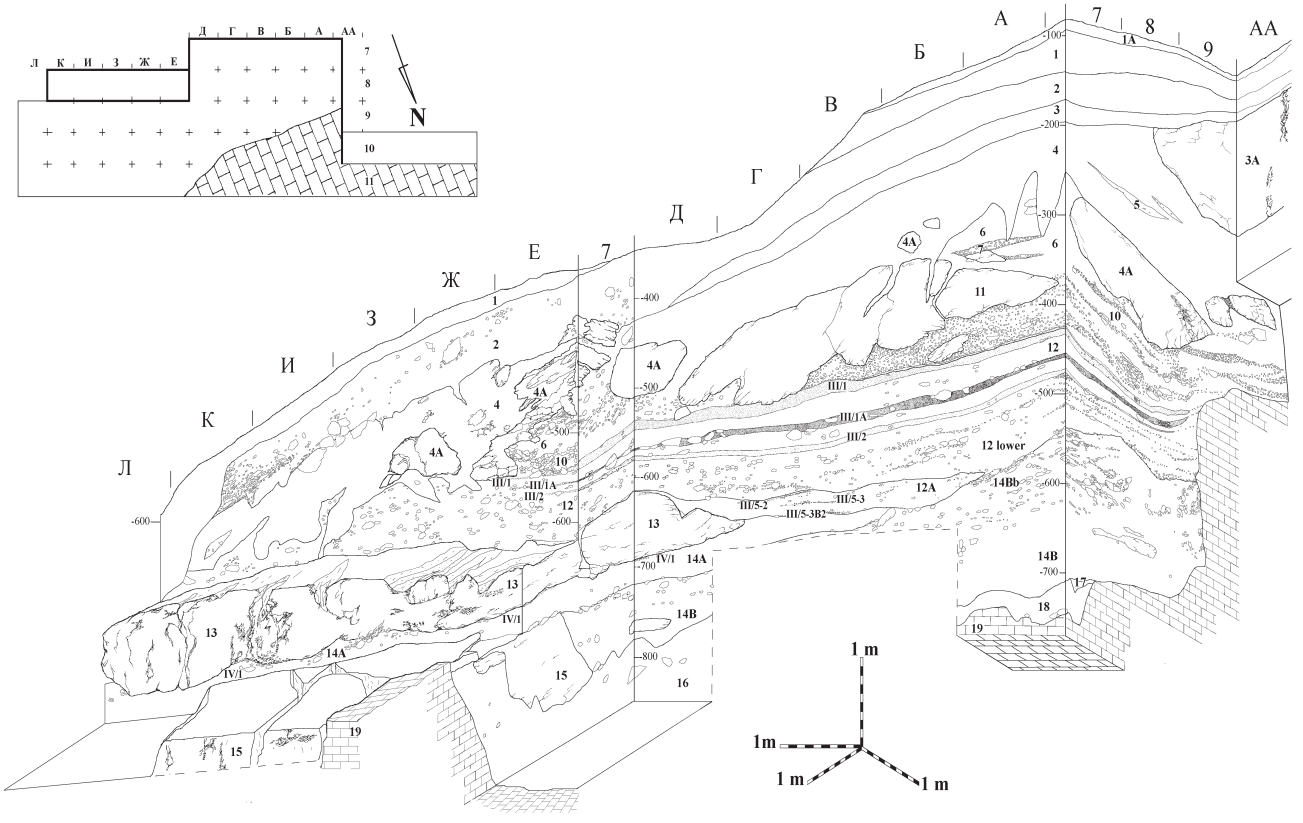


Fig. 1-2 Kabazi V. Combined sections along square lines AA, 6/7, Д/Е, 7/8 and 8/9; Arabic numerals indicate lithological layers, combined Roman and Arabic numerals indicate archaeological levels.

Geological History and Archaeological Sequence

The stratigraphical sequence of Kabazi V comprises a total of 11 strata which are subdivided into 27 lithological layers (Table 1-1; Fig. 1-2; 1-3; 1-4; 1-5; 1-6). Three formation stages can be distinguished for Kabazi V. The first stage is connected with the deposition of Stratum G sediments; these consist of karstic clay and weathered bedrock: lithological layers 19, 18, 17 (Fig. 1-2; 1-3; 1-4). The karstic clay formed in channels of weathered bedrock, a configuration which would suggest the presence of a spring during this stage of site formation. There are no traces of human occupation in Stratum G.

The second stage is characterised by the accumulation of the fine-grained sediments encountered in strata F, E4, E3, E2 and E1 (Table 1-1). According to R. Ferring, these strata contain deposits from the weathering of bedrock clays (Ferring 1998). Also, two roof fall events occurred during the formation of these strata: lithological layers 15 and 13 (Fig. 1-2; 1-3; 1-5; 1-6, *B*). Remnants of human occupations are connected with lithological layers 14A, 12A and 12 (Table 1-1; Fig. 1-2; 1-3; 1-4; 1-5; 1-6).

The third stage begins subsequent to the next rock-shelter roof collapse – lithological layer 11 (Fig. 1-2; 1-3; 1-5). Colluvial and eolian sediments form the upper part of the sequence: strata D, C, B2, B1 and A (Ferring 1998). These strata accumulated in an open site setting. Archaeological material was found in lithological layers 10, 9, 6, 5, 4, 3, 2 and 1 (Table 1-1; Fig. 1-2; 1-3; 1-4; 1-5; 1-6).

Therefore, whereas the first stage of Kabazi V formation is connected with karstic rock-shelter evolution, the second stage reflects the accumulation of rock-shelter/*abri* deposits, and the third stage correlates with accumulations in an open-air site setting. The human occupations at Kabazi V were closely connected with its geological evolution. Whilst in the first stage, the rock-shelter floor inclined too sharply to permit habitation, during the second stage, weathering of the rock-shelter walls (lithological layers 16 and 14A) as well as rock-fall (lithological layer 15) in its eastern part, led to the formation of a more or less horizontal surface, thus making the location more comfortable for both

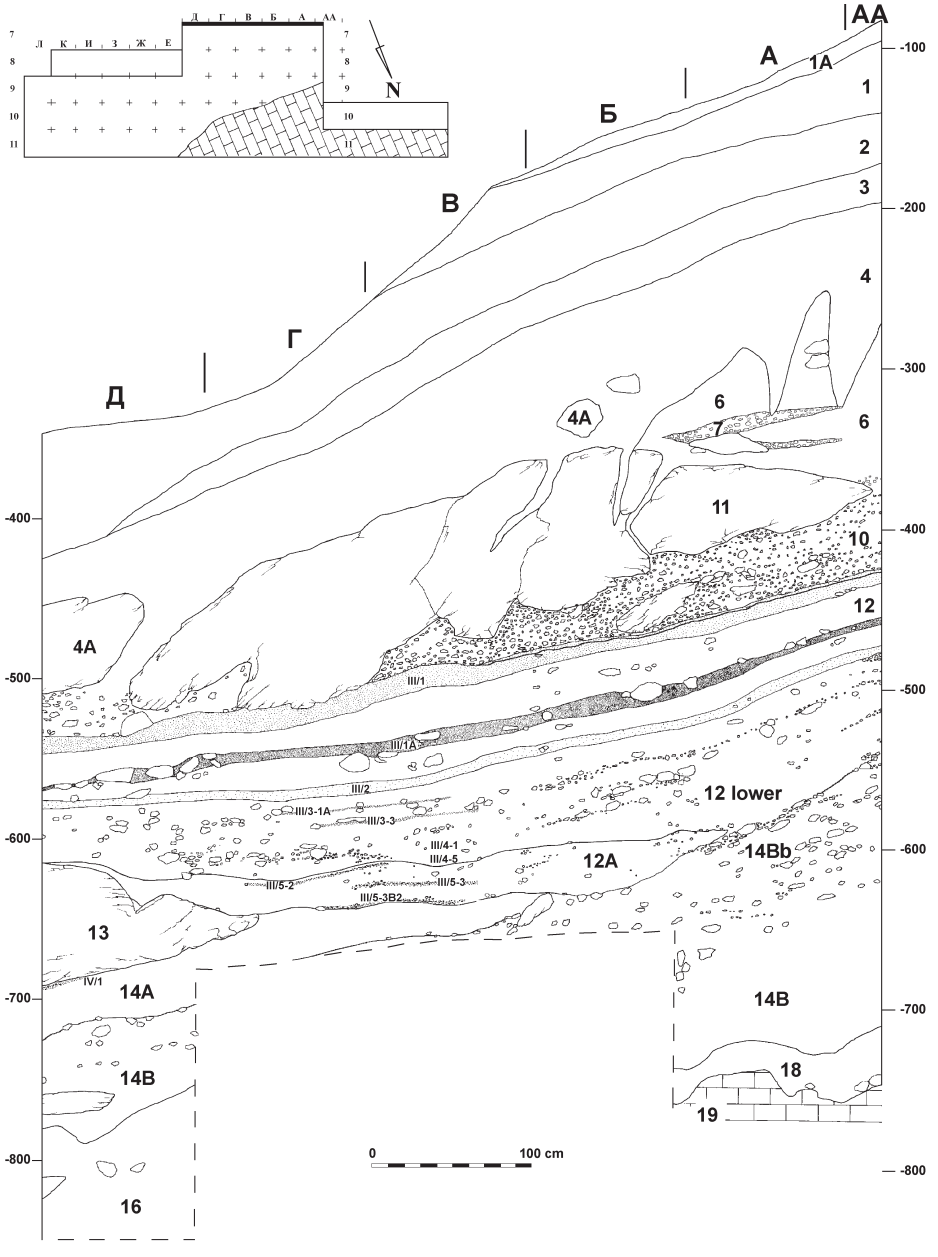


Fig. 1-3 Kabazi V. Section along square line 6/7; Arabic numerals indicate lithological layers, combined Roman and Arabic numerals indicate archaeological levels.

humans and bats – *Myotis sp.* (Chapter 4, this volume). The presence of the latter also suggests that the rock-shelter was sufficiently deep. The first human occupations observed in Unit IV, lithological layer 14A, accumulated directly on the surface of the limestone blocks from the first roof collapse – lithological layer 15 (Fig. 1-3; 1-5; 1-6, *B*). Some artefacts were found in fissures between blocks (archaeological level 4RF). These oldest occupations took place on a more or less horizontal surface in the eastern part of rock-shelter. The inclination of this surface is relative to the inclination angles of the rock-fall – lithological layer 15. In the western part of the excavation area, lithological layer 14A was cut by erosion (Fig. 1-3). Erosion channels were also found on brecciated sediments in lithological layer 14Bb, on square lines AA and A (Fig. 1-3). These channels are oriented west – east along the back wall of the shelter. This means that the western part of the rock-shelter was not protected from slope erosion.

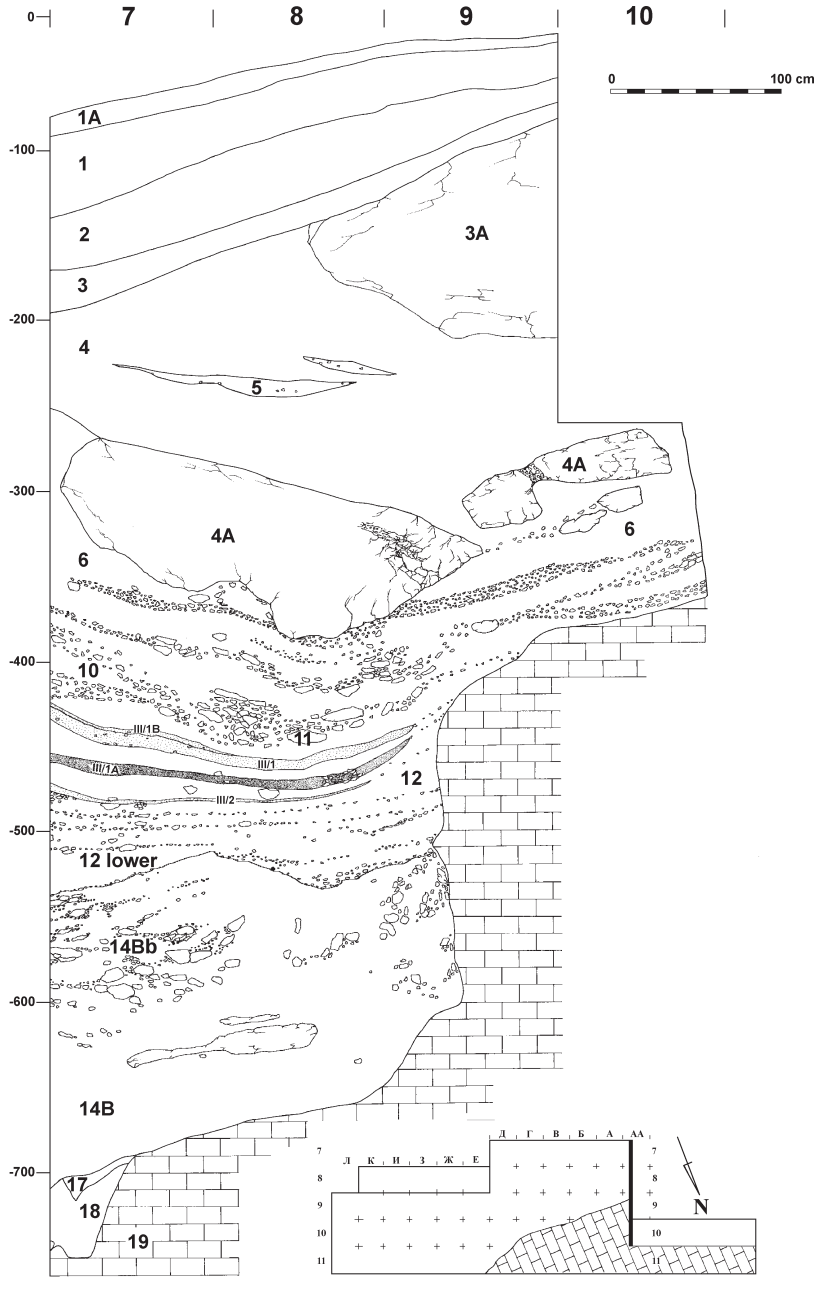


Fig. 1-4 Kabazi V. Section along square line AA; Arabic numerals indicate lithological layers, combined Roman and Arabic numerals indicate archaeological levels.

Following the second roof collapse (lithological layer 13) the lense-shaped lithological layer 12A accumulated (Table 1-1; Fig. 1-2; 1-3). There is some evidence of pedogenic process in lithological layer 12A. This layer contains a number of occupations assigned to sub-unit III/7, III/6 and III/5. In the western part of the excavation area, lithological layer 12A accumulated on the eroded surface of lithological layers 14A and 14 B (Fig. 1-3), but were also found in vertical fissures of blocks from the second roof collapse – lithological layer 13 (Fig. 1-5; 1-6, *A*). Part of layer 12A sediments accumulated on the top of the limestone blocks of lithological layer 13. The prolonged weathering of limestone blocks in this latter layer is attested by numerous fissures and caverns (Fig. 1-6, *B*), which subsequently became filled with sediments of lithological layer 12. Also, in these fissures and caverns, numerous artefacts and faunal remains

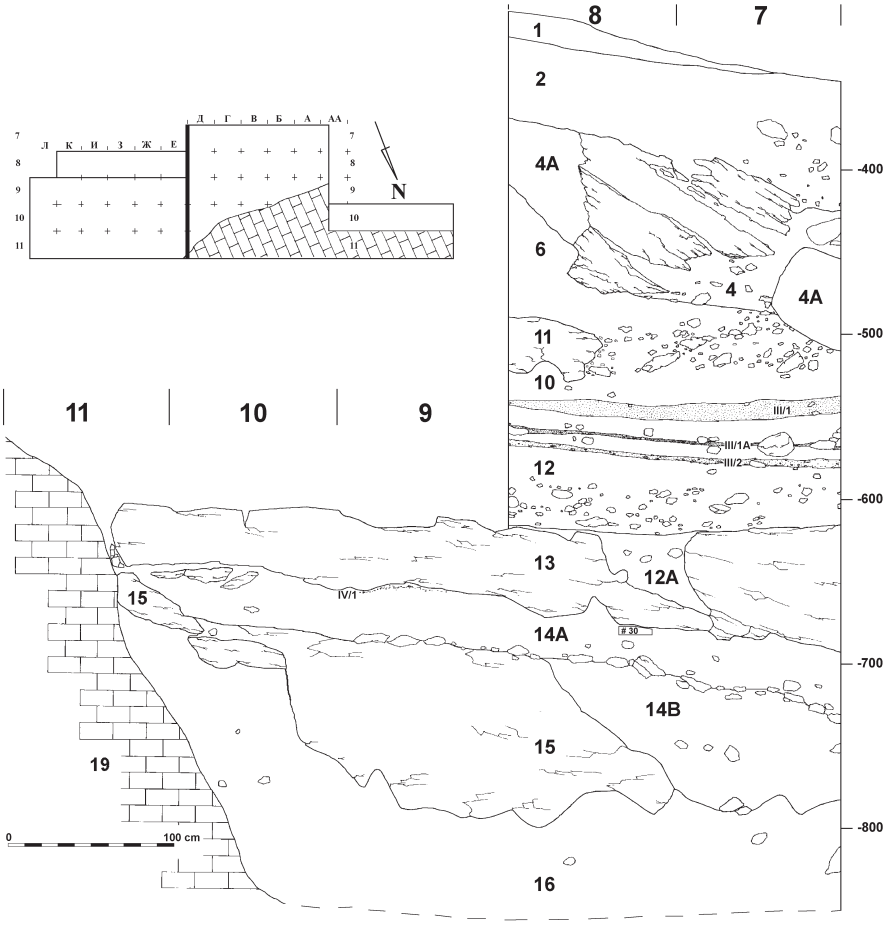


Fig. 1-5 Kabazi V. Section along square line Д/Е; Arabic numerals indicate lithological layers, combined Roman and Arabic numerals indicate archaeological levels.

were found (archaeological level 3RF). In other words, these artefacts and bones are the remnants of occupations on the top of limestone blocks from the collapsed roof – lithological layer 13. In the western part of the excavation area the inclination of lithological layer 12A follows that of the eroded surface of lithological layers 14B and 14A (Fig. 1-3).

Spatially, the occupations in sub-units III/7, III/6 and III/5 were limited by brecciated sediments of lithological layer 14Bb to the west, the back-wall of the rock-shelter to the north, and the upper part of the second roof collapse to the east.

Following the deposition of lithological layer 12A, the surface of the rock-shelter became more horizontal, but still with a sharp inclination in the western part of excavation area: square lines A, AA and partly Б (Fig. 1-3). Lithological layer 12 accumulated on the surface of limestone blocks of lithological layer 13 – 2nd rock-fall (Fig. 1-5; 1-6, *A*), on lithological layer 12A (Fig. 1-3) and in eroded breccia of lithological layer 14Bb (Fig. 1-3; 1-4). Due to the colour of sediments and sizes of limestone debris, lithological layer 12 is subdivided into two parts: 12 upper and 12 lower (Table 1-1). These differ from one another due to erosional disconformities (Ferring 1998). Also, according to R. Ferring, there is "*no evidence of soil formation and prolonged exposure of erosional surfaces*" in either parts of lithological layer 12 (Ferring 1998, p. 277). Numerous archaeological occupations of sub-units III/4, III/3 stem from lithological layer 12 lower. The deposits of archaeological sub-unit III/4 were the most affected by erosion. Archaeological sub-units III/2 and III/1 were found in the upper part of lithological layer 12 (Table 1-1; Fig. 1-2; 1-3; 1-4; 1-5; 1-6, *A*).

In the western part of the excavated area (square lines AA, A, Б and B) the deposition of lithological layer 12 was interrupted by water flow, which penetrated into the rock-shelter area. Evidence of

GEOLOGICAL SEQUENCE			ARCHAEOLOGICAL SEQUENCE		
Strata	**Description**	**Lithological layers**	**Levels**	**Sub-units**	**Units**
A	10YR4.5/1 poorly sorted gravelly silt loam; many angular and many rounded limestone cobbles and pebbles; thick carbonate crusts on the clast bases; gradual wavy boundary.	1	I/1		I
B1	10YR7/2 gravelly silt; clasts, mainly granules, with some rounded pebble to cobble clasts; continuous carbonate coats and some possible concretions; gradual irregular boundary.	2	I/2		
B2	10YR7/2 gravelly silt; clasts, mainly granules, with many rounded cobbles and few boulders; continuous carbonate coats on clasts; clear irregular boundary parallel to modern surface.	3	IA		IA
C	10YR8/1 silt; massive; contains few granule-size fossil clasts in upper part; thins down-slope; upslope it merges with weathered bedrock; faint bedding planes parallel to slope; lower 10 cm indurated; gradual smooth boundary.	4	IIA		IIA
		4a (4 rockfall)	1RF		
		5	IIA		
D	10YR7/3 clast supported granule gravel; some thin beds are silt matrix supported; clasts mainly small fossils from bedrock; beds subhorizontal; gradual wavy boundary.	6 (upper)	II/1		II
		6 (lower)	II/2		
		7	sterile		
		8	sterile		
		9 (upper)	II/3		
			II/3a		
			II/3b		
		9 (lower)	II/4		
		10 (upper)	II/4a		
			II/5		
			II/5a		
			II/6		
		10 (lower)	II/7		
		11 (3 rockfall)	2RF		
E1	10YR7.5/4 silt with angular cobble to pebble eboulis clasts; some zone clast supported; few thin discontinuous beds of sand-sized rock fragments; unit thins and pinches out to east; base of unit appears erosional.	12 (upper)	III/1B	III/1	III
			III/1		
			III/1A		
			III/1C		
			III/2	III/2	
			III/2A		

Table 1-1 Kabazi V. Lithological and archaeological sequences.

GEOLOGICAL SEQUENCE			ARCHAEOLOGICAL SEQUENCE		
Strata	**Description**	**Lithological layers**	**Levels**	**Sub-units**	**Units**
E2	10YR5/3 granual silt, with thin lenses of clast supported granual to pebble eboulis; base of unit appears erosional.	12 (lower)	III/3-1 III/3-1A III/3-1B III/3-1C III/3-1D III/3-2 III/3-2A III/3-3 III/3-3A	III/3	III
			III/4-1 III/4-2 III/4-3 III/4-4 III/4-5 III/4-6	III/4	
E3	10YR6/2 granual silt, some zone of clast supported; few thin discontinuous beds of pebble-sized rock fragments; few large blocks of limestone rockfall (these are more common and larger in east wall of block); sediments fill vertical fissures in rockfalll blocks at east; base of unit appears erosional at west.	12A	III/5-1A III/5-1 III/5-1B III/5-2 III/5-3 III/5-3B III/5-3B2	III/5	
			III/6-1-2 III/6-3	III/6	
			III/7-1 III/7-2 III/7-3	III/7	
		13 (2 rockfall)	3RF		
E4	2.5YR7/3 granual silt; massive, very hard when dry; clasts are mainly nummulitic fossil fragments; increase with eboulis content and clast size with depth, with the same silt matrix; unit thins and pinches out to west; the boundary is a few large blocks of limestone rockfall east (sediments fill vertical fissures in rockfall blocks) and appears erosional at west.	14A	IV/1 IV/2 IV/3 IV/4		IV
F	2.5Y7/4 granual silt; massive, very hard when dry; clasts are mainly nummulitic fossil fragments with many rounded cobbles and boulders; brecciated (lithological layer 14Bb) near the back-wall (square lines AA and A); gradual wavy boundaries.	14Bb 14B 15 (1 rockfall) 16			
G	weathered bedrock; 2.5Y4/4 clayey channel (lithological layer 17) lies directly on weathered bedrock limestone (lithological layers 18 and 19).	17 18 19			

Table 1-1 Continued.

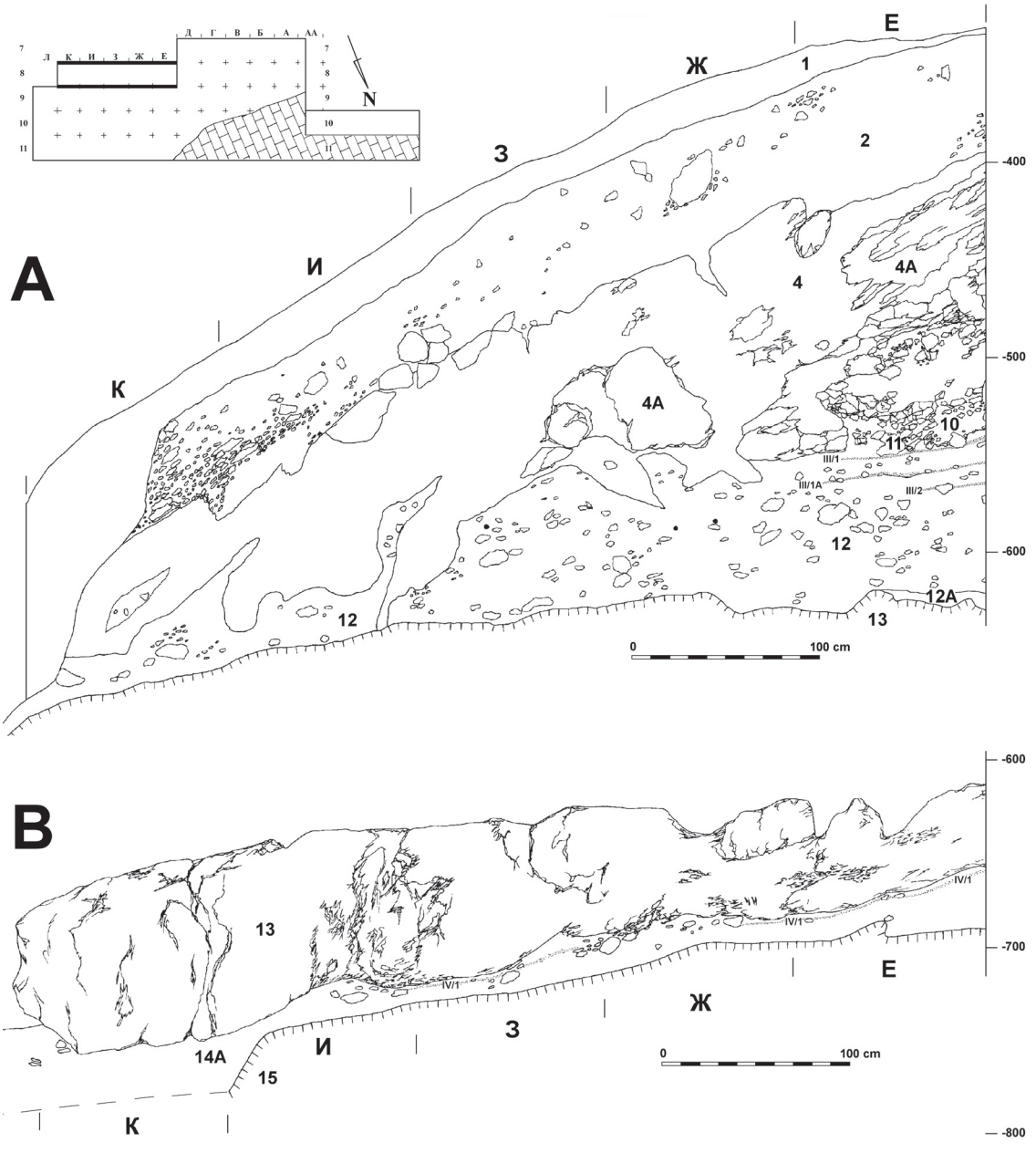


Fig. 1-6 Kabazi V. Sections along square lines 7/8 (**A**) and 8/9 (**B**); Arabic numerals indicate lithological layers, combined Roman and Arabic numerals indicate archaeological levels.

water flow was detected in the deposits of lithological layer 10, as there are "*thin beds of nummulitic fossils and small eboulis that are flow oriented to the south-south-west*" (Ferring 1998, p. 277). The water flow, which is reflected in lithological layer 10 sediments, commenced prior to, and continued on after, the third roof collapse – lithological layer 11 (Table 1-1; Fig. 1-2; 1-3; 1-4). Whereas the western part of lithological layer 12 was partly disturbed by water flow (Fig. 1-3; 1-4), the eastern part was destroyed by slope erosion (Fig. 1-6, *A*). At the same time, the central part of lithological layer 12 was securely covered by limestone blocks of lithological layer 11, which prevented post-depositional disturbance (Fig. 1-3).

In fact, the accumulation of limestone blocks of lithological layer 11 marked the close of the second formation stage and the beginning of the third stage at Kabazi V. In other words, the Kabazi V rock-shelter became an open-air site. According to

A. Yevtushenko, in the 1993-1996 field seasons some occupations (levels II/3, II/3a, II/3b, II/4, II/4a, II/5, II/5a, II/6 and II/7) from lithological layers 10 and 9 were found in primary context. These occupations, which stemmed from lithological layer 6, were partly disturbed. On the other hand, the uppermost archaeological material from lithological layers 5, 4, 3, 2 and 1 was found in a secondary context (Yevtushenko 1998a, 279).

During the field campaign in 2002-2003 no archaeological occupations were found in primary contexts in lithological layers 10 and 6. Lithological layers 9, 8 and 5 did not extend into the 2002-2003 excavation area. Some redeposited Middle Palaeolithic artefacts were found in lithological layers 10, 7, 6, 4, 3, 2 and 1.

To conclude, the Kabazi V stratigraphical sequence contains just one and a half metres of cultural bearing *in situ* soft deposits (lithological layers 14A, 12A and 12), which accumulated in a small rock-shelter or *abri*. There are two lines of evidence regarding the depth of the rock-shelter; first there are the remains of bats – *Myotis sp.*, which were found in lithological layer 14A, Unit IV (Chapter 4, this volume), and second there is an assumed area of bear hibernation in lithological layer 12, level III/2 (Chabai, Patou-Mathis 2006). The platform near the rock-shelter was not secularly protected from erosional processes at any stage of site formation. Also, in all stages of rock-shelter evolution the sedimentation rate was not impressive; there is multiple evidence of prolonged weathering of limestone debris.

Depositional Characteristics of Archaeological Occupations

A total of 37 archaeological levels were discovered in the course of the 2002-2003 field campaigns; all of these are characterised by differing, and sometimes steep, gradients (Table 1-2, Fig. 1-7; 1-8), all have yielded cultural deposits of differing thickness and density (Table 1-2), and all are separated by sterile sediments of varying thickness (Table 1-3). Although the occurrence of these sterile sediments between archaeological levels, pits, hearths and sooty scatters might be viewed as a "guarantee" of an undisturbed primary position of artefacts and bones, on the other hand, the gradients of occupied surfaces in some parts of the excavation area were some 20 degrees. Consequently, such angles could equally have led to post-depositional transportation of archaeological material. Also, in many cases the thickness of sterile sediments between levels measures just a few millimetres. Indeed, there is always the danger that such "minimal" accumulations might only exist in the imagination of the excavators. Finally, and unfortunately, erosional processes played a significant role in the formation of some parts of the cultural deposits at Kabazi V. Thus, not all 37 archaeological levels are characterised by the same degree of homogeneity. Thus, one of the biggest difficulties to have arisen from the main excavation at Kabazi V is the precise definition and consequences of erosion for the preservation of the archaeological levels.

Sub-unit III/1

Sub-unit III/1 consists of four occupational levels: III/1B, III/1, III/1A and III/1C. Level III/1B is the washed part of level III/1. Water flow, which is reflected in lithological layer 10 sediments, led to a disturbance of the cultural deposits of level III/1 in squares 7A, 7Б, and partially in 7В. Of course there are no sterile sediments between levels III/1B and III/1. In a sense, both levels belong to the same palimpsest of occupations. Level III/1 is one of the thickest levels of the sub-unit, characterised by densely packed artefacts, bones and burnt material (Table 1-2; Fig. 1-9). Along with levels III/1A and III/2, level III/1 is clearly visible in the profiles as a grey lens which contrasts clearly against the yellow-red background of lithological layer 12 sediments. Due to the absence of sterile sediments, the 12 cm thick cultural deposits assigned to level III/1 cannot be subdivided into different occupational levels. The gradient observed in level III/1 accumulations ranges from 10° (along square lines А and АА) to 7° (along square lines Б – 3) in a west – east direction (Fig. 1-7). The north-south gradient is, however, minimal (Table 1-2), and barely recognisable (Fig. 1-8). With the exception of a number of light and dense sooty scatters in an exposed area of level III/1, clear structures were not observed (see Chapter 2, this volume).

Level III/1A is separated from level III/1 by a relatively thick (for Kabazi V standards) lense of sterile sediments on square lines АА through Д, and less pronounced sterile sediments on the square lines Е through 3 (Table 1-3). The depositional attributes of level III/1A, such as thickness of cultural bearing sediments, density of artefacts and gradient angles are very close to those observed in level III/1 (Table 1-2; Fig. 1-7; 1-8). The main difference between these occupations lies in the character and organisation of the living surface or surfaces. First, the living surface of level III/1A was covered by medium to large

	Levels	Thickness, in cm	Density of artefatcs, per cubic meter	Inclination angles	
				North-South	West-East
Sub-unit III/1	III/1B	2–8	2069.7	–	12°
	III/1	2–12	2022.6	2°–3°	7°–10°
	III/1A	4–12	2810.1	2°–3°	11°
	III/1C	3–6	266.6	–	5,5°
Sub-unit III/2	III/2	3–8	782.6	6°	11°
	III/2A	4	666.6	–	5°
Sub-unit III/3	III/3-1	2.0	1439.1	6°	6°–11°
	III/3-1A	2.0	1243.5	5°	12°
	III/3-1B	4.0	291.6	–	6°
	III/3-1C	3.0	288.8	–	5.5°
	III/3-1D	3.0	352.4	–	6.5°
	III/3-2	2.0	926.1	7°	6°–11°
	III/3-2A	2.0	1583.0	–	8.5°
	III/3-3	2.0	1452.2	5°–12°	7°–10°
	III/3-3A	2.0	2230.4	8°	7°–11°
Sub-unit III/4	III/4-1	2.0	1080.6	5°–14°	6°–18°
	III/4-2	1–2	1005.0	5°–16°	13°–17.5°
	III/4-3	2.0	775.0	11°	14°–19.5°
	III/4-4	2.0	705.0	15°–16°	14°–17°
	III/4-5	2.0	858.8	15°	15.5°
	III/4-6	1–3	622.2	13°	15°
Sub-unit III/5	III/5-1A	4.0	369.4	11°	14.5°
	III/5-1	2.0	815.4	13°	12°
	III/5-1B	2.0	450.0	9°	13.5°
	III/5-2	4.0	925.0	11°	12.5°
	III/5-3	2.0	907.4	11°	7°
	III/5-3B	2–4	1172.7	10°	11°
	III/5-3B2	2–4	1133.3	9°	7.5°
Sub-unit III/6	III/6-1-2	2.0	1033.0	12.5°	7.3°
	III/6-3	2.0	1900.0	10°	12.5°
Sub-unit III/7	III/7-1	3.0	1466.7	19°	13.5°
	III/7-2	5.0	1280.0	25°–32°	19.5°
	III/7-3	4.0	750.0	22°	14.5°
Unit IV	IV/1	2.0	1397.5	1-2°	10.5°
	IV/2	2.0	870.8	1-2°	9.5°
	IV/3	2.0	427.8	1-2°	11°

Table 1-2 Kabazi V. Characteristics of cultural deposits, by level.

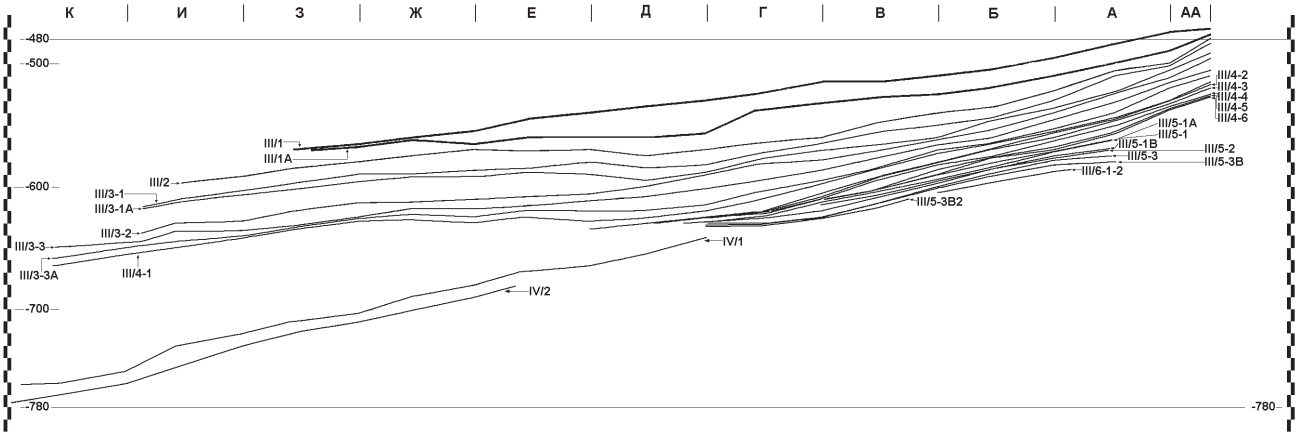


Fig. 1-7 Kabazi V. Pattern of gradients in archaeological levels along square lines 8/9; combined Roman and Arabic numerals indicate archaeological levels.

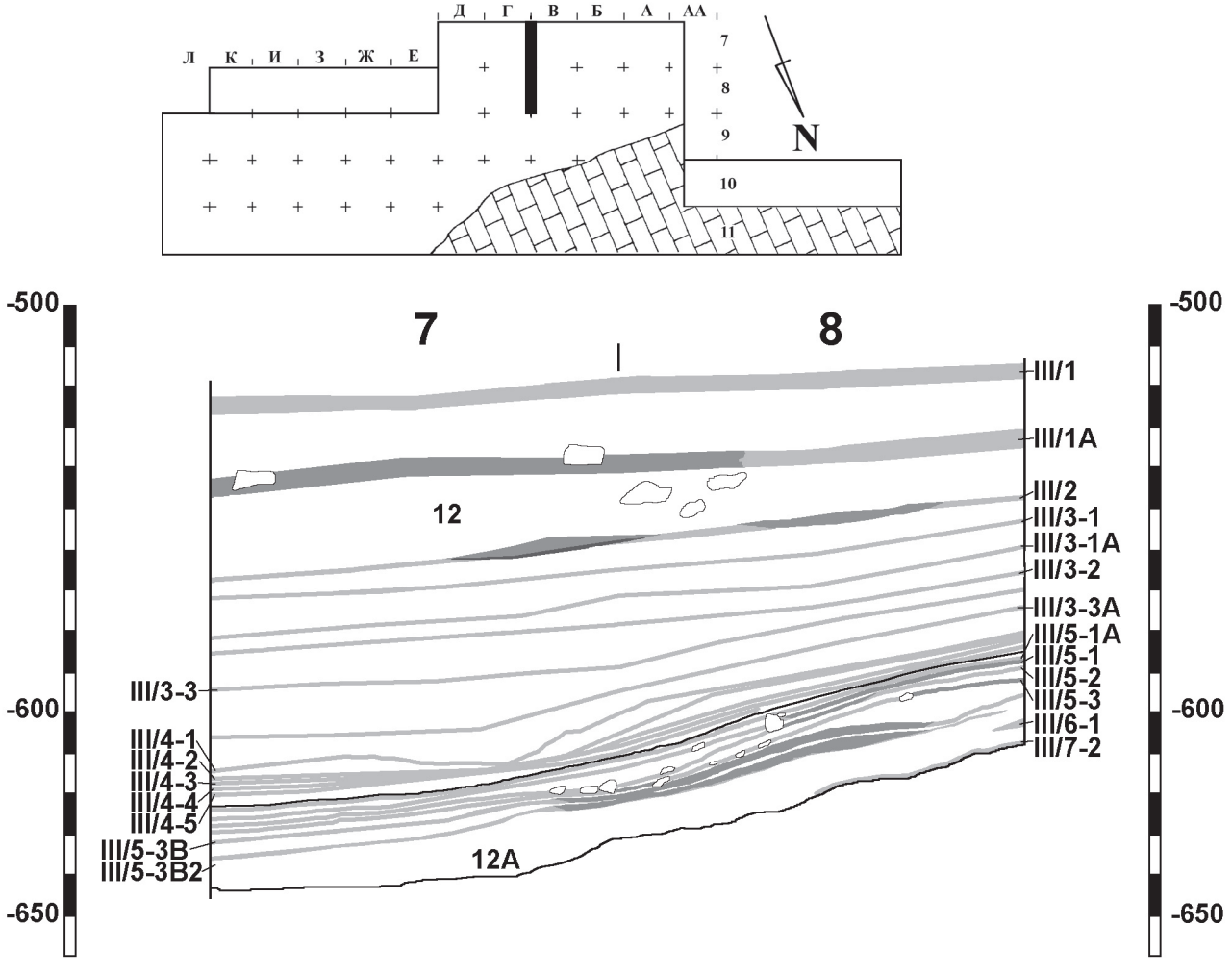


Fig. 1-8 Kabazi V. Section of lithological layers 12 and 12A along square line Г/В; Arabic numerals indicate lithological layers, combined Roman and Arabic numerals indicate archaeological levels.

Archaeological levels	Squares lines АА-Д	Squares lines Е-Л
III/1B – III/1	0 cm	–
III/1 – III/1A	5-28 cm	5-7 cm
III/1A – III/1C	–	4-11 cm
III/1C – III/2	–	3-5 cm
III/1A – III/2	6-25 cm	–
III/2 – III/2A	–	8-10 cm
III/2A – III/3-1	–	3-6 cm
III/2 – III/3-1	4-15 cm	–
III/3-1 – III/3-1A	5-12 cm	3-5 cm
III/3-1A – III/3-2	3-9 cm	–
III/3-1A – III/3-1B	–	3-9 cm
III/3-1B – III/3-1C	–	2-9 cm
III/3-1C – III/3-1D	–	2-7 cm
III/3-1D – III/3-2	–	3-7 cm
III/3-2 – III/3-3	4-10 cm	5-7 cm
III/3-2 – III/3-2A	2-4 cm	–
III/3-2A – III/3-3	3-5 cm	–
III/3-3 – III/3-3A	4-9 cm	1-5 cm
III/3-3A – III/4-1	10-13 cm	3-9 cm
III/4-1 – III/4-2	min – 5 cm	–
III/4-2 – III/4-3	min – 2 cm	–
III/4-3 – III/4-4	min – 3 cm	–
III/4-4 – III/4-5	min – 3 cm	–
III/4-5 – III/4-6	3-5 cm	–
III/4-6 – III/5-1A	3-8 cm	–
III/5-1A – III/5-1	min – 3 cm	–
III/5-1 – III/5-1B	min	–
III/5-1B – III/5-2	3-5 cm	–
III/5-1 – III/5-2	min – 4 cm	
III/5-2 – III/5-3	2-4 cm	–
III/5-3 – III/5-3B	1-4 cm	–
III/5-3B – III/5-3B2	3-10 cm	–
III/5-3B2 – III/6-1-2	4-5 cm	–
III/6-1-2 – III/6-3	–	2-4 cm
IV/1 – IV/2	–	7-10 cm
IV/2 – IV/3	–	5-7 cm
IV/3 – IV/4	–	3-5 cm

Table 1-3 Kabazi V. Thickness of sterile sediments between archaeological levels.

limestone blocks, and second, the living floor(s) was/were interrupted by a number of pits and hearths (Chapter 2, this volume).

Level III/1C was encountered in squares 8Е, 8Ж, 8З, and partially in 8И. The main concentrations of bones and artefacts lie in squares 8Ж and 8З. Finds from level III/1C are separated from the uppermost level III/1A by 4 to 11 cm thick sterile sediments (Table 1-3). The gradient and artefact density observed for level III/1C are both minimal (Table 1-2). It would appear that this level lies at the periphery of occupation which otherwise extended into unexcavated parts.

In sum, levels III/1 and III/1A comprise an intense palimpsest of occupations. Level III/1B refers to a part of level III/1 which was disturbed by water flow, and level III/1C was only exposed in a very small area for it to be assigned with any great certainty to a particular level. Levels III/1, III/1A and III/1C were found in primary contexts. A post-depositional transportation of bones and artefacts is not visible. Levels belonging to sub-unit III/1 were covered during moderate continental climate conditions during the Denekamp Interstadial (Chapter 4, this volume). The moderate rate of precipitation, and, to some extent, fluctuations in temperatures, led to limestone/clay bedrock exfoliation, which in turn resulted in a silt with numerous angular *eboulis* clasts – Stratum E1 (Table 1-1); additionally, colluvial sediments also contributed to sedimentation. Consequently, bone surfaces and the edges of artefacts were discovered in an excellent state of preservation. The light to medium grey patina on flints appeared only after the exposure of artefacts (!). In other words, artefacts covered by sediments were not patinated. This is suggestive of an absence of prolonged weathering and a relatively rapid burial of both bones and flints.

Sub-unit III/2

Sub-unit III/2 comprises the two levels III/2 and III/2A. In squares 8И, 8З, 8Ж and 8Е, level III/2 is separated from the uppermost level III/1C by a 3-5 cm thick layer of sterile deposits, whereby the thickness of this sterile layer is most distinct along square lines АА, А, Б, В, Г and Д (Table 1-3). The west-east gradient (from square line АА to square line И) is comparable with the same observed for the uppermost levels (Fig. 1-7). On the other hand, the north-south gradient is roughly twice as pronounced (Table 1-2; Fig. 1-8). The thickness of cultural bearing deposits ranges from 3 to 8 cm, they being thicker along square lines АА through Г, but thinner along lines Д through И. At the same time, in the area of sooty scatters, level III/2 is represented by a thin

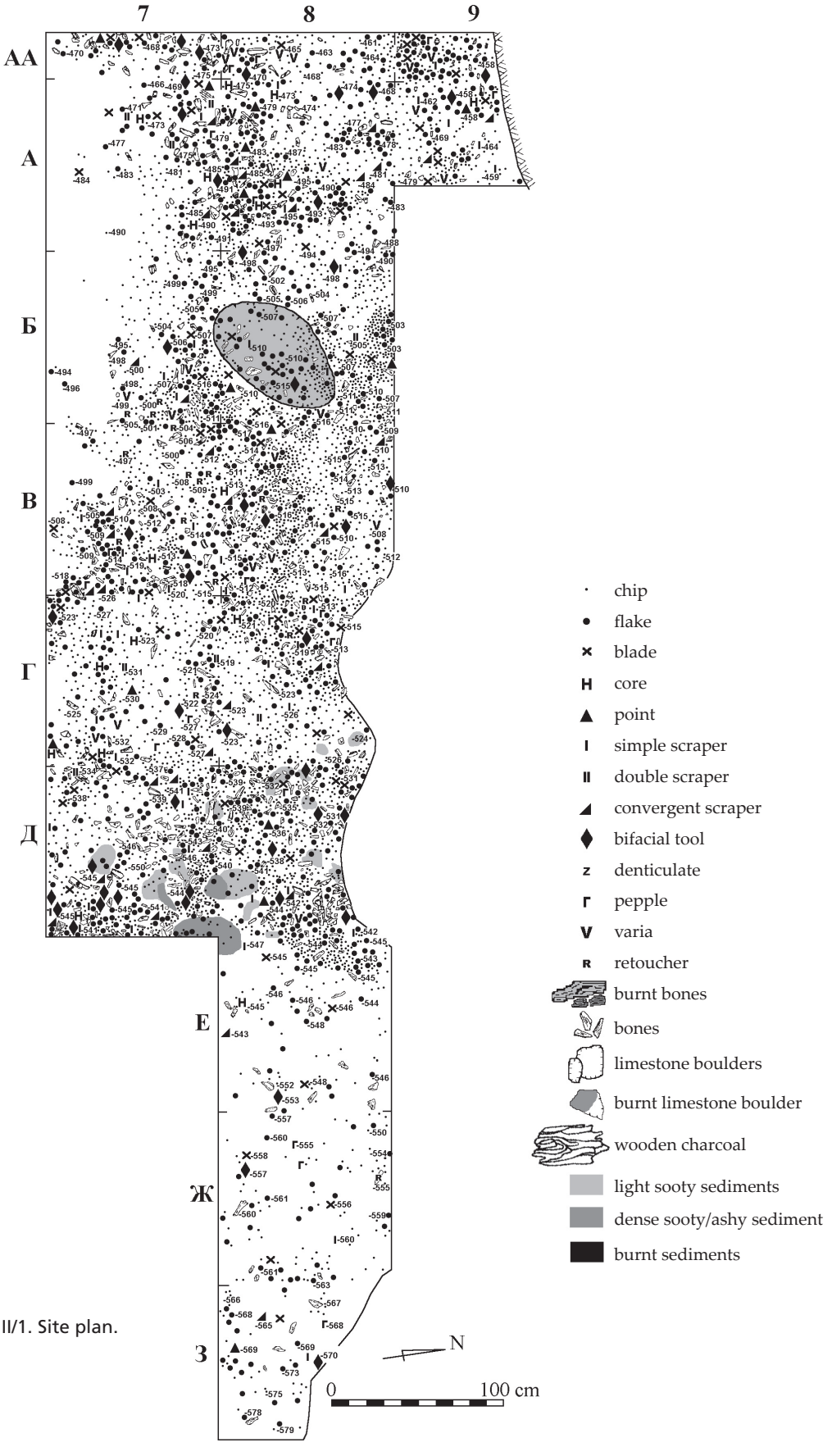
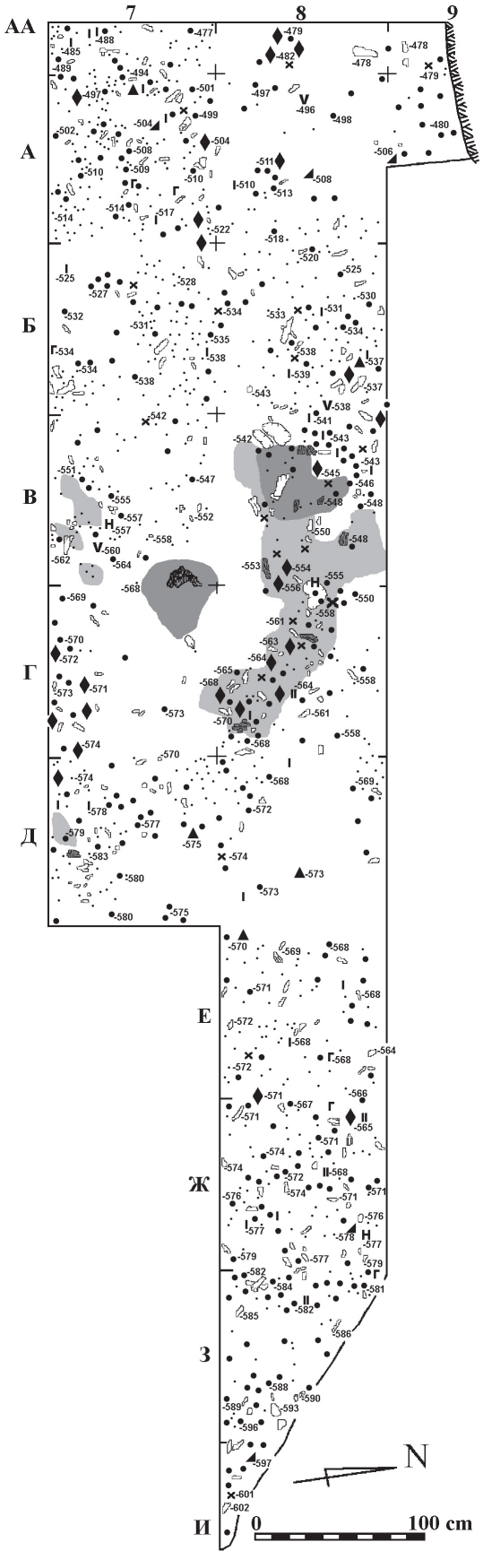


Fig. 1-9 Kabazi V, level III/1. Site plan.



carpet of finds no thicker than a single artefact or bone (Fig. 1-10). In fact, the thickest (8 cm) cultural bearing deposits were discovered on the southern part of square line 7, from square АА through square Г. The overall density of artefacts is among the lowest in Kabazi V (Table 1-2). One clear hearth, as well as an amorphous sooty scatter, were revealed in level III/2 (Chapter 2, this volume).

Level III/2A was found in squares 8*И*, 8Ѓ, 8Ж and 8Е, about 8-10 cm below the lowest finds of level III/2 (Table 1-3). For the most part it concentrates in square 8Ж. The depositional characteristics of this level are very approximate (Table 1-2). In the aforementioned squares it is likely that the periphery of a much larger occupational area, which continues southwards, has been revealed.

Taken into account the thickness of cultural bearing deposits, level III/2 is a palimpsest of several occupations. Nothing is clear with level III/2A: it was exposed on a very small area. These levels were deposited under harsh stadial climatic conditions (Chapter 4, this volume). Some bone surfaces from level III/2 exhibit traces of prolonged weathering (Chapter 6, this volume). Artefacts edges are fresh. It can be safely assumed that both levels III/2 and III/2A lie in primary context. The base of lithological layer 12 upper shows traces of erosion (Table 1-1), however, this erosion did not affect cultural deposits from sub-unit III/2.

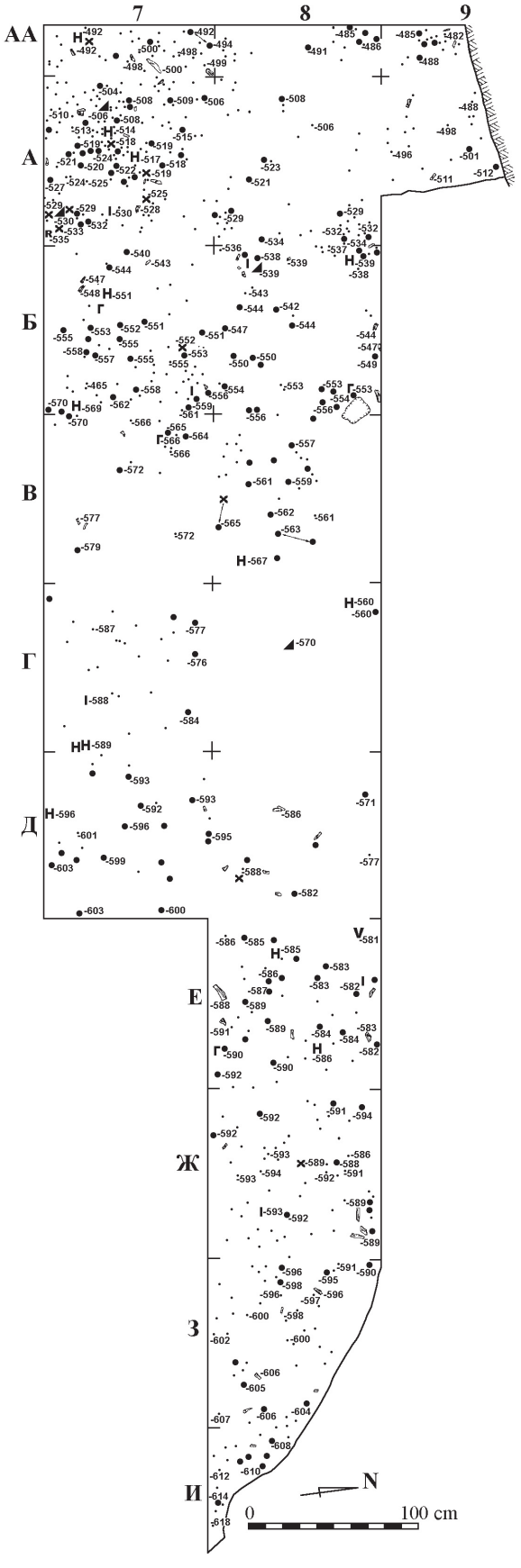
Sub-unit III/3

Sub-unit III/3 consists of nine levels: III/3-1; III/3-1A; III/3-1B; III/3-1C; III/3-1D; III/3-2; III/3-2A; III/3-3; III/3-3A.

On square lines АА, А, Б, В, Г and *Д*, level III/3-1 is separated from level III/2 by a 4-15 cm thick accumulation of sterile deposits. Similar accumulations of sterile sediments were also observed between level III/3-1 and level III/2A in squares 8*И*, 8Ѓ, 8Ж and 8Е (Table 1-3). The west-east and north-south gradients resemble those observed for the uppermost levels (Table 1-2; Fig. 1-7; 1-8). Cultural deposits of level III/3-1 are 2 cm thick (Table 1-2), i.e. are no thicker than a single artefact or bone. The thickness of sooty concentration on square lines АА, А, Г and *Д*, range from 0.5 to 3 cm. The density of artefacts is 1439.1 per m^3.

On square lines АА, А, Б, В, Г and *Д*, level III/3-1A is separated from the uppermost level III/3-1

Fig. 1-10 Kabazi V, level III/2. Site plan: for conventional signs see Fig. 1-9.



by 5-12 cm thick accumulation of sterile sediments. However, in squares 8*И*, 8З, 8Ж and 8Е these sterile accumulations are not quite as thick (Table 1-3). The characteristics of the cultural deposits of level III/3-1A are similar to those of level III/3-1 (Table 1-2; Fig. 1-7; 1-8). In level III/3-1A two areas of material concentrations occur, in the west and in the east (Fig. 1-11). The western concentration was found on square lines АА, А, Б, В, and the eastern on square lines Г, *Д*, Е, Ж, З, *И*.

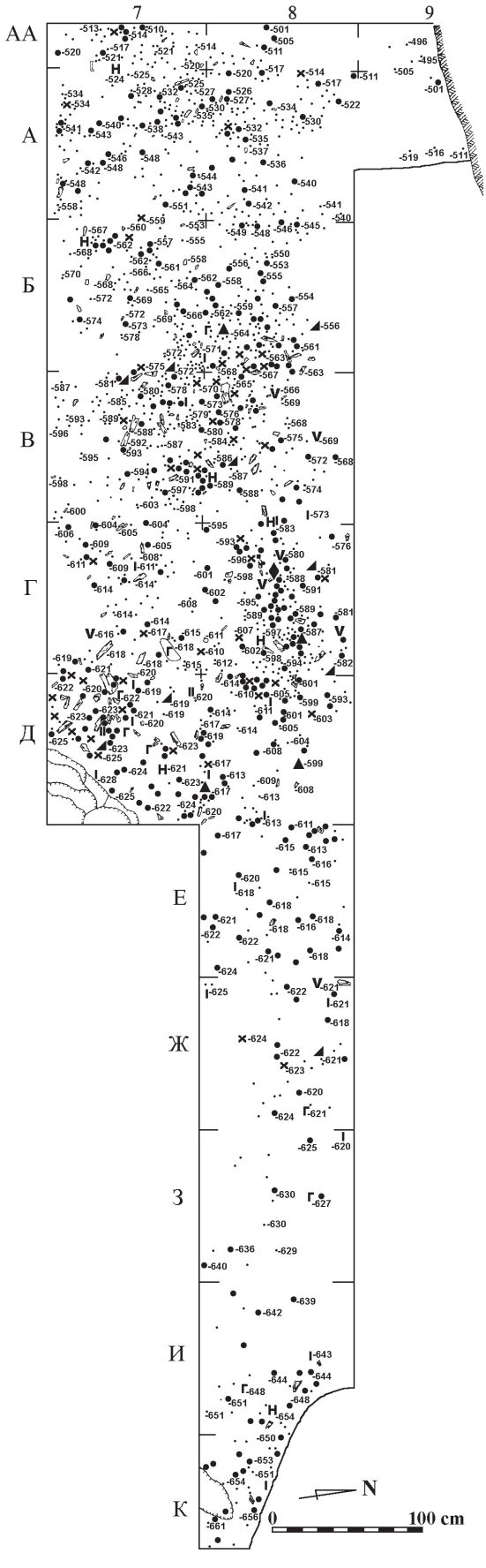
Levels III/3-1B, III/3-1C and III/3-1D were exposed in only a very small area, in squares 8Е, 8Ж and 8З. There are very few bones and artefacts associated with these levels. The formal depositional characteristics of levels III/3-1B, III/3-1C and III/3-1D are listed in the Table 1-2 and 1-3.

On square lines АА, А, Б, В, Г and *Д*, level III/3-2 is separated from level III/3-1A by a 3-9 cm accumulation of sterile deposits. In squares 8*И*, 8З, 8Ж and 8Е, level III/3-2 is separated from level III/3-1D by 3-7 cm thick sterile sediments (Table 1-3). The gradients of level III/3-2 fall within the same range as the uppermost occupations (Table 1-2; Fig. 1-7; 1-8). Cultural deposits of level III/3-2 are no thicker than a single bone or artefact, whereby the same thickness (about 2 cm) is also characteristic for the encountered sooty concentrations in squares 7Б, 7В, 8Б and 8В (Chapter 2, this volume).The density of artefacts is not impressive (Table 1-2).

Level III/3-2A was found in squares 7В, 7Г, 7*Д*, and partially 8В. In these squares level III/3-2A is separated from the uppermost occupation of level III/3-2 by a 2-4 cm thick accumulation of sterile sediments. The west – east gradient for level III/3-2A is 8.5°. The thickness of level III/3-2A is equal to the thickness of a single artefact or bone. The density of artefacts is extremely high: 1,583 artefact per m^3 of cultural bearing deposits. The sooty concentration is ovoid in shape (length, 79 cm; width, 47 cm) and is associated with level III/3-2A. It is likely that level III/3-2A lies at the periphery of a larger occupation.

Level III/3-3 is separated from both level III/3-2A and level III/2 by 3-5 cm and 4-10 cm thick accumulations of sterile deposits, respectively (Table 1-3). Level III/3-3 is characterised by a relatively steep gradient from north to south (about 12°), especially in squares 8Г and 8В, while in squares 7 Г and 7 В its gradient is not so pronounced (Fig. 1-8). The west-east gradient of level III/3-3 is about the same as that observed for the uppermost occupations (Table 1-2; Fig. 1-7). Cultural deposits are 2 cm thick, i.e. are

Fig. 1-11 Kabazi V, level III/3-1A. Site plan: for conventional signs see Fig. 1-9.



equal to the thickness of a single bone or artefact. The density of artefacts is 1,452.2 flints per m³. Both the hearth and the sooty concentrations were found in squares 7Т and 7Д. The thicknesses of the hearth and the sooty concentrations range from 0.5 cm to 2.0 cm (Chapter 2, this volume).

Level III/3-3A is one of the most densely occupied levels in Kabazi V (Table 1-2). The main concentration of flint and fauna material was found in square lines Б, В, Г and Д (Fig. 1-12). The thickness of sterile sediments between levels III/3-3 and III/3-3A varies from 4 cm in squares 8E – 8K, and up to 9 cm on square lines АА – Д. The gradients of level III/3-3A are similar to those observed for level III/3-3 (Table 1-2; Fig. 1-7). Also, the north-south gradient is nearly the same as defined for level III/3-3 (Fig. 1-8). Although artefact density is high, the thickness of the cultural bearing sediments is minimal, that is equal to the thickness of a single bone or flint item (Table 1-2). Neither sooty concentrations nor hearths were found in level III/3-3A.

There is no evidence for any kind of disturbance of the sediments associated with levels of sub-unit III/3. Bone surfaces and artefacts are in excellent condition. The numerous thin sooty concentrations and thin hearths from the different occupations are separated by sterile sediments (Chapter 2, this volume). Thus, levels III/3-1, III/3-1A, III/3-2, III/3-2A, III/3-3, and III/3-3A were found in primary context. It cannot be excluded that the same also applies for levels III/3-1B, III/3-1C and III/3-1D, although the small numbers of finds, as well as the small excavated areas, do not permit this conclusion. Taking into account the thickness of the cultural bearing sediments of each level, all are good candidates for single occupational episodes. At the same time, it is unlikely that the thickness of cultural bearing deposits can be directly interpreted in terms of occupational episodes. Sub-unit III/3 was found in the upper part of lithological layer 12 lower. According to the environmental studies, these sediments accumulated under stadial conditions (Chapter 4, this volume).

Sub-unit III/4

Sub-unit III/4 is subdivided into six levels: III/4-1, III/4-2; III/4-3; III/4-4; III/4-5; III/4-6. These six levels were found at the base of lithological layer 12 lower. The base of this lithological layer appears to be erosional. In total, sediments forming sub-unit III/4 are

Fig. 1-12 Kabazi V, level III/3-3A. Site plan: for conventional signs see Fig. 1-9.

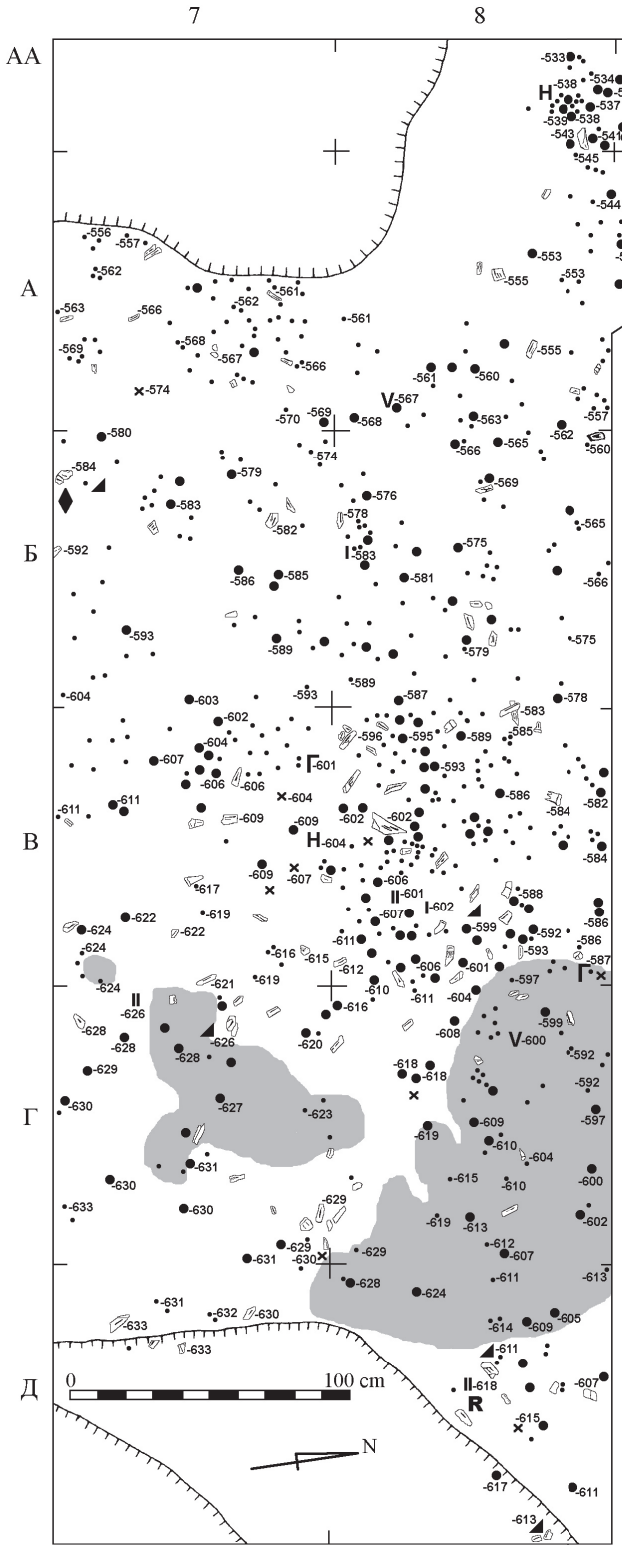


Fig. 1-13 Kabazi V, level III/5-1. Site plan: for conventional signs see Fig. 1-9.

no more than 10 cm thick. In most cases, there were no real sterile sediments between the defined levels (Table 1-3). During excavation several features were used to differentiate between the different occupation comprising sub-unit III/4. The most important of these was the occurrence of sooty concentrations, and/or of different kinds of structures. Unfortunately, sooty scatters were not encountered in all six levels; further, the sizes of these features (the largest being 30 cm long and 25 cm wide) were of little help in the definition of different levels. An artificial pit was found in level III/4-2 (Chapter 2, this volume). One more observation, which was used when differentiating the different levels belonging to sub-unit III/4, was the position of limestone boulders, the base of the boulder indicating the ancient floor; however, even boulders were rare in this part of the sequence. Thus, the breakdown of the 10 cm thick cultural deposits of sub-unit III/4 into six levels mostly reflects the attempts of archaeologists searching for expressive and convincing criteria for subdivision, than it is based on any kind of either archaeological or geological realities. The formal depositional characteristics are given in Table 1-2. The only feature of particular note is the increasing angle of gradients in both north-south and west-east directions (Fig. 1-7; 1-8). The preservation of both artefacts and fauna is good.

Thus, sub-unit III/4 is obviously a 10 cm thick palimpsest, which, unfortunately, could not be reliably subdivided into different occupations. Also, erosion affected this part of lithological layer 12 lower. In the sense of archaeological homogeneity, it is the most problematic sub-unit in the Kabazi V sequence.

Sub-unit III/5

Sub-unit III/5 is subdivided into seven different levels: III/5-1A, III/5-1; III/5-1B; III/5-2; III/5-3; III/5-3B and III/5-3B2.

Level III/5-1A was discovered on square lines АА, А, Б, В, and partially Г. Level III/5-1A is separated by a 3-8 cm thick layer of sterile sediments from level III/4-6 (Table 1-3). The gradients (both north-south and west-east) are somewhat slighter than those observed in sub-unit III/4 levels (Table 1-2; Fig. 1-7; 1-8). The thickness of artefact and bone bearing sediments is about 4 cm, though the density of artefacts is among the lowest to have been noted at Kabazi V (Table 1-2). Hearths and sooty concentrations were not encountered.

Although the sterile sediments observed between levels III/5-1A and III/5-1 are not pronounced (Table 1-3), level III/5-1 differs from the uppermost occupation, it being of a markedly more intense grey colour. In fact, this colour difference is the main attribute for differentiating between these levels. Also, level III/5-1 occupies a much larger area (square lines АА, А, Б, В, Г and Д), and presented relatively large, amorphously shaped sooty concentrations (Fig. 1-13). These sooty scatters are about 0.5 cm thick, and as such correspond to the overall thickness of level III/5-1 that is no thicker than a single bone or flint artefact. The density of artefacts can be described as "medium" for Kabazi V standards (Table 1-2). For level III/5-1 gradients of 12°-13° in both directions (north-south and west-east) are characteristic (Table 1-2; Fig. 1-7; 1-8). The most peculiar feature of level III/5-1 is its position within a natural depression, which was limited by the back-wall of the rock-shelter to the north, the brecciated hillock (lithological layer 14Bb) to the west, and the upper part of limestone debris from roof collapse (lithological layer 13) to the east (Fig. 1-13). Also, a relatively large collection of both bones and artefacts stems from cracks and fissures in the limestone block – lithological layer 13. The association of these collections with level III/5-1 is vague, they more likely originating from lithological layer 12A sediments.

The sterile sediments between levels III/5-1 and III/5-1B are barely visible. Again, the main attribute considered upon the differentiation between these levels was the more intense grey colour of level III/5-1. Level III/5-1B, as well as level III/5-1A, was found on square lines АА, А, Б, В, and partially Г. Level III/5-1B is no thicker than a single bone or artefact. All remaining depositional attributes of level III/5-1B are very similar to those of level III/5-1A (Table 1-2).

Whereas on squares lines АА, А, Б and В, level III/5-2 is separated from level III/5-1B by a 3-5 cm thick layer of sterile sediments, on square lines Г and Д, these same two levels are separated by a 4 cm thick interrupted lense of sterile sediments. A further attribute to have served in the differentiation of these two levels was the varying intensity of sooty concentrations; in level III/5-2 these are much greyer in colour, and are also characterised by quite different shapes (Fig. 1-14). Further, the sooty concentrations in level III/5-2 include three hearths, which is not the case for level III/5-1 (Chapter 2, this volume). The thickness of the sooty concentrations in level III/5-2 varies from a few millimetres up to 3 cm, whereby the average thickness of artefact and bone bearing deposits overall barely reaches 4 cm. The density of artefacts in level III/5-2 is once again "medium", and gradients lie within the same range as observed in the uppermost occupation of sub-unit III/5 (Table 1-2; Fig. 1-7; 1-8). The natural limitations in the level III/5-2 habitation area are the same as those for level III/5-1 (Fig. 1-13; 1-14).

The thicknesses of sterile sediments separating levels III/5-3 from III/5-2 range from 2 to 4 cm. The habitation area of level III/5-3 is limited in just the same way as levels III/5-1 and III/5-2, but the latter being a little wider. Artefacts and bones from level III/5-3 were found on square lines Е, Ж and З. Whereas the west-east gradient of this layer is significantly less pronounced than was the case for the uppermost occupations of sub-unit III/5, the north-south gradient is roughly the same as defined for uppermost levels of sub-unit III/5 (Table 1-2; Fig. 1-7; 1-8). Level III/5-3 is 2 cm thick. In fact, this means that it is no thicker than a single bone or artefact. The same thickness is characteristic for the amorphous, relatively large sooty concentration in squares 8В and 8Г (Chapter 2, this volume). The density of artefacts in level III/5-3 is once again "moderate" for Kabazi V standards (Table 1-2).

Sterile sediments measuring 1 to 4 cm thick separate level III/5-3 from III/5-3B (Table 1-3). The gradients of level III/5-3B hardly differ from those of the uppermost levels of sub-unit III/5 (Table 1-2; Fig. 1-7; 1-8). The thickness of cultural bearing deposits ranges from 2 to 4 cm, or in other terms, is not thicker than one or two bones or artefacts. Hearths and sooty concentrations found in level III/5-3B were also of the same thickness (Chapter 2, this volume). The density of artefacts is relatively high (Table 1-2). The habitation area of level III/5-3B is limited by the back-wall of the rock-shelter, the brecciated hillock, and the limestone block, i.e. in exactly the same way as was the case for the uppermost levels of sub-unit III/5.

Level III/5-3B2 is separated from the uppermost level III/5-3B by a 3-10 cm thick accumulation of sterile deposits. The remains of the level III/5-3B2 habitation area were found on square lines В, Г and partially Б and Д (Fig. 1-15). The western part of level III/5-3B2 (square lines А, and partially Б) appears to be eroded. The larger part of level III/5-3B2 is taken up by a hearth. Gradients for level III/5-3B2 are the smallest noted for sub-unit III/5 (Table 1-2; Fig. 1-7; 1-8). Level III/5-3B2 is from 2 to 4 cm thick, and the density of artefacts encountered is close to that defined for the uppermost level III/5-3B (Table 1-2). The hearth from level III/5-3B2 is referred to as III/5-3B1. It is of note that the (AMS) dated charcoal sample (Chapter 3, this volume) stems from level III/5-3B2.

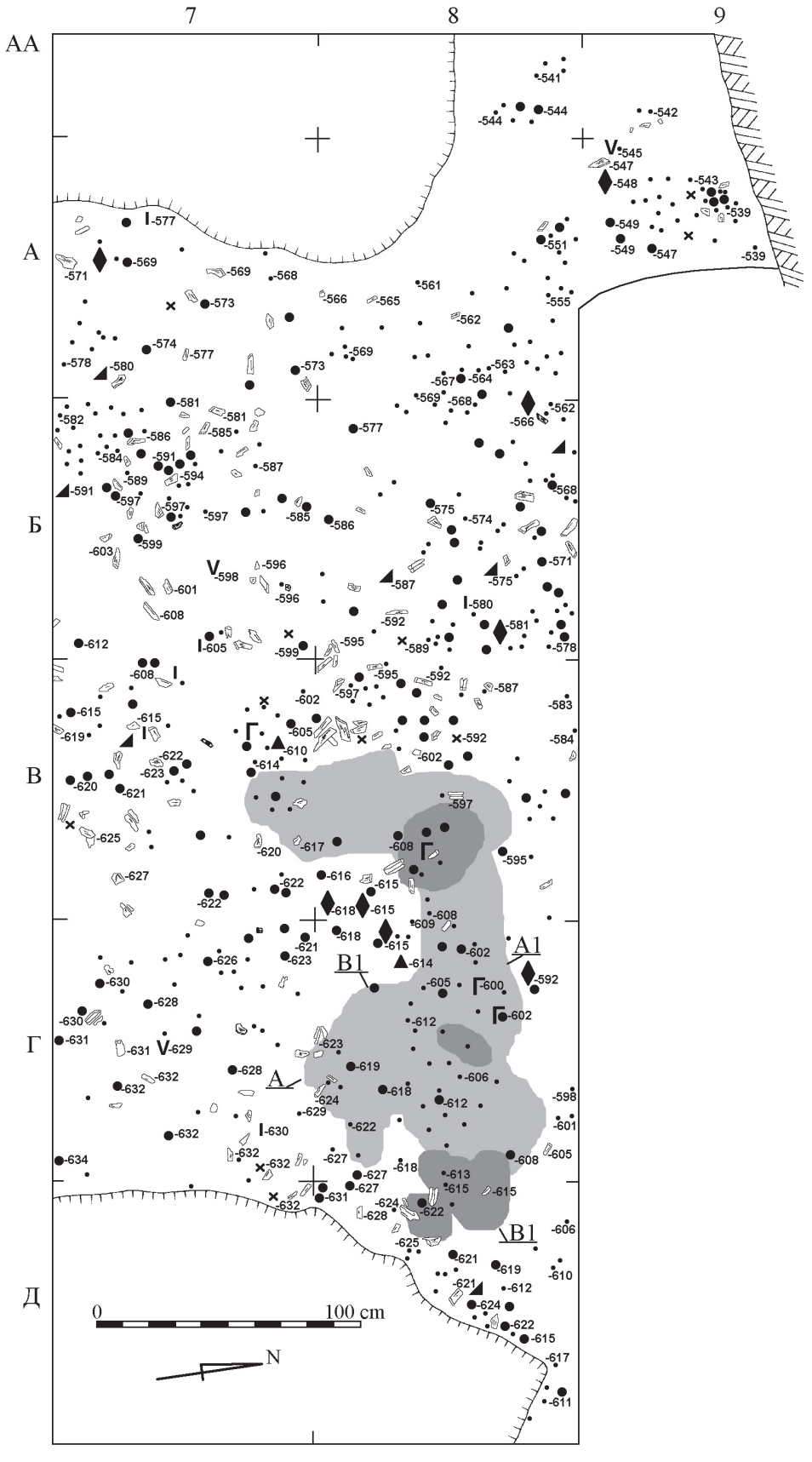


Fig. 1-14 Kabazi V, level III/5-2. Site plan: for conventional signs see Fig. 1-9.

There are no doubts as to the primary position of the levels composing sub-unit III/5. Thin, densely packed with fauna, artefacts and burnt material, archaeological levels alternate with thin accumulations of sterile sediments. Thin concentrations of burnt material are also associated with archaeological occupations. The gradients of these layers suggest that some post-depositional transportation of archaeological finds has probably taken place. At the same time, there is no clear evidence of such processes. Bone surfaces and flint edges are of excellent preservation.

Sediments from lithological layer 12A, which envelop sub-unit III/5, show the features of weak pedogenic processes. This observation is supported by environmental studies: lithological layer 12A was formed under interstadial climatic conditions, which led to the formation of forest-steppe landscapes (Chapters 4 and 5, this volume). Two pieces of charcoal found in the hearth of level III/5-3B2 (Fig. 1-15) may represent additional direct evidence of the existence of forest vegetation in the vicinity of the site. The easternmost piece of charcoal from this hearth provided the sample for the radiocarbon date OxA-14,726 (38.78±0.36 ka uncal. BP) (Chapter 3, this volume). Sub-units III/4 and III/5, which formed under the same climatic conditions, demonstrate very different degrees of stratification; whereas sub-unit III/5 levels, which are thin and densely packed with finds, are separated by thin sterile levels, levels from sub-unit III/4 are 10 cm thick monotonous accumulations of sediment, fauna and artefacts. In the latter case, this might be explained by the influence of erosion.

Sub-unit III/6

Sub-unit III/6 consists of two levels, III/6-1-2 and III/6-3. Both levels were found on the eroded boundary between lithological layers 12A and 14A/14B. In general, levels III/6-1-2 and III/6-3 were concentrated in squares adjacent to the rock-shelter wall. Between levels III/5-3B2 and III/6-1-2 there lies a circa 5 cm thick layer of sterile sediment. A slightly thinner sterile layer is located between levels III/6-1-2 and III/6-3 (Table 1-3). Both these latter levels are thin and densely packed with artefacts (Table 1-2). The gradients of levels in sub-units III/6 and III/5 all lay within the same range (Table 1-2). There are no hearths or sooty concentrations associated with levels III/6-1-2 and III/6-3. Although the edges of flints are well preserved and not at all rounded, bone surfaces are heavily eroded. Thus, it is likely that levels III/6-1-2 and III/6-3 are the remnants of eroded occupations.

Sub-unit III/7

Sub-unit III/7 comprises three different levels (III/7-1, III/7-2 and III/7-3), all of which were found in erosional pockets and trenches cutting into the upper part of lithological layers 14A and 14B (Fig. 1-16). All of these erosional pockets/trenches, which are between 5 and 10 cm deep, were filled with sediments from lithological layer 12A. The formal depositional characteristics of levels III/7-1, III/7-2 and III/7-3 are listed in Table 1-2. The homogeneity of archaeological material from these levels is highly problematic.

Unit IV

Unit IV is subdivided into three levels, IV/1, IV/2 and IV/3, all of which were encountered within the 20-30 cm thick lithological layer 14A. In most of the excavated area (square lines *Д* – *И*), layer 14A is sandwiched between thick limestone blocks from collapsed parts of the rock-shelter roof (lithological layers 13 and 15) (Fig. 1-2; 1-3; 1-6, *B*). In other words, the sterile deposit above level IV/1 comprised a 50-100 cm thick limestone block. The block (lithological layer 13) is not monolithic, it showing numerous cracks and fissures. The upper surface of the block is heavily weathered, though it would appear that it was at some point covered by sediments from lithological layer 12A; some accumulations, including artefacts and faunal remains, from this layer penetrated into the cracks and fissures. This means that these cracks and fissures might represent the potential source of post-depositional intrusions of sub-unit III/5 material in level IV/1 fauna and artefact collections.

Artefacts and fauna belonging to level IV/1 were found on square lines Г, *Д*, Е, Ж, З, *И*, К, and *Л* (Fig. 1-17). The west-east gradient is 10.5°, while a north-south gradient is practically absent (Table 1-2; Fig. 1-7). There are two concentrations of archaeological material. The first was found in squares 7*Д*, 8*Д*, 9*Д* and 8Е; the second was uncovered in squares 10Е, 11Е, 10Ж, 11Ж, 10З, 11З, 10*И*, and 11*И* (Fig. 1-17). The thickness of level IV/1 is defined as equal to the thickness of one find. The density of artefacts is relatively high (Table 1-2). Neither fire-places, nor sooty scatters were found.

Level IV/2 is separated from level IV/1 by a 7-10 cm thick sterile layer (Table 1-3). The gradients observed in level IV/2 resemble those encountered in the uppermost level (Table 1-2; Fig. 1-7). Again, level IV/2 is as not thicker than a single bone or artefact, and the density of artefacts can be described

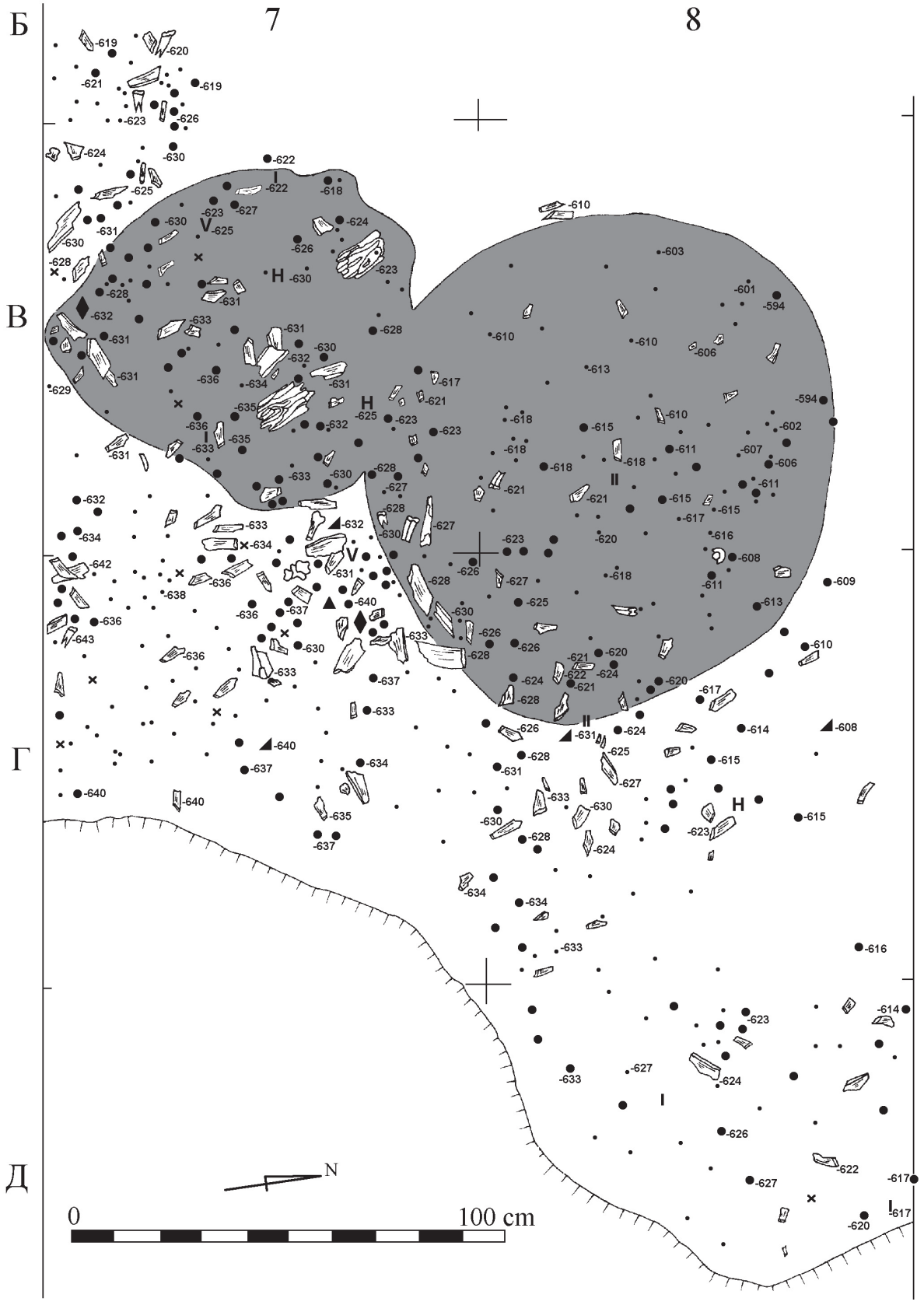


Fig. 1-15 Kabazi V, level III/5-3B2. Site plan: for conventional signs see Fig. 1-9.

as moderate (Table 1-2). A small sooty concentration was exposed in square 10И.

Levels IV/3 and III/2 are separated by a 3-5 cm thick accumulation of sterile sediment (Table 1-3). The gradients of these levels do not really differ from those observed for the uppermost levels of Unit IV, though the density of artefacts is much lower (Table 1-2). The thickness of level IV/3 is equal to the thickness of a single bone or artefact. A small and thin sooty concentration was detected in square K10. It should be noted that the area covered by level IV/3 (square lines: Ж, З, И, К and Л) is smaller here than it was the case in the uppermost levels of Unit IV.

All levels of Unit IV were found in primary context. There is no clear evidence of post-depositional disturbance of levels IV/1, IV/2 and IV/3. At the same time, in spite of the excellent preservation of stone artefacts, the preservation of faunal remains is not so good. First, bones are generally rare, and second, their surfaces are heavily weathered. This might be explained by the stadial climatic conditions that were prevailing at the time of Unit IV accumulation (Chapter 4, this volume), although alternative explanations are also just as likely. It is widely known that limestone blocks draw moisture, which at the same time is bad for bone preservation. The fauna from Unit IV was sandwiched between thick limestone blocks, and therefore would have been influenced by permanent post-depositional high moisture conditions.

Conclusions

There are two main groups of occupations at Kabazi V. Whereas the first group comprises levels found in primary contexts with minimal, or even absent, post-depositional disturbance (levels in sub-units III/1, III/2, III/3, III/5 and in Unit IV), the second group incorporates levels which feature the remnants of human occupations to have been affected by erosional processes (levels in sub-units III/4, III/6 and III/7). Thus, it follows that occupations from the first group are characterised by a higher degree of homogeneity in both artefact and fauna assemblages than those from the second group. Be this as it may, homogeneity is an absolutely relative value; there are no clear depositional attributes which aid in the definition of single occupations or palimpsests of occupations, although a high density of artefacts and a sufficient thickness of cultural deposits might be viewed as evidence for the latter. At Kabazi V levels III/1, III/1A and III/2 are the most likely candidates for palimpsests, while all remaining occupations require additional technological, typological and zooarchaeological definitions.

The one and a half metres of in situ soft sediments of Kabazi V contain at least 25 primary context occupations, the most of which are separated from one another by sterile sediments. In most cases the preservation of both fauna and flint artefacts are excellent, which is suggestive of a relatively rapid conservation process. Upon due consideration of the radiocarbon measurements (Chapter 3, this volume) and results from environmental studies (Chapters 4 and 5, this volume) the accumulation of lithological layers 14A, 12A and 12 probably straddled a period of some 10 to 15 thousands years. An apparently slightly shorter periods of time – about 10 thousands years (Hengelo – Denekamp) – would have probably been required for the accumulation of the 1.2 metre thick sediments of lithological layers 12 and 12A. This interprets to an average sedimentation rate for these latter layers of 0.12 mm per year, which is not particularly impressive; for example, at both the open-air site Kabazi II and in the buried rock-shelter Zaskalnaya V, also under conditions prevailing during Hengelo – Denekamp, sediment is known to have accumulated at twice this rate (Chabai 2004c). Also, in the buried rock-shelter Chokurcha I about 1 m of sediments of Unit IV accumulated under Hosselo Stadial conditions (Chabai 2004a). On the other hand, the amount of accumulated sediments in layers 12 and 12A at Kabazi V, is larger than has been recorded for the rock-shelters of Kiik Koba, Prolom I and Buran Kaya III, where during the OIS 3 period less than one metre of sediment was accumulated, respectively (Bonch-Osmolowski 1940; Kolosov 1979; Monigal 2004). It would appear that the closest sedimentation analogy for Kabazi V is another buried rock-shelter, Zaskalnaya VI. The dated part of the Zaskalnaya VI sequence includes cultural layers II, III and IIIa. According to radiocarbon studies by P. Pettitt, these layers can be dated to 30 – 40 ka BP (Pettitt 1998). The total thickness of Zaskalnaya VI, II, III, and IIIa is about one metre (Kolosov 1986, pp. 8), and cultural layers are much thicker than those observed at Kabazi V. On the other hand, Zaskalnaya VI, cultural layer II displays a complicated stratigraphy, comprising a number of "charcoal lenses". In spite of the not very impressive sedimentation rates, the fauna and artefacts from both sites are excellently preserved.

To summarise, the in situ archaeological occupations discovered at Kabazi V accumulated at

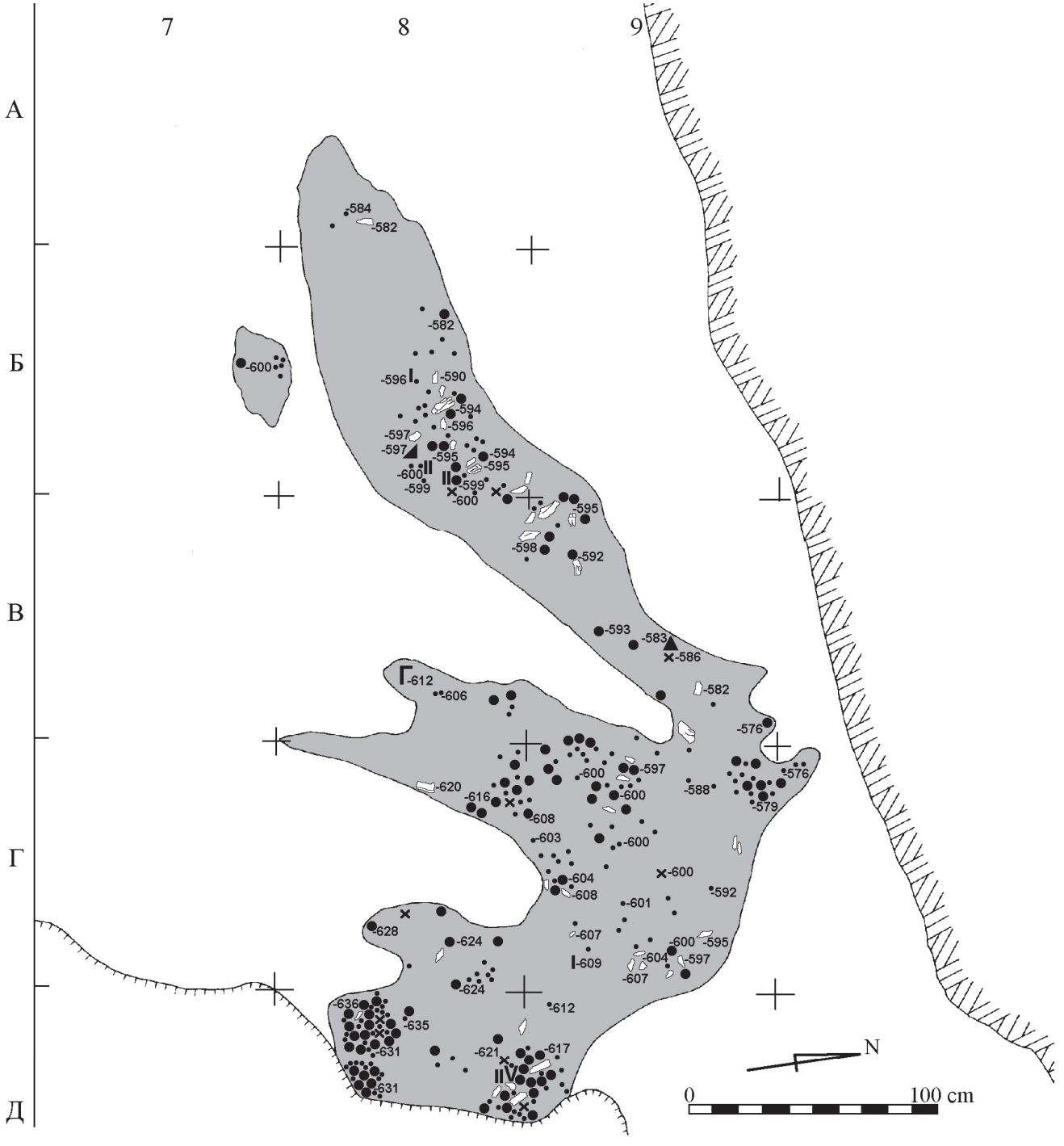


Fig. 1-16 Kabazi V, level III/7-2. Site plan: for conventional signs see Fig. 1-9.

the end of OIS 3 (see Chapter 3, this volume for other arguments). The main natural agents of site formation include the exfoliation of both the back-wall of the rock-shelter (soft Eocene fossil clay) and the rock-shelter roof (the Eocene nummulitic limestone), as well as the deposition of colluvium, which reached at least into the western part of the rock-shelter. The sedimentation rate was low, and human visits were frequent and characterised by quite intensive economic activities. All of these factors resulted in a relatively small sequence of *in situ* sediments, heavily saturated by thin occupational levels that were often separated by thin beds of sterile sediments.

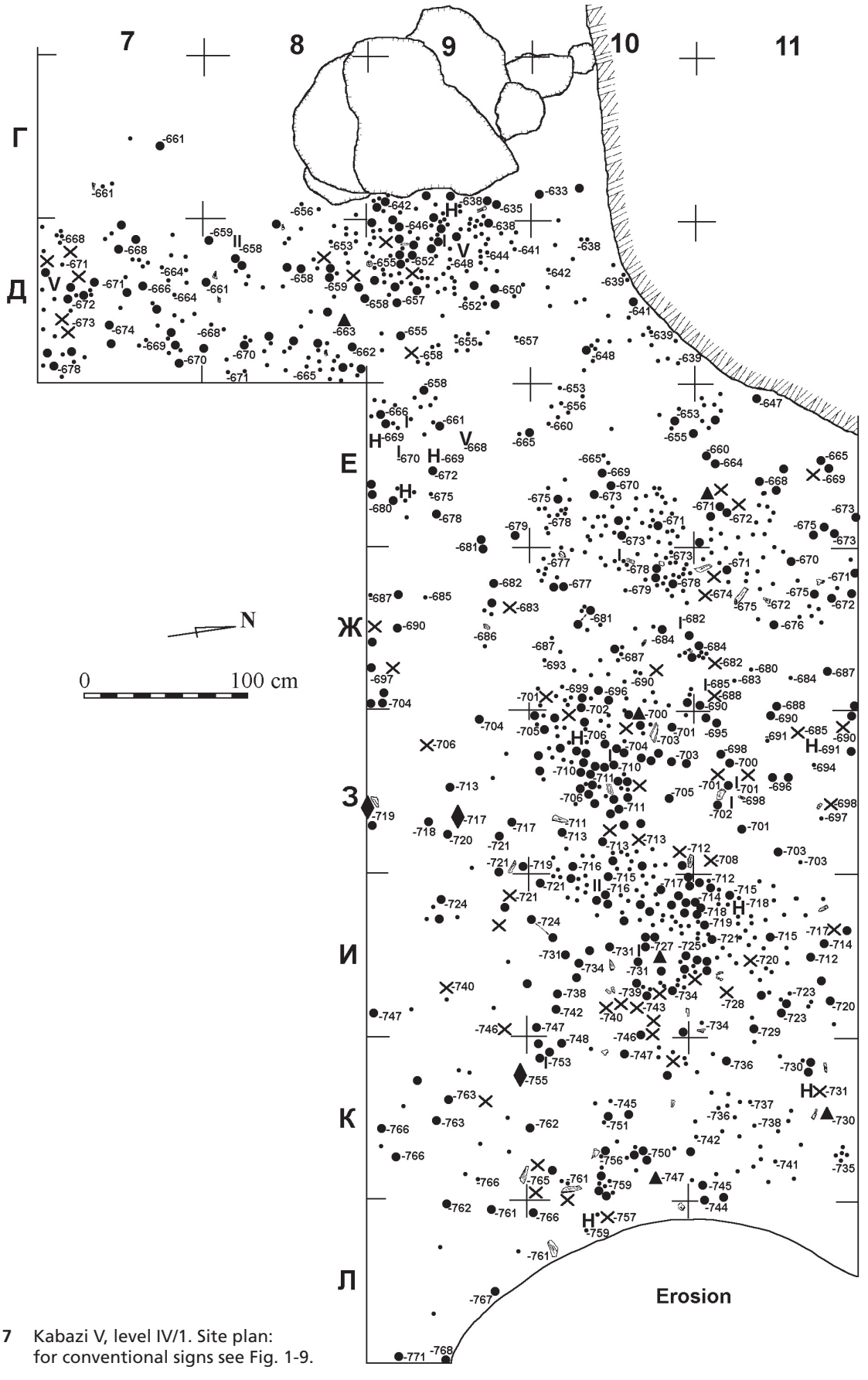


Fig. 1-17 Kabazi V, level IV/1. Site plan: for conventional signs see Fig. 1-9.

Abstract

КАБАЗИ V:
СТРАТИГРАФИЯ ЛИТОЛОГИЧЕСКИХ И КУЛЬТУРНЫХ ОТЛОЖЕНИЙ

ЧАБАЙ В.П.

Погребенный грот Кабази V находится непосредственно под известняковыми выходами южного обрывистого борта куэсты, на высоте 360 метров над уровнем моря и 150 метров над уровнем р. Альма. Стоянка входит в «кабазийский куст» среднепалеолитических памятников (Fig. 1-1). Локализация Кабази V связана с разрушенным в древности неглубоким гротом, камера которого сформировалась в толще эоценовых (Eb) фоссилизированных окаменевших глин, подстилающих нуммулитовые эоценовые (Ea) известняки, слагающие поверхность куэсты. В шестиметровой пачке отложений Кабази V выделено 11 стратумов, которые подразделяются на 27 литологических слоев (Table 1-1; Fig. 1-2; 1-3; 1-4; 1-5; 1-6). Основную роль в понимании эволюции скального убежища Кабази V играет его положение относительно борта куэсты. Борт куэсты почти параллелен линии север – юг, тогда как задняя стенка Кабази V почти параллельна линии восток – запад, то есть, скальное убежище было расположено под прямым углом к борту куэсты. Такое положение способствовало заносу коллювиальных седиментов с борта куэсты на площадку перед гротом. Геологическая история Кабази V представлена тремя основными стадиями. Во время первой стадии аккумулировались седименты стратума G, происхождение которых связано с действием карстового источника. Для второй стадии характерно формирование пещерных и коллювиальных отложений стратумов F, E4, E3, E2 и E1. В отложениях стратума E4 отмечены остатки наиболее древних поселений IV (Unit) культурного слоя (Table 1-1). В отложениях стратума E3 обнаружены пачки археологических горизонтов (sub-units) III/7, III/6, III/5, в отложениях стратума E2 – пачки горизонтов III/4, III/3, а в отложениях стратума E1 – пачки горизонтов III/2 и III/1. Во время отложения указанных стратумом отмечаются следы эрозионных процессов и обвалов козырька навеса. После очередного обвала козырька грот прекратил свое существование, и началась третья стадия аккумуляции седиментов. На третьей стадии формируются эоловые и коллювиальные отложения характерные для открытых стоянок. Данные отложения обнаружены в стратумах D, C, B2, B1 и A. Наряду с переотложенным археологическим материалом, в коллювиальных отложениях были законсервированы в первичном положении некоторые археологические горизонты (levels) II культурного слоя.

Характер образования литологических отложений оказал определяющее влияние на гомогенность и сохранность поселений Кабази V. Артефакты и фаунистические остатки культурных слоев I, IA и IIA были снесены с участка, располагавшегося выше раскопа. В значительной мере переотложены артефакты ряда горизонтов II/1 и II/2, которые относятся к IIA культурному слою. Эрозионными процессами частично переотложены пачки горизонтов III/4, III/6 и III/7. В первичном залегании обнаружены горизонты II/3, II/3a, II/3b, II/4, II/4a, II/5, II/5a, II/6 и II/7, пачки горизонтов III/1, III/1A, III/2, III/3, III/5 и горизонты IV культурного слоя (Table 1-1).

В целом, заселение стоянки во время образования отложений стратумов E4–E1 было достаточно интенсивным: насыщенность горизонтов артефактами колеблется от средних

до высоких значений, толщина многих горизонтов составляет несколько сантиметров и при этом они разделены незначительными по мощности стерильными прослойками (Tables 1-2; 1-3).

Исходя из радиометрических и биостратиграфических данных (Главы 3 и 4), представляется возможным утверждение о том, что аккумуляция 1,2 метра отложений стратумов E3, E2, E1 заняла не более 10 тыс. лет. Ближайшей аналогией темпам аккумуляции внутригротовых отложений (E3, E2, E1) Кабази V является скорость образования почти метровой пачки седиментов 5-11 литологических слоев Заскальной VI.

Chapter
2

Kabazi V: Hearths & Pits

Victor P. Chabai & Andrey P. Veselsky

Pits, hearths, and even different kinds of fences, are not a rare occurrence at Crimean Middle Palaeolithic sites, with such structures already reported at Starosele, Shaitan Koba, Kabazi I, Kabazi II, Kholodnaya Balka, Chokurcha I, Volchi Grotto, Kiik Koba, Zaskalnaya V, Zaskalnaya VI, Prolom I, and Prolom II (Bonch-Osmolowski 1930, 1940; Ernst 1934; Formosov 1958, 1959a, 1959b; Chernysh 1965; Liubin 1969, 1970; Kolosov 1972, 1979, 1983, 1986; Bader and Bader 1979; Marks et al. 1998; Chabai 2004a, 2005a). Unfortunately, the majority of these structures are not well documented.

The significance of Middle Palaeolithic structures is difficult to overestimate. Many of the Middle Palaeolithic behavioural studies have featured the analysis of hearths and pits, and the associations of these structures with artefact and bone assemblages (Perlès 1977; Rigaud and Geneste 1988; Gamble 1986, 1999; James 1989; Stringer and Gamble 1993; Mellars 1996).

The main aim of this chapter is to describe the new data from Kabazi V, as well as to propose some methods of investigation and lines of interpretation. The sedimentation conditions of Kabazi V, lithological layers 12 and 12A, appear to be favourable for the preservation of any kinds of structures, with the occupations of sub-units III/1, III/2, III/3, III/4 and III/5 being buried within a fine-grained silt (Chapter 1, this volume). On the other hand, the depositional conditions of Unit IV (lithological layer 14A) were not so favourable – occupations were deposited within a massive silt with *éboulis*. Usually thin living surfaces, separated by sterile sediments, provide an opportunity for better stratigraphical control of spatial and temporal positions of different kinds of structures. At the same time, the gradients of living surfaces, temporarily repeated erosional processes, as well as trampling, especially in palimpsests of occupations, poses a number of interpretational problems. Two kinds of structures were studied in Kabazi V: concentrations of burnt material and pits/depressions.

Concentrations of Burnt Material

The burnt material found in Kabazi V comprises bones, flint artefacts, sandstone pebbles, limestone boulders, limestone gravels, granular silt sediments, soot, and calcite ash, whereby the main component of concentrations is soot. Soot was recorded as being of a fine-grain structure, fatty to the touch, of a dark grey/black colour, and was found mixed with silt. Concentrations of soot formed both grey/black

scatters and beds which were visible in both plan and profile. Ash was observed as thin whitish calcite beds. Burnt bones show all variations of colours: red, brown, black, and whitish. The whitish bones are taken as evidence for high temperature heating, which resulted in an oxidisation of the organic matter (Bar-Yosef and Weiner 1996). Heavily burnt flints are rare. The most part of the burnt flint assemblage comprises relatively small and thin pieces (length/width: < 3 cm; thickness: < 0.5 cm). The burnt sandstone pebbles, limestone boulders and gravels are easily breakable and had turned to reddish/greyish/whitish colours. The basic sediment in lithological layers 12 and 12A at Kabazi V is a fine-grained silt which developed from the weathering of Eocene fossil clay. When burnt, this granular silt formed thin crusts of either yellow-red or red-brown colours.

There are three types of burnt material concentrations at Kabazi V. The first type is clearly limited concentrations of sooty/ashy sediments which contain burnt bone/artefacts fragments. These are usually of ovoid or rounded shape, and mostly dark grey in colour. Thin crusts of yellow-red/red-brown burnt sediments underlay sooty/ashy concentrations. In a few cases, beds of whitish calcite ash are found incorporated into the sooty sediments. These features are interpreted as the remains of *in situ* hearths (e.g. Callow et al. 1986, pp. 193-194).

Features assigned to the second type of burnt material concentrations are more complicated, they comprising two parts. The first, and often smaller, part is a crust of burnt sediment which was covered by a dense sooty/ashy bed. The shapes of both sooty/ashy beds and burnt crusts are often irregular, whereby the former, which also overlay burnt sediments, are of an intensive dark colour owing to dense concentrations of burnt bone fragments and soot. Occasionally, thin and interrupted beds of whitish calcite ash were observed within the sooty bed. In other words, this first part shows signs of a stratigraphical sequence, as is common for a hearth, although its shape does not substantiate this line of interpretation. The second part of this type is a tail area of light grey coloured sooty sediments which extends in one or two directions. The concentration of soot in these sediments, which also contain some burnt bones and artefacts, is much lower than that observed in the aforementioned first part. On the basis of the above evidence, features assigned to this second group are interpreted as partly disturbed hearths (dense sooty/ashy beds and burnt sediments crusts), with the tail area representing the destruction zone.

Features assigned to the third and final type are the simplest to describe, but are the most difficult to interpret. These comprise concentrations of sooty sediments, which are sometimes mixed with burnt bone/artefacts fragments. The soot concentration is not very high, but sufficiently dense to be easily visible as light grey colour scatters; there are no underlying burnt sediments. In fact, the light sooty scatters are reminiscent of the tail areas of the type 2 features described above. The difference consists, however, in the absence of an adjacent hearth. Hence, the third type of burnt material concentrations are referred to quite simply as light sooty scatters.

Type 1, hearths

Eight hearths were found in six levels: III/1; III/1A; III/2; III/3-3; III/5-3B and III/5-3B2; five simple hearths were found in levels III/1, III/2, III/3-3 and III/5-3B; and three deepened hearths were excavated in levels III/1A, III/5-3B and III/5-3B2.

Simple hearths

In level III/1 a hearth was discovered in squares 7Д, 8Д and 8E (Fig. 2-1), although it remained unexcavated in square 7Д. The hearth is of an ovoid shape, and is one of the smallest and thinnest known from Kabazi V; it is just 39 cm long, 23 cm wide and about 1 cm thick. The stratigraphy of the hearth is characterised by two beds: an upper bed of dense sooty silt, and a lower bed with crusty burnt sediments. Due to a high concentration of soot, the upper bed is dark grey, almost black in colour. Numerous small fragments of burnt bones are associated with these sooty sediments. The burnt sediments encountered in the lower bed form a thin yellow-red crust. Generally speaking, the sooty bed is slightly thicker than the lower bed of burnt sediments. The hearth is situated on the eastern edge of the dense artefact concentration located in squares 7Д, 8Д, and partly 8E (Fig. 2-1). Also, numerous sooty scatters were found in the same squares (see section: Type 3, the light sooty scatters, this Chapter).

The hearth from level III/3-3, which was discovered on the border of squares 7Г and 7Д (Fig. 2-2), is roughly of the same size as the small hearth investigated in level III/1 described above. This second hearth is of an ovoid shape, 37 cm long, 25 cm wide and 2 cm thick. Again, the stratigraphical sequence of this hearth is characterised by two beds: whereas the first comprises a black dense sooty silt, the second is red crust of burnt silt. The thickness of the latter measures no more than 0.5 cm. Numerous small fragments of burnt bones and a few burnt flint chips were found in both beds. The hearth is situated between a partially disturbed hearth and light sooty cluster. All three concentrations of burnt material

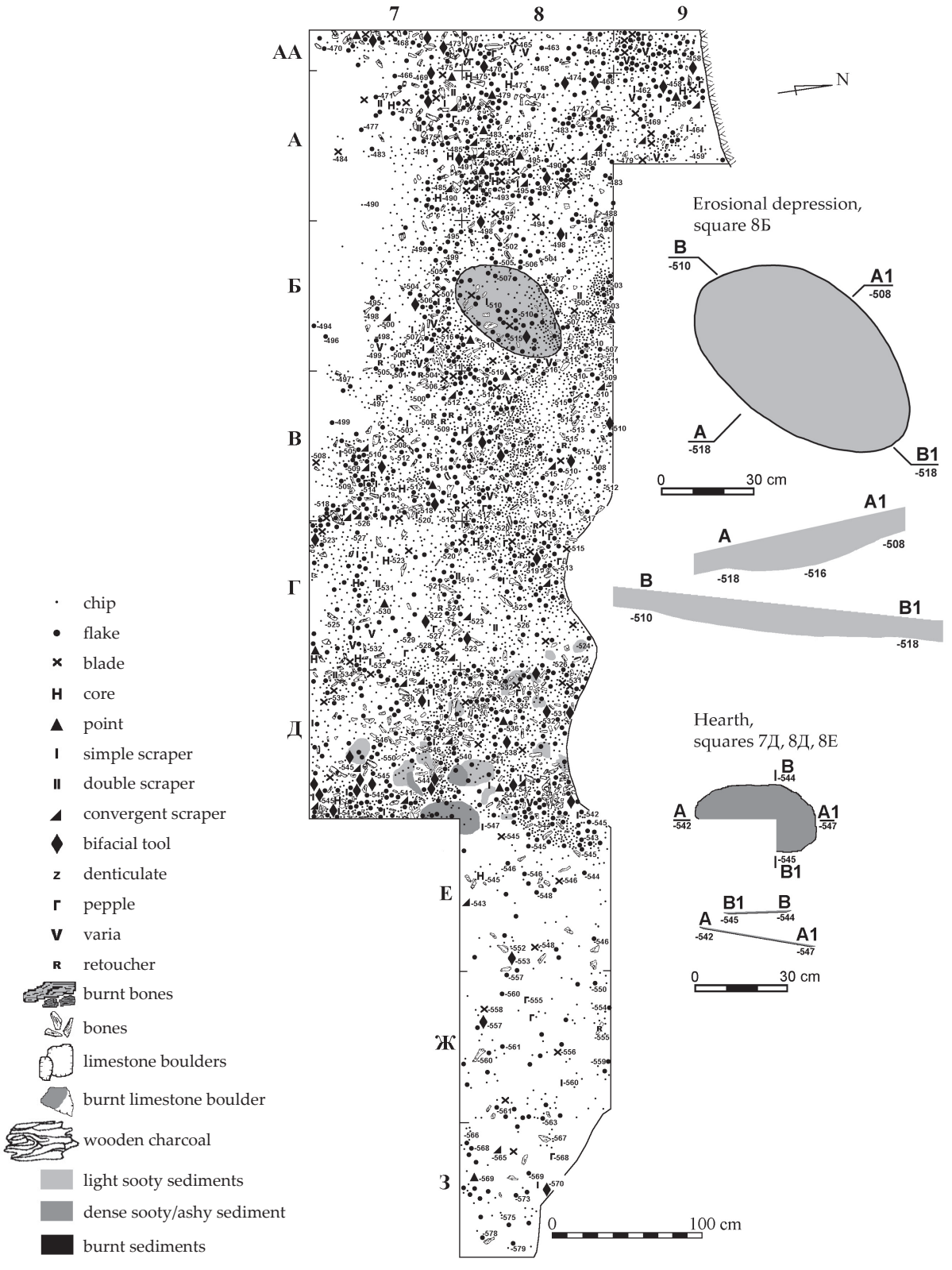


Fig. 2-1 Kabazi V, level III/1: plan. Erosional depression, square 8Б: plan and profiles. Simple hearth, squares 7Д, 8Д, 8Е: plan and profiles.

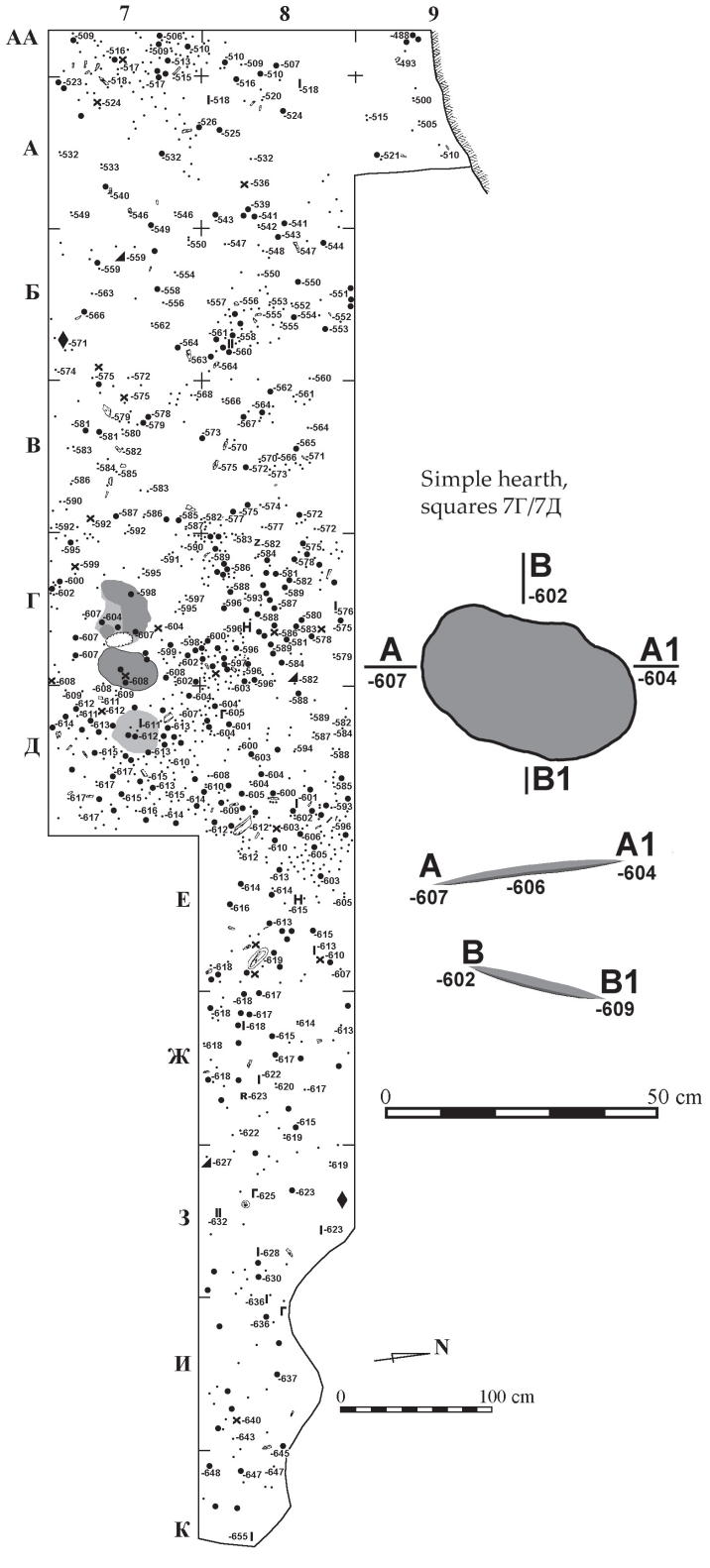


Fig. 2-2 Kabazi V, level III/3-3: plan. Simple hearth, squares 7Г/7Д: plan and profiles. For conventional signs see figure 2-1.

form a line which stretches from north to south over a distance of 115 cm. A concentration of artefacts was found in the northern and southern areas, adjacent to the hearth.

The irregular ovoid shaped hearth discovered in level III/2 was exposed on the border between squares 7В and 7Г (Fig. 2-3). It has a maximum length of 46 cm, it is 45 cm wide, and 4 cm thick. The stratigraphy of this hearth constitutes a 2.5 cm thick bed of dense sooty silt, and a 1.5 cm thick crust of burnt silt. Whereas the former is intensively black, the latter is brown-red. The upper dense sooty bed contains a concentration of relatively large fragments (length up to 10 cm) of heavily burnt mammoth tube bones. The colour of these burnt mammoth bones is black. Also, the dense sooty bed yielded small pieces of burnt bone of a whitish colour, as well as a few heavily burnt flint chips. No concentrations of artefacts were detected adjacent to this hearth, and finds were limited to a few bones and artefacts that were found in a 40-50 cm zone to the north, east, and south of the hearth. The finds in the north and north-east were associated with a partially disturbed hearth and a tail area of a destruction zone (squares 8В and 8Г).

A medium size simple hearth was exposed in level III/5-3В, square 8Г (Fig. 2-4). The hearth, which is round in shape, displays a maximum diameter of 46 cm, and is 3 cm thick at its thickest point. The stratigraphy of the hearth comprises a 2.5 cm thick bed of dense sooty silt and a 0.5 cm thick crust of burnt silt. Some blackish burnt pieces of bone and a few burnt artefacts were recovered from the dense sooty bed. A concentration of artefacts and bones was found south of the hearth.

The largest simple hearth was excavated in the same level III/5-3В, in squares 7В, 7Г, 8В, 8Г (Fig. 2-4; 2-5). This hearth is ovoid, 113 cm long, 104 cm wide, and 3 cm thick. Once again, the stratigraphy of the hearth deposits is made up of two main beds, a 2.0-2.5 cm thick dense sooty sediment, and an underlying 0.5-1.0 cm thick crust of burnt silt. Thin incisions of calcite ash were observed in the dense sooty sediments, with the latter yielding some lightly burnt pieces of flint.

Deepened hearths

The deepened hearth in level III/1А, square 8Е could only be partly exposed during excavation (Fig. 2-6). However, on the basis of its excavated part, it can be assumed that this hearth was of an elongated ovoid shape; its maximum investigated length was 40 cm, with a width of 20 cm. The hearth deposits measured 11 cm thick, of which 8 cm comprised light sooty sediments and contained blackish burnt bone fragments and a few burnt chips. From this deposit a

Fig. 2-3 Kabazi V, level III/2: plan. Simple hearth, squares 7В/7Г: plan and profiles along square line В/Г. Partly disturbed hearth and destruction zone, squares 8В and 8Г. For conventional signs see figure 2-1.

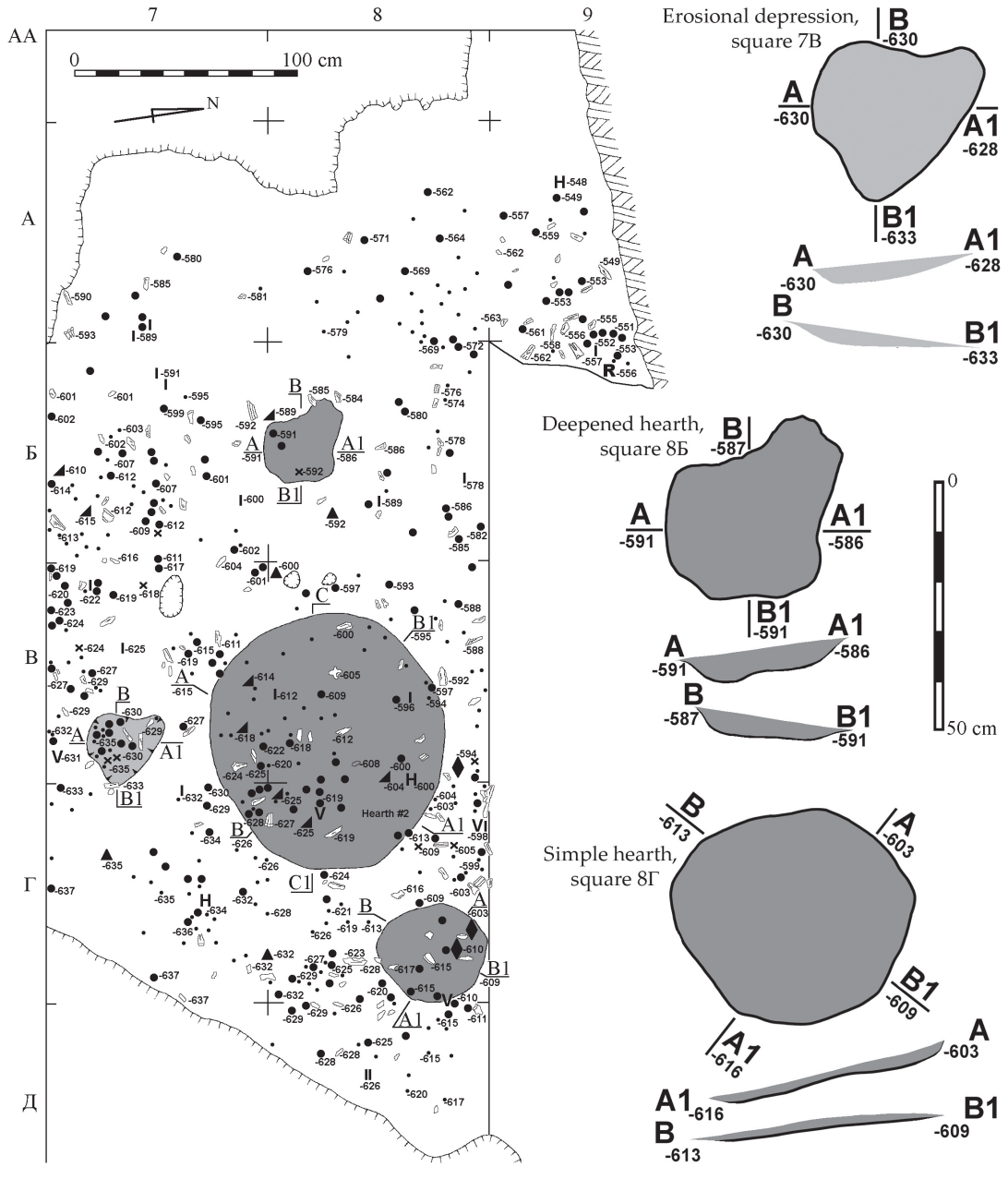


Fig. 2-4 Kabazi V, level III/5-3B: plan. Erosional depression, square 7B: plan and profiles. Deepened hearths in square 8Б, and simple hearth in square 8Г: plans and profiles. For conventional signs see figure 2-1.

relatively large (length – 8.5 cm) retoucher on a tube bone fragment was excavated. This piece was burnt to the same degree as all other bones from this layer. Below the light sooty silt was observed a 2 cm thick bed of dense sooty silt. The thickness of the lowermost reddish burnt crust measured about 1 cm. The general parameters of the hearth correspond with dimensions observed for "pits". The southern and northern walls of this pit are slightly sloping; its western wall is abrupt and limited by a flat quadratic limestone boulder (length/width, about 16 cm; thickness, 8 cm). The side of the boulder, which had been laid adjacent to the hearth, shows traces of intensive heating, i.e. it is crumbly and had turned to a reddish colour. In comparison to the simple hearths the stratigraphical sequence of the deepened hearth

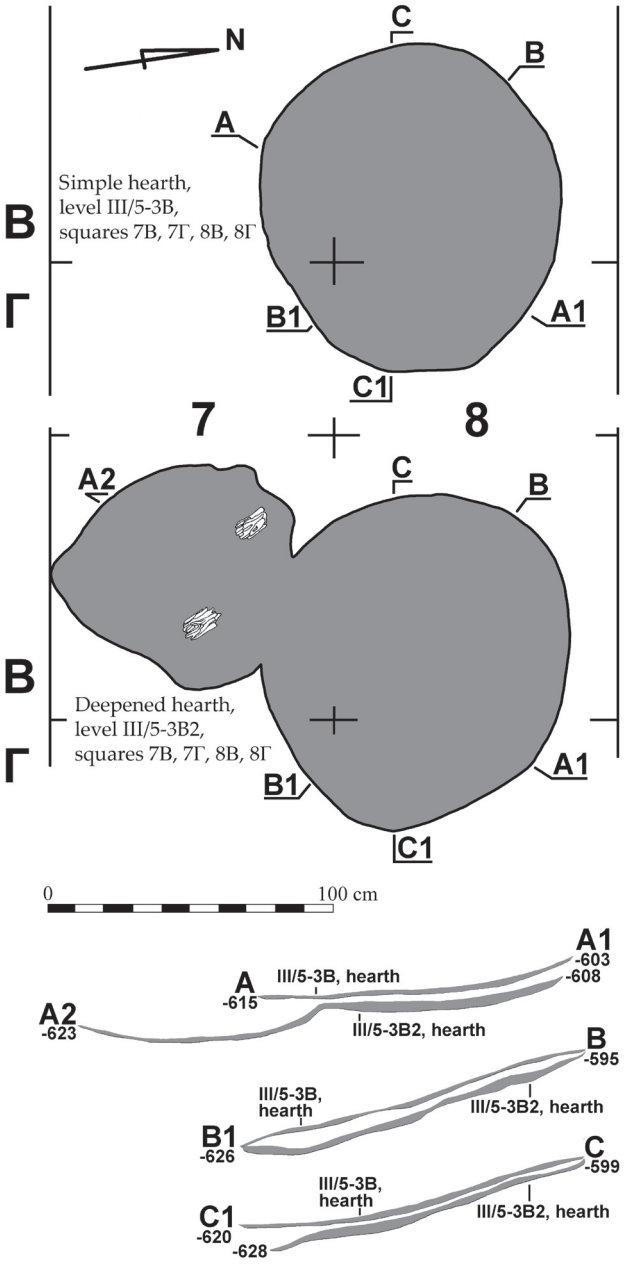


Fig. 2-5 Kabazi V, levels III/5-3B and III/5-3B2, squares 7В, 7Г, 8В, 8Г: plans and profiles of the simple and deepened hearths. For conventional signs see figure 2-1.

is more complicated. In contrast to the simple hearths with their straight forward stratigraphy, this deepened hearth displays a total of three beds of burnt material (light sooty silt, dense sooty silt, and a crust of burnt silt). Although the association of the dense sooty silt and the burnt crust with the functioning of the hearth is more or less clear, the appearance of the light sooty sediments in the hearth pit may be linked to later erosion and trampling activity in adjacent areas.

A deepened hearth of similar shape was reported by F. Bordes at Pech de l'Azé II, and interpreted as a dug-out "tailed hearth" (Bordes 1972, pp. 61-63). In the case of Kabazi V, III/1A the artificial origin of the "pit" is very problematic. The west-east gradient of level III/1 in this particular square (8E) lies at roughly 11°. The only deepened and abrupt part of this deepened hearth was its western – upper – wall, while all other walls were slightly sloping. The correlation of the walls of "pits" with the prevailing gradient of the slopes were studied for the numerous erosional depressions discovered at Kabazi V (see section Pits and erosional depressions, this Chapter). At the same time, the "limiting stone" was the only limestone boulder found in a vertical position in this level. It is likely that the western wall of the erosional depression was lined with this flat boulder, and afterwards used as the location for a hearth.

A further deepened hearth was exposed in level III/5-3B, square 8Б (Fig. 2-4). The hearth, the shape of which can be described as irregular, had a maximum length of 42 cm, a maximum width of 35 cm, and was up to 6 cm thick. As such, it is the thickest hearth to have been discovered at Kabazi V. Beneath the 5.5 cm thick bed of dense sooty silt was observed a 0.5 cm thick yellow-red crust of burnt silt. Upon excavation, the former produced a few burnt bone fragments and flint pieces. The walls of the hearth "pit" are slightly sloping, especially the lower wall, in relation to the gradient of the living floor. Seeing as the "pit" used for this hearth resembles in both its shape, size, and form a natural erosional depression discovered in square 7B (Fig. 2-4), it is likely that a similar natural depression was chosen as the location for this hearth also.

The most complicated deepened hearth was excavated in level III/5-3B2, in squares 7В, 7Г, 8В, 8Г (Fig. 2-5 and Fig. 1-15 in Chapter 1, this volume). This hearth comprises two conjoined parts. Whereas the bigger part is represented by a circle (diameter: 119 cm, thickness: 2.5 cm), the smaller part is of an irregular shape (length: 84 cm, width: 80 cm, thickness: 2 cm). The stratigraphies of both parts are characteristic of those discovered at Kabazi V; the upper bed is formed by a dense sooty silt, and the lower consists of a crust of burnt silt. The thickness of the former is about 1.5 cm, while the latter is about 0.5 thick. Thin interrupted lenses of calcite ash were found in the dense sooty silt. Also, small fragments of burnt bones and flints, as well as charcoal of varying sizes, are associated with the dense sooty silt deposit. Two pieces of charcoal were found

in the form of relatively big (length/width: ca. 12-10 cm) splinters. One of these was used as a sample for radiocarbon dating (Chapter 3, this volume). The combination of charcoal and calcite ash beds is understood as direct evidence for the use of wood as a fuel for the hearth.

A section (A1-A2) cut through both parts of the hearth provided a profile which appears to show two conjoining pits (Fig. 2-5). However, neither in plan nor in profile, could a clear border between the two "pits" be defined, and it is likely that such a border never existed. The northern walls of the pits are more or less abrupt, while all remaining walls are pretty much shallow or slightly sloping (Fig. 2-5, compare the sections A1-A2, B-B1 and C-C1). The north-south gradient of the living surface lies at 9-10°. As observed among the deepened hearths described above, the abrupt wall is always situated to the side of the pit where the slope gradient is at its highest. In level III/5-3B2 the deepened hearth was placed in an already available erosional depression; in other words, the earlier eroded surface was used as a location for the hearth. It is very unlikely, that both parts of this heath were in use at any one time, but, at the same time, there is no stratigraphic evidence which might prove or reject the contemporaneous exploitation of both its parts.

To sum up, there is no available evidence in support of the assumption that artificial fire-pits were constructed at Kabazi V. Rather, the observed "deepened hearths" were placed in already available natural depressions.

Type 2, partly disturbed hearths with destruction zones

Burnt material concentrations assigned to this type were discovered in the following occupations: level III/1, squares 7*Д* and 8*Д*; level III/2, squares 8В and 8Г; level III/3-1, squares 7АА, 7А, 8А; level III/3-3, square 7Г; level III/1А, square lines Б, В, Г; level III/3-2, square lines Б, В; level III/5-2, square lines В, Г; level III/5-3, squares 8В, 8Г.

The largest hearth destruction zone was revealed in level III/1А, square lines Б, В and Г, and covers an area of in excess of three square metres (Fig. 2-6). The thicknesses of the sooty sediments, which are densely packed with burnt bones and artefacts, ranges from 3 cm to 6 cm. A number of heavily burnt large and small mammoth bone fragments were found in squares 7Б, 7В and 8В. The colours of these burnt bones ranges from variations of light brown, dark grey and white, i.e. both low and high temperatures were reached during the burning of this material. The burnt flint from square 6Б showed a natural TL peak (NTL in blue) at around 360 °C (Chapter 3, this volume); this might be considered as low heating. As noted by R. Housley et al., square 6В in level III/1А provided similar luminescent sensitivity results to both overlying and underlying sterile sediments, thus indicating that these sediments "*were little affected by any heating*" (Chapter 3, this volume).

In squares 7В and 8Б, below the sooty sediments, were found two pairs of thin, near ovoid-shaped beds of burnt reddish sediments that were covered by a dense sooty bed. The thickness of reddish burnt sediments is no more than 0.3 cm, while the thickness of the dense sooty bed is about 3 cm. As noted by R. Housley et al., square 6В in level III/1А, which lies adjacent to the burnt crust in square 7В, provided similar luminescent sensitivity to both overlying and underlying sterile sediments. Once again, this indicates that these sediments "*were little affected by any heating*" (Chapter 3, this volume). Each of the pairs of burnt crusts (squares 7В and 8Б) might then be the remnant of hearths, which were later destroyed by natural factors and/or human activity. At least two limestone boulders (squares 7В and 7Г/8Г) show traces of intensive heating. One side of each boulder was heavily burnt: the limestone had become crumbly and had taken on a reddish colour. The distance between the burnt parts of the boulders is about 50 cm; no burnt sediments were observed separating these boulders, nor were such sediments found below them.

Artefact concentrations in squares bordering 7В/8В and square 7Б were found to connect with the tail area. Generally speaking, 267 of 445 tools from level III/1А were found in the destruction zones of hearths; it should also be noted that these zones make up about one quarter of the entire excavated area of level III/1А.

In levels III/3-1 and III/3-2 a little more than one square metre was covered by the destruction zones of hearths. The destruction zone in level III/3-1, squares 7АА, 7А and 8А, is irregular in shape (Fig. 2-7); it is 132 cm long, 114 cm wide and 0.5 cm thick. The greater part of this concentration of burnt material comprises a light sooty tail area, while the hearth remnant, in the form of burnt sediments and a dense sooty cluster, was found on the squares 7АА, and in part of 7А. The parameters of the excavated part of the hearth are as follows: length – 47 cm; width – 56 cm; and thickness – 0.5 cm. A concentration of artefacts was found close to the eastern edge of the tail area. Small fragments of blackish burnt bone are associated with both the hearth and its tail area.

In level III/3-2 an irregularly shaped destruction zone was found in squares 8Б, 8В and in part of 7Б

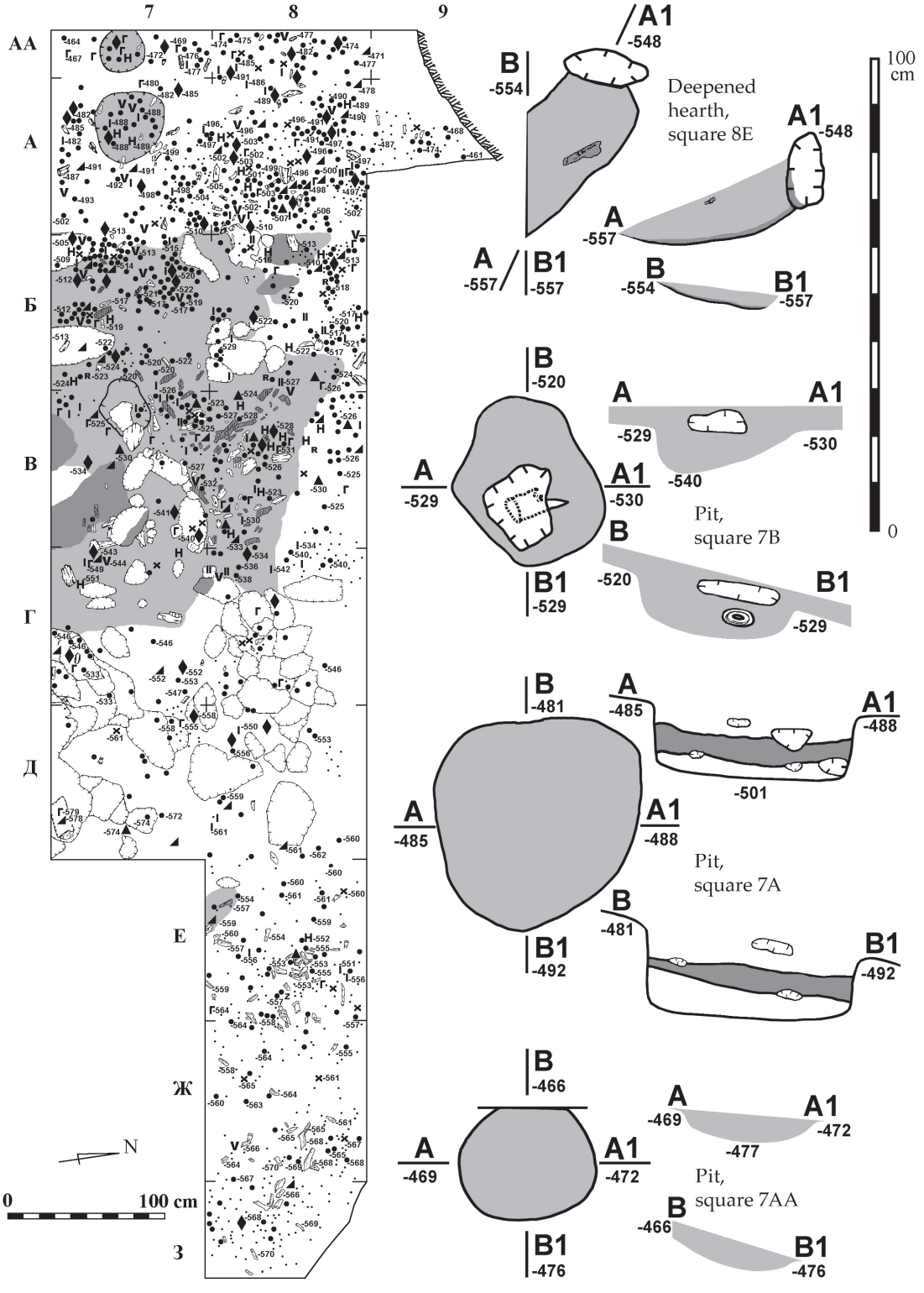


Fig. 2-6 Kabazi V, level III/1A: plan. Deepened hearth, square 8E: plan and profile. Pits in squares 7B, 7A and 7AA: plans and profiles. For conventional signs see figure 2-1.

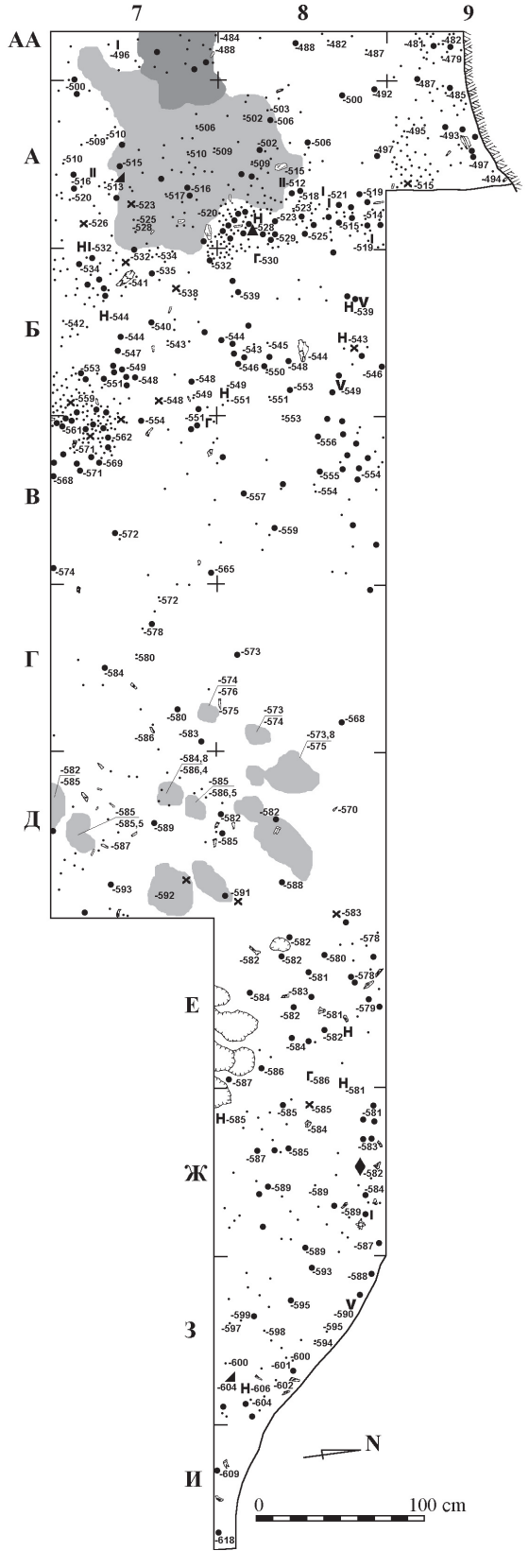


Fig. 2-7 Kabazi V, level III/3-1: plan. For conventional signs see figure 2-1.

and 7В (Fig. 2-8). In its west – east extension this destruction zone was 187 cm long, from north to south it measured 147 cm; it is barely 2 cm thick. The light sooty tail area covered the most part of this zone, while the hearth was exposed in the northern part of square 8Б. The burnt sediments are of nearly rounded shape, with a diameter of 36 cm; they are less than 1 cm thick. The same parameters are common for the dense sooty bed, beneath which burnt sediments were found. There are no clear artefact concentrations in association with the destruction zone of this feature, although both burnt flints and bones were encountered.

In levels III/2, III/5-2 and III/5-3 the destruction zones usually cover an area of around one square metre. The destruction zone in level III/2 consists of a hearth (dense sooty and burnt sediments beds) and a light sooty tail area. The whole destruction zone is of an irregular elongated shape which stretches from north to south (Fig. 2-3). It is 165 cm long and 73 cm wide. Its thickest point (3.5 cm) was found at the border between squares 8В and 8Г, decreasing to just 0.5 – 1 cm to the west and east. Irregularly shaped burnt sediments were exposed on the western edge of the destruction zone. These burnt sediments cover an area 48 cm long and 40 cm wide; they are 0.3 cm thick. Relatively large fragments of burnt mammoth bones were found both in the dense sooty sediments and in the tail area (Fig. 2-3). The colours of burnt bones vary from black to white, the latter possibly indicative of high temperatures during heating. Also, the eastern part of the destruction zone is associated with a concentration of artefacts. A total of 45 complete and fragmented tools were found in the tail area, fourteen of which are bifacial tools. The entire excavated area of level III/2 produced 108 unifacial and 32 bifacial tools. In fact, one third of the tool assemblage from level III/2 is associated with about 1 square metre of this tail area. However, at the same time, this tool assemblage might also be connected to the hearth discovered in squares 7В/7Г.

In level III/5-2 an irregularly shaped hearth with its destruction zone was found in squares 7В, 8В, 8Г and 8*Д* (Fig. 2-9). This zone measured up to 189 cm long and 99 cm wide; it was between 0.5 cm and 3 cm thick. Three clusters of burnt sediments were covered by dense sooty/ashy beds. Two of these were located in squares 8В (length: 30 cm, width: 26 cm) and 8Г (length: 17 cm; width: 11 cm), and were of an ovoid shape, and the third, which was of an irregular shape, was found in squares 8Г/8*Д* (length: 41 cm; width: 35 cm). All three were around 0.3 cm thick. Very thin, interrupted beds of calcite ash were found above the burnt

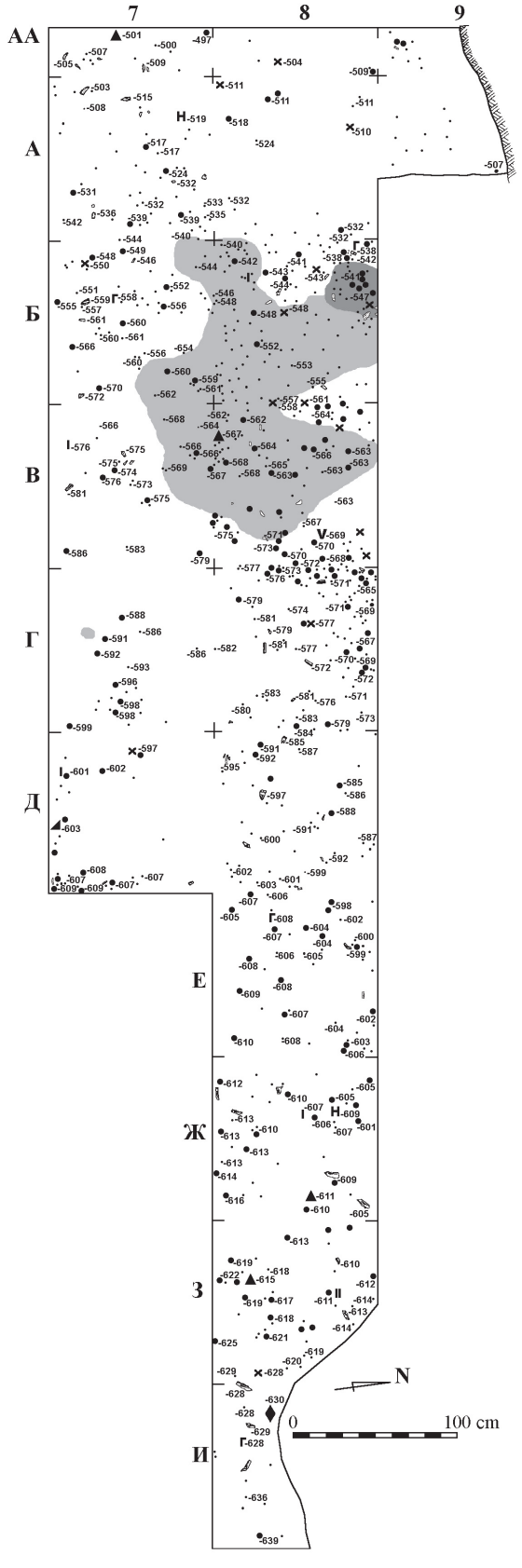


Fig. 2-8 Kabazi V, level III/3-2: plan. For conventional signs see figure 2-1.

sediments. It would appear that we are confronted by the remnants of three hearths. The tail area is situated between the potential hearths, but also extends towards the south, i.e. it follows the gradient of the living surface. There are no obvious concentrations of artefacts in the proximity of the destruction zone. Some burnt bone fragments and flint chips were found in the hearths and in the tail area.

A cross-shaped destruction zone was excavated in level III/5-3, squares 8В, 8Г and 8*Д* (Fig. 2-10). This zone measures 223 cm in length, it is 99 cm wide, and between 0.5 cm and 1.0 cm thick. Two ovoid shaped zones of burnt sediments were exposed beneath a sooty/ashy bed. The thicknesses of each of these measured about 0.3 cm. The zone of burnt sediments in square 8В/8Г is 47 cm long and 34 cm wide. The destruction zone, in square 8Г, is much smaller, it measuring 27 cm long and 20 cm wide. Thin beds of calcite ash were found covering both zones of burnt sediments. There is no doubt that such combination of burnt sediments, calcite ash, and sooty beds are the remnants of hearths. The light sooty tail area stretches from the hearth remnants in all directions. A concentration of flint material was exposed in this destruction zone, and in areas surrounding it (Fig. 2-10). In level III/5-3 a total of 84 tools were found, of which 37 stem from the destruction zone and nearby area.

The smallest destruction zones were discovered in levels III/1 and III/3. In level III/1 two small, irregularly shaped concentrations of sooty and burnt sediments were found in squares 7*Д* and 8*Д* (Fig. 2-1). The combined thickness of these deposits is about 1 cm. The maximum dimension of sooty cluster is about 35 cm, while the maximum dimension of burnt sediments measures 18 cm. These two destruction zones are associated with a relatively large (about 2 square metres) concentration of bones and artefacts. At the same time, this affiliation is not certain, because in the same squares (7*Д*, 8*Д*) a hearth was also found (Fig. 2-1). Further, these destruction zones lie in close proximity to one another, which might suggest that they in fact belong to the remnants of just one hearth.

A larger destruction zone was found in level III/3-3, square 7Г (Fig. 2-2). This has an irregularly shape and is 45 cm long, 39 cm wide and 0.5 cm thick. Ovoid (length, 40 cm; width, 18 cm) and rounded (diameter, 10 cm) zones of burnt sediments were again covered by a sooty bed. The thickness of the burnt sediments measures about 0.3-0.5 cm. Both zones of burnt sediments were connected by a light sooty tail area. Therefore, it is likely that we are dealing with the remnants of a single hearth.

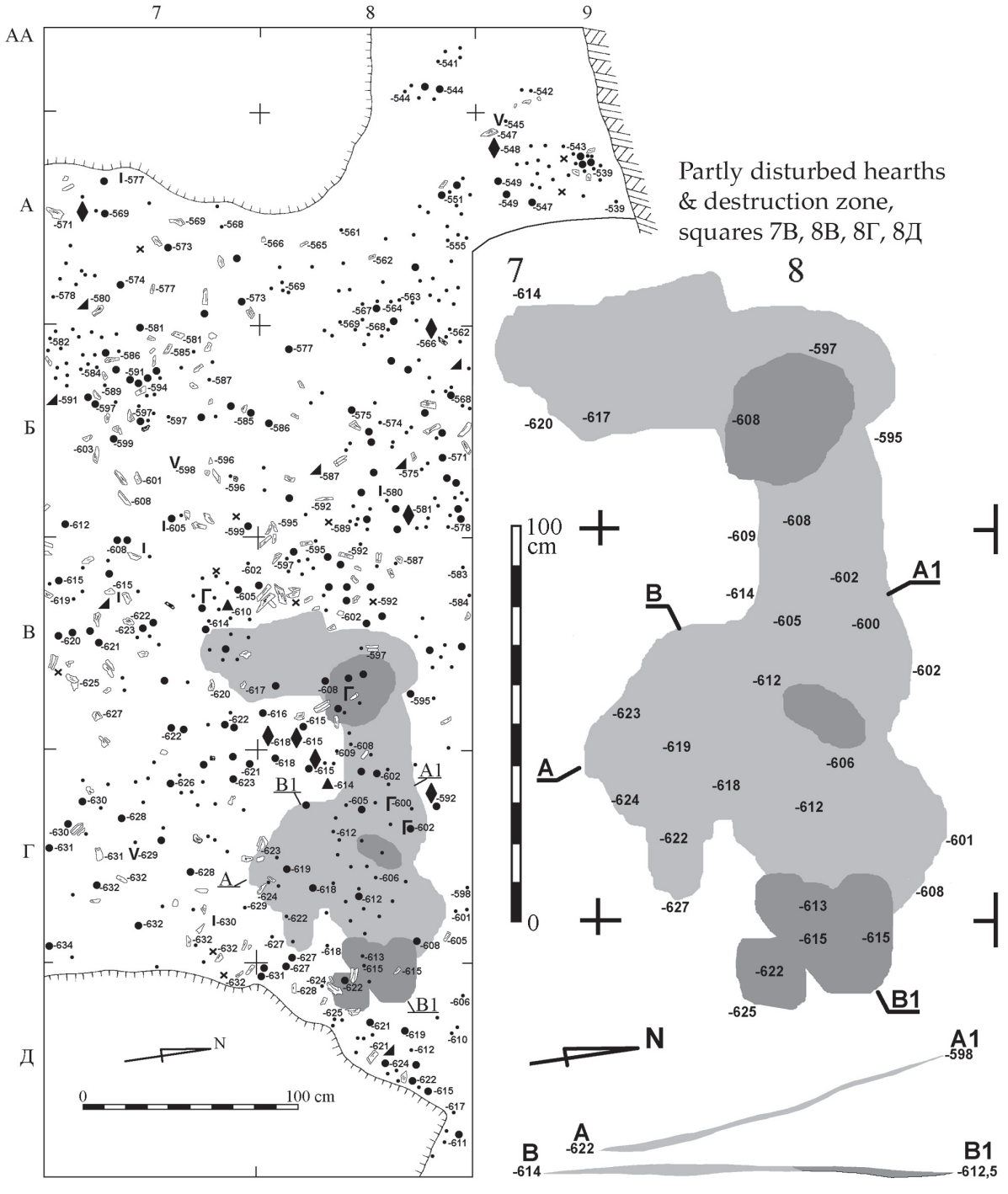
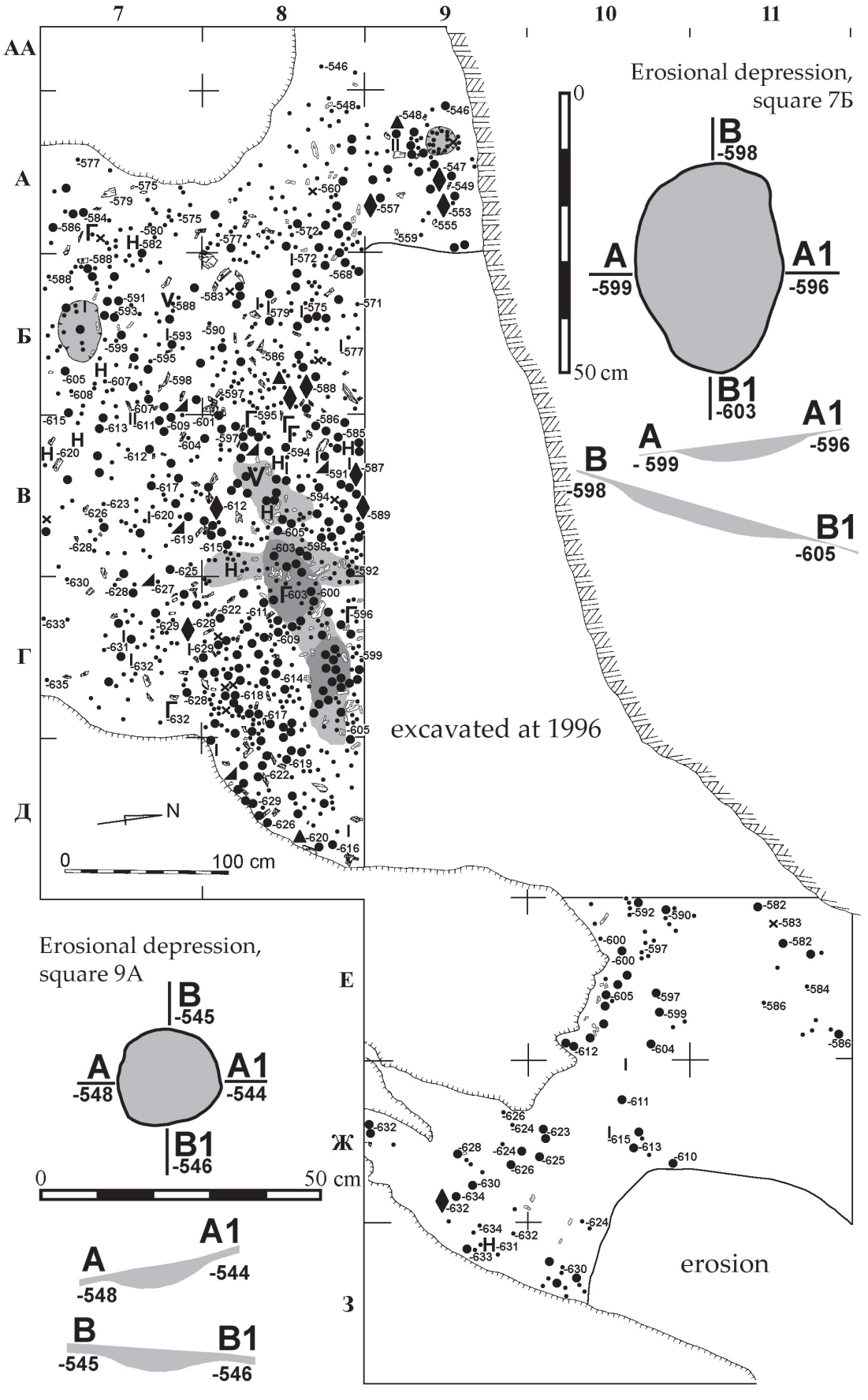


Fig. 2-9 Kabazi V, level III/5-2: plan. Partly disturbed hearths with destruction zone in squares 7В, 8В, 8Г, 8Д: plan and profiles. For conventional signs see figure 2-1.

Fig. 2-10 (Opposite page) Kabazi V, level III/5-3: plan. Erosional depressions in squares 9А and 7Б: plans and profiles. ► For conventional signs see figure 2-1.


7
8
9
10
11
АА
А
Б
В
Г
Д
Е
Ж
З
Erosional depression, square 7Б
0
50 cm
B -598
A -599
A1 -596
B1 -603
A1 -596
A -599
B -598
B1 -605
excavated at 1996
N
0
100 cm
Erosional depression, square 9A
B -545
A -548
A1 -544
B1 -546
0
50 cm
A1 -544
A -548
B -545
B1 -546
erosion

Type 3, light sooty scatters

The third type of burnt material concentrations comprises thin and relatively small scatters of soot. Due to the relatively low soot concentrations these scatters are usually light grey. Burnt artefacts associated with these sooty scatters are extremely rare, and when they are usually represented by chips. Fragments of burnt bone recovered from these concentrations are very small and vary in colour from light brown to dark grey. Light sooty scatters were found in occupations in level III/1, squares 8Г, 7*Д*, 8*Д*; level III/2, squares 7В and 7*Д*; level III/3-1, square lines Г and *Д*; level III/3-2А, squares 7Г, 7*Д*; level III/3-3, square 7*Д*; level III/4-1, square 7Г; level III/4-2, squares 7В and 8Г; level III/4-5, square 7АА; III/5-1, square lines Г and *Д*; level IV/2, square 10 *И*; and level IV/3, squares 10К/11К (Fig. 2-1; 2-2; 2-3; 2-7; 2-11; 2-12; 2-13; 2-14; 2-15). In all cases, the thicknesses of these sooty scatters with their burnt bone/artefacts fluctuate between 0.5 cm to 1.0 cm. The largest light sooty scatter was found in level III/5-1, square 8Г and 8*Д*; it measures 171 cm long and 93 cm wide (Fig. 1-13, Chapter 1, this volume). The smallest scatter was discovered in level III/4-1, square 7Г; it has diameters of 6 cm and 11 cm (Fig. 2-11).

Concentrations of archaeological material are usually not associated with light sooty scatters, the only potential exceptions being scatters in level III/1, squares 8Г, 7*Д*, 8*Д* (Fig. 2-1) and level III/3-3, square 7*Д* (Fig. 2-2), where these scatters may be connected with concentrations of unburnt bone and artefacts. However, it should be noted that in these two levels the light scatters lie in close proximity to hearths. In other words, the aforementioned concentrations of finds might be instead connected with these hearths and not with the light sooty scatters.

On the other hand, the light sooty scatters are undoubtedly associated with archaeological levels, or in other words, with "carpets" of finds. The density of bones and artefacts in these scatters are the same as in surrounding squares, and light scatters are never found in association with sterile sediments. Further, light scatters always follow the relief of living floors, and in the case of sub-unit III/4, they appear to be the only reliable attribute on the basis of which separate levels could be differentiated. Unfortunately, however, due to the limited size of these scatters, all subdivisions must still be considered as tentative (Fig. 2-11; 2-12; 2-13). The origin of light sooty scatters might be related to post-depositional transportation of burnt material. Also, it cannot be excluded that in massive silt deposits (lithological layer 14, Unit IV) sooty scatters represent the only form of hearth preservation.

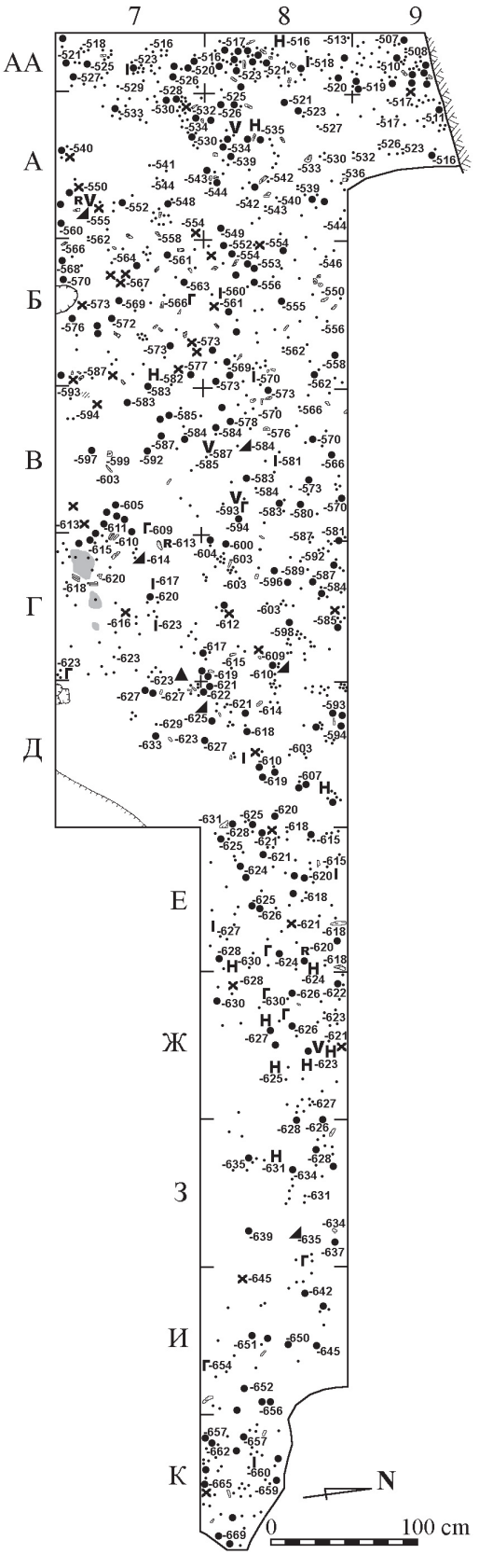


Fig. 2-11 Kabazi V, level III/4-1: plan. For conventional signs see figure 2-1.

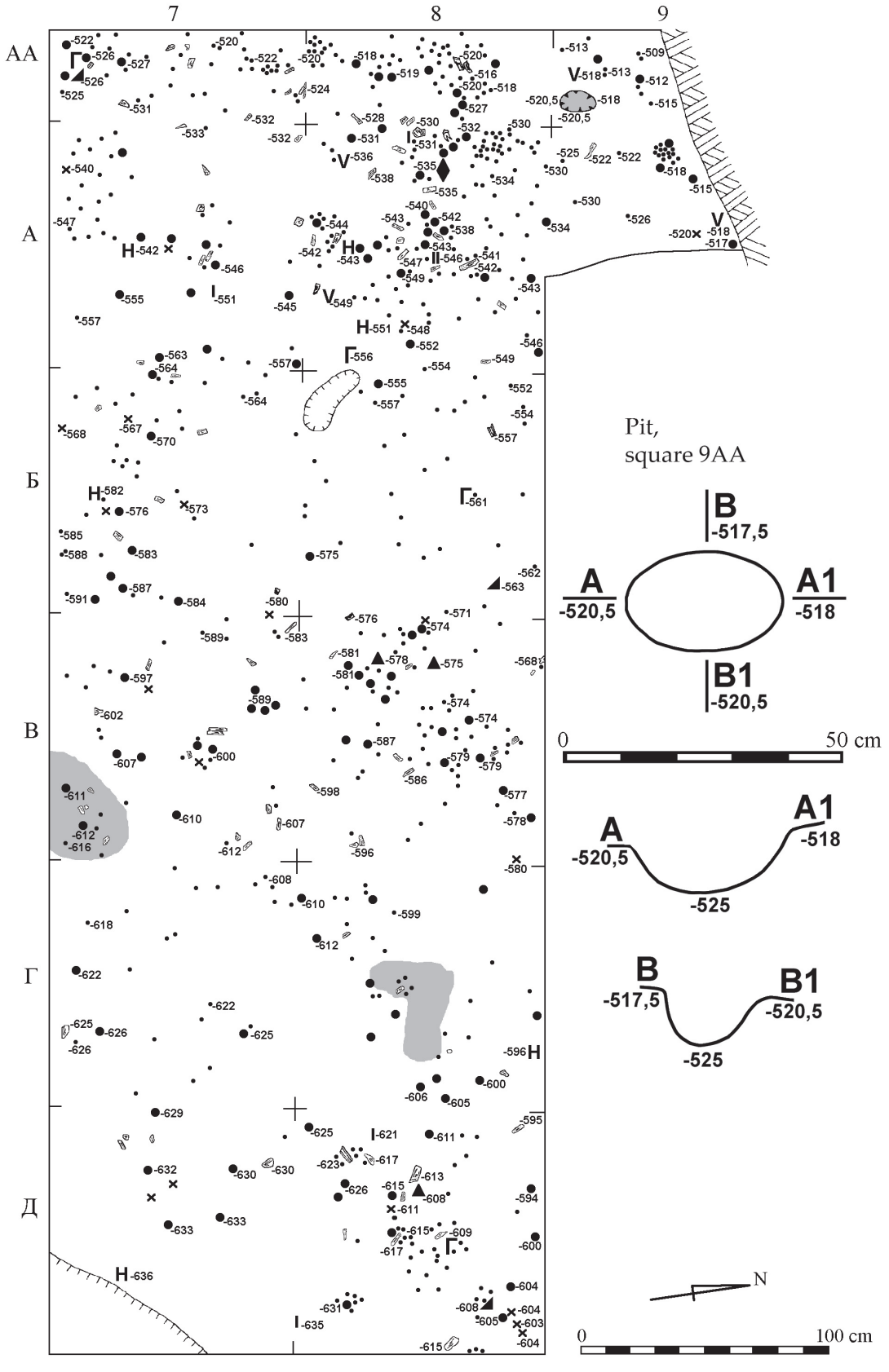


Fig. 2-12 Kabazi V, level III/4-2: plan. Pit, square 9AA: plan and profiles. For conventional signs see figure 2-1.

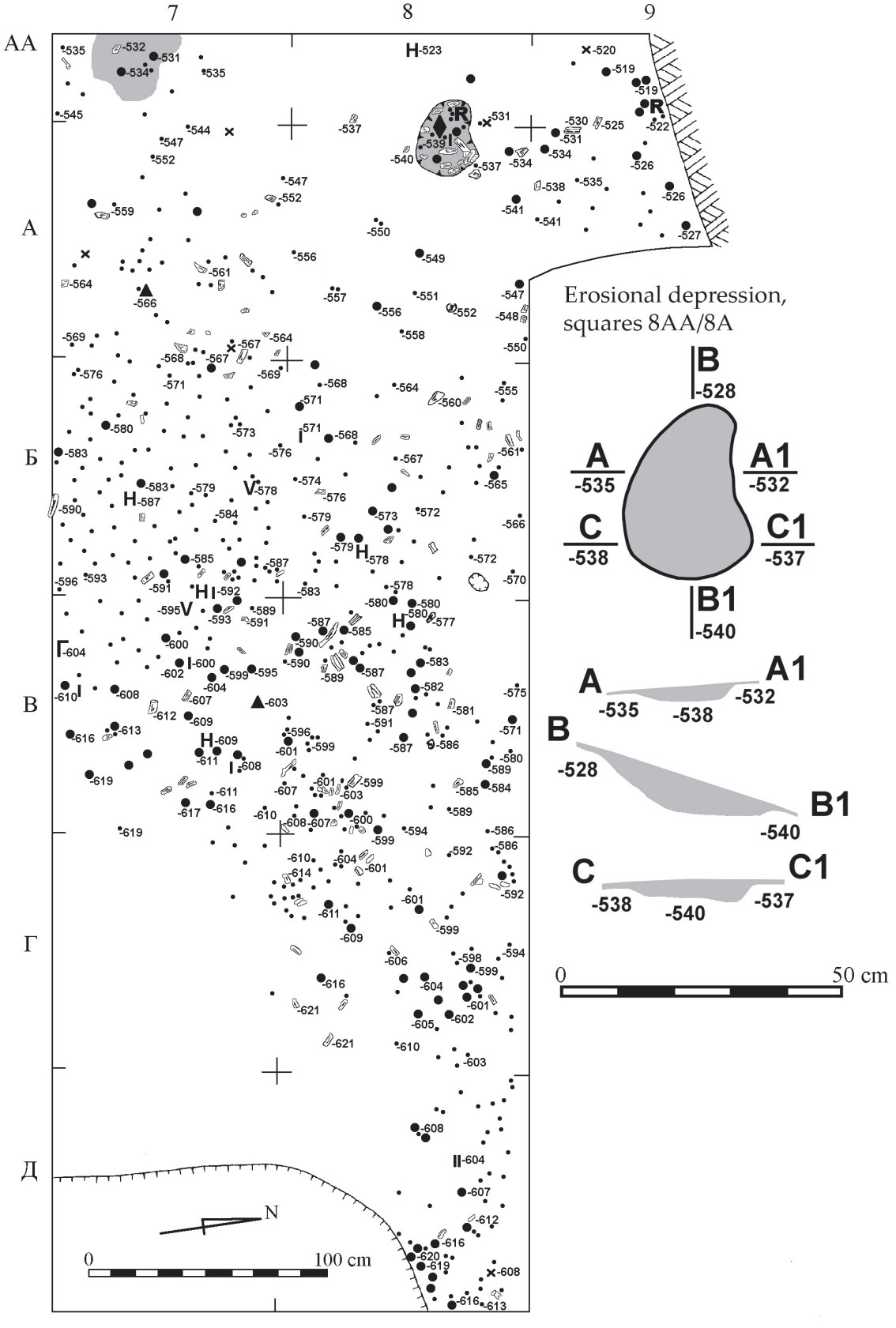


Fig. 2-13 Kabazi V, level III/4-5: plan. Erosional depressions, squares 8AA/8A: plans and profiles. For conventional signs see figure 2-1.

Summary: burnt material concentrations

Under the sedimentation conditions which prevailed in lithological layers 12 and 12A, i.e. relatively slow accumulation of fine-grained silt, it appears that the main attribute of *in situ* hearths is the specific stratigraphical sequence of burnt material. The composition of different kinds of burnt material in clearly limited areas, such as the crusts of burnt sediments and overlying sooty/ashy sediments, provides the best evidence that the excavated object was a hearth. The presence of burnt bones and artefacts within the sooty/ashy sediments is also relatively important, although this attribute is of a more supplementary character. Another variation of hearth preservation at Kabazi V is represented by irregularly shaped, but still well stratified, hearths with a dispersed sooty tail area. In most of these features the direction of the dispersal, i.e. of the tail area, corresponds to the gradients of the living surfaces (Fig. 2-3; 2-7; 2-8; 2-9; 2-10). This might indicate that erosion and gravitation were the main agents in post-depositional disturbance. On the other hand, the appearance on the same living surface of clearly limited hearths (Fig. 2-1; 2-2; 2-3; 2-6) might suggest the importance of trampling as an additional agent of post-depositional disturbance.

Archaeozoological studies of level III/2 fauna have demonstrated that even thin levels could comprise several occupational episodes of both humans and carnivores (Chabai, Patou-Mathis 2006), and that each of the human visits was the result of one hunting event, which could occur in different seasons. In level III/2 the undisturbed and the partly disturbed hearths are situated at a distance of just 47 cm from one another (Fig. 2-3). Thus, it is very unlikely that both were in use at any one particular point in time. In such palimpsests it is evident that the later (youngest) hearth has higher chances of preservation in its primary context. For example, the well preserved hearth in squares 7В/7Г remained intact, while the earlier hearth in square 8В was trampled by the last visitors to the site during this occupation period. The same scenario might also apply to occupations in levels III/1, III/3, and III/1A (Fig. 2-1; 2-2; 2-6).

The majority of hearths are characterised by rather conservative dimensions, with thicknesses rarely reaching 3 cm. The only exception is the deepened hearth from level III/5-3В, square 8Б, which produced 6 cm thick deposits of both sooty silt and burnt crust. The maximum length and width of hearths ranges between 37 and 46 cm, and 20 and 46 cm, respectively. Again, the exceptions come from sub-unit III/5 (Fig. 2-4; 2-5). The hearth from level III/5-3В, squares 7В, 7Г, 8В, 8Г (length: 113 cm; width: 104 cm) and the hearth from level III/5-3В2 (diameter: 119 cm) demonstrate parameters at least twice the size of hearths from sub-units III/1, III/2 and III/3. Also, a number of hearths from sub-unit III/5 show evidence that wood was burned for fuel (calcite ash and charcoal in hearths from levels III/5-3В, squares 7В, 7Г, 8В, 8Г and III/5-3В2, squares 7В, 7Г, 8В, 8Г). On the other hand, in the hearth and disturbed hearths from levels III/1A, square lines Б, В, Г and III/2, square 7В/7Г and 8В/8Г, mammoth bones were used for fuel (Fig. 2-3; 2-6). In other words, the hearths where wood was burned are larger than those which were fuelled with bone. This conclusion is based on length and width dimensions, while the thicknesses for both wood and bone fuelled hearths are roughly the same. The differences in fuel observed in sub-units III/1, III/2 on the one hand, and sub-unit III/5 on the other, partly correspond with results from environmental studies. According to A. Markova, sub-unit III/5 accumulated during the period of forest-steppe landscapes, while the formation of sub-unit III/2 is associated with a steppe environment (Chapter 4, this volume). However, in sub-unit III/1, which at the time was characterised by forest-steppe landscapes, wood was not the chosen fuel, with mammoth bone still the preferred fuel.

Hearth dimensions, especially thickness, are thought to reflect the duration of these features. In this respect it is of interest to note that there are neither long term, nor reused hearths at Kabazi V. The simple (two bed) stratigraphical sequence in all hearths studied is suggestive of only short-term exploitation. Whereas a high degree of fragmentation of burnt bones is interpreted as evidence for a more prolonged exploitation of hearths (Stiner 1994, pp. 147-150), at Kabazi V relatively big pieces of burnt bones were recovered from hearths and tail areas/destruction zones. Even under the conditions with low rates of sedimentation visits were not frequent, and sterile sediments clearly separate hearths, which were sometimes placed in the same areas (Fig. 2-5). Thus, all hearths studied at Kabazi V are characterised by short periods of exploitation only.

The limited excavated area, as well as the permanent blurring effect of occupational palimpsests, does not permit a detailed study of spatial relations between hearths and concentrations of archaeological material. The only reliable conclusion from attempts made at such observations is that concentrations of artefacts and bones are usually found adjacent to either hearths or to their tail areas (Fig. 2-1; 2-2; 2-3; 2-4; 2-6; 2-7; 2-8; 2-10). Therefore, hearths appear to represent the centres of economic activity. Also, sometimes there are no pronounced

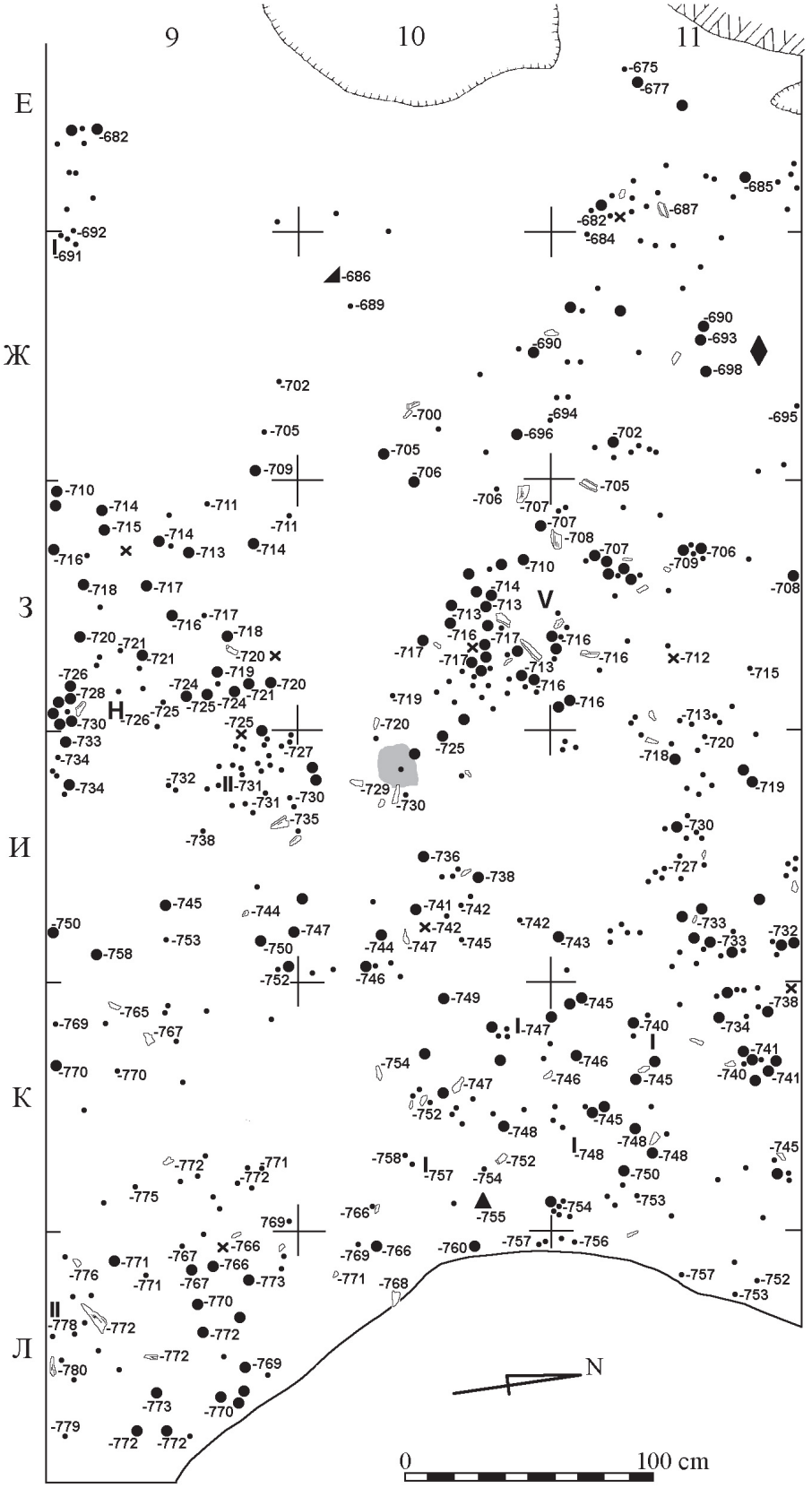


Fig. 2-14 Kabazi V, level IV/2: plan. For conventional signs see figure 2-1.

concentrations of archaeological material at all in the studied areas (Fig. 2-9). In some cases (see for example Fig. 2-3), it is very tempting to interpret these areas as backward toss zones, forward toss zones, and drop zones (Binford 1983). However, taking into account the palimpsest character of occupations it remains very difficult to provide convincing evidence for the temporal coexistence of hearths and concentrations of archaeological material around them.

Pits and Erosional Depressions

Repeated erosion of the sloping living surfaces resulted in the occurrence of a number of depressions, and was also responsible for a degree of post-depositional transportation of material. The main difference between artificially made pits and erosional depressions lies in the shape of the walls. Whereas artificially made pits display at least three more or less abrupt walls, erosional depressions are characterised by slightly sloping/shallow walls, with abrupt walls, if present, situated to the side of the depression where the slope gradient is at its highest. Both artificially made pits and erosional depressions acted as traps for sediment and archaeological material. Such agents as erosion, trampling and gravitation were responsible for post-depositional archaeological material transportation into erosional depressions and artificial pits. Depending on the trapped material, both pits and depressions are often mistakenly interpreted as "caches" of archaeological material or hearths.

Erosional depressions

Erosional depressions were discovered in levels III/1, III/5-3B, III/5-3, and III/4-5. This list might be extended by two bone and flint assemblages recovered from levels III/7-2 and III/7-3, which were defined as erosional channels filled with archaeological material (Chapter 1, Fig. 1-16, this volume).

The erosional depression in level III/1, square 8Б, is ovoid in shape and 68 cm long, 41 cm wide, and 3 cm deep (Fig. 2-1). Its wall can be described as slightly sloping. This depression was filled with light sooty silt, which included pieces of both burnt and unburnt bone and flint; similar finds were also excavated in neighbouring areas. To some extent, in plan this feature resembles a slightly deepened hearth. At the same time, however, the absence of a crust of burnt silt speaks against this interpretation.

An irregularly shaped depression was studied in level III/5-3B, in square 7B (Fig. 2-4). Its has a maximum length of 51 cm, a maximum width of 44 cm, and a maximum depth of 7 cm. This depression, the walls of which were slightly sloping, was filled with light sooty sediments and archaeological material. The latter includes a small cluster of finds comprising 281 chips, 7 flakes, 4 blades, 2 chunks, and 4 relatively big fragments of bone. Neither burnt flints nor burnt bones were found in this depression. The remaining 90% of square 7B produced 1,445 chips, 24 flakes, 4 chunks, 3 heavily burnt flints, and 8 unifacial tools. Thus, in 10% of the area belonging to this square 16.5% of flints from the whole area of square 7B had been trapped. No important finds, such as flint tools, cores, bifacial preforms, pebble or bone retouchers, were found in this erosional "cache".

The shape and size of the erosional depression in square 7B are very close to those attested for the deepened hearth in square 8Б (Fig. 2-4). The differences between them lying solely in the stratigraphical sequence of burnt material in the latter (see section Deepened hearths, this Chapter).

Two erosional depressions were found in level III/5-3 (Fig. 2-10). The largest of these was revealed in square 7Б; it is ovoid in shape with a long axis oriented west-east in line with the gradient of the living surface. This depression is 37 cm long, 26 cm wide and 3 cm deep. The depression was filled with light sooty sediments. Two flakes and 146 chips were recovered from this depression. More than one thousand chips, 6 flakes, one bifacial and 9 unifacial tools were found in the remaining part of square 7Б.

One more erosional depression was found in level III/5-3, square 9A (Fig. 2-10). It is round in plan, and has a maximum diameter of 12 cm; it is 2.5 cm deep. Seventy nine chips were trapped in this depression. In the remaining area of square 9A one unifacial and two bifacial tools, 14 flakes, two chunks and 433 chips were found. None of these artefacts were burnt, and no burnt material was identified in the erosional depression.

The erosional depression from level III/4-5, squares 8AA/8A, is of an ovoid shape and is 31 cm long, 23 cm wide, and 7 cm deep. Generally speaking, its walls can be described as slightly sloping (Fig. 2-13). The orientation of the long axis of this depression corresponds to the gradient of the assumed living surface. The depression was filled with light sooty silt in which a single heavily burnt flint was found. No burnt bones were found. Numerous artefacts were associated with the sooty deposits

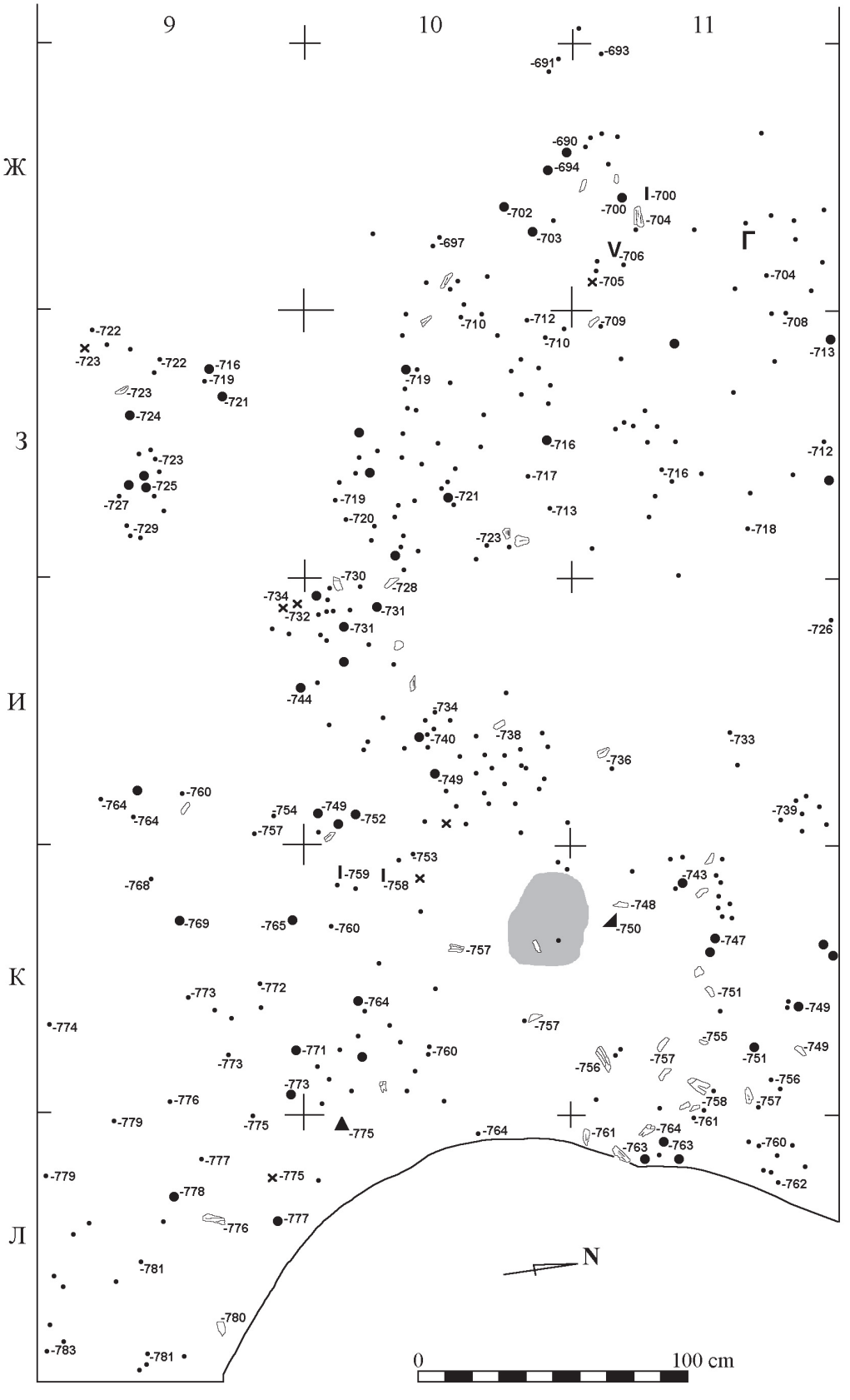


Fig. 2-15 Kabazi V, level IV/3: plan. For conventional signs see figure 2-1.

in this depression. These include 140 chips, 2 small chunks, 3 flakes, 2 unifacial tools, one preform of a bifacial tool, and one unidentifiable heavily burnt flint. At the same time, the adjacent areas are nearly void of flint artefacts, especially square 8AA. It should be noted that square 8AA is situated immediately above the erosional depression. Thus, the most likely scenario is that this rich "cache" of artefacts became trapped in the depression following transportation from further up the slope. Reasons for post-depositional transportation of artefacts on this 15.5° slope were probably gravitation and erosional processes.

Artificial pits

Four artificial pits were found in the two levels III/1A and III/4-2. Pits from level III/1A comprise two clearly artificial features and one problematic feature. The biggest pit was found in square 7A (Fig. 2-6), it is round and displays a maximum diameter of 49 cm; it has a maximum depth of 18 cm. All walls are abrupt. The wall and bottom of the pit conjoin in a near right angle. The stratigraphical sequence of the pit comprises three beds, from bottom to top these are: grained silt with some limestone gravel; dense sooty silt; and grained silt with some limestone gravel. The grained silt is the basic sediment for this level (Chapter 1, this volume). The thicknesses of the aforementioned beds vary in different parts of the pit. Generally, the thickness of each bed is equal to one third of the total thickness of the pit deposits (Fig. 2-6). A three-bed stratigraphy of pit deposits was also studied by G. A. Bonch-Osmolowski at Kiik Koba, upper level. He came to the conclusion that such a sequence is reflective of three periods of pit utilization (Bonch-Osmolowski 1940, p. 133). There are no differences between any of the defined beds in artefact densities or in artefact composition. Altogether, 280 artefacts were recovered from the pit (chips: 92.1%; flakes: 4.6%; blades: 1.7%; tools: 1.1%; and sandstone pebbles: 0.4%). The 1,739 artefacts from square 7A are represented by the following: chunks: 0.6%; chips: 87.8%; cores: 0.3%; preforms: 0.7%; flakes: 6.3%; blades: 0.8%; tools: 2.9%; and bone retouchers: 0.1%. In spite of the absence of some artefact categories in the pit assemblage, there is no significant difference between pit and square 7A flint collections. That is, there is no reliable evidence to suggest that the pit was deliberately filled with artefacts. Considering the stratigraphical sequence of the pit, it might be suggested that the pit became a trap for both sediments and archaeological material over a relatively long period of time. It would also appear that one of the main agents responsible for the filling up of the pit with sediments and artefacts was trampling. On the other hand, the pit stratigraphy, which is different from the stratigraphy of the neighbouring area, substantiates the palimpsest character of level III/1A.

The next pit in level III/1A was found in square 7B (Fig. 2-6). It has an irregular shape and measures 37 cm long, 31 cm wide and 11 cm deep. The western, southern and eastern walls are abrupt, while the northern wall is slightly sloping. The transition from the western, southern and eastern walls to the bottom of the pit is rounded. The pit was filled by the same sooty silt as was found in nearby squares of level III/1A. The pit was "covered" by a flat limestone boulder of trapezoidal shape (*max* length, 18 cm; *max* width, 16 cm; *max* thickness, 4.5 cm). Beneath this boulder were found 36 chips, 1 flake, 1 fragmented convex scraper, 14 small pieces of tube bones, and one tooth from a young mammoth. These finds were dispersed through the entire depth of the pit deposits and did not appear to lie on clear surface(s). About 3 cm of sooty silt was found between the mammoth tooth and the limestone "cover". This means that the artefact and fauna materials are not contemporaneous. It is difficult to assume a deliberate character of the archaeological material found in this pit.

The last pit found in level III/1A was revealed in square 7AA (Fig. 2-6), and is the most problematic regarding its interpretation. It is nearly round in shape and displays a maximum diameter of 29 cm; it is 8 cm deep. Its walls are semi-abrupt, and the transitions from the walls to the pit bottom are rounded. As such, these attributes place this feature somewhere between erosional depressions and artificial pits. The pit was filled with light sooty silt. Collections of artefacts (chips, a flake and a bifacial tool fragment) and the fauna assemblages recovered from this pit and from neighbouring squares are very much homogeneous.

The most impressive pit with respect to its content is that discovered in level III/4-2, square 9AA (Fig. 2-12).This ovoid shaped pit, which is 29 cm long, 18 cm wide, and 7 cm deep, has semi-abrupt walls and a rounded bottom. This pit was densely packed with artefacts, which comprised 2,735 chips, 44 flakes, and 7 blades. This *debitage* is the waste, which originates from a single bifacial perform. A more detailed description of these artefacts is provided in Chapters 10 and 16, this volume. Considering the completeness of a refitted bifacial preform cover from this pit, it may be assumed that this material was carefully collected on some kind of bedding and then carried to the pit into which it was then

deposited. Also, the completeness of the preform cover does not suggest that post-depositional transportation was involved. It is of particular note that there is not a single refit between the artefacts from the pit and artefacts recovered from level III/4-2. Only one question remains with regard to this pit: Why did the waste from the production of this bifacial preform need to be so carefully hidden?

Summary: pits and erosional depressions

At least three abrupt/semi-abrupt walls appear to be the most reliable attribute in the identification of artificial pits. The small sizes of pits do not suggest any other use than as caches. At least in one case, in level III/4-2, square 9AA, this suggestion could be substantiated.

Discussion

In the Crimean Middle Palaeolithic artificial pits are associated with Micoquian occupations, while hearths are characteristic for both Micoquian and Levallois-Mousterian levels. There are two main types of pits in the Crimean Micoquian: small pits and large pits. Small pits contain either deliberately hidden artefacts or became filled by the same archaeological material as was found in nearby areas of the living surface. Yu. G. Kolosov also reported caches which he found in Zaskalnaya V and Zaskalnaya VI. In Zaskalnaya VI, layer II, square 32A, near the back-wall of the rock-shelter, a rounded pit with a V-shaped profile (diameter: 20 cm; depth: 5 cm) was discovered. In this pit were found eight bifacial tools (Kolosov 1986, p. 19, fig. 4). In Zaskalnaya V, layer III, square 12Д, another rounded pit was exposed (diameter: 18 cm; depth: 3 cm). This pit contained 84 flakes and chips. According to Kolosov, all had been flaked from just one nodule (Kolosov 1983, p. 70). Also, some erosional depressions and artificial pits are known from Zaskalnaya VI, layer IV (Kolosov 1986, p. 52). All of these exhibit comparable shapes and dimensions to those discovered at Kabazi V. At Zaskalnaya VI, IV, pits and depressions were filled with archaeological material. However, there is no evidence that this archaeological material was deposited deliberately. An ovoid pit (length: 28 cm; width: 9 cm; depth: 14 cm) with an U-shaped profile was excavated at Chokurcha I, level IV-B, square 22Б (Chabai 2004a, pp. 349-350). Nothing special was found in it.

Three large pits (ovoid, rectangular and rounded) with abrupt walls were found at Kiik Koba, upper level (Bonch-Osmolowski 1940, p. 133-136). One of these contained the burial of a child; all others were filled with the same material as was encountered in the surrounding archaeological level. The lengths of these pits ranged from 70 to 140 cm, with widths between 80 and 100 cm; they were between 38 and 70 cm deep. Also, three large (one ovoid and two rounded) pits with slightly sloping walls were exposed at Kiik Koba, upper level. The diameters of these pits ranged from 100 to 150 cm, they were between 10 and 20 cm deep. The artificial character of these pits was proved by the presence of small spoil heaps which had accumulated when the pits were dug (Bonch-Osmolowski 1940, p. 134).

Hearths have been reported from numerous sites. Unfortunately, very rarely were these described in any detail, and it is even rarer that descriptions were accompanied by plans and profiles. The majority of the hearths known from the Crimean Middle Palaeolithic are of a simple type, as were all hearths studied at Kabazi V. The most probable candidate for deepened hearths comes from Kiik Koba, upper level; squares 15-16 (Bonch-Osmolowski 1940, p. 133), but the presence of burnt sediments below an ashy bed were not reported. Hearths surrounded by limestone boulders were found at Kabazi I and Prolom II, layer II (Formosov 1959b; Kolosov 1986). To summarise, a maximum of three types of hearth are known from the Crimean Middle Palaeolithic. Based on the available evidence it can be stated that during the Crimean Middle Palaeolithic there is no reliable evidence for the multiple exploitation, i.e. long-term usage, of hearths. Further, very thick hearth deposits and complicated hearth stratigraphies have never been reported.

All in all, Kabazi V occupations are characterised by high densities of artefacts, and the presence of pits and hearths. These suggest an intensive exploitation of the living surfaces at camp sites. On the other hand, the thicknesses of hearths, as well as their very simple two bed stratigraphy, are suggestive of short-term occupation events at Kabazi V.

Abstract

КАБАЗИ V: ОЧАГИ И ЯМЫ

ЧАБАЙ В. П., ВЕСЕЛЬСКИЙ А. П.

В культурных отложениях Кабази V обнаружено 8 очагов в первичном залегании, не менее 11 частично разрушенных очагов и многочисленные светло-серые сажистые скопления. Очаги представлены пятью простыми наземными (Fig. 2-1; 2-2; 2-3; 2-4; 2-5) и тремя углубленными (Fig. 2-4; 2-5; 2-6). Углубленные очаги размещены в эрозионных впадинах. Свидетельства преднамеренного углубления очагов не обнаружены. Пачки отложений очагов подразделяются на два слоя: черный сажисто-пепельный слой и залегающий под ним красноватый обожженный суглинок. Большинство очагов имеют овальную форму, их размеры варьируют в следующих пределах: длина от 37 см до 46 см; ширина от 20 см до 46 см; толщина от 2 см до 3 см. Несколько более крупные округлые очаги (диаметр >100 см) обнаружены в отложениях пачки горизонтов III/5.

Частично разрушенные очаги в плане представлены двумя вплотную расположенными скоплениями: черным сажисто-пепельным скоплением и светло-серым сажистым шлейфом (Fig. 2-3; 2-6; 2-7; 2-8; 2-9; 2-10). Под черным сажисто-пепельным скоплением залегает прослойка красноватого обожженного суглинка. В плане, чаще всего, оба скопления аморфны. Первое скопление – это частично разрушенный очаг, а второе – зона его разрушения. Основными причинами частичного разрушения очагов являются эрозионные, гравитационные и антропогенные факторы. Метрические характеристики частично разрушенных очагов и очагов, найденных в первичном положении, практически сходны.

Многочисленные светло-серые сажистые скопления (Fig. 2-2; 2-3; 2-7; 2-11; 2-12; 2-13; 2-14; 2-15), как правило, представлены незначительными по размерам слабыми концентрациями обожженного материала. Вопрос об образовании светло-серых сажистых скоплений остается открытым.

Основным топливом для очагов горизонтов III/1A и III/2 служили кости мамонтов, а для очагов горизонтов III/5-2, III/5-3, III/5-3B2 – дерево. Как правило, площадь очагов, в которых использовалось древесное топливо, несколько больше. Исходя из характера обожженного материала, можно заключить, что температура горения в очагах редко достигала 750° С. Простая двухслойная стратиграфия, незначительная толщина, низкие температуры горения и отсутствие свидетельств переустройства очагов свидетельствуют об их кратковременном характере.

В Кабази V обнаружено 4 искусственные ямы (Fig. 2-6; 2-12) и 5 хорошо выраженных эрозионных углублений (Fig. 2-1; 2-4; 2-10; 2-13). Главное отличие искусственных ям от эрозионных углублений состоит в наличии у первых, как минимум, трех практически вертикальных стенок. Только в одной из ям были «найдены» намеренно «спрятанные» артефакты. В яме, обнаруженной в горизонте III/4-2 на квадрате 9AA (Fig. 2-12), были помещены 2735 чешуек, 44 отщепа и 7 пластин. На основании проведенного ремонтажа было доказано, что данные сколы были сняты с одной преформы двустороннего листовидного орудия (Глава 16, в данном томе). На раскопанной площади горизонта III/4-2 орудие или преформа обнаружены не были.

Высокая плотность кремневых и фаунистических находок, наличие очагов и ям указывает на то, что горизонты Кабази V являются лагерями с достаточно широким и разнообразным набором видов производственной активности. С другой стороны, толщина очагов и их двухслойная стратиграфия не предполагают длительного использования данных поселений.

Chapter
3

Luminescence Analyses (OSL and TL) and AMS Radiocarbon Determinations from Kabazi V

Rupert A. Housley, David C. W. Sanderson, Chris I. Burbidge, Daniel Richter & Tom F. G. Higham

Kabazi V was one of a number of Crimean Middle Palaeolithic sites included in the Natural Environment Research Council's EFCHED (Environmental Factors in the Chronology of Human Evolution and Dispersal) initiative (Housley *et al.* 2006). The site was visited in the summer of 2004 and a series of samples was taken for optically-stimulated luminescence (OSL), thermoluminescence (TL) and AMS radiocarbon age determination. Analysis of the samples took place in 2005-2006. This paper reports the findings of these scientific analyses and compares the results with previous analyses that used different geochronology methods.

Introduction and Sampling

The archaeological, stratigraphic and environmental contexts of this site have been outlined in the publications of Alexander Yevtushenko and in chapters to this monograph by other contributors, and will not be reiterated here (Yevtushenko 1998a, 1998b; Chapters 1, 4, 5, this volume). Based on these previous studies it is clear that the sediments in the buried rock shelter of Kabazi V derive mainly from two principal sources, the hard nummulitic limestone which forms the top of the second ridge cuesta of the Crimean Mountains, and from the weathering of the softer clays and fossiliferous clays that underlie the nummulitic limestone (C. R. Ferring, in Yevtushenko 1998, 274). Several beds of these clays contain abundant nummulitic fossils which were released upon weathering and are contained as clasts within the shelter sediments. It is thus possible that an appreciable proportion of the sedimentation on the site derives from autochthonous sources, from the in situ weathering of the cave roof and walls. However, in determining if optical luminescence dating could be applied successfully to the deposits of the site it is the nature of the allochthonous sediments that is likely to be of more importance, for only if the dated minerals had undergone sufficient exposure to light during transportation will the luminescence signal have been reset to permit successful photo-stimulated dating. Determination of such circumstances was therefore a priority.

Sixteen small OSL profiling samples (in the sense of Burbidge *et al.* 2007) were taken from a vertical profile in 2004. Sampling extended from the base of lithological layer 10 to the upper part of 14B, at c. 10 cm vertical intervals in a column c. 20 from the vertical line separating grid squares 6Б and 6В, such that each stratum was sampled at least once. In all cases, loose material was scraped from the cleaned section into zip lock bags while shaded by a reflective blanket. The purpose of the profiling samples was to survey the suitability of the sediments for a fully quantitative OSL analysis.

Given the many uncertainties that could potentially jeopardize the successful application of OSL in such a sedimentary setting, alternative dating strategies had also to be considered. The need to cross-correlate with other methodologies also determined the need to apply other dating techniques to the site. Although it was realised that the periods of hominin activity at Kabazi V may lie beyond the upper limit of the radiocarbon methodology, it was deemed important to sample for ^{14}C especially since ^{14}C analyses had not previously been undertaken from the site. A series of six radiocarbon samples was taken from the same cleaned exposed section at Kabazi V as the other samples. These were associated with archaeological levels III/1A, III/1, III/4-5, III/5-3B1 and IV/3. A range of material was selected for dating: burnt bone, bone with or without cut-marks, and charcoal (Table 3-1).

Within the cultural horizons other materials amenable to scientific dating were observed – including heated stones that were possibly suitable for thermoluminescence if of sufficient mass. From the sampled section (grid SW, square 6Б) several lithic clasts, which appeared to have been heated sufficiently, were removed. Unfortunately only two potentially heated clasts of sufficient mass could be found, one of flint and the other of limestone. Both originated from the same archaeological level III/1A (Table 3-2). Despite the poor size of this assemblage the clasts were taken on the understanding they could form a pilot study. Associated field dosimetry readings were made on the surface of the exposed section from where the burnt stones derived in order to help understand the γ dosimetry of the site.

Field sampling for quantitative OSL dating was also undertaken on the understanding that the samples could only be dated were the results of the profiling indicated that conditions were right. Quantitative OSL sampling entailed the removal of larger steel tube samples (2 cm diameter, 20 cm length), coupled with a set of environmental dosimetry measurements from the sampling holes. The four large OSL samples came from a vertical section to the left of the profiling positions (section SW, square 6B) and encompassed a series of archaeological levels III/1A, III/4, III/5-3 and IV/1 (Tables 3-2 and 3-4; Fig. 3-1).

Dating was undertaken in separate geochronology laboratories: the OSL profiling and laboratory gamma dosimetry measurements were made in the SUERC at East Kilbride, Scotland; the TL analysis of the heated stones was undertaken in the Department of Human Evolution, Max-Planck-Institute in Leipzig, and AMS ^{14}C was made in the Oxford University Radiocarbon Accelerator Unit.

Sample No.		Lab No.	Arch. Horizon	Square, Geol. Layer	x	y	z	Material
EFD4C	419	-	III/1A	Sq. 6Б, layer 12			-509	Cut-marked bone
EFD4C	420	OxA-X-2134-45	III/1A	Sq. 6Б, layer 12			-520 to -525	Burnt bone
EFD4C	421	-	III/1	Sq. 6Б, layer 12			-492	Bone
EFD4C	435	-	III/4-5	Sq. 7Б, layer 12	3	36	-590	Bone
EFD4C	436	OxA-14726	III/5-3B1	Sq. 7В, layer 12				Charcoal
EFD4C	437	-	IV/3	Sq. 11Ж	25	35	-704	Bone

Table 3-1 Accelerator Mass Spectrometry (AMS) ^{14}C samples from Kabazi V.

Sample No.		Lab No.	Arch. Horizon	Square, Geol. Layer	Sample Type	Depth (cm)
EFD4L	260	SUTL 1666	III/1A	Sq. 6В, layer 12	OSL tube	-530
EFD4L	261	SUTL 1667		Sq. 6В, layer 12	OSL tube	-593
EFD4L	262	SUTL 1668		Sq. 6В, layer 12A	OSL tube	-625
EFD4L	263	SUTL 1669		Sq. 6В, layer 14A	OSL tube	-646
EFD4L	264	SUTL 1664	III/1A	Sq. 6Б, layer 12	TL burnt flint (18.95g)	-522
EFD4L	265	SUTL 1665	III/1A	Sq. 6Б, layer 12	TL burnt limestone (17.34g)	-519
EFD4L	276	SUTL 1663\1		Sq. 6Б, layer 10	Profile black bag	-480
EFD4L	277	SUTL 1665\2	III/1	Sq. 6Б, layer 12	Profile black bag	-496
EFD4L	278	SUTL 1665\3		Sq. 6Б, layer 12	Profile black bag	-499
EFD4L	279	SUTL 1665\4		Sq. 6Б, layer 12	Profile black bag	-515.5
EFD4L	280	SUTL 1665\5	III/1A	Sq. 6Б, layer 12	Profile black bag	-522.5
EFD4L	281	SUTL 1665\6		Sq. 6Б, layer 12	Profile black bag	-529.5
EFD4L	282	SUTL 1665\7		Sq. 6Б, layer 12	Profile black bag	-537.5
EFD4L	283	SUTL 1665\8	III/2	Sq. 6Б, layer 12	Profile black bag	-543.5
EFD4L	284	SUTL 1665\9		Sq. 6Б, layer 12	Profile black bag	-548.5
EFD4L	285	SUTL 1665\10		Sq. 6Б, layer 12	Profile black bag	-555.5
EFD4L	286	SUTL 1665\11		Sq. 6Б, layer 12	Profile black bag	-566
EFD4L	287	SUTL 1665\12		Sq. 6Б, layer 12	Profile black bag	-582 to -587
EFD4L	288	SUTL 1665\13		Sq. 6Б, layer 12	Profile black bag	-604 to -608
EFD4L	289	SUTL 1665\14		Sq. 6Б, layer 12A	Profile black bag	-624 to -627
EFD4L	290	SUTL 1665\15		Sq. 6Б, layer 14A	Profile black bag	-638 to -643
EFD4L	291	SUTL 1665\16		Sq. 6Б, layer 14B	Profile black bag	-652 to -656

Table 3-2 Luminescence samples from Kabazi V.

Luminescence Profiling

Methodology

A luminescence age is calculated by dividing the radiation dose absorbed by a sample during its burial, by the average dose rate to it during that time, so absorbed dose is a proxy for age. The absorbed dose is actually measured as the laboratory administered dose that produces a signal equivalent to the natural signal, hence the term equivalent dose (D_e). The term "luminescence sensitivity" is here used to mean the luminescence signal (I) measured per unit absorbed dose (D). This is a relative measure, since besides being a product of equipment, set-up, and type of measurement I varies as a function of D. The relationship can generally be approximated by a saturating exponential function, which is produced as the traps storing the latent luminescence signal become filled as the sample is exposed to more radiation. In the present study, infrared light (at a mean wavelength of 880 nm), blue light (at 470 nm), and heat were each used to stimulate luminescence signals (I) from the samples. Following convention, these signals are termed infrared stimulated luminescence (IRSL), optically stimulated luminescence (OSL), and thermoluminescence (TL) respectively.

Luminescence profiling aims to rapidly produce a stratigraphically detailed survey of a site (Burbidge *et al.* 2007). The objectives are to assess the presence and suitability of particular minerals/grain-sizes/signals for full luminescence dating measurements, and to provide a record of variations in luminescence and related characteristics that can be integrated with archaeological and sedimentological interpretations.

Sample				Equivalent Dose						
				Polymineral Fine			Polymineral Coarse			HFECoarse
	Field No	Archaeological		IRSL	Post-IR OSL	Post-IR&OSL TL	IRSL	Post-IR OSL	Post-IR&OSL TL	OSL
SUTL	EFD4L#	Context	Ali	(Gy)	(Gy)	(Gy)	(Gy)	(Gy)	(Gy)	(Gy)
1663 a	276	Layer 10	1	88 ± 23	13.2 ± 5.2	131 ± 18	96.7 ± 3.3	96.2 ± 8.0	204 ± 4	±
			2	132 ± 32	37.6 ± 8.3	209 ± 20	81.0 ± 1.8	77.0 ± 2.9	136 ± 2	±
b	277	Layer 12, III/1	1	137 ± 65	38.7 ± 7.6	109 ± 11	63.3 ± 1.9	52.5 ± 2.3	109 ± 2	74.1 ± 9.9
			2	145 ± 45	55.1 ± 16.5	104 ± 11	101 ± 3	113 ± 4	218 ± 4	±
c	278	Layer 12	1	90 ± 17	37.2 ± 10.1	216 ± 39	61.4 ± 2.6	48.1 ± 3.4	92 ± 2	
			2	84 ± 18	44.3 ± 14.4	163 ± 31	68.5 ± 2.2	96.7 ± 3.8	107 ± 2	±
d	279	Layer 12	1	117 ± 35	29.9 ± 5.3	131 ± 14	69.7 ± 1.7	52.6 ± 2.5	143 ± 3	63.8 ± 4.3
			2	109 ± 21	3.9 ± 5.7	87 ± 7	61.4 ± 1.4	65.0 ± 2.7	167 ± 3	41.7 ± 5.6
e	280	Layer 12, III/1A	1	68 ± 16	32.0 ± 6.3	134 ± 15	115 ± 3	75.5 ± 2.5	288 ± 5	53.7 ± 4.0
			2	95 ± 20	24.4 ± 5.0	172 ± 26	85.0 ± 1.7	64.1 ± 1.8	190 ± 3	61.5 ± 3.5
f	281	Layer 12	1	114 ± 25	18.0 ± 5.7	93 ± 9	70.5 ± 2.1	58.0 ± 2.7	129 ± 2	±
			2	109 ± 22	22.5 ± 9.3	70 ± 9	64.2 ± 1.2	89.3 ± 5.5	233 ± 4	±
g	282	Layer 12	1	141 ± 40	22.2 ± 8.5	138 ± 19	269 ± 11	225 ± 18	334 ± 7	±
			2	134 ± 49	15.4 ± 5.1	154 ± 26	249 ± 7	196 ± 13	330 ± 7	±
h	283	Layer 12, III/2	1	164 ± 23	57.5 ± 7.4	155 ± 12	78.5 ± 3.0	68.7 ± 4.6	110 ± 2	56.1 ± 2.2
			2	155 ± 18	47.6 ± 7.6	139 ± 10	82.4 ± 2.1	82.3 ± 4.8	127 ± 2	40.5 ± 1.6
I	284	Layer 12, III/3&4	1				94.7 ± 1.9	92.0 ± 2.5	145 ± 3	33.5 ± 0.9
			2				66.3 ± 1.4	72.5 ± 2.6	139 ± 2	48.2 ± 1.3
j	285	Layer 12, III/3&4	1		72.8 ± 69.0		79.2 ± 1.7	91.0 ± 3.1	138 ± 2	36.9 ± 3.2
			2	2 ± 44	9.1 ± 28.3		75.7 ± 1.7	83.9 ± 2.9	181 ± 3	41.4 ± 2.5
k	286	Layer 12, III/3&4	1	237 ± 68	39.0 ± 7.5	113 ± 10	49.5 ± 1.4	76.8 ± 1.5	114 ± 2	±
			2	163 ± 46	32.5 ± 4.8	133 ± 11	66.2 ± 1.4	68.2 ± 2.3	157 ± 3	±
l	287	Layer 12, III/3&4	1	140 ± 55	-7.7 ± -9.4	129 ± 20	93.6 ± 2.2	65.6 ± 2.2	161 ± 3	143 ± 50
			2	127 ± 76	-6.0 ± -9.7	251 ± 110	74.5 ± 1.5	73.8 ± 2.9	141 ± 2	60.3 ± 5.1
m	288	Layer 12, III/3&4	1	64 ± 15	43.7 ± 8.6	113 ± 13	67.8 ± 2.2	42.0 ± 1.9	135 ± 3	±
			2	37 ± 19	70.9 ± 25.1	900 ± 1339	105 ± 3	87.3 ± 4.3	118 ± 2	±
n	289	Layer 12A, III/5	1	51 ± 17	52.3 ± 20.7	284 ± 93	78.5 ± 1.6	94.1 ± 3.7	248 ± 4	±
			2	74 ± 30	13.2 ± 13.0		57.4 ± 1.7	43.9 ± 2.0	90 ± 2	±
o	290	Layer 14A, IV/4	1	3 ± 11			196 ± 4	188 ± 9	359 ± 7	53.1 ± 9.2
			2			459 ± 238	147 ± 3	208 ± 7	298 ± 5	
p	291	Layer 14B, V	1	241 ± 50	68.5 ± 22.1	386 ± 44	240 ± 5	304 ± 9	459 ± 8	80.4 ± 9.7
			2	333 ± 187	31.1 ± 9.2	417 ± 59	173 ± 3	178 ± 7	360 ± 6	53.4 ± 4.0

Table 3-3a Equivalent dose estimates for polymineral, polymineral coarse, and etched (quartz) fractions from Kabazi V, in Grays (Gy).

Preparation of the profiling samples produced three separate mineral/grain-size fractions that would be analysed for a number of properties:

1. Polymineral sand-sized fraction ("polymineral coarse", PMC)
2. Quartz enriched sand sized fraction ("hydrofluoric-etched coarse", HFC)
3. Polymineral silt-sized fraction ("polymineral fine", PMF)

To produce these fractions preparatory treatments were applied to approximately 5 g of bulk sample (for details of the procedures see Fig. 3-2). The samples were initially wet sieved, to reduce the chance of contamination by geological grains from limestone clasts. Carbonates were then removed from the 90-250 μm fraction using HCl acid, and after thorough rinsing in water to clean the grains, sufficient of the polymineral coarse material was

Sample				Sensitivity						
				Polymineral Fine			Polymineral Coarse			HFE Coarse
	Field No	Archaeological		IRSL	Post-IR OSL	Post-IR&OSL TL	IRSL	Post-IR OSL	Post-IR&OSL TL	OSL
SUTL	EFD4L#	Context	Ali	(cps/Gy)	(cps/Gy)	(cp°C/Gy)	(cps/Gy)	(cps/Gy)	(cp°C/Gy)	(cps/Gy)
1663 a	276	Layer 10	1	0.46 ± 0.10	1.81 ± 0.21	0.14 ± 0.02	10.1 ± 0.3	5.4 ± 0.4	6.0 ± 0.1	0.4 ± 0.1
			2	0.46 ± 0.10	1.53 ± 0.22	0.21 ± 0.02	46.8 ± 0.9	28.0 ± 0.9	21.7 ± 0.4	±
b	277	Layer 12, III/1	1	0.22 ± 0.10	1.61 ± 0.20	0.21 ± 0.02	17.3 ± 0.4	19.4 ± 0.6	8.1 ± 0.1	9.5 ± 0.3
			2	0.36 ± 0.10	0.84 ± 0.19	0.20 ± 0.02	25.0 ± 0.6	18.7 ± 0.6	5.9 ± 0.1	±
c	278	Layer 12	1	0.69 ± 0.11	1.19 ± 0.19	0.11 ± 0.02	7.5 ± 0.3	7.5 ± 0.4	3.3 ± 0.1	7.0 ± 0.2
			2	0.56 ± 0.10	0.86 ± 0.19	0.09 ± 0.02	13.7 ± 0.4	16.3 ± 0.5	6.9 ± 0.1	±
d	279	Layer 12	1	0.41 ± 0.11	2.27 ± 0.22	0.19 ± 0.02	30.3 ± 0.7	18.1 ± 0.6	9.9 ± 0.2	21.9 ± 0.5
			2	0.65 ± 0.11	1.50 ± 0.21	0.30 ± 0.02	41.2 ± 0.8	24.0 ± 0.8	16.0 ± 0.3	11.7 ± 0.3
e	280	Layer 12, III/1A	1	0.57 ± 0.10	1.85 ± 0.21	0.18 ± 0.02	32.8 ± 0.7	32.6 ± 0.9	14.7 ± 0.3	20.3 ± 0.5
			2	0.61 ± 0.11	2.24 ± 0.23	0.13 ± 0.02	77.8 ± 1.5	54.8 ± 1.3	21.9 ± 0.4	36.0 ± 0.7
f	281	Layer 12	1	0.55 ± 0.11	1.71 ± 0.21	0.22 ± 0.02	17.1 ± 0.4	16.8 ± 0.6	7.3 ± 0.1	±
			2	0.60 ± 0.11	1.03 ± 0.20	0.19 ± 0.02	105 ± 1.9	12.5 ± 0.6	18.8 ± 0.3	±
g	282	Layer 12	1	0.40 ± 0.11	1.14 ± 0.18	0.13 ± 0.02	5.6 ± 0.2	4.8 ± 0.3	4.1 ± 0.1	±
			2	0.30 ± 0.10	1.85 ± 0.20	0.11 ± 0.02	10.8 ± 0.3	6.0 ± 0.4	4.8 ± 0.1	±
h	283	Layer 12, III/2	1	0.91 ± 0.12	2.32 ± 0.23	0.29 ± 0.02	8.5 ± 0.3	7.4 ± 0.4	3.3 ± 0.1	107 ± 2.0
			2	1.12 ± 0.12	2.02 ± 0.22	0.32 ± 0.02	22.1 ± 0.5	9.9 ± 0.5	8.2 ± 0.2	98.7 ± 1.8
I	284	Layer 12, III/3&4	1	0.09 ± 0.09	0.56 ± 0.18	-0.02 ± -0.02	68.3 ± 1.3	51.3 ± 1.2	22.1 ± 0.4	277 ± 4.8
			2	0.01 ± 0.09	0.59 ± 0.17	0.00 ± -0.02	61.6 ± 1.2	31.6 ± 0.9	20.0 ± 0.3	298 ± 5.2
j	285	Layer 12, III/3&4	1	-0.03 ± -0.10	0.21 ± 0.16	0.02 ± 0.02	50.4 ± 1.0	30.1 ± 0.9	15.6 ± 0.3	21.9 ± 0.5
			2	-0.10 ± -0.09	0.29 ± 0.17	0.02 ± 0.02	45.0 ± 0.9	28.0 ± 0.8	12.9 ± 0.2	38.4 ± 0.8
k	286	Layer 12, III/3&4	1	0.42 ± 0.12	1.74 ± 0.21	0.24 ± 0.02	22.7 ± 0.5	170 ± 3.1	10.6 ± 0.2	±
			2	0.43 ± 0.11	2.72 ± 0.24	0.24 ± 0.02	61.2 ± 1.2	37.7 ± 1.0	16.7 ± 0.3	±
l	287	Layer 12, III/3&4	1	0.28 ± 0.10	0.90 ± 0.19	0.12 ± 0.02	34.5 ± 0.7	34.1 ± 0.9	14.9 ± 0.3	5.6 ± 0.2
			2	0.17 ± 0.10	0.76 ± 0.18	0.04 ± 0.02	73.2 ± 1.4	25.3 ± 0.8	19.6 ± 0.3	19.8 ± 0.5
m	288	Layer 12, III/3&4	1	0.56 ± 0.10	1.50 ± 0.20	0.18 ± 0.02	13.2 ± 0.4	19.2 ± 0.6	5.0 ± 0.1	±
			2	0.32 ± 0.10	0.62 ± 0.18	0.01 ± 0.02	22.9 ± 0.5	13.7 ± 0.6	7.4 ± 0.1	±
n	289	Layer 12A, III/5	1	0.43 ± 0.10	0.63 ± 0.19	0.06 ± 0.02	55.9 ± 1.1	26.4 ± 0.8	19.2 ± 0.3	±
			2	0.29 ± 0.10	0.63 ± 0.17	-0.03 ± -0.02	18.7 ± 0.5	19.1 ± 0.6	8.5 ± 0.2	±
o	290	Layer 14A, IV/4	1	0.40 ± 0.10	1.17 ± 0.18	-0.05 ± -0.02	28.2 ± 0.6	11.4 ± 0.5	9.6 ± 0.2	5.7 ± 0.2
			2	-0.09 ± -0.09	0.04 ± 0.17	0.03 ± 0.02	34.1 ± 0.7	33.1 ± 1.0	40.7 ± 0.7	4.2 ± 0.2
p	291	Layer 14B, V	1	0.51 ± 0.10	0.75 ± 0.19	0.16 ± 0.02	66.7 ± 1.3	33.6 ± 1.0	20.9 ± 0.4	14.1 ± 0.4
			2	0.18 ± 0.10	1.26 ± 0.19	0.12 ± 0.02	51.6 ± 1.0	21.6 ± 0.7	17.2 ± 0.3	28.5 ± 0.6

Table 3-3b Luminescence sensitivities, in photon counts per second per Gray from polymineral and etched quartz fractions from Kabazi V.

removed to make up three aliquots. The remaining material was HF etched to produce a quartz-rich fraction. The less than 90 μm fraction was settled in water for 2 mins and the suspended (less can c. 20 μm) fraction collected and centrifuged out for further processing. Approximately 2 ml of this was treated in H_2O_2 and HCl acid to remove organics and carbonates, and the undissolved material settled in acetone to isolate the 4-11 μm fraction, which was itself settled onto steel discs in acetone.

Two aliquots from each fraction were subjected to simple regenerative D_e determinations, using IRSL, post-IR OSL, and post-IR&OSL TL for the polymineral fractions, and sensitivity corrected OSL for the HF etched fraction. This rapidly produced large matrices of luminescence sensitivity and D_e values from top to base of the section, including paired reproducibility assessment.

Results

The results, plotted in stratigraphic order, are shown in Figs. 3-3a and 3-3b, together with a column showing the results of the field gamma spectrometry which indicate changes in dose rate down the section. The individual sample determinations are summarised in Tables 3-3a and 3-3b.

Little quartz was obtained from many of the samples, but what was recovered had similar, if variable, sensitivity to the polymineral coarse fraction. The fines were less sensitive for all signals. It is notable that the ashy level (III/1A) had similar sensitivity to sterile sediments above and below it. This indicates that the materials used for profiling were little affected by any heating.

The polymineral coarse fraction yielded the most consistent patterns in D_e: similar values were obtained through the section, except for the bottom (lithological layers 14A and 14B) and a single sample from just above archaeological context III/2 in lithological layer 12. IRSL and post-IR OSL gave values of c. 60-80 Gy for most samples, and c. 150-250 Gy for the exceptions. Post-IR&OSL TL values were around 1.5 times these, and increased scatter was evident in the upper section. Post-IR&OSL TL on the polymineral fine fraction yielded similar patterns and values to post-IR&OSL TL on the polymineral coarse fraction. However, D_e values from IRSL on the polymineral fine fraction varied from c. 50 to 150 Gy through most of the section, exhibiting variable results (c. 80-140 Gy) above archaeological context III/1A, a steady rise (c. 70-155 Gy) between III/1A and III/2, a decline to c. 50 Gy in lithological layer 12A, and then much higher values in layer 14. In the upper half of the section, post-IR OSL from the fines approximately mirrored the pattern of IRSL results but with much lower values (c. 15 – 40 Gy). Lower in the section post-IR OSL results were highly scattered. OSL measurements on the HF etched coarse fraction exhibit a decrease through the upper half of the section, from c. 70 Gy to c. 40 Gy. Results from below this are more scattered, but comparison of the D_e values of 50-80 Gy obtained from the lowermost layers with those from the polymineral fractions, indicates both that the HFC results may be strongly affected by saturation of the signal from quartz, and that the IRSL and post-IR OSL signals from the PMC fraction came from similar (non quartz) minerals.

Using alpha, beta and gamma dose rates calculated from full series parent radionuclide concentrations estimated by laboratory gamma spectrometry (Table 3-3a, 3-5), with correction for *in-situ* water content and the addition of an approximate cosmic ray dose rate of 0.15 mGy/a, many of the fractions and

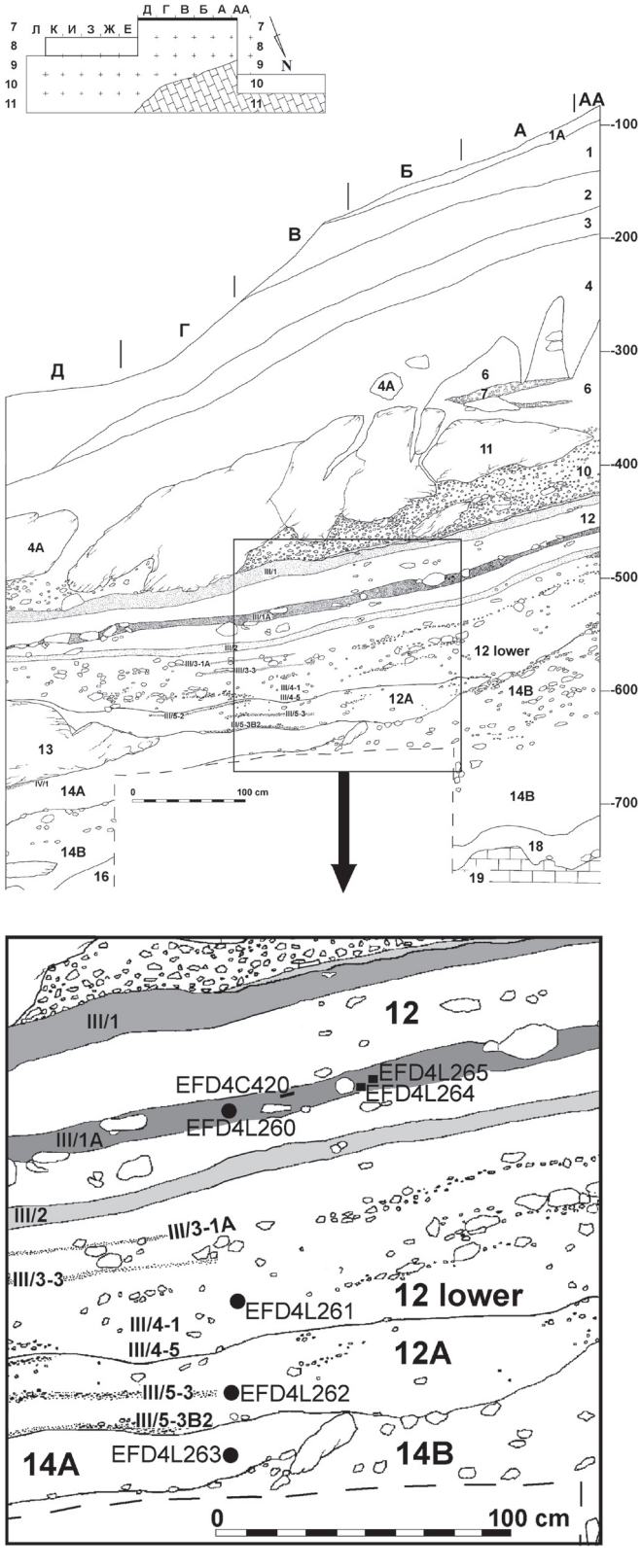


Fig. 3-1 Section at Kabazi V in 2004 showing position of OSL and TL samples in squares 6В and 6Б.

Kabazi V	**Field Gamma dosimetry results**					
Reference	Geometry (pi)	Measured dose rate /mGy a-1		Geometrically corrected dose rate /mGy/a		
EFD4G080	3.8	0.17	±0.01			Exploratory surface of section
EFD4G088	4	0.20	±0.01	0.20	±0.02	Hole associated with EFD4L260
EFD4G089	4	0.19	±0.01	0.19	±0.02	Hole associated with EFD4L261
EFD4G090	4	0.18	±0.01	0.18	±0.02	Hole associated with EFD4L262
EFD4G091	4	0.20	±0.01	0.20	±0.02	Hole associated with EFD4L263
EFD4G092	3.8	0.18	±0.01	0.20	±0.02	Surface layer III/1A
EFD4G093	3.8	0.17	±0.01	0.20	±0.02	Surface burnt flint EFD4L264
EFD4G094	3.8	0.18	±0.01	0.20	±0.02	Surface associated with EFD4L265
Mean		0.184		0.196		
Std Dev		0.012		0.008		
Std Err		0.004		0.003		

Table 3-4 Field gamma dosimetry results from Kabazi V.

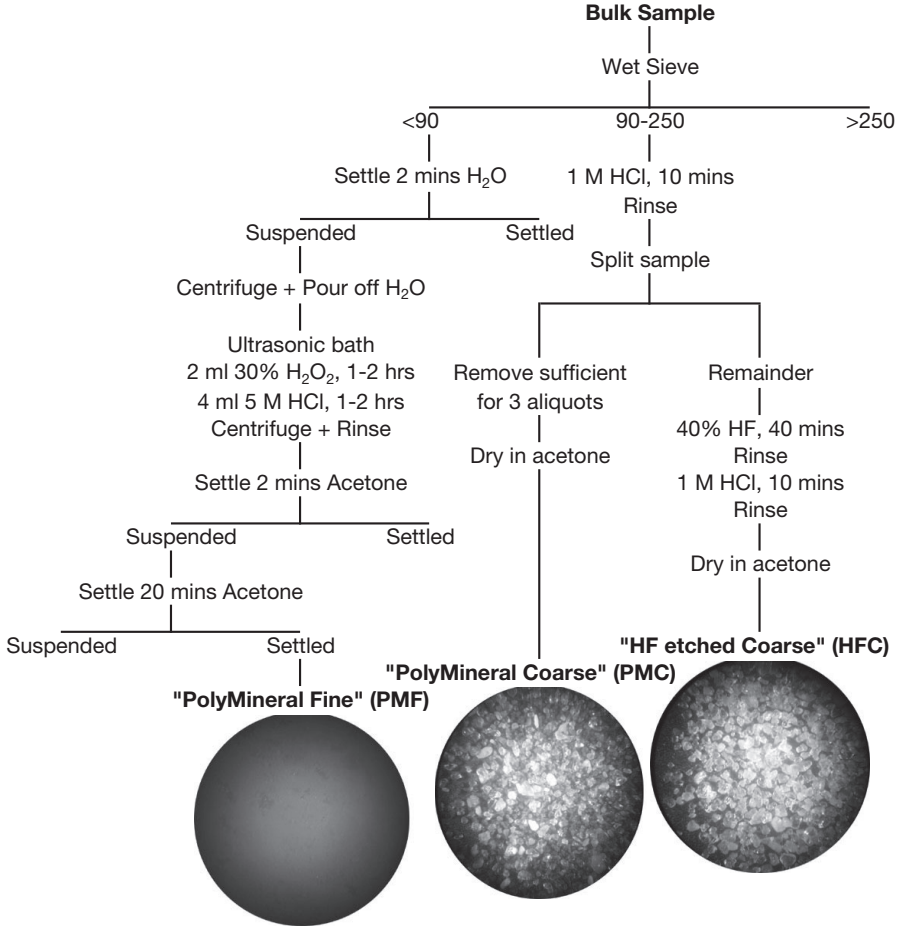


Fig. 3-2 Preparation of "polymineral fine", "polymineral coarse" and "hydrofluoric etched coarse" mineral/grain-size fractions from profiling samples.

signals indicate apparent ages in the range c. 60-100 ka for the majority of the section, and c. 200 ka for layer 14.

The results of luminescence profiling at Kabazi V present a dilemma, particularly with respect to data from the polymineral coarse fraction. High D_e values at the base and in one sample from the middle of the section indicate that the relatively consistent lower values from the majority of samples are not strongly affected by the inclusion of older (geological) material and/or residual signals. Limestone clast samples from the same geological formation were taken at Kabazi II. These yielded similar or higher D_e values than those from the base of the Kabazi V section. This implies that the OSL signals in the coarse grains of most samples from Kabazi V were reset in the 60-100 ka range of apparent ages. However, this is substantially older than most of the independent dating evidence. Also, the geomorphological context of these samples and their lack of progression in D_e with depth (until the base of the section) are consistent with the accumulation of material with residual luminescence age.

In summary then, profiling indicates that either OSL signals were bleached at deposition and layer 12 accumulated circa OIS 4, or that OSL signals were bleached c. OIS 4 and layer 12 accumulated later by reworking of this material without substantial light or heat exposure.

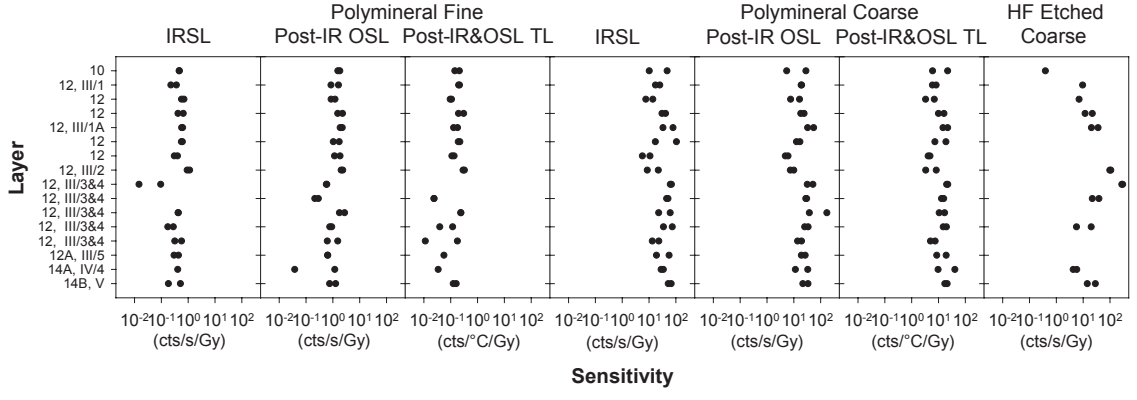


Fig. 3-3a Luminescence profiling results from Kabazi V, showing the sensitivity of the samples to luminescence (from Burbidge *et al.*, 2005, Fig. 5.5). Samples are plotted in stratigraphic order.

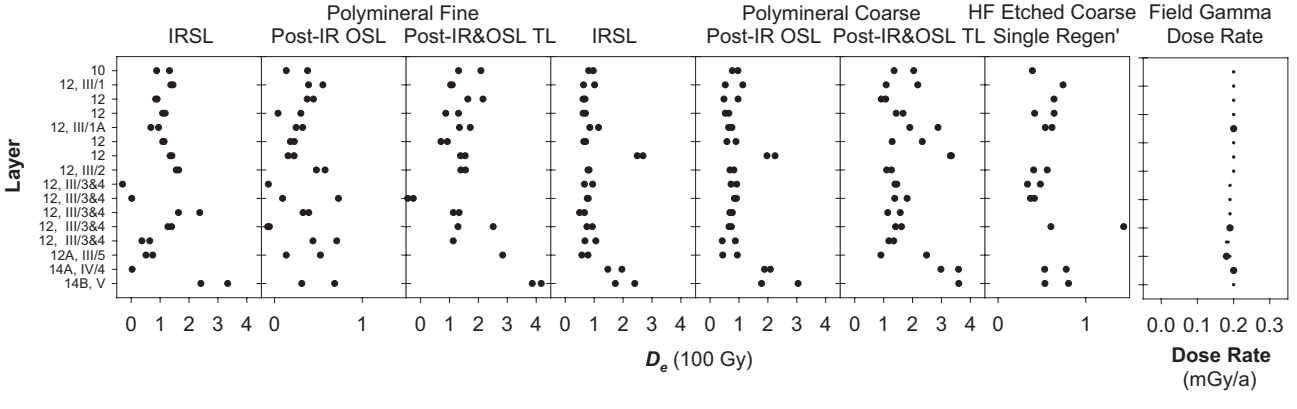


Fig. 3-3b Luminescence profiling results from Kabazi V, with field dosimetry results (from Burbidge *et al.*, 2005, Fig. 5.5). Samples are plotted in stratigraphic order. Note changes in D_e scale with mineral/grain size fraction. Smaller points in the plot of field gamma dose rate are interpolated values.

Sample	Potassium (%)		Thorium (ppm)		Uranium apparent concentration (ppm)								
			Full series		Full series		Pre-Radon		Post Radon		From ^{210}Pb		Water content (%)
SUTL1666	0.230	±0.02	1.622	±0.10	1.736	±0.08	3.723	±1.374	1.610	±0.09	1.13	±0.61	0.060
SUTL1667	0.230	±0.02	1.550	±0.05	1.682	±0.05	2.252	±0.650	1.632	±0.06	1.25	±0.44	0.050
SUTL1668	0.200	±0.02	1.584	±0.10	1.636	±0.08	1.742	±1.090	1.627	±0.11	1.30	±0.60	0.070
SUTL1669	0.320	±0.02	2.015	±0.06	1.672	±0.05	1.375	±0.580	1.703	±0.06	1.89	±0.44	0.100
Mean	0.245		1.692		1.682		2.273		1.643		1.39		0.070
Std Dev	0.051		0.216		0.041		1.03		0.041		0.34		0.024

Table 3-5 High resolution gamma spectrometry results from bulk samples associated with OSL sampling tubes.

Field dosimetry measurements

Gamma dose rates were recorded on site using a 2x2″ NaI scintillation probe and portable gamma spectrometer (Health Physics Instruments Rainbow MCA). Spectra were collected for 600s periods from eight measurement locations and were converted to dose rates using standard SUERC procedures. The instrument had been checked and calibrated using the doped concrete calibration pads at SUERC before commencement of fieldwork in July 2004, and was rechecked in September 2004 on conclusion of the fieldwork. Dose rates were estimated using three conversion methods (integral count rates > 450 keV, integral count rates >1350 keV and an energy integration method) and corrected for field geometry. The results are tabulated in Table 3-4. Readings EFD4G 088-91 were recorded in 4π geometry in the sample holes used to collect tube samples for possible luminescence dating; a further 4 observations were made with the detector presented to the face of the excavated stratigraphy, estimated to be in 3.8π geometry. Of these readings EFD4G 093 is in the position of the burnt flint sample EFD4L 264 which has been subjected to TL measurements at the Leipzig Max Planck Institute for Evolutionary Anthropology. From Table 3-4 it can be seen that the gamma ray does rates inferred from in-situ measurements are highly consistent from position to position, with a mean value of 0.196±0.008 mGy a^{-1}. The instrument calibration is believed to be accurate with a systematic uncertainty of approximately 10%, which should be taken into account in age estimation based on these data.

Laboratory gamma spectrometry

Bulk samples of sediments associated with OSL tube sampling were dried, ground, and analysed by high resolution gamma spectrometry at SUERC. From Kabazi V the four OSL tube sampling positions have been examined in this manner. Samples were sealed for >3 weeks after drying and grinding to allow Radon daughters to equilibriate, and then measured for periods of 25-100 ks in a shielded Ortec GMX detector of 50% relative efficiency. Gamma ray lines associated with ^{40}K and nuclides from the ^{238}U and ^{232}Th decay series were quantified and used to estimate radionuclide concentrations, scaled relative to an internal Shap Granite standard presented in similar form. Table 3-5 summarises the radionuclide parent concentrations. For the ^{40}K this was based on the gamma emission at 1462 keV; for the Th decay series on the weighted mean results from lines from ^{228}Ac, ^{212}Pb, ^{212}Bi, and ^{208}Tl; and for the U decay series on analysis of lines from ^{234}Th, ^{226}Ra (and ^{235}U), ^{214}Bi, ^{214}Pb, and ^{210}Pb. Results in Table 3-5 from the Th decay series are expressed as Th elemental concentrations based on full-series radioactive equilibrium. The K and Th concentrations are broadly consistent between samples, with slightly elevated concentrations in the bottom sample of the sequence (SUTL1669), and mean values of 0.245±0.05 % K and 1.69±0.22 ppm Th respectively. For the Uranium series apparent parent concentrations are also tabulated inferred from (i) the full series weighted according to the relative gamma ray emission intensities of all nuclides analysed, (ii) the pre-radon nuclides (lines from ^{234}Th and ^{226}Ra), (iii) post-radon nuclides (^{214}Bi and ^{214}Pb) and (iv) ^{210}Pb. The full series and post-Rn estimates are closely aligned (reflecting the dominant influences on precision obtained from the high intensity emissions from post-Rn U

series nuclides) with mean apparent concentrations of 1.68 and 1.64 ppm respectively. Estimated concentrations from the pre-radon nuclides show slightly higher values in the top two samples, which may reflect recent dissolved uranium deposition within the last few thousands years, in the limestone system of the site. Uranium concentrations based on ^{210}Pb are slightly lower with a mean value of 1.39 ppm and show increasing concentrations with depth, which are attributed to a greater probability of radon loss through diffusion to the surface in the upper layers compared with deeper samples.

Table 3-6 shows the gamma dose rate contributions from K, Th and U series based on the mean results of all samples, and taking the diverse U series apparent concentrations tabulated above. Also shown are total dose rate estimates from the full series, post radon and ^{210}Pb scenarios, both for the dry sample and for samples in wet condition, based on the weight losses recorded during sample drying. Dose rate conversions factors were based on those of Aitken (1983) and the water content correction formula of Aitken (1985).

Since the gamma spectrometry samples had been sealed prior to counting, thus avoiding radon loss under laboratory conditions, it is to be expected that full series estimates of the wet dose rates would be higher in general than gamma dose rates observed in the field. This is indeed so, with the mean value of 0.315 ± 0.018 being significantly greater than the field recorded value of 0.196 ± 0.008 mGy a^{-1}; however the difference between these estimates cannot be reconciled by radon loss alone. The predicted gamma dose rates based on the ^{210}Pb derived uranium estimates, which are arguably the most appropriate means of estimating average radon retention under field conditions, would lead to predicted gamma dose rates of 0.284 ± 0.04 mGy a^{-1}; again in excess of the observed field values. Noting that radon loss is greater for the upper samples than deeper layers, the total gamma dose rate predicted for the depth of sample SUTL1666 (corresponding to the same layer as the flint samples) is 0.258 ± 0.07 mGy a^{-1}; this is in slightly better agreement with the gamma results. However, the general pattern of observation is that the laboratory gamma analyses are associated with higher dose rate estimates than field observations by some 20 % or more even after consideration of water content and radon loss in the field. Given that the spatial response of the field measurements extends to 10-30 cm from the measurement position, and will include limestone clasts of all sizes present, whereas the laboratory sample originates from within approximately 5-10 cm of the sampling tube position and will have excluded the larger limestone clasts present on site, it is argued that the data imply an enhanced concentration of radionuclides in the finer fractions represented to a greater extent within the laboratory sample than the field observations.

On this basis the mean field dose rates are preferred as basis of estimates of the gamma dose rates to burnt flints and sediment samples undergoing luminescence dating. The laboratory gamma results provide additional information on the concentration variations with position on a finer scale than possible with the field instrument, and also give information about the recent movement of uranium in the upper layers sampled, plus the general state of radon retention under recent field conditions.

Sample	**Potassium**		**Thorium**		**Uranium**							
			Full series		Full series		Pre-Radon		Post Radon		From ^{210}Pb	
Dry Gamma dose rate /mGy a^{-1}	0.059	±0.013	0.087	±0.011	0.193	±0.005	0.261	±0.119	0.189	±0.005	0.160	±0.039
Total Gamma dose rate /mGy a^{-1}					0.339	±0.017			0.335	±0.017	0.306	±0.042
Wet Gamma dose rate /mGy a^{-1}					0.315	±0.018			0.311	±0.018	0.284	±0.040

Table 3-6 Gamma dose rate estimates for dry samples and wet matrices.

Thermoluminescence

Sampling

Two heated rock samples from a single layer at Kabazi V were submitted to the luminescence dating laboratory at the Department of Human Evolution at the Max-Planck-Institute for Evolutionary Anthropology, Leipzig, Germany for dating with thermoluminescent methods (Table 3-2). The macroscopic features that suggest an alteration of the samples by fire were the presence of surface cracking and 'potlid' structures (in sample EFD4L 264), and a grey surface colour (in EFD4L 265).

Sample EFD4L 265 was a limestone fragment that appears to have been heated. Currently there is no established preparation method for dating such material since the few studies which have investigated the TL dating potential of such samples (e.g. Roque et al., 2001) have reported ambiguous results. For this reason no further work was undertaken on this sample.

Sample preparation

Sample EFD4L 264 was prepared for TL-dating by stripping off the outer 2 mm layer with a low speed water cooled diamond saw. This removes parts which might have been bleached and all parts of the sample which had been exposed to α and β-radiation from the surrounding sediment. These radiations thus can be excluded from the age calculation, which improves the precision of the resulting ages. The remaining material was gently crushed in a hydraulic steel mortar. About 200 mg of powder were used for measurements of radioactive element concentrations by ICP-MS (Inductively-Coupled-Plasma Mass-Spectrometry) and INAA (Instrumental Neutron Activation Analysis). The grain fraction of 90-160 μm for the determination of the palaeodose was then obtained by sieving, while the fine grain of 4-11 μm material for alpha sensitivity measurements was prepared after Zimmermann (1971).

Testing for sufficiency of heating for TL-dating

In general prehistoric heating temperatures in excess of about 400°C (Melcher & Zimmerman 1977) are necessary for a successful application of the TL-dating method to heated flint samples. To ascertain that this had happened, a small sub-sample was removed from the edges of the clast. Crushed, sieved and treated with HCl the resulting grains were mounted on a set of four discs to test for the sufficiency of heating for TL analysis before the entire sample was subjected to the rather time consuming (and destructive) full dating procedure. Two of the sets of four discs received a β-dose and the resulting TL glow curve of all the discs from the one sample is shown in Fig. 3-4.

For TL dating only signals above approximately 300°C are of interest. This is because the stability of the signal below this temperature is not sufficiently good to be applied to samples from this time period. Sample EFD4L 264 showed a natural TL peak (NTL in blue) at around 360 °C. Additional β-irradiation increases the TL signal proportionally over the temperature range of the peak, thus providing a heating plateau (ratio of NTL+β/NTL) over the TL-peak (Fig. 3-5). This feature shows that the sample had undergone sufficient ancient heating for the TL-signal to be zeroed making it suitable for TL dating. The heating plateaus include the NTL peak and produced values in the order of about 345 - 400 °C (Fig. 3-5).

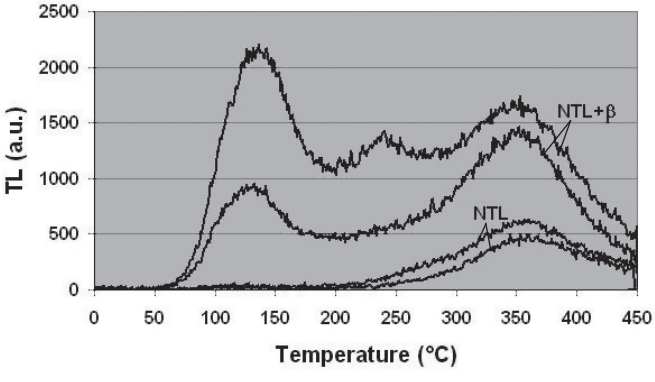


Fig. 3-4 TL glow curve of test measurements.

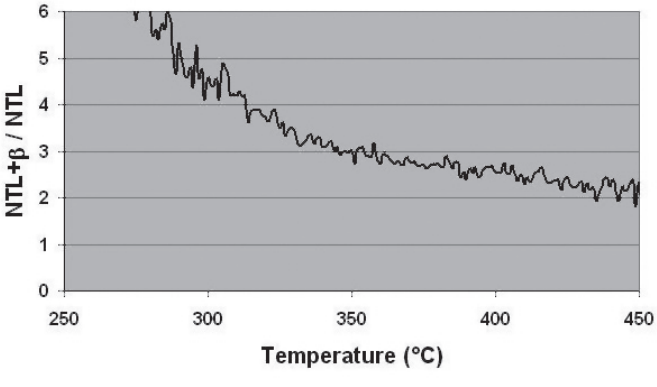


Fig. 3-5 Heating plateau test (ratio NTL+β NTL) for the test analysis.

Part of the 90-160 μm fraction was heated in a furnace to 360°C for 90 min under air to provide thermally zeroed material for establishing a regenerated TL growth curve. Chemical preparation with 10% HCl and the use of a defloculant in the case of the coarse grains completed the sample preparation.

TL measurements were performed in a N_2 atmosphere in a Risø DA-15 system, with a bi-alkala photomultiplier tube, with the detection restricted to the UV-blue region by a Schott BG25 and a Hoya HA-30 filter. A heating rate of 5 °C s^{-1} to 450 °C was employed with immediate background subtraction.

Samples were β-irradiated in the Risø DA-15 system with a calibrated $^{90}Sr/^{90}Y$-source (about 0.109 Gy s^{-1}), while α-irradiations were done in a Littlemore 721A under vacuum with six ^{241}Am sources, calibrated to about 0.187 μm^{-2} min^{-1}. Irradiated samples were stored for 3-4 weeks at room temperature before being TL measured.

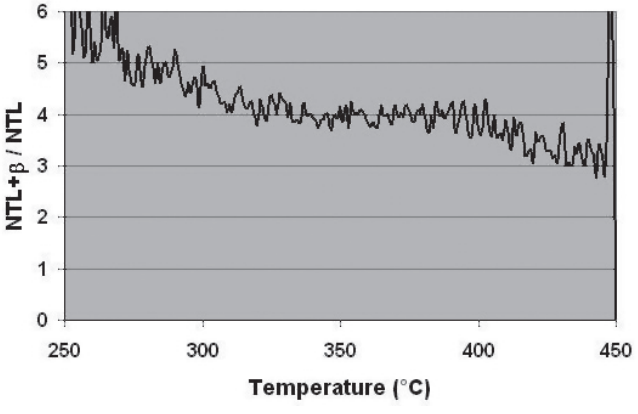


Fig. 3-6 2nd heating plateau test (ratio NTL+β NTL) for the interior of the flint sample.

Second test for sufficiency of heating

Next the heating plateau test was repeated using material from the extracted core in order to verify that the interior of the sample had been sufficiently heated thus ensuring that the TL-signal was completely zeroed (Fig. 3-6). The heating plateau is similar to the one obtained from material from the edge of the sample and indicates the sufficiency of heating of the interior of the clast. The heating plateau of this second test fell in the range 335 - 400 °C (Fig. 3-6).

Thermoluminescence methods and analysis

The potential age of the sample suggests that the NTL is well within the linear range of the additive TL growth curve. Four additive dose points were given and a regeneration growth curve with corresponding dose points was measured. The palaeodoses were calculated from the least square linear regression results from these two dose curves (Aitken 1985; Valladas 1992). The alpha sensitivity (b-value) was determined on material zeroed in the laboratory at 500°C for 30 min.

Data analysis was performed with the software Analyst. The integration range was defined as the joint temperature range of the heating (Fig. 3-7) as well as of the D_e-plateau (Fig. 3-8) for the additive dose curve. The latter is the temperature region of constant results of the equivalent dose (D_e) determination. The presence of such a plateau is another indication of the sufficiency of the prehistoric heating and that the samples are well zeroed.

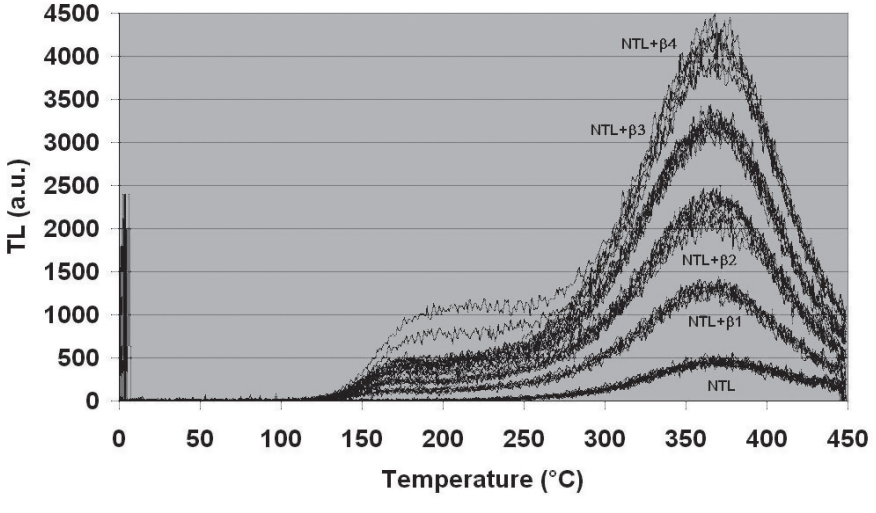


Fig. 3-7 TL curves for sample EFD4L 264.

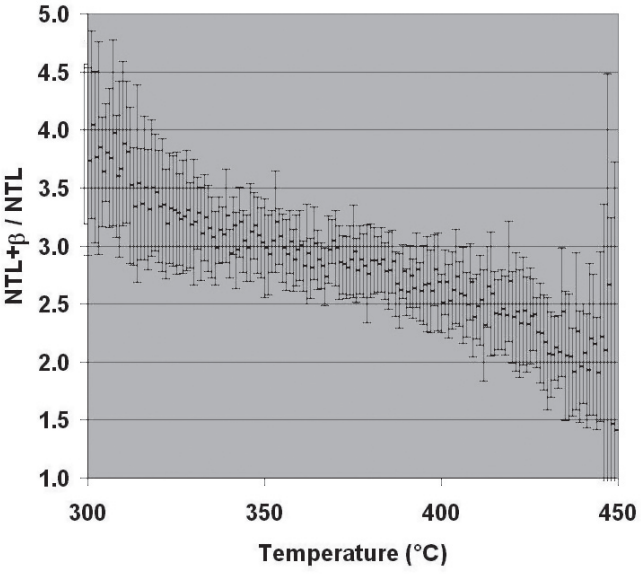


Fig. 3-8 Heating plateaus for sample EFD4L 264 (340-390°C).

Results

The TL additive and regeneration glow curves are shown in Fig. 3-7 with the resulting heating plateaus determined on the material/discs eventually used for palaeodose analysis (Fig. 3-8).

Unfortunately, the two growth curves for EFD4L 264 (Fig. 3-9) do not show a similar gradient of slope. This lack of supralinearity indicates that the sample is subject to sensitivity change due to heating in the laboratory and that the natural TL peak could not be regenerated. Instead, several other peaks occur at lower temperatures. The supralinearity correction is thus not valid in this instance and can not be used for estimating the palaeodose. The resulting age has therefore to be regarded as a minimum age.

The cosmic dose rates were calculated after (Barbouti and Rastin (1983) and Prescott and Stephan (1982) taking into account the elevation above sea level, longitude and latitude, as well as a sedimentary overburden of 4 m for Kabazi V of 2.25 g cm^{-1} average density. The overburden was assumed to have been constant for the entire burial time and an error estimate of 5% is assumed for these cosmic dose rate values. The external γ-dose rate from the sediment was measured with a portable NaI-scintillator and average values for several readings are given in Table 3-8 as $\dot{D}_{\gamma-ext.}$. Gamma spectrometry laboratory measurements on the milled sediment from around the luminescence samples revealed no significant secular disequilibria for the U-decay chains. However, there could have been changes in the U-decay chain and hence alterations in the gamma dose rates which can not be detected by this method. For example, disequilibrium could have occurred several times early in the history of the sediment, but today the chains are back in equilibrium. In general, such events can not be accounted for, but in many cases γ-spectrometry provides indications of such problems, which then can be accounted for. Here it is assumed that possible disequilibria in the decay chains have a negligible effect on the dose rates, which are given in Table 3-8. However, in order to allow for any such variation or changes in the external γ-dose rate caused by changing water contents, an error estimate of 20% is used for age calculation.

The element concentration for U, Th and K were determined with INAA and ICP-MS on samples crushed to <50 μm. While the results for U and Th were identical with the two methods, the K content varied by several orders of magnitude. ICP-MS analysis were repeated several times, but failed to provide consistent results for K, emphasising the problems for measuring this isotope with that particular method. Neither ratio of these elements measured with INAA corresponds to the average ratios observed for the composition of the earth's crust either. However, it can be questioned if the crust ratio is necessarily valid for flint (a quick literature survey does not suggest any correlation). We prefer to use the results obtained by INAA in this study. Because of the small size of sample EFD4L264 the element concentrations were obtained with IC-MS on extracted (interior) material, while for INAA material which was cut off from the outer part of the sample had to be used. The values obtained by the latter might not represent the element concentration of the part used for luminescence analysis because of geochemical changes and/or zoning. However, U and Th results agree well between these two methods on those different parts of the sample, which seems to suggest that any differences for K are likely not significant.

The alpha sensitivity of the samples is extremely low, which leads to very small internal dose rates. The ages are thus heavily dependant on the estimation of the external gamma and cosmic dose rates. While for the latter an error of 5% is assumed, the associated error for the external gamma dose was set to 20% in order to include the effects of possible variations due to changes in water content or in the geometries used. The result is a value of 81±9 ka as a minimum age for sample EVA-LUM-06/02 (EFD4L264) due to the failure for supralinearity correction previously described (Table 3-9).

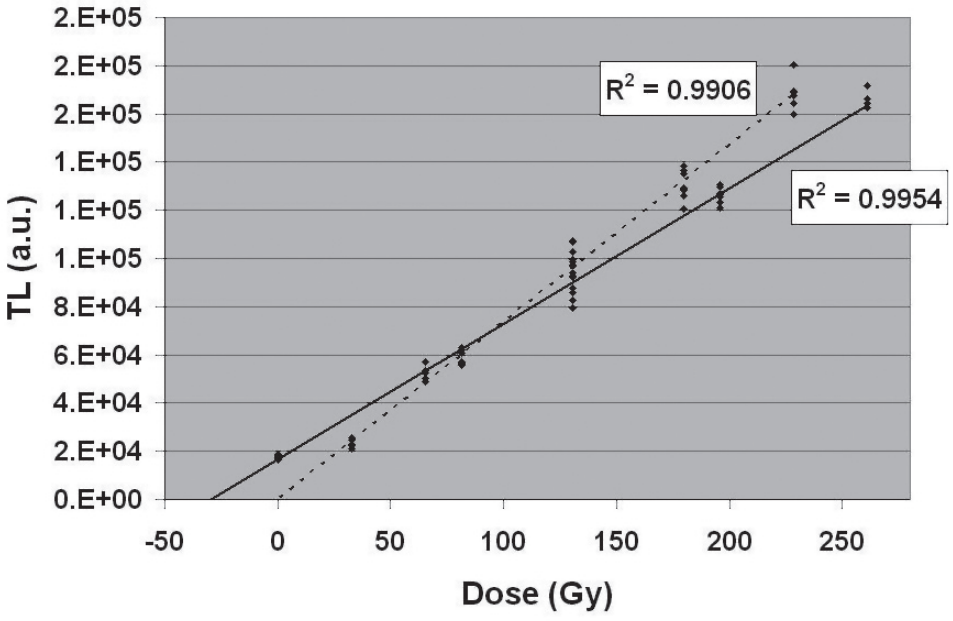


Fig. 3-9 TL growth curves for sample EFD4L 264. The additive growth curve is marked on the swiped line and the regeneration on the dotted line. The x-axis intercepts of the linear regression give the D_E for the additive growth curve and the supralinearity correction D_I for the regeneration growth curve.

Sample No.:	NTL peak (°C)	Heating plateau (°C)	D_E-plateau (°C)	b-value
EFD4L 264	370	340-390	350-400	8.0 ± 0.4

Table 3-7 Summary of TL analysis results.

Sample No.	U (ppm)	Th (ppm)	K (ppm)	$\dot{D}_{\alpha-\mathrm{int.}}$ (•Gy a^{-1})	$\dot{D}_{\beta-\mathrm{int.}}$ (•Gy a^{-1})	$\dot{D}_{\cos m.}$ (•Gy a^{-1})	$\dot{D}_{\gamma-ext.}$ (•Gy a^{-1})
EFD4L 264	0.13 ± 0.01	0.19 ± 0.12	485 ± 15	24	62	157	184

Table 3-8 Summary of dosimetric results.

EVA-LUM-	Sample No.	palaeodose (Gy)	$\dot{D}_{\mathrm{int.}}$ (•Gy a^{-1})	$\dot{D}_{ext.}$ (•Gy a^{-1})	age (ka)
06/01	EFD4L264	32.3 ± 1.0	101	399	81 ± 9

Table 3-9 Summary of results and ages for sample EVA-LUM-06/01 (EFD4L 264) from Kabazi V.

AMS Radiocarbon

Methodology and results

One charcoal and one charred bone sample (EFD4C 420 & 436) were chemically pretreated in Oxford with the routine acid-alkali-acid (AAA) pre-treatment. This is designed to mobilise the two major contaminants present in soils that may affect radiocarbon dating of these types of samples, humic acids and fulvic acids. Both are organic compounds derived from the decayed remains of plants in the surface layers of the soil. Their presence in archaeological charcoals may constitute error of unknown magnitude and is highly site specific. Humic substances within the soil have been classified according to the ease with which they can be removed from soils using alkaline solutions (Head 1987). Humic acids may be defined as the fraction extracted by alkaline solution that becomes insoluble after acidification (Head 1987: 144). Fulvic acids are soluble both in acid and alkaline solutions (Head 1987). The residue soluble and insoluble in alkaline solutions is termed "humin" and is usually the fraction targeted for radiocarbon dating. In this instance the two dated fractions were not the "humin" residue, for in one case (the charred bone, EFD4C 420) the sample became soluble when treated with a solution of sodium hydroxide. In effect, this sample is the humic acid fraction and for this reason has been given an OxA-X designation to show that the age is less reliable than the chemically more rigorously treated samples. OxA-X-2134-45 is best seen as no more than a minimum age estimate for the horizon from which it came.

The four bone samples (EFD4C 419, 421, 435 & 437) were chemically pretreated using the standard Oxford method of the time, however all four produced very low percentage yields below 1% (Table 3-10). These values are considerably less than the threshold that Oxford considers to be needed to produce reliable age estimates and so no further analysis was undertaken. The results of dating for the two successful samples are shown in Table 3-10 – with OxA-14726 being considered the more reliable.

Sample No.		Lab No.	Treatment fraction	Sample wt. (mg)	Yield (mg)	%Yield	δ13C (per mil)	Age (uncal. years BP)
EFD4C	419	P16819	-	580.0	0.69	0.10	-	-
EFD4C	420	OxA-X-2134-45	Humic acids	367.0	61.60	16.80	-24.5	30,980 ± 220 (% mod 2.1 ± 0.1)
EFD4C	421	P16821	-	580.0	0.20	0.00	-	-
EFD4C	435	P16822	-	550.0	1.80	0.30	-	-
EFD4C	436	OxA-14726	Humin	137.7	35.60	25.90	-22.8	38,780 ± 360
EFD4C	437	P16824.0	-	520.0	0.46	0.10	-	-
EFD4C	437	P16824.1	-	540.0	0.70	0.10	-	-

Table 3-10 AMS ^{14}C age determinations from Kabazi V.

Discussion

It is clear that the site of Kabazi V presents considerable challenges to the application of scientific dating methodologies. Rink et al. (1998, 339) gave a best age estimate for archaeological horizon III/1 of c. 26-30 ka BP, whilst the estimate for the stratigraphically lower level III/1A produced an age of <41 ka. In contrast, on the basis of four tooth enamel measurements McKinney (1998, 351) estimated that archaeological horizon III/1 at Kabazi V had an age of c. 73.3±6.0 ka.

The luminescence data from our studies in general supports the 'high chronology' for the site proposed by McKinney (1998) on the basis of U-series determinations, for the TL dating of sample EFD4L 264 indicates a minimum age of 81±9 ka, whilst the OSL profiling would indicate apparent ages down sequence of c. 60-100 ka. In contrast, the ESR favours a 'low chronology' of around 26-30 ka or <41 ka, placing the site chronologically within MIS 3.

An important problem arises when attempting to directly compare the pair of radiocarbon determinations produced in this study with the luminescence results, and the existing electron spin resonance and mass spectrometric U-series datasets of

Rink et al. (1998) and McKinney (1998), in that radiocarbon ages are not equivalent to absolute dates produced by other methodologies. At present it is not possible to reliably calibrate radiocarbon ages greater than 26 ka cal BP (Reimer et al. 2004) because there is no agreement on which of the various terrestrial and marine datasets that map the variation of ^{14}C production over time is likely to be the most accurate. In this study not having an agreed calibration dataset does not alter the broad conclusions, which is that the ^{14}C data better support the 'low chronology' hypothesis.

Conclusions

Despite many attempts and varied methodologies the dating of Kabazi V remains unresolved. In this paper OSL profiling has been used to assess the prospects of dating the sediments in the matrix of the site. It appears that there is sufficient luminescence sensitivity in all phases examined for quantitative work to be undertaken. The apparent ages of the initial profiling work suggest that coarse grain sedimentary chronologies in the 60-100 ka or earlier range might be expected from the tube samples collected but not yet measured. This may include residual signals accumulated in upslope positions prior to colluvial re-deposition and it may be worth considering the possibility that single-grain coarse sediment dating could help to assess the extent to which such dates carry residual age.

The flint result obtained by MPI Leipzig gave extremely promising TL behaviour, with evidence from the "plateau curves" to verify that resetting by heat appears to have been achieved. The result from the sample dated is broadly consistent with the upper end of the implied sediment luminescence chronology, although again it is hard at this stage to know whether the item had been deposited in a primary context or had been incorporated by re-depositional process. Both luminescence methods indicate a significantly longer chronology than the carbon samples; although the difficulties associated with the latter measurements and their calibration have been noted and might be expected to lead to underestimated ages. It does appear therefore that further work on the sediment samples, possibly including single grain approaches, and further TL analyses on a larger assemblage of burnt flints may hold out the potential of getting a better chronology for the site. Together these approaches hold out the prospect of a profitable way forward in the future, for one positive outcome from this study has been the demonstration that the field gamma dosimetry of the site is remarkably consistent and stable. Because of this, heated clasts previously excavated could be used successfully for TL without too many difficulties, despite the loss of information arising from having removed the samples from their environment without recording the field dosimetry. Together these approaches hold out at least the potential for resolving a site that still is problematic in relation to the chronology of hominin occupation in the Middle Palaeolithic.

Abstract

КАБАЗИ V: ЛЮМИНЕСЦЕНТНЫЙ АНАЛИЗ (OSL И TL) И РАДИОУГЛЕРОДНЫЕ (AMS) ОПРЕДЕЛЕНИЯ

ХЁСЛИ Р. А., САНДЕРСОН Д. К. В., БАРБИДЖ К. И., РИХТЕР Д., ХИГАМ Т. Ф. Х.

Для образцов из отложений Кабази V был получен ряд радиометрических определений. Фрагмент трубчатой кости из горизонта III/1A продатирован радиоуглеродным методом: OxA-X-2134-45, 30,98±0,22 тыс. лет назад. Образец древесного угля из горизонта III/5-3B2 получил радиоуглеродную дату OxA-14726, 38,78±0,36 тыс. лет назад. Достоверность результата полученного по образцу угля (OxA-14726) выше, чем достоверность даты полученной по образцу кости (OxA-X-2134-45). OSL параметры для литологических слоев 12 – 12A и 14A составляют 60-100 и 200 тысяч лет назад, соответственно. Минимальный TL возраст обожженного кремня из горизонта III/1A составил 81,0±9,0 тысяч лет назад.

Ранее по образцам эмалей зубов гидрунтинуса для горизонтов III/1 и III/1A была получена пара ESR показателей: 26–30 и <41 тысяч лет назад, соответственно (Rink *et al.*, 1998). Средний U-series возраст четырех образцов зубов гидрунтинуса из горизонта III/1 составил 73,3-0,6 (McKinney 1998)

Таким образом, хронологическое положение отложений Кабази V определяется двумя хронологическими шкалами – «короткой» и «длиной». «Короткой шкале» соответствуют даты, полученные радиоуглеродным и ESR методами. «Длинная шкала» образована TL, U-series и OSL показателями. На основании «короткой шкалы» можно сделать вывод о том, что отложения Кабази V аккумулировались во время OIS 3, тогда как «длинная шкала» относит образование стоянки к OIS 4 и OIS 5.

Chapter
4

Small Mammal Fauna from the Middle Palaeolithic Site Kabazi V. Palaeoenvironmental Reconstruction

Anastasia K. Markova

The complex studies of the cultural layers from Kabazi V have also included the analysis of palaeontological remains. In this paper, finds of small-mammals recovered during excavations at this site in 2002-2003 are presented, thus completing the picture suggested by finds recovered in earlier investigations at the site in 1994-1996 (Markova 1999), to which reference will also be made. Simultaneously, archaeologists V. P. Chabai and A. I. Yevtushenko have been studying the archaeological levels identified at the site which yielded artefacts attributed to Middle Palaeolithic industries (Yevtushenko 1998a, 1998b; Chabai *et al.*, 2004).

Kabazi V is situated in the internal ridge of the Crimean Mountains, on the right bank of the Alma River, 100 m above the Alma river channel, and 360 m above sea level (44.84188°N, 34.03340°E). The sequence includes several archaeological levels containing Middle Palaeolithic artefacts. Absolute dates give reason to assume that human occupation at Kabazi V occurred during MIS 3 and was probably not of particularly long duration, as has also been determined for nearby Kabazi II (Chabai et al., 2004). The upper part of the sequence (level III/1A) has provided a date on charred bone of 30,980±220 BP (OxA-X-2134-45), level III/1 has produced an ESR age of 26,000-30,000 BP, and level III/5-3B1 has been dated to 38,780±360 BP (OxA-14726) (Rink *et al.*, 1998; Chapter 3, this volume). Hence, Unit III was formed between the Hengelo Interstadial and the beginning of MIS 2.

Methods of Sampling and Analysis

Palaeontological remains were recovered during excavation using 5 mm and 1 to 1.5 mm screens. Material was then dried in the sun and bone remains selected for analysis. In a second stage, bones belonging to small-mammals were studied under a microscope (SMC 4, ASKANIA), measured, and then drawn. Pieces were then compared to modern small-mammal materials from the Crimean (in collections at the Moscow Zoological Museum, and at the Zoological Institute RAS, S.-Petersburg). The remains were also compared with palaeontological collections of small mammals recovered previously from other Palaeolithic sites in the region.

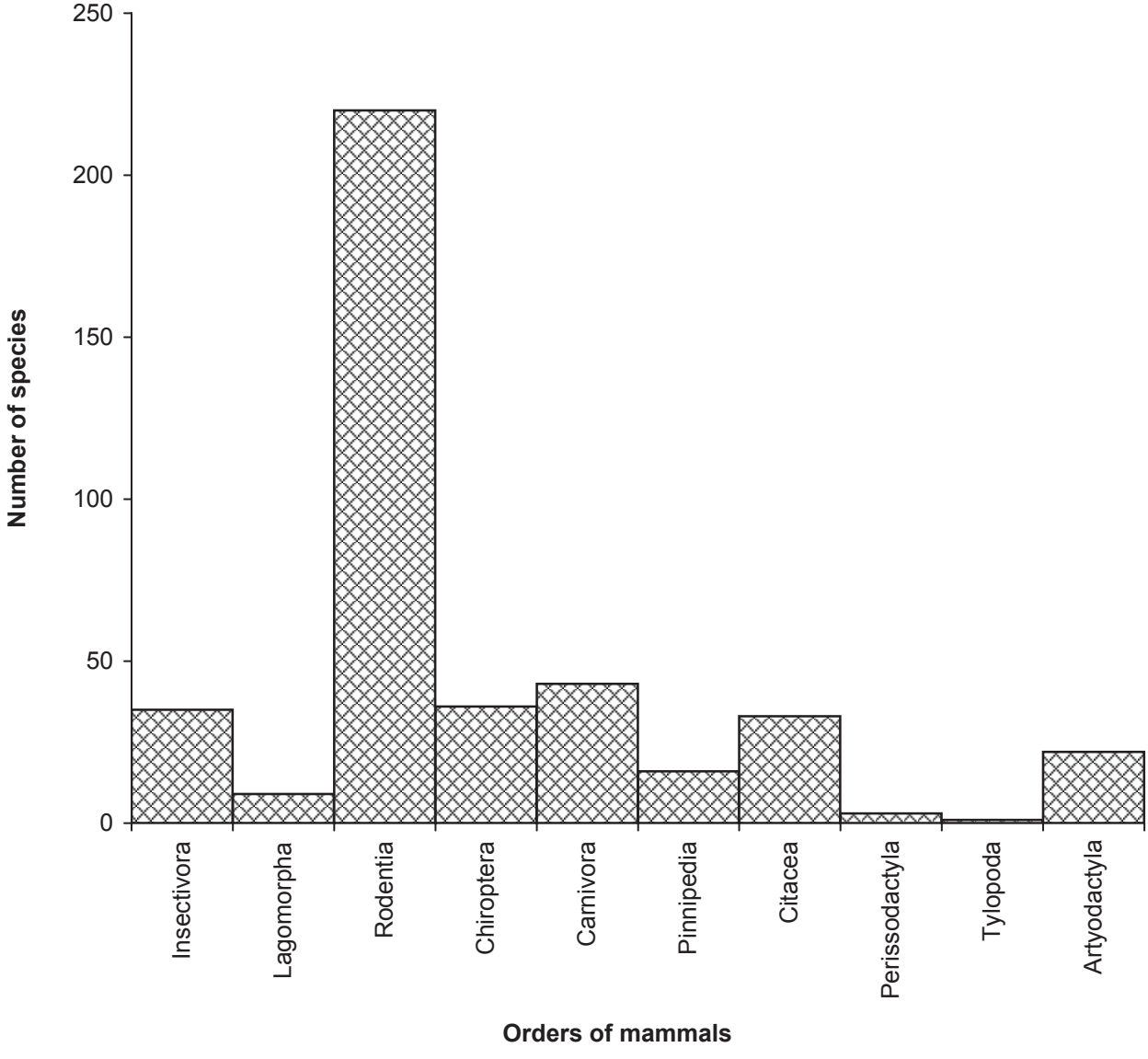


Fig. 4-1 Distribution of modern mammal species of FSU according to different Mammalia orders.

Small mammals belonging to the orders Rodentia, Lagomorpha and Insectivora constitute the principal part of both modern and past faunas, of which in the modern mammal fauna of the former USSR there are about 250 representatives (mostly Rodentia), with only about 160 species corresponding to all other orders (including Chiroptera and marine orders) (Dinets, Rotshild 1998)(Fig. 4-1).

Large mammals usually display very wide ranges, and for this reason are obviously not reflective of the local environment. A significant part of small-mammal species are closely connected with specific environmental conditions, are ecologically specialised, and occur only in certain habitants. Further, rodents and lagomorphs are herbivorous and are trophically closely associated with prevailing plant communities. Hence, these animals serve as a good indication of surrounding vegetation, and help considerably in any reconstruction of past environments.

Material

The bone material from Kabazi V is well preserved. The angles of teeth were not broken, and many mandibles with teeth were found. Bones are light yellow in colour. Some of the finds had clearly become deposited at the place of death, while others show traces of digestion, i.e. deposition involved both bird and animal predators. Saturation of materials in most levels is high.

Small-mammal bone material was recovered from Units II, III and IV at Kabazi V. These units comprise a total of 11 main strata; all differ in thickness and extent, as well as sample sizes. Small-mammal remains were found in 4 Levels of Unit II, in 7 Levels of Unit III, and in 2 Levels of Unit IV (Table 4-1). The total number of remains is high and includes more than one thousand small-mammal bones identified at species level.

	Level II/3	**Level II/3-4**	**Level II/4**	**Level II/4a**	**Sub-Unit III/1**	**Sub-Unit III/2**	**Sub-Unit III/3**	**Sub-Unit III/4**	**Sub-Unit III/5**	**Sub-Unit III/6**	**Sub-Unit III/7**	**Level IV/1**	**Level IV/2**
Bone numbers	74	65	3	41	135	92	96	22	352	38	24	81	37

Table 4-1 Kabazi V. Number of bones identified per level.

Small Mammal Remains from Unit II

Small-mammal material from Unit II was already recovered in 1994-1996, and includes finds from levels II/3, II/3-4, II/4, and II/4a (Table 4-2, Fig. 4-2).

Fauna from Unit II comprised 148 remains that were identified at species level (Markova, 1999). The upper levels of Unit II (II/3 and II/3-4) contained ten species of Insectivora and Rodentia, many of which *(Spermophilus pygmaeus, Allactaga major, Cricetulus migratorius, Lagurus lagurus)* inhabit open landscapes of different types, such as steppe, forest-steppe and even semi-desert. The dominant species *Microtus obscurus* is also indicative of open environments, such as meadows. Several mammals from this sample, including *Talpa* sp., *Apodemus (Sylvaemus) flavicollis*, were shown to be connected with forested and shrubed areas, and two further species *(Arvicola terrestris* and *Microtus oeconomus)* demonstrated the proximity of a water reservoir. On the basis of material from levels II/3 and II/3-4 an alternating landscape was reconstructed featuring open steppe-like, forested and shrub elements.

A small number of remains from only two species from level II/4 were also indicative of meadow-steppe and forested areas.

Lower Levels of Unit II (II/4 and II/4a) yielded the remains of five species that are suggestive of open landscapes. However, some forested areas would also have been situated near the site, as indicated in both levels by the presence of yellow-necked mouse, a species whose preferred habitat are broad-leaved forests.

Thus, during the accumulation of the different levels belonging to Unit II the Kabazi V area would have been characterised by open landscapes of different types with forested areas. The presence of water vole and root vole also indicate that water was present nearby. Cold-adapted animals were not found in Unit II, with the small mammal fauna suggestive of forest-steppe landscapes in the lower Crimean Mountains.

Taxa	Level II/3	Level II/3-4	Level II/4	Level II/4a
Insectivora - insectivores				
Talpa sp. - Eurasian mole	1	·	·	·
Sorex araneus Linnaeus – Eurasian common shrew	1	·	·	·
Rodentia – rodents				
Spermophilus pygmaeus Pallas – little suslik	2	1	·	13
Allactaga major Kerr - great jerboa	1	·	·	·
Ellobius (Ellobius) talpinus Pallas northern mole-vole	·	·	·	1
Apodemus (Sylvaemus) flavicollis Melchior – yellow-necked mouse	·	2	1	·
Cricetulus migratorius Pallas – grey hamster	2	2	·	·
Arvicola terrestris Linnaeus – water vole	1	·	·	·
Lagurus lagurus Pallas – steppe lemming	1	1	·	2
Microtus (Microtus) obscurus Eversmann – Altaian vole	65	56	2	25
Microtus (Pallasiinus) oeconomus Pallas – root vole	·	3	·	·
Total number of species:	8	6	2	4

Table 4-2 Kabazi V, unit II. Small mammal species composition.

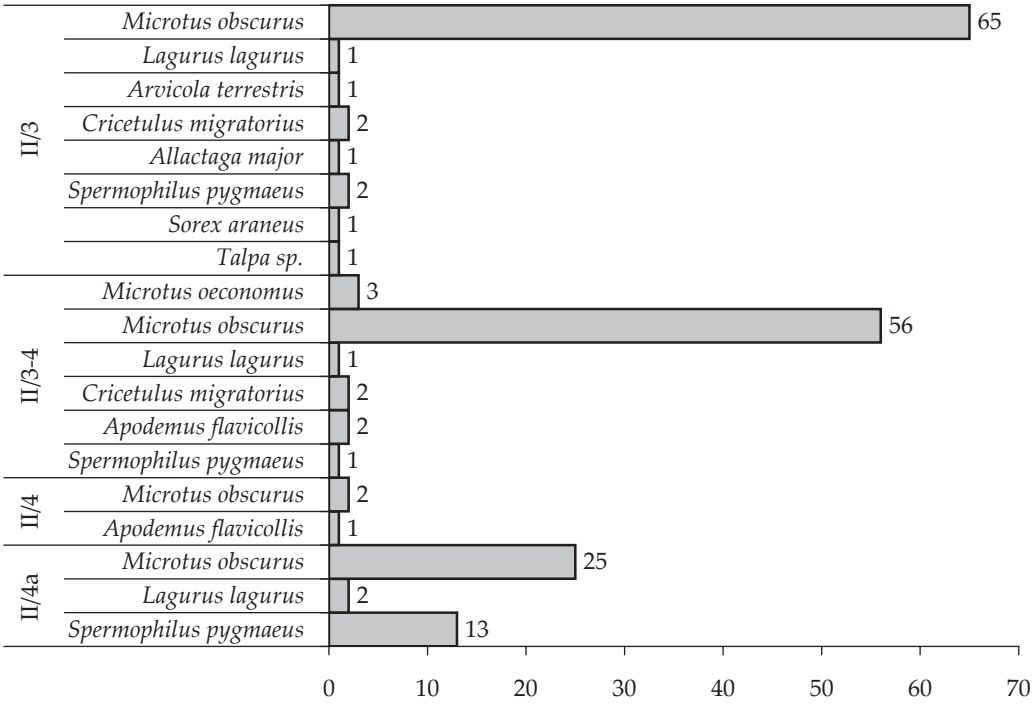


Fig. 4-2 Kabazi V, unit II. Species composition and quantity of small mammal remains.

Small Mammal Remains from Unit III

The highest number of small-mammal remains was recovered from several levels belonging to Unit III. In the seven archaeological levels of this unit a total of 759 remains of Insectivora, Lagomorpha and Rodentia were found. In our analysis we combine the materials from Unit III levels into one sub-unit. For example, the mammals from levels III/5-1, III/5-1A, III/ 5-2-1, III/5-3 were combined to constitute fauna in sub-unit III/5.

Most remains belong to Rodentia (12 species), with one insectivore species and one species of lagomorphs (Table 4-3, Fig. 4-3).

The dominant species in Unit III is the Altaian vole *Microtus obscurus*, remains of which were found in all levels in the highest quantity. Sub-dominants include small suslik, great jerboa, northern mole-vole and water vole (Table 4-4, Fig. 4-4).

Small mammals identified in Unit III are mostly of typical open-landscape species. Among the 14 species recovered, nine belong to animals that inhabit steppe-like environments, with only three species suggestive of forested areas. The altain vole *Microtus obscurus* is related to meadow-steppe, and the water vole Arvicola terrestris inhabits the banks of water reservoirs (Fig. 4-5, *1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11*; 4-6, *1, 2, 3, 4, 5, 6, 7, 8*).

Therefore, it is apparent that steppe, meadow-steppe and hydrogenous species were present in all levels of Unit III (Fig. 4-7).

Meadow-steppes are indicated by only one species *Microtus obscurus*, but this species was absolutely dominant at the site (Fig. 4-5, *1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11*; 4-6, *1, 2, 3, 4, 5, 6, 7, 8, 9*; 4-8, *1, 2, 3, 4, 5, 6, 7, 8, 9, 10*; 4-9, *4, 5*; 4-10, *4, 5, 6*; 4-11, *1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15*; 4-12, *1, 2, 3, 4, 5, 6, 7, 8*).

Taxa	Sub-Unit III/1	Sub-Unit III/2	Sub-Unit III/3	Sub-Unit III/4	Sub-Unit III/5	Sub-Unit III/6	Sub-Unit III/7
Insectivora							
Sorex araneus Linnaeus – Eurasian common shrew	·	·	·	·	1	·	·
Lagomorpha							
Lepus europeaus Pallas – European brown hare	·	·	2	·	·	·	·
Rodentia							
Spermophilus pygmaeus Pallas – little suslik	20	15	13	1	21	2	·
Marmota bobac Müller – bobac marmot	·	·	1	·	1	·	·
Allactaga major Kerr – great jerboa	·	1	·	5	2	1	·
Pygeretmus (Alactagulus) pumilio Kerr – lesser five-toed jerboa	·	2	·	·	·	·	·
Dryomys nitedula Pallas – forest dormouse	1	·	4	·	·	·	·
Apodemus (Sylvaemus) flavicollis Melchior – yellow-necked mouse	6	2	·	1	1	·	·
Ellobius (Ellobius) talpinus Pallas – northern mole-vole	·	·	1	4	62	5	1
Cricetulus migratorius Pallas – grey hamster	·	1	·	·	3	·	·
Arvicola terrestris Linnaeus – water vole	1	5	3	1	20	·	1
Eolagurus luteus Eversmann – yellow steppe lemming	3	7	25	·	2	3	·
Lagurus lagurus Pallas – steppe lemming	·	1	12	·	·	·	·
Microtus (Microtus) obscurus Eversmann – Altaian vole	65	41	33	10	239	27	22
Total number of species:	6	9	9	6	10	5	3

Table 4-3 Kabazi V, unit III, 2002-03 field campaigns. Small mammal species composition.

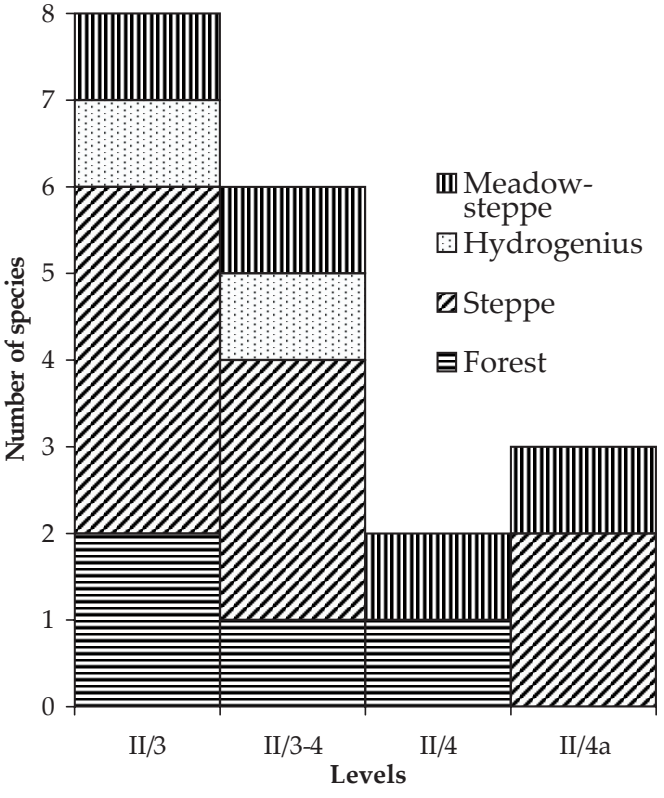


Fig. 4-3 Kabazi V, unit II. Ecological groups of small mammals.

Taxa	Level IV/1	Level IV/2
Chiroptera		
Myotis sp. – mouse-eared bat	1	.
Rodentia		
Spermophilus pygmaeus Pallas – little suslik	6	3
Ellobius (Ellobius) talpinus Pallas – northern mole-vole	6	1
Cricetulus migratorius Pallas – grey hamster	1	1
Microtus (Microtus) obscurus Eversmann – Altain vole	78	32
Total number of species:	5	4

Table 4-4 Kabazi V, unit IV. Small mammal species composition.

Steppe species present the largest group of mammals from Unit III and include yellow steppe lemming *Eolagurus luteus* (Fig. 4-9, *1, 2, 3*; 4-13, *1, 2, 3*; 4-14, *4, 5, 6, 7*; 4-15, *7*), steppe lemming *Lagurus lagurus* (Fig. 4-14, *3, 4*), Northern mole-vole *Ellobius talpinus* (Fig. 4-9, *6*; 4-10, *3*; 4-13, *4*; 4-16, *1, 2, 3, 4, 5, 6, 7, 8, 9*; 4-17, *2*), lesser five-toed jerboa *Pygeretmus pumilio* (Fig. 4-18, *1, 2*), great jerboa *Allactaga major* (Fig. 4-17, *3*; 4-18, *3*; 4-19, *1, 2, 3*; 4-20, *1, 2*; 4-21, *1, 2*), grey hamster *Cricetulus migratorius* (Fig. 4-15, *6*; 4-22, *1*) and others.

A hydrogenous species is the water vole *Arvicola terrestris* which was found in most levels (Fig. 4-8, *12, 13*; 4-10, *2*; 4-13, *2*; 4-15, *1, 2, 3, 4, 5*).

Only few forest species were found in sub-units III/1, III/2, III/3, III/4 and III/5, and include yellow-necked mouse *Apodemus flavicollis* (Fig. 4-10, *2*; 4-13, *5, 6*; 4-14, *1*; 4-20, *3*; 4-22, *2*). Only in sub-units III/6 and III/7 were forest mammals absent (Fig. 4-7). However, the quantity of remains found in these older sub-units is lower than in upper ones (Table 4-4).

On the whole, considerable differences in the quantity of remains are noted from level to level, and this can strongly affect and influence the number of different species distinguished in each. However, and be this as it may, these differences might also reflect climatic changes. Accordingly, conditions may have been drier and possibly colder during sub-units III/6 and III/7, only later becoming milder, i.e. during sub-units III/5-III/4. Level III/1 might be correlated with the Briansk – Denekamp Interstadial (the last part of MIS 3), which is confirmed by ^{14}C dating. A larger number of steppe adapted animals were discovered in sub-units III/2 and III/3 than in sub-unit III/1; the typical steppe mammal *Lagurus lagurus* was found only in the two former sub-units. The semi-desert animal *Pygeretmus pumilio* was recovered only in sub-unit III/2. The appearance of these animals may indicate increasing aridity during the deposition of these levels (stadial conditions), although some forested areas would also have existed at this time. The composition of small mammal species in sub-units III/4 and III/5 are indicative of slightly milder conditions, and possibly corresponds to the Hengelo Interstadial.

Cold-adapted animals were found neither in Unit III nor in the upper part of Unit II, which is characteristic for all Late Pleistocene small-mammal faunas recovered from other Crimean Middle Palaeolithic sites.

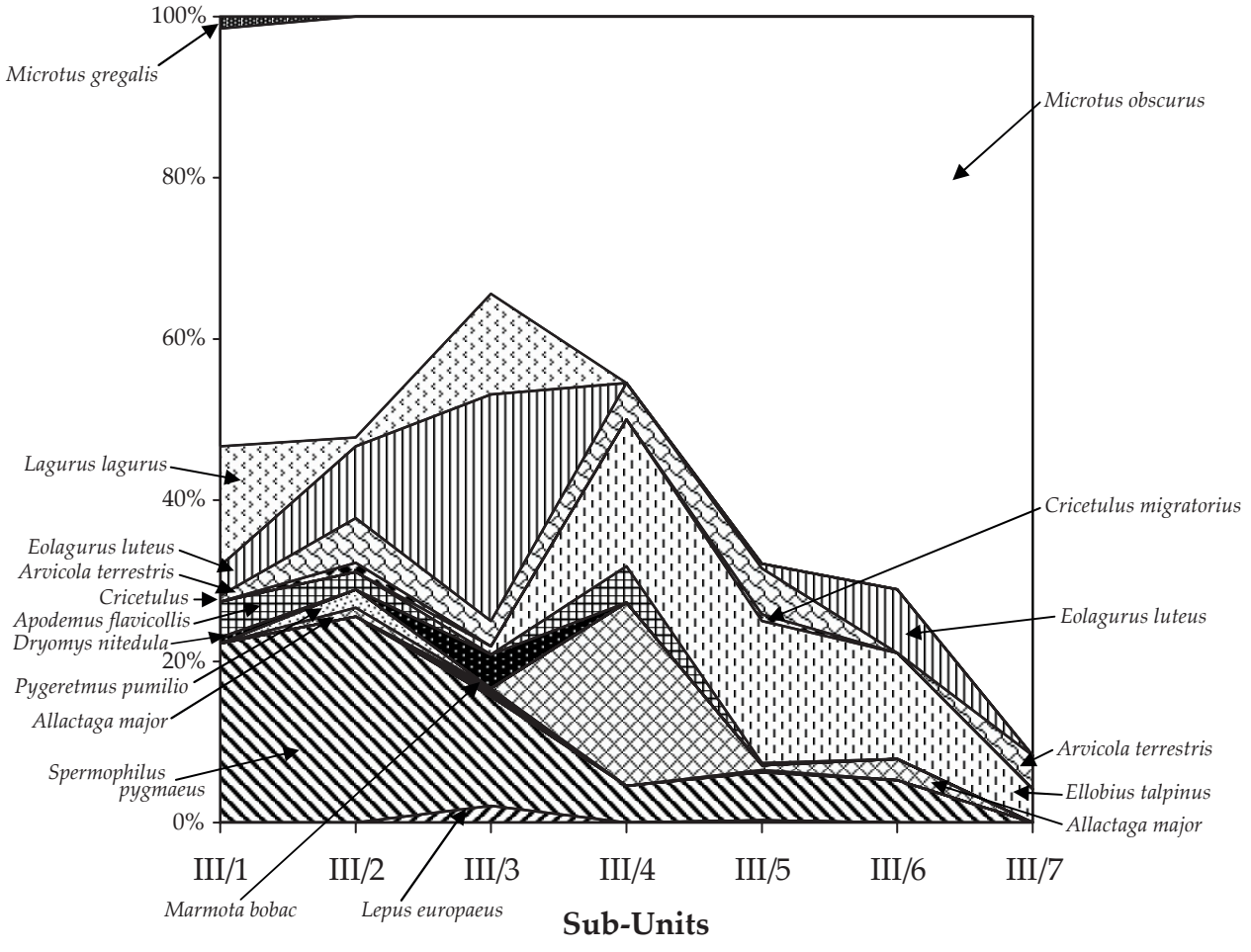
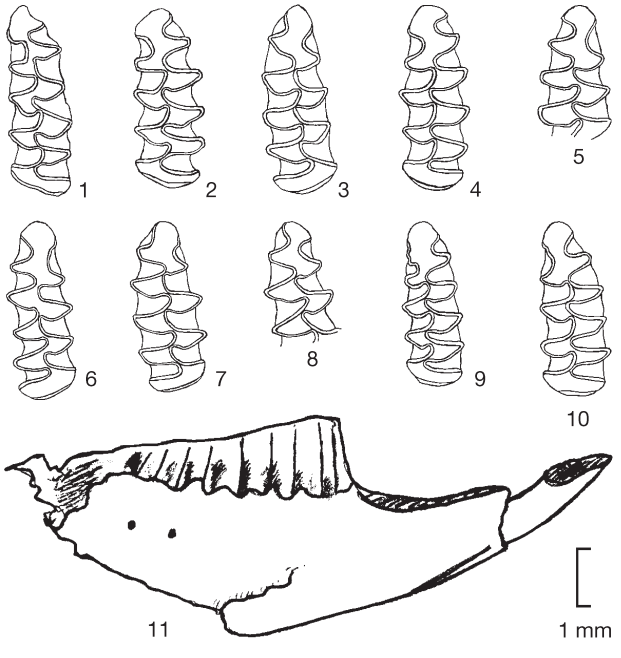


Fig. 4-4 Kabazi V, unit III. Species composition and quantity of mammal remains (%).



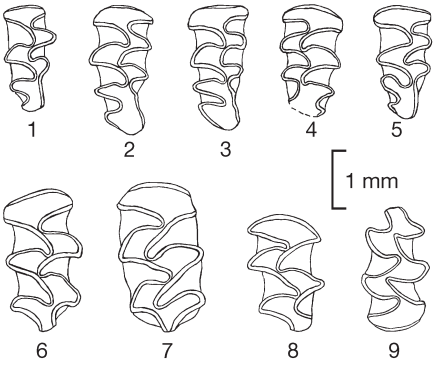


Fig. 4-6 Kabazi V, sub-unit III/1: 1, 2, 3, 4, 5 – M3 of *Microtus obscurus*; 6, 7 – M1 of *Microtus obscurus*; 8 – M2 of *Microtus obscurus*; 9 – m2 of *Microtus obscurus*.

◄**Fig. 4-5** Kabazi V, sub-unit III/1: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 – m1 of *Microtus obscurus*; 11 – lower mandible of *Microtus obscurus.*

Fig. 4-7 Kabazi V, unit III. Ecological groups of small mammals.

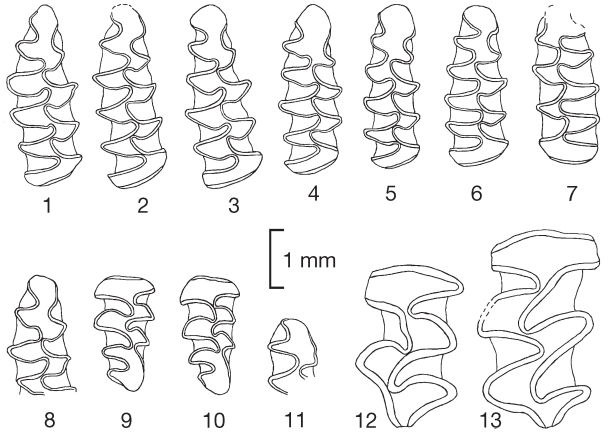


Fig. 4-8 Kabazi V, sub-unit III/2: 1, 2, 3, 4, 5, 6, 7, 8 – m1 of *Microtus obscurus*; 9, 10 – M3 of *Microtus obscurus*; 11 – m1 of *Microtus gregalis* (fragment); 12 – M2 of *Arvicola terrestris*; 13 – M1 of *Arvicola terrestris.*

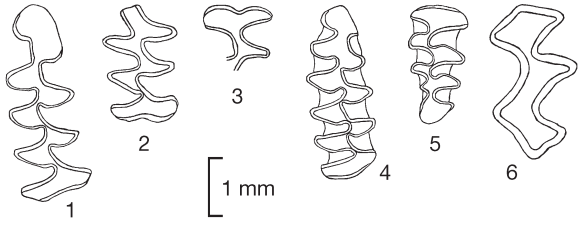


Fig. 4-9 Kabazi V, sub-unit III/3: 1 – m1 of *Eolagurus luteus*; 2 – m2 of *Eolagurus luteus*; 3 – M3 (fragment) of *Eolagurus luteus*; 4 – m1 of *Microtus obscurus*; 5 – M3 of *Microtus obscurus*; 6 – M2 of *Ellobius talpinus.*

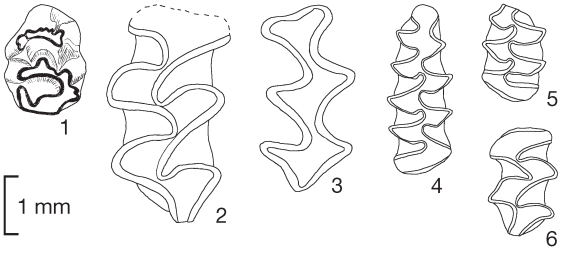


Fig. 4-10 Kabazi V, sub-unit III/4: 1 – M1 of *Apodemus flavicollis*, 2 – m1 of *Arvicola terrestris*; 3 – M1 of *Ellobius talpinus*; 4 – m1 of *Microtus obscurus*, 5 – m2 of *Microtus obscurus*, 6 – M2 of *Microtus obscurus*.

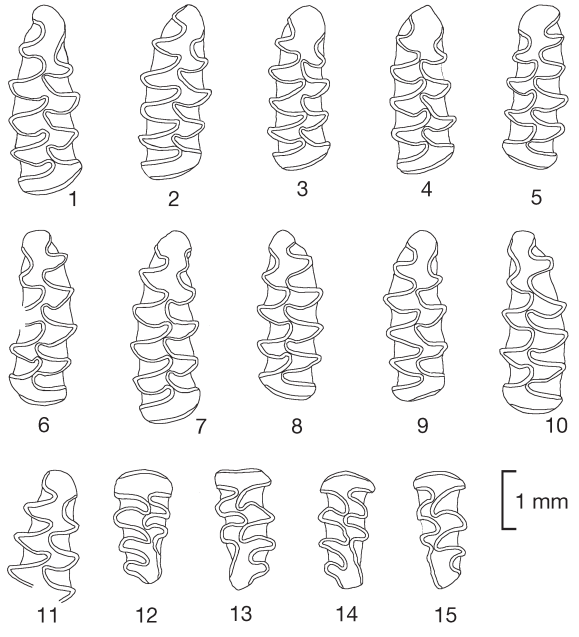


Fig. 4-11 Kabazi V, sub-unit III/5: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 – m1 of *Microtus obscurus*; 12, 13, 14, 15 – M3 of *Microtus obscurus*.

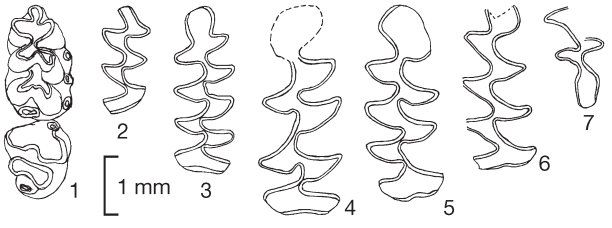


Fig. 4-14 Kabazi V, sub-unit III/2: 1 – m1 and m2 of *Apodemus flavicollis*; 2 – m2 of *Lagurus lagurus*; 3 – m1 of *Lagurus lagurus*; 4, 5, 6 – m1 of *Eolagurus luteus*; 7 – M3 of *Eolagurus luteus*.

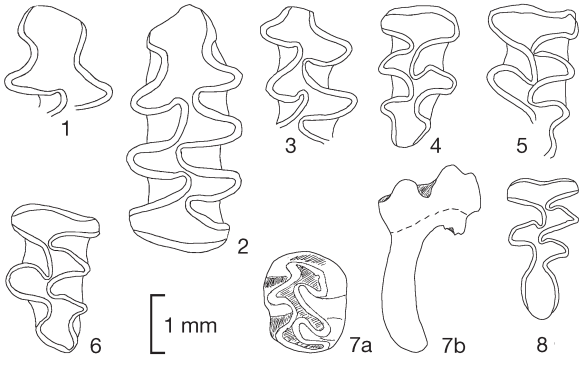


Fig. 4-15 Kabazi V, sub-unit III/5: 1, 2 – m1 of *Arvicola terrestris*; 3 – m2 of *Arvicola terrestris*; 4, 5, 6 – M3 of *Arvicola terrestris*; 7a, 7b – m2 of *Cricetulus migratorius*; 8 – M3 of *Eolagurus luteus*.

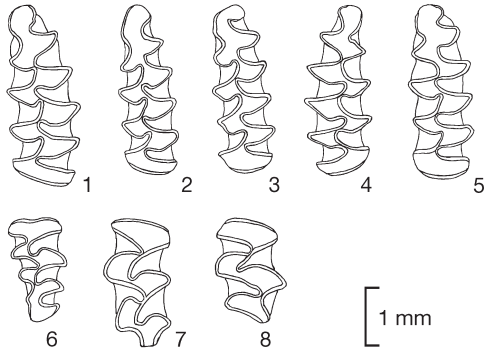


Fig. 4-12 Kabazi V, sub-unit III/5: 1, 2, 3, 4, 5 m1 of *Microtus obscurus*; 6 – M3 of *Microtus obscurus*; 7 – M1 of *Microtus obscurus*; 8 – M2 of *Microtus obscurus*.

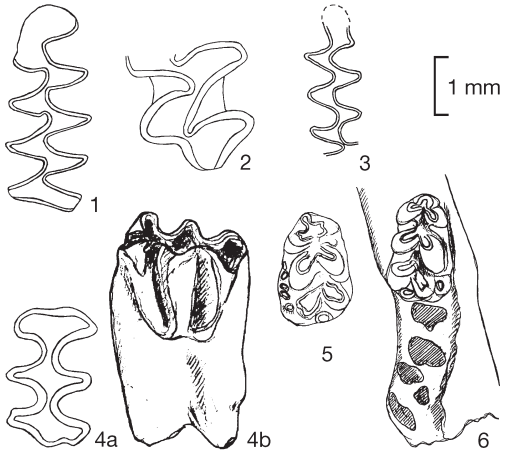


Fig. 4-13 Kabazi V, sub-unit III/1: 1, 3 – m1 of *Eolagurus luteus*; 2 – M1 of *Arvicola terrestris*; 4a, 4b – M1 of *Ellobius talpinus*; 5, 6 – m1 of *Apodemus flavicollis*.

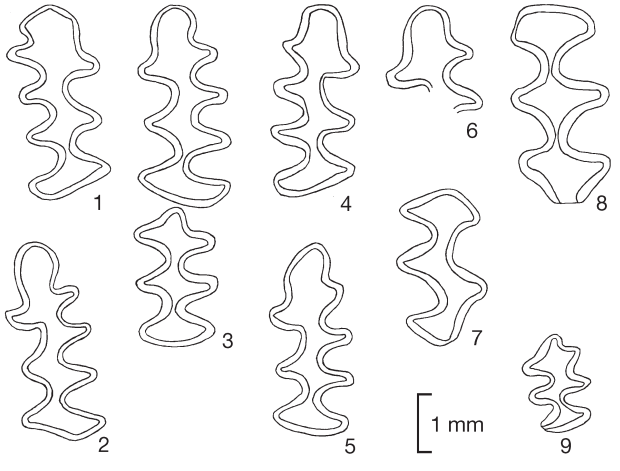


Fig. 4-16 Kabazi V, sub-unit III/5. 1, 2, 4, 5, 6 – m1 of *Ellobius talpinus*; 3 – m1 and m2 of *Ellobius talpinus*; 7 – M2 of *Ellobius talpinus*; 8 – M1 of *Ellobius talpinus*; 9 – m2 of *Ellobius talpinus*.

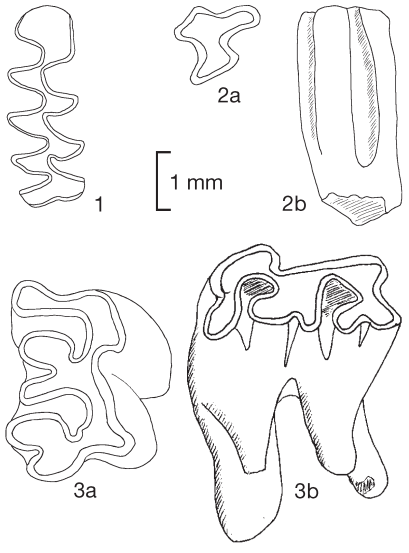


Fig. 4-17 Kabazi V, sub-unit III/6: 1 – m1 of *Eolagurus luteus*; 2a, 2b – M3 of *Ellobius talpinus*; 3a, 3b – M2 of *Allactaga major*.

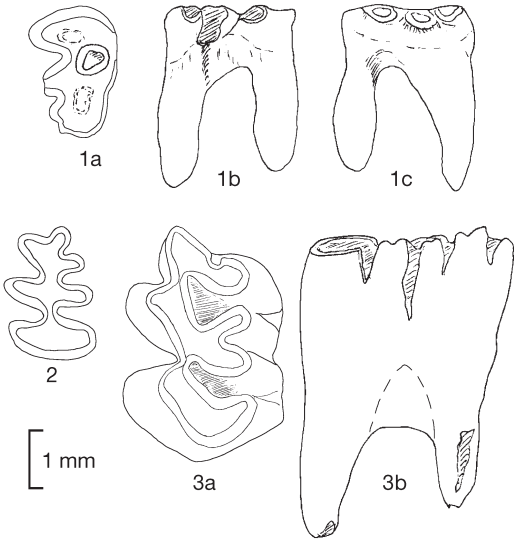


Fig. 4-18 Kabazi V, sub-unit III/2: 1 – m3 of *Pygeretmus pumilio*; 2 – m1 of *Pygeretmus pumilio*; 3a, 3b – m2 of *Allactaga major.*

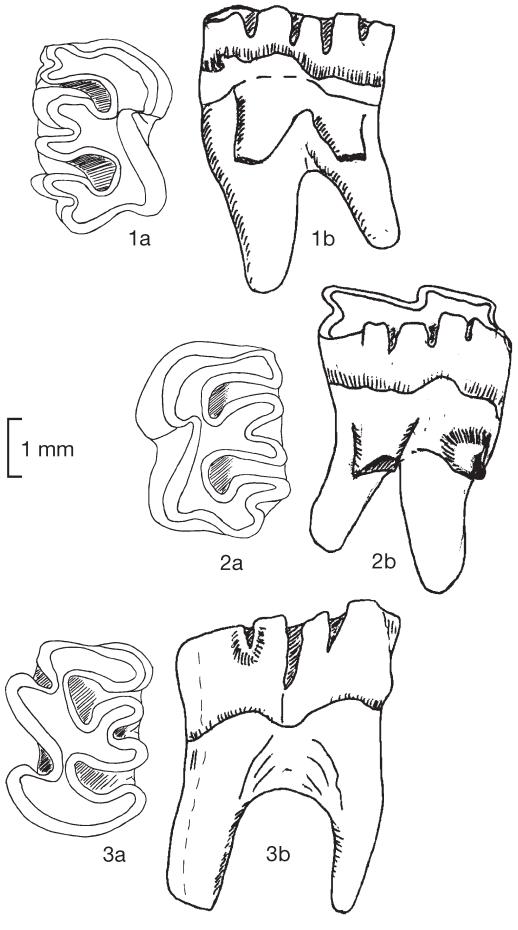


Fig. 4-19 Kabazi V, sub-unit III/4: 1a, 1b – M2 of *Allactaga major*; 2 a, 2b – M2 of *Allactaga major*; 3a, 3b – m2 of *Allactaga major*.

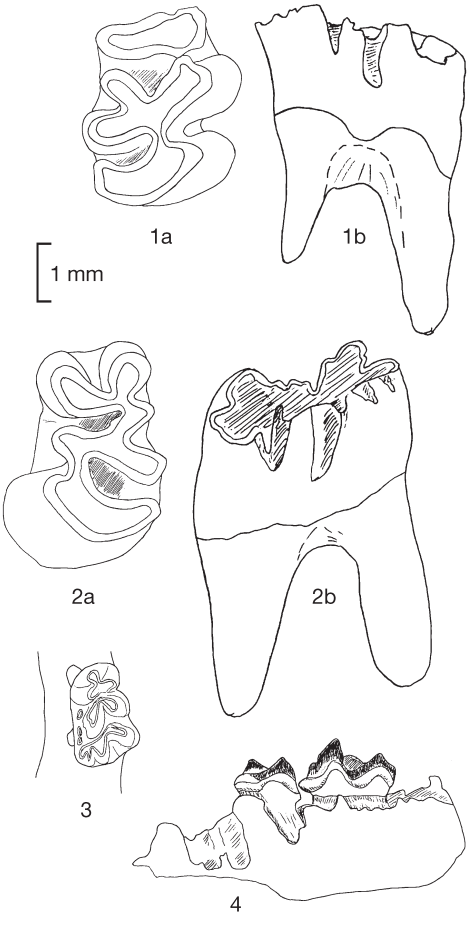


Fig. 4-20 Kabazi V, sub-unit III/5: 1a, 1b – m2 of *Allactaga major*; 2a, 2b – m1 of *Allactaga major*; 3 – m1 of *Apodemus flavicollis*; 4 – lower mandible of *Sorex araneus.*

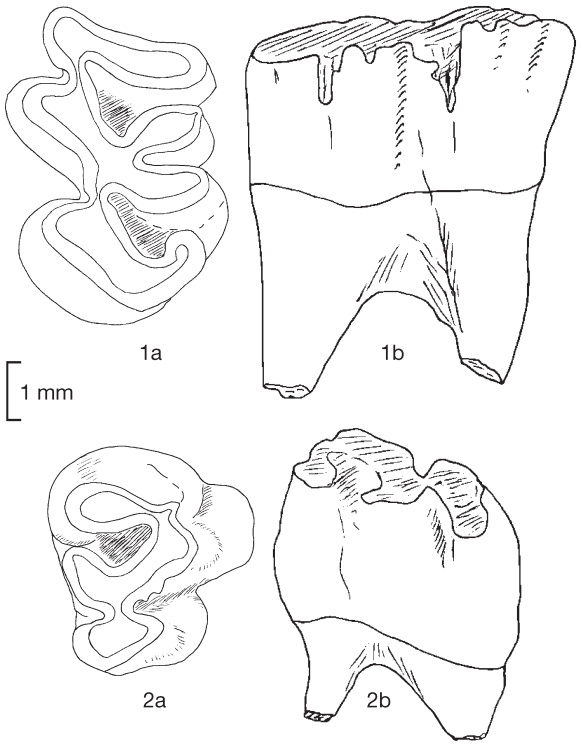


Fig. 4-21 Kabazi V, sub-unit III/7: 1a, 1b – m2 of *Allactaga major*; 2a, 2b – m3 of *Allactaga major*.

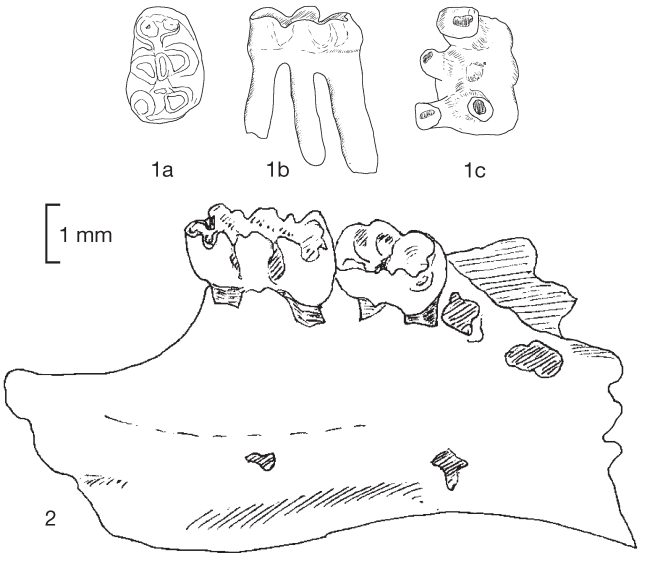


Fig. 4-22 Kabazi V, sub-unit III/2: 1a, 1b, 1c – m1 of *Cricetulus migratorius*; 2 – lower mandible with m1 and m2 of *Apodemus flavicollis*.

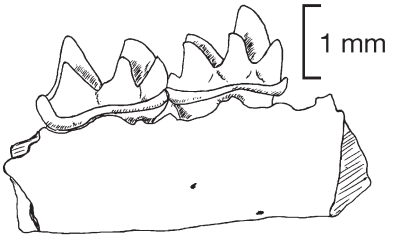


Fig. 4-23 Kabazi V, level IV/1. Fragment of lower mandible of *Myotis* sp.

Small Mammal Remains from Unit IV

In Unit IV a total of 118 remains of small mammals were identified at species level. The five distinguished species belong to the orders Chiroptera and Rodentia (Table 4-4).

The remains of mouse-eared bat (Myotis genera) found in Level IV/1 (Fig. 4-23) show very extensive ranges in Eurasia, with five different species of *Myotis* genera in the Crimea alone. Their favourite food is insects; their common habitats are caves, rock shelters and hollows in tree-trunks. Most species belonging to *Myotis* genera prefer rather mild climatic conditions, including forest steppe, forests of different types, and various mountain habitats.

Little suslik is a typical habitant of the steppe and semi-desert; cerials are its preferred food.

Northern mole – vole, which inhabits forest-steppe, steppe and semi-desert, prefers biotopes with various grass cover and soft soils.

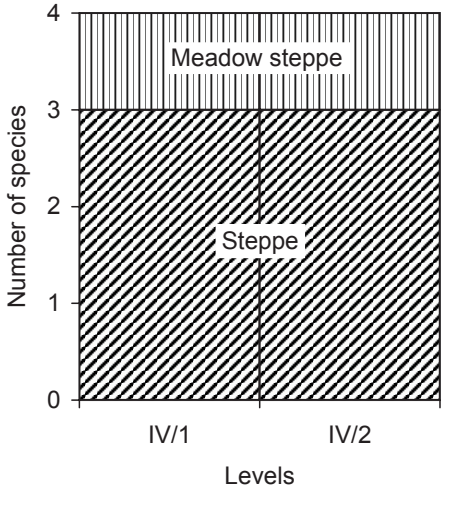


Fig. 4-24 Kabazi V, unit IV. Ecological groups of small mammals.

Ellobius talpinus can also live in "takyrs" in semi-deserts and deserts. This animal appears only very rarely on soil surfaces; mostly it lives in subterranean long bore-cores and feeds on the roots and bulbs of grass plants.

The modern range of the grey hamster is very wide and includes the southern part of Eastern Europe and West Siberia, as well as Kazakhstan and Central Asia. It inhabits forest-steppe, steppe, semi-desert and desert, both in the plains as well as in the mountains. Among its favourite foods are seeds and sometimes insects (Gromov *et al.*, 1963).

Altaian vole *Microtus obscurus* prefers meadows and steppe-like environments.

Forest and cold-adapted animals were not found in Unit IV. Open steppe-like landscapes were the principal environments during the accumulation of the deposits of the Unit IV (Fig. 4-24). The absence of forest species in the Unit IV small mammal assemblage could be explained by the restricted number of remains found in Unit IV. In all other levels of Kabazi V the number of remains of forest species is rather low.

Palaeoenvironments During the Accumulation of Kabazi V Deposits

The high quantities of small mammal bones recovered from Kabazi V make it possible to reconstruct the principal environments in the proximity of Kabazi V at times of human occupation. Accordingly, mammal assemblages strongly suggest that Kabazi V, a collapsed rock-shelter close to the Kabazi plateau, was situated in an area in which steppe-like landscapes prevailed. The majority of small mammals found in deposits from the site would have inhabited open environments, such as steppes, forest-steppes, and semi-desert. Nine of the 16 small-mammal species could be attributed to this group and include little suslik, bobac marmot, great jerboa, lesser five-toed jerboa, northern mole-vole, grey hamster, yellow steppe lemming, steppe lemming, and narrow-skulled vole. Some of these, such as the little suslik, were found in all levels, others only in some of the levels (Table 4-5, Fig. 4-25). The dominant species in all levels is the Altaian vole *Microtus obscurus* (Table 4-5, Fig. 4-25). This animal has also been noted at many other Middle Palaeolithic Crimean sites, e.g. at Kabazi II, Buran Kaya III, Siuren 1, Starosele, Karabi Tamchin, and Chokurcha (Markova 1999, 2004 a, 2004b, 2004c, 2005). In earlier papers this vole was described as *Microtus arvalis* or *Microtus socialis* (Gromov 1961). Only new cariotypic studies of this animal have led to the differentiation of a separate species (Malygin 1983, Zagaradniuk 1991). The morphological characteristics of the molars of this species also indicate its distinction from the other species of the *Microtus arvalis* group (Markova 1999).

Fig. 4-25 shows the distribution of the quantity of small mammal remains in the archaeological sub-units of Kabazi V. *Microtus obscurus* remains dominate in all levels (Table 4-5). This animal would have preferred open environments, such as steppes and meadows. Altain vole was also shown to be main constituent in the assemblages from Kabazi II.

The second most dominant small mammal recovered from most levels is the little suslik (Fig. 4-25). This animal is found quite typically in steppes, semi-deserts and deserts, where it feeds on cerials, tulips, onions and others plants. Its bore-cores ("krotovinas") can extend up to 2 m below the surface.

The northern mole-vole was also a common element of the small mammal assemblages during Kabazi V human occupation periods. The remains of this animal were found in Unit II, III and IV (Table 4-5). Its modern range covers forest-steppes, steppes, semi-deserts and deserts of Eastern Europe (including the Crimea), Kazakhstan, Central Asia, and Siberia. This animal is adapted to an underground existence, and prefers soft soils with rich grass cover. Its food includes the roots and bulbs of different grasses.

Yellow steppe lemming bones found in Unit III also indicate open landscapes near the site. This species is now absent in the Crimea, but was found in other Crimean Palaeolithic sites, and was very common during the Pleistocene on the Russian Plain. Yellow steppe lemming remains were recovered both in interglacial and glacial Pleistocene deposits. It was a very common feature of the "Mammoth assemblage" during the last glaciation (Baryshnikov, Markova 2002; Markova 2004d).

Steppe lemming remains were recovered in Unit II and Unit III (sub-units III/1, III/2, III/3). This mammal inhabits the south of Eastern Europe, including the Crimea, Kazakhstan and the south of Siberia up to the Enisei River. Steppe lemming is a typical habitant of steppe and semi-deserts. Its range widened extensively during all the glacial periods of the Pleistocene, including the time of the Valdai Glaciation (Markova, 2004d), periglacial open environments proving very favourable.

Great jerboa remains were found at the site in low quality, but in many of the levels. Currently, it

Taxa	Level II/3	Level II/3-4	Level II/4	Level II/4a	Level II/7	Sub-Unit III/1	Sub-Unit III/2	Sub-Unit III/3	Sub-Unit III/4	Sub-Unit III/5	Sub-Unit III/6	Sub-Unit III/7	Level IV/1	Level IV/2
Chiroptera														
Myopis sp. - mouse-eared bat	·	·	·	·	·	·	·	·	·	·	·	·	1	·
Insectivora														
Talpa sp. – Eurasian mole	1	·	·	·	·	·	·	·	·	·	·	·	·	·
Sorex araneus Linnaeus – Eurasian common shrew	1	·	·	·	·	·	·	·	·	1	·	·	·	·
Lagomorpha														
Lepus europaeus Pallas – Eiropean broun hare	·	·	·	·	·	·	·	2	·	·	·	·	·	·
Rodentia														
Spermophilus pygmaeus Pallas – little suslik	2	1		13	·	30	23	13	1	21	2	·	6	3
Marmota bobac – bobac marmot	·	·	·	·	·	·	·	1	·	1	·	·	·	·
Allactaga major Kerr – great jerboa	1	·	·	·	·	·	1	·	5	2	1	·	·	·
Pygeretmus (Alactagulus) pumilio Kerr – lesser five-toed jerboa	·	·	·	·	·	·	2	·	·	·	·	·	·	·
Dryomys nitedula Pallas – forest dormouse	·	·	·	·	·	1	·	4	·	·	·	·	·	·
Apodemus (Sylvaemus) flavicollis Melchior – yellow-necked mouse	·	2	1	·	6	2	·	1	1	·	·	·	·	·
Ellobius (Ellobius) talpinus Pallas – northern mole-vole	·	·	·	1	·	·	·	1	4	62	5	1	6	1
Cricetulus migratorius Pallas – grey hamster	2	2	·	·	·	·	1	·	·	3	·	·	1	1
Arvicola terrestris Linnaeus – water vole	1	·	·	·	·	1	5	3	1	20	·	1	·	·
Eolagurus luteus Eversmann – yellow steppe lemming	·	·	·	·	·	5	8	27	·	2	3	·	·	·
Lagurus lagurus Pallas – steppe lemming	1	1	·	2	·	20	1	12	·	·	·	·	·	·
Microtus (Microtus) obscurus Eversmann – Altaian vole	65	56	2	25	·	70	47	33	10	239	27	22	78	32
Microtus (Pallasiinus) oeconomus Pallas – root vole	·	3	·	·	·	·	·	·	·	·	·	·	·	·
Microtus (Stenocranius) gregalis Pallas – narrow-skull vole	·	·	·	·	·	2	·	·	·	·	·	·	·	·
Total number of species:	8	6	2	4	1	8	8	10	6	9	5	3	5	4

Table 4-5 Kabazi V. Small mammal species composition, combined collection from all field campaigns.

inhabits southern parts of Eastern Europe, and is common in the Crimea. The modern range of great jerboa also includes Kazakhstan and southern Siberia. *Allactaga major* prefers forest-steppes, steppes and semi-deserts. Its food includes seeds, bulbs and the roots of different grasses. Great jerboa was widely distributed during the last glaciation. It spread further west at this time.

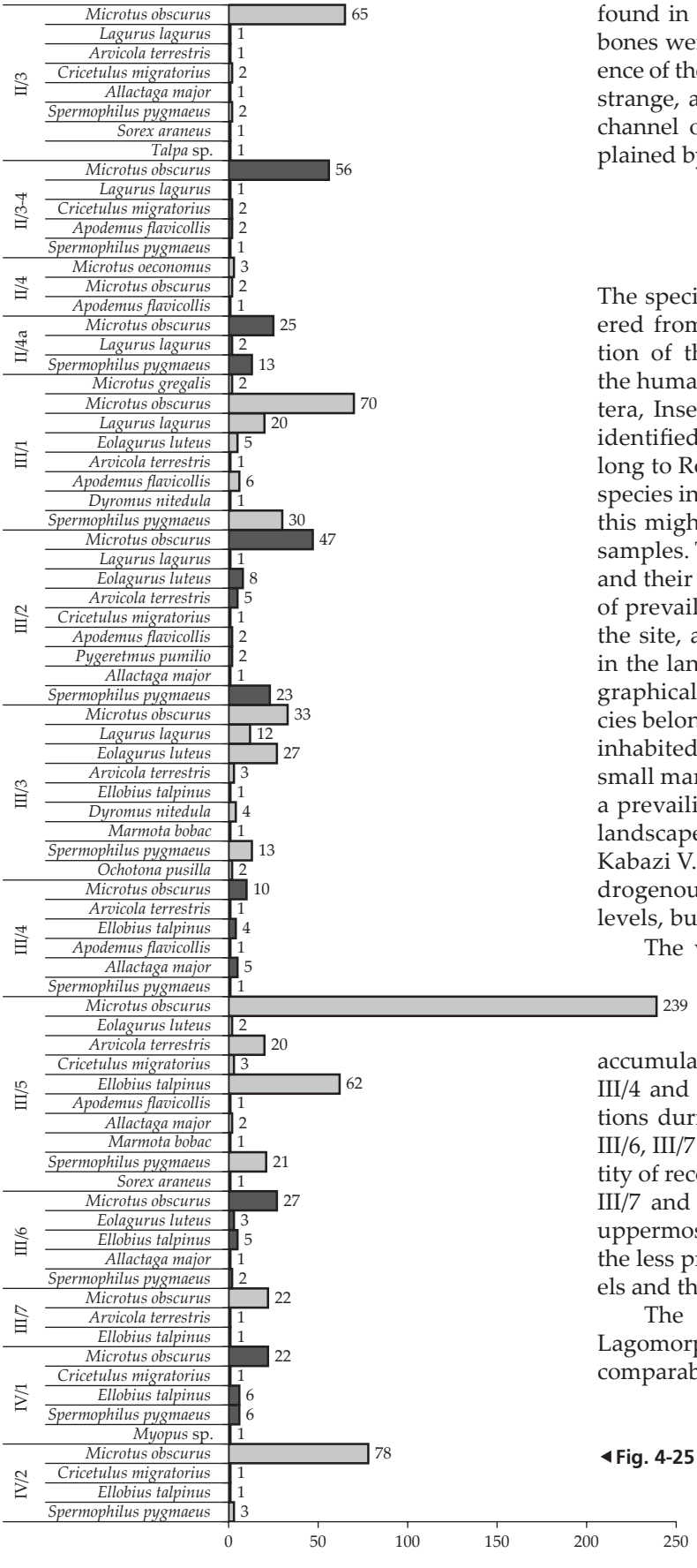
Remains of the lesser five-toed jerboa were only found in level III/2. This mammal is no longer found in the Crimea. Its modern range includes the lower Volga basin, Kazakhstan and Central Asia. Its favourable biotopes are semi-deserts and deserts. However, *Pygertmus pumilio* is also known to penetrate into regions with steppe. Its food includes bulbs, seeds, and green parts of plants. Lesser five-toed jerboa prefers to build their bore-holes in solid deposits. The remains of this animal were also identified in layer 6 at Buran-Kaya III (Markova 2004b). The presence of bones of *Pygeretmus pumilio* indicates an area with solid soils near the site during the Kabazi V, III/2 accumulation.

A small number of remains from two further steppe mammals (bobac marmot and narrow-skulled vole) support the impression of widely distributed open landscapes during the Middle Palaeolithic at Kabazi V.

Three forest species are also known from Kabazi V. These are Eurasian mole, yellow-necked mouse, and forest dormouse. The last two species are found typically in broadleaved forests. Eurasian mole is distributed in forests and forest-steppes (Fig. 4-26).

Common shrew is now found in many regions covering most of the natural zones of Eurasia. It is absent only in semi-deserts and desert. This insectivore feeds on insects, Amphibia, small mammals, and the seeds of coniferous trees (Flint et al., 1970).

Two hydrogenous voles were identified at the site. Water vole *Arvicola terrestris* remains were



found in most levels. Root vole *Microtus oeconomus* bones were recovered only in level II/3-4. The presence of these species in deposits at Kabazi V is rather strange, as nowadays the site lies 150 m above the channel of the Alma River. The finds may be explained by the hunting activity of birds (Fig. 4-26).

Conclusions

The species composition of small mammals recovered from Kabazi V makes possible a reconstruction of the principal palaeoenvironments during the human occupation. Eighteen species of Chiroptera, Insectivora, Lagomorpha and Rodentia were identified at the site, most of which (14 species) belong to Rodentia. Although the occurrence of these species in the sub-units and levels of the site varies, this might be explained by the varying volume of samples. The composition of small mammal species and their ecological fittings can be taken as markers of prevailing ecological situations in the vicinity of the site, and also provide information on changes in the landscape which occurred during the stratigraphical sequence (Fig. 4-26). The majority of species belong to groups of animals which would have inhabited arid open landscapes. Thus, most of the small mammals found at Kabazi V are indicative of a prevailing arid steppe with nearby forest-steppe landscapes. This group dominates in all layers of Kabazi V. Forest and meadow-steppe as well as hydrogenous species are also present in most of the levels, but only in very low numbers.

The varying ratios of the principal ecological groups of small mammals lead to the following conclusions: a higher occurrence of forest and shrub areas during the accumulation of Unit II and Unit III (sub-units III/1, III/4 and III/5), but with more arid climatic conditions during earlier depositional phases (sub-units III/6, III/7 and levels IV/1, IV/2). However, the quantity of recovered mammal remains in sub-units III/6, III/7 and levels IV/1, IV/2 were lower than in the uppermost occupations. Thus, this might explain the less pronounced richness in species in these levels and the absence of forest species remains.

The diversity of small mammals (Rodentia, Lagomorpha and Insectivora) from Kabazi V is quite comparable with the modern one, though species

◄**Fig. 4-25** Kabazi V. Species composition and quantity of remains of small mammals

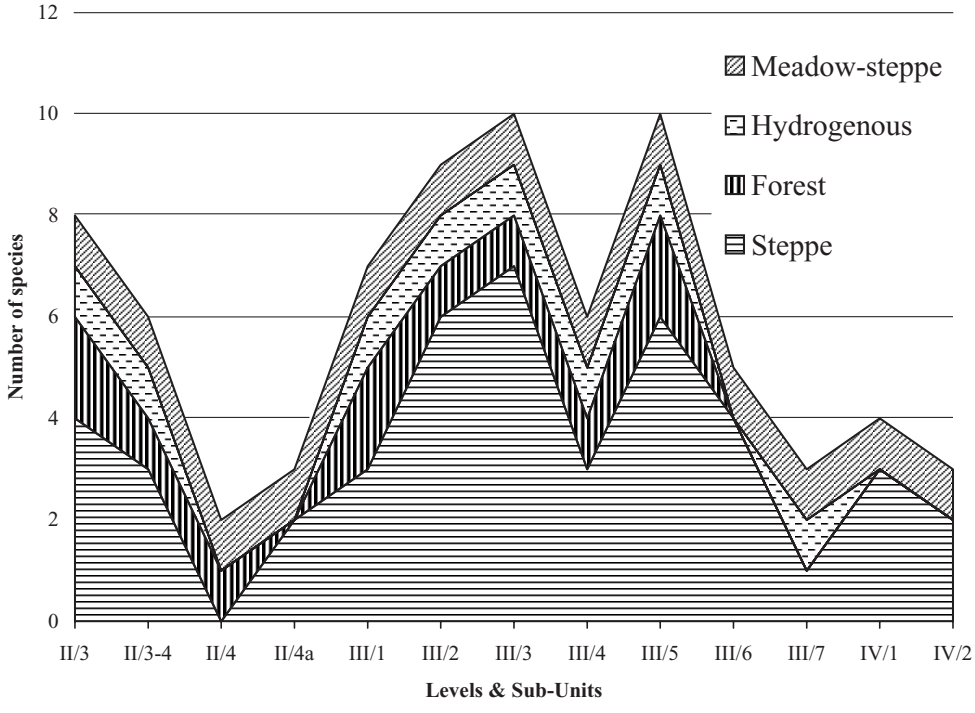


Fig. 4-26 Kabazi V. Ecological groups of small mammals from different levels and sub-units.

composition has changed significantly (Table 4-6). A total of 18 species were found at Kabazi V, with 20 small mammals (rodents, insectivores and lagomorphs) currently noted for the Crimea.

Some of the mammals found in Kabazi V deposits are no longer present in the Crimea: The range of the yellow steppe lemming *Eolagurus luteus* has decreased significantly. Nowadays, it is known only in some regions of Mongolia and China, and in the Zaisan Depression. Narrow-skulled vole *Microtus gregalis*, which was very common during the Pleistocene on the Russian Plain and in the Crimea, has now disappeared from Eastern Europe and is only found in the steppes of Kazakhstan and in the tundra zone, probably due to the appearance of a continuous forest zone following the end of the Valdai glaciation. Bobac marmot *Marmota bobac* also disappeared from Crimea and is now distributed in easternmost steppe territories. The aforementioned animals were common in Crimea and on the Russian Plain during the Valdai Glaciation, attracted as they were by decreasing temperatures during glaciation. The different types of open landscapes, with grass cover, were the prerequisites for their existence. The lesser five-toed jerboa *Pygeretmus* (*Alactagulus*) *pumilio* restricted its range in the Holocene under the influence of increasing humidity. Forest dormouse *Dryomys nitedula* is also not found in the modern Crimean fauna (Table 4-6).

Several aliens appeared in the Crimea in the Holocene, including rats and red squirrel, primarily as a result of anthropogenic influence and even deliberate introduction (red squirrel was introduced in the 20th century).

The accumulation of bones at Crimean sites is primarily connected with the hunting activities of owls, which would have nested in the rocks and rock-shelters (Gromov 1955; 1961). Consequently, these birds, which would have hunted on small mammals living in open areas, have greatly influenced the composition of the small mammal fauna spectrum at Kabazi V. Thus, due to the hunting ranges of owls, which can cover some several kilometres, the fauna distinguished at Kabazi V actually reflects natural conditions encountered in a rather wide area around the site. Obviously the influence of open landscapes distributed on the Kabazi plateau on the species composition of Kabazi V small mammals must have been significant.

The Kabazi V fauna list differs significantly from the modern one, which could be explained first of all by the different climatic conditions in the Late Pleistocene and at the present time, but also by anthropogenic pressure on nature in the Crimea during the Holocene. In sum, the new rich materials recovered during the excavations in 2002-2003 have made possible more reliable reconstructions.

Taxa	Kabazi V	The recent Crimean small mammals
Insectivora		
Erinaceus europeaus L. – European hedgehog	·	+
Talpa sp. - Eurasian mole	+	·
Crocidura leucodon Herm. – white-toothed shrew	·	+
Crocidura suaveolens Pall – lesser white-toothed shrew	·	+
Sorex minutus L. – pigmy shrew	·	+
Sorex araneus Linnaeus – Eurasian common shrew	+	+
Lagomorpha		
Lepus europaeus Pallas – European hare	+	+
Rodentia		
Sciurus vulgaris L. – red squirrel	·	+
Spermophilus pygmaeus Pallas – little suslik	+	·
Marmota bobac Pallas – bobac marmot	+	·
Allactaga major Kerr – great jerboa	+	·
Pygeretmus (Alactagulus) pumilio Kerr – lesser five-toed jerboa	+	·
Dryomys nitedula Pallas – forest dormouse	+	·
Sicista subtilis Pallas – Southern Birch Mouse	·	+
Apodemus (Sylvaemus) flavicollis Melchior – yellow-necked mouse	+	+
Rattus norvegicus Berc. – common rat	·	+
Rattus rattus L. – roof rat	·	+
Mus musculus L. – house mouse	·	+
Ellobius (Ellobius) talpinus Pallas – northern mole-vole	+	+
Cricetus cricetus L. – common hamster	·	+
Cricetulus migratorius Pallas – grey hamster	+	+
Arvicola terrestris Linnaeus – water vole	+	+
Eolagurus luteus Eversmann – yellow steppe lemming	+	·
Lagurus lagurus Pallas – steppe lemming	+	+
Microtus (Microtus) obscurus Eversmann – Altaian vole	+	+
Microtus (Pallasiinus) oeconomus Pallas – root vole	+	·
Microtus (Sumerionys) socialis Pallas – social vole	·	+
Microtus (Stenocranius) gregalis Pallas – narrow-skull vole	+	·
Total number of species:	17	20

Table 4-6 Small mammal species composition of modern and fossil Rodentia, Lagomorpha and Insectivora in Crimea.

The fauna from the earliest occupations at Kabazi V (Unit IV, sub-units III/7, III/6) is indicative of open steppe-like and meadow-steppe landscapes near the site. Later, during Unit III (sub-units III/1, III/4, III/5), few forest species appear in the small mammal assemblages. This shows a change to open environs with some forested and scrubbed areas located near the site. Some of the intermediate sub-units of Unit III (sub-units III/2 and III/3) might have experienced some increased aridity (stadial conditions?). At the close of human occupation at Kabazi V (Unit II) small mammal species included steppe, forest and meadow-steppe mammals, which are indicative of similar environmental conditions to those which prevailed during sub-unit III/1. The large mammal data from Kabazi V supports the impression of wide tracts of open landscape near the site, where typical steppe and semi-desert animals, such as saiga-antelope *(Saiga tatarica)* and Pleistocene ass *(Equus hydruntinus)* were the dominant species (Burke 1999).

On the whole, the Kabazi V sequence is correlated with MIS 3 (Chabai *et al.*, 2004), which was the most moderate stage of the last glaciation (Arnold *et al.*, 2002). The absence of cold-adapted animals in all levels indicates that climatic conditions during times of human occupation would have been moderate and comfortable. During the Late Pleistocene, and even during the coldest phase of the Valdai Glaciation, the low Crimean Mountains with their various local biotopes and different types of vegetation were the refuge not only for mammals, but also for Middle Palaeolithic human groups.

Abstract

МЕЛКИЕ МЛЕКОПИТАЮЩИЕ СРЕДНЕПАЛЕОЛИТИЧЕСКОЙ СТОЯНКИ КАБАЗИ V. ПАЛЕОЭКОЛОГИЧЕСКАЯ РЕКОНСТРУКЦИЯ

МАРКОВА А.К.

Видовой состав мелких млекопитающих, обнаруженных в многослойной палеолитической стоянке Кабази V, позволяет реконструировать основные изменения окружающей среды на протяжении обитания древнего человека. Из культурных отложений стоянки удалось определить восемнадцать видов мелких млекопитающих (Chiroptera, Insectivora, Lagomorpha, Rodentia). Содержание остатков мелких млекопитающих в различных слоях отличается, что зависело, в значительной мере, от объема исследованного материала. Видовой состав и экологические особенности мелких млекопитающих указывают на основные характеристики ландшафтов, окружающих стоянку и также на определенные экологические изменения окружающей среды на протяжении существования памятника (Fig. 4-26). Большинство определенных видов мелких млекопитающих относятся к обитателям открытых аридных ландшафтов и указывает на распространение аридных степных и лесостепных местообитаний. Эта группа животных доминирует во всех слоях Кабази V. Лесные, луговые и околоводные млекопитающие также присутствуют в большинстве слоев стоянки, но в очень малом количестве.

Отношение между основными экологическими группами млекопитающих позволяет говорить о более значительном распространении залесенных участков вблизи стоянки во время накопления культурных слоев II и III (пачки горизонтов III/1, III/4, III/5). Более аридные климатические условия существовали в более раннюю фазу накопления отложений (пачки горизонтов III/6, III/7, и горизонты IV/1, IV/2). Нужно отметить, однако, что количество костных остатков мелких млекопитающих, обнаруженных в этих слоях ниже, чем в более поздних отложениях. Этот факт, вероятно, объясняет и более низкое видовое богатство мелких млекопитающих в более ранних отложениях, и, возможно, отсутствие в них остатков лесных видов.

Разнообразие мелких млекопитающих (Rodentia, Lagomorpha, Insectivora) из Кабази V сопоставимо с современным, однако видовой состав заметно отличается (Table 4-6). Восемнадцать видов, были определены в Кабази V; в настоящее время в Крыму обитают 20 видов грызунов, насекомоядных и зайцеобразных.

Некоторые из найденных в Кабази V млекопитающих в настоящее время не обитают в Крыму: ареал желтой пеструшки Eolagurus luteus в настоящее время резко сократился (сейчас она обитает лишь в Монголии, Китае и Зайсанской котловине). Узкочерепная полевка Microtus gregalis, вид, широко распространенный на Русской равнине и в Крыму на протяжении всего плейстоцена, во второй половине голоцена исчез из Восточной Европы, и теперь населяет казахстанские степи, а также тундры. Разделение ареала этого вида произошло в конце валдайского оледенения в результате формирования сплошной лесной зоны. Также из Крыма исчез сурок байбак Marmota bobac, который сохранился в более восточных степях. Упомянутые выше животные находили благоприятные условия обитания в Крыму и на Русской равнине во время последнего оледенения, т.к. температурные параметры не являлись для них ограничивающим фактором. Основным условием их обитания является распространение открытых ландшафтов разных типов. Тарбаганчик Pygeretmus (Alactagulus) pumilio , определенный в Кабази V, также сократил свой ареал в голоцене под влиянием возросшей увлажненности. Лесная соня Dryomys nitedula не обнаружена в современной фауне Крыма (Таблицы 4-6). В голоцене произошло появление в фауне Крыма двух видов крыс и белки (последняя была акклиматизирована в XX веке).

Накопление костных остатков мелких млекопитающих в крымских стоянках, прежде всего, связано с охотничьей деятельностью сов, гнездящихся в скалах и расщелинах (Gromov 1955, 1961). Нужно отметить, что совы предпочитают охотиться на мелких млекопитающих, распространенных, прежде всего на открытых участках. Этот момент, вероятно, отражается на видовом составе мелких млекопитающих Кабази V. Также важно иметь ввиду, что охотничий ареал хищных птиц составляет несколько километров, таким образом, фауна мелких млекопитающих, обнаруженная в Кабази V, дает представление о ландшафтах, распространенных широкой полосой вокруг стоянки. Несомненно, что влияние на видовой состав млекопитающих данного памятника открытых ландшафтов расположенного вблизи плато Кабази должно было быть значительным.

Состав фауны стоянки Кабази V сильно отличается от видового состава современной фауны горного Крыма. Прежде всего, это объясняется изменившимися климатическими условиями. На современную фауну также оказало влияние антропогенное воздействие. Полученные в 2002-2003 гг. новые богатые материалы костных остатков мелких млекопитающих из стоянки Кабази V позволяют провести более достоверные реконструкции.

Фауна из наиболее ранних отложений (культурный слой IV, пачки горизонтов III/7, III/6) указывает на преобладание открытых степных и луговых ландшафтов вблизи стоянки. Позднее, во время формирования отложений пачек горизонтов III/1, III/4, III/5, в фауне появляется несколько лесных видов, что свидетельствует о чередовании вблизи стоянки как открытых, так и лесных биоценозов. Вероятно, пачка горизонтов III/1 отложились в брянский межстадиал (=Денекамп), а пачка горизонтов III/5 – в межстадиал Гражданский проспект (=Хенгело). Фауна некоторых пачек горизонтов (III/2, III/3) возможно отражает некоторую аридизацию (стадиальные условия?). В наиболее поздних отложениях стоянки (культурный слой II) фауна мелких млекопитающих включает степные, лесные и луговые виды. Эта фауна отражает сходные климатические условия с таковыми пачки горизонтов III/1, и, возможно, отвечает концу брянского межстадиала. Результаты исследований

крупных млекопитающих также дают представление о широком распространении открытых ландшафтов около стоянки. Видами – доминантами являлись сайга *Saiga tatarica* и плейстоценовый осёл *Equus hydruntinus* (Burke 1999; Глава 6 в этом томе).

Отложения всех слоев Кабази V коррелируются с изотопно-кислородной стадией 3 (MIS 3), с наиболее теплой фазой последнего оледенения (Arnold et al., 2002). Отсутствие во всех слоях стоянки животных, адаптированных к суровым климатическим условиям, указывает на умеренный климат, благоприятный для обитания древнего человека. Низкие горы Крыма с многообразием локальных биотопов и разнообразной растительностью являлись на протяжении валдайского оледенения рефугиумом как для млекопитающих, так и для древнего человека.

Chapter 5

Pollen Study of Kabazi V

Natalia Gerasimenko

At Kabazi V, sediments were sampled for pollen analysis between a depth of 6.45-4.90 m, with 30 samples taken in 5 cm intervals (Fig. 5-1). The sampled sediments had accumulated within the rock shelter (Yevtushenko 1998a; Chapter 1, this volume) and represent fine loose whitish carbonate products that had resulted from the destruction of its roof and walls. The collected samples were processed a total of two times: firstly, using our standard technique (Gerasimenko 1999, 2004), and later on using heavy liquids with different density; sodium pyrophosphate processing was excluded. Microfossils were found in just eight samples, and these in only small amounts (see below). In other samples pollen were practically absent; in all of these, 0-2 microfossils were observed per slide, which included the spores of Filicales (ferns) and/or pollen of herbs and sedges. The admixture of quartz in slides was also poor. Only at the base of the sequence (6.45-6.25 m) did samples contain significant amount of quartz sand, which is indicative of an influx of colluvial material into the rock shelter during formation of these deposits. Whereas the sample from level 6.45-6.40 m was relatively rich in pollen (see below), in samples from the interval 6.40-6.25 m, broken and folded pollen grains of herbaceous plants, and possibly of Betulaceae, occurred in notable numbers. Two levels higher up in the sequence contained mainly unidentified pollen grains (5.90-5.85 and 5.55-5.50 m).

Sample #1 from the bottom of the sequence, at a depth of 6.40-6.45 m (Fig. 5-1), yielded 54 microfossils, 35 of which are spores, most of which (21) could be assigned to Filicales, while the remaining 19 include Bryales and a few (3) Lycopodiaceae. The amount of arboreal pollen (AP) is low: 4 grains of *Pinus*, one grain of *Alnus*, and one grain of Caprifoliaceae (*Viburnum*). Non-arboreal pollen (13 grains) comprise Cyperaceae (7 grains), Poaceae (2), Rosaceae (3), and a single grain of Lamiaceae.

Sample #4, collected from a depth of 6.25-6.20 m (Fig. 5-1), provided a large number of microfossils, but most of these proved poorly preserved and could not be identified (in spite of the absence of sand in the sample). Among the identified pollen from this sample (52) there were 13 pollen grains from trees, 24 grains of non-arboreal pollen (NAP), and 15 spores. *Alnus glutinosa* dominates the AP spectrum (7 grains). Other arboreal taxa include *Pinus* (3 pollen grains, one of which is badly broken), *Betula* (2),

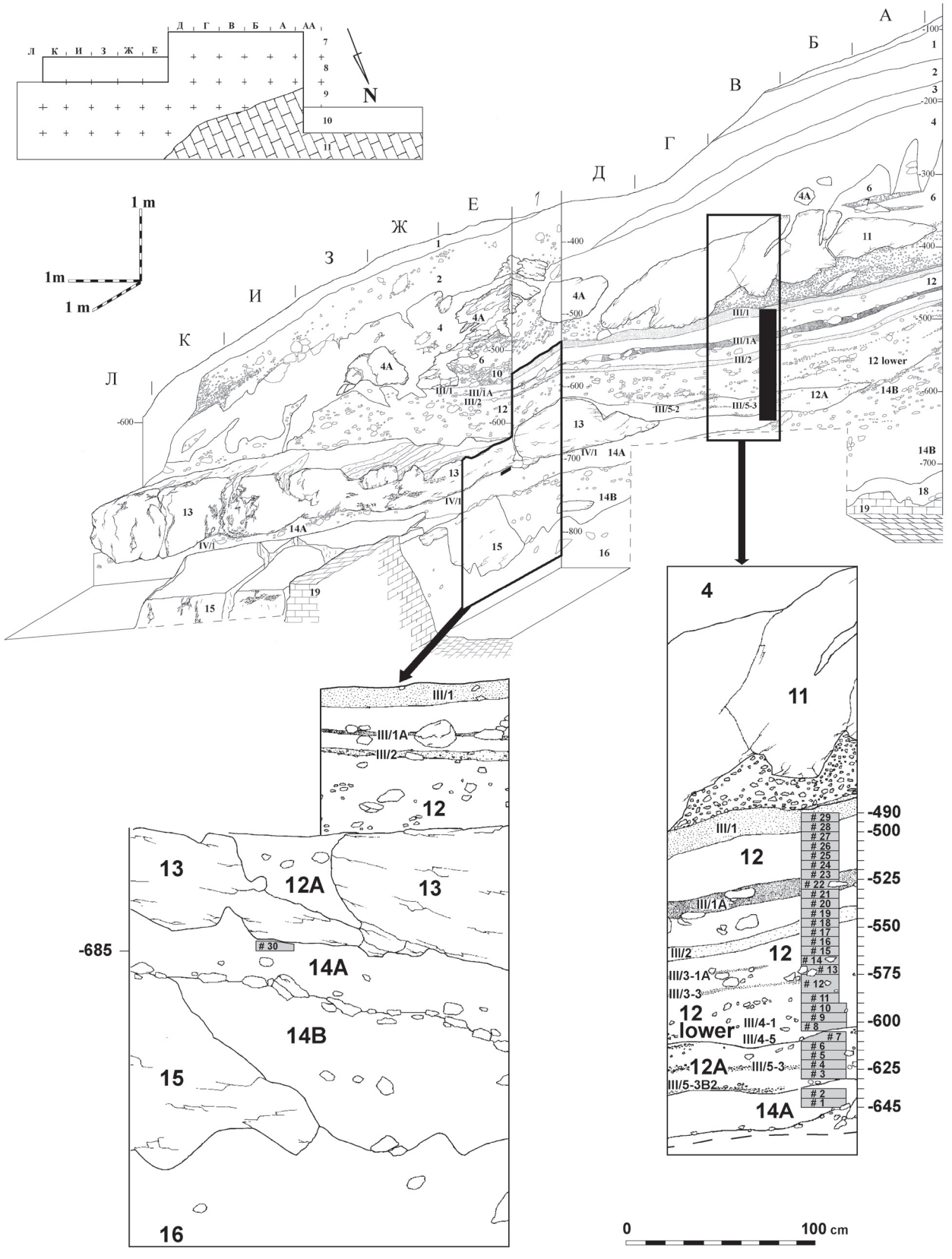


Fig. 5-1 Kabazi V: sections along square lines 6/7 and Д/Е; arabic numbers (e.g. #12) show the position of collected pollen samples in the deposits. For a detailed description of the sections see Chapter 1.

and *Fagus* (one well-preserved pollen grain). In the NAP, Asteraceae pollen dominate (10 grains), while Brassicaceae, Cyperaceae, and Poaceae occur in the same number (3-4 of each, respectively), with single Rosaceae, Fabaceae, and Lamiaceae pollen grains also found. Spores include mainly Filicales (12) and only a few Bryales and Lycopodiaceae.

Sample #7 from a depth of 6.10-6.05 m (Fig. 5-1) displays a slightly higher content of Filicales than other samples (4-5 per slide), but no pollen were found.

Sample #8 (Fig. 5-1) was collected from a depth of 6.05-6.00 m (80 microfossils) and is distinguished by its high content of Bryales spores (46) and a predominance of AP (21) over NAP (8). AP comprise *Pinus* (13 grains) and *Betula* (8), while NAP include mainly Lamiaceae pollen (5) and a few grains of Cyperaceae and Asteraceae. *Betula pendula* pollen was identified, and five spores of Filicales were also found, as well as many unidentified pollen of herbs, and possibly pollen of the Betulaceae family.

Sample #14 was taken at a depth of 5.70-5.65 m (Fig. 5-1). Most of the total number of 32 microfossils were spores (12 Filicales and 10 Lycopodiales). AP were represented by *Alnus* (5 grains), and NAP included Cyperaceae (3 grains) and single Lamiaceae and Rosaceae pollen, respectively. The next **sample #15** (5.65-5.60 m) displays a slightly higher content of Filicales than other samples (4-5 per slide), but no pollen were found.

Sample #22 (Fig. 5-1) was collected from a depth of 5.30-5.25 m (65 microfossils), and is similar to **sample #8** (6.05-6.00 m). It has a high content of Bryales spores (23), with a few Filicales (4 spores), and also many unidentified herbal pollen. Arboreal pollen (14 grains) included *Pinus* (6 grains), *Betula* (5), Rhamnaceae (2), and a single pollen grain of *Crataegus*. *Betula pubescens* pollen was also identified. NAP (24 grains) comprise Cyperaceae (12 grains), Asteraceae, Lamiaceae and Rosaceae (3 grains of each), Chenopodiaceae (2) and Brassicaceae (1 grain).

Sample #29 (Fig. 5-1) stems from the top of the sequence (4.95-4.90 m). It yielded 31 microfossils represented by Filicales spores and herbal pollen. The latter (20 grains) include Lamiaceae (6 grains), Rosaceae (3), Fabaceae (1), Chenopodiaceae (4), Asteraceae (3), Cyperaceae (2) and Poaceae (1). Arboreal pollen was not found in this sample.

The pronounced lack of pollen at Kabazi V is striking in contrast with earlier results from investigations at Kabazi II where relatively rich pollen spectra were found in nearly all levels of the sequence (Gerasimenko 1999, 2005). However, it should be noted that Kabazi II and Kabazi V, although both located on the slope of a cuesta on the Alma River valley, differ in one significant way: whereas Kabazi V deposits accumulated in a rock shelter, Kabazi II was an open-air site (Chabai 2004c). This factor might very well explain the very low content of plant microfossils at the latter site.

Kabazi V is characterised by alternating Micoquian and Levallois-Mousterian cultural levels, and at some levels Micoquian and Levallois-Mousterian artefacts are mixed. In Crimea, the co-existence of Micoquian and Levallois-Mousterian industries occurred during the interval between 50/45-29/28 kyr BP (Chabai 2004c), which fits well with C^{14}-AMS dates obtained (Chapter 3, this volume) from the lower sub-unit III/5 (38.78±0.36) and the upper sub-unit III/1A (30.98±0.22) as well as ESR ages of 26-30 and <41 kyr (Rink *et al*., 1998). On the other hand, U-series (McKinney 1998) and TL/OSL datings (Chapter 3, this volume) suggest an Early Glacial age for Kabazi V between 60 and 100 kyr BP.

A main characteristic of microfossil composition in all levels of Kabazi V is a high ratio of spores. Indeed, this is a typical feature to have been observed at other rock-shelter sites of Crimea, e.g. Zaskalnaya V (Gubonina 1985), and particularly Buran Kaya III (Gerasimenko 2004). A predominance of spore plants, most of which are shade-resistant, might represent local environments at cave entrances. The characteristic feature of the Buran Kaya III spore population was a rather high amount of *Botrychium* and Lycopodiaceae (including boreal species) during the stadials, whereas Filicales (ferns) and Bryales (green mosses) occurred through the whole studied interval (the end of Middle Pleniglacial – Late Pleniglacial). At Zaskalnaya V, Filicales, namely Polypodiaceae, became abundant only during the interstadials (Gubonina 1985). The same evidence is observed in the pollen diagram of Kabazi II (Gerasimenko 1999), though the proportion of Polypodiaceae at this open-air site is much smaller than in the caves. A predominance of Polypodiaceae over Bryales during interstadials is very expressive in the archaeological and natural sites of the Carpathian area (Gerasimenko 2006, 1994). In the warmer Crimean Mountains, ferns (Polypodiaceae) could survive cold climate in the caves, and a prevalence of their spores might rather be an indicator of humidity. Indeed, the significant amount of Polypodiaceae spores also means that conditions could not have been very cold.

At Kabazi V, Filicales (Pterideae and Polypodiaceae) or Bryales dominate in all studied levels, with Lycopodiaceae (club-mosses) only becoming significant between 5.70-5.65 m (sub-unit III/3). This information indicates that whereas interstadial environments probably prevailed during the formation of the studied layers at Kabazi V, deposits assigned to sub-unit III/3, marked by an increase in club-mosses, might also have formed during a stadial.

The considerable ratio of arboreal pollen in the pollen spectrum at Kabazi V (with exception of the lowest and uppermost deposits), combined with an absence of pollen of herbaceous xerophytes (with exception of the uppermost deposits), is also suggestive of a relatively humid climate during the formation of the main part of the Kabazi V sequence studied here. The relative abundance of *Pinus*, *Alnus* and *Betula* might be explained by the more effective transport of their pollen through the air, compared to other taxa. On the other hand, pollen of Chenopodiaceae is also characterised by high dissemination abilities, and is usually well preserved. Thus, the absence of the latter is a more direct indication of a relatively humid environment, with the expansion of mesophytic herb cover during the formation of the studied sequence. In the NAP the majority of samples, pollen of Lamiaceae and Rosaceae (both belong to Herbetum mixtum group) dominate alongside Cyperaceae (sedges), which are typical for mountain meadow-steppes.

During the formation of the main part of the studied sequence, meadow steppes evidently alternated with boreal (southern-boreal?) forest. At Kabazi V, there is no direct evidence of southern-boreal vegetation (only a single pollen grain of *Fagus*), but it should not be forgotten that pollen of broad-leaved taxa are much less capable of air transportation than pollen of coniferous and small-leaved taxa, which would have meant a much more limited access of the former to the rock shelter. It has already been shown that Interstadial vegetation around neighbouring Kabazi II was southern-boreal (Gerasimenko 1999). An abundance of Polypodiaceae spores has also been interpreted as an important marker for the presence of broad-leaved trees (Gubonina 1985). A few pollen grains of bushes, which grow in mixed and deciduous forests (*Viburnum, Crataegus,* Rhamnaceae), were found at Kabazi V, though at Kabazi II the pollen of these plants also occur in the deposits of stadials (evidently from refugia sites in the Crimean mountains).

Judging from the low content of botanical microfossils at Kabazi V, only a very tentative subdivision into phases of vegetational and environmental dynamics can be suggested.

At the beginning of its formation, sample #1 from unit IV (Fig. 5-1), wet meadows (with a high ratio of sedges) predominated around the site, ferns and mosses grew near the entrance to the rock shelter. There existed an intense runoff (strong sand input into the cave). The presence of *Viburnum*, which is a moisture-loving plant, might confirm a reconstruction of humid environments, but, generally speaking, arboreal vegetation possibly had a limited distribution in the river valley (cool climate?). On the other hand, a predominance of Polypodiaceae does indicate that the climate could not have been very cold.

Samples from the depth interval of 6.25-6.05 m, sub-unit III/5 (Fig. 5-1), evidently reflect slightly warmer and drier conditions. Warming is indicated by an increase in the tree population (particularly *Alnus*) and the appearance of broad-leaved *Fagus*. Although ferns and hygrophytic sedges were still a significant element in the vegetation cover, the ratio of mesophytic herbs (Lamiaceae, Rosaceae, Asteraceae, few Fabaceae and Brassicaceae) increased considerably at this time. Meadows around the site were replaced by meadow-steppe. This could reflect an increase of evaporation in a warmer climate. Pollen counts for the Asteraceae family, which includes plants of disturbed substrata and xerophytic species, also increase at this level, as does the number of evidently re-deposited (distorted and unidentified) herbal pollen. Silt colluviation could have occurred at this time due to slow runoff.

At the depth 6.05-6.00 m, sub-unit III/4 (Fig. 5-1), green mosses absolutely prevailed over ferns near the cave entrance. The arboreal vegetation represented by pine and birch, spread and formed forest-steppe ecotones. Wet-loving Polypodiaceae and *Alnus* were strongly reduced. Humidity was decreasing continuously compared to the preceding phases, though the climate did not become warmer.

At the depth 5.70-5.65 m, sub-unit III/3 (Fig. 5-1), a sharp increase in Lycopodiales can be interpreted (as explained above) as a tentative indicator of cooling. Birch-pine forest seems to disappear. Wet meadows spread, and a few *Alnus* grew near the river.

At the depth 5.30-5.25 m, level III/1A (Fig. 5-1), environments were similar to those of sub-unit III/4. The entrance to the rock-shelter was covered by green mosses. The woods, which evidently expanded onto the slopes, consisted of pine and birch, and a few *Rhamnus* and *Crataegus* occurred. Sedges and mesophytic herbs formed patches of meadow-steppe.

The uppermost of the investigated samples, depth 4.95-4.90 m, level III/1 (Fig. 5-1), indicates an

environmental change – a sharp reduction of arboreal vegetation and some xerophytization of meadow-steppe coenoses. Pollen of Chenopodiaceae first appeared at a depth of 5.30-5.25 cm (level III/1A), but at the top of the sequence Chenopodiaceae predominated over Cyperaceae. This fact, and particularly the absence of arboreal pollen, gives reason to assume a cooling and an increase in aridity.

Thus, pollen data from Kabazi V indicate that environments changed from wet and cool, transitional stadial to interstadial (unit IV), to warmer and progressively drier (sub-units III/5 and III/4), then to cool and wet, stadial? (sub-unit III/3), and then again to warmer and drier (level III/1A), and finally to cool and dry, transitional from interstadial to stadial (level III/1).

The spread of boreal trees (*Pinus, Betula, Alnus*) indicate that the climate was cooler than at present, as it is typical for an interstadial. Single pollen grains of *Fagus* (beech), Rhamnaceae (buckthorn) and *Crataegus* (hawthorn) might indicate the presence of some elements of a temperate vegetation. The latter are expected to have existed in refugia in the Crimean Mountains. At Kabazi II, Rhamnaceae and *Crataegus* also occurred during the stadials, but *Fagus* appeared only a few times during the formation of the Kabazi II sequence – at the end of the Last Interglacial, during the second Early Glacial stadial and during the Moershoofd interstadial (Gerasimenko 2005). Judging from the age of the Kabazi V industries (see above), the first and the second *Fagus* appearances seems to be too old to permit a correlation with the *Fagus* marked level at Kabazi V. Instead, a correlation with the first half of Middle Pleniglacial might be possible. On the other hand, the rather high proportion of *Betula* and *Alnus* pollen, observed in the studied deposits at Kabazi V, is more typical for the Odderade interstadial at Kabazi II. Nevertheless, pollen counts at Kabazi V are insufficient and could be strongly distorted due to under-representation of broad-leaved pollen in rock-shelter deposits compared to open-air site ones. At the other Crimean rock-shelters (Zaskalnaya V and Buran-Kaya III), the Middle Pleniglacial interstadial deposits also have few or no pollen from broad-leaved trees and high counts of Polypodiaceae spores.

Abstract

ПАЛИНОЛОГИЧЕСКОЕ ИЗУЧЕНИЕ СТОЯНКИ КАБАЗИ V

ГЕРАСИМЕНКО Н.П.

Палинологически проанализированы 29 образцов из отложений стоянки Кабази V. Однако палиноморфы были выявлены в небольших количествах (32-80) лишь в восьми из них, при этом значительная их часть представлена спорами. Разительный контраст по количеству и составу микрофоссилий с таковыми стоянки Кабази II очевидно объясняется различными условиями формирования палиноспектров открытой и пещерной стоянок. Преобладание спор в спорово-пыльцевых спектрах пещерных стоянок Крыма ранее было выявлено на памятнике Буран Кая III (Gerasimenko 2004) и для некоторых слоев стоянки Заскальная V (Gubonina 1985). При этом, также как на стоянках Закарпатья (Gerasimenko 2006), прослеживалось преобладание спор папоротников в отложениях интерстадиалов и спор плаунов в стадиальных отложениях.

Другими характерными особенностями состава палиноморф стоянки Кабази V являются – полное отсутствие пыльцы травянистых ксерофитов на уровнях от культурного

слоя IV до горизонта III/1A, а также отсутствие палиноморф широколиственных пород, в том числе и в слоях с преобладанием спор папоротников и преобладанием микрофоссилий древесных пород среди пыльцы. Единственное хорошо сохранившееся пыльцевое зерно бука выявлено в пачке горизонтов III/5. Преобладание древесной пыльцы и спор папоротников над пыльцой трав характерно для спектров интерстадиальной растительности.

Несмотря на низкое содержание микрофоссилий, изменение их качественного состава по разрезу стоянки позволяет предварительно наметить следующие ландшафтно-климатические изменения.

В основании разреза, культурный слой IV характеризовался очень высоким содержанием спор папоротников (встречены и плауны) и преобладанием микрофоссилий трав над древесной пыльцой. Группа трав представлена осоками и разнотравьем. В группе древесных преобладает пыльца сосны (единично встречены микрофоссилии ольхи и калины). Низкое участие пыльцы деревьев на фоне преобладания мезофитных трав может свидетельствовать о влажном, но довольно прохладном климате (возможно переходном от стадиала к интерстадиалу). Вокруг входа в пещеру господствовали влажно-луговые ландшафты с высоким участием папоротников и осок.

Пачка горизонтов III/5 характеризуется снижением участия спор (среди них представлены почти исключительно папоротники) и пыльцы осок, повышением роли древесной пыльцы. Спорово-пыльцевые спектры близки к лесостепному типу. В группе пыльцы древесных ольха преобладает над сосной, встречено пыльцевое зерно бука. Группа трав представлена разнотравьем богатого состава, но доминирует пыльца сложноцветных. Вероятно, в это время вблизи стоянки сырые луга сменились луговыми степями, а в пойме расширились площади черноольшанников. Климат стал суше и очевидно теплее.

Пачка горизонтов III/4 характеризуется максимальным содержанием спор зеленых мхов и преобладанием пыльцы древесных пород (сосны и березы) над пыльцой травянистых растений (разнотравье). На склоне распространялся светлый березово-сосновый лес с мохово-разнотравным покровом. Зеленые мхи росли у входа в грот. Резкое сокращение роли папоротников и ольхи свидетельствуют о продолжении тренда снижения переувлаженения.

Лесостепные и лесо-луговые условия, существовавшие во время формирования пачек горизонтов III/5 и III/4, на Средне-Европейской равнине были бы отнесены к интерстадиальным, но для интерстадиалов западных предгорий Крыма реконструировано существенное участие в составе растительности широколиственных пород. Одной из причин отсутствия этой пыльцы в пещерных отложениях Кабази V может быть значительно более низкая летучесть микрофоссилий широколиственных пород в сравнении с сосной и мелколиственными породами.

Пачка горизонтов III/3 отличается очень высоким участием спор, в том числе, плаунов. Последнее позволяет предполагать похолодание во время его формирования, сопровождавшееся переувлажнением у входа в грот. Среди микрофоссилий представлены почти исключительно гигрофиты: ольха, осоки. По своим характеристикам спектр напоминает условия стадиалов раннего валдая или начала среднего плениглициала, связанные с распространением влажных лугов.

Горизонт III/1A характеризуется спорово-пыльцевым спектром лесостепного типа, со значительным участием спор зеленых мхов. Можно предположить, что луговые степи с единичными кустами крушиновых и боярышника чередовались в это время с сосново-березовыми перелесками. У входа в пещеру росли зеленые мхи, а роль папоротников была очень незначительна. Снижение увлажнения вероятно связано с повышением испарения в условиях интерстадиального потепления климата.

Горизонт III/1 резко отличается по полному исчезновению пыльцы деревьев и впервые наблюдающемуся преобладанию пыльцы трав над спорами. В составе пыльцы трав господствует разнотравье, но в заметном количестве появляются и микрофоссилии ксерофитов – маревых. Так как этот слой содержит также довольно много спор папоротников, он, вероятно, может быть отнесен к переходному от интерстадиала к стадиалу.

Если принять версию, что малолетучая пыльца широколиственных пород не попадала в пещерные отложения, полученные спорово-пыльцевые данные не противоречат

имеющимся C^{14}, AMS и ESR датировкам, относящим слои стоянки к интервалу между 38 и 26-30 тыс. лет назад (Rink *et al.*, 1998; Глава 3 в этом томе). В то же время, высокое участие пыльцы березы и ольхи, а также и травянистых мезофитов на соседней стоянке Кабази II более характерны для раннего гляциала или первой половины среднего плениглациала. Пыльца бука, прослеженная в нижней части разреза Кабази V, на стоянке Кабази II встречена на трех уровнях – в конце последнего интергляциала, во время второго раннеледникового и в первом среднеплениглациальном интерстадиале. Корреляция со средним плениглациалом совпадает с археологическими данными о возрасте отрезка сосуществования микокских и леваллуа-мустьерских индустрий, представленного на памятнике Кабази V (Глава 18 в этом томе). Учитывая малочисленность палинологических данных, считаем, что их результаты имеют в данном случае лишь вспомогательное значение.

Chapter
6

Analyses Archéozoologiques des Unités III et IV de Kabazi V

Marylène Patou-Mathis

Nous avons analysé les restes de grands mammifères des deux unités III et IV du site de Kabazi V.

Paléoécologie et Chronologie

Les grands mammifères présents dans les assemblages ne reflètent pas dans son intégrité l'environnement car ils résultent de choix anthropiques.

L'*Equus hydruntinus* et l'antilope saïga sont présents tout le long de la séquence, cependant à partir du niveau III/3-2, le petit équidé devient plus abondant que l'antilope (Fig. 6-1). Les espèces «froides» (rhinocéros laineux, mammouth et renne) ne sont présentes que dans les niveaux supérieurs (III/1 à III/4-1), mais absentes de III/3-1B, III/3-1D, III/3-2, III/3-3 (Fig. 6-2). Le cerf est absent des sous-unités III/4, III/6 et III/7 et de l'unité IV (Fig. 6-3). Quelle que soit la sous-unité, d'après les spectres fauniques, le climat était froid et sec et le paysage steppique avec des espaces boisés dans la vallée près du cours d'eau. Cependant, durant la formation des sous-unités supérieures, III/1 et III/2, le climat était plus rigoureux et plus aride que dans le reste de la séquence, au moins jusqu'à la fin de la sous-unité III/6. En effet, pour la sous-unité III/7 et l'unité IV, les restes fauniques déterminés étant rares, il est difficile de formuler des hypothèses paléoécologiques.

Les niveaux III/1 et III/1A ont été datées respectivement entre 26 et 30 000 ans (par ESR) et 30,98±0,22 BP (OXA-X-2134-45). Elles seraient donc contemporaines de l'interstade de Denekamp. Le niveau III/5-3B2 est daté par AMS de 38,78±0,36 BP (interstade d'Hengelo). Pour les fouilleurs, les dépôts de l'unité III eurent lieu lors de phases stadiaires (sous-unités III/2, III/3, III/6 et III/7) ou interstadiaires (sous-unités III/4 et III/5) de l'Interpléniglaciaire wechsélien (contemporains de l'OIS 3). L'unité IV serait contemporaine d'une phase stadiaire du début l'Interpléniglaciaire wechsélien (OIS 3). Nos résultats concordent avec les leurs exceptés pour les sous-unités III/1 et III/3 qui correspondraient plutôt respectivement à une phase stadiaire et interstadiaire.

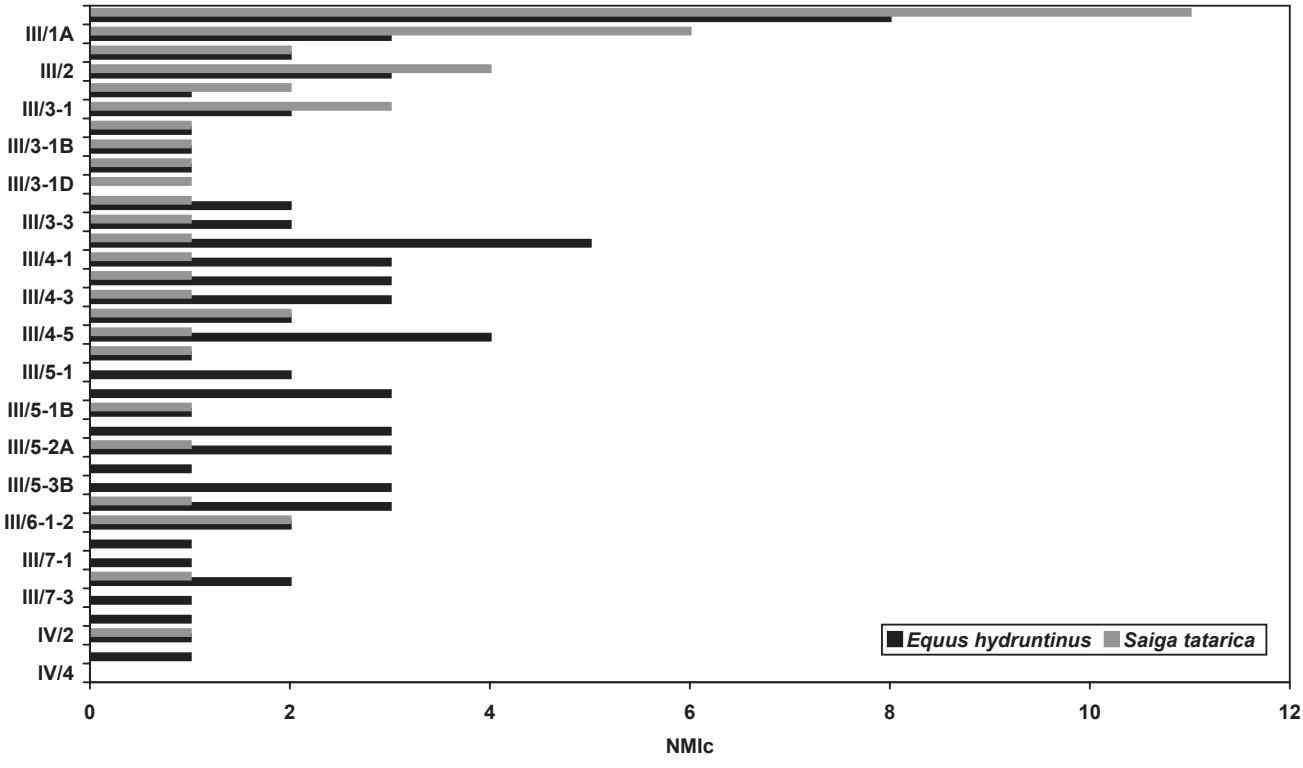


Fig. 6-1 Kabazi V, Units III and IV: Variation of *Equus hydruntinus*/*Saiga tatarica*.

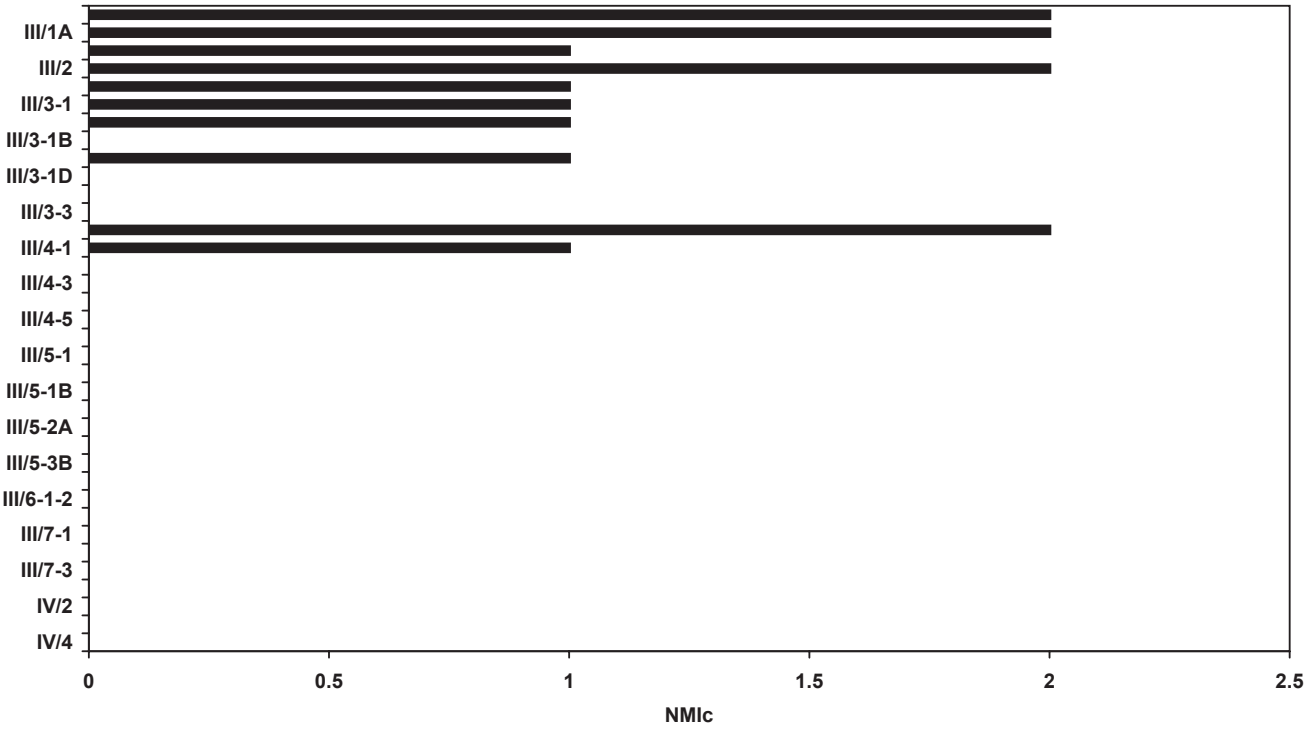


Fig. 6-2 Kabazi V, Units III and IV: Variation of "cold" species *(Coelodonta antiquitatis*/*Mammuthus primigenius*/*Rangifer tarandus).*

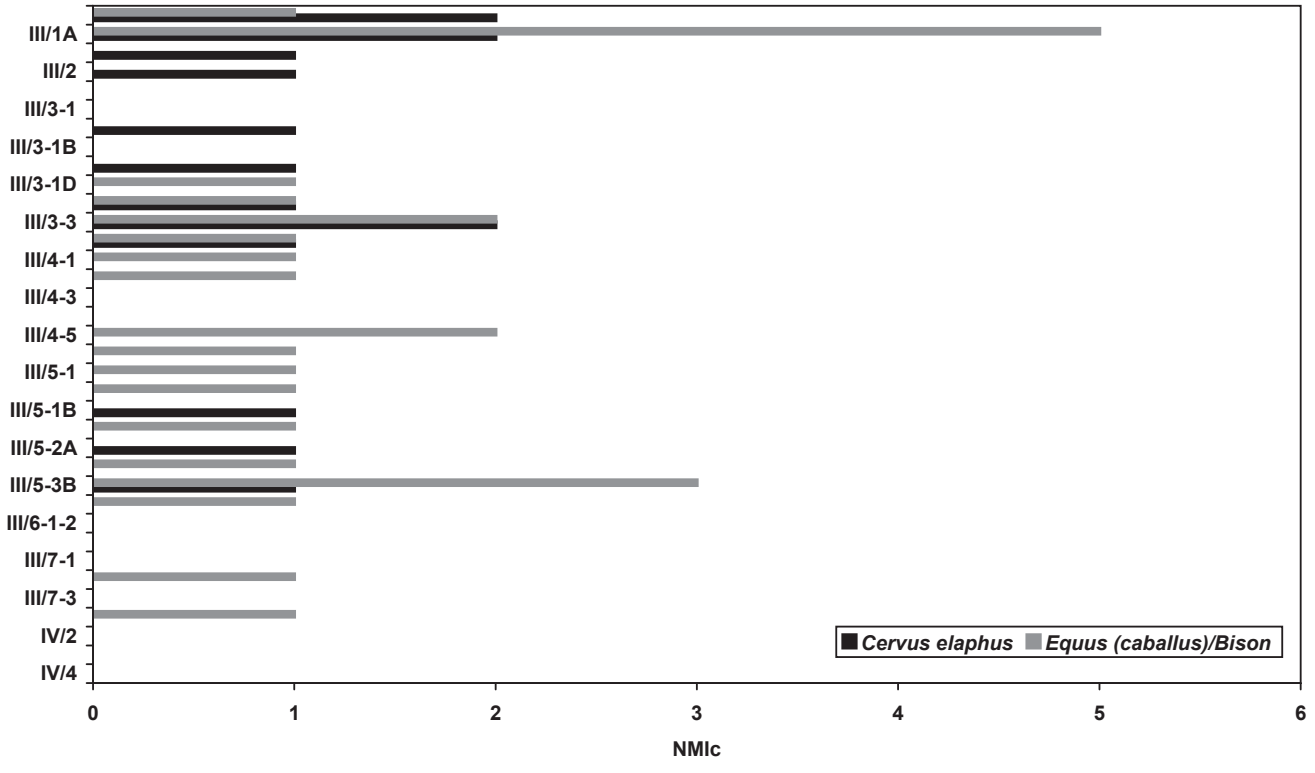


Fig. 6-3 Kabazi V, Units III and IV: Variation of *Cervus elaphus/Equus sp. (cf. caballus) sp./Bison cf. priscus).*

Analyses Archéozoologiques

Unité III

L'unité III comprend 7 sous-unités, elles-mêmes subdivisées en plusieurs niveaux.

Sous-unité III/1

La sous-unité III/1 est subdivisé en 3 niveaux: III/1, III/1A et III/1C. Quatre fosses, une en III/1 et 3 en III/1A, ont été dégagées à la fouille. En III/1A, un foyer a également été mis en évidence. Le niveau III/1C, le plus pauvre en matériel osseux, n'est présent que sur quatre carrés. Par contre les niveaux III/1A et surtout III/1 sont riches (Table 6-1). La densité du matériel osseux est respectivement de 390, 162 et 152 (Table 6-1).

Dans les trois niveaux, les herbivores sont largement dominants (Table 6-1). Les restes de carnivores sont peu abondants et absents en III/1C. Ils sont représentés par le loup et l'hyène ou l'ours. L'abri n'a pas servi de repaire de carnivores. Par contre, ils ont laissé des traces de leur passage en III/1 et III/1A. Des os portent des marques de régurgitation hyène (18 en III/1 et 6 en III/1A) et de dents de carnivores, petits (6 en III/1 et 1 en III/1A) ou grand (1 en III/1A). Ces carnivores ne sont pas à l'origine des ces trois assemblages osseux et n'ont eu qu'un rôle modeste dans leur histoire.

Le déficit en ossements est élevé et ce quel que soit le niveau (d'après le NME/NMIc, le nombre d'os par individu estimé est de 16 en III/1, 11 en III/1A et 5 en III/1C). Les esquilles indéterminées sont largement majoritaires (respectivement 87,28 %, 78,22 % et 93,09 %). La fragmentation du matériel est très importante. La grande majorité des esquilles indéterminées correspond à des fragments de diaphyses dont 71,73 et 84 % ont une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont rares, elles sont un peu plus abondantes dans les niveaux III/1 et III/1A (respectivement 4 et 3 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (respectivement 7046, 21683 et 319 grammes). La surface des ossements est relativement bien conservée. Les agents climato-édaphiques ont peu altéré le matériel.

	III/1			III/1A			III/1C		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	309	176	8	46	23	3	10	8	2
Saiga tatarica	359	221	11	221	144	6	16	13	2
Bison cf. priscus	4	4	1	6	4	2	·	·	·
Cervus cf. elaphus	9	9	2	13	7	2	4	3	1
Rangifer tarandus	·	·	·	11	2	1	·	·	·
Artiodactyla	107	·	·	19	·	·	·	·	·
Equus (caballus) sp.	·	·	·	17	13	3	·	·	·
Equus/Bovinae	·	·	·	8	1	·	·	·	·
Coelodonta antiquitatis	4	2	1	·	·	·	·	·	·
Mammuthus primigenius	13	3	1	231	12	1	1	1	1
Total Herbivores:	**805**	**415**	**24**	**572**	**206**	**18**	**31**	**25**	**6**
Canis lupus	4	4	1	4	4	1	·	·	·
Crocuta/Ursus sp.	2	2	1	7	2	1	·	·	·
Total Carnivores:	**6**	**6**	**2**	**11**	**6**	**2**	·	·	·
Lepus sp.	9	8	1	·	·	·	·	·	·
NRDt		**820**			**583**			**31**	
NRDa		**24**			**17**			**11**	
NRI		**5788**			**2155**			**566**	
NRT		**6632**			**2755**			**608**	
Density		**390,11**			**162,05**			**152**	

Table 6-1 Kabazi V, sub-unit III/1. Large mammal remains.

NR: number of remains, NME: minimum number of skeletal elements, NMIc: minimum number of individual by combination, NRDt: number of totally determined remains, NRDa: number of anatomically determined remains, NRI: number of undetermined remains, NRT: total number of remains.

Les marques de radicelles de plantes (vermiculations) sont relativement bien représentées. Ceci atteste d'un recouvrement des matériels assez rapide et du développement d'un léger couvert végétal sous une atmosphère parfois humide. Vingt un os en III/1 et huit en III/1A portent des marques de boucherie (stries et stigmates de percussion). Des os (13 d'*Equus hydruntinus,* 3 de saïga et un d'artiodactyle indéterminé en III/1 et 11 de mammouth en III/1A) et des esquilles sont brûlées (respectivement 20%, 17% et 12% des NRT). Certains de ces os ont probablement été utilisés comme combustibles. Le feu augmente aussi le degré de fragmentation, la plupart des esquilles brûlées ont en effet une longueur inférieure à 2 cm.

Les spectres fauniques des trois niveaux sont dominés par la saïga, l'*Equus hydruntinus* est abondant, le cerf et le mammouth sont également présents (Table 6-1). Le bison est absent de III/1C. Le rhinocéros laineux et le lièvre n'ont été déterminés qu'en III/1, le cheval et le renne qu'en III/1A. Un reste d'oiseau a été identifié en III/1.

Le niveau III/1C, présente que sur quatre carrés 8Е, 8Ж, 8З et 8И, n'a livré que 31 restes déterminés. Les 16 ossements attribués à la saïga appartiennent à au moins 2 individus, un jeune et une femelle âgée. Chaque grande partie squelettique, à l'exception de la partie supérieure des membres postérieurs, est représentée par au moins un élément. L'*Equus hydruntinus* a été identifiés par 10 ossements appartenant à au moins deux individus, un jeune et un adulte. Chaque grande partie squelettique, à l'exception du squelette axial, est représentée par au moins un élément. Le cerf a été déterminé par un tibia (en

deux morceaux), une diaphyse de métatarsien et un grand sésamoïde appartenant à au moins un adulte *sensu lato*. Un fragment de lame dentaire atteste de la présence d'un jeune mammouth. Le faible nombre d'ossements de grands mammifères identifiés rend difficile la mise en évidence de leur modalité d'acquisition et d'exploitation par les Néanderthaliens.

Niveau III/1

Dans le niveau III/1, deux espèces dominent le spectre faunique: l'antilope saïga, avec 41 % des individus estimés, et l'*Equus hydruntinus*, avec 27 %.

Acquisition et exploitation des saïgas

La saïga a été identifiée par 359 restes appartenant à au moins 11 individus. La courbe de mortalité montre une mort par prédation, les adultes dans la force de l'âge sont bien représentés (Fig. 6-4). Ce profil correspond à une courbe de chasse anthropique d'une petite harde composée de jeunes (dont un mâle) et de femelles. La saison d'abattage n'a pu être déterminée. On note un déficit en ossements, NME/NMIc = 21. Toutes les grandes unités squelettiques sont présentes, la partie supérieure des membres antérieurs est bien représentée, ainsi que le squelette céphalique (Fig. 6-5). Les antilopes saïgas ont été pour la plupart apportées entières à l'abri. La présence de cartilages costaux atteste du dépeçage sur le site du thorax. Des marques de découpe ont été observées sur sept os, elles attestent de la désarticulation: entre le radius-ulna et le carpe; entre le tibia et le tarse; entre le tarse et le métatarsien et entre la 1ère et la 2ème phalange. En outre, quatre fragments d'os longs (2 radius-ulna et 2 métacarpiens) portent des marques de percussion sur os frais. Un fragment de diaphyse de métapodien, une extrémité de phalange et un fragment de dent sont brûlés. Par ailleurs, trois os portent des marques de petits carnivores et treize d'hyène.

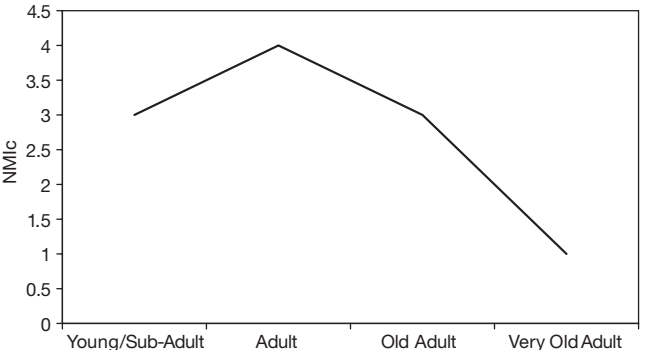


Fig. 6-4 Kabazi V, level III/1: Mortality profile of *Saiga tatarica*.

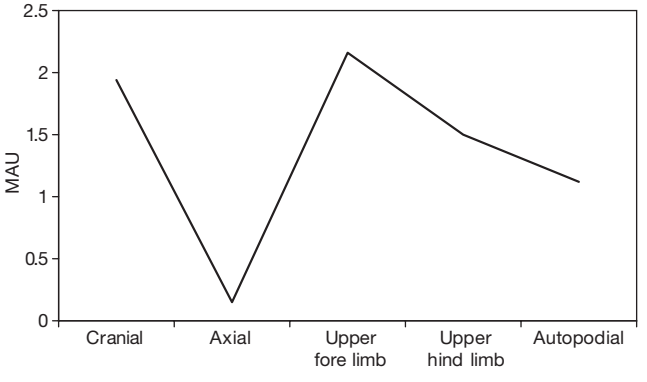


Fig. 6-5 Kabazi V, level III/1: Preservation of major skeletal units of *Saiga tatarica*, in minimum animal units (MAU).

Acquisition et exploitation des *Equus hydruntinus*

Equus hydruntinus a été identifié par 309 restes appartenant à au moins 8 individus dont un mâle et deux femelles gravides. Leur courbe de mortalité montre une mort par prédation anthropique, les adultes dans la force de l'âge sont bien représentés (Fig. 6-6).

Les deux femelles gravides ont probablement été tuées au printemps. Toutes les grandes unités squelettiques sont représentées avec cependant un

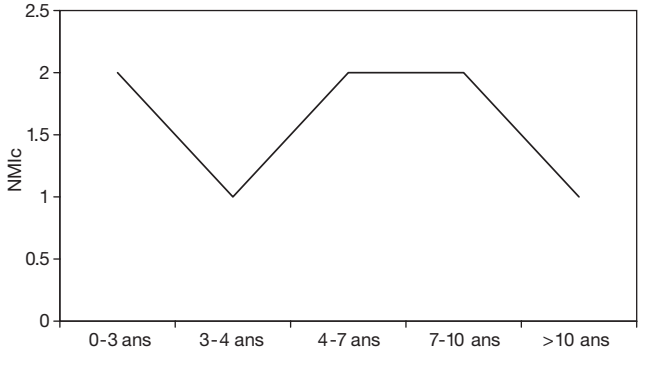


Fig. 6-6 Kabazi V, level III/1: Mortality profile of *Equus hydruntinus.*

déficit des os du squelette axial (Fig. 6-7). Par contre, les os de la partie supérieure des membres sont abondants. Ces équidés ont été chassés et dépecés sur le lieu d'abattage. Une diaphyse de fémur ou d'humérus porte des stries de décharnement et des stigmates de percussion. Une diaphyse de métapodien principal présente également des impacts résultant d'une fracturation d'origine anthropique. Treize ossements sont brûlés (pétreux, deux jugales, humérus, radius, fémur, tibia, patella, trapézoïde, petit carpien ou tarsien, deux métapodiens principaux, métapodien vestigial). Par ailleurs, un os porte des marques de dents de petits carnivores et un autre d'hyène.

Les autres espèces

La présence du cerf a été identifiée par 9 ossements: quatre dents appartenant à un jeune d'environ 15 mois et 5 os de l'autopode. Ces restes appartiennent à moins deux individus, un jeune et un adulte *sensu lato*. Le jeune d'après son âge serait mort en septembre. Une des déciduales a été régurgitée par l'hyène. Les quatre restes de boviné (probablement le bison) correspondent à deux fragments diaphysaires d'os de la partie supérieure du membre postérieur (fémur et tibia) et à deux os de l'autopode (cubo-naviculaire et scaphoïde). Ils appartiennent à un adulte, probablement âgé d'après la présence d'une exostose sur le cubo-naviculaire. Quatre fragments dentaires ont été attribués à un rhinocéros laineux (jeune?). Le mammouth a été identifié par 10 fragments d'une même lame dentaire et trois fragments osseux dont une 3ème phalange juvénile. Ces treize restes appartiennent à un individu juvénile. Ces animaux, de même que le lièvre, ont pu être chassés ou charognés par des Néanderthaliens ou des carnivores, notamment l'hyène. Les carnivores ne sont représentés que par des dents appartenant à un loup adulte et à un jeune ours ou hyène. Leur origine demeure inconnue (animaux intrusifs?).

Répartition spatiale

Dans le niveau III/1, les ossements sont dispersés avec une plus forte concentration en: 8A (838 restes), 8Д (731), 8Г (568) et 7A (433). Les os déterminés sont particulièrement abondants en: 7Б, 7AA, 7B 7Г, 7Д, 8AA et 8B. Des esquilles indéterminées et des os de saïga et d'*Equus hydruntinus* ont été découverts dans la fosse (en 8Б). Les secteurs, 7A-8A, d'une part, et 7B-7Г-7Д d'autre part, correspondent à des aires d'activités culinaires (plusieurs os avec des marques de boucherie). Ils sont également riches en esquilles brûlées, en 7Д une zone cendreuse a été dégagée lors des fouilles.

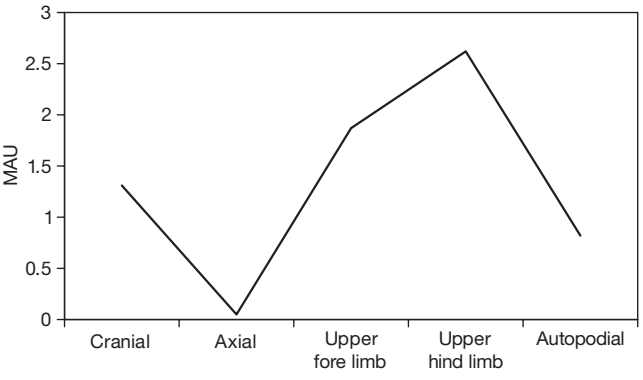


Fig. 6-7 Kabazi V, level III/1: Preservation of major skeletal units of *Equus hydruntinus*, in minimum animal units (MAU).

Niveau III/1A

Dans le niveau III/1A, l'antilope saïga domine le spectre faunique avec 30% des individus estimés (Table 6-1). L'*Equus hydruntinus* et le cheval sont abondants (15% du NMIcT chacun). Le bison et le cerf représentent chacun 10 % du NMIcT.

Acquisition et exploitation des saïgas

L'antilope saïga a été identifiée par 221 restes appartenant à au moins 6 individus: un jeune, un mâle sub-adulte, 2 adultes dans la force de l'âge et 2 adultes âgés. La saison d'abattage n'a pu être déterminée. On note un déficit en ossements, NME/NMIc = 24. Toutes les grandes unités squelettiques sont présentes. La partie supérieure des membres antérieurs est bien représentée, ainsi que les os de l'autopode (Fig. 6-8). Les antilopes saïgas ont été pour la plupart apportées entières à l'abri. La présence d'un cartilage costal atteste du dépeçage sur le site du thorax. Des marques de découpe ont été observées sur 2 os, elles attestent de la désarticulation entre l'humérus et le radius-ulna. En outre, deux fragments d'humérus portent des marques de percussion sur os frais. Par ailleurs, un os portent des marques de rongement de petits carnivores et cinq de régurgitation d'hyène. Ces antilopes ont été chassées et consommées par des Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

Equus hydruntinus a été identifié par 46 restes appartenant à au moins 3 individus dont un jeune (1-2 ans) et deux femelles gravides âgées de 7-8 ans et

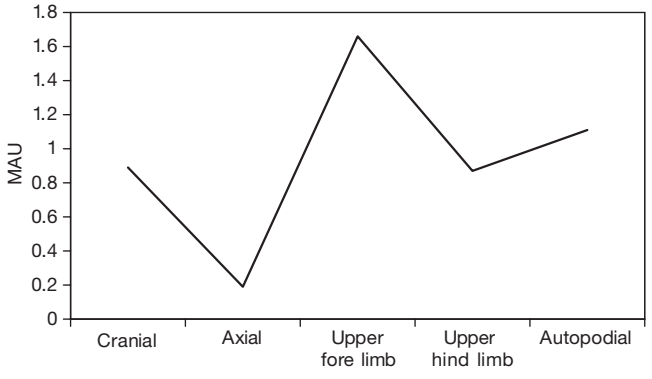


Fig. 6-8 Kabazi V, level III/1A: Preservation of major skeletal units of *Saiga tatarica*, in minimum animal units (MAU).

9-10 ans. Les deux femelles gravides ont probablement été tuées au printemps. Toutes les grandes unités squelettiques sont représentées avec cependant un fort déficit des os du squelette axial (un seul os, coxal d'un fœtus). Seuls les ossements du squelette crânien (19) et les os de la partie supérieure des membres postérieurs sont relativement abondants (17). L'exploitation de leur carcasse a été poussée. Aucune marque n'a été observée sur ces restes. Ces petits équidés ont été chassés, probablement au printemps, dépecés sur le lieu d'abattage et consommés par des Néanderthaliens.

Les autres espèces

Les 17 ossements attribués au cheval appartiennent: au squelette céphalique (3 os pétreux, une mandibule droite juvénile, deux déciduales, un M3 supérieure droite et un bourgeon de M3 inférieure droite), à la partie supérieure des membres (7 fragments d'humérus, de tibia) et à l'autopode (une extrémité distale de métapodien principal et un pisiforme gauche). Ces restes appartiennent à au moins trois individus, un jeune (2-3 ans), un sub-adulte (40-50 mois) et un adulte d'environ 8-9 ans. La présence du cerf a été identifiée par 13 ossements: une hémimandibule droite portant une P4, une P4 inférieure droite et six fragment d'au moins deux jugales, une diaphyse d'os long (en trois morceaux), un grand cunéiforme et un grand sésamoïde. Ces restes appartiennent à au moins deux adultes dans la force de l'âge. Le renne a été identifié par 11 restes correspondant à une molaire très fragmentée (10 micro-fragments) et une phalange intermédiaire présentant une exostose. Ces ossements appartiennent à au moins un adulte très âgé. Les six restes de boviné (probablement le bison) correspondent à deux fragments d'une diaphyse d'humérus droit, un condyle de fémur juvénile (deux morceaux), un scaphoïde droit juvénile et une phalange intermédiaire juvénile. Ces os appartiennent à au moins un jeune et un adulte *sensu lato*. Aucune marque n'a été observée sur ces restes. Le mammouth a été identifié par 202 micro-fragments de lame dentaires d'au moins deux déciduales (dont une D4 inférieure droite) et 29 fragments osseux correspondants à 10 métapodiens et phalanges juvéniles. Ces restes appartiennent à un jeune (2-12 ans). Un croc de grand carnivore est présent sur un fragment de métapodien, en outre, onze restes sont brûlés (un fragment de métapodien et 10 micro-fragments de lame dentaire). Ces animaux ont été chassés ou charognés et consommés par des Néanderthaliens.

Les carnivores ne sont représentés que par des dents appartenant à un loup adulte âgé (plus une phalange proximale) et à un ours ou une hyène (un adulte *sensu lato*). Leur origine demeure inconnue (animaux intrusifs ?).

Répartition spatiale

Les ossements sont dispersés avec une plus forte concentration en 8E (484 restes), 7B (472) et dans le secteur, 8A (327) – 7A (222). Les os de saïga et de mammouth abondent en 7B, 7A et 8A, ceux d'*Equus hydruntinus*, dans un autre secteur de l'abri en 8E-8Ж-83. Des marques de boucherie ont été observées sur des os de saïga trouvés en 8E (2), 8B et 83. Lors des fouilles, un foyer a été mis en évidence en 8E, ainsi qu'une très grande zone cendreuse qui s'étend sur six carrés, 7-8/Б-В-Г. Cependant les esquilles brûlées ont été retrouvées sur toute la surface de l'abri, comme les onze ossements brûlés de mammouth découverts en 7Г (1), mais aussi en 7*Д* (10). Par ailleurs, trois fosses (en 7B, 7A, 7AA) ont également été dégagées. Quarante-trois esquilles indéterminées, trois restes de mammouth, dont la D4 inférieure et deux os de saïga (un pisiforme et un scaphoïde) ont été découverts dans la fosse (secteur 7B). La fosse (secteur 7A) ne contenait que des micro-esquilles brûlées, un humérus de bison, quatre fragments de lame dentaire de mammouth, deux fragments crâniens d'espèce indéterminée, un fragment de jugale d'artiodactyle et 3 restes da saïga (une P2 supérieure, un pisiforme et un fragment de corps de côte). Dans la fosse (secteur 7AA), ont été exhumés: des micro-esquilles brûlées (de longueur très inférieure à 2 cm), 9 esquilles indéterminées (dont 5 brûlées), un fragment de lame dentaire de mammouth et trois os de saïga (une phalange distale, un capitato-trapézoïde et un fragment de carpien ou tarsien régurgité). Les

secteurs, 7B-7A-8A (avec les fosses et une partie de la zone cendreuse), d'une part, et 8E-8Ж-8З (autour du foyer) d'autre part, correspondent à des aires d'activités culinaires.

Sous-unité III/2

La sous-unité III/2 est subdivisée en deux niveaux: III/2 et III/2A.

Niveau III/2

L'étude de la faune du niveau III/2 a déjà fait l'objet d'une publication (Chabai et Patou-Mathis, 2006). Nous ne donnons ici que les principaux résultats à fin de comparaison.

Le matériel est relativement abondant, la densité est de 2262. Les esquilles indéterminées sont largement dominantes (99 % du NRT, Table 6-2). Les restes de carnivores sont peu abondants (0,58% du NRDt). La présence d'une canine déciduale usée d'ourson atteste de la venue dans l'abri, au moins un hiver, de cet ursidé accompagné probablement de sa mère. Par contre, l'abri n'a pas servi de repaire à des carnivores. Des os de saïga ont été rongés par l'hyène. La majorité des esquilles indéterminées a une longueur inférieure ou égale à 2 cm. Ces os ont subi une première fracturation d'origine anthropique (extraction de la moelle), puis une seconde fragmentation due probablement au piétinement ou au poids des sédiments qui ont recouvert l'assemblage. Par ailleurs, 95 % d'entre elles sont brûlés. Ces os qui n'appartiennent qu'à des animaux de grande ou grosse taille ont servi de combustible. L'état de surface des ossements attribués aux saïgas est relativement bon. Ces ossements ont subi peu d'altération climato-édaphique Ceci suggère un recouvrement rapide du matériel par les sédiments et des variations de température ou d'hygrométrie peu marquées. Par contre, l'état de surface des ossements d'*Equus hydruntinus* est beaucoup moins bon. Ils ont notamment subi une altération due au weathering plus marquée. Ceci suggère un recouvrement sédimentaire moins rapide de ce matériel. Par contre, aucun de ces os n'a été rongé par l'hyène.

Deux espèces dominent le spectre faunique: l'antilope saïga, avec 30,7% de la totalité des individus déterminés, et l'*Equus hydruntinus* avec 23% (Table 6-2).

	III/2			III/2A		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	64	39	3	8	1	1
Saiga tatarica	211	130	4	21	13	2
Cervus cf. elaphus	31	6	1	·	·	·
Artiodactyla	7	·	·	·	·	·
Coelodonta antiquitatis	1	1	1	·	·	·
Mammuthus primigenius	14	3	1	1	1	1
Coelodonta/Mammuthus	1	1	·	·	·	·
Total Herbivores:	**329**	**180**	**10**	**30**	**15**	**4**
Ursus arctos	1	1	1	·	·	·
Fox or *Mustelidae*	1	1	1	·	·	·
Total Carnivores:	**2**	**2**	**2**	·	·	·
Lepus sp.	12	7	1	·	·	·
NRDt		**343**			**30**	
NRDa		**11**			**1**	
NRI		**38109**			**364**	
NRT		**38463**			**395**	
Densité		**2262,53**			**131,66**	

Table 6-2 Kabazi V, sub-unit III/2: Large mammal remains.

Acquisition et exploitation des saïgas

Les Néanderthaliens ont abattu au moins 4 antilopes saïgas: un jeune, trois adultes, un dans la force de l'âge et deux femelles âgées. Ces animaux sont issus probablement d'une petite harde composée de jeunes et de femelles. D'après l'âge du jeune (environ 4 mois), cette chasse a eu lieu à la fin de l'été avant la migration automnale (summer range des saïgas). Toutes les grandes parties du squelette sont représentées. Ces animaux ont été apportés entiers à proximité de l'abri. Cependant, on remarque: un déficit des ossements, l'absence de certains os (hyoïde, sacrum, sternum) et la rareté des vertèbres et des côtes, ce qui suggère que le dépeçage a eu lieu en dehors de l'abri. L'absence d'os longs entiers montre une exploitation poussée des carcasses; recherche de la moelle et de la graisse. Les Néanderthaliens ont également récupéré la peau des saïgas.

Acquisition et exploitation des *Equus hydruntinus*

Les Néanderthaliens ont consommé au moins trois *Equus hydruntinus*: un jeune et deux femelles adultes dans la force de l'âge, dont une gravide. D'après l'âge du foetus, environ 24 semaines, ils sont morts probablement au printemps. Toutes les grandes parties du squelette sont représentées avec cependant un fort déficit en ossements notamment du squelette axial. D'après le pourcentage de survie, seule la femelle gravide et le jeune résultent d'une chasse. Ils ont été dépecés sur le lieu de chasse, puis apportés en quartiers par les chasseurs jusqu'à l'abri. L'exploitation des carcasses a été poussée, aucun os n'est entier. L'autre adulte a probablement été charogné, avec probablement un accès tardif à la carcasse.

Les autres espèces

Les hommes ont probablement chassé un lièvre. Ils ont collecté des morceaux sur les carcasses: d'un cerf âgé (seuls sont présents des dents et des os de l'autopode, ce qui correspond à un charognage avec accès tardif à la carcasse d'une femelle ou d'un mâle sans bois) et peut-être, d'un très jeune mammouth (que des dents dont un fragment de défense, apport sélectif) et d'un rhinocéros laineux (un fragment de dent en très mauvais état de conservation). On note en effet la présence d'un fragment de tibia et des esquilles indéterminées appartenant à l'une ou l'autre deux grosses espèces.

D'après l'analyse taphonomique et la nature des esquilles brûlées nous proposons l'hypothèse que ce niveau correspond à plusieurs occupations dont au moins deux anthropiques. Vers la fin d'une période estivale, des Néanderthaliens ont occupé l'abri. Ils ont chassé au moins quatre saïgas. Après leur départ des hyènes sont venus ronger leurs déchets. À un autre moment, probablement au printemps, des Néanderthaliens se sont installés dans l'abri. Ils ont chassé au moins une femelle gravide et un jeune *Equus hydruntinus* et peut-être un lièvre. Ils ont également collecté de morceaux de carcasse d'au moins un *Equus hydruntinus*, un mammouth et un rhinocéros laineux. En outre, ils ont utilisé leurs os comme combustible.

Analyse de la répartition horizontale des ossements

Deux zones cendreuses ont été dégagées à la fouille: 8В-8Г et 7В-7Г. Les esquilles indéterminées sont concentrées dans un même secteur autour de 8Г (8Д, 8В, 7Г et 7В), parmi elles, les brûlées sont largement majoritaires alors que les non brûlées abondent en 8Г, mais aussi en 8АА, 8Ж et 7Б. La densité des ossements déterminés est plus élevée en 8В (surtout des os de saïgas et d'*Equus hydruntinus*), 8Г (surtout des os de saïgas), 8Ж (surtout des restes du squelette céphalique de saïgas et des os de l'autopode des *Equus hydruntinus*) et 7Б. Les ossements de saïgas sont également abondants en 7Г. Des foyers étaient installés dans un secteur centré autour de 8Г. Les activités de boucherie sur les équidés et les saïgas ont eu lieu principalement en 8Ж et 83 et ceux de petite désarticulation et de consommation près des foyers. La répartition spatiale des ossements portant des marques de boucherie ou des stigmates de fracturation confirme cette hypothèse.

Niveau III/2A

Elle n'est présente que dans 3 carrés. La densité du matériel osseux est de seulement 131 (Table 6-2). Les restes déterminés sont peu nombreux, 7,59 % du NRT. Les carnivores sont absents (Table 6-2). Le déficit en ossements est très élevé, d'après le NME/NMIc, le nombre d'os par individu estimé est de 4. Les esquilles indéterminées dominent très largement avec un peu plus de 92 %. La fragmentation du matériel est très importante. En effet, 86,54 % des esquilles indéterminées correspond à des fragments de diaphyses d'une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont très rares (0,27 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. La surface des ossements est

relativement bien conservée. Les marques laissées par les agents climato-édaphiques et les plantes sont très rares. Ceci atteste que l'enfouissement a été relativement rapide et que les variations de température ou d'hygrométrie ont été peu marquées. Cent huit esquilles brûlées ont été découvertes; ces os ont servi de combustible.

Seulement trois espèces sont représentées: l'antilope saïga, l'*Equus hydruntinus* et le mammouth (Table 6-2).

Le faible nombre d'ossements de grands mammifères identifiés dans ce niveau rend difficile la mise en évidence de leur origine et des éventuelles techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des saïgas

On note pour l'antilope saïga un fort déficit en ossements, NME/NMIc = 11. Les grandes unités squelettiques sont représentées par au moins un élément. Les 21 restes identifiés appartiennent à au moins deux individus, un jeune et un adulte. Parmi les esquilles indéterminées, plusieurs correspondent à des fragments de diaphyse d'os longs pouvant appartenir à cette espèce. Une diaphyse de tibia appartenant au jeune porte des stries de désarticulation. Les Néanderthaliens ont chassé et consommé ces deux saïgas. L'exploitation de leur carcasse, qui a probablement eu lieu devant l'abri, a été poussée.

Les autres espèces

Equus hydruntinus a été identifié à partir de huit fragments d'un même tibia droit adulte. Parmi les esquilles indéterminées, plusieurs correspondent à des fragments de diaphyse d'os longs pouvant appartenir à ce petit équidé. Nous n'avons observé aucune marque anthropique sur ces os. Le mammouth est présent par un fragment de lame dentaire.

Ces animaux ont peut-être été charognés par les Néanderthaliens.

Répartition spatiale

Les ossements, brûlés et non brûlés, sont concentrés dans deux carrés: 8Ж (231) et 8E (100).

	III/3-1			III/3-1A			III/3-1B		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	21	18	2	23	15	1	9	5	1
Saiga tatarica	55	40	3	19	18	1	6	5	1
Cervus cf. elaphus	·	·	·	6	3	1	·	·	·
Artiodactyla	·	·	·	8	·	·	·	·	·
Equus (caballus) sp.	·	·	·	·	·	·	·	·	·
Mammuthus primigenius	6	1	1	7	1	1	·	·	·
Total Herbivores:	**82**	**59**	**6**	**63**	**37**	**4**	**15**	**10**	**2**
Fox	2	2	2	·	·	·	·	·	·
Ursus cf. arctos	·	·	·	3	3	1	·	·	·
Total Carnivores:	**2**	**2**	**2**	**3**	**3**	**1**	·	·	·
NRDt		**84**			**66**			**15**	
NRDa		**2**			**7**			**0**	
NRI		**740**			**643**			**195**	
NRT		**826**			**716**			**210**	
Density		**45,89**			**39,77**			**52,5**	

Table 6-3 Kabazi V, levels III/3-1, III/3-1A, III/3-1B, III/3-1C and III/3-1D: Large mammal remains.

Sous-unité III/3

Cette sous-unité est subdivisée en 9 niveaux: III/3-1, III/3-1A, III/3-1B, III/3-1C, III/3-1D, III/3-2, III/3-2A, III/3-3 et III/3-3A.

Niveaux III/3-1, III/3-1A, III/3-1B, III/3-1C et III/3-1D

Les niveaux inférieures, III/3-1B à III/3-1D n'ont été retrouvées que sur quatre carrés. Seules III/3-1 et III/3-1A sont relativement riches en matériel osseux (Table 6-3). La densité des ossements varie de 39 (III/3-1A) à 52 (en III/3-1B). Les niveaux III/3-1 et III/3-1A sont les plus riches en nombre de restes déterminés (respectivement 10,17 % et 9,22 % du NRT); III/3-1C est la plus pauvre (4,97 % du NRT).

Quelle que soit le niveau, les herbivores sont largement dominants (75 % en NMIc pour l'ensemble du niveau). Les restes de carnivores sont très rares; ils ne sont présents qu'en III/3-1 (renard indéterminé) et III/3-1A (ours brun) (Table 6-3). L'abri n'a pas servi de repaire de carnivores. Par contre, la présence de 15 os régurgités par l'hyène atteste de sa venue dans l'abri dans tous les niveaux sauf en III/3-1C. Le déficit en ossements est très élevé et ce quelle que soient l'espèce et le niveau (d'après le NME/NMIc, le nombre d'os par individu estimé varie entre 8 en III/3-1A et 2 en III/3-1C).

L'analyse globale de ce niveau montre une très nette dominance des esquilles indéterminées (90,64 %). La fragmentation du matériel est très importante. La grande majorité des esquilles indéterminées correspond à des fragments de diaphyses dont 79 % ont une longueur inférieure ou égale à 2 cm. Les esquilles de longueur supérieure à 2 cm ne sont abondantes que dans les niveaux III/3-1 (22 %) et III/3-1A (23 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles en III/3-1 et III/3-1A (965 grammes au total). La surface des ossements est relativement bien conservée. Les agents climato-édaphiques ont peu altéré le matériel. Ceci atteste d'un enfouissement relativement rapide des matériels et de l'existence de peu de variations de température ou d'hygrométrie. À part les traces de combustion, les marques d'origine anthropique sont extrêmement rares, seules deux esquilles indéterminées, découvertes en et III/3-1et III/3-1C, portent des impacts de percussion sur os frais. Par contre de nombreuses esquilles brûlées ont été trouvées dans chacune des niveaux (entre 11,73 % du NRT en III/3-1A et 38,02 % en III/3-1D). Ce qui atteste de l'utilisation d'os comme combustible. Aucun foyer n'a été mis au jour lors des fouilles, mais une zone cendreuse a été dégagée en III/3-1. Le feu augmente aussi le degré de fragmentation, plus de 96 % des esquilles brûlées ont en effet une longueur inférieure ou égale à 2 cm.

Le spectre faunique est peu diversifié; les deux espèces présentes dans toutes les niveaux sont l'antilope saïga et, excepté en III/3-1D, l'*Equus hydruntinus* (Table 6-3). Le mammouth a été déterminé en III/3-1, III/3-1A et III/3-1C, le cerf en III/3-1A et III/31C et le cheval qu'en III/3-1D et. Un reste de petit oiseau a également été identifié en III/3-1.

Le très faible nombre d'ossements de grands mammifères identifiés dans les niveaux inférieures du niveau III/3-1 rend difficile la mise en évidence de leur origine. En III/3-1B, la saïga a été identifiée par six restes: trois dents fragmentées dont une P2 supérieure droite d'adulte, une vertèbre caudale, une extrémité distale de tibia et un scaphoïde droit (Table 6-3). L'*Equus hydruntinus* est présent par: 7 fragments de jugales, une diaphyse de tibia et un grand sésamoïde (Table 6-3). En III/3-1C, trois os de l'autopode ont permis d'identifier la présence de la saïga, trois

III/3-1C			III/3-1D		
NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
3	1	1	.	.	.
3	3	1	8	6	1
2	1	1	.	.	.
.	.	.	1	1	.
.	.	.	1	1	1
1	1	1	.	.	.
9	**6**	**4**	**10**	**8**	**2**
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
	9			**10**	
	0			**2**	
	172			**149**	
	181			**161**	
	45,25			**40,25**	

Table 6-3 Continué.

fragments de jugales celle d'*Equus hydruntinus*, deux fragments de molaire celle du cerf et un morceau de lame dentaire celle du mammouth (Table 6-3). Enfin, en III/3-3D, parmi les 10 ossements déterminés appartiennent à la saïga (os de l'autopode et cartilage costal), au cheval (une jugale), à un artiodactyle indéterminé (un fragment de molaire) (Table 6-3).

Acquisition et exploitation des saïgas des niveaux III/3-1 et III/3-1A

Dans le niveau III/3-1, au moins trois individus, une jeune, un adulte et un adulte âgé, ont été estimés à partir des 55 ossements attribués à la saïga. Le déficit en ossements est très élevé, NME/NMIc = 14. Le squelette crânien (27 restes) et l'autopode (22 os) sont les parties les mieux conservées. Le squelette axial est représenté par 4 os: un fragment de cartilage costal, un fragment de vertèbre et une vertèbre caudale. Les os des membres sont très rares, un humérus et un ulna fragmentés. Cependant, de nombreuses esquilles indéterminées correspondent à des fragments de diaphyse d'os longs de la taille de la saïga.

Dans le niveau III/3-1A, les 19 restes déterminés ont permis d'estimer la présence d'au moins un mâle sub-adulte. Comme dans le niveau précédente, on note un très fort déficit en ossements (NME/NMIc = 18). L'autopode (10 os) et le squelette crânien (7 restes) sont les parties les mieux conservées. Les os des membres sont très rares, un humérus et un tibia fragmentés. Cependant, plusieurs esquilles indéterminées correspondent à des fragments de diaphyse d'os longs pouvant appartenir à la saïga.

Dans les deux niveaux, l'exploitation des carcasses a été poussée, aucun os long n'est entier. Par ailleurs, deux dents (une en III/3-1 et une en III/3-1A) et un talus (en 3-1A) ont été régurgités par l'hyène. Les Néanderthaliens ont probablement chassé ces antilopes saïga. Ils les ont rapportées à leur au campement, certaines entières (présence de cartilages costaux), d'autres sous forme de quartiers. Le rôle de l'hyène en tant que responsable d'une partie de ces matériels ne peut cependant être totalement exclu.

Acquisition et exploitation des *Equus hydruntinus* des niveaux III/3-1 et III/3-1A

Dans le niveau III/3-1, au moins deux individus ont été estimés à partir des 21 ossements attribués à *Equus hydruntinus*. La présence de d'un fragment de diaphyse de radius ou de tibia et deux humérus complets de fœtus (de 35 et 55 mm de longueur) attestent que ces deux individus sont des femelles gravides dont une dans la force de l'âge. Le déficit en ossements est très élevé, NME/NMIc = 9. Toutes les grandes unités squelettiques sont représentées. Le squelette crânien (8 restes) et les os de la partie supérieure des membres (10 os) sont les parties les mieux conservées. Le squelette axial est présent par un fragment de dernière vertèbre lombaire ou de première caudale et l'autopode par un grand sésamoïde. En outre, de nombreuses esquilles indéterminées correspondent à des fragments de diaphyse d'os longs de la taille de ce petit équidé.

Dans le niveau III/3-1A, les 23 restes déterminés ont permis d'estimer la présence d'au moins un adulte très âgé. Comme dans le niveau précédente, on note un très fort déficit en ossements, NME/NMIc = 15. À l'exception de l'autopode, toutes les grandes unités squelettiques sont représentées. Le squelette crânien (14 restes) est la partie la mieux conservée. Le squelette axial est présent par 6 fragments, 5 correspondent à deux cartilages costaux et l'autre à une vertèbre indéterminée. Les os des membres sont très rares, un diaphyse de radius et un tibia en deux morceaux. Cependant, plusieurs esquilles indéterminées correspondent à des fragments de diaphyse d'os longs pouvant appartenir à *Equus hydruntinus*.

Dans les deux niveaux, l'exploitation des carcasses a été poussée, aucun os long n'est entier. Les Néanderthaliens ont probablement chassé ces Equus hydruntinus, au cours du printemps en III/3-1. Ils les ont partiellement dépecés sur le lieu de chasse (présence de cartilages costaux) et apporté des quartiers au campement. Par ailleurs, cinq dents ont été régurgitées par l'hyène (1 en III/3-1, 4 en III/3-1A). Le rôle de ce carnivore en tant que responsable de l'accumulation d'une partie de ces matériels est possible, mais la présence d'os de deux fœtus attesterait plutôt d'un rôle secondaire, l'hyène ne serait venue qu'après le départ des Néanderthaliens.

Les autres espèces des niveaux III/3-1 et III/3-1A

Le renard n'est représenté que par deux dents (en III/3-1) et l'ours brun par deux dents et une phalange intermédiaire (en III/3-1A). Treize fragments de lame dentaire ont permis d'identifier la présence d'un jeune mammouth en III/3-1 et en III/3-1A. Le cerf, en III/3-1A, n'est présent que par six fragments dentaires correspondant au plus trois jugales. L'origine de ces restes ne peut être précisée.

Répartition spatiale

Dans le niveau III/3-1, les ossements sont dispersés avec une plus forte concentration dans un même secteur, 8Ж (203 restes) – 8E (111). Ce secteur

correspond à une aire d'activité culinaire (nombreux ossements déterminés de saïga et d'*Equus hydruntinus*). Lors des fouilles, une grande zone cendreuse a été dégagée en 7AA et 7A-8A. Dans cette zone, 93 ossements (15 brûlés) ont été découverts dont trois dents d'*Equus hydruntinus* et 2 de saïga. En 9A, une esquille porte des impacts de percussion sur os frais. Les esquilles brûlées sont dispersées. Dans le niveau III/3-1A, les ossements sont dispersés avec une plus forte concentration en 8E (114 restes) et 7A (100). Dans ces deux niveaux, les esquilles brûlées sont dispersées. Dans les trois niveaux inférieurs, les ossements sont dispersés avec une plus forte concentration en 8E (respectivement 88, 74 et 58 restes). En III/3-1C (8Ж), une esquille porte des impacts de percussion. Les esquilles brûlées sont dispersées avec en III/3-1D une plus forte densité dans les carrés 8E et 83.

Niveaux III/3-2 et III/3-2A

Le niveau III/3-2A n'ayant livré que 65 restes (61 esquilles indéterminées, un fragment de jugale d'*Equus hydruntinus*, un fragment de cartilage costal de la taille de la saïga, un fragment de vertèbre et une vertèbre caudale juvénile d'espèce indéterminée). La densité du matériel osseux est de 38 (Table 6-3). Les restes déterminés sont peu nombreux, 6,53 % du NRT. Les carnivores sont absents (Table 6-4). Cependant, la présence, sur une incisive d'*Equus hydruntinus* et un petit os indéterminé, de marques de dents d'hyène attestent de sa venue dans l'abri. Le déficit en ossements est très élevé, d'après le NME/NMIc, le nombre d'os par individu estimé est de 8. Les esquilles indéterminées dominent très largement avec un peu plus de 91 % (Table 6-4). La fragmentation du matériel est très importante. En effet, 83 % des esquilles indéterminées correspond à des fragments de diaphyses d'une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont très rares (1 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. La surface des ossements est relativement bien conservée. Les agents climato-édaphiques ont peu altéré le matériel, de même des marques de radicelles de plantes sont très rares. Ceci atteste que l'enfouissement a été relativement rapide et que les variations de température ou d'hygrométrie ont été peu marquées. Cinquante-neuf esquilles brûlées ont été découvertes; ces os ont peut-être servi de combustible; une grande zone cendreuse a été dégagée lors des fouilles.

Seulement quatre espèces sont représentées: l'*Equus hydruntinus*, l'antilope saïga, le cerf et le cheval (Table 6-4).

Le faible nombre d'ossements de grands mammifères identifiés dans ce niveau rend difficile la mise en évidence de leur origine et des éventuelles techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

On note un très fort déficit en ossements d'*Equus hydruntinus*, NME/NMIc = 4. Les éléments conservés sont essentiellement des dents (9/6, dont une a été régurgitée par l'hyène) et deux os de l'autopode. Ils appartiennent à au moins deux individus: un jeune de moins d'un an et un adulte jeune. Parmi les esquilles indéterminées, plusieurs correspondent à des fragments de diaphyse d'os longs pouvant appartenir à *Equus hydruntinus*. Nous n'avons observé aucune marque anthropique sur les os.

On peut émettre l'hypothèse que ces *Equus hydruntinus* ont été consommés par les Néanderthaliens. Mais, le rôle de l'hyène en tant que responsable de l'accumulation d'une partie de ce matériel ne peut être totalement exclu.

Acquisition et exploitation des saïgas

Comme pour *Equus hydruntinus*, on note pour l'antilope saïga un fort déficit en ossements, NME/NMIc = 14. Les grandes unités squelettiques, à l'exception de la partie supérieure des membres postérieurs, sont représentées par au moins un élément. Un fragment de cartilage costal atteste de la désarticulation sur place du thorax. Les 17 restes identifiés appartiennent à au moins un individu sub-adulte. Dans ce niveau, au moins une saïga a été chassée et apportée entière dans l'abri par les Néanderthaliens. L'exploitation de la carcasse a été poussée, aucun os long n'est entier, mais nous n'avons observé aucune marque anthropique sur les os (ni de carnivore).

Les autres espèces

Le cheval est présent par: des dents (6/3), deux fragments d'os longs et un métapodien principal (en deux morceaux). Ces restes appartiennent à au moins un adulte dans la force de l'âge. Cinq ossements, trois dents et deux tarsiens, ont été attribués au cerf. Ils appartiennent à au moins un adulte âgé. Nous n'avons observé aucune marque sur les os; leur origine est difficile à déterminer. Ces animaux ont pu être chassés ou charognés par des Néanderthaliens ou des carnivores.

	III/3-2			III/3-3			III/3-3A		
	NR	NME	NMIc	NR	NME	NMIc	NR	NME	NMIc
Equus hydruntinus	11	8	2	6	5	2	44	35	5
Saiga tatarica	17	14	1	8	8	1	39	27	1
Bison cf. priscus	·	·	·	3	3	2	7	4	1
Cervus cf. elaphus	5	5	1	4	4	2	7	5	1
Cf. Rupicapra sp.	·	·	·	·	·	·	6	5	1
Artiodactyla	5	3	·	7	·	·	7	·	·
Equus (caballus) sp.	10	6	1	·	·	·	·	·	·
Equus/Bovinae	·	·	·	10	2	·	1	1	·
Coelodonta antiquitatis	·	·	·	·	·	·	1	1	1
Mammuthus primigenius	·	·	·	·	·	·	3	2	1
Total Herbivores:	**48**	**36**	**5**	**38**	**22**	**7**	**115**	**80**	**11**
Fox	·	·	·	·	·	·	1	1	1
Canis lupus	·	·	·	·	·	·	1	1	1
Total Carnivores:	·	·	·	·	·	·	**2**	**2**	**2**
Lepus sp.	·	·	·	1	1	1	·	·	·
NRDt		**48**			**39**			**117**	
NRDa		**18**			**12**			**35**	
NRI		**668**			**1103**			**1998**	
NRT		**734**			**1154**			**2150**	
Density		**38,63**			**60,73**			**119,44**	

Table 6-4 Kabazi V, levels III/3-2, III/3-3 and III/3-3A: Large mammal remains.

Répartition spatiale

Dans le niveau III/3-2, les ossements sont dispersés avec une plus forte concentration en 8A (138 restes). Dans la grande zone cendreuse (en 7-8/Б-В), 131 ossements (5 brûlés) ont été découverts, dont: 2 ossements d'*Equus hydruntinus*, 3 de cerf, 2 de saïga, 5 d'artiodactyle indéterminé. Les esquilles brûlées sont dispersées.

Niveaux III/3-3 et III/3-3A

Le niveau III/3-3A est la plus riche (Table 6-4). La densité du matériel osseux varie de 61 (en III/3-3) à 120 (en III/3-3A) (Table 6-4). Les restes déterminés sont peu nombreux, respectivement 3,38 % et 5,44 % du NRT. Les herbivores sont largement dominants dans les deux niveaux (Table 6-4). Les carnivores sont absents en III/3-3. En III/3-3A, ils sont représentés par deux dents: une de renard et une de loup. L'abri n'a pas servi de repaire de carnivores. Cependant, la présence de marques de dents d'hyène atteste de sa venue dans l'abri en III/3-3 (4 ossements régurgités: dent de bison, d'artiodactyle et d'*Equus hydruntinus*, métapodien d'artiodactyle) et surtout en III/3-3A (14 ossements régurgités dont 8 dents et un fragment de métapodien d'*Equus hydruntinus*). Le déficit en ossements est très élevé dans les deux niveaux (d'après le NME/NMIc, le nombre d'os par individu estimé est respectivement de 3 et 7). Les esquilles indéterminées dominent très largement (Table 6-4). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses d'une longueur inférieure ou égale à 2 cm (84 et 80 %). Les grandes esquilles (> à 5cm) sont plus abondantes dans les niveaux III/3-3A. Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due

probablement à l'action conjuguée du poids des sédiments et du piétinement. La surface des ossements est relativement bien conservée. Les agents climato-édaphiques ont peu altéré le matériel, de même des marques de radicelles de plantes sont très rares. Ceci atteste que l'enfouissement a été relativement rapide et que les variations de température ou d'hygrométrie ont été peu marquées. Des esquilles brûlées ont été découvertes, 77 (soit 7 %) en III/3-3 et 37 (soit 2 %) en III/3-3A; ces os ont peut-être servi de combustible. En III/3-3, deux zones cendreuses et un foyer ont été dégagés lors des fouilles. Cinq esquilles indéterminées, 1 en III/3-3 et 4 en III/3-3A portent des impacts qui résultent d'une percussion d'origine anthropique.

L'*Equus hydruntinus,* l'antilope saïga, le cerf et le bison sont présents dans les deux niveaux (Table 6-4). Le chamois (détermination incertaine), le rhinocéros laineux et le mammouth n'ont été déterminés qu'en III/3-3A et le lièvre qu'en III/3-3.

Le faible nombre d'ossements de grands mammifères identifiés dans le niveau III/3-3 rend difficile la mise en évidence de leur origine et des éventuelles techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

Dans les deux niveaux, on note un très fort déficit en ossements (voir les NME/NMIc, Table 6-4). En III/3-3, six restes d'*Equus hydruntinus* ont été identifiés: cinq dents (une en deux morceaux) et un fragment de diaphyse de radius-ulna droit. Ils appartiennent à au moins un jeune (entre 2 et 3 ans) et un adulte âgé de 7-8 ans. En III/3-3A, *Equus hydruntinus* a laissé essentiellement des dents (34/27) et des fragments: d'un coxal (nouveau-né), d'un radius, d'un métacarpien principal, d'un métacarpien vestigial, d'un tibia et d'un tarsien. Ces 44 restes appartiennent à au moins 5 individus: un nouveau-né, un jeune de 2-3 ans, un sub-adulte de 3-4 ans et deux adultes de 7-8 ans. Dans les deux niveaux, on note un fort déficit des os du squelette post-crânien. Cependant, quelle que soit le niveau, de nombreuses esquilles indéterminées correspondent à des fragments de diaphyse d'os longs pouvant appartenir à *Equus hydruntinus*. L'exploitation des carcasses a été poussée, aucun os long n'est entier. Nous n'avons observé aucune marque anthropique sur les os.

On peut émettre l'hypothèse que quelques *Equus hydruntinus* ont été chassés, peut-être au début de l'été en III/3-3A, et dépecés sur place, puis les quartiers ainsi préparés ont été apportés et désarticulés devant l'abri. Seules les activités culinaires semblent avoir eu lieu à l'intérieur. Mais, le rôle de l'hyène en tant que responsable de l'accumulation d'une partie de ces matériels, notamment de ceux qui sont rapportés aux jeunes, ne peut être totalement exclu.

Acquisition et exploitation des saïgas

Dans les deux niveaux, comme pour *Equus hydruntinus*, on note un très fort déficit en ossements (voir les NME/NMIc, Table 6-4). En III/3-3, l'antilope saïga n'est identifiée que par: un fragment crânien, une diaphyse de radius, une partie proximale d'ulna, un corps de vertèbre, un fragment de cartilage costal, une extrémité distale de tibia et un fragment de diaphyse de métapodien. Ces huit restes appartiennent à au moins un individu adulte. En III/3-3A, les éléments du squelette céphalique sont les plus nombreux (15 restes), le squelette axial est également bien représenté (13 os), par contre les os des membres et de l'autopode sont rares (respectivement 6 et 5 os). Ces trente-neuf ossements ont été attribués à au moins un adulte âgé. En III/3-3A, au moins une saïga a été chassée et apportée entière à l'abri par les Néanderthaliens. L'exploitation de la carcasse a été poussée, aucun os long n'est entier, mais nous n'avons observé aucune marque sur les os, ni anthropique, ni de carnivore.

Les autres espèces

Le bison est présent: en III/3-3 par trois dents, dont une a été régurgitée par l'hyène, appartenant à deux individus (un sub-adulte et un adulte âgé) et en III/3-3A par deux humérus, un droit et un gauche (en trois morceaux), un métacarpien (en deux fragments) et un grand sésamoïde attribués à un adulte *sensu lato*. Onze restes, 4 en III/3-3 (deux dents et deux phalanges vestigiales dont une de juvénile) et 7 en III/3-3A (5 dents et un humérus gauche en deux morceaux), ont été attribués au cerf. Ils appartiennent à au moins: un adulte âgé en III/3-3 et à un jeune et un adulte âgé en III/3-3A. Deux fragments de lame dentaire et une phalange distale de juvénile a permis d'identifier la présence du mammouth en III/3-3A. Une P2 inférieure gauche usée appartient au rhinocéros laineux. C'est sous réserve que nous avons attribué six ossements, très fragmentés ou altérés, au chamois (dents et os de l'autopode). Le lièvre n'est représenté que par une extrémité distale d'humérus en III/3-3. Nous n'avons observé aucune marque anthropique sur les os; leur origine est difficile à déterminer. Ces animaux ont pu être chassés ou charognés par des Néanderthaliens ou des carnivores.

Répartition spatiale

En III/3-3, les ossements sont dispersés avec une plus forte concentration en: 8Д (158), 8Б (126) et 7A (101). Une esquille indéterminée trouvée en 8Д présente des impacts de percussion. Deux zones cendreuses et un foyer ont été dégagés lors des fouilles du carré 7Г. Dans ce carré, 90 ossements, aucun n'est brûlé, ont été découverts dont une molaire d'*Equus hydruntinus* et deux os de saïga. En III/3-3A, les ossements sont dispersés avec une plus forte concentration dans un même secteur, 7Д (431) – 7B (263) – 7Г (229) – 8Г (215). Quatre esquilles indéterminées portent des impacts de percussion (2 en 7Д, une en 8Д et une en 83). Ce secteur correspond à une aire de traitement des carcasses. Dans les deux niveaux, les esquilles brûlées sont dispersées.

Sous-unité III/4

La sous-unité III/4 est subdivisée en 6 niveaux. Deux fosses, une en III/4-2 et une en III/4-5, ont été dégagées à la fouille. Les niveaux III/4-2 et III/4-4 sont les plus riches et les niveaux III/4-1 et III/4-6 les plus pauvres (Table 6-5). La densité du matériel osseux varie de 29 (en III/4-1) à 108 (en III/4-4) (Table 6-5). Les niveaux III/4-1 et III/4-6 sont environ deux fois plus riches en nombre de restes déterminés que les autres niveaux (respectivement 6,8 % et 6,01 % du NRT); III/4-4 est la plus pauvre (1,14 % du NRT).

Quelle que soit le niveau, les herbivores sont largement dominants (Table 6-5). Les carnivores sont absents des niveaux III/4-2 et III/4-4 (pourtant les plus riches en restes osseux). Le loup n'est présent qu'en III/4-1 et III/4-6 et l'hyène en III/4-3 et en III/4-5. Un petit carnivore indéterminé a laissé un seul reste en III/4-5. L'abri n'a pas servi de repaire de carnivores. Cependant, la présence de 8 os régurgités par l'hyène atteste de sa venue dans l'abri en III/4-1 (1 os régurgité), III/ 4-2 (3) et surtout III/4-3 (4). Le déficit en ossements est très élevé et ce quelle que soit le niveau (d'après le NME/NMIc, le nombre d'os par individu estimé varie de 3 en III/4-3 à 5 en III/4-1).

	III/4-1			III/4-2			III/4-3		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	27	22	3	21	16	3	15	12	3
Saiga tatarica	4	4	1	5	4	1	5	4	1
Bison cf. priscus	2	2	1	2	2	1	·	·	·
Bovinae/Cervidae	·	·	·	·	·	·	13	1	1
Equus (caballus) sp.	·	·	·	·	·	·	·	·	·
Equus/Bovinae	1	1	·	·	·	·	·	·	·
Mammuthus primigenius	1	1	1	·	·	·	·	·	·
Total Herbivores:	**35**	**30**	**6**	**28**	**22**	**5**	**33**	**17**	**5**
Canis lupus	2	2	1	·	·	·	·	·	·
Crocuta crocuta	·	·	·	·	·	·	1	1	1
Small carnivore	·	·	·	·	·	·	·	·	·
Total Carnivores:	**2**	**2**	**1**	·	·	·	**1**	**1**	**1**
Lepus sp.	·	·	·	1	1	1	1	1	1
NRDt		**37**			**29**			**35**	
NRDa		**29**			**25**			**24**	
NRI		**478**			**1462**			**1019**	
NRT		**544**			**1516**			**1078**	
Density		**28,63**			**108,28**			**82,92**	

Table 6-5 Kabazi V, sub-unit III/4: Large mammal remains.

L'analyse globale de ce niveau montre une très nette dominance des esquilles indéterminées (95,31 %, Table 6-5). La fragmentation du matériel est très importante. La grande majorité des esquilles indéterminées correspond à des fragments de diaphyses d'une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont plus abondantes dans les niveaux III/4-1 et III/ 4-6. Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles, >> à 2 cm (1 377 grammes au total). La surface des ossements est relativement bien conservée. Les agents climato-édaphiques ont peu altéré le matériel (action un peu plus marquée en III/4-2 et III/4-4, présence dans ce niveau d'esquilles effilées), de même des marques de radicelles de plantes sont rares. Ceci atteste que l'enfouissement a été relativement rapide et que les variations de température ou d'hygrométrie ont été peu marquées. Pour l'ensemble, deux cents esquilles brûlées et un fragment de métapodien vestigial d'*Equus hydruntinus* (en III/4-5) ont été trouvées (3,1% du NRT). Ces os, notamment en en III/4-1où ils sont un peu plus nombreux, ont peut-être servi de combustible. Cependant, à l'exception de trois petites plages cendreuses mises au jour, deux en III/4-2 et une en III/4-5, aucun foyer n'a été dégagé. Trois os portent des impacts qui résultent d'une percussion anthropique: en III/4-1, une esquille indéterminée et une diaphyse d'humérus de boviné ou de cheval et en III/4-5, un éclat osseux indéterminé.

Les spectres fauniques, quelle que soit le niveau, sont dominés par l'*Equus hydruntinus* (Table 6-5). L'antilope saïga, moins abondante, est également présente dans toutes les niveaux, ainsi que, peut-être, excepté en III/4-6, le bison (détermination incertaine, boviné ou cervidé dans les niveaux III/4-3, III/4-4 et III/4-5, Table 6-5). Le mammouth n'a été déterminé qu'en III/4-1, le cheval en III/4-5 et le lièvre en III/4-2 et III/4-3. Des restes d'oiseaux ont également été identifiés excepté en III/4-1 et III/4-4.

Le faible nombre d'ossements de grands mammifères identifiés dans chacune des niveaux du niveau III/4 rend difficile la mise en évidence de leur origine et, pour les espèces plus abondantes, des

III/4-4			III/4-5			III/4-6		
NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
13	12	2	18	17	4	32	7	1
2	2	2	3	3	1	3	2	1
.	.	.	1	1	1	.	.	.
1	1	1	1	1		.	.	.
.	.	.	1	1	1	.	.	.
.	.	.	2	2	.	.	.	.
.	.	.	.	.	.	.	.	.
16	**15**	**5**	**26**	**25**	**7**	**35**	**9**	**2**
.	.	.	.	.	.	2	1	1
.	.	.	1	1	1	.	.	.
.	.	.	1	1	1	.	.	.
.	.	.	**2**	**2**	**2**	**2**	**1**	**1**
.	.	.	.	.	.	.	.	.
16			**28**			**37**		
9			**27**			**6**		
1373			**1234**			**572**		
1398			**1289**			**615**		
107,54			**99,15**			**61,5**		

Table 6-5 Continué.

techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

Les âges des individus estimés sont: en III/4-1 un jeune (1-2 ans), un adulte dans la force de l'âge et un mâle adulte âgé; en III/4-2 un jeune d'environ 28 mois et un adulte âgé; en III/4-3, un jeune (1-2 ans), un adulte jeune et un adulte de 7-8 ans; en III/4-4 un jeune d'environ 28 mois et un adulte de 7-8 ans; en III/4-5 deux jeunes (un de 1-2 ans et un d'environ 28 mois) et 2 adultes, un de 7-8 ans et un de 9-10 ans et en III/4-6 un adulte dans la force de l'âge (6-8 ans). La présence d'adultes dans la force de l'âge, excepté en en III/4-2, attestent de chasses anthropiques. Dans tous les niveaux, on note un fort déficit en ossements notamment du squelette post-crânien (voir NME/NMIc, Table 6-5). Excepté en III/4-1, où toutes les grandes unités squelettiques sont représentées, dans les autres niveaux, les *Equus hydruntinus* ne sont identifiés que par quelques éléments, essentiellement des dents et des os de l'autopode (excepté en III/4-4 où ces derniers font défauts). Un fragment de côte et un corps de vertèbre sont présents en III/4-1. Des os des membres ont été déterminés en: III/4-1 (scapula, radius-ulna et tibia), en III/4-3 (fémur et tibia), III/4-4 (radius-ulna et tibia), en III/4-5 (tibia) et en III/4-6 (scapula, humérus et fémur). Cependant, quelle que soit le niveau, de nombreuses esquilles indéterminées correspondent à des fragments de diaphyse d'os longs pouvant appartenir à *Equus hydruntinus*. L'exploitation des carcasses a été poussée, aucun os long n'est entier.

On peut émettre l'hypothèse que quelques *Equus hydruntinus* ont été chassés et dépecés sur place, puis les quartiers ainsi préparés ont été apportés et désarticulés devant l'abri. Seules les activités culinaires semblent avoir eu lieu à l'intérieur. Cependant, la pratique concomitante de chasses et de charognages de ces animaux par les Néanderthaliens ne peu pas être exclue. Cependant, le rôle de l'hyène en tant que responsable d'une partie des matériels, notamment en III/4-2, ne peu être totalement exclu.

Acquisition et exploitation des saïgas

Les âges des individus estimés sont: un adulte *sensu lato*, en III/4-1, III/4-2, III/4-5 et III/4-6, un adulte âgé III/4-3 et en III/4-4 un jeune et un adulte *sensu lato*. Dans tous les niveaux, on note un très fort déficit en ossements, notamment des os de la partie supérieure des membres (voir NME/NMIc, Table 6-5). En III/4-1 et III/4-4, les antilopes saïga ne sont identifiées que par quelques dents et os de l'autopode, en III/4-3 en plus de ces éléments, deux fragments d'un même cartilage costal sont présents. Une vertèbre caudale, un grand sésamoïde et un os malléolaire sont présents en III/4-5. Trois fragments, un de côte et deux d'un métapodien, ont été identifiés en III/4-6. Nous n'avons observé aucune marque anthropique sur les os.

Des morceaux de carcasses de saïga ont été apportés au campement soit par des carnivores (l'hyène, notamment en III/4-3), soit par l'homme. Ce dernier les aurait alors chassés ou charognés.

Les autres espèces

Les carnivores ne sont représentés que par des dents et, pour le loup de III/4-1, une phalange proximale. Seul, un fragment de lame dentaire a permis d'identifier la présence du mammouth en III/4-1. Le cheval, en III/4-5, n'est présent que par une déciduale supérieure. Des fragments de diaphyse d'os longs de bison ont été découverts en III/4-1 et, associés à une molaire inférieure d'adulte dans la force de l'âge, en III/4-2. Par ailleurs, un fragment de diaphyse d'humérus de Boviné ou de cheval porte des impacts de percussion sur os frais (en III/4-1). Le lièvre n'est représenté que par une phalange distale en III/4-2 et un tibia de juvénile en III/4-3. Nous ne pouvons, vu le peu de restes appartenant à ces espèces, déduire leur origine.

Répartition spatiale

En III/4-1, les ossements sont dispersés avec une plus forte concentration en: 8AA (183), 8A (77) et 8E (64). Deux os portent des impacts qui résultent d'une percussion anthropique: une esquille indéterminée (en 7AA) et une diaphyse d'humérus de boviné ou de cheval (en 8*Д*). En III/4-2, les ossements sont dispersés avec une plus forte concentration dans deux secteurs: (1) 8AA (222) – 8A (164) – 7A (159); (2) 8B (204) – 7B (178) – 8Г (163), dans ce secteur, deux petite plages cendreuses ont également été dégagées (en 7B et 8Г). Ce dernier correspond à une aire culinaire. Dans le carré 9AA, une fosse a été découverte lors des fouilles, elle contenait 16 esquilles indéterminées dont une brûlée. En III/4-3, les ossements sont dispersés avec une plus forte concentration en: 7Б (205), 8*Д* (204), 8B (132), 7A (126), 7B (123) et 7Г (116). En III/4-4, les ossements sont dispersés avec une plus forte concentration dans un même secteur, 8Г (307) – 8B (187) – 7B (174) – 7Б (166). En III/4-5, les ossements sont dispersés avec une plus forte concentration dans un même secteur, 8B (216) – 7B (177) – 8Б (145), correspondant probablement à une

aire culinaire. Dans le carré 8AA-A, une fosse a été dégagée lors des fouilles (83 restes indéterminés et une déciduale de cheval), de même qu'une petite plage cendreuse en 7AA où 10 esquilles indéterminées et un métapodien vestigial d'*Equus hydruntinus* brûlés ont également été découverts. Un éclat osseux a été trouvé en 7A. En III/4-6, les ossements sont dispersés avec une plus forte concentration en 8B (209). Quelle que soit le niveau, les esquilles brûlées sont dispersées.

Sous-unité III/5

La sous-unité III/5 est subdivisée en huit niveaux: III/5-1, III/5-1A, III/5-1B, III/5-2, III/5-2A, III/5-3, III/5-3B, III/5-3B2.

Niveaux III/5-1, III/5-1A et III/5-1B

Le niveau III/5-1 est la plus riche et le III/5-1B la plus pauvre (Table 6-6). La densité du matériel osseux varie de 69 (III/5-1B) à 98 (en III/5-1A). Les esquilles indéterminées sont largement majoritaires (respectivement 96,15%, 96,1% et 87,13%). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses et respectivement 81,91%, 82,56% et 86,76% d'entre elles ont une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont rares (respectivement 0,25%, 3,62% et 1,82%). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (<< 2cm, respectivement 444 gr, 240 gr et 299 gr).

La surface des ossements est assez bien conservée. Les agents climato-édaphiques ont peu altéré les matériels, un peu plus en III/5-1 (desquamation, quelques esquilles effilées). Des marques de radicelles de plantes (vermiculations) sont présentes en III/5-1A. Ceci atteste d'un recouvrement des matériels assez rapide, un peu plus lent en III/5-1, et la formation d'un léger couvert végétal en III/5-1A. Dans les trois niveaux, les carnivores sont absents (Table 6-6). En outre, ils n'ont laissé aucune trace de leur passage, à l'exception d'une incisive d'*Equus hydruntinus* qui a peut-être été régurgitée par l'hyène (en III/5-1). L'abri n'a pas servi de repaire aux carnivores. L'action anthropique est attestée par la découverte d'esquilles brûlées (respectivement 25, 22 et 11). De plus, en III/5-1B, une diaphyse de radius-ulna d'*Equus hydruntinus* porte des points de calcination. Ces os ont probablement été utilisés comme combustibles. Des éclats osseux résultant de percussion sur os frais sont également présents (1 en III/5-1A et 4 en III/5-1B). En III/5-1B, une diaphyse d'humérus d'*Equus hydruntinus* porte des stigmates de percussion sur os frais.

Quelle que soit le niveau, le déficit en ossements est très élevé (d'après le NME/NMIc, le nombre d'os par individu estimé est de 8 en III/5-1, 5 en III/5-1A et III/5-1B). Les spectres fauniques, très pauvres en espèces et en individus, sont, quelle que soit le niveau, dominé l'*Equus hydruntinus* (Table 6-6). Le bison est également présent en III/5-1 et III/5-1A, la saïga en III/5-1B, le lièvre en III/5-1A et III/5-1B et un cervidé indéterminé en III/5-1B.

Acquisition et exploitation des *Equus hydruntinus*

Dans les trois niveaux, excepté en III/5-1A (absence du squelette axial), toutes les grandes unités squelettiques sont représentées. En III/5-1, les 43 restes appartiennent à au moins deux individus, un jeune de 1 ou 2 ans et un mâle âgé d'environ 8-9 ans. En III/5-1A, les 25 restes sont attribués à au moins trois individus, un jeune de moins de 2 ans et 2 adultes, un d'environ 5-6 ans et un d'environ 7-8 ans, dont une femelle gravide. Enfin, en III/5-1B, les 71 ossements sont rapportés à au moins un individu, une femelle adulte âgée d'environ 8-9 ans.

Dans ces trois niveaux, les *Equus hydruntinus* ont été chassés, en III/5-1A peut-être au printemps, et consommés par les Néanderthaliens. D'après le peu d'élément anatomique conservé, leur dépeçage a eu lieu sur le lieu d'abattage et leur traitement en dehors de l'abri. La moelle des os longs a été systématiquement prélevée.

Les autres espèces

Le bison n'est représenté, en III/5-1, que par un fragment de jugale et en III/5-1A par une P2 supérieure droite usée et un grand sésamoïde. Un fragment de diaphyse médiane de métatarsien principal a permis d'identifier la présence d'un cervidé en III/5-1B. L'antilope saïga, qu'en III/5-1B (cependant, en III/5-1A deux fragment d'os longs ont des dimensions correspondant à celles de la saïga), est représenté par: une voûte crânienne (en 2 parties), une côte (en deux morceaux) et une partie proximale de métapodien (en 7 fragments). Ces animaux ont été chassés ou charognés par des Néanderthaliens.

En III/5-1 une vertèbre et un fragment d'os long de rongeur ont été identifiés et en III/5-1A deux fragments d'os longs d'oiseau de petite taille.

	III/5-1			III/5-1A			III/5-1B		
	NR	NME	NMIc	NR	NME	NMIc	NR	NME	NMIc
Equus hydruntinus	43	23	2	25	18	3	72	15	1
Saiga tatarica	·	·	·	·	·	·	11	3	1
Bison cf. priscus	1	1	1	2	2	1	·	·	·
Cervidae	·	·	·	·	·	·	1	1	1
Artiodactyla	1	·	·	4	·	·	0	0	0
Total Herbivores:	**45**	**24**	**3**	**31**	**20**	**4**	**84**	**19**	**3**
Total Carnivores:	·	·	·	·	·	·	·	·	·
Lepus sp.	·	·	·	1	1	1	2	2	1
NRDt		**45**			**32**			**86**	
NRDa		**3**			**6**			**11**	
NRI		**1200**			**935**			**657**	
NRT		**1248**			**973**			**754**	
Density		**96**			**97,3**			**68,54**	

Table 6-6 Kabazi V, levels III/5-1, III/5-1A and III/5-1B: Large mammal remains.

Répartition spatiale

En III/5-1 les ossements sont peu dispersés avec une plus forte concentration dans un même secteur, 8В (292) – 7Г (200) – 7В (115). Dans les carrés 7Г et 7В des zones cendreuses ont été mises en évidence lors de la fouille. Les activités culinaires étaient centrées dans ce secteur. En III/5-1A les ossements sont peu dispersés avec une plus forte concentration dans un même secteur, 8В (306) – 7В (212) – 7Б (111). Par ailleurs, des os longs d'Equus hydruntinus ont été débités sur place en 7В et un éclat osseux résultant de percussion sur os frais est présent en 8В. Ce secteur correspond à l'aire principale de traitement de cet équidé. En III/5-1B, les ossements sont localisés principalement en: 7Б (199), 7В (150) et 8Б (110). En 8В, une diaphyse d'humérus d'*Equus hydruntinus* porte des stigmates de percussion sur os frais et 3 éclats osseux résultant de percussion sur os frais, un a également été découvert en 8АА. Quelle que soit le niveau, les esquilles brûlées sont dispersées.

Niveau III/5-2 et III/5-2A

Le niveau III/5-2 est la plus riche en restes osseux (Table 6-7). La densité du matériel osseux est de 128 en III/5-2A et 154 en III/5-2. Les esquilles indéterminées sont largement majoritaires (respectivement 92,11 % et 96,99 %). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses et respectivement 89,48 % et 86,65 % d'entre elles ont une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont rares (respectivement 2,33 % et 2,48 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (<< 2cm, respectivement 1 108 gr et 699 gr).

La surface des ossements est assez bien conservée. Les agents climato-édaphiques ont peu altéré les matériels, un peu plus en III/5-2 (quelques esquilles effilées, des marques de desquamation, d'oxyde de fer et de dissolution). Des marques de radicelles de plantes sont très rares, présentes en III/5-2. Ceci atteste d'un recouvrement des matériels assez rapide, légèrement plus lent en III/5-2. La présence de dépôts d'oxyde de fer atteste de percolation, l'humidité lors de la formation de le niveau sus-jacente devait être relativement importante. Les carnivores ne sont présents, par trois ossements appartenant probablement à un mustélidé, qu'en III/5-2 (Table 6-7). En outre, ils n'ont laissé aucune trace de leur passage. L'abri ne leur a pas servi de repaire. L'action anthropique est attestée par la découverte d'esquilles brûlées (respectivement 97 et 34). Ces os ont probablement

été utilisés comme combustibles. De plus, sur 5 restes d'*Equus hydruntinus* (2 en III/5-2, fragments de diaphyse de tibia, et 3 en III/5-2A, 2 d'hémi-mandibule et un d'humérus) des points de calcination ont été observés. En III/5-2, deux éclats osseux, un d'os indéterminé et l'autre de diaphyse de métatarsien de bison résultent d'une percussion sur os frais. Dans ce même niveau, 13 esquilles indéterminées et une diaphyse de tibia d'*Equus hydruntinus* portent des stigmates de percussion sur os frais. Toujours en III/5-2, parmi les esquilles indéterminées, une diaphyse d'os long, pouvant appartenir à *Equus hydruntinus*, présente des stries de décharnement. Enfin, en III/5-2A, un retouchoir sur métatarsien principal d'*Equus hydruntinus* a été identifié.

Dans les deux niveaux, le déficit en ossements est très élevé (d'après le NME/NMIc, respectivement 6 os par individu estimé). Les spectres fauniques, très pauvres en espèces et en individus, sont, quelle que soit le niveau, dominé l'*Equus hydruntinus* (Table 6-7). Le bison est présent en III/5-2, la saïga et le cerf en III/5-2A. Trois os de petit oiseau et de rongeur sont également présents en III/5-2.

Acquisition et exploitation des *Equus hydruntinus*

Toutes les grandes unités squelettiques sont représentées, excepté en III/5-2A le squelette axial. En III/5-2, les 73 restes appartiennent à au moins trois individus, un jeune de 1 ou 2 ans et deux adultes, dont un de moins de 7-8 ans. En III/5-2A, les 36 ossements sont attribués à au moins trois individus, un jeune de 1 ou 2 ans, un adulte d'environ 7-8 ans et un mâle âgé d'environ 9-10 ans.

Dans ces deux niveaux, les *Equus hydruntinus* ont été chassés et consommés par les Néanderthaliens. D'après le peu d'élément anatomique conservé, leur dépeçage a eu lieu sur le lieu d'abattage et leur traitement en dehors de l'abri. La moelle des os longs a été systématiquement prélevée.

Les autres espèces

Le bison, qu'en III/5-2, a été identifié par 4 restes: une P2 supérieure et une P2 inférieure appartenant à un adulte relativement âgé, un fragment de diaphyse de

	III/5-2			III/5-2A		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	73	28	3	36	21	3
Saiga tatarica	·	·	·	3	3	1
Bison cf. priscus	4	4	1	·	·	·
Cervus cf. elaphus	·	·	·	2	2	1
Artiodactyla	8	·	·	8	2	·
Equus/Bovinae	57	·	·	0	·	·
Total Herbivores:	**142**	**32**	**4**	**49**	**28**	**5**
Small carnivore	3	2	1	·	·	·
Total Carnivores:	**3**	**2**	**1**	·	·	·
Lepus sp. or fox	1	1	1	·	·	·
NRDt		**146**			**49**	
NRDa		**12**			**1**	
NRI		**1844**			**1611**	
NRT		**2002**			**1661**	
Density		**154**			**127,76**	

Table 6-7 Kabazi V, levels III/5-2 and III/5-2A: Large mammal remains.

tibia et un de métatarsien présentant des marques de percussion sur os frais. En outre, dans ce niveau, 57 fragments de mandibule, d'os pétreux et d'os longs appartiennent au bison ou à *Equus hydruntinus*. Un fragment de diaphyse médiane de métatarsien principal et un fragment de molaire a permis d'identifier la présence du cerf en III/5-2A. L'antilope saïga, qu'en III/5-2A, est représenté par 3 restes: une cheville osseuse gauche, un fragment de molaire et un morceau de côte. Par ailleurs, un fragment crânien, 2 fragments de jugale et 5 morceaux de diaphyse de tibia et de métapodiens appartiennent à un artiodactyle indéterminé. Ces animaux ont été chassés ou charognés par des Néanderthaliens.

Répartition spatiale

En III/5-2, les ossements sont dispersés avec une plus forte concentration en: 8В (347), 8Д (274), 8Г (247), 7Г (240), 7Б (213) et 8Б (199). Dans les carrés 7В, 8Б et 8Г, une zone cendreuse a été dégagée lors de la fouille. Par ailleurs, Deux fragments de diaphyse de tibia d'*Equus hydruntinus* présentent des points de calcination en 8Б et 7Г. Les os présentant des marques de fracturation ont été découverts en: 7А (10), 7Г (3), 7В (2) et 9А (dont un métatarsien de bison, en 7В, et un tibia d'*Equus hydruntinus*, en 7Г). Parmi les esquilles indéterminées, une diaphyse d'os long, pouvant appartenir à *Equus hydruntinus*, présente des stries de décharnement (en 8Г). Cette zone correspond à une aire d'activité culinaire. En III/5-2А les ossements sont moins dispersés que dans le niveau précédent avec une plus forte concentration en 7Б (364), 8Г (276) et 8В (252). Les restes d'*Equus hydruntinus* sont plus abondants en 7Б et 9А. Ce secteur correspond à l'aire principale de traitement de cet équidé. Sur trois restes d'*Equus hydruntinus* (2 d'hémi-mandibule et un d'humérus) des points de calcination ont été observés en 9А et 8В. Le retouchoir a été identifié en 8АА. Quelle que soit le niveau, les esquilles brûlées sont dispersées.

Niveaux III/5-3, III/5-3B et III/5-3B2

Une partie importante du niveau III/5-3 a fait l'objet de fouilles en 1996, le matériel osseux exhumé n'a pas été analysé lors de ce travail. Dans les niveaux III/5-3 et III/53-B des fosses ont été mises en évidence lors des fouilles. Par ailleurs, en III/5-3B et III/5-3B2 trois foyers ont été dégagés. Le niveau III/5-3B est la plus riche en restes osseux (Table 6-8). La densité du matériel osseux varie de 82 (III/5-3) à 353 (en III/5-3B). Les esquilles indéterminées sont largement majoritaires (respectivement 97,08, 97,45 et 97,54 %). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses et respectivement 85,97, 90,1 et 90,76 % d'entre elles ont une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont très rares (respectivement 0,87, 0,32 et 0,56 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (<< 2cm).

La surface des ossements est assez bien conservée. Les agents climato-édaphiques ont peu altéré les matériels, un peu plus en III/5-3B (quelques esquilles effilées). Des marques de radicelles de plantes sont très rares. Ceci atteste d'un recouvrement des matériels assez rapide, légèrement plus lent en III/5-3B. Les carnivores ne sont présents qu'en III/5-3B2, par six ossements (dents et os de l'autopode) appartenant à deux isatis et un loup (Table 6-8). Ils n'ont laissé des traces de leur passage (marques de dents sur deux os d'isatis) qu'en III/5-3B. L'abri ne leur a pas servi de repaire. L'action anthropique est attestée par la découverte d'esquilles brûlées (respectivement 58, 266 et 95). De plus, sur 3 restes d'*Equus hydruntinus* (2 en III/5-3B, un fragment de diaphyse d'humérus et une jugale et un fragment de jugale en III/5-3B2) et sur une jugale de bison en III/5-B, des points de calcination ont été observés. Des os, en III/5-3B une diaphyse de tibia d'*Equus hydruntinus* et en III/5-3B2 deux fragments de diaphyses d'espèce indéterminée, portent des stigmates de percussion sur os frais. Des stries de décharnement sont présentes sur une diaphyse de tibia d'*Equus hydruntinus* de III/5-3B et sur une esquille indéterminée de III/5-3B2.

Dans les trois niveaux, le déficit en ossements est très élevé (d'après le NME/NMIc, respectivement 11, 8 et 4 os par individu estimé). Les spectres fauniques, très pauvres en espèces et en individus, sont, quelle que soit le niveau, dominés par l'*Equus hydruntinus* (Table 6-8). Le bison est présent dans les trois niveaux, le cheval et un cervidé indéterminé en III/5-3B et la saïga en III/5-3B2. Par ailleurs, un os de petit oiseau est présent en III/5-3B2.

Acquisition et exploitation des *Equus hydruntinus*

Toutes les grandes unités squelettiques sont représentées, excepté le squelette axial en III/5-3B2. En III/5-3, les 36 restes appartiennent à au moins un individu âgé d'environ 10 ans. En III/5-3B, les 63 ossements sont attribués à au moins trois individus, un jeune de 1 ou 2 ans, deux adultes âgés d'environ 4-5 ans et 7-8 ans (dont un mâle et une femelle).

	III/5-3			III/5-3B (III/5-3A et III/5-3B1)			III/5-3B2		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	36	18	1	63	41	3	29	21	3
Saiga tatarica	·	·	·	·	·	·	2	2	1
Bison cf. priscus	2	1	1	9	6	2	3	2	1
Cervidae	·	·	·	1	1	1	·	·	·
Artiodactyla	3	2		2	1	·	·	·	·
Equus (caballus) sp.	·	·	·	1	1	1	·	·	·
Equus/Bovinae	·	·	·	1	·	·	2	1	·
Total Herbivores:	**41**	**21**	**2**	**77**	**50**	**7**	**36**	**26**	**5**
Canis lupus	·	·	·	·	·	·	1	1	1
Alopex lagopus	·	·	·	·	·	·	5	5	2
Total Carnivores:	·	·	·	·	·	·	**6**	**6**	**3**
NRDt		**41**			**77**			**42**	
NRDa		**4**			**13**			**16**	
NRI		**1497**			**3436**			**2306**	
NRT		**1542**			**3526**			**2364**	
Density		**81,15**			**352,6**			**295,5**	

Table 6-8 Kabazi V, levels III/5-3, III/5-3B and III/5-3B2: Large mammal remains.

Le niveau III/5-3B2 a livré 29 restes appartenant à au moins trois individus, un sub-adulte, un adulte d'environ 6-7 ans et une femelle très âgée (> ou = à 10 ans).

Dans ces trois niveaux, les *Equus hydruntinus* ont été chassés et consommés par les Néanderthaliens. D'après le peu d'élément anatomique conservé, leur dépeçage a eu lieu sur le lieu d'abattage et leur traitement en dehors de l'abri. La moelle des os longs a été systématiquement prélevée. Le niveau III/5-3 à fait l'objet de fouilles antérieures, et que de ce fait, nous n'avons qu'une partie du matériel, ce qui limité l'interprétation palethnographique.

Les autres espèces

Le bison est représenté: en III/5-3 que par une labiale (en deux morceaux) appartenant à un adulte, en III/5-3B par des jugales et un fragment de radius attribués à au moins deux individus, un jeune adulte et un adulte âgé et en III/5-3-B2 une première incisive d'adulte âgé et une diaphyse de fémur. Un cuboïde et une phalange distale d'adulte d'antilope saïga ont été déterminés en III/5-3B2. Un fragment de diaphyse médiane de métatarsien principal a permis d'identifier la présence d'un cervidé en III/5-3B. Un coxal gauche presque complet découvert en III/B est rapporté au cheval. Ces animaux ont été chassés ou charognés par des Néanderthaliens.

Répartition spatiale

En III/5-3, les ossements sont dispersés avec une plus forte concentration en 8Г (389), 8Д (195), 8В (179), 7Г (153) et 7Б (151). Les fosses en 7Б et en 9А ne contenaient que des micro-esquilles. Rappelons que ce niveau à fait l'objet de fouilles antérieures et que, de ce fait, nous n'avons qu'une partie du matériel.

En III/5-3B, les ossements sont dispersés avec une plus forte concentration dans un même secteur: 8Г (691) – 7В (567) – 8В (536), et en 7Б (483). Ce secteur correspond à une zone cendreuse où ont été dégagés les foyers en 7-8/В-Г et en 8Г. Dans le foyer en 7-8/В-Г, 194 ossements (106 sont brûlées) ont été retrouvés dont deux restes d'*Equus hydruntinus* (une jugale partiellement brûlée et une diaphyse de tibia avec des stries de décharnement). Certains ossements ont été utilisés comme combustibles. En 7В, une diaphyse de tibia d'*Equus hydruntinus* porte des stigmates de percussion sur os frais). La fosse en 7В, contenait

64 ossements (3 brûlés), dont deux fragments de jugale d'*Equus hydruntinus*. Ce secteur correspond à une aire d'activité culinaire. Le foyer en 8Б, ne contenait que des micro-esquilles.

En III/5-3B2, les ossements sont dispersés avec une plus forte concentration dans un même secteur, 7Г (929) – 8Г (530) – 7В (588). En 7Г, un fragment de jugale d'*Equus hydruntinus* porte des points de calcination et une esquille indéterminée des stries de décharnement. Ce secteur correspond à l'aire principale de traitement de cet équidé. Deux fragments de diaphyses d'espèce indéterminée (8Д) portent des stigmates de percussion sur os frais.

Sous-unité III/6

La sous-unité III/6 est subdivisée en deux niveaux: III/6-1-2, III/6-3. Le niveau III/6-3, présente que sur quatre carrés, est la plus pauvre en matériel osseux (Table 6-9). Elle n'a livré que deux os déterminés (2 vertèbres caudales entières d'*Equus hydruntinus*) et des esquilles indéterminées dont deux diaphyses d'os long (une de la taille d'*Equus hydruntinus* et une de la taille de l'antilope saïga), quatre de ces restes sont brûlées (Table 6-9). L'autre niveau est plus riche, mais elle n'a livré que relativement peu d'ossements déterminés (3,66 % du NRT, Table 6-9). La densité du matériel osseux varie de 9 (en III/6-3) à 74 (en III/6-1-2). Les esquilles indéterminées sont largement majoritaires (respectivement 95,90 % et 94,44 %). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses et elles ont majoritairement une longueur inférieure ou égale à 2 cm (respectivement 86,95 % et 88,23 %). Les grandes esquilles (> à 5cm) ne sont présentes que dans le niveau III/6-1-2 (0,90 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle très importante due à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (<< 2cm). La surface des ossements est relativement bien conservée. Les agents climato-édaphiques ont peu altéré les matériels (légère desquamation, quelques esquilles effilées en III/6-1-2). Les marques de radicelles de plantes sont rares (respectivement 0,57 % et 2,77 % du NRT). Ceci atteste d'un recouvrement des matériels assez rapide, un peu moins en III/6-1-2. Les carnivores sont absents de III/6-3. En III/6-1-2, ils sont représentés que par une canine déciduale usée d'ourson (Table 6-9). Par ailleurs, dans ce niveau, des hyènes ont régurgité: la canine d'ourson, un talus d'*Equus hydruntinus*, l'extrémité proximale d'un métatarsien et une P3-4 supérieure d'antilope saïga. Ces ossements attestent de leur passage dans l'abr. Kabazi V a servi d'abri à des ours, mais pas de repaire aux hyènes. L'action anthropique est attestée par: 56 esquilles brûlées et en III/6-1-2, des stries de décharnement sur une diaphyse d'os long de la taille d'*Equus hydruntinus*, des marques de percussion sur os frais sur un fragment de diaphyse de tibia d'*Equus hydruntinus* et sur 3 esquilles indéterminées. Certains os ont probablement été utilisés comme combustibles.

Quelle que soit le niveau, le déficit en ossements est très élevé (d'après le NME/NMIc, le nombre d'os par individu estimé est de 5 en III/6-1-2 et 2 en III/6-3). Les spectres fauniques, très pauvres en espèces et en individus, sont quelle que soit le niveau, dominé l'*Equus hydruntinus* (Table 6-9). La saïga n'est présente qu'en III/6-1-2.

Le faible nombre d'ossements de grands mammifères identifiés dans chacune des niveaux de la sous-unité III/6 rend difficile la mise en évidence de leur origine et, pour les espèces plus abondantes, des techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

En III/6-1-2, cet équidé est représenté par 28 ossements appartenant au squelette céphalique (16 restes correspondant à 2 hémi-mandibules et 4 dents), à la partie supérieure des membres postérieurs (5 restes correspondant à un fémur et à 2 tibias) et à l'autopode (7 os correspondant à un métapodien vestigial, un métatarsien principal, un talus et un carpien ou tarsien). Cent une esquilles indéterminées ont des dimensions correspondant à la taille de ce petit équidé. Tous ces restes appartiennent à au moins un jeune de moins d'un an et un adulte âgé d'environ 9 ans.

Dans ce niveau, les Néanderthaliens ont peut-être chassé une femelle et son jeune. D'après le peu d'élément conservé, leur dépeçage a probablement eu lieu sur le lieu d'abattage. La moelle des os longs a été systématiquement prélevée.

Les autres espèces

Elles ne sont présentes qu'en III/6-1-2. L'antilope saïga a été identifiée par: 5 restes céphaliques (correspondant à deux jugales), un fragment de pubis, deux fragments d'os longs (un radius-ulna et un tibia) et 6 os de l'autopode (un métacarpien, un métatarsien, un semi-lunaire et un cubo-naviculaire). Ces ossements appartiennent à au moins un jeune et un adulte âgé. D'après le peu d'élément

	III/6-1-2			III/6-3		
	NR	**NME**	**NMIc**	**NR**	**NME**	**NMIc**
Equus hydruntinus	28	13	2	2	2	1
Saiga tatarica	14	9	2	·	·	·
Artiodactyla	8	2	1	·	·	·
Total Herbivores:	**50**	**24**	**5**	**2**	**2**	**1**
Ursus sp.	1	1	1	·	·	·
Total Carnivores:	**1**	**1**	**1**	·	·	·
NRDt		**51**			**2**	
NRDa		**6**			**0**	
NRI		**1334**			**34**	
NRT		**1391**			**36**	
Density		**73,21**			**9**	

Table 6-9 Kabazi V, sub-unit III/6: Large mammal remains.

anatomique conservé, leur traitement a eu lieu en dehors de l'abri. La moelle des os longs a été prélevée. Par ailleurs, six fragments de dents d'artiodactyle indéterminé ont été identifiés, ainsi que qu'une diaphyse d'humérus (en deux morceaux) appartenant à une espèce de plus grande taille que la saïga (Boviné ?). Ces animaux ont été chassés (saïga) ou charognés par des Néanderthaliens.

Répartition spatiale

En III/6-1-2, les ossements sont dispersés avec une plus forte concentration dans un même secteur, 9В (323) – 8Б (175) – 7Б (133), et en 9Г (173). Ont été observées: en 9Г des stries de décharnement sur une diaphyse d'os long de la taille d'*Equus hydruntinus*, en 8Б des marques de percussion sur une diaphyse de tibia d'*Equus hydruntinus* et en 9Б, trois éclats de percussion. Les esquilles brûlées sont dispersées. Le secteur mis en évidence correspond probablement à une aire culinaire. En III/6-3, les 36 ossements sont localisés en 11Ж (19), 11E (11) et 10E (6). En 11В seul des micro-esquilles ont été découvertes.

Sous-unité III/7

La sous-unité III/7 est subdivisée en trois niveaux: III/7-1, III/7-2, III/7-3. Le niveau III/7-3, présente que dans un seul carré (8Б) correspondant à une zone cendreuse, est la plus pauvre en matériel osseux. Elle n'a livré que des esquilles indéterminées, dont 3 brûlés, et un fragment de jugale d'*Equus hydruntinus* (Table 6-10). Les deux autres niveaux sont un peu plus riches (Table 6-10). La densité du matériel osseux varie de 61 (III/7-1) à 113 (en III/7-3). Les esquilles indéterminées sont largement majoritaires (respectivement 97,41 %, 96,23 % et 99,11 %). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses et respectivement 84,23 %, 87,2 % et 83 % d'entre elles ont une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5 cm) sont absentes à l'exception d'une en III/7-1. Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (<< 2cm). La surface des ossements est assez bien conservée. Les agents climato-édaphiques ont peu altéré les matériels (légère desquamation). Les marques de radicelles de plantes sont relativement peu représentées. Ceci atteste d'un recouvrement des matériels assez rapide. Dans les trois niveaux, les herbivores sont largement dominants (Table 6-10). Les restes de carnivores sont absents en III/7-1 et III/7-3. Seule une partie spongieuse d'os long d'un petit carnivore a été déterminée en III/7-2. En outre, ils n'ont laissé aucune trace de leur passage L'abri ne leur a donc pas servi de repaire. L'action anthropique est attestée par la découverte d'esquilles brûlées (respectivement 14, 55 et 3). En outre, en III/7-2, deux os d'*Equus hydruntinus* portent des points de calcination. Certains os ont probablement été utilisés comme combustibles.

	III/7-1			III/7-2			III/7-3		
	NR	NME	NMIc	NR	NME	NMIc	NR	NME	NMIc
Equus hydruntinus	5	5	1	18	11	2	7	5	1
Saiga tatarica	·	·	·	6	4	1	·	·	·
Bovinae	·	·	·	1	1	1	·	·	·
Total Herbivores:	**5**	**5**	**1**	**25**	**16**	**4**	**1**	**1**	**1**
Small carnivore	·	·	·	1	1	1	·	·	·
Total Carnivores:	·	·	·	**1**	**1**	**1**	·	·	·
NRDt		**5**			**26**			**1**	
NRDa		**6**			**2**			**0**	
NRI		**414**			**716**			**112**	
NRT		**425**			**744**			**113**	
Density		**60,71**			**74,4**			**113**	

Table 6-10 Kabazi V, sub-unit III/7: Large mammal remains.

Quelle que soit le niveau, le déficit en ossements est très élevé (d'après le NME/NMIc, le nombre d'os par individu estimé est de 5 en III/7-1, 4 en III/7-2 et 1 en III/7-3). Les spectres fauniques, très pauvres en espèces et en individus, sont quelle que soit le niveau, dominé l'*Equus hydruntinus* (Table 6-10). En III/7-2, le bison et la saïga sont également présents.

Le faible nombre d'ossements de grands mammifères identifiés dans chacune des niveaux de la sous-unité III/7 rend difficile la mise en évidence de leur origine et, pour les espèces plus abondantes, des techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

En III/7-1, les 5 ossements d'*Equus hydruntinus* correspondent à: un fragment de jugale, une P3-4 supérieure gauche, un fragment de branche horizontale d'hémi-mandibule, un petit trochanter de fémur gauche et un fragment de corps de côte. Quarante-huit esquilles indéterminées ont des dimensions correspondant à la taille de ce petit équidé. Tous ces restes appartiennent à un adulte d'environ 6-7 ans. En III/7-2, les 18 restes sont: un fragment de jugale, une P3-4 supérieure droite (en trois morceaux), un bourgeon de jugale droite, une déciduale gauche prête à tomber, un fragment d'hémi-maxillaire, une vertèbre caudale, 9 fragments de diaphyse d'os longs (humérus, radius-ulna, fémur, tibia (6 morceaux), et un fragment d'extrémité proximale de métapodien vestigial. Vingt-trois esquilles indéterminées ont des dimensions correspondant à la taille de ce petit équidé. Tous ces ossements se rapportent à deux individus, un jeune de 2-3 ans et un adulte d'environ 10-11 ans.

Dans ces deux niveaux, les *Equus hydruntinus* ont été chassés et consommés par les Néanderthaliens. D'après le peu d'élément anatomique conservé (surtout en III/7-1), leur dépeçage a eu lieu sur le lieu d'abattage. La moelle des os longs a été systématiquement prélevée.

Les autres espèces

En III/7-2, le bison a été identifié par un fragment de P2 inférieure droite (d'un adulte dans la force de l'âge) et l'antilope saïga par un fragment de vertèbre, une cavité glénoïde de scapula, 3 fragments de diaphyse d'humérus et un petit cunéiforme (ces restes appartiennent à un adulte *sensu lato*). Ces animaux ont été chassés (au moins la saïga) ou charognés par des Néanderthaliens.

Répartition spatiale

En III/7-1 les ossements sont peu dispersés avec une plus forte concentration dans un même secteur, 9В (124) – 9А (115) – 9Б (77). Cette zone correspond probablement à une aire culinaire En III/7-2 les ossements sont peu dispersés avec une plus forte concentration en: 9Г (255), 8Б (210) et 8Г (130). Cette zone correspond à une grande zone cendreuse. En

III/7-3, tous les ossements sont localisés dans une zone cendreuse, en 8Б.

Unité IV

L'unité IV est subdivisée en 4 niveaux: IV/1, IV/2, IV/3 et IV/4. Le niveau IV/4, présente que dans quatre carrés (9K, 11K, 9Л et 10Л), est la plus pauvre en matériel osseux. Elle n'a livré que des esquilles indéterminées dont trois diaphyses d'os long de la taille d'*Equus hydruntinus* et deux brûlées (Table 6-11).

Les trois autres niveaux sont un peu plus riches, mais elles n'ont livré que peu d'ossements déterminés (Table 6-11). La densité du matériel osseux varie de 26 (en IV/2) à 20 (en IV/1). Les esquilles indéterminées sont largement majoritaires (respectivement 94,64 %, 97,36 % et 97,83 %). La fragmentation du matériel est très importante. En effet, la grande majorité des esquilles indéterminées correspond à des fragments de diaphyses et respectivement 79,4 % 86 % et 87 % ont une longueur inférieure ou égale à 2 cm. Les grandes esquilles (> à 5cm) sont très rares, un peu plus abondantes dans le niveau IV/1 (3,23 %). Les os déjà fracturés ont subi une seconde fragmentation post-dépositionnelle due probablement à l'action conjuguée du poids des sédiments et du piétinement. Ceci est confirmé par la présence de micro-esquilles (<<2cm). La surface des ossements est assez mal conservée. Les agents climato-édaphiques ont altéré les matériels surtout celui de IV/1 (desquamation, dissolution, esquilles effilées). Les marques de radicelles de plantes sont relativement bien représentées en IV/1 (0,8 % du NRI). Ceci atteste, surtout en IV/1, d'un recouvrement des matériels assez lent et du développement d'un léger couvert végétal sous une atmosphère relativement humide.

Dans les trois niveaux, les herbivores sont largement dominants (Table 6-11). Parmi les carnivores, seules une vertèbre (en 3 morceaux) et une phalange proximale de renard ont été déterminées en IV/1. En outre, ils n'ont laissé aucune trace de leur passage L'abri ne leur a donc pas servi de repaire. L'action anthropique est attestée par la présence d'esquilles brûlées (respectivement 7, 12 et 13). Par ailleurs, en IV/1des 8 éclats osseux résultant d'une percussion sur os frais ont été exhumés.

Quelle que soit le niveau, le déficit en ossements est très élevé (d'après le NME/NMIc, le nombre d'os par individu estimé dans chacune des niveaux est de 3). Les spectres fauniques, très pauvres en espèces et en individus, sont, quelle que soit le niveau, dominé l'*Equus hydruntinus*, le bison est présent en IV/1 et la saïga en IV/2 (Table 6-11).

Le faible nombre d'ossements de grands mammifères identifiés dans chacune des niveaux de l'unité IV rend difficile la mise en évidence de leur origine et, pour les espèces plus abondantes, des techniques d'acquisition et d'exploitation utilisées par les Néanderthaliens.

Acquisition et exploitation des *Equus hydruntinus*

En IV/1, les 13 ossements d'*Equus hydruntinus* correspondent à: un fragment de branche horizontale d'hémi-mandibule, une diaphyse d'humérus (en 2 fragments), une diaphyse de tibia (en 9 morceaux) et une extrémité proximale de métapodien vestigial. Treize esquilles indéterminées ont des dimensions correspondant à la taille de ce petit équidé. Tous ces restes appartiennent à un adulte sens lato. En IV/2, les 4 restes sont: un fragment d'os pétreux, un fragment de jugal, un fragment de diaphyse de radius-ulna et un fragment d'extrémité proximale de métapodien principal. Vingt-deux esquilles indéterminées ont des dimensions correspondant à la taille de ce petit équidé. Tous ces ossements se rapportent à un adulte sens lato. En IV/3, les 7 ossements sont: une P3-4 supérieure droite, une M3 supérieure gauche, trois fragments d'une même jugale, un fragment de diaphyse d'os long et une partie distale de phalange proximale. Treize esquilles indéterminées ont des dimensions correspondant à la taille de ce petit équidé. Tous ces restes appartiennent à un adulte dans la force de l'âge d'environ 7 ans.

Pour chacune de ces niveaux, un seul *Equus hydruntinus* a été chassé et consommé par les Néanderthaliens. D'après le peu d'élément conservé, leur traitement a eu lieu en dehors de l'abri. La moelle des os longs a été systématiquement prélevée.

Les autres espèces

Le bison a été identifié en IV/1 par un fragment de bourgeon de M1-2 inférieure droite. L'antilope saïga est présente en IV/2 par une première incisive droite adulte. Dans ce niveau un fragment de métapodien de renard ou de lagomorphe, un morceau de racine de jugale et de branche montant d'hémi-mandibule droite d'artiodactyle indéterminé sont également présents. En IV/3, seuls deux fragments de jugale d'artiodactyle indéterminé ont été déterminés. Ces animaux ont été chassés ou charognés par des Néanderthaliens.

Répartition spatiale

En IV/1 les ossements sont dispersés avec une plus forte concentration dans un même secteur, 10И (82)

	IV/1			IV/2			IV/3		
	NR	NME	NMIc	NR	NME	NMIc	NR	NME	NMIc
Equus hydruntinus	13	4	1	4	4	1	7	5	1
Saiga tatarica	·	·	·	1	1	1	·	·	·
Bison cf. priscus	1	1	1	·	·	·	·	·	·
Artiodactyla	·	·	·	2	2	·	2	1	1
Total Herbivores:	**14**	**5**	**2**	**7**	**7**	**2**	**9**	**6**	**2**
Fox	4	2	1	·	·	·	·	·	·
Total Carnivores:	**4**	**2**	**1**	·	·	·	·	·	·
Lepus sp ./Fox	·	·	·	1	1	1	·	·	·
NRDt		**18**			**8**			**9**	
NRDa		**8**			**4**			**0**	
NRI		**495**			**443**			**361**	
NRT		**521**			**455**			**370**	
Density		**20,03**			**25,27**			**21,76**	

Table 6-11 Kabazi V, Unit IV: Large mammal remains.

– 103 (63) – 10К (40) – 11К-11Ж (39). En IV/2 les ossements sont dispersés avec une plus forte concentration dans un même secteur, 11К (72) – 11И (67) – 113 (35), et en 103 (53), 10К (49), 9Л (36). En 10И, une petite zone cendreuse a été dégagée. En IV/3 les ossements sont dispersés avec une plus forte concentration dans un même secteur, 11К (83) – 113 (50) – 10К (41, dans une petite zone cendreuse) – 10И (38) – 103 (32). Quelle que soit le niveau, les esquilles brûlées sont dispersées.

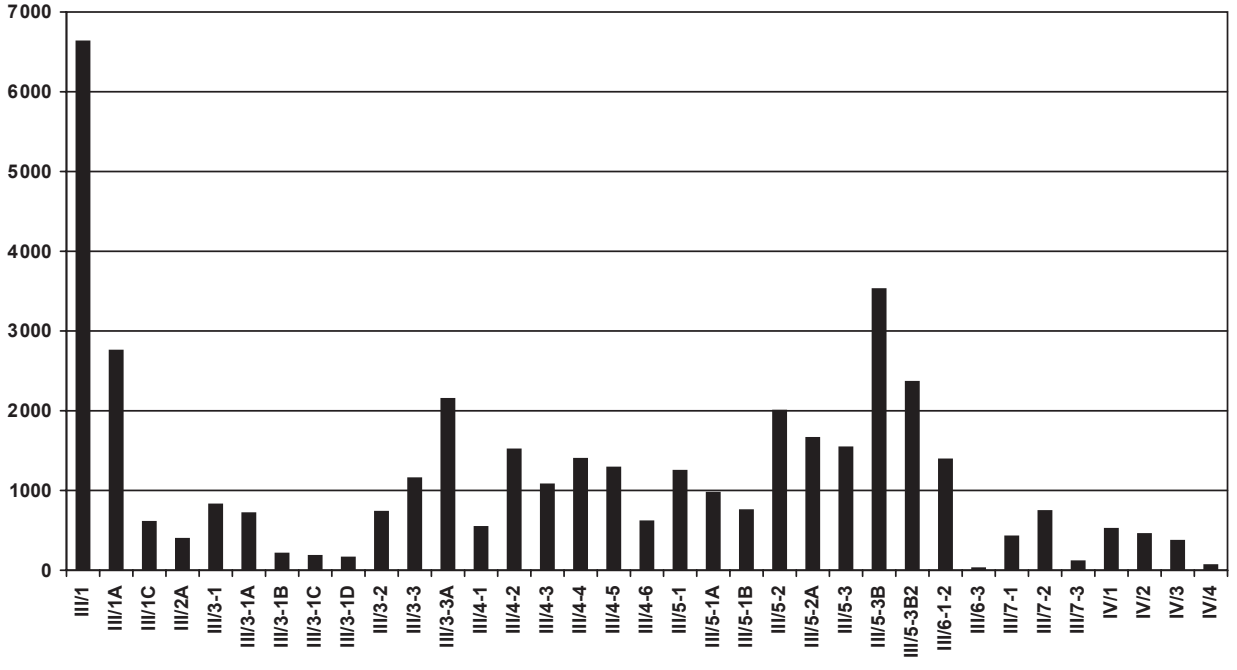


Fig. 6-9 Kabazi V, Units III and IV: Variation of large mammals remains (NRT).

IV/4		
NR	NME	NMIc
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	65	
	65	
	16,25	

Table 6-11 Continued.

Discussion

Dans la plupart des niveaux, excepté celles de l'unité IV, la surface des os est relativement bien conservée. Les matériels osseux ont subi peu d'action d'agents climato-édaphiques, ce qui atteste d'un recouvrement par des sédiments assez rapide. Par contre, la fragmentation a été très importante. Elle a une double origine: une première fracturation d'origine anthropique, puis une fragmentation post-dépositionnelle due au poids des sédiments et au piétinement. Ce qui traduit des occupations répétitives de l'abri. L'abri n'a jamais servi de repaire à l'hyène ou au loup, par contre, ils ont laissé dans certains niveaux, notamment dans les niveaux III/3-2, III/3-3A, III/4-2 et III/4-3, des marques de leur passage (os rongés ou régurgités). Tout le long de remplissage, les spectres fauniques sont peu diversifiés et pauvres en nombre d'individus. Les Néanderthaliens de Kabazi V ont chassé et consommé essentiellement des *Equus hydruntinus* et des antilopes saïgas. Parfois, des femelles gravides d'*Equus hydruntinus* ont été abattues (en III/1A, III/3-1 et III/5-1). Lorsque la saison d'abattage a pu être déterminée, seule la période estivale (fin printemps-début automne) a été constatée. Les Néanderthaliens ont également pratiqué, de temps en temps, le charognage, surtout pour les autres espèces, notamment les rhinocéros laineux et les mammouths. La plupart du temps, ils ont apporté à l'abri les saïgas entières et les équidés sous formes de

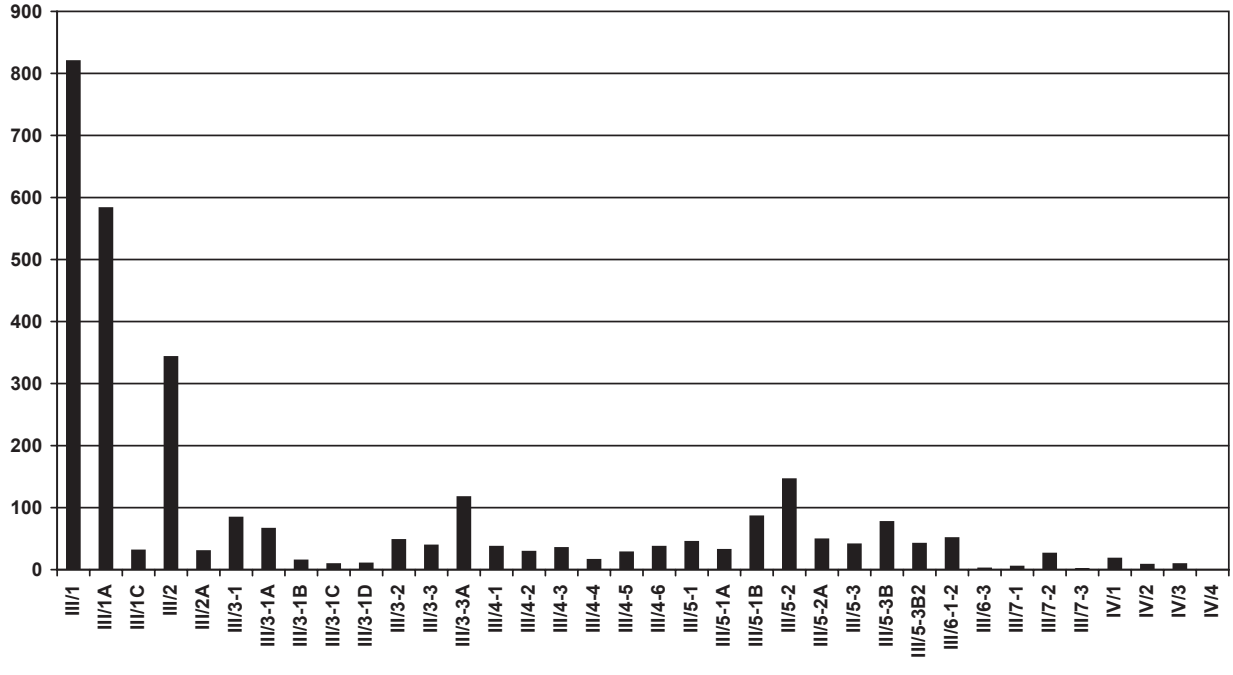

Fig. 6-10 Kabazi V, Units III and IV: Variation of determined remains (NRDt).

grands quartiers. Le dépeçage ou la désarticulation a eu lieu principalement devant l'abri. Des fosses, des foyers et des zones cendreuses ont été dégagés lors des fouilles. La fonction de ces fosses demeure inconnue, certaines correspondent peut-être à des bauges d'ours. Des os ont souvent été utilisés comme combustible, surtout dans les sous-unités supérieures. D'après l'analyse de la répartition horizontale des matériels osseux, des aires culinaires ont été mises en évidence dans de nombreux niveaux. Plusieurs sont localisées dans les zones cendreuses ou autour des foyers. Kabazi V, durant la formation des unités III et IV a servi à de multiples reprises d'habitat temporaire. Les occupations apparaissent successives et de courte, voire de très courte durée. Cependant, les occupations des niveaux III/2, III/1, III/5-3B, III/1A, III/3-3A, III/5-3B2 et III/5-2 apparaissent plus intensives, peut-être ont-elles été de plus longue durée (Fig. 6-9; 6-10). La densité ou la durée de ces occupations, de même que les comportements de subsistance apparaissent indépendants des variations climatiques. On remarque cependant que les occupations dans les niveaux inférieures (à partir de III/6-3) sont nettement plus éphémères. Les industries sont attribuées, selon les niveaux, au Micoquien (Starosele, sous-unité III/1 et III/5-3B2 ou Ak Kaya, sous-unité III/2) ou au WCM (sous-unité III/3 et unité IV). Les comportements de subsistance apparaissent donc également indépendants de l'attribution culturelle.

Abstract

Archaeozoological Analyses of Units III and IV of Kabazi V

Marylène Patou-Mathis

In most of the layers, except those of Unit IV, the bone surfaces are relatively well preserved. Obviously, the bones were not very much altered by climatic factors or edaphic agents. This attests for their rapid conservation by subsequent sedimentation. On the other hand, the bone fragmentation seems to be very important, which was caused by two factors: At first, the bones were fractures by humans, and subsequently, they were broken by post-depositional processes, for example trampling and sediment pressure. Hyena and wolf did never stay there for longer periods, but traces of their presence were recognizable (gnawed and digested bones) in certain occupations, particularly levels III/3-2, III/3-3A, III/4-2 and III/4-3. In general, the faunal spectra are not very rich in species and very poor in the number of individuals. The Kabazi V Neanderthals essentially hunted and consumed *Equus hydruntinus* and *Saiga* antelope. Sometimes, pregnant females of *Equus hydruntinus* were butchered (levels III/1A, III/3-1 and III/5-1). If the hunting season could be determined, it turned exclusively out to be the summer (late spring to early autumn). Scavenging was, at times, also practised by the Neanderthals, always concerning different species, such as wholly Rhino and Mammoth. Mostly, they brought complete Saiga and large portions of horses into the rock shelter. They skinned and dismembered the animals always in front of the shelter. Excavation yielded numerous pits, fireplaces and sooty/ashy zones; the function of the pits still unknown. Some of them resemble bear dens. Bones were often used as fuel for fire, particularly in the upper layers. Horizontal distribution analysis of the bones argues for numerous zones of consumption in several layers, many of them close to the fireplaces or ashy zones. At the time of formation of Units III and IV, Kabazi V repeatedly served as a short time camps. The duration of

human occupations seem mostly to have been short, very short indeed. On the other hand, the occupations of levels III/1, III/1A, III/2, III/3-3A, III/5-2, III/5-3B and III/5-3B2 appear to have been more intensive, and possibly they are of longer duration. Density and duration of the occupations, as well as the nutritional behaviour of the people, seem to have been quite independent from climatic changes. On the other hand, the occupations of the lower levels seem to have been of more ephemeral character. The lithic industry is attributed to the Micoquian (Starosele facie – sub-units III/1 and III/5-3B2; and Ak Kaya facie – sub-unit III/2) and to the Western Crimean Mousterian (sub-unit III/3 and Unit IV). Consequently, the nutritional strategy seems to be independent from particular cultural affiliations.

Abstract

КАБАЗИ V, КУЛЬТУРНЫЕ СЛОИ III И IV: АРХЕОЗООЛОГИЧЕСКИЙ АНАЛИЗ

М. ПАТУ-МАТИС

В большинстве горизонтов, кроме горизонтов IV культурного слоя, фаунистические остатки отличаются хорошей сохранностью. Влияние климатического фактора на сохранность костей было незначительно, что свидетельствует об их достаточно быстрой консервации в отложениях стоянки. Два фактора определили фрагментацию костного материал: расщепление костей гоминидами и дробление фаунистических остатков посредством вытаптывания и веса седиментов. Время от времени, грот служил логовом гиен или волков: костный материал горизонтов III/3-2, III/3-3A, III/4-2 et III/4-3 имеет следы зубов и воздействия желудочного сока хищников. В целом, фаунистические коллекции не отличаются видовым разнообразием и сколь-нибудь значительным количеством особей. Основную добычу неандертальцев составляли *Equus hydruntinus* и *Saiga tatarica*. В горизонтах III/1A, III/3-1 et III/5-1 были добыты беременные самки гидрунтинусов, что свидетельствует о летнем (конец лета – начало осени) сезоне обитания данных поселений. Иногда неандертальцы практиковали сбор падали, которая представлена шерстистым носорогом и мамонтом. Часто туши сайги приносились в грот целиком, тогда как гидрунтинусы импортировались в виде достаточно крупных частей скелетов. Как правило, разделка добычи происходила за пределами грота. Во многих горизонтах были обнаружены ямы, очаги и золисто-сажистые скопления. Происхождение ям остается не ясным, не исключено, что они являются результатом обустройства медведями своего логова. Несмотря на летний сезон обитания многих горизонтов, кости, особенно в верхних пачках, использовались как топливо для очагов. Планиграфический анализ костного материала показал наличие свидетельств

«кулинарных зон» на площади многих горизонтов. «Кулинарные зоны» локализируются возле золисто-сажистых скоплений либо очагов.

Во время аккумуляции III и IV культурных слоев грот Кабази V служил местом для весьма кратковременных поселений. Однако, поселения горизонтов III/1, III/1A, III/2, III/3-3A, III/5-2, III/5-3B и III/5-3B2 отличаются более высокой интенсивностью, что может свидетельствовать о их возможно несколько большей продолжительности. Интенсивность или продолжительность этих поселений не зависит от климатических вариаций и не отражает различий в стратегии жизнедеятельности. Примечательно также то, что нижние горизонты являются более кратковременными, чем верхние.

Кремневые материалы были отнесены к микоку (старосельская фация – пачки горизонтов III/1, III/5; аккайская фация – пачка горизонтов III/2) и леваллуа-мустье (пачка горизонтов III/3 и культурный слой IV). Следовательно, стратегии жизнедеятельности не зависят от технико-типологических характеристик кремневого инвентаря.

Палеолитические стоянки Крыма · Том 3 · Часть 1

КАБАЗИ V:

ИНТЕРСТРАТИФИКАЦИЯ МИКОКСКИХ И ЛЕВАЛЛУА-МУСТЬЕРСКИХ КОМПЛЕКСОВ

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