Edited by

A.E. Marks and V.P. Chabai

THE MIDDLE PALEOLITHIC OF WESTERN CRIMEA - Vol. 1

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DE L'UNIVERSITE DE LIEGE

THE PALEOLITHIC OF CRIMEA
I

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Edited by

A.E. Marks and V.P. Chabai

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CONTENTS

Preface vii

Acknowledgments xi

PART I: BACKGROUND

1 The History of Crimean Middle Paleolithic Studies 1
Victor P. Chabai

2 The Geologic Setting of Mousterian Sites in Western Crimea 17
C. Reid Ferring

3 The Classification of Flint Artifacts 31
Victor P. Chabai and Yuri E. Demidenko

PART II: STAROSELE

4 Starosele: The Early Excavations and Unanswered Questions 53
Yuri E. Demidenko

5 Starosele: The 1993-95 Excavations 67
Anthony E. Marks, Yuri E. Demidenko, Katherine Monigal, and Vitaliy I. Usik, with a contribution by C. Reid Ferring

6 Human Remains at Starosele 101
Katherine Monigal, Anthony E. Marks, and Vitaliy I. Usik

7 Starosele 1993-1995: The Lithic Artifacts 117
Anthony E. Marks and Katherine Monigal

PART III: KABAZI II AND KABAZI V

8 Kabazi II: Introduction 167
Victor P. Chabai, with a contribution by C. Reid Ferring

9 Kabazi II: The Western Crimean Mousterian Assemblages of Unit II, Levels II/7-II/8C 201
Victor P. Chabai

10 Kabazi-II, Units IIA-III: Artifacts 253
Victor P. Chabai

11 Kabazi V: Introduction and Excavations 273
Alexander I. Yevtushenko, with a contribution by C. Reid Ferring

12 Kabazi V: Assemblages from Selected Levels 287
Alexander I. Yevtushenko

PART IV: DISCUSSION

13 Electron Spin Resonance (ESR) and Mass Spectrometric U-Series (MSUS) Dating of Teeth in Crimean Paleolithic Sites: Starosele, Kabazi II, and Kabazi V 323
W. Jack Rink, Hee-Kwon Lee, Julie Rees-Jones and Karen A. Goodger

14 U-Series Dating of Enamel, Dentine, and Bone from Kabazi II, Starosele, Kabazi V, and GABO 341
Curtis McKinney

15 Preliminary Synthesis: Middle Paleolithic Assemblage Variability in Western Crimea 355
Victor P. Chabai and Anthony E. Marks

References 369

Contributors 383

PREFACE

Study of the Crimean Paleolithic has a long history, replete with distinguished scholars. From the pioneering work of C. S. Merejkowski, in the late 19th Century, through G. A. Bonch-Osmolowski in the 1930s, to Yu. Kolosov in the 1960s through 1980s, the area has been intensively and ably investigated. That Crimea still has the potential for additional studies is certainly a reflection of its seemingly endless, rich, and complex prehistory. This recent work, presented in this and subsequent volumes of *The Paleolithic of Crimea*, results from this richness and, although we have made numerous new discoveries, as well as reinterpreting a few old ideas, it seems to us that we have just begun to scratch the surface in our quest to understand, not only to describe, the variability in adaptations and technological/typological developments which took place during the Middle and Early Upper Paleolithic in Crimea. While these studies began as the Joint Ukrainian/American Middle Paleolithic Project, they soon became truly multi-national with scholars from Ukraine, the United States, Canada, Belgium, Moldova, France, and Russia all making important contributions.

The genesis of this current research, like Crimean prehistory itself, is complex. For the Ukrainian team, it began as a natural continuation of the work of Yu. Kolosov in the 1980s by V. Chabai and A. Yevtushenko, both of whom had worked as students with Yu. Kolosov and both of whom wrote dissertations on the Crimean Middle Paleolithic. Neither ever doubted that they would continue this work or that there was still much to do.

For the American team, it began when A. Marks received two very insightful letters from two young Ukrainian scholars, Drs. Yuri Demidenko and Vitaliy Usik, asking for reflections on his work at Boker Tachtit in the Negev of Israel. These letters asked difficult but interesting questions, sufficient answers to which would have taken much work. It seemed easier to bring these young scholars to America so that discussions could be held at length and interaction made more direct and effective. With the considerable help of Dr. Don Henry, University of Tulsa, as well as others, a one month visit was arranged. During this visit, Drs. Demidenko and Usik opened a whole new world of Paleolithic studies to A. Marks, whose knowledge of ex-Soviet Middle Paleolithic studies was limited to a very few publications in English and French. By the end of the visit, there was discussion of possible joint American/Ukrainian work, but few concrete ideas were put forth.

Upon their return to Ukraine, Drs. Demidenko and Usik discussed the possibilities of cooperative work with V. Chabai. Of all the ongoing and planned projects in Ukrainian Paleolithic archeology, the projected work into the Crimean Middle Paleolithic seemed most promising. Discussions with a number of scholars working in Crimea suggested that such cooperation might be possible and, given the Middle Paleolithic focus of that work, A. Marks found the idea irresistible.

An invitation from V. Bidzilia and V. Chabai of the Archeolog contract company to A. Marks to visit Crimea was accepted and, with financial help from his university, he spent ten days in Crimea in October of 1992 with Drs. Yu. Kolosov, V. Chabai, V. Stepanchuk, A. Yevtushenko, and N. Gerasimenko, as well as with Drs. Demidenko and Usik. Much discussion took place about what was of interest to each, how cooperation might be achieved, and how all could become part of a truly international and multidisciplinary project. It was important that any such project really be joint in planning, in field work, in analyses, and in the process of bringing all the data into meaningful understanding. No one wanted "cooperation" where the Americans supplied the funds, arranged for specialist studies, and the Ukrainians tolerated their presence in the field. In retrospect, both sides were conscious that to achieve true cooperation and meaningful joint studies, there had to be mutual respect and a willingness to engage in intensive and occasionally difficult interaction.

While October is not the best time to live in a tent in Crimea, being a bit cold, to put it mildly, the weather did encourage a good deal of conversation over warming food and drink. By the end of the ten days, A. Marks and V. Chabai both felt that they not only could work with each other but that they would like to do so. The discussions had defined in what ways the American side could enhance the range of needed studies, while it also clarified what we could do together. Because V. Chabai and A. Yevtushenko were planning to excavate two known sites, close to the existing camp and because at that time gasoline and fuel were very hard to obtain in Crimea, it was decided that initial emphasis should be placed on the Middle Paleolithic of western Crimea. Three major goals were proposed: the absolute dating of as many western Crimean Middle Paleolithic sites as possible; the definition of the techno-typological variability of as many assemblages as possible; and, the study of faunal materials to elucidate the adaptive range during the Middle Paleolithic, as well as the relationships between raw material economy and faunal exploitation.

With the support of US National Science Foundation, Southern Methodist University, and the Crimean Branch of the Institute of Archeology, Simferopol, sufficient funds were made available so that a first field season took place in the summer of 1993. Excavations at Kabazi II and V had been long planned, but it was not initially obvious where the American team would excavate. Since our goals included absolute dating, as well as technological studies of all the recognized industries, additional stratigraphically controlled samples from Starosele, the type site of the Staroselian industry, were required. Because Formozov had so well sealed the remaining Pleistocene sediments at Starosele, the site was an obvious and necessary choice.

Our plans to carry out absolute dating coincided with a small project of P. Allsworth-Jones, McDonald Institute, Cambridge, UK, and J. Rink, McMaster University, who were collecting bones and teeth from old excavations in Eastern Europe for AMS and ESR dating. An invitation was extended to them to join us in the field, where J. Rink carried out gamma spectrometry, collected additional samples, and placed dosimeters into Kabazi II, Kabazi V, and Starosele. This work, beyond the original scope of their project, added significantly to ours and the results started by that initial effort are clearly obvious in this volume. In addition, Curtis McKinney, who specializes in U-series dating, also joined the project so that two independent systems could be applied to datable materials.

While one of the major goals of the project was to elucidate faunal exploitation, at first, it was impossible to estimate just how much work that would entail. Previous excavations at Kabazi II had produced a huge amount of faunal material, but it was not possible to predict how much would come from Kabazi V and Starosele, so funds were not requested initially for that work.

In spite of the absence of funds for faunal studies, contacts were made to find an appropriate person to do the work, when and if funded. It was with considerable luck that A. Marks was put in touch with A. Burke, who was not only enthusiastic about the possibilities of joining the project but also was willing to propose, successfully as it turned out, to the Social Sciences and Research Council of Canada that they fund her participation for a period of three years. This not only made possible her work with us, but also made it possible for her to bring students into Crimea, so that even more work could be done. In spite of this, the amount of animal bone being excavated at the three sites was staggering, and there was an additional three years of unstudied bone from Kabazi II, recovered prior to our project. To meet the deadlines imposed, A. Burke convinced M. Patou-Mathis, Institut de Paléontologie Humaine, Paris, to join the project and to take responsibility for the Kabazi II materials. In addition, she arranged for our microfauna to be studied by A. Markova, Russian Academy of Sciences, Moscow, and our snails by C. Mihailescu, Academy of Sciences, Moldova, both of whom joined us in the field to collect samples in 1995. We were truly fortunate to attract such distinguished scholars and their contributions, presented in the next volume, add significantly to the overall value of this work.

The incredibly good preservation of both artifacts and organic materials and the presence of clear morphological patterning of the retouched tools suggested that we could go beyond the techno-typological studies traditional in Middle Paleolithic systematics. At about this time, we came into contact with Marvin Kay, an expert on use wear and, somewhat later, with Bruce Hardy, who had just completed a dissertation on residue analysis of Middle Paleolithic artifacts. Both joined our group, with Marvin Kay working in the field with us at Starosele, as well as studying many of the artifacts for use wear. The results of these studies, both use wear and residue analyses, have been remarkable—well beyond our grandest expectations. They take the analysis of Crimean Middle Paleolithic artifacts to another level and make it very clear that there is little positive correlation between traditional typological nomenclature and the actual function of many tools. Perhaps, most important of all of this work has been the overwhelming evidence that a significant number of these Middle Paleolithic retouched tools were hafted and that, in many cases, the hafts were wooden. Detailed reports of this work will be presented in the next volume and will add important information for reconstructing specific site usage, as well as examining the relationship between form and function in retouched tools.

While the original plan was to limit excavations to the three wholly Middle Paleolithic sites of Kabazi II, Kabazi V, and Starosele, the western Crimean site of Siuren I had been reported to contain a very late Middle to Upper Paleolithic transitional industry. Since the end of the Middle Paleolithic was one of our concerns, and the dates suggested for Siuren I (ca. 20,000 BP) were unusual, to say the least, it was decided to add Siuren I to our field schedule. Siuren I posed a problem, however. Artifact bearing sediments were still present under a huge limestone block, but the archeological levels, as reported, also contained some quite clear Upper Paleolithic materials, mainly Aurignacian. The Upper Paleolithic fell outside our primary interests but, fortunately, Marcel Otte, University of Liège, was not only focused on the broad question of the earliest Upper Paleolithic, but also came to visit us in the field. Agreements were reached between him and our group to expand our efforts to include the Early Upper Paleolithic and its possible transition from the Middle Paleolithic. With a generous grant from INTAS, covering work at Siuren I and some additional excavations at Kabazi II and Kabazi V, the Belgian team joined us and we expanded from The Middle Paleolithic of Crimea Project to The Paleolithic of Crimea Project.

By the end of three field seasons, it was clear that the traditional dichotomy between western and eastern Crimea with their different industries was probably in need of serious revision. This made it necessary to continue work into the eastern Crimea, since the dating of the western Crimean sites had to be correlated with the eastern industries, such as the Kiik-Koba, which is still unknown in western Crimea. In addition, Siuren I was the single early Upper Paleolithic site in western Crimea, but there were indications of other possible early Upper Paleolithic sites to the East. Yet, the first three years of work did constitute, by itself, a reasonably coherent body of investigations and it was decided to publish our results before taking on the Middle Paleolithic and Early Upper Paleolithic of the eastern Crimea. This volume and the next represent the final reports from these three years of work. It would be a mistake, however, to view this work as complete: Crimea must be viewed and understood in its totality, rather than as two separate and distinct areas.

In spite of our decision to publish our results from western Crimea before formally moving eastward, in 1996 we made an agreement with A. Yanevich to excavate and study the Middle Paleolithic materials from the rock shelter of Buran Kaya III in eastern Crimea. The agreement also included the cooperative study and absolute dating of the overlying early Upper Paleolithic levels by A. Yanevich and the Belgian team. The site turned out to be highly stratified with in situ prehistoric occupations from Neolithic through Middle Paleolithic, for the first time providing an abundant sequence of assemblages just at the apparent boundary between the Middle and Upper Paleolithic. Because of the numerous absolute dates gotten and the rather surprising assemblages recovered, these excavations will be included in a separate volume as part of this series. The complexity of the assemblages at both Siuren I and Buran-Kaya III clearly showed that our work in western Crimea had only begun to touch on the questions of Middle Paleolithic variability, adaptations, development, and disappearance: many more years of work will be needed before a true understanding of the Middle and Early Upper Paleolithic of Crimea, as a whole, will be achieved. We all look forward to that day and are working toward it.

ANTHONY E. MARKS
VICTOR CHABAI
MARCEL OTTE
December 1997

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Finally, we would like to thank Marcel Otte, University of Liège, for including the Crimea in the organization of the INTAS grant, for accepting our work as part of the ERAUL series, and, most of all, for his encouragement and involvement with our work.

Sites do not excavate themselves. Over three years, a large number of people helped us in the excavations for various periods: all deserve our thanks. Participants are listed below by where they worked:

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Chapter 1

THE HISTORY OF CRIMEAN MIDDLE PALEOLITHIC STUDIES

VICTOR P. CHABAI

INTRODUCTION

The more than 100 years of Paleolithic investigations in Crimea have been described many times by different authors (Vekilova 1971, 1979; Chabai 1991; Stepanchuk 1991; Kolosov, Stepanchuk, and Chabai 1993; Chabai, Marks, and Yevtushenko 1995; Yevtushenko 1995). Generally, these articles have described the chronology of surveys and excavations, as well as their main results, in terms of artifactual, faunal, and geological studies. These have been subdivided into different periods, distinguished by the scale of the investigations and when they took place. This chapter, while covering some of the same ground, will emphasize the methodological and theoretical frameworks used in past and present investigations in the Crimean Middle Paleolithic and how they relate to concurrent approaches in western archeology.

PRE-WORLD WAR II INVESTIGATIONS

It is well known that the first investigations into the Crimean Paleolithic, in fact, the first studies of the Middle Paleolithic of the Russian Empire, are closely connected with K. Merejkowski. He was a twenty-four year old student at St. Petersburg University when, in 1879, he found the site of Volchi Grot in Crimea. This was the first stratified Mousterian site found in Russia and its discovery marked the real beginning of Russian Paleolithic field archeology.

In 1880, S. Poliakov began excavations at Kostenki—the Upper Paleolithic site on the Don River. The theoretical background for both Merejkowski's and Poliakov's research is found in the writings of G. de Mortillet. Moreover, in 1880, K. Merejkowski visited the Anthropological School and Society of Anthropology in Paris, then headed by G. de Mortillet, who confirmed the Paleolithic age of Merejkowski's finds (Tikhonov 1995). In doing so, within the framework of the prevailing evolutionary theory, it was established that the Mousterian, with the same *fossile directeur* as in France, was also to be found far to the East (Merejkowski 1884; de Mortillet 1900).

After the excellent, but very brief, investigations of K. Merejkowski, field work on the Crimean Paleolithic underwent a hiatus of more than 40 years. At the same time, these 40 years were very important in the development of Russian archaeological theory. According to I. Tikhonov (1995), this period saw the formation of the St. Petersburg school of paleoethnology. This school of thought, for its theoretical basis, mainly accepted G. de Mortillet's ideas of the evolution of human culture. The school's founder, F. K. Volkov (F. K. Vovk), proposed that paleoethnology, as a science, should be concerned with the emergence and evolution of human anatomy, as well as with social and economic adaptations. He taught that paleoethnology should be based on physical anthropology, prehistoric archeology, and ethnology. Also, F. Volkov recognized that this "trinity" was closely linked to a number of disciplines in the natural sciences, such as geology, paleontology, and geography. He claimed that the study of ancient humans united nature and culture. Moreover, according to F. K. Volkov, prehistoric archeology was mainly a natural science, transitional between geology and history (Platonova 1995).

During the end of the nineteenth century and the beginning of the twentieth century, the study of Stone Age sites on the Russian Plain, in France, North Africa, and the Near East provided both experience and new data, permitting the elaboration of field methods, as well as new theoretical insights into human evolution, for the St. Petersburg school. Later, from the 1920s to the 1940s, a number of students of the St. Petersburg paleoethnological school played outstanding roles in the development of Soviet archeology. Some of them are well-known specialists in the Paleolithic, such as P. Efimenko and G. Bonch-Osmolowski. The latter became the leader of Crimean Paleolithic studies between the two World Wars.

The scientific ideas of G. Bonch-Osmolowski were based primarily on the theoretical approaches of the St. Petersburg paleoethnological school (Platonova 1995). In 1924, he was the leader of the Crimean Paleoethnological Expedition which began the systematic study of caves and rockshelters. During six field seasons, Bonch-Osmolowski tested 220 caves and rockshelters in Crimea. Nine of them contained horizons of Stone Age artifacts and fauna: Volchi Grot, Kiik-Koba, Mamat-Koba, Shaitan-Koba, Adji-Koba, Kacha rockshelter, Siuren I, Siuren II, and Fatma-Koba. Some of these sites had been previously tested by K. Merejkowski, but their contents were confirmed by Bonch-Osmolowski in the years from 1924 to 1929.

The first year of his excavations brought excellent results. Aside from rich artifactual and faunal remains in two different levels, the cave of Kiik-Koba produced two human burials, one in each level (Bonch-Osmolowski 1925). The lower layer contained a great number of small flakes with notches, irregular, discontinuous retouch, as well as some denticulated and bifacial tools. The artifacts of the upper layer consisted predominantly of small, well made pointed flake tools, as well as no fewer than 10% bifacial tools. He excavated Kiik-Koba by lithological layers and when these were thick, he subdivided them into narrower excavation levels, following the inclination of the sediments. These tight stratigraphic controls allowed him to prove the temporal association between the burials and the Middle Paleolithic layers. In addition, Bonch-Osmolowski used a grid system, he mapped artifacts and bone in place, and he screened all sediments. During the Kiik-Koba excavations, he adopted the position that "there is no waste material in the Paleolithic" (Vekilova 1979: 7). In spite of this, a number of his colleagues from the State Academy of History of Material Culture were skeptical about the claimed Mousterian age of the burials (Platonova 1995). At the same time, however, M. Boule confirmed that the Kiik-Koba humans were *Homo neanderthalensis* (Boule 1925, 1926).

In 1926, Bonch-Osmolowski visited France with the aim of studying Paleolithic assemblages and French excavation methods. To some extent, he was not impressed by French field archeology: ". . . the excavation methods used in France are not so developed as in our country, from the point of view of technique and registration of material. Partly, this could be explained by the impressive wealth of Paleolithic sites" (Bonch-Osmolowski, quoted in Platonova 1995: 135, author's translation). On the other hand, he was impressed by the achievements of French scientists in the study of the typology of Paleolithic artifacts.

In sum, Bonch-Osmolowski's first season of excavations at Kiik-Koba, his study of the French assemblages using statistical methods, combined with his acceptance of the French typological terminology, laid the foundations for his subsequent work. Without question, it was the time when he understood the need to move away from ideas of unilinear cultural evolution.

During 1929-30, Bonch-Osmolowski excavated the two-layered rockshelter site of Shaitan-Koba in western Crimea. A third deposit of archaeological materials was found on the slope in front of the rockshelter, where it had been swept during Medieval times. The Shaitan-Koba Middle Paleolithic assemblages were quite different from those at Kiik-Koba, the main difference being the rarity of bifacial tools at Shaitan-Koba, as opposed to more than 10% in the upper layer at Kiik-Koba. In addition, at Shaitan-Koba, there was an increase in the number of blades from bottom to top, a large number of parallel cores, as well as burins, endscrapers, and asymmetrical points on blades. Considering the relatively developed blade technology, and using the French sequence as a model, he proposed that the Shaitan-Koba assemblages were of the Abri-Audi type; that is, transitional between the Middle and Upper Paleolithic (Bonch-Osmolowski 1928, 1930). Moreover, he believed that all three of the Shaitan-Koba assemblages belonged to a single "culture," while the typological differences among them were of chronological significance only. At the time, it was not clear what he meant by the terms "culture" and "Abri-Audi type"; whether they were typologically and technologically distinct, both developing through time, or whether each was a stage of evolution within the "Mousterian Period" (Vaufrey 1931). In other words, did he accept a "culture-stylistic" multilinear evolution or a unilinear development of the Paleolithic? Perhaps, he mixed the two concepts.

Such a mixture of approaches is reflected in his 1934 article, written after about 10 field seasons studying the Crimean Paleolithic (Bonch-Osmolowski 1934). In it, he sees the lower Kiik-Koba industry belonging to an "amorphous" stage and the upper layer to a Late Acheulian stage of evolution, while the lower layer of Shaitan-Koba was stated to be Late Mousterian. The assemblages of Chokurcha and Volchi Grot were also placed into the Late Acheulian. At the same time, the industry of Shaitan-Koba, upper layer, was seen to be the technological analogy of the Abri-Audi type, while the assemblages of upper Kiik-Koba, Chokurcha, and Volchi Grot were seen as typologically close to the Central European Micoquian. To make clear, to some extent, this mixture of approaches, Bonch-Osmolowski noted the necessity of distinguishing between local "cultures," which reflect variability within the stages of evolution, and the stages themselves (Bonch-Osmolowski 1934: 138).

In the same article, Bonch-Osmolowski made his first attempt to present a new view of the whole Crimean Stone Age. He proposed lower, middle, and late stages for the Aurignacian, based on the typological variability and stratigraphy of the Siuren I assemblages. The study of Late Paleolithic sites lead him to the conclusion that there were Azilian and Tardenoisian stages in the Crimean Stone Age. At the same time, Bonch-Osmolowski did not find analogs in the Crimean assemblages for the Solutrean and Magdalenian stages of evolution. His only explanation was that Solutrean and Magdalenian sites had not yet been discovered, since he believed that they had to be in Crimea. He rejected P. Efimenko's point of view, that Crimea belonged to the Caps zone (the Near East and Northern Africa) of Paleolithic evolution, where the Solutrean and Magdalenian stages were not present, at all. It was his strong belief that, in Paleolithic times, the Crimean peninsula was more closely linked with Europe than with the Near East and Northern Africa.

Apart from his evolutionary structure, Bonch-Osmolowski also proposed new ideas of methodological value. One of these was that there is a close relationship between core reduction strategy and the typological structure of tool kits. His groupings of the assemblages of Shaitan-Koba (blade production leads to simple sidescrapers), on the one hand, and those of Kiik-Koba (flake production leads to canted tools), on the other, are the best example of this approach.

The huge scale of his investigations (during 10 years he tested about 400 rockshelters and caves), and the results of that incredible testing program (only 10 Paleolithic sites were found) led him to the pessimistic conclusion that, during the Paleolithic, Crimea was less populated than was France.

Unfortunately, this 1934 paper was published when Bonch-Osmolowski was repressed as an anti-Soviet conspirator. He spent three years (1933-1936) in Vorkutalag—a camp for political prisoners. During this time, all representatives of Volkov's school of paleoethnology were repressed as well, since Volkov, who had been dead for 15 years, was labeled a "Ukrainian nationalist" (Bunak 1954). Thus, the Marxist approach to the study of prehistory won the battle against "bourgeois science." Bonch-Osmolowski returned to scientific work in 1936. There was no place, however, for former prisoners in the system of the Academy of Sciences. In spite of this, Bonch-Osmolowski was able to make a contract with the Academy of Science publishing house for publication of a series of monographs on his investigations. From 1936 to 1943 he prepared three books about the typology of artifacts, the geology, the fauna assemblage, and the anatomy of the hominid finds from Kiik-Koba rockshelter (Bonch-Osmolowski 1940, 1941, 1954).

During the 1930s, the investigations of N. Ernst at Chokurcha (Ernst 1934), O. N. Bader at Chagorak-Koba and at Volchi Grot (Bader 1940a, 1940b; Bader and Bader 1979), as well as the excavations of D. A. Krainov (1947, 1979) at the site of Bakchisaraiskaya, added little to the understanding of the Crimean Paleolithic.

POST-WORLD WAR II INVESTIGATIONS

During the 1950s, the investigations of the Crimean Middle Paleolithic are closely linked with the name of A. A. Formozov. The scale of his field activity is extremely impressive. He needed only five field seasons of about two months each to excavate more than 250 m^3 at Starosele, about 100 m^2 at Kabazi I to a depth of 2 meters, and 8 m^2 at Kholodnaya Balka rockshelter to a depth of 2.3 meters (Formozov 1958, 1959a). In spite of Formozov's statement that he followed the excavation methods adopted by Bonch-Osmolowski, his field achievements are far less impressive. The chief of the Crimean Paleolithic Expedition, which included Formozov's team, S. N. Bibikov, made a number of observations concerning Formozov's excavation methods at Starosele which resulted in Formozov losing his permit to excavate there under his own authority. Some of these observations clearly demonstrate that the site of Starosele was mainly destroyed, rather than excavated. During the first three field seasons Formozov did not use a grid system or any kind of mapping: there was no stratigraphic control of the excavated sediments (Bibikov 1954; Chabai 1996a). It is obvious that there was nothing in common between Bonch-Osmolowski's and Formozov's excavation methods.

In September of 1953, in a sondage in the northern part of Starosele, Formozov found the burial of a child (Formozov 1954). During the excavation, the stratigraphy of the burial was not studied or recorded. In spite of this, a field commission of the Academy of Sciences, consisting mainly of physical anthropologists, proclaimed a Paleolithic age for the burial, as well as its transitional morphological status from archaic to modern. The child skull of Skhul I was suggested as a close analogy.

Only the famous Soviet archeologist, S. N. Zamyatnin, noticed the unclear stratigraphic character of that burial (Roginski et al. 1954). Ignoring this, the physical anthropologists considered this the long-awaited evidence of the persistent character of human evolution. In other words, it was a new link in the chain, linking the *Homo neanderthalensis* and *Homo sapiens sapiens*. No one paid attention to F. Clark Howell's opinion that the Starosele child was hydrocephalic. Also, no one showed any interest in the results of the chemical analyses of the bones made by E. Danilova which failed to confirm the Pleistocene age of the burial (Howell 1958; Klein 1965). Forty years were needed to find other burials with the same body orientation and in clear stratigraphical position, to prove the Medieval age of the Starosele child (see Chapter 6 for detailed discussion of this whole episode).

At the same time, Formozov's team did make some improvements in survey strategy. A. A. Schepinski looked for buried and fully collapsed rockshelters and, as the result, he found Kabazi I, a buried rockshelter; and Kholodnaya Balka, a rockshelter totally filled with sediments (Formozov 1959a, 1959b).

Application and Development of Typological Systems

Formozov's typological investigations were of doubtful value. In spite of this, the standards of his typology were sufficient to propose a two-part subdivision of the Crimean Mousterian. He believed that, in the Crimean Mousterian, there coexisted two different populations: one of them used a bifacial method of tool production (Kiik-Koba, upper layer; Chokurcha; Starosele), while the other population produced only unifacial tools (Kabazi I, Kholodnaya Balka, Bakchisaraiskaya) (Formozov 1954). This two part subdivision initiated the discussion about the typological variability of the Crimean Middle Paleolithic. Thus, the stylistic approach, as the base for typological variability studies of the Middle Paleolithic proposed in Soviet archeology by Bonch-Osmolowski, was employed for the first time by Formozov. About the same time, the same approach was applied to Upper Paleolithic assemblages of the Kostenki region (Rogachev 1957). From then on, this stylistic approach held sway within both Upper and Middle Paleolithic studies in the Soviet Union.

For the development and elaboration of the stylistic approach, a relatively sophisticated system of typological description was needed. From the beginning of the 1960s, it was the type-list of F. Bordes (1961) which was used. Even the first attempts to apply the Bordian type-list to the Crimean Middle Paleolithic exposed a number of problems. Practically simultaneously, R. Klein (1965, 1969) and V. Gladilin (1966, 1970, 1971) used the scheme of F. Bordes to study Crimean Middle Paleolithic assemblages, but with different approaches to its implementation. The American scientist mechanically imposed the French system onto Crimean industries. The result was not successful. All the studied assemblages looked more or less like the Charentian, and Klein himself noted that his results were "more an academic exercise than a revelation of truth" (1965: 63). Later, V. Gladilin noticed that the Crimean industries did not fit well into the "Procrustes' bed" of French industrial variants (Gladilin 1980: 23).

V. Gladilin (1966), modifying F. Bordes' system for the recognition of variants, proposed a new scheme for distinguishing the local variability within the Crimean Middle Paleolithic. His approach was based on the idea that the recognized French variants were appropriate in Western Europe only, while the organization of typological variability in other territories needed different approaches. At the same time, Gladilin used the Bordian artifact nomenclature, as well as the Bordian interpretation of Levallois technology. Although he noticed the "peripheral" and poorly developed nature of Levallois technology in the Crimean Middle Paleolithic, Gladilin used it when setting up his local Crimean variants: a *Levallois-Mousterian* (Shaitan-Koba, Kholodnaya Balka, and Bakchisaraiskaya), a *Levallois-Mousterian of Acheulian Tradition* (the assemblages of Starosele), a *Mousterian with Acheulian Tradition* (Volchi Grot, lower layer and Chokurcha-I), a *Micro-Mousterian with Acheulian Tradition* (the assemblage of Kiik-Koba, upper layer), and, a *Tayac variant* (Kiik-Koba, lower layer).

In truth, the proposed variants were still a close analogy of the French variants in both form and content. At that time, Gladilin thought that the technology of flaking played a dominant role in determining the tradition of tool production. That is why all his proposed variants were grouped into four parts: with Levallois technology, with bifacial technology (Acheulian Tradition), with "regular" flaking (Mousterian), and, others (Tayac, etc.). On the other hand, this grouping was his first attempt to substitute the Bordian approach with a "universal" classification system which could be employed on the different Middle Paleolithic materials from different parts of the world. Such a descriptive system was developed by Gladilin some time later, but, at the end of the 1960s, as well as during the 1970s, the Bordian method was spread all over the Old World.

Mainly, the Bordian type-list was employed on Crimean assemblages without bifacial tools. Yu. Kolosov (1972a), applied the Bordian method without any changes to the Shaitan-Koba assemblage. N. K. Anisyutkin (1979), described the assemblages of Bakchisaraiskaya and Kholodnaya Balka in Bordian terms. The main achievement of these studies was the statement that the assemblages of Bakchisaraiskaya and Kholodnaya Balka belonged to the same industry, while the materials of Shaitan-Koba appeared to be closely related to them. Thus, these were attempts to propose something different from the Bordian variants, using the Bordian approach of artifact description. It must be noted that these assemblages are very easy to study using the Bordian type-list: there are only a few bifacial tools, as well as a small number of convergent tools with different types of thinning and inverse retouch. Even the small number of those "complicated" artifacts, however, posed some typological problems. For instance, the type "Mousterian point" in Kolosov's descriptions of Shaitan-Koba often includes tools of crescent shape, which are sufficiently pointed in plan and profile to be points, but, at the same time, are not symmetric enough to be points (Kolosov 1972a). To avoid that kind of problem, N. Anisyutkin proposed an Index of Convergent Tools, which is the percentage of points and convergent scrapers to the total number of tools. Thus, there were two ways to adopt the Bordian type-list to the description of the local Middle Paleolithic assemblages: first, to add new morphological attributes to those distinguished by F. Bordes, and, second, to add new indices, which permit comparisons among assemblages using attributes unrecognized in the Bordian type-list.

The other Crimean assemblages, full of different shapes of bifacial tools and convergent unifacial tools, were impossible to describe within the framework of the Bordian type-list. Gladilin clearly understood that the use of Bordian type-list leads to the distinguishing of the Bordian variants. Attempts to propose a nomenclature of typological variability different from that of Bordes', but based on his system of artifact description, leads to the same Middle Paleolithic variants as in France, but under other names. At the same time, it was commonly believed that Middle Paleolithic assemblage variability of Eastern Europe was not the same as in France. So, "from the decks of, made under the French standards, caravels you can see again and again the desired Bordian India" (Gladilin 1980: 22, author's translation).

Yet, to see a "Bordian India" was not desired. At that time, the theory of "archeological culture" was the main approach used in prehistoric investigations in Soviet archeology. This approach was developed mainly in Bronze and Early Iron Age archeology. In relation to Paleolithic studies, this approach was an extreme manifestation of the "stylistic" point of view. The different definitions implied that an archeological culture in the Paleolithic is an archeological reflection of a distinct human group, which is distinguished by a territory of habitation, the time of activity, the mode of economic activity, the kind of technology employed, and the specific typological structure of artifact assemblages, as well as some specific types of tools, which are characteristic for the separate "culture" only (Gladilin 1976, 1985; Liubin 1977; Kolosov 1978, 1986). It is clear that to be "independent," the archeological culture needed to correspond to some kind of social organization. For the Upper Paleolithic, a family or community type of organization was nearly unanimously adopted, while, for the Middle Paleolithic, the type of organization remained an open question. There were many different ideas, from some amorphous form of organization, such as a "proto-community," to an Upper Paleolithic-type family organization (Semenov 1983).

Gladilin's Approach

It is very difficult to imagine that human groups with similar technology and typology of artifacts coexisted in the Dordogne, France, and in Crimea: in other words, that they belonged to the same archeological culture or had the same social organization, maintaining their tradition of artifact production during thousands of years in territories separated by the thousands of kilometers. So, to avoid that kind of logical link, it was necessary to propose a new system of artifact description which would be able to distinguish the differences among Middle Paleolithic assemblages located in very disparate territories. Thus, in 1976, V. Gladilin proposed a new "universal" multi-leveled classification of Middle Paleolithic artifacts. (This is discussed in more detail in Chapter 3 of this volume.)

At about the same time, Yu. G. Kolosov started excavations at a number of newly discovered sites in eastern Crimea, all of which had pronounced components of bifacial tools. The discoveries of the multi-layered rockshelters of Zaskalnaya III, Zaskalnaya V, Zaskalnaya VI, Zaskalnaya IX, Ak-Kaya III, Prolom I, Prolom II, etc., as well as the open air sites of Sary-Kaya and Krasnaya Balka, produced an explosion of new information in Middle Paleolithic studies of Crimea (Kolosov 1972b, 1977, 1979a, 1979b).

Gladilin, meanwhile, using his new classificatory framework, studied all the then known Middle Paleolithic sites on the Russian Plain and in Crimea. Gladilin at this time proposed a new nomenclature for the hierarchical, two-level subdivision of the Middle Paleolithic, as well as elaborating the criteria for each level. The upper level was called a "variant." A variant was determined by what Gladilin felt were three "stable" attributes: tool size, the percentage of bifacial tools, and the percentage of denticulated tools. Assemblages with at least half of tools smaller than 5 cm were recognized as Micro-Mousterian. If the tools included more than 50% denticulates, it was called Denticulated Mousterian. A 5% limit of bifacial tools separated a "regular" from a "bifacial" Middle Paleolithic variant.

At the lower level of typological variability was the "type of industry." The type of industry reflected the techno-typological similarity of a number of assemblages or even of a single discrete assemblage. In reality, similarity at the "type of industry" level meant a statistical resemblance in tool shapes (or branches of Gladilin's artifact classification) in a number of assemblages, as well as a similarity in flaking technology. For the Crimean Middle Paleolithic, Gladilin proposed four "variants," which were sub-divided into several "types of industries."

Among the other assemblages, the assemblage from Starosele was distinguished as a "Starosele type of industry" of the variant "Mousterian with bifacial tools." This meant that in the Starosele assemblage there were more than 5% bifacial tools, less than 50% denticulates, and that the majority of tools were longer than 5 cm. Moreover, the Staroselian "type of industry" was characterized by equal proportions of parallel and radial cores, an Ilam of ca. 15, an absence of Levallois cores and blanks, and a dominance of scrapers among the tools. Among the latter, as well as among the points, Gladilin noted unifacial and bifacial semi-crescent, laurel, and sub-rectangular shapes. The semi-crescent shape was noted as being a peculiar type of the Starosele "type of industry."

Another "type of industry" belonging in the variant of Mousterian with bifacial tools was the Ak-Kaya. It consisted of a number of assemblages in a series of rockshelters and open-air sites near the Ak-Kaya and Sary-Kaya questas in eastern Crimea, which were discovered by Yu. G. Kolosov at the end of 1960s and during the beginning of the 1970s. The Ak-Kaya type of industry was distinguished by Gladilin on the basis of the second and third layers of Zaskalnaya V, which contained archetype assemblages. The characteristic features of the Ak-Kaya type of industry were: a dominance of parallel cores, a low percentage of denticulates and notches, as well as an abundance of crescent and triangular-shaped bifacial and unifacial scrapers and points. Tool types peculiar to the Ak-Kaya type of industry were bifacial "scraper-knives," similar to the Klausennische, Bockstein, and Prondnik types (Kolosov 1978, 1983, 1986).

The assemblages of Chokurcha, Chagorak-Koba, Volchi Grot, lower layer, and Kabazi I were classified as belonging to the same variant of Mousterian with bifacial tools, but their attribution on the level of type of industry was not done, due to either small artifact samples (Chagorak-Koba, Kabazi I) or their unclear stratigraphic position (Chokurcha, Volchi Grot).

The next variant adopted for the Crimean Middle Paleolithic by Gladilin was the Regular Mousterian. In other words, it was a Mousterian without bifacial tools or with fewer than 5% bifacial tools. In addition, tools were longer than 5 cm and denticulates accounted for less than 50% of the tools. There were two types of industries belonging to this variant: Shaitan-Koba and Kholodnaya Balka. The last was seen by two assemblages: Bakchisaraiskaya and Kholodnaya Balka. The typological structures of the tool kits at both the Shaitan-Koba and Kholodnaya Balka types of industries were the same. Both tool assemblages were based on obversely retouched scrapers, among which simple types dominate. The main differences were seen in the cores. In the Shaitan-Koba assemblage, parallel cores clearly predominated, while radial and parallel cores occurred in equal numbers in the Kholodnaya Balka type of industry.

The variant Micro-Mousterian with bifacial tools was represented by the Kiik-Koba, upper layer type of industry. That type included three assemblages: Kiik-Koba, upper layer; Zaskalnaya VI, layer 4; and Prolom I. These were all characterized by abundant bifacial tools (about 15%), a paucity of denticulates and notches, and the small size of a majority of both bifacial and unifacial tools (less than 5 cm in length). In addition, all the assemblages exhibited a high degree of similarity. Most striking was the abundance of points, ca. 45% of all tools. For the most part, both unifacial and bifacial points were no longer than 5 cm, and the majority had different canted shapes.

The assemblage of the lower layer of Kiik-Koba was called a Denticulated Micro-Mousterian variant. The main features of this type of industry were: an overall small tool size, a great number of notched and denticulated tools, and only a few bifacial tools. The cores of this assemblage were usually unsystematic, blades were rare, as were faceted platforms.

Thus, the techno-typological subdivision of the Crimean Middle Paleolithic proposed by Gladilin had little in common with the Bordian system, from the point of view of nomenclature and in the proposed criteria governing its subdivision. It is clear that Gladilin's "variants" were to provide a formal order for the Middle Paleolithic variability, while the "types of industry" reflected actual techno-typological variability. From that point of view, Gladilin's "types of industry" were more closely related to F. Bordes' "variants," but were not the same. Aside from the typological similarities needed to place different assemblages into the same "type of industry," Gladilin proposed a number of technological criteria, as well. F. Bordes used technological criteria too, but limited them to Levallois/non-Levallois and faceted/non-faceted. For Gladilin, the technological criteria included a number of different "principles of flaking," such as Levallois Tortoise, Levallois Convergent (for points), Primitive (radial, discoidal, unsystematic), Protoprismatic (parallel), as well as a number of technological indices.

To some extent, the strict approach for the determination of a "type of industry" was a reflection of the "archeological culture" paradigm, which needed to distinguish discrete entities typologically, technologically, chronologically, and geographically. Moreover, some types of industries, such as Ak-Kaya and Kiik-Koba, upper layer, were identified by Gladilin as Early Paleolithic archeological cultures. To this extent, he was in agreement with Yu. Kolosov, who identified industries as Ak-Kaya and Kiik-Koba Mousterian Cultures (Kolosov

1977, 1979a, 1979b). On the other hand, a number of types of industries, even including single assemblages, were stated to be "potential" archeological cultures. So, in practice, more than one assemblage with a similar techno-typological structure was needed before an archeological culture was recognized.

As noted, for the determination of an archeological culture there had to be several attributes, such as a distinct territory, time and mode of activities, technology, and typology of artifacts. Thus, the discrete character of the archeological culture was underlined. It necessitated careful examination of techno-typological differences among Middle Paleolithic assemblages. Gladilin's classification of artifacts and assemblages served this purpose, as much as possible.

To a number of scholars, the idea of defining the differences among assemblages was thought to be more meaningful than approaches which highlighted common features among different assemblages. Yet, maps of archeological cultures of different stages of the Paleolithic remained a patchwork quilt. Even in the area of the Second range of Crimean Mountains, which is about 70 kilometers long by 5 kilometers wide, six typologically different Middle Paleolithic "types of industries" were defined. This system had discovered and defined more typological variability than anyone needed.

Without question, the typological differences among the assemblages noted above are obvious but, in the framework of the "archeological culture" paradigm, only a "stylistic" explanation was adopted. So, it is possible to suggest that the implication of the "archeological culture" theory for Middle Paleolithic studies proved to be a barrier to the development and elaboration of new approaches in the study of Middle Paleolithic variability.

At the end of the 1970s and the beginning of the 1980s, two ways of grouping these typologically different "types of industries" were proposed. Again, both were done within the framework of a "stylistic" approach. N. D. Praslov grouped all known Crimean Middle Paleolithic sites, as well as a number of industries from the Russian Plain, into a Belogorskaya Culture (Praslov 1984). All the assemblages which formed the Belogorskaya Culture were united by the presence of numerous or even single bifacial tools. To explain the extensive technological and typological variability within the culture, Praslov appealed to both "time of existence" and "economic activity" differences. Yet, he never explained what he meant by these two terms. It must be noted that Praslov never used either of the artifact classifications proposed by Gladilin and Bordes. His approach is more closely related to the type-fossil approach; in the case of the Belogorskaya Culture, the role of the type-fossil was played by bifacial tools. Moreover, Praslov did not take into consideration that bifacial tools from the Middle Paleolithic assemblages of the Russian Plain and Crimea are typologically very different. Even those assemblages, such as that from Shaitan-Koba which everyone agreed showed virtually no bifacial technology, have a few bifacially retouched tools. For Praslov, the two bifacial tools (no more than 1.5% of the total number of tools) from the lower layer of Shaitan-Koba were sufficient evidence to group it together with the assemblages of the numerous, multi-layered sites of Zaskalnaya, where bifacial tools account for about 20% of all tools.

V. N. Gladilin did not pay much attention to Praslov's model. He made a new attempt to improve his own classification of Middle Paleolithic variability by proposing "facies" as a new classification level, which fit between the "variant" and the "type of industry" (Gladilin 1980, 1985). The facies was defined as a group of Middle Paleolithic assemblages with similar tool kits at the class level (points, scrapers, knifes, denticulated and notched tools, burins, etc.), while the assemblages belonging to the same type of industry demonstrated similarity on the level of tool shape (branches), as well as by a wide range of technological peculiarities. Thus, the facies, built on the base of tool class similarity, was used to define generic links of groups of assemblages at a higher level than the level of "type of industry."

According to Gladilin, Middle Paleolithic populations were constantly migrating. This movement was caused by climatic fluctuations. During migrations, different population groups came into contact with one another, adopting the technological achievements of neighbors. These contacts resulted in a mosaic picture of the "types of industries" (Gladilin 1985: 53). Thus, the typological structure of assemblages on the level of tool classes (facies) appears to be more stable than the typological structure of tool kits at the branch (type of industry) level.

As always happens, these kinds of ideas are better in theory than in practice and, here, even the theory was not too clear. The variant Mousterian with bifacial tools was subdivided into two facies: Eastern Micoquian and Bockstein. The Eastern Micoquian facies included Starosele (Crimea), Rihkta (Polesse, Northern Ukraine), and Antonowka (Donets Basin, Eastern Ukraine) "types of industries." If the contacts in that geographic triangularity, the corners of which—Polesse, Donets Basin, and Crimea—are separated by about 500 kilometers, are very problematic, then the common ancestor for all of them is more or less probable. However, most disappointingly, the typological structure of these assemblages is not similar on the class level (Chabai 1991).

Most peculiar was the Chokurcha facies, which was said to consist of six Crimean Middle Paleolithic assemblages (Chokurcha II; Zaskalnaya VI, layer IV; probably one of the layers of Chokurcha I; and the surface material from Kara-Kitai; Okup; and Kiatskaya Zasuka). It is very difficult to determine the typological structure of the last four assemblages, which are totally unknown (the assemblage of Chokurcha I was lost during World War II), or were only preliminary published. It is obvious that there is little in common between Chokurcha II and the Zaskalnaya VI assemblages. The former has no bifacial tools, while the latter has about 10% of bifacial tools. The typological structure of the tool kits, on the level of classes, is different, too (Bader 1979; Kolosov 1983, 1986).

Gladilin's attempt to classify the Middle Paleolithic of Crimea and Eastern Europe demonstrates two important points. First, there is an information gap in what we know of a number of the Crimean assemblages. On the one hand, the gap comes from the use of different systems to describe the typological structure of the various assemblages. This led to the situation where two assemblages described in two different typological systems could not be compared. On the other hand, a number of assemblages, such as Kabazi I, Chokurcha I, Chokurcha II, Volchi Grot, etc., were known only from very preliminary publications and have never been studied using *any* typological system.

The second important point is the finite nature of further elaboration of the "archeological culture" paradigm as the only explanation for typological variability. In this regard, no one ever made an attempt to prove that tool shape was a stylistically meaningful attribute. The supporters of the "archeological culture" paradigm adopted, without any arguments, the idea of a stylistic meaning for tool shape. V. N. Gladilin, as one of the advocates of the "archeological culture" concept, proposed a way of developing the "archeological culture" paradigm based on an abstract hierarchy of sub-divided categories, which was based on abstract typological attributes. To some extent, the prehistoric reality was hidden under a number of abstract attributes and categories which were adopted axiomatically.

Gladilin's approach to the understanding of the theory of archeological culture appears to be a manifestation of the method of scientific formalism. The main achievement of his approach was the creation of a systematic descriptive system which could be applied to different kinds of Middle Paleolithic assemblages. Yet, at the same time, this descriptive system could not be an explanatory model for the cultural processes in the Middle Paleolithic.

In other words, if it proposed the Kiik-Koba "type of industry" or a Kiik-Koba Mousterian culture, it is no more than a description of typological peculiarities, not an explanation of the social content of that industry.

In the framework of Gladilin's approach, the only explanation of typological variability which could be employed was migration. The appearance of Bockstein and Eastern Micoquian facies on the Russian Plain and in Crimea was explained as migrations from Central Europe, while the assemblages without bifacial tools were explained as coming from the Balkans (Gladilin 1985: 54).

Gladilin's approach was based on the study of lithic assemblages only, which is not enough to understand prehistoric processes. The Crimean Middle Paleolithic sites are extremely rich in fauna remains, yet, throughout the history of Crimean Paleolithic investigations, faunal studies paralleled those of the lithic assemblages, as if they had no connection to the lithics. Another problem in the studies of the Crimean Middle Paleolithic was the lack of chronological controls.

THE PRESENT: INDUSTRY DEFINITIONS

From the mid-1980s to the present, studies of the Crimean Middle Paleolithic have developed along several paths: new descriptive analyses of the earlier excavated assemblages (Chabai 1990, 1991; Stepanchuk 1991), technological studies (Chabai and Sitlivy 1994; Chabai 1995), the use of nontraditional explanations for Middle Paleolithic variability (Stepanchuk and Chabai 1986; Chabai, Marks, and Yevtushenko 1995; Demidenko 1996), chronological investigations, and, large scale excavation of new sites. As usually happens, these new approaches have been based mainly on new material.

In the mid-1980s the Crimean Paleolithic Expedition headed by Yu. Kolosov discovered three multi-layered, deeply stratified, Middle Paleolithic sites: Kabazi II, Kabazi V, and GABO. Kabazi II was the first site where, in one stratigraphic sequence, at least 13 meters deep, three typologically different industries were recognized (Chabai 1991, 1996b).

Thanks to this discovery, a new conception of techno-typological and relative chronological subdivisions for the Crimean Middle Paleolithic was proposed in the volume *The Early Paleolithic of the Crimea* (Kolosov, Stepanchuk, and Chabai 1993). The authors of this new conception do not agree among themselves about the chronology and the content of the techno-typological variability of the Crimean Early (Lower and Middle) Paleolithic industries, but, at least, they have agreed on the techno-typological subdivision of about 100 assemblages, 35 of them from the multi-layered, deeply stratified sites. In this subdivision, the techno-typological variability in the Crimean Middle Paleolithic has been grouped into four industries (according to Chabai) or Mousterian cultures (according to Kolosov and Stepanchuk): Ak-Kaya, Kiik-Koba, Staroselian, and Western Crimean Mousterian (WCM).

These four industries have been described, in full or in part, a number of times (e.g., Chabai 1991; Kolosov, Stepanchuk, and Chabai 1993; Chabai, Marks, and Yevtushenko 1995) and will be described only briefly here, along with the chronology which has been proposed for them.

The **Ak-Kaya** industry is known from several assemblages at multi-layered sites in eastern Crimea, such as Ak-Kaya III, Zaskalnaya III, V, and VI, Sary-Kaya I, Krasnaya Balka, Prolom II, among others. Its techno-typological structure consists of an absence of Levallois debitage, a low percentage of faceted platforms (IF = 40-45) and blades (Ilam ≈ 10), about 80% scrapers, including abundant canted and bifacial examples, and only a few points, including both bifacial and unifacial varieties. In general, the bifacial tools range from 16 to 30% of all tools. The most characteristic bifacial tools are "knives" of Bockstein, Klausennische, Prondnik, and morphologically similar types.

Based on the Zaskalnaya V stratigraphic sequence, Yu. Kolosov proposed a three-stage subdivision of the Ak-Kaya Mousterian culture. The early stage included Zaskalnaya V, layers IV-VII; Zaskalnaya VI, layers IV-VI; and, probably, Prolom II, layer IV. The middle stage included Zaskalnaya V, layers II and III; Zaskalnaya VI, layers II and III; and Prolom II, layers II and III. The late stage included Zaskalnaya V, layers I and Ia; Zaskalnaya VI, layer I; and Prolom II, layer I. Yet, specific, meaningful differences among the flint assemblages of the proposed stages were not defined. The existing dissimilarities could be explained generally as resulting from variable artifact densities per layer. According to Kolosov, the main techno-typological difference between the stages consisted of the number of bifacial tools; that is, the early stage had a lower percentage than did the middle stage. Finally, the techno-typological character of the late stage showed a lowering of their percentage, as a "dying away" of Ak-Kaya bifacial technology.

On the basis of his impressions of the Zaskalnaya V stratigraphy, as well as two minimal ^{14}C dates (Zaskalnaya V, layer II, greater than 50,000 BP and Zaskalnaya VI, layer II, greater than 45,000 BP), Yu. Kolosov proposed an absolute chronology to match his stages: the early stage dating from Amersfoort to Brörup, the middle stage from 75,000 BP to 45,000 BP, and the late stage from 45,000 BP to 35,000 BP.

The **Kiik-Koba** industry is present at Prolom I, upper and lower layers, and at Kiik-Koba, upper level. All three assemblages show an incredible homogeneity in techno-typological structure. They are all characterized by few blades (ca. 10%) and few faceted platforms (ca. 40%), a dominance of radial and discoidal cores, many points, including bifacial ones (ca. 40% of all tools), and relatively few scrapers (ca. 30%).

The very peculiar attribute of the Kiik-Koba is small tool size. Most bifacial and unifacial tools are less then 5 centimeters in length. V. Stepanchuk, on the basis of collagen indicators, has suggested that Kiik-Koba, lower level, and Prolom I (both layers) are of significantly different ages, but within Early Würm. At the same time, no meaningful evolution of techno-typological structure has been reported.

While the Ak-Kaya and Kiik-Koba industries were recognized, as such, for some time (Gladilin 1976, 1985; Kolosov 1977, 1979a, 1979b, 1983, 1986), the recognition and definitions of the Staroselian and the WCM were only recently made (Chabai 1990, 1991).

The **Staroselian** industry has been recognized at Kabazi V, Units I-III; Kabazi II, Units I and III; GABO, upper and lower layers; as well as at Starosele, upper and lower Units of Formozov's 1955-1956 excavations. The typological structure of the Staroselian was described as follows: bifacial leaf points, ca. 2%; points, including bifacial ones, less than 16%; scrapers, including bifacial ones, ca. 60%; and notched and denticulated tools, ca. 15%. The percentage of bifacial tools varies between 4% and 12%. In general, the bifacial tools consist of different shaped points. Bifacial scrapers and "knives" of Bockstein, Klausennische, and Prondnik types are rare. Convergent, obversely retouched scrapers are common: ca. 40% of all scrapers.

At the same time, the assemblages are significantly different technologically. Both assemblages from Starosele and that from Kabazi II, Unit I, seem to show a relatively developed technology of primary flaking, which is characterized by only parallel cores, a low number of faceted platforms (IF = 40), and high number of blades (Ilam = ca. 20). A quite different picture is seen at Kabazi V, GABO, and Kabazi II, Unit III. Blades are rare (Ilam < 10), as are parallel cores.

Based on these observations and the stratigraphic sequence at Kabazi II, Chabai proposed a two-stage subdivision of the Staroselian. The first stage includes Kabazi II, Unit III; GABO, upper and lower layers; and Kabazi V, Units I-III. Kabazi II, Unit I and Starosele, upper and lower Units of Formozov's 1955-1956 excavations, comprise the second stage.

The **Western Crimean Mousterian** industry (WCM) is known from Kabazi I; Kholodnaya Balka; Bakchisaraiskaya, lower layer; Chokurcha II; Shaitan-Koba, lower, upper levels, and complex of the hill; and Kabazi II, Unit II, levels 1A through 9. The main feature which separates the WCM from the other Crimean Middle Paleolithic industries is the complete absence of bifacial technology. The very few bifacial tools which were found in the assemblages of Kabazi I, Kholodnaya Balka, and the lower layer of Bakchisaraiskaya may be explained as the result of mixture of different artifact-bearing lithological horizons during the excavations of these sites during the mid-1950s. Another two bifacial tools, found at the bottom of the Shaitan-Koba rockshelter might not be associated with the assemblage of the lower level. Thus, the typological structure of WCM may be characterized by the following tool class percentages: points, from 18% to 27%; scrapers, ca. 65%; and denticulates, no more than 10%. Lateral and distal points on blades are characteristic (see Chapter 3). More than 80% of the scrapers are simple.

At the same time, these assemblages show pronounced differences in their primary flaking. In the lower layer of Shaitan-Koba, it was based on both radial and single platform parallel cores. Faceted platforms are not numerous, blades comprise no more than 10% of all blanks. Bakchisaraiskaya, lower layer; Kabazi I; and Kholodnaya Balka are similar. The primary flaking at Shaitan-Koba, upper level and complex of hill, and that of Kabazi II, Unit II, level 8, is characterized by mainly parallel, single, and opposed platform cores, as well as by Levallois tortoise and radial cores. Faceted platforms (IF ≈ 65) and blades are common (Ilam = 20 to 25). Levallois blanks with centripetal dorsal scar patterns are present, too.

The other group of WCM assemblages, from Kabazi II, Unit II, levels 1A through 7, are characterized by a pronounced dominance of parallel, single, and opposed platform cores. Levallois and radial cores are rare in the assemblage of level 7 and completely absent in the uppermost levels. The artifact assemblages of levels 1A and 1 contained some opposed platform cores with pronounced volumetric flaking surfaces, while blades comprise from 30% to 40% of all blanks.

On the basis of these technological differences and the stratigraphic sequences at Shaitan-Koba and Kabazi II, Unit II, Chabai proposed a three-stage subdivision of the WCM. The first stage consists of Shaitan-Koba, lower level; Kabazi I; Bakchisaraiskaya, lower layer; and Kholodnaya Balka. The second stage includes Shaitan-Koba, upper level and complex of the hill, and Kabazi II, Unit II, level 8. Finally, the third stage is found at Kabazi II, Unit II, levels 1A through 7.

Chronology

While the four industries had been described, their absolute and even relative chronology, with all their proposed stages, was still unknown. The achievements of chronological investigations in the Pleistocene of Crimea were not too great. There are two ^{14}C dates, several U-Series dates run in the 1950s, and a number of collagen indicators. Both of the ^{14}C dates were mentioned above: greater than 45,000 BP for Zaskalnaya VI, layer II, and greater than 50,000 BP for Zaskalnaya V, layer II. The U-Series dates were made by V. V. Cherdyntsev during the mid of 1950s and the beginning of the 1960s. At that time, he was just beginning to develop this dating method (Cherdyntsev 1955). His results were perceived as more or less unsuccessful and not to be taken seriously, which may be why U-Series dating was not further developed in the Soviet Union. In any case, his calculations of Uranium, Thorium, Radium, and Actinium isotopes in Pleistocene bones gave some interesting results (Cherdyntsev et al. 1961).

The dates he got were as follows: 31,000-33,000 BP for Kabazi I and 31,000 BP, 41,000 BP, and 110,000 BP for Starosele. Unfortunately, there were no indications of the layers or depths from which the dated bones came. It now seems clear that the problem lay in the poor excavations at and even poorer interpretations of Starosele and Kabazi I, than in any deficiency in the method of dating. Yet, it is also clear that the "absolute" methods provided little useful information.

The method to establish a relative chronology developed by I. G. Pidoplichko during the 1950s appeared to provide a more or less reliable source of information about the temporal distribution of the Crimean Paleolithic sites. His method was based on the calculation of collagen remains in Pleistocene bones (Pidoplichko 1952). From the beginning of the 1950s to the mid-1970s, I. G. Pidoplichko, M. N. Grischenko, and K. V. Kapelist compiled collagen indices for the different layers of Kiik-Koba, Prolom I, Zaskalnaya V, Zaskalnaya VI, Starosele, Kabazi I, Bakchisaraiskaya, Shaitan-Koba, Kholodnaya Balka, Chokurcha I, Mamat-Koba, and Adji-Koba (Pidoplichko 1952; Grischenko 1968; Vekilova 1971; Kolosov 1971, 1972a, 1979b; Kolosov, Stepanchuk, and Chabai 1993).

Thus, the correlation system used until recently for the Crimean Paleolithic industries was based on collagen indices, stratigraphic sequences of Middle Paleolithic sites, and archeologically determined stages of technological evolution (Chabai 1987; Chabai and Stepanchuk 1989; Chabai 1991; Kolosov, Stepanchuk, and Chabai 1993).

As described above, the stages of technological evolution of the WCM and Staroselian are supposed to be well correlated with the stratigraphy of Kabazi II and Shaitan-Koba. Thus, Chabai proposed a scheme of five chronological periods, which corresponded to the different combinations in time of the four Crimean Middle Paleolithic industries and the Lower Paleolithic industry of Kiik-Koba, lower layer (Table 1).

The first and earliest stage is represented by two assemblages: Kiik-Koba, lower layer and Kabazi II, Unit IV. Neither assemblage is Crimean Middle Paleolithic and it appears from geological considerations that this stage dates to the Last Interglacial. The second stage sees the appearance of the Ak-Kaya and the Kiik-Koba and, possibly, the Staroselian. It is in the third stage when there is a coexistence of all four industries. This period is divided into two parts, indicating that the WCM appeared during the latter half of the third stage. By the fourth stage, the Kiik-Koba has disappeared, while by the fifth, only the WCM and the Staroselian were present.

Without question, this proposed correlation of Crimean Middle Paleolithic industries was based on several assumptions, such as the possibility to correlate the layers of different sites using collagen indices; the belief in the in situ character of Kabazi II, Unit I, lower level; the belief that the studied samples from Starosele, 1955/56 excavations actually represented meaningful assemblages; and, finally, the strong belief that similarities in technological attributes among different sites appear to be manifestations of the same stage of evolution within each industry. The last belief is one side of the coin of multi-linear evolution, but still a stylistic approach to Middle Paleolithic variability.

Yu. Kolosov and V. Stepanchuk employed the concept of archeological culture to all four Crimean Middle Paleolithic industries. Thus, they interpreted the Ak-Kaya, Kiik-Koba, Staroselian, and the WCM industries as the archeological reflections of different groups of people, who held different traditions of stone artifact production. As proposed by V. Gladilin, V. Chabai used the concept of "facies" for the description of the WCM and Staroselian industries. This means that he suggested different patterns of artifact production for both of these industries. For his interpretation of the Ak-Kaya and Kiik-Koba industries he used the vague formula of "cultural entities" (Kolosov, Stepanchuk, and Chabai 1993). While this formulation clearly needed confirmation through recent absolute dating, the main work of assemblage description and organization had been accomplished, within the limits imposed by earlier excavation techniques and often poorly published results of now missing collections.

Apart from the description, however, these formulations have so far failed to explain the perceived techno-typological variability in behavioral terms. There was still much to do.

TABLE 1-1
Relative Chronology of the Crimmean Early Paleolithic

Period	*Kiik-Koba, Lower Layer Industry*	*Kiik-Koba, Upper layer Industry*	*Ak-Kaya Industry*	*Starosele Industry*	*WCM Industry*
V				Kabazi II, Unit I	Kabazi II, Unit II, Levels 1A-1
				Starosele, Upper Layer	Kabazi II, Unit II, Levels 2-7
IV				Starosele, Lower Layer	Kabazi II, Unit II, Level 8
			Zaskalnaya VI, Layer I		Shaitan-Koba, Complex of the Hill
			Zaskalnaya V, Layer I		Shaitan-Koba, Upper Level
III-B			Prolom II, Layer I	Kabazi V, Units I-II	Shaitan-Koba, Lower Level
			Zaskalnaya VI, Layer II		Bakchisaraiskaya, Lower Layer
		Prolom I	Zaskalnaya V, Layer II		Kabazi I
III-A			Prolom II, Layer II	Kabazi V, Unit III	
			Zaskalnaya VI, Layers III-IV		
			Zaskalnaya V, Layers III-IV		
II			Prolom II, Layers III-IV	Kabazi II, Unit III	
			Zaskalnaya VI, Layers V-VIII		
		Kiik-Koba, Upper Layer	Zaskalnaya V, Layers V-VII		
I	Kabazi II, Unit IV				
	Kiik-Koba, Lower Layer				

Chapter 2

THE GEOLOGIC SETTING OF MOUSTERIAN SITES IN WESTERN CRIMEA

C. REID FERRING

INTRODUCTION

The physiographic and geologic settings of the Middle Paleolithic sites reported in this volume are described in this chapter. Detailed descriptions of stratigraphy and sediments at the sites of Starosele, Kabazi II, and Kabazi V are incorporated into their separate chapters.

The Crimean peninsula is situated on the northern Black Sea coast in southern Ukraine and is connected to the mainland by the narrow Perekop Isthmus (fig. 2-1). The center of the peninsula is at approximately 45° N, 34° 30′ E. It is almost 300 kilometers wide, and about 179 kilometers from north to south, giving it a total area of about 25,727 m^2 (fig. 2-2). The eastern coast of the peninsula is that of the Sea of Azov, a shallow basin fed by the Don River. A narrow strait separates easternmost Crimea from the western Caucasus (fig. 2-1). The west coast of the peninsula is of gentle relief, facing the northwestern part of the Black Sea which is fed by the Dniepr, whose delta is ca. 150 kilometers to the west. The coastal waters of the Black Sea, as well as the Kerkenite Gulf, the Sivash Sea, and the Sea of Azov, are all extremely shallow as these are the continuation of the Russian Platform (Daniloff 1905).

Crimea can be divided into three major regions: the steppe of the north, the mountainous regions of the south, and the Kerch Peninsula in the east. The mountainous region, 160 km east-west and 50 km north-south, comprises three ridges: the main, or coastal ridge; the second; and the third, or northern, ridge. The southern coast, particularly in southwestern Crimea, is extremely steep, with bordering mountains that rise abruptly from the sea (fig. 2-2). These mountains are tallest in southwestern Crimea, near Yalta, with elevations of over 1,500 meters. In contrast, the northern half of the peninsula exhibits low relief, and is a loess-mantled extension of the southern Ukrainian steppes (Hoffecker 1987).

The main ridge of the Crimean Mountains is formed of Triassic, Jurassic, and Cretaceous rocks, the summits of which are characterized by karstic terraines (fig. 2-3). Its highest point, 1545 m, is at Mount Roman-Kosh on the Babugan Yaila. The second ridge is formed by Cretaceous and Paleogene rocks with elevations up to 500 m. Separated from this by a longitudinal valley, the third ridge is formed of Paleogene and Neogene rocks, with elevations up to 300 m (fig. 2-4) (Moisseiev 1937).

The steppe zone is characterized by undulating erosional relief, less marked on its eastern and western coasts, with a maximum elevation of 185 m. In the north are found numerous salt lakes—this is an important salt mining area—separated from the sea by narrow sand spits. The northeastern coast is bisected by numerous capes, peninsulas, bays, and gulfs where it adjoins the Sivash Sea, an inland basin. Between the Sivash Sea and the Sea of Azov runs the Akmani Isthmus, which connects the northern steppe zone to the Kerch Peninsula. The Kerch Peninsula is characterized by a southwestern lowland region and a northern and southeastern mountainous region, whose highest points are 182 m in height (Moisseiev 1937).

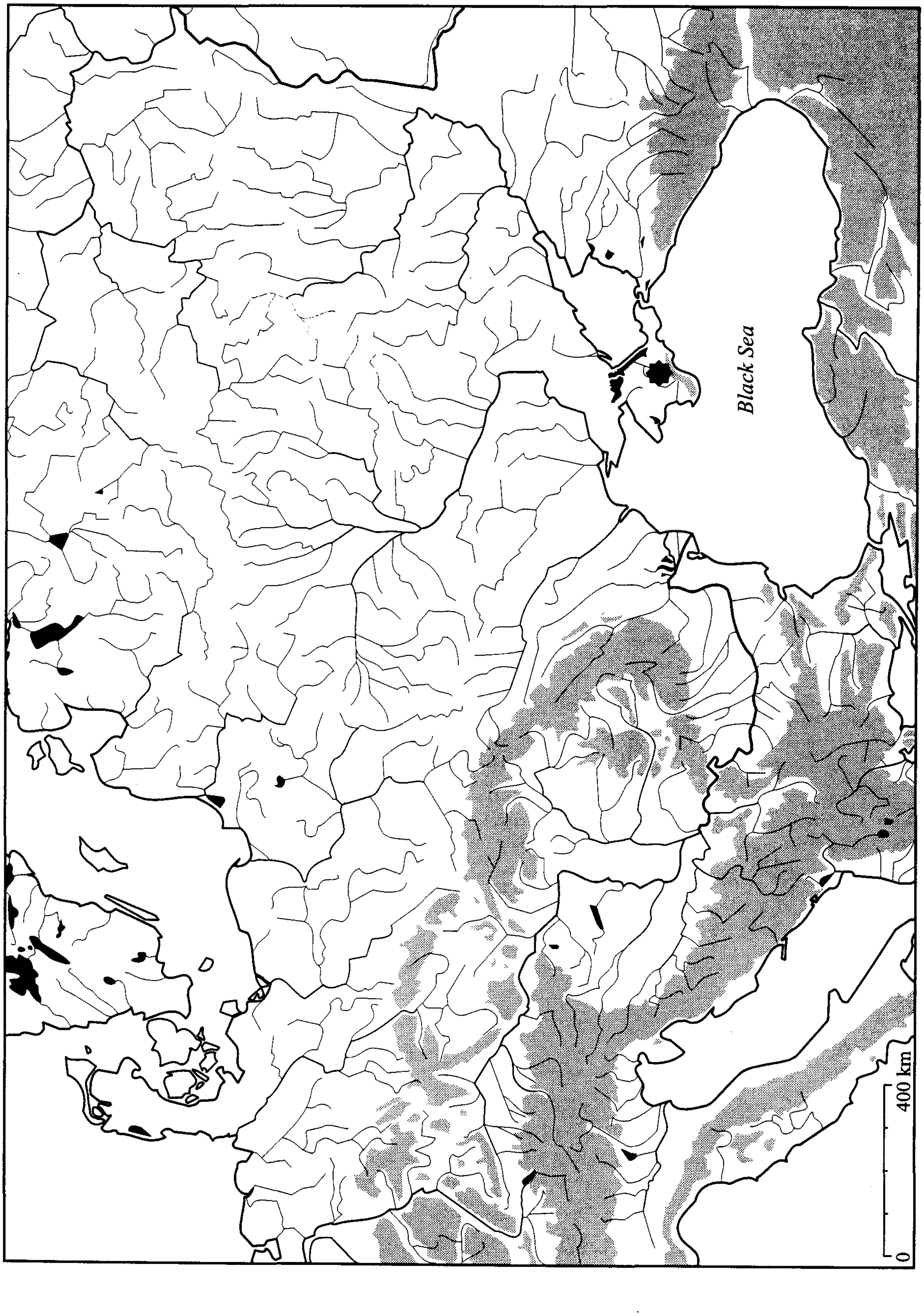


Fig. 2-1—Map of Central and Eastern Europe, showing location of the Crimean peninsula.

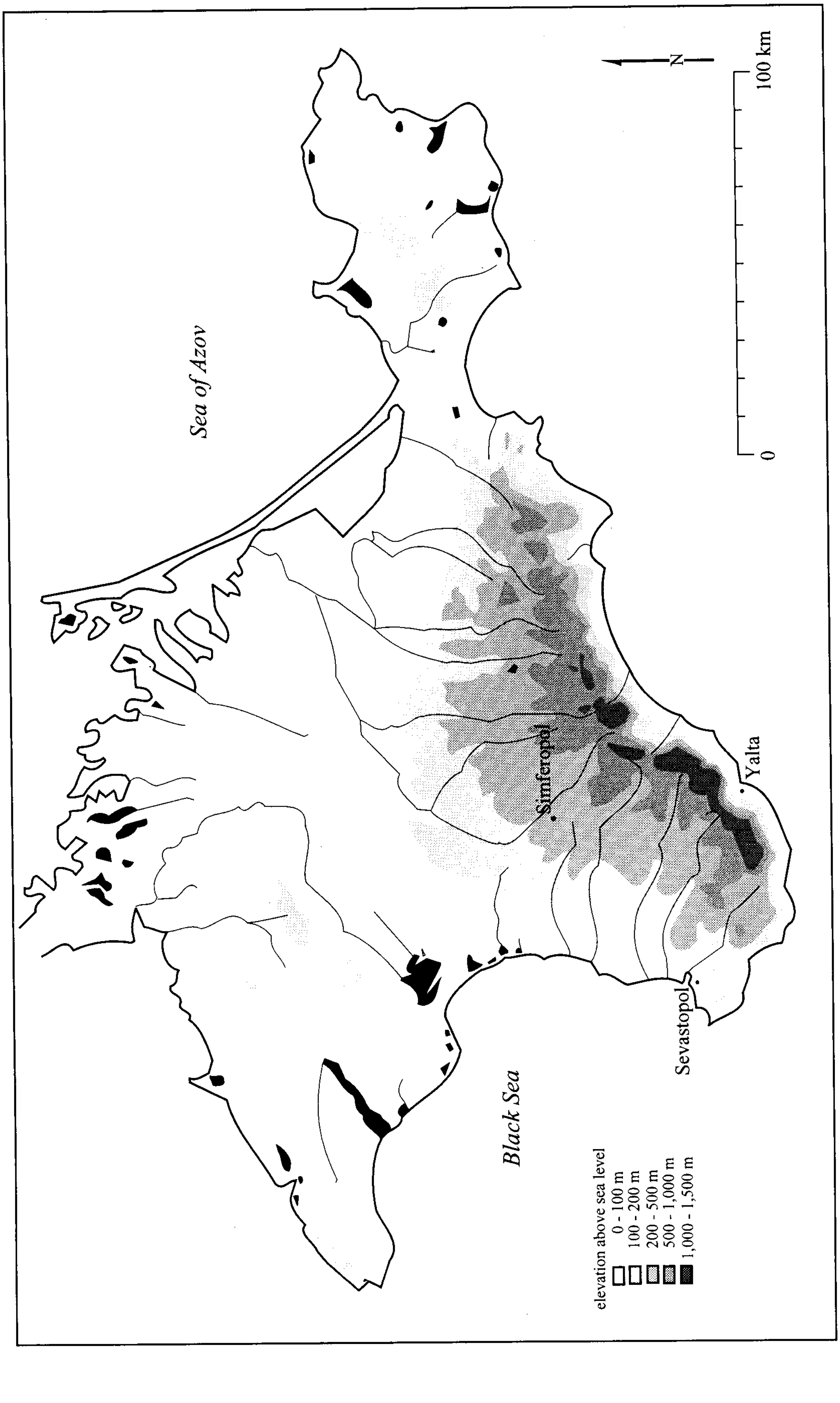


Fig. 2-2—Map of Crimea.

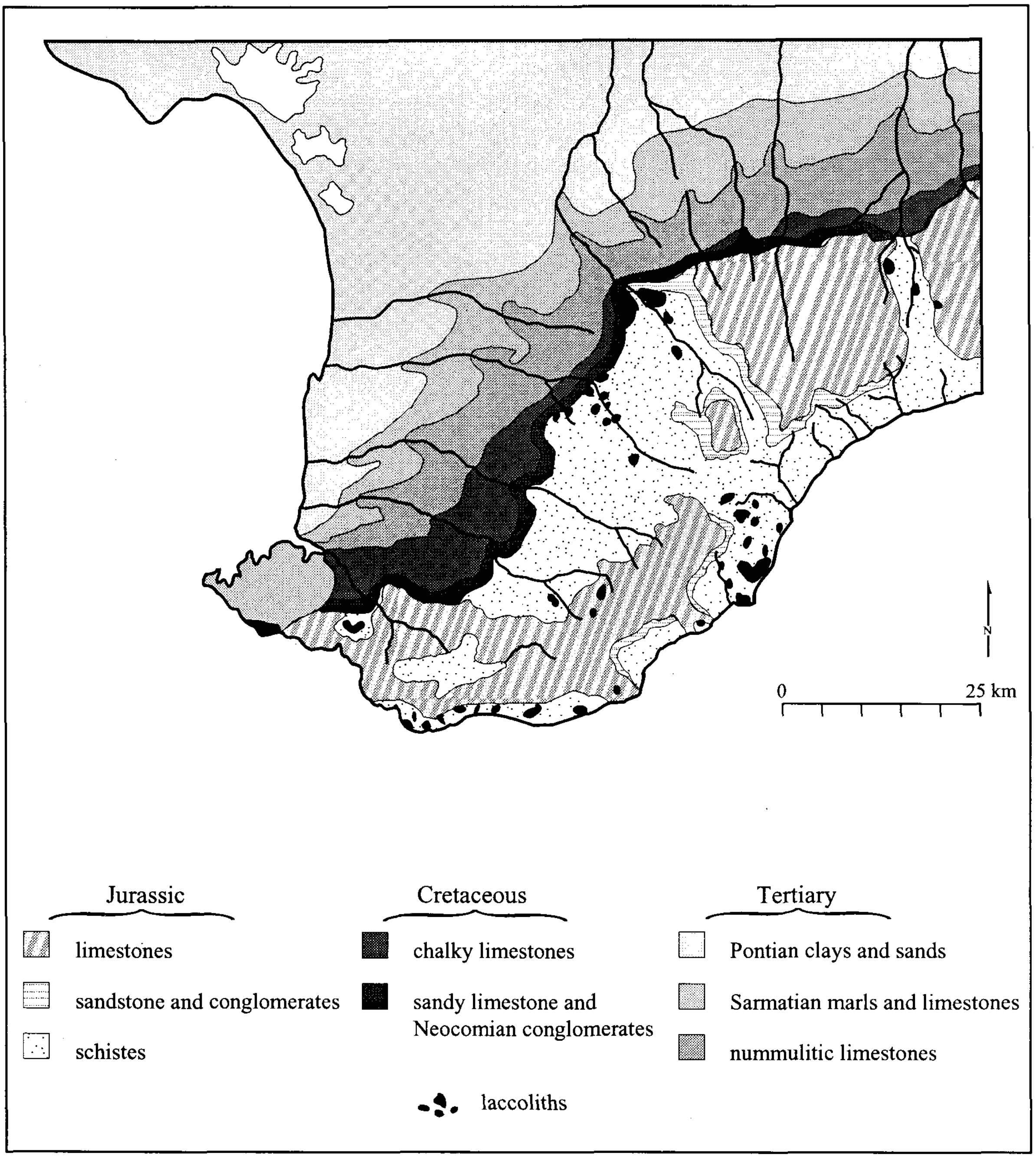


Fig. 2-3—Lithology of Crimea (redrawn from Daniloff 1905: map V).

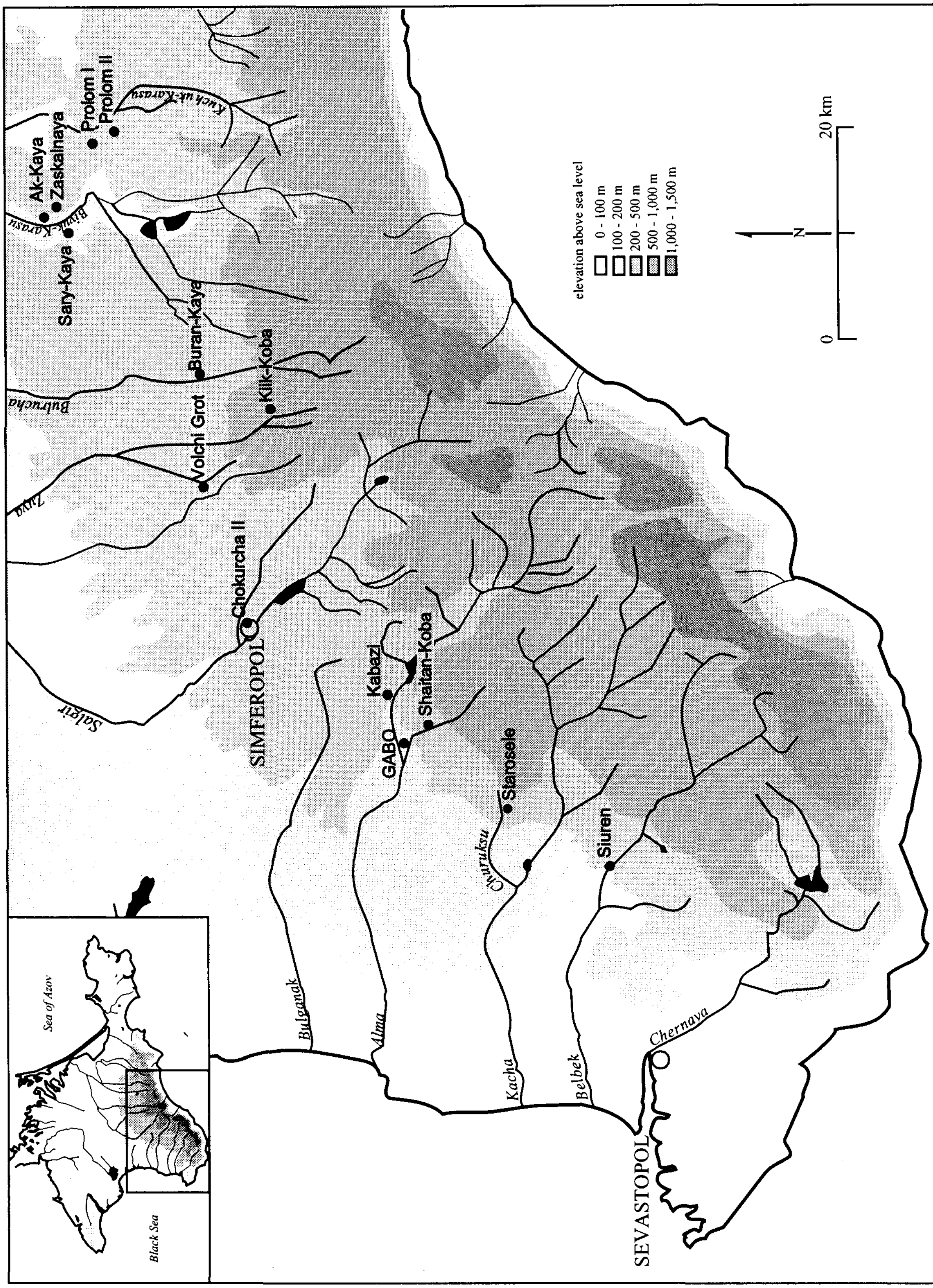


Fig. 2-4—Map of the mountainous Crimea, with Paleolithic site locations.

Drainages

The rivers of Crimea are dependent both on weather conditions and the topography of the peninsula. As a general rule, Crimean rivers are poor in water, and during the summer in drought years can dry up completely in their lower courses. Three classes of drainages can be distinguished depending on where they are found: mountainous Crimea, the steppe plateau, and the Kerch peninsula.

The karstic system of the Main Ridge of the Crimean Mountains feeds all the major rivers of Crimea. The north and south sides of the ridge have distinct hydrologies; the former includes that region on the northern side of the Yaila and the schistic areas, and is fed by the karstic system and drainoff from the mountains, resulting in shallow basin, gentle rivers. The southern side includes the coastal area and the southern side of the limestone plateau; its rivers have short, narrow basins with much higher velocities.

The rivers, from their sources in the Yaila, descend rapidly and consequently towards the north-west until they enter the zone of Tertiary strata at edge of the steppe, where they deviate west into the Yevpatoria Gulf, or east into the Sivash Sea (Daniloff 1905). The north side feeds the Chernaya, Belbek, Kacha, and Alma rivers, all found in southwestern Crimea and draining into the Black Sea. The north side also feeds the Salgir River, with its important tributaries Angara, Beshterek, Zuya, Bulrucha, Biyuk-Karasu, draining west; and the Bulganak and Indol rivers, draining east into the Sea of Sivash. The rivers in this system are fairly rapid at their headwaters, but as they reach their lower courses, the valleys widen, become more shallow, and the waters are more tranquil.

<u>Chernaya.</u> The Chernaya is formed from three tributaries; the source for the southern two is in the Baïdari Valley and crosses the zone of Jurassic limestones. The third, the Chouliou, has a longitudinal course; its source is near Adim-Chokrak where it cuts through the Middle Cretaceous, neocomian, and Jurassic limestones, and joins the other two affluents at Tchorguna (Favre 1877). Although the headwaters of the Chernaya are shallow, it never completely dries up, however, its affluents frequently do in the summer months (Daniloff 1905).

<u>Belbek.</u> The Belbek starts on Mount Balikli, near the village Koutchouk-Ouzenbach, where its upper course is also referred to as the Ouzenbach. The Belbek Valley enlarges considerably just below its source and serpents through alluvial terraces until it passes the Gavri Village, where the valley narrows again and the river enters a narrow pass in the Cretaceous cliffs.

<u>Kacha.</u> The Kacha begins in the western flanks of the Yaila and the Babugan Yaila with the confluence of three streams the Biyuk-Ouzène, the Pissara, and the Donga. Two affluents join it at Adjikoï (the Stelia) and lower, at Bissala (the Marta). Its tributary, the Churuksu, joins it near Bakchisarai, where it cuts into the Middle Eocene nummulitic limestone and the underlying Lower Paleogene and Upper Cretaceous strata. The discharge of the Kacha is less than that of the Alma.

<u>Alma.</u> The Alma begins on the northern flank of the Babougan-Yaila; at the headwaters, the river is rapid and capricious in a narrow winding valley. One of its principle affluents is the Bodrak.

<u>Salgir.</u> The Salgir, the most important river on the peninsula, is considerably longer—181 km—than the rivers of the southwest, which are about 60-70 km in length. This lengthening of the Salgir is due to it entering the Tertiary zone at Simferopol, where it brusquely deviates to the east and enters the steppe. As it enters the steppe (which comprises two-thirds of its length) the character of the river, up to this point very active, changes radically and becomes quite sinuous, with a low discharge which frequently dries up during the summer.

The rivers of the south side of the Main Ridge actively erode the limestone summits, and the arêtes between the rivers are abraded easily so that the rivers join each other. These rivers are only active in the spring, when the permeable calcareous ground reaches capacity. They all have short courses and are poor in water.

CLIMATE

Today, Crimea has a subhumid, Mediterranean type climatic regime and, due to the influence of the surrounding seas, the climate is much milder than that of southern Ukraine. The mean annual precipitation is ca. 530 millimeters, with the maximum in early summer, and there is a soil moisture deficit for most of the year (fig. 2-5). The peninsula experiences extreme variability in climate depending upon the latitude and altitude of any particular locality.

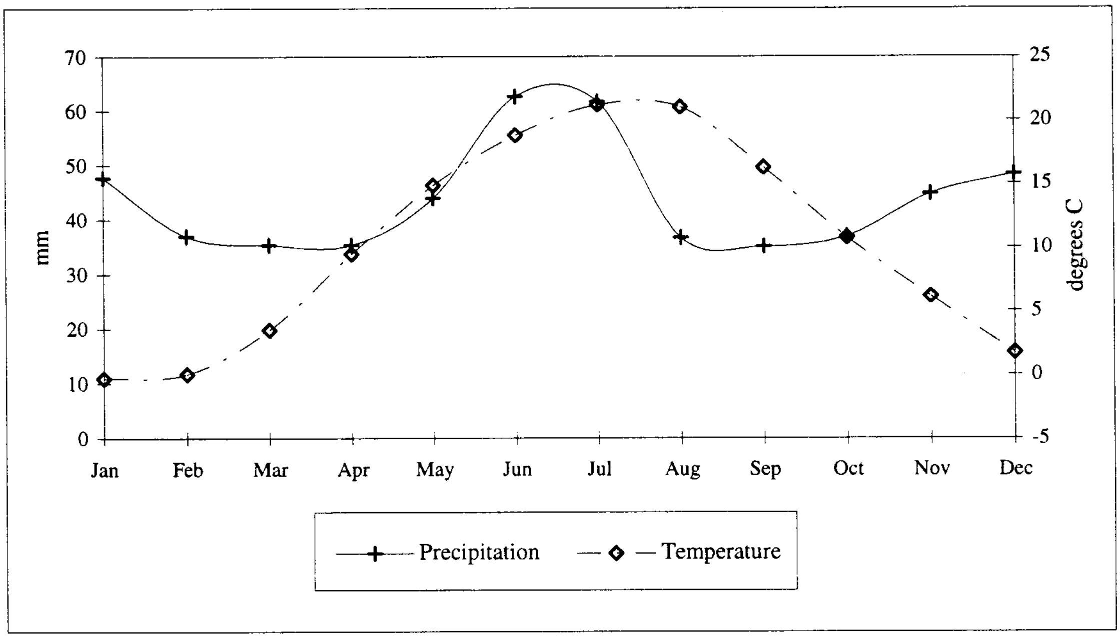


Fig. 2-5—Climatic data for Simferopol, Crimea: average monthly precipitation (mm) for the years 1901-1988, average monthly temperature (degrees Celsius) for the years 1821-1993 (NOAA 1997).

The steppe zone, unprotected from the winds blowing from the north, experiences severe winters, with frequent snow and a maximum low temperature of -20° C (Moisseiev 1937). The mean annual temperature at Askanija-Nova is just over 9° C (NOAA 1997). Temperature differences between the steppe and southern Crimea are considerably less dramatic in the summer months when the steppe is less than one degree cooler than more southerly regions. This area receives less rainfall than the more southerly areas, with a mean annual precipitation of 387 mm.

The climate of the mountainous region varies by altitude. At Simferopol, in the second ridge of the Crimean mountains, the mean annual temperature is 10° C (NOAA 1997). Winters are moderate, with 2 months of freezing temperatures, but rare snow. Summer temperatures are somewhat cooler here than both the steppe and the coast, thanks to its sheltered location, with an average of 21 degrees during July and August. Rainfall in the northern ranges varies from 400 - 700 mm per year.

The high summits in the first range of the Crimean mountains are very cold as a function of altitude; the Yaila summit at Ai Petri, for example, has a mean annual temperature of 5.8° C.

These areas often drop below freezing at night even in summer, whereas daytime temperatures can surpass 20° C (Favre 1877). Precipitation often exceeds 1,000 mm a year. At the same time, it is these summits which protect the low-lying coast from the northern winds, and enables the exceptionally pleasant climate there, making it a popular resort area. Winters along the coast are very mild, barely falling below 4° C in the coldest months, and snowing only in exceptional years. Temperature variations are not particularly drastic. The mean annual temperature here is 13° C, approaching that of Venice, and just slightly cooler than Nice. The coastal climate is moderately dry, with an average of only 70 rainy days per year (Moisseiev 1937).

SOILS

The Isthmus of Perekop and the area around the Sivash Sea are mantled by alkaline soils and salt marshes, well-developed chernozem soils are found throughout the steppe, and mountain-forest, meadow, and chernozem soils are distributed throughout the mountainous region (Moisseiev 1937).

VEGETATION

Today, the steppe area of Crimea is covered by grassy vegetation. In the northern mountain ranges, there is a forest-steppe zone grading into timber forests, which include oak, white beech, maple, ash, beech, and pine as one moves further south (Moisseiev 1937). The summits of the mountain ranges, often stony plateaus, are covered by grass—they are referred to as "Yailas" or summer pastures (Permyakov and Maidanovitch 1984). Vegetation along the coast includes cypress, magnolia, and palms, and olives and grapes are commonly cultivated; it is similar to the Mediterranean flora. The present day vegetation has been grossly modified by agricultural, herding, and forestry management. However, the forested southwestern Crimean hills of today are reflective of the late Quaternary character of the region, contrasting with the steppic vegetation of northern Crimea (Khotinskiy 1984).

REGIONAL GEOLOGY

The Crimean Peninsula is a tectonically uplifted landmass extending from the mainland of Ukraine into the Black Sea (fig. 2-1). In its broadest context, Crimea is an orogenic component of the progressive closure of the Tethys Sea, tectonically associated with the Caucasus Mountains to the East. (Nalivkin 1973; Belov 1989). The elevated landmass of Crimea is the northern limb of an anticline, formed during the convergent plate movements. The southern limb of the anticline is submerged about 2,000 meters below the surface of the Black Sea.

While the mountains of the southwestern Crimea register the orogenic uplifts, the rocks generally represent the various pre- and syn-orogenic marine environments. Together, it is the combination of the bedrock lithology, the structural configuration of the mountains, and the post-orogenic erosional history of those features that broadly define the archeological site settings in this region.

The bedrock of southwest Crimea is comprised of Mesozoic and Cenozoic rocks (Nalivkin 1973). Because of their structural deformation into the large anticline, the oldest rocks, of Triassic age, crop out along the Black Sea coast. The other exposed rocks are progressively younger from south to north, with the rolling steppe region of northern Crimea underlain by Miocene and Pliocene marine clays.

For the present discussions, it is convenient to distinguish three major components of the bedrock geology of southern Crimea: (1) the Triassic-Jurassic (T-J) clastic-dominated suite of the coastal mountains, (2) the Cretaceous-Eocene (K-E) carbonate-shale suite adjacent to and north of the older rocks, and, (3) the shale-dominated terrane farther north, corresponding with the Crimean steppe. All of the Mesozoic and Neogene rocks under consideration dip strongly to the north or northwest, and also exhibit numerous faults, including those that are perpendicular or oblique to the main structural trend.

The T-J rocks of the southern mountains are dominated by 7,000-9,000 meters of late Tr and early Jr flysch (mainly shales, but with thin sandstone and conglomerate). These are overlain by ca. 1,500 meters of middle Jr marine clays and continental deposits. The upper Jr rocks are 1,100 meters of reef limestones. These rocks form the highest peaks in the southern mountains and are overlain by ca. 1,600 meters of massive lower Cretaceous limestone which crop out to the north of those peaks at lower elevations.

Because of their lithology and high erosion rates, the southern mountains generally comprise poor settings for site formation, although it is not clear how much this low site potential has been verified by archeological survey. Furthermore, lithic raw materials are apparently much less common there, with only a few cherts noted in the thin lower Jr limestones of the area (Nalivkin 1973: 584).

The K-E terrane, as informally defined here, corresponds with the second ridge of the Crimean Mountains. These rocks are composed of late Jr and early K massive limestones in the southern part of the area, cropping out near the sites of Siuren, Starosele, and Buran Kaya (fig. 2-4). In the southwestern part of the area, where uplift has apparently been the greatest, these rocks have been incised by streams forming deep canyons, as at Starosele (fig. 2-6). East of Simferopol there is much less relief, and the limestone terrane merges quite gradually with the steppe to the north. Along the drainages, these rocks are excellent settings for rockshelter formation, as illustrated by sites such as Siuren. They contain some cherts, but the extent and character are not known to the writer.

The remainder of the Cretaceous-Eocene sequence of rocks includes much thinner stratigraphic units and beds of intercalated shales, clays, marls, chalks, and, in the Eocene, the distinctive nummulitic limestone. Uplift and erosion of these rocks have resulted in the formation of in-facing cuestas, notably in the region between Bakchisarai and Simferopol (fig. 2-4). Near Simferopol, streams such as the Alma river are superposed over the structures, but have also exploited the shale-marl-clay beds to form broader valleys behind the ridges (fig. 2-7). The drainages west of the Alma, such as the Bodrak near GABO, become progressively narrower and steeper.

The in-facing cuesta scarps expose the alternating beds of limestone, chalk, marl, and shale mentioned above, creating ideal settings for rockshelter formation (fig. 2-8). They additionally expose chert-bearing limestones, such as near Kabazi. Shelters such as Kabazi I and Kabazi V have formed just below the nummulitic limestone, near the top of the cuesta on the north side of the Alma Valley (figs. 2-8, 2-9, 2-10). Kabazi II, on the other hand, accumulated deposits behind a huge rock slab that fell to rest on a bench formed at the contact between a hard limestone and a clay bed. Specific geologic histories of these sites are included in the following chapters.

In addition, these differentially resistant rocks have also been eroded into benches and sloping platforms, as in the Alma Valley near Kabazi (fig. 2-7). Some of these are capped by alluvial gravel as strath terraces, while thick alluvial deposits are generally limited to very low positions along the streams behind the ridge capped by the nummilitic limestone. Broader terraces occur beyond that ridge where the streams cross softer rocks.

Thus, southwestern Crimea is geologically and environmentally distinct from the rest of the peninsula. This distinctive character is important in terms of both environmental contexts and site formation settings.

Fig. 2-6—Photograph of the site of Starosele. Note steep canyon walls in background.

Fig. 2-7—Photograph of Alma River Valley. View is to the south, taken from top of the Eocene nummulitic limestone above Kabazi I. Note steep in-facing cuesta slope, limestone benches along valley, and peaks of the southern mountains in the distance.

Fig. 2-8—Photograph of the cuesta overlooking the Alma River Valley. View is to the east, with Kabazi I and Kabazi II on slope below thick Eocene nummulitic limestone. Note vegetated bench on slope, defining position of Kabazi II.

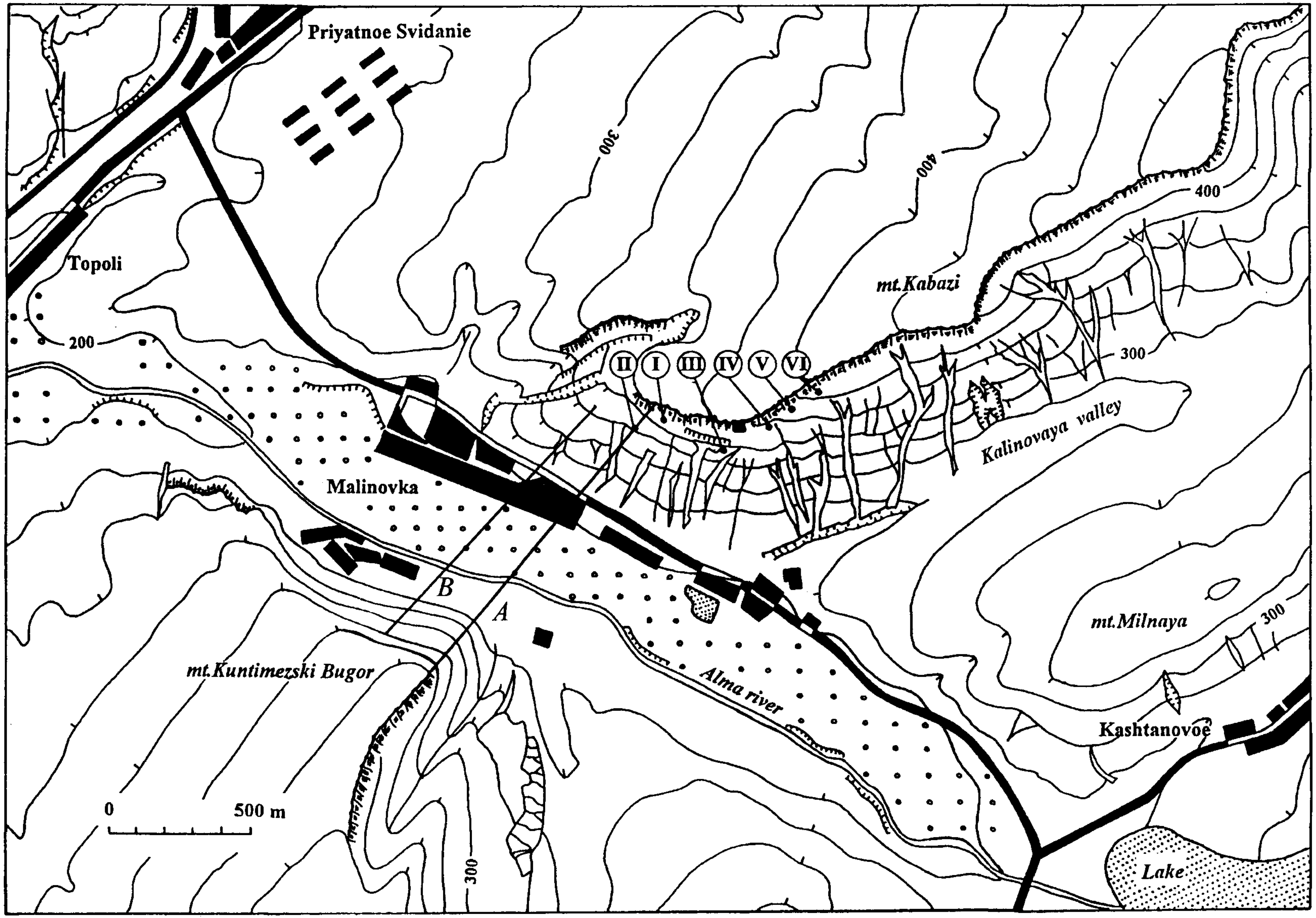


Fig. 2-9—Map of the Alma River Valley near Kabazi Sites. Note locations of topographic cross-sections of figure 2-10. Roman numerals indicate positions of Kabazi sites.

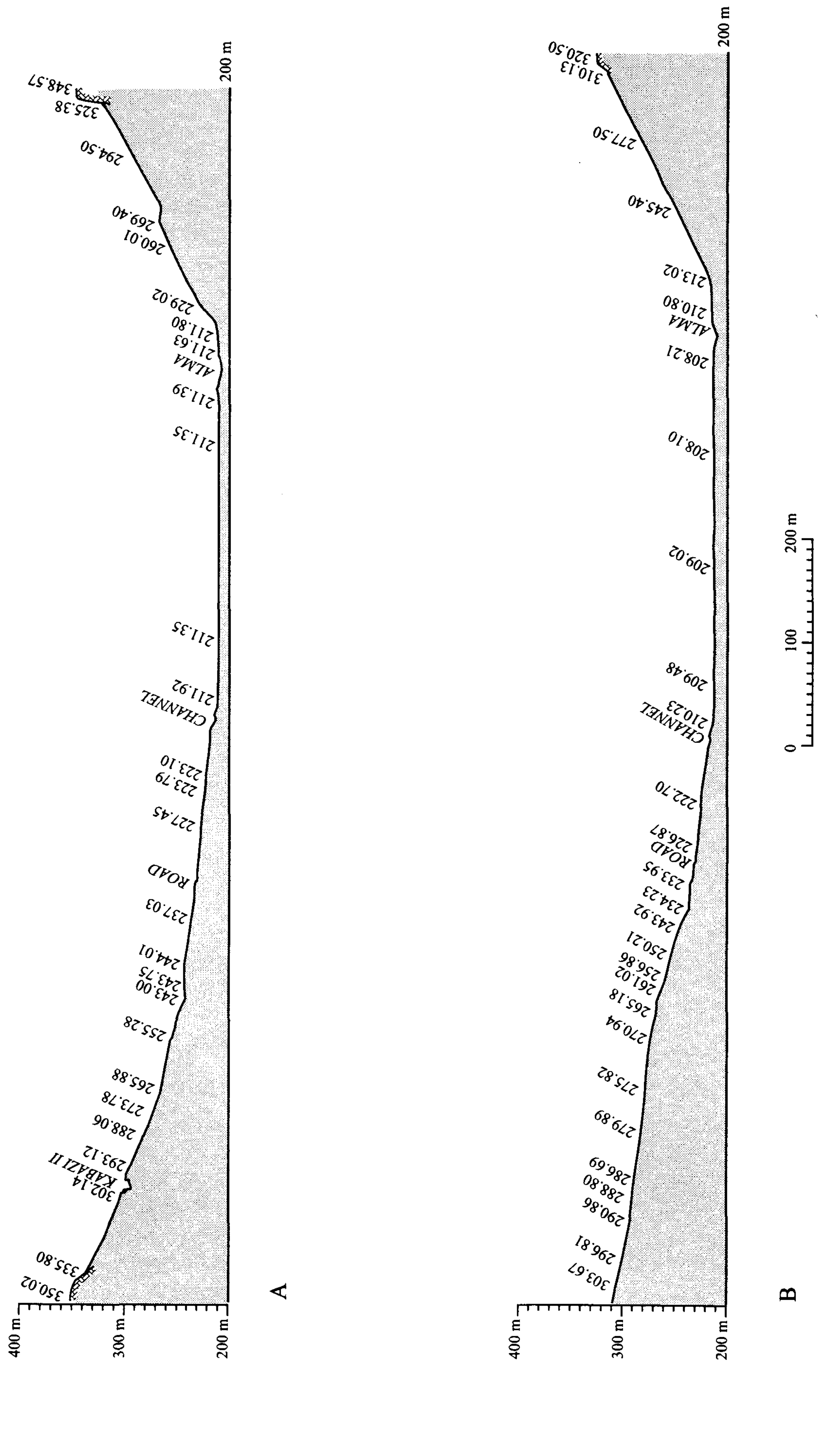


Fig. 2-10—Topographic cross-sections across the Alma River Valley: *A*–cross-section through Kabazi II; *B*–cross-section through cemetary (third terrace).

Chapter 3

THE CLASSIFICATION OF FLINT ARTIFACTS

V. P. CHABAI and YU. E. DEMIDENKO

INTRODUCTION

In this chapter we present a detailed description of our classification system for lithic artifacts. In our opinion, such a chapter should give any reader not only a sense of what we mean for any given core/debitage/tool type and its morphological attributes, as in the case of a simple glossary, but, additionally, it also should explain why such a classification was developed, why its nomenclature and attributes were selected, and what kind of information they give for our typological descriptions. Also, this should show how our choices affect our understanding of a lithic assemblage, in the sense of lithic industrial variability, and, finally, how they are used in constructing some of the life ways of the people who made the assemblage. Thus, the classification process for lithic artifacts is the first and, certainly, very important step in Paleolithic studies. Its importance is especially seen after the completion of artifact descriptions, when all subsequent information, short of reanalysis with a different classification, can be gotten only from these descriptive data. Therefore, the independent development or selection of an already existing classification system for the description of Paleolithic lithic artifacts is a very serious choice which, from our point of view, is, indeed, interconnected with different approaches to Paleolithic investigations, as a tool for their resolution.

The history of Paleolithic investigations in Old World prehistory can be very roughly subdivided into three periods, according to the development of classification systems and the change through time of paradigms for analyzing and interpreting lithic artifacts.

From the early beginning of Paleolithic investigations in the late nineteenth century until the 1950s, the main approach involved the *fossile directeur* concept. This approach was mainly based on the recognition of some tool types which were sufficiently distinct in time and space that they could be used to identify assemblages of different Paleolithic epochs and their industries. Archeologists following that paradigm did not need much detailed morphological subdivisions of tool types, their exact quantity, measurements, or even any elementary statistical description of assemblages. Therefore, they rarely kept all excavated lithics; not because they were bad field archeologists, but simply because they did not need them to answer their questions. Thus, during that time of Paleolithic investigations which corresponds to the paradigm of "unilinear evolutionary Paleolithic development," actual detailed classification systems were not needed and such classification systems did not really exist.

This situation changed radically when, in the beginning of the 1930s (Bonch-Osmolowski 1934), it was understood that distinctive but rare fossile directeur tool types could not serve effectively as the only typological indicators for understanding Paleolithic industrial variability through time and space. This was because quite a number of assemblages which shared the same few fossile directeur types were found to be otherwise very different, both typologically and quantitatively. This variability in non-fossile directeur types was impossible to interpret as insignificant typological "noise." This attention to non-fossile directeur types and, additionally, to cores and debitage of different primary flaking techniques was most prominently expressed by F. Bordes, in what is now referred to as the Bordian method (e.g., Bordes 1950, 1961a). The interpretative paradigm of this method is based on the strong assumption that practically all lithic artifacts were produced by Paleolithic man as consciously desired products, with their typological differences ". . . reflecting the cultural differences of human groups in possession of varied traditions" (Bordes 1972: 146). Such a new cultural paradigm certainly called for very careful morphological descriptions and subdivisions of all lithic items. Therefore, F. Bordes developed a classification system in a type-list format, with additional technological and typological indicators, expressed as indices, all related to the proportional occurrences of items within a whole assemblage. With such an instrument in hand, F. Bordes subdivided the French Mousterian into several industries and variants.

It also should to be emphasized here that Bordes' type-list was developed using French, mainly Perigordian, Paleolithic lithic materials. Despite this, however, F. Bordes was aware that outside France, other types existed and he added them to his type-list (stemmed points and bifacial, foliate pieces), after its initial formulation. While Bordes thought that his type-list had the potential for use outside of France, this was an open question for him. Bordes himself only applied his system to one site outside southwestern Europe, Yabrud I, in Syria, during the 1960s; others applied his system to non-French materials (e.g., Freeman 1966; Marks 1968). While these initial attempts worked reasonably well, this was not always the case in later attempts. This was because many different tool types found outside southwestern Europe had no equivalents in the type-list. Thus, choosing the "closest" Bordian type for each tool only "hid" them. This made it both reasonable and predictable that non-southwestern European assemblages would exhibit the same typological patterning as did the French assemblages originally used by Bordes. Of course, these problems were understood quite quickly. In some regions, Middle Paleolithic researchers added new types or subtypes to the tool list. These attempts, while useful in detailed descriptions, did not change the effects of the Bordian system, since industry and variant criteria were mainly based on tool classes, rather than tool types. Another approach was to develop definitions and classifications of special tool classes (e.g., Bosinski 1967; Schild and Wendorf 1977: 35-43). Finally, in some cases, the basic Bordian system was rejected and different classificatory schemes were developed to reflect local morphological variability (Gladilin 1976). With these new systems, which reflected regional features, new local Lower and Middle Paleolithic industries and variants were defined. Thus, the Bordian method has been used successfully in some regions, has been modified in others, and essentially abandoned or never accepted in still others.

The Bordian approach has two sequential levels for understanding Middle Paleolithic industrial variability: (1) a classificatory one of morphological and typological descriptions of lithic artifacts, and (2) a cultural one for their interpretations. Thus, for F. Bordes recurrent patterns in retouched tool assemblages were explained as reflecting different "cultural" groups. It was this latter paradigm which has been most reconsidered and critiqued in recent years.

First, there was the "functional approach" of L. and S. Binford (1966, 1969; Binford 1973), where morphological variability in Middle Paleolithic tool assemblages was explained as differences in human activities at different sites and their excavated loci (see also Freeman 1966, 1992).

Another approach has been taken by P. Mellars (1969, 1992). Based on the observation that some of the recognized Bordian typological assemblage variability correlates with time (that all variability is not synchronous) he notes that it must reflect changes in patterning through time within and between recognized industries. Therefore, all variability cannot be functionally driven. Both these approaches, however, accepted Bordes' premise that the defined, retouched tool types were made on purpose and represent discrete mental templates.

Since the late 1960s, others have suggested that lithic artifacts of the Middle Paleolithic should not to be analyzed as static "dead rocks," but, rather, should to be viewed as pieces representing different stages of lithic reduction. This approach was first applied to primary flaking reduction and its products. Nowadays, it is generally accepted that different debitage types may represent different stages of one reduction sequence, but that the pattern of reduction might be radically changed through multiple primary flaking. Accordingly, the technical characteristics of many debitage types may not correspond to what is seen on many of the abandoned cores in the same assemblage (e.g., Marks and Volkman 1986; Baumler 1988). Therefore, now many archeologists use a great variety of attributes for both cores and debitage, with the aim of reconstructing reduction patterns which, otherwise, may be invisible (e.g., Van Peer 1992).

Since the mid-1980s, a similar approach has arisen for studying retouched tools, where tools are interpreted not as discrete types reflecting mental templates but as different stages of manufacture and utilization, along a predictable morphological continuum (Dibble 1984, 1995a). This new paradigm for the understanding of retouched tool variability has not yet received great support among many archeologists; yet, it seems to apply well in several cases, including that of the Zagros Mousterian. Whether this interpretation of retouched tool variability truly can account for all variability is far from proven, but for tools which must be rejuvenated, it certainly plays some significant role.

Thus, nowadays, Paleolithic archeology includes so many "dynamic" interpretations that numerous very detailed descriptive morphological taxa and attributes for lithic artifacts have become crucially important. So, with an increased tendency to "mine" more and more information from lithics to justify a variety of explanations of Middle Paleolithic industrial variability and of human behavior, a detailed classification system, indeed, is needed.

ARTIFACT CLASSIFICATIONS OF CRIMEAN MIDDLE PALEOLITHIC ASSEMBLAGES

The archeologists of the Russian Empire, Soviet Union, Russia, and Ukraine who were involved in Crimean Paleolithic investigations, also have gone through basically the same history of approaches to the study of Middle Paleolithic industries and explanatory models as seen in the West.

The discoverer of the first Crimean Paleolithic sites in 1879/1880, K. S. Merejkowski, defined the presence of Mousterian on the Crimean peninsula on the basis of *fossiles directeurs*, a biface and a point, from Volchi Grot (Merejkowski 1884).

The next period of Crimean Paleolithic investigations started in the 1920s and lasted until the 1960s, when the "Bordian system" for both the classification of lithic artifacts and the interpretation of their variability was introduced. During that period of almost four decades, the *fossile directeur* concept was dominant. At the same time, however, the outstanding archeologist, G. A. Bonch-Osmolowski, introduced several quite progressive methodological innovations to Paleolithic investigations. These innovations were the following: the development of careful excavation methods which, at Kiik-Koba, for example, are still considered classic (e.g., Gladilin 1985); keeping all lithics found during excavations, because each of them might give some information; the application of standardized elementary statistical methods for reporting the main artifact categories of each assemblage; using the "refitting method"; the consideration of possible interconnections between shape and function in Paleolithic tools; and, considering not only an evolutionary paradigm but also that of possible synchronic cultural differences within the Mousterian (Bonch-Osmolowski 1934, 1940).

Thus, in the 1930s, the methodological innovations of G. A. Bonch-Osmolowski, as those of, for example, Abbé H. Breuil and D. Peyrony, were among those new ideas which actually prepared the scientific groundwork for the subsequent development and the wide-spread acceptance of the Bordian system for Old World Middle Paleolithic investigations.

Since the mid-1960s, the Bordian system has been accepted by many archeologists for Middle Paleolithic investigations on the Russian Plain and in Crimea of the former Soviet Union. This process, however, was going on in some different ways than it was for western European archeologists. While the cultural paradigm was considered as most appropriate, because it had already been introduced into Upper Paleolithic studies in Soviet archeology (Rogachev 1955, 1957), the Bordian classification system of lithic artifacts and his industrial variants actually did not get great support.

First, applications of Bordes' type-list to the Crimean Middle Paleolithic assemblages showed very different results. For industries with no bifacial tools and a predominant use of Levallois or elongated parallel flakes and blades as blanks—now known as the "Western Crimean Mousterian Industry" (Chabai 1990, 1991)—the classification basically worked quite well (e.g., Anisyutkin 1964, 1979; Kolosov 1972). On the other hand, the use of Bordes' type-list for industries with numerous different bifacial tools, as well as unifacial tools with more than one retouched edge, always led to their classification as "Charentian-like" Mousterian. This characterization, however, at times was noted to be ". . . more of an academic exercise than a revelation of truth" (Klein 1965: 63). Similar attempts to use the Bordian system were also undertaken by V. N. Gladilin (1966, 1971) for Eastern European Middle Paleolithic assemblages, including those in Crimea. These efforts documented too many typological differences between many Eastern European tool forms and those specifically recognized in the Bordian type-list, forcing him to abandon Bordes' classification and to develop his own (Gladilin 1976).

This classification was developed using materials from Antonowka I and II (south-eastern Ukraine) and other similar assemblages of the so-called "Eastern Micoquian." Complex tool types were impossible to put into the Bordian types and even the additional tool types defined by G. Bosinski (1967) for similar Central European "Micoquian" complexes did not help much. It should to be emphasized that Gladilin's classification is a true classification: it is hierarchical, with several levels of artifact description. While very detailed, this classification system will be discussed below, since it served as a base for our classification of the Crimean Middle Paleolithic. We also should mention his main approach toward tool definitions. All complex tools (all those with convergent retouched edges) were subdivided on the basis of their overall shape. Such an approach allows the definition of a great variety of convergent and *déjeté* tools as, for instance, leaf, willow, crescent, trapezoidal, rectangular, ovoid, etc., which clearly exist in the Crimean industries. At the same time, Gladilin's classification has an open character that allows the addition of any tool type, should a new shape be found. This is a very different classificatory approach than the Bordian type-list which has a closed character.

Recognition of the great variability of tool types within the Middle Paleolithic of Eastern Europe, including Crimea, allowed V. N. Gladilin to conduct his own detailed cultural subdivision of the Middle Paleolithic industries, taking into consideration all local typological features and peculiarities (Gladilin 1976, 1985).

Thus, since the mid-1970s, Soviet archeologists involved in Eastern European Middle Paleolithic investigations have had two classification systems from which to choose, that of Bordes or Gladilin.

During the late 1960s, Yu. G. Kolosov became a leader of Crimean Paleolithic field investigations. As already noted, he was quite familiar with Bordian systematics. His discoveries of a number of multilevel Middle Paleolithic sites in eastern Crimea, with huge artifact samples and with a predominance of various bifacial and unifacial convergent tool types, however, forced him to think of changes to Bordes' type-list. During these efforts, Yu. G. Kolosov created a regional classification, by mixing the approaches of Bordes and Gladilin (Kolosov 1983, 1986). Core-like pieces and debitage were classified according to Gladilin's detailed classification, but the shape of specific pieces of debitage was not used. For tool classification, Yu. G. Kolosov created a kind of "open" type-list, but following Bordes' systematics. At the same time, bifacial and unifacial tools were grouped together under general tool classes (e.g., sidescrapers, knives, points) and only within these classes were they further subdivided, following V. N. Gladilin. Because Yu. G. Kolosov did not use any hierarchical attributes, the number of tool types he recognized were many. The shape of complex tools was mainly used for the classification of different bifacial and partly bifacial knives (mostly made on flint plaquettes), with either thinned or natural backs, but not for other tools. These bifacial knives served as the main typological feature for Yu. G. Kolosov in his definition of the local Middle Paleolithic Ak-Kaya Culture of eastern Crimea. Thus, we can say that his classification is a very regional one, especially developed and adopted to the local Crimean flint assemblages.

A similar regional classification was developed by V. N. Stepanchuk (a student of Yu. G. Kolosov) for the analysis of the so-called Kiik-Koba Middle Paleolithic industry also found in eastern Crimea (Stepanchuk 1991). This classification utilizes a mixture of Kolosov's and Gladilin's systematics. V. N. Stepanchuk developed a classification without using the shape of complex tools, but emphasizing "on-axis" and "off-axis" as a subdivision for types. He did this because he wanted to emphasize the great predominance of convergent, pointed tools in the materials, almost half of which were *déjeté* (off-axis) types. He did not make any serious attempt to further subdivide tools by the shape of the retouched edges, however. This was because the presence of numerous canted tools was sufficient for Stepanchuk's cultural definition of the Kiik-Koba industry, within the eastern Crimean Middle Paleolithic.

At the same time, V. P. Chabai used Gladilin's classification in a very detailed way for the description of flint assemblages from a number of western Crimean multilevel sites (Chabai 1990, 1991). The main reason he chose that classification was the typological character of the so-called Starosele industry (defined by V. N. Gladilin as a kind of "Eastern Micoquian"). Since the mid-1980s, this industry has been represented in western Crimea by assemblages from the following sites: Starosele; Kabazi V, Units I-III; and Kabazi II, Units I and III. About 40% of the tools had more than one retouched edge (e.g., trapezoidal, crescent, rectangular, etc.). Moreover, within the framework of Gladilin's classification, it was possible not only to define detailed techno-typological similarities and differences among Crimean Middle Paleolithic industries, but also to put the Crimean industries into an Eastern European Middle Paleolithic context (e.g., Gladilin 1976, 1985; Chabai 1990, 1991). Using tool shape as the basic typological attribute, some Ukrainian archeologists began to discuss the typological variability of the Eastern European Middle Paleolithic (Gladilin 1976, 1985; Sytnik 1985; Chabai 1991; Kukharchuk 1993; Yevtushenko 1995; Chabai and Yevtushenko, in press). So, despite the criticism of Gladilin's classification as excessively complex and over-formalized (e.g., Praslov 1984), it became the basic classification system used in Ukrainian Middle Paleolithic studies.

GLADILIN'S CLASSIFICATION: BASIC PRINCIPLES

V. N. Gladilin based his classification on the logical principle of subdivision, emphasizing the hierarchical character of his criteria. At the first level of that hierarchical system, a lithic assemblage is subdivided according to the criteria of "functions" into three categories: waste products, blanks, and tools. The blanks and waste categories are then subdivided into *sections*: core-like pieces, blanks, chips, and chunks. After these, core-like pieces are subdivided into two *classes*: cores and pre-cores (initial "tested" cores), while the blanks are subdivided into *classes* of flakes and blades. If the subdivision on the levels of *categories, sections*, and *classes* are obvious and do not raise any questions, the further classification, at more detailed, lower hierarchical levels, demonstrates the qualitatively new possibilities for artifact description.

The most innovative is that for core-like pieces. First, the class of cores is subdivided according to the "principle of flaking" into three *branches*: primitive, Levallois, and protoprismatic (Gladilin 1976). These *branches,* based on additional samples, were replaced by an even more detailed subdivision, including radial, discoidal, unsystematic, and converging (Chabai 1991). These new branches were considered *groups* in Gladilin's original classification (1976). The taxon *group* is defined by the direction of scars on a core flaking surface, as well as by the number and disposition of flaking surfaces and striking platforms. For instance, the branch of protoprismatic (parallel) cores was subdivided into several groups: uni-directional (a single striking platform and single flaking surface); uni-directional-alternate (two opposed striking platforms oriented on two different core sides and two opposite orientated flaking surfaces on different sides of a core); bi-directional (two opposed striking platforms and a single flaking surface); bi-directional-adjacent (two opposed striking platforms with two adjacent flaking surfaces); orthogonal (two striking platforms arranged on adjacent sides, with perpendicular removals in relation to each other on a single flaking surface); sub-crossed (three adjacent striking platforms and a single flaking surface), etc. Finally, the lowest levels of core subdivision are *type*, which reflects the flaking surface shape, and *subtype*, which reflects the method of core undersurface modification. The same hierarchical system was used for pre-cores, in order to understand initial core reduction processes and to permit comparisons with seemingly exhausted cores.

The classes of flakes and blades are classified using the same taxonomic nomenclature as that applied to core-like pieces. It is obvious, because with the same nomenclature for both core-like pieces and blanks (debitage), it is possible to do technological analyses and comparisons: that is, the *branches* reflect the "principle of flaking" (protoprismatic, Levallois, etc.); *groups* are associated with the direction of scars on the dorsal surface of blanks, including presence or absence of cortex, and *types* reflect blank shape. As opposed to the core classification, there are sub-types in the blank description which reflect the kinds of platform preparation: cortex, plain, dihedral, roughly faceted, finely faceted, etc.

Tools are also subdivided into several classes. The class definition is based on assumed tool function. This way, the classes of hand-axes, spear-points, points, scraper-knives, denticulates, notches, end-scrapers, burins, etc., were recognized. For a number of them, however, it is difficult to assume even their possible function. Therefore, the class definitions were really based more on the traditional morphological nomenclature of the tools, than on a functional one (Gladilin 1976). At the same time, V. N. Gladilin supported the idea that, to some extent, a tool's morphology does reflect its possible function. Thus, on the taxon level *branch*, for a variety of convergent tools with more than one retouched edge, several distinct shapes were recognized: for example, sub-triangular (two straight edges), semi-crescent (combination of straight and convex edges, and straight base), sub-crescent (the same combination of retouched edges but with a rounded base), crescent (the same combination of retouched edges but bi-pointed), trapezoidal (double *déjeté*), hook-like (combination of convex and concave retouched edges), etc. Such a classification is similar to Bordian method of classifying bifaces according to their shape. So, to some extent, it is possible to say that Gladilin's basic typological approach is a development of Bordes' biface classification for all other complex, multi-retouched tools regardless of bifacial or unifacial retouch treatment.

The single and double-edged retouched pieces were classified at the *branch* level in a traditional way, emphasizing straight, convex, and concave edges. Then, each defined *branch,* according to the kind of secondary retouch, was subdivided into dorsal (obverse), ventral (inverse), alternate, partly-bifacial (with one more or less completely retouched surface, while another surface is treated over no more than 66% of its area), bifacial retouch, as well as unretouched. As opposed to Bordes' type-list, both unifacial and bifacial tools were brought together under the *branch* level, reflecting tool shape. On the other hand, the significance of bifacial retouch was defined at the *group* level, which put it into the same classificatory level as obverse, inverse, and alternate retouch. By doing this, V. N. Gladilin clearly underlined the priority of shape, as opposed to retouch. Thus, the well-known Bordian scraper types such as alternate sidescraper, bifacial sidescraper, and inverse sidescraper, lost their significance as distinct tool types and were subordinated to tool shape. The same classificatory approach was applied to different kinds of thinning, truncations, and backings which were relegated to the level of *subtype.* Therefore, such Bordian tool types as scraper with thinned back, typical and atypical backed knives, truncations, etc., were put into the classification system only after shape and "method of treatment." So, for example, using Gladilin's tool nomenclature, a bi-truncated, faceted piece with obverse convex retouch on one lateral edge appears as a scraper-knife--simple convex--dorsal--bi-truncated-faceted tool (Gladilin 1976: 68, 166, and fig. XV, 2). Another example is the well-known Central and Eastern European type, the Bockstein knife which, according to this classification system would be a scraper-knife--sub-triangular--bifacial--naturally backed tool (Gladilin 1976: 71). Finally, in this classification were some combined tools; for example, scrapers-denticulates, burins-notches, etc. The criteria of their subdivision into *branches, groups,* and *types* were the same as already described for the other tools.

Here, we would like to note a very peculiar feature of Gladilin's classification. On the one hand, this is a very detailed typological classification developed with the Bordian assumption that Middle Paleolithic tools were made on purpose and are of different discrete types, although V. N. Gladilin (1976: 91) always admitted that some pieces could be either unfinished or spoiled half-products (e.g., Demidenko and Usik 1993). On the other hand, Gladilin's system for subdividing tools according to their different shapes and retouched edges also allows anybody to consider "tool life" dynamically: examining the possibilities of different stages of their production and use. In other words, this classification is also a good descriptive typological "background" for Dibble's tool variability interpretation which is so different interpretively from Bordes'. Thus, Gladilin's classification is actually suitable for different interpretative paradigms for understanding Middle Paleolithic industrial variability.

At the same time, it is worth noting that a description of any lithic collection treated according to Gladilin's classification can be very easily transformed into Bordes' type-list for possible comparisons of different Middle Paleolithic industries in one system. On the other hand, it is impossible to transform Bordes' type-list into Gladilin's classification, since the latter is more detailed.

Without doubt, from a strictly typological point of view, it would be quite difficult to develop a more detailed and well-organized classification system than Gladilin's. The classification of core-like pieces and tools, in spite of its seeming complexity, permits a very detailed typological description of any Middle Paleolithic industry. The "open" character of this classification also permits, within its framework, any newly recognized tool types. This is similar to the very universal descriptive "instruments" of D. Mendeleev's periodic table of elements or C. Linnaeus' classification of organisms. It is obvious, however, that Middle Paleolithic stone artifacts are not as organized as atoms of chemical elements or the plant and animal kingdoms. Sometimes it is, of course, very difficult to calculate the number of possible meaningful attributes for stone artifacts (even without different measurements) and to organize them into a system of classification. Such important debitage and tool attributes as blank profile, profile of distal extremity, profile of blank at midpoint, lipping of platforms, retouch angle for tools, and so on, were not included in Gladilin's classification. Any system has its limitations. The artifact classification proposed by V. N. Gladilin was filled to capacity by different and important attributes. The addition of still new attributes would make this classification so complicated that it would be unattractive for application. Thus, we divided the typological and technological attribute analyses in space but not in time. In other words, a clear distinction was made between typological and technological attribute analyses.

TYPOLOGICAL CLASSIFICATION ADOPTED IN THIS VOLUME

On the whole, the typological descriptions and attribute analyses used in this volume are based on Gladilin's classification (1976), Bordes' type-list (1961a), Marks' definitions (1976), as well as contributions of other specialists (e.g., Bosinski 1967; Van Peer 1988, 1992; Chabai 1990, 1991).

Artifact Categories

Major artifact groupings with common morphological features are the following: cores, pre-cores, preforms, flakes, blades, chunks, chips, and, finally, tools. All these categories have different technological significance. They are supposed to result from different kinds of processes, and, in their proportional occurrence, indicate different aspects of raw material exploitation.

Cores

The traditional definition of cores is used (Bordes 1961a). The further classification of cores is based on Gladilin (1976). All cores are subdivided into the following *branches*: discoidal, radial, Levallois tortoise, parallel, parallel transverse, bi-directional, bi-directional transverse, bi-directional adjacent, bi-directional alternate, orthogonal, convergent, convergent transverse, unsystematic, and unidentifiable. Such a subdivision is based on the analysis of the number, arrangement, and correlation of both flaking surface (s) and striking platform (s).

Discoidal. These have two opposed flaking surfaces, with the striking platform covering no less than 75% of the cores' perimeter.

Radial. These are very similar to discoidal but only have one flaking surface.

Levallois Tortoise. These are classical examples with one specially prepared main striking platform, a number of supplementary platforms, traces of centripetal preparation of the core's main flaking surface, and, when struck, a large scar on this flaking surface which covers a significant area of it (Bordes 1961a; Boëda, Geneste, and Meignen 1990).

Parallel. These are single platform cores with a number of parallel scars on one flaking surface. Such cores have elongated proportions, where the length of its flaking surface is greater than its width.

Parallel, Transverse. These are the same as parallel, but the width of the flaking surface is greater than its length.

Bi-Directional. These have two opposed striking platforms and one flaking surface. The length of flaking surface is always greater than its width.

Bi-Directional, Transverse. These are the same as bi-directional, but the width of flaking surface is greater than its length.

Bi-Directional, Adjacent. These have two opposed striking platforms where the flaking surfaces are adjacent.

Bi-Directional, Alternate. These have two opposed striking platforms, but on two opposite flaking surfaces.

Orthogonal. These have two striking platforms on adjacent edges of a core and one flaking surface.

Convergent. These have a single striking platform and uni-directional, convergent removals on one flaking surface. The length of flaking surface is always greater than its width, in relation to the direction of the removals from the striking platform.

Convergent, Transverse. These are the same as convergent, but the width of flaking surface is greater than its length.

Unsystematic. These have multiple platforms and multiple flaking surfaces, which are situated and used in relation each to other without special order, or where flaking surfaces served as striking platforms and vice versa.

Unidentifiable. These include two categories: the first are just small fragments of cores. The second consist of very exhausted cores, where striking platforms, flaking surfaces, and the disposition of these are not clearly recognizable.

All of these core *branches* are then subdivided into several *types* (according to shape of flaking surface) and into *sub-types* (by the method of undersurface treatment).

The following core *types* are distinguished: ovoid, rectangular, triangular, narrow flaked surface, and unidentifiable/broken. For cores with a pronounced volumetric shape of the flaking surface there are sub-cylindrical and sub-pyramidal.

The following core *sub-types* are distinguished: naturally flat (unprepared with a flat, cortical undersurface); naturally convex (unprepared with convex, cortical undersurface); flat (prepared by several removals for a flat undersurface); and, convex (prepared by several removals for a convex undersurface).

Pre-Cores

This category is represented by pieces with unfinished preparation of the striking platform and/or flaking surface. The main feature of this "unfinished character" is the presence of considerable cortex on the striking platform and/or flaking surface that shows the initial primary reduction of such core-like pieces. At the same time, the character of utilization testifies to their core-like reduction and not to initial tool preparation. Further description and subdivision of pre-cores are based on the same criteria which were used in the core classification.

Preforms

This category necessitates the presence of relatively large flint plaquettes, nodules, or primary flakes. Such pieces usually have only a few quite large flake scars on their surfaces, which are interpreted as test blows of the raw material. Considering the clearly very initial character of such pieces, they are simply called preforms because it is impossible to know clearly if some of them are pre-cores or unfinished tools, especially when they are bifacial.

Flakes

These are blanks with an along-axis length less than twice their maximum width and larger than 2.99 cm in either width or length.

Blades

These are all blanks with an along-axis length of more than twice their maximum width and with a length of more than 2.99 cm.

Apart from the morphological studies of blanks (debitage), using a number of specific attributes presented below, here we would like to point out two special categories of blanks.

They are Levallois flakes and blades, and bifacial shaping/thinning flakes and blades. The former are not numerous but are prominent elements of characteristic debitage in some Western Crimean assemblages. The latter often occupy a quite significant place within the debitage of Staroselian assemblages because of the great significance of bifacial tool production and the rejuvenation of tools at Staroselian sites. There are no uniform definitions for these blanks in Paleolithic archeology, as they vary significantly morphologically in different Paleolithic industries. Therefore, we present definitions which we used during the analysis of the Crimean Middle Paleolithic lithic assemblages under discussion.

Levallois Flakes and Blades

As already noted for the core definitions, we consider as Levallois that which is commonly called "classical" Levallois (*Levallois préférentiel*). In our opinion, the definition of classical Levallois blanks was recently very clearly articulated by P. Van Peer (1988: 144) and we simply cite his morphological characteristics of Levallois endproducts. They are the following: "longitudinal symmetry of shape; many dorsal flake scars in organized disposition . . . convex (lateral and longitudinal) dorsal surface; a well developed bulb of percussion; and, a prepared butt."

A few more comments are needed, as well. The dorsal scar pattern is multi-directional, mainly centripetal. The presence of small cortical areas on the dorsal surface is acceptable because it does not contradict the other morphological characteristics of Levallois blanks. Such Levallois flakes and blades with a small cortical area are present in some assemblages of Kabazi II (see, also, Van Peer 1988: figs. A17, 7; A19, 7; A25, 3, and 7).

Bifacial Shaping/Thinning Flakes and Blades

Depending upon bifacial tool production peculiarities (e.g., soft/hard hammer percussion, handaxe/leaf point manufacture), published morphological characteristics of bifacial shaping/thinning pieces vary to some extent (see, for example, Bordes 1961a: 6-8; Newcomer 1971; Schild and Wendorf 1977: 19-20; Bradley and Sampson 1986: 36-39; Demidenko and Usik 1993). On the basis of the Staroselian collections, we recognized the following morphological features for bifacial debitage. There is a faceted or plain, but usually lipped, butt (because of the extensive use of soft stone and bone retouchers) which has an obtuse angle in relation to the ventral surface of the blank. Other characteristics include numerous dorsal scars, especially proximally positioned (similar to Upper Paleolithic debitage with traces of "striking platform abrasion"); incurvate and twisted profiles; mainly trapezoidal (expanding towards the distal end) in shape, with few blunt (thick) extremities, and generally thin bodies.

Chunks

These are distinguished as variably sized pieces of raw material without recognizable dorsal or ventral surfaces, striking platforms, or dorsal scar patterns. Some heavily burned artifacts can lose recognizable features and also can be defined as chunks.

Chips

They exhibit all the morphological features usual for blanks (dorsal and ventral surfaces, butts), but have a maximum dimension of no more than 2.99 cm. For the present studies, two categories of chips are recognized: regular and bifacial shaping/thinning. The latter are basically very similar to bifacial shaping/thinning flakes and blades but being very small pieces (less than 3 cm in maximum dimension), usually do not show clearly the specific morphological characteristics of bifacial reduction and, therefore, are very hard to distinguish from thinning chips of unifacial tools or from core treatment. As will be shown in the detailed assemblage descriptions, bifacial shaping/thinning chips is not a very large artifact category.

On the other hand, even their presence certainly demonstrates resharpening of bifacial tools on the sites.

Tools

All artifacts with any kind of continuous retouch or burin facet are referred to as tools. The tool category is subdivided into a number of *classes*: points, scrapers, denticulates, notches, burins, borers, truncated-faceted pieces, battered pieces, thinned pieces, retouched pieces, bifacial scrapers, bifacial points, bifacial preforms, and unidentifiable. All *classes* are subdivided into *branches*, based on overall shape. Each *branch* is then subdivided into *types*, which reflect the position of retouch, and *subtypes*, which reflect different kinds of retouch, backing, and/or thinning.

The shape of tools with a single retouched edge was classified in the traditional way of noting only the shape of the retouched edge: convex, straight, and concave. In addition, however, when a retouched edge has both a convex and concave retouched section, it is referred to as wavy. For those tools with two or more retouched edges and where at least two converge, however, 5 main shapes are recognized: triangular, trapezoidal, rectangular, crescent, and leaf-shaped. Depending upon the number of retouched edges, each of these is divided into semi-, sub-, and completely shaped, as described below for specific types.

<u>Points.</u> These tools exhibit a pointed, sharp angle both in plan and profile. The blank orientation in relation to axis of removal does not play any significant role in defining this category (Gladilin 1976; Baumler and Speth 1993). See figure 3-1 for schematic illustrations of various types.

Distal. Only the tool tip has retouch. This *branch* can be subdivided into *types* by position of retouch: obverse, inverse, and alternate.

Lateral. Only the tip and one lateral edge are obversely retouched. Such points were defined by G. Bosinski (1972: 153 and fig. 1, a-c) for the Middle Paleolithic assemblages of Balve IV type in Germany.

Willow-Leaf, Obverse. These are elongated points made on blades or rather narrow flakes which have convex lateral, completely retouched, obversely, edges. This retouch results in a double-pointed tool with the shape of a willow leaf.

Sub-Leaf, Obverse. This point is different from that previously described by being much shorter and wider. It is completely retouched, obversely, both at the pointed tip and all along the convex lateral edges. At the same time, the proximal parts are not retouched, and, because of this, the form is defined as sub-leaf.

Sub-Triangular, Obverse. This point is obversely retouched and has more or less straight converging lateral edges and a pointed tip. The proximal end is not retouched. This point corresponds to F. Bordes' Mousterian points, types 6 and 7 (1961a: 21-22).

Triangular, Obverse. This is a triangular shaped point with all three edges obversely retouched and, at least, one clearly pointed tip.

Semi-Crescent, Obverse. This is a point with one straight obversely retouched lateral edge, a second convexly retouched lateral edge, and one pointed tip. The proximal end is either retouched or unretouched, and is more or less straight but never pointed.

Sub-Crescent, Obverse. This is a point with the same shape of retouched edges as the semi-crescent point, the only difference is that the proximal end, retouched or unretouched, is rounded.

Crescent, Obverse. This is a double pointed piece, completely retouched obversely along all of its perimeter, with a clear crescent shape. One edge is straight and the other convex. The bulb of percussion has been cut away by retouch.

Hook-Like, Obverse. This has a combination of converging, obversely retouched concave and convex lateral edges, and a pointed, asymmetric tip.

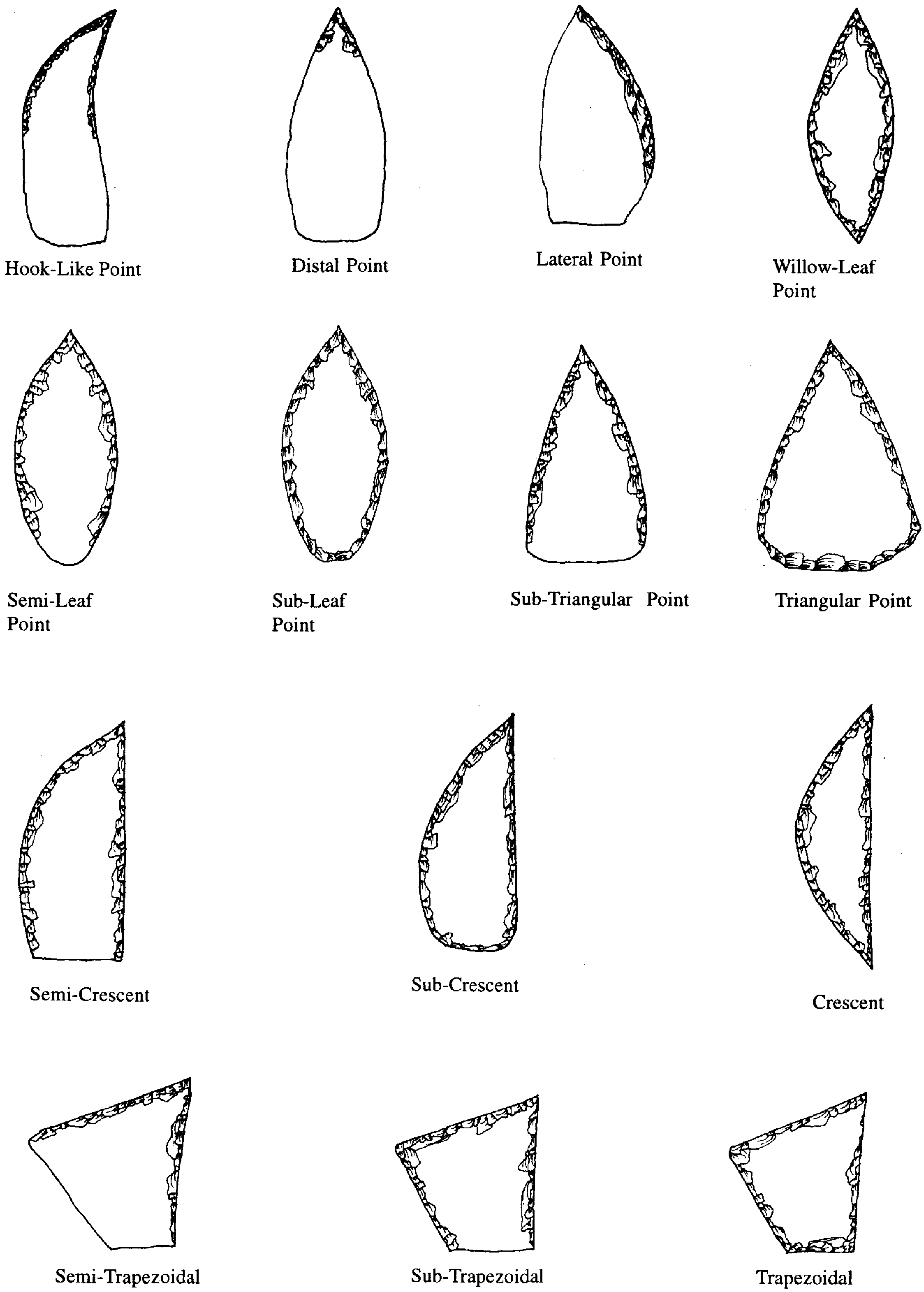


Fig. 3-1—Schematic illustrations of point types.

Semi-Trapezoidal, Obverse. This has two more or less straight, converging, obversely retouched edges which meet in a pointed tip. The peculiarity of this kind of point is that it is usually made on a trapezoidal-shaped blank.

Sub-Trapezoidal, Obverse. Three straight, obversely retouched edges are conjoined by, at least, one pointed tip. Usually, this type of tool was made on a transverse flake.

Trapezoidal, Obverse. This has four retouched edges, a trapezoidal shape, and, at least, one pointed tip.

Unidentifiable. This includes only unifacially retouched tips of points.

Scrapers. These are tools on flakes or blades with a continuously retouched edge or edges, without a pointed tip, notches, burin facets, or denticulated edges. The retouch may range from invasive to Quina but it is never marginal. See figures 3-2 and 3-3 for schematic illustrations of various types.

The traditional Bordian definitions (Bordes 1961a: 25-29) were used for obversely retouched transverse-straight, transverse-convex, transverse-concave, straight, convex, concave, double-straight, straight-convex, straight-concave, double-convex, concave-convex scrapers. Additional types are recognized for the Crimean Middle Paleolithic and are as follows:

Transverse-Straight Oblique, Obverse. The straight, obversely retouched edge is at about 45 degrees to the axis of the blank.

Transverse-Convex Oblique, Obverse. The same as above, but with a convex retouched edge.

Transverse-Convex, Obverse, Thinned Base. The usual transverse-convex dorsal scraper, but with a thinned base.

Transverse-Convex, Obverse, Proximal. The retouched edge of this type is on the proximal end of the blank.

Straight, Obverse, Naturally Backed. The lateral edge opposite the obversely retouched straight edge is naturally backed.

Straight, Obverse, Truncated-Faceted. A normal straight scraper, but with a truncated-faceted proximal or distal end.

Convex, Obverse, Naturally Backed. This combines one obversely retouched, convex edge with a naturally backed opposite edge.

Convex, Obverse, Thinned Back. This combines one obversely retouched convex edge with inverse thinning of the opposite edge.

Convex, Obverse, Truncated-Faceted. This is the usual simple convex scraper, but with a truncated-faceted base.

Wavy, Obverse. This is a scraper with a single retouched edge which has one section convex and the other concave. They may be more complicated but never have sharp intersections between the different shapes which would make them denticulates.

Straight-Convex, Obverse, Thinned Base. The classical straight-convex scraper, but with a thinned base.

Straight-Convex, Obverse, Truncated-Faceted. This is the usual double straight-convex scraper, but with a truncated-faceted base.

Straight-Concave, Obverse, Truncated-Faceted/Thinned. This is a normal double straight-concave scraper which has a truncated-faceted proximal end, as well as inverse thinning of the distal end.

Semi-Rectangular, Obverse. This has two obversely retouched, more or less straight, edges: one along a lateral edge and the other, perpendicular to the first, at one extremity. The retouched edges meet at a right angle.

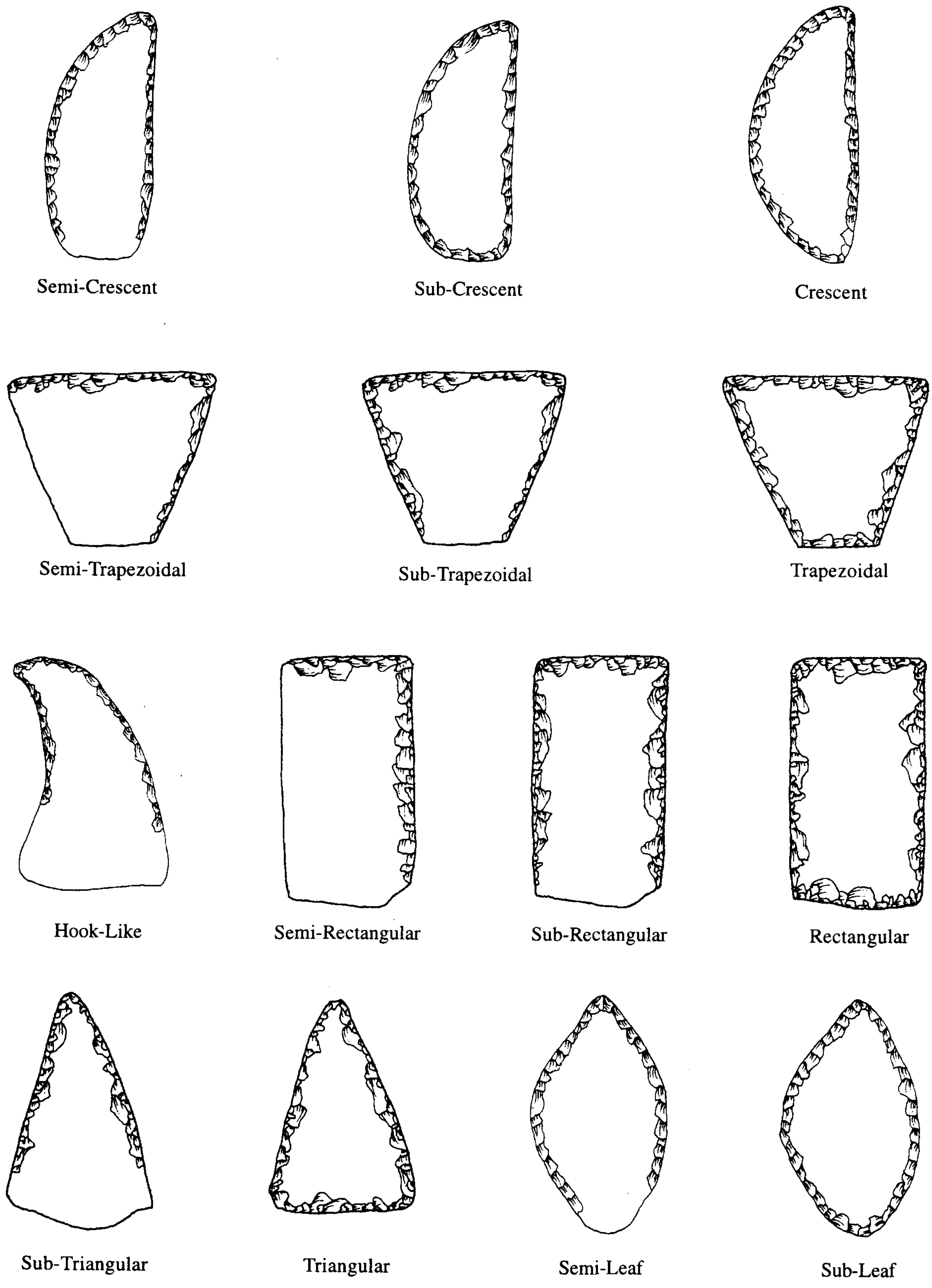


Fig. 3-2—Schematic illustrations of scraper types (1).

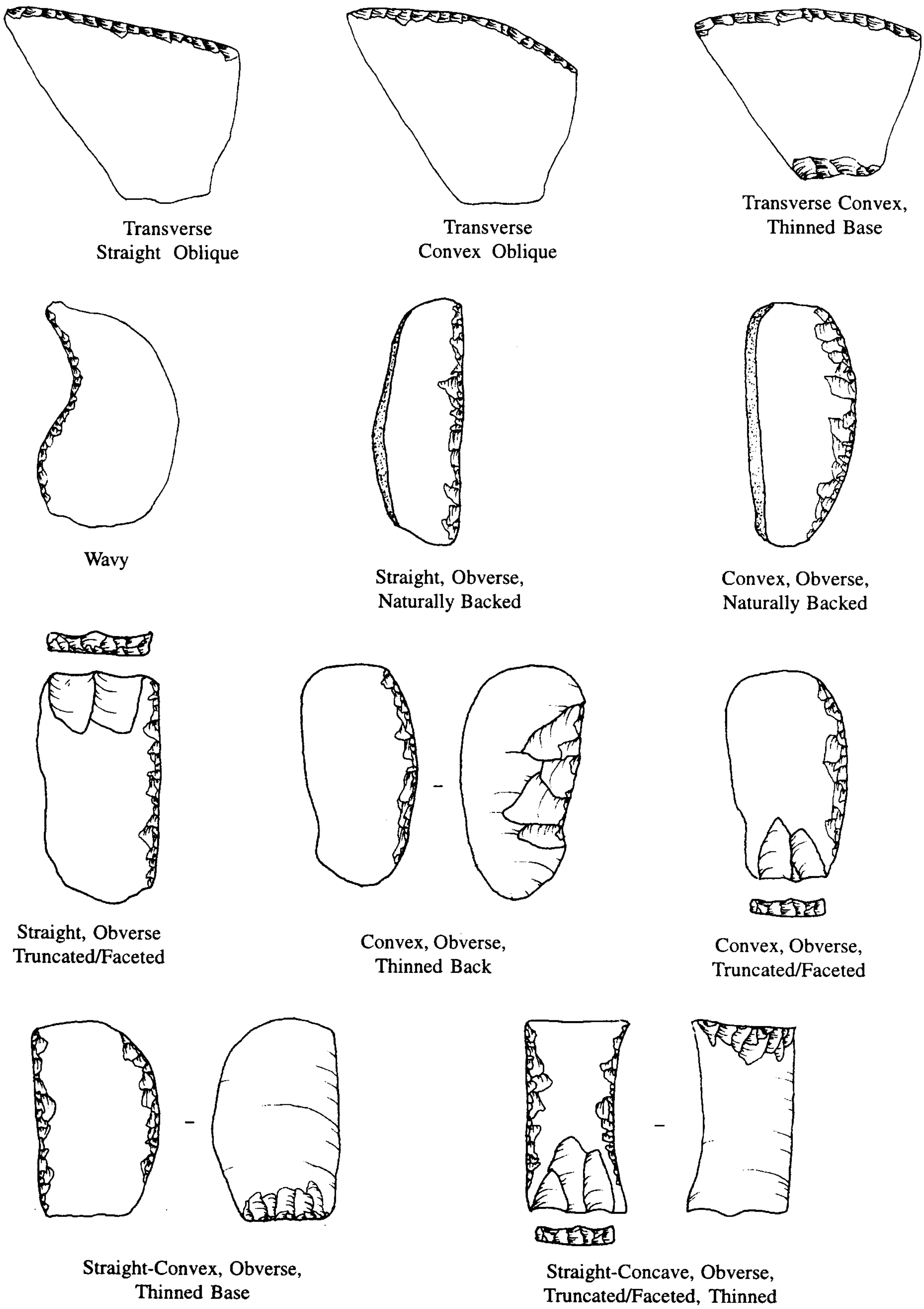


Fig. 3-3—Schematic illustrations of scraper types (2).

Sub-Rectangular, Obverse. This has three obversely retouched edges, two of which are on the lateral edges, while the third is at the distal end. The lateral edges meet the distally retouched edge at right angles. G. Bosinski (1972: 153 and fig. 1f) describes this type as a "rectangular" scraper.

Rectangular, Obverse. This tool has four retouched edges, two of which are lateral, a third is distal, while the fourth is proximally positioned. All the edges meet each other in approximate right angles.

Sub-triangular, triangular, semi-crescent, sub-crescent, crescent, sub-leaf, hook-like, semi-trapezoidal, sub-trapezoidal, trapezoidal scrapers have the same number of retouched edges, the same shapes, and relationships on the blanks as do points (see "Points" in this chapter). The only difference is the absence of a tip which is sharply pointed. The tips of these scrapers are more rounded than pointed in plan and/or abrupt in profile, unlike the points, which have pointed tips both in plan and profile. The nomenclature of thinning, retouch of the back, and truncations is the same as that used for transverse and simple scrapers.

<u>Denticulates.</u> This tool class includes pieces with different numbers and combinations of denticulated edges, made by continuous, but not marginal, retouch. The nomenclature for tool shape (*branch*), retouch position (*type*), thinning, backing, truncation (*sub-type*) is the same as that used for scrapers.

<u>Burins, borers, battered pieces, truncated-faceted (with unretouched edges), end-scrapers, thinned pieces, retouched pieces.</u> F. Bordes' definitions were mainly used (see also Gladilin 1976; Marks 1976; Debénath and Dibble 1994). More detailed description followed the same levels of subdivision as that used for scrapers and points. The retouched pieces, thinned pieces, truncated-faceted (with unretouched edges), battered pieces, burins, etc., were classified without consideration of overall shape.

<u>Bifacial Points.</u> This *class* includes bifacially retouched tools with no fewer than two retouched edges, meeting in, at least, one pointed tip which is sharp in plan and profile.

<u>Bifacial Scrapers.</u> This *class* includes bifacially retouched tools with the diversity of retouched edges, shapes, and combinations, but without any tip pointed in plan and profile. Unless otherwise noted, all bifacial retouch is plano-convex (see below).

Straight, Naturally Backed. This type has one retouched, straight edge opposite a naturally backed edge. Usually, this type includes a wide variety of shapes. While a far more detailed typology is possible, in this investigation, these bifacially retouched, single-edged backed pieces are not numerous. The one analogy is the Keilmesser type of the Central European Micoquian (Bosinski 1967).

Convex, Naturally Backed. The same as above, but with a convexly retouched edge. In the context of these two last types of bifacially retouched, single-edged scrapers, it is necessary to emphasize their usual morphological variability; not only between straight and convex shapes but also within these shapes. This means that the one-edged, bifacially retouched scrapers need more detailed morphological subdivision.

Semi-Crescent. These are bifacially retouched tools with one convex and one straight edge, conjoined at a distal tip and having a straight base.

Semi-Crescent, Truncated-Faceted. This is as above but the base is truncated-faceted.

Converging, Bi-Convex, Alternate. Bifacial scrapers of this type have two converging convex edges, meeting in a tip. Each edge is retouched in a plano-convex manner, but different sides were used for shaping and retouch.

<u>Tool Fragments.</u> As usual for any Paleolithic lithic collection, there are always some broken tools. There are different approaches for their classification. In this study we use the

following system: taking into consideration the presence of tools with more than one retouched edge (e.g., semi-rectangular, semi-trapezoidal, sub-triangular branches of side-scrapers and points) it is impossible to accurately recognize proximal and medial fragments of broken scrapers and points. Therefore, only sizable distal fragments were classified by type, to the level possible. Proximal and medial fragments of broken scrapers and points were defined as tool fragments; notches, denticulates, burins, etc. on broken blanks were classified by their typological elements.

ATTRIBUTE ANALYSIS ADOPTED HERE

Several meaningful attributes, important mainly for technological studies, are not reflected in the typological classification. All of these attributes were studied for each artifact, paralleling the typological criteria, to make possible large scale correlations of different morphological features and various dimensions. The attributes presented below are of two kinds: qualitative and quantitative. In spite of that, all of them are organized by the artifact category to which each relates.

Cores

Several attributes, not considered in the typology, were observed for cores: presence and number of supplementary platforms, the dimensions of the supplementary platforms, the dimensions of the main striking platform, as well as overall core measurements.

Main Platform refers to one which is relatively thick. It tends to be the largest and most prepared, as well as having the longest blanks struck from it.

Supplementary Platforms are different from the main platform both morphologically and technologically. The main morphological distinction for supplementary platforms is minimal "thickness." Usually, the angles of supplementary platforms are so sharp that it often looks like the edge of a bifacial tool. This is the first and common feature of all supplementary platforms. The second feature is also usual, but not so common, as the first: the absence of platform preparation on the undersurface. The supplementary removals are done directly from the lateral and/or distal extremes of the unmodified, cortical undersurface. The technological meaning of the supplementary platforms lies in the preparation of flaking surface convexity (Chabai and Sitlivy 1993). On the whole, cores in these assemblages quite often show lateral and distal placement of supplementary platforms.

Maximum Core Length. The distance between the main striking platform and distal end or opposed striking platform of the core. This is measured along the direction of removals. In the case of radial and discoidal cores, the maximum length is measured as the greatest diameter of the flaking surface.

Maximum Core Width. The maximum distance between core edges, perpendicular to maximum length.

Core Thickness. The thickness of a core at midpoint along the maximum length.

Width of Main Platform. The maximum width of the main striking platform, regardless of the platform preparation.

Main Platform Thickness. The maximum thickness of the platform, regardless of platform preparation. This measurement is not available for discoidal and radial cores.

Maximum Length of Scars off Main Platform. The maximum length of the longest scar on the main flaking surface.

Maximum Platform Width and Maximum Scar Length of Supplementary Platforms are measured in the same manner as for the main striking platform.

Condition of Core Flaking Surface. Three kinds of flaking surface condition were observed: *regular, overpassed* and *hinge-fractured.*

Platform Preparation. Several types of platform preparation and condition were observed:

Plain/Unfaceted. These are formed by a single removal which is more or less perpendicular to the plane of the flaking surface.

Lateral. These platforms are prepared by one or more removals which are transverse to the plane of the flaking surface (Crew 1976).

Multiple Faceted. This type includes platforms of different shapes: straight, convex, concave, as well as combinations of these. All of them are prepared by several removals perpendicular to the plane of flaking surface (see Bordes 1961a).

Lateral, Multiple Faceted. The same as above, but all removals are transverse to the plane of the flaking surface.

Blanks

A similar range of attributes was used for both blades and flakes.

Dorsal Scar Pattern. This refers to the scar patterns visible on the dorsal surface of blanks.

Lateral. One or a number of scars have been struck perpendicular to the axis of blank removal.

Radial. A number of scars, no fewer than three, come from no fewer than three different directions, all toward the center of a blank. Excluded are those where the scars are at right angles to each other.

Uni-Directional. One or more scars in the same direction as the axis of blank removal.

Uni-Directional-Crossed. The combination of a single or a number of scars along the blank axis and a single or a number of scars perpendicular to the blank axis.

Bi-Directional. A number of scars arranged along the blank axis. These scars originate from two different platforms opposite each other. Also, this type includes blanks with a single or a series of scars, which are simply derived from the distal end of the blank.

Bi-Directional-Crossed or *3-Directional.* This is as above, but with a single or a number of scars perpendicular to the blank axis, as well as the two sets along the blank axis.

Converging. This is when a number of scars are close to the blank axis, but are oriented so that they converge along the axis.

Crested. A single or several scars oriented perpendicular to the blank axis and originating from the center of the blank. This is the classic *lame à crête,* but other varieties can be classified as *pièces débordantes.* There is considerable variety in the detailed morphology, but this has not been studied here.

4-Directional. This type is very close to radial. At least four scars must be present on a dorsal surface. Each is about at right angles to the adjacent scars.

Covered by Cortex. More than 75% of the dorsal surface is covered by cortex.

Axis Attributes. Three attribute states for axis were distinguished: *on-axis, off-axis,* and *unknown.* This refers to whether the blank corresponds or not with the axis of the blow which detached it.

Shape Attributes. Ten different shapes were recognized. It is not necessary to described all of them, because their recognition is based on the approximate extrapolation of known geometrical shapes on blank morphology. The following blank shapes were distinguished: *ovoid, triangular, rectangular, trapezoidal, trapezoidal elongated, leaf-shaped, expanding, crescent, irregular,* and *unknown.*

Lateral Profile. The lateral profile of a blank refers the form of curvature when the ventral surface is placed against a flat plane, excluding the bulb of percussion.

Flat. The ventral surface is on a single, regular plane.

Incurvate Medial. The greatest distance between a flat plane and the ventral surface of blank lies along the blank mid-section.

Incurvate Distal. The greatest distance between a flat plane and the ventral surface of a blank lies near its distal extremity.

Convex. The ventral surface is convex, so that when resting on a flat surface, only the mid-section touches the surface.

Twisted. A blank is considered twisted when "there is a bending . . . both along the axis of removal and perpendicular to that axis. The twist may be in either direction" (Marks 1976: 373).

Irregular/Unknown. These are broken blanks or ones with profiles which do not fall into the defined types.

<u>Distal Profile.</u> This refers to the shape of the distal termination of the blank.

Feathering. The dorsal and ventral surfaces converge at a very acute angle.

Hinged. This type of distal extremity occurs when the ventral surface curves upward, onto the dorsal surface, such that the distal extremity is convex.

Blunt. The distal end of a blank does not feather and is not hinged. It may be, for instance, cortex or irregular.

Overpassed. The distal end includes part of the opposite end of the core. Usually, this results from the removal of a blank with pronounced distal incurvature.

<u>Cross-section at Midpoint.</u> This refers to the shape of the dorsal surface in relation to the lateral edges, viewed in cross-section, midway along the length of the blank. Also referred to as "profile at midpoint."

Flat. The plane of dorsal surface is parallel to the ventral surface. Usually, this type includes blanks where the dorsal surface is formed shaped by a single removal.

Triangular. The dorsal surface consists of two scars oblique to the ventral surface, forming a triangular cross-section. A number of specific configurations are possible, but this does not include any with a right angle between the ventral surface and one dorsal scar.

Trapezoidal. The cross-section is formed by the ventral surface and three or more dorsal scars, such that the shape is trapezoidal. When the intersection of the ventral surface and one dorsal scar is at a right angle, the piece is not classified here.

Lateral Steep. This includes both triangular and trapezoidal cross-sections where one angle between the ventral and dorsal surfaces is about 90 degrees. Usually, the lateral steep profiles appear to be a characteristic feature of crested debitage.

Crescent. This cross-section lacks defined planes, tending to have a continuously arched dorsal surface. This kind of profile is characteristic of primary blanks.

Irregular. A profile which does not conform to the defined types by being highly irregular or inconsistent.

<u>Platform Preparation.</u>

Cortex. The platform is covered by cortex, a naturally weathered, or otherwise unmodified surface.

Plain (Unfaceted). The platform consists of part of a single scar, which is perpendicular to the plane of percussion of the blank. This is the *lisse* type defined by F. Bordes (1961a).

Unfaceted, Lateral. As above, but the scar originated from a blow transverse to the plane of percussion of the blank.

Dihedral. The platform consists of two partial scars on different planes (Bordes 1961a).

Multiple Faceted. This platform exhibits more than two scars usually at different planes. These scars come from removals perpendicular to the plane of percussion.

Multiple Faceted, Lateral. This type of platform shows a series of narrow, parallel removals transverse to the plane of percussion.

Crushed. The platform surface is crushed to such an extent as to be unidentifiable.

Missing and Missing by Retouch. These types lack platforms.

Lipping. This refers to the configuration of the intersection between the striking platform and the ventral surface of a blank. In general, the softer the hammer and the more diffuse the blow, the less pronounced will be the éraillure scar and the bulb of percussion. In addition, when the blow is soft and diffuse, there will be a flange at the intersection of the platform and the ventral surface. Although it is impossible to predict with certainty these effects, assemblages largely produced with a soft hammer will exhibit high percentages of lipping, small to missing bulbs of percussion, and few and minor éraillure scars. There are three states in relation to lipping: *lipped, semi-lipped,* and *not lipped.* In the classic example of lipping, there is a clear flange between the platform and the ventral surface, there is no discernible bulb of percussion, and no éraillure scar. In the case of *semi-lipped*, the flange is present but there is a noticeable, although small, bulb of percussion and, only occasionally, a small éraillure scar. When the flange is missing, the piece is *not lipped.* The sizes of the bulbs of percussion and éraillure scars are variable.

Blank Measurements

Length. This is the distance between the point of percussion and distal end, which is measured along the axis of the blank. Therefore, it is not necessarily the maximum length of the blank.

Width. This is the maximum distance between the lateral edges, measured perpendicular to the axis of the blank.

Thickness. The thickness of blank at midpoint, along the axis of the blank.

Platform Width. The maximum distance between the two extreme lateral points of the platform surface.

Platform Height (Thickness). The maximum distance from a point where the platform meets the dorsal surface to a point where platform meets the ventral surface. This measurement is taken perpendicular to the platform width.

Tools

These refer to all blanks which appear to have purposeful modification on one or more edges.

Tool Shaping. Different methods of tool shaping were recognized. On the whole, each differs from the others by the peculiarities of edge shaping.

Unifacial. This refers to any type of retouch which originates on one surface of the blank. It may be obverse or inverse, but not bifacial or alternating. It occurs on blanks where the surfaces can be recognized as ventral and dorsal.

Plano-Convex, Bifacial. This is a method of bifacial tool production, recently referred to as "Kulna technique" (Boëda 1995). This method exhibits a sequence of operations which was first described by G. Bosinski (1967). First, relatively large flakes are removed to form a flat, ventral surface on a blank (flake, blade, pebble, or plaquette). Then, using this ventral surface as a striking platform, the dorsal surface was retouched by either scalar, stepped, or sub-parallel retouch or some combination of these. Usually, these tools are plano-convex in both transverse and longitudinal sections.

True Bifacial. This method of bifacial tool preparation uses a combination of obverse and inverse retouch on the same edge or edges. Usually, both the dorsal and ventral surfaces are heavily retouched and, in that way, these tools often show a bi-convex profile in both longitudinal and transverse sections.

Semi-Bifacial. A tool edge(s) is partly retouched by bifacial and partly by unifacial methods.

Placement of Retouch. In this study we recognize *Inverse, Obverse, Alternate, Alternating,* and *Bifacial* retouch. The definitions all follow V. N. Gladilin (1976) and A. E. Marks (1976). Alternate retouch refers to a blank with one edge obversely retouched and the other edge inversely retouched. Alternating retouch refers to one edge where inverse and obverse retouch alternate.

Types of Retouch. This study recognizes the following types: *Scalar, Sub-Parallel, Parallel, Stepped, Marginal,* and *Irregular* (Bordes 1961a; Gladilin 1976). Also, truncations and burin facets were defined using the traditional approach.

Thus, artifact descriptions are based on both the classification described in this chapter and the artifact attribute analysis. This does not mean, however, that the authors always mention the names of the hierarchically subdivided taxa, but this chapter defines what kinds of artifacts are meant under the such terms as "semi-rectangular scraper," "sub-crescent point," "straight bi-truncated-faceted denticulate," etc. It is also important to note that each artifact, whether tool or debitage, was studied using the attribute analysis. This approach has created a base for comparative studies of different taxa and attributes and their relationships, and will serve for subsequent detailed analyses of the Crimean Middle Paleolithic industries. Finally, it must be noted here that we have not presented here an exhaustive list of either branches or types. This is an open system of classification and can be expanded as required by the artifacts under study.

Chapter 4

STAROSELE: THE EARLY EXCAVATIONS AND UNANSWERED QUESTIONS

YURI E. DEMIDENKO

INTRODUCTION

Before describing the methods and results of the new excavations (1993-1995) at Starosele, it is obviously necessary to present the database which existed prior to the new excavations. Most of these data come from several articles and a final report (monograph), mainly by the site's first excavator, A. A. Formozov (1954, 1958), but by others, as well (Alexeyev 1954; Gerasimov 1954; Roginsky et al. 1954). The only excavations before ours were conducted between 1952 and 1956. Additional information is also available from the many published articles by archeologists and others referring to Starosele, its stratigraphy, its finds, and its place in the Middle Paleolithic systematics of Eastern Europe, and Crimea, in particular. Thus, there was quite a lot of information available before the new excavations but, in spite of this, all was not clear. Rather than present an exhaustive review of the previously published data, only the important points will be discussed here, in order that the reader may understand why, after so many years of inattention, the archeology of Starosele was revisited.

SITE LOCATION AND DISCOVERY

The site of Starosele is located in southwestern Crimea, within the Kanly-Dere, a side box canyon which runs north into the Bakchisaraiskaya Valley at Starosele village, now within the northern edge of Bakchisarai town (fig. 4-1). In 1952, Middle Paleolithic artifacts were discovered on a rock platform along the base of the cliffs on the eastern side of the canyon, 11-13 m above the canyon bottom, by N. P. Katsur, an associate of the Bakchisarai Museum (Kolosov, Stepanchuk, and Chabai 1993: 145; Chabai 1996: 116, but see Alexeeva 1997; Kris 1997). At the time of this discovery, a young archeologist from Moscow, A. A. Formozov, had just received permission from the Bakchisarai Museum to survey for Paleolithic sites around Bakchisarai and, as a professional archeologist, also was given the responsibility for excavations at the newly discovered sites (Formozov 1958: 5-6). Therefore, that same year, A. A. Formozov began excavations at Starosele.

FORMOZOV'S EXCAVATION OF STAROSELE (1952-1956)

Recognition of the Site and its Distribution

A. A. Formozov started to investigate the site in 1952, considering it a cave or rockshelter. He really never recognized the difference between the terms "cave" and "rockshelter," using them as synonyms when describing the site. In the following text, we will use only the term "rockshelter," because it is more appropriate, in terms of how Formozov understood and wrote about Starosele. First, A. A. Formozov considered the site (fig. 4-2) as being composed of a northern and a southern recess (in fact, he referred to them as caves). The northern recess looks like a real rockshelter, with a covered chamber ca. 15 m wide by ca. 5 m deep, while the southern recess is completely open to the sky, lacking any roof (fig. 4-3).

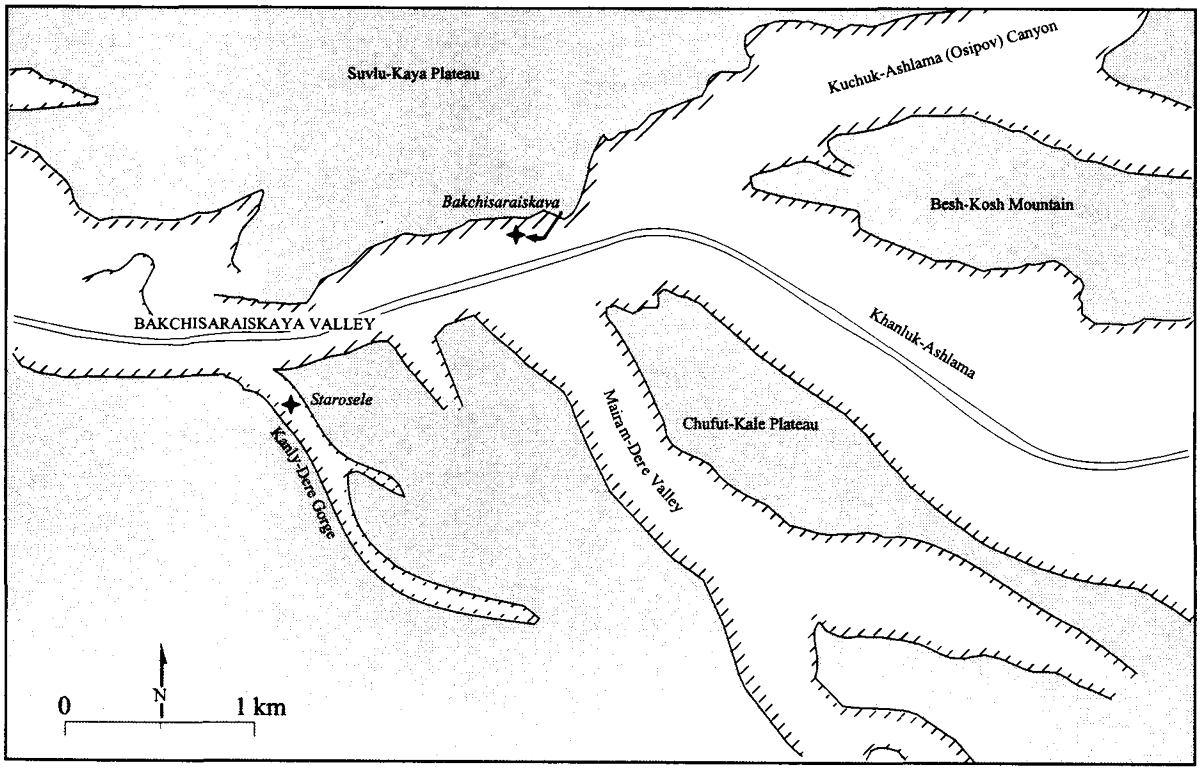


Fig. 4-1—Map of Bakchisaraiskaya Valley (redrawn from Formozov 1958: 13, pl. 5).

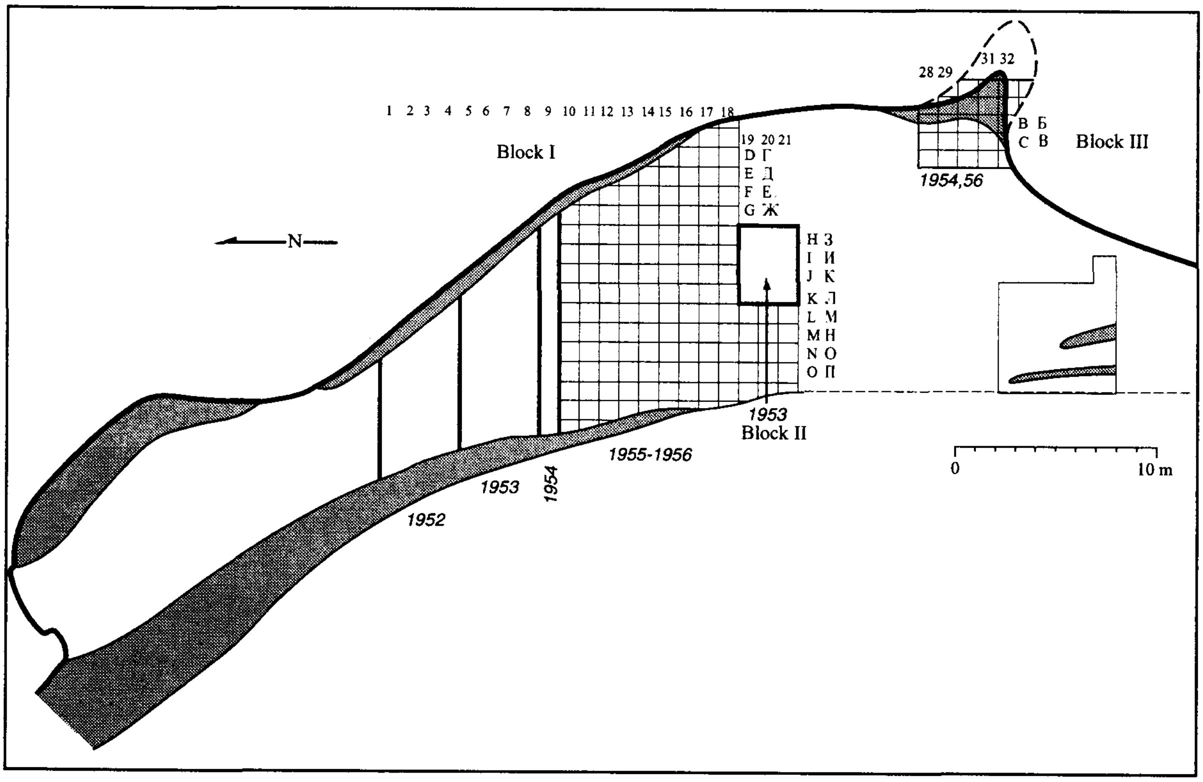


Fig. 4-2—Plan of Formozov's excavations at Starosele (Formozov 1958: 26, pl. 16).

Fig. 4-3—Photograph of Starosele. View is to the north, with rockshelter/northern recess in background.

During the 1952 field season, A. A. Formozov excavated a layer of very recent sheep dung and ash in the northern recess, but below that layer was only bedrock. Therefore, he thought that the Pleistocene deposits with the Middle Paleolithic artifacts had been swept out in post-Paleolithic, probably Medieval, times by local people who wanted blocks of limestone from the bedrock of the shelter (Formozov 1954: 13).

After this initial test, A. A. Formozov started excavations in the southern "recess," beginning at its northern edge and, finally, found Middle Paleolithic artifacts and faunal remains in situ in Pleistocene deposits. During four field seasons, A. A. Formozov believed that he was excavating the preserved, central part of the site. In 1956, however, he was forced to change this opinion when the geologist M. V. Muratov, based on morphological observations of the bedrock of the northern and southern recesses, told A. A. Formozov that the northern recess was very recent, surely post-Paleolithic in origin, and that during the Middle Paleolithic it was simply a cliff wall (Formozov 1958: 21). So, given this, the Middle Paleolithic site was situated only in the so-called southern recess.

The Pleistocene deposits of the southern recess were located on an Eocene limestone bedrock bench. The maximum width of this bench is about 16 m, east-west, and its length is about 40 m, north-south. Consequently, the total site area could have been about 400 m^2 (fig. 4-2). Traces of early twentieth century limestone quarrying were visible on the cliff wall. The presence of large limestone slabs found during the 1953-56 field seasons within the Pleistocene deposits allowed A. A. Formozov to conclude that the site had been inside a rockshelter and that its roof (overhang) had collapsed partly during the Middle Paleolithic and then was almost completely destroyed by local people beginning in the eighteenth century or even earlier (Formozov 1958: 21-24).

Process and Methods of Excavation

A. A. Formozov, after his test of the southern recess, began his excavations from the northern edge of the site and moved south during the 1952 and 1953 field seasons. In this manner, he excavated about 70 m2—lines 1 through 8 of his excavation block, as illustrated in 1958 (fig. 4-2). The Pleistocene deposits had a considerable slope from south to north and, in accordance with this slope, the thickness of the deposits increased toward the south. Thus, the deposits along line 1 were about 0.30-0.70 m thick, while the deposits along line 8 were about 2 m thick (Formozov 1958: figs. 25 and 26). At the end of the 1953 field season, A. A. Formozov decided to excavate a 2x2 m sondage (squares J and K/19-20) in a central portion of the southern recess, in order to check and to define the stratigraphy in a part of the site with deeper sediments. In the upper part of this test (0.7-0.9 m below the modern surface) in square J20, A. A. Formozov uncovered a child burial, discussed below.

Although the test pit was excavated only down to the middle of the deposits, A. A. Formozov used this to define a level of huge limestone slabs across different parts of the site. It started from lines 5-8 and continued to lines 19-21 of his excavations (fig. 4-2). This level of huge limestone slabs, which was thought to be the collapsed roof/overhang of the rockshelter, was to serve as a major stratigraphic marker for Formozov's site descriptions.

During the 1954 field season, A. A. Formozov excavated both the squares of line 9 and the test pit of 1953 completely down to bedrock and began excavations of a new block (Block III) in the south-eastern portion of the site (fig. 4-2).

The excavations of the 1952-1954 field seasons can be considered the first period of the work at Starosele, because excavation methods were changed quite radically during next two field seasons (1955-56). First, prior to 1955, A. A. Formozov's excavation methods were very unusual, even for their time, because he did not use even a grid system (Formozov 1954: fig. 4), have any datum point, or make excavation maps of the vertical and horizontal spatial distributions of artifacts. Perhaps, most surprisingly, he failed to excavate according to different stratigraphic layers or to correlate the recovered artifacts with them. Finally, not all his finds during the excavations were kept.

Owing to pressure from the head of the Crimean Paleolithic investigations, S. N. Bibikov, because of these "excavation methods" (Bibikov 1954), A. A. Formozov lost his official permission ("open list") to excavate Starosele. Dr. M. D. Gvozdover was given responsibility for excavations of the site during next two field seasons (Chabai 1996: 116-118).

Now, under the scientific and methodological control of Dr. M. D. Gvozdover, A. A. Formozov continued his excavations at Starosele. These excavations, during 1955-56, can be considered as the second period of excavations. At the beginning of the 1955 field season, the following methodological rules for excavations were initiated:

(1) A 1 m^2 grid system was established for the site and, accordingly, it was established that areas excavated from 1952 through 1954 were squares of lines 1 through 9 and 19 through 21 (fig. 4-2).

(2) A number of datum points were established, making possible accurate vertical controls, as well as the mapping of cultural stratigraphy and artifacts.

(3) All artifacts were kept, although only those animal bones thought to be identifiable were retained during excavations.

(4) Finally, it was decided that excavations would be carried out in four 50 cm thick arbitrary levels and that the artifacts and bone from each level would be kept separate. This was done because Middle Paleolithic artifact concentrations were found in several places, both above and below the level of the huge limestone slabs ("fallen roof").

Although the archeological levels were not separated according to different lithological horizons, nonetheless, such vertical subdivision of deposits during excavations could have permitted A. A. Formozov to get a sense of possible differences in both the natural stratigraphy and the vertical distribution of the Middle Paleolithic artifacts and bone in this site. Thus, the excavation methods were truly improved in comparison to those A. A. Formozov had used from 1952 through 1954.

During the 1955 field season, A. A. Formozov excavated the squares of lines 10-13 and, partly, squares of lines 14-16 (fig. 4-2). Only during this field season did he separate all finds by the four arbitrary 50 cm vertical levels. During the 1956 field season, A. A. Formozov decided that the upper two arbitrary levels should be lumped together, because there were not many artifacts in either of these levels. The lower two levels were also lumped together, because in Formozov's opinion they represented just one, quite thick cultural layer (Formozov 1958: 48). The level of huge limestone slabs ("fallen roof") served as the major stratigraphic marker between these newly recognized Middle Paleolithic cultural layers. During this last field season, A. A. Formozov excavated the squares of lines 17-18 and some squares of lines 14-16 and 19-21 (fig. 4-2). It must be noted that, even with the imposed improved excavation methodology, A. A. Formozov excavated about 140 m^2 of the site with a depth of deposits ranging from 2 to 4 m during last two field seasons. The speed of excavations was really incredible. Through such excavations, A. A. Formozov connected his excavation Blocks I and II and, accordingly, completely excavated the northern and central portions of the site (ca. 230 m^2). He also finished excavations of Block III (ca. 23 m^2).

At that point, A. A. Formozov finished his excavations at Starosele. The existing profiles along the southern end of the excavations were buried under 200 m^3 of backfill and limestone boulders. In this way, the site was closed by A. A. Formozov from possible "robber excavations." By the end of the 1956 field season, a total of 250 m^2 of Starosele had been excavated (fig. 4-2) (Formozov 1958: 25).

Stratigraphy

Formozov's description of the Starosele stratigraphy is very complicated and, in places, confusing. A few examples of Formozov's approach to understanding site stratigraphy will be given before his description itself, so that it may become comprehensible. Although A. A. Formozov had the help of professional geologists, Drs. V. V. Bogachev and M. V. Muratov, they did not work constantly at the site during the excavations. In fact, they made only occasional and short visits to the site. Moreover, the geologists did not write any specific geological, stratigraphic descriptions either for A. A. Formozov's article or monograph. Therefore, all stratigraphic descriptions were done by A. A. Formozov himself.

In his stratigraphic descriptions, A. A. Formozov sometimes mentions advice given by the geologists (e.g., Formozov 1958: 29), in some other cases he describes situations when he forced the geologists to accept his particular opinion (Formozov 1958: 42-43). Although there is a chapter in his monograph specifically devoted to the stratigraphy (Formozov 1958: 25-52), stratigraphic information is found throughout all other chapters of the book. Therefore, it is very difficult to understand the real stratigraphic situation of the site, while reading the monograph. Thus, in one case, there is a statement that

> . . . [the] great thickness of cave sediments is connected not to a long period of site occupation, but to the speed of accumulation in the cave area of clay sediments by flood streams. Under such conditions, a great thickness of deposits could be accumulated quite quickly, while there were not any changes in the site's flint industry for this time period. Thus, we can combine in one unit all finds from the Starosele site and consider them as practically contemporaneous. (Formozov 1958: 77, author's translation)

On the other hand, on another page of the book, can be found an absolutely different statement, to the effect that the site ". . . was occupied in the Mousterian epoch more or less continuously during quite long period of time" (Formozov 1958: 52, author's translation). This example of contradictory interpretations is not the only one concerning the stratigraphic descriptions and this, again, shows how hard it is to understand the actual site stratigraphy, as seen by A. A. Formozov. Nonetheless, we will present Formozov's original stratigraphic descriptions, because it shows what was believed by A. A. Formozov and others who used his work. Our descriptions of the stratigraphy, as seen in the new excavations, will demonstrate the problems inherent in the original work.

Since the excavations of 1953, A. A. Formozov recognized two main types of Pleistocene deposits at Starosele. The first is a kind of reddish clay, while the second is represented by angular limestone blocks. Aside from these two main types of deposits, A. A. Formozov also noted some levels of gravel, a level of huge limestone slabs ("fallen roof"), and rolled and unrolled rocks embedded in reddish clay deposits. It is clear that Formozov's reddish clay deposits included different types of clay, loam, and silts of different color, as well as gravel lenses. Combining all these different types of deposits under one term was done because he believed that all these deposits were "not of different age, do not cover one another and each turns into another in different site areas" (Formozov 1958: 29). Additionally, the geologists considered such deposits to belong to one geological unit (Formozov 1958: 29). The level of huge limestone slabs ("fallen roof") was considered a geological marker and as a catastrophic event which happened during the middle period of the accumulation of the site deposits. Also recognized were two steps of bedrock, forming the rockshelter's bench.

Observations of all these sediments allowed A. A. Formozov to build a sequence of sediment accumulation at the site (Formozov 1958: 43). In brief, it was as described below.

Alluvial deposits of clay and gravel accumulated on the lower bedrock step and on some lower areas of the upper bedrock step by periodic floods in the canyon bottom. Such floods rolled and washed in some limestone slabs in the lower clay deposits. On the other hand, on higher areas of the upper bedrock step, only fallen limestone slabs from the rockshelter's ceiling were accumulated, because floods did not reach these high areas of the rockshelter's bench. Some temporary streams, derived from the edge of plateau cliff above the south-eastern corner of the site, also affected the site (the area of excavation Block III) by running to the northern edge of the site and, therefore, destroying some of the original sediments in the northern site area. As noted above, the huge limestone slabs (the "fallen roof") fell down onto site sediments during a middle period of sediment accumulation. After the "fallen roof" level, clay sediments accumulated again by new stream action. At the same time, limestone slabs were accumulating from the rockshelter ceiling. This limestone slab accumulation on the highest areas of the site was falling straight onto the "fallen roof" level, while in the other areas of the site, it was falling onto the clay level which had been deposited by stream action.

In accordance with these stratigraphic observations, A. A. Formozov saw different stratigraphic sequences in different areas of the site, because of the interaction of flooding from the canyon, the streams from off the cliff plateau, and because the "fallen roof" level was not present across the whole excavated area (e.g., in squares of lines 1-5).

The site's northern area had no "fallen roof" level and clay deposits there had been destroyed by water action, leaving sediments of clays and gravels. The central site area was partly covered by the limestone slabs of the "fallen roof" and both above and below this level were clay deposits. The southern area had the most complicated stratigraphy where clay sediments lay on the "fallen roof" level of the limestone slabs, as well as below them. Sediment accumulation stopped in post-Mousterian times, when the canyon bottom became deeper and new floods could not reach the rockshelter's platform and its sediments.

This stratigraphic description was based on the strong assumption that site deposits were accumulated quite quickly and that the differences in stratigraphy meant almost nothing for possible cultural sub-divisions at the site (Formozov 1958: 77).

The description of the sedimentary history of Starosele left many questions unanswered and seems to be inaccurate in some ways. First, even as described, the 4 m deep deposits of the southern excavated area are certainly characteristic of several periods of accumulation, with a clear break in the middle represented by the "fallen roof" level of huge limestone slabs. Second, the reported the occurrence of 13 intact fireplaces below and two above the "fallen roof" level (Formozov 1958: 51, fig. 34), the fresh, unrolled condition of most flint artifacts, and the excellent faunal preservation, as reported by Formozov, all indicate that not all the so-called "clay sediments" were accumulated by strong floods. Third, from Formozov's description of the gravel sediment accumulations, their origins are not clear; in some cases, they appear to have been deposited by floods (actual gravels) but, in other cases, they seem to be small, limestone fragments exfoliated from the cliff face. Fourth, the position of the rolled limestone boulders in the sediments is not clear—did they occur throughout all sediments or just in some particular stratigraphic positions? The answers to these two last questions are crucially important for the understanding of the overall sediment accumulation.

Even based on Formozov's descriptions, it is obvious that the Starosele stratigraphy is very complex, and does not represent one episode of rapid sediment accumulation. Given the some 12,000 flint artifacts, about 60,000 identifiable animal bones, and the fifteen fireplaces in very different stratigraphic positions within the site deposits (Formozov 1958: figs. 26-28), a greater consideration of the rate and manner of sediment accumulation was certainly warranted.

Human Remains

As is abundantly clear from A. A. Formozov's monograph (1958), the discovery of the "Starosele child" during the 1953 field season greatly influenced his opinions about the relative dating of the Starosele deposits within the Middle Paleolithic and, accordingly, of the flint materials found therein. Given the importance of the child burial both to Formozov and to later workers, the details of its discovery and the numerous interpretations arising from it will be described in Chapter 6. Here, only its stratigraphic position and the attempts to confirm it will be presented.

On 24 September 1953, a skeleton of a child was found at a depth of ca. 0.7-0.9 m below surface, in square J20 of a 4 m^2 sondage (squares J/K-19/20) (Formozov 1954, 1958: 61-75; Marks et al. 1997). Because of the potential importance of the find, excavations were halted and a commission was sent to evaluate the situation of the discovery. The majority felt that the burial was in situ and, therefore, was Middle Paleolithic (Roginsky et al. 1954).

The lack of unanimity regarding its association with the Middle Paleolithic deposits, as well as its unclear phylogenetic status, resulted in putting Starosele into the western scientific literature more than any other Crimean Middle Paleolithic site.

While a number of experimental systems were tried to date the sediments and the burial (see Chapter 6), there were the normal attempts using geological data to establish the age of the Middle Paleolithic occupation, not merely to date the burial. First, geologist V. V. Bogachev proposed a Riss Glacial period for the human occupation at the site (Formozov 1954: 15). The accepted decision, however, was made by another geologist, M. V. Muratov, who dated the bedrock sculpting at the site to Rissian times and the reddish clay deposits above bedrock to the Last Interglacial (Muratov 1961: 355). Here we should note that until the late 1960s, the predominant opinion among Soviet archeologists for the chronological placement of the Paleolithic followed that of the prominent geologist and paleontologist V. I. Gromov, who established the border between the Mousterian and the Upper Paleolithic periods as occurring during Rissian times (Gromov 1948). Therefore, a determination of a Riss/Würm age for the Middle Paleolithic occupation at Starosele site by M. V. Muratov was considered in the 1950s to be a very late Mousterian. This geological date for the site was fully accepted by A. A. Formozov, because it was consistent with his view of a late Mousterian age for the site (Formozov 1958: 45-47).

Fauna

The faunal sample obtained during the five field seasons of Formozov's excavations was incredibly rich. In spite of the fact that A. A. Formozov kept only bones considered identifiable by the paleontologists V. I. Gromov and N. K. Vereshchagin, and all other bones were mainly discarded during excavations, initially there were reported to be 58,909 bones from 287 individuals of *Equus hydruntinus* in a faunal sample of 59,845 bones from 379 individuals of 20 different species (Formozov 1958: 53). Later, however, a modified list was presented which lowered the number of identifiable bones to 18,368 but did not change the dominance of the *Equus hydruntinus* (Vereshchagin and Baryshnikov 1980: 39). It also should be noted here that all animal bones from every part of the site, disregarding their horizontal and vertical provenience, were combined into one group, and were analyzed and published as a single unit. Thus, the fauna was considered as originating from one Middle Paleolithic archeological level. The noted great predominance of *Equus hydruntinus* among the identified faunal remains led A. A. Formozov to a strong assumption that they were evidence for a very specialized hunting strategy during late Mousterian times (Formozov 1958: 55-58; Vereshchagin 1967).

Flint Industry

As mentioned above, A. A. Formozov considered all the Middle Paleolithic finds "as practically contemporaneous," without any significant variability, and, therefore, combined them together, describing them as a single assemblage. At the same time, he especially noted that the Middle Paleolithic flints below the "fallen roof" level were much more numerous than those above that "stratigraphic marker." The decisions concerning the Mousterian age of the "Starosele child," the skeleton's "transitional" morphological features, which should have corresponded to a late Mousterian industry, the subsequent geological and other dates of the Starosele sediments, all obviously forced A. A. Formozov to look for very late Mousterian characteristics in the flint assemblage and, not surprisingly, he found them. In particular, he defined fifteen "evolved Mousterian" and "Upper Paleolithic" features in the flint assemblage. They are the following: (1) thin bifacial tools, (2) secondary treatment of bifacial tools by parallel flaking, (3) the presence of projectile points, (4) the presence of prismatic cores, (5) a number of blades and blade-flakes, (6) thin pieces of debitage, (7) a number of thin scrapers and knives, (8) the presence of tools resembling Upper Paleolithic retouched blades, (9) tools similar to end-scrapers, (10) a number of narrow points, (11) some asymmetric points similar to Châtelperronian ones, (12) a number of tools with "perfect" retouch, (13) the presence of burins, (14) the presence of tools like *pièces esquillées*, and (15) a great variety of tool types for a Mousterian period (Formozov 1958: 106-107).

Careful reading of Formozov's work and the artifact illustrations surely allow most archeologists to conclude that the so-called "Upper Paleolithic" tool types are represented by only single, mainly atypical examples. Also, the technologically "Upper Paleolithic" traits, as well as the so-called "evolved Mousterian" techno-typological features, might well be quite common characteristics of any Middle Paleolithic industry, while others may relate to specific, on-site reduction processes, unrelated to time or developmental stage. Quite apart from the possible meaning of the attributes he thought significant, the lumping of all the artifacts, regardless of their stratigraphic position, made it impossible to judge just which attributes really coexisted.

The general characteristics of the flint assemblage (12,023 flint artifacts, including 121 cores, 734 complete and 373 broken tools) are the following: characteristic primary reduction processes produced both radial and parallel cores. For the tool-kit, it is worth noting that, along with a predominance of simple scraper types, there were a number of unifacially convergent tools, as well as bifacial and partly bifacial tools (Formozov 1958: 76-110). This prominent bifacial typological component additionally allowed A. A. Formozov to consider Starosele as belonging with those Mousterian industries "with a bifacial tool tradition."

Bone Implements

Aside from the flint artifacts, M. D. Gvozdover also recognized about 250 bone pieces with some marks (Formozov 1958: 105-106; Gvozdover and Formozov 1960). These bones were subdivided by M. D. Gvozdover into two groups: the first contained bones with cut marks—traces of cutting meat from the bones. Such pieces, of course, were not defined as tools. The second group, however, was represented by typical bone retouchers for secondary flint tool treatment (retouching). Of course, these bone pieces were defined as real tools but were not intentionally prepared or shaped. This type of bone tool was already known for the Middle Paleolithic of Crimea, since its first recognition in the materials from Kiik-Koba (Bonch-Osmolowski 1940).

CONCLUSIONS ON FORMOZOV'S EXCAVATIONS AND THEIR RESULTS

In sum, from 1952 through 1956, excavations at Starosele uncovered rich Middle Paleolithic remains with numerous flint and bone artifacts, as well as faunal material, some features (15 fireplaces), and even human remains. These came from deposits over ca. 250 m^2 in area, with depths ranging from 0.3 m to 4 m in thickness. The total excavations approached 250 m^3. Unfortunately, during his excavations, A. A. Formozov paid little to no attention to the interrelationship between natural and cultural vertical and horizontal stratigraphies. Therefore, his conclusions concerning stratigraphy and the age of the site were based on the assumption of rapid sediment accumulation, which never seemed very convincing. In addition, the combination of all Middle Paleolithic artifacts and faunal material into one unit, as if excavated from a single cultural level, never seemed justified, either. There were also some problems with the "Starosele child" because of very different dates and its many distinct modern morphological features. Thus, the very intensive and large scale excavations of Starosele during 1950s left many unanswered questions with its very contradictory data, in spite of Formozov's detailed monograph (1958).

ATTEMPTS TO UNDERSTAND STAROSELE AFTER FORMOZOV'S EXCAVATIONS

It should to be noted that even during Formozov's excavations at Starosele (Bibikov 1954), as well as after them, there was a wide range of opinions among Soviet archeologists involved in Middle Paleolithic investigations in Eastern Europe about Starosele. Many felt that because of Formozov's excavation methods, his interpretations of the site stratigraphy and the Mousterian assemblage, the site and its materials needed some additional evaluation (e.g., Grigoriev 1968: 125-126; Gladilin 1971: 25-26; Kolosov 1972: 125-126; Lazukov et al. 1981; Kolosov, Stepanchuk, and Chabai 1993: 145-151). At the same time, such a reevaluation could be done only using Formozov's data and materials because new excavations were not then possible. Some attempts at reevaluation were undertaken by a number of scholars, using what information and material was available.

Establishing the Age of Starosele

In the mid-1960s, utilizing both geological and paleontological data simultaneously, two different specialists proposed later dates for the upper Starosele sediments and their cultural materials than had previously been proposed.

Geologist I. K. Ivanova (1965) made the suggestion, reinterpreting Muratov's description of the Starosele stratigraphy, that Paleolithic man first occupied the site at the end of Last Interglacial and then, after the period of the "fallen roof," continued to stay there during the Last Glacial. According to Ivanova, the sediments below the "fallen roof" accumulated by alluviation, while the sediments above the "fallen roof" had a different origin. The reported presence of mammoth, woolly rhinoceros, and arctic fox in the faunal sample also supported a Last Glacial Age, at least for part of the site. More precise dating was felt to be impossible, given Formozov's data (Ivanova 1965: 106, 1983: 26-28).

Richard Klein also suggested that the faunal materials ". . . indicate a Last Glacial (rather than Last Interglacial) age for the site. Particularly indicative are the presence of reindeer and arctic fox" (Klein 1965: 48).

After these reinterpretations of the dating of Starosele, this general Würm date was accepted by all specialists who studied the Middle Paleolithic of Crimea and Eastern Europe. Of course, it was only somewhat earlier in the decade that the Mousterian of Western Europe had been defined as an early Würm complex (Bordes 1961).

Much later, V. P. Chabai, using Ivanova's interpretation, a careful reading of A. A. Formozov's volume (1958), as well as utilizing as much as possible the published site profiles, also came to the conclusion that only the lower site sediments with rolled limestone boulders were deposited by alluvial processes (Kolosov, Stepanchuk, and Chabai 1993: 148-149).

A quite original sedimentologic-based interpretation of Starosele was proposed by paleontologist N. K. Vereshchagin. In his opinion, a Mousterian site was initially situated at the cliff edge, on the plateau, and then was washed down, over the cliff into the "rockshelter" during seasonal rains. Therefore, the site's Mousterian materials were not in situ, at all (Vereshchagin 1961: 383; Vereshchagin and Baryshnikov 1980: 33-35; but contra see Chabai in Kolosov, Stepanchuk, and Chabai 1993: 149-150).

Attribution of the Starosele Industry and Question of the Multi-layer Character of the Occupations

After Formozov's description of the Starosele Middle Paleolithic industry, a number of archeologists tried to place it into a specific industrial facies. We will only note the main attempts.

F. C. Howell, who was very impressed by the child skeleton at Starosele, following Formozov's published data, included the artifact assemblage along with other Crimean Middle Paleolithic assemblages (Kiik-Koba, upper layer and Chokurcha I) as having Charentian characteristics (Howell 1959: 38). In doing so, it was the first attempt to place the Starosele materials into the defined Western European Mousterian type industries.

A similar definition, but after personal observation of the lithic collections in Moscow, was proposed by R. Klein (1965, 1969). He also emphasized that the Starosele assemblage resembled F. Bordes' Charentian Mousterian yet, at the same time, had some peculiar typological features which showed real differences from the French Charentian assemblages. It is interesting to note here that both these American scholars paid little attention to the presence of bifacial tools at Starosele. For instance, Klein viewed what Formozov called miniature bifaces as Quina-type bifacial scrapers or as bifacial foliates (Klein 1965, 1969). By placing these tools within the Bordian type list and emphasizing F. Bordes' tool frequency graphs, the Starosele material did, indeed, seem most similar to the Charentian Mousterian, compared to the other French Mousterian industries.

Then, we should take note of V. N. Gladilin's definition of the Starosele flint industry. His conclusions were based on his personal observation of Starosele lithic collections from Formozov's excavations stored in Moscow and Leningrad. Initially, Gladilin (1966) recognized it as a "Levallois-Mousterian of Acheulian tradition." To arrive at such a definition, V. N. Gladilin used the presence of a number of debitage pieces with prepared butts as evidence for Levallois flakes and blades, as well as viewing the bifacial tools as indicative of an Acheulian tradition. As is clearly seen from this Starosele typological definition, V. N. Gladilin used a "wide" definition of Levallois technique, similar to that used by F. Bordes for his industrial subdivisions.

In the mid-1970s, however, V. N. Gladilin developed his own systematics for the study and classification of Middle Paleolithic industries of the Russian Plain and Crimea (Gladilin 1976, 1985). In this new classification, the Starosele assemblage was included as a separate type within the Eastern Micoquian group of industries. Because Gladilin's characterization of the Starosele material was the most specific until the early 1990s, it is useful to present it here. In brief, the Starosele assemblage had the following significant features (Gladilin 1976: 98):

(1) There were about equal proportions of radial and parallel cores and only a few classic Levallois radial ones.

(2) Levallois flakes (classical, with radial scar patterns) and points were very rare.

(3) The main technological indices were IF = ca. 35, Ilam<15.

(4) More than 40% of the debitage had unidirectional parallel dorsal scar patterns.

(5) Bifacial tools accounted for ca. 10% of all tools.

(6) Denticulates were not numerous.

(7) There were a lot of sidescrapers and points.

(8) Aside from numerous simple, well-known tool types, there were newly defined types, such as unifacial crescent and semi-crescent scrapers and points, as well as bifacial ones with thinned ventral surfaces, amygdaloid bifacial points, unifacial laurel leaf and partly bifacial points, and rectangular and sub-rectangular unifacial scrapers. There were also a number of leaf "projectile" points, both unifacially and bifacially shaped laurel and willow forms.

(9) Notches and Upper Paleolithic tool types were quite rare.

During his studies, V. N. Gladilin, using the labels on the flints to separate artifacts from the 1955-56 excavations according to Formozov's two horizons (above and below "fallen roof" level of huge limestone slabs), was able to see some techno-typological differences between these two horizons but, unfortunately, V. N. Gladilin did not pay much attention to these differences at that time and, therefore, he combined all data and presented his characteristics of the industry for all flints as a single unit. Along with this, V. N. Gladilin always considered Starosele to have two Middle Paleolithic cultural levels and expressed the opinion that more careful techno-typological analysis of the industry, according to the two levels, would be very desirable (Gladilin 1976: 97-98).

V. N. Gladilin was not alone in seeing the typological characteristics of the Starosele material as a kind of Eastern Micoquian. This opinion, based on Formozov's published data, was also independently expressed by several more archeologists (e.g., Bosinski 1967; Mania and Toepfer 1973; Gábori 1976; Allsworth-Jones 1986). Moreover, based on the Starosele artifact illustrations published by A. A. Formozov (1958), a special Micoquian knife-side-scraper, of Starosele type, was defined (Ginter and Kozlowski 1969: 51).

The discovery in the 1980s of three new Middle Paleolithic sites (Kabazi II, Kabazi V, and GABO) not far from Starosele and containing some assemblages similar to that of Starosele, led to another reconsideration of the Starosele materials.

V. P. Chabai, as part of his work toward his dissertation, "The Early Paleolithic of the south-western Crimea," was advised by V. N. Gladilin to study the Starosele materials, especially to define differences between the samples from above and below the "fallen roof" level. This material, from Formozov's 1955-56 excavations, was stored in Moscow. In the late 1980s, Chabai's observations of the collections from above ("cultural level 1") and below ("cultural level 2") the "fallen roof" level allowed him to define typological similarities of these two collections. His techno-typological characteristics of these two collections agreed with Gladilin's characteristics, with only one great exception. Chabai saw virtually no Levallois radial cores in "level 1," while such cores were present, although rare, in "level 2," along with non-Levallois parallel ones. In addition, he specially noted, in both levels, a great number of multi-sided, mainly convergent, unifacial tools, including quite numerous points, often with thinned ventral surfaces, which are not typical in Eastern Micoquian industries. These typological features allowed V. P. Chabai to exclude Starosele from the Eastern Micoquian Middle Paleolithic industrial group represented by Rikhta and Antonowka, and to define it as a special, separate Crimean Middle Paleolithic industry with bifacial tools. The predominance of non-Levallois, parallel cores in both "levels" of Starosele also allowed V. P.

Chabai to consider the materials from Starosele as a technologically late phase of the Starosele type industry (Chabai 1991; Kolosov, Stepanchuk, and Chabai 1993: 133-134, 145-155).

The leading archeologist of Crimean Paleolithic investigations of the 1960s-1980s, Yu. G. Kolosov, also expressed some ideas on Starosele and its Middle Paleolithic industry. First, he was in complete agreement that there were at least two, and maybe more, Middle Paleolithic cultural levels and only Formozov's excavation methods prohibited recognition of them and their characteristics (Kolosov 1972: 125-126). Moreover, Yu. G. Kolosov proposed that one of the Starosele levels might represent an Eastern Micoquian industry of Ak-Kaya type, following his opinion of the connections between bifacial tools and mammoth remains in the Crimean Middle Paleolithic (Kolosov 1986: 117).

The last significant contribution toward an industrial attribution of the Starosele industry within the Crimean Middle Paleolithic was proposed by A. I. Yevtushenko (1995). Using Chabai's classification of lithics from Formozov's excavations, some preliminary observations of the lithics from Level 1 of the 1993 excavations, as well as some similar flint assemblages from Kabazi II and Kabazi V, he suggested his own industrial interpretation of the Starosele industry. Following Chabai's notion of the marked significance for convergent, unifacial tools, he proposed that the Starosele industry should be viewed as a kind of amalgamation of both Micoquian and Charentian industries (Yevtushenko 1995).

CONCLUSIONS

The data available from Formozov's excavations at Starosele and their publication did not permit subsequent attempts at understanding the site and its materials to be very successful. While ideas abounded, no one was very sure of their interpretations, because of the quite poor and unsystematic original manner in which Formozov excavated and recorded his finds.

The following main unanswered questions, among many, seemed to us to be the most important which could be resolved by additional excavations:

(1) What was the real nature of the site stratigraphy and how did it originate?

(2) What were the actual vertical and horizontal distributions of faunal and artifactual materials and would they reflect occupational continuity?

(3) Was Formozov's description of the artifacts, lumped together, an accurate reflection of the assemblages from different lithological layers?

(4) How did Starosele date; was sediment accumulation really so rapid and, if so, when did it take place?

Although questions had been raised about the association between the Starosele child and the Middle Paleolithic artifacts, it seemed unlikely that any new excavations would shed light on this problem. It was quite to our surprise when our excavations did, in fact, help solve this problem and this is discussed in detail in Chapter 6.

As already noted in the Preface of this volume, new investigations of the Crimean Middle Paleolithic were strongly connected with the need for new excavations at Starosele. The absence of detailed new data on this site would have made it impossible to develop and justify any serious new ideas about the Starosele type industry, since the data on the eponymous site were so contradictory and unclear. It was an old idea to undertake new excavations at Starosele (e.g., Kolosov 1972: 126) but it was only realized by the Joint Ukrainian-American project during the 1993-1995 field seasons of excavations and, then, not without some conflict (Kohl 1996, with comments).

Chapter 5

STAROSELE: THE 1993-95 EXCAVATIONS

A. E. MARKS, YU. E. DEMIDENKO, K. MONIGAL, and V. I. USIK
(with a contribution by C. R. FERRING)

INTRODUCTION

Renewing field research at a previously excavated site has its advantages and its disadvantages; Starosele had more than its share of both. As described in detail in the previous chapter, Starosele saw extensive excavations during the mid-1950s, as well as the publication of a detailed monograph on the results (Formozov 1958). Thus, renewed excavations might not have been warranted except that absolute dates were lacking and the original work posed as many questions as it seemingly answered. When the idea of renewing work at Starosele arose, it was based essentially on our desire to obtain samples for a range of absolute dating methods which were not yet developed at the time of the original excavations and which were to be used at other Middle Paleolithic sites in the Western Crimea. Since Starosele was the type-site for one of the two lithic industries recognized in the Western Crimea (Kolosov, Stepanchuk, and Chabai 1993), its absolute dating was vital.

Once Starosele was included in the overall project, it became necessary to review Formozov's (1958) monograph in detail, in order to get some idea of how many samples might be needed. A close reading of the monograph and related publications (e.g., Formozov 1954), however, raised additional questions, discussed in the previous chapter, which could only be answered, if at all, by a full range of studies of newly acquired samples—geological, zoological, and artifactual. Only with these studies would even the technically best of absolute dates be meaningful archeologically.

While it was not expected that all the questions raised by Formozov's report could be resolved, particularly the unclear association between the Starosele child and the Mousterian occupation, it was felt that, given the significant depth of deposits, a number of new insights could be gained through careful but spatially limited excavations. (In this regard, since Starosele was universally recognized as an important site, the archeological authorities in both Kiev and Simferopol requested that we excavate as restricted an area as possible in acquiring our samples.)

Aside from our primary goal of obtaining samples from well defined stratigraphic contexts for absolute dating, our other goals, based on the unanswered questions in Formozov's work, were as follows: (1) to reconstruct the geomorphic and paleoenvironmental history of the site, through detailed description and sampling of the various lithological layers for sediment, pollen, microfauna, and mollusks, particularly to ascertain whether or not this site was a collapsed cave and, if so, under what climatic conditions it collapsed; (2) to define the history of artifact deposition throughout the sediments to establish whether or not their distribution resulted from continuous or discontinuous occupations; (3) to sample the artifacts from different lithological units to establish whether or not they belonged to the same or different techno-typological groups; and, (4) to acquire sufficient faunal samples to make possible a reconstruction of season(s) of the year of its occupation in each lithological unit, to elucidate the taphonomic patterns of bone aggradation throughout the deposits, as well as to verify whether the reported hunting of a single species was characteristic of the deposits, as a whole, or whether it represented only a fauna-rich sub-set of the deposits.

Obviously, as we became more familiar with the site from actual excavations, our goals shifted somewhat to meet the limitations and potentials of the site itself. Yet, one of the advantages provided by the previous excavations lay in the very fact that Formozov proposed specific interpretations of his data and provided both his reasoning for these conclusions and the data he used to reach them. Thus, we knew what to look for in our work; what we should expect to find to confirm or reject Formozov's results. We did not choose Starosele as a vehicle to prove Formozov wrong; rather, it was chosen, aside from the need for absolute dates, because Formozov's conclusions indicated that Starosele was truly an interesting site and more recent work had proclaimed it the type-site of the Staroselian industry (Kolosov, Stepanchuk, and Chabai 1993).

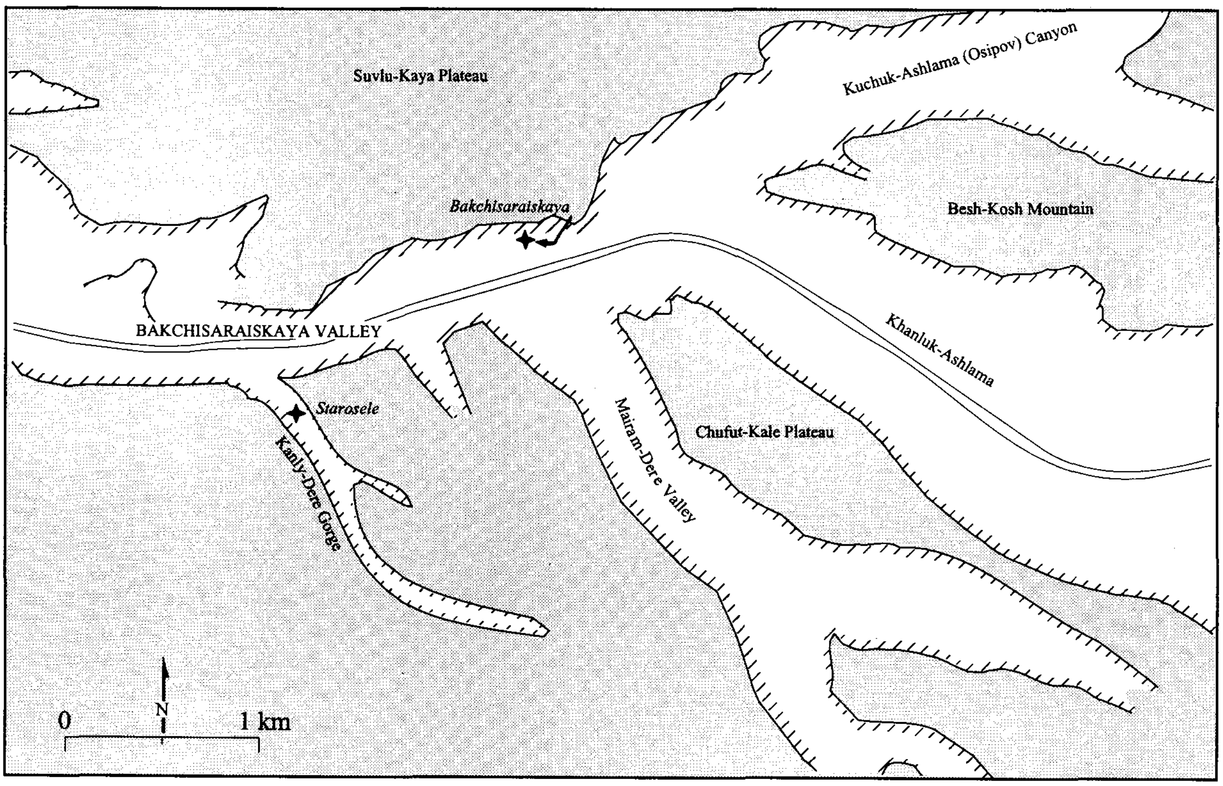


Fig. 5-1—Map of Bakchisarai and neighboring valleys (redrawn from Formozov 1958: 13, pl. 5).

Among the advantages provided us by Formozov's previous work was an established grid system and permanently fixed elevation markers on the wall of the cliff behind the site. These allowed us to adopt his grid and, in doing so, to mesh our horizontal and vertical controls with his. An additional advantage in renewing work at Starosele was that Formozov had carefully reburied his open, 4 meter-deep profiles with some 200 cubic meters of fill. While removing it took three full days (some 27 man-days) of work at the beginning of the 1993 field season, the intact profiles presented us at the very beginning of our work with a clear, intact view of the whole 4 m depth of deposits. Since part of these profiles ran along the deepest exposure of deposits excavated by Formozov, they provided us with an immediate access to all the lithological units and their stratigraphic relationships, from bedrock to the surface. This not only permitted us a picture of what was to come in our excavations but also forced us to confront, early in the excavations, the relationship between the extant sediments and

Fig. 5-2—Photo of cliff above Starosele; site is in foreground, the small cave visible to the right is the result of erosion from the fracture-controlled spillway visible just above it.

Formozov's renderings (1958: 40-41, figs. 27 and 28) and understandings of them (1958: 43), recently restated by Gvozdover et al. (1996).

Among the disadvantages of renewing excavations at Starosele was that Formozov had excavated an area of 250 m^2 to an average depth of 1 m; that is, some 250 m^3 of deposits were removed from surface to bedrock. While, according to his maps, he had left some 150 m^2 unexcavated, this was not really the case. His own map (Formozov 1958: 26, fig. 16) shows that bedrock was very close to the surface in the southernmost portion of the site, while even a quick examination of the surface showed that the western margin of the "site area" was markedly eroded. Thus, we estimated that significant intact, culture-bearing sediments covered no more than about 100 m^2, of which we excavated 38 m^2. (An additional 5 m^2 of in situ deposits outside the artifact bearing sediments were excavated to provide geological information.) Quite obviously, in order to leave as much intact as possible, we were not able to excavate sufficient areas to make possible truly meaningful analyses of the horizontal spatial patterning of either artifacts or bones.

Given the spatially different artifact distributions in different lithological units, it is unlikely that the remaining, unexcavated area will contain significant numbers of artifacts from all occupations. In fact, this variable horizontal artifact distribution was fully recognized by Formozov: one of the richest areas of artifact distribution in Formozov's excavations (1958: 51, fig. 34) had essentially stopped before the southern end of his excavations and its disappearance toward the south was one of the reasons Formozov ended his work at Starosele (Formozov 1958: 48, 52). Although we recovered a small number of artifacts from what we think was a comparable level in our excavations (Level 4), we did not get a reasonable sample.

In spite of these uncertainties and limitations, the excavations at Starosele provided us with a good range of data, both environmental and cultural. In this chapter, we will present our excavation strategies and methodologies, the geological and archeological stratigraphic sequences, and how we interpret their relationships. While mention will be made of preliminary faunal studies, the detailed reports of these studies will be presented in the next volume of reports. The absolute dates reported here are discussed in detail in Chapters 13 and 14, while Chapter 6 details our recovery of human remains and how they impact on the question of the dating and phylogenetic status of the Starosele child.

SITE SITUATION AND STRATIGRAPHY (by C. R. Ferring)

Site Situation

The site of Starosele is located on the east side of the narrow Kanly Dere Gorge which is cut into Eocene limestones by a small headwaters tributary of the Churuksu River (fig. 5-1). This gorge is one of several northwest-trending drainages that appear to be fault-controlled. The site is situated on a bedrock bench that occurs discontinuously along the gorge, 11-13 meters above the bedrock channel base. This bench formed on a resistant, chert-bearing limestone that is overlain by a softer limestone. The latter is weathered into a shelter that expands in depth north from the excavated area and which formed in recent times (Formozov 1958: 21). Above the excavation area (fig. 5-2), however, the vertical gorge wall is maintained by exfoliation of tall, thin slabs of bedrock. None of the sediments in the excavation area indicate that the deposits formed in a rockshelter.

A fracture-controlled spillway above the southern end of the excavation area (fig. 5-2), conveys surface runoff from the gorge rim to the canyon below. During site occupations, colluvium, including weathered limestone and eroded *terra rosa* soil matrix, was probably partly transported across the same spillway into the site area and partly from other spillways

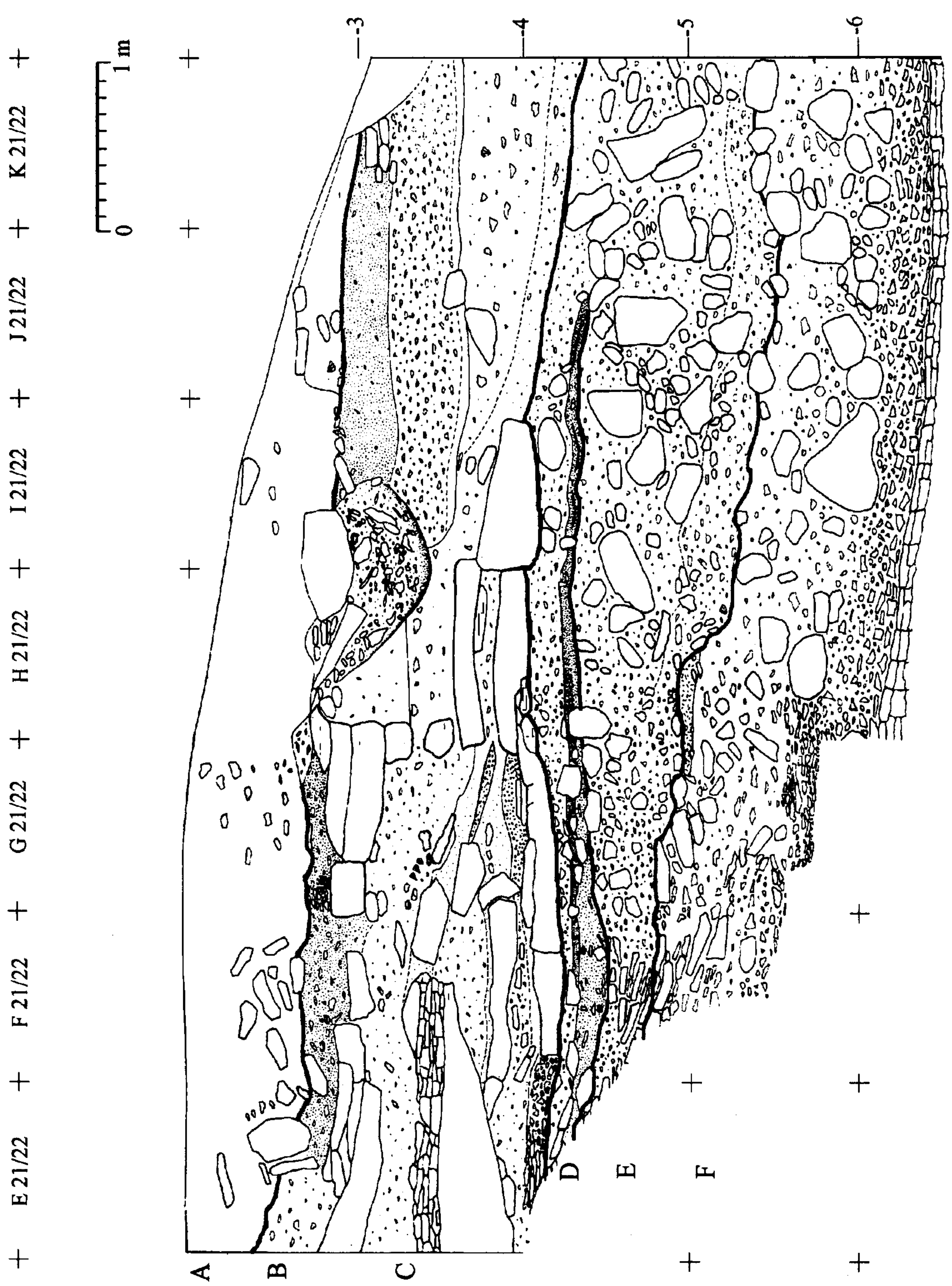


Fig. 5-3—Starosele, east-west profile of line 21/22 E-K. Erosional channel is visible in squares H/I 22/22, Stratum B.

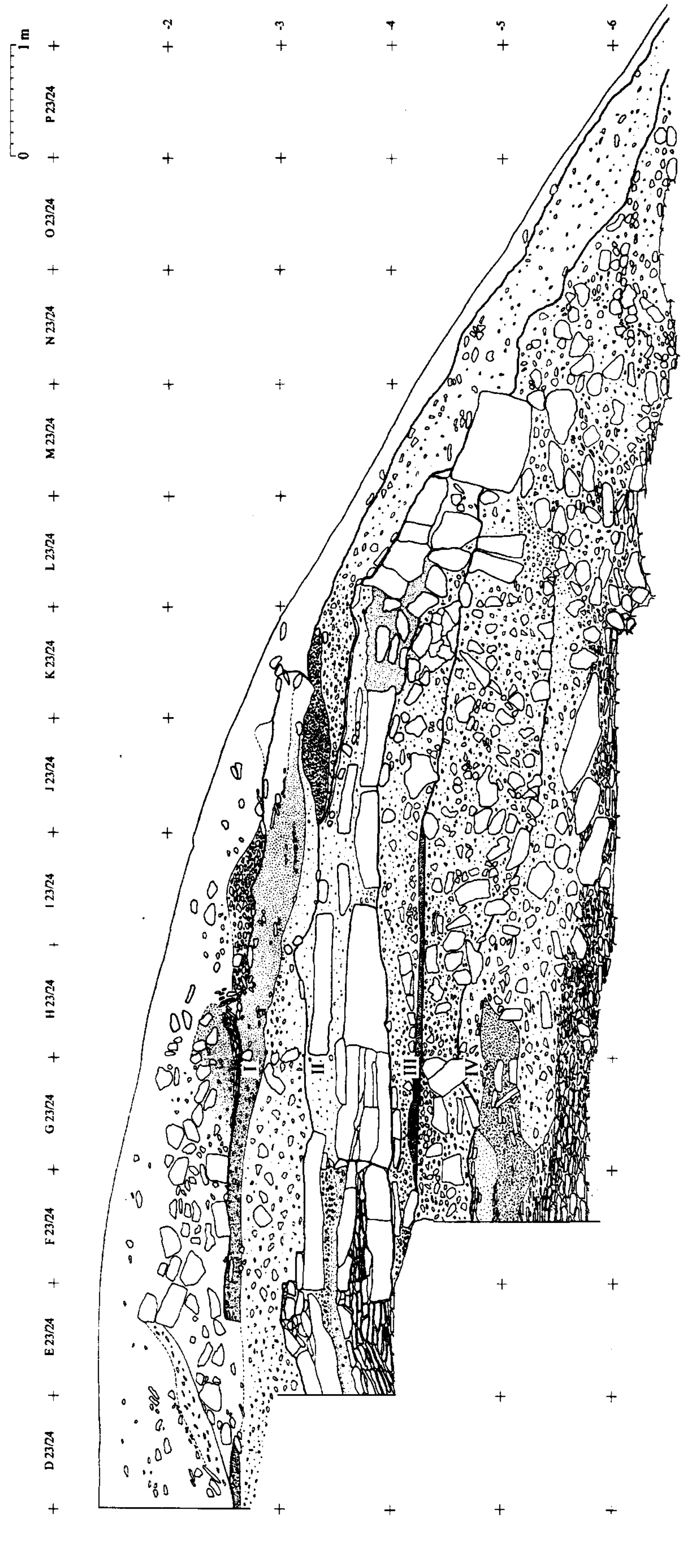


Fig. 5-4—Starosele, east-west profile of line 23/24 D-P. Roman numerals indicate cultural levels.

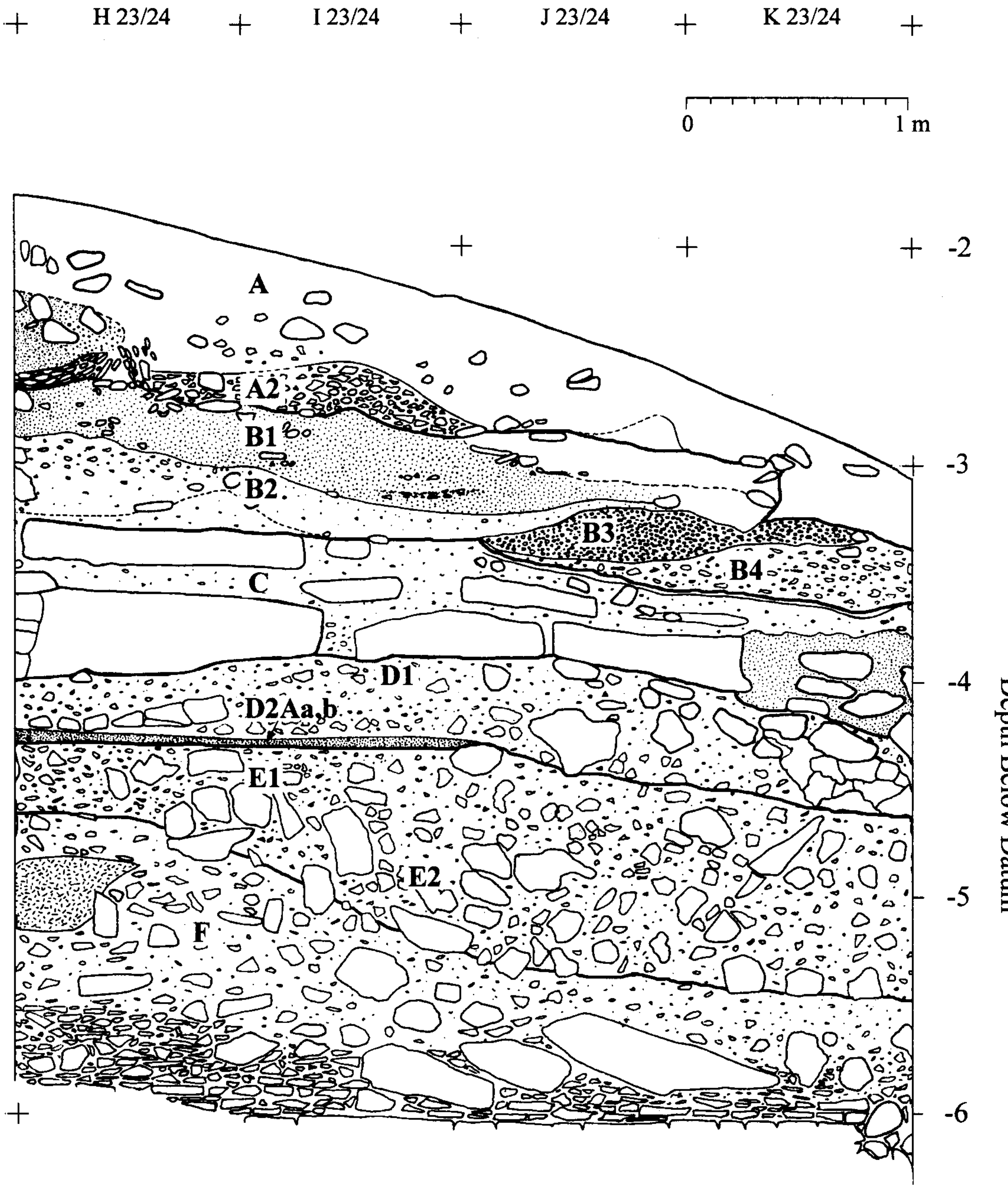


Fig. 5-5—Starosele, east-west profile of line 23/24 H-K. Letters indicate geological units.

further up the gorge. As the site is located only about one kilometer from the head of the gorge, most of the alluvium carried by the stream, including that in the site, is essentially colluvium that has washed into the gorge from above.

Stratigraphy

The sediments at the site were described and sampled along a profile from the north face of Squares E22 through G22 (fig. 5-3), and then from the north face of Squares H24 through K24 (fig. 5-4). Samples were taken from a two meter wide portion of the latter; from I23 and J23. The sediments in this section (fig. 5-5) were divided into six stratigraphic units (Table 5-1). In order to maintain a clear distinction between lithological and archeological stratigraphic units, the geological units are referred to as Strata and are named A through F, from top to bottom. The archeological deposits are named Levels, numbered from 1 through 4, from top to bottom (fig. 5-5, Table 5-1).

Sediments at the site have been eroded into a low dome that breaks sharply to the gorge floor to the west. From the highest point, near rows F-G (fig. 5-6), the surface drops toward the bedrock wall, probably as a result of historic period rock quarrying. Sediments within the Pleistocene section are horizontally bedded, east/west, to row K, at which point all but Strata F and E slope downward toward the gorge bottom. This is clearly seen in the limestone slabs at the western end of the profile (north face of Squares K24 to N24), indicating that the slope was already established prior to this period of large scale cliff wall exfoliation (fig. 5-4). It also indicates a significant downcutting of the gorge bottom prior to this major episode of exfoliation.

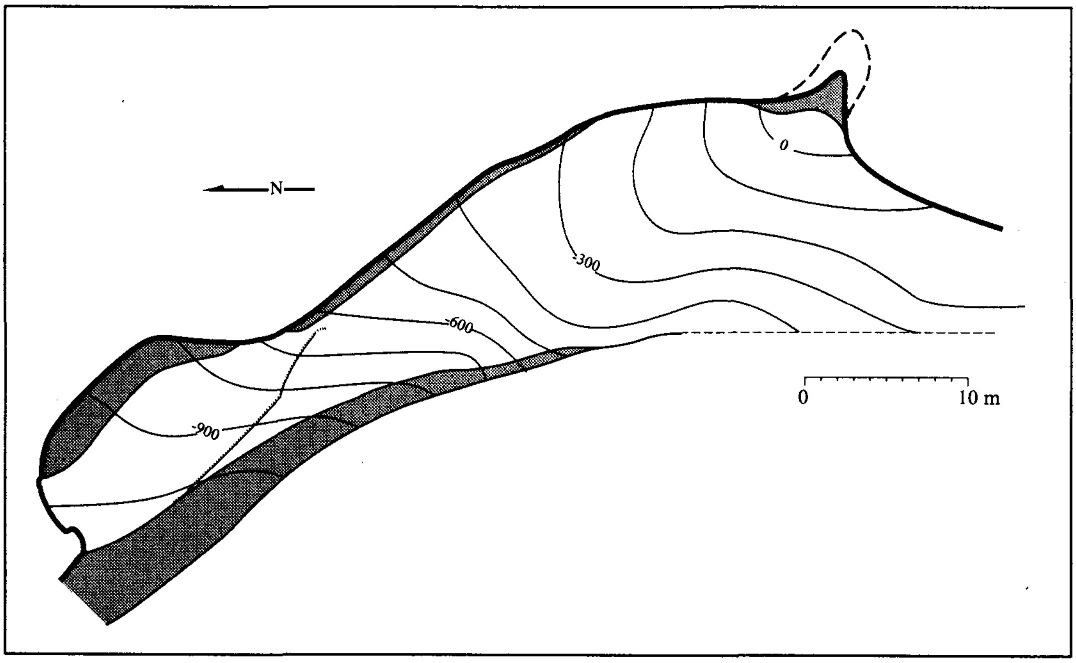


Fig. 5-6—Starosele, contour map of site (after Formozov 1958: 20, fig. 20). Hatched line indicates dripline of shelter.

The large horizontal slabs of exfoliated limestone in the center of the section (Stratum C), between which is found Level 2, either changed the geomorphology of the site or they simply correspond with a change in depositional environment. Below the slabs, in Strata F through D, are large boulder gravels, with a few thin, finer-grained interbeds. The increase in red clayey to loamy matrix in the low part of the section is probably the result of infiltration and

TABLE 5-1
Starosele, Stratigraphic Description (all colors Munsell moist)

Stratum	Thickness (max. cm.)	Description
A	112	(Soil A horizon): 10YR5/2 gravelly silt-silt loam; fine moderate angular blocky structure; many rounded pebbles and cobbles, decreasing in size upward; gradual smooth boundary to (Soil Ak horizon): 10YR5.5 gravelly silt loam; common angular exfoliates increasing in frequency to east; loose; many carbonate coats on peds and clasts; several intrusive pits and disturbed areas; unit may be recent; abrupt boundary.
B1	20	(Soil Ck horizon): 10YR7/3 gravelly to sandy silt; very hard; rounded spherical and platy rock fragments; few coarse sand to granule lenses; very porous; many bone fragments; part of CL1-1; clear wavy boundary.
B2	30	(Soil Bt horizon): 8.75YR5/4 gravelly silt loam; common rounded cobble to granule clasts; moderate fine angular blocky structure; common stress clay coats around clasts; very hard and porous; abundant bone and burned bone; lower part (Soil Btk horizon): 7.5YR5/4 loam; common rounded cobbles; fine to medium subangular blocky structure; abundant carbonate filaments; part of CL-1; abrupt wavy boundary. [NB: this unit grades to east to unit with thick limestone slabs and common small exfoliates; in west it overlies Strata B2/B3; to east it overlies Stratum C.]
B3	0-35	Lenticular gravel bed of well-rounded granules with a few pebbles and cobbles; clast-supported; no bones or artifacts observed; unit has cut into unit B4; abrupt boundary.
B4	0-30	7.5YR5/4 gravelly silt loam, with pedogenic carbonate of modern soil; rounded pebbles and cobbles; part of CL-1; abrupt boundary.
C	45-75	Thick limestone exfoliation slabs, in horizontal position. Matrix is 10YR6.5/2 sand and coarse silt interbeds with common angular platy exfoliates and many rounded pebbles and cobbles. Unit is matrix supported, with matrix between slabs and above slabs to west; unit thickens to east to about 135 cm; contains CL-2; abrupt smooth boundary.
D1	55-70	Thinly bedded clast-supported rounded pebble and cobble gravel, fining up to granule and pebble gravel, with 5-10 cm boulders scattered throughout unit; few carbonate crusts on bases of cobbles; many voids between clasts; interclast matrix is 7.5YR4/6 loam; clear to abrupt boundary.
D2a	2-4	Very thin bed, 10YR7.5/3 sandy silt; very porous; common charcoal and bone; pinches out westward in square I23; abrupt smooth boundary.
D2b	3-15	8.75YR7/6 clast supported gravelly silt; abundant well rounded granules and few to many rounded pebbles; many fine pores; compact; few bones; CL-3; clear boundary.
E1	45-85	Clast supported rounded boulder gravel; poorly sorted pebble to cobble interclasts, and a few discontinuous clayey zones; clay coats on clasts; gradual boundary to F.
E2	0-25	10YR7/4 gravelly loamy sand; lenticular wedge, pinches out in square H23; cobble to small boulder exfoliate clasts; abrupt upper and lower boundaries; lower boundary contacts CL-4.
F	80	Clast supported rounded boulder gravel with thin horizontal sandy or loamy zones; more fine matrix than in E1; no secondary carbonates; clayey zone with CL-4 in upper part is 7.5YR4/6 granule loam; lies unconformably on weathered bedrock limestone.

[1] CL= cultural level

pedogenesis. The fine-grained beds (D2 and E2) appear to represent very localized filling of depressions by lower energy stream flow (fig. 5-5), contrasting with the overall high-energy environments represented by the boulders in Strata F through D. (A thin clayey zone at the top of Stratum F contains Level 4, while a gravelly silt layer near the middle of Stratum D—at the top of D2b—contains Level 3.)

Although not clearly seen in the studied profile, the profile 2 meters to the south (fig. 5-7), shows a marked cut and fill sequence between Strata E2 and F, while the distribution of artifacts and bone at the surface of F (Level 4) in the studied profile shows a hiatus when this cut took place.

Above the limestone slabs, undisturbed Pleistocene sediments in Stratum B are much finer in texture than sediments below the slabs. Along with the prior incision of the gorge which partly isolated the site from larger floods, the local effect of the slabs may have been to divert all but the most local spillway transport away from the site. The effect of the local spillway can be clearly seen in Figure 5-7 as an erosional channel which originates at the base of the spillway. In any event, the slabs are quite unweathered, except near the sloping western edge of the site, suggesting that Stratum B was deposited shortly after the fall of the slabs.

The heterogeneous alluvial facies of Stratum B were deposited in swales and small channels as cut and fill packages. They include mixtures of colluvium and angular exfoliation debris from the cliff above the site, indicating much lower energy than the gravels below the limestone slabs. The Stratum B sediments are cemented by pedogenic carbonates related to the soil that formed in these deposits after the last Middle Paleolithic occupations. Level 1 occurs in these sediments, while two of the small gravel lenses in this section are sterile. Not only is this stratum missing north of row 20, but, to the south, there are numerous pits into it from the modern sediments of Stratum A (fig. 5-8).

The uppermost sediments (Stratum A) are young anthrogenic accumulations of quarry debris and spoil from pit/hearth construction, contained in a matrix of colluvial loams derived from the gorge margin above the cliff. A number of Level 1 artifacts and bones were mixed into Stratum A, but the majority of finds in this unit are A.D. eighteenth century sherds and bones of domesticated animals. In addition, an infant burial was found in this stratum (see Chapter 6).

Weathering of the sediments below the limestone slabs, as well as their partial erosion along the western edge of the bench (fig. 5-4), suggest a depositional hiatus between those sediments and the overlying deposits of Strata C and B. After this temporal break, exfoliation of the limestone slabs was quickly followed by deposition of Stratum B sediments. Given the slope on the west of Stratum B, it is likely some portion of it was eroded prior the accumulation of the modern sediments of Stratum A. How much, however, cannot be ascertained on the basis of the available evidence.

Overall, the sedimentary environments at the site would normally appear to have been most unfavorable for site formation. Preservation of fauna and, at least, two hearths associated with the occupation horizons in Strata D and F must have been fostered by the incorporation of sufficient fine matrix to protect these materials from subsequent flood events that delivered large boulders to the site. The uniform carbonate lithology of the sediments probably buffered the deposits over their long period of weathering, accounting for the excellent bone preservation. The sequence, as seen, suggests a long period of weathering of the lower deposits, followed by rapid deposition of the limestone slabs and the Stratum B alluvium, and then another long period of post-occupational weathering.

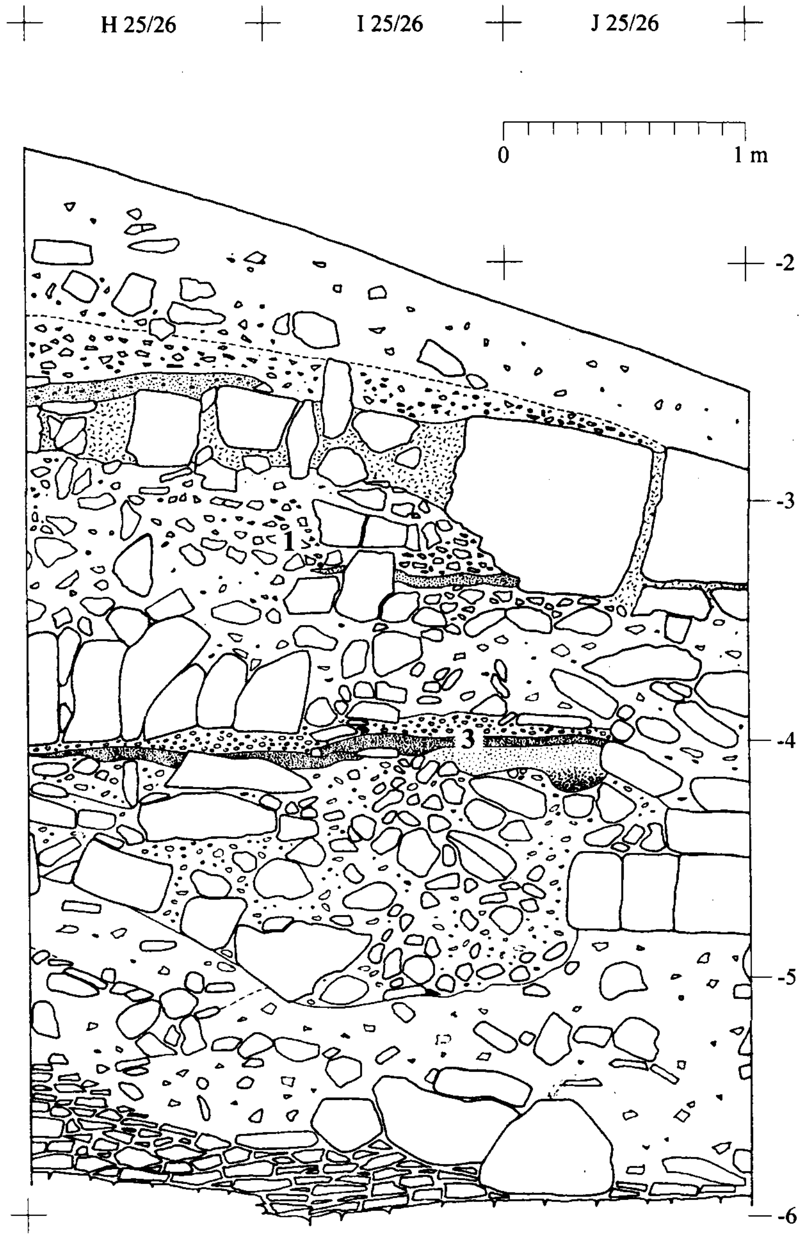


Fig. 5-7—Starosele, east-west profile of line 25/26 H-J. Cultural Level 1 pinches out towards the west at the large limestone blocks between -3 and -4 m. The erosional channel is visible between -4 and -5 m below datum.

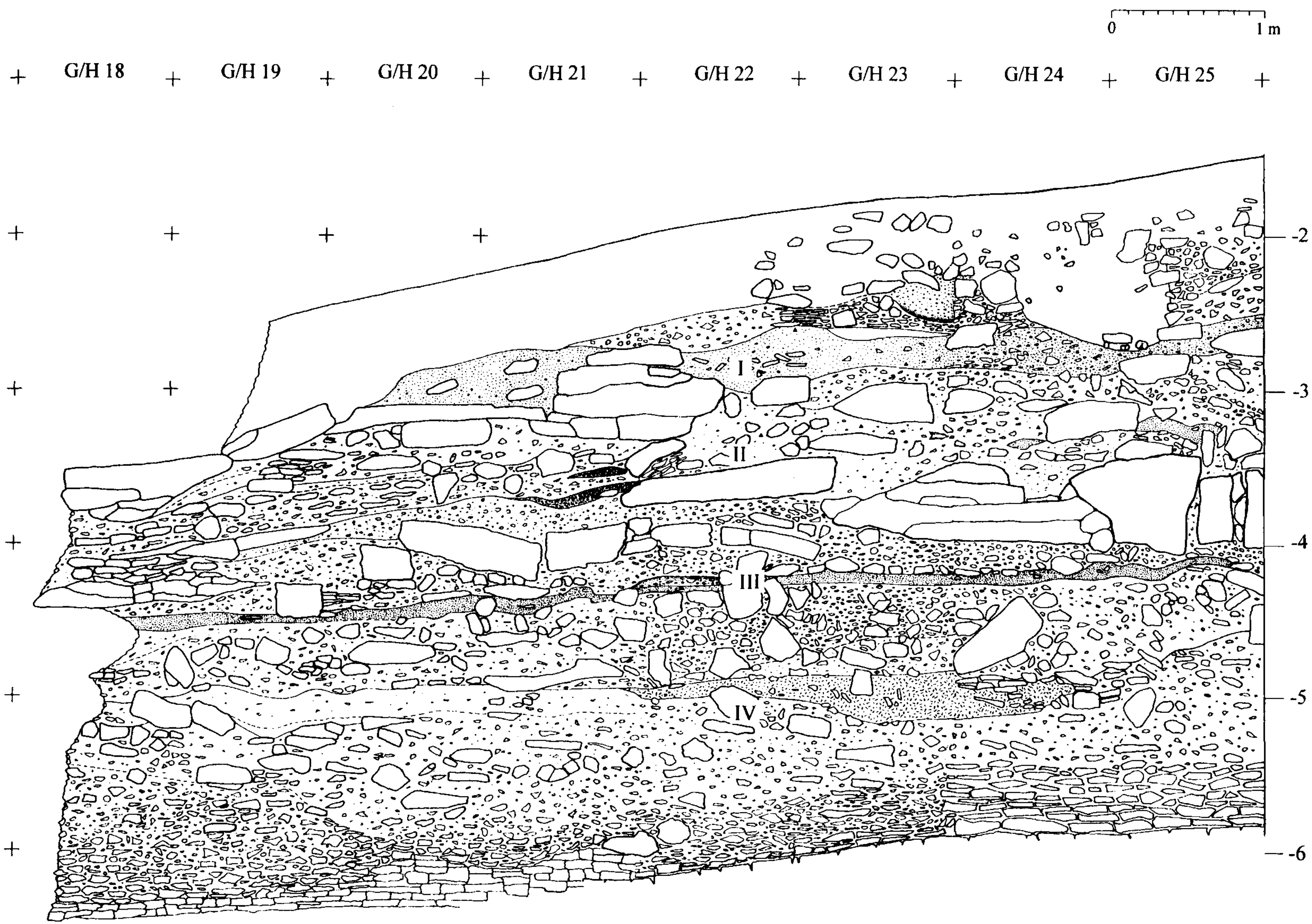


Fig. 5-8—Starosele, north-south profile of line G/H 18-25. Roman numerals indicate cultural levels. The burial pit of the adult sepulture discovered in 1994 is visible in squares G/H 24-25, between -2 and -3 m below datum.

EXCAVATION STRATEGIES

Formozov's excavations had a major impact on how we had to approach the new excavations. Not only had he entirely removed well over half the site, but his buried profile along the southern edge of his excavations formed a necessary starting point (fig. 5-9A). These profiles established the exact position and orientation of his one-meter grid system, as well as providing a stratigraphic cross-section through the deepest part of the site. Thus, we decided to expand the original grid system, using his buried profiles as guides.

In addition, to maintain continuity, initially we used his +13 meter elevation marker as our datum. Unlike the original work, however, which used a datum at the base of the canyon and measured elevations as above that, we measured down from the +13 meter datum. Thus, our reading of -3.50 m would be equivalent to his reading of +6.50 m. By the 1995 field season, we had shifted to Formozov's +10 meter datum, in order to deal more easily with the lower sedimentary levels.

The buried profiles ran mainly on an east/west orientation. Since they consisted of two east/west sections, connected by a 3 meter north/south section, their cleaning provided standing profiles at ninety degree angles (fig. 5-9A). This configuration resulted in two potential excavation blocks, a westerly one delimited by his excavations on the north and west (Squares D19/21 through G19/21), and a larger one to the south defined by his east/west profile along row 20/21 (fig. 5-9A). Within normal limits, the extant walls toward the eastern side of the site were correctly oriented and, given the highly variable matrix sizes, quite straight. There had been a bit of erosion of Strata A and B along the northern edge of Squares D/G 19, and about 20 centimeters of the modern deposits of Stratum A had been eroded along the northern edge of the H/K 22 line. This erosion must have occurred during the period 1953 to 1956, when this profile—the southern profile of his Block II—was exposed. This exposure and the resulting erosion will be of some significance when the recently discovered human burials are discussed in the next chapter.

There was a greater problem with Formozov's westerly grid. There, he had cut too much to the south, so that most of row 22, K through P (fig. 5-9A), in fact, had been excavated by him. Since there were few in situ artifacts in that area, this caused few problems. Thus, while Figure 5-9B shows we excavated all of rows 22 and 23, most of row 22 west of K was merely back dirt.

Upon clearing the buried profiles, it was immediately apparent that Formozov's published renderings of them had only the most general similarities with what we saw (fig. 5-10). His profile shows a layer of large, elongated but rounded boulders, with artifacts and gravels above them and below them. The area below this line of boulders shows some large, rounded rocks along with some artifacts. In the most general sense, the profile does show artifacts above and below a line of rocks, with larger rocks at the bottom. Yet, this drawing was not even of acceptable standards when it was done. What it did was to visually justify Formozov's beliefs that there was a single, continuous occupation, except during the brief period of large rock fall which he interpreted as "roof fall." The complexity of various stream erosions of the sediments, which he discussed in the text (Formozov 1958: 43), is not visible on any of his profiles (Formozov 1958: 39-41, figs. 26-28).

What concerned us most, and seriously affected our excavation strategy, was what Formozov apparently had not seen. Most importantly, his east/west profile along the 21/22 line (fig. 5-3), as well as the exposed north/south profile on the G/H line (fig. 5-8), clearly showed a thin horizon of fine sediments, in which bones and artifacts occurred in some abundance (our Level 3). Visually, it was markedly different from the sediments above and below it, and its termination along the 21/22 line in Square J was abrupt and clearly marked.

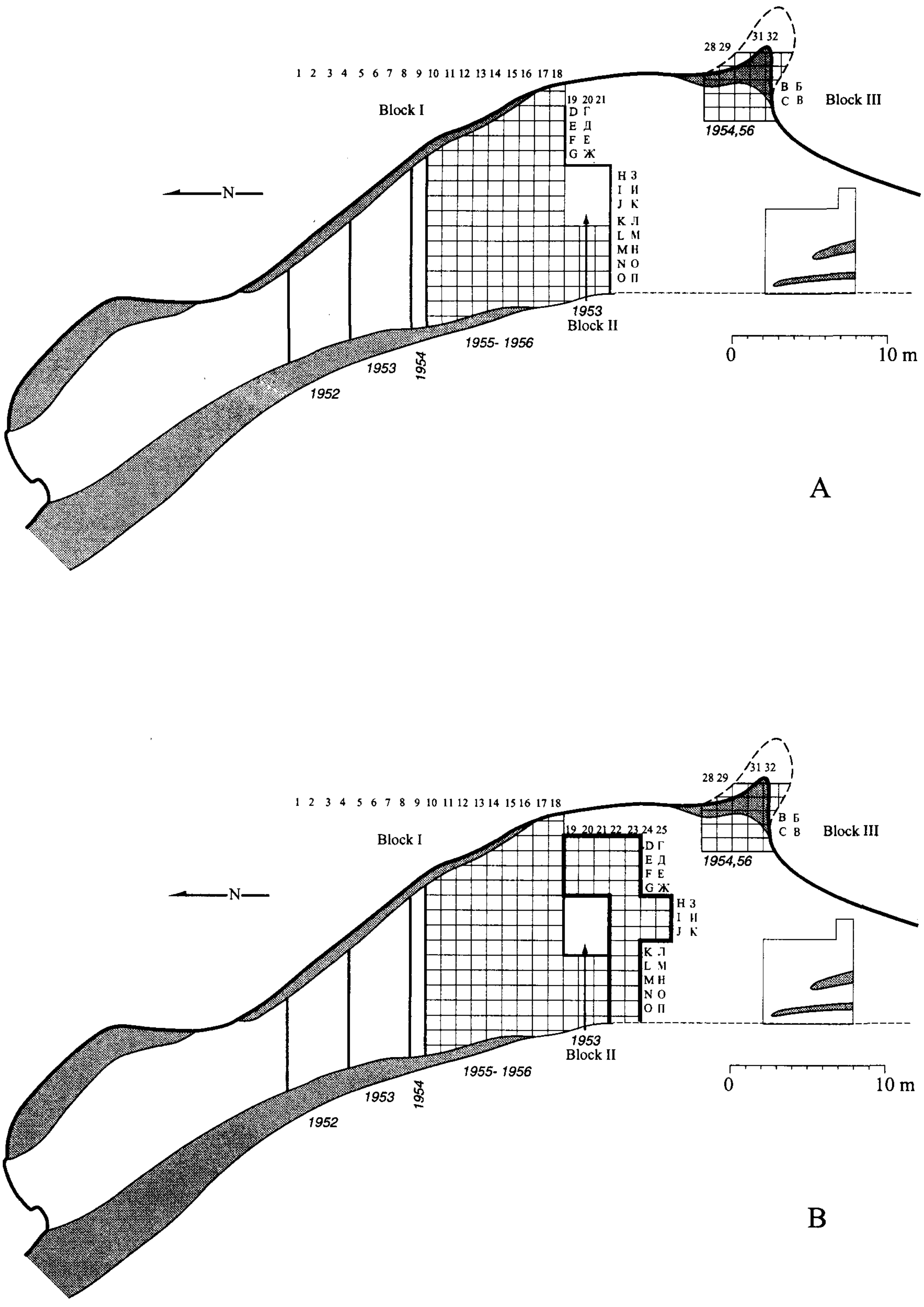


Fig. 5-9—Starosele, plan of excavated areas: *A*–plan of Formozov's excavations; grid system was not used during years 1952-53. Heavier lines indicate exposed profiles. *B*–plan of Formozov's and the recent excavations (in heavier lines) at Starosele. (Redrawn from Formozov 1958: 26, pl. 16.)

In addition, Formozov's profile along the 21/22 line (1958: 40, fig. 27) failed to indicate a massive erosional channel which had cut into the uppermost archeological level and was heading northward, directly toward the area where the Starosele child had been found. If such obvious features had gone unseen or had been judged too unimportant to draw conclusions or discuss specifically, then what about the more subtle variations in lithology and artifact distribution? It was at this point we realized that we ourselves had to firmly and completely understand the stratigraphy based upon our own observations rather than accepting those of Formozov.

Since the exposed profiles were lithologically complex, particularly the sediments above the limestone slabs (Stratum B), it was decided that excavations would proceed mainly by peeling back to the south along the 21/22 line, a meter or two at a time. Since the northwestern-most area was exposed on two sides, the north and west, it was decided to take this out first. In that way, the local stratigraphic situation could be monitored from two directions.

Beyond our concerns to fully control the stratigraphy, we had to consider that the gorge in which Starosele lies is at the edge of the town of Starosele and holds a path which leads from the town up the western cliff face to an area of new buildings. In addition, the box canyon often has hikers, groups of school children, and even shepherds passing through it. Since the excavations were planned to last for three field seasons and it was not practical to rebury the site at the end of each field season, we had to consider how to minimize the chances of "pot hunting" or even casual disturbances by those passing through. We decided that the best way to do this was by planning the excavations to leave as little surface exposed as possible at the end of each field season. That is, excavations of any given square would be stopped only when they rested either on the top of the exfoliated limestone slabs (below Levels 1 or 2) or when they rested on bedrock.

Thus, during the 1993 field season, after drawing the exposed profiles, we excavated Squares D-G/18-21 (15 m^2) to the bottom layer of exfoliated limestone slabs below Level 2. While Formozov's monograph (1958: 51, fig. 34) indicated that he had excavated the whole of line 18, in fact, in this area he had only excavated it to the top of the limestone blocks. Our excavations of this block exposed cultural materials in Stratum B (Level 1) above the limestone blocks and, also, in a thin, ca. 10 centimeter space between two layers of exfoliated slabs, where there was another layer of fine sediments with bone and a few artifacts (Level 2).

We also opened Squares H22/23 through K22/23—a 2 m by 4 m strip—to the lowest layer of exfoliated limestone slabs. These excavations confirmed the stratigraphically complex aggradation of Stratum B (including Level 1), and the continuation of Level 2 toward the southwest, into Squares H22 and H23. These excavations also indicated that the thickness of the exfoliated limestone slabs increased toward the south, making their removal more time consuming than originally planned.

At the end of the first field season, a 1 m^2 pit in Square F21 was placed through the limestone slabs to a depth of some 30 cm. This test confirmed the presence and richness of our Level 3 in that area. At the end of this small test, we refilled the test pit with limestone slabs and dirt, and piled dirt up about 1 meter high, along the opened profiles. We placed the appropriate dosimeters into the profiles, in order to get readings from all exposed cultural levels. The site at the end of the first field season, therefore, had some partly exposed profiles, but all horizontal surfaces were sealed by the exfoliated limestone slabs (fig. 5-11).

The efforts to minimize site damage proved to be rather successful. Aside from a few small holes in the profiles and the loss of two dosimeters from cultural Level 3, the site was in good condition when we returned for the 1994 field season. During that season, we removed the exposed exfoliated limestone floor and excavated the 1993 excavated areas to bedrock.

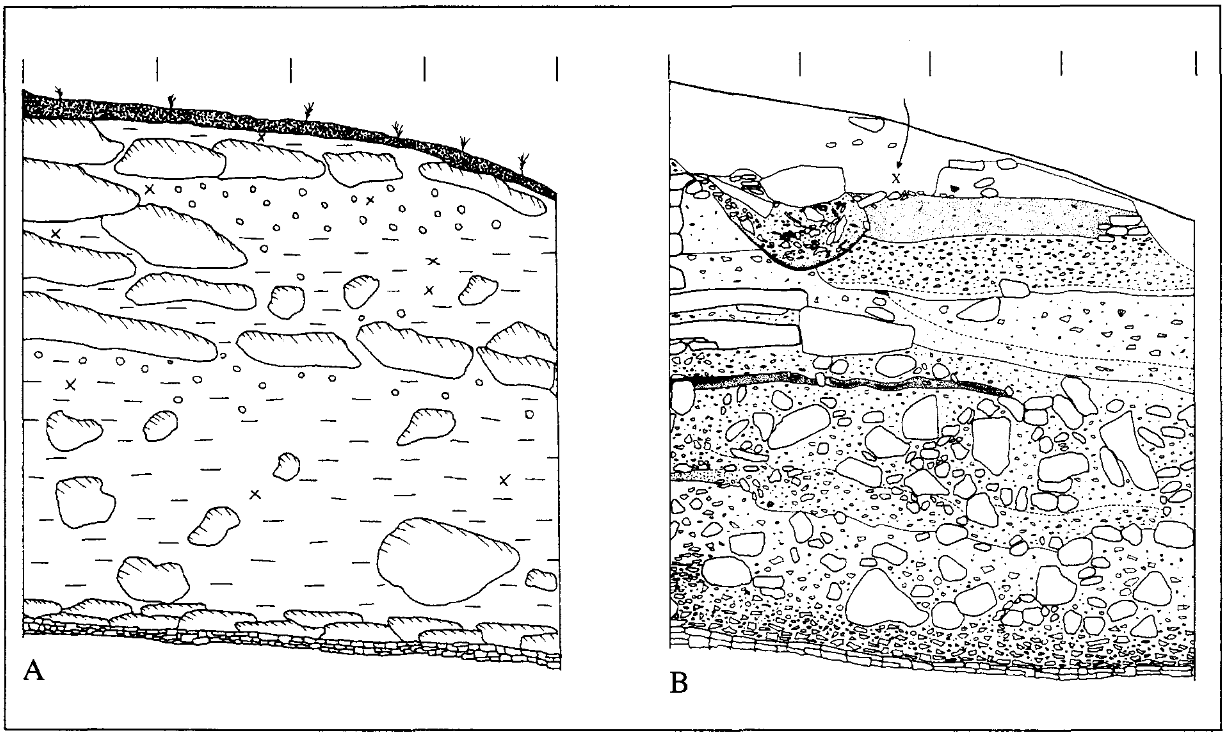


Fig. 5-10—Starosele, east-west profile of line 21/22 H-K (4 m). *A*–as illustrated by Formozov (1958: fig. 27); *B*–the same profile after removal of backfill and cleaning, as drawn in 1993.

Also, we opened Squares D through G 22 and 23 to the top of the exfoliated limestone slabs and the same was done for a 2 m by 3 m block of Squares H24/25 through K24/25.

During the final field season, in 1995, we took the H24/25 through K24/25 block and the D through G22/23 Squares down to bedrock. In addition, we opened a trench along line 23 for Squares L through P. While it was clear that most of the cultural materials from the upper levels either had been washed into that area or had been eroded away in recent times, it was felt that the lower cultural level might be present and that, in any case, the trench would complete a major profile from near to the cliff to the edge of the eroded western slope. Although Formozov's grid map indicates excavations up to the actual cliff face, during the first field season it became clear that the sediments up to 3 meters from the cliff were disturbed by recent quarrying. Since these disturbed sediments rested on bedrock at a depth of only 1 meter below the surface, that area was not excavated by us, as even part of the D line contained only remnants of Level 1 and a thin scatter of Level 2. Along the D line, the lowest of the exfoliated limestone slabs rested directly on bedrock (fig. 5-9).

Excavation Methods

The excavations themselves ran to extremes of technique. The exfoliated limestone slabs had to be broken up with sledge hammers and then taken out, in pieces, with picks. The finer sediments were excavated with trowels and knives. All artifacts larger than chips were placed onto maps within their appropriate squares, and then their elevation was shot in by farmer's level. All pieces recognized in the field as tools were given numbers sequentially for each square and each cultural level. While a few tool fragments were not recognized in the field, and therefore their exact original position within the square cannot be reconstructed, these account for less than 10% of the tools.

Fig. 5-11—Starosele, photo of excavations at beginning of 1995 season, showing the limestone slabs sealing levels 2 and 3 and their removal.

Faunal materials were treated in a similar fashion. All bones larger than about 40 millimeters were drawn onto the map of the square and their elevation shot in, as before. No attempt was made to identify specific body parts in place, but individual teeth, tooth rows, and mandible fragments were drawn in so they could be identified on the map. In the case of long bones, their easy field identification was hampered by extensive breakage during occupations. Although bone preservation was excellent, it was unusual to find a complete long bone, or even a complete articular end. When these occurred, however, a reasonable rendition of their shape was made in the drawing.

After the mapping of a square, all fine sediments were put through a 3 mm mesh and all cultural and biological residues collected. When appropriate, for instance, for Level 2 which had considerable microfauna, the sediments were passed through both 3 mm and 1 mm mesh screens. During the final field season, when we were collecting snails for analyses, all fine sediments were passed through both sized screens.

Given the stratigraphic situation, it was decided that cultural levels would be excavated without using arbitrary sub-levels. Thus, as noted above, artifacts and bones were mapped in place, including their elevations. It was possible, therefore, to separate the tools by elevation, within a level, if that seemed useful during analysis. We were concerned about the thickness of some of Level 1, but the first year's work showed us that, while some small areas had recognizable lenses, they were so limited in area to be useless for analysis. In addition, artifact and bone distributions were vertically continuous within the cultural levels and deciding just which artifacts formed a surface at any time was not possible. Therefore, Level 1 certainly represents a palimpsest of artifact and bone depositions, but ones which appear to relate to the activities of a single group.

ANALYSES

Approaches taken to the analyses of the various samples collected depended upon the nature of each sample. As already discussed in this chapter, soil samples were studied for structure and particle size, and are presently undergoing analysis for pollen content. The faunal materials, including mollusca and microfauna, are being studied following traditional identification to species and age, where possible. In the case of the macrofauna, however, additional studies involving taphonomy, age at death, evidence for butchering and carnivore modification, and the use and/or modification of bone into tools are also in progress. These studies will be presented in the second volume of these final reports.

The study of the lithic artifacts includes traditional typological classification and description, a range of technological observations, as well as considerations of horizontal distributions relative to other features. The artifact classification will follow that described in Chapter 3, with references to other systems. In addition, significant samples of the tools have been studied for use-wear and for residues. These latter studies will also be reported in detail in the second volume of final reports.

CULTURAL STRATIGRAPHY

The cultural stratigraphy consists of all the lithic artifacts and the great majority of the faunal remains. Since there was some evidence for carnivore activity at Starosele (Burke, personal communication), as well as for the washing in of animal bones during floods, it is probable that some of the bone accumulation did not result from human activity. Therefore, each will be considered separately, in relation to their disposal through the excavated deposits and in the conclusions drawn from their vertical distributions. Horizontal distributions of culturally derived materials will be considered in following chapters.

Distribution of Lithic Artifacts

By the end of the second field season, when some squares had been excavated to bedrock, it was abundantly clear that Formozov's view that artifact deposition had been more or less continuous throughout the process of sedimentation was incorrect. While Level 1 has a thickness ranging from less than 10 cm to as much as 30 cm in a few places, Levels 2 and 3 were truly surfaces, separated from each other and from Levels 1 and 4 by significant, artifactually sterile deposits (fig. 5-12). The lowest level, Level 4, was defined mainly by a surface of faunal remains and two thin clusters of wood charcoal, since very few artifacts were present. As such, if a "floor," at all, it was highly ephemeral, representing, at best, a temporary surface on which accumulated some lithics and bones. It is also possible that what we saw as Level 4 was an erosional surface, on which some artifacts had been dropped. Clearly, it was not the only surface in these lower deposits, since some chips and a larger tool or two were recovered below Level 4 (fig. 5-12), while, in places, bone distributions suggest other exposed surfaces during the process of aggradation (see below). In no other case, however, was the accumulation sufficient to recognize a stable surface but, on the other hand, it is also clear that the lower deposits were not washed into the site area during a single event.

Of all the levels, Level 1 was the most disturbed. There were various amorphous pits from the modern Stratum A intruding into the top of Level 1 (e.g., fig. 5-8) and it is likely that some of this level had been eroded prior to the modern quarrying of the cliff face (fig. 5-4). In addition, there was a major burial pit dug through Level 1 onto the upper exfoliated limestone slabs in parts of Squares H24 and most of H25 (fig. 5-8) and the sizable erosional channel seen in Figure 5-3 significantly disturbed the Level 1 sediments in Squares H22 and I22, and somewhat less so in Square H23, as well (fig. 5-8). Thick exfoliated slabs prevented a Level 1 occupation of Squares I25 and K25, by forming a natural wall some 60 cm above the Level 1 surface. In spite of these problems, the vast majority of lithic artifacts and bones were laying horizontally: only those associated with clear disturbances tended to be on edge. In addition, a distinct fireplace was uncovered in Square I22 that showed no disturbance (fig. 5-14). Associated with it was a thin spread of bone charcoal for a meter or so to the south and east, clearly indicating a surface at 2.85 m b.d. in that area.

Level 2 artifact distributions were also largely horizontally positioned. A single exception was a scraper on edge, just at the interface between the intact sediments and some modern disturbance in Square D22. This level contained no evidence for fireplaces, except for a rare, small piece of bone charcoal. Because of the paucity of artifacts, the vertical distributions tend to show only a few pieces at the eastern end of the excavations and others, at the western side of the site, which have been washed downslope (figs. 5-12, 5-13).

Level 3 artifacts, again, were almost always horizontally positioned. An amorphous fireplace in Squares F20/21 rested among some relatively small exfoliated slabs. Just to the south, in row F22, there was evidence of a shallow, temporary pond. Here, the artifacts were both under and on top of the pond sediments. The test in F21 during the first field season indicated the possibility of two distinct artifact/bone layers, separated by the thin layer of fine gravels and fragments of snail shells (fig. 5-15). It appeared that there might be two different cultural layers in that area, while only one homogeneous layer could be seen in the exposed profile for Level 3. Because of this, we recognized a Level 3 and a 3a for the materials and continued that in the following field season. It was discovered, however, that the sterile gravels represented a very small, ephemeral puddle, which was limited to less than 3 m^2 and did not affect artifact distributions even a meter north of F22 (fig. 5-16). As a result, we have grouped the Level 3 and 3a materials together for study and publication.

It is difficult to generalize about the distribution of Level 4 artifacts because there are so few. Aside from a few chips, found mainly from below Level 4 (fig. 5-12), only a handful of

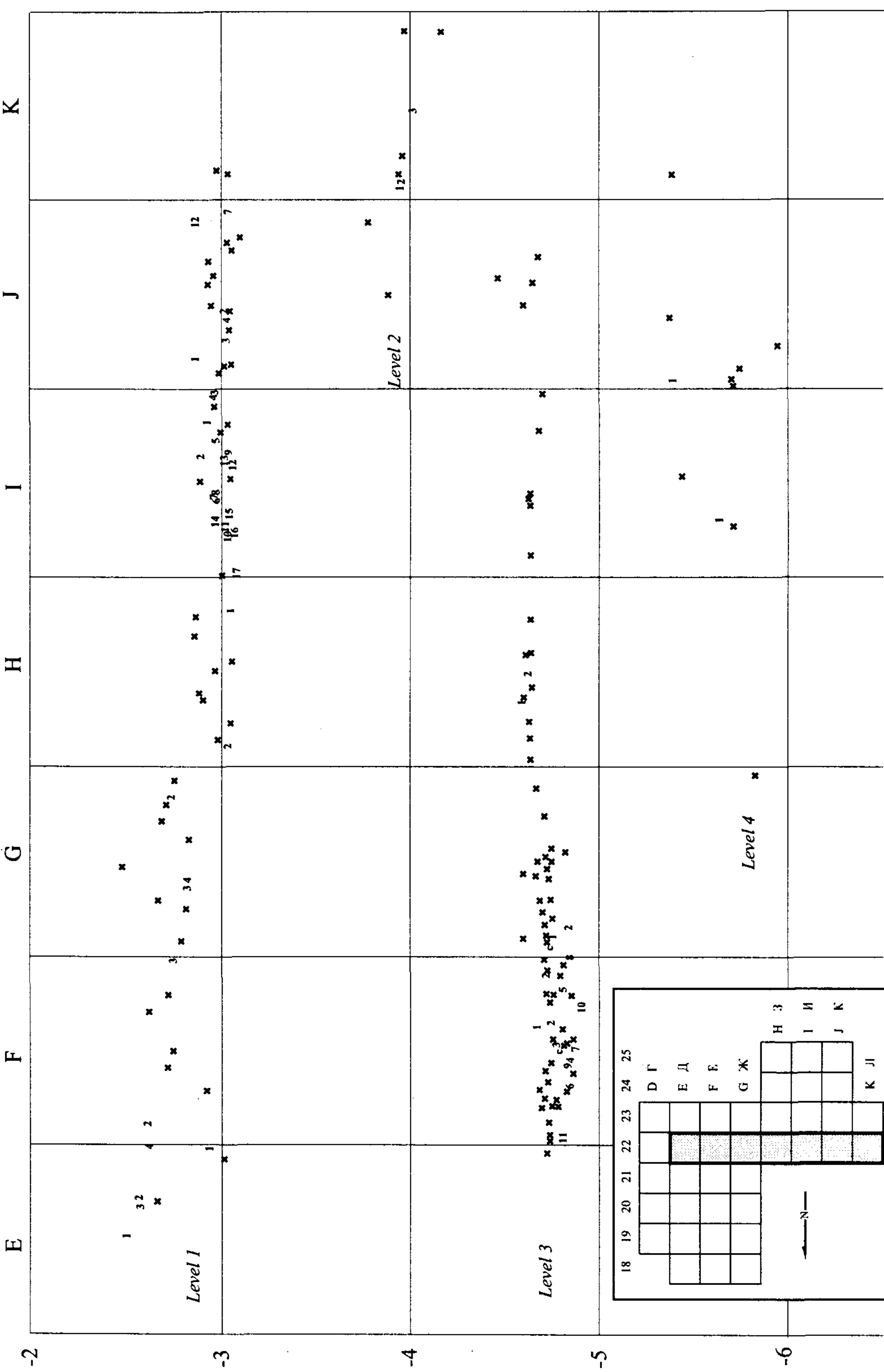


Fig. 5-12—Starosele, vertical distributions of lithic artifacts, line 22 E-K; tools indicated by Arabic numerals, debitage by "x," cores by "c." Inset is plan of recent excavations at Starosele, indicating place of profile.

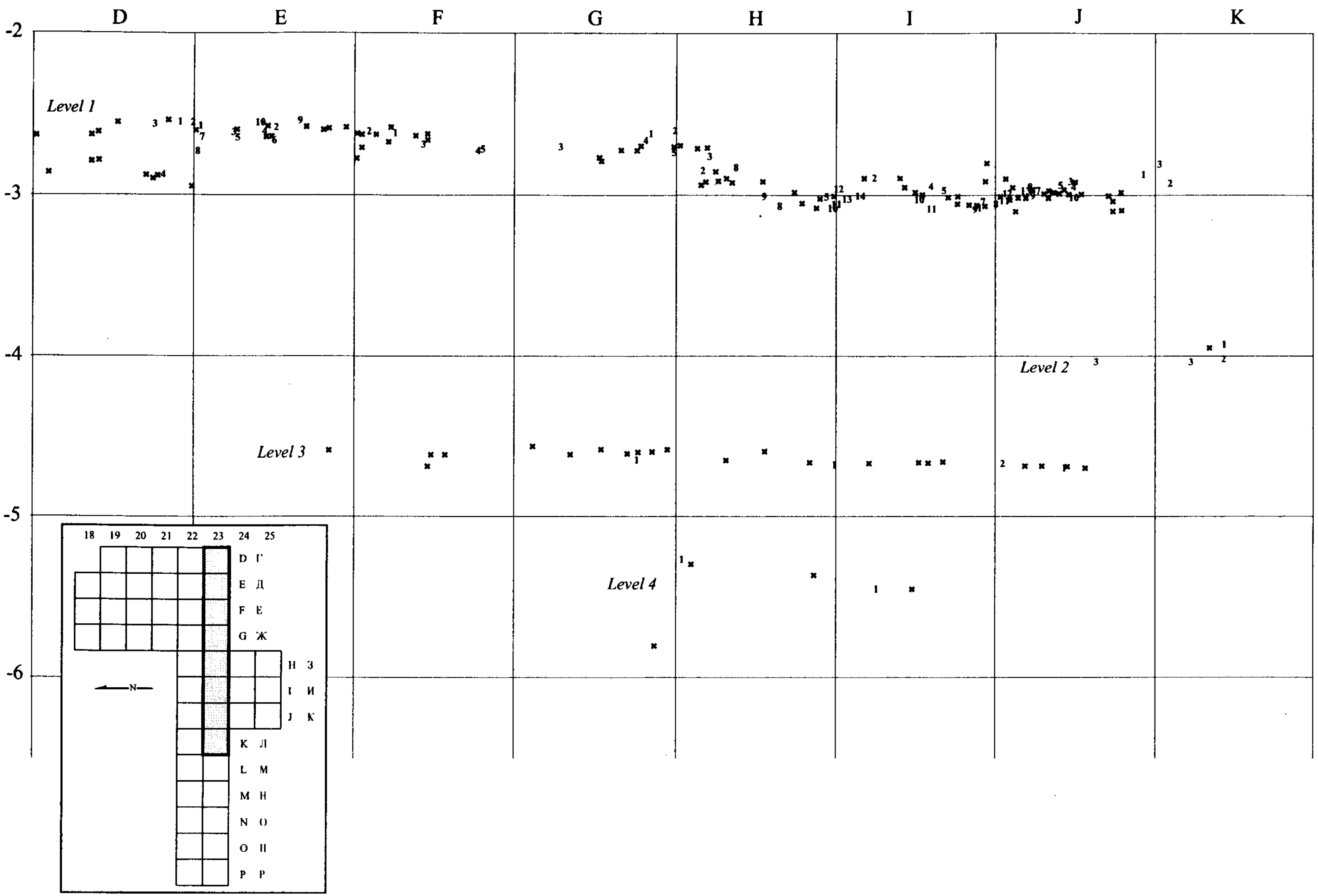


Fig. 5-13—Starosele, vertical distributions of lithic artifacts, line 23 D-K; tools indicated by Arabic numerals, debitage by "x," cores by "c." Inset is plan of recent excavations at Starosele, indicating place of profile.

larger pieces, mainly tools, were recovered. A single, very thin (ca. 1 cm thick) oval area of burned earth and small wood charcoal fragments was found at the same level, partly in Squares L23/22 (fig. 5-17). Additional small fragments of wood charcoal, however, were recovered throughout the sediments below Level 4, all the way to bedrock. They did not cluster and are probably merely part of the sediments washed in during the periodic flooding of the canyon.

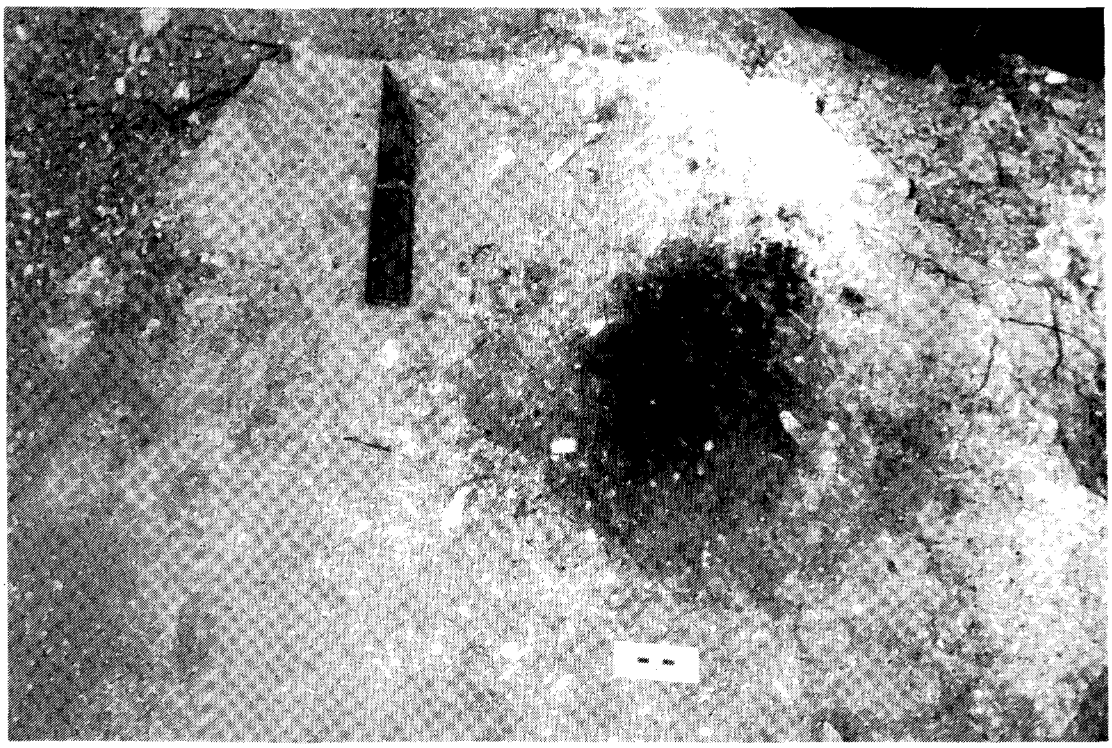


Fig. 5-14—Starosele, Level 1 fireplace.

As noted by Formozov (1958: 41-43), there is a slope downward along the north/south axis of the site, seen most clearly in the bone distributions discussed below. There is also a slight downward trend to the artifacts from east to west, across the main portion of the site, which becomes very marked for Levels 1 and 2 along the western edge (fig. 5-12), but is not present east of K, in rows 24 and 25 (fig. 5-18). This, along with similar bone distributions, clearly document the steep western slope down which artifacts and bones washed toward the canyon bottom.

Distribution of Faunal Remains

In spite of the possibility of carnivore activity, the vertical distribution of the faunal materials strongly paralleled that of the lithic artifacts, although, given their much larger number, their vertical spread in each archeological level is somewhat greater than that of the artifacts (figs. 5-19 through 5-22). While there are very few bones in stratigraphic positions unrelated to the archeological material (e.g., fig. 5-21), it appears that most possible carnivore activity took place on the abandoned surfaces of archeological occupations.

In Level 1, bone accumulation was strongly associated with lithic clusters, both horizontally and vertically. As noted above, these clusters are too small to provide analytically useful samples and, therefore, are combined for analyses. The bone distribution

Fig. 5-15—Starosele, profile of test pit in Square F20-21, 1993 excavations. At the base of the profile, cultural Level 3 and the pond sediments of Level 3a are visible.

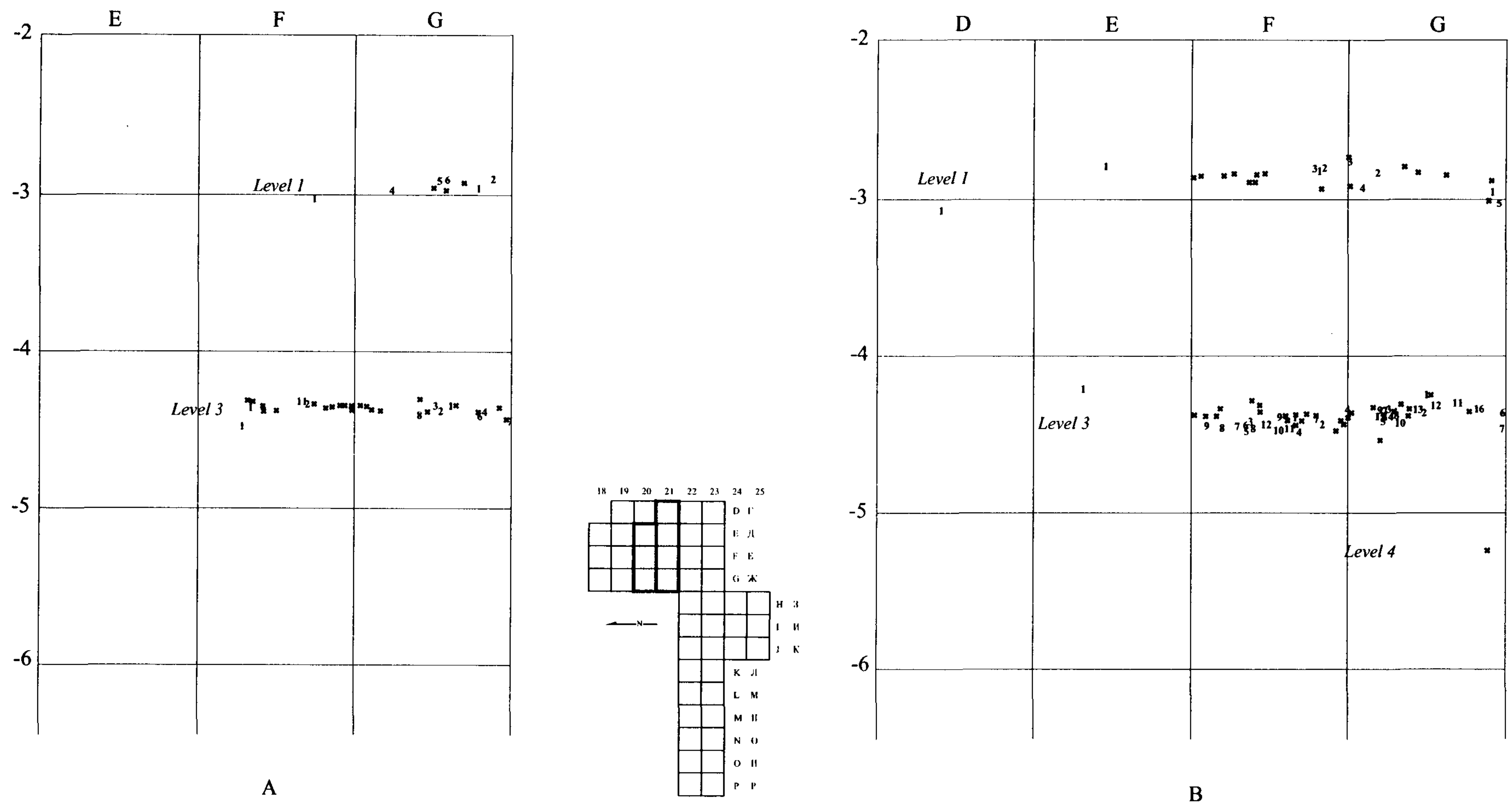


Fig. 5-16—Starosele, vertical distributions of lithic artifacts: *A*–line 20 E-G; *B*–line 21 D-G; tools indicated by Arabic numerals, debitage by "x," cores by "c." Inset is plan of recent excavations at Starosele, indicating place of profile.

of Level 2 was the same as that of the artifacts but vastly outnumbered them. In Level 2, the bones were less fragmented than in the other levels which might indicate a very brief period of surface stability between the two rockfalls which sealed this level.

In the cases of both Levels 1 and 2, the bone distribution, as that of the lithic artifacts, was largely horizontal as far west as row K (fig. 5-20). At this point, however, both show evidence of having been washed down toward the canyon bottom, following the slope of the surface. For both levels, there was a marked accumulation of faunal materials around the westernmost limestone blocks in Squares M22 and N22 (fig. 5-19). It is likely that this was typical all along the western edge of the site, but the 23 row was the only one to expose that markedly sloping area. Levels 1 and 2 do show a downward slope toward the north, but this is not the case for Levels 3 and 4 south of row 20 (figs. 5-21 and 5-22).

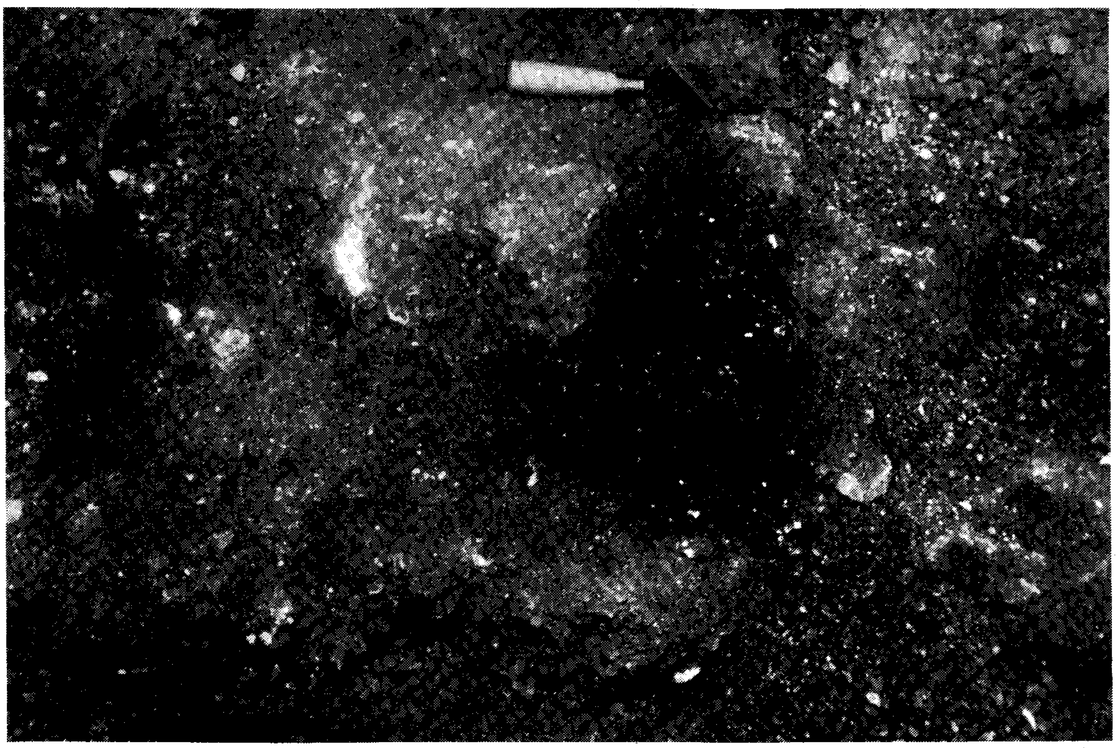


Fig. 5-17—Starosele, Level 4 fireplace.

Again, Level 3 faunal remains clustered with the artifact distributions. In this level, bone condition was similar to that in Level 1—excellent surfaces but a high degree of splintering and breakage from cultural processing (Burke, personal communication). The largest bone concentration was around a single, amorphous fire area in Squares F20 and F21. The absence of "out-of-place" Level 3 bones at the western edge of the excavations clearly shows that the erosional slope which affected Levels 1 and 2 was not yet formed during the Level 3 occupation (fig. 5-19).

The bones from Level 4 were quite different. Again, they outnumbered the artifacts by a large margin but, unlike in the other levels, these bones showed weathering cracks and mainly consisted of tooth/mandible sections and large pieces of long bones (Burke, personal communication). Very few small fragments were recovered. The vertical distribution of the bones continued below Level 4, although density dropped (figs. 5-19 through 5-22). Given the extremely small number of lithic artifacts, it is the bones which provide the best clue to the relationship between them, the artifacts, and the sediments. The sediments, as described

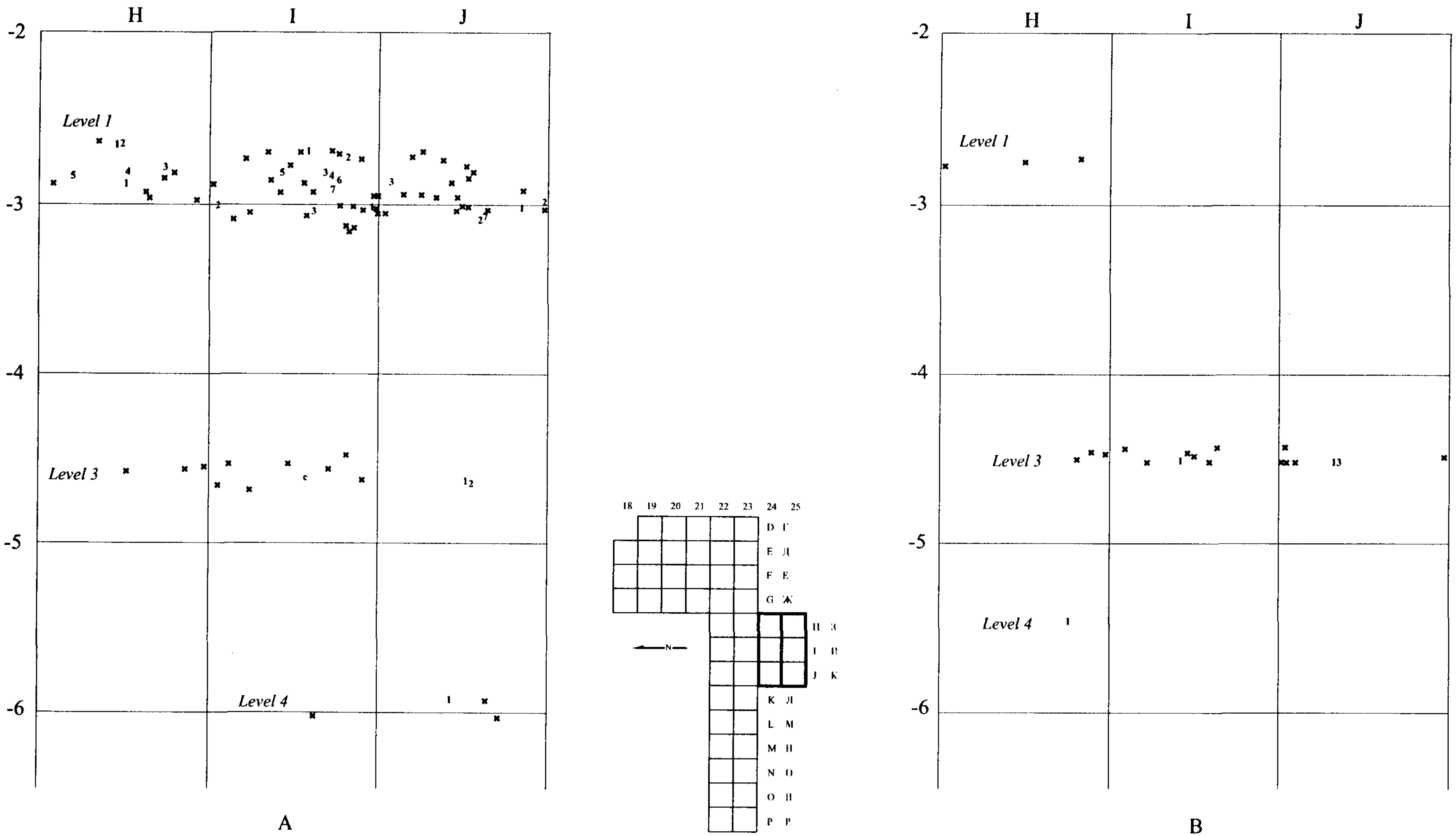


Fig. 5-18—Starosele, vertical distributions of lithic artifacts: *A*–line 24 H-J; *B*–line 25 H-J; tools indicated by Arabic numerals, debitage by "x," cores by "c." Inset is plan of recent excavations at Starosele, indicating place of profile.

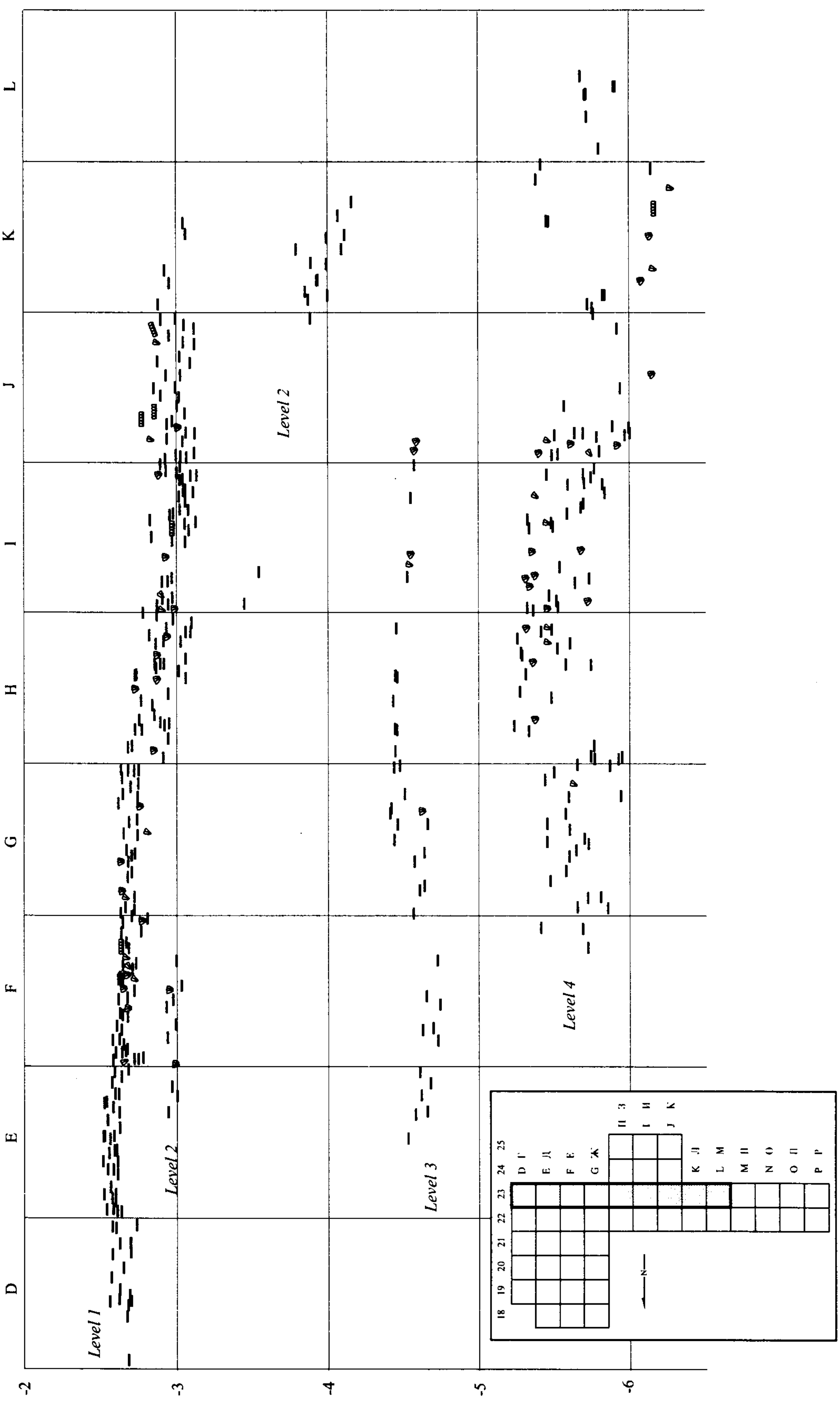


Fig. 5-19—Starosele, vertical distributions of faunal remains, line 23; – –bones; –individual teeth; –tooth rows. Inset is plan of recent excavations at Starosele, indicating place of profile.

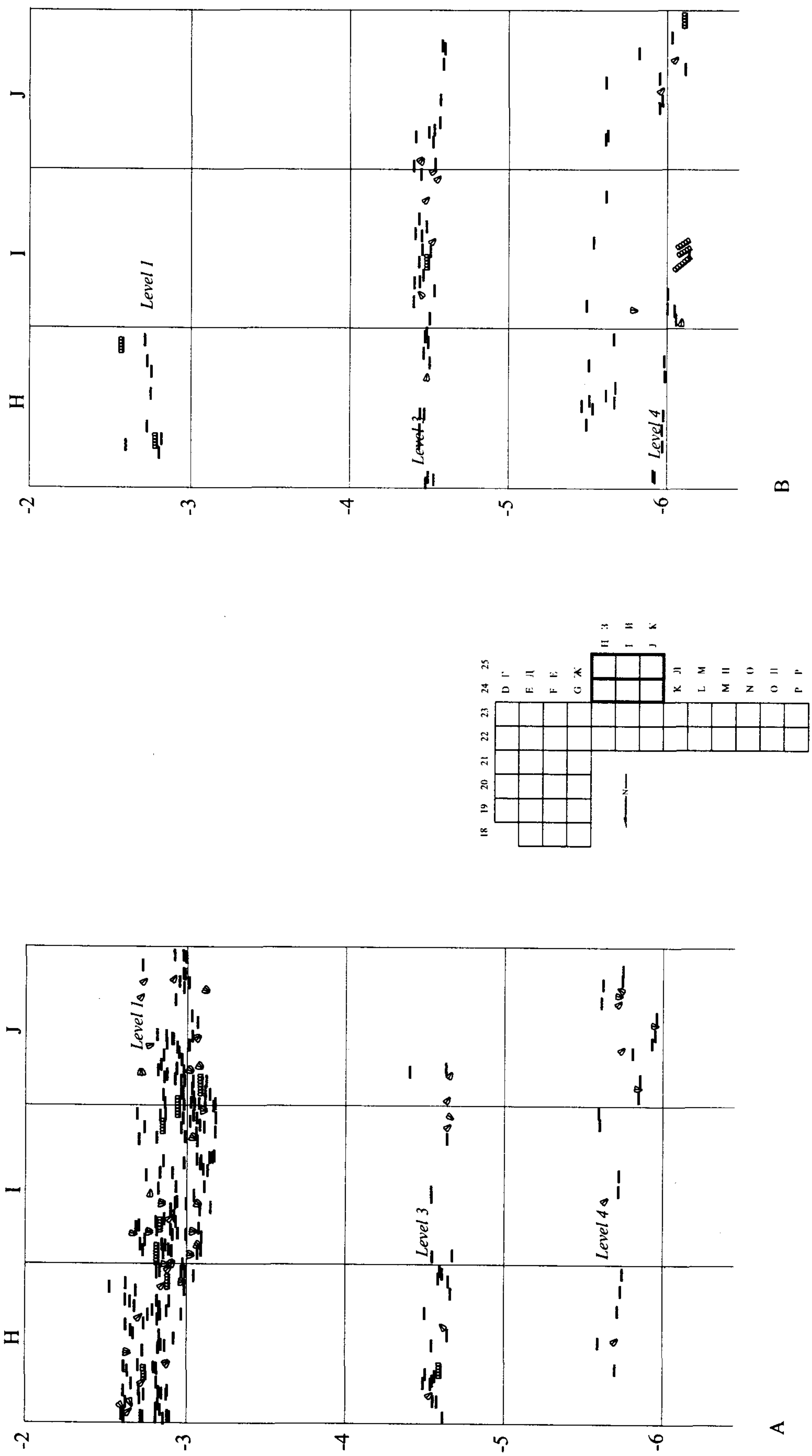


Fig. 5-20—Starosele, vertical distributions of faunal remains: *A*–line 24 H-J; *B*–line 25 H-J; –bones; –individual teeth; –tooth rows. Inset is plan of recent excavations at Starosele, indicating place of profile.

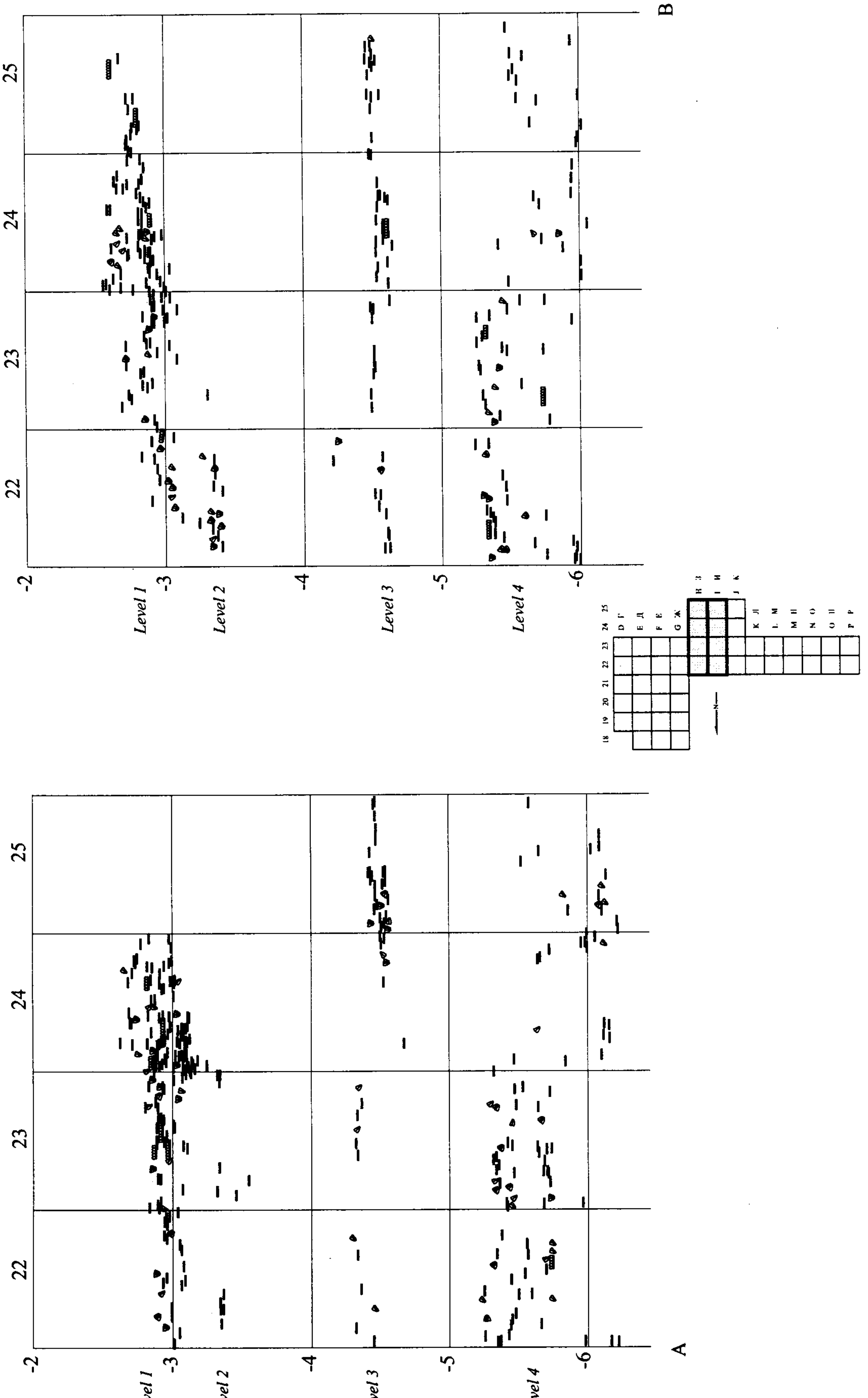


Fig. 5-21—Starosele, vertical distributions of faunal remains: *A*–line H 22-25; *B*–line I 22-25; ▬ –bones; ◆ –individual teeth; ▭ –tooth rows. Inset is plan of recent excavations at Starosele, indicating place of profile.

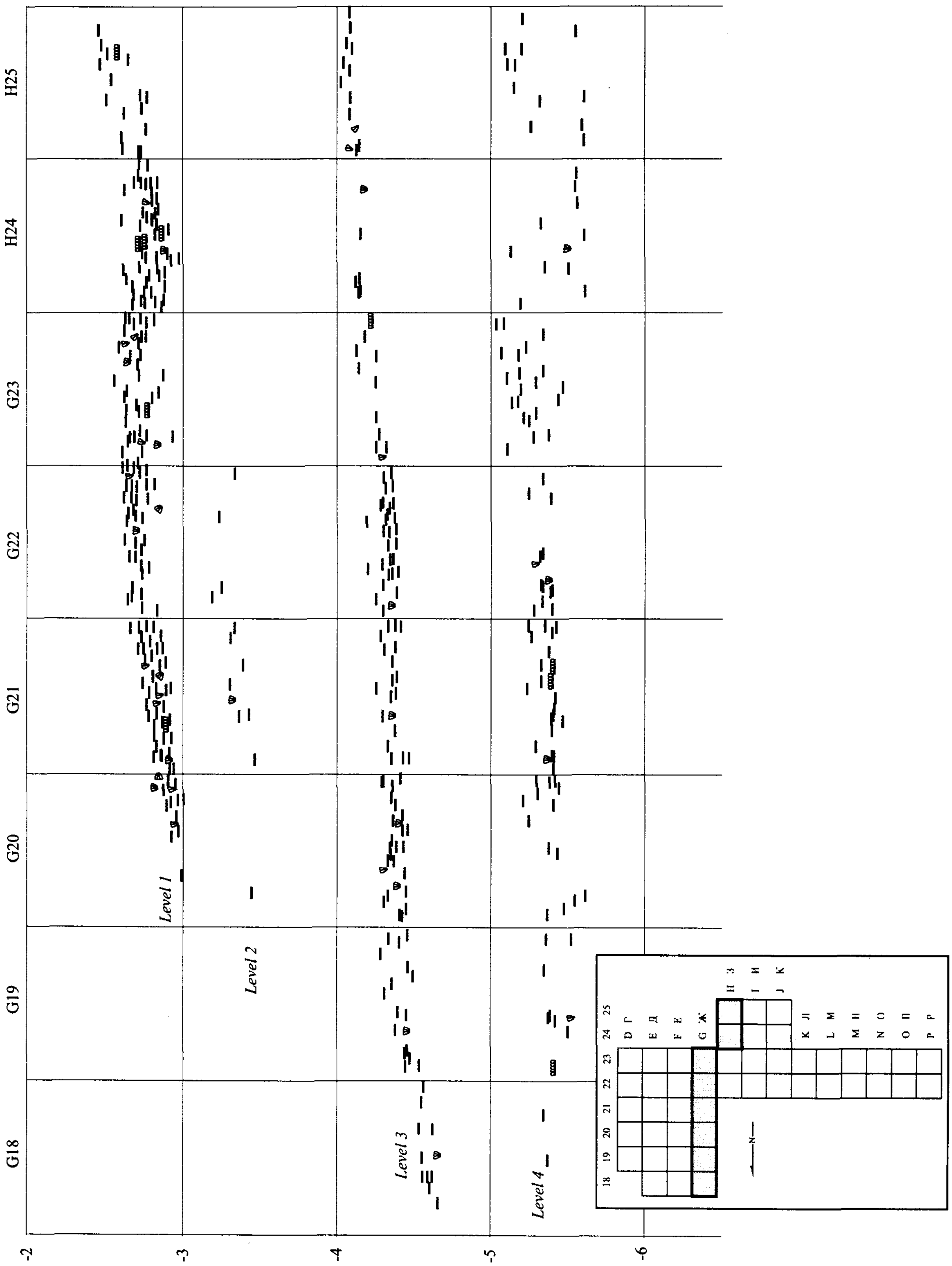


Fig. 5-22—Starosele, vertical distributions of faunal remains, line G 18-23/H 24-25; ▬—bones; ◆—individual teeth; ▦—tooth rows. Inset is plan of recent excavations at Starosele, indicating place of profile.

above, were brought to the site by strong water action. Aside from the surface of Stratum F, which we called Level 4, it is likely that the bones below Level 4 were mainly brought to the site by water action from above the canyon. The "below Level 4" bones were also often on edge or markedly slanting through the deposits. The very few artifacts in similar stratigraphic position, however, show no evidence of rolling or edge damage. Therefore, it is suggested that they were dropped on surfaces during dry periods between the floods and were sufficiently incorporated into the sediments that the next flood did not move them significantly.

Considering the sediments, the fauna, and the artifacts, as a whole, there is not the slightest evidence for a continuous occupation over the 3 meter depth of Pleistocene deposits. Only Levels 1 and 4 (if Level 4 and "below 4" are grouped together) suggest any temporal depth; it is only minor for Level 1 and is mostly due to natural causes in Level 4 and below.

THE DATING OF STAROSELE

Although it became clear early in the excavations that artifacts and bones did not accumulate continuously during sediment aggradation, the actual dates of periods of occupation were unknown. Formozov's belief that all of the Starosele materials came from a single event led him to date it as late Middle Paleolithic, and to justify it by seeing "evolved" elements in the lithic materials, as discussed in detail in Chapter 4. Since the occupations clearly were separate events, it was possible that, overall, they spanned a long period or, conversely, that even though they were separate events, they may have all taken place over a relatively short period.

As noted above, the lower sedimentary units (Strata D through F) mainly were deposited by strong fluvial action, although certainly not by a single flood episode, since at least one major cut and fill episode can be seen in the profiles. The weathered nature of those sediments, as well as their eroded western edge, suggest some time in place before the period of large scale exfoliation of the limestone cliff. The absence of weathering of the exfoliated slabs, except at the break in slope toward the west where the slabs are closest to the surface, indicates that Stratum B accumulated soon after the exfoliation. Given the various minor alluvial/colluvial lateral facies in Stratum B, it was probably a period of rapid accumulation. Thus, it would seem that the sediments below the exfoliated limestone were in place some significant duration prior to the exfoliation and that the sediments above the exfoliation may have accumulated over a brief period.

In relation to the archeological occupations, this would mean that Levels 1 and 2 should be quite close in time and the various visits to Starosele during the Stratum B accumulations would cover only an insignificant time. The temporal relationship of Levels 1 and 2 with Level 3 is less clear. While Level 3 is in the older, pre-exfoliation sediments, it is close to the top of these. Thus, it is possible that all these levels are close in time, since the period of exfoliation was very brief. The stratigraphic positions of Levels 3 and 4, within the older sediments, might suggest they are somewhat similar in age, but their very different positions within those sediments could mean a considerable temporal gap. Only absolute dates could solve these problems because, at best, these observations refer to relative, rather than absolute, time.

Providing absolute dates for accumulations of sediments, natural and/or cultural, becomes difficult when their ages exceed 30,000 BP. Given the Middle Paleolithic character of the materials (excluding the Starosele child itself), absolute dates in excess of 30,000 BP, if not even 40,000 BP, are justifiably expected. While the majority of absolute dates for Starosele do exceed 30,000 BP (see Chapters 13 and 14 for detailed discussions), as usual, multiple dating systems have provided multiple results. While these are often in statistical agreement, the range of standard errors tends to be so wide as to be less than satisfying. As the absolute dating now stands, the various archeological occupations must be dated in somewhat general terms.

Level 1 has dates from three different dating techniques, AMS on bone collagen (Hedges et al. 1996: 189), ESR on tooth enamel (Chapter 13) and U-Series on tooth enamel and dentine (Chapters 13 and 14). Although samples were taken from Level 1 for TL dating, none of the flint was sufficiently burned to be datable (J. Rink, personal communication).

The AMS dates produced two clusters, both of which are apparently technically good and both received the same exact pre-treatments. One cluster consists of two dates taken from bones excavated by Formozov from above the exfoliated limestone and the other comes from two bones excavated by us from Level 1, also above the exfoliated limestone. Both sets came from near each other; the Formozov samples from Squares H21 and L18 (our lettering system) and ours from Square H22, at depths of 2.83 and 2.91 below datum (see figure 6-1). The higher bone comes from the top of Level 1, while the lower bone came from within a concentration of Level 1 materials. The dates are as follows:

Formozov sample	Square H21	36,160 ± 1,250	(OxA-4133)
Formozov sample	Square L18	35,510 ± 1,170	(OxA-4134)
Recent sample	Square H23 (2.83 bd)	41,200 ± 1,800	(OxA-4775)
Recent sample	Square H23 (2.91 bd)	42,500 ± 3,600	(OxA-4887)

As pointed out (Hedges et al. 1996: 189), each set is internally consistent and it is not apparent why the "second is so much older than the first." The difference between the pairs, by averaging within each pair, is 6,015 years; that is, the first averaged date is 35, 835 BP and the second is 41,850 BP. At one standard deviation, neither the averaged date nor the paired dates overlap. At two standard deviations, however, all dates do overlap and so, at a 97% confidence level, all dates are statistically the same. This provides a rather wide window for the occupation.

Regardless of how inexact the absolute AMS dating may be, it is clear that using AMS dating exclusively, Level 1 was occupied some time around 40,000 years ago and more probably somewhat before 40,000 BP than after it. This, by itself, certainly supports Formozov's belief in a late Middle Paleolithic date, at least for Level 1. Level 2 was undated, but its stratigraphic position is clearly temporally close to Level 1 and these dates should be equally valid for Level 2.

The coupled ESR/U-Series dates on tooth enamel for Level 1 are generally consistent with the AMS dates, but tend to match more closely with the older set, rather than the younger (see Chapter 13 for detailed discussion). As of now, a date of 41,200 ± 3600 BP should be considered a minimum.

When both the AMS dates and the coupled ESR/U-Series dates are considered together, a date of ca. 40,000 BP would seem reasonable. As pointed out in Chapter 13, however, the ESR/U-Series dates are affected by beta levels, so a date in the late 40,000s is probable, correlating better with the second set of AMS dates. While we may never get tighter temporal controls on the Level 1 occupation, it is clearly a late Middle Paleolithic. Yet, it is certainly not the youngest Middle Paleolithic in the Crimea, which at the moment appears to be the Western Crimean Mousterian at Kabazi II, Unit II, or possibly, the Kiik Koba occupation of Level B/B1 at Buran-Kaya III, in eastern Crimea (Pettitt 1997).

Level 3 has both coupled ESR/U-series dates (Chapter 13) and a sequence of U-series dates on tooth enamel (Chapter 14).[1] The former produced a range of 37,800 BP to 46,000 BP, with

[1] The manuscript of Chapter 14 was received too late to be considered in this discussion.

a mean date of 41,900 ± 4,100 BP, only slightly older than the Level 1 average. The latter gave a date of 45,800 ± 5,100 BP. While this date is absolutely older, the mean date and it are statistically identical. Again, however, the coupled ESR/U-Series dates must be adjusted for beta effect and, as explained in Chapter 13, this discrepancy would affect the Level 3 dates more than the Level 1 dates, making them closer to 50,000 BP than to 40,000 BP.

Given the stratigraphic position of Level 3 near the top of the older sediments and close to the exfoliated limestone slabs, it is not surprising that it appears to be only somewhat older than the Level 1 occupation directly on the limestone slabs. How much time difference is involved? It could be very minimal or, equally, it could be in the order of 8,000 years or somewhat more (see Chapter 13).

A single U-Series date for Level 4 of 104,000 ± 8,500 has been published, noting that was preliminary and might undergo significant change (Marks et al. 1997). It turns out that this original reported date was incorrect, as discussed by C. McKinney in Chapter 14. Although combined ESR/U-Series samples are currently being processed (J. Rink, personal communication), they will not be available for some time. Thus, the absolute age of Level 4 remains highly tentative. On the other hand, the geological deposits consisting of transported *terra rosa* soils, without significant weathering, suggest that these deposits only somewhat post-date the Last Interglacial. Given the combination of assemblage types, geological deposits, and absolute dates from Kabazi II and GABO, a date around 70-80,000 BP would not be surprising. In fact, it would make a good deal of sense both archeologically and geologically. Only time will tell, however.

Discussion

As documented above, the vertical distributions of both lithic artifacts and bones clearly show that their accumulations were episodic, not continuous. The absolute dates also indicate a significant period between Level 4 and Level 1. These facts have a profound effect on the *a priori* acceptance of previous descriptions and interpretations of the Starosele lithic "industry." Since it is obvious that Formozov's justification for lumping all materials into a single analytic unit was without validity, it is also possible that the works of Gladilin, Chabai, and Yevtushenko, as they relate to Starosele, also need revision. Even though they kept separate the samples of Formozov's "cultural level 1" and "cultural level 2" from his 1955/56 excavations (see Chapter 4 for a detailed discussion of this), they could not have separated the materials from below the "roof fall" into their two clearly distinct stratigraphic units (our Levels 3 and 4). Although Formozov noted that there were two levels below his "roof fall," he decided they were not significantly different and put them together as "cultural level 2" (Formozov 1958: 48). Only the new excavations at Starosele can resolve whether this grouping was justified. As will be shown in detail, unfortunately, it cannot be justified, since the Levels 3 and 4 assemblages are very distinct, as are the Levels 1 and 3 assemblages. Thus, new descriptions of the Starosele assemblages are necessary, as are judgments as to how they relate to assemblages from other sites in the area.

Chapter 6

HUMAN REMAINS AT STAROSELE

K. MONIGAL, A. E. MARKS, and V. I. USIK

INTRODUCTION

The attention the site of Starosele has drawn is mostly due to the discovery, during the original excavations conducted by Alexander Formozov, of the remains of a child which were claimed to be associated with the uppermost Middle Paleolithic cultural level. Initially, the Starosele child was viewed as morphologically transitional between Neanderthals and modern humans, but since that time, conflicting opinions have surfaced about its phylogenetic attribution—it has been referred to as Neanderthal, transitional, and *Homo sapiens sapiens*—even though few physical anthropologists have been able to view the remains. The claim that the remains were stratigraphically contemporary with the Middle Paleolithic material encouraged the idea of it being morphologically transitional, and influenced how the stratigraphic sequence and lithic artifacts were interpreted by Formozov. The numerous attempts at absolute dating, both during the 1950s and more recently, have not clarified the situation. A further source of confusion has been the child's stratigraphic position and whether it was, in fact, directly associated with Middle Paleolithic deposits. During the 1993 and 1994 seasons at Starosele, two more skeletons were discovered, in much the same stratigraphic situation as the Starosele child. These unexpected findings require a reappraisal of the Starosele child, its phylogenetic status, and its relationship with the Middle Paleolithic deposits. Background and detailed information regarding the excavations conducted by Formozov and the joint Ukrainian/American project can be found in Chapters 4 and 5. This chapter reviews the discovery and excavation of the Starosele child by Formozov, the numerous attempts at dating the burial, how the child has been viewed over the years, the new human remains, how they pertain to the Starosele child, and what conclusions can now be drawn from all these data.

DISCOVERY OF THE STAROSELE CHILD

During the second season of Formozov's excavations at Starosele (1953), a 2 x 2 m test pit (referred to as "Block II") was opened to the south of the extant excavation area, in order to verify the stratigraphy. On 24 September 1953, in the southeastern corner of the pit (square J20), at a depth of 0.7-0.9 meters below surface, a nearly complete child's skeleton was discovered (fig. 6-1). The test excavation was immediately widened one meter to the east and south to the same depth as the burial (forming a 4 x 3 m block), leaving thin baulks as close to the burial as possible to view the profiles. Owing to its fragile condition, the skeleton was covered with glue to stabilize it (Gerasimov 1954: 23).

The skeleton appeared to lie on a horizontal surface immediately above the layer of large limestone slabs, separated from them by a thin layer of "white gravels" (Formozov 1958: 61-63). The body was oriented east-west, with the head toward the west and the face turned to the south. It lay on its back with its left shoulder slightly raised, its legs extended, the upper arms straight, with the lower left forearm bent so that the left hand lay on the pelvis (fig. 6-2) (Formozov 1958: 63-65). The gravel lens on which the skeleton lay was sterile, and there was nothing suggesting funereal offerings associated with the body. The uppermost Middle

Paleolithic cultural level lay some 10 cm above the layer in which the Starosele child was resting.

Following normal custom, when a potentially important find was being made (especially if it was a human skeleton in a Paleolithic context, as it was with the Neanderthals at Kiik-Koba, in 1924), the excavations were suspended and a commission of specialists (Ya. Ya. Roginsky, S. N. Zamyatnin, and M. M. Gerasimov) was assembled to examine the find in the field. This commission was joined by other professionals (S. N. Bibikov, P. N. Schults, E. V. Veimarn, V. N. Chernetsov, V. I. Moshinskaya, V. V. Bogachev, V. V. Bobin, and K. F. Sokolova) who tried to determine if the child burial was in situ; that is, was it contemporaneous with the Middle Paleolithic materials or was it intrusive from the surface and, thus, of post-Middle Paleolithic age? In spite of the remaining baulks, the commission could not see any evidence of an intrusive pit, nor any evidence that the sediments above the burial had been disturbed. The majority of the commission reported that they believed that the burial, in fact, was of Middle Paleolithic age (Alexeyev 1954; Gerasimov 1954: 23; Roginsky et al. 1954).

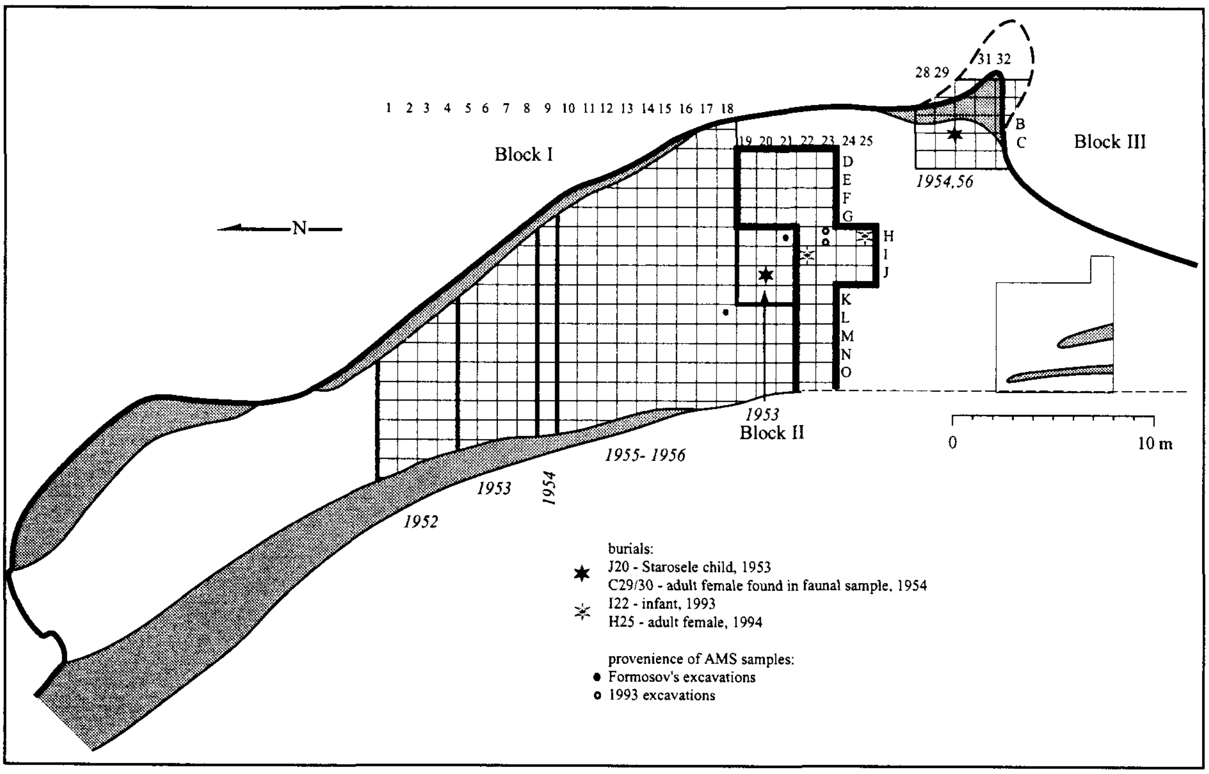


Fig. 6-1—Starosele, general plan of excavations, indicating the zones excavated by Formozov and by the Ukrainian-American project, the position of the burials, and the samples dated by AMS. (Redrawn from Formozov 1958: 26, pl. 16.)

The one dissenting voice in the commission, S. N. Zamyatnin, remarked that, given the homogenous nature of the sediments, it was unlikely that an intrusive burial pit would have been seen or could have remained intact and that, therefore, he could not exclude the possibility of a post-Mousterian age for the burial (Alexeyev 1954: 158; Roginsky et al. 1954: 40).

Formozov immediately rejected the possibility that the burial was of Late Paleolithic, Mesolithic or Neolithic age, as suggested by Zamyatnin, since only Middle Paleolithic cultural remains had yet been found at the site (Formozov 1958: 66). Only later, during the 1955/1956 field season, did Formozov find ceramics and domestic animal bones of A.D. eighteenth century age. (Formozov 1958: 44). In his monograph, however, he claimed that the preservation of the child's bones in no way resembled the preservation of the bones of eighteenth century age, that the skull had no mongoloid (Tartar) features, and that, therefore, it must date to the Middle Paleolithic (Formozov 1958: 67). Formozov also had little doubt that the burial was intentional (Formozov 1958: 67).

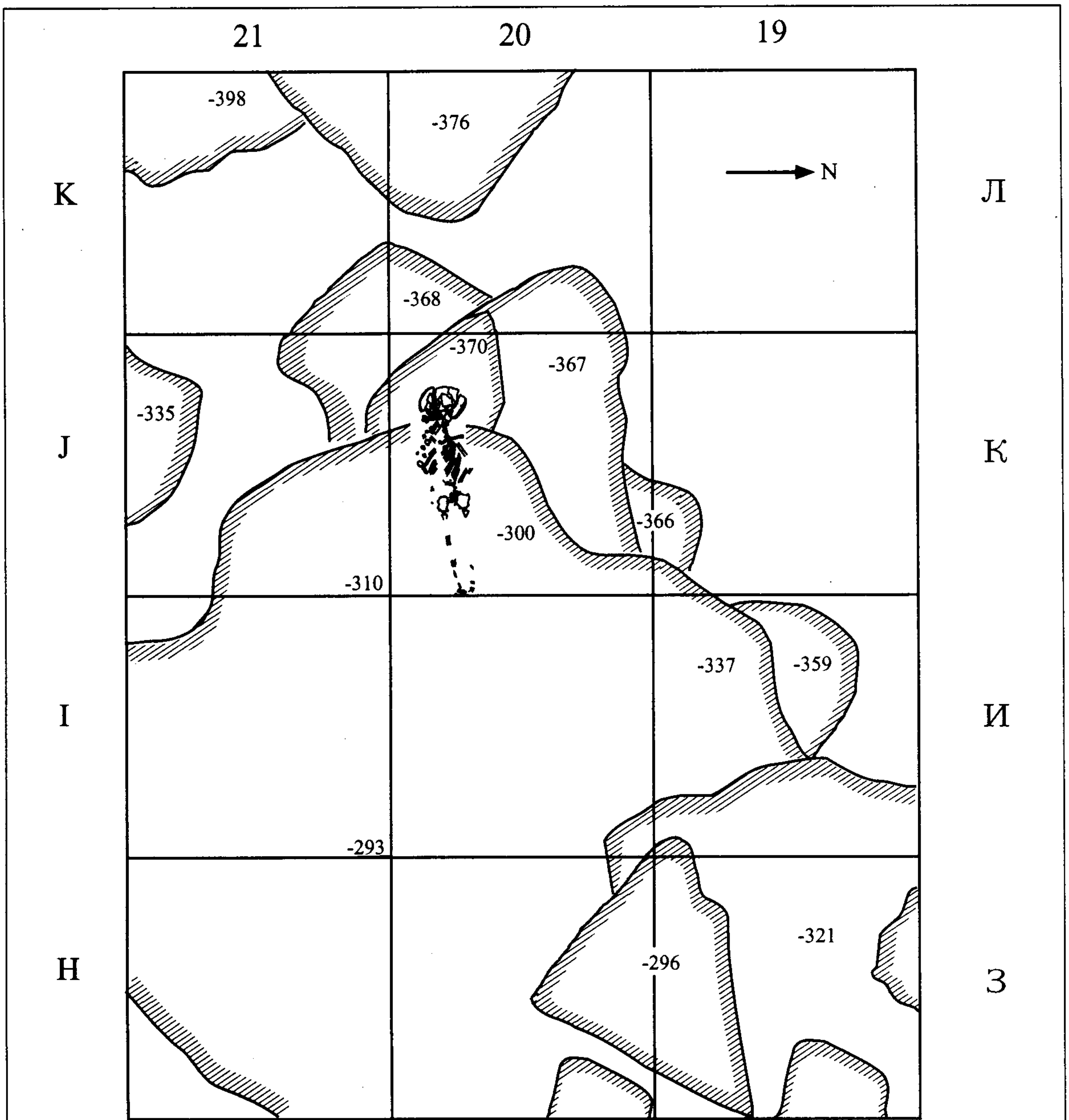


Fig. 6-2—The Starosele child (adapted from Formozov 1958: fig. 35). Grid is 1 meter.

Although not recognized during the excavation, additional human remains were identified among the faunal materials from the upper deposits of Block III, squares B/C-29/30 (fig. 6-1) by paleontologist N. K. Vereschagin (Smirnov 1991: 142). These consisted of the anterior lower jaw, including the chin and alveoli for 4 incisors, and fragments of a radius and humerus. The remains were attributed by Ya. Ya. Roginsky, G. F. Debets and M. M. Gerasimov to an adult woman with fully modern morphological features (Formozov 1958: 75). These remains were neither extensively studied nor published, and their current whereabouts are unknown (Smirnov 1991: 269). Smirnov (1991: 142) expressed the opinion that these human remains ". . . might originate from a destroyed burial." While Formozov briefly discussed these findings in his monograph, and expressly stated that they were of modern origin, almost without exception these other human remains have been ignored by subsequent authors.

Reconstruction of the Starosele Child

The Starosele child was in poor condition when it was discovered; mostly crushed and fragmentary, although still in anatomical position. The remains consisted of the cranium, mandible, vertebrae, clavicle, ribs, 2 humeri, a radius, ulna, a finger bone, coccyx bone, 2 femurs, a tibia, a fragmentary pelvis, and foot bones (fig. 6-2). The skull and mandible were reconstructed by Gerasimov and published by Roginsky in 1954 (fig. 6-3), while the post-cranial remains, which could be of little interest given the age of the child and their fragmented state, were not examined further. Most of the teeth and all of the alveolar ridge of the maxilla were intact, enabling the child's dental age to be estimated at 24 months. The infant had all of the alveolar sockets of 16 milk teeth; in modern infants, the molar milk teeth erupt between 20 and 30 months of age. The anterior fontanel, however, appeared to still be open; this closes in modern infants not later than the 19th month, suggesting the child's age to be closer to 18-19 months of age. The discord between the dental age and the fontanel closing, although not remarked upon by Roginsky who gave the age as 18-19 months, has been attributed to hydrocephalus (Howell 1958; Spitery 1980).

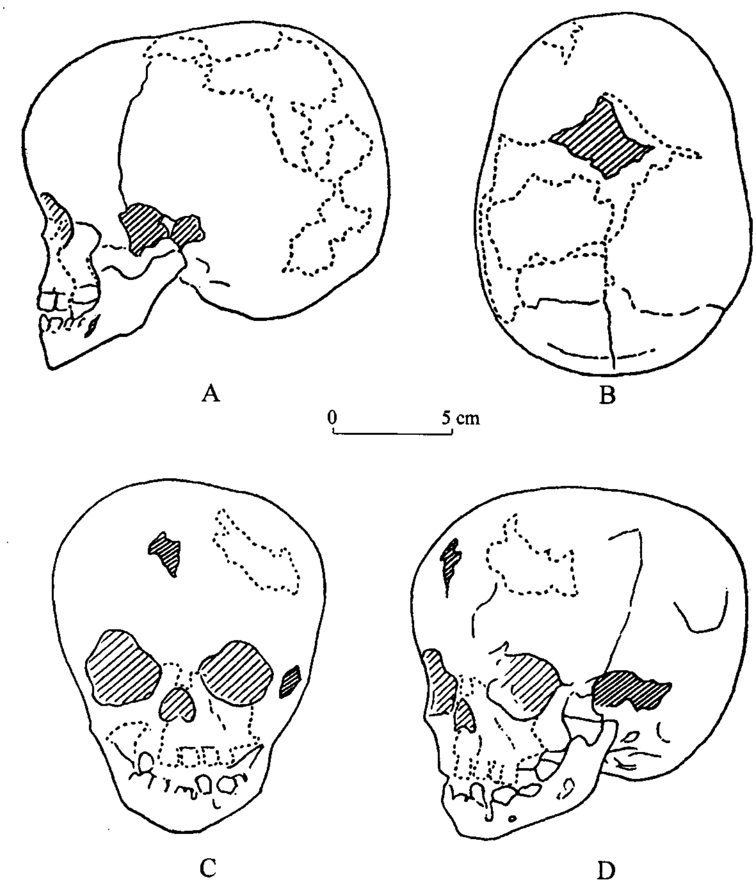


Fig. 6-3—Reconstruction of the Starosele child's skull: *A*–left lateral view of the cranium; *B*–dorsal; *C*–anterior; *D*–left oblique (adapted from Vallois 1955: figs. 1 and 2).

Roginsky believed the Starosele child to be neanthropic, but that it had several primitive features that made it quite similar to the specimens from Skhul, especially the Skhul I infant. The "primitive" features included the thickness of the skull and zygomatic processes, the absence of frontal protuberances, a weak development of the parietal protuberances, a thickening of the lateral orbital margins, small temporal bones, the great width of the anterior mandible, large teeth, the alveolar prognathism, and weakly developed mastoid processes. The "modern" traits included a high brain case, a prominent and domed brow, low angular orbits, an occiput which rises vertically with little curvature, the zygomatic width, the short face, the thickness of the mandibular body, the incipient chin, and gracile facial bones (Roginsky 1954; Vallois 1955; Alexeyev 1976). The results of a symposium convened to discuss the child's evolutionary significance, in 1954, upheld Roginsky's analysis, noting additional primitive features of the Starosele child's skull and concluding that it represented a hominid transitional between Neanderthals and modern *Homo sapiens sapiens* (Alexeyev 1976).

DATING THE STAROSELE CHILD

Numerous attempts have been made to either directly or indirectly date the Starosele child burial. During the 1950s, three absolute dating methods—collagen, fluorine, and radioactive isotopes—were used on the skeleton itself and on faunal materials believed to be contemporaneous with it. In 1992, two animal bones from Formozov's excavations in proximity to the Starosele child, which had been stored at the Institute and Museum of Anthropology of Moscow State University, were made available for AMS dating.

The collagen test, performed by I. G. Pidoplichko, produced an index of the ratio between the mineral and organic contents of the bones (the older the bone, the higher its mineral content), with the expectation that bones from the same stratum have the same, or approximately the same, indices. The collagen tests on the material from Starosele proved inconclusive, however. Initially, Pidoplichko ran tests on four *Equus hydruntinus* bones from the 1952 excavations, obtaining a mean index of 456 (indices: 402, 418, 495, 509), which, according to his system, was of late Mousterian age (Formozov 1958: 58-59). He then ran tests on the Starosele child bones, producing indices of 241, 255, 361 which, in his terms, were much younger than the tested faunal materials. Pidoplichko, suspecting the glue used to preserve the child skeleton was affecting the results, ran additional tests on more faunal material, including one bone which was impregnated with glue, which produced indices of 290, 307, 343, 344, 367, 472. Aside from the wide spread of the indices, a number fell within the range of those gotten from the child itself. Moreover, in Pidoplichko's chronological scale, these new indices fit into the very late Middle Paleolithic and early Upper Paleolithic. Assays were not run on faunal remains from the A.D. eighteenth century cultural deposit. Both Pidoplichko and Formozov explained the very late indices as the consequence of variable bone preservation according to sediment types, and the influence of the glue on both the child's bones and the Middle Paleolithic animal bones (Formozov 1958: 72-74; McKern and Kozlik 1962: 405).

Fluorine assays, performed by V. V. Danilova, were still more inconclusive: faunal samples from Block II of Starosele (adjacent to the burial) gave an index of 0.13, while the skeleton contained no fluorine whatsoever (the fluorine content of bones is expected to increase with geologic age). Danilova concluded, therefore, that the skeleton was not of Mousterian age, a conclusion rejected by Formozov (1958: 60) on the grounds that the sedimentary conditions resulted in a variable fluorine retention, the glue on the child's skeleton affected the results, and the test was, at that time, not well developed (Formozov 1958: 74-75; McKern and Kozlik 1962: 405).

The third absolute dating method was employed by V. V. Cherdyntsev using the radioactive isotopes actinium/radium, radium/uranium, and thorium. The Ac/Ra and Ra/U tests produced dates at Starosele ranging from 26,000 to 33,000 BP, and the Thorium test produced dates of 31,000; 41,000; and 110,000 BP (Cherdyntsev and Meshkov 1954; Cherdyntsev 1956; Cherdyntsev et al. 1961). Since 100 grams of bone were required to perform the tests, the tests were run on faunal remains from the 1952 excavations (ca. 17 meters to the north of the burial), the provenience of which, unfortunately, was not recorded. The dates produced by these tests were not accepted by Formozov, since he believed there was a single, late Middle Paleolithic occupation of Starosele, because Cherdyntsev had produced inconsistent results in the dating of other sites, and because the method was not well developed (Formozov 1958: 59-60)

The inconsistencies both within and among these dating systems, their experimental nature, and Formozov's belief that there was a single, late Mousterian occupation of Starosele, led to their complete rejection. Instead, rather tautological reasoning was used to estimate the age of the cultural material from Starosele: the lithic artifacts were said to be Mousterian, but with "evolved" characteristics, such as blades and well-shaped bifacial pieces, and the Starosele child was said to have "evolved" physical features, as well. The site must, therefore, be of late Mousterian age.

As part of the program "Dating the Paleolithic in Eastern Europe," sponsored by the McDonald Institute, the British Academy, the Radiocarbon Dating Laboratory in Oxford, and corresponding institutions in the C.I.S., AMS dates were recently run on faunal samples from Formozov's excavations in another attempt to date the Starosele child (Gvozdover et al. 1996). The samples were collected by M. D. Gvozdover during the 1956 excavations, as part of her study on bone retouchers, and are said to derive from above the "roof collapse," in a position analogous to the child's burial (squares H21 and L18; fig. 6-1). Two samples, broken fragments of long bones identified as *Asinus*, produced dates of 36,160 ± 1250 (OxA-4133) and 35,510 ± 1170 (OxA-4134) (Hedges et al. 1996: 189). These dates, if correct, provide an age for the cultural layer above the child's burial, and therefore, only a possible indirect age for the burial itself. These dates are discussed in more detail in Chapters 5, 13 and elsewhere (Hedges et al. 1996; Marks et al. 1997; Monigal et al. 1997).

VIEWS OF THE STAROSELE CHILD

Since its discovery, the Starosele child has received a fair amount of attention for numerous reasons. Mousterian burials were, and still are, relatively rare. The mixture of Neanderthal and Modern human traits it was said to possess made it the only one of its kind on the European continent. Also, it fit in with then-current evolutionary ideas about the origin of *Homo sapiens sapiens* evolving in the Near East and moving from there into Europe. In spite of all of this attention, however, there has been much confusion in the literature over its stratigraphic context and disagreement over its morphological attribution; the latter seeming to vary according to the prevailing evolutionary paradigm. Citations of the Starosele child tend to be of two types: those debating its phylogenetic attribution and those who use it to demonstrate evidence of advanced Mousterian cultural practices by claiming that the burial was intentional.

Two seminal articles which appeared in 1955 brought the Starosele child to the attention of the Western World and reflected the opinions which would hold sway for the next thirty years. Ullrich (1955), using the data from Formozov's (1954) and Roginsky's (1954) descriptions of the site and child, entertained no doubt that the burial was intentional and of Mousterian age. He also pointed out that the burial had the same body orientation as that found at Tabun, La Chapelle and Skhul. While noting that the skull had both Neanderthal and modern traits, he was unwilling to commit himself to the child's phylogenetic attribution, although he suggested it might be related to the specimens from Mt. Carmel (Ullrich 1955). A few years later, Ullrich stated that the child was not a Neanderthal, but was most likely a presapiens related to the Near Eastern fossils (Ullrich 1958).

In an independent and very detailed review of the Russian reports, Vallois (1955) came to much the same conclusions as Ullrich. The mixture of Neanderthal and modern traits suggested to him that it had more affinity to the Skhul fossils than it did to classic Neanderthals. The coexistence of dolichocephaly, hypsicephaly, the shortness of the face with a low orbital position, and prognathism also suggested to Vallois similarities to the preaurignacians from Grimaldi. He put forth a hypothesis that the Aurignacian *Homo sapiens sapiens* did not evolve from the western European Neanderthals, but might have evolved from those of Eastern Europe. He argued that, since the Aurignacians already had modern features, they must have developed during the Mousterian, to which the specimens from Skhul, Teshik Tash, and Starosele attest. A possible center of evolution of *Homo sapiens sapiens,* in Vallois' opinion, was Russia (Vallois 1955).

As the remains of the Starosele child were examined by very few anthropologists, all Russian, Vallois' article and its long, detailed treatment of the site and the burial, was one of the only sources of information about the site available to western, non-Russian speaking archeologists. Unfortunately, Vallois' article misrepresented the child's stratigraphic context and may be the cause of the confusion in the subsequent literature regarding the burial. He stated that the stratigraphy of Starosele was "extremely simple": under a humus layer 30 centimeters thick, there was a single, homogenous cultural layer from 0.4 meters to 2 meters below surface, in which the burial lay (Vallois 1955: 556). While Formozov certainly did not belabor the complexity of Starosele's stratigraphy and did believe the lithic artifacts to be homogenous, he still recognized that a layer of rockfall separated two distinct cultural layers. In none of the published Russian reports was it stated that the child was actually in the cultural layer. While Vallois did mention that no burial pit was visible, he was more concerned whether or not it was an intentional Mousterian burial, not whether it was of an intrusive, later age.

Howell (1957, 1958) followed a line of reasoning similar to Vallois in two articles treating the evolutionary connections of Neanderthals and modern humans. He suggested that there was "broad racial continuity" across eastern Europe and into Southwest Asia, and that Neanderthals were either "sapienized" in the Near East or evolved in place further to the north. He placed the Starosele child midway—chronologically and morphologically—between the fossils from Skhul and Qafzeh and the Cro-Magnons, and stated that "the Starosele child would thus testify to the first penetration of such people into the eastern margins of the European continent" during Würm I (Howell 1958: 196).

Coon (1967: 558) remarked that many of the "modern" features of the skull were exaggerated; that the forehead is more rounded and curved, and the face shorter than modern-day infants of the same age, yet neither could one ignore its "primitive" features such as the thick cranial vault, weakly developed mastoids and large teeth. Coon offered two possibilities for its origin: an early example of modern "caucasoids," resulting from the miscegenation of Neanderthals and Homo sapiens, or the result of in situ evolution from Neanderthal to *Homo sapiens sapiens*.

These articles, based on information derived from Russian reports rather than firsthand observation, differed only in whether the transition to modern humans took place in Eastern Europe (e.g., Gerasimov 1964; Uryson 1964; Alexeyev 1966, 1976; Birdsell 1972; Thoma 1978) or in the Near East (e.g., Yakimov 1954, 1969; Bunak 1959). There was some variation on how "modern" the skull was seen to be.

An early study by G. F. Debets (1956) compared the Starosele child's skull measurements to those of modern specimens and, based on modern growth curves, attempted to predict how the child would appear fully grown. Debets was of the opinion that the child was, in fact, a *Homo sapiens sapiens* and did not have characteristics which were any more primitive than modern skulls (Debets 1956). In a similar study, some two decades later, Alexeyev (1976) concluded that in the brain case height, the size of the facial skeleton, and thickness of mandibular body, the Starosele child was modern. He claimed that his inferred growth curves showed the child to be no different from Upper Paleolithic archaic *Homo sapiens sapiens*.

Jelínek (1969) and Uspensky (1969), comparing a number of its metrical indices to Neanderthal and modern children, have both claimed that the Starosele child had unambiguously modern characteristics. Thoma, one of the few physical anthropologists able to study a cast of the skull, claimed that the primitive traits noted by Roginsky can be found on any hominidae, and that the child was a typical proto-Cro-Magnon which happened to have a few primitive characteristics. Thoma, incidentally, reported that the pathologists to whom he showed the cast did not consider the child to have any deformation of the skull (Thoma 1962), *contra* Howell (1958), Spitery (1980), and Wolpoff (1980) who considered it to be hydrocephalic. Bunak (1959), likewise, thought that it was closer to modern *Homo sapiens sapiens* than to Neanderthals, claiming that there were fully developed frontal protuberances. More recently, there has been a strong tendency on the part of physical anthropologists and archeologists to view it as completely modern, while also expressing concern that so young a specimen could be attributed to a specific subspecies and indicating doubts about the context of the burial (e.g., Tillier 1989, 1990; Trinkaus 1989; Stringer and Gamble 1993; Soffer 1994).

On the other hand, since its discovery, some have viewed it as essentially Neanderthal; Gross (1956: 75) referred to the Starosele child as Neanderthal, in the same group as the Last Interglacial Neanderthals from Ehringsdorf, Krapina, La Quina, and Saccopastore. Many of the other authors attributing the Starosele child to Neanderthals (e.g., Phenice and Sauer 1977; Bunak 1980; Shackley 1980; Spitery 1980; Lambert 1987; Gvozdover et al. 1996) seem to be misled by the apparently associated archeological remains, assuming it is Neanderthal because the cultural materials were Mousterian.

The question of the Starosele child was further complicated for western scholars in 1962 when McKern and Kozlik (1962: 405) made specific reference to the additional human remains found in Block III (discussed above; fig. 6-1) at Starosele. McKern and Kozlik (1962: 405) stated that "from these fragments it was concluded that this individual repeated the morphological mixture of Neanderthal and sapiens traits that had been seen in the earlier found child . . ." and that "the association of this second find with the Mousterian layer was never questioned." In fact, since the bones in question came from an area well separated from the main excavation block, where the stratigraphy was not clear, their association was not demonstrated. Given that the bones were never described in any detail, and that Formozov, following the opinions of Ya. Ya. Roginsky, G. Debets, and M. Gerasimov, stated that the mandible was modern in every respect (Formozov 1958: 75), McKern and Kozlik's comments were without basis. The most recent interpretation of these bones, based on a careful reading of the original day books, is that they came from a modern "destroyed burial" (Smirnov 1991: 142).

Aside from the confusion surrounding the phylogenetic attribution of the Starosele child, a number of authors have questioned its context and age. Gábori (1976) not only questioned the association of the skeleton with the Middle Paleolithic deposits, but also the homogeneity of the deposits. Klein (1969), referring to the collagen and fluorine tests, raised the question of contemporaneity, a point also raised by Harrold (1980) and Trinkaus (1982), although others were not so cautious (e.g., Jelínek 1969; Birdsell 1972; Alexeyev 1976, 1981; Thoma 1978). Grahmann (1956) even suggested that the skull was not reconstructed properly.

It is unclear if questions about the child's context have been raised due to the original misgivings expressed by Zamyatnin (which were rarely mentioned in the Russian reports and not at all in non-Russian literature), or were due to the inconsistent stratigraphic descriptions published in the non-Russian literature. For example, Vallois (1955: 556) and Binant (1991: 10) state that the burial was within *the single* archeological level. Jelínek (1969: 500) states that it was in the "surface layer which contains mousteroid cultural finds." McKern and Kozlik (1962: 403) state that it was found in a "layer of crushed stone in association with . . . stone tools," while only Ullrich (1955: 96) and Gábori (1976: 133) correctly state that it was not within the upper archeological layer, but below it.

The Starosele child has also attracted much attention from archeologists who often cite it as an example of an intentional Mousterian burial (e.g., Grahmann 1956; Gamble 1986; May 1986; Binant 1991; Defleur 1993; Ullrich 1995; Alekshin 1996). In a few instances, it is even remarked how Mousterian peoples cared for their infirm, citing the child's hydrocephalic condition (e.g., Defleur 1993; Alekshin 1996). Those who do not question the association of the skeleton with the Middle Paleolithic cultural level and are aware that no burial pit was seen during its excavation, invariably cite the relatively good preservation (given its age) of the skeleton, that it was found in anatomical position, and that the overlying sediments were horizontally bedded with no evidence of disturbance.

In short, the Starosele child has been problematic. Even the physical anthropologists who have seen the specimen, or a cast of it, cannot agree on the extent to which it shows "modern" or "primitive" features. It is impossible to verify the context of the burial; neither the notes nor drawings are detailed enough, and Formozov tended to take a rather simplistic view of the stratigraphy (see Chapter 5). Yet another problem is the objectivity of those writing the major reports on the Starosele child: Alexeyev and Gvozdover both were part of the original excavation team, and Gerasimov and Roginsky were part of the commission which examined the find in situ and concluded that it was of Middle Paleolithic age. All of these authors concurred with Formozov's beliefs that the child was associated with the Middle Paleolithic cultural remains, all emphasized the "primitive" traits the skeleton possessed, and all wrote major publications about the child on which all the other literature concerning the burial is based.

Although the child's burial was completely removed, along with the surrounding matrix, the opening up of Formozov's original profiles, the discovery of his original datum, and a newly published profile of the sediments one meter to the south of the burial (Smirnov 1991: 143), enabled us to place the burial into its probable stratigraphic context. It appears that the burial was below our Level 1, resting just above the major rockfall episode which seals Level 2, in a matrix of "white gravels." These "gravels," noted by Formozov, are, most likely, small chips and blocks of weathered and washed exfoliated limestone accumulated in a major erosional channel, clearly seen in Formozov's intact southern profile (see Figure 5-3, this volume). Additional discoveries of human remains during the 1993 and 1994 seasons necessitate a reappraisal of the original Starosele child's context and origin.

New Discoveries of Human Remains at Starosele

New discoveries of human remains during the 1993 and 1994 seasons have added still more reasons to carefully review the context and probable origin of the Starosele child. While these new finds cannot *prove* that the Starosele child is not what is was claimed to be, they do amount to a very strong argument that a new interpretation is warranted.

An infant burial was discovered in 1993, during the opening up and cleaning of Formozov's line 21 profile, in square I22. That particular profile had been opened in 1953 and had been left open until it was reburied by Formozov at the end of his excavations in 1956 (fig. 6-4). It appears that during those years, a portion of this burial, including its northern and western parts, as well as the skull and all the upper body, were eroded away. The remaining portions clearly lay within the matrix of modern loamy soil, some 10 cm above our cultural Level 1 (fig. 6-5). While no burial pit was visible, it appeared that the surface on which the skeleton lay, as well as the southern and eastern edges of the sepulture, had been artificially straightened by the removal of limestone slabs as the pit was dug. There were no associated artifacts or grave goods. The remains, which were in correct anatomical position, consisted only of parts of the femurs, the lower legs and feet, including toes.

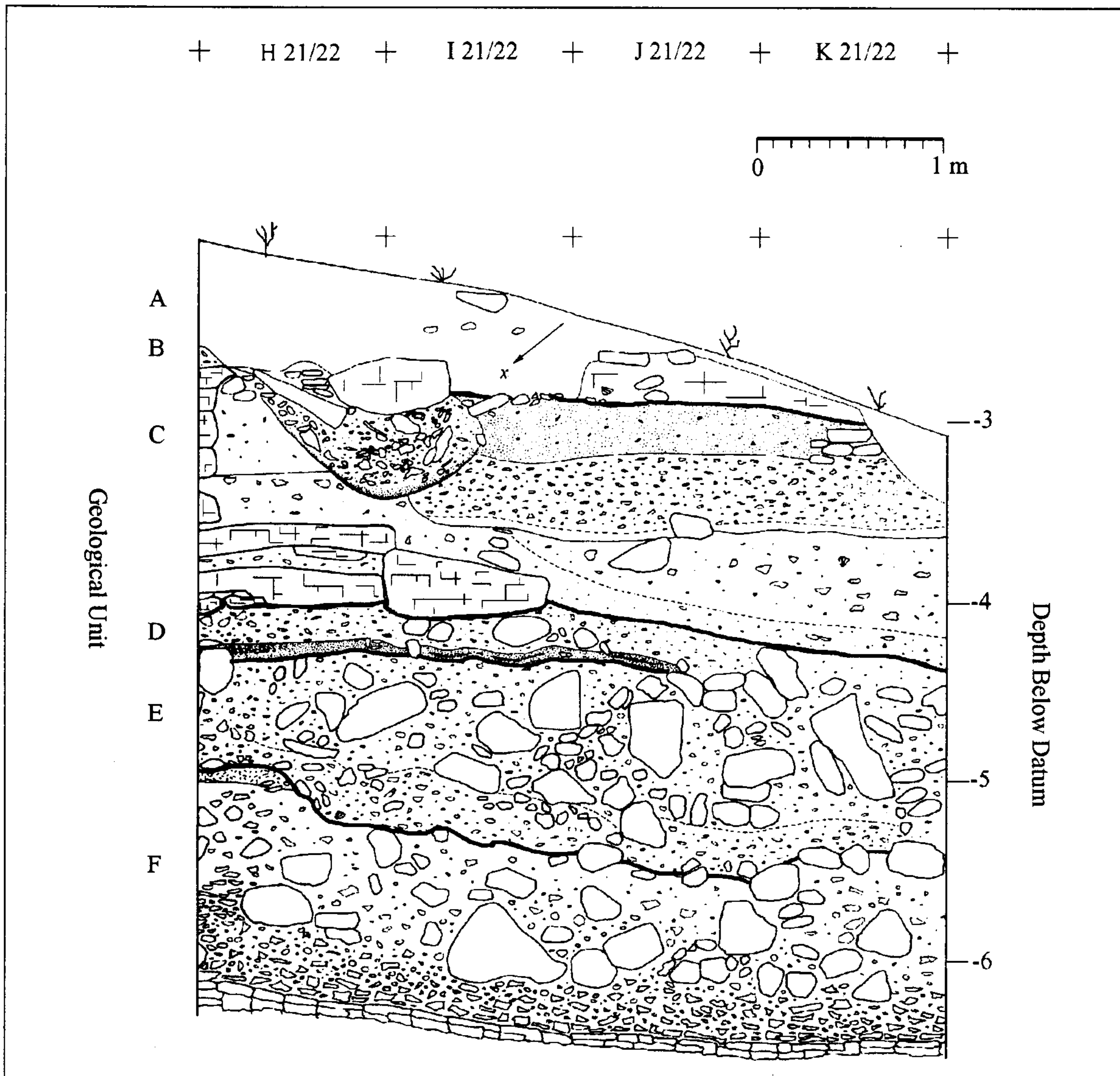


Fig. 6-4—Starosele, east-west profile of line 21/22 H-K as drawn in 1993 after removal of backfill and cleaning. The bones of the infant protruding from the profile are indicated by the arrow and the *x* at the top of the profile. To the left of the burial is an erosional channel, filled with exfoliated limestone fragments, gravels, and some derived Middle Paleolithic artifacts and bones. *A-F*–geological units: *A*–modern soil; *B*–complex of alluvial and colluvial sediments; *C*–exfoliated limestone sediments intercalated with fine sediments; *D*–gravels and exfoliated limestone fragments; *E*–boulders and gravels in reddish matrix; *F*–boulders in red clayey matrix.

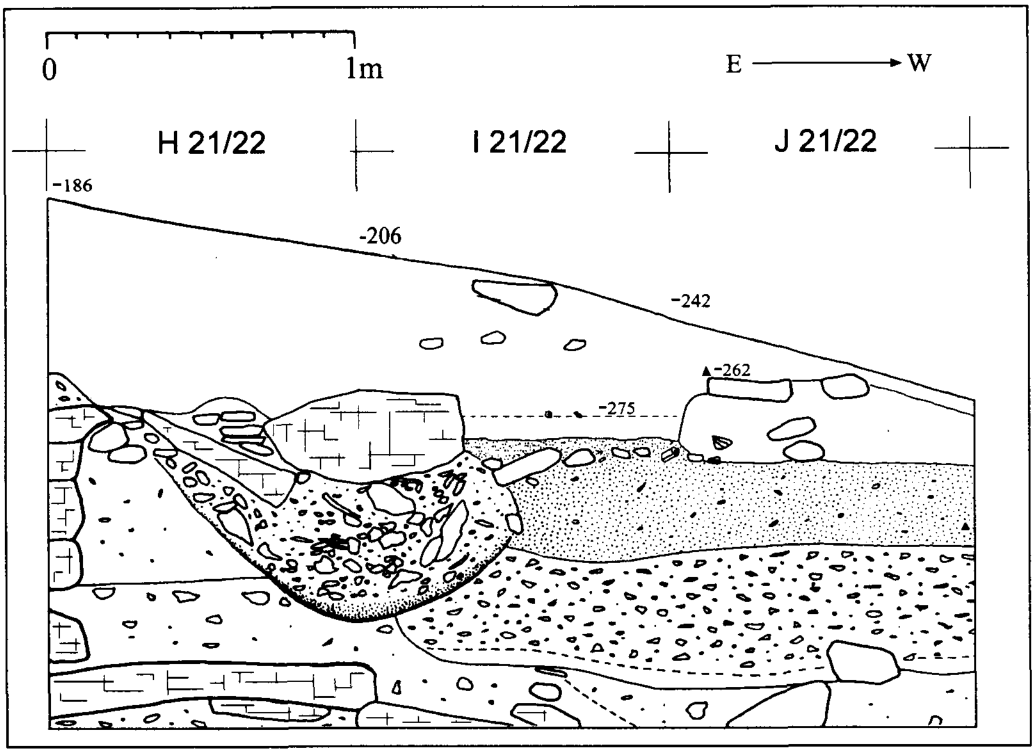


Fig. 6-5—Starosele, detailed profile of infant burial along line 21/22 H-J (1993).

Given the position of the legs and feet, it is possible to deduce that the infant had lain on its right side, with the legs in a semi-flexed position, the body oriented east-west, with the head west, and the face turned to the south (fig. 6-6). Thus, while the body position was different from that of the Starosele child (the latter's legs were extended), the body orientation was the same.

At the time of discovery, questions immediately arose concerning the possible relationship of the new discovery to the child burial discovered by Formozov, since they were only two meters apart. Both burials were about 90 centimeters below surface: however, while the 1953 burial was found below the uppermost archeological horizon, lying on top of the major rockfall in Pleistocene deposits, the 1993 burial was fully within modern sediments, above the uppermost archeological layer, and clearly of post-Paleolithic age. Given these differences and the fragmentary state of the 1993 burial, it was impossible to link the two burials as more than an improbable coincidence.

During the 1994 season, yet another burial was discovered, of a middle aged adult, this time in clear stratigraphic context, in squares G/H/I 25, 4.5 meters south-east of the 1953 burial, and 2 meters south of the 1993 burial (figs. 6-1 and 6-6). The burial pit, which was clearly visible (fig. 6-7), was wide: 1 meter at the top and 0.6 meters at the base. It began in the modern sediments and passed through our Level 1 into sterile deposits directly below, ending just above the limestone slabs. As a result of the disturbance of a portion of Level 1, a few Middle Paleolithic animal bones and flint artifacts were mixed in the burial fill, with one flake resting directly above the pelvis (fig. 6-6). The skeleton was complete and in correct anatomical position, lying on its back, its upper arms along its side and lower left arm bent so that the hand lay on the pelvis. The left shoulder was slightly raised. The legs were extended, the body oriented east-west, with the head to the west, and the face turned to the south. There is no doubt that this burial is modern, given its stratigraphic position and its state of preservation, which was vastly superior to the Middle Paleolithic fauna. The skeleton itself, without question, is modern (Trinkaus, personal communication).

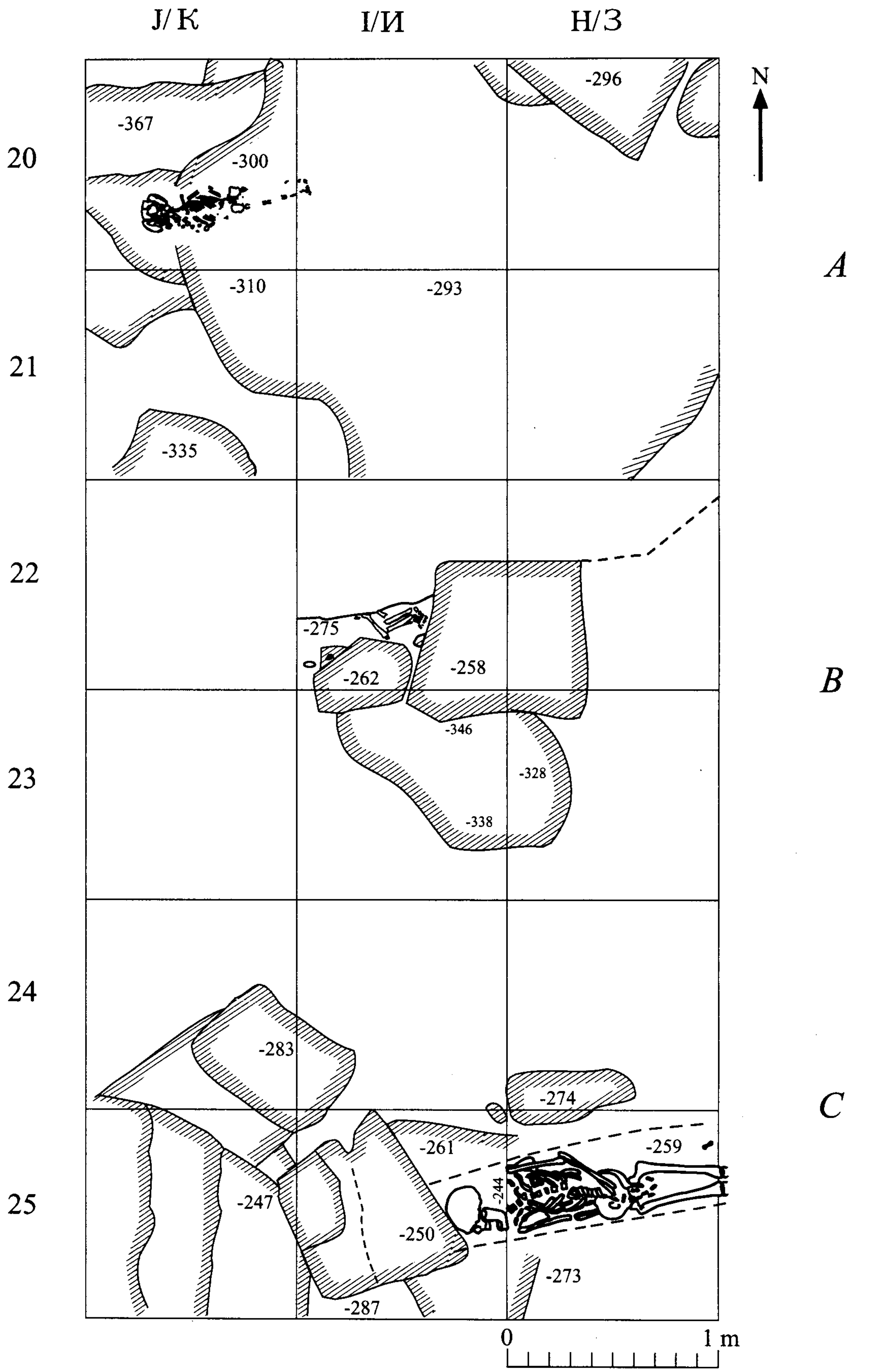


Fig. 6-6—Starosele, plan of the three human burials. *A*–the Starosele child (1953); *B*–the infant burial (1993); the broken line indicates the limit of erosion; *C*–the adult (1994).

Fig. 6-7—Starosele, photo of excavations at the end of the 1994 field season. The adult's burial pit is clearly visible below the arrow. The limestone slabs on the floor of the excavation are the lowermost: the uppermost slabs can be seen under the burial pit and to the right of the pit, along the back wall.

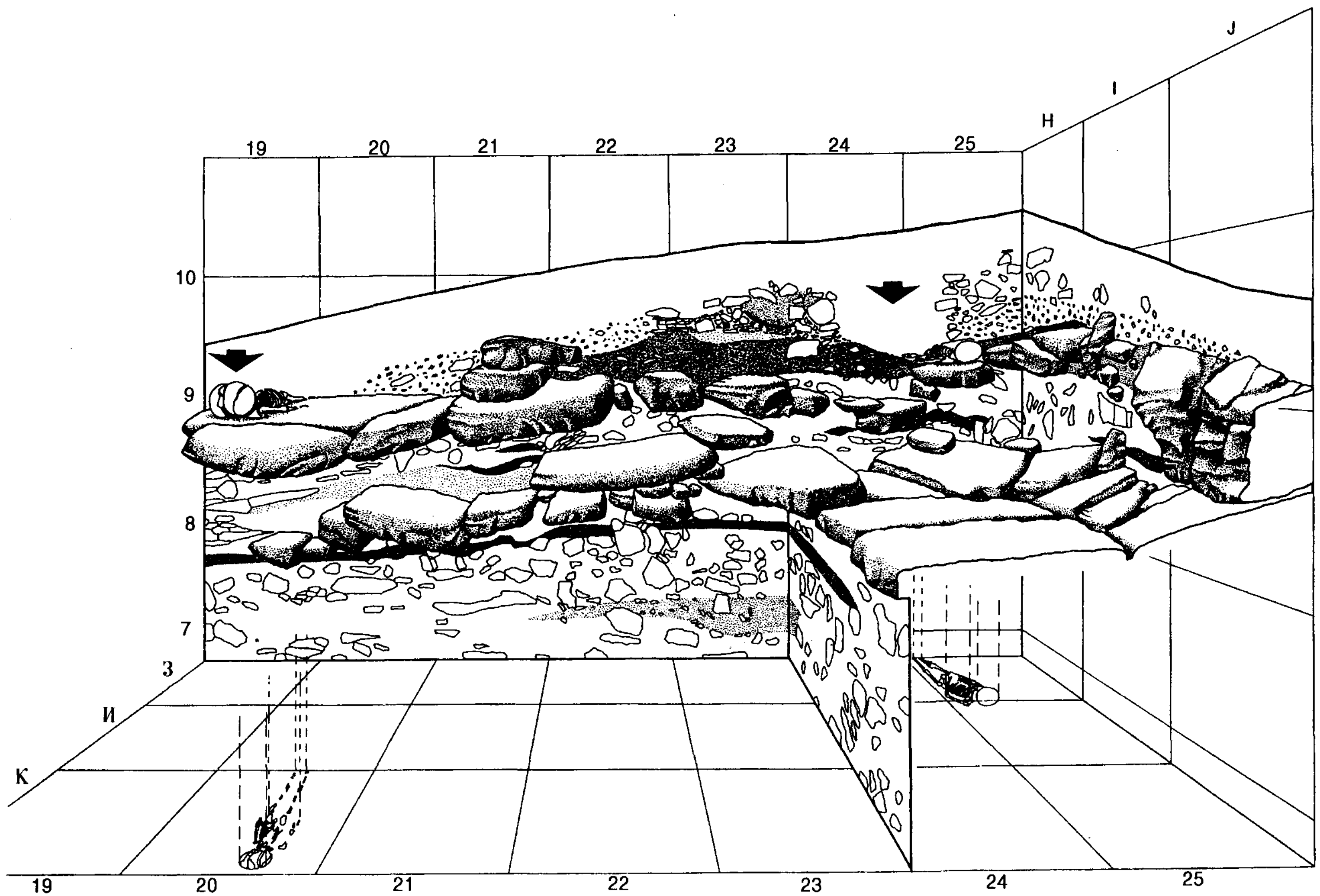


Fig. 6-8—Starosele, three-dimensional reconstruction of the stratigraphy, showing both the Starosele child (1953) and the adult burial (1993) in relation to the various sediments. The burials have been projected down onto a grid to show their orientations.

While neither of the recently discovered burials can be conclusively linked with the Starosele child, a number of striking similarities make the association highly probable. First, the presence of these two new burials places three individuals within a very small area (fig. 6-7). Of these, two are clearly modern (the recent finds), only the Starosele child is claimed to be of Middle Paleolithic age. When it is considered that over the remaining 260+ excavated square meters only three other human bone fragments were found, the tight clustering of these complete skeletons is curious.

Although no burial pit was seen for the Starosele child and one was plainly present in the case of the recent adult burial, both skeletons were in the same stratigraphic position, under the uppermost Middle Paleolithic level, resting on the top of the exfoliated limestone slabs (fig. 6-8). The 1993 burial, while fully within modern sediments, was at approximately the same depth below surface as both of these. All were without grave goods and all had the same body orientation (fig. 6-9). Obviously, the similarities among all three, two of which are without question modern, are striking. Although it is conceivable that this is no more than an unexplainable coincidence—that within a ca. 290 square meter excavated area of the site, two modern burials and a Middle Paleolithic one were all clustered spatially at the same depth below surface, with the same body orientation and, with the exception of the infant, the exact same body position—there are additional reasons to believe that coincidence is not involved.

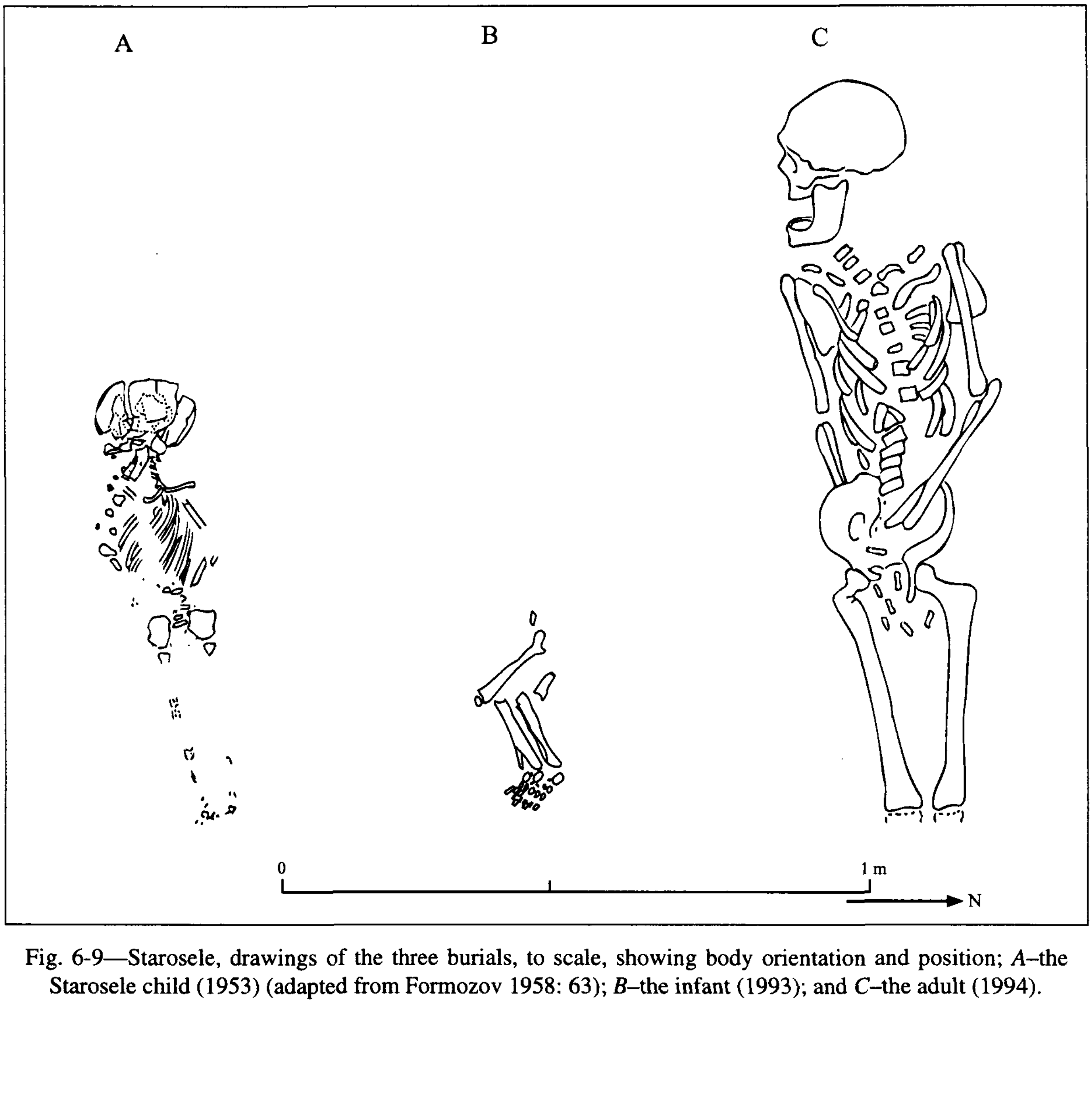


Fig. 6-9—Starosele, drawings of the three burials, to scale, showing body orientation and position; *A*–the Starosele child (1953) (adapted from Formozov 1958: 63); *B*–the infant (1993); and *C*–the adult (1994).

The Kanly-Dere box canyon was a traditional burial area during late Medieval times. A seventeenth-eighteenth century Muslim cemetery lay just inside the canyon's east side, about 100 meters from the site; it was excavated at the end of the 19th Century, as noted by Formozov (1958: 23). Also, before the nineteenth century, Crimeans commonly had separate burial areas outside their villages (V. Mytz, personal communication). Burials in these family groupings, regardless of their ethnic affiliations, followed Muslim burial practices, which included an extended position on the back, with the head to the west and the face to the south, since, from the Crimea, Mecca is to the south. Thus, the clustering of the human remains, their orientation, and their position, are fully consistent with Muslim burial customs. All these data make it virtually certain that the Starosele child was a late Medieval Muslim burial intrusively placed through the uppermost, in situ, Middle Paleolithic deposits.

CONCLUSION

The discovery of the Starosele child, now nearly a half century old, was an incredibly important find; it impacted chronological, physical, and cultural theories of how modern humans developed and entered Europe. Given over one hundred major references to the Starosele child in the anthropological literature since its discovery, there can hardly be any doubt that the child, and further information regarding the site, are still salient to our understanding of the emergence of modern humans.

While new excavations do not support Formozov's view of the stratigraphy and site formation processes at Starosele, in the case of the Starosele child burial, he can hardly be faulted. The sondage in which the child was found was widened for a better perspective of the stratigraphy at the time of its discovery and the excavators did their utmost to preserve the skeleton intact. Before removing the remains, a commission consisting of eleven very eminent archeologists, physical anthropologists, and geologists—some of whom had to travel a substantial distance to arrive at the site—was gathered to render their opinions on whether it was an intentional burial, whether it was Middle Paleolithic, and whether it was in situ, and drawings and notes followed the standard practice of the time. All of the steps Formozov took to ensure that his own interpretations of the site were not without basis are commendable.

None of the authors here have viewed remains of the Starosele child, nor were we present at the earlier excavations. The new excavations at Starosele were never intended to elucidate the circumstances of the discovery of human remains there in 1953, but the discovery of two more skeletons in such similar contexts can hardly be discounted. The resemblance of the new, unquestionably modern human remains in depths of burial, closeness of burial, conformation with Muslim burial practices to the 1953 skeleton, and the use of the Kanly-Dere canyon as a Muslim cemetery during recent times, all suggest that the original, Starosele child burial is likewise modern.

Chapter 7

STAROSELE 1993-1995: THE LITHIC ARTIFACTS

A. MARKS and K. MONIGAL

INTRODUCTION

The lithic artifact assemblages from Starosele will be presented in this chapter. Since the clarity of the stratigraphic and temporal separation among the recognized archeological deposits is without doubt (see Chapter 5), each archeological level will be considered a separate assemblage and treated as such. The only exception will be the few artifacts from Level 0. The uppermost sediments of the recent soil A and B horizons were mixed with the upper Level 1 sediments during the digging of pits and other disturbances in modern times, and contain artifacts originally from Level 1. Those artifacts have been included with those from Level 1; no distinction will be made between them and the Level 1 sample.

The presentation of the assemblages will follow, more or less, the sequence required for a study of a *chaîne opératoire*, with the caveat that only limited success was had in conjoining artifacts and that the very important information derived from residue and use-wear studies is not yet available but will be presented in full by Bruce Hardy and Marvin Kay, respectively, in the next volume of final reports. Thus, this chapter will be limited to data derived from technological and typological studies, and it is fully recognized that there may be little positive correlation between the typological classification of tools and their actual, original use.

HORIZONTAL ARTIFACT DISTRIBUTIONS

Due to the limited extent of the recent excavations at Starosele and the somewhat spotty distribution of artifacts in some archeological levels, there is only a moderate amount of information available from spatial analysis. It does appear, however, that there were probably quite different patterns of horizontal artifact distributions among the levels. As already noted in Chapter 5, Level 1 is a palimpsest, which, in places, reaches a depth of some 30 cm. Although this might suggest that artifact distribution across the excavated area should be rather uniform, this was not the case. Rather, there is a single locus of dense artifact concentration and a gradual falling off in density over 3 to 4 m in those directions where this can be traced (fig. 7-1a). Beyond that, the drop in artifact density is marked to the north and west, but this is the result of erosion of the level and has no interpretive meaning.

While the vast majority of Level 1 artifacts are chips, removing them does not change the density patterning significantly: there is still a single dense locus (fig. 7-1b). This locus, in Squares I and J 22 through 24, also contains the fireplace at the base of Level 1. Tool distribution follows that of the rest of the materials, only at a much lower density (fig. 7-1c). Core distribution is more general (fig. 7-1d), but the limited number of cores makes this pattern of questionable significance.

The single concentration in Level 1 might suggest that artifact discard took place over a fairly small area. Using the artifact distribution toward the east as a guide (fig. 7-1a), one might argue that the total concentration would have been some 12 m in diameter: an area of more or less 113 m2. Yet, such an interpretation is probably not reasonable. While a fall-off in artifact density toward the east is clear, it may have to do with the impending cliff wall, only 3

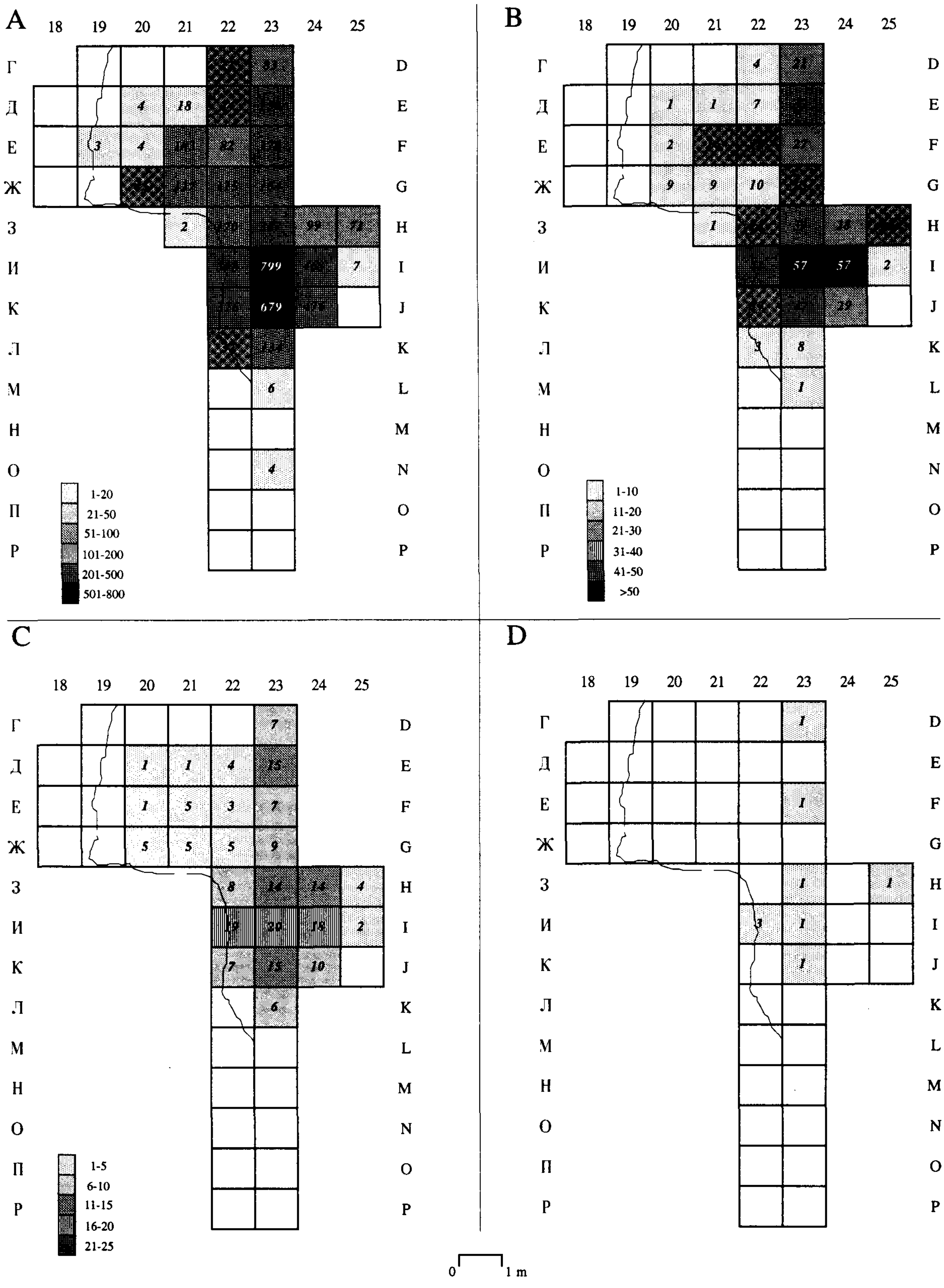


Fig. 7-1—Starosele, Level 1 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores. Dashed line indicates erosion of uppermost 40 cm of Level 1.

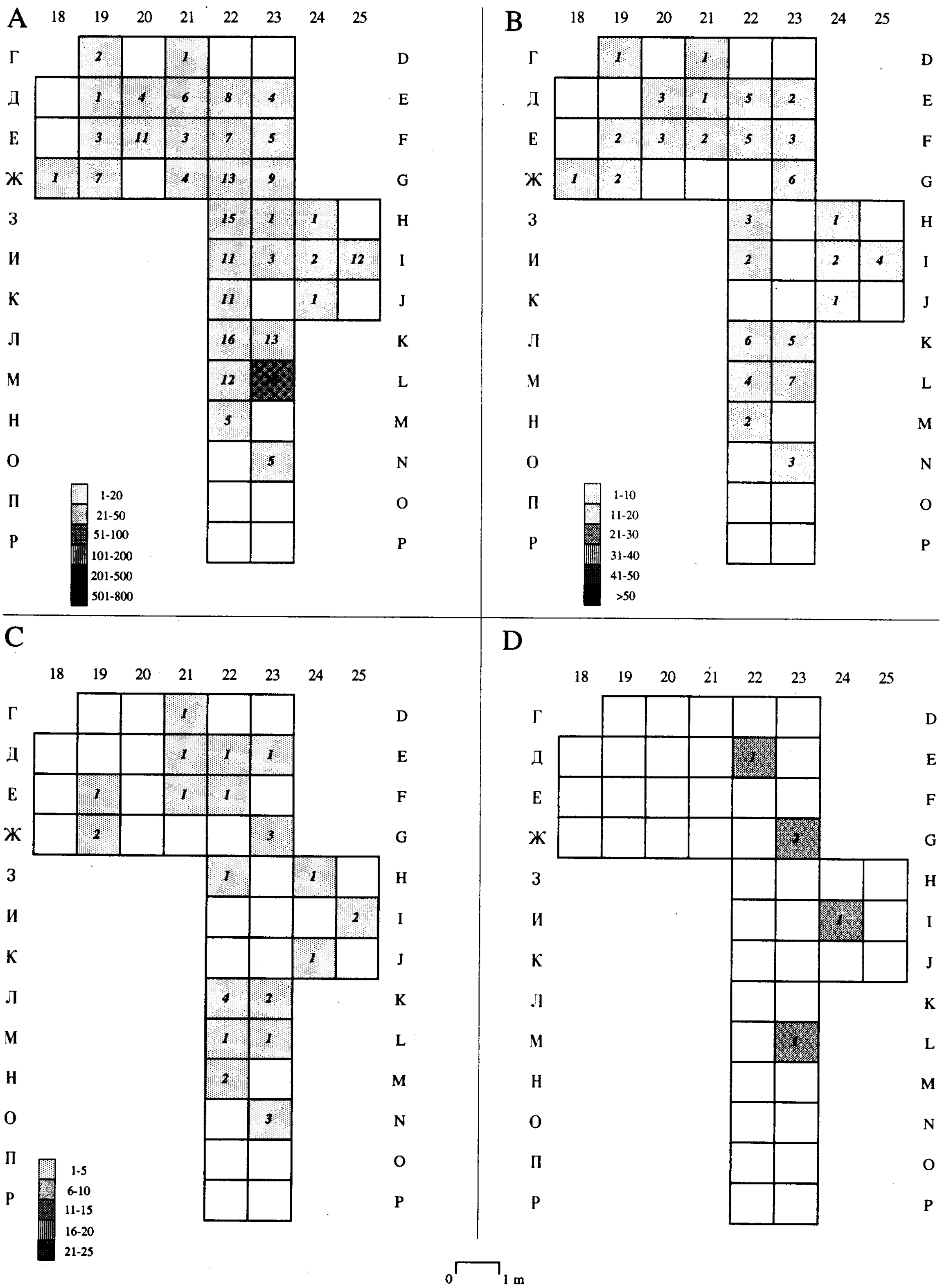


Fig. 7-2—Starosele, Level 2 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores.

m further east. Thus, this pattern might not be a reasonable guide for other directions. Furthermore, the large lithic collections from the 1952 and 1953 excavations currently housed in the Bakchisarai Museum are markedly similar to those materials recovered from our Level 1. Since those excavations were between 21 and 13 m to the north of ours, it means that a significant number of comparable materials, were distributed over, at least, an area extending 25 m north/south. Given the erosional pattern along the western edge of the site prior to the Level 1 occupation (see Chapter 5), it is likely that any Level 1 artifact discarded west of line K would have been on a rather steep slope and, thus, would have rapidly been moved to the canyon bottom. It is probable, therefore, that the original Level 1 artifact distribution, the result of multiple occupations, formed a rather dense, elongated concentration about 25 m north/south by no more than ca. 7 m east/west; an area of about 175 m^2.

The Level 2 artifact distribution shows no concentrations, at all. In fact, the number of artifacts is minimal (fig. 7-2a). In addition, those artifacts in Rows K through N had been washed down the slope and do not represent original positions. While there appears to be two slightly differentiated debitage/tool clusters (fig. 7-2b), their low numbers prohibit meaningful interpretations. This can be seen in the distribution of the few tools (fig. 7-2c) and cores (fig. 7-2d). Interpretations are further limited by the absence of burned areas, clusters of bone, etc. It is obvious that Level 2 represents minimal discard/loss of artifacts, over a short period. This is confirmed by the presence of partly articulated mammal skeletons, intact rows of teeth (fig. 7-3), and even a complete *Equus* mandible in Square G22. Certainly, compared with the artifact distribution in Level 1, there is no indication of a central locus. This, of course, may be merely the result of low numbers of artifacts, but it may also reflect the absence of a fireplace or other features around which activities are likely to have concentrated.

Fig. 7-3—Starosele, photograph of *Equus* tooth row in Level 1.

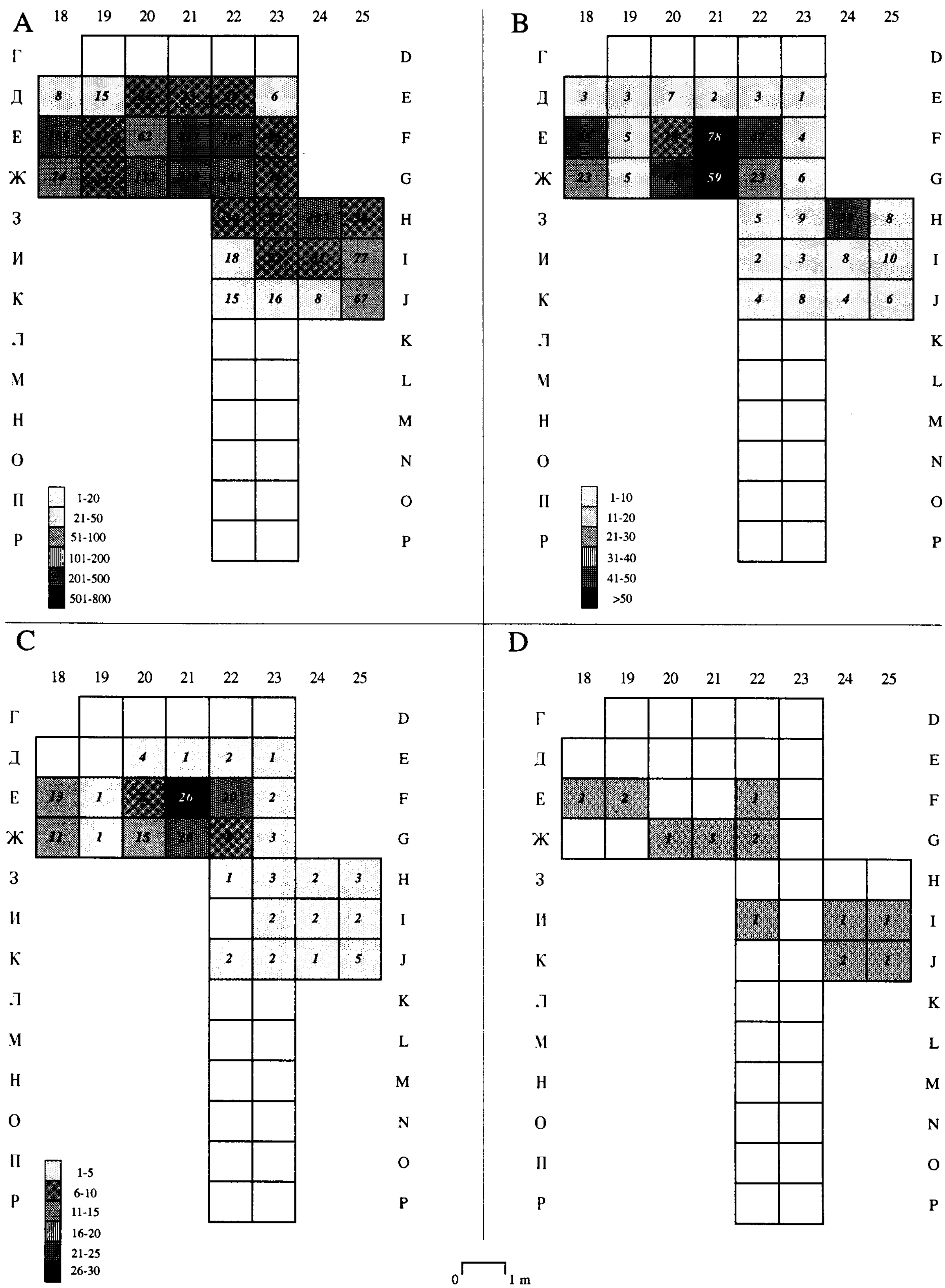


Fig. 7-4—Starosele, Level 3 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores.

The artifact distribution in Level 3 is significantly different from those of Levels 1 and 2 (fig. 7-4a). There are indications of as many as three small, somewhat overlapping artifact concentrations (fig. 7-4a), which are clear for the debitage/tools (fig. 7-4b) and the cores (fig. 7-4d). The tools alone, however, indicate only 2 concentrations, suggesting, but not demonstrating, the possibility of different activity areas. In spite of these patterns, there is some evidence for connections between the two northern-most concentrations, based on a limited number of conjoins made on the quite distinctive honey-colored flint (fig. 7-5).

The apparent multiple small artifact concentrations, even within the relatively limited excavation area, has implications for the areas excavated by Formozov (1958) and the samples from Formozov's "under the roof fall" studied by Chabai (Kolosov, Stepanchuk, and Chabai 1993). While it seemed, at first, that the amount of Level 3 excavated by Formozov was probably quite limited (Hedges et al. 1996), upon reflection, these small concentrations might have existed over a large area to the north, and certainly did extend into his excavations adjacent to ours, since the Level 3 artifact distributions go right to the edge of the contact between the new and the old excavations (fig. 7-4). Thus, the Level 3 material was mixed together with lower materials in Formozov's samples, since he put all the materials found below the "roof fall" together. It must be recognized that, to some extent, Formozov's samples from below the "roof fall" consist of, at least, materials from two quite distinct archeological levels. Having established this, however, does not necessarily mean that the mixture was so great as to make his sample invalid. Rather, it suggests that Formozov's sample must be viewed with caution.

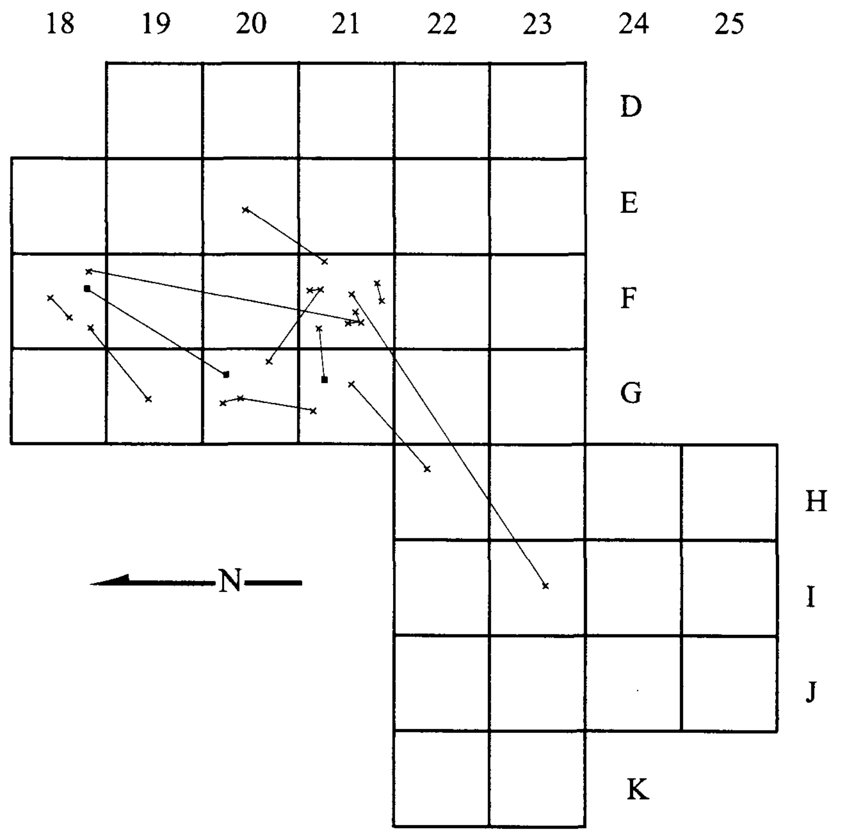


Fig. 7-5—Starosele, Level 3, plan of honey-colored flint conjoins.

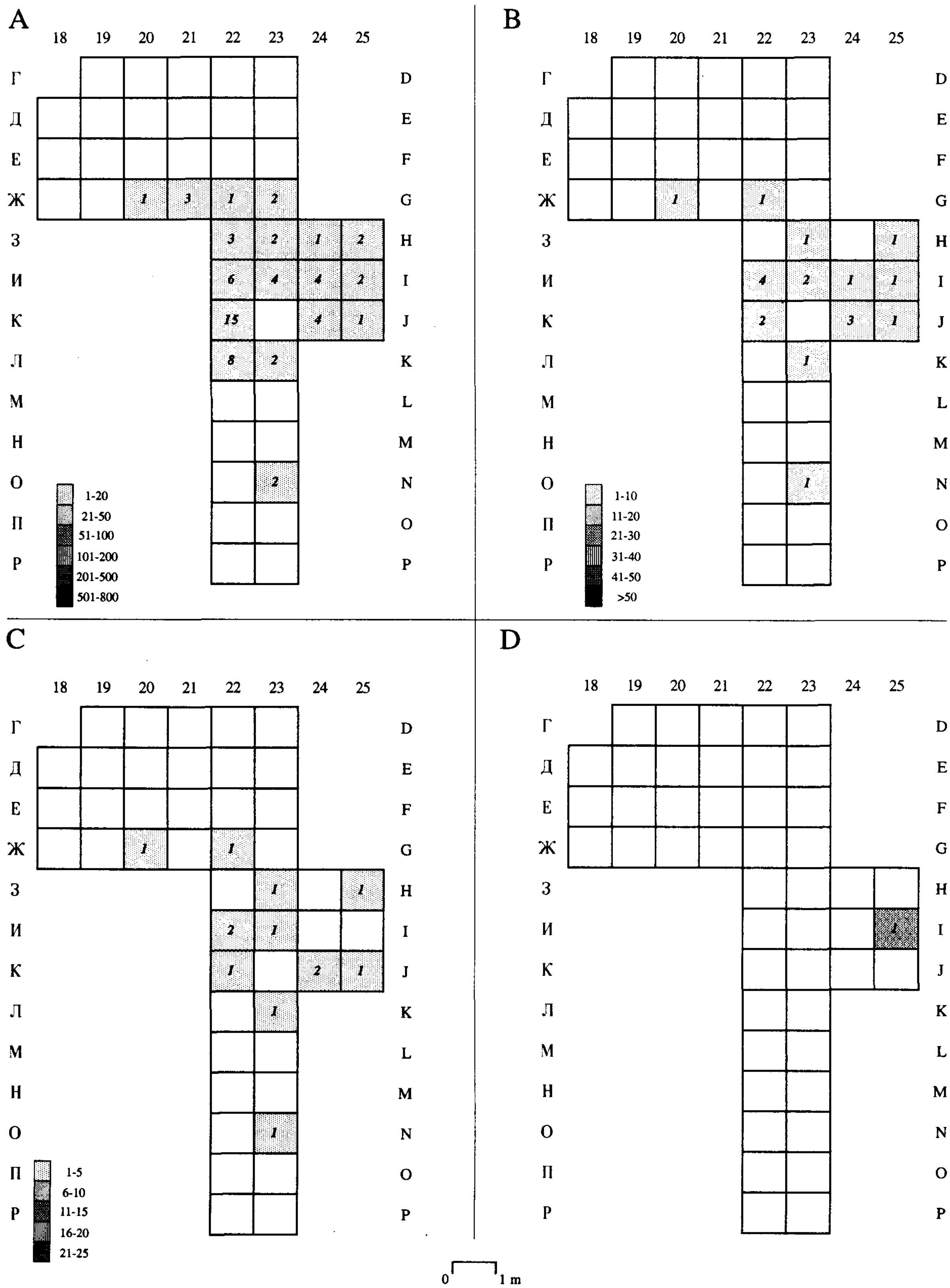


Fig. 7-6—Starosele, Level 4 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores.

Little can be said of the artifact distributions in Level 4. First, at best, Level 4 was a rather temporary surface, and the presence of fresh, unrolled artifacts scattered in the sediments below the Level 4 surface (and grouped here together with Level 4) indicate that there were a number of short-lived surfaces, within a general aggradation of alluvial sediments (see Chapter 5). Second, the extremely low number of artifacts of all kinds (fig. 7-6a-d) preclude interpretations, other than that the area exposed in the recent excavations was certainly outside any area of significant artifact discard. Still, the presence of these few artifacts, as well as a small, oval concentration of wood charcoal in Squares L22/23 at the Level 4 surface, suggests the possibility of a larger surface; one where artifact discard may have been greater. This well may have been the case, since Formozov (1958: fig. 33) illustrates a dense concentration of lithics, bone, and "fireplaces" only a few meters to the north of our almost sterile exposures. It is not at all clear from the maps, however, whether Formozov's material came from our Level 4, our Level 3, a combination of both, or from some surface which was not represented in our excavations. A more extensive evaluation of these possibilities will be made in the final chapter, since data beyond those recovered in the new excavations must be used to arrive at a reasonable answer.

Raw Material Availability

Although flint is considered to be essentially ubiquitous along the northern edge of the second range of the Crimean Mountains, its actual distribution is patchy. Without doubt, there are huge exposures of flint in and near the Bodrak Valley and rich, if somewhat smaller sources in the Alma Valley, both more than 10 km east of Starosele. In addition, a honey (tobacco) colored, fine-grained flint has been reported in the Kacha Valley, 7 km south of Starosele.

In the immediate vicinity of Starosele there are two sources of flint: one in the eastern wall of the Kanly-Dere Gorge, just behind and north of the site, and one in the northern wall of the main Bakchisaraiskaya Valley, just one kilometer east of the entrance to the Kanly-Dere Gorge and a few hundred meters west of the site of Bakchisaraiskaya (see Chapter 5, fig. 5-1). In both places, however, the flint occurs as small nodules encased in thick, chalky cortex. Adjacent to Starosele, the flint is a matte gray with white speckles, while the further source is gray-brown with white speckles. No flint nodules or even flakes of these types were seen larger than a few centimeters, although the very thick cortex could increase the overall size of a nodule to over 7 cm in greatest dimension. It is difficult to judge the abundance of these sources during occupation; only a few pieces of the gray-brown flint were seen around some exfoliated boulders on a steep slope in front of the northern cliff wall in the main valley and not a single piece of this flint was found among the assemblages at Starosele. In the Kanly-Dere Gorge, the gray flint occurred as nodules in the limestone cliff, but at elevations some 5 m below and some 20 m north of the top of the Starosele sediments. Thus, it is possible that this source was not fully exposed during the Level 1 occupation at Starosele, although, based on elevations and bottom slope, it should have been fully available during the earlier occupations of Levels 4 and 3. As will be discussed below, it does occur in small amounts in the upper three levels but, just as importantly, a good number of broken nodules, some slightly flaked, were seen in the backfill Formozov used to bury his profiles. While their original provenance is unknown, it is probable they were recovered from the prehistoric sediments and were discarded at the time of excavation.

RAW MATERIAL SELECTION

In spite of the immediate availability of flint at Starosele, very little of it was selected for flaking during any occupation (Table 7-1). Rather, the vast majority of the flint appears to come from sources farther away than the two known nearby sources. Just how far is not sure, since systematic surveys for flint sources have not been carried out in this part of western Crimea, although what is known suggests that much of the flint came from between 7 km and 10 km away.

TABLE 7-1
Starosele, Distribution of Debitage/Debris and Tools by Level and Raw Material Type

	Level 1				*Level 2*				*Level 3*				*Level 4*			
	Debitage		*Tools*		*Debitage*		*Tools*		*Debitage*		*Tools*		*Debitage*		*Tools*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Black-gray, fine	169	42.4	80	43.2	11	28.9	5	62.5	122	33.6	52	35.1	3	42.9	7	53.8
Opaque white-gray, fine	46	11.5	21	11.4	10	26.3	—	—	35	9.6	9	6.1	—	—	5	38.7
Matte gray, patinated, coarse	137	34.3	72	38.9	17	44.7	1	12.5	94	25.9	51	34.5	1	14.3	1	7.7
Translucent amber gray	23	5.8	7	3.8	—	—	1	12.5	18	5.0	6	4.1	2	29.0	—	—
Honey-colored	—	—	—	—	—	—	—	—	66	18.2	21	14.2	1	14.3	—	—
Black speckled, coarse	24	6.0	5	2.7	—	—	1	12.5	28	7.7	9	6.1	—	—	—	—
N	399		185		38		8		363		148		7		13	

The recognition of different kinds of flints was somewhat hindered by variable amounts of patination. The absence, presence, and degree of patination on any given artifact apparently was determined by extremely local conditions of deposition. Artifacts only a few centimeters apart might have very different surface chemical modification. Therefore, sorting by raw material could be done only at a fairly general level. Because of the large sample size for artifacts of all kinds, only a sub-sample were classified by raw material, including all artifacts from the 1994 field season and a part of those recovered during 1993 and 1995. Because the Level 4 sample was so small, all Level 4 artifacts were included in the study.

The majority of flint artifacts at Starosele were made on a fine-grained, slightly translucent gray/black flint, which, when patinated, became whitish gray and opaque (Table 7-1). With the exception of Level 3, these combined account for over half of all flint recovered in each level. The second most common flint was a coarse, matte gray, patinated flint which does not seem to occur unpatinated. A small number of artifacts in each level were a translucent, amber gray, while the local coarse-grained, gray speckled flint was found in small amounts in the top three occupations only. Finally, there was an unpatinated, honey-colored, fine-grained flint that occurred in significant amounts in Level 3, not at all in Levels 1 and 2, and with only a single piece in Level 4 (Table 7-1).

As noted above, with the exception of the immediately local, coarse, speckled flint, the exact sources of the other flints are unknown. Yet, some information is available. Fresh, unweathered cortex on the fine-grained gray and translucent flints show that they were either actually quarried or, more likely, were collected in front of actively eroding sources. On the other hand, the honey-colored, fine-grained flint found in Level 3, has a weathered, smooth cortex indicative of a gravel source. Based on the cores, it is possible that this latter flint came in nodular packages no larger than 7 cm. In addition, the number of fractured pieces, the common hinge-fracturing and splitting which took place during its reduction, all suggest that it was quite dry when flaked; again, indicating it was in secondary position when collected.

BASIC ASSEMBLAGE PATTERNING

The use of screens ensured the recovery of even the smallest artifacts. While the decision where to draw the line between chips and debitage/blanks is always subjective, a conservative border of 3.0 cm for flakes and blades was chosen to be used in the analyses of all the sites in the project: smaller items were considered chips, larger were considered debitage/blanks. Retouched fragments less than 3.0 cm in greatest dimension, however, were classified into a specific tool class, such as scraper or notch, when their typological attributes were clear. When unclear, they were placed into "tool fragments." In addition, at least at Starosele, a number of complete pieces less than 2.99 cm in greatest dimension were recovered which had been retouched. Therefore, the larger chippage, between 1.99 cm and 2.99 cm were, at times, considered as blanks for tool production. Because of that, chips in that size range will be described, although separately from the blanks measuring 3.0 cm and over.

Although chunks are normally listed under debris and not otherwise considered, at Starosele some chunks were used as blanks for tool production; at least, some showed clear evidence of retouch. Thus, they have been listed along with other classes of debitage, so that the extent to which they were utilized in tool production can be seen (Table 7-2). In all assemblages, there were a number of pieces with multiple breaks which prevented their classification into a specific artifact class. These have been placed along with the chips and preforms to prevent biasing the attribute observations.

TABLE 7-2
Starosele, Assemblages by Major Artifact Classes (>3cm) for Debitage/Tools and Tools

	Level 1				*Level 2*				*Level 3*				*Level 4*			
	All		*Tools*		*All*		*Tools*		*All*		*Tools*		*All*		*Tools*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Bifacial piece	31	6.7	25	80.6	1	1.4	1	100.0	—	—	—	—	—	—	—	—
Flake	311	67.3	118	37.9	57	77.0	23	40.4	277	72.5	128	46.2	15	75.0	11	73.3
Primary flake	31	6.7	7	22.6	2	2.7	1	50.0	12	3.1	5	41.7	1	5.0	—	—
Blade	71	15.4	40	56.3	8	10.8	4	50.0	49	12.8	20	40.8	2	10.0	1	50.0
Primary Blade	4	0.9	—	—	—	—	—	—	4	1.0	1	25.0	—	—	—	—
Core	9	1.9	1	11.1	5	6.8	—	—	18	4.7	2	11.1	1	5.0	—	—
Chunk	5	1.1	2	40.0	1	1.4	1	100.0	22	5.8	8	36.4	1	5.0	1	100.0
N	462		193	41.8	74		30	40.5	382		164	42.9	20		13	65.0
Unident. fragments†	68	1.3			4	1.8			99	4.2			—	—		
Chips (<3 cm)	4767	89.9			148	65.5			1856	79.4			43	68.3		
Bifacial preforms	6	0.1			—	—			—	—			—	—		
N	5303				226				2337				63			

†These exceed 3 cm in maximum dimension, extensive breakage precludes placement into specific blank classes.

The vast majority of artifacts recovered in each assemblage are chips, with the exception of Level 2, where they are only moderately represented, a result of slope wash to the west (Table 7-2). Aside from the fully predictable numerical dominance of chips on the intact floors, the basic configuration of all assemblages is notable by their shared paucity of cores and the low proportional occurrence of primary elements. This merely reinforces the observation that the low quality, immediately local raw materials were not extensively used and, thus, that most flint was imported into the site during all occupations. In addition, however, it indicates that the importation of raw material in Levels 1, 2, and 4 did not normally include unmodified cobbles/plaquettes, minimally reduced nodules, or even cores.

These conclusions are strengthened by the high percentage of tools in each blank category and even by the number of chunks used as blanks for tools (Table 7-2). It appears that, with the possible exception of Level 3, very little core preparation and primary flaking took place in the areas of Starosele exposed by our excavations. Rather, it seems that the majority of lithic modification took the form of tool production by retouch, tool rejuvenation through the removal of retouching chips, and, for Levels 1 and 2, bifacial reduction of preforms which produced shaping and thinning flakes as by-products. The sample from Level 4 is so small that little may be said with certainty. Yet, the large size of the blanks demonstrates their removal from large cores, while the presence of bifacial thinning flakes and chips among the debitage documents bifacial reduction.

Patterns of Core Reduction

Owing both to the paucity of cores and to the very limited amount of conjoining, little direct evidence is available on core reduction patterns. On the other hand, since no Levallois products were recovered from any level, given the sample sizes, it is safe to say that the Levallois method was not used in Levels 1 and 3 and was unlikely to have been used in Level 2, which is exactly like Level 1 in all other recognizable attributes. The Level 4 sample is so small that it only may be stated that there is no convincing evidence among the recovered materials for Levallois reduction methods.

Since there are major differences between Levels 1 and 3 in the range and kind of reduction patterns, each level will be considered separately. These differences are seen mainly through attribute patterns on debitage, augmented by the few cores and "core tools" which were recovered. This section will deal mainly with broad patterns, as seen from the cores, while their associated attributes on the debitage will be covered in detail when the debitage is discussed.

Level 1

The reduction strategies for this level have already been preliminarily discussed within the context of the overall *chaîne opératoire* for the level (Marks et al. in press). More information is now available, but our understanding has remained the same. Based on the available sample, there is little evidence for habitual on-site true core reduction. The cores themselves consist mainly of small fragments or very small discoidal cores made on the poor, local raw material (fig. 7-7a, b). A single larger core was recovered which exhibits bi-directional removals from one flaking surface, one platform of which is well faceted, while the other is unfaceted (fig. 7-7c). While this core, in general shape, is what might be expected from a Levallois method, the absence of supplementary, lateral platforms and the angles between the flaking surface and the undersurface have led some to believe that it is not a core, at all, but an early stage rejected bifacial preform (V. Usik, personal communication).

Based on the cores and possible cores, therefore, there is no evidence for any core reduction strategy other than discoidal, and then only in the production of very small blanks. On the other hand, there is very clear evidence for bifacial reduction of flint plaquettes and large flakes into bifacial foliates, with the resulting production of bifacial shaping and thinning flakes, as well as chippage. In fact, although the proportional occurrence of bifacial tools is relatively low within the tool assemblage, the by-products of their production are numerous (fig. 7-8) and the larger examples were extensively used as blanks for unifacial tools (Marks et al. in press). Those tools seemingly made on blanks from true core reduction appear to have been imported into the site, either as blanks or as finished tools.

The importation of blanks as large flakes and bifacial preforms is logical, since their size vastly exceeds the size of the recovered cores (fig. 7-9a). That these blanks were struck from

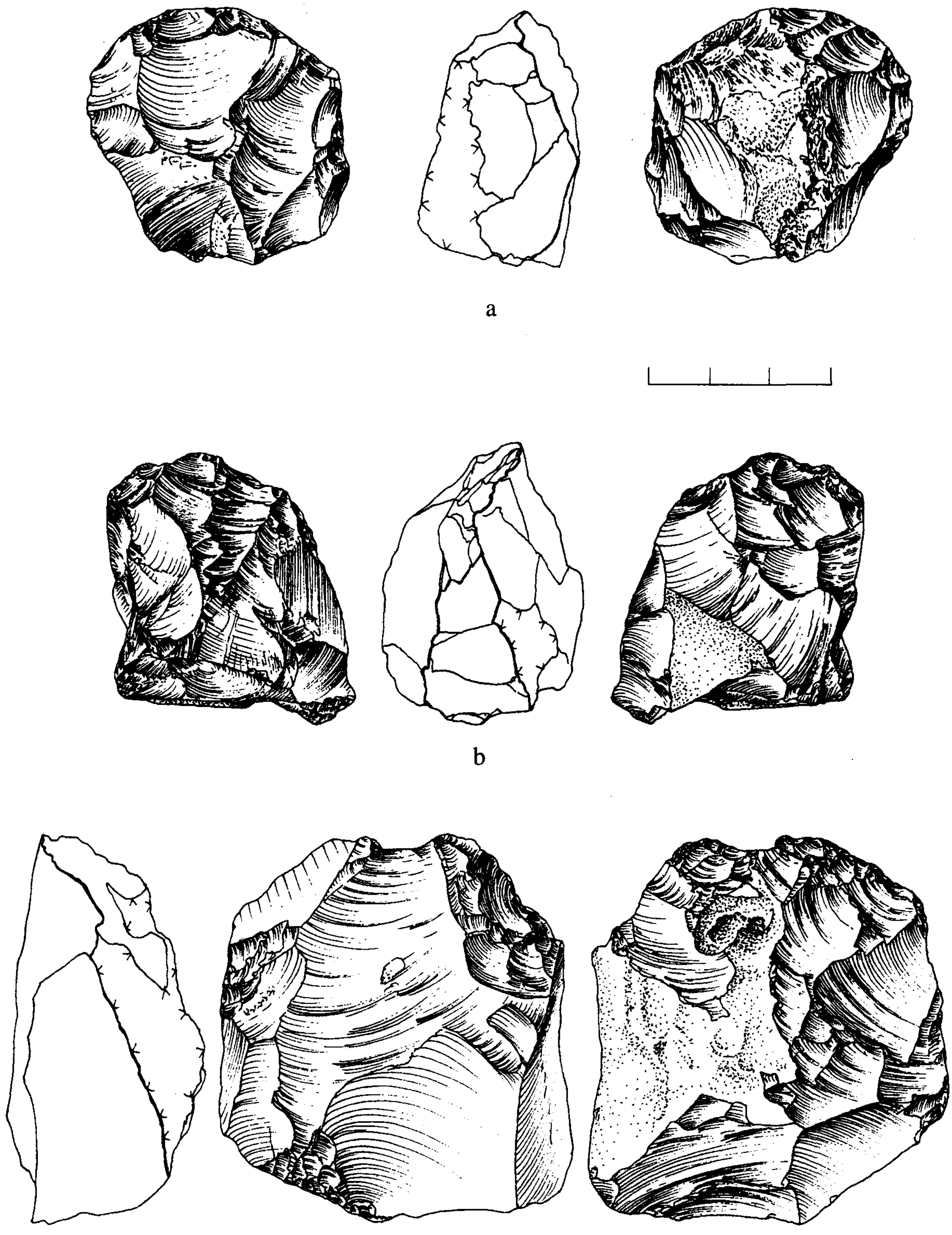


Fig. 7-7—Starosele, Levels 1 and 2, Cores: *a*–discoidal core on poor local flint from Level 1; *b*–partial discoidal core on gray flint from Level 2; *c*–"opposed platform" core on fine-grained flint from Level 1.

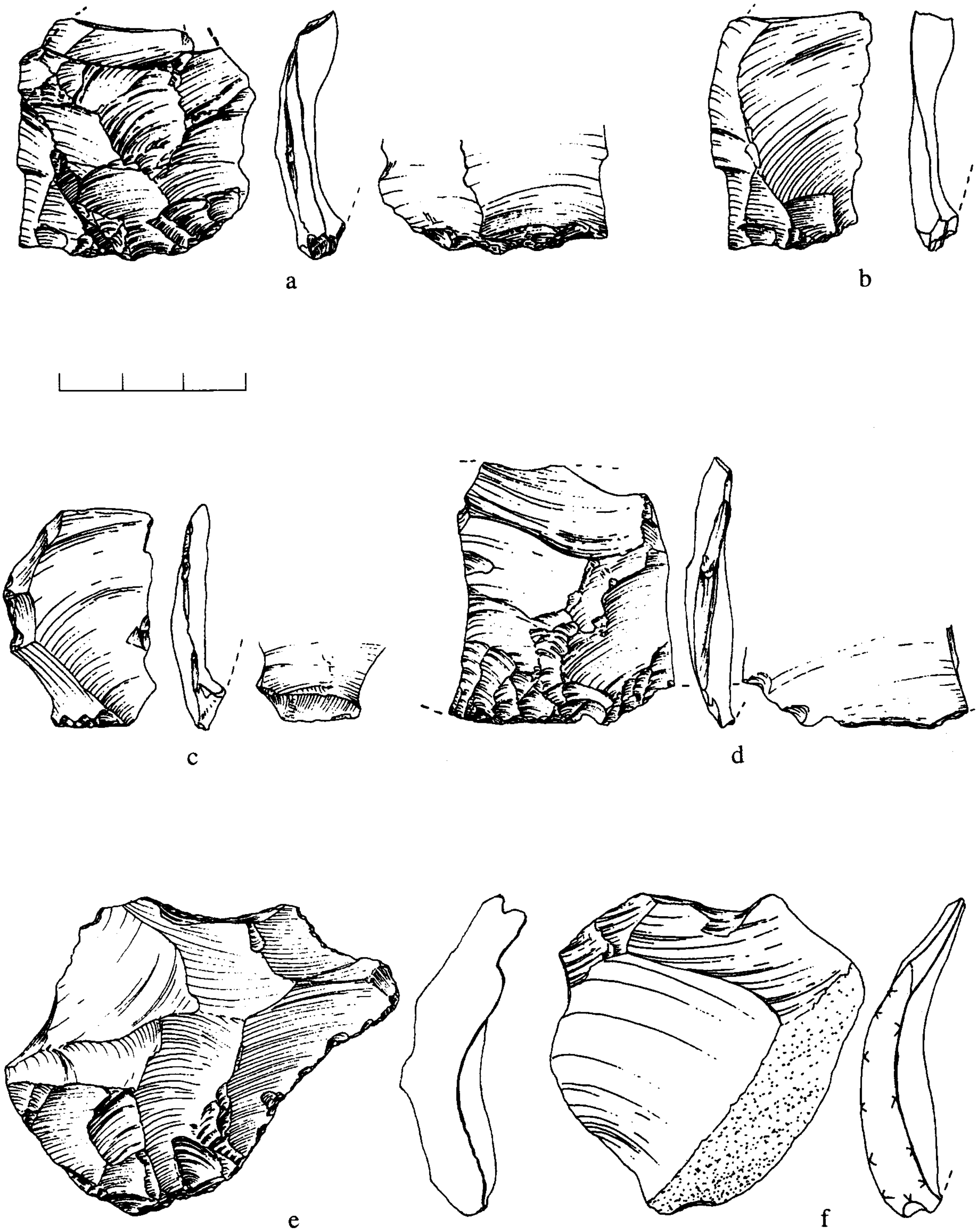


Fig. 7-8—Starosele, Level 1, By-products of bifacial foliate production: *a-d*–bifacial thinning flakes, note obtuse, faceted or unfaceted lipped platforms and the marked convexity of the flakes; *e-f*–bifacial shaping flakes.

true cores is without doubt, although none exhibits original dorsal scars permitting a more exact determination of the core reduction process or processes involved. Certainly, the blank shown in Figure 7-9a did not come from a Levallois reduction method and it is not attributable to discoidal reduction, either.

The presence of some blanks more than twice as long as wide (Ilam = 17.6), might suggest the presence of a purposeful blade technology. There is no evidence, however, for this among the few cores, and the attributes of these elongated pieces indicate that they were almost all by-products of the shaping and thinning of bifacial foliates.

In sum, the data available from Level 1 indicates that the vast majority of on-site raw material reduction was associated with bifacial foliate production and rejuvenation. There is little evidence for the early stages of raw material reduction, even of plaquettes used in bifacial tool production. On-site, true core reduction appears to have been rare and *ad hoc.* Yet, the large blanks used in some bifacial and unifacial tool production show that the reduction of true cores took place off-site and was a necessary part of the *chaîne opératoire* of the group which was responsible for the Level 1 lithic assemblage.

Level 2

The extremely small sample from this level precludes definitive conclusions. Yet, all the available evidence suggests that the patterns seen in Level 1 were repeated in Level 2. The cores, again, are simply small remnants or very small discoidal or partial discoidal cores (fig. 7-9b), mainly on the poor, local raw material. There are numerous bifacial shaping and thinning flakes and even a single distal bifacial foliate fragment, documenting that bifacial reduction was a significant technological element. While elongated pieces are somewhat less common than in Level 1 (Ilam = 12.3), their attributes are fully comparable and, they too resulted from bifacial tool production.

Level 3

Although the percentage of cores here is not significantly greater than in any other level except Level 1 (Table 7-2), the cores tend to be somewhat less amorphous. This is only relative, however, since none of them suggests any great patterning or even control on the part of the knappers. There are essentially two types which point to two different reduction strategies. The first consists of small globular cores with multiple platforms, each platform being the scar of a previous flaking surface (fig. 7-10c). They produced small flakes and, given the patchy cortex on their surfaces, it appears that they were never much larger than when abandoned. These few tend to be on the poor, local raw material.

The second core type is known only on the honey-colored nodular flint. Basically, it is a single platform core with one wide flaking surface and little, if any, platform preparation. The abandoned cores, however, exhibit a few flake scars coming from the end opposite the main striking platform. This may indicate numerous removals (fig. 7-10e) or only a few (fig. 7-10f, g). In all cases, the backs of the cores are unmodified and the last series of flakes are struck off an unprepared platform. While there are few cores of this type, conjoins and debitage attribute analyses show this pattern to be quite common. Figure 7-10a is a good example where the flake scars show the initial exploitation of a single platform to remove a series of flakes and then the use of an opposed platform to remove more. In this case, both platforms are cortical. Smaller conjoin series (fig. 7-10b, d) show that removals from a single platform occurred in series and tended to be struck either parallel to each other or, as in Figure 7-10b, somewhat converging. This patterning provides an opportunity for blade production. Yet, the proportional occurrence of elongated pieces (Ilam = 14.4) is lower than in Level 1 which had

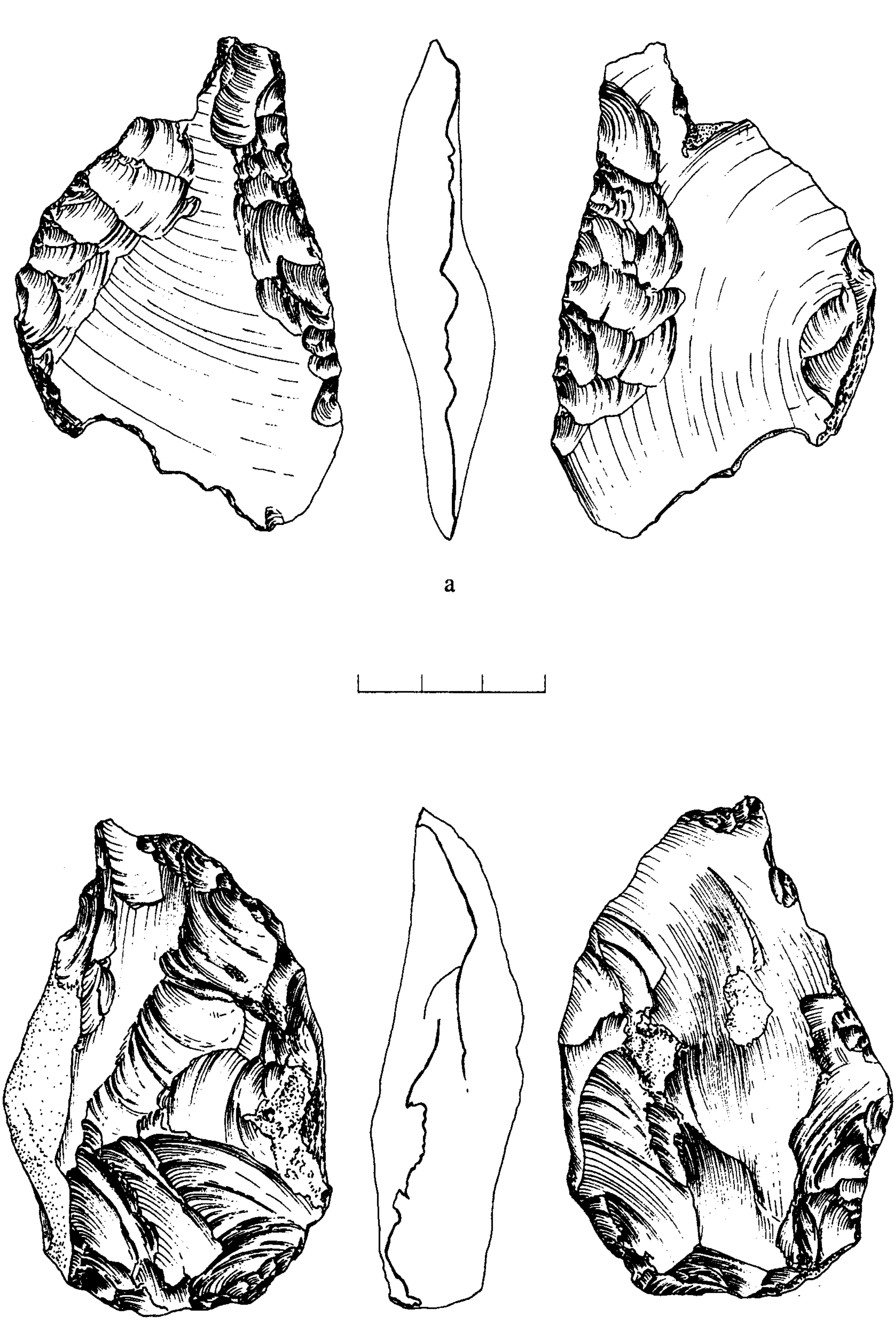


Fig. 7-9—Starosele, Level 1, Bifacial preforms: *a*–partly retouched preform on large secondary flake; *b*–very early stage preform, on a partially cortical flake with some inverse thinning.

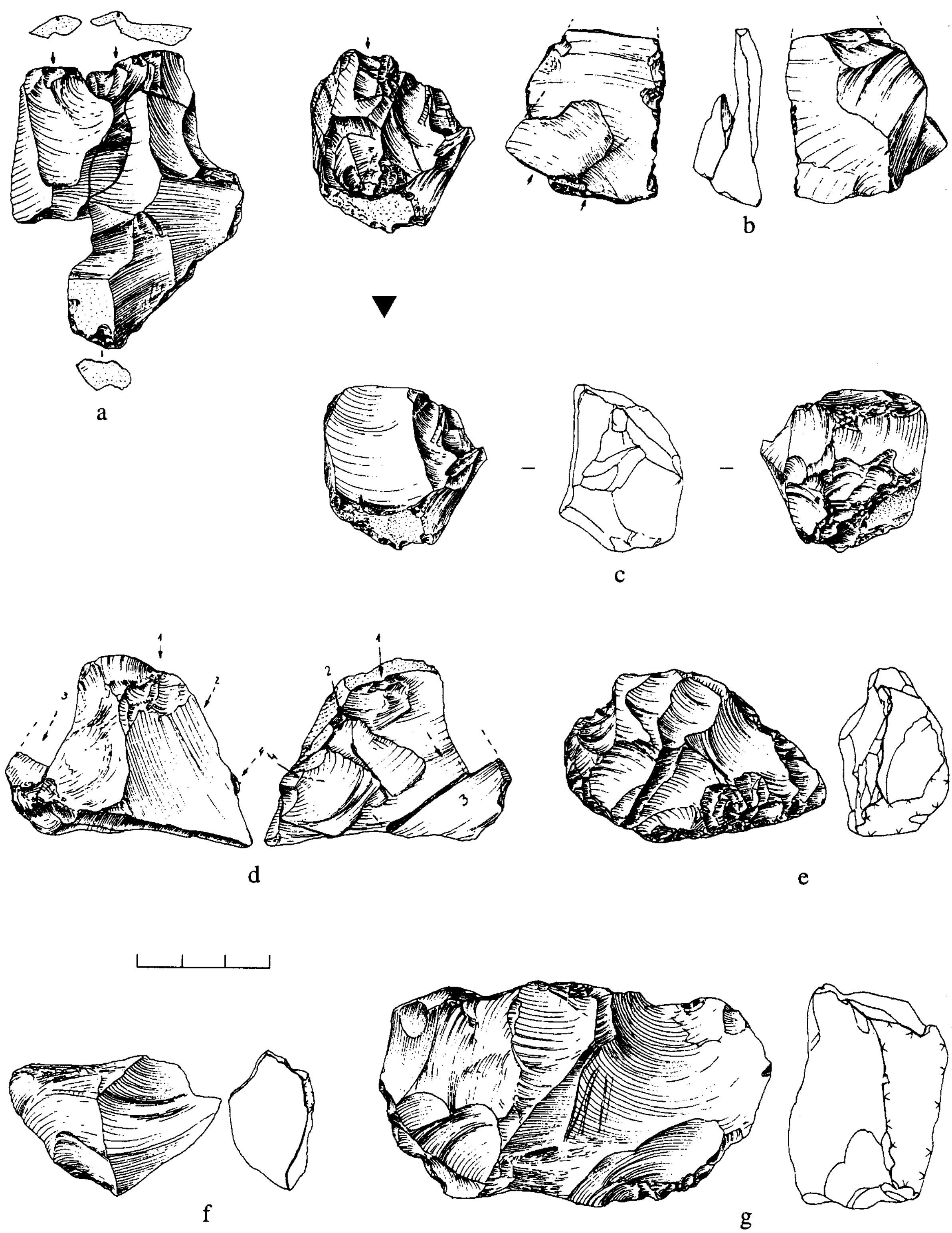


Fig. 7-10—Starosele, Level 3, Cores and conjoins: *a*–conjoins showing opposed platform removal sequence; *b*–conjoin sequence showing slightly converging removals; *c*–globular core; *d*–conjoins showing series of parallel removals; *e-g*–cores with mainly one platform but with some indication of opposed platform flaking.

no purposeful blade production and, in the absence of blade cores, it seems unlikely that these elongated pieces were produced with any consistency.

In spite of the apparent patterning in reduction strategies, the blanks produced were usually short, thick, and ugly. Partly, this resulted from the brittle nature of the honey-colored raw material but, mainly, it was the result of the use of hard hammer percussion. Not only are the negative bulbs of percussion large, but the edges which were struck often show crushing (fig. 7-10e, g). At best, the overall impression is one of mediocre workmanship and of an off-hand, if not fully *ad hoc,* approach to blank production. This is in marked contrast with the finely controlled flaking evident in Levels 1 and 2 and gives the whole assemblage of Level 3 a non-standardized, primitive aspect.

Level 4

Only a single core was recovered from just below the Level 4 surface. Apparently made on a plaquette, it has a slightly domed flaking surface and some converging flake scars. Unfortunately, one side has been crushed and another has flake scars resulting from post-depositional movement (fig. 7-11). Thus, while it might be Levallois, no certain characterization is possible. Flake scars on the blanks provide little additional information. Only a single tool may be on a Levallois blank, while the other blanks are either too heavily retouched to permit judgment, or are clearly non-Levallois. Thus, there is really no useful information on the reduction strategies used in Level 4, except that the large size of the blanks indicates the use of even larger cores.

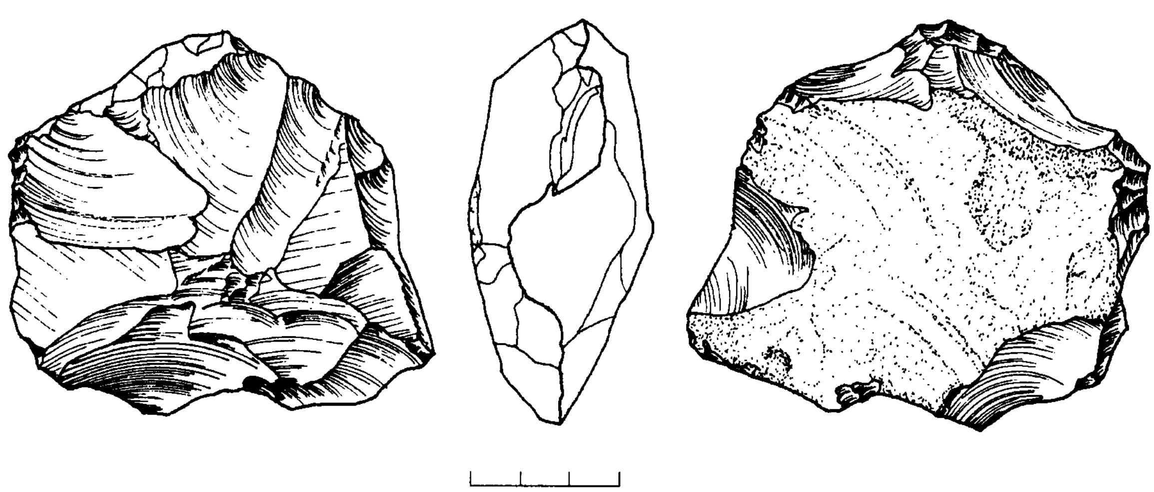


Fig. 7-11—Starosele, Level 4, Core, probably on plaquette. Edge retouch at top is post-depositional, as are the last flakes from the bottom.

Blank Variability

All the assemblages produced many more flakes than blades, while primary elements were even more rare. In fact, for most assemblages, the samples of blades and primary elements are so small as to make separate attribute studies meaningless. Therefore, the following discussions of blank morphology are based on combined samples of all debitage and tool blanks, excluding bifacial tools, preforms, chunks, cores, and their fragments. Broken pieces were used to the extent to which they provided information: that is, a proximal flake fragment could be observed for platform attributes but not for length. Each aspect of morphology, therefore, may be represented by a different sample size. In spite of different kinds of occupation, artifact discard, and immediate post-occupational conditions, the percentage of broken pieces in each assemblage is rather similar: Level 1, 35.4%; Level 2, 35.4%; Level 3, 26.4%; and Level 4, 31.6%. As will be seen below, the higher percentage of complete pieces in Level 3 can be explained by an average greater thickness of those pieces, which made them less likely to break.

The emphasis of this section will be comparative among the assemblages. Yet, those from Levels 2 and 4 are too small to be very meaningful. Thus, focus will be placed on the distinctions and similarities between Levels 1 and 3. Given the extensive use of soft hammer, bifacial reduction in Levels 1 and 2, and the use of hard hammer, true core reduction in Level 3, it might be expected that the blanks of Level 3 would be significantly different from those in Levels 1 and 2. While this is true for some aspects of their morphology, the differences in other attributes are not so marked. For instance, in spite of the major difference between Levels 1 and 3 in the dominance of bifacial reduction in Level 1 and its absence in Level 3, the same proportional distribution of on-axis and off-axis blanks occurs, with each having ca. 49% struck off-axis.

Platform Characteristics

Platform attributes reflect both the specific preparation of the platform prior to a blank being struck and the mode of removal (hard vs. soft hammer). While the former is clearly seen, the latter is less so. Hard hammers tend to leave pronounced bulbs of percussion, noticeable éraillure scars, and relatively thick and wide platforms. Of course, this is not always the case, since a hard hammer used softly on a core near the intersection of the platform and the flaking surface may well produce a blank with a small platform, a diffuse bulb, and with little to no éraillure scar. Thus, these observations for any sample must be thought of as tendencies, rather than specifically interpretable for each piece.

While platform size will be dealt with when metrics are discussed, the presence or absence of lipping will be noted here (Table 7-3). Lipping refers to a flange at the contact between the platform and the ventral surface. This occurs only when the force which removed the blank is very diffuse and it is usually, although not always, associated with an absence of a bulb of percussion (e.g., fig. 7-8 a, c) or even crushing (fig. 7-8d) . In the coding, a semi-lipped state was recognized, where the lipping was present but so, too, was a small, diffuse bulb of percussion. It was decided that both the semi-lipped and lipped platforms should be grouped together as representing the probable use of a soft hammer. Experience has shown that classifying the strength of the éraillure scar is highly subjective and, so, this attribute has not been included. In addition, while a series of platform types were coded (following those recognized by F. Bordes 1961), it was decided that three categories were sufficient: unfaceted, multiple faceted (including dihedral and the various complex forms), and those platforms still covered with cortex (Table 7-3).

TABLE 7-3
Starosele, Platform Characteristics of Debitage and Tools

Platform	Level 1 N	Level 1 %	Level 2 N	Level 2 %	Level 3 N	Level 3 %	Level 4 N	Level 4 %
Unfaceted	108	46.2	23	57.5	139	57.4	7	53.8
Multiple faceted	107	45.7	14	35.0	61	25.2	5	38.5
Cortex	19	8.1	3	7.5	42	17.4	1	7.7
N	234		40		242		13	
IFs		42.7		27.5		21.9		38.5
Lipping								
Not lipped	155	53.4	28	58.3	206	75.7	10	66.7
Lipped and semi-lipped	135	46.6	20	41.7	66	24.3	5	33.3
N	290		48		272		15	

Taking into account the possible effects of the small sample from Level 2, both Levels 1 and 2 have very similar patterns of platform preparation. Most notable is the low occurrence of cortical platforms and the relatively high occurrence of faceted platforms. The pattern for Level 3 is quite different: cortical platforms are twice as common, and there are proportionately far fewer faceted platforms than in Levels 1 and 2 (Table 7-3). The Level 4 sample, while extremely small, parallels those of Levels 1 and 2. Some significant degree of lipping occurs on over 4 out of 10 pieces in both Levels 1 and 2, while this falls to only 2.5 out of 10 in Level 3. Level 4 is closer to Levels 1 and 2 than to Level 3 but, again, the sample is so small as to be hard to interpret.

These platform patterns are fully consistent with the data derived from the few cores and from the basic reduction patterns seen in other aspects of the assemblages. The high percentage of faceted and lipped platforms in Levels 1 and 2, among other attributes, are strongly linked to soft hammer bifacial tool shaping and thinning (Callahan 1979; Bradley and Sampson 1986; Whittaker 1994). While soft hammer can be inferred from this, there are also a number of bone retouchers found in Level 1, so soft hammer use is beyond question.

As noted previously, the paucity of cores, the presence of bifacial foliates and bifacial preforms, all suggest that unmodified nodules or plaquettes were rarely imported onto the site during the occupations of Levels 1 and 2. The rarity of cortex platforms in those levels certainly is consistent with a lack of initial raw material reduction. The opposite interpretation for Level 3 is also reinforced by the high percentage of blanks with cortex platforms. On the other hand, the low percentage of faceted platforms in Level 3 would seem to reflect a lack of careful striking platform preparation, rather than any particular type or shape of raw material. What is striking is that Level 3 is markedly different in these aspects from Levels 1 and 2, as well as from Level 4.

Shape Characteristics

These include overall blank shape, as seen from the dorsal surface, the nature of the distal extremity, the cross-section at mid-point, and the shape of the blank profile viewed from the side (Table 7-4). While these aspects of blank morphology often have indirect relationships with the shape of the flaking surface of the core from which the blank was struck, there are only rarely direct relationships between any one attribute state and flaking surface shape. What these attributes show is the overall patterns present in an assemblage of blanks. While these aspects of blank morphology may be significant to some degree, other aspects, such as dimensions, may be even more important, as will be seen below.

Because interest here lies in the universe of blanks which were available for tool production, the sample includes both debitage and those blanks actually made into tools. Again, because of small sample sizes, the proportional occurrences of attributes states for Levels 2 and 4 probably have little meaning and are presented merely for the record. Discussion will be limited to Levels 1 and 3, since their samples are quite large and, therefore, may be taken as characteristic of each assemblage.

Level 1

There is considerable variability in blank shape, although combined trapezoidal and elongated trapezoidal dominate. In fact, trapezoidal and rectangular forms account for 76.7% of all blanks. No other shape exceeds 7.3% of the sample. This might suggest considerable purposeful shape standardization but that interpretation would be unwarranted. Since many blanks produced in Level 1 came from the shaping and thinning of bifacial foliates, it is expected that their lateral edges would be either more or less parallel or expanding. Since these thinning blanks are normally struck off-axis, the distal ends are often oblique to the axis of removal and, therefore, define some trapezoidal shape. What is striking about blank shape

TABLE 7-4
Starosele, Shape Characteristics of Tools and Debitage

	Level 1		*Level 2*		*Level 3*		*Level 4*	
Blank Shape	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Rectangular	67	23.3	6	14.3	54	22.0	2	13.3
Ovoid	21	7.3	9	21.4	35	14.2	1	6.7
Triangular	19	6.6	2	4.8	25	10.2	5	33.3
Trapezoidal	64	22.2	10	23.8	58	23.6	3	20.0
Elongated trapezoidal	90	31.3	8	19.0	38	15.4	3	20.0
Expanding	21	7.3	4	9.5	26	10.6	1	6.7
Crescent/sub-crescent	6	2.1	3	7.1	10	4.1	—	—
N	288		42		246		15	
Profile at Midpoint								
Flat	27	8.5	8	14.3	40	14.9	—	—
Triangular	143	45.1	19	33.9	115	42.8	7	46.7
Lateral steep	58	18.3	8	14.3	47	17.5	2	13.3
Trapezoidal	87	27.4	21	37.5	66	24.5	6	40.0
Lenticular/bi-convex	2	0.6	—	—	1	0.4	—	—
N	317		56		269		15	
Profile at Distal End								
Thinning	172	56.8	29	65.9	99	35.2	8	57.1
Hinged	79	26.1	8	18.2	100	35.6	5	35.7
Overpassed	16	5.3	3	6.8	9	3.2	—	—
Blunt	36	11.9	4	9.1	73	26.0	1	7.1
N	303		44		281		14	
Blank Profile								
Flat	52	12.6	6	9.2	52	15.0	1	5.3
Incurvate	194	47.0	29	44.6	134	38.6	8	42.1
Twisted	117	28.3	21	32.3	79	22.8	6	31.6
Irregular	27	6.5	4	6.2	14	4.0	2	10.5
Convex	23	5.6	5	7.7	68	19.6	2	10.5
N	413		65		347		19	

in Level 1 is the paucity of ovoid/crescent shaped blanks; that is, those with one or two convex lateral edges. In addition, blanks with triangular shape are also rare. These, with the maximum blank width at the platform, would be rare in a technology where the main mode of detachment was a soft bone hammer. Thus, Level 1 blank shapes are consistent with the kinds of reduction patterns seen through other aspects of the assemblage.

This consistency continues when mid-point profiles and distal profiles are considered. As expected from a bifacial technology, there are few pieces with one blunt edge, and those that are present must have come from other types of reduction. The remaining mid-point cross-sections indicate little primary reduction, for those with trapezoidal and triangular (normally flat triangular) sections usually come only after a nodule or plaquette has been initially shaped. The distal profiles are dominated by blanks where the distal end is feathered: that is, these blanks did not reach all the way to the far side of the core or bifacial piece being worked. This is typical for bifacial reduction, but is also usual in normal cores. It is the low number of hinged and blunt distal ends (Table 7-4) which correlates well with both an emphasis on bifacial reduction, as well as the use of a soft hammer.

The blank profiles along their length show that almost half are incurvate. While this is normal for almost any assemblage (most flakes/blades are struck from flaking surfaces which are convex along the axis of the blow, regardless of the core type), when it is combined with those with twisted profiles, they account for some 75% of all profiles, as would be expected when the technology emphasizes bifacial reduction. The low proportional occurrences of convex and irregular profiles indicate diffuse force was used most of the time, as expected.

Level 3

Most striking about blank shape is that, with the exception of crescent/sub-crescent pieces, each shape accounts for at least 10% of the sample (Table 7-4). In fact, while rectangular and trapezoidal account for ca. 20% each, the other shapes are rather evenly represented. Thus, unlike Level 1, there are no dominant shapes. Like Level 1, however, the mid-point cross-sections show the same general proportional distribution, except for having flat pieces at double the rate of Level 1 (Table 7-4). This indicates a higher use of unmodified flaking surfaces in Level 3 than in Level 1, but doesn't suggest that it was typical.

Unlike Level 1, distal profiles exhibit high rates of blunt and hinged ends; over 41% combined. This is associated with hard hammer striking, as well as with rather small cores where the force of the blow was sufficiently strong to go all the way through the core. If the cores were large, such force would have resulted in overpassed pieces, which are very rare here (Table 7-4). It also should be noted that while distal feathering is normal in most assemblages, in Level 3 it stands at only 35%, compared with almost 57% in Level 1.

Compared to Level 1, blank profiles in Level 3 exhibit much higher occurrences of flat and convex ventral surfaces, and significantly lower percentages of incurvate and twisted profiles (Table 7-4). The flat and convex ventral surfaces are associated with hard hammer force in blank removal and, again, suggest that the lengths of core flaking surfaces were not great. In fact, the high percentage of convex ventral surfaces is quite unusual and, in this case, was probably accentuated by the rather dry and brittle flint used for many of the cores.

Blank vs. Chip Variability

As discussed above, the line between blanks and chips was set at 2.99 cm for the whole project (see Chapter 3). While this demarcation had to be maintained in order to make comparisons among assemblages possible, some unbroken tools from Levels 1, 2, and 3, as well as the last scar facets on the discarded cores at Starosele, measure between 1.99 cm and 2.99 cm in greatest dimension. Thus, it is necessary to consider the sample of blanks from which they were drawn to see whether it is significantly different from the universe of larger pieces classified as blanks/debitage. Because of very small sample sizes from Levels 2 and 4 (12 and 10, respectively), only those from Levels 1 and 3 will be considered.

One difference between this chippage and the large pieces is that many more of the former are flakes: Level 1, 80.5% and Level 3, 89.9%. In spite of this, blades do occur, accounting for 13.4% in Level 1 but only for 3.1% in Level 3. Primary flakes occur in about the same proportions as for the larger items. As might be expected, fewer chips are broken: 28.9% in Level 1 and 16.2% in Level 3. Even this lower percentage in Level 1 seems high, but if it is considered that many were biface thinning chips, they probably broke while coming off the bifacial blank, rather than after their removal.

There are few differences between the platform characteristics of the chips and those of the larger pieces. The only marked difference is that in Level 1 only 2.0% chips have cortex platforms, as opposed to 8.1% for the larger pieces. Given the technology, however, this is fully understandable and expected. For both levels, more of the chips are unfaceted, fewer are multiple faceted, and fewer are lipped, but the differences are not great. There are also higher occurrences of unrecognizable platforms among the chips, since crushing is much more prevalent for these smaller and thinner pieces.

Blank shape of the chips follows the proportional distribution of the blanks/debitage rather closely. In Level 1, only ovoid pieces are more common by some 11% and elongated trapezoidal pieces are less common by 15%. Otherwise, the shape categories average changes of no more than 2.8% from those of the larger pieces. For Level 3, again, ovoid pieces are more common by 8% and elongated trapezoidal are lower by 9%. For the other shapes, the average change is in the order of 3.1%.

There are no significant differences at all in the proportional distributions of blank profiles for either level when comparing the chips and blanks/debitage. Distal profiles are the same for Level 1 but there are two fully expected differences in Level 3: there is an increase of 15% for those with feathered ends, and a 10% decrease for those with blunt ends. Otherwise, the differences are in the 2.0% range. Profiles at midpoint show expected differences in both levels: there are fewer pieces with triangular cross-sections (9% in Level 1 and 8% in Level 3) and more with flat cross-sections (11% in Level 1 and 5% in Level 3).

In summary, while there are a few significant differences between samples with greatest dimension of less than 2.99 cm but more than 1.99 cm, and the sample of larger pieces, for the most part, the smaller sample can be distinguished essentially only be size. They appear to be merely the smaller end of an otherwise rather homogeneous group of platform and shape characteristics.

Dorsal Scar Patterns

Dorsal scar patterns are useful as an indirect indication of core reduction: at least, it is a view of what part of the core flaking surface looked like just prior to the removal of the blank. In this context, it is among the prime diagnostic features used to assign a blank either to the Levallois method or to some other reduction strategy (Bordes 1961a). At Starosele, where few cores were recovered, the dorsal scar patterns are a potentially profitable source for reconstructing flaking patterns. Unfortunately, these patterns are relatively uninformative (Table 7-5). There is very little difference in the proportional occurrences between Levels 1 and 3. A few points, however, do suggest some differences in patterning. In Level 1, complex patterns (radial and 3 directions) are twice as common as in Level 3. In Level 3, unidirectional scar patterns are significantly more common than in Level 1, which is consistent with the presumed core types. The cores in Level 3, however, as well as one conjoin series, indicate that opposed platform flaking was common. Yet, Level 3 has few flakes with bidirectional scar patterns. This confirms that, as reconstructed above, the Level 3 cores were

TABLE 7-5
Starosele, Cortex and Dorsal Scar Patterns of Tools and Debitage

	Level 1		Level 2		Level 3		Level 4	
Cortex	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
None	250	60.2	44	67.7	228	65.7	13	68.4
Cortical	165	39.8	21	32.3	119	34.3	6	31.6
N	415		65		347		19	
Scar Patterns								
Lateral crossed	34	9.9	5	8.5	34	11.0	3	25.0
Uni-directional	130	38.0	29	49.2	160	51.9	4	33.3
Uni-directional and crossed	69	20.2	11	18.6	52	16.9	3	25.0
Radial	30	8.8	4	6.8	11	3.6	—	—
Bi-directional	42	12.3	7	11.9	29	9.4	2	16.7
3 directions	37	10.8	3	5.1	22	7.1	—	—
N	342		59		308		12	

flaked one platform at a time. In this way, the abandoned cores have bi-directional scar patterns but only a very few of the blanks show this pattern.

Part of the dorsal scar pattern relates to the presence of cortex. While there are few primary elements (those with 50% of their dorsal surfaces covered by cortex) (Table 7-2), between 35% and 40% of all blanks in all levels have some dorsal cortex. This shows that in Level 1, the imported preforms still had some cortex (which is also seen on some bifacial foliates) and that in Level 3, the raw material used for cores was relatively small and that the cores did not produce large numbers of flakes. In fact, the difference between Levels 1 and 3 in this regard is striking: the core to blank ratio for Level 1 is 1:59.8, while in Level 3 it is only 1:25.9.

Blank Dimensions

The vast majority of pieces recovered were less than 3.0 cm in greatest dimension (chips). Considering those complete pieces with one dimension greater than 2.0 cm, in Levels 1 and 3 there are clear clusters in length/width patterns in which a significant number are wider than long (fig. 7-12). That is why greatest dimension, rather than length, is the significant size dimension. The range in greatest dimension is similar for all levels but Level 4, where the largest piece (not on fig. 7-12) measures 13.2 cm in length. As can be seen in the scatter plots (fig. 7-12), as the pieces become larger, size clustering decreases. In Level 1 this also shows that the largest pieces tend toward elongated forms, while in Level 3, this pattern is present, but less marked.

Mean greatest dimensions for Levels 1, 2, and 3 are very much the same, as is also the case for width (Table 7-6). On the other hand, blank thickness, platform width, and platform height in Level 3 is significantly greater than in Levels 1 and 2 (Table 7-6). While Level 4 greatest dimension is much greater than that of the other levels, overall thickness is about the same. When these dimensions are considered only for tools, however, in Levels 1, 2, and 4 they are significantly larger than the equivalent dimensions for the debitage in the same levels (Table 7-6). Overall, Levels 1 and 2 show no significant differences in any metrical attributes that would indicate differences in blank production, while comparisons between Levels 1 and 3 do indicate statistical differences in blank production. Level 4, which has markedly bigger

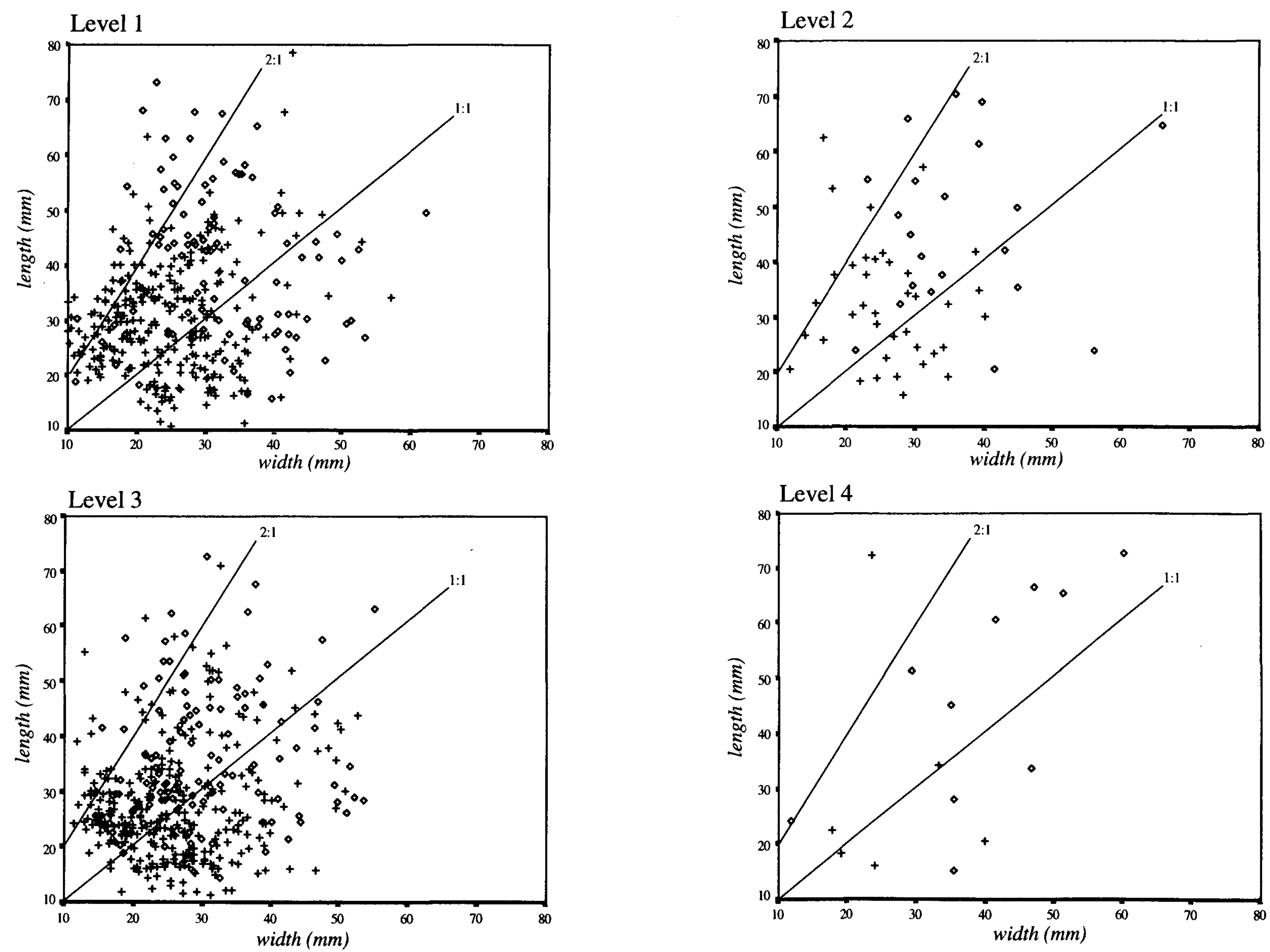


Fig. 7-12—Starosele, Length/width scatterplots of all compete tools (◇), chips and debitage (+) from each level. Note that a good number of all pieces are wider than long and that the larger pieces tend to be tools in all levels.

TABLE 7-6
Starosele, Dimensional Attributes of Debitage (> 2.99 mm) and Tools†, Complete Pieces Only

		Level 1		*Level 2*		*Level 3*		*Level 4*	
		Deb.	*Tools*	*Deb.*	*Tools*	*Deb.*	*Tools*	*Deb.*	*Tools*
Length	Mean	34.9	41.3	36.6	47.2	33.4	36.8	42.7	52.5
	S.D.	10.0	13.2	10.5	15.0	11.4	12.4	26.8	33.6
	N	169	95	27	15	150	105	3	10
	t-value	-4.478	p=.000*	-2.690	p=.010*	-2.300	p=.022*	-0.462	p=.653
Width	Mean	27.3	32.3	27.4	33.9	30.5	29.8	32.3	39.0
	S.D.	8.5	9.6	7.0	7.6	9.1	9.8	8.2	12.7
	N	169	95	27	15	150	106	3	10
	t-value	-4.346	p=.000*	-2.814	p=.008*	0.574	p=.566	-0.849	p=.414
L/W	Mean	1.4	1.4	1.5	1.5	1.2	1.3	1.5	1.4
	S.D.	0.6	0.6	0.7	0.5	0.7	0.5	1.4	0.6
	N	169	95	27	15	150	105	3	10
	t-value	0.213	p=.831	0.093	p=.926	-1.144	p=.254	0.351	p=.732
Max. Dim.	Mean	37.9	45.0	39.1	49.3	38.8	39.9	49.1	56.6
	S.D.	7.5	11.2	8.2	12.8	7.9	11.4	20.6	30.3
	N	169	95	27	15	150	105	3	10
	t-value	-6.194	p=.000*	-3.153	p=.003*	-0.868	p=.386	-0.395	p=.700
Surface Area	Mean	951.0	1314.0	974.3	1601.0	999.9	1115.4	1232.5	2301.7
	S.D.	460.6	511.8	295.9	606.0	451.5	571.7	446.1	2079.8
	N	169	95	27	15	150	105	3	10
	t-value	-5.903	p=.000*	-4.518	p=.000*	-1.799	p=.073	-0.859	p=.409
Thickness	Mean	6.0	6.8	4.8	8.1	7.9	8.3	5.7	9.3
	S.D.	3.7	2.7	1.7	3.2	3.6	4.0	1.8	4.4
	N	169	95	27	15	150	106	3	10
	t-value	-1.678	p=.094	-4.330	p=.000*	-1.382	p=.194	-1.382	p=.194
Platform Width‡	Mean	11.2	13.4	11.4	15.0	15.7	17.0	13.3	21.2
	S.D.	5.3	7.2	5.8	7.2	8.1	8.4	9.8	9.3
	N	194	103	34	14	169	104	3	11
Platform Height‡	Mean	3.7	4.1	3.8	5.2	5.8	5.9	5.7	6.0
	S.D.	2.2	2.4	1.8	3.1	3.2	3.8	2.2	3.9
	N	194	103	34	14	169	104	3	11

†excluding all bifacial and varia tools.
‡ all intact platforms.
* t-value is significant at $p < .05$.

pieces than the other assemblages, shows similarities in dimensional comparisons only to Level 3, and that only in blank thickness and platform size.

Blank Selection

While it might be expected that blank selection for tool production would be influenced both by the variable quality of the raw materials and by the artifact classes available, neither seems to have be very significant to the groups which came to Starosele. There is virtually no difference between the proportional occurrences of the different raw materials and the proportion of tools made from each material (Table 7-1). The same is true when the total tools in each level is compared with the total blanks in each level: with the exception of Level 4, in each level between 40.5% and 47.9% of all blanks were made into tools (Table 7-2). Sixty-five percent of the blanks in Level 4 were retouched, but with a total sample of 20 items, this doesn't mean much.

There are significant differences between levels and the percentage of certain artifact classes chosen for tool production (Table 7-2). In Level 1, a higher percentage of available blades were selected as blanks for tools (56.3%) than were flakes (38.6%), while only about one out of five primary elements were so used (22.6%). The Level 2 patterns parallel those from Level 1 when class samples are reasonable (Table 7-2).

Selection patterns by artifact class for Level 3 exhibit some marked differences from Levels 1 and 2. Unlike Level 1, blades were selected in a lower proportion (40.8%) than were flakes (47.9%), and primary flakes were a desired blank form; ca. 40% were made into tools. Another aspect of the Level 3 selection was the use of chunks as tool blanks. While each other level has a single tool made on a chunk, chunks themselves are rare. In Level 3, almost 6% of the blanks are chunks and of them, 45.5% were retouched (Table 7-2). This is another facet of the *ad hoc* appearance of the Level 3 tool assemblage.

The proportional occurrence of tools by major artifact class (Table 7-7) shows relatively few differences. In each level, most tools were made on flakes: the somewhat lower percentage in Level 1 than in the other levels is a result of the core/bifacial tools in that level and their paucity or absence in the other levels. Also, blade tools are proportionately more common in Level 1 than in Level 3, or in Level 2, for that matter, but they are not so numerous as to exhibit any strong preference for them. It seems that, in spite of quite different technologies used to produce blanks in Levels 1 and 3, the tool assemblages have similar, if not identical, patterns of blank selection. Levels 2 and 4 have such small samples that they are affected significantly by the small number of artifacts. Still, the proportional distributions of tools by artifact class for those levels are not markedly different from the assemblages with large samples.

TABLE 7-7
Starosele, Tool Assemblages by Major Artifact Classes

	Level 1		*Level 2*		*Level 3*		*Level 4*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Blade	40	20.7	4	13.3	20	12.2	1	7.7
Flake	118	61.1	23	76.7	128	78.0	11	84.6
Primary Element	7	3.6	1	3.3	5	3.0	—	—
Core/Chunk†	28	14.5	2	6.7	11	6.7	1	7.7
N	193		30		164		13	

†Including all bifacial foliates and their fragments. Those are on flake blanks are treated as cores.

It is probable that the morphological differences among the artifact classes played, at best, a secondary role in blank selection. The primary criterion in blank selection for tool production was size: the larger the blank the more likely it was to have been made into a tool (Tables 7-6, 7-8). In this case, it is not merely length in the traditional sense, but the longest blank edge was considered important, whether it was parallel, perpendicular, or oblique to the axis of the blank. Table 7-8, therefore, is structured so that the longest edge determines where the blank is classified: a transverse flake 5 cm long and 7.1 cm wide is in the 7 cm to 8 cm group. There is not only a positive selection for blanks which have a long edge or edges but also for those which have greater dimensions of all types (Table 7-6). This selective preference for large blanks does not mean that small blanks were not also retouched. It is merely that of the many small blanks available, relatively few were used, while among the relatively few large blanks, most were made into tools.

TABLE 7-8
Starosele, Grouped Maximum Dimension (mm) for Tools and Debitage and Tools Alone

	Level 1				*Level 2*				*Level 3*				*Level 4*			
	All		*Tools*		*All*		*Tools*		*All*		*Tools*		*All*		*Tools*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
20.0-29.9	114	31.0	10	8.8	12	22.6	1	8.3	187	45.1	28	15.0	4	25.0	—	—
30.0-39.9	135	36.7	18	13.3	19	35.8	2	10.5	125	30.1	27	21.6	3	18.8	2	66.7
40.0-49.9	78	21.2	36	46.2	11	20.8	5	45.5	65	15.7	29	44.6	3	18.8	2	66.7
50.0-59.9	29	7.9	22	75.9	7	13.2	4	57.1	31	7.5	17	54.8	1	6.3	1	100.0
60.0-69.9	10	2.7	8	80.0	3	5.7	2	66.7	5	1.2	4	80.0	3	18.8	3	100.0
70.0-79.9	2	0.5	1	50.0	1	1.9	1	100.0	2	0.5	1	50.0	1	6.3	—	—
80.0-89.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
90.0-99.9	—	—	—	—	—	—	—	—	—	—	—	—	1	6.3	1	100.0
N	368	100.0	95		53	100.0	15		415	100.0	106		16	100.0	9	
Mean	36.1		44.5		40.2		49.1		33.9		39.9		48.9		58	
S.D.	10.7		11.3		12.50		12.9		11.1		13.9		27.5		29.2	

A comparison of tools and debitage showed, however, that while the above basic blank selection criteria hold true, there are some differences in selection among the assemblages. In Level 1, tools are significantly bigger than unretouched pieces in all aspects, except thickness and degree of elongation (length/width index). While tools are marginally thicker in cross-section, they are not significant at the .05 level, and this measurement is highly dependent on their overall size. The mean length/width index is the same in both tools and debitage, suggesting that elongation—as measured on the debitage axis—was not highly important in blank selection for tools. Rather, it is the maximum length of the edge which shows the greatest significant difference between the tools and debitage. Level 2 likewise shows the same preference for larger blanks; here, the tools are significantly larger in dimensional attributes than the debitage, including thickness. Level 3, on the other hand, demonstrates little difference among the tool and debitage groups in their dimensional aspects, except marginally in length ($p=.022$). In part, this is due to the overall limited size range of the Level 3 blanks, but also points to the possibility of more opportunistic use of blanks and less importation of blanks in this level as compared to the others. In Level 4, while the means are certainly larger for the tools (even by excluding the outlying 132 mm long sidescraper), there is no indication that the they are statistically different from the debitage. However, again, the sample sizes are too small in this level to make such tests anything more than indicative.

TOOL ASSEMBLAGES

Tools range in type and quality from extensively retouched bifacial foliates and beautifully symmetrical, well-retouched scrapers to rather amorphous blanks with poorly applied, partly discontinuous retouch. There is no problem recognizing well made tools but, at the other end

TABLE 7-9
Starosele, Tool Assemblages by Level

Tool Type	*Bordian Equivalent*	*Level 1* *N*	*Level 1* *%*	*Level 2* *N*	*Level 2* *%*	*Level 3* *N*	*Level 3* *%*	*Level 4* *N*	*Level 4* *%*
UNIFACIAL TOOLS									
Points		***21***	***13.2***	–	–	***5***	***3.6***	***1***	***10.0***
semi-leaf	6, 7	–	–	–	–	2	1.4	–	–
distal	62	1	0.6	–	–	–	–	–	–
lateral	62	2	1.3	–	–	–	–	–	–
sub-triangular	6, 7	10	6.3	–	–	1	0.7	–	–
sub-trapezoidal	21	2	1.3	–	–	–	–	1	10.0
semi-trapezoidal	21	1	0.6	–	–	2	1.4	–	–
tip fragment	6, 7	5	3.1	–	–	–	–	–	–
Scrapers		***72***	***45.3***	***14***	***66.7***	***56***	***40.0***	***9***	***90.0***
simple straight	9	8	5.0	2	9.5	5	3.6	1	10.0
simple convex	10	10	6.3	2	9.5	14	10.0	1	10.0
simple concave	11	4	2.5	–	–	6	4.3	–	–
transverse straight	22	4	2.5	1	4.8	1	0.7	–	–
transverse convex	23	6	3.8	1	4.8	–	–	–	–
transverse concave	24	–	–	–	–	2	1.4	–	–
transverse straight oblique	22	3	1.9	1	4.8	3	2.1	–	–
transverse convex oblique	23	–	–	–	–	2	1.4	–	–
transverse concave oblique	24	–	–	–	–	2	1.4	–	–
transverse wavy oblique	23	–	–	–	–	2	1.4	–	–
double straight	12	2	1.3	–	–	3	2.1	–	–
double convex	15	5	3.1	1	4.8	1	0.7	1	10.0
double straight-convex	13	5	3.1	1	4.8	2	1.4	3	30.0
double straight-concave	14	–	–	–	–	1	0.7	–	–
double convex-concave	17	2	1.3	–	–	2	1.4	–	–
semi-leaf	19	2	1.3	1	4.8	–	–	–	–
sub-triangular	18	3	1.9	–	–	1	0.7	–	–
semi-rectangular	21	2	1.3	–	–	–	–	–	–
sub-trapezoidal	21	3	1.9	1	4.8	1	0.7	3	30.0
semi-trapezoidal	21	8	5.0	2	9.5	7	5.0	–	–
sub-crescent	13	2	1.3	1	4.8	1	0.7	–	–
semi-crescent	13	1	0.6	–	–	–	–	–	–
hook-like	17	2	1.3	–	–	–	–	–	–
Endscrapers		***1***	***0.6***	***1***	***4.8***	***3***	***2.1***	–	–
atypical endscraper	31	1	0.6	1	4.8	1	0.7	–	–
on retouched blade	30	–	–	–	–	2	1.4	–	–
Perforators		–	–	–	–	***1***	***0.7***	–	–
inverse	35	–	–	–	–	1	0.7	–	–
Burin/Perforators		–	–	–	–	***1***	***0.7***	–	–
on truncation/obverse	62	–	–	–	–	1	0.7	–	–
Denticulates		***5***	***3.1***	***3***	***14.3***	***21***	***15.0***	–	–
simple	43	5	3.1	3	14.3	16	11.4	–	–
complex	43	–	–	–	–	5	3.6	–	–
Notches		***12***	***7.5***	***1***	***4.8***	***16***	***11.4***	–	–
lateral	42	11	6.9	1	4.8	14	10.0	–	–
distal	54	1	0.6	–	–	2	1.4	–	–
Retouched Pieces		***35***	***22.0***	***1***	***4.8***	***37***	***26.4***	–	–
obverse	62	32	20.1	1	4.8	31	22.1	–	–
alternating	62	1	0.6	–	–	–	–	–	–
inverse	45	2	1.3	–	–	6	4.3	–	–

TABLE 7-9 *continued*

Tool Type	Bordian Equivalent	Level 1 N	Level 1 %	Level 2 N	Level 2 %	Level 3 N	Level 3 %	Level 4 N	Level 4 %
BIFACIAL TOOLS		***13***	***8.2***	***1***	***4.8***	–	–	–	–
sub-crescent scraper	63	1	0.6	–	–	–	–	–	–
foliate, complete	63	6	3.8	1	4.8	–	–	–	–
foliate, distal	63	1	0.6	–	–	–	–	–	–
foliate, proximal	63	5	3.1	–	–	–	–	–	–
RESTRICTED TOTAL		***159***	***100.0***	***21***	***100.0***	***140***	***100.0***	***10***	
Tool Fragments		4		–		6		–	
Foliate Fragments		6		–		–		–	
Discontinuous Retouch		23		9		18		–	

of the spectrum, the problems are many. Just how much retouch must an edge have to be placed into the tool category? How regular and/or strong must the retouch be to keep it out of the "use retouch" or "edge damaged" categories? Even if retouch is well made, if it is on only a small fragment of what had to have been a larger tool, how is it to be classified? These and other questions have no universally accepted answers. In Chapter 3 we have tried to define how these problems were to be resolved. In theory, all the authors in this volume used the same criteria. In practice, it is likely that full comparability was not reached. Even for Starosele, at different times the same piece would be put into different categories by the same person. The problems lay mostly with the partly retouched pieces, the single notches, the marginally retouched flakes, etc. Because of the unavoidable subjectivity involved, these types may not correspond to the reader's classification.

These partially retouched pieces tell us that a fair number of usually small flakes were either lightly retouched or used for short periods of time without resharpening. These are the tools of the moment, rather than those tools which might have been curated or even resharpened. As such, they provide little typological information and are not useful for comparisons among assemblages. They are, however, quite useful in judging the range of activities at one site as opposed to another, since in spite of their minimal purposeful modification, they often exhibit clear use wear and even residues. All of these pieces have been recognized and counted as tools, *sensu lato.* If, however, the retouch is discontinuous or the piece so fragmentary that it merely can be recognized as having some retouch, it has not been included in the restricted tool list but is shown as a separate category below it (Table 7-9).

The typology used for the retouched tools is outlined in Chapter 3. While the principles behind this typology are not Bordian (1961a), there are similarities, and each of the types recognized here can be put into Bordian terms. This is done by including the Bordian number with the type name to aid the western reader for whom our typology may be unfamiliar. It must be remembered, however, that much information is lost when only the Bordian types are used, since much of the variability seen in Crimea is quite distinct from that recognized and defined by Bordes for southwestern Europe.

Because of the small tool sample from Level 2 and its comparability with the larger sample from Level 1, the illustrated Level 2 tools will be included with those of Level 1 and the description of the Level 1 tools applies, as well, to those from Level 2.

Level 1

A major characteristic of the Level 1 tool assemblage is the presence of bifacially flaked tools. This, however, is proportionately a rather small part of the tool kit, *per se*. Yet, the bifacial technology which produced those tools also produced large numbers of blanks chosen for modification into unifacial tools. While the number of such blanks varies from tool class to tool class, overall about 65% of all tools were produced on such bifacial shaping and thinning blanks, while only about 20% appear to have been made on blanks derived from true cores. The remaining examples could not be attributed to one reduction technique or the other.

Since the technology did not tend to produce blanks which were naturally pointed on axis (for an exception see Figure 7-14g), points were formed by retouch. One of the most vexing decisions in Middle Paleolithic typology is distinguishing between points and converging scrapers. Emphasis here (as explained in Chapter 3) is placed on the sharpness of the point but not on the symmetry of the piece relative to the axis of removal. Thus, points may well be off-axis, although on-axis examples are common. While there are relatively few points in this assemblage (10.2%), they tend to be well made, with rather heavy retouch. Triangular shapes (the typical Mousterian point) are usual, but other shapes, such as trapezoidal, also occur.

Within terms of the typology, however, the triangular ones are sub-triangular (fig. 7-13a, g, i-j) or elongate sub-triangular (fig. 7-13f, h), while the trapezoidal are either semi-trapezoidal (fig. 7-13b) or sub-trapezoidal (fig. 7-13k). There are also a few lateral points where only one edge is retouched (fig. 7-13c) or where one edge is much more strongly retouched than the other (fig. 7-13d-e). With these, the blanks appear to have been elongated, perhaps even of blade proportions. Two rather large and crude sub-triangular points also have inverse thinning (fig. 7-13g, j).

The numerically dominant tool class is the scraper. Within class variability is great and it is particularly in this class that the problem of the "lower limit" of acceptability is most vexing. Since many of the blanks chosen to produce scrapers came from bifacial reduction and were not only light and thin, but also small, the question arose of how big must a piece be to be a scraper? How heavy must the retouch be? If the blank is truly small, by necessity, the retouch, even if quite invasive, cannot be very strong. We have tried to be consistent and will document the difference between scrapers and retouched pieces with illustrated artifacts.

Among the scrapers, simple forms (lateral or transverse) account for a significant proportion, some 21.6% of all tools and 46.8% of all unifacial scrapers. The rather important ratio of simple transverse scrapers (36.0% of all scrapers) relates directly to the high number of transverse flakes produced during bifacial tool production. For both the lateral and transverse scrapers, convex edges predominate (fig. 7-14a-d, g-h), but are closely followed by straight (fig. 7-14e-f, i-j, l-m), whatever the orientation to the blank axis. When a concave edge occurs, it is only slightly concave (fig. 7-14k). For the most part, the retouch on these simple scrapers is obverse, sub-parallel or slightly scalar, and rather invasive. Edge angles are low and there is little evidence for resharpening in the form of overlapping lines of retouching scars. A single transverse example has both obverse and inverse retouch along the same working edge (fig. 7-14b), while another transverse scraper has a lateral truncated-faceted side (fig. 7-14i).

Convex forms dominate the double scrapers. If each edge is considered separately, 17 are convex, while 13 are straight and only 6 are concave. Retouch on these scrapers parallels that on the single scrapers; mainly obverse, sub-parallel or lightly scalar, invasive but not strong (figs. 7-15a, k, o; 7-16d). As before, this obviously relates to the light blanks chosen for modification, even the larger examples (fig. 7-15o). There are exceptions: a double straight/convex scraper on a relatively thick flake has strong, almost demi-Quina retouch, as well as truncated-faceted distal and proximal ends (fig. 7-15i). Another straight/concave example, at the very lower end of acceptability in this class, also has a truncated-faceted distal end (fig. 7-15j). A third example, straight/convex, has a short section of bifacial retouch along one edge (fig. 7-15k). One transverse convex oblique scraper approaches a backed knife but the edge which should be sharp is, in fact, perpendicular to the plane of the flake and, so, completely dull (fig. 7-14d).

The complex scrapers, those with two or more converging retouched edges, mainly follow the patterns noted above, but also include a number of heavily retouched pieces made on flakes from true cores. The latter include sub-crescent (fig. 7-15l-m), semi-crescent, two sub-trapezoidal (fig. 7-15g-h), one semi-trapezoidal (fig. 7-16i), and one atypical semi-leaf (fig. 7-16j) forms. Most semi- or sub-trapezoidal scrapers, however, are made on small flakes, at times thick (fig. 7-15c, f) but mainly thin bifacial reduction by-products (fig. 7-15b, d-e).

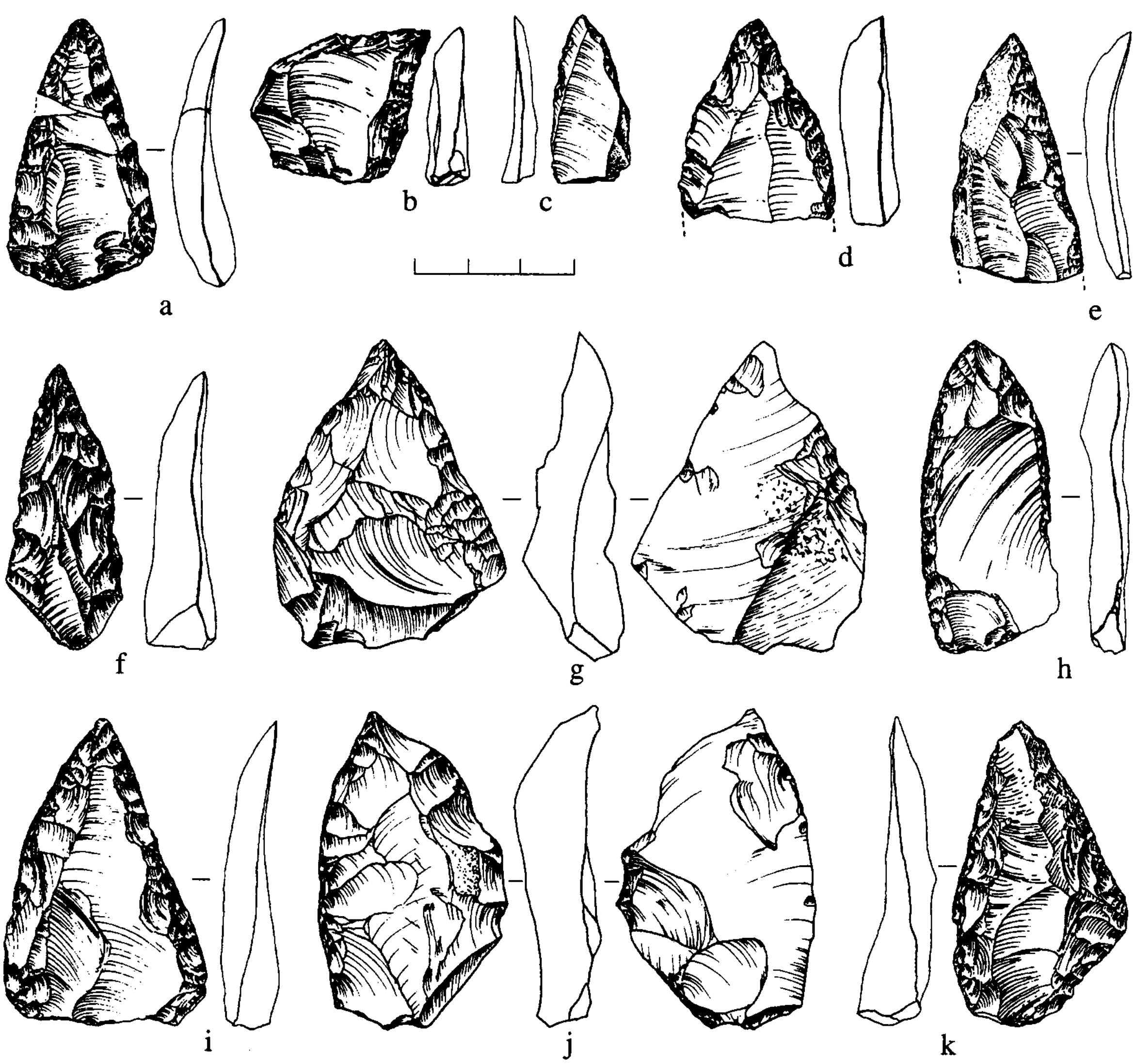


Fig. 7-13—Starosele, Level 1, Points: *a,f-j*–sub-triangular (*g* and *j* are sub-triangular thinned, and *f* and *h* are elongated); *b*–semi-trapezoidal; *c-e*–lateral; *k*–sub-trapezoidal.

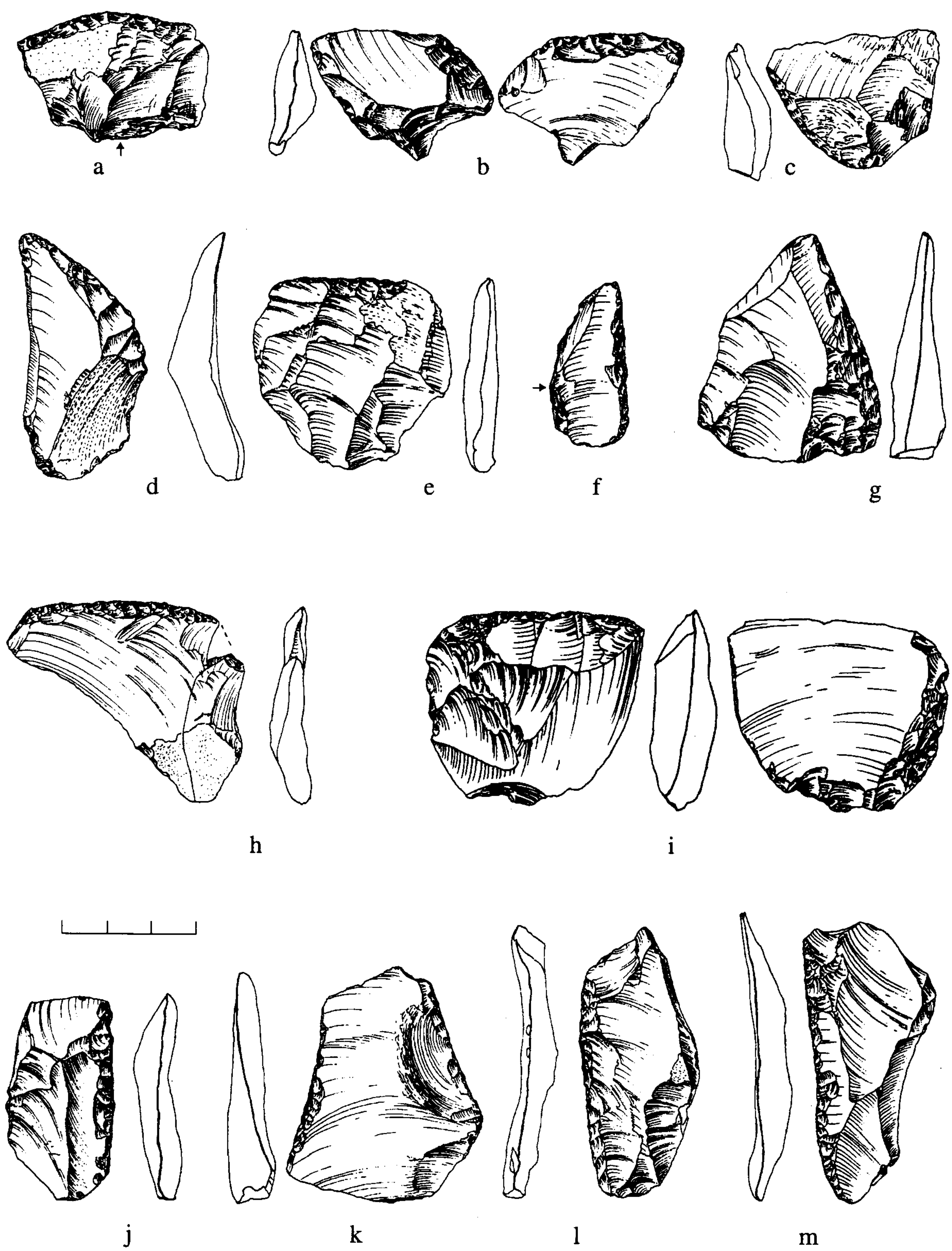


Fig. 7-14—Starosele, Levels 1 and 2, Scrapers: *a-b,h*–transverse convex (*b* has part obverse, part inverse retouch, as well as discontinuous retouch on the left lateral edge); *c,g*–simple convex; *d*–oblique convex which approaches a backed knife in Bordian terms but the unretouched edge is blunt; *e,i*–straight transverse (*i* has lateral truncated-faceting); *f*–simple, straight transverse with inverse retouch; *j,l-m*–simple straight; *k*–weak, slightly concave scraper from Level 2. Note that many of these (*b, h, j, l-m*) are made on bifacial shaping/thinning flakes and blades.

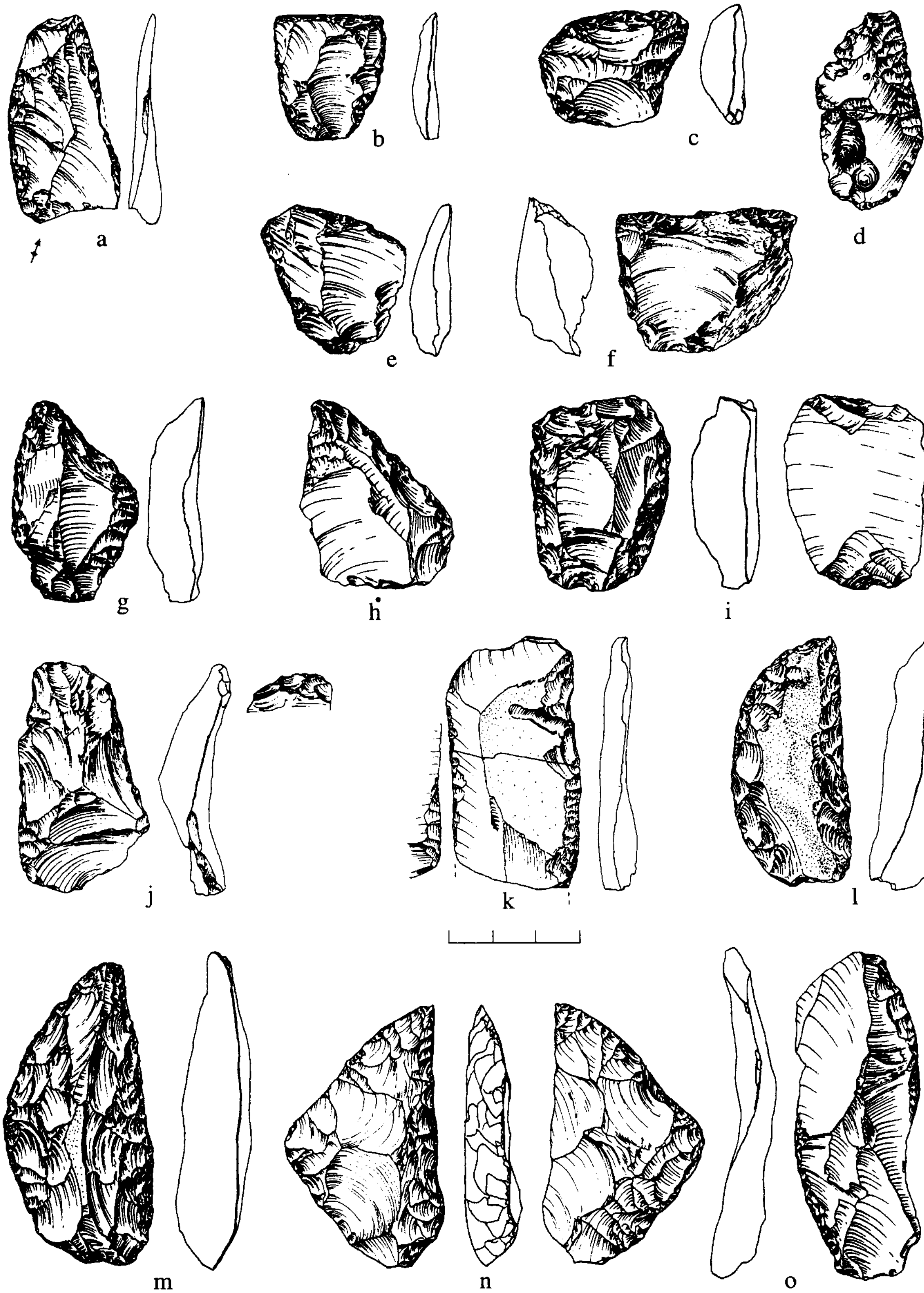


Fig. 7-15—Starosele, Level 1, Scrapers: *a*–double straight/convex; *b-c,g-h*–sub-trapezoidal; *d-f*–semi-trapezoidal; *i*–double straight/convex with truncated-faceting at both ends; *j*–poor straight/concave scraper with distal truncated-faceting; *k*–double straight/convex with minor bifacial retouch; *l-m*–sub-crescent; *n*–sub-crescent bifacial scraper; *o*–double convex.

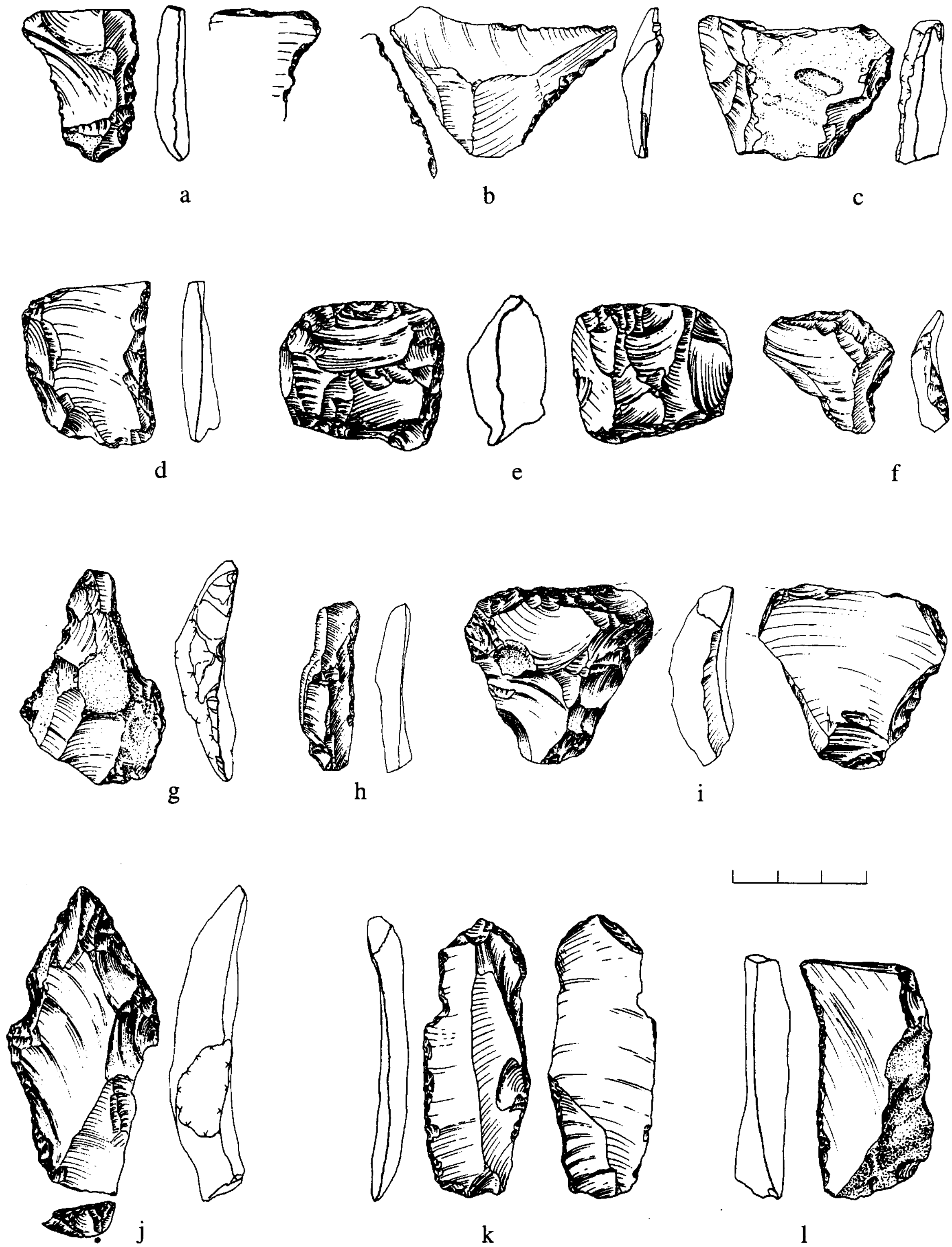


Fig. 7-16—Starosele, Level 1, Tools: *a,g*–denticulates; *b-c,h,l*–obversely retouched pieces; *d*–double convex/concave scraper; *e–pièce esquillée; f*–notch; *i*–semi-trapezoidal scraper with some possible inverse thinning; *j*–semi-leaf scraper; *k*–alternately retouched blade.

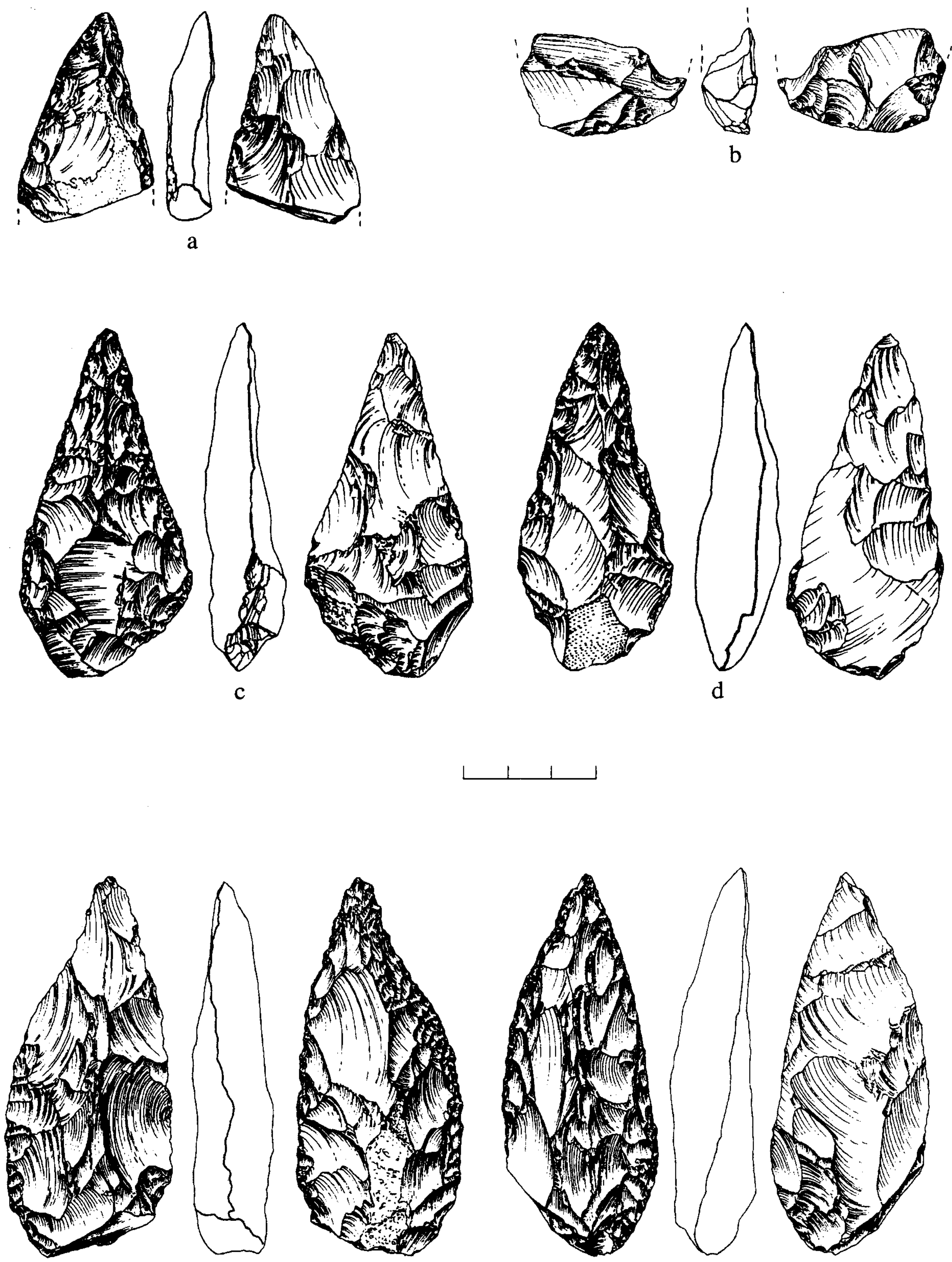


Fig. 7-17—Starosele, Level 1, Bifacial foliates: *a*–distal tip; *b*–proximal fragment; *c-f*–complete examples (*e* shows extensive rejuvenation along the upper half of the right lateral edge).

With the exception of the one illustrated as Figure 7-16i, none has any ventral thinning and even on this one, the inverse scars may relate to a core edge and breakage, rather than to purposeful modification.

Of the remaining unifacial tools, only retouched pieces occur in any number. There are isolated examples of *pièces esquillées* (fig. 7-16e) and an atypical endscraper on a broken flake. There are a few denticulates (fig. 7-16a), including one which is converging bi-concave (fig. 7-16g). The denticulations on the latter are small but clear, although the retouch is so steep as to mask the serrated edges. There are a few notches made by retouch (fig. 7-16f); a paucity of notches is rather typical for the Middle Paleolithic in the Crimea and may relate to the large number of truly *in situ*, undisturbed assemblages.

The retouched pieces are made on a range of blanks but usually occur on bifacial shaping and thinning flakes (fig. 7-16b, h, k). Retouch is usually continuous but not as invasive as on those classified as scrapers. Retouch is mostly obverse (fig. 7-16c, h, l), although a few pieces have alternate retouch (fig. 7-16b, k). In addition, there are pieces with only somewhat discontinuous or somewhat irregular retouch, such as the inverse retouch on Figure 7-16b. These are not listed in the restricted type list but are noted below that list (Table 7-9).

Although they represent a proportionately small part of the tool assemblage, the bifacial tools are a very important and characteristic element of Levels 1 and 2 at Starosele. With a single exception, these bifacial tools are foliates and their fragments. The single scraper is an atypical sub-crescent—it is more triangular than crescent-shaped—and might be a reworked fragment of a broken foliate (fig. 7-15n).

The bifacial foliates are all rather similar. All were produced by the asymmetric reduction of two surfaces, in which one face is first flaked with a parallel plane of detachment so that it is more or less flat. This face is then used as a platform to flake the opposite surface with a secant plane of detachment, resulting in an arched surface—thus, the plano-convex cross-section. In this sense, this is not a true bifacial reduction with alternating removal from opposite faces and a resulting bi-convex cross-section. Rather, it is a sequential unifacial technique, with a final, "bifacial" appearance. It is technologically understandable to use this technique when reducing thin plaquettes; that is, to first create a cortex-free "ventral" surface before tool shaping. The technique is used here, however, on flakes where the ventral surface already exists. Perhaps, the "bifacial" aspect created more effective edges for cutting than would a simple unifacial tool.

Although some bifacial pieces were made on flakes (fig. 7-17d), as were some preforms (fig. 7-9), others may have been made directly from the bifacial reduction of plaquettes. In spite of this, all are about the same size, all are formed by plano-convex flaking, and all have their maximum width near the base (fig. 7-17c-f). Distal tips tend to be very sharp (fig. 7-17a, c-f), while proximal ends have either a "v" shape (fig. 7-17c-d, f) or are only slightly convex (fig. 7-17b, e). One example (fig. 7-17e) shows clear resharpening along the upper right lateral edge, to the point where that section is concave and very steeply retouched. It is obvious that these foliates saw considerable resharpening: there are a number of small distal tips, two broken, two removed by lateral blows during resharpening, and a larger example clearly broken during use (fig. 7-17a). There are also a few small proximal fragments (fig. 7-17b) and a number of pieces which seem to have come off bifacial objects but are too small or amorphous to be securely typed. These have been left out of the restricted typology and are listed below it (Table 7-9).

Level 2

Since only 22 true tools were recovered, their proportional occurrence means little. In the variety of types present, this assemblage is no different from that of Level 1. There is one typical sub-crescent scraper, as well as sub- and semi-trapezoidal scrapers. There are somewhat more convex retouched edges than straight ones, while none is concave. As in Level 1, retouch is generally light scalar (fig. 7-14j), but more heavily retouched tools do exist (fig. 7-15h). There is no inverse retouch, although two pieces have some limited bifacial retouch along one edge. The distal bifacial foliate fragment has a sharp point and is made by plano-convex technique.

Perhaps the greatest difference between the assemblages of Levels 1 and 2 is the paucity of simple retouched pieces in Level 2. Given the seemingly ephemeral nature of the Level 2 occupation, the rarity of such *ad hoc* tools seems appropriate.

Level 3

As in Level 1, scrapers dominate the assemblage. Unlike Level 1, however, there are significant numbers of denticulates and notches, and points are rare. The range of scraper types is wide and their orientation to blank axis is highly variable. Among those scrapers with a single working edge, there are many which are parallel, transverse, and oblique to the axis of blank removal. The more complex scrapers also show a lack of association between the axis of blank removal and the placement of the retouched edges.

The most common scraper forms are obversely retouched, simple convex (fig. 7-18e, h, k, o), concave (figs. 7-18j; 7-19g), and straight (figs. 7-18f; 7-19c). Occasionally, these have additional minor modifications, such as limited retouch on an opposing edge (fig. 7-18f, h), a retouched notch or two (fig. 7-18j), or both (fig. 7-18k). One convex scraper has a hint of bifacial retouch near the base, opposite the scraping edge (fig. 7-18o), but it is more likely that this resulted from minor battering than from any purposeful bifacial reduction strategy.

Obversely retouched transverse and transverse oblique scrapers also show considerable shape variation of the retouched edge: straight (fig. 7-18a, d), convex, concave (fig. 7-18c) and wavy (fig, 7-18b, i). The wavy examples are both dominated by convex sections and would be classifiable as transverse convex in Bordian terms.

Among the scrapers with a single retouched edge, there are a number formed by inverse retouch. There are straight (fig. 7-18l) and concave (fig. 7-18n) among the simple scrapers and straight oblique (fig. 7-19h) and concave (fig. 7-19f) among the oblique forms. The latter example also has a little inverse retouch at the distal end but not enough to make it into a complex scraper.

There is a variety of double scrapers, including double straight, bi-convex, straight combined with either convex (figs. 7-18g; 7-20b) or concave, and one convex/concave example (fig. 7-19d). In this group, all retouch is obverse.

Those complex scrapers, with two or more converging retouched edges, are dominated by semi-trapezoidal forms. One of these is among the largest and best made in the level (fig. 7-18m), another with two concave edges is among the most atypical imaginable (fig. 7-19m). There are also two with alternately retouched edges (fig. 7-19k). There is a sub-trapezoidal scraper fragment and one sub-triangular scraper which approaches a sub-triangular point but the point is too thick to classify it in that category (fig. 7-19l).

There are few points in Level 3. One semi-trapezoidal example has some irregular inverse retouch which appears to have been done at the same time as the more regular obverse retouch (fig. 7-20e). One of the semi-leaf examples has a relatively blunt tip but it is quite flat and, so, marginally fits into the points (fig. 7-20f). The few remaining points are quite typical within their types.

There are significant numbers of denticulated and notched pieces in Level 3. These are not the result of trampling but are purposefully made. All notches are either heavy single blow with additional retouch in the concavity (fig. 7-20d), are single blow notches on thick flakes

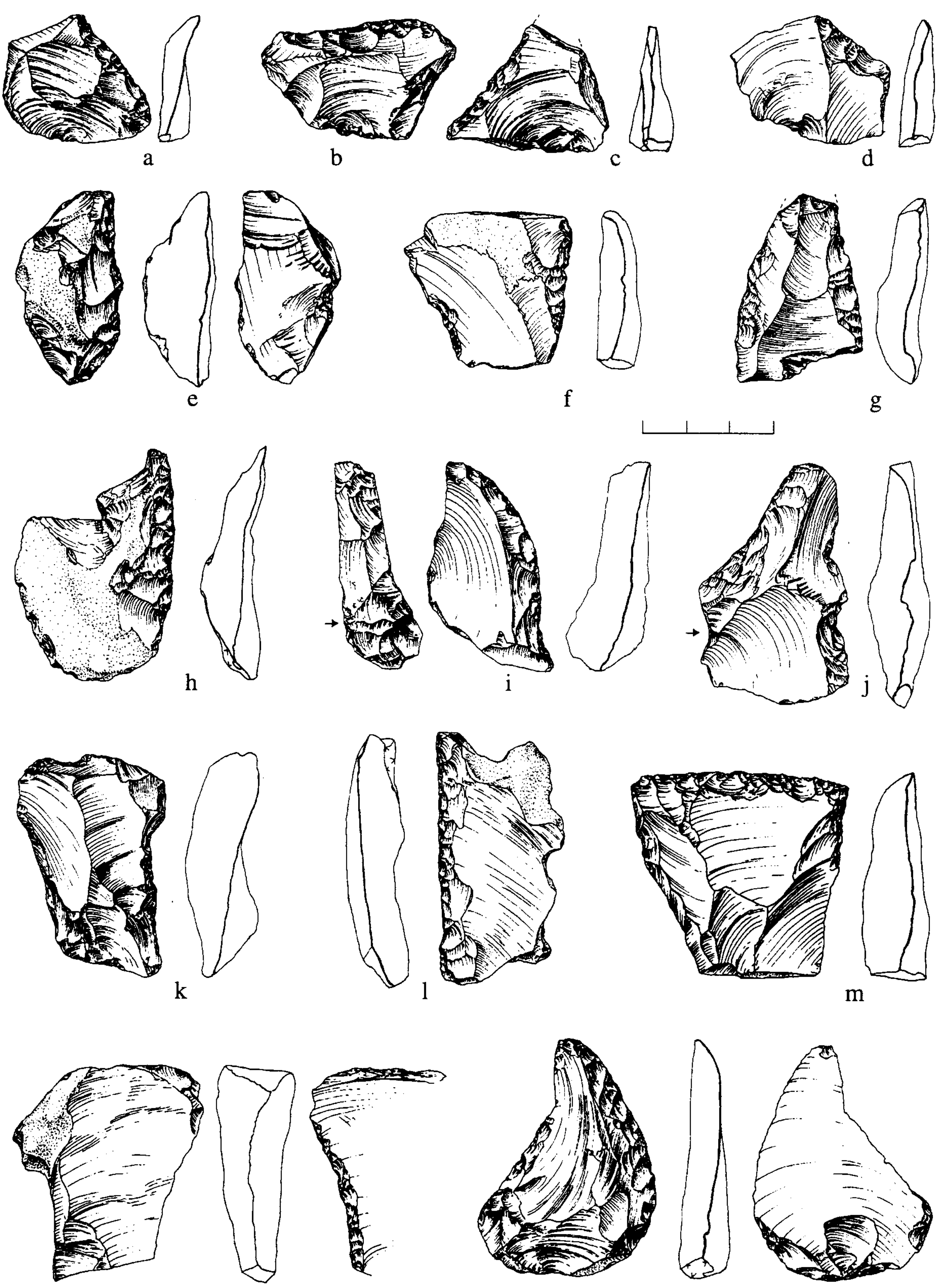


Fig. 7-18—Starosele, Level 3, Scrapers: *a,d*–transverse straight oblique; *b,i*–transverse wavy; *c*–transverse oblique concave; *e,h,o*–simple convex (*e* and *o* have minor inverse "thinning"); *f*–simple straight; *g*–double straight/convex; *j*–simple concave with opposed notches; *k*–simple concave with opposed lateral retouch and a distal notch; *l*–simple straight inverse; *m*–semi-trapezoidal; *n*–simple inverse concave.

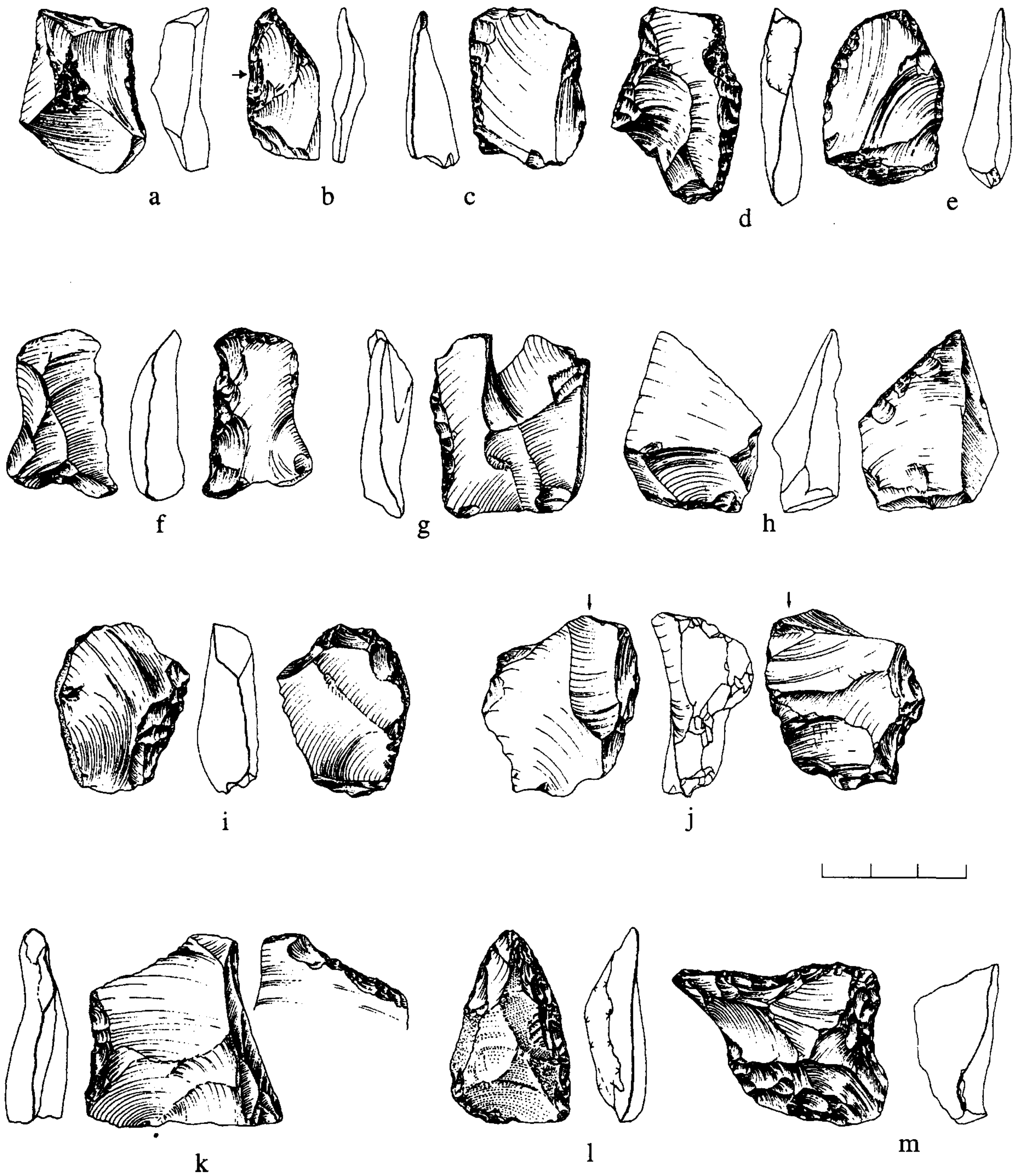


Fig. 7-19—Starosele, Level 3, Tools: *a-b,e*–various retouched pieces; *c*–simple straight scraper; *d*–double convex/concave scraper; *f*–transverse concave oblique inverse scraper; *g*–simple concave scraper; *h*–transverse straight oblique inverse scraper; *i*–lateral endscraper with adjacent straight inverse scraper; *j*–burin and perforator on thick flake; *k*–alternately retouched semi-trapezoidal scraper; *l*–semi-triangular scraper, approaching a point; *m*–highly atypical semi-trapezoidal scraper with two concave edges.

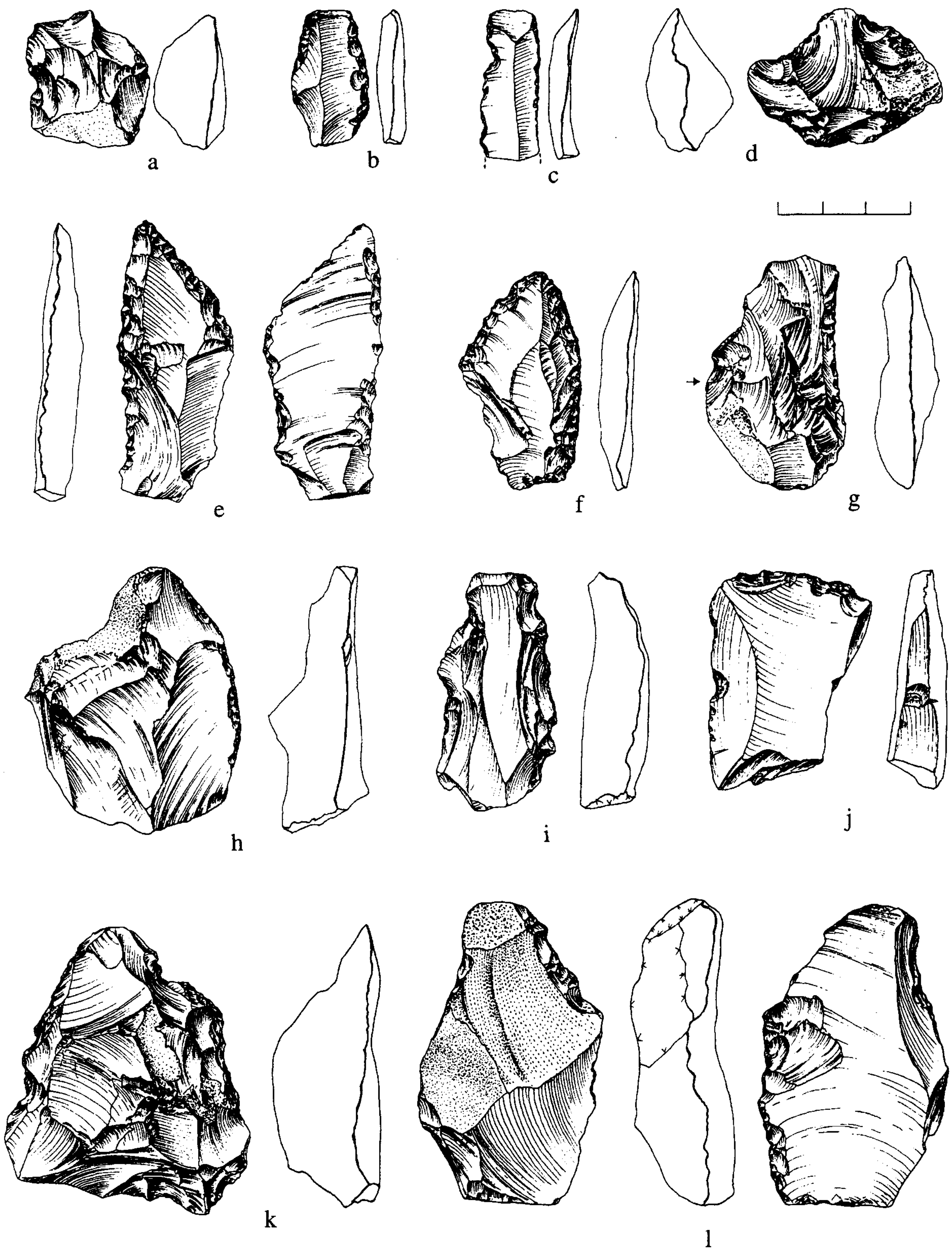


Fig. 7-20—Starosele, Level 3, Tools: *a,d*–notched pieces; *b*–very small double straight/convex scraper; *c*–discontinuously retouched blade fragment; *e*–semi trapezoidal point with irregular inverse retouch; *f*–semi-leaf point with rather blunt end; *g*–transverse flake with light continuous retouch; *h*–simple retouched flake; *i*–bilateral denticulate; *j*–end denticulate; *k*–denticulate with 3 retouched sides; *l*–denticulate with both inverse and obverse adjoining retouched edges.

such that their removal would not likely have been accidental (fig. 7-20a), or they are clearly made by retouch. The denticulates include one small and one large (fig. 7-20k) example where 3 edges are obversely denticulated, 3 where 2 parallel edges are denticulated (fig. 7-20i), one with a distal denticulation (fig. 7-20j), 3 with two adjoining denticulated edges (two semi-rectangular and one small fragment), 9 with simple lateral denticulation (3 inversely retouched), one with lateral denticulation mainly inverse but partly obverse, as well (fig. 7-20l), and one transverse denticulation. The transverse example and one of the inversely retouched lateral pieces could be classified as *racloirs denticulés*. In addition, there are two core fragments, each with an edge finely denticulated.

The continuously retouched pieces tend to be made on rather small and thin blanks. Retouch ranges from a few with light marginal retouch to others with flattish scalar retouch. These pieces parallel scraper forms but the retouch is too light to justify their inclusion into the scraper class (figs. 7-19a-b, e; 7-20g, h). In addition, there are a number of discontinuously retouched pieces not included in the restricted typology (fig. 7-20c).

There are a small number of tools which are atypical of the Middle Paleolithic but typical of the Upper Paleolithic. Two of these have been typed as varia. One approaches an endscraper on the lateral edge of a transverse flake but also has strong, semi-steep inverse retouch across the distal end (fig. 7-19i). The second piece is a thick flake, almost a core section, which has a clear burin facet on one side and a short but very pointed perforator formed by strong, steep retouch on the other (fig. 7-19j). There is another clear perforator made by inverse retouch on the distal end of a small flake and two possible endscrapers on heavily retouched blades. The lateral retouch on both is much stronger than that which defines the working edges of the endscrapers and without the latter, they would have been classified as slightly convex scrapers. Still, the distal ends are well formed—one evenly arched and the other somewhat ogival. It is possible that these are not endscrapers at all: the worked distal ends merely might be modifications to facilitate hafting.

Level 4

Although very few tools were recovered from Level 4 and just below it, some of them stand out from those of the other levels by their size. They are truly large. In addition, a number are of the shape and style traditionally thought of as typically "Staroselian" (Gladilin 1976). Of the 13 tools, there is a single sub-trapezoidal point (fig. 7-21a), 3 sub-trapezoidal scrapers (fig. 7-21e-g), one very large bi-convex scraper (fig. 7-21i), 3 double straight/convex scrapers (fig. 7-21b, d, h), one simple straight scraper, one simple convex scraper with a very rough, crushed denticulation on the opposite edge (fig. 7-21c), and 3 flake fragments with continuous obverse retouch. In fact, all retouch is obverse and, aside from the crushed platform on one double scraper (fig. 7-21b), there is no ventral modification on any tool. Retouch varies from quite flat and invasive (fig. 7-21h) through semi-stepped (fig. 7-21i) to almost steep (fig. 7-21g).

The large bi-convex scraper (fig. 7-21i) stands out from the rest of the Level 4 assemblage, indeed, from all of the assemblages. Its upper surface, which is arched in cross-section, has been entirely shaped by the removal of small flakes, 2-3 cm in length, using the lateral edges of the piece as platforms. This was followed by limited and discontinuous stepped retouch of the lateral edges. In fact, the piece resembles a plano-convex bifacial piece, except that there is no ventral modification whatsoever; even the bulb of percussion of the blank is still present. This piece, along with a few blanks in Level 4 resembling bifacial shaping/thinning flakes (e.g., fig. 7-21e), indicate that the presence of a bifacial reduction technology in Level 4 should not be overruled, although the small sample size from this level precludes any interpretation of its importance to the Level 4 inhabitants.

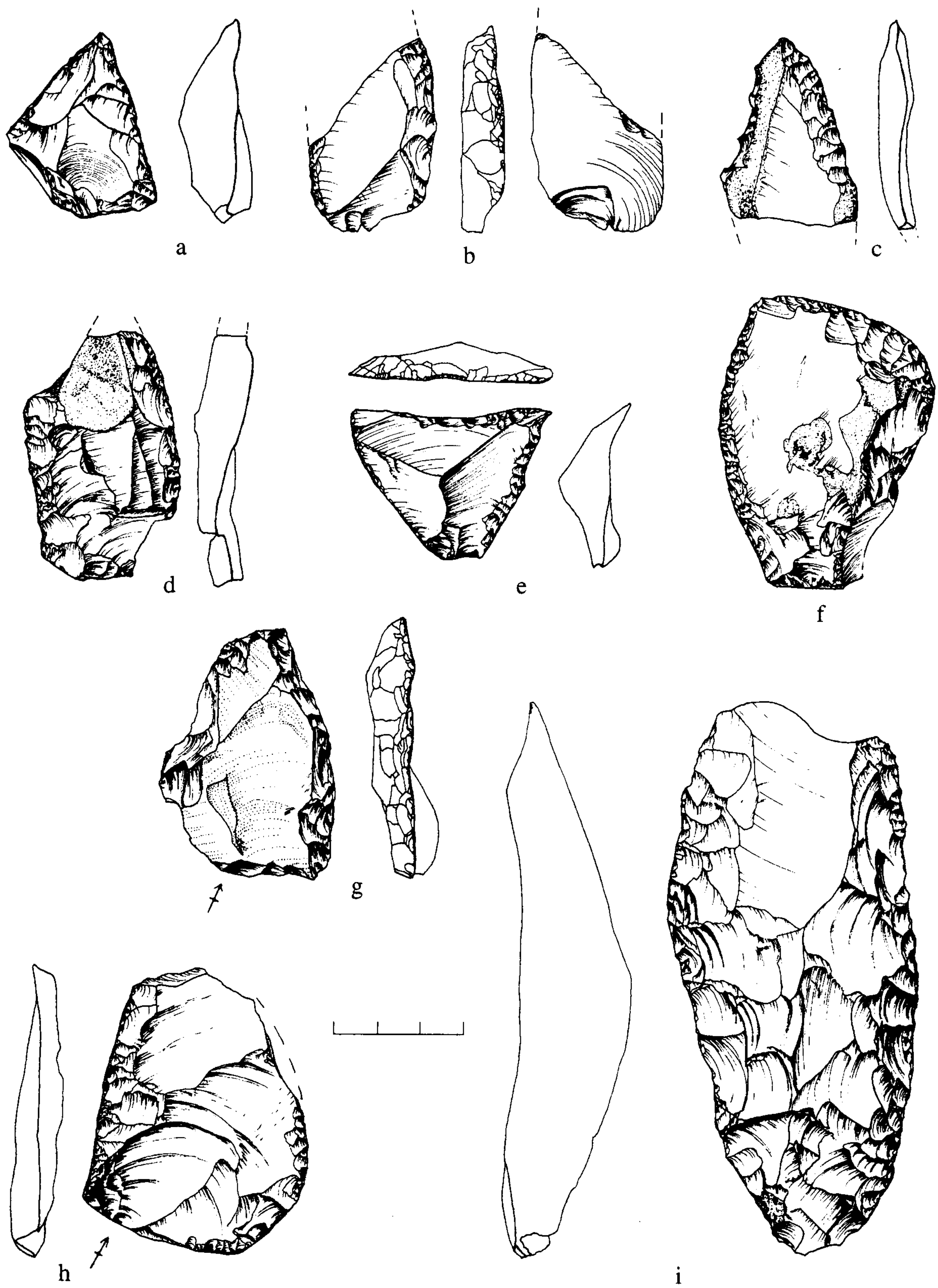


Fig. 7-21—Starosele, Level 4, Tools: *a*–sub-trapezoidal point; *b,d,h*–double straight/convex scrapers; *c*–simple convex scraper with opposed crushed edge; *e-g*–sub-trapezoidal scrapers; *i*–double bi-convex scraper.

Inter-Assemblage Comparisons

Although the focus of the preceding sections has been comparative, it is useful to summarize the similarities and difference among the four assemblages at Starosele and to see to what extent these assemblages might have derived from the same occupational patterns and, also, whether they are part of the same homogeneous industry, as claimed by Formozov (1958).

Deposition and Activity Patterning

Because only a relatively small area of each archeological level was exposed by our excavations, interpretations of occupation and discard patterning must be tentative. It must also be noted that the interpretations here are based on the lithic artifacts and their distributions. Additional data from use wear and residue studies, as well as from the abundant faunal material from all occupation levels, will add considerably to final interpretations of activity patterning at the site.

Level 1

As described in Chapter 5, the assemblage appears to be a composite of several ephemeral occupations which, together, were as much as 30 cm thick. The stratigraphic distributions of both the artifacts and the bone, however, indicate that these occupations were quite close in time and, perhaps, are only a palimpsest because of fairly slow local aggradation.

It can be inferred from the nature of the assemblage that only a limited number of activities were important during those short site visits (Marks et al. in press). Striking is the absence of primary raw material reduction: unifacial and bifacial tools, as well as bifacial preforms, were mainly imported into the site. In terms of a *chaîne opératoire*, the early stages are missing (fig. 7-22). Those few cores present point to *ad hoc* reduction of usually small pieces of local, poor raw material. From the assemblage, it is abundantly obvious that bifacial tools were made from existing bifacial preforms and that the many by-products of these activities were used as blanks for the production of a number of unifacial tools.

It is also well documented that the bifacial tools themselves were extensively rejuvenated and, given that most of the bifacial foliates were recovered intact, they were discarded not because of breakage, but because of edge angles, shape, or some such attribute which made them unsuitable for further rejuvenation and use. This suggests that activities were mainly focused on the use of the bifacial tools, but that by themselves, they were not sufficient in number and in morphological variety to fulfill all immediate needs.

Since there is little evidence for primary flaking, or even the importation of unmodified plaquettes which would have supplied the blanks needed for bifacial or large flake tool production, it is unlikely that much emphasis was placed on replacing exhausted or broken tools. Rather, bifacial tools were used until no longer serviceable and were then discarded. Just what the activities were which called for tool use can be inferred from the kinds of tools found. The bifacial foliates may well have been used on the ends of thrusting spears (they are too large and heavy to be effective for throwing spears) but, given that their rejuvenation was mainly limited to the distal half of each foliate, it is reasonable to suggest that they were used as hafted knives and were rejuvenated while still hafted. (This interpretation can be derived solely from the morphology of the lithic artifacts themselves, but use wear and residue studies do confirm this conclusion.)

The unifacial tools made on the by-products of bifacial tool production are dominated by lightly retouched pieces and scrapers which have low edge angles and light but invasive retouch. Very few show evidence for resharpening: thus, both the retouched pieces and most of the scrapers may be interpreted as expedient tools used briefly and then discarded. A few

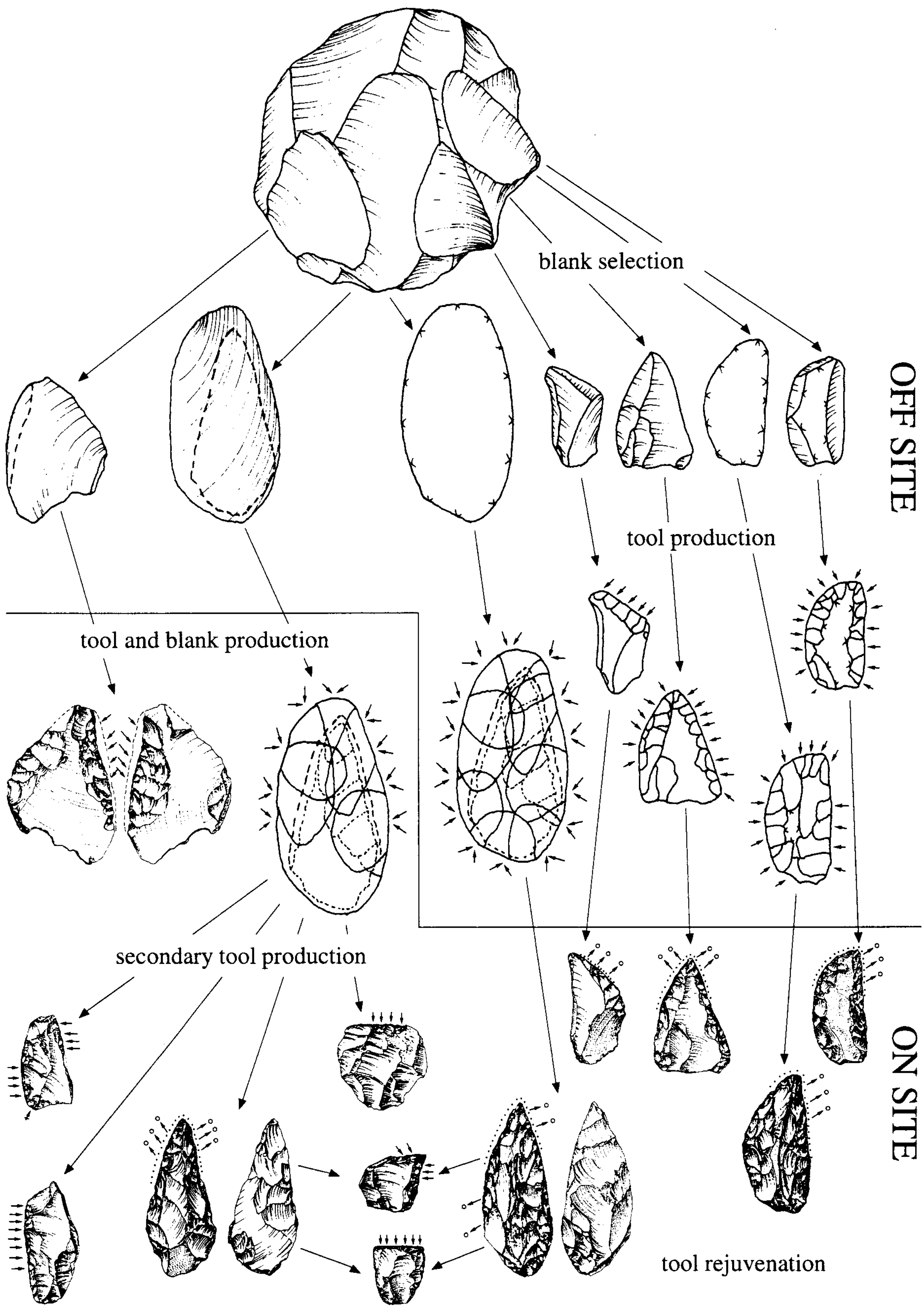


Fig. 7-22—Starosele, Schematic sequence of raw material reduction, showing off-site and on-site work.

of the large unifacial tools (those seemingly imported into the site already complete) do indicate rejuvenation comparable to that seen on the bifacial foliates. These pieces, particularly the sub-crescent scrapers, may also have been hafted and served the same function as the foliates; that is, they may have been used as knives, rather than as scrapers. In fact, although a high percentage of the tool kit is typologically classifiable as scrapers, the rarity of heavily retouched/resharpened examples suggests that scraping, *per se*, was not an important activity.

In sum, the Level 1 assemblage represents a number of ephemeral site visits during which imported tools were used to exhaustion, while a number of expedient tools were produced, used, and discarded. The activities seem to have related more to cutting and, given the number of unifacial points, to killing, as well. It looks as if Starosele was used mainly as a place of hunting and butchering, with little primary production of traditionally curated tools and limited processing of hides, wood, or bone which would have called for much stone tool rejuvenation and would have resulted in high edge angles and serious edge damage on discarded scrapers/denticulates/notches.

The presence of the single fireplace but a good deal of bone charcoal does indicate that, at least, one occupation was sufficiently long to justify a fire. The clear artifact density patterning, both vertical and horizontal, as well as the range and condition of the lithic artifacts, however, preclude interpreting Starosele during the Level 1 period as a home base or base camp of any sort. Using completely different evidence, the same conclusion is reasonable and applies equally to all the levels. Even today, under Interglacial conditions, the site is cold and very windy, and during the summer, the sun does not reach the surface of the site until afternoon. Under glacial conditions, the east side of the canyon must have been far from optimal for prolonged stays.

Level 2

The paucity of artifacts and their spread across a single surface documents very ephemeral and limited human activities, within the area exposed. If typical of the whole original surface, this level is probably comparable to one of the palimpsest components of Level 1 and the range of activities was either the same or even more limited than seen in Level 1. Therefore, there is reason to believe that the interpretations of Level 1 apply to this level, as well.

Level 3

The minimal vertical spread of the Level 3 artifacts and bone indicates that discard took place either entirely during a single occupation or during a number of closely spaced occupations on a stable surface. The horizontal artifact distribution, with its separate concentrations, might lend credence to an interpretation of multiple occupations. The very small size of these clusters and the linkage between two clusters seen through conjoining, however, would argue for a single occupation in the area exposed by our excavations. The highly ephemeral fireplace does not argue for its repeated use and it is possible—even if only a single occupation is represented—that it was not of long duration.

The relatively high proportional occurrence of cores/chunks in the assemblage points to on-site primary reduction of raw materials. The rarity of true primary elements, however, shows that nodules of raw material were not cleaned of their cortex on-site in any consistent manner and raw material might have been partly decorticated off-site. It is obvious that some nodules/cores were brought in and reduced on-site to produce blanks for tool production. In this sense, almost all of the *chaîne opératoire* is present on-site, except for raw material acquisition which, for the most part, took place off-site. Some immediately available raw material was collected and, compared with other levels, proportionately twice as much of it was used in tool production as was the case for the next highest usage seen, in Level 1.

Tool production, relative to the numbers of blanks produced, is comparable to that in Levels 1 and 2: somewhat over 40% of the potential blanks were retouched into tools. The pattern of tool production is indicative of a somewhat different range of activities than those inferred for Levels 1 or 2, in that some tools classes, such as denticulates and notches, are well represented, while points are not. As in all the other levels, however, scrapers are the dominant class of tools. Although few show clear evidence for resharpening, a number have additional typological elements, such as supplementary retouch or notches, so that some seem to have seen a number of different usages during their brief lives.

Thus, based on the overall assemblage composition, the variety and proportional occurrences of different tool classes, and the high number of simple retouched pieces, it can be suggested that activities during the occupation of Level 3 involved a wider range than seen in Level 1.

Level 4

The few artifacts found on the surface of Level 4 and those spread below it, preclude much significant information on artifact deposition and activity patterning. A few observations are possible, however. The sediments below and above Level 4 were deposited on-site by strong fluvial processes, yet the artifacts are not rolled or even slightly water polished. Therefore, it is reasonable to infer that they were dropped in place when the surface was exposed and dry. It is also clear that they were sufficiently covered by low energy deposited sediments that later floods did not wash them away or polish them.

With such a small sample, activity patterning cannot be addressed in any depth. The very high percentage of tools in the recovered assemblage, the almost total absence of debitage, and the presence of chips cannot be explained as resulting of natural causes: rather, these artifacts appear to have been discarded through cultural agencies. It is impossible, with the data collected by us from Level 4, to know whether the artifacts represent an example of an extremely ephemeral occupation or whether they represent an extreme periphery of a larger and denser artifact concentration. The tools which were recovered, however, are mainly scrapers which are generally more heavy retouched and are considerably larger than those found in the other levels. One clue exists. Formozov (1958) described his material from "below the roof fall" as including quite large artifacts, including big sub-trapezoidal scrapers of the type found by us in Level 4. Therefore, it is probable that the recent excavations, in fact, represent the very margin of an artifact concentration almost totally excavated by Formozov.

Technology

Levels 1, 2, and 4 are similar in having various levels of evidence for bifacial reduction. The evidence is strongest in Level 1 which has the whole range of plano-convex bifacial reduction; from preforms through bifacial rejuvenation chips. In Level 2, the evidence is somewhat weaker, owing to small sample size, but the presence of a plano-convex bifacial distal foliate fragment, bifacial thinning flakes and chips all confirm the presence of this technique. The evidence from Level 4 is much weaker. There are a few biface reduction chips and one flake which appears to be a by-product of bifacial shaping. While these items may indicate bifacial reduction, it is impossible to judge whether it was the same technique seen in Level 1 or not.

There is no indication of any bifacial technology in Level 3. There are no bifacial preforms, no bifacial tools, no bifacial thinning or shaping flakes, and no chips derived from bifacial tool rejuvenation. This is a very significant difference between Level 3 and the other levels.

Another significant technological difference between Level 3 and the other levels is the presence of uni-directional and bi-directional core reduction in Level 3, but not in the other levels. Although the cores in Level 3 are crude, in concept they appear quite clear. These reduction pattern differences are reflected in blank attributes, as well. Compared to all other levels, Level 3 shows the least attention to platform preparation, with more than twice the percentage of cortex platforms. Lipping is also rare in Level 3 and, combined with the platform types, indicates that a hard hammer mode of detachment was prevalent in Level 3, while the use of a soft hammer mode was the norm in Levels 1 and 2 and, probably, was common in Level 4, as well.

The use of hard hammer detachment in Level 3 is confirmed by the comparatively high percentages of convex and flat blank profiles, and by the high percentages of hinged and blunt distal ends, as compared with all other levels. Also, unlike Level 1, no bone retouchers were found.

In short, it appears that Level 3 is technologically distinct in its core reduction strategies, its absence of bifacial reduction, and in its mode of blank removal. While there is certainly some variability among Levels 1, 2, and 4, they are more technologically alike than any one is like Level 3.

In spite of the differences in the way blanks were produced, all assemblages exhibit fairly similar configurations in major artifact classes. Flakes are always dominant, blade production appears to be fortuitous, if present at all, and initial on-site raw material reduction is generally limited, resulting in low percentages of primary elements. The differences in the way blanks were produced, however, did result in differences within artifact classes. The bifacial reduction in Levels 1 and 2 resulted in flakes and blades which are smaller, thinner, have smaller platforms and more incurvature than is typical for the blanks in Level 3. While bifacial reduction appears to have been present in Level 4, the blanks differ markedly from those in Levels 1 and 2 in size: they are much larger in all dimensions in Level 4.

Typology

The four assemblages at Starosele share a number of typological features in common. Perhaps most noticeably, all tool assemblages are dominated by scrapers, as are virtually all Middle Paleolithic tool assemblages in Crimea, for that matter (Kolosov, Stepanchuk, and Chabai 1993; Chabai, Marks, and Yevtushenko 1995). Aside from the single bifacial scraper in Level 1, all levels have essentially the same range in scraper types, within the limits imposed by some small sample sizes.

The same range does not mean that the internal patterning of the scrapers is the same in all levels. If each individual retouched edge is classified by shape—straight, convex, and concave—Levels 1 and 2 are very similar to each other and they are quite different from Levels 3 and 4 (fig. 7-23A). The major difference between Level 3 and the other levels is the high percentage of concave edges in Level 3: almost 25% of all edges.

If the scrapers are grouped by the number of retouched edges per piece, again, Levels 1 and 2 are very much alike, while the other two levels are quite distinct (fig. 7-23B). In this case, although the sample size is very small, Level 4 has a much higher percentage of pieces with 3 retouched edges (33.3%) than do the other levels, which range from 3.6% to 7.1%. Level 3 stands out by a proportionately high percentage of simple scrapers (66.1%) compared with double scrapers (30.4%), while in Levels 1 and 2 there is a balance between simple (48.6%) and double scrapers (47.2%) (fig. 7-23B). While obverse scraper retouch is similar in all assemblages—there is very little heavy, demi-Quina retouch or very flat, very invasive sub-parallel retouch—Level 3 has significantly more inverse retouch than do the others levels. In Level 3, 14.3% of the scrapers have at least one edge inversely retouched, compared with only

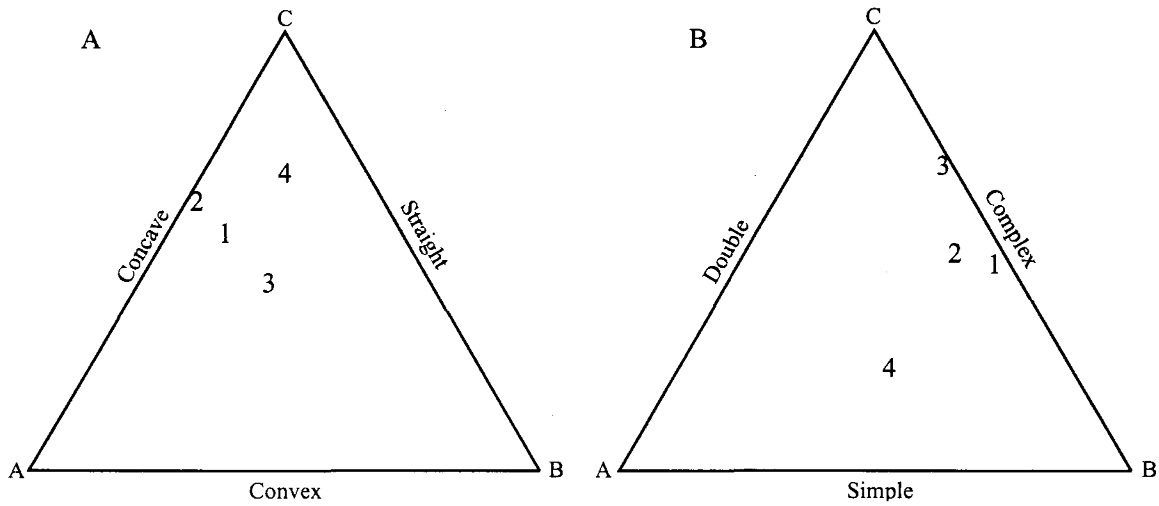


Fig. 7-23—Starosele, *A*–tripole graph of the relationship among shapes of scraper edges (*a*–straight; *b*–concave; *c*–convex) by numbered level; *B*–tripole graph of the relationship among types of scrapers (*a*–complex scrapers; *b*–double scrapers; *c*–simple scrapers) by numbered levels. Note how Levels 3 and 4 stand apart from Levels 1 and 2, as well as from each other.

2.8% in Level 1, while Levels 2 and 4 have none at all. (This tendency is even more strongly expressed in the retouched pieces with 27.0% in Level 3 having inverse retouch, compared with only 3.1% in Level 1.) It is possible to see a unity in Levels 1 and 2, but scraper variability in Levels 3 and 4 separate them from the top two levels, as well as from each other.

Within the tool assemblages, the internal proportional relationships between scrapers and denticulate/notches shows some significant differences. Again, Levels 1 and 2 are similar with scraper to denticulate/notch ratios of 4.2:1 and 3.5:1, respectively, while in Level 3 this ratio drops to only 1.5:1. There are no denticulates or notches in the Level 4 tool assemblage. Other differences are apparent, as well. Level 1 has significantly more unifacial points than any of the other levels, although the small sample sizes for Levels 2 and 4 make this observation tentative. On the other hand, both Levels 1 and 3 have good samples and the difference is marked: 13.1% for Level 1 and only 3.6% for Level 3.

Of course, the presence of bifacial technology in Levels 1 and 2 had an effect on the tool assemblages, particularly for Level 1, where 8.1% of all tools are bifacial. While Level 2 has only 4.8%, the small sample size must be considered. Level 4 has no bifacial tools, but the tool sample is minuscule and there is other evidence for bifacial reduction. It is Level 3 which stands out here with a total absence of bifacial materials.

One of the characteristics of the traditional definition of the Staroselian industry is the use of invasive inverse retouch to thin otherwise obversely retouched points and scrapers (Yevtushenko 1995). This does occur in the present samples but it is quite rare. It is seen mostly in Level 1, where 2 of the 21 points have inverse thinning (fig. 7-13g, j) and where possibly 2 of 72 scrapers have it, as well (fig. 7-16i). In addition, 3 scrapers and one retouched flake are on truncated-faceted pieces. In Level 2, one of the 14 scrapers is modified in this way, and in Level 3 only one of the points and one of the 56 scrapers have what might be considered purposeful inverse thinning (fig. 7-18e). A single scraper fragment and one denticulate are on a truncated-faceted pieces. Level 4 lacks any inverse retouch, at all. Thus, if the tendency for inverse thinning of unifacial retouched tools is a characteristic of the Staroselian, it is strangely lacking from the recent excavations at Starosele. It is possible, perhaps probable, that this tendency was best expressed in Formozov's sample from "under the roof fall," from which we recovered only 13 tools (our Level 4). Thus, our sample might not have been representative in this case. The samples from Levels 1 and 3 are sufficiently large, however, that if such thinning was habitually used by the people who visited Starosele then it should have been present in significantly greater numbers than is the case. It must be concluded, therefore, that this tendency seen by Yevtushenko (1995) would be applicable only to the assemblage of our Level 4.

CONCLUSIONS

The inter-assemblage comparisons make it abundantly clear that the four assemblages at Starosele are neither technologically nor typologically homogeneous. Levels 1 and 2 are essentially the same in all ways and, thus, belong to the same industry. Levels 3 and 4 are another matter. Level 4 certainly has many of the traits seen in Levels 1 and 2 and, in that sense, seems to be related to them. Yet, a number of differences are apparent, as well. Because of the extremely small sample size from Level 4, it is simply impossible to judge whether it is merely a somewhat different facies of the same industry as Levels 1 and 2, or not. If one expanded the existing Level 4 sample, it still would not look exactly like Levels 1 and 2. Certainly, bifacial tools would probably be present and the range of scrapers and points increased. Tool size, however, is so much larger in Level 4 that it cannot be merely a sampling bias. If the hypothesis that our Level 4 is the same as most of the artifacts placed by Formozov into his "below the roof fall," then comparisons can be made using reasonable samples, with the caveat that Formozov's sample includes an unknown amount of material from our Level 3. Until this comparison is made, Level 4 should be considered generally similar to Levels 1 and 2, possibly representing an early phase of the Level 1/2 industry.

Level 3 is technologically unrelated to Levels 1, 2, and 4. It lacks bifacial reduction, its core reduction is based mainly on single and opposed platform flaking, there is very little platform preparation, etc. Even some retouching traits are different: there is a strong tendency for inverse retouch on scrapers, denticulates, and retouched pieces, which is undeveloped in the other levels.

At the broadest typological level, all assemblages are dominated by scrapers. As shown above, however, those from Level 3 are significantly different in their proportional distribution than those in the other levels. In addition, Level 3 has significantly more denticulates and notches than the other levels and significantly fewer points. While all the tool assemblages are clearly Middle Paleolithic in aspect, that from Level 3 is markedly different from those of the other levels.

In conclusion, based on both technology and typology, the assemblage from Level 3 is fully distinct and unrelated to the assemblages from Levels 1, 2, and 4. The four assemblages from Starosele represent, at least, two unrelated industries and, possibly, three. Based on the present situation, it appears that the assemblages from Levels 1 and 2 could fall broadly into what has been defined as Staroselian. Level 4, even with the very small sample, is consistent with the traditional Staroselian.

Level 3, however, is not Staroselian in any traditional or non-traditional sense. What industry it represents, as yet, is unknown. It does share an absence of bifacial technology with the WCM, as found at Kabazi II, Unit II, but the similarities end there. Thus, the Level 3 assemblage, at the moment, stands alone among the defined Middle Paleolithic assemblage variability in Crimea.

While the new excavations at Starosele have not fully resolved which assemblages should be designated as the Starosele industry, the site has produced stratigraphically and temporally distinct assemblages which now can be used in inter-site comparisons.

Chapter 8

KABAZI II: INTRODUCTION

VICTOR P. CHABAI
(with a contribution by C. R. FERRING)

INTRODUCTION

The first Middle Paleolithic artifacts on Kabazi Mountain were found in 1880 by K. Merejkowski (1881). About 70 years later A. Schepinski discovered the first stratified site on the mountain—the buried rockshelter of Kabazi I—which was excavated by A. Formozov during his 1956 field season (Formozov 1959). Then, at the beginning of the 1960s, geologists V. Petrun and L. Bilokrys (1962) discovered more than 20 areas with Middle Paleolithic surface material at different places along the northern and western slopes of Kabazi Mountain. These investigations encouraged Yu. Kolosov in 1969 to make a new attempt to find stratified sites, but his survey was not successful. During the mid-1970s, the slopes of Kabazi Mountain were cut by a series of artificial terraces and planted with pine trees to prevent slope erosion. These artificial terraces exposed deposits along the whole of both slopes to a depth of about 1.5 meters. Some areas of exposed deposits contained Middle Paleolithic artifacts. In 1983, one of these areas (Kabazi V) was discovered by Yu. Zaitsev. Two years later, a new expedition, headed by Yu. Kolosov, found one more stratified site (Kabazi II), and two areas (Kabazi III, Kabazi IV) of derived deposits, containing the Middle Paleolithic artifacts (Kolosov, Stepanchuk, Chabai 1988) (see fig. 2-9).

EXCAVATION STRATEGY

The topographic situation at Kabazi II (fig. 8-1) was initially thought to be analogous to that at the site of Bakchisaraiskaya. Bakchisaraiskaya, excavated by D. Krainov in 1956-57, is situated along the middle part of the slope of the Bakchisarai valley, some 20 kilometers west of the Alma River Valley. The stratigraphic sequence of that site contains about 2.5 m of deposits (Krainov 1979). In 1986, when the excavations of Kabazi II started, about the same thickness of deposits was expected. No one noticed the limestone block, which lay a few meters down-slope from the excavation area, and no one guessed its true size, nor vertical position. Moreover, it was commonly believed, based on observations of modern rockshelter formation processes, that Kabazi II belonged to the range of rockshelters which had collapsed and been buried by colluvium. Two large limestone blocks exposed at different elevations later during the excavations (fig. 8-2) and attributed to parts of collapsed roofs appeared to be indirect evidence supporting an interpretation of Kabazi II as a buried rockshelter (Kolosov, Stepanchuk, and Chabai 1993).

As a result of this interpretation, during the 1986-1987 field seasons, Sondage 1 and an area of about 40 m^2 above the wall of the artificial terrace were excavated (fig. 8-1, the "lower area"). These excavations demonstrated that the collapsed rockshelter hypothesis was wrong, since, by 1987, the sondage went to a depth of 13 m without reaching bedrock. Thus, in 1987 it was already clear that the main factor in the site's formation process was played by the slab that is situated just down-slope from the site. To clarify the situation, it was necessary to expose about 20 m^2 more of the "lower" excavation area. That was done during the 1993-1995 field seasons. At the same time, to clarify the upper part of the stratigraphic sequence,

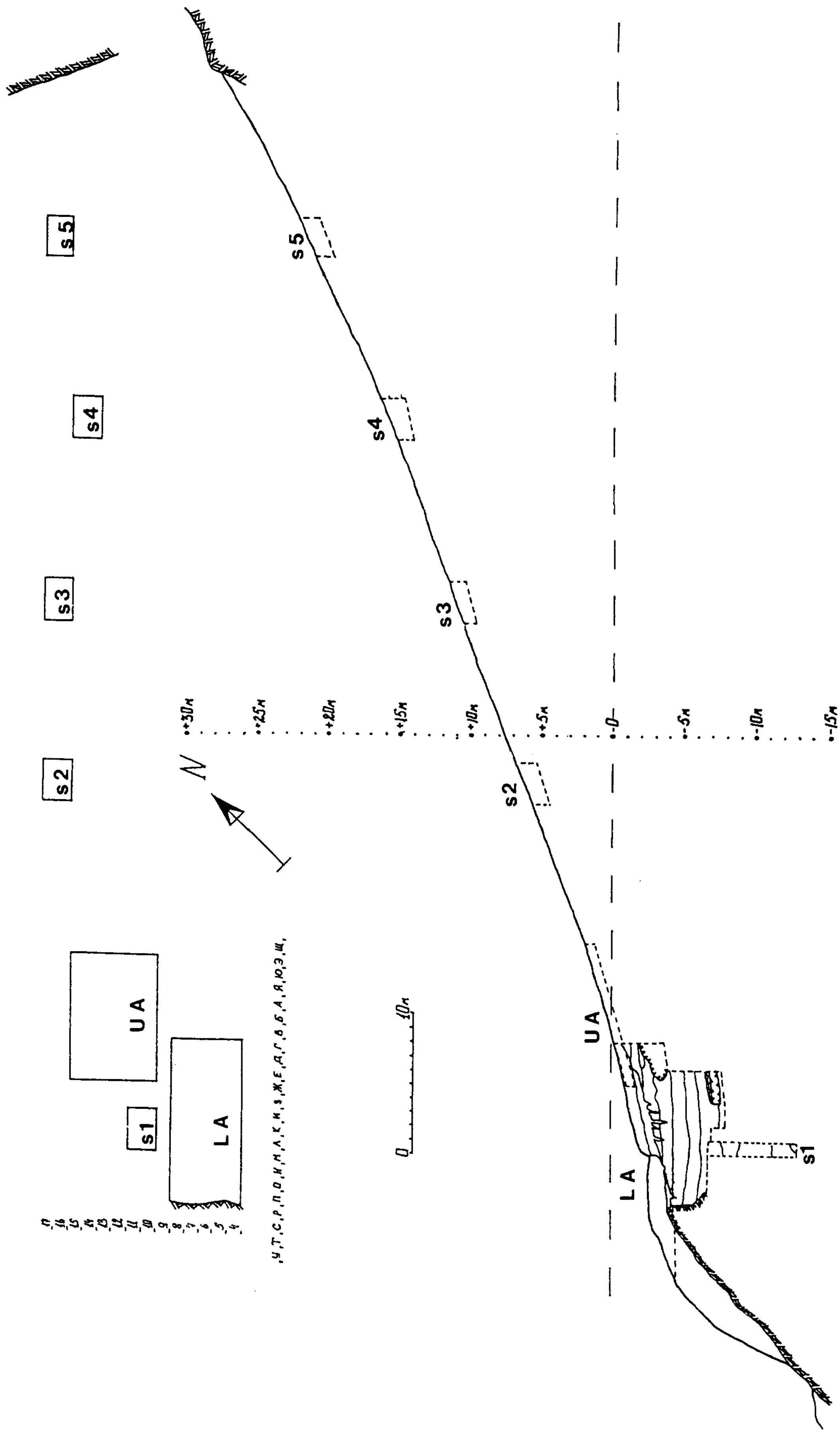


Fig. 8-1—Kabazi II: map of the excavations and the schematic cross-section of the upper part of the Kabazi Mountain slope through the sondages 1-5 (s1-s5), upper excavation area (UA) and lower excavation area (LA).

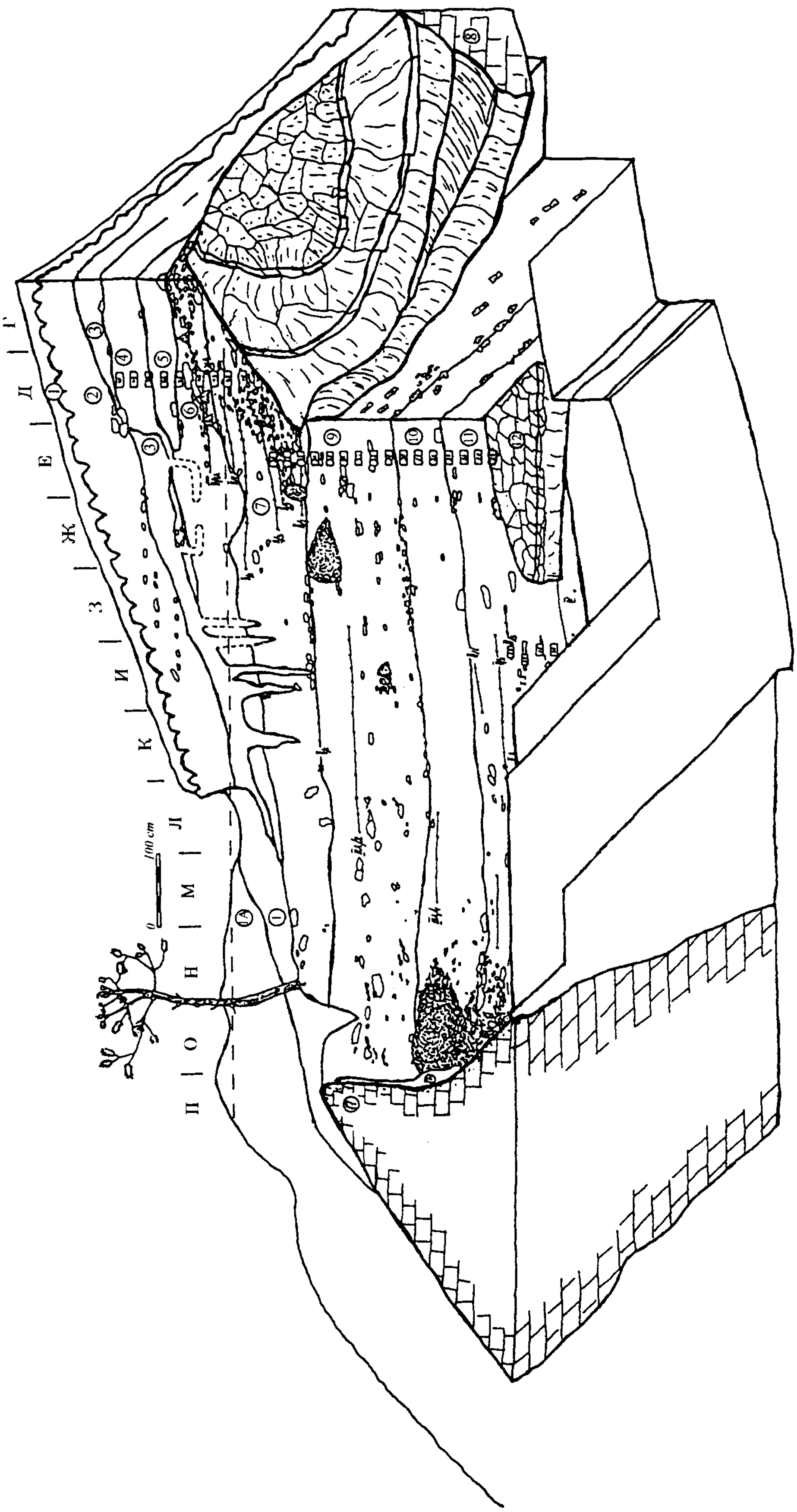


Fig. 8-2—Kabazi II: the lower excavation area showing disposition of: *17*–limestone barrier; *8*, *12*–blocks; *1-7*, *9-11*–sediments.

the "upper" excavation area and Sondages 2 through 5 were exposed to a depth of about 1 m (fig. 8-1).

Now it appears that Kabazi II formed in the open, along the valley slope, and that the history of sediment accumulation can be summarized as follows:

(1) The site deposits are on a bench of limestone created by the erosion of the overlying clay-marl.

(2) A massive (about 10 m tall) slab of limestone fell onto this bench, creating a barrier that trapped colluvium and filled in behind the massive boulder.

(3) At least two more limestone blocks fell or rolled to the site as the colluvium aggraded. These blocks weathered in place, leaving large amounts of angular eboulis in the sediments enveloping them.

GEOLOGICAL SETTING AND STRATIGRAPHY (by C. R. FERRING)

Setting

Kabazi II is situated on the north valley wall of the Alma River, on the southern slope of Kabazi Mountain. This mountain is part of a line of cuestas of the "second" ridge of the western part of the Crimean Mountains. Kabazi II is located on the back-slope of the cuesta, upstream from the entrance of the river to the Black Sea Plain. The upper-most part of undisturbed deposits at Kabazi II is about 33 m below the limestone cliffs and 90 m above the present river (fig. 8-3a). The north valley wall is of exposed Eocene limestone, chalk, and marl. The cuesta ridge is formed by the thick resistant second nummulites limestone (Ea), which is first underlain by softer limestone (Eb), and then by a thick, 20-25 m bed of marine clay-marl (Ec) that rests on a hard limestone (Ee). The lower two-thirds of the mountain slope exposes thickly bedded chalk.

Alluvial deposits occur mainly along the north side of the valley, as a series of at least three terraces. The highest of these is about 20 m below the upper deposits at Kabazi II, and is 60 m above the Alma River channel (fig. 8-3b).

Kabazi II formed in the open on the valley slope. Its geologic history is a consequence of local rock-fall events, up-slope weathering, and colluvial processes. The site deposits are on a bench on limestone (Ed) created by erosion of the overlying clay-marl (Ec). A massive (>10 m tall) slab of limestone fell to this bench, creating a barrier which trapped colluvium. Colluvial sediments (Table 8-1) episodically filled in behind the massive slab, incorporating the stratified archeological horizons. At least two large (>2 m) limestone blocks fell or rolled to the site as colluvium aggraded; these blocks weathered in place, leaving large amounts of angular eboulis in the sediments enveloping them.

Stratigraphy

An 8 meter section at the site was studied and sampled in 1994. This is the upper part of the 13 m of sediments that were exposed in the deep sondage, located just north of the main excavation block. The studied section extends from Stratum 1, at the surface, to the upper part of Stratum 13, exposed at the base of the main excavation block (fig. 8-4). The stratigraphic nomenclature of the excavator, V. P. Chabai, has been retained, since it recognized the major lithologic-pedogenic changes in the section. Initially, it should be pointed out that Stratum 12, as defined, is actually a large limestone boulder, while Stratum 8 includes a boulder and the eboulis-rich deposits around the boulder.

Field descriptions (Table 8-1) have been augmented by initial laboratory analyses of texture and carbonate content (Table 8-2; fig. 8-5). The upper part of the southeast wall (fig.

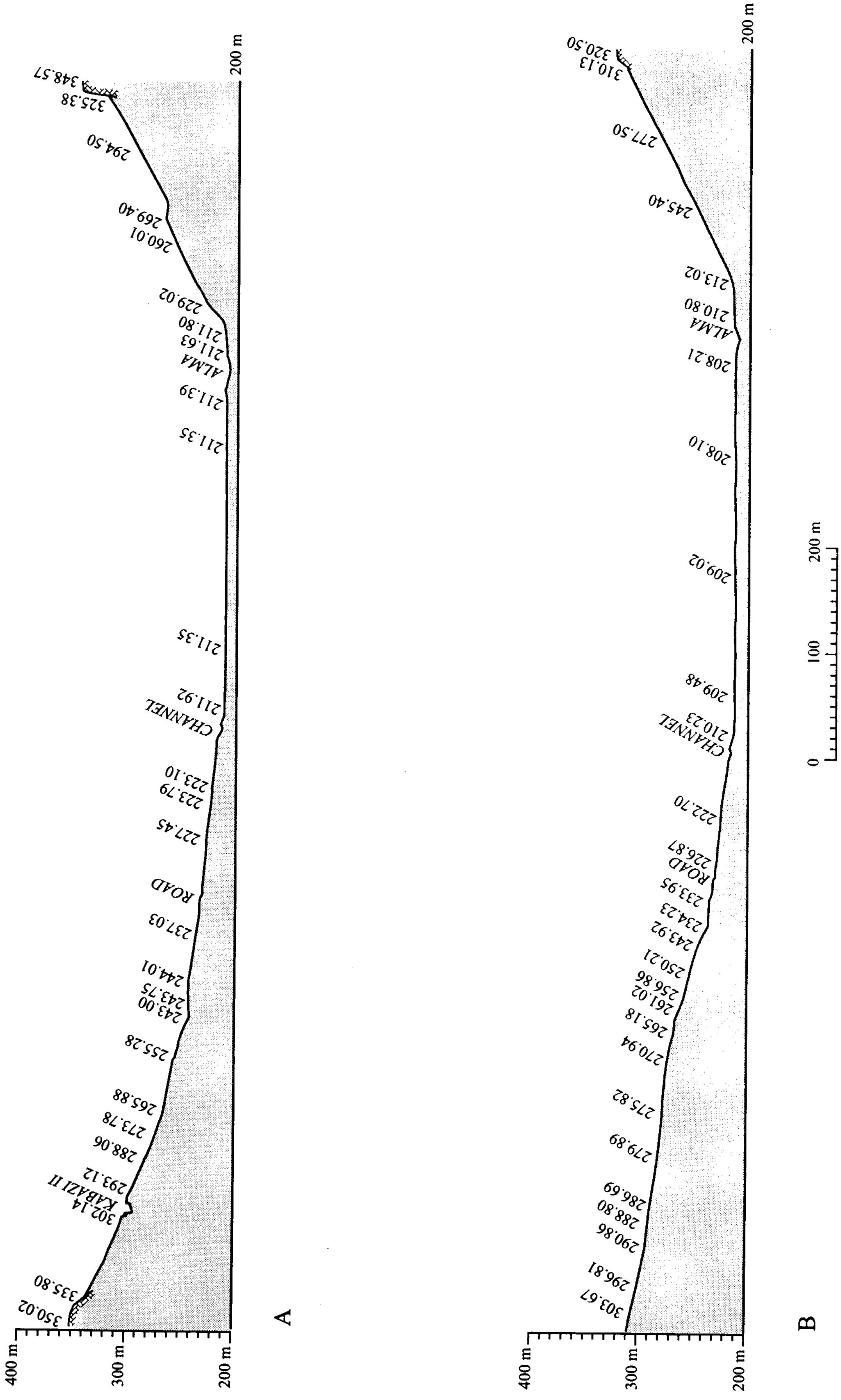


Fig. 8-3—Cross-sections of the Alma River Valley: *A*–cross-section through Kabazi II; *B*–cross-section through cemetary (third terrace).

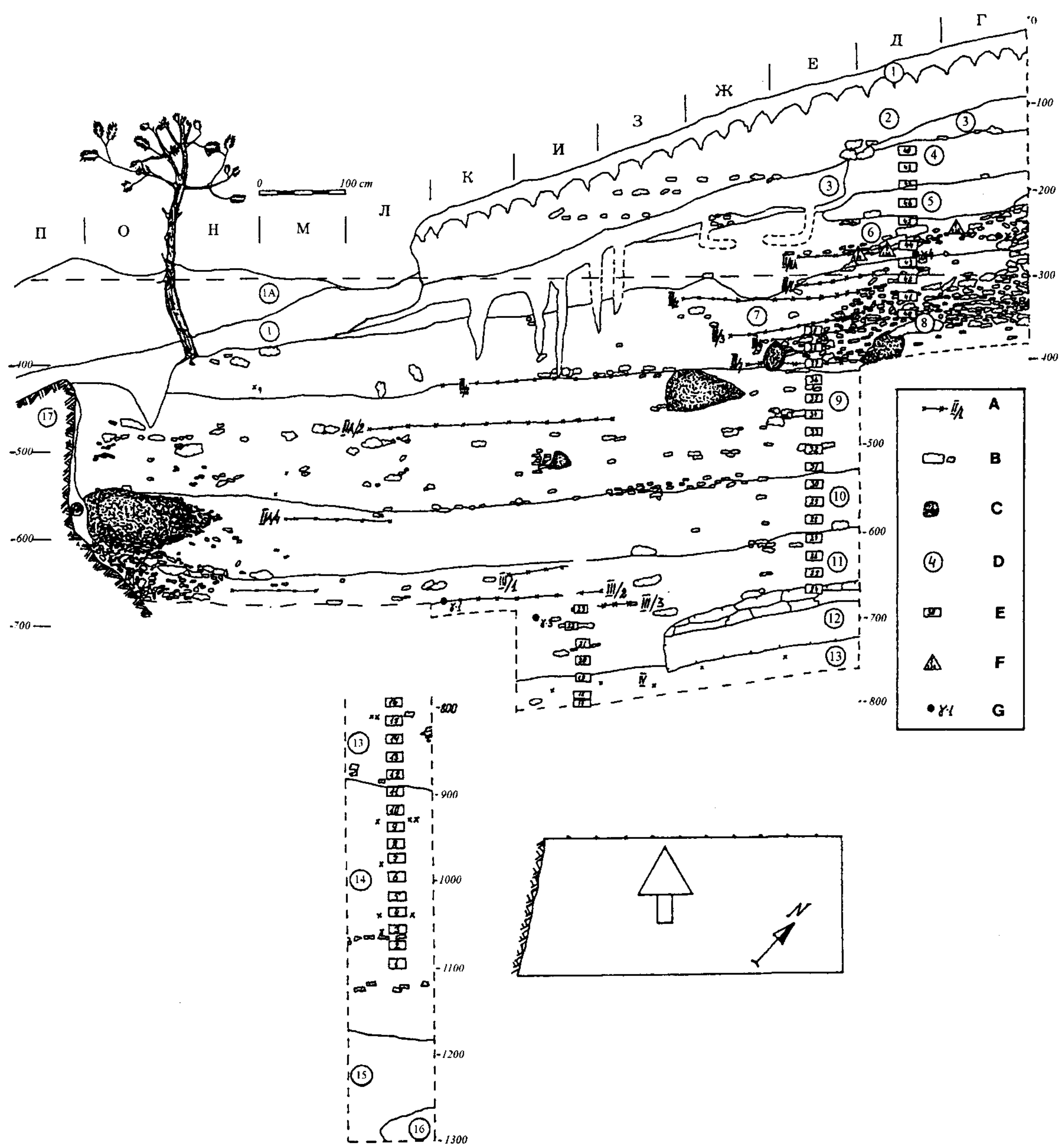


Fig. 8-4—Kabazi II: section along the line of squares "9": *A*–archeological levels; *B*–limestone blocks; *C*–large animal tunnels; *D*–numbers of Strata; *E*–numbers of pollen samples; *F*–ESR samples; *G*–ESR dosimeters.

8-6) was described (Strata 1-7). The north wall of the main excavation block was described in two segments; the "north" segment, located in the eastern part of the wall, and which included Strata 1 through 8. The "northwest" segment was described in the western part of the wall and included Strata 7 through 13 (fig. 8-4).

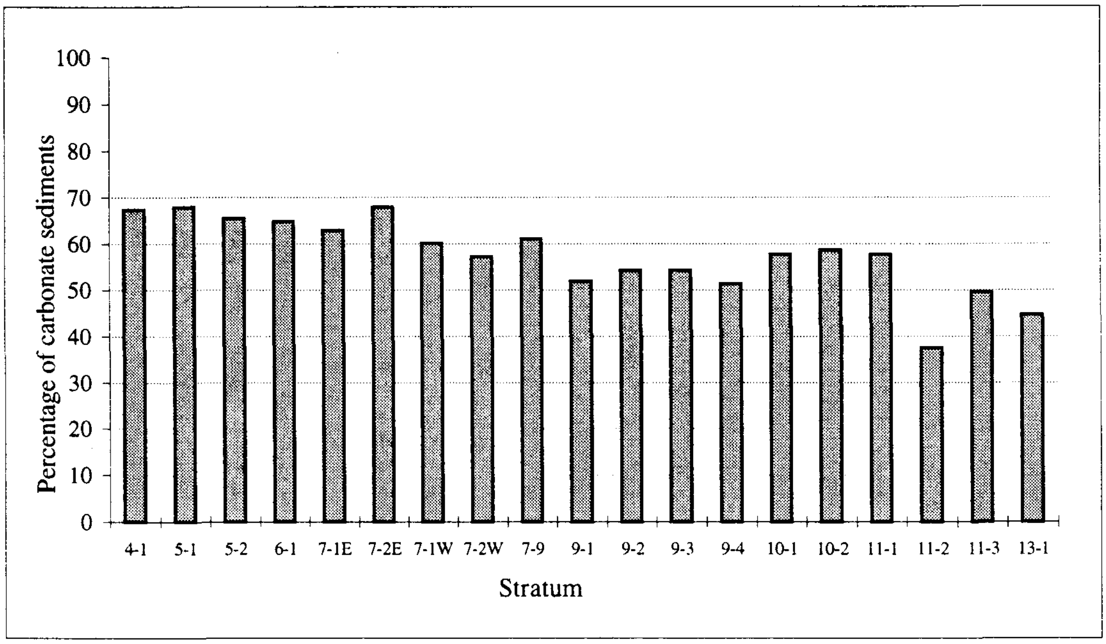


Fig. 8-5—Kabazi II: graph of carbonate sediments.

Particle size and carbonate analyses on the samples from Strata 4 through 13 were conducted at the Center for Environmental Archeology, University of North Texas-Denton, USA. These data pertain only to the <4 mm fractions of the sediments, since it was not possible to transport adequate samples for the larger clast fractions. The sedimentary matrix is the <2 mm fraction, including clay, silt, and sand fractions: these data are presented in Table 8-2, with granule frequencies reported separately. Figure 8-7 shows the particle size frequencies (weight percentages).

Strata 1 and 2 appear to be young colluvial sediments; a modern soil formed in these materials. An erosional break separates Stratum 3 from Stratum 2.

Prolonged weathering of Strata 3 through 6/7 sediments is indicated by pedogenic features in these parent materials. Tongues of carbonate-rich material from Stratum 3 down into Stratum 7 are suggestive of weak cryogenic processes. Pedogenic carbonate filaments and concretions are evidence of dissolution/precipitation in the same soil.

A major erosional disconformity separates Strata 6 and 7. The north and south profiles in the block reveal that Strata 5 and 6 were eroded away; related to this erosion is the very irregular contact between Strata 3/4 and 7 in the southern block wall, compared to the wavy but abrupt contact in the north wall. Likewise, the contact between Strata 7 and 9 is lower and much more irregular in the south wall than in the north wall. Between the north and northwest segments of the profile, marked increase in clay content is evident within Stratum 7 (Table 8-2). These observations indicate that surface erosion in the main block area was towards the southern margin of the large boulder that trapped the sediments, as was recognized by the excavator.

Excepting the effects of the large limestone blocks in Strata 11/13 and 7/8, Strata 11 through 7 represent continuous, rapid colluvial deposition, supplied by apparently rapid

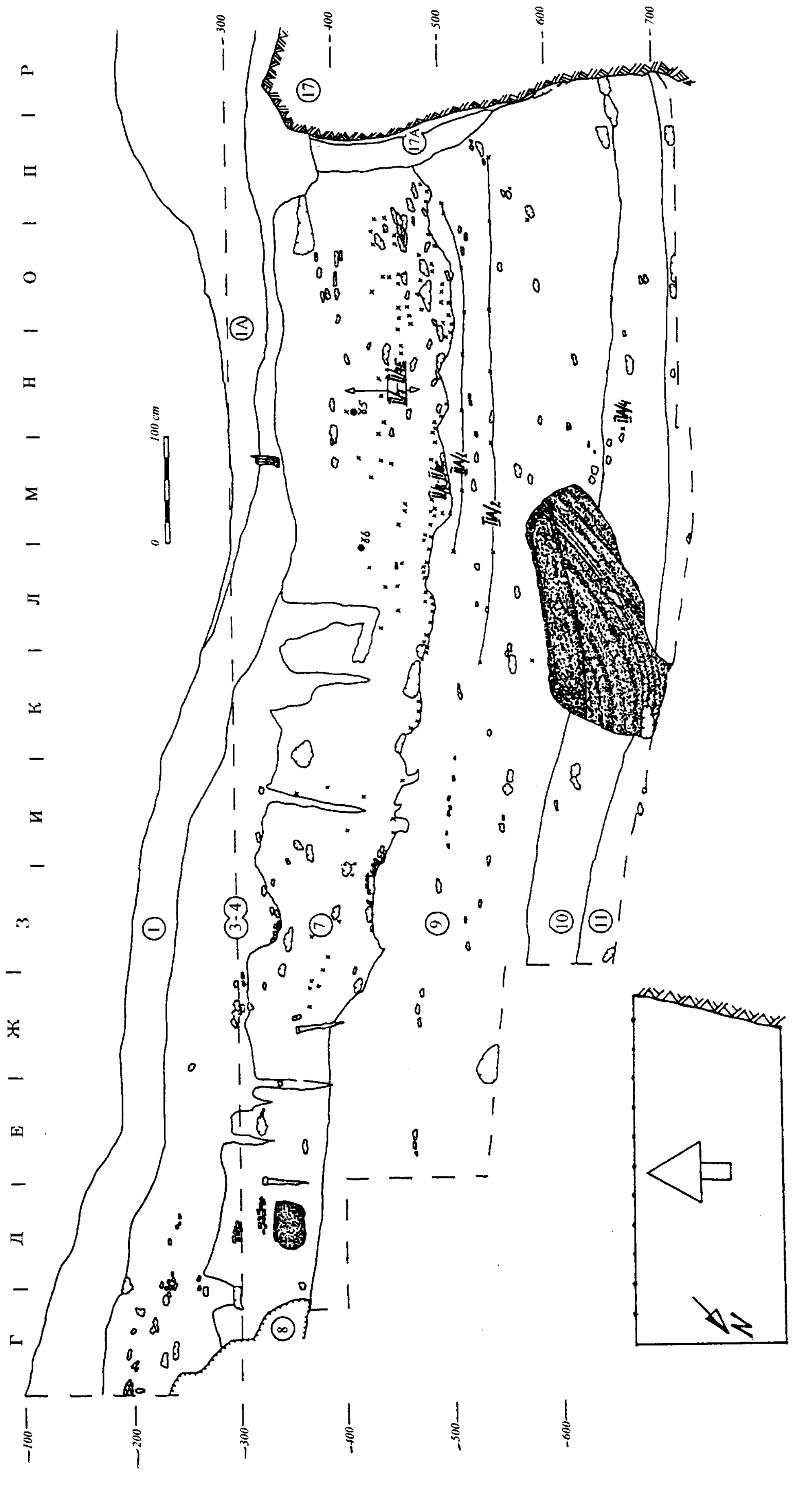


Fig. 8-6—Kabazi II: section along the line of squares "3." See key, figure 8-4.

TABLE 8-1
Kabazi II, Stratigraphic Description (all colors Munsell moist)

Stratum	Description
1a	(Soil A1 horizon): 10YR2/2 granular silt; strong fine sub-angular blocky structure; angular to sub-angular limestone granules and pebbles; few platy pebbles; abundant fine roots; common snails; clear smooth boundary.
1b	(Soil A2 horizon): 10YR3/2 granular silt; strong fine angular and sub-angular blocky structure; poorly sorted angular limestone granules and pebbles; common fine roots; few snails; clear irregular boundary.
2a	(Soil AC horizon): 10YR4/2 granular silt to silt loam; angular limestone granules and pebbles; smaller clasts sub-rounded; carbonate crusts on larger clasts; many fine roots; few snails; gradual smooth boundary.
2b	(Soil C1 horizon): 10YR4/3 granular silt; strong granular structure; poorly sorted rounded limestone granules and few pebbles; 1 mm to 2 mm carbonate crusts on clast bases; few fine woody roots; diffuse smooth boundary.
2c	(Soil C2 horizon): 10YR5/3 granular silt loam; strong granular structure; poorly sorted granule to cobble limestone clasts, sub-angular to angular; carbonate crusts coat larger clasts; erosional boundary in whole section, gradual in profile.
3	(Soil Ck horizon): 10YR6/3 granular silt; few limestone granules and pebbles, sub-angular to sub-rounded with carbonate coats; common carbonate filaments, soft carbonate masses and pores with carbonate linings; clear erosional boundary.
4	(Soil Ck2 horizon): 10YR6/4 granular silt, with increase in carbonate masses and filaments; clear boundary; unit is truncated ca. 2.3 meters from east wall.
5	(Unit inaccessible for description.)
6	10YR7/3 matrix; sub-angular to sub-rounded boulder to cobble eboulis clasts, common at base, on erosional surface, fining up through 6 and probably through 3; eboulis abundant in northern part of block near huge block of limestone fall; common carbonate filaments and carbonate pore linings; base of unit is disconformity with clast-filled, southwest trending shallow gullies.
7-8	10YR6/3 matrix; common granule to cobble clasts; smaller ones sub-rounded, larger ones angular; clasts abundant near large block as above; abundant artifacts and bones in CL II/1-II/7; clear horizontal contact with stratum 9 corresponds with CL II/8.
9	10YR7/4 matrix at top, 8.76YR7/4 at base; unit fines upward from clast supported granule to small pebble zones at base to zones with many fewer large clasts at top; few angular boulders through unit; smaller clasts rounded, larger ones angular; few thin beds of matrix-free granules; matrix is loamy sand-silty sand; no secondary carbonates; gradual boundary with 10.
10	8.75YR7/4 matrix; coarse, usually clast-supported unit; more boulder sized clasts than in 9; larger clasts in beds that dip gently to southwest; most clasts are angular eboulis; granule dominated lenses between coarser stone layers; matrix is silty sand; gradual contact with 11.
11	10YR7/3 matrix at top, 10YR6.5/4 at base; poorly sorted unit, mainly clast-supported; angular pebble eboulis common, few larger angular boulders to 30 cm; more silty matrix than 10; unit is harder than 10, and has few carbonate filaments and thin clast coatings in lower part; gradual contact with 13.
12	Huge limestone block in eastern part of excavation area.
13	10YR5.5/3 granular silt loam-loam; rare larger clast; common carbonate filaments, pore linings and few fine soft concretions; few pressure coats around clasts; base not exposed.

generation of eboulis up-slope. Rapid deposition, in this case, needs to be qualified by the quite small volume of sediment needed to fill the area behind the huge limestone barrier that trapped these sediments. The U-Series ages from the site support the case for rapid sedimentation. If the dates from cultural Levels III/2 and II/2 are assumed to be correct, they

TABLE 8-2
Kabazi II, Granulometry

Stratum	*Clay*	*Silt*	*Sand*	*>2mm*	*>4mm*	*CaCO3*
1				21.3	10.6	
2				25.6	22.6	
3-4				23.5	8.3	
4-1	5.71	28.82	65.47			67.4
5-1	4.74	27.8	67.47			67.9
5-2	5	30.5	64.5			65.5
6-1	4.04	29.38	66.59			64.9
7-1E	3.2	30.57	66.23			63
7-2E	1.45	33.65	64.9			67.9
7-1W	10.43	25.67	63.91	24.1	13	60.1
7-2W	10.51	27.4	62.09	27.5	16.4	57.2
7-9	6.7	29.71	63.59	26.7	18.7	61.1
9-1	5.6	26.6	67.8	30.7	22.9	51.9
9-2	4.18	28.53	67.29	26.6	15.6	54.3
9-3	8.23	29.3	62.47	26.4	20.2	54.3
9-4	11.84	26.22	61.94	33.6	21.6	51.4
10-1	1.05	29.6	69.35	31.1	27.8	57.7
10-2	2.55	28.97	68.48	27.5	26.2	58.7
11-1	11.62	25.81	62.57	28.3	21.7	57.7
11-2	1.45	39.6	58.96	26.2	13.6	37.4
11-3	14.15	24.76	61.09	23.2	22.4	49.5
13-1	18.62	27.31	54.07	24.8	19	44.6

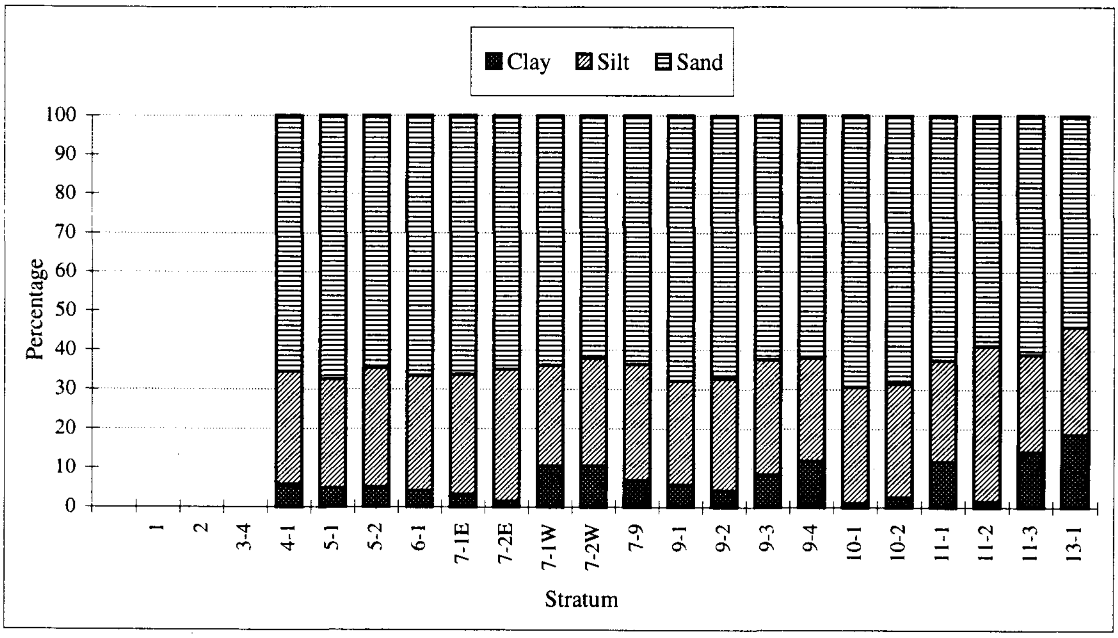


Fig. 8-7—Kabazi II: particle size fragments.

indicate a sedimentation rate for the 3.3 m of deposits of 0.08 cm/year. This rate would be sufficiently high to inhibit, or even to preclude, anything but very weak pedogenesis (Ferring 1986). The rounding of the small clasts in these strata may signify weak, pedogenically related dissolution of carbonate clasts, but these smaller clasts may have been rounded prior to deposition in the site area. Nonetheless, larger angular clasts are present throughout Strata 11 through 7, suggesting persistent cold winters. More frequent occupation of the site is indicated in the upper part of this section (upper Stratum 9 through Stratum 7), although errors in estimating rates of sedimentation are important limits on accurately defining occupational intensity here. Bone taphonomic analysis should assist in evaluating the U-Series dates by providing independent qualitative control on rates of sedimentation/burial.

The sediments of Stratum 13, containing the deepest sediments exposed in this excavation, are quite different from all of the younger deposits in the section. The loamy texture (including the highest clay content in the section), pedogenic features, and very low frequency of larger eboulis suggest greater slope stability above the site, slower deposition on the site, and warmer/moister conditions than those represented in the younger sediments. Pedogenic features in the lower part of Stratum 11 (in contact with Stratum 13) suggest that the slower deposition and increased weathering continued during the transition to rapid deposition of the overlying strata. Carbonate leaching from the middle of Stratum 11 (Table 8-2), as well as the presence of pedogenic clay in lower Stratum 11 and upper Stratum 13, suggest that the large boulder (Stratum 12) was either buried by sediments before weathering took place, or that the weathering occurred under moist and temperate conditions, leading to dissolution rather than to spalling. (By contrast, the boulder in Stratum 8 either arrived in a weathered condition or it spalled under different climatic conditions than those associated with the boulder of Stratum 12.)

In sum, Kabazi II is situated in a unique topographic setting, created through differential erosion of the Eocene bedrock and the fall of a huge boulder that trapped colluvial sediment and provided living surfaces for Middle Paleolithic occupants over a considerable span of late Pleistocene time. Because of its position well down-slope from the source of the eboulis sediments, comparisons of these Kabazi II colluvial deposits with those from normal rockshelters, such as Kabazi V, will be hampered; this is because of potential and probable sorting and alteration of sediment derived from limestone weathering up-slope. Also, microtopographic effects on transportation and deposition can add considerable noise to the sedimentary record of the site. Over short distances some strata (e.g., 7) show changes in texture (fining down slope), or were eroded away altogether. Patterns of rapid eboulis deposition (Strata 7 through 11), contrasting with fine sediments and weathering (Strata 13 and lower Strata 11) appear to have some paleoclimatic basis, as opposed to merely resulting from microtopographic effects. This can be partly or wholly confirmed by the exposure of larger areas to assess spatial aspects of local sedimentation.

Nonetheless, the secluded position behind the massive boulder not only trapped sediment, but, as revealed by the excavations, attracted Middle Paleolithic inhabitants. Rather rapid deposition, interrupted by erosional episodes, led to excellent stratigraphic separation of living surfaces and good bone preservation. From this vantage point, the unique setting of Kabazi II may encumber geologic correlation with other sites, but it fostered preservation of an excellent archeological record that can easily be compared to those of other well-preserved sites.

EXCAVATION METHODOLOGY

The main problem for the excavations at Kabazi II was how to subdivide the lithologically monotonous strata containing the faunal remains and flint artifacts into archeological levels.

Another difficult problem was choosing an appropriate system to record the positions of fauna and artifacts in those archeological levels.

The first week of Kabazi II excavations (Sondage 1, of the 1986 field season) clearly demonstrated that it was impossible to use geological criteria as the sole method of stratigraphic control. In Sondage 1, the thickness of Stratum 7 was about 1.2 m. Also, it was noted that the density of artifact and faunal remains in the upper, middle, and lower parts of Stratum 7 were very different, but that the sediments were homogeneous. That is, in Stratum 7, several different levels of artifacts and fauna were recognized, interspersed by several levels of sterile deposits (Kolosov, Stepanchuk, and Chabai 1988). Thus, it became clear that during the sedimentation of Stratum 7, the site was occupied a number of different times. Distinguishing these occupational levels in lithologically monotonous deposits required different methods.

The "Carpet Method"

This method is useful for the excavation of intensively occupied surfaces (e.g., fig. 8-8*B*, *C*). These surfaces, with extremely large numbers of bones closely packed together, create a "carpet" of bones. Since, in nature, truly horizontal surfaces exist only on water, these occupational "carpets" follow the angle of inclination of the stratum enveloping them.

The first cleaning of the surfaces usually gives the whole picture of spatial distribution of occupational levels. The excavation procedure for that kind of occupation includes the cleaning of all objects in each 1-m^2 unit, the mapping of each object's position horizontally, with no fewer than ten artifact or bone elevations taken per square meter. Only then are the bones and artifacts removed from the surface and bagged. If the thickness of the occupational level is more than the thickness of the average bone (about 3 to 5 cm), the excavations are carried out in 3 to 5 cm levels. Each excavation level is mapped as described above. For instance, the most intensively occupied level, II/8, was excavated, mapped, and labeled as II/7F, II/8, II/8A, II/8B. The somewhat less intensively occupied Level IIA/2 was divided into IIA/2 and IIA/2A.

The "Inclination Angle Method"

This is the only useful method for the excavation of living surfaces, such as at Kabazi II, which were not intensively occupied. It is also good for sterile levels. After the excavation of any kind of level, the surface of excavation area is mapped by following its angle of inclination, which is the same as the slope of the lithological stratum enveloping it. The excavation of sterile levels is executed by the angle of inclination. Taking into account that bones and artifacts on an occupational surface often do not consist of a "carpet" of finds, it is very important in that kind of excavation to follow the angle of lithological inclination. Besides the numerous elevation readings per square meter, the different-sized limestone blocks abundant in the deposits are of great importance, too. The limestone blocks, falling on an excavation area, appear to be reliable markers of ancient surfaces. For instance, if closely clustered artifacts or bones, on the one hand, and limestone blocks, on the other hand, are at the same or about the same elevations, they are recognized as belonging to a single ancient surface. The excavation of this kind of surface is carried out in 3 to 5 cm-thick levels, as well.

Documentation Procedures

All objects exposed on an excavation area, including limestone blocks more than 5 cm long, were mapped at a scale of 10:1. No fewer than 10 elevations were taken in each 1-m2 area, since a 1 m2 grid has been adopted for Kabazi II. All faunal remains and limestone blocks were mapped reflecting their actual shape, in the adopted scale. Flint artifacts were

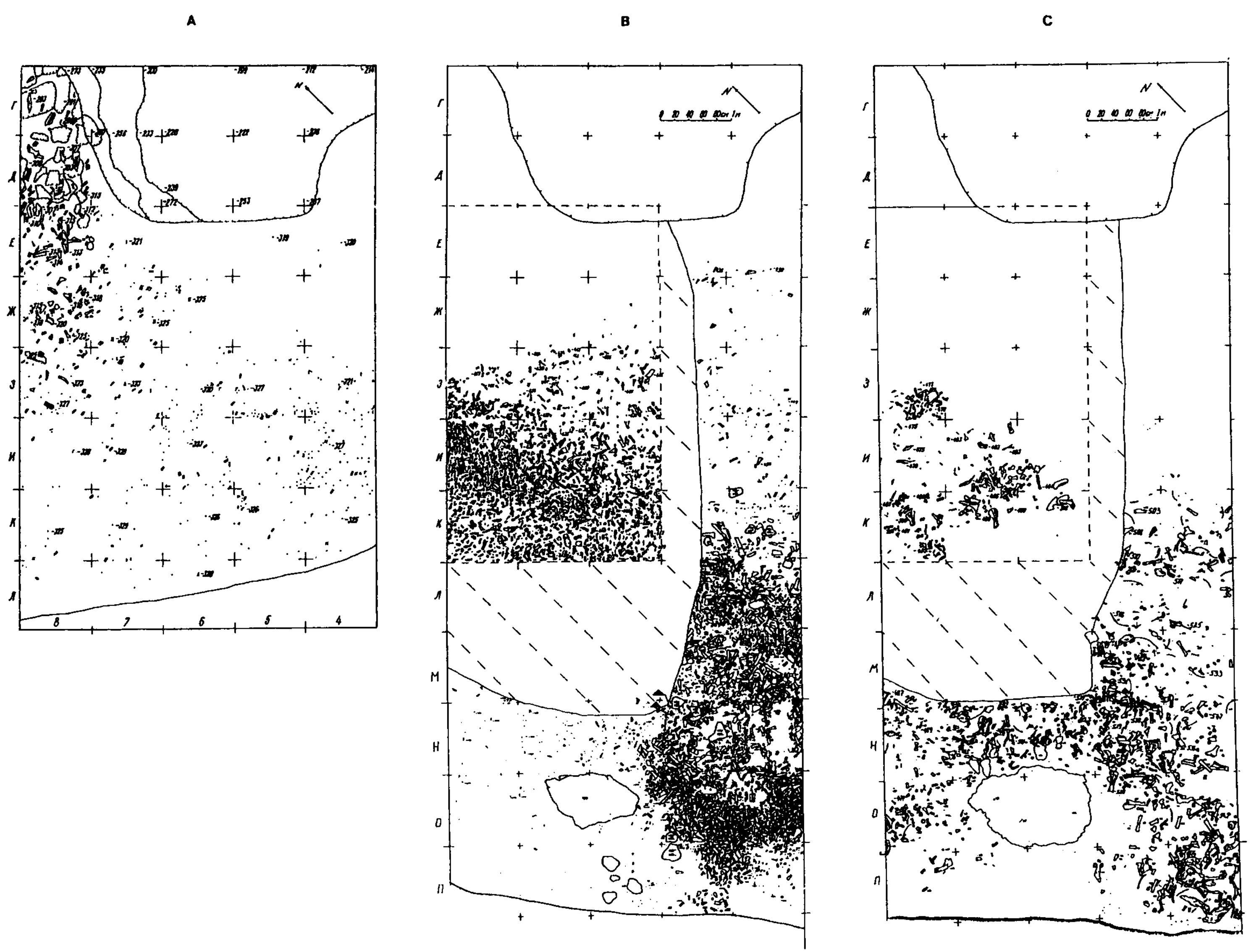


Fig. 8-8—Kabazi II: Horizontal plans showing the patterns of faunal and artifact distributions. The dotted lines show the areas destroyed by the local "amateurs." *A*–Level II/2; *B*–Level II/8; *C*–Level IIA/2.

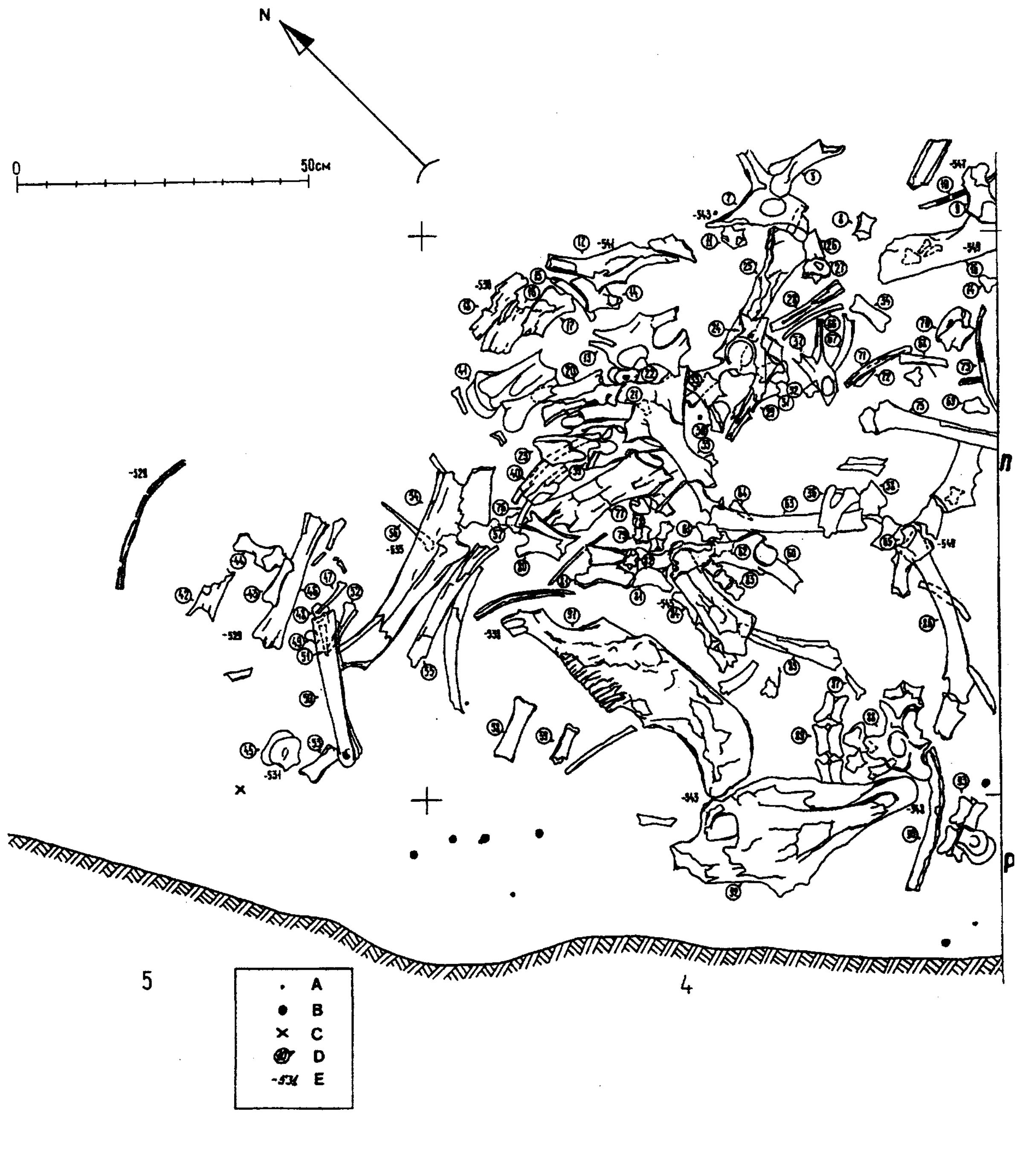


Fig. 8-9—Kabazi II, Level IIA/2: cluster of bones. *A*-chips; *B*-flakes; *C*-blades; *D*-bones; *E*-elevations.

mapped in conventional signs, by artifact class or tool type. For the bone clusters, separate maps at a scale of 5:1 were drawn with sequential numbering of each bone by 1-m2 area (fig. 8-9). In addition, the artifacts from each square of each level were labeled by unit, level, square, and elevation.

The sediments around the main clusters of bones and/or artifacts were sieved, using 1.5 mm screen, in order to recover the smallest fragments and chips. Also, selected squares were screened, in order to recover snails and/or microfauna.

ARCHEOLOGICAL SEQUENCE

The archeological sequence of Kabazi II consists of five main archeological units in which are found 21 occupational levels and 4 horizons with archeological material. In addition, there are 7 more separate horizons where some in situ artifacts and faunal remains were recognized. The archeological units are designated by Roman numerals and the levels are numbered consecutively in Arabic numerals within each unit, with subdivisions indicated by uppercase Latin letters. Horizons, which tend to be ephemeral in nature, are simply indicated by their elevation.

Archeological Unit I was discovered in derived deposits of Strata 2 through 4 (fig. 8-4). Unit I was subdivided into four archeological horizons, in accordance with the stratigraphic sequence. The first and second horizons of that unit are in Stratum 2, the third horizon is in Stratum 4. Archeological material from Stratum 3 was distinguished as the "carbonate" horizon of Unit I. Neither faunal remains, nor charcoal were found in Unit I. A few bones found in Horizon 3 of Unit I could be intrusive from the lower Stratum 5. Usually, flint artifacts of Unit I are patinated and exhibit natural breakage along their edges. Without doubt, the whole Unit 1 artifact assemblage was moved onto the excavation area by colluviation from farther up the slope, along with the sediments of Strata 1 through 4, which enveloped that unit (Chabai and Zhuk 1994).

Archeological Horizon "-195" consists of a very few artifacts and bones which were uncovered in Stratum 5 (fig. 8-4). This horizon, "-195," as well as Stratum 5, covered less than 1.5 m^2 of the excavated area. Thus, it is difficult to determine the origin of both the archeological horizon and geological stratum. Considering the unknown origin of sediments, Horizon "-195" was identified as a separate archeological occurrence.

Archeological Unit II consists of 14 occupational surfaces. The uppermost, Level II/1A was defined in Stratum 6. The other 13 occupational surfaces, from Levels II/1 through II/8C, were in Stratum 7 (figs. 8-4, 8-6). Level II/8C is on the contact between Strata 7 and Strata 9 (fig. 8-6). Usually, the thickness of each of these levels was limited to the maximum thickness of the largest horizontally positioned artifact or bone. An exception is found in some areas of Level II/8, and its analog of the 1994 field season, Level II/7F8, which are filled with numerous faunal fragments. Even in this case, the thickness of Levels II/8-II/7F8 is less than 15 cm in any one square. At the same time, the usual thickness of the rest of the levels was about 3 to 8 cm in any one square. All of the levels of Unit II are separated by sterile deposits. The thickness of the sterile deposits separating the occupational surfaces is not very different; their usual thickness ranges from about 8 cm to 15 cm.

Artifacts and faunal remains in the levels of Unit II were horizontally deposited, but are differently distributed on their surfaces. Except for those artifacts from Level II/1A, the flints of other levels exhibit both excellent edge preservation and an absence of patina. The fauna preservation is good but not fine; usually, the bone surfaces are significantly weathered.

According to the horizontal distribution of artifacts and faunal remains, the levels of Unit II have been subdivided into two patterns. The first includes Levels II/1A, II/1, II/2, II/3, II/4, II/5, II/6, II/7. The main concentrations of fauna and flints in these levels are distributed across the northern part of excavation area (fig. 8-8*A*). Usually, the levels of the first pattern show a clear border around artifact clusters toward the south. The lower part of the Unit II levels shows a quite different pattern of artifact distribution. Levels II/7AB, II/7C, II/7D, II/7E, II/7F8-II/8, II/8C are distributed across the southern part of the excavation area (fig. 8-8*B*). Also, the second pattern exhibits at least two clear borders of fauna and artifact spread to the north: straight in the middle of excavation area and near the vertical slab of limestone. The time of the shift from one distribution pattern to the other correlates with the appearance of the limestone block (Stratum 8) in the excavated area (figs. 8-2, 8-6); that is, before the collapse of that block, the second pattern of artifact and fauna distribution pertained. So, the disposition of large limestone blocks on the site played a significant role in the spatial organization of the occupations. Each of the occupations covered an area about 20 to 30 m^2. Only Levels II/1A and II/1 were excavated over an area of about 12 to 16 m^2, because the occupational surfaces of these levels apparently extend to the north, beyond the excavated area.

No fireplaces, charcoal, or burned bone concentrations were defined. Only occasionally were small fragments of burned bone, as well as tiny pieces of burnt flints, recovered.

Archeological Unit IIA was found in Strata 9 and 10 (fig. 8-4). Unit IIA is subdivided into eight levels: IIA/1, IIA/2 (Level II/9 of the 1987 excavations), IIA/2-3, IIA/3, IIA/3A, IIA/3B, IIA/4, IIA/4B. During the excavations of the 1986-1988 field seasons, only parts of Levels IIA/2 and IIA/4 were found in the excavated area. As a result, during the 1986-1988 field seasons, it was noticed that Level IIA/2 was separated by about 0.5 m of sterile sediments from the uppermost Level II/8, as well as by about 1 m of sterile deposits from the lower Level IIA/4. During the 1993-1996 excavations, several new levels were exposed.

Level IIA/1 was found in the upper part of Stratum 9 and was separated by about 10-15 cm of sterile deposits from the uppermost Level II/8, and by the same thickness of sterile deposits from Level IIA/2 below. As already reported, below Level IIA/2 there was about 1 m of sterile deposits. In the southern part of excavation area, during 1995 field season, four more levels were found (IIA/2-3, IIA/3, IIA/3A, IIA/3B) which fell stratigraphically below the Level IIA/2 occupational surface. At the same time, all levels differ very much in several ways. Levels IIA/1, IIA/2, IIA/4 are composed of surfaces mainly covered by bones and only some artifacts. These surfaces include relatively horizontally disposed and differently oriented artifacts. The thickness of each of these levels is about 5-10 cm. The pattern of artifact distribution of Levels IIA/1, IIA/2, IIA/4 is close to the southern pattern seen in Unit II (fig. 8-8*C*). Like the levels of Unit II, these occupational surfaces also lack charcoal and/or burnt bone concentrations. The bone surface and artifact edge conditions are excellent. The post-depositional damage is minimal, if it exists at all.

The artifact and faunal remains in Levels IIA/2-3, IIA/3, IIA/3A, IIA/3B, and IIA/4B exhibit no vertical or horizontal concentrations. The vertical spread of bones and artifacts fluctuate about 15-20 cm in each level. The preservation of bone surfaces and flint edges is comparable to that described for the upper levels. The number of bones from these levels is very limited and is not comparable to the density of faunal remains on true occupational surfaces. For instance, one square of Level IIA/4 contains from 80 to 100 bone fragments. The same is true for Levels IIA/1 and IIA/2. A quite different picture is seen in Levels IIA/2-3, IIA/3, IIA/3B, IIA/4B where the number of bones per square with a thickness of 15-20 cm is no more than 20 small fragments. The number of artifacts in these levels is about one-third fewer than in Levels IIA/1, IIA/2, IIA/4. At the same time, it must be noted that there is no evidence of post-depositional transport of artifacts and fauna in Levels IIA/2-3, IIA/3, IIA/3B, and IIA/4B. Thus, during the excavations, Levels IIA/2-3, IIA/3, IIA/3B, and IIA/4B were considered "sterile," while Levels IIA/1, IIA/2, IIA/4 were considered "living floors." As much as the differences between "sterile" and "living floor" are obvious, the origin of the "sterile" levels is completely unclear. Taking into account the absence of post-depositional artifact transportation in the "sterile levels," it is difficult to suggest a natural origin for the artifacts in these levels. Thus, in terms of human activity, two possible explanations can be proposed. The "sterile" levels are parts of peripheries of occupational surfaces somewhere beyond the excavated area. The other possibility is that the "sterile levels" reflect episodic visits of unclear purpose. Neither of these explanations can be tested at this time. Thus, a vague explanation for the origin of these "sterile" levels has been adopted; that is, "sterile" levels reflect indirect human activity.

Archeological Unit III occurred in the upper part of Stratum 11 (fig. 8-4). This unit is subdivided into four levels: III/1A, III/1, III/2, and III/3. Levels III/1A and III/1 are separated by no more than 10 cm of sterile deposits. At the same time, Levels III/1, III/2, and III/3 are separated from each other by no less than 20 cm of sterile deposits. The other attributes, including thickness of the levels, pattern of artifact distribution, and preservation of both artifacts and faunal remains are as described above for the "living floor" of Unit IIA.

Archeological Unit IV, with a thickness of about 15 cm, was found in the upper part of Stratum 13 (fig. 8-4). The vertical distribution of Unit IV artifacts is chaotic, or, in other words, numbers of flints are spread throughout the whole thickness of Unit IV and do not form any kind of cluster or clusters, or one or more horizontal surfaces. The finds of Unit IV consist only of flint artifacts. Some of the flints show post-depositional damage to their edges, as well as being patinated. At the same time, the deposits in which the unit lies are undoubtedly in situ. It must be noted that there is a complete absence of faunal material in the undisturbed deposits of Unit IV.

Six more archeological horizons were distinguished in the 2 m^2 sondage in Stratum 14, at depths of 930; 980; 1037–1050; 1080; 1100; and 1135-1145 cm below datum (fig. 8-4). All of them contain flint artifacts and faunal remains in excellent preservation. Neither flint artifacts, nor faunal remains were found in Strata 15 and 16.

FAUNAL REMAINS

The fauna from the 1986-1988 excavations of Unit II was studied by N. G. Belan. The most representative species is *Equus hydruntinus* (Table 8-3). This Equid averages 80-90% of all fauna in each level. Moreover, each *E. hydruntinus* individual is represented by about 60 to 70 bones. Bones of other species are represented only by a few bones each.

TABLE 8-3

Kabazi-II, Units II & IIA: Fauna Remains from 1986-1988 Excavations[1]

	II/1		*II/2*		*II/3*		*II/4*		*II/5*		*II/6*		*II/8*		*IIA/2*		*Total*	
	NISP	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*
Equus hydruntinus	756	3a[2], 4j[3]	362	5a, 1j	450	4a, 1j	309	5a	345	9a, 1j	382	4a, 1j	2565	28a, 2j	292	4a	5464	73a, 10j
Equus latipes	1	1											4	1			5	2
Bison priscus mediator	1	1			1	1							3	1a	5	3		
Saiga tatarica					1	1	1	1	2	1	1	1	1	1	1	1	7	5
Cervus elaphus									1	1			1	1			2	2
Carnivors ?													2	2			2	2
Lepus sp.													1	1			1	1
Marmota bobac									1	1	1	1					2	2
Rodent ?									2	1			1	1	1	1	2	2
Unidentifiable	1112		425		554		212		386		344		2765		253		6051	

[1] identifications by N. G. Belan.
[2] a - adult.
[3] j - juvenile.

The brief analysis of faunal material from Unit II led V. P. Chabai, A. E. Marks, and A. Yevtushenko (1995) to a conclusion about the pattern of faunal exploitation in Unit II. That pattern seemed to represent repeated ephemeral butchering episodes, linked to seasonal hunting. Taking into account the presence of young individuals, which appear in practically every level, it becomes clear that this season is likely to be the end of summer or beginning of autumn.

The faunal analysis of Units IIA and III are in process now, as are the faunal remains from Levels II/7-II/8C excavated in the 1993-1995 field seasons.

ARTIFACT DESCRIPTIONS: THE 1986-1988 FIELD SEASONS

The following section briefly summarizes the results of the first stage of excavations at Kabazi II, which took place during the 1986-1988 field seasons, and which provided the initial view of the stratigraphy and the superposition of assemblages at the site. Chapters 9 and 10 describe the results of excavations which took place under the current project and focus on Units II, IIA, and III.

Artifacts of Unit I

The flint assemblage of Unit I consists of 52 cores, 366 chips, 132 flakes, 32 blades, and 109 tools. Among the cores, parallel examples with single or two opposite platforms dominate, as do uni-directional and bi-directional types of dorsal scar patterns among the blanks. Neither Levallois nor radial cores are present, and Levallois blanks with centripetal dorsal scar pattern are absent, as well. The percentage of faceted platforms is moderate (IF = 43.8, IFs = 23.5). At the same time, blades represent about 20% of all blanks.

About 13% of the tool kit is represented by points. Among these, semi-crescent (fig. 8-10: *5*) and sub-triangular (fig. 8-10: *3,7*) dominate. Also, a single Levallois point was found (fig. 8-10: *6*). Scrapers are the most abundant class of tools; about 53% of the total number of retouched pieces. The most representative types of scrapers are simple straight (fig. 8-11: *6*) and simple convex. A less significant number is comprised of double (fig. 8-11: *2*) and transverse scrapers (figs. 8-11: *1,3-5*; 8-12: *2*). The latter usually exhibit different kinds of proximal thinning (figs. 8-11: *1,4,5*; 8-12: *2*). About one third of the scrapers are different types of convergent forms; sub-triangular (figs. 8-10: *1*; 8-12: *1*), sub-crescent (figs. 8-10: *2,4*; 8-12: *6*), sub-laurel (fig. 8-10: *8*), semi-rectangular (fig. 8-12: *4*), and sub-trapezoidal (fig. 8-12: *5*). The same shapes are common for the bifacial scrapers, all made in the plano-convex manner (fig. 8-12: *3*). These bifacial scrapers account for about 11% of the tool kit.

Taking into account the tool kit's typological structure, such as the presence of transverse scrapers with thinned bases, rectangular scrapers, unifacial and bifacial sub-triangular and sub-crescent scrapers, the flint industry was identified as Staroselian. The closest analogy to the Unit I assemblage was recognized in the material excavated by A. Formozov (1958) in the 1955-1956 excavations at Starosele (Chabai 1991; Yevtushenko 1995).

Artifacts of Unit II

Based on technological and stratigraphical peculiarities, the levels of Unit II were grouped into three complexes: (1) Levels II/8-II/9; (2) Levels II/5-II/7; (3) Levels II/1A-II/4. As a technological development is evident in the flint assemblages in Unit II (Chabai 1991; Chabai and Sitlivy 1994), the description will proceed from the lowest to the uppermost grouped levels.

The flint assemblage of the lower Levels II/8-II/9 consists of 48 cores, 444 flakes, 140 blades, 137 tools, and 1553 chips. About the half of all cores are bi-directional and uni-directional, often with supplementary platforms (fig. 8-13). Levallois (fig. 8-14: *1,2*) and

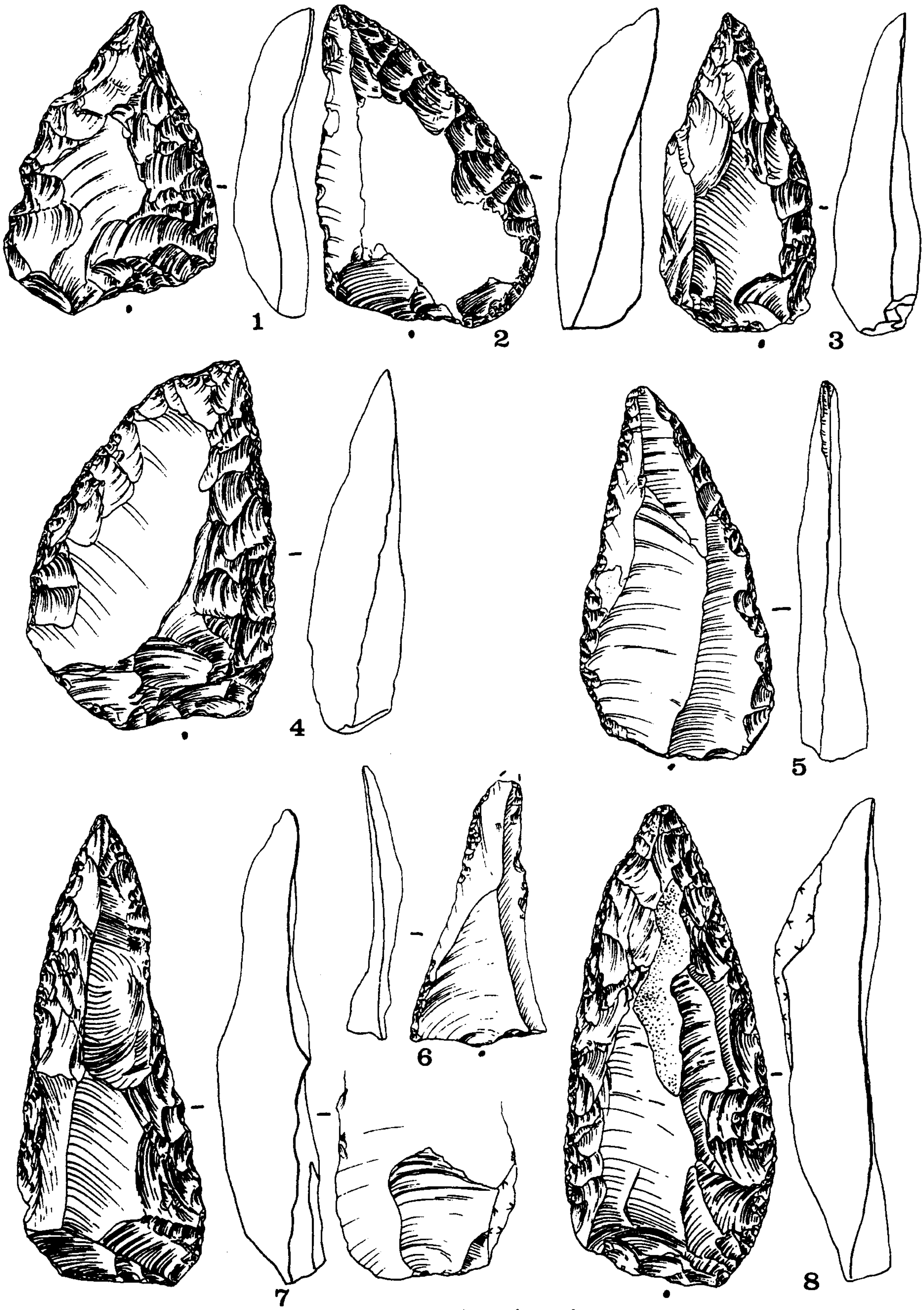


Fig. 8-10—Kabazi II, Unit I Tools: *1*–sub-triangular scraper; *2,4*–sub-crescent scrapers; *3,7*–sub-triangular points; *5*–semi-crescent point; *6*–Levallois point; *8*–sub-laurel scraper.

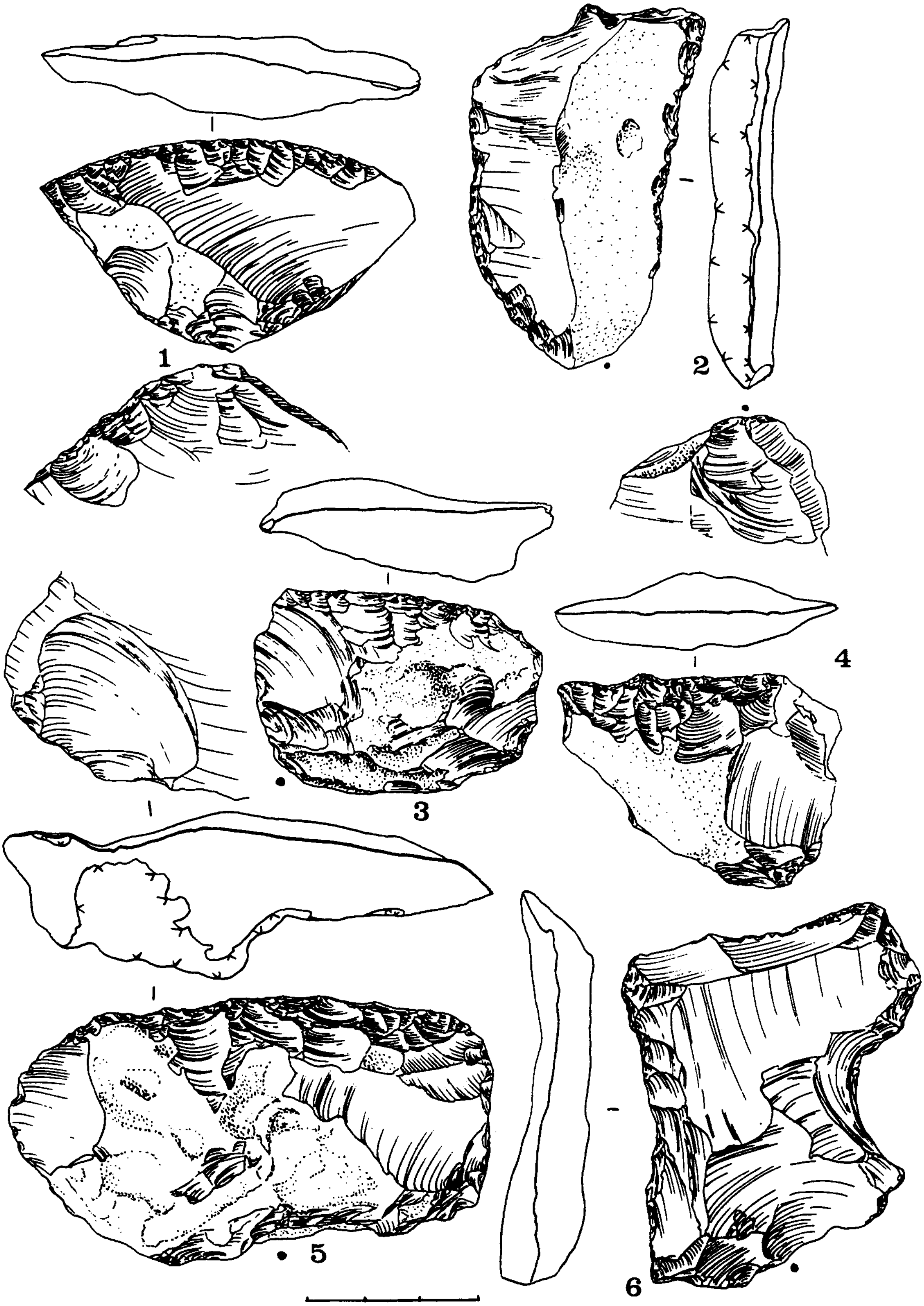


Fig. 8-11—Kabazi II, Unit I Scrapers: *1*–transverse-convex, thinned base; *2*–double straight-convex; *3*–transverse-straight; *4,5*–transverse-straight, thinned base; *6*–simple straight.

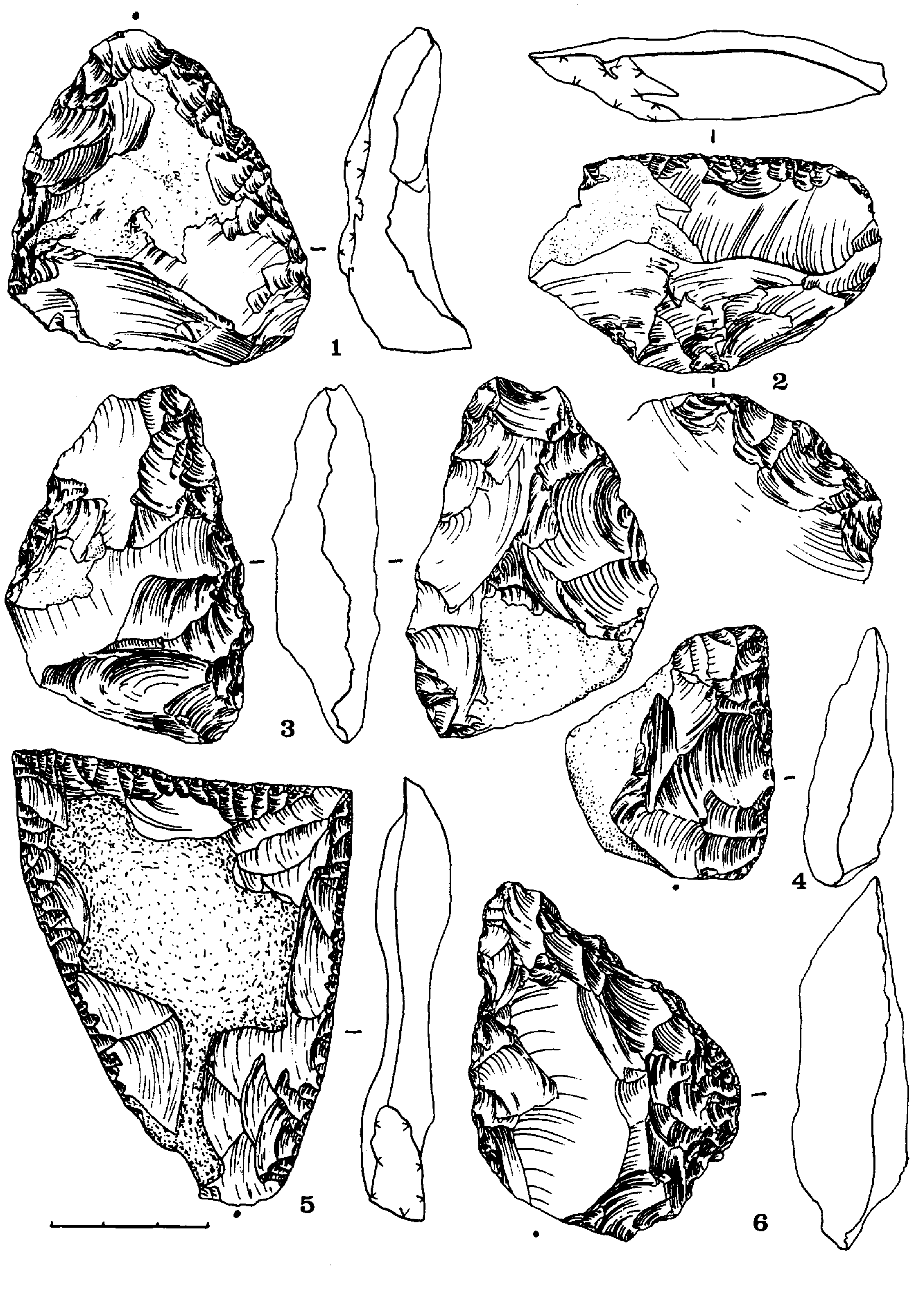


Fig. 8-12—Kabazi II, Unit I Scrapers: *1*–sub-triangular; *2*–transverse-straight, thinned base; *3*–bifacial; *4*–semi-rectangular; *5*–sub-trapezoidal; *6*–sub-crescent.

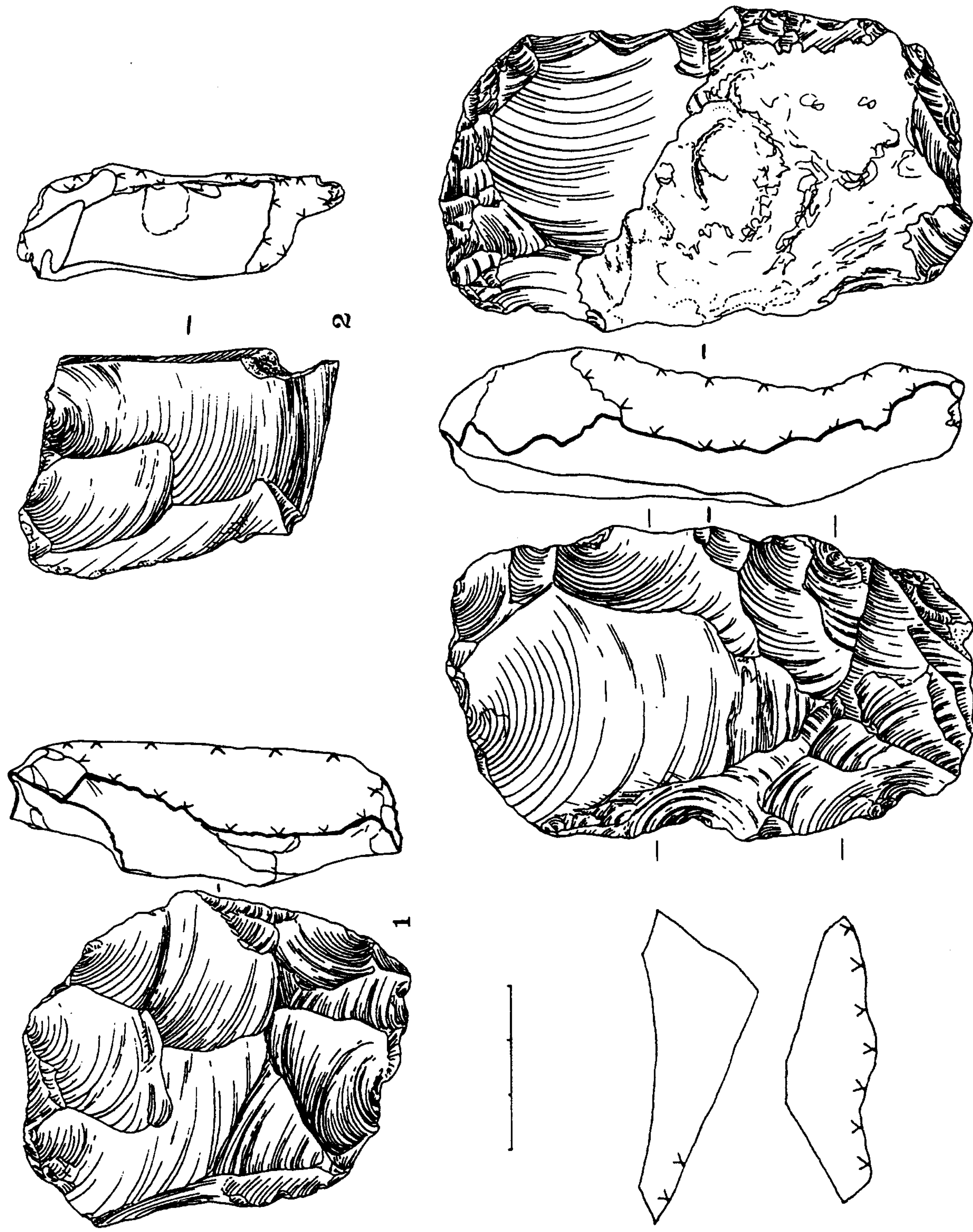


Fig. 8-13—Kabazi II, Unit II, Level II/8 Cores: *1*,3–bidirectional; 2–unidirectional.

radial cores are not so numerous, but are present, too. The dorsal scar patterns of blanks correlated with core morphology, as well. Uni-directional and bi-directional scars dominate, uni-directional-crossed and bi-directional-crossed are also numerous. Levallois blanks (fig. 8-15: *1*) comprise about 5% of all blades and flakes. The percentage of faceted platforms (IF = 69.9, IFs = 47.6) is the highest among the Crimean Middle Paleolithic industries. Blades, with an index of 23.9, are common, too.

Mainly, the tool assemblage is represented by scrapers (about 60%); the main types are simple convex (fig. 8-15: *1*) and straight, amounting to more than a half of all scrapers. Double scrapers are half as numerous. The percentage of convergent scrapers is about 15% of all scrapers, about half of which are of semi/sub-crescent types. Generally, the scrapers are made on blades or elongated flakes, including Levallois, and have obverse scalar flat retouch.

Points account for about 20% of all tools. About one-half of all points are of semi-laurel shape (fig. 8-16: *5,8*). Other shapes are represented by single examples, including lateral (fig. 8-19: *2*), which will become important in the upper levels of Unit II. Mainly, the points have obverse scalar or flat retouch.

The denticulates have the same shapes as the majority of scrapers. The classes of notches, borers, etc., are represented by a single piece each.

The flint assemblage of Levels II/5-II/7 consists of 36 cores, 642 flakes, 315 blades, 1662 chips, and 160 tools. The cores are only bi-directional and uni-directional (fig. 8-17: *1*). No Levallois or radial cores were found. At the same time, a few Levallois blanks were recovered in the assemblages of Levels II/7 and II/6 (fig. 8-15: *2-5*). Not one Levallois blank was found in Level II/5. Uni-directional and bi-directional dorsal scar patterns are common, as are *débordante* blades (fig. 8-18: *2,6*). Also, the number of blades is significantly higher (Ilam = 33), while the percentage of faceted platforms is the same as in the underlying levels (IF = 67.3; IFs = 44.5).

Among the tools, the scrapers are most common (about 67%). The simple, single-edged scrapers (fig. 8-18: *2,6*) comprise about 80% of all scrapers. Double and converging scrapers account for no more than 10% each. Mainly, the scrapers are formed by obverse flat scalar retouch.

Points comprise about 21% of the tool assemblage. Half of them are sub-triangular and semi-crescent (fig. 8-16: *6*). More or less representative are types with obliquely retouched and distally retouched tips. Usually, the points are made on blades and have obverse scalar and/or sub-parallel, flat retouch. The other tool classes, such as denticulates, notches, borers and atypical end-scrapers, are represented by a few pieces each.

The flint assemblage of Levels II/1A-II/4 consists of: 4 precores, 45 cores, 584 flakes, 333 blades, 2,079 chips, and 241 tools. The cores are only uni-directional (fig. 8-17: *2*) and bi-directional (fig. 8-17: *3*). Some of them, such as those with a narrow flaked surface and those which are sub-cylindrical (fig. 8-17: *3*) exhibit volumetric flaking surfaces. Not a single Levallois blank was identified. At the same time, crested blades and flakes, often partly covered by cortex, are present, as well as secondary crested blanks (figs. 8-18: *4*; 8-19: *3,5*). On the whole, the flint assemblage of Levels II/1A-II/4 is characterized by the increasing percentage of blades (Ilam = 36.5) and the somewhat decreasing faceted platforms, which fall to IF = 53.5, IFs = 31.3.

As usual, the scrapers are the most representative tool class, about 55%. More than two-thirds of the scrapers are of simple straight and simple convex types (fig. 8-18: *1,3,4*). Double and converging scrapers are not numerous. All scrapers have obverse flat scalar and/or sub-parallel retouch.

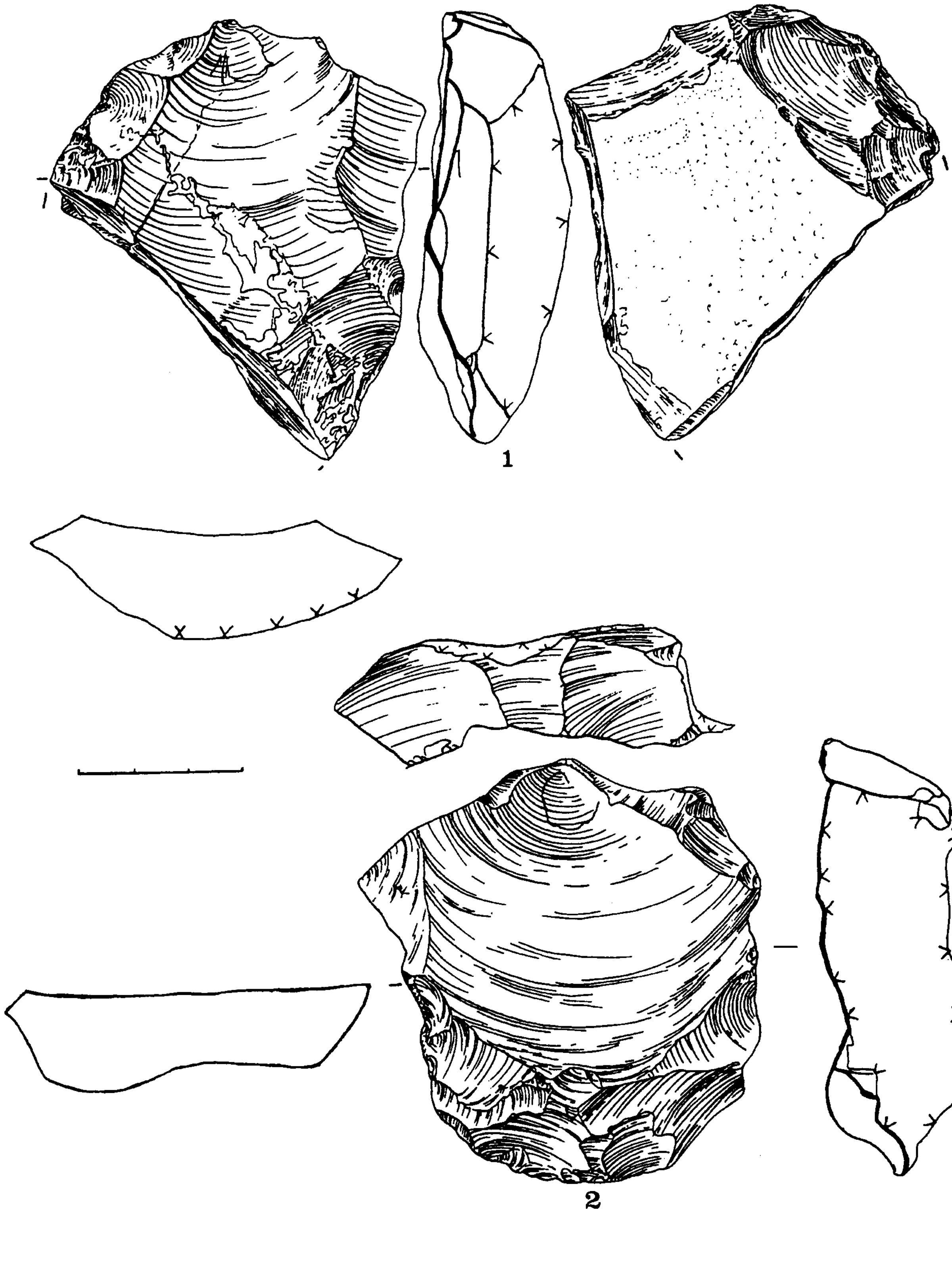


Fig. 8-14—Kabazi II, Unit II, Level II/8 Cores: *1,2*–Levallois tortoise.

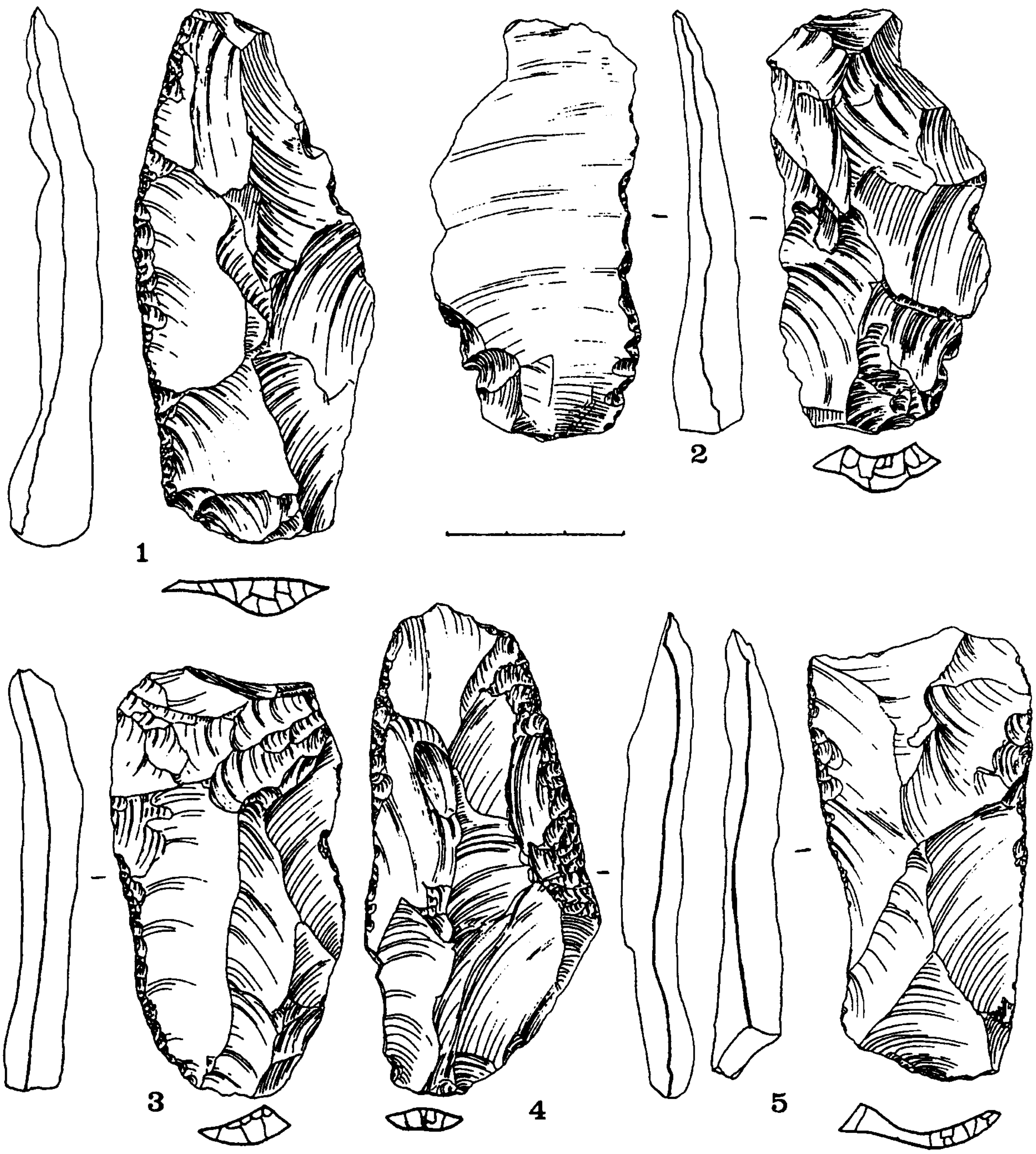


Fig. 8-15—Kabazi II, Unit II, Level II/8 *(1)*, Level II/7 *(2-4)*, Level II/6 *(5)* Tools on Levallois blanks: *1,3*–convex scrapers; *2*–inversely retouched piece; *4*–double-straight scraper; *5*–obversely retouched piece.

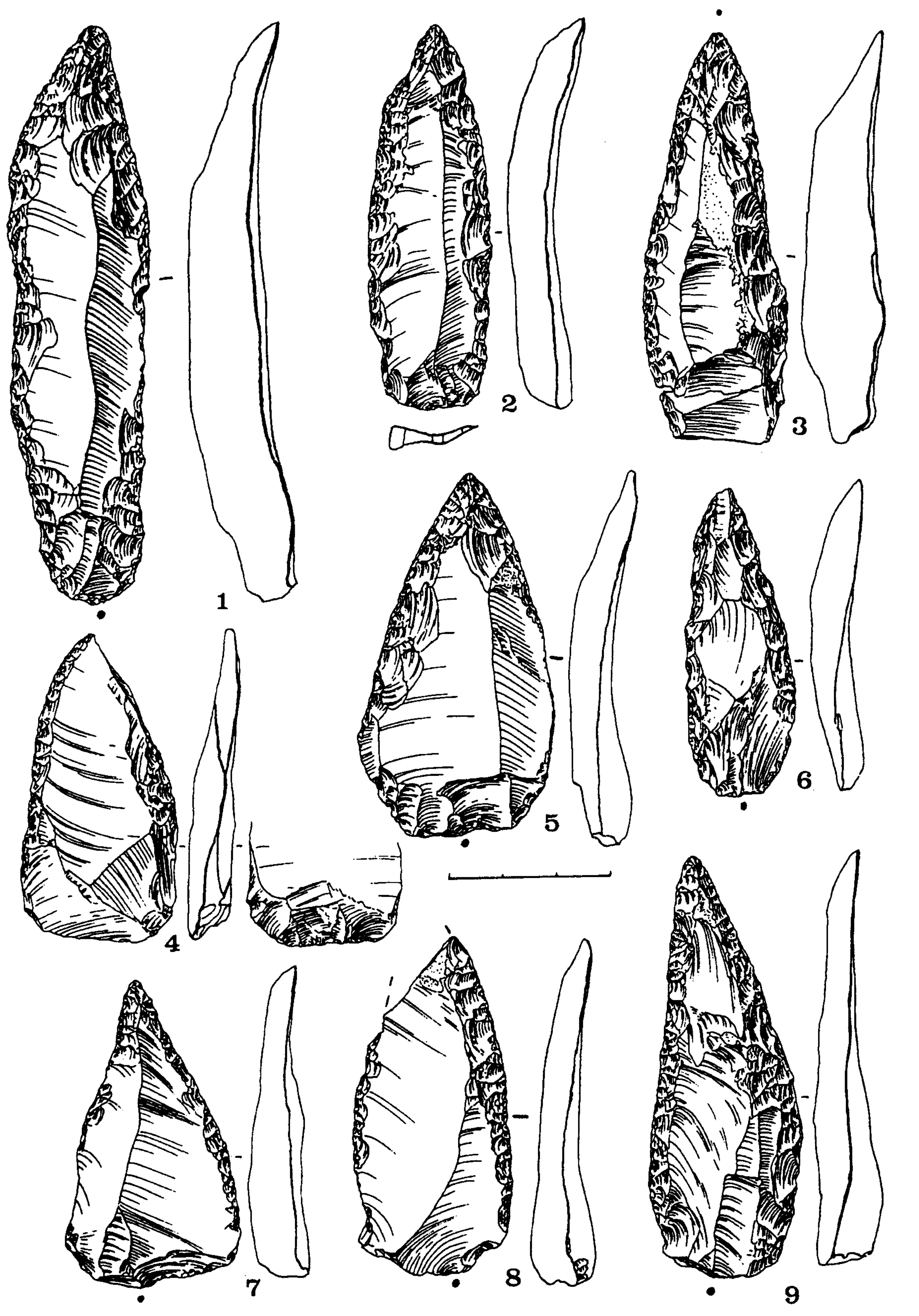


Fig. 8-16—Kabazi II, Unit II, Level II/8 *(5, 8)*, Level II/2 *(6)*, and Level II/1 *(1-4, 7, 9)* Points: *1*–sub-willow point; *2,3*–semi-willow points; *4,7*–sub-triangular points; *5,8*–semi-laurel points; *6,9*–semi-crescent points.

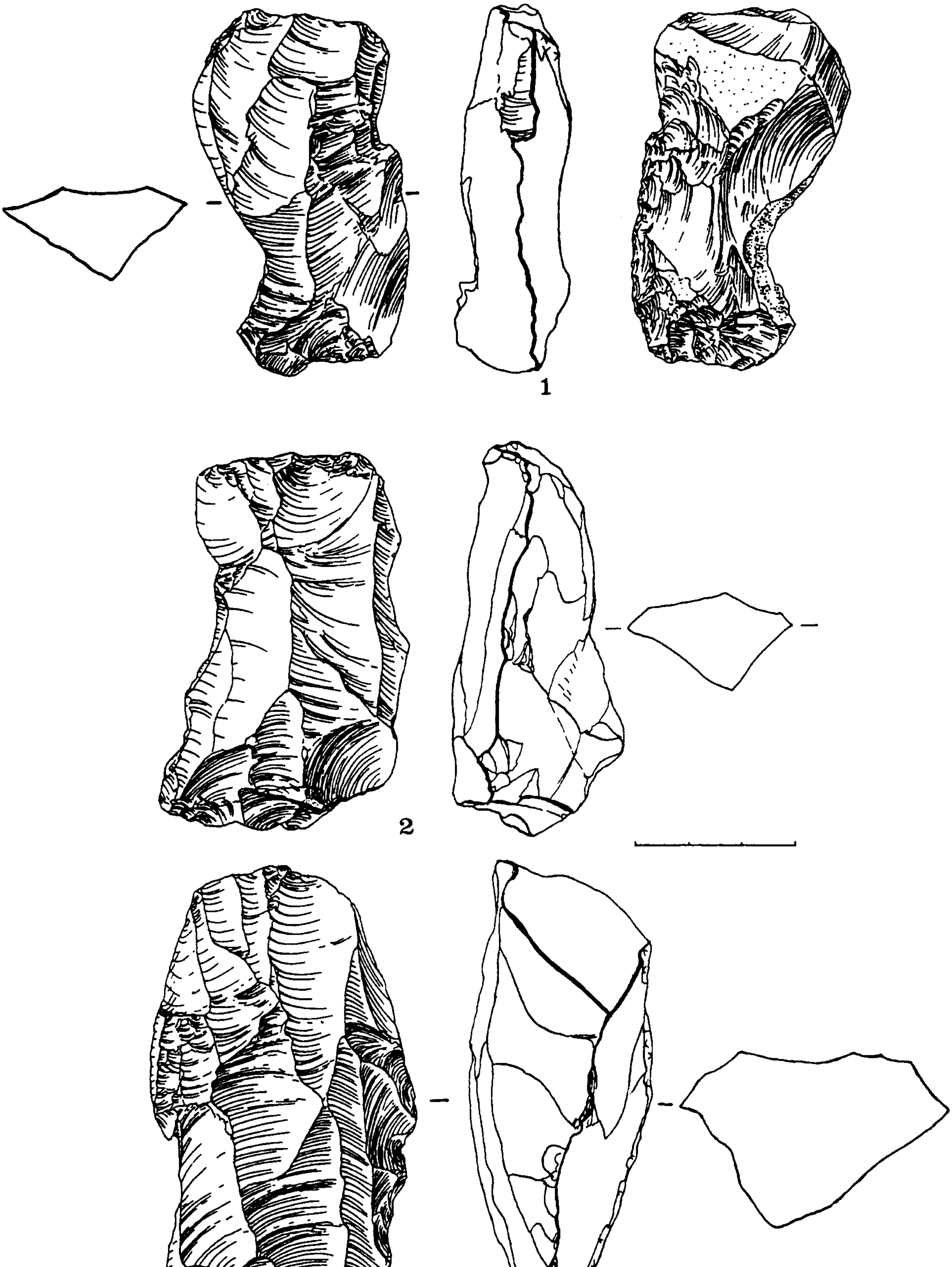


Fig. 8-17—Kabazi II, Unit II, Level II/6 *(1)*, Level 2 *(2)*, and Level 1 *(3)* Cores: *1,2*–unidirectional; *3*–bidirectional.

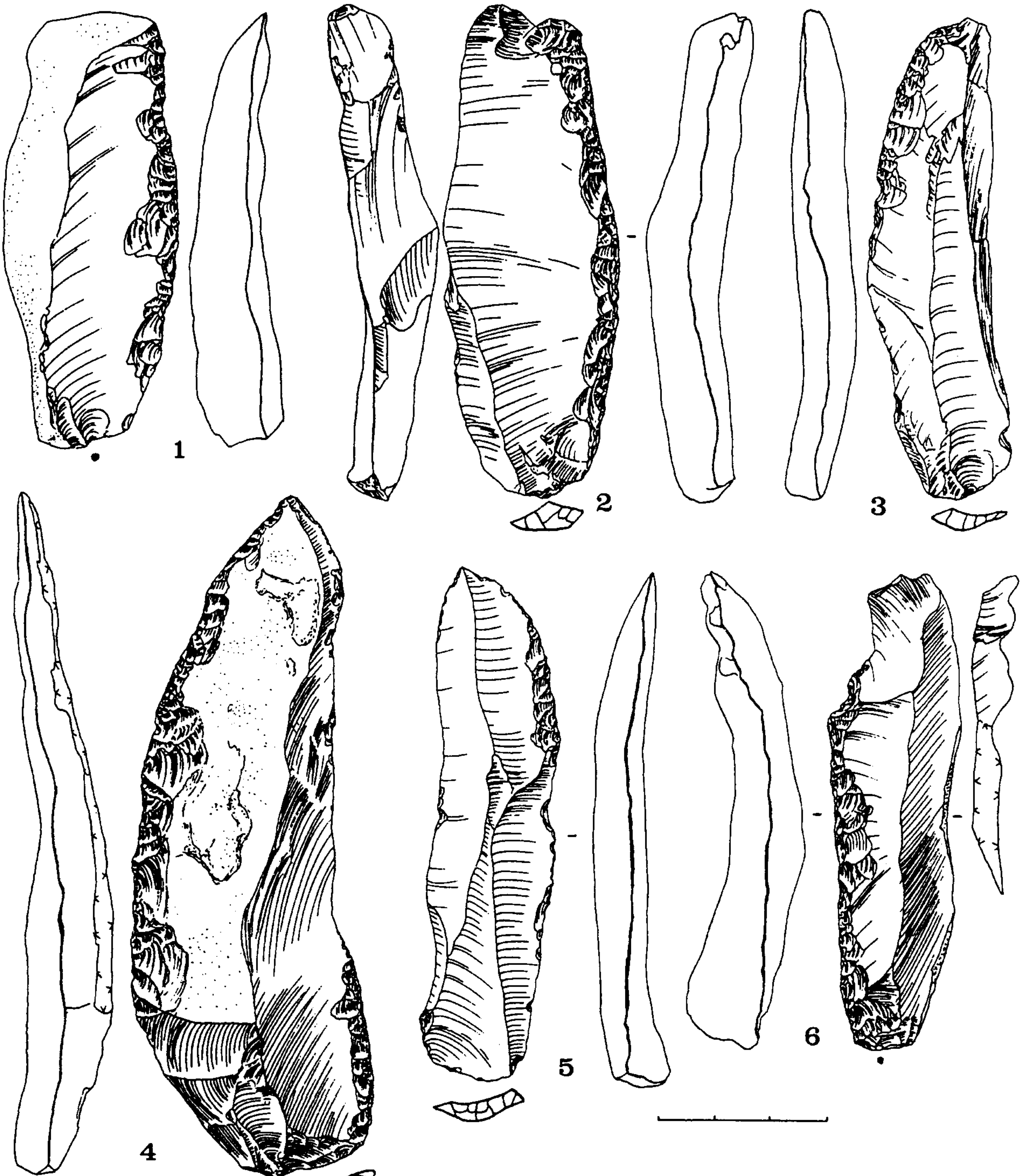


Fig. 8-18—Kabazi II, Unit II, Level II/7 *(5)*, Level II/6 *(2, 6)*, and Level II/1 *(1, 3, 4)* Tools: *1-4*–simple convex scrapers; *5*–retouched blade; *6*–simple straight scraper.

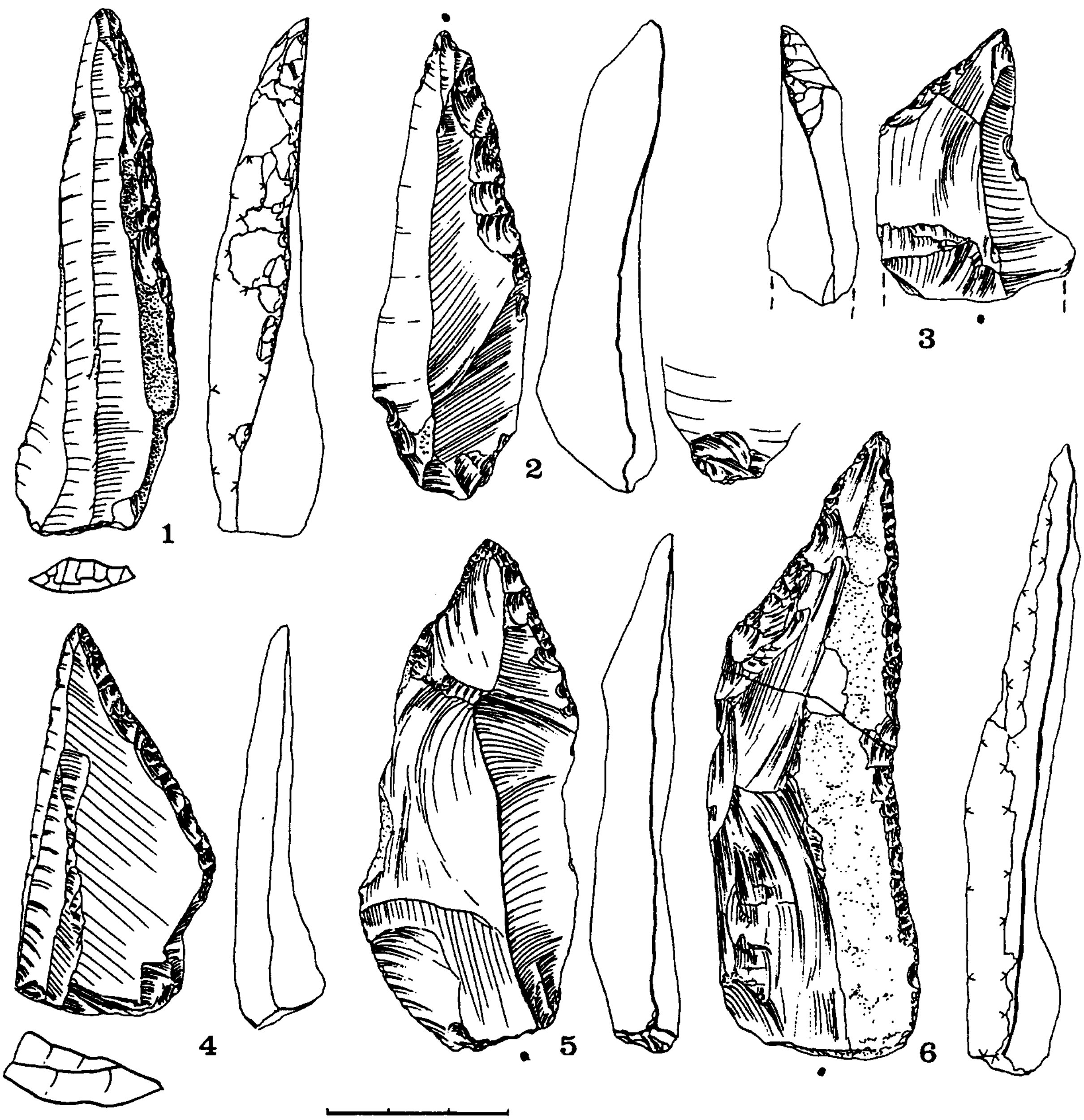


Fig. 8-19—Kabazi II, Unit II, Level II/8 *(2)* and Level II/1 *(1, 3-6)* Tools: *1*–backed blade; *2*–lateral point; *3,4*–obliquely truncated blades; *5*–distal point; *6*–obliquely retouched point.

Points account for about 28% of all tools. The most representative types are those with only distal retouch (fig. 8-19: *5*) and those which are willow-shaped (fig. 8-16: *1-3*) and sub-triangular (fig. 8-16: *4,7*). Also important are lateral, obliquely retouched (fig. 8-19: *6*), and semi-crescent (fig. 8-16: *9*). Most points, as well as the majority of scrapers, are made on blades. Points exhibit obverse, scalar flat, subparallel, and marginal retouch. The denticulates, as usual, are uncommon; about 10 %, and their forms closely parallel the scrapers. Two new tool classes appear in the assemblage of Levels II/1A-II/4: obliquely truncated blades (fig. 8-19: *3,4*) and backed blades (fig. 8-19: *1*). Each type is represented by only few pieces each.

It was recognized that the typological structure of all Unit II levels is more or less stable; the changes in tool kit and in the methods of tool retouch are not significant. On the other hand, the changes through time in the methods of core reduction are significant and obvious. The core reduction strategy of Level II/8 was recognized to be similar to the Biache method, as described by E. Boëda (1988). At the same time, the core reduction strategy in the upper levels is close to the Rocourt method (Otte, Boëda, and Haesaerts 1990; Chabai and Sitlivy 1993, 1994; Chabai 1995).

The flint assemblages of Kabazi II, Unit II, have been described within the context of the Western Crimean Mousterian. On the basis of technological and typological comparisons, a similarity with Shaitan-Koba, upper horizon and Kabazi II, Unit II, Level II/8 is clear. Then, taking into account the techno-typological characteristics and stratigraphic position of the lower horizon at Shaitan-Koba, an early stage of the Western Crimean Mousterian (WCM) was proposed. That stage, based on radial and parallel primitive flaking, includes the assemblages of Shaitan-Koba, lower horizon and Bakchisaraiskaya, lower layer. Taking into account technological peculiarities and stratigraphic sequences, the following scheme for the WCM evolution was adopted: Stage 1, based on radial and parallel primitive flaking, includes Bakchisaraiskaya, lower layer and Shaitan-Koba, lower layer; Stage 2, where the Biache method was used (Shaitan-Koba, upper layer and Kabazi II, Unit II, Level 8); Stage 3, the assemblages of Levels II/7-II/1A at Kabazi II, Unit II, based on the Rocourt method of core reduction (Chabai 1991; Chabai and Sitlivy 1994). Unfortunately, that attractive evolutionary picture was confused to some extent by the question about the technological content of all these described shifts. The abrupt disappearance of Levallois cores and blanks in Level II/5 and the absence of volumetrically reduced cores in Level II/6 posed the problem of understanding the specific transitions from one flaking method to another. A possible solution to this problem was proposed within the framework of Biache flaking (Chabai 1994). In any case, it is obvious that for the solution of this problem, new materials from the lower levels of Unit II are required.

Artifacts of Unit III

The flint assemblages of this Unit consist of 2 preforms, 2 cores, 61 chips, 23 flakes, and 25 tools. The preforms appear to be no more than lightly tested flint plaquettes. It is impossible, therefore, to define their typological status more precisely, or to define them even as unfinished bifacial tools or as precores. One of the cores is very exhausted; another broken example appears to be of parallel type. On the other hand, the flake sizes are very small, and the flake sample is too limited to study fruitfully. Nine of the tools are tiny retouched fragments. The others include points (fig. 8-21: *1*), single edge scrapers (fig. 8-21: *2,3*), transverse scrapers with thinned base (fig. 8-20: *6*), a proximal transverse scraper with thinned back (fig. 8-21: *5*), a convex scraper with thinned back (fig. 8-20: *5*), a semi-rectangular scraper (fig. 8-20: *4*), a bifacial scraper (fig. 8-20: *3*), and a few bifacial leaf-points (fig. 8-20: *1,2*). Even taking into account the statistically insignificant character of the Unit III sample, it

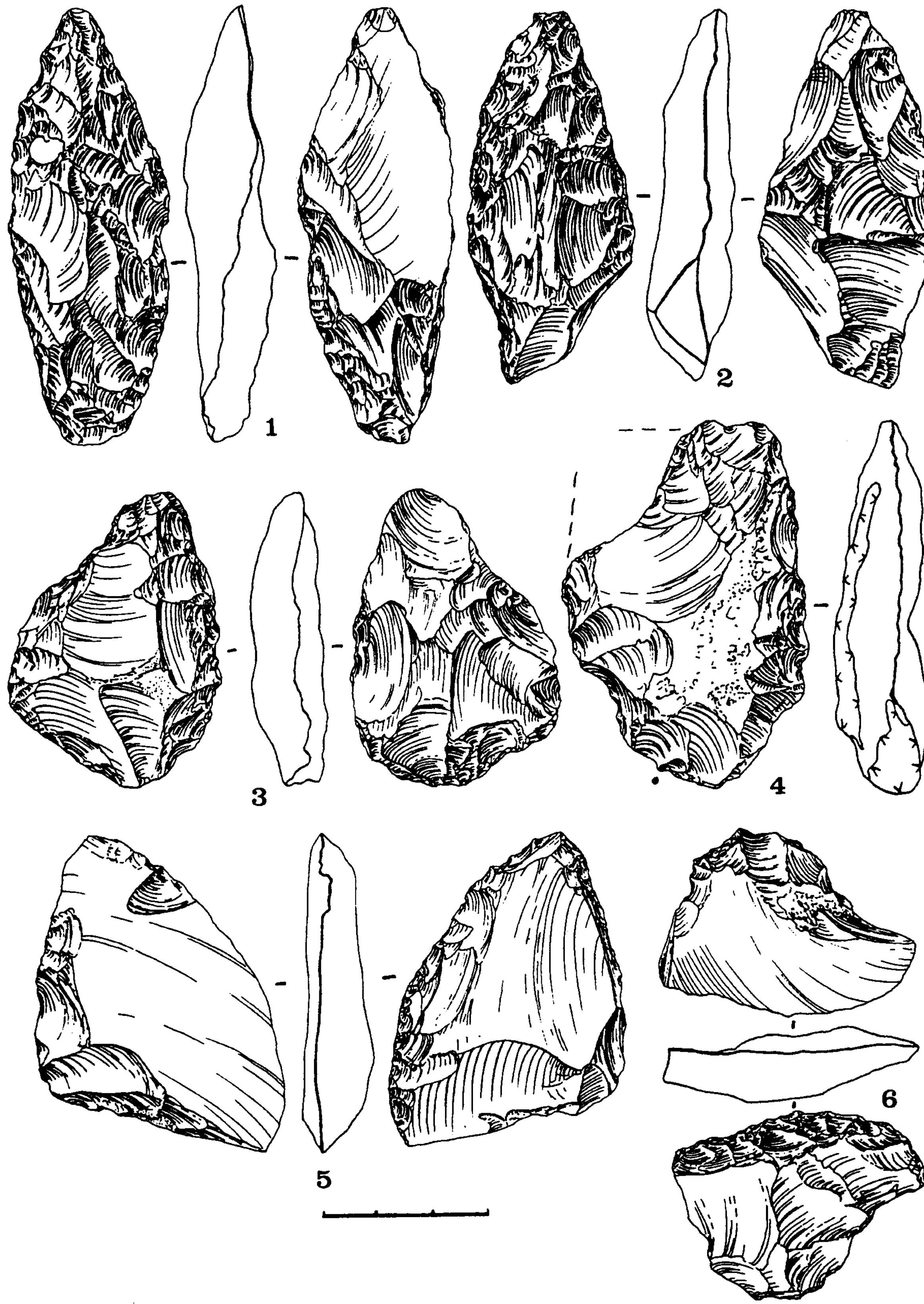


Fig. 8-20—Kabazi II, Unit III, Level III/2 Tools: *1,2*–Bifacial leaf points; *3*–bifacial scraper; *4*–semi-rectangular scraper; *5*–convex thinned back scraper; *6*–transverse-convex thinned base scraper.

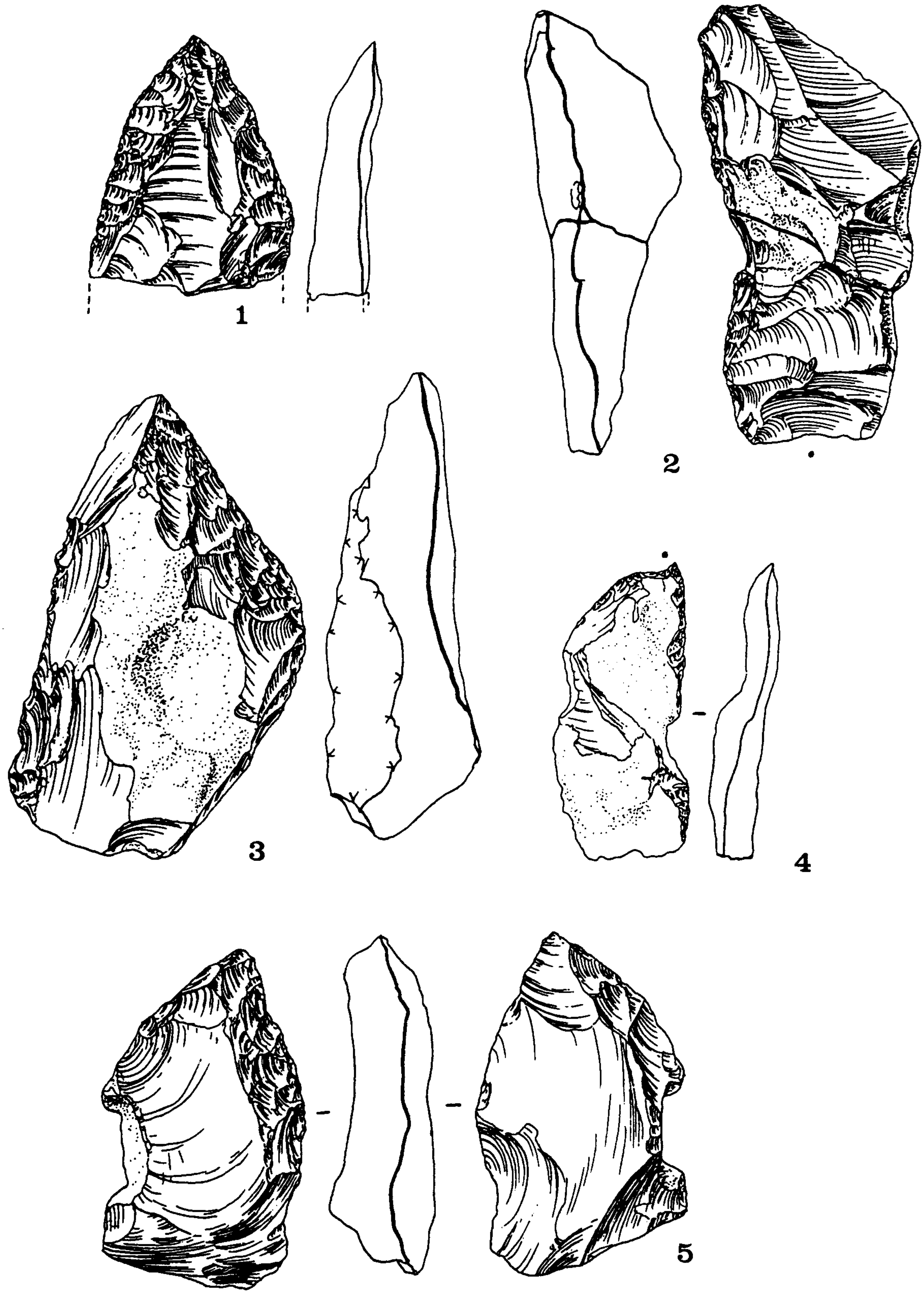


Fig. 8-21—Kabazi II, Unit III, Level III/2 Tools: *1*–point; *2*–simple concave scraper; *3*–simple convex scraper; *4*–retouched piece; *5*–transverse-convex thinned back scraper.

is possible to state that it is similar to Staroselian assemblages. This conclusion is based on the presence of tool types which appear to be characteristic of the Staroselian (Chabai 1991). This assemblage was used to define the lower chronological border of the Staroselian.

The following subdivision of the Staroselian was proposed, based on the stratigraphies of Kabazi II and Kabazi V, as well as on the techno-typological characteristics of their flint assemblages, including the Starosele 1955-56 materials: Stage 1, the flint assemblages of Kabazi V, Unit III and Kabazi II, Unit III; Stage 2, the assemblages of the lower and upper units of Starosele from A. Formozov's 1955-56 excavations; and the derived materials from the Kabazi II, Unit I. The main difference between those two stages was seen in the use of different flaking methods: radial flaking in the Kabazi V, Unit III and parallel flaking at Starosele (Chabai 1991; Chabai and Yevtushenko in press). The recent excavations at Starosele and Kabazi II (see Chapters 7, 9, and 10), indicate that this simple dichotomy needs revision.

Artifacts of Unit IV

More than 700 artifacts were recovered from excavations of 12 m^2. About 100 of them are small flakes with discontinuous, marginal retouch. About 40 more flakes exhibit different types of continuous retouch, mainly marginal. A few pieces have scalar retouch, but even these pieces are hard to define as scrapers, because of the small size and irregular shapes of the blanks (fig. 8-22: *2,4,9,10*). Bifacial tools are represented by three broken pieces (fig. 8-22: *7,13*), as well as by a single complete tool which is less than 4 cm long, but could be called a bifacial converging scraper (fig. 8-22: *3*).

Typologically, this flint assemblage is similar to that of the lower layer of Kiik-Koba (Chabai 1991), but, at the same time, the unclear character of the processes undermines the possible significance of the proposed typological similarity. In any case, based on the stratigraphic position of Unit IV, a Last Interglacial date was proposed, similar to that proposed for Kiik-Koba, lower layer.

The lower horizons at Kabazi II, from -930 to -1145 below datum, have a few flints and bones each. That fact alone suggests the possibility of older occupational surfaces than any so far uncovered.

In sum, Kabazi II appears to contain the longest Paleolithic stratigraphic sequence in Crimea and one of the more significant ones in Eastern Europe. The fact that one profile contains at least three typologically different industries, makes Kabazi II, to date, a unique site in the Crimean Middle Paleolithic. The present study is the continuation of previous investigations and it is still far from completion. In the framework of the present investigation, several problems can be resolved. The most important is establishing the absolute chronology of the Kabazi II archeological sequence. Also important are the definitions of typological and technological variability and patterns of raw material exploitation. The results of the extensive investigations at Kabazi II during last three years and the study of artifacts from recently discovered levels are presented in the following chapters.

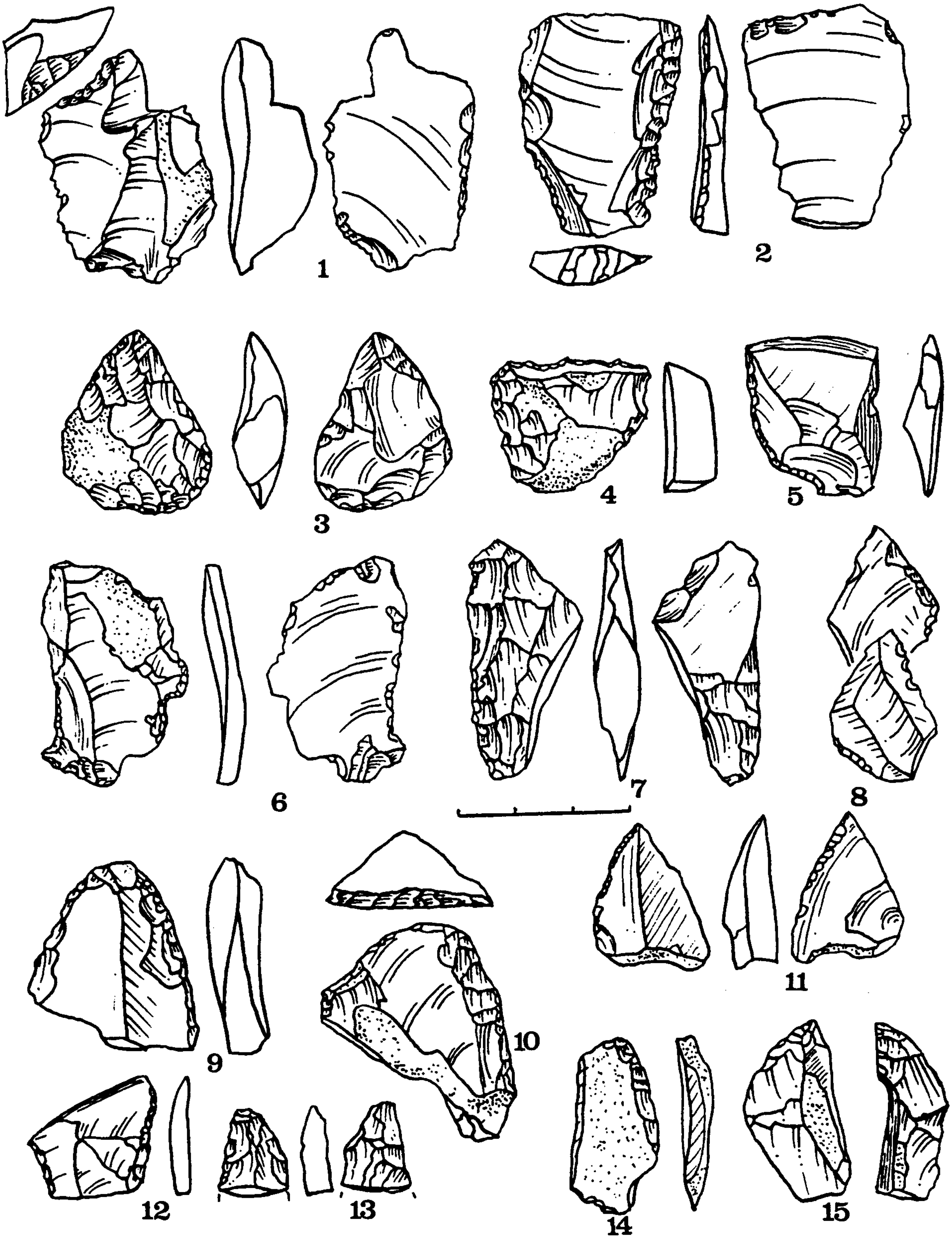


Fig. 8-22—Kabazi II, Unit IV Tools: *1,2,4-6,8-12,14,15*–retouched pieces; *3*–bifacial scraper; *7,13*–fragments of bifacial tools.

Chapter 9

KABAZI II: THE WESTERN CRIMEAN MOUSTERIAN ASSEMBLAGES OF UNIT II, LEVELS II/7-II/8C

VICTOR P. CHABAI

This chapter will provide the description of the artifact assemblages from Kabazi II, Unit II, lower levels, as well as an examination of inter-assemblage variability. The results of the studies indicate that all assemblages belong within the Western Crimean Mousterian (WCM) and, although there is clear evidence for some developmental change, the assemblages, as a group, show strong homogeneity.

THE STRUCTURE OF THE ARTIFACT ASSEMBLAGES

A total of 6,618 artifacts were recovered from Levels II/7 through II/8C of Kabazi II, Unit-II during three field seasons of excavations. In general, flint artifacts include seven major categories: chunks, pre-cores, cores, chips, flakes, blades, and tools. In spite of the same excavated area for each level, and the same mode of distribution of both artifacts and faunal remains, the levels differ in assemblage size and the proportions among the artifact categories. As usual, the most numerous category is the chip, from 60% to 80% of all artifacts, followed by flakes, blades, tools, chunks, cores, and pre-cores (see Table 9-1 for essential counts which exclude chips and chunks).

TABLE 9-1
Kabazi II, Unit II, Artifact Totals

	II/7			*II/7AB*			*II/7C*			*II/7D*		
	N	*%*	*ess %*	*N*	*%*	*ess %*	*N*	*%*	*ess %*	*N*	*%*	*ess %*
Chunks	9	2.8		35	3.7		31	2.5		28	2.6	
Preforms	—	—	—	—	—	—	—	—	—	—	—	—
Pre-cores	2	0.6	1.6	1	0.1	0.3	—	—	—	2	0.2	1.1
Cores	8	2.5	6.3	24	2.5	7.5	11	0.9	4.2	8	0.8	4.3
Chips	186	57.9		590	62.5		965	76.7		847	79.9	
Flakes	107	33.3	84.9	209	22.1	65.5	178	14.1	67.9	124	11.7	67.0
Blades	4	1.2	3.2	49	5.2	15.4	36	2.9	13.7	28	2.6	15.1
Tools	5	1.6	4.0	36	3.8	11.3	37	2.9	14.1	23	2.2	12.4
Total	321			944			1258			1060		

	II/7E			*II/7F8*			*II/8C*		
	N	*%*	*ess %*	*N*	*%*	*ess %*	*N*	*%*	*ess %*
Chunks	21	2.0		38	2.3		11	3.2	
Preforms	—	—	—	—	—	—	—	—	—
Pre-cores	1	0.1	0.4	3	0.2	0.8	—	—	—
Cores	13	1.2	5.3	16	1.0	4.4	—	—	—
Chips	785	74.8		1243	75.5		249	73.5	
Flakes	154	14.7	63.1	247	15.0	67.7	63	18.6	79.8
Blades	59	5.6	24.2	56	3.4	15.3	12	3.5	15.2
Tools	17	1.6	7.0	43	2.6	11.8	4	1.2	5.1
Total	1050			1646			339		

Four types of artifact category configurations, based on essential counts, were defined. The first type, represented by the assemblage from Level II/7, is characterized by low percentages of blades and tools, a normal percentage of cores (ca. 6%), and a somewhat high percentage of flakes when compared to the rest of Unit II (Table 9-1). The second type of artifact patterning, seen in Levels II/7AB, II/7C, II/7D, and II/7F8, has proportionately about four times as many tools and blades as does type 1. The third type of artifact patterning, seen in the assemblage of Level II/7E, is characterized by a high percentage of blades (24.18%), and a somewhat lower percentage of tools than in the assemblages of type 2. The salient feature of the fourth type, seen in the assemblage of Level II/8C, is the complete absence of cores and pre-cores. The percentages of tools and blades in this assemblage type fall between those of types 2 and 3.

All of these levels were excavated over the same horizontal area and had the same kind of artifact and faunal distributions. Taking into account the different densities of both artifacts and fauna per level, it is necessary to explain their differences using a wide range of the typological and technological criteria, and, finally, to study the artifacts from the point of view raw material exploitation.

Level II/7

Pre-cores and Cores

Ten pre-cores and cores were found in Level II/7 (Table 9-2). The Levallois tortoise cores are classic examples: the first is complete, with a triangular flaking surface, and the second is broken. Both Levallois cores are at the stage of exploitation when the main flake was removed. The flaking surfaces of these cores are characterized by centripetal preparation, but only the right supplementary platforms were prepared by a number of removals on the undersurface. In both cases, the width of the supplementary platforms covered no less than 80% of the lateral edges. Levallois flake scars cover most of the flaking surface, removing its whole dorsal convexity. In the case of the complete core, the lengths of Levallois flake scars are about 76% of the length of the flaking surface of the core (Table 9-2).

The parallel core with the ovoid flaking surface is made on a flake (fig. 9-1: *1*). The distal and lateral sides show traces of the convex preparation of the flaking surface, but only on the right side was a supplementary platform prepared along practically its whole length. The main platform is well faceted and distally positioned. Several parallel removals extend practically the whole length of flaking surface (Table 9-2).

The bi-directional rectangular core has two well-faceted opposed platforms without any lateral preparation of the flaking surface. The first platform is more pronounced than the second. It is significantly wider, thicker, and the lengths of the scars from this platform are longer (Table 9-2). Essentially, it is a single platform, parallel core with an opposed supplementary platform used to produce flaking surface convexity.

The discoidal ovoid and the unsystematic cubical cores show several unsuccessful attempts to strike blanks from different directions off unprepared platforms.

Except for the two last pieces, the cores from Level II/7 are characterized by minimal thickness, in comparison to their width and length. The variation in length is from 4.3-6.9 cm, the variation in width is from 4.4-6 cm, while thickness ranges from 0.9-2.6 cm. The lengths of the last scars removed vary from 3.3-5.9 cm.

TABLE 9-2
Kabazi II, Unit II, Cores and Pre-cores

											Supplementary Platforms: Left		Right			
Level	*Core Type*	*Length*	*Width*	*Thickness*	*Plat. 1 Width*	*Plat. 1 Thickness*	*Plat. 1 neg. max. Length*	*Plat. 2 Width*	*Plat. 2 Thickness*	*Plat. 2 neg. max. Length*	*Width*	*Max. Negative Width*	*Width*	*Neg. max. length*	*Comments*	*TOTAL*
II/7	**DISCOIDAL**															
	Ovoid	6	5	2.3	–	–	–	–	–	–	–	–	–	–		1
	LEVALLOIS TORTOISE															
	Triangular															
	flat	5.5	5	1.2	1.5	1	4.2	–	–	–	–	–	4.1	1.2	FPl	1
	Broken															
	naturally flat	>4.6	>5	0.9	>4	0.9	>4.6	–	–	–			>3.9	2.1	FPl	1
	PARALLEL															
	Ovoid															
	convex	6.9	6	2.2	4	2.1	5.9	–	–	–	–	–	5.5	2.3	FPl, moF	1
	BI-DIRECTIONAL															
	Rectangular															
	convex	4.7	5.1	1.7	4.2	1.2	3.3	3.6	0.1	1.3	–	–	–	–	FPl	1
	UNSYSTEMATIC															
	Cubic															
	multiplatforms	4.3	4.4	2.6	–	–	–	–	–	–	–	–	–	–		1
	UNIDENTIFIABLE															
	exhausted/broken	–	–	–	–	–	–	–	–	–	–	–	–	–		2
	PRE-CORES															
	parallel	6.7	3	4.8	1.3	3	–	–	–	–	–	–	–	–	FPl	1
	single crested ridge	5.8	3.5	5.6	3.9	5.1	–	–	–	–	–	–	–	–		1
	TOTAL:															**10**
II/7AB	**DISCOIDAL**															
	Ovoid	4	3.8	1.7	–	–	–	–	–	–	–	–	–	–		1
	LEVALLOIS TORTOISE															
	Ovoid															
	flat	7.1	6.8	3.1	5	3.1	1.8	5.9	1.8	3.2	–	–	4.6	2.7	unst.,2FPl	1
	Broken															
	flat	>6.4	5.1	1.3	–	–	–	3.3	0.9	1.6	>6.3	4.4	>4.9	2.1	unst.,Fpl	1
	CONVERGENT TRANSVERSE															
	Rectangular															
	flat	5.1	5.9	1.1	5.7	1	4.1	–	–	–	4	1.3	4.4	1.7	FPl.,moF	1
	PARALLEL															
	Rectangular															
	flat	6.5	5.9	3.8	4.2	1.5	5.8	–	–	–	–	–	–	–	FPl	1
	convex	5.2	4.7	3	4.6	2.6	4.6	2.2	0.1	3	2.6	1	–	–		1
	Triangular															
	naturally flat	6.5	5.5	2	4.2	1.7	4.6	1.6	1.5	1.8	4.2	1.6	–	–	Pl.2-sp,FPl	1
	Sub-Cylindrical															
	naturally flat	7.4	5.2	2.3	4.1	2.2	7.4	–	–	–	–	–	–	–	vol.,latFPl.	1
	Narrow Flaked Surface															
	naturally flat	6.4	2.3	4.2	2.6	3.3	3.4	–	–	–	–	–	–	–	CrBpr.,h.f.	1
	Broken															
	flat	>4.6	>4.2	1.8	>4.1	1.6	>4.3	–	–	–	–	–	–	–	FPl	1
	flat	6.3	>5.9	2.8	4.9	2	5.7	–	–	–	–	–	–	–	FPl	1
	PARALLEL TRANSVERSE															
	Rectangular															
	naturally flat	5.6	6.7	2	5.3	1.1	5.6	–	–	–	–	–	–	–		1
	naturally flat	5.5	6.4	1.7	5.1	0.9	5.5	–	–	–	–	–	3.7	0.9		1
	BI-DIRECTIONAL TRANSVERSE															
	Rectangular															
	naturally flat	6.6	7.5	2.3	4.6	1.6	3.7	3	1.6	4.3	–	–	–	–		1
	BI-DIRECTIONAL															
	Rectangular															
	naturally flat	5.5	4.6	1.2	3.3	0.7	3.1	3.6	0.7	3	3.8	1.5	4.7	1.9		1
	naturally flat	6.9	5.6	1	4.7	1.7	3.3	2.6	0.9	4.5	–	–	3.5	0.8	FPl	1
	UNIDENTIFIABLE															
	exhausted/broken	–	–	–	–	–	–	–	–	–	–	–	–	–		8
	PRE-CORES															
	bi-directional	6.2	5.6	2.2	3.4	1.3	2.3	3.3	1.7	–	–	–	–	–	FPl.,moF	1
	TOTAL:															**25**

TABLE 9-2 *continued*

											Supplementary Platforms					
											Left		Right			
Level	*Core Type*	*Length*	*Width*	*Thickness*	*Plat. 1 Width*	*Plat. 1 Thickness*	*Plat. 1 neg. max. Length*	*Plat. 2 Width*	*Plat. 2 Thickness*	*Plat. 2 neg. max. Length*	*Width*	*Max. Negative Width*	*Width*	*Neg. max. length*	*Comments*	*TOTAL*
II/7C	**RADIAL**															
	Broken															
	naturally flat	5.5	>4.3	1.9	–	0.1	3.3	–	–	–	–	–	–	–		1
	naturally flat	6.4	>4.9	1.8	–	0.1	3.5	–	–	–	–	–	–	–		1
	LEVALLOIS TORTOISE															
	Ovoid															
	convex	5.4	5.1	1.9	4	1,8	3.5	–	–	–	0.6	2	0.1	2.3	FPl	1
	CONVERGENT TRANSVERSE															
	Rectangular															
	flat	4	6.4	2.3	4.3	1.7	5.2	–	–	–	–	–	–	–	FPl.,moF	1
	PARALLEL															
	Rectangular															
	naturally flat	>5.6	4	2.7	4.2	2.3	>2.7	–	–	–	>3.8	2.7	–	–		1
	naturally flat	>6.9	>6.1	2.8	6	2.8	>5.7	–	–	–	–	–	–	–		1
	BI-DIRECTIONAL															
	Rectangular															
	naturally flat	6.4	7.1	1.7	4.9	1.6	8.8	2.2	0.1	3.5	–	–	–	–	moF	1
	Sub-Cylindrical															
	naturally flat	9.9	5.3	3	4	3.2	9.2	2.4	4	7.1	–	–	–	–	vol.	1
	Narrow Flaked Surface															
	convex	6.3	2,7	3.5	4.3	2.2	3.8	3.3	1.8	2.8	–	–	–	–	FPl	1
	BI-DIRECTIONAL ALTERNATE															
	Rectangular	4.8	4.4	2.5	2.8	2.6	4	3.5	2.2	3.2	>0.1	1.9	>0.1	2.1		1
	ORTHOGONAL															
	Broken															
	naturally flat	>3.9	4.8	1.7	4.8	1.7	>3.6	–	–	>3.3	–	–	–	–	FPl	1
	TOTAL:															**11**
II/7D	**RADIAL**															
	Rectangular															
	convex	4.8	4.9	3.2	–	–	–	–	–	–	–	–	–	–	FPl	1
	LEVALLOIS TORTOISE															
	Ovoid															
	flat	7.1	7.5	2.6	6.4	2	7.2	–	–	–	–	–	–	–	FPl	1
	PARALLEL															
	Sub-Cylindrical															
	convex	4.4	3.5	2.7	3	2.5	4.2	–	–	–	–	–	2.9	1.3	vol.	1
	BI-DIRECTIONAL															
	Rectangular															
	flat	4.4	4.4	1.5	3.3	0.9	3	2.8	1.5	1.9	3.5	2.5	–	–		1
	naturally flat	6	6	1.5	6	1.2	4.1	3.3	0.8	2.8	–	–	2.9	2.1	FPl	1
	BI-DIRECTIONAL CONJOINED															
	Sub-Cylindrical															
	flat	6.1	4	2.4	2.2	1.2	6.1	3.3	2.7	5.3	–	–	–	–	vol.	1
	UNIDENTIFIABLE															
	exhausted/broken	–	–	–	–	–	–	–	–	–	–	–	–	–		2
	PRE-CORES															2
	TOTAL:															**10**
II/7E	**RADIAL**															
	Ovoid															
	convex	5.9	5.7	2	–	1.7	3.5	–	–	–	–	–	–	–	FPl	1
	convex	5	5.1	3.1	–	2	3.9	–	–	–	–	–	–	–	FPl	1
	PARALLEL															
	Rectangular															
	naturally flat	5.2	5.1	1.3	5.1	1.1	5.2	–	–	–	–	–	–	–	FPl.,overp.	1
	Narrow Flaked Surface															
	crested ridge	5.9	2.9	5.4	3.6	4.1	5.4	–	–	–	–	–	–	–		1

TABLE 9-2 *continued*

											Supplementary Platforms					
											Left		Right			
Level	*Core Type*	*Length*	*Width*	*Thickness*	*Plat. 1 Width*	*Plat. 1 Thickness*	*Plat. 1 neg. max. Length*	*Plat. 2 Width*	*Plat. 2 Thickness*	*Plat. 2 neg. max. Length*	*Width*	*Max. Negative Width*	*Width*	*Neg. max. length*	*Comments*	*TOTAL*
	Unidentifiable															
	broken	7.8	>2.1	>4.8	>4.8	2.8	7.8	–	–	–	–	–	–	–		1
	broken	>7.8	>4.6	>2.9	–	–	–	–	–	–	–	–	–	–		1
	BI-DIRECTIONAL															
	Rectangular															
	naturally flat	6.7	5.4	1.3	3.9	0.7	4	3.3	1.2	4.6	6.4	1.2	5.6	1.5	FPl	1
	convex	7.8	5.4	2.5	5.4	2.3	5.6	2.5	0.4	4.5	6.6	1.9	–	–	FPl	1
	naturally flat	8.1	5.3	1.7	2.7	1.2	5.8	3.9	1.2	3.7	–	–	–	–	FPl	1
	BI-DIRECTIONAL ALTERNATE															
	Ovoid															
	flat	7.2	7.1	2.7	6	3.3	6.3	4.9	3.2	6.3	5	2.1	–	–	FPl	1
	UNIDENTIFIABLE															
	exhausted/broken	–	–	–	–	–	–	–	–	–	–	–	–	–		3
	PRE-CORES															
	crested ridge/bi-direct.	7.4	2.8	3.5	2.1	4.8	2.4	2.7	3.6	3.8	–	–	–	–		1
	TOTAL:															**14**
II/7F8	**RADIAL**															
	Ovoid															
	convex	5.3	4.4	2.2	–	1.3	3.3	–	–	–	–	–	–	–	FPl	1
	naturally flat	8.7	8.8	1.3	–	0.8	5	–	–	–	–	–	–	–	FPl	1
	LEVALLOIS TORTOISE															
	Rectangular															
	naturally flat	7	6.5	1.6	5.6	2	7	–	–	–	3.8	1.8	6.4	1.8	FPl	1
	flat	5.5	5	1.4	4	1	2.8	–	–	–	4.4	2.3	3.9	2.4	lat.FPl.,h.f.	1
	Triangular															
	naturally flat	7.2	7.8	2.1	7.7	1.5	5.9	–	–	–	6	2	5.8	1.5	FPl.,moF	1
	Broken															
	naturally flat	>4.8	7.2	1.4	4.6	1	>4.8	–	–	–	–	–	–	–	FPl	1
	PARALLEL															
	Rectangular															
	naturally convex	5.3	4.4	1.6	4.1	1.3	3.9	–	–	–	–	–	–	–		1
	Broken															
	naturally flat	>7.3	>4.4	>2.4	4.7	1.2	>7.3	–	–	–	–	–	–	–		1
	BI-DIRECTIONAL															
	Rectangular															
	naturally flat	6.5	5.5	1.1	5.5	0.6	4.4	3.8	0.7	4	4.8	1.1	4.3	1.2		1
	naturally flat	6	5	1.9	4.6	0.8	3.7	3.6	1	3.2	4	–	3.6	1.1		1
	Triangular															
	naturally flat	>4.8	4.1	1.3	4	1.6	4.1	–	–	–	–	–	–	–	moF	1
	UNIDENTIFIABLE															
	exhausted/broken	–	–	–	–	–	–	–	–	–	–	–	–	–		4
	PRE-CORES															
	radial	7.2	6.6	2.7	–	0.8	5	–	–	–	–	–	–	–	unfin.Lev.core	1
	crested ridge	–	–	–	–	–	–	–	–	–	–	–	–	–		3
	TOTAL:															**19**
	UNIT II - TOTALS: 89															

Abbreviations

FPl -	faceted platform
lat.FPl -	lateral faceted platform
2FPl -	two opposite faceted platform
Pl.2-sp. -	two opposite platform, one of them - supplementary
moF -	made on flake
unfin.Lev.core -	unfinished Levallois core
unst -	unstruck Levallois flake
vol -	volumetric flaking surface
CrBpr -	crested blade preparation of the flaking surface
overp -	overpassed removal on the flaking surface
h.f. -	hinge fracture removal on the flaking surface

Blanks

Level II/7 contains 116 blanks. Of that number, 109 are flakes, two of which are retouched. Blades are represented by only 7 pieces (3 retouched, which are also included in the number of blanks). Thus, because of the poor sample, all debitage will be described together.

Dorsal Scar Patterns. There are 10 main types of dorsal scar patterns on flakes and blades from Level II/7 (Table 9-3). The most common, by far, are pieces with converging scar patterns, of which more than 40% have some cortex. 23.5% of pieces with this type of scar pattern are wider than they are long.

The second most common scar pattern is uni-directional-crossed, of which about 70% are partly covered by cortex, but only 3 pieces of this type are wider than long. The third most common pattern is bi-directional, and half of them are partly cortex covered.

Other dorsal scar patterns are represented by only a few pieces each. It must be noted, however, that 9% are wholly cortical. An important factor is the presence of Levallois flakes and *pièces débordantes* (Table 9-3).

The dorsal scar pattern on the *pièces débordantes* (6 pieces) is crested. At the same time, that definition is too generalized. The real crested pattern, seen on three examples, has dorsal scars originating only from the crest. The other three blanks show not only scars from the crest, but also uni-directional (one flake) or bi-directional (one flake and one blade) scars from the removals after the crest formation. Four of the six *pièces débordantes* have at least 25% cortex and all have the lateral steep cross-section at midpoint.

The Levallois pieces include a broken flake with a centripetal dorsal scar pattern and a complete blade with the same scar pattern, but with a small cortical area near the butt (fig. 9-2: *4*).

TABLE 9-3
Kabazi II, Unit II, Flake Dorsal Scar Patterns

	II/7	*II/7AB*	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*Total*
Covered by cortex	9.2	16.3	12.2	8.0	9.8	9.0	10.4	11.0
Lateral	3.7	5.7	5.9	5.1	4.3	7.8	—	5.5
Radial	4.6	5.7	5.4	2.2	5.5	7.2	11.9	5.8
Converging	27.5	17.6	18.1	20.3	17.2	20.4	17.9	19.5
Uni-directional	6.4	16.3	22.9	17.4	16.6	15.1	17.9	16.5
Uni-directional-crossed	21.1	13.7	9.8	15.2	17.8	13.6	16.4	14.6
Bi-directional	12.8	11.5	9.8	15.2	12.3	12.2	17.9	12.5
Bi-directional-crossed	7.3	4.0	6.8	5.8	7.4	4.7	4.5	5.6
4-directional	0.9	0.4	—	0.7	—	—	—	0.3
Crested	4.6	5.3	6.2	4.3	6.1	4.3	1.5	5.0
Levallois	0.9	2.6	2.9	2.9	1.8	4.3	—	2.7
Unidentifiable	—	0.9	—	2.9	1.2	1.4	1.5	1.1
N	109	227	205	138	163	279	67	1188

Shape. There are 9 blank shapes (Table 9-4). The most common is rectangular. Other shapes include ovoid, triangular, trapezoidal, elongated trapezoidal, irregular, expanding, and crescent, but which occur only in small numbers. The correlation of shape geometry and axis of blank removal shows that off-axis blanks are most numerous (Table 9-5), in spite of the normal rectangular blank shape.

Profiles and Cross-Sections. In general, lateral profiles from Level II/7 are flat (Table 9-6). Medially incurvate blanks are half as numerous as flat blanks; distally incurvate, twisted, convex, and unidentifiable are rare. Among the distal profiles (Table 9-7) the feathered type

TABLE 9-4
Kabazi II, Unit II, Flake Shape as Percentages of Each Type

	II/7	II/7AB	II/7C	II/7D	II/7E	II/7F8	II/8C	N	ess %
Rectangular	35.8	23.3	38.5	30.4	40.5	24.0	20.9	360	42.01
Triangular	7.3	6.2	8.8	10.1	6.7	10.0	7.5	98	11.43
Trapezoidal	12.8	21.6	10.2	13.8	19.0	18.6	6.0	190	22.17
Trapezoidal elongated	1.8	—	—	—	—	0.4	—	3	0.35
Ovoid	2.8	3.5	5.9	5.8	4.9	5.7	13.4	64	7.46
Leaf shaped	—	1.8	0.5	—	1.2	1.8	—	12	1.4
Crescent	6.4	0.9	3.4	2.9	2.5	1.8	—	29	3.38
Expanding	3.7	2.2	2.4	5.1	4.9	2.1	1.5	36	4.2
Irregular	10.1	6.2	5.9	2.2	1.8	5.0	11.9	65	7.58
Unidentifiable	19.3	34.4	24.4	29.7	18.4	30.5	38.8	331	—
N	109	227	205	138	163	279	67	1188	857

TABLE 9-5
Kabazi II, Unit II, Flake Axis as Percentages of Each Type

	II/7	II/7AB	II/7C	II/7D	II/7E	II/7F8	II/8C	N	ess %
On-axis	37.6	32.6	44.4	41.3	39.3	41.6	40.3	470	50.6
Off-axis	49.5	40.5	29.8	33.3	46.0	39.4	29.9	458	49.4
Unknown	12.8	26.9	25.9	25.4	14.7	19.0	29.9	260	
N	109	227	205	138	163	279	67	1188	928

TABLE 9-6
Kabazi II, Unit II, Flake Lateral Profiles as Percentages of Each Type

	II/7	II/7AB	II/7C	II/7D	II/7E	II/7F8	II/8C	N	ess %
Flat	45.9	36.6	42.4	51.4	58.8	53.1	44.8	564	51.2
Incurvate medial	22.9	20.7	31.2	11.6	22.1	19.0	34.3	264	24.0
Incurvate distal	11.0	15.0	7.3	13.0	6.1	3.9	6.0	104	9.4
Twisted	11.0	11.0	7.8	10.1	8.0	12.5	1.5	116	10.5
Convex	1.8	5.7	6.3	5.1	2.5	3.9	6.0	54	4.9
Unidentifiable	7.3	11.0	4.9	8.7	3.1	7.5	7.5	86	
N	109	227	205	138	163	279	67	1188	1102

TABLE 9-7
Kabazi II, Unit II, Flake Distal Profiles as Percentages of Each Type

	II/7	II/7AB	II/7C	II/7D	II/7E	II/7F8	II/8C	N	ess %
Feathering	57.8	55.5	58.5	54.3	55.8	45.8	53.7	639	72.1
Hinged	11.0	8.8	11.7	15.9	12.3	10.8	13.4	137	15.5
Overpassed	4.6	6.6	2.4	1.5	1.2	1.8	—	34	3.8
Blunt	10.1	10.0	1.5	2.9	7.4	7.5	4.5	76	8.6
Missing	16.5	19.4	25.9	25.4	23.3	34.1	28.4	302	
N	109	227	205	138	163	279	67	1188	886

TABLE 9-8
Kabazi II, Unit II, Flake Cross-Section at Midpoint as Percentages of Each Type

	II/7	*II/7AB*	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*ess %*
Flat	0.9	5.3	1.0	—	—	2.9	—	23	1.9
Triangular	40.4	39.6	35.1	37.0	39.3	36.2	46.3	453	38.1
Lateral steep	12.8	7.1	9.3	8.7	8.0	9.0	4.5	102	8.6
Trapezoidal	29.4	24.3	34.1	35.5	33.7	32.6	22.4	367	30.9
Bi-convex	—	—	—	1.4	—	—	—	2	0.2
Irregular	3.7	5.7	5.4	4.3	2.5	1.8	7.5	48	4.0
N	109	227	205	138	163	279	67	1188	

prevails; hinged, overpassed, and blunt are uncommon. Triangular and trapezoidal midpoint cross-sections are common (Table 9-8), and half of those with lateral steep cross-section are *pièces débordantes*. Pieces displaying a crescent-shaped cross-section are all wholly cortical flakes.

Platforms. There are 67 identifiable platforms, 23 of which are unfaceted, and 11 of which are dihedral faceted (Table 9-9). Among the multiple faceted platforms, straight faceted platforms are the most representative. There is one lateral multiple faceted and 7 lateral plain platform, as well.

Real lipped platforms are relatively rare: 11 out of 65 identifiable examples. The number of unlipped is approximately double that. At the same time, semi-lipped platforms comprise about one-half of all identifiable butts (Table 9-10).

TABLE 9-9
Kabazi II, Unit II, Flake and Blade Platform Types as Percentages

		cortex	*plain*	*lateral plain*	*dihedral*	*faceted*	*lateral faceted*	*N ident.*	*N crushed*	*N missing*	*miss. by retouch*	*N Total*
II/7	Blades	—	—	—	50.0	50.0	—	2	1	3	1	7
	Flakes	3.1	35.4	10.8	15.4	33.8	1.5	65	8	36	—	109
	Total	*3.0*	*34.3*	*10.4*	*16.4*	*34.3*	*1.5*	*67*	*9*	*39*	*1*	*116*
II/7AB	Blades	2.9	17.1	8.6	11.4	57.1	2.9	35	4	26	2	67
	Flakes	14.0	27.9	15.5	9.3	29.5	3.9	129	23	75	—	227
	Total	*11.6*	*25.6*	*14.0*	*9.8*	*35.4*	*3.7*	*164*	*27*	*101*	*2*	*294*
II/7C	Blades	3.6	17.9	7.1	10.7	46.4	14.3	28	6	12	—	46
	Flakes	15.3	17.5	13.1	16.1	33.6	4.4	137	10	58	—	205
	Total	*13.3*	*17.6*	*12.1*	*15.2*	*35.8*	*6.1*	*165*	*16*	*70*	—	*251*
II/7D	Blades	—	58.8	5.9	11.8	23.5	—	17	2	15	3	37
	Flakes	13.8	14.9	10.6	10.6	44.7	5.3	94	11	32	1	138
	Total	*11.7*	*21.6*	*9.9*	*10.8*	*41.4*	*4.5*	*111*	*13*	*47*	*4*	*175*
II/7E	Blades	—	22.0	2.4	7.3	68.3	—	41	6	19	1	67
	Flakes	11.7	21.7	10.8	7.5	48.3	—	120	10	33	—	163
	Total	*8.7*	*21.7*	*8.7*	*7.5*	*53.4*	—	*161*	*16*	*52*	*1*	*230*
II/7F8	Blades	—	9.4	—	21.9	65.6	3.1	32	9	24	2	67
	Flakes	9.8	28.2	5.7	12.6	43.1	0.6	174	29	76	—	279
	Total	*8.3*	*25.2*	*4.9*	*14.1*	*46.6*	*1.0*	*206*	*38*	*100*	*2*	*346*
II/8C	Blades	—	20.0	—	—	80.0	—	5	1	6	—	12
	Flakes	4.9	29.3	4.9	14.6	41.5	4.9	41	6	20	—	67
	Total	*4.4*	*28.3*	*4.4*	*13.0*	*45.7*	*4.4*	*46*	*7*	*26*	—	*79*
N Blades		0.7	21.4	4.4	12.5	56.9	3.8	160	29	105	9	303
N Flakes		11.4	24.2	10.5	12.0	39.2	2.6	760	97	330	1	1188

TABLE 9-10
Kabazi II, Unit II, Flake and Blade Platform Lipping as Percentages of Each Type

	II/7		II/7AB		II/7C		II/7D		II/7E	
	blades	*flakes*	*blades*	*flakes*	*blades*	*flakes*	*blades*	*flakes*	*blades*	*flakes*
Unlipped	14.3	21.1	13.4	20.3	21.8	31.2	18.9	31.9	17.9	29.5
Semi-lipped	14.3	26.6	34.3	23.8	28.3	26.3	24.3	31.9	40.3	36.2
Lipped	14.3	8.3	4.5	6.6	6.5	7.8	—	4.3	3.0	6.7
Unknown	57.2	44.0	47.8	49.4	43.5	34.6	56.8	31.9	38.8	27.6
N	7	109	67	227	46	205	37	138	67	163

	II/7F8		II/8C		Total N		Total ess %	
	blades	*flakes*	*blades*	*flakes*	*blades*	*flakes*	*blades*	*flakes*
Unlipped	22.4	26.2	33.3	38.8	57	324	36.8	44.4
Semi-lipped	19.4	30.5	8.3	11.9	87	333	56.1	45.7
Lipped	3.0	3.9	—	6.0	11	72	7.1	9.9
Unknown	55.2	39.4	58.3	43.3	148	459		
N	67	279	12	67	303	1188	155	729

Thus, the debitage of Level II/7 may be characterized by: (1) a dominance of blanks with convergent and uni-directional-crossed dorsal scar patterns; (2) a high percentage of completely and partly cortical blanks—52.2% of all blanks; (3) a dominance of rectangular shaped blanks; (4) a dominance of off-axis oriented blanks; (5) a dominance of blanks with flat profiles in association with feathered distal ends and either triangular or trapezoidal midpoint cross-sections; (6) a dominance of semi-lipped platforms; (7) an extremely low percentage of blades (Ilam = 6.42%), which is very unusual for a Western Crimean Mousterian assemblage; (8) a moderate level of faceted platforms for a WCM assemblage: IF = 53.8, IFs = 36.9; and, (9) a mean blank length of 4.02 cm, a mean blank width of 3.28 cm, and a mean blank thickness of 0.61 cm.

Tools

Only 5 tools were recovered in Level II/7: a point; two scrapers, one semi-crescent and one sub-triangular; and two laterally retouched flakes (Table 9-11). The point and the scrapers are made on blades. The point is semi-crescent obverse, shaped by marginal and scalar flat retouch (fig. 9-3: *9*). The same types of retouch were used for retouching the semi-crescent obverse sidescraper (fig. 9-4: *1*). The sub-triangular dorsal scraper was shaped by steep scalar and sub-parallel semi-steep retouch. The point of that scraper is made on the proximal end of the blank (fig. 9-5: *3*).

TABLE 9-11
Kabazi II, Unit II, Tool Classification

		II/7	II/7AB	II/7C	II/7D	II/7E	II/7F8	II/8C	N	%	ess %
Points		***1***	***5***	***4***	***2***	**–**	***3***	**–**	***15***	***9.1***	***18.3***
Levallois	dorsal	–	–	1	–	–	–	–	**1**	0.6	**1.2**
Lateral	dorsal	–	1	–	–	–	–	–	**1**	0.6	**1.2**
Distal	dorsal	–	2	–	–	–	–	–	**2**	1.2	**2.4**
	alternate	–	–	1	–	–	–	–	**1**	0.6	**1.2**
Sub-Triangular	dorsal	–	–	–	1	–	1	–	**2**	1.2	**1.2**
Semi-Crescent	dorsal	1	–	1	–	–	–	–	**2**	1.2	**3.7**
Sub-Crescent	dorsal	–	1	–	–	–	–	–	**1**	0.6	**1.2**
Semi-Leaf	dorsal	–	–	1	–	–	–	–	**1**	0.6	**1.2**
Sub-Leaf	dorsal	–	–	–	–	–	2	–	**2**	1.2	**2.4**
Willow Leaf	dorsal	–	1	–	–	–	–	–	**1**	0.6	**1.2**
Unidentifiable	dorsal	–	–	–	1	–	–	–	**1**	0.6	**1.2**

TABLE 9-11 *continued*

		II/7	*II/7AB*	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*%*	*ess %*
Scrapers		*2*	*10*	*11*	*4*	*9*	*16*	*2*	***54***	*32.7*	***65.9***
Transv.-Straight	dorsal	–	–	–	–	–	2	–	**2**	1.2	**2.4**
Straight	dorsal	–	3	3	–	3	3	2	**14**	8.5	**17.1**
	dorsal, *backed*	–	1	–	–	–	–	–	**1**	0.6	**1.2**
	dorsal, *truncated-faceted*	–	1	–	–	–	–	–	**1**	0.6	**1.2**
Convex	dorsal	–	1	4	1	–	5	–	**11**	6.7	**13.4**
	dorsal, *backed*	–	1	–	–	–	1	–	**2**	1.2	**2.4**
	dorsal, *thinned back*	–	–	–	–	–	1	–	**1**	0.6	**1.2**
	dorsal, *truncated-faceted*	–	–	–	–	–	1	–	**1**	0.6	**1.2**
Concave	dorsal	–	–	1	–	–	–	–	**1**	0.6	**1.2**
Double-Straight	dorsal	–	1	1	–	–	–	–	**2**	1.2	**2.4**
Straight-Convex	dorsal	–	1	–	–	2	1	–	**4**	2.4	**4.9**
Bi-Convex	dorsal	–	–	–	–	1	–	–	**1**	0.6	**1.2**
	ventral	–	–	–	–	–	1	–	**1**	0.6	**1.2**
Semi-Rectangular	dorsal	–	–	–	1	1	–	–	**2**	1.2	**2.4**
Sub-Triangular	dorsal	–	–	–	1	2	–	–	**3**	1.8	**3.7**
	dorsal, *backed*	1	–	–	–		–	–	**1**	0.6	**1.2**
	dorsal, *backed/distal thinned*	–	–	1	–	–	–	–	**1**	0.6	**1.2**
Semi-Crescent	dorsal	1	–	–	1	–	–	–	**2**	1.2	**2.4**
Sub-Crescent	dorsal	–	–	1	–	–	–	–	**1**	0.6	**1.2**
Sub-Leaf	dorsal	–	1	–	–	–	–	–	**1**	0.6	**1.2**
Convergent	dorsal	–	–	–	–	–	1	–	**1**	0.6	**1.2**
Denticulates		–	*1*	*1*	–	–	*2*	–	***4***	*2.4*	***4.9***
Straight	dorsal	–	–	1	–	–	–	–	**1**	0.6	**1.2**
	dorsal, *bi-truncated-faceted*	–	–	–	–	–	2	–	**2**	1.2	**2.4**
Concave	dorsal	–	1	–	–	–	–	–	**1**	0.6	**1.2**
Notches		–	–	*1*	*1*	*2*	*1*	–	***5***	*3.0*	***6.1***
Lateral	dorsal	–	–	1	–	1	–	–	**2**	1.2	**2.4**
	alternating	–	–	–	1	–	–	–	**1**	0.6	**1.2**
	ventral	–	–	–	–	1	1	–	**2**	1.2	**2.4**
Burins		–	–	–	–	*1*	–	–	***1***	*0.6*	***1.2***
On Truncation	proximal	–	–	–	–	1	–	–	**1**	0.6	**1.2**
Borers		–	–	–	–	*1*	–	–	***1***	*0.6*	***1.2***
Sub-Triangular	dorsal	–	–	–	–	1	–	–	**1**	0.6	**1.2**
Battered Pieces		–	–	–	*1*	–	–	–	***1***	*0.6*	***1.2***
Lateral	alternating	–	–	–	1	–	–	–	**1**	0.6	**1.2**
Bi-Truncated-Faceted		–	–	–	*1*	–	–	–	***1***	*0.6*	***1.2***
Distal-Proximal	unretouched	–	–	–	1	–	–	–	1	0.6	1.2
Retouched Pieces		*2*	*18*	*20*	*13*	*4*	*19*	*2*	***78***	*47.3*	
Lateral	dorsal	2	17	16	11	3	17	1	**67**	40.6	
	ventral	–	–	–	2	–	–	1	**3**	1.8	
	alternating	–	1	–	–	–	–	–	**1**	0.6	
Bi-Lateral	dorsal	–	–	3	–	1	1	–	**5**	3.0	
	alternate	–	–	1	–	–	–	–	**1**	0.6	
Distal	alternating	–	–	–	–	–	1	–	**1**	0.6	
Unidentifiable		–	*2*	–	*1*	–	*2*	–	***5***	*3.0*	
Lateral	dorsal	–	2	–	1	–	1	–	**4**	2.4	
Distal	dorsal	–	–	–	–	–	1	–	**1**	0.6	
TOOLS TOTAL		*5*	*36*	*37*	*23*	*17*	*43*	*4*	***165***	*1.0*	

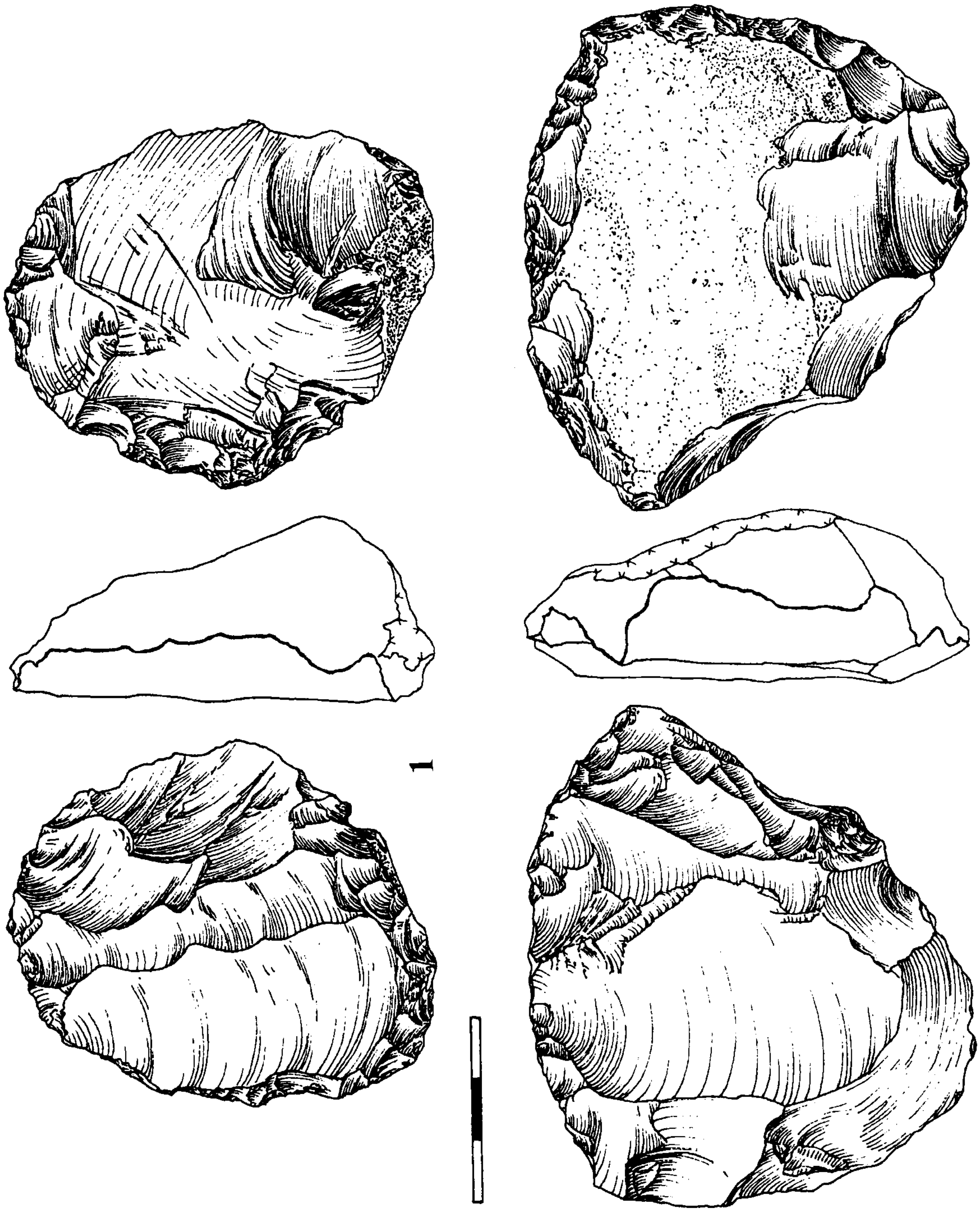


Fig. 9-1—Kabazi II, Unit II, Levels II/7 (*1*) and II/7F8 (*2*), Cores made on flakes: *1*–parallel ovoid; 2–Levallois tortoise triangular.

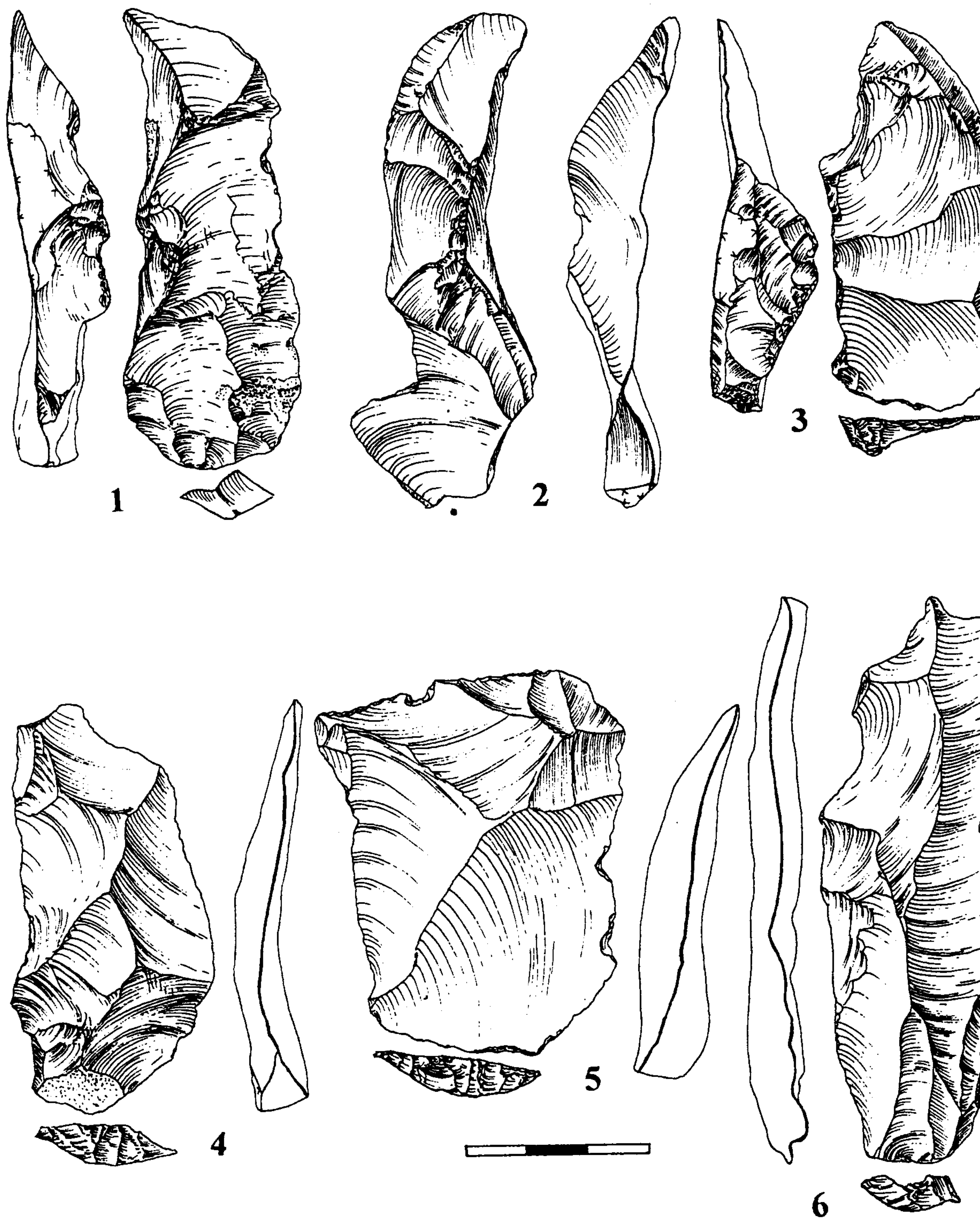


Fig. 9-2—Kabazi II, Unit II, Levels II/7 *(4)*, II/7AB *(6)*, II/7C *(5)*, II/7D *(1, 2)*, and II/7F8 *(3)*, Blanks: *1-3–pièces débordantes*; *4,5*–Levallois pieces; *6–enlèvement deux*.

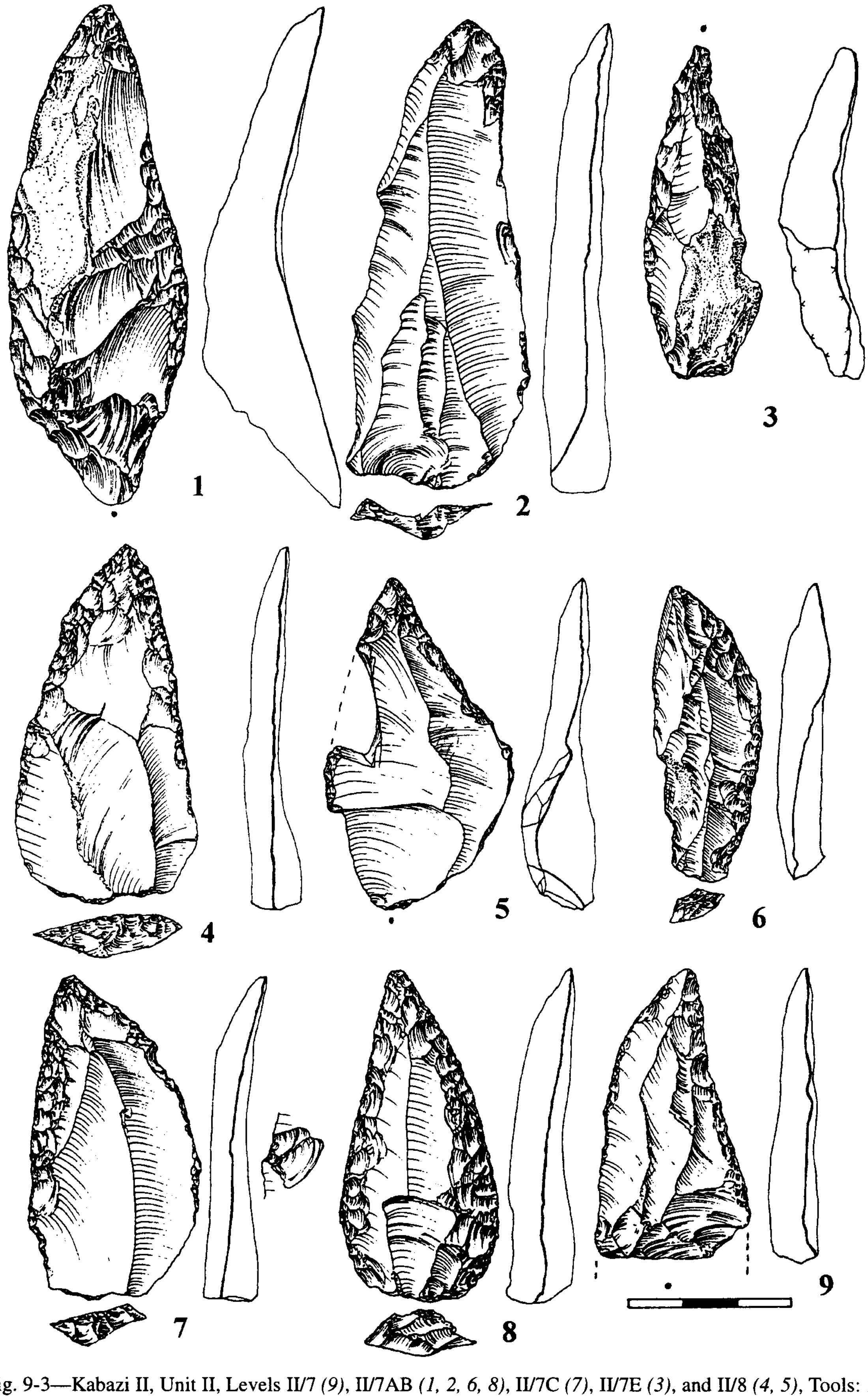


Fig. 9-3—Kabazi II, Unit II, Levels II/7 *(9)*, II/7AB *(1, 2, 6, 8)*, II/7C *(7)*, II/7E *(3)*, and II/8 *(4, 5)*, Tools: *1*–willow-leaf dorsal point; *2*–distal dorsal point; *3*–sub-triangular dorsal borer; *4*–sub-triangular point; *5*–sub-leaf dorsal point; *6*–lateral dorsal point; *7,9*–semi-crescent dorsal points; *8*–sub-crescent dorsal point.

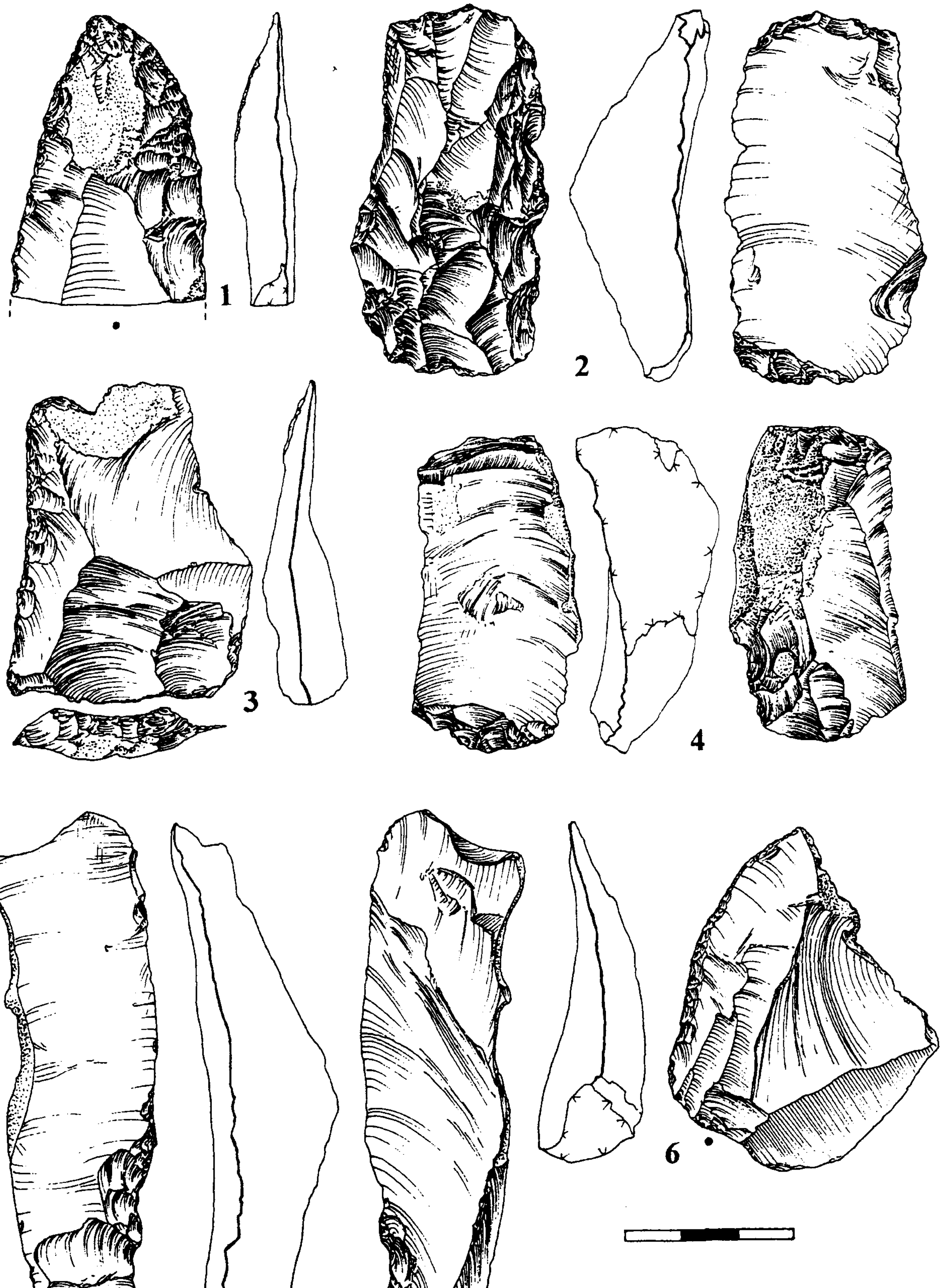


Fig. 9-4—Kabazi II, Unit II, Levels II/7 *(1)*, II/7D *(5)*, II/7F8 *(2, 4, 6)*, and II/8C *(3)*, Tools: *1*–semi-crescent dorsal scraper; *2,4*–straight dorsal bi-truncated-faceted denticulates; *3*–straight dorsal scraper; *5*–lateral alternating notch; *6*–convex dorsal scraper.

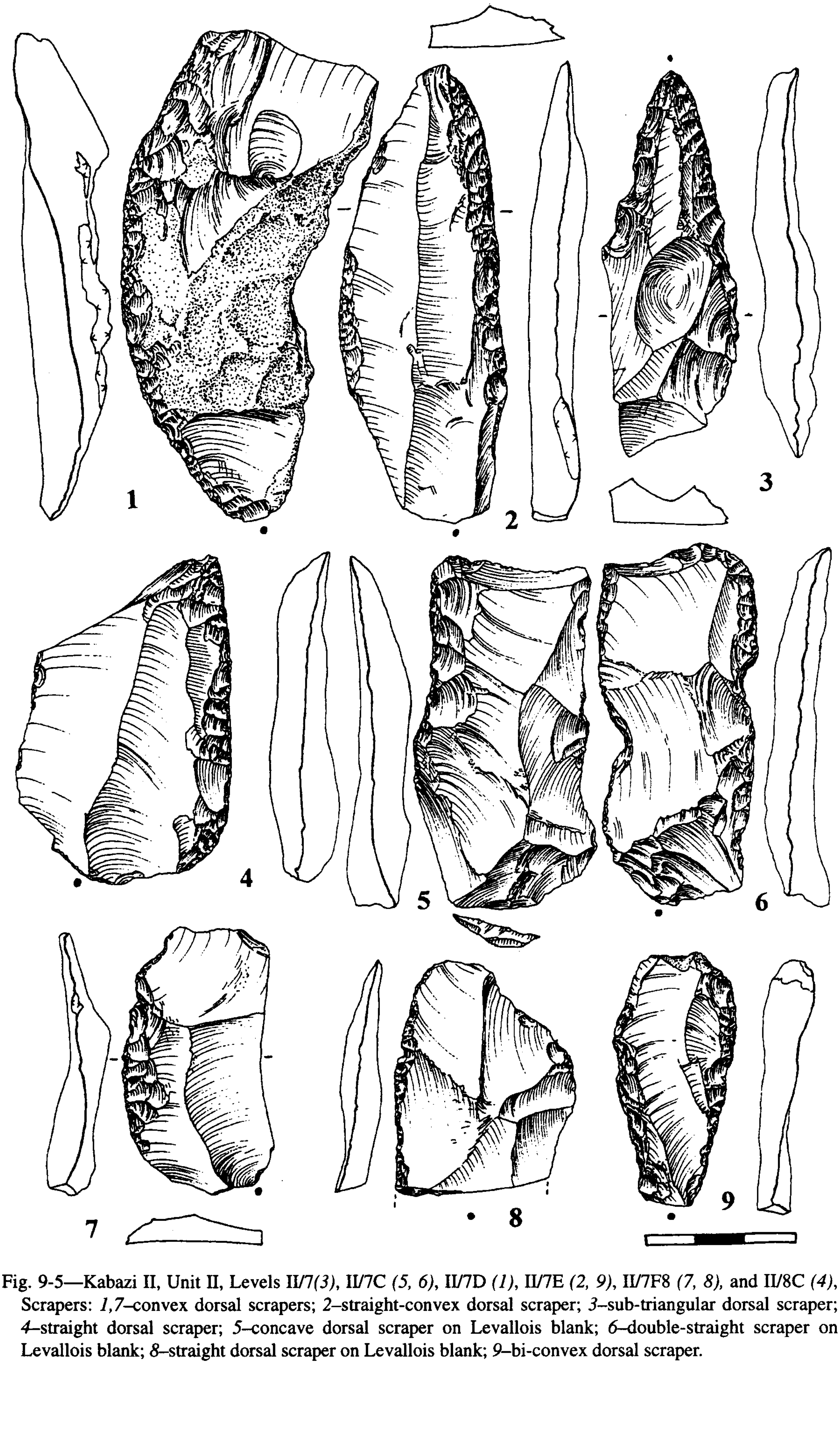


Fig. 9-5—Kabazi II, Unit II, Levels II/7*(3)*, II/7C *(5, 6)*, II/7D *(1)*, II/7E *(2, 9)*, II/7F8 *(7, 8)*, and II/8C *(4)*, Scrapers: *1,7*–convex dorsal scrapers; *2*–straight-convex dorsal scraper; *3*–sub-triangular dorsal scraper; *4*–straight dorsal scraper; *5*–concave dorsal scraper on Levallois blank; *6*–double-straight scraper on Levallois blank; *8*–straight dorsal scraper on Levallois blank; *9*–bi-convex dorsal scraper.

Level II/7AB

Pre-cores and Cores

There are 24 cores and 1 pre-core in Level II/7AB (Table 9-2). The single pre-core is made on a flake with two lateral opposed platforms on the dorsal surface. The flaking surface is unstruck.

Cores are subdivided into 5 main groups: Levallois tortoise, discoidal, uni-directional, bi-directional, and unidentifiable. The Levallois tortoise cores are either unstruck ovoid or broken. The Levallois ovoid example has two opposing wide and thick striking platforms and a single supplementary platform which was prepared on the right side. The retouch for the left side convexity was made directly from a cortical undersurface. The broken Levallois core has, at least, one main faceted platform and two lateral, supplementary platforms, which were prepared on the undersurface (Table 9-2).

The group of uni-directional cores consists of a single convergent transverse and nine parallel pieces. The convergent transverse core is made on a flake. The platforms consist of a main and two opposed supplementary platforms. The latter were prepared from the core undersurface. The flakes struck from the main, well-faceted platform pass through practically the whole flaking surface.

Among the complete parallel cores, most have rectangular flaking surfaces (4 of 7). One of them has a volumetric flaking surface, a laterally faceted platform, and transverse scars on the undersurface (fig. 9-6: *1*). Another has a narrow flaking surface prepared by a crested ridge (fig. 9-6: *2*). Five parallel cores have multiple faceted platforms. Three parallel cores have lateral, supplementary platforms, two of which also have a supplementary platform at the distal extremity. The undersurfaces of the parallel cores are naturally flat or flattened by transverse removals. The range of uni-directional core size is as follows: length, from 5.2-7.4 cm; width, from 4.7-6.7 cm. Only two parallel cores are relatively thick: 3.8 cm and 4.2 cm (Table 9-2).

The bi-directional cores have rectangular flaking surfaces and naturally flat undersurfaces. Both opposed platforms are of the same, or very similar, width and thickness. In addition, the lengths of the removals from the main platforms are the same or very similar, as well. In two cases, the flaking surfaces are supported by the supplementary platforms. Only one core has the main platform faceted. The range of the bi-directional core sizes is close to that described above for the parallel cores (Table 9-2).

Most cores of Level II/7AB are relatively large. Except for a single discoidal core, the range of lengths is 5.1-7.4 cm, and widths 4.6-7.5 cm. The range in thickness is greater, from 1.1-3.8 cm (but 4.2 cm for the narrow flaked surface core). At the same time, only 3 of 16 identifiable pieces are thicker than 3 cm. The maximum scar lengths for uni-directional cores range 4.1-7.4 cm. Only the core with the narrow flaked surface has a scar length of less than 4 cm, because of the series of hinge fractures on the flaking surface (fig. 9-6: *2*). Three bi-directional cores exhibit less than a 4 cm range for maximum scar lengths (Table 9-2).

Blanks

The debitage of Level II/7AB includes 294 artifacts: 209 flakes, 49 blades, 18 tools made on flakes, and 18 tools made on blades.

Blades. The blade assemblage consists of 67 pieces, including the 18 blade tools. Only 18 blades are unbroken.

Dorsal Scar Patterns. Six main types of dorsal scar pattern were distinguished. The most numerous (18) is uni-directional-crossed (Table 9-12). Only two of these are partly covered by cortex. The percentage of blades with bi-directional-crossed dorsal scar patterns in Level II/7AB is much lower than the previous type. Eight of 11 of these are partly covered

TABLE 9-12
Kabazi II, Unit II, Blade Scar Patterns as Percentages of Each Type

	II/7AB	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*Total*
Covered by cortex	—	2.2	5.4	3.0	—	—	1.7
Lateral	2.9	2.2	5.4	6.0	1.5	—	3.4
Converging	19.4	15.2	8.1	22.4	22.4	—	17.9
Uni-directional	14.9	19.6	29.7	16.4	17.9	16.7	18.6
Uni-directional-crossed	26.8	23.9	13.5	23.9	14.9	41.6	22.0
Bi-directional	19.4	13.0	13.5	10.4	14.9	33.3	15.2
Bi-directional-crossed	16.4	6.5	10.8	7.5	11.9	—	10.5
4-directional	—	2.2	—	—	—	—	0.3
Crested	—	10.9	8.1	10.4	13.4	8.3	8.4
Levallois	—	4.3	5.4	—	1.5	—	1.7
Unidentifiable	—	—	—	—	1.5	—	0.3
N	67	46	37	67	67	12	296

TABLE 9-13
Kabazi II, Unit II, Blade Shape as Percentages of Each Type

	II/7AB	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*ess %*
Rectangular	29.9	23.9	51.4	37.1	38.8	66.7	109	51.7
Triangular	10.4	15.2	8.1	6.0	3.0	16.7	25	11.8
Trapezoidal elongated	7.5	13.0	13.5	9.0	22.4	—	37	17.5
Ovoid	—	4.3	2.7	—	—	—	3	1.4
Leaf-shaped	4.5	—	—	—	1.5	—	4	1.9
Crescent	9.0	15.2	2.7	4.5	6.0	8.3	22	10.4
Expanding	—	—	—	1.5	—	—	1	0.5
Irregular	7.5	6.5	2.7	4.5	3.0	—	10	4.7
Unidentifiable	31.3	21.7	18.9	37.1	25.4	8.3	85	
N	67	46	37	67	67	12	296	211

TABLE 9-14
Kabazi II, Unit II, Blade Axis as Percentages of Each Type

	II/7AB	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*ess %*
On-axis	73.3	69.6	83.8	68.7	76.1	66.7	217	88.2
Off-axis	10.4	21.7	10.8	4.5	4.5	16.7	29	11.8
Unknown	16.4	8.7	5.4	26.9	19.4	16.7	50	
N	67	46	37	67	67	12	296	246

TABLE 9-15
Kabazi II, Unit II, Blade Lateral Profiles as Percentages of Each Type

	II/7AB	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*ess %*
Flat	47.8	30.4	51.4	44.8	40.4	25.0	113	40.1
Incurvate medial	19.0	26.1	24.3	16.4	19.4	16.6	60	21.3
Incurvate distal	7.5	13.0	—	4.5	16.4	25.0	28	9.9
Twisted	22.4	26.1	24.3	26.9	9.0	25.0	63	22.3
Convex	3.0	2.2	—	1.5	2.9	—	18	6.4
Irregular/unknown	—	2.2	—	6.0	11.9	8.3	14	
N	67	46	37	67	67	12	282	

TABLE 9-16
Kabazi II, Unit II, Blade Distal Profiles as Percentages of Each Type

	II/7AB	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*ess %*
Feathering	46.3	58.6	67.6	35.8	53.7	58.3	150	71.8
Hinged	4.5	4.3	8.1	6.0	17.9	16.7	26	12.4
Overpassed	11.9	6.5	5.4	3.0	3.0	8.3	18	8.6
Blunt	—	2.2	2.7	4.5	14.9	—	15	7.2
Missing	37.3	28.3	16.2	50.7	10.4	16.2	87	
N	67	46	37	67	67	12	296	209

TABLE 9-17
Kabazi II, Unit II, Blade Cross-Section at Midpoint as Percentages of Each Type

	II/7AB	*II/7C*	*II/7D*	*II/7E*	*II/7F8*	*II/8C*	*N*	*ess %*
Flat	—	—	2.7	1.5	—	—	2	0.7
Triangular	55.2	52.2	40.5	49.3	44.8	33.3	143	48.3
Lateral steep	7.5	6.6	10.8	10.4	16.4	8.3	31	10.5
Trapezoidal	37.3	39.1	32.4	32.8	38.8	58.3	110	37.2
Crescent	—	2.2	13.5	6.0	—	—	10	3.4
N	67	46	37	67	67	12	296	296

by cortex. Some of the bi-directional-crossed blades (fig. 9-2: *6*) were identified as "*enlèvement deux*" of the bipolar variant of the Biache method (Boëda, Geneste, and Meignen 1990). Blades with converging and bi-directional scar patterns have about same quantity of partial cortification as the previous type. Both blades with lateral scars are partially cortical.

Shape. Taking into account the great number of broken blades, the shapes were not definable for about one-third of the pieces (Table 9-13). About one-half of these were flaked on-axis (Table 9-14). About 30% of blades are rectangular, of which 18 were flaked on-axis. Other shapes are represented: elongated trapezoidal, triangular, irregular, leaf-shaped, and sub-crescent. Generally, most of the blades were flaked on-axis, only 10.4% being off-axis (Table 9-14).

Profiles and Cross-Sections. About one-half of the blades have a flat lateral profile. The number of medially incurvate and twisted are approximately equal. Distally incurvate and convex profiles are not numerous (Table 9-15).

On more than one-third of the blades, the distal ends were missing (Table 9-16). Among the remainder, feathering prevails. Hinged and overpassed distal ends are not numerous.

The most common midpoint cross-sections are triangular and trapezoidal (Table 9-17). Lateral steep is represented only by a few pieces and not one of them is a *lame débordante.*

Platforms. Only 35 butts were identifiable (Table 9-9) and multiple faceted dominate. Other types are represented by a few examples each: plain, lateral plain, dihedral, and covered by cortex. About half (35) of the blades have platforms (Table 9-10). Of these, 23 are semi-lipped, while the rest are split between lipped and unlipped.

The characteristic features of the blade assemblage from Level II/7AB are: (1) a dominance of blades with uni-directional-crossed dorsal scar patterns; (2) more than one-third of the blades are partly or completely cortical; (3) blades with rectangular shape, removed on-axis, flat in profile, and triangular in cross-section, dominate; (4) a dominance of multiple faceted, semi-lipped platforms; and, (5) a high percentage of blades: Ilam = 22.8.

Flakes. There are 227 flakes, of which 18 are retouched. More than half of the flakes (53%) are broken.

Dorsal Scar Patterns. Five different dorsal scar patterns prevail in approximately equal proportions: converging, uni-directional, completely cortical, uni-directional-crossed, and bi-directional (Table 9-3). Moreover, more than one-half of the flakes with converging and uni-directional scar patterns are partly cortical, as are about half of the uni-directional-crossed and one-third of bi-directional examples. Six flakes with centripetal scar patterns were defined as Levallois. Also, six others were defined as *éclats débordants*, with crested dorsal scar patterns, all of them partly cortical. In general, 56.8% of flakes are completely or partly cortical.

Shape. Because of breakage, about one-third of the flakes could not be classified according to shape (Table 9-4). Rectangular and trapezoidal-shaped pieces are about equally prevalent. More than 75% of the rectangular flakes were removed on-axis (Table 9-5). The opposite is true for the trapezoidal flakes: 75.5% of them were removed off-axis. About one-third of all flakes were removed on-axis, 40.5% off-axis, while the others were unidentifiable (Table 9-5).

Profiles and Cross-Sections. Flat lateral profiles dominate (Table 9-6). Mainly, flat profiles are associated with feathered distal ends and both triangular and trapezoidal cross-sections. The medially incurvate, distally incurvate, and twisted profiles occur in more or less equal proportions (Table 9-6). Hinged, overpassed, blunt, and missing distal ends combined do not match the number of feathered ends (Table 9-7). The percentage of crescent-shaped cross-sections approximately reflect the number of cortical flakes (Table 9-8).

Platforms. Ninety-eight flakes have crushed or missing platforms. Multiple faceted and plain platforms prevail over other platform types (Table 9-9). The percentage of laterally prepared platforms, 19.4% (including lateral plain and lateral multiple faceted), is surprisingly high.

About one-half of the flakes, 112 pieces, are not identifiable for lipping. The flakes with unlipped and semi-lipped platforms occur in approximately equal proportions (Table 9-10). As always, lipped platforms are not numerous.

In sum, the flake assemblage of Level II/7AB is characterized by: (1) an equal proportion of five different dorsal scar patterns: converging, uni-directional, uni-directional-crossed, bi-directional, and covered by cortex; (2) a high percentage (more than one-half) of cortical and partially cortical flakes; (3) a dominance of rectangular and trapezoidal-shaped flakes; (4) a dominance of flat profiles, feathered distal ends, and triangular or trapezoidal cross-sections; and, (5) approximately equal proportions of plain and multiple faceted platforms, and a relatively high percentage of laterally prepared platforms, in association with a dominance of semi-lipped and unlipped butts.

It is obvious that there are some differences between blade and flake morphology, beyond length/width proportions. The features which are found both on the flakes and on the blades include flat profiles, in association with feathered distal ends and either triangular or trapezoidal cross-sections and both have a majority of unlipped and semi-lipped butts. In general, these similarities are correlated to blank profiles. The differences between the flakes and blades, however, cover a wider range of their morphology: dorsal scar patterns differ among the two groups; blades are less cortical; only rectangular blades are common, as opposed to the dominance of both rectangular and trapezoidal-shaped flakes; and multiple faceted platforms are more common among blades.

Unfortunately, the faceting indices, especially for blades, mean little because of very small sample sizes (there are only 34 identifiable platforms). For the flakes, the indices are IF = 49.5; IFs = 38.7, as opposed to the same indices for both blades and flakes combined: IF = 55.5; IFs = 44.4.

Tools

Thirty-six tools were recovered from Level II/7AB (Table 9-11). One-half of them (18) are simple retouched pieces. All of them have discontinuous retouch on one of their lateral edges. In 17 cases this is obverse, either on the right or on the left edge; on two it is scalar retouch; on eight it is marginal; and on nine it is irregular. A single retouched piece has alternating retouch: scalar and marginal.

Among the tools with continuous retouch, scrapers (10) are most common (Table 9-11). Seven of them are one-edged, simple scrapers, either convex (2) or straight (5). All have obverse scalar and/or stepped retouch, usually with flat or semi-steep retouched edges. One of the straight obverse scrapers has a truncated-faceted proximal end. Two-edged scrapers include a double-straight obverse (fig. 9-7: *2*), as well as a straight-convex obverse example. Both have flat marginal and steep scalar retouch. Only one convergent scraper, a sub-leaf obverse example, was found, and it has scalar and stepped semi-steep retouch.

The points include a willow-leaf (fig. 9-3: *1*), a sub-crescent (fig. 9-3: *8*), a lateral (fig. 9-3: *6*), and 2 distal points (fig. 9-3: *2*). All have obverse scalar and/or sub-parallel flat retouch. The single denticulate is a piece with a concave edge retouched by steep scalar, obverse retouch. Two tiny obversely retouched fragments of blanks were categorized as unidentifiable.

Level II/7C

Pre-cores and Cores

A total of 11 cores came from Level II/7C; there are no pre-cores (Table 9-2). Typologically, the core assemblage is subdivided into several types: radial, Levallois tortoise, convergent transverse, parallel, bi-directional, and orthogonal.

Both radial cores are broken; they have unfaceted platforms and are approximately the same size (Table 9-2). The maximum scar lengths do not exceed 3.5 cm.

The Levallois tortoise core appears to be classic, with a multiple faceted main platform and two supplementary lateral platforms prepared from the undersurface. The main removal, from the central part of the flaking surface, was not successful. The Levallois flake was no more than 3.5 cm of the total 5.0 cm length of flaking surface.

The convergent transverse core was made on a flake with a single main multiple faceted platform. Several converging removals from that platform almost cover the whole flaking surface. The maximum scar length is 5.2 cm of the 6.4 cm flaking surface.

Most bi-directional cores have rectangular flaking surfaces. The three examples have no supplementary platforms. Two of them have volumetric flaking surfaces with rectangular, naturally flat and narrow flaked surfaces. Both still retain several transverse scars on the flaking surface and the undersurface from the crested ridge preparation. The maximum scar lengths exceed 4.0 cm. Only in the case of the narrow flaked surface core, where hinge-fracturing was present, did the scars cover only 3.8 cm of its 6.3 cm flaking surface.

The orthogonal core is broken, with two flaking surfaces on one side of the core, which created the core flaking surface. That pattern of scars on the flaking surface is evidence for two adjacent striking platforms, arranged at right angles to each other.

Cores range in length from 4.0-9.9 cm, in width from 4.0-7.1 cm (except the core with a narrow flaked surface), and in thickness from 1.7-2.8 cm (except for the narrow flaked surface core).

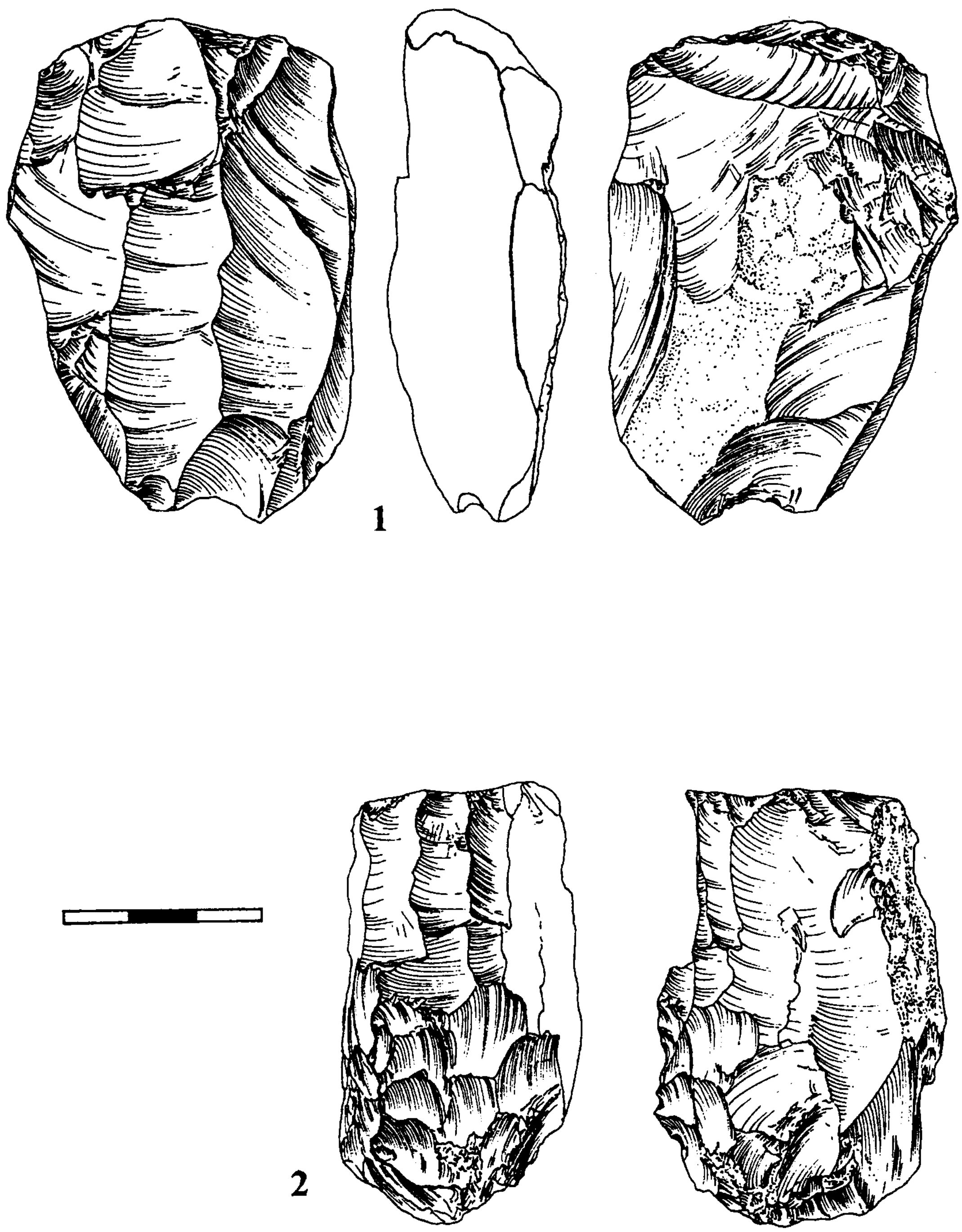


Fig. 9-6—Kabazi II, Unit II, Level II/7AB, Cores: *1*–parallel sub-cylindrical; 2–narrow flaked surface.

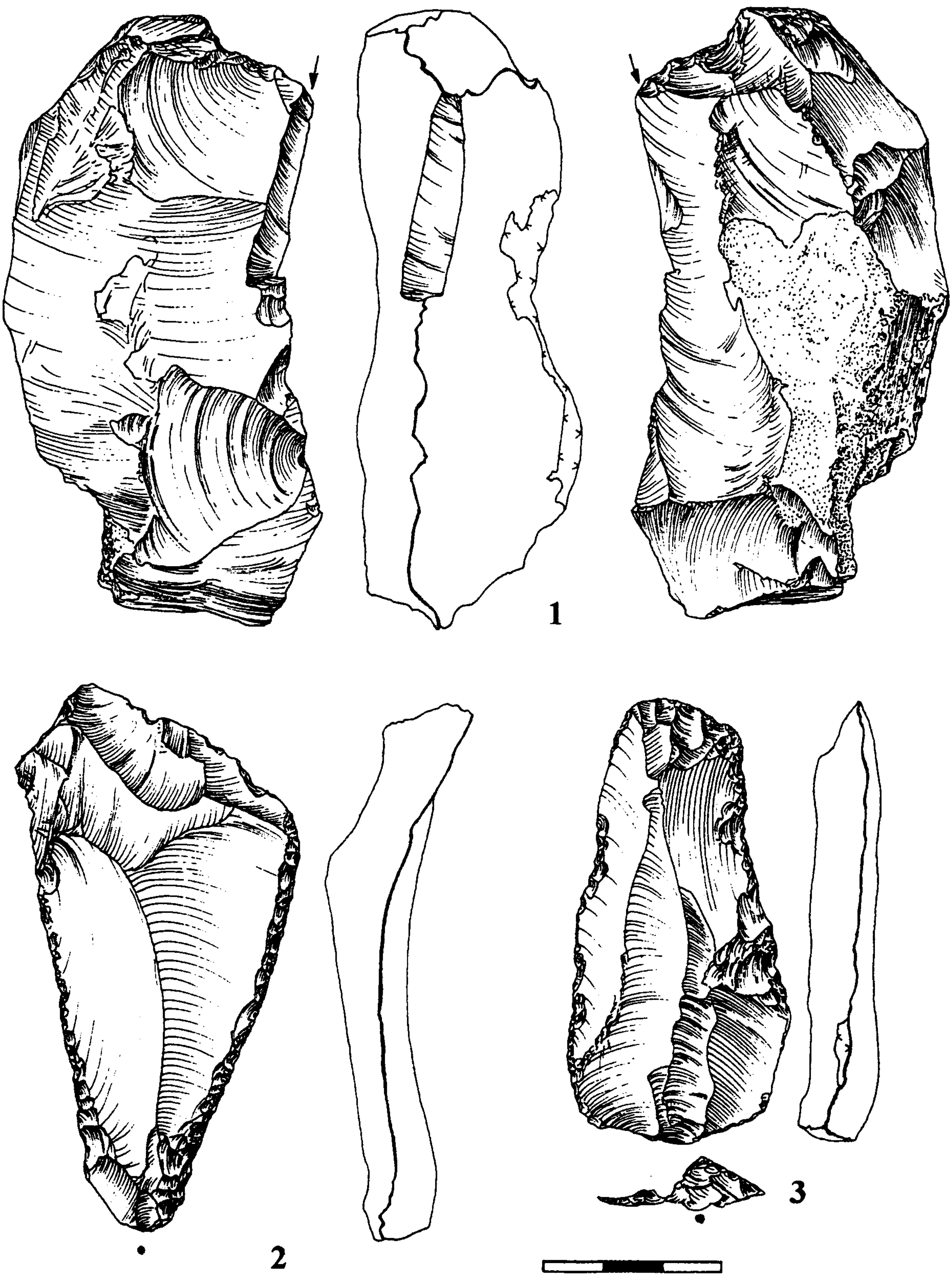


Fig. 9-7—Kabazi II, Unit II, Levels II/7AB *(2)* and II/7E *(1, 3)*, Tools: *1*–burin on truncation, proximal; *2*–double-straight dorsal scraper; *3*–semi-rectangular dorsal scraper.

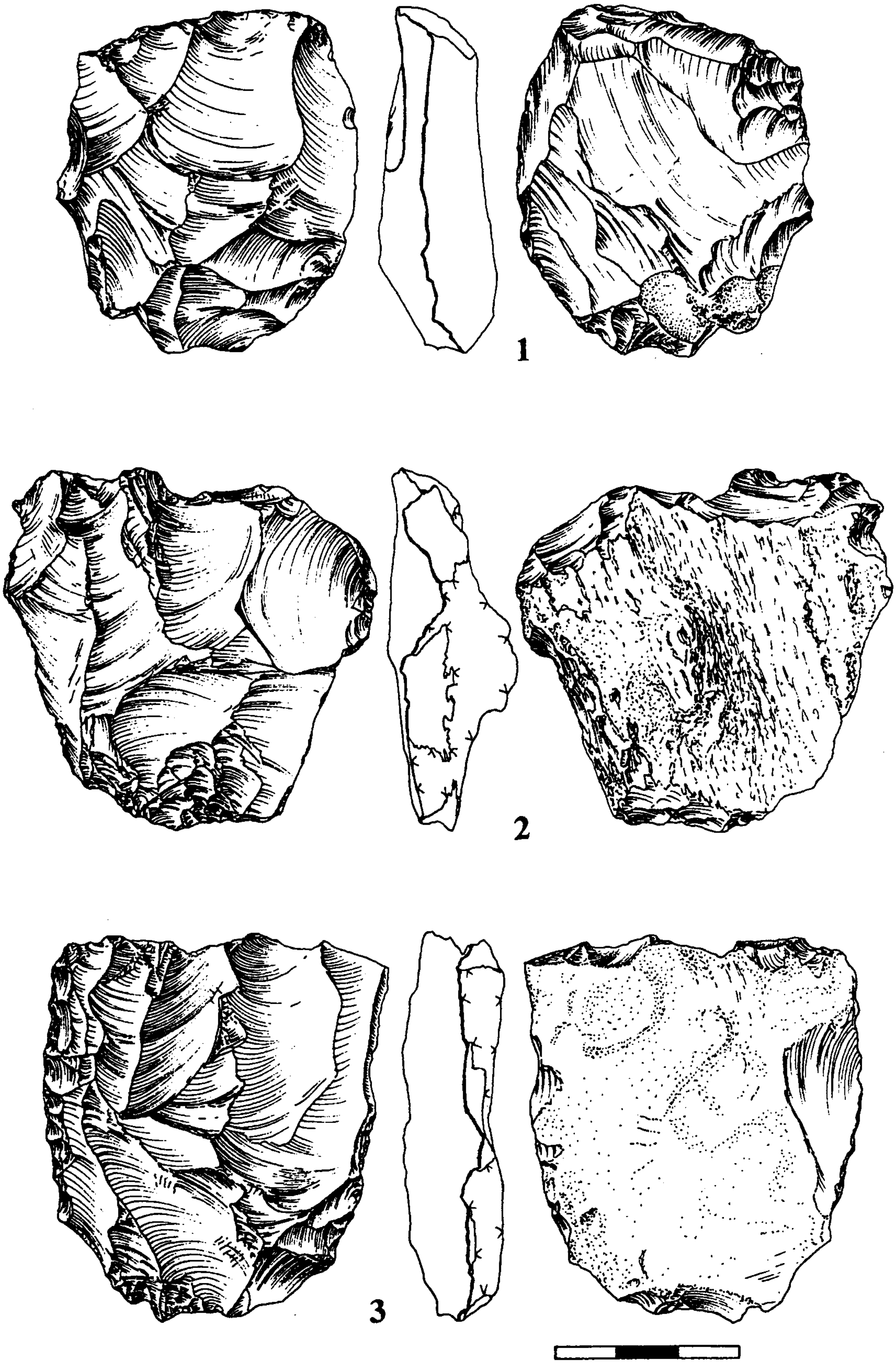


Fig. 9-8—Kabazi II, Unit II, Levels II/7D *(2)* and II/8 *(1, 3)*, Cores: *1*–Levallois tortoise rectangular; *2,3*–bi-directional rectangular.

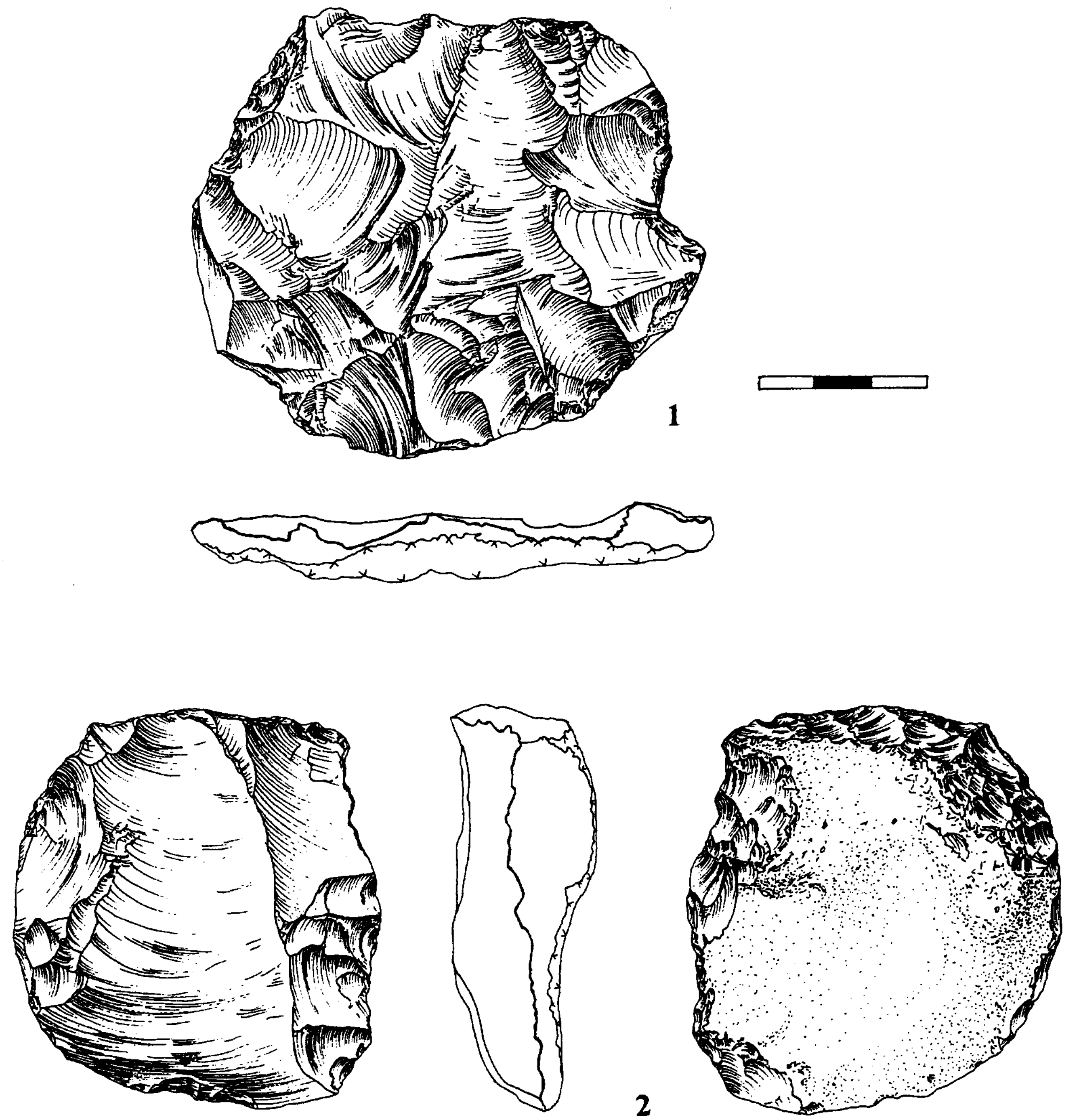


Fig. 9-9—Kabazi II, Unit II, Level II/7F8 *(1, 2)*, Cores: *1*–radial ovoid; *2*–Levallois tortoise rectangular.

Blanks

The blanks from Level II/7C include 36 unretouched blades, 10 tools on blades, 178 flakes, and 27 tools on flakes. The total number of retouched and unretouched blanks is 251 (Table 9-1).

Blades. There are 46 blades, more than half of which are complete (24): six retouched and eighteen unretouched. Their technological attributes are as follows:

Dorsal Scar Patterns. The most common dorsal scar pattern is uni-directional-crossed (Table 9-12). About 25% of them are partially cortical. Somewhat less numerous are the blades with uni-directional dorsal scar patterns. One-third of them are partly cortical. Two blades with centripetal dorsal scar patterns were identified as Levallois. Generally, about 30% of all blades are partly covered by cortex.

Shape. Ten blades were too broken to identify. Three more were identified as irregular (Table 9-13). About 24% of the blades are rectangular. Practically all of them were struck on-axis. Only one triangular and the sub-crescent blades are oriented off-axis samples. At the same time, most of the trapezoidal elongated blades were removed off-axis. On the whole, however, about 70% of all blades were removed on-axis (Table 9-14).

Profiles and Cross-Sections. Flat, medially incurvate, and twisted lateral profiles on blades occur in approximately equal proportions (Table 9-15). These three types are associated with feathered distal ends and either triangular or trapezoidal midpoint cross-sections (Table 9-17). Finally, it must be noted that about 30% distal ends of blades are missing (Table 9-16).

Platforms. Thirteen out of the 28 identifiable platforms are multifaceted (Table 9-9). Covered by cortex and laterally prepared plain are rare. Semi-lipped and unlipped butts occur in approximately equal numbers (Table 9-10).

The main characteristic features of the Level II/7C blade assemblage are: (1) a dominance of blades with uni-directional and uni-directional-crossed dorsal scar patterns—these blades are usually completely decorticated; (2) fewer than one-third of blades are partly covered by cortex; (3) most blades were removed on-axis; (4) there are equal proportions of flat, medially incurvate and twisted blades, which usually have feathered distal ends and triangular or trapezoidal cross-sections; (5) a dominance of multiple faceted platforms, which are, in general, either semi-lipped or not lipped at all; and, (6) an expected Ilam of 18.3.

Flakes. A total of 205 flakes, including retouched, were recovered, of which only 89 are complete. Their attributes are, as follows:

Dorsal Scar Patterns. The most common dorsal scar patterns are uni-directional and converging (Table 9-3), of which 44.1% are partly covered by cortex. On bi-directional and uni-directional-crossed examples only 20% have some cortex on the dorsal surface. It must be noted that flakes with lateral and bi-directional-crossed dorsal scar patterns are two times as likely to have some cortex on them than are the radial and *débordant* types. Six pieces with radial dorsal scar patterns were identified as Levallois (figs. 9-2: *5*; 9-5: *5,6*) The percentage of completely cortical pieces is still very high (12.2%). The percentage of completely and partially cortical flakes combined accounts for 50.2% of all flakes.

Shape. Flake shape is strongly dominated by rectangular pieces (Table 9-4). In an essential count (without unidentifiable), the rectangular flakes account for ca. 50% of all shapes. Moreover, 87.3% of the rectangular flakes were struck on-axis. In Level II/7C this specific feature of rectangular flakes is notable because, as a general rule, flakes displaying other shapes tend to be struck off-axis. Overall, the percentage of flakes removed on-axis is 44.4%, mainly due to the rectangular flakes (Table 9-5).

Profiles and Cross-Sections. In Level II/7C, flat and medially incurvate flakes dominate (Table 9-6). They are usually associated with feathered distal ends and either triangular or trapezoidal cross-sections. Other types of flake profiles, distal ends, and cross-sections occur only in small amounts (Tables 9-6, 9-7, 9-8). An exception is flakes with crescent cross-sections (15.1%), which generally correlate with primary flakes.

Platforms. Only 137 flake platforms are identifiable (Table 9-9). Many are covered by cortex. Multiple faceted platforms are relatively common; about one-third of all identifiable platforms. As described above, a high percentage of laterally prepared platforms occurs. About one-half of identifiable butts are unlipped, while real lipped platforms are rare (Table 9-10).

So, the main characteristic features of the flake assemblage from Level II/7C are the following: (1) uni-directional and converging dorsal scar patterns dominate and about half of them are partly covered by cortex; (2) there are Levallois flakes and *éclats débordants* present; (3) there is a very high percentage of rectangular shaped flakes struck on-axis; (4) flakes with either flat or medially incurvate profiles, associated with feathered distal ends and either triangular or trapezoidal cross-sections, are most common; (5) faceted platforms are common (IF = 54.0, IFs = 38.0); and, (6) there are equal proportions of semi-lipped and unlipped butts.

There are a number of similarities, as well as differences, between the flake and blade morphology. The differences which stand out include different dorsal scar patterns and a greater percentage of flakes with dorsal cortex (over 50%), compared with fewer than one-third of the blades. The similarities include the presence of Levallois and *pièces débordantes* in both, a shared dominance of rectangular blanks, and, in general, the same distribution of blank profiles, distal ends, and cross-sections, with only a higher occurrence of twisted lateral profiles among the blades. On the other hand, semi-lipped blades and flakes are equally prevalent, while unlipped butts are more common for flakes.

Tools

A total of 37 tools came from Level II/7C; 10 of them were made on blades, the rest on flakes (Table 9-11). Of these, 17 were broken.

Retouched pieces are the most common class of tools (20 pieces). They are subdivided into two groups: laterally retouched (16) and bi-laterally retouched (4). Retouch is either marginal and/or irregular, but practically always discontinuous and obverse. In only a single case was there a piece alternately retouched.

Scrapers (11) include a number of types: straight (3 pieces), convex (4), concave (fig. 9-5: *5*), double-straight (fig. 9-5: *6*), sub-crescent, and sub-triangular (1 each). Most scrapers have scalar and sub-parallel obverse flat or semi-steep retouch. Only the sub-triangular scraper exhibits stepped steep obverse retouch. The same scraper has traces of both back and distal thinning.

There are only four points in the tool-kit of Level II/7C: one Levallois point with retouched edges and tip, a distal point, a semi-leaf point, and a semi-crescent point (fig. 9-3: *7*). Only the distal point has alternate retouch: the other points have obverse retouch which is either scalar or marginal flat. There is a single denticulate and a single notched tool, both on flakes.

Level II/7D

Pre-cores and Cores

There are 2 pre-cores and 8 cores from this floor (Table 9-2). One of the pre-cores has a striking platform oriented for flaking across the narrow side of the flint plaquette, from which a few testing removals were struck. The other pre-core is unidentifiable because of fragmentation.

Bi-directional cores are most common (3). Two of them have a rectangular-shaped working surface and exhibit a single prepared lateral supplementary platform on the undersurface. Both of these cores have relatively wide and well prepared opposed main striking platforms (fig. 9-8: *2*). A bi-directional sub-cylindrical core has two conjoined flaking surfaces, worked from opposed, unfaceted striking platforms. The scars of the removals from both platforms cover the whole flaking surface.

Morphologically close to the previous type is the single parallel, sub-cylindrical core. The difference between them involves the number and arrangement of the striking platforms. The parallel, sub-cylindrical core has a single main unfaceted striking platform and another platform which appears to be supplementary and arranged on the right side of the core. The scars of the removals from the main striking platform cover the whole flaking surface.

The Levallois tortoise core is a classic, struck example. The scar from the Levallois flake covers about 90% of the flaking surface. The lateral and distal preparation of the flaking surface were done from unprepared supplementary platforms. The main platform is wide and well-faceted. The single radial core is typical.

The length variation of cores ranges from 4.4-7.1 cm. Approximately the same range characterizes width: from 4.0-7.5 cm. In general, the cores from Level II/7D are not thick. The variation in thickness is only 1.5-2.7 cm. Only the radial core is relatively thick (3.2 cm).

Blanks

There are 175 blanks, of which 37 are blades (9 retouched) and 138 are flakes (14 retouched).

Blades. The number of blades is low, only 37 pieces. Moreover, 20 of them are broken. Their index is typical for this unit at Kabazi II; Ilam = 21.1. Their attributes are as follows:

Dorsal Scar Patterns. Uni-directional is the most common, of which about one-half are partially covered by cortex. The other types are represented by approximately equal quantities, including *lames débordantes* (fig. 9-2: *1,2*). There are two Levallois blades with centripetal dorsal scar patterns. One of them has a cortical area on the central part of dorsal surface. In general, 15 of the 37 blades are partly cortical.

Shape. More than one-half of blades (19) are rectangular (Table 9-13), of which only one was removed off-axis. In general, on-axis blades dominate; only 4 were removed off-axis (Table 9-14).

Profiles and Cross-Sections. Flat lateral profiles are predominant (Table 9-15), and, in general, correlate with feathered distal ends (Table 9-16) and triangular or trapezoidal midpoint cross-sections (Table 9-17). Medially incurvate and twisted blades occur in equal numbers (Table 9-15).

Platforms. Twenty of 37 blade platforms are either crushed, missing, or missing by retouch (Table 9-9). Among those identifiable, plain, unfaceted butts prevail. A single piece has a laterally prepared, plain platform. Only 16 pieces are identifiable in relation to lipping (7 unlipped and 9 semi-lipped) (Table 9-10).

The main technological features of the blade assemblage of Level II/7D appear to be similar to those from Levels II/7AB and II/7C. At the same time, it must be noted that among the blades with uni-directional scar patterns, about half are partly cortical, as are 40% of all blades.

Flakes. There are 138 flakes, of which 50 are broken. Their technological attributes are as follows:

Dorsal Scar Patterns. Four dorsal scar patterns prevail in approximately equal proportions: converging, uni-directional, bi-directional, and uni-directional-crossed (Table 9-3). About one-half of the last three types are partly covered by cortex. Four Levallois flakes are present; two are partly cortical. In total, the partly cortical pieces account for less than half of all flakes, 45.7%.

Shape. About 30% of the flakes are too broken to identify by shape (Table 9-4). Of the remainder, more than 30% are rectangular and are usually removed on-axis (Table 9-5).

Profiles and Cross-Sections. As is usual for the Unit II assemblages, most flakes are flat (Table 9-6), feathered at the distal end (Table 9-7), and triangular or trapezoidal in cross-section (Table 9-8).

Platforms. About one-third of the platforms are unidentifiable: crushed, missing, or missing by retouch. Among identifiable platforms, multiple faceted are common, which, together with laterally prepared multiple faceted platforms, account for one-half of all identifiable butts (Table 9-9). The percentage of faceted platforms is very high: IF = 60.6; IFs = 50.0. Only six butts are truly lipped (Table 9-10).

In summary, the flake assemblage of Level II/7D is characterized by: (1) a dominance, in equal proportions, of uni-directional, uni-directional-crossed, bi-directional, and converging dorsal scar patterns; (2) a high percentage of partially cortical and cortical flakes; (3) a dominance of rectangular flakes removed on-axis; and, (4) a very high percentage of faceted platforms.

In general, these technological features are identical for flakes and blades. The differences are only significant for dorsal scar patterns—where the blades are dominated by uni-directional preparation and the flakes are not.

Tools

Twenty-three tools were excavated from Level II/7D, 10 of them were made on blades. As usual for Unit II assemblages (Table 9-18) most tools (13) are laterally retouched pieces, of which 4 are on blades. Mainly, the retouched pieces have either marginal or irregular obverse retouch; in all cases it is flat. Only two have inverse retouch.

Four scrapers were found; 3 were made on blades and one on a flake. All have scalar sub-parallel either flat or semi-steep obverse retouch. Each scraper is a different type: convex (fig. 9-5: *1*), sub-triangular, semi-rectangular, and semi-crescent. Even given this small sample, it is unusual for a WCM assemblage to have converging scrapers.

Only two points were found: one sub-triangular dorsal and the other a tip of a broken point. One example each of a notch (fig. 9-4: *5*), a bi-truncated-faceted piece, a battered piece, and an unidentifiable fragment were recovered.

Level II/7E

Pre-cores and Cores

Level II/7E contained only a single pre-core and 13 cores (Table 9-2). The pre-core is a piece of flint plaquette with two opposite platforms arranged on the ends of a crested ridge, which was positioned on the narrow side of the plaquette.

There are two main groups of cores in Level II/7E: bi-directional, parallel, and radial (Table 9-2). Among the parallel cores, there are only two cores where the shape of the flaking surface is identifiable: one is rectangular and the other is a narrow flaked surface core. The first has a wide multiple faceted main platform without any supplementary platforms. The second core is unusual even for the upper levels of Unit II. Its undersurface was prepared as a crested ridge. It clearly shows that the method of crested ridge preparation during the initial stage of flaking was used. The utilization of that core, however, was not successful. A series of hinge-fractures stopped the flaking.

The opposed platform cores include bi-directional rectangular (3) and bi-directional alternate (1). The last has two opposed flaking surfaces on opposite sides of a plaquette. Except for a single bi-directional alternate core, all others of this group have supplementary unfaceted platforms. The <u>radial cores</u> are both ovoid and typologically typical: only the multiple faceted platforms are unusual.

On the whole, core lengths are relatively standardized: from 8.1-5.2 cm. The same is true for widths which range 5.1-7.1 cm (excepting the narrow flaked surface core and the pre-core with the crested ridge). Thus, the cores from Level II/7E are as long as they are wide. The average thickness is not so great: half of the identifiable cores are less than 3.1 cm thick. At the same time, the length of flake scars removed from the main platforms are not less than 4.0 cm long.

Blanks

Two hundred thirty blanks were recovered from Level II/7E, of which 154 are unretouched flakes, 59 are unretouched blades, 9 are flake tools, and 8 are blade tools. Their attributes are as follows:

<u>Blades.</u> More than two-thirds of the blades (45) are broken. In any case, it is one largest blade samples in Unit II.

Dorsal Scar Patterns. Uni-directional-crossed, converging, and uni-directional scar patterns are best represented (Table 9-12). Only 19.0% of these three types are also cortical. It must be noted that *débordant* blades are common, 10.4%. Half of them are partly cortical. On the whole, the percentage of partly cortical blades is low in comparison with other assemblages of Unit II.

Shape. There are 25 blades whose shape is unidentifiable, but among the identifiable, the most common shape is rectangular, ca. 60% (Table 9-13). Not one of them was removed off-axis. Taking into account 18 pieces (26.9%) which are not identifiable as to axis, it must be noted that only 3 blades were removed off-axis, while 46 blades were removed on-axis (Table 9-14).

Profiles and Cross-Sections. Flat blades represent about one-half of the identifiable pieces (Table 9-15). The flat blades, as a rule, are associated with feathered distal profiles (Table 9-16), as well as with triangular and trapezoidal midpoint cross-sections (Table 9-17).

Platforms. More than one-half of blade platforms (41) are identifiable. Among them, two-thirds are multiple faceted (Table 9-9). About two-thirds of the identifiable butts are semi-lipped, while real lipped platforms are rare (Table 9-10).

The main characteristic features of this blade assemblage include the following: (1) a dominance, in approximately equal proportions, of blades with uni-directional crossed, converging, and uni-directional scar patterns; (2) a relatively low number of partly cortical pieces; (3) the usual dominance of rectangular-shaped blades removed on-axis; (4) a dominance of flat blades in association with feathered distal ends and either triangular or trapezoidal cross-sections; (5) a dominance of multiple faceted platforms, usually with semi-lipped profiles; and, (6) a very high percentage of blades: Ilam = 29.1.

<u>Flakes.</u> A total of 163 flakes were found, of which 67 were broken. As a group, they may be characterized, as follows:

Dorsal Scar Patterns. The dorsal scar patterns are those which are usual for Unit II assemblages (Table 9-3). Three types predominate in approximately equal proportions: uni-directional-crossed, uni-directional, and converging. Somewhat less than one-third of these flakes are partially cortical. Only three Levallois flakes were recognized. The percentage of completely and partly cortical flakes is 35.7%, which is the lowest among flakes in Unit II.

Shape. One hundred thirty-three flakes were identifiable to shape: about half are rectangular and, in general, were removed on-axis. The second more or less common type is triangular (Table 9-4). Of the 139 flakes identifiable as to axis, more than half were off-axis (Table 9-5).

Profiles and Cross-Sections. The situation with flake lateral profiles is usual for the Unit II assemblages, meaning a pronounced dominance of flat flakes (Table 9-6) associated with feathered distal ends and either triangular or trapezoidal distal cross-sections (Table 9-7). Nevertheless, it must be noted that there are similar percentages of lateral steep midpoint cross-sections (Table 9-8), which are, in general, associated with *éclats débordants*. Also, there are relatively high percentages of medially incurvate flakes and those with hinged distal ends (Table 9-7).

Platforms. About one-half of all identifiable platforms are multiple faceted (Table 9-9). The lipped platforms are not numerous and, as is usual, semi-lipped platforms are most common (Table 9-10).

In summary, the flake assemblage from Level II/7E is characterized by the following features: (1) a dominance, in equal proportions, of three dorsal scar patterns: uni-directional, uni-directional-crossed, and converging; (2) a low percentage of cortical and partly cortical flakes; (3) the usual Unit II association between shape and flake orientation, as well as the usual range of flake profiles; and, (4) a very high percentage of faceted platforms (IF = 66.6; IFs = 58.5). This is the only example where the technological attributes of blades and flakes are so similar.

Tools

Seventeen tools were defined in Level II/7E, nine of which are broken, but not so heavily as to be unidentifiable (Table 9-11). The eight tools were made on blades. Scrapers account for more than one-half of all tools. All scrapers were retouched by obverse scalar, either flat or semi-steep, retouch. The scrapers are subdivided into three main groups of types: simple, double (fig. 9-5: *2,9*), and convergent (fig. 9-7: *3*). Also among the tools are two notches, a borer (fig. 9-3: *3*), and a burin on proximal truncation (fig. 9-7: *1*). The retouched pieces (four) include three flakes and a blade. The edges of the retouched pieces are retouched by either marginal or irregular obverse retouch which is always discontinuous.

Level II/7F8

Pre-cores and Cores

There are 19 core-like pieces (Table 9-2). Among the pre-cores there is a single unfinished Levallois tortoise and three pieces with prepared crested ridges. The first has a centripetally prepared flaking surface and an unprepared main striking platform. The single crested ridge pre-cores also lack main striking platforms.

The most numerous core type is the Levallois tortoise (four). All are classic examples with multiple faceted main platforms, and the scars for the centripetal preparation of the flaking surface were struck from lateral and distal supplementary platforms (figs. 9-1: *2*; 9-8: *1*; 9-9: *2*). Two of these cores differ from the others by being either on a flint pebble flake (fig. 9-1: *2*) or on a flint pebble (fig. 9-9: *2*), rather than on plaquettes.

The other common core type is bi-directional (three), two of which are intensively utilized with supplementary platforms made on both sides of the cores (fig. 9-8: *3*). The third bi-directional core was made on a flake without supplementary platforms. Both parallel cores also lack supplementary platforms.

The radial cores (two) are unusual for Unit II assemblages in terms of their dimensions (Table 9-2). Even taking into account that, on the whole, the cores of Unit II are very thin, it is really unusual when a core is about 9 cm in diameter and only 0.9 cm thick (fig. 9-9: *1*). Moreover, complete cores from Level II/7F8 are relatively long, wide and, at the same time, very thin. The length ranges from 5.3-8.7 cm and width ranges 4.1-8.8 cm. The variation in thickness, however, is only from 1.1-2.2 cm. The scars on the flaking surfaces are usually longer than 4 cm, except on one radial and one Levallois core. In the last case, the central flake scar hinge-fractured at the midpoint of the core (fig. 9-8: *1*; Table 9-2).

Blanks

Level II/7F8 produced 346 pieces, of which 247 are unretouched flakes, 32 are flake tools, 56 are unretouched blades, and 11 are blade tools.

Blades. A total of 67 blades were found, 34 of which were broken.

Dorsal Scar Patterns. The most common dorsal scar pattern is converging. Uni-directional-crossed, bi-directional, bi-directional-crossed, uni-directional, converging, and crested (*débordant*) (fig. 9-2: *3*) are represented in approximately equal amounts (Table 9-12). Only Levallois and lateral patterns are rare. About 28% of the blades are partially cortical.

Shape. Nearly one-half of the blades are rectangular (Table 9-13) and they were all removed on-axis. The second most common form is elongated trapezoidal: only one of those was removed off-axis. On the whole, almost all the blades in this assemblage were struck on-axis (51 out of 54 identifiable pieces) (Table 9-14).

Profiles and Cross-Sections. Flat lateral profiles account for 40% of the sample (Table 9-15). Feathered distal ends are most common, again, accounting for more than half of all identifiable distal ends, although hinged and blunt distal ends are fairly numerous (Table 9-16). Triangular and trapezoidal midpoint cross-sections occur in approximately equal amounts (Table 9-17). The number of lateral steep cross-sections, as always, reflects the presence of *lames débordantes*.

Platforms. The number of multiple faceted platforms is really impressive (21 out of 32 identifiable butts). The remaining identifiable platforms are subdivided into plain and dihedral (Table 9-9). As usual, lipped butts are rare, while unlipped and semi-lipped are represented in approximately equal numbers (Table 9-10).

The blade assemblage of Level II/7F8 exhibits several characteristic features: (1) a relatively proportional distribution of dorsal scar pattern types; (2) a moderate number of partly cortical blades; (3) a pronounced dominance of rectangular and elongated trapezoidal blades; (4) a high variability in blade profile, but mainly feathered distal ends in association with the trapezoidal and triangular cross-sections; (5) a high percentage of multiple faceted butts, which are either unlipped or semi-lipped; and, (6) the usual percentage of blades in the assemblage, Ilam = 19.4.

Flakes. Two hundred seventy-nine flakes were recovered, of which 118 were broken and 30 retouched.

Dorsal Scar Patterns. The most prevalent dorsal scar pattern is converging, about half (47.3%) of which are covered by some cortex. Uni-directional-crossed, bi-directional, and uni-directional dorsal scar patterns are represented by lower percentages, but they are still significant (Table 9-3) and have about the same ratio of partly cortical flakes (41.2%) to non-cortical flakes, as do those which are converging. About half of the *pièces débordantes* are partly cortical, as are a quarter of the Levallois flakes. On the whole, about one-half of all flakes (45.5%) are partly or completely covered by cortex.

Shape. There are 194 flakes which are identifiable by shape. Rectangular and trapezoidal shapes predominate (Table 9-4). The percentage of flakes removed on-axis and off-axis are approximately equal (Table 9-5).

Profiles and Cross-Sections. The range of different lateral profiles is similar to the other assemblages described above. Flat flakes account for about half (Table 9-6). Again, as usual, flat profiles are often associated with feathered distal ends (Table 9-7) and either triangular or trapezoidal cross-sections (Table 9-8). While not numerous, there are some lateral steep cross-sections, which are usually associated with *pièces débordantes*.

Platforms. There are 174 identifiable platforms, about 10% of which are covered by cortex (Table 9-9). Multiple faceting accounts for about one-half of all identifiable platforms, resulting in high faceting indices: IF = 62.5, IFs = 48.4. The unlipped and semi-lipped platforms are approximately of equal proportions. The lipped butts are not numerous, but more than one-third of all platforms could not be identified in relation to this attribute (Table 9-10).

The flake assemblage of Level II/7F8 is characterized by: (1) a great variety of types of dorsal scar patterns: uni-directional-crossed, bi-directional, uni-directional, and converging; (2) a moderate and average percentage of cortical and partly cortical flakes; (3) a dominance, in equal proportions, of trapezoidal and rectangular-shaped flakes, of which the former, in general, were removed off-axis, while the latter were removed on-axis; (4) a dominance of flakes with flat lateral profiles in association with feathered distal ends and triangular or trapezoidal cross-sections; and, (5) a great number of multiple faceted platforms associated with either unlipped or semi-lipped butts.

The flake and blade assemblages share a similar distribution of dorsal scar patterns, shapes, proportions of partially and completely cortical pieces, midpoint cross-section shapes, distal end profiles, faceted and unfaceted platforms, as well as lipped and unlipped butts. At the same time, some differences are present, too: the proportions of lateral profile curvature are different (blades are twice as likely to be incurvate than flakes) and there are proportionately significantly more faceted platforms among the blades, as compared to the flakes. The total percentage of faceted platforms for blades and flakes combined, IF = 69.2; IFs = 51.9, is somewhat higher than for flakes alone: IF = 62.5; IFs = 48.4.

Tools

Forty-three tools came from Level II/7F8, 14 of which are on blades and 32 on flakes. More than one-half of the tools (24) are broken. The tool assemblage includes points, scrapers, notches, denticulates, retouched pieces, and unidentifiable fragments (Table 9-11).

The points consist of two sub-leaf (fig. 9-3: *5*), and one sub-triangular (fig. 9-3: *4*). All but one point was retouched with flat scalar obverse retouch; on the other, retouch is obverse semi-steep.

Scrapers (16) include transverse-straight, straight (fig. 9-5: *8*), convex (figs. 9-4: *6*; 9-5: *7*), straight-convex, bi-convex, and convergent. Only obverse retouch was used in scraper production. In general, most scrapers have either flat or semi-steep scalar retouch, although some sub-parallel and stepped obverse retouch occurs, as well. These last two types of retouch are usually associated with semi-steep retouched angles.

Both denticulates are straight obverse with bi-truncated-faceted extremities (fig. 9-4: *2,4*). The single straight denticulated edge in both cases was formed by obverse scalar steep retouch. The single notched tool has inverse scalar steep retouch. The retouched pieces are subdivided into lateral—which are the most common—bilateral, and distal, which are each represented by a single piece. The distally retouched example is the only case of alternate scalar semi-steep retouch in Level II/7F8. The other retouched pieces were manufactured by either marginal or irregular discontinuous flat obverse retouch.

Level II/8C

Pre-cores and Cores

No pre-cores or cores were recovered in this level.

Blanks

The debitage consists of 79 pieces, including: 63 flakes, 12 blades, and 4 retouched flakes. Owing to the small blade sample, blade attributes will be only briefly summarized.

Blades. Even for such a small sample, their dorsal scar patterns are usual for the blade assemblages of Unit II: uni-directional-crossed, bi-directional, uni-directional, and crested (Table 9-12). Half of the blades are covered by cortex.

Usually, blades are rectangular-shaped (Table 9-13) and were removed on-axis (Table 9-14). The number of flat lateral profiles on blades (Table 9-15) is not high; most have feathered distal ends (Table 9-16), and either triangular or trapezoidal midpoint cross-sections (Table 9-17). Among the identifiable platforms, the most numerous ones are multiple-faceted (Table 9-9), and most are unlipped (Table 9-10).

Flakes. Of the 67 flakes, 37 are broken. While the sample is small, it can be described in normal fashion.

Dorsal Scar Patterns. As described above, the uni-directional-crossed, bi-directional, uni-directional, and converging scar patterns are equally prevalent (Table 9-3). About 40% of flakes with those scar patterns also are covered by cortex to some degree, while 43.3% of all flakes have some cortex.

Shape. Because of breakage, 26 flakes are not identifiable by shape. The most common identifiable shape is rectangular (Table 9-4). Ovoid flakes are relatively numerous, as are irregularly shaped ones. Those flakes struck on-axis are more numerous than those struck off-axis, although about one-third could be identified in this way (Table 9-5).

Profiles and Cross-Sections. Flat and medially incurvate flakes are equally represented (Table 9-6). The other flake profiles are not as numerous. Feathered distal ends dominate (Table 9-7). Taking into account the number of missing distal ends, it is obvious that feathered distal ends are the most representative form. About half of the flake cross-sections are triangular, although trapezoidal and crescent cross-sections are relatively numerous (Table 9-8).

Platforms. There are 41 identifiable platforms; about half are multiple faceted (Table 9-9). Even for such a small number of platforms, the indices are usual for Unit II: IF = 69.6, IFs = 46.3.

In general, the debitage assemblage of Level II/8C is characterized by (1) equally prevalent uni-directional-crossed, uni-directional, bi-directional, and converging dorsal scar patterns; (2) 40% of flakes which are partly or completely covered by cortex; (3) a dominance of rectangular-shaped flakes removed on-axis; (4) a dominance of flat flakes associated with feathered distal ends and either triangular or trapezoidal cross-sections; (5) a high percentage of multiple faceted platforms (for flakes and blades): IF = 63.0, IFs = 50; and, (6) a moderate proportion of blades: Ilam = 15.2.

Tools

The tool-kit from Level II/8C consists of two obversely retouched straight scrapers (figs. 9-4: *3*; 9-5: *4*) and two retouched pieces (Table 9-11).

INTER-LEVEL COMPARATIVE ANALYSIS

The recovered assemblages from Unit II at Kabazi II all seem to belong within the same industry—the Western Crimean Mousterian (WCM). In fact, in spite of the often small samples sizes, the degree of inter-level homogeneity is striking, although not universal. This section will pull together the separate level samples to elucidate where homogeneity and variability are found.

Pre-cores

Pre-cores were recovered in all but Levels II/7C and II/8C (Table 9-2). In Levels II/7, II/7E, and II/7F8, the pre-cores are crested ridge pieces made on the narrow side of a plaquette and/or the narrow side of a rectangular chunk. The pre-cores with narrow flaked surfaces from Level II/7D are morphologically similar to the crested ridge pieces. At the same time, a rather different morphology exists for the parallel (II/7) and bi-directional pre-cores made on flakes (II/7AB). Unlike the crested ridge and narrow flaked surface cores, where the narrow flaking surfaces were established at the pre-core stage, the flaking surfaces of parallel and bi-directional pre-cores, even at this stage of core organization, are significantly wide. Mainly, these differences are technological. Typologically, these pre-core types are found together in Level II/7 and individually in other levels. Thus, it is likely that the absence of one or the other type in any one level is merely the result of small sample size.

Cores

In accordance with the number and arrangement of striking platforms and scar position on core flaking surfaces, cores have been subdivided into four main groups: radial and discoidal; Levallois tortoise; parallel and convergent; and, bi-directional and orthogonal. Cores from all these groups occur in all levels, except II/7E, where Levallois tortoise cores were missing, and Level II/8C which had no cores, at all (Table 9-2). A common feature of these core assemblages is the presence of supplementary platforms that were used during the preparation of distal/lateral flaking surface convexities. The supplementary platforms occur on Levallois tortoise, parallel, and bi-directional cores.

Although there are a number of different cores types in each level, most cores, regardless of type, have rectangular-shaped flaking surfaces. In addition, different core types with naturally flat undersurfaces are found in each level. The crested ridge pre-cores correspond well with the series of narrow flaked surface and sub-cylindrical cores from Levels II/7AB, II/7C, II/7D, and II/7E. Another common feature of all core assemblages is the frequent use of faceted platform preparation. All of these features comprise the basic typological attributes of the WCM core assemblages. Thus, the pre-core and core assemblages of all of these levels are technologically and typologically homogeneous.

Blades

There are 303 blades from all assemblages, and about 36% of tools were made on blades. There is no doubt that the blade production was an integral part of the technology which produced these assemblages. The average percentage of blades among all blank types is 20.32%, clearly indicating that blades were positively selected for modification into tools.

Dorsal Scar Patterns

In every level of Unit II, four dorsal scar patterns occur in more or less significant numbers on blades: uni-directional-crossed, bi-directional, uni-directional, and converging (Table 9-3). These four account for 70% of the scar patterns on blades. Blades with uni-directional-crossed dorsal scar patterns are most common, and are less cortical (about 23%) than blades with other types of dorsal scar patterns. At least 30%, and often as much as 45%, of blades with bi-directional, bi-directional-crossed, and converging dorsal scar patterns are partly covered with cortex. The blade assemblages of Levels II/7AB, II/7D, and II/7F8 have a significant number of bi-directional-crossed scar patterns (Table 9-12).

Blades with crested/débordant dorsal scar patterns are reasonably represented, not surprisingly, given the core shapes. About half of them are partly covered with cortex. There are Levallois blades in three of the seven levels (II/7C, II/7D, II/7F8) but the total number of Levallois blades is very small (Table 9-12). On average, the number of partly cortical blades is very high at ca. 32%.

Shape

More than one-half of the blades are rectangular-shaped (Table 9-13). At the same time, the variation in the percentages of rectangular blades among the assemblages is very high: from ca. 24% in Level II/7C to ca. 67% in Level II/8C. The explanation of such a high range most likely lies in the small sample sizes. For example, in the assemblages containing large samples, such as II/7AB, II/7E, and II/7F8, the range is not so impressive (Table 9-13). The next most common blade shapes are triangular, elongated trapezoidal, and crescent. The proportional ranges of these types among the levels are high. In all cases, however, each of these types is more common in each level than types such as ovoid, leaf-shaped, and expanding. It must be noted that the rectangular blades are always associated with on-axis blank orientation. Moreover, even taking into account the poor sample sizes, the range of on-axis and off-axis orientation is not significant: as a whole, more than 88% of identifiable blades are struck on-axis (Table 9-14).

Profiles and Cross-Sections

Blades with flat lateral profiles predominate on average, and also in each assemblage (Table 9-15). These are followed by medially incurvate and twisted blades, each of which is represented by approximately equal numbers not only overall, but also in each assemblage. Feathered distal ends occur over 50% of the time in each blade assemblage (Table 9-16), while, overall, feathered ends (essential counts) are ca. 70% of all distal ends. Triangular, lateral steep, and trapezoidal midpoint cross-sections are represented by about the same percentages in all but one assemblage; only in Level II/8C, with 12 blades, is there another pattern of occurrence (Table 9-17).

Platforms

Faceted platforms are really predominant in each assemblage, except for Level II/7D, where plain platforms are most common (Table 9-9). Overall, they account for ca. 60% of all identifiable butts. Laterally prepared plain and faceted butts are not numerous, but are present in each assemblage.

Semi-lipped butts are the most common type of lipping in Levels II/7 through II/7E, while unlipped platforms dominate in the blade assemblages of Levels II/7F8 and II/8C (Table 9-10).

Thus, the blade assemblages of Levels II/7 through II/8C are homogeneous in the following attributes: (1) proportions of different dorsal scar patterns; (2) the percentage of partly cortical blades; (3) the predominance of rectangular blades; (4) the predominance of on-axis blades; (5) the predominance of flat, medially incurvate, and twisted pieces; (6) predominance of feathered distal ends and a paucity of other forms; (7) equal proportions of the same cross-sections (triangular and trapezoidal); (8) a predominance of multiple faceted platforms: IF = 73.3, IFs = 60.6; and, (9) a paucity of true lipped platforms.

The inter-assemblage differences are connected to the variable presence of Levallois blades and *lames débordantes*, which are few and do not occur in all levels. These types are not consistent, with different proportions of dorsal scar patterns (Level II/7D) and platform types. It is felt, however, that these differences result from statistically small samples.

On the other hand, there are some real differences among levels. For instance, the extremely low blade index of Level II/7, excavated in 1987 and covering an area of about 30 m^2. Another 24 m^2 were excavated during the 1993 field season. The 1987 flint assemblage consisted of 126 unretouched and retouched blades and 274 flakes and flake tools. Therefore, the amount of debitage from the 1987 field season is about four times larger than the amount of debitage from the 1993 season, where only 116 pieces of debitage were recovered. The same pattern applies to the bone assemblages. Thus, the 1987 and 1993 excavated areas differ both in density of artifacts and faunal remains, and ratios of flint categories. Those differences could be explained by the intra-site variability of fauna and raw material exploitation. Then, it must be noted a relatively lower percentage of semi-lipped butts in Level II/7F8, than in the uppermost assemblages of Levels II/7E through II/7AB.

Flakes

Combined, a total 1188 flakes were recovered from Levels II/7 through II/8C. This sample is considerably larger than that of the blades, and, not surprisingly, the majority of retouched tools were produced on flakes.

Dorsal Scar Patterns

Five types of dorsal scar patterns commonly occur in each level: converging (17% to 27%), uni-directional (15% to 23%, but 6.4% in II/7), uni-directional-crossed (9.7% to 21.1%), bi-directional (9% to 15%, but 4.5% in II/7), and covered by cortex (7% to 16%). Levallois flakes were found in every level except II/8C. The percentage of partially cortical flakes among those flakes with lateral, uni-directional-crossed, uni-directional, converging, and crested dorsal scar patterns is from 40% to 55%. The percentage of partly and completely cortical flakes, regardless of dorsal scar pattern, is ca. 48%.

Shape

Rectangular-shaped flakes dominate in all the levels (Table 9-4). They range in percentage from 20% to 40%. More than 80% of rectangular-shaped flakes were removed on-axis. The same is not true for the trapezoidal and triangular flakes, where the majority were removed off-axis. On average, flakes removed on-axis and flakes removed off-axis show a 50/50 split (Table 9-5).

Profiles and Cross-Sections

As noted above, flat lateral profiles dominate among the flakes (36% to 58%). Feathered at distal end (45% to 58%), and either triangular (35% to 46%) or trapezoidal (23% to 35%) in cross-section are most common (Tables 9-6, 9-7, 9-8).

Platforms

Multiple faceted platforms are more representative of the lower part of Unit II in Levels II/8C, II/7F8, II/7E, II/7D, than of the upper levels (Table 9-9). In the lower levels, multiple faceted platforms vary from 41% to 48% of all identifiable butts. The percentages of multiple faceted platforms in Levels II/7C, II/7AB, II/7 are only from 29% to 35%. The percentages of unfaceted platforms are relatively stable and, on average, account for more than one-third of all identifiable flakes. Semi-lipped and unlipped platforms in all levels have approximately the same percentages and, combined, make up about 90% of identifiable butts (Table 9-10). Truly lipped platforms are rare (3% to 8%).

Thus, there are no significant differences among the flake assemblages of Levels II/7 through II/8C which need to be explained from the point of view of different typological structures. All types of attributes adopted for the present study are present in all flake assemblages. The only difference is poorly represented: the different percentages of faceted platforms in the flake assemblages of Levels II/8C-II/7D, on the one hand, and in the assemblages of Levels II/7C-II/7, on the other. At the same time, taking into account this poorly characterized difference and the "absolute" similarity of all other typological attributes, it must be concluded that there is complete typological similarity of the flakes assemblages from Levels II/7-II/8C.

This conclusion is correct for the blade and flake assemblage comparisons, as well. The differences result from the proportional distribution of the same dominant types more than from the presence or absence of some quantitatively significant attributes. The different proportional distributions are displayed in the dorsal scar patterns, shape types, lateral profiles, cross-sections at midpoint, occurrence of faceted platforms, and lipping.

The blades with uni-directional-crossed dorsal scar patterns are dominant, whereas in the flake assemblages, a converging pattern is most common. At the same time, both types of dorsal scar patterns are represented in each level's assemblage by a significant number of artifacts. The percentage of rectangular-shaped blades is higher than for rectangular-shaped flakes. At the same time, the trapezoidal elongated blades are much more common than are trapezoidal elongated flakes.

The differences between blade and flake lateral profiles appear to be correlated with the length/width proportions of blades and flakes. The percentage of twisted blades is twice that of twisted flakes. The variations in midpoint cross-section shapes of blades differ from those of flakes because of the rarity of crescent type blades (fully cortical), while that type ranges from 12% to 18% of all flake cross-sections. Since this attribute state, on both flakes and blades, is associated with primary blanks, it is not surprising that few are blades. Finally, the blade assemblages are different from those of flakes in having significantly higher percentages of multiple faceted platforms and relatively lower percentages of unlipped butts.

The majority of differences between the flake and blade assemblages are correlated with metrical attributes, which are traditionally used to distinguish between flakes and blades. Exceptions to this are seen in the lack of significant differences between flake and blade dorsal scar pattern distributions, and by the significantly greater percentage of multiple faceted platform on blades, among others.

Tools

A total of 165 tools were recovered from Levels II/7 through II/8C. In spite of often small sample sizes, it is still valid to note that the main typological feature of all the assemblages is the total absence of bifacial tools, as well as of bifacial treatment elements (Table 9-11). While statistical comparison of tool assemblages by level is not possible because of the small samples, strong similarities are obvious, from the first glance. Only two classes of tools are always present in each level: scrapers and retouched pieces. Points are absent in the assemblages of Levels II/7E and II/8C and not a single denticulate was found in Levels II/7, II/7D, II/7E, and II/8C. Notched tools are present only in Levels II/7C, II/7D, II/7E, II/7F8, while battered pieces (II/7D), borers (II/7E), and burins (II/7E) were present as isolated items.

While each level sample is small, the homogeneity of the tools, as well as the debitage, makes it possible to combine the various levels' tool samples into a single group for discussion. In the combined sample, simple retouched pieces are the most numerous and occur in all levels: there are 78, of which 67 have lateral, obverse retouch. Other types of seldom-seen retouched pieces include lateral alternate, bilateral obverse, lateral inverse, bilateral alternate, and distal alternate. The main feature of all the retouched pieces was the method of their manufacture; mainly by lateral discontinuous obverse (either marginal or irregular) retouch. Given the weak retouch on most of these pieces, it is possible that this edge modification frequently resulted from use, rather than purposeful retouch, and even those with continuous retouch present no evidence that they were ever resharpened.

The scrapers were subdivided into four main groups: simple (32), transverse (2), double (7), and converging (13). One-half of the simple scrapers have straight scraping edges and this type is present in all levels, except for Levels II/7 and II/7D. Simple convex scrapers are only a bit less common, being present in Levels II/7AB, II/7C, II/7D, and II/7F8. There is only a single concave scraper (II/7C). Simple scrapers were mainly manufactured by obverse scalar flat retouch. Sub-parallel, stepped retouch, as well as steep and semi-steep retouch are very rare. Inverse and alternate retouch were present in a single case each.

The double-edged scrapers are subdivided into double-straight, straight-convex, and bi-convex types and were recovered in Levels II/7AB, II/7C, II/7E, and II/7F8. Overall, the retouch on double-edged scrapers is the same as on simple scrapers, as is the case for the two straight transverse scrapers (Level II/7F8). The simple, double, and transverse scrapers are not very different from the lateral, bilateral, and distally retouched pieces. The main difference is a kind of retouch used for the manufacturing of each class of tools. In the case of scrapers, the retouch is continuous (scalar, sub-parallel, irregular), while in the case of the retouched pieces it is discontinuous and/or marginal.

The convergent scrapers are subdivided into sub-triangular, semi-crescent, sub-crescent, sub-leaf, semi-rectangular, and unidentifiable types. Convergent scrapers are present in all levels, except in II/8C, where only four tools were found. Convergent scrapers were made by obverse scalar flat and sometimes semi-steep retouch.

A total of 15 <u>points</u> were recovered. Some points have the same shapes as the convergent scrapers. They are subdivided as follow: sub-triangular in Level II/7D; sub-crescent in II/7AB; one semi-crescent each in Levels II/7, II/7C, and II/7F8; and sub-leaf in Levels II/7AB, II/7C, and II/7F8. The rest are distal points in Levels II/7AB and II/7C, a lateral point in Level II/7AB, and a Levallois dorsal point in Level II/7C. The difference between the first group of points (the shapes of which are close to convergent scrapers) and the second group lies in the character of retouch. Usually, the lateral edges of the first group are retouched along almost their entire length, while the distal and Levallois points are retouched only at the tip. The lateral point has only a single retouched edge, as well as a retouched tip. Both groups of points are found together and in association with the same type of other tools. Scalar obverse retouch was used to manufacture points of both groups.

Four <u>denticulates</u> were in the tool-kits of Levels II/7AB, II/7C, and II/7F8. Two, both from Level II/F8, are straight-obverse-bi-truncated-faceted types. The others are subdivided into concave obverse (II/7AB) and straight obverse (II/7C) types. The straight-dorsal-bi-truncated-faceted denticulates were made by obverse, scalar steep retouch. The production of the denticulated edge on the straight obverse tools was carried out with scalar flat retouch. The denticulated bi-truncated-faceted tools, which were well known from the previous excavations of Unit II, appear to be a pronounced typological feature of the Western Crimean Mousterian industry. Moreover, the single bi-truncated-faceted unretouched piece (Level II/7D), which was classified under the class truncated-faceted, could represent an unfinished denticulated tool, because the method of distal/proximal treatment in the Unit II is currently only known to be associated with denticulated tools.

The five <u>notched tools</u> come from four levels: II/7C, II/7D, II/7E, and II/7F8. They exhibit lateral notches, formed by scalar retouch. The retouch types and retouch angles are subdivided into obverse flat, alternate semi-steep, inverse-flat, and inverse steep. The notched tools are not numerous enough to be a distinctive typological feature of Unit II. The same applies for the tool classes such as <u>burins</u>, <u>borers</u>, and <u>battered pieces</u>.

The tool-kits of Levels II/7 through II/8C are typologically similar, mainly in relation to scraper morphology. The other tool classes are not numerous enough to elucidate important typological differences. The most prevalent tool class is retouched pieces which are morphologically close to scrapers. The high percentage of simple obverse scrapers, the presence of distal, lateral, and sub-crescent points made on blades, plus the presence of bi-truncated-faceted obverse straight denticulates appear to be the main characteristic typological features of the WCM industry tool-kit.

In conclusion, two main points should be emphasized from the comparative study of pre-cores, cores, flakes, blades, and tools from Levels II/7 through II/8C. First, there are no typologically significant differences in pre-cores, cores, flakes, blades, and tools among those levels. Second, the typological structure of pre-cores, cores, flakes, blades, and tools from those levels is virtually identical to the Shaitan-Koba type of the WCM industry evolution (Chabai 1990, 1991, 1996). Finally, in spite of the described homogeneity, there are some changes from Levels II/8C and II/7F8 to the Levels II/7E -II/7AB which must be noted. Those changes, from bottom to top, are mainly seen on the blades as increasing lipping and semi-lipping, as well as increasing laterally prepared butts but, also, overall, in the decrease of faceted platforms. In spite of this, the proportional occurrences of Levallois flakes and blades remains stable throughout the sequence. Thus, these changes would seem to reflect changes within blade production itself, rather than indicating an increase in the production of blades, which is documented only in the upper levels (II/1 and II/1A) of Unit II (see Chapter 8).

CORE REDUCTION STRATEGIES

The reconstruction of core reduction strategies is based on both refittings and analyses of technologically meaningful attributes described above. A number of reduction strategies were used at Kabazi II, Unit II: the Levallois tortoise method, the volumetric flaking method, the uni-polar variant of the Biache method, and the bi-polar variant of the Biache method.

Levallois Tortoise Method

Even taking into account the real possibility that both core morphology and size changed during the reduction process, it is difficult to imagine that the production of Levallois tortoise cores made on flakes differed from that which is traditionally called the Tortoise method (Gladilin 1976, 1989; Chabai and Sitlivy 1993) or *Levallois préférentiel* (Boëda, Geneste, and Meignen 1990). The further utilization of such cores could transform them into other core types, such as parallel (II/7), convergent (II/7C), or bi-directional (II/7C). It is impossible, however, to start with parallel or converging removals and finish with the removal of a central flake which was prepared by centripetal blows from supplementary platforms. Finally, after this procedure, part of the ventral surface of the primary flake is seen on the flaking surface of the core (fig. 9-1: *2*). It seems obvious that the Levallois tortoise core made on a flake exhibits both the first and the last stages of that specific type of core reduction. Although it is difficult to either exclude or prove further reduction patterns for this type of core, some of them could be explained in the following way: use of the same striking platform or preparation of an opposite one and the removal of several blanks in one or opposite directions. This effort would result in a uni-directional or bi-directional core on flake. Some parallel (II/7), convergent (II/7AB, II/7C), and bi-directional (II/7C) cores made on flake cores are present and might represent transformed Levallois tortoise cores (Table 9-2).

Volumetric Flaking Method

A significant number of pre-cores (5) have well-prepared crested ridges. Other types of pre-cores, which are morphologically close to the above, have a narrow flaked surface. The main metrical attribute of those types is the width to thickness proportion: thickness is much greater than width. The narrow flaked surface cores have the same metrical attributes (Table 9-2). All of the narrow flaked surface cores show several scars on one side from the formerly made crested ridge (fig. 9-6: *2*). The same kind of scars on sides and undersurfaces are seen on some sub-cylindrical cores in Levels II/7AB (fig. 9-6: *1*) and II/7C. Thus, the evidence for crested ridge preparation is seen on the narrow surface pre-cores, narrow flaked surface cores, and sub-cylindrical cores. The relationship between the width/thickness ratio of crested ridge pre-cores, narrow surface pre-cores, and sub-cylindrical cores clearly demonstrate that they and their pre-cores are much thicker than are the other types. The dimensions of thickness and width for crested ridge pre-cores, narrow surface pre-cores and cores, and sub-cylindrical cores are very close, while the other types of cores are significantly wider than they are thick (Table 9-2). The same is true for the refitted bi-directional sub-cylindrical core from II/7C (figs. 9-10 and 9-11). Before the refitting, the width/thickness ratio was 5.3:3 cm, and its length was 9.9 cm. After refitting six blanks and one flake core tablet onto the flaking surface and striking platform, the dimensions changed significantly: the width/thickness ratio became 5.3:5.5 cm, while the length expanded to only 10.3 cm. Moreover, the refitted blades are very far from the beginning of the initial stage of flaking (stage 1); there is no evidence of primary core preparation blanks on the refitted blades (fig. 9-10: *1*). Thus, this core changed morphologically during its reduction from a narrow flaked surface type (fig. 9-10: *1*) to a sub-cylindrical core (fig. 9-11: *2*). It is possible to suggest that the first stage of that core exploitation started with the crested ridge formation. That particular preparation resulted in a rectangular shape for the core flaking surface and the necessity of a volumetric exploitation. The evidence of that stage appears on the pre-cores with crested ridges. At the same time, one platform, or two opposed platforms, were prepared and placed at the ends of the crested ridge.

The second stage of this exploitation started with the removal of the crested ridge and continued with a number of blade and/or flake removals. The orientation of the removals on the core flaking surface depended upon the orientation of the striking platform angle, which initially was oriented along the crested ridge scar. In the case of exhaustion or the crushing of the striking platform, resharpening and reorientation of the striking platform followed. The reorientation of the platform led to the exploitation of a new part of the nodule/plaquette. In other words, it led to the appearance of a new flaking surface, which conjoined with the previous flaking surface.

The second stage of this method of core exploitation led to sub-cylindrical cores with one platform or two opposed platforms. There are three main groups of blanks which resulted from using this flaking method: (1) small flakes covered by cortex or partially cortical, showing mainly uni-directional and converging dorsal scar patterns (stage 1, with preparation of crested ridge and striking platform); (2) blades or flakes partly covered by cortex (beginning of the second stage), one or two with the crested dorsal scar pattern; (3) a series of blades or elongated flakes with uni-directional or bi-directional dorsal scar patterns. All of those blank groups are associated with crested ridge pre-cores, narrow flaked surface pre-cores and cores, and sub-cylindrical cores. At the same time, these kinds of blanks could have been produced by other methods of core reduction also found in these assemblages. The closest analogy to the method described above is that found with the Rocourt industry (Otte, Boëda, and Haesaerts 1990; Chabai and Sitlivy 1993; Chabai 1995).

Biache Method, Uni-Polar Variant

Reconstruction of the Levallois tortoise and the crested ridge reduction methods was obvious, even typologically. At the same time, it is impossible to explain, within the frameworks of either method, the presence of elongated Levallois flakes, Levallois blades, a great number of uni-directional-crossed or bi-directional-crossed flakes and blades, non-cortical-crested *pièces débordantes*, as well as the abundance of parallel and bi-directional cores with supplementary platforms. A few years ago (Chabai and Sitlivy 1993; Chabai 1995), the reconstruction of the core reduction process was proposed for Levels II/5 through II/8, and was based on E. Boëda's description of the Biache method (Boëda, Geneste, and Meignen 1990). Later, H. Dibble (1995) tried to demonstrate that Boëda's early description (1988) of this method for Level IIa of Biache-St.-Vaast was not correct. Therefore, does the

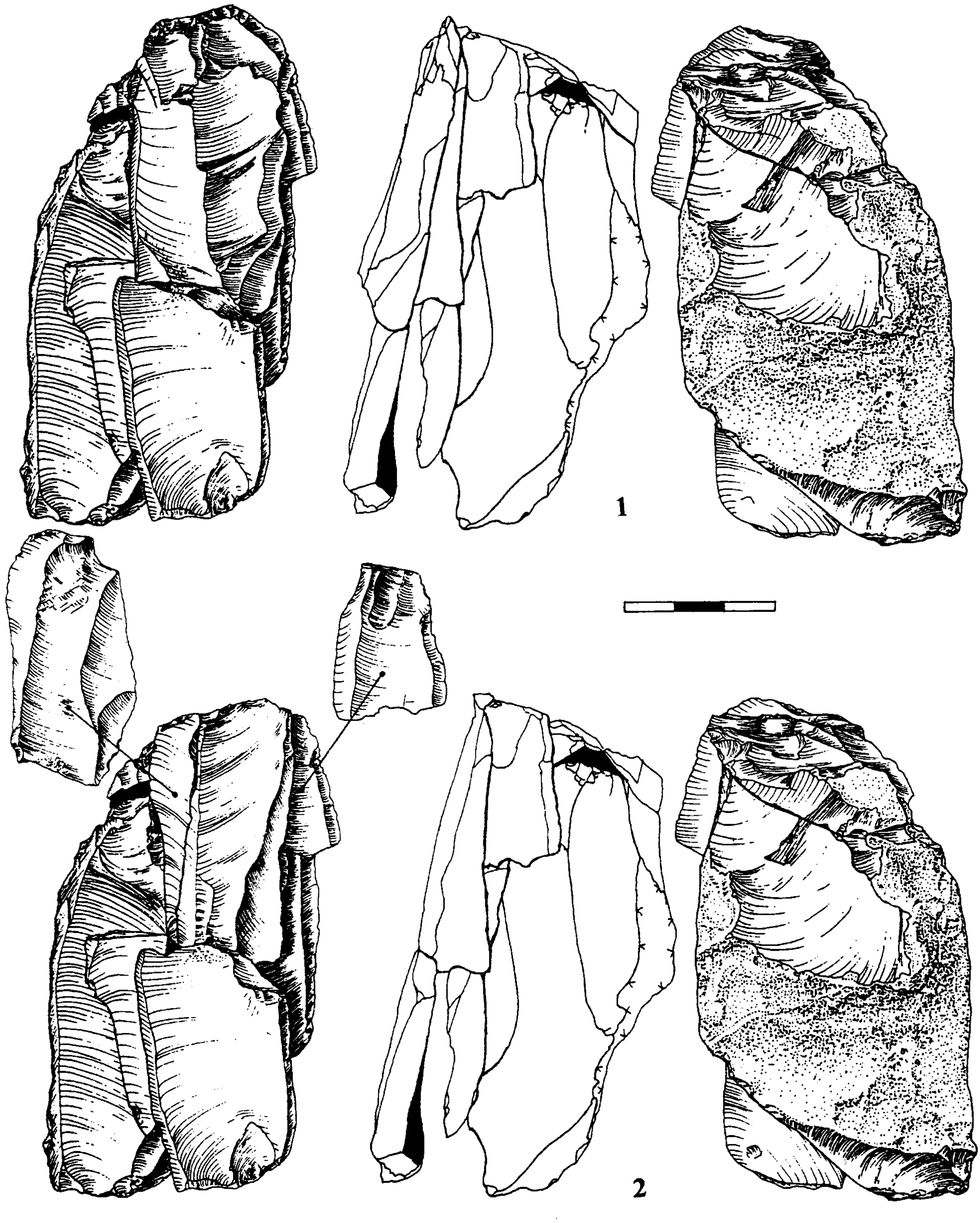


Fig. 9-10—Kabazi II, Unit II, Level II/7C, Refitted bi-directional core with volumetric flaking surface.

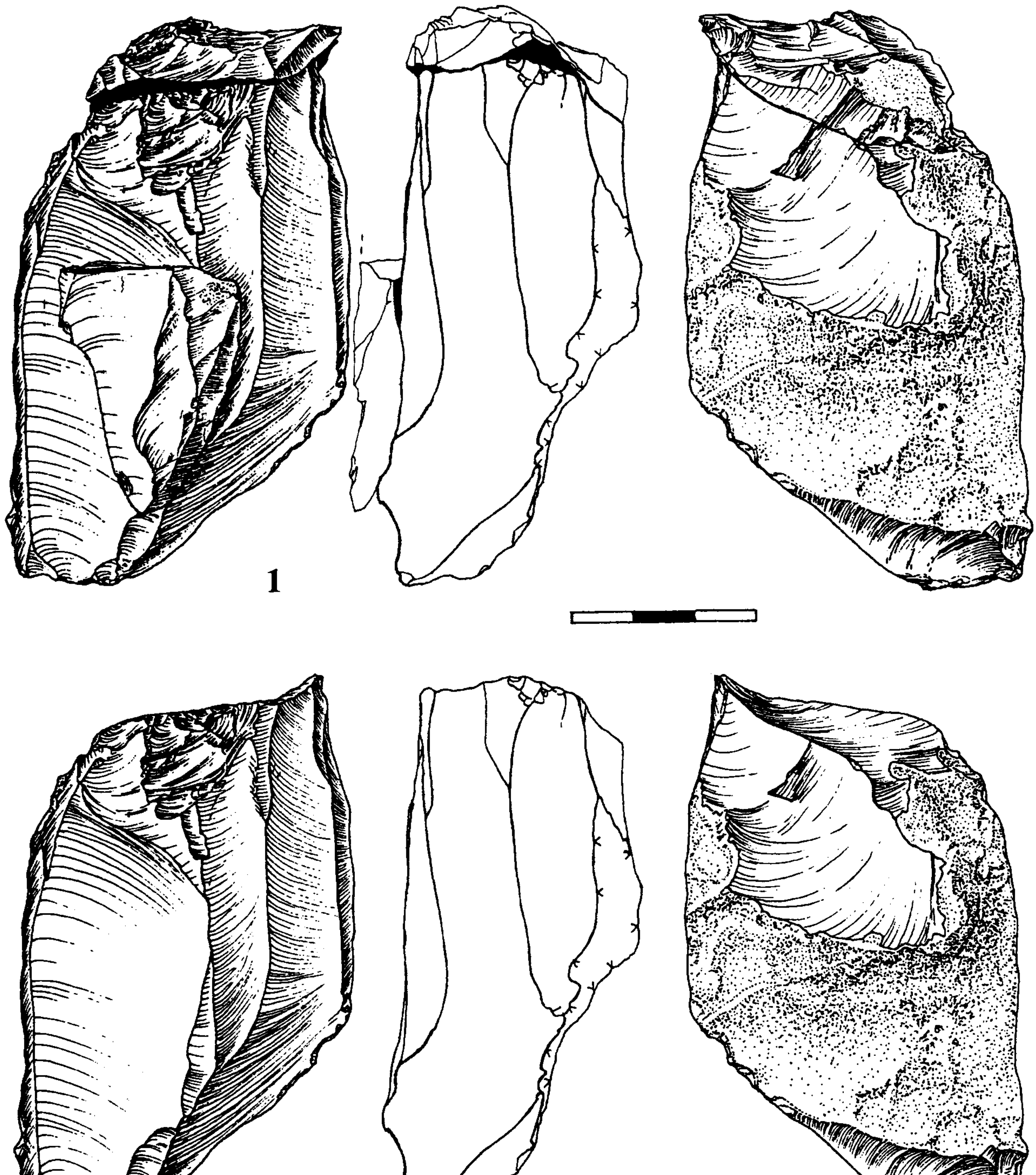


Fig. 9-11—Kabazi II, Unit II, Level II/7C, Refitted bi-directional core with volumetric flaking surface.

Biache-St.-Vaast method really exist, if not at the type-site? The "trump card" of the present study is the reconstruction of the reduction sequence, based on a single refitting and the dimensional attributes of different types of blanks and Levallois tortoise, bi-directional, uni-directional, and radial cores.

The refitting consists of four flakes and one core (figs. 9-12 and 9-13). Based on that refitting, it is possible to reconstruct the following reduction sequence.

Stage 1. At this stage, the main striking and supplementary platforms were prepared. The differences in the platforms are both metric and functional. Both kinds of platforms cover about the entire core perimeter. The thickness of the main striking platform is no less than 2.5 cm. The exact thickness of the supplementary platforms is not available because they have sharp angles which are closer to that of an edge of a bifacial tool, than of a core platform. It is obvious that the removal of large blanks from those platforms is impossible. Therefore, the purpose of the supplementary platforms is the removal of excess flint volume from the sides and distal end of the core and, in that way, produce the necessary flaking surface convexity. Using the supplementary and main platforms, the flaking surface was shaped by a series of flakes removed from all sides of the core toward the center (fig. 9-13*A*). Looking at existing scars, it is clear that each of the "*A*" removals was not longer than 5 cm, while the core length was ca. 10.8 cm, width ca. 11.9 cm, and thickness ca. 3.8 cm. Again, based on the available scars, it is reasonable to assume that about three removals were struck from the main striking platform, while the supplementary platforms have about 11 pieces struck from them. There is no doubt that these numbers are only approximations, but they demonstrate the minimal number and average size (length) of the core sharpening removals.

Typologically, stage 1 of flaking resulted in a radial, ovoid, naturally flat core and a series of blanks (n = 14+) with supposed converging, uni-directional, uni-directional-crossed, and covered by cortex dorsal scar patterns. All of these dorsal scar patterns were determined by the centripetal mode of flaking, when the removed blanks covered only half of the core flaking surface. The majority of blanks with these dorsal scar patterns would have been partly covered by cortex, and none of them would be longer than 5 cm. Technologically, stage 1 resulted in a core with a centripetally prepared, domed flaking surface.

Stage 2. The centripetally-shaped domed flaking surface predetermined the removal of a rectangular-shaped blade with a radial dorsal scar pattern. Unfortunately, the proximal end of that blade is broken. The distal end is truncated but, looking at the remaining portion of that blank, as well as the scars on the dorsal surface of the next blank, it is obvious that the length of the Levallois blade was ca. 10 cm, its width ca. 4.5 cm, and its thickness ca. 0.8 cm (fig. 9-13: *1*). After that removal, the core appears to be a classic example of a Levallois tortoise core. This Levallois tortoise core is 0.8 cm less thick than the previous radial core. The attempt to strike another blank from the same part of the main striking platform, in the same direction, hinge-fractured: there may not have been enough convexity of the flaking surface to make a successful removal possible. The length of this assumed blank is no more than 3 cm; the dorsal scar pattern would have been uni-directional-crossed. This last removal was reconstructed, based on the scars of the next flake's dorsal surface (fig. 9-13: *2*). Blank 3 was removed at a 55 degree angle to the axes of previous blanks. Its dimensions are: length, 6.5 cm; width, 7.5 cm; and thickness, 1.0 cm. The dorsal scar pattern appears to have been the uni-directional-crossed type (fig. 9-13: *3*). After removal of flake 3, the core could be described as being converging, transversal, ovoid, and naturally flat.

The next removal (4) was reconstructed on the basis of both of the scars on the core, and possible scars resulting from the removal of flakes 1 and 3. Looking at the scars of the previous Levallois blade (1), the dorsal scar pattern of flake 4 most probably was uni-directional-crossed (fig. 9-13: *4*). The metric characteristics of flake 4 are: length, ca. 8 cm;

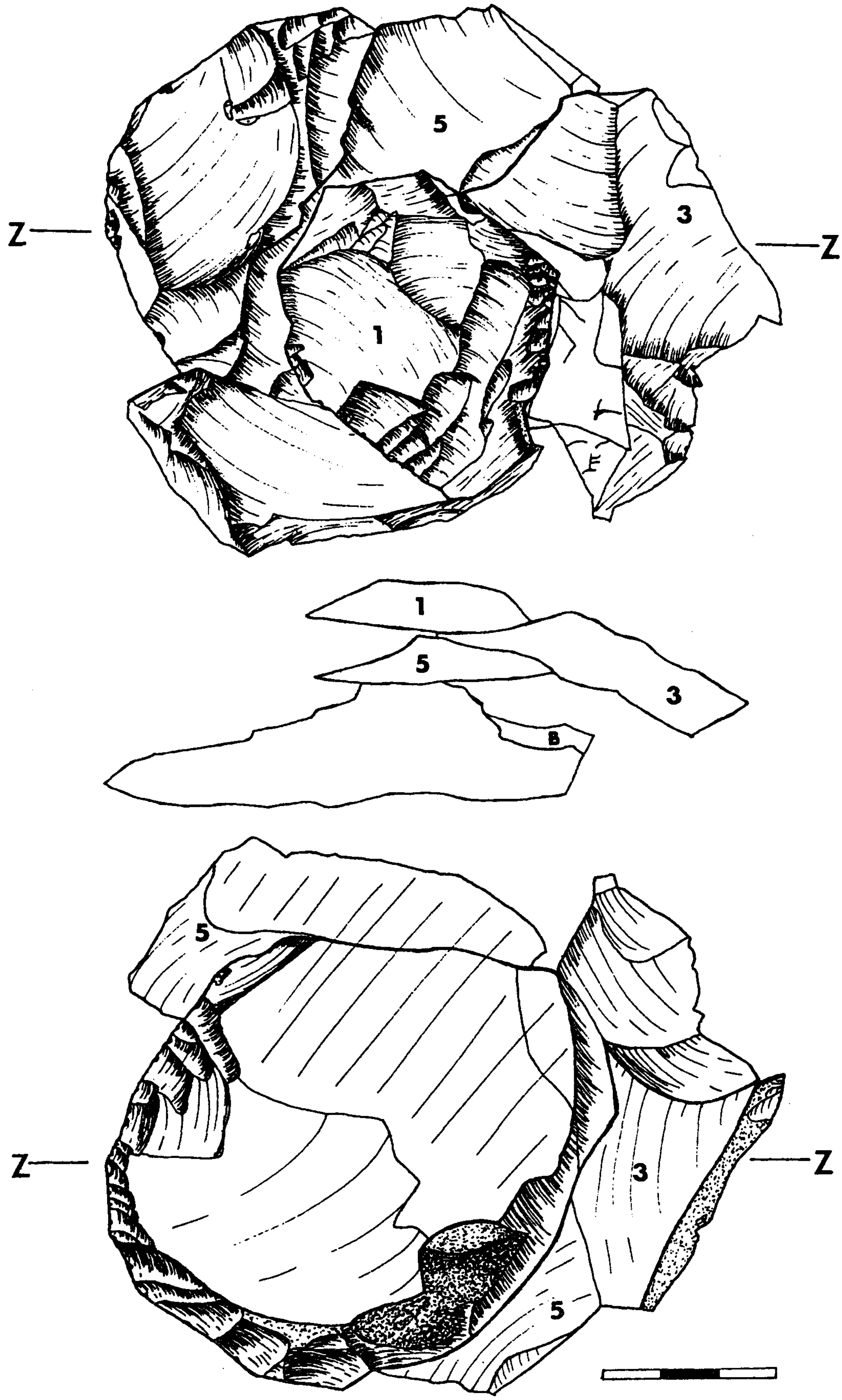


Fig. 9-12—Kabazi II, Unit II, Level II/7F8, Refitted Levallois tortoise core.

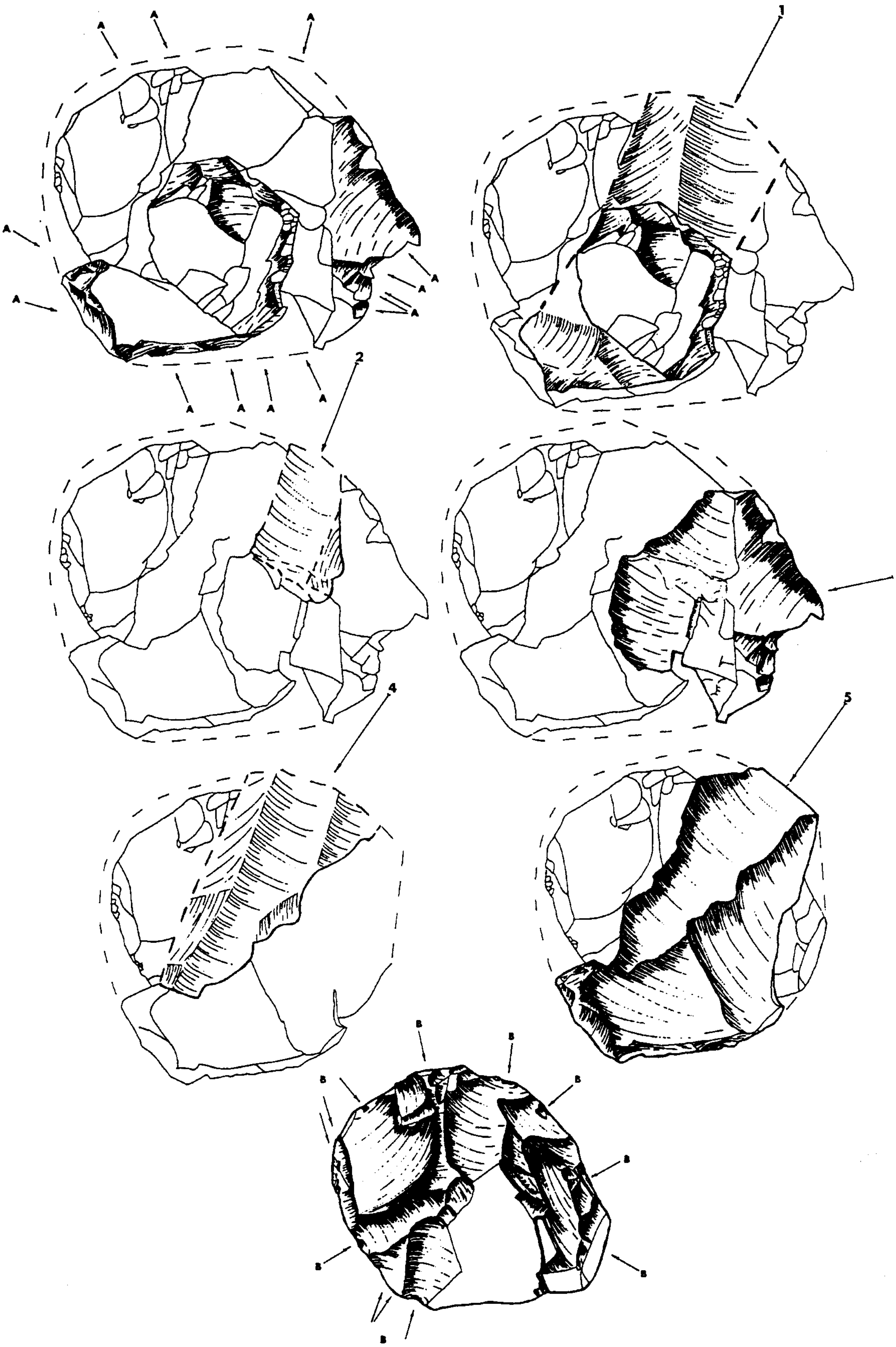


Fig. 9-13—Kabazi II, Unit II, Level II/7F8, Reduction sequence of the refitted Levallois tortoise core: *A*–stage 1 shaping flakes; *B*–stage 3 radially directed preparatory flakes; *1-5*–succession of blank removals.

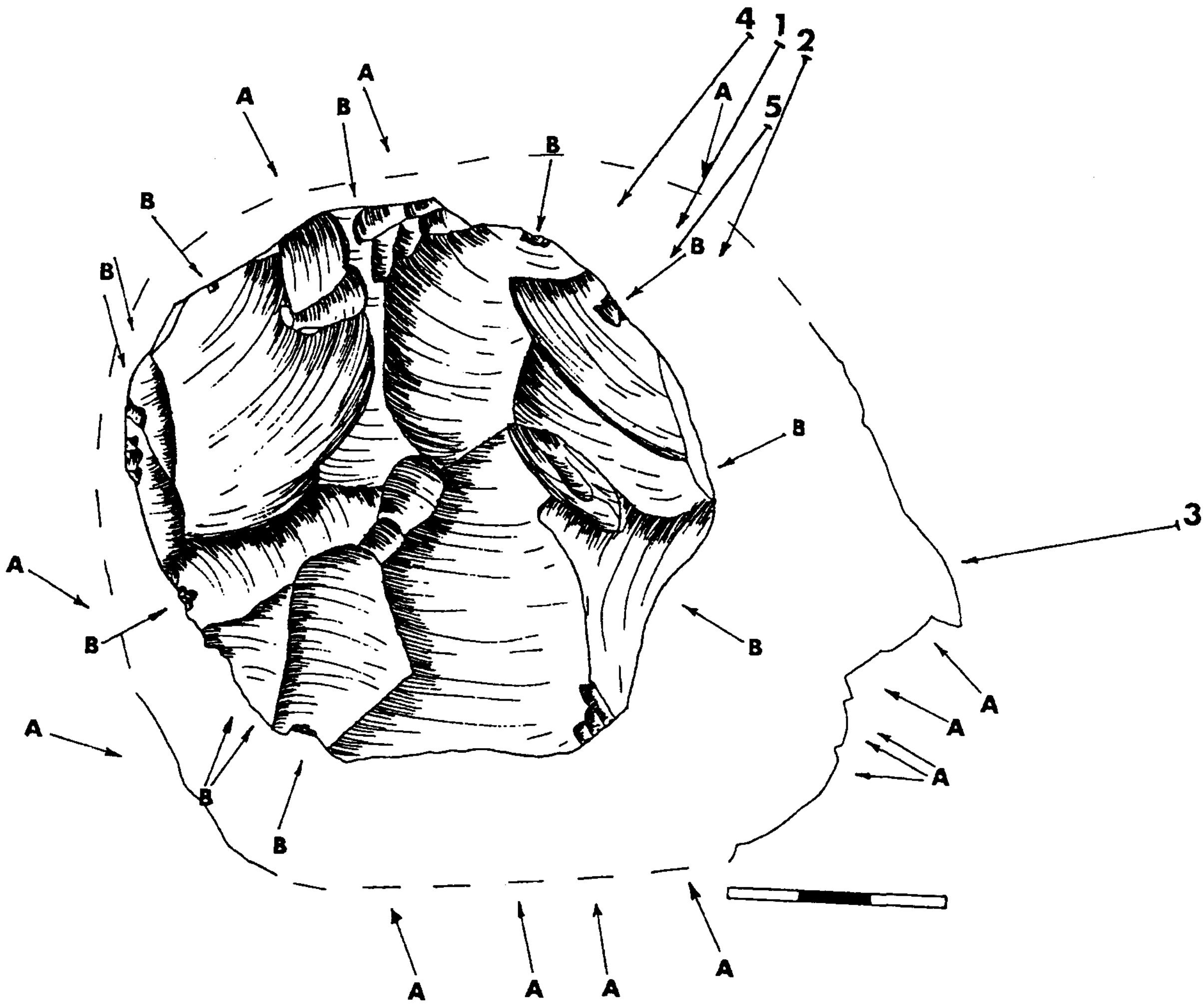


Fig. 9-14—Kabazi II, Unit II, Level II/7F8, Generalized scheme of the reduction sequence of the refitted Levallois tortoise core shown in figure 9-13: *A*–stage 1 shaping flakes; *B*–stage 3 radially directed preparatory flakes; *1-5*–succession of blank removals.

width, ca. 4.5 cm; and thickness, ca. 1.0 cm. The removal of flakes 3 and 4 produced the pronounced convexity at the central part of the core. That convexity made it possible to remove the next flake (fig. 9-13: *5*). At the same time, the absence of distal shaping of the core before that removal predetermined the overpassed distal end of flake 5, which appears to have had a converging dorsal scar pattern (length 10.3 cm; width 5.6 cm; thickness 0.8 cm). After the removal of flake 5, the core was identifiable as either parallel or convergent. The thickness of the parallel/convergent core is only about 2.0 cm. After the removal of flake 5, the flaking surface convexity was completely exhausted. Theoretically, there are two ways to rejuvenate such a core: the first, by removing *débordant* blanks from both sides of the core; or by the centripetal shaping of the surface to establish the flaking surface convexities. The latter was used.

Stage 3. The centripetal preparation (fig. 9-13*B*) of the flaking surface resulted in the appearance of a radially prepared core with pronounced convexity on the central part of the dorsal flaking surface. Thus, the flaking surface was prepared again to strike a Levallois blank. Taking into account the visible scars, at least 12 preparation flakes were removed, the longest of which was only 3.5 cm. This process reduced core width by ca. 1.5 cm. After rejuvenation, the core was 7.8 cm long, 7.3 cm wide, and 2.0 cm thick. The next Levallois blank was not removed because of two natural holes on the main striking platform and several hinged fractures on the flaking surface.

This reduction process may be summarized as follows:

(1) Typologically, during the reduction sequence, the core changed from radial/unstruck Levallois, to Levallois tortoise, to converging, parallel/converging, and, again, to radial/unstruck Levallois, always with supplementary platforms.

(2) The results of flaking produced five blanks from the main striking platform (one Levallois blade, three flakes with uni-directional-crossed scar patterns, and one flake with a converging scar pattern), as well as, at least, 26 flakes from flaking surface preparation, removed mainly from the supplementary platforms (fig. 9-14). These latter flakes are subdivided into shaping and rejuvenating pieces. The shaping flakes from stage 1 are assumed to have converging, uni-directional, and uni-directional-crossed dorsal scar patterns. Moreover, many of them are partly or completely covered by cortex. The length of the largest of them is less than 5.0 cm (fig. 9-14).

The rejuvenating blanks are assumed to have the same types of dorsal scar patterns as the sharpening blanks, but without cortex. The length of the rejuvenating flakes is less than 3.5 cm. At the same time, the range in length of the flakes removed from the main platform appears to be from 6.5 cm to 10.3 cm. There are no doubts that the presented reconstruction does not exhaust all the possible variability of the Biache method used in Unit II of Kabazi II.

Biache Method, Bi-Polar Variant

It is clear that all types of blanks produced on the above core did not result solely from a Biache method, as seen by the presence of narrow/crested ridge technology and the Levallois tortoise core on flake. Yet, the idealized picture of the Biache reduction sequence, based on the described refittings, shows that it is very difficult to imagine the removal of partly cortical flakes from the flaking surface after the striking of the first Levallois blank. It is difficult to account for the partly cortical crested blades in the framework of that method, as well as the narrow flaked surface and sub-cylindrical cores. Even taking into account these exceptions, it is impossible to define a "Biache" assemblage, versus one without the Biache method for non-cortical, uni-directional and bi-directional blanks, single platform, and opposed platform cores. Levallois blanks, uni-directional-crossed and bi-directional-crossed scar patterns are supposed to be a distinctive feature of core exploitation utilizing supplementary platforms, even as heavily, partly cortical, and lateral flakes are associated with shaping flakes only. All of these types of blanks and cores are well-represented in the assemblages of Unit II (Tables 9-2, 9-3, 9-12). As proposed above, the uni-polar variant of the Biache method was added to the bi-polar variant of the same method in the assemblages of Unit II (Chabai and Sitlivy 1993). At the same time, taking into account the absence of refitted bi-directional cores, the implication of the bi-polar Biache method requires a more precise definition.

As was seen, large and small flakes are produced at all stages of the Biache method of core exploitation. Moreover, the metric structure of the blanks, of all types of dorsal scar patterns, are not significantly different, as is true for the amount of cortical blanks among the different metric classes (fig. 9-15*A-J*). The only exceptions to this rule are the Levallois blanks, which are usually not less than 4.0 cm long (fig. 9-15*J*). Both the size of blanks and the amount of cortical pieces are traditionally considered important evidence of core reduction sequences.

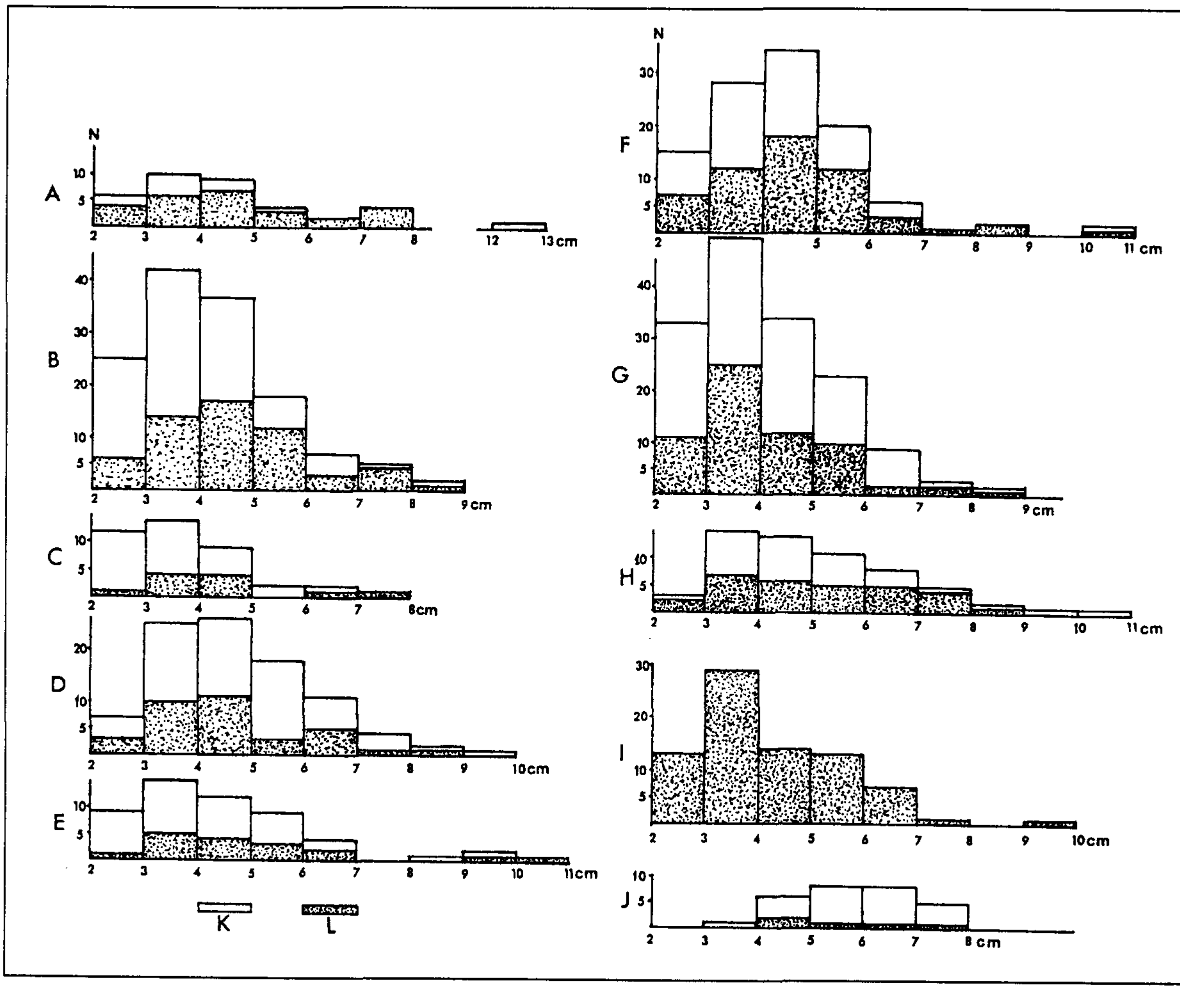


Fig. 9-15—Kabazi II, Unit II, Levels II/7-II/8C, Distributions of different types of blank scar patterns by metric groups: *A*–lateral; *B*–uni-directional-crossed; *C*–radial; *D*–bi-directional; *E*–bi-directional-crossed; *F*–uni-directional; *G*–converging; *H*–crested; *I*–covered by cortex; *J*–Levallois; *K*–blanks without cortex; *L*–partly covered by cortex. The metric group 2-3 centimeters includes transversal flakes only; the width of these flakes is more than 3 centimeters.

There is no doubt, however, that there is a technological difference between large, presumably desired, blanks and small shaping/rejuvenating flakes and blades.

The elaboration of criteria to permit more precise definitions and technological comparative analysis of both core and debitage assemblages should help to elucidate variations in the Biache method. The main danger of this kind of study is that some assumptions may not be well-grounded. However, in this particular case, several observations could be presented to support these assumptions.

The supplementary platform, as has been noted many times, is the main characteristic feature of the Unit II core assemblage. It is obvious that Levallois tortoise cores, by definition, must have lateral/distal supplementary platforms. At the same time, all converging orthogonal and almost all bi-directional cores also have supplementary platforms, as do about half of the parallel cores (Table 9-2). The largest scars of blanks struck from supplementary platforms are no more than 3.0 cm, while the length of discarded Levallois, uni-directional, bi-directional, converging, and orthogonal cores is usually more than 5.0 cm. Only the lengths of three bi-directional cores are less than 5.0 cm. The average thickness of all cores noted above is ca. 2.0 cm. The cores were reduced more in their thickness than in length/width dimensions. There are few Levallois and parallel cores with scar lengths from blanks removed from the main striking platform which are less than 5.0 cm long, and no more than one-third of the bi-directional cores show scar lengths less than 5.0 cm. Taking into account the discarded character of cores, it is possible to assume that the lower metric boundary for blanks removed from a main striking platform is no less than 4.0 cm, while the upper metric boundary for shaping/rejuvenating flakes is no more than 3.0 cm. The other possible assumptions are that "desired" blanks were always removed from the main striking platform and/or platforms, as well as the Levallois blanks—which are always considered to be "desired." It must be noted that the upper boundary for shaping/rejuvenating flakes is valid only for the last stage of core exploitation, when the cores are becoming exhausted.

To estimate the possible lengths of shaping/rejuvenating flakes, as demonstrated by the above refitted core, it is necessary to increase the average length for the shaping/rejuvenating flakes. The maximum length of shaping/rejuvenating flakes could be up to 5.0 cm. Furthermore, estimating the sizes of Levallois blanks (fig. 9-15*J*), even those partly covered by cortex, it is necessary to reduce the lower metric boundary of "desired" blanks. There is no doubt that the "desired" blanks exist in the 4-5 cm range and even, perhaps, in the 3-4 cm range. Thus, if there are no "desired" blanks below 3 cm, and only heavily cortical flakes from core shaping blanks over 5 cm, the metric classes 3-4 cm and 4-5 cm include both shaping/rejuvenating and "desired" blanks. The upper boundary of the non-cortical flake distribution consists of Levallois blanks. None of them is longer than 8 cm, meaning that the chance of finding any kind of stage 1 blank from the Biache method, except shaping blanks, from 8 cm to 13 cm long, is very unlikely. Therefore, a relatively "pure" assemblage of blanks struck from the main platform, using the Biache method, would include blanks from 5 cm to 8 cm in length. Still, it must be noted that looking at the lengths of volumetric narrow flaked surface cores, the range mentioned above also could well include numerous blanks produced in a crested/ridge-volumetric technology.

Twenty-one complete Levallois blanks, 11 uni-directional-crossed, 12 uni-directional, 21 bi-directional, 8 bi-directional-crossed, 20 converging, and 10 non-cortical *débordant* blanks are between 5 cm and 8 cm in length (fig. 9-15*A-J*). This ratio of one Levallois blank to four non-Levallois pieces, is very close to that which was described for the refitted core. Yet, it is difficult to imagine that the uni-directional-crossed and/or bi-directional-crossed blanks were obtained through the exploitation of a narrow flaked surface/crested ridge core reduction or some other method, which did not result in any core in the Unit II assemblages. Taking into account the refitted core, the correlation between parallel and Levallois cores, on the one hand, and Levallois cores and flakes with uni-directional-crossed dorsal scar patterns, on the other, is obvious. The correlation between Levallois and bi-directional-crossed blanks, as well as the correlation between bi-directional cores and Levallois blanks is supported by the presence of two opposed platform, unstruck Levallois cores with centripetally prepared flaking surfaces (II/7A), and the entire number of bi-directional cores flaked after the shaping/rejuvenation of the flaking surface from the supplementary platforms. This latter correlation was well described in the *méthode Levallois récurrente bipolaire, schéma B*, from Biache-Saint-Vaast, Level IIa (Boëda, Geneste, and Meignen 1990). Undoubtedly, the Biache method was present in Unit II in its bi-directional variant. That variant differs from uni-directional only by the presence of a second, as opposed to only a main, striking platform.

In summary, the three methods of flaking in the assemblages of Unit II, Levels II/7 through II/8C include: Levallois tortoise cores made on flakes, a volumetric method, and, the Biache method. The first and last are very similar, in terms of the reduction strategy (centripetal preparation of the flaking surface, the removal of several bi-directional or uni-directional Levallois blanks, and, again, repreparation). The use of both Levallois tortoise and the Biache method led to the manufacture of Levallois blanks. The possible scenarios of further exploitation of Levallois tortoise cores made on flakes result in the presence of a limited number of flakes with uni-directional-crossed, bi-directional-crossed, uni-directional, and bi-directional scar patterns, on the one hand, and uni-directional and bi-directional cores on flakes on the other. These results are very similar to the Biache method. At the same time, the total number of blanks obtained in the Biache method, especially cortical pieces, are very numerous. It is possible to view the Levallois tortoise cores made on flakes as a variant of the Biache method, but the peculiarity of the initial blanks for core preparation and the quantitative attributes of flaking indicate significant differences.

Thus, the assemblages of Levels II/8C through II/7C appear to contain one more example of the coexistence of Levallois and volumetric methods of flaking. The same was seen in the European assemblages of Riencourt-les-Bapaume, Level CA and Saint-Germain-des-Vaux/Port-Racine (Cliquet 1992; Ameloot-Van der Heijden 1993; Ameloot-Van der Heijden and Tuffreau 1993; Révillion 1993), as well as in the Levant at Rosh Ein Mor (Marks and Monigal 1995).

TOOL RETOUCH

It is very difficult to find any heavily retouched tool in the assemblages of Levels II/7 through II/8C. Usually, retouch covers no more than 0.5 cm of treated edge. About 40% of the left/right lateral and proximal/distal ends were modified by scalar retouch. This is the most common type of retouch for the different kinds of scrapers and points. Marginal (16.9%) and irregular (23.7%) retouch were used mainly for the edges of simple retouched pieces and some points. Sub-parallel (8.5%), parallel (0.8%), and stepped (5.9%) retouch are not well-represented. Flat retouch angles dominate (67.3%), followed by semi-steep (23.5%), and steep (9.1%). The method of bi-truncation/faceting is not well-represented either; there are four examples, but two of them are associated with straight-edge denticulates, and one piece is not retouched, at all. In spite of the small number of truncated-faceted pieces, the bi-truncated-faceted denticulates, although rare, are found in a number of Kabazi II, Unit II levels and at Shaitan-Koba, and appear to be one of the diagnostic tools of the WCM.

On the whole, it is clear that retouch in these assemblages does not significantly modify blank shape. The number of retouched tools is only about 11% of all potential blanks. Even Levallois blanks were only rarely selected for retouch (6 of 37). The main attribute for blank selection appears to be length. The inhabitants of Unit II did not pay very much attention to blanks smaller than 4 cm. The tools commonly have lengths between 4-7 cm, with most falling between 5-7 cm. Debitage with lengths from 2-4 cm account for ca. 45% of the combined assemblage, yet, only 2.6% of those between 3-4 cm were selected for retouch. At the same time, 7.9% of the blanks in the 4-5 cm range were chosen; 18.1% in the 5-6 cm range, 31.7% in the 6-7 cm range, 10.3% in the 7-8 cm range, 45.5% in the 8-9 cm range, and 50.0% in the 9-10 cm range. Seventy-five percent of blanks between 10-11 cm were retouched. It is clear that there was no direct selection of blanks in relation to the presence of cortex. Cortical blanks were selected for retouch in their proportional occurrence in the assemblages of Unit II, ca. 36%.

It is difficult to prove a positive selection based on shape, blank profile, or distal end profile. The retouched pieces are dominated by rectangular blanks, which are flat in profile and feathered at the distal ends. Flakes and blades with the same attributes dominate among the unretouched blanks.

The single indication of selection, which does not correspond to regular blank distribution, is the preference for elongated blanks. This conclusion is supported by the number of tools on blades in relation to tools on flakes. The percentage of tools made on blades is 37.7%, while the average percentage of blades among all blanks is ca. 20%.

The abundant bones were never used as retouchers. The different types of retouch are assumed to have been produced by flat ovoid relatively small sandstone pebbles which are present in each level.

PATTERN OF RAW MATERIAL EXPLOITATION

Taking into account the number of cores, primary blanks, partly cortical blanks, sandstone pebbles/hammerstones/retouchers, as well as the core and blank refitting, there is an obvious on-site pattern of primary flaking and tool production. Only Level II/8C has an absence of cores, while Level II/7 shows an unusually low level of blade production (Table 9-1). At the beginning of this chapter, these cases, and the high percentage of blades in Level II/7E, were described as four types of artifact patterning: type 1, from Level II/7 (a low percentage of tools); type 2, from Levels II/7AB, II/7C, II/7D, and II/7F8 (the normal artifact patterning); type 3, from Level II/7E (an unusually high percentage of blades); and, type 4, from Level II/8C (an absence of cores and pre-cores). The "unusual" first, third, and fourth types could be explained as representing different activity intensities on the excavated parts of the "living floor" occupations. On the western part of Level II/7, some 30 m^2 of which were excavated during the 1987 field season, 126 retouched and unretouched blades were found, while the total number of blanks was only 400 (Ilam = 31.5). At the same time, 24 m^2 of the southeastern part of the same occupation level, excavated in 1993, produced only a few blades (Ilam = 6.0), as well as overall few artifacts and fauna. Several occupations, for example, Level II/7F8, exhibit three kinds of artifact and faunal distributions on their occupation surfaces. The first is the central part of the occupation which has an extremely high density of bones. This is where the majority of artifacts are situated. The second zone of artifact and faunal distribution is characterized by significantly smaller numbers of bones and flint. This zone is usually found around the first zone. The third zone is distribution is characterized by the complete absence of bones and tools. So, the number of artifacts and fauna decreased, at times, from the center to the periphery of occupation (see Figure 8-8). Since it is sheer chance what part of an occupation surface an excavation will expose, the likely differences in artifact category distributions among excavated assemblages are probably caused by differences in the portions of the occupations exposed. Along with Levels II/7 and II/8C, it seems that a peripheral part of an occupation was excavated in Level IIA/1, as well. The peripheral character of Levels II/7 and II/8C is proven by the extremely low density of artifacts per square meter, unusual even for the Unit II levels (Table 9-18). In spite of the absence of pre-cores and cores, the core treatment elements in the assemblage of Level II/8C are present in the usual numbers for Unit II assemblages (Tables 9-3 and 9-12). This means that regular core reduction processes could have taken place somewhere in the unexcavated parts of the occupational surfaces of Levels II/8C and IIA/1.

TABLE 9-18
Kabazi II, Unit II, Lithic Variability by Occupation Level

	pre-cores %	*cores %*	*blanks:cores*	*tools:cores*	*primary blanks %*	*crested blanks %*	*blanks:tools*	*density of artifacts per sq.m.*
II/7	1.6	6.4	14.5 : 1	0.6 : 1	8.6	4.3	22.2 : 1	52.5
II/7AB	0.3	7.5	12.5 : 1	1.5 : 1	12.6	4.1	7.2 : 1	145.0
II/7C	—	4.2	22.8 : 1	3.4 : 1	10.4	7.2	5.8 : 1	137.9
II/7D	1.1	4.3	21.8 : 1	2.9 : 1	7.4	5.1	6.6 : 1	80.4
II/7E	0.4	5.3	17.7 : 1	1.3 : 1	7.8	7.3	12.5 : 1	101.7
II/7F8	0.8	4.4	21.6 : 1	2.7 : 1	7.2	6.1	7.0 : 1	143.1
II/8C	—	—	—	—	8.9	2.5	18.8 : 1	43.8

The analysis of the structural relationships among the artifacts of Levels II/7 through II/8C leads to the conclusion that there are no significant differences between the newly derived data and those presented for the Kabazi II, Unit II assemblages in 1995 (Chabai, Marks, and Yevtushenko 1995). These conclusions may be summarized, as follows: (1) a low occupational intensity which is reflected by low blank to core and tool to core ratios; (2) both primary flaking and tool production took place on the site; (3) considering the types of retouch and retouch angles, it appears that there was little, if any, tool rejuvenation; and, (4) flint sources and instruments of flaking were available nearby.

Chapter 10

KABAZI-II, UNITS IIA-III: ARTIFACTS

VICTOR P. CHABAI

THE TYPOLOGICAL STRUCTURE OF THE ARTIFACT ASSEMBLAGES

A total of 1,041 artifacts were recovered from Unit IIA, while the assemblages from two levels of Unit III produced only 230 artifacts. As it was noted in Chapter 8, the different levels of Units IIA and III are of different significance. Levels IIA/1, IIA/2, IIA/4, III/1A, III/1 are interpreted as ancient living floors, as opposed to Levels IIA/2-3, IIA/3, IIA/3A, IIA/3B, and IIA/4B which are not considered to be the result of immediate, direct human activity ("sterile" levels). That is why the description of artifact distributions in these latter levels is not warranted.

The "sterile" levels of Unit IIA contain an insufficient number of artifacts (272 pieces). At the same time, there are more than twice that number of artifacts from Levels IIA/1, IIA/2, and IIA/4 (769 pieces). Even the levels which are interpreted as ancient living floors have an incredibly low number of artifacts (Table 10-1). According to the proportional relationships among different categories of artifacts, the flint assemblages from these living floor levels can be subdivided into two types. The first includes the assemblage of Level IIA/1, which is characterized by only a moderate percentage of tools and by a high percentage of blades. The proportional occurrence among different categories of artifacts in the second type (Levels IIA/2 through III/1A) is directly opposite to the first. The blade component is extremely low, but at the same time, all living floor assemblages from Levels II/A2 through III/1 are characterized by extremely high tool percentages. The living floor levels of Unit III are identical to the second pattern of artifact occurrences seen in Unit IIA. Finally, a major shared feature of both types is the complete absence of cores and pre-cores.

Level IIA/1

The artifact sample from Level IIA/1, excluding chips, includes 49 flakes, 6 retouched flakes, 22 blades, and 1 retouched blade.

Blades. Of the 23 blades, 12 are broken and 11 are complete. Their technological attributes are as follows:

Dorsal Scar Pattern: uni-directional, 8; uni-directional-crossed, 3; converging, 3; crested, 3; cortex, 2; 4-directions (Levallois), 1; bi-directional, 1; bi-directional-crossed, 1; unidentifiable, 1.

Although scar patterns vary, 30% of the blades have some dorsal cortex, including the single Levallois blade (fig. 10-1: *2*), and two are completely cortex-covered.

Shape: rectangular, 6; sub-crescent, 5; triangular, 3; elongated trapezoidal, 2; unidentifiable, 7.

Axis: on-axis, 17; off-axis, 3; unknown, 3.

Lateral Profile: flat, 8; incurvate medial, 5; twisted, 5; convex, 2; incurvate distal, 2; unidentifiable, 1.

Distal End: feathered, 6; hinged, 3; blunt, 3; overpassed, 2; missing, 9.

Cross-Section at Midpoint: triangular, 12; trapezoidal, 6; crescent, 2; lateral steep, 3.

TABLE 10-1
Kabazi II, Units IIA & III, Artifact Totals

	IIA/1			*IIA/2*			*IIA/2-3 "sterile"*			*IIA/3 "sterile"*			*IIA/3A "sterile"*		
	N	*%*	*e %*†	*N*	*%*	*e %*	*N*	*%*	*e %*	*N*	*%*	*e %*	*N*	*%*	*e %*
Chunks	9	2.9		4	3.1		4	3.2		2	5.7		4	7.8	
Preforms	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pre-cores	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cores	—	—	—	—	—	—	—	—	—	1	2.9	8.3	1	2.0	5.9
Chips	225	72.1		96	73.3		101	81.5		21	60.0		30	58.8	
Flakes	49	15.7	62.8	19	14.5	61.3	6	4.8	31.6	6	17.1	50.0	10	19.6	58.8
Blades	22	7.1	28.2	3	2.3	9.7	4	3.2	21.1	2	5.7	16.7	3	5.9	17.6
Tools	7	2.2	8.9	9	6.9	29.0	9	7.3	47.4	3	8.6	25.0	3	5.9	17.6
Total	312			131			124			35			51		

	IIA/3B "sterile"			*IIA/4*			*IIA/4B "sterile"*			*III/1A*			*III/1*		
	N	*%*	*e %*	*N*	*%*	*e %*	*N*	*%*	*e %*	*N*	*%*	*e %*	*N*	*%*	*e %*
Chunks	1	1.6		10	3.8		5	7.7		12	7.6		5	6.8	
Preforms	—	—	—	3	1.2	4.6	—	—	—	2	1.3	5.6	3	4.1	20.0
Pre-cores	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cores	—	—	—	—	—		—	—	—	—	—	—	—	—	—
Chips	48	77.4		186	71.3		43	66.2		109	69.4		53	72.6	
Flakes	7	11.3	53.9	36	13.8	55.4	13	20.0	76.5	23	14.6	63.9	7	9.6	46.7
Blades	—	—	—	3	1.2	4.6	2	3.1	11.8	3	1.9	8.3	—	—	—
Tools	6	9.7	46.2	23	8.8	35.4	2	3.1	11.8	8	5.1	22.2	5	6.8	33.3
Total	62			261			65			157			73		

†Essential counts.

Blades with flat lateral profiles are associated with feathering distal ends (6) and triangular cross-sections. As usual, the lateral steep cross-sections at midpoint (3) are associated with *lames débordantes*.

Platform: plain, 4; multiple faceted, 8; unfaceted, 4; lateral plain, 1; dihedral, 1; cortex, 1; missing, 7; crushed, 1.

Lipping: lipped, 2; semi-lipped, 6; unlipped, 6; unknown, 9.

Taking into account the small number of blades in the assemblage, it is still necessary to note some peculiar typological features. First, the presence of *lames débordantes* and Levallois blades in the collection and, second, the relatively high percentage of partly and completely cortical blades. Also important is the relatively high percentage of faceted platforms (IF = 60). Finally, a last significant feature is that blades, per se, are common (Ilam = 29.5).

Flakes. The flake assemblage of Level IIA/1 consists of 27 broken and 28 complete pieces.

Dorsal Scar Pattern: cortex, 3; converging, 16; uni-directional, 9; lateral, 5; uni-directional-crossed, 5; radial, 5; bi-directional, 3; 3-directional, 3; crested, 2; Levallois, 2; unidentifiable, 2.

Shape: rectangular, 11; trapezoidal, 10; ovoid, 3; triangular, 3; leaf-shaped, 1; expanding, 1; sub-crescent, 1; irregular, 3; unidentifiable, 22.

Axis: on-axis, 10; off- axis, 23; unknown, 22.

Lateral Profile: flat, 21; incurvate medial, 10; incurvate distal, 5; twisted, 8; convex, 4; unidentifiable, 7.

Distal End: feathered, 31; hinged, 5; overpassed, 2; blunt, 2; missing /unknown, 15.

Cross-Section at Midpoint: triangular, 18; trapezoidal, 12; crescent, 14; flat, 3; lateral steep, 3; unidentifiable, 5.

Platform: plain, 7; lateral plain, 9; dihedral, 5; multiple faceted, 11; lateral multiple faceted, 1; cortex, 1; missing/unidentifiable, 21.

Lipping: lipped, 2; semi-lipped, 17; unlipped, 15; missing, 21.

Within the flakes, it is important to note two *débordant* and two Levallois flakes (fig. 10-1: *1,6*), as well as that about half of the flakes (27) are completely or partially covered by cortex.

It is not useful to compare the blade and flake attributes because of the small samples sizes. At the same time, it must be noted that all attributes present are found on both flakes and blades. Among the more significant are the presence of Levallois and *débordant* flakes and blades.

When blades and flakes are combined as a group, they are characterized by: (1) a relatively high percentage of blanks with uni-directional-crossed, uni-directional, and converging scar patterns; (2) a high percentage of cortical and partly cortical flakes; (3) a high percentage of rectangular-shaped blanks, struck on-axis or off-axis; (4) a dominance of blanks with flat lateral profiles, in association with feathered distal ends and triangular cross-sections at midpoint; (5) a moderate level of faceted platforms (IF = 55.3, IFs = 42.5); (6) an equal proportion of unlipped and semi-lipped platforms; and, (7) a very high percentage of blades (Ilam = 29.5).

Tools. The tools consist of 1 scraper, 1 borer, 3 thinned pieces, and 2 retouched pieces (Table 10-2). The scraper is a double obverse straight-convex scraper on a blade, retouched by both scalar flat and marginal flat retouch. The borer is a semi-leaf scraper made on a Levallois flake. It is retouched with scalar flat alternating retouch (fig. 10-1: *1*). The three proximally thinned unretouched pieces were made on flakes. In two cases, the thinning was by inverse scalar flat retouch, and in one case, it was by bifacial scalar flat retouch. One of the retouched pieces is a Levallois flake with inverse retouch (fig. 10-1: *6*). The other has simple marginal retouch along one edge.

Level IIA/2

Blanks. Excluding chips, there are 19 flakes, 3 blades, 7 retouched flakes, and 2 retouched blades in this sample. Given the small number of blades, they have been included with the flakes for technological description. The technological attributes are as follows:

Dorsal Scar Pattern: uni-directional, 9; uni-directional-crossed, 6; lateral, 1; bi-directional, 3; bi-directional-crossed, 3; converging, 2; crested, 4; radial (Levallois), 1.

Shape: rectangular, 9; trapezoidal, 8; ovoid, 2; triangular, 1; sub-crescent, 2; unidentifiable, 9.

Axis: on-axis, 13; off-axis, 12; unidentifiable, 6.

Lateral Profile: flat, 20; incurvate medial, 4; incurvate distal, 3; twisted, 3; unidentifiable, 1.

Distal End: feathered, 16; hinged, 3; overpassed, 1; blunt, 2; missing, 9.

Cross-Section at Midpoint: triangular, 10; crescent, 10; trapezoidal, 6; lateral steep, 4; flat, 1.

Platform: multiple faceted, 9; lateral faceted, 1; plain, 5; dihedral, 4; cortex, 1; missing, 11.

Lipping: lipped, 4; semi-lipped, 7; unlipped, 6; unidentifiable, 14.

In general, the typological characteristics of the assemblage of Unit IIA/2 are typical for the levels of Unit II. The major characteristics are: (1) a pronounced number of flakes with uni-directional-crossed and uni-directional scar patterns; (2) a significant percentage of cortical blanks (ca. 40%); (3) the presence of Levallois and *débordant* blanks (fig. 10-1: *4,5*); and, (4) the dominance of rectangular-shaped blanks with flat lateral profiles, feathered distal ends, and either triangular or trapezoidal midpoint cross-sections.

TABLE 10-2
Kabazi II, Units IIA & III, Tool Classification

		IIA/1	*IIA/2*	*IIA/ 2-3-3B* †	*IIA/4*	*IIA/ 4B*	*III/1A*	*III/1*	*Total*	*%*	*e%*
Scrapers		*1*	*2*	*4*	*11*	–	*3*	*1*	**22**	***28.9***	***59.5***
Transverse-Straight	dorsal	–	–	–	2	–	–	–	**2**	2.6	5.4
Transverse-Convex	dorsal, *thinned base*	–	–	–	1	–	–	–	**1**	1.3	2.7
	dorsal-proximal	–	–	–	1	–	–	–	**1**	1.3	2.7
	dorsal-prox., *thinned back*	–	–	1	–	–	–	–	**1**	1.3	2.7
Straight	dorsal	–	1	1	–	–	–	–	**2**	2.6	5.4
Convex	dorsal	–	–	1	–	–	–	1	**2**	2.6	5.4
	dorsal, *thinned back*	–	–	–	2	–	–	–	**2**	2.6	5.4
	dorsal, *nat. backed*	–	–	–	2	–	–	–	**2**	2.6	5.4
Straight-Convex	dorsal	1	–	–	–	–	2	–	**3**	4.0	8.1
	dorsal, *t-f*	–	–	–	1	–	–	–	**1**	1.3	2.7
Straight-Concave	dorsal, *t-f/thinned*	–	–	–	1	–	–	–	**1**	1.3	2.7
Convex-Concave	dorsal	–	–	–	–	–	1	–	**1**	1.3	2.7
Sub-Rectangular	dorsal, *nat. backed*	–	1	–	–	–	–	–	**1**	1.3	2.7
Semi-Trapezoidal	dorsal	–	–	–	1	–	–	–	**1**	1.3	2.7
Unidentifiable	dorsal	–	–	1	–	–	–	–	**1**	1.3	2.7
Borers		*1*	–	–	–	–	–	–	*1*	***1.3***	***2.7***
Semi-Leaf	alternate	1	–	–	–	–	–	–	1	1.3	2.7
Denticulates		–	–	*1*	*1*	–	–	–	*2*	***2.6***	***5.4***
Straight	dorsal	–	–	1	–	–	–	–	**1**	1.3	2.7
	dorsal, *thinned base*	–	–	–	1	–	–	–	**1**	1.3	2.7
Notches		–	–	–	–	*1*	–	–	*1*	***1.3***	***2.7***
Lateral	ventral	–	–	–	–	1	–	–	**1**	1.3	2.7
Bifacial Scrapers		–	–	*3*	*1*	–	*2*	*1*	*7*	***9.2***	***18.9***
Convex	plano-convex, *backed*	–	–	–	–	–	1	1	**2**	2.6	5.4
Converg.-Bi-Convex	alternate	–	–	–	–	–	1	–	**1**	1.3	2.7
Semi-Crescent	plano-convex, *t-f*	–	–	1	–	–	–	–	**1**	1.3	2.7
Unfinished	plano-convex	–	–	–	1	–	–	–	**1**	1.3	2.7
Unidentifiable Bifacial	proximal	–	–	2	–	–	–	–	**2**	2.6	5.4
Thinned Pieces		*3*	–	–	–	–	–	*1*	*4*	***5.3***	***10.8***
Proximal	unretouched	3	–	–	–	–	–	–	**3**	4.0	8.1
	bi-laterally retouched	–	–	–	–	–	–	1	**1**	1.3	2.7
Retouched Pieces		*2*	*6*	*10*	*8*	*1*	*2*	*1*	*30*	***39.5***	
Lateral	dorsal	–	2	6	4	–	2	1	**15**	21.1	
	alternating	–	–	2	1	–	–	–	**3**	4.0	
	ventral	1	1	–	–	–	–	–	**2**	1.3	
Bilateral	dorsal	1	1	–	1	–	–	–	**3**	4.0	
	alternate	–	–	–	–	1	–	–	**1**	1.3	
Distal	dorsal	–	2	2	2	–	–	–	**6**	7.9	
Unidentifiable	dorsal	–	*1*	*3*	*2*	–	*1*	*1*	*9*	***11.8***	
TOOLS TOTAL		**7**	**9**	**21**	**23**	**2**	**8**	**5**	**76**	**1.0**	**1.0**

†"Sterile" Levels IIA/2-3; IIA/3; IIA/3A; IIA/3B.

<u>Tools.</u> The tool-kit of Unit IIA/2 consists of 8 retouched tools: one straight obverse scraper (fig. 10-1: *3*) and one sub-rectangular obverse scraper which tends toward either a semi-ovoid scraper or even an end-scraper with lateral retouch, and is made on an *éclat débordant* (fig. 10-1: *4*), and six simple retouched pieces (Table 10-2). Only a single retouched piece had inverse retouch. In general, obverse scalar, marginal, and irregular flat retouch were used on the edges.

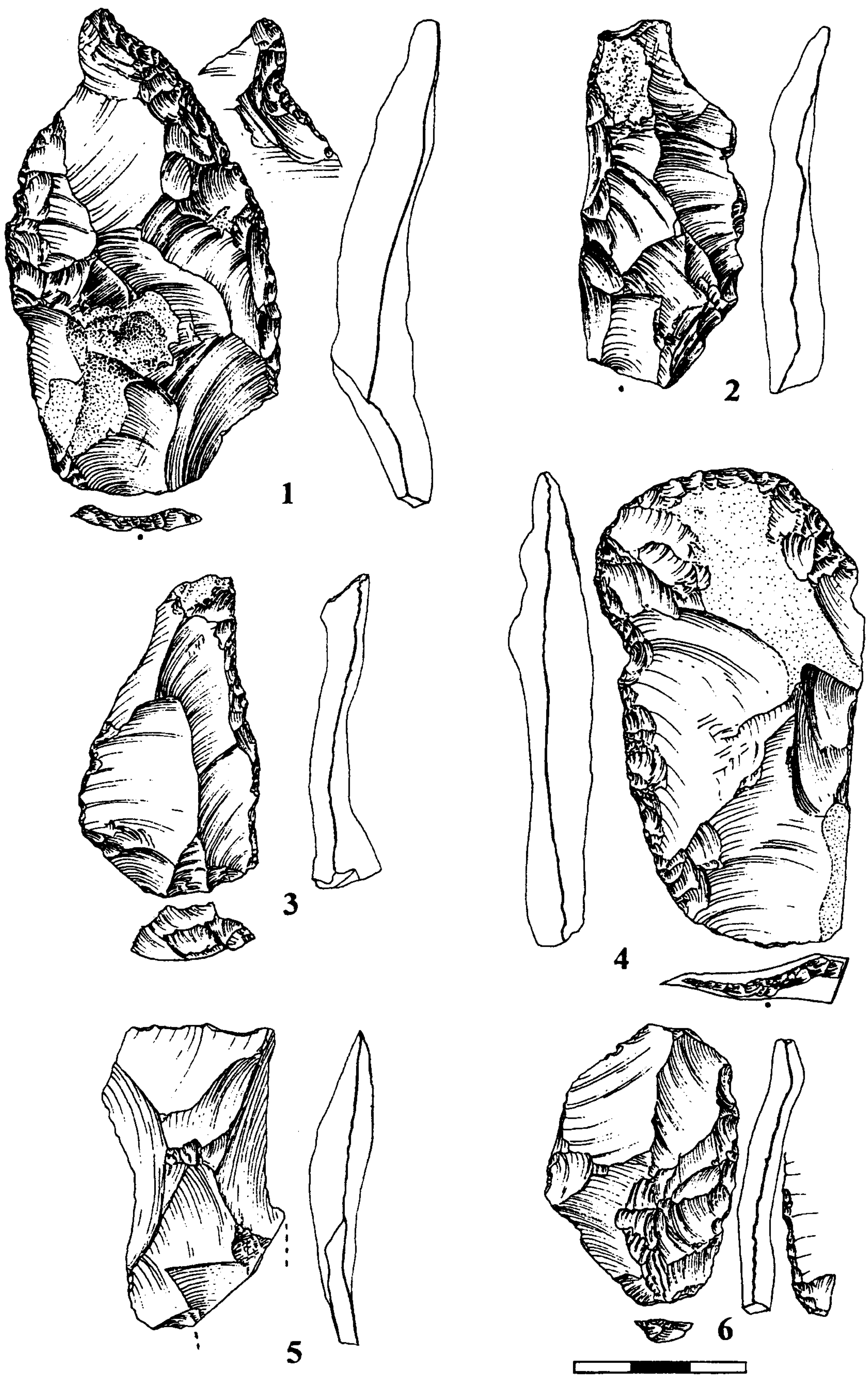


Fig. 10-1—Kabazi II, Unit IIA, Levels IIA/1 *(1, 2, 6)* and IIA/2 *(3, 4, 5)*, Tools: *1*–borer, semi-leaf alternate, made on Levallois flake; *2,5*–unretouched Levallois pieces; *3*–straight dorsal scraper; *4*–sub-rectangular dorsal scraper; *6*–inversely retouched Levallois piece.

The "Sterile" Levels: IIA/2-3, IIA/3, IIA/3A, and IIA/3B

The unclear character of the formation processes resulting in the presence of artifacts through about 1.5 m of the stratigraphic sequence and the insignificant number of artifacts does not warrant extensive assemblage description. Thus, the following is a short description of the artifacts from these levels.

Cores. Only two cores were recovered; one from Level IIA/3 and the other from Level IIA/3A. Both are parallel with rectangular-shaped flaking surfaces and faceted platforms. One is made on a ventral flake surface, while the other is on a plaquette.

Blanks. The blanks consist of 28 flakes, 9 blades, 14 tools on flakes, and 2 tools on blades. Their combined technological attributes are as follows:

Dorsal Scar Pattern: only two types occur—uni-directional-crossed and uni-directional. Only 24 of the 53 blanks are without cortex.

Shape: trapezoidal, sub-crescent, and rectangular are most common.

Axis: most are off-axis.

Lateral Profile: all types of profiles are present, but only a few of each.

Platform: a majority are missing. Of the identifiable examples, the most common is unfaceted.

Lipping: all types of lipping are represented.

Tools. There are a total of 21 tools from these "sterile" levels (Table 10-2). Ten of them are simple retouched pieces with obverse or alternate marginal or irregular retouch. There are three simple scrapers, either convex or straight. They have obverse, scalar retouch. Two are made on bifacial thinning flakes. A single denticulate and an unidentifiable fragment are also unifacial (Table 10-2).

The main interest of these levels is the presence of three bifacial pieces from Level IIA/2-3. Two of them are typologically unidentifiable; one broken, the other both broken and unfinished. The third is a semi-crescent, plano-convex scraper with truncated-faceted base (fig. 10-2: *2*). Another unusual tool is from Level IIA/3: a convex-transverse scraper with thinned back. The retouched edge of this scraper is made on the proximal end of the flake, and has obverse, scalar, flat retouch. After initial shaping, an attempt was made to resharpen the retouched edge from the ventral surface (fig. 10-2: *1*).

In conclusion, it must be noted that the main characteristic of the sample from the "sterile" levels is the appearance of bifacial tools and bifacial thinning elements. In Level IIA/2-3, bifacial thinning elements include a flake modified into a convex scraper and 16 chips (see Chapter 3). All bifacial thinning chips were identified from complete pieces, out of a sample of 50. Another 51 chips, all with missing butts, could not be identified. Bifacial thinning chips were subdivided into two metric groups: one less than 1.9 cm; and the other greater than 1.9 cm. The first group has 14 pieces; the second group only 2. In spite of a dominance of the first metric group, the second group and a single bifacial thinning flake are more clear, because the bifacial thinning attributes are more pronounced on larger blanks. The smaller chips, even with bifacial thinning attributes, could be the result of either bifacial or non-bifacial reduction.

The bifacial thinning elements from Level IIA/3 consist of a single flake and 5 chips of the smaller-sized group. The assemblage of Level IIA/3A includes chips of both size groups; 4 of the smaller and 3 of the larger. The total number of identifiable chips is 16. In Level IIA/3B there is a bifacial thinning flake which has been modified into a straight obverse scraper, 5 chips of the smaller size group, and a single chip from the larger group.

Thus, the artifact sample of the "sterile" levels is typologically different from that of the Unit II assemblages, as well as from Levels IIA/1 and IIA/2, in the following ways: (1) the

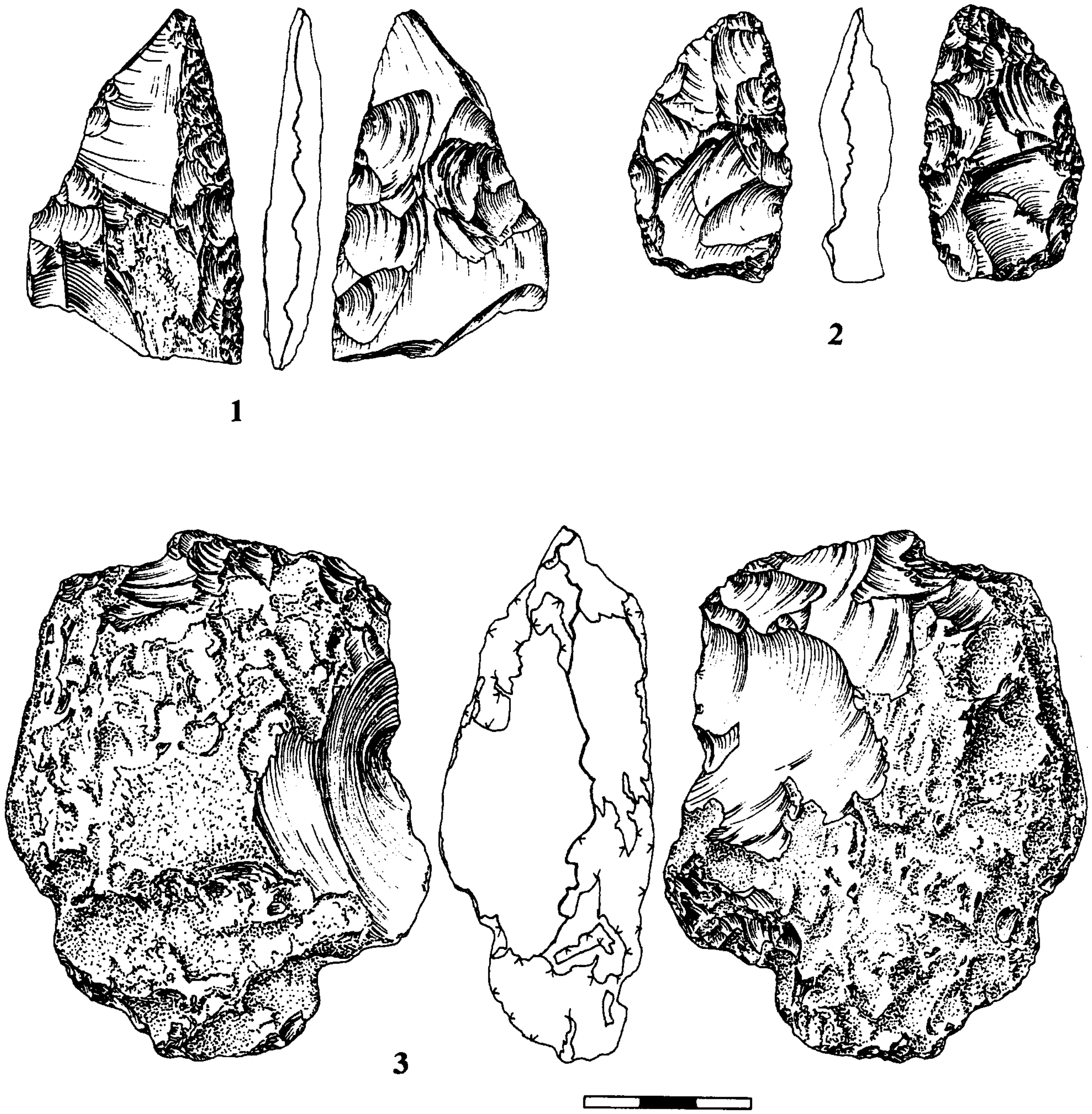


Fig. 10-2—Kabazi II, Unit IIA, Levels IIA/2-3 *(1, 2)* and IIA/4 *(3)*, Tools: *1*–convex-transverse, thinned back scraper; *2*–bifacial semi-crescent with truncated-faceted base scraper; *3*–preform.

presence of bifacial tools; (2) the presence of bifacial thinning elements; (3) the absence of Levallois flakes and blades; and, (4) the absence of *pièces débordantes*.

Level IIA/4

The assemblage of Level IIA/4 is represented by 261 artifacts: 10 chunks, 3 tested flint plaquettes, 186 chips, 36 flakes, 3 blades, 21 tools on flakes, 1 tool on blade, and 1 unfinished bifacial tool on a flint plaquette (Table 10-1).

Preforms. There are three pieces; two tested flint plaquettes (9.1 x 7.3 x 3.5 cm and 7.8 x 6.1 x 1.9 cm) and one massive transversely struck primary flake (7.2 x 9.7 x 3.3 cm). All of them show several flake scars on both surfaces (figs. 10-2: *3*; 10-4).

Chips. There are 186 chips, of which 61 are complete. Within this group, 22 are bifacial thinning chips, 15 of which measure less than 1.9 cm and 7 between 1.9 cm and 2.9 cm. About 27%—some 51 pieces—are either completely or partially covered by cortex.

Blanks. There are 61 blanks from Level IIA/4: 3 blades, 1 bifacial thinning blade, 54 flakes, and 3 bifacial thinning flakes. Again, given the small blade sample, blades and flakes have been combined in the description of their technological attributes:

Dorsal Scar Pattern: uni-directional, 11; uni-directional-crossed, 12; converging, 11; lateral, 4; radial, 6; bi-directional, 6; 3-directions, 3; irregular, 2; cortex, 6.

Shape: trapezoidal, 14; rectangular, 11; ovoid, 3; triangular, 5; irregular, 3; expanding, 3; sub-crescent, 2; unidentifiable, 20.

Axis: on-axis, 30; off-axis, 31.

Lateral Profile: flat, 20; incurvate medial, 11; twisted, 12; incurvate distal, 4; irregular, 8; convex, 6.

Distal End: feathered, 25; hinged, 11; overpassed, 6; blunt, 3; missing, 16.

Cross-Section at Midpoint: triangular, 20; trapezoidal, 11; crescent, 16; flat, 1; lateral steep, 4; irregular, 7; unidentifiable, 2.

Platform: crushed/missing/retouched, 34; plain, 12; dihedral, 6; multiple faceted, 9.

Lipping: lipped, 6; semi-lipped, 10; unlipped, 11; missing/unidentifiable, 34.

About 30% of unretouched blanks are completely or partially covered by cortex. At the same time, about 70% of tools are partly or completely covered by cortex.

Tools. The tools of Level IIA/4 are represented by 23 pieces (Table 10-2), subdivided into scrapers (11), denticulates (1), retouched pieces (8), an unfinished bifacial tool (1), and unidentifiable (2). The scrapers are all made on flakes, including two transverse-straight, two transverse-convex (fig. 10-3: *6*), and four convex types (fig. 10-3: *1,5*). The following types of scrapers are represented by a single example each: straight-convex, straight-concave (fig. 10-3: *3*), and semi-trapezoidal (fig. 10-3: *4*). All scrapers were retouched by obverse scalar, sub-parallel flat, or, in the case of two examples, semi-steep to steep retouch. The main feature of these scrapers is the wide use of different kinds of thinning and truncation. Both double edged scrapers have truncated-faceted proximal ends. Moreover, one of them has a thinned distal end (fig. 10-3: *3*). Two of the convex scrapers have similar back thinning (fig. 10-3: *5*). Thinned bases are associated with one transverse-convex scraper (fig. 10-3: *6*), as well as with a single denticulated piece. On the whole, for scrapers and denticulates, thinning and/or truncation were used on five of the twelve. At the same time, two more of the scrapers are naturally backed (fig. 10-3: *1*). One transverse-convex scraper shows traces of resharpening similar to those from the "sterile" levels.

The single bifacial piece is an unfinished tool made on plaquette. The initial preparation was done in the typical plano-convex manner (fig. 10-3: *2*). The retouched pieces were usually made on flakes and retouched with obverse marginal or irregular discontinuous retouch.

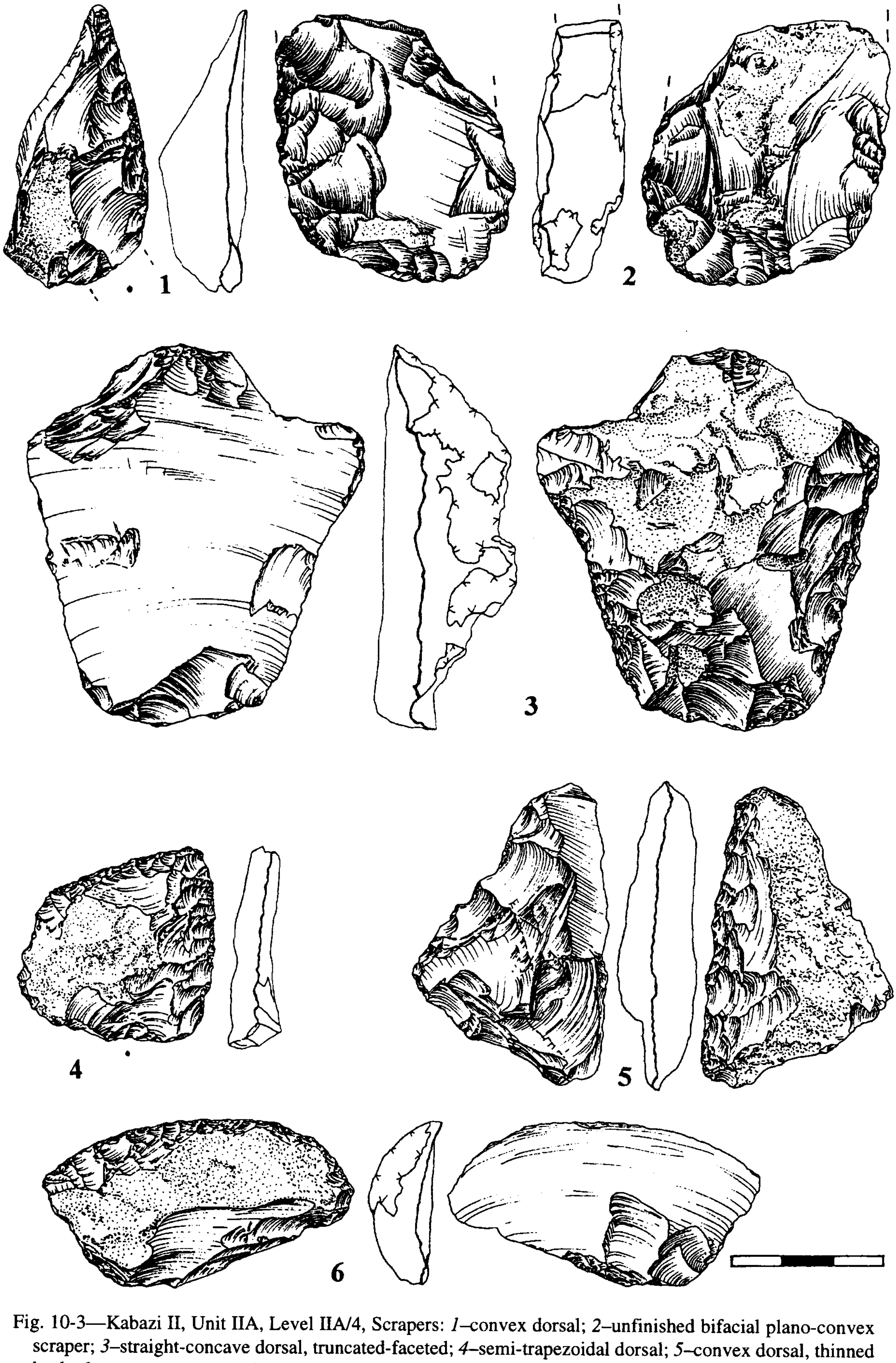


Fig. 10-3—Kabazi II, Unit IIA, Level IIA/4, Scrapers: *1*–convex dorsal; *2*–unfinished bifacial plano-convex scraper; *3*–straight-concave dorsal, truncated-faceted; *4*–semi-trapezoidal dorsal; *5*–convex dorsal, thinned back; *6*–transverse-convex dorsal, thinned base.

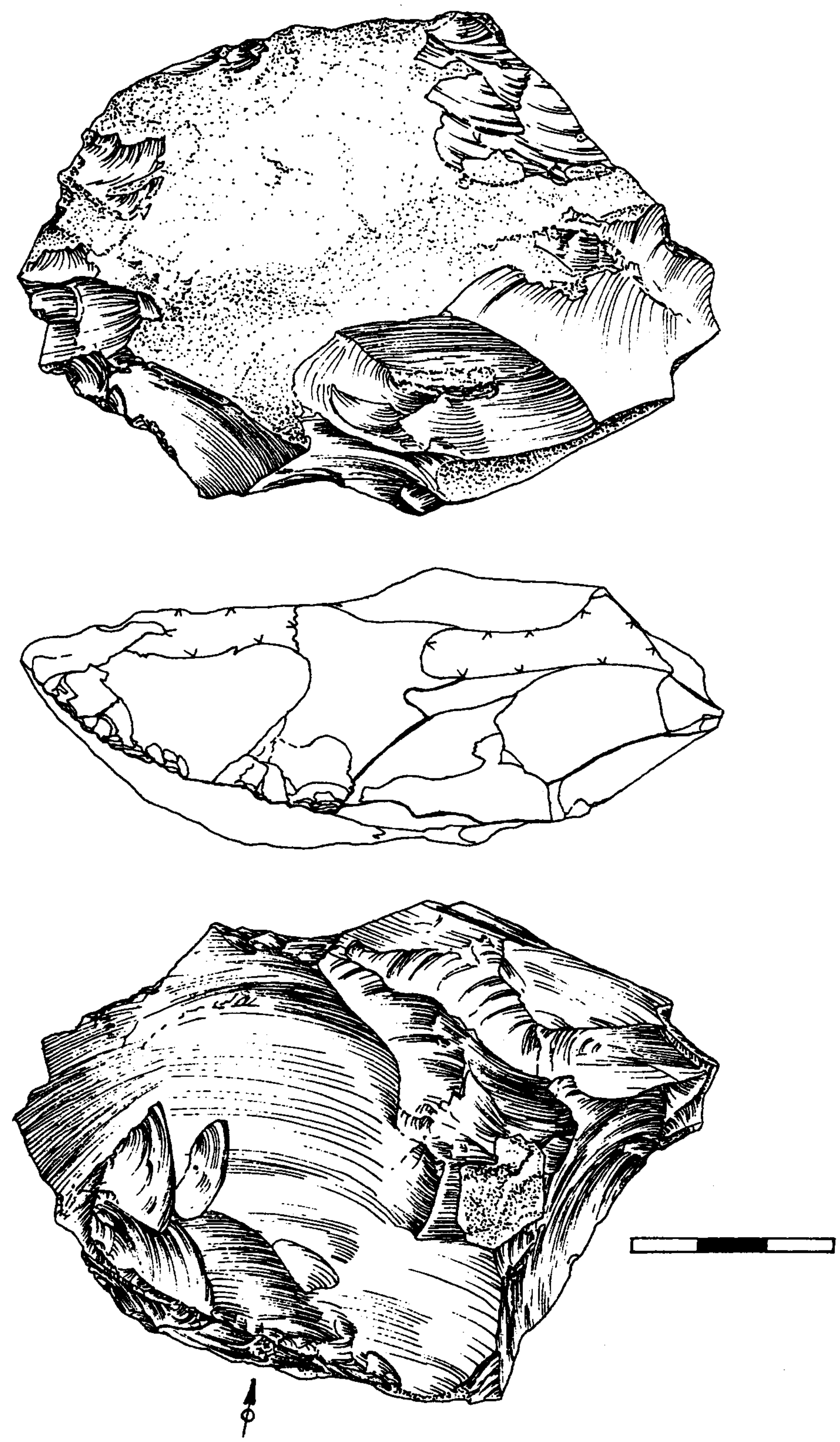


Fig. 10-4—Kabazi II, Unit IIA, Level IIA/4, Preform made on flake.

In spite of the small artifact sample, the characteristic features of the IIA/4 assemblage are obvious. One of the main features is the presence of bifacial thinning chips, flakes, and blades. The lack of Levallois, *pièces débordantes*, and the absence of pre-cores and cores are also important characteristics of this assemblage. The presence of tested pieces (preforms) of raw material, however, should be noted. The percentage of completely and partially cortical tools is double that of the debitage. The pronounced component of transverse scrapers and scrapers with thinned backs should be noted, too. The mean dimensions of unretouched blanks are: length, 3.31 cm; width, 2.73 cm; and thickness, 0.45 cm. For retouched tools the mean dimensions are: length, 4.02 cm; width, 3.84 cm; and thickness, 0.9 cm.

The "Sterile" Level IIA/4B

Only 65 artifacts were recovered from IIA/4B. About two thirds—43 pieces—are chips. The remainder includes 5 chunks, 13 flakes, 2 tools (a notched and a retouched piece), and 2 blades. It is difficult to find any distinctive features in this group due to the very small sample size. Moreover, the average size of the blanks is very small. The maximum flake length is about 3.8 cm. Only a single feature in this assemblage can be noted: the presence of bifacial thinning elements. Those elements include a single flake and 11 chips. These last were among 19 complete chips. The size distribution of bifacial thinning chips is as follows: 6 pieces between 2.0-2.9 cm, and 5 pieces from 0.5-1.9 cm.

Level III/1A

The assemblage of Level III/1A consists of 12 chunks, 4 preforms, 109 chips, 23 flakes, 3 blades, and 8 tools.

Preforms. The preforms are comprised of two primary flakes ($\bar{x}$ = 8.3 cm x 5.1 cm x 1.5 cm), a primary blade (8.8 cm x 4.1 cm x 1.7 cm), and a complete flint plaquette (5.0 cm x 4.5 cm x 2.7 cm). Each preform was tested by several blows (fig. 10-6: *1*).

Blanks. There are 21 flakes, 3 blades, 4 tools on flakes, and 1 tool on a blade. Again, because of the small blade sample, the blades and flakes were combined for attribute analysis. About half of all blanks are covered by cortex.

Dorsal Scar Pattern: uni-directional, 5; bi-directional, 2; convergent, 9; lateral, 1; uni-directional-crossed, 5; radial, 2; cortex, 5.

Shape: rectangular, 8; trapezoidal, 2; crescent, 2; triangular, 2; irregular, 1; unidentifiable, 14.

Axis: on-axis, 7; off-axis, 8; unidentifiable, 14.

Lateral Profile: flat, 10; twisted, 6; incurvate medial, 6; incurvate distal, 2; convex, 2; unidentifiable, 3.

Distal End: hinged, 13; feathered, 9; blunt, 3; unidentifiable, 4.

Cross-Section at Midpoint: triangular, 13; trapezoidal, 8; crescent, 2; flat, 3; unidentifiable, 3.

Platform: plain, 5; dihedral, 5; missing, 15; crushed, 4.

Lipping: lipped, 5; unlipped, 1; semi-lipped, 4; unidentifiable, 19.

Four flakes with lipped platforms were identified as bifacial thinning elements. The mean blank sizes are: length, 3.31 cm; width, 2.41 cm; and thickness, 0.47 cm. Two of these are partially cortical.

Chips. There are 42 unbroken chips. Two-thirds of them are bifacial thinning chips. Twenty-one are less than 1.9 cm long, while only six fall between 1.9-2.9 cm.

Tools. Only 8 tools were identified: three double-edged scrapers, two bifacial scrapers, two retouched pieces, and a single unidentifiable tip fragment (Table 10-2). The double-edged scrapers are subdivided into two straight-convex scrapers (fig. 10-5: *2*) and one

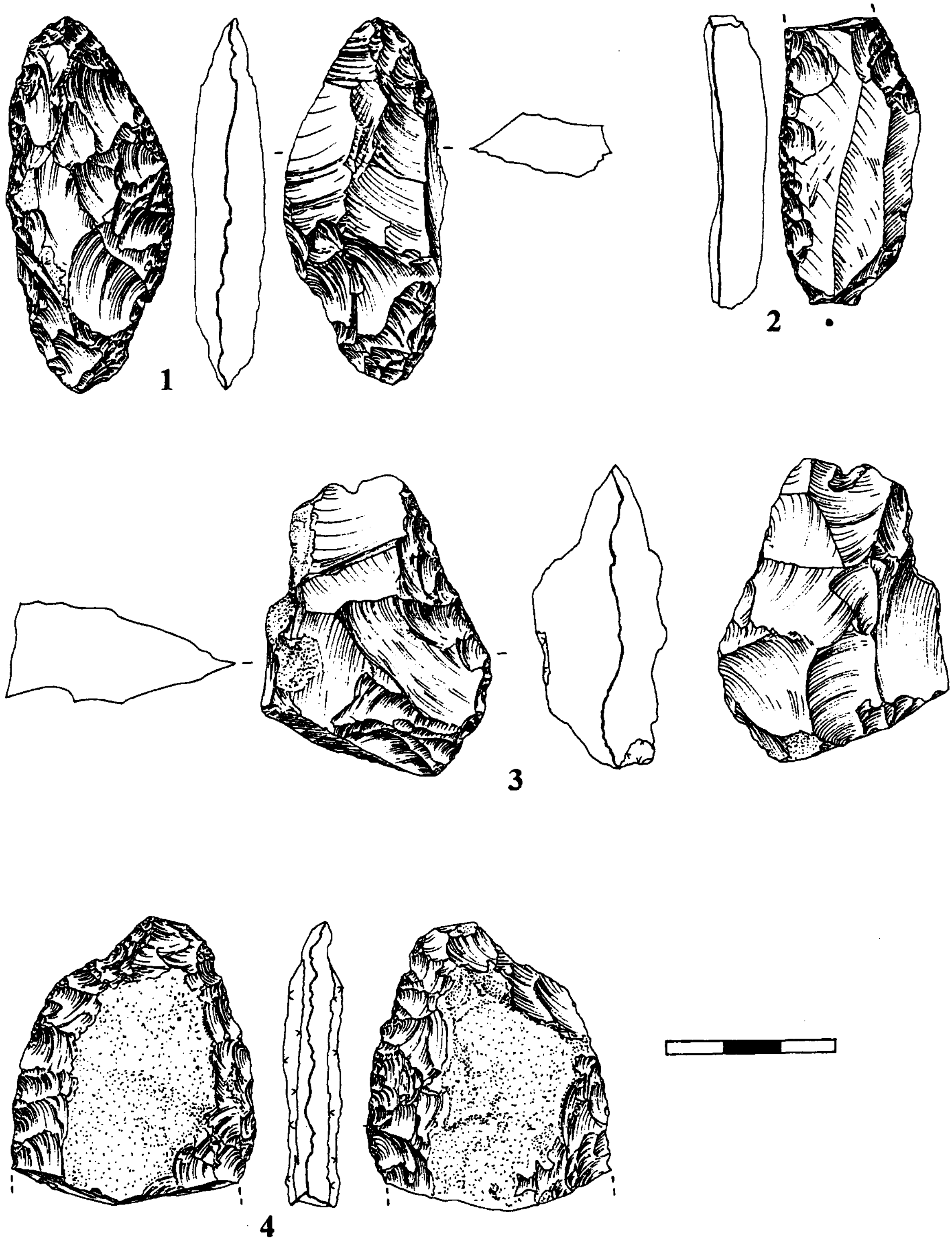


Fig. 10-5—Kabazi II, Unit III, Levels III/1A *(1, 2, 4)* and III/1 *(3)*, Tools: *1,3*–convex plano-convex, backed bifacial scraper; *2*–straight-convex, dorsal scraper; *4*–convergent-biconvex alternate bifacial scraper.

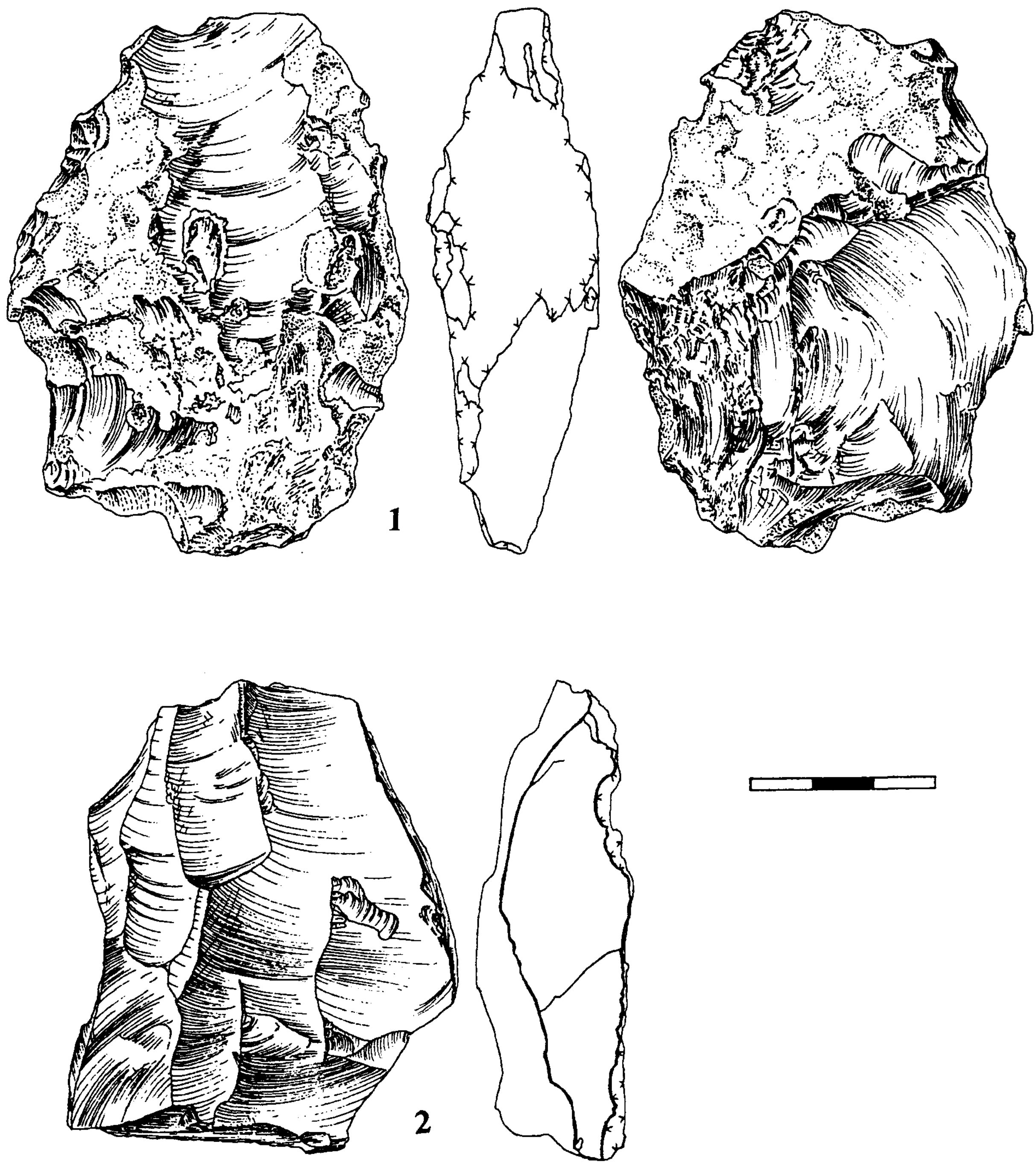


Fig. 10-6—Kabazi II, Unit III, Levels III/1 *(2)* and III/1A *(1)*, Preforms: *1,2*–preforms made on flint plaquettes.

concave-convex scraper. All of them are obversely retouched with scalar flat or semi-steep retouch (in one case by stepped steep retouch). One bifacial scraper is convex backed (fig. 10-5: *1*) and one is convergent-plano-convex alternate (fig. 10-5: *4*). Both scrapers are made on plaquettes. The convex bifacial scraper is made on a leaf-shaped piece with a single convex lateral retouched edge; opposite to this edge is a natural platform. The other bifacial scraper is represented by two alternate retouched edges conjoining in a tip. Each of them is made in a plano-convex manner. The retouched pieces are represented by flakes with marginal and irregular obverse flat retouch. Thus, the main typological features of Level III/1A are the presence of bifacial tools, bifacial thinning elements, and preforms for their production.

Level III/1

The excavations of this level are not yet completed. During the 1995 field season, 17 m^2 were excavated. The remaining 12 m^2 will be excavated during the 1996 season. The total number of artifacts recovered to date is 73 pieces, consisting of 5 chunks, 3 preforms, 53 chips, 7 flakes, and 5 tools.

Preforms. There are two preforms on complete plaquettes (7.6 cm x 5.8 cm x 2.0 cm and 7.5 cm x 5.0 cm x 2.3 cm) and one fragment of either a plaquette or a nodule (>5.0 cm x >3.5 cm x >1.7 cm). The complete preforms are relatively heavily retouched by numerous removals on one side of the plaquette, while the other side was used as a striking platform (fig. 10-6: 2). This method of plaquette flaking is typical of plano-convex tool production.

Chips. Seven chips out of the 13 identified ones with butts are bifacial thinning elements. Half of them (3) have a length greater than 2 cm.

Blanks. Blanks include 7 flakes, 2 tools on flakes, and 2 tools on blades. Because of the extremely small sample, the technological attributes will not be quantified, but only discussed briefly. Dorsal scar patterns are represented by a few pieces each of radial, converging, lateral, bi-directional, and cortex. More than half of the blanks are partly or completely covered by cortex. Trapezoidal, irregular, expanding, rectangular, as well as unidentifiable shapes are present. Blanks removed on-axis and off-axis are in about equal proportions. The lateral profiles include flat, incurvate medial, and twisted. Three types of distal ends are represented by feathering, overpassed, and hinged. The midpoint cross-sections include only triangular and trapezoidal. Only two platforms are multiple faceted. Unlipped and lipped butts are represented in equal proportions. The mean dimensions of blanks are length, 3.65 cm; width, 3.03 cm; and thickness 0.61 cm.

Tools. The tool-kit of Level III/1 (Table 10-2) consists of broken obverse convex scrapers, an obversely notched tool with a thinned base, an obversely retouched blade, an obversely retouched unidentifiable fragment, and a naturally backed bifacial scraper with a straight edge retouched in plano-convex manner (fig. 10-5: *3*).

The assemblage of Level III/1, like the previous level, is characterized by the presence of bifacial tools and bifacial thinning elements.

TYPOLOGICAL COMPARATIVE ANALYSIS

Taking into account the small number of artifacts from these levels, it is impossible to conduct traditional typological comparisons by level. In order to conduct typological studies of the similarities and differences among the various assemblages from the living floors, comparisons based on the presence or absence of attributes in each assemblage are used.

The common feature for all the living floors is the complete absence of cores. At the same time, Levels IIA/4, III/1A, and III/1 differ from Levels IIA/1 and IIA/2 by the presence of tested plaquettes, which are assumed to be preforms for bifacial tool production. This type of preform is a distinctive feature of the Ak-Kaya Middle Paleolithic industry of eastern Crimea (e.g., Sary-Kaya and Zaskalnaya V, layer II). The other type of preform, broad primary flakes, is more characteristic of the Staroselian (see Chapter 12). Moreover, the assemblages from Levels IIA/4, III/1A, and III/1 are very different from the assemblages of Levels IIA/1 and IIA/2 in the presence of bifacial thinning elements. In case of the debitage from both IIA/1 and IIA/2, only two flakes and two chips might have been bifacial thinning elements. At the same time, bifacial thinning flakes and blades, as well as bifacial chips, are common in Levels IIA/4, III/1A, and III/1, as are tools made on bifacial thinning flakes and blades.

The assemblages of Units IIA and III are too small for comparisons of the numerous blank attributes. It is obvious, however, that blades are more common in Level IIA/1 than in any other level. Levallois and *pièces débordantes* are present only in the assemblages from Levels IIA/1 and IIA/2. The main difference in tool typology between Levels IIA/1 and IIA/2, on the one hand, and Levels IIA/4, III/1A, and III/1, on the other, is the presence of bifacial tools in the latter. The peculiar feature of the Level IIA/4 assemblage is the widespread use of ventral thinning in scraper production.

Thus, it is obvious that the differences between the typological structures of Levels IIA/1 and IIA/2, and of Levels IIA/4, III/1A, and III/1, are significant. Mainly, these differences are determined by the presence of Levallois and *pièces débordantes* in association with obversely retouched blanks in Levels IIA/1 and IIA/2, and the presence of bifacial tools, bifacial thinning elements, and thinned scrapers in Levels IIA/4, III/1A, and III/1. The same differences are reinforced by the absence of bifacial tools, bifacial thinning elements, and thinned scrapers in the assemblages of Levels IIA/1 and IIA/2, and the lack of Levallois debitage in the assemblages of Levels IIA/4, III/1A, and III/1.

At the same time, there is not a great dissimilarity between the typological structure of Levels IIA/1 and IIA/2 and that of the Unit II assemblages. It seems possible, therefore, to state that there is a typological similarity between the Unit II assemblages and those from Levels IIA/1 and IIA/2.

The typological structure of Unit IIA, Level IIA/4 and Unit III, Levels III/1A and III/1, is closer to that of the Crimean industries with bifacial tools. The bifacially backed scrapers and bifacial convergent scrapers are both made on plaquettes in a plano-convex manner, and appear to be an exact analogy to the bifacial tool-kit of the Ak-Kaya industry of the Eastern Crimea. Yet, the different types of thinned scrapers, especially the convex and straight transverse, are a clear analog for the scraper assemblage of Kabazi V, Unit III, which is a Staroselian industry. However, the mixture of bifacial and thinned scraper types is not present in any level of Kabazi II, Units IIA or III. The thinned scrapers are part of the Level IIA/4 tool-kit, while the bifacial scrapers are associated with Levels III/1A and III/1. The presence of bifacial thinning elements and unfinished bifacial tools on plaquettes in the assemblage of Level IIA/4 suggests the possibility of on-site bifacial tool production. Moreover, both the Staroselian and the Ak-Kaya industries include this mixture of types, while the thinned scrapers and the bifacial plano-convex scrapers are unusual in the Western Crimean Mousterian industry.

Thus, taking into account all possibilities, it seems to be correct to define, in a broad context, the assemblages of Levels IIA/4, III/1A, and III/1 as Crimean Micoquian. This broad definition is based on the mixed typological character of the IIA/4, III/1A, and III/1 assemblages, in spite of the very poor sample sizes from the described levels. It is not excluded that more detailed typological studies of Ak-Kaya assemblages will confirm the non-accidental character of the proposed definition.

TECHNOLOGICAL ANALYSIS

Taking into account the typological similarities of the assemblages of Unit II and those of Levels IIA/1 and IIA/2, as well as the small size of the assemblage from the last living floor, yet another description of the WCM flaking methods is not necessary (see Chapter 9). It must be noted that the technological studies of the Levels IIA/4, III/1A, and III/1 assemblages are very limited, due to the small sample sizes and the lack of any refitting. Nevertheless, it seems possible to present some observations which might be significant from the technological point of view: (1) there is an absence of cores and core treatment elements (*débordant* and large primary flakes); (2) there are large plaquettes and some primary flakes, both tested by a few removals; (3) there are finished and unfinished complete bifacial tools; (4) there are unifacial tools made on primary flakes; (5) there is a significant percentage of tools made on flakes exhibiting ventral thinning; (6) there are unifacial tools made on bifacial thinning flakes and/or blades; (7) there are bifacial thinning elements, represented by chips, flakes, and blades; and, (8) the debitage is a relatively small, with mean lengths between 3.26-3.65 cm.

These attributes can be divided into two groups. The first exhibits a lack of regular core reduction, an absence of cores and their by-products, and a small mean value in debitage size. The second group clearly includes bifacial tool production, and both bifacial and unifacial tool resharpening. Looking at the abundant evidence for bifacial tool production, it is obvious that, at least, some of the bifacial tools were made on-site. Thus, based on the available materials, it seems possible to propose the following stages of bifacial tool production.

The first stage of bifacial tool production is represented by the presence of preforms. All preforms are approximately of the same length, from 7.5 cm to 9.1 cm. The variation in width is sizable—from 3.5 cm to 7.3 cm, as is the variation in thickness—from 1.5 cm to 3.5 cm. The difference between preforms and unfinished bifacial tools lies in the extent of their modification. Usually, preforms were retouched by three or four removals. These removals were used to create a limited sharp edge. This edge served as the striking platform for subsequent removals from both sides of the plaquette. It must be underlined that all removals were produced from the sharp angle edge/platform. The length of scars of these removals is about 4.0 cm. It is obvious that all of the flakes which relate to this stage of production were associated with the attributes of bifacial trimming elements, such as obtuse platform angles. The first stage of reduction resulted in plaquettes and massive primary flakes retouched by several blows (figs. 10-2: *3*; 10-4; 10-6), as well as a number of cortical and partially cortical small flakes (4.0 cm long) with obtuse platforms.

The second stage of bifacial tool production is documented by unfinished bifacial tools. The unfinished bifacial tools are usually made on plaquettes that are distinguished by completely retouched edges. The edge modification has been done in the typical plano-convex manner, creating a flat surface on one face by removing the cortex and then using that surface as a platform to retouch the other surface by the same kind of retouch. In the case of unfinished bifacial tools, retouch is not extensive. Usually the second surface is still partly cortical. That stage of bifacial tool production is the result of plano-convex retouch on blanks (fig. 10-3: *2*), as well as resulting in a series of partly and/or non-cortical debitage, often with obtuse platform angles. Looking at the size of unfinished and finished bifacial tools and the lengths of scars on their surfaces, it is clear that the length and width of debitage removed from both surfaces is usually no more than 3.0 cm.

The third stage in the reduction process usually consists of careful retouch of the edge(s) and results in a finished bifacial tool (fig. 10-5: *1,3,4*), as well as abundant chipage. It must be noted that comparisons of preforms and bifacial tool sizes from Kabazi II, Unit III and

Starosele, Level 1 show that during bifacial tool production, the primary blanks were reduced more in width than in length. For instance, the variation of length for preforms ranges from 7.5-9.1 cm, and for bifacial tools from 6.2-8.5 cm. At the same time, the variation in width for preforms ranges from 3.5-7.3 cm and for bifacial tools from 4.4-2.8 cm. This reduction process is well documented for the material of the Ak-Kaya industry in eastern Crimea, at Sary-Kaya, for instance.

Another reduction sequence is documented for unifacial tools. The blanks used for unifacial tool production can be divided into two metric groups: the first, more than 5 cm long and the second, less than 4 cm long. Only two retouched bifacial thinning flakes and one retouched blade fall between those two metrical groupings. As a rule, the larger blanks are cortical or partly cortical, while the smaller blanks are represented by flakes and blades either partly cortical or without any dorsal cortex. It appears that some of the smaller blanks used for unifacial tool production originated as bifacial treatment elements. At least five of them have markedly obtuse platform angles and other attributes associated with bifacial reduction. Thus, both blades and flakes less than 4 cm long are the by-products of bifacial tool production, while blanks more than 5 cm long appear to be the result of any kind of reduction sequence, not represented on the site by other types of artifacts.

All unifacial retouched tools have the same types of retouch and thinning, regardless of size. Truncated-faceted pieces are present on both large and small tools. The retouch of thinned scrapers could be one of the sources of the bifacial thinning chips. Among the different types of retouch, obverse scalar flat retouch is dominant. Marginal, irregular, sub-parallel, and steep retouch are also present. Different retouch angles also characterize the unifacial tool-kits of Levels IIA/4, III/1A, and III/1.

Thus, the artifact production of Levels IIA/4, III/1A, and III/1 is characterized by: (1) a lack of regular core reduction; (2) bifacial tool production and resharpening; (3) the use of the plano-convex method of bifacial tool shaping; and, (4) unifacial tool production using blanks from both regular and from bifacial reduction.

PATTERN OF RAW MATERIAL EXPLOITATION

The living floor levels of Units IIA and III are the first known Middle Paleolithic occupations in the Crimea characterized by the complete absence of cores and by extremely low densities of artifacts. This is one common feature of the assemblages from Units IIA and III. An examination of other non-typological structural relationships demonstrates three attribute clusters associated with these living floor levels.

Type 1. This type is associated with Level IIA/1. It is seen by an absence of cores, preforms, bifacial finished and unfinished tools, but, at the same time, by the presence of core treatment elements (>5 cm primary flakes and *pièces débordantes*), which comprise about 10% of all blanks. There is a moderate percentage of tools (8.9%), a high percentage (ca. 40%) of partly and completely cortical blanks, as well as the character of artifact and bone distributions and, finally, a low density of artifacts (ca. 40 per m^2). These attributes make this assemblage a good analog to the Level II/8C assemblage (Chapter 9).

Type 2. This type of raw material exploitation is represented by the assemblage of Level IIA/2. This level is characterized an extremely low density of artifacts—19.3 artifacts per m^2—and a high percentage of tools—29.03% (Table 10-1). At the same time, there is no evidence for bifacial reduction. There is a complete absence of bifacial tools, as well as of bifacial treatment elements. On the other hand, core preparation and maintenance elements compose 16.12% of all blanks. There was not a single core found during the 1987 and 1995 field seasons. The three tools and six flakes excavated in 1987 from 6 m^2 of Level IIA/2 do not dramatically change the situation.

Taking into consideration the number of core treatment elements, it is impossible to exclude absolutely the possibility of on-site core reduction. Most probably, primary flaking and tool production took place on-site, but in extremely low frequencies.

At the same time, the very high tool percentage raises the question of the importation of tools onto the site. This possibility is supported by the size comparison of two tools and a single Levallois flake with the other blanks. The straight scraper (length 5.4 cm, width 3.0 cm, thickness 0.5 cm), the sub-rectangular scraper (8.5 cm x 4.4 cm x 0.4 cm), and even a broken Levallois flake (>5.3 cm x 2.8 cm x 0.7 cm) appear to be the largest blanks in the Level IIA/2 assemblage (fig. 10-1: *3,4,5*). The same is clear in relation to the obverse leaf-shaped point made on a *lame débordante* (about 8 cm long) from the 1987 excavation. Only three flakes among all the unretouched pieces may be comparable in size with these tools: a flake with a uni-directional-crossed scar pattern (4.9 cm x 3.1 cm x 0.3 cm), a primary flake (5.5 cm x 3.1 cm x 1.1 cm), and an *éclat débordant* (5.2 cm x 3.0 cm x 0.7 cm). The other blanks are not longer than 4.5 cm, as is true for the rest of the tools. Thus, the probable characteristic of Level IIA/2 is both limited "on-site" primary flaking and tool production, with the importation of tools produced "off-site."

<u>Type 3.</u> This type is associated with Levels IIA/4, III/1A, and III/1. The density of artifacts is about the same as for the IIA/4 living floor: 27.04 artifacts per m^2 in Level IIA/4, 15.7 artifacts per m^2 in Level III/1A, and only 8.8 artifacts per m^2 in Level III/1. The last value may be explained by the unfinished excavations of that level. All of these levels are characterized by the presence of preforms, unfinished and/or complete bifacial tools, bifacial thinning elements, thinned obverse scrapers, and the absence of cores and core treatment elements. There is a high tool percentage in all these levels: 35.3% for Level IIA/4, 22.22% for III/1A, and 33.33% for III/1 (Table 10-1). On-site bifacial tool production is well documented by the presence of preforms, unfinished bifacial tools, and thinning elements. The same on-site production is possible for unifacial tools made on bifacial thinning flakes and blades, as well as for small unifacial tools (no longer than 4 cm). A few retouched pieces are made on bifacial thinning blades.

In Levels IIA/2, IIA/4, and III/1, there are a number of tools the sizes of which are not comparable to other blanks. In Level IIA/4, a convex obverse scraper with thinned back measures 6.0 cm x 3.9 cm x 1.2 cm (fig. 10-3: *5*), a convex obverse naturally backed scraper on exotic flint is 5.6 cm x 2.6 cm x 1.3 cm (fig. 10-3: *1*), and a straight-concave, truncated-faceted/thinned scraper measures 7.4 cm x 6.7 cm x 1.8 cm (fig. 10-3: *3*). Of the total debitage from IIA/4, only a single broken blade could be of comparable size (>5.7 cm x 2.1 cm x 1.1 cm). The length of unretouched blanks does not exceed 4.2 cm.

In Level III/1A, large tools are represented by a broken, straight-convex scraper (>5.1 cm x 2.4 cm x 0.7 cm), which was made on a flat blade with a uni-directional dorsal scar pattern (fig. 10-5: 2). Only one unretouched blade could be compared in size with this tool (>4.9 cm x 1.7 cm x 0.7 cm). Other retouched and unretouched blanks are not longer than 4.9 cm. Moreover, the maximum dimensions of the rest of the unretouched and retouched pieces from both Levels IIA/4 and III/1 usually have pronounced bifacial thinning attributes. This situation of limited on-site unifacial tool production, as well as the additional unifacial tools made off-site, is repeated. In the case of bifacial tools, it is not absolutely clear whether they were produced on-site or off-site. Qualitatively, (characteristics such as color), not a single flake and only a few chips were associated with the two bifacial tools from Level III/1A. This fact clearly demonstrates that it would be wrong to exclude the possibility of limited bifacial tool importation. There is no doubt that limited on-site bifacial and unifacial tool production took place on the IIA/4, III/1A, and III/1 living floors, as did some unifacial and bifacial tool importation.

It looks as if both the WCM occupation of Level IIA/2 and the Crimean Micoquian of Levels IIA/4, III/1A, and III/1 used the same pattern of raw material exploitation. Finally, a clearly unanswered question remains: how was it possible to process such a huge number of bones, using such small number of artifacts?

Chapter 11

KABAZI V: INTRODUCTION AND EXCAVATIONS

ALEXANDER I. YEVTUSHENKO
(with a contribution by C. R. FERRING)

SETTING AND HISTORY OF RESEARCH

The Middle Paleolithic site of Kabazi V is situated on the steep, south facing slope of the Kalinovaya Balka (Guelder Rose Valley), which connects to the right bank of the Alma River. Although the site is not far from Kabazi II (ca. 400 m), which lies on the same mountain but along the west-facing slope of the Alma River Valley, the site situation is quite different. Kabazi II is located on the middle slope, while Kabazi V is situated under the limestone cliff near the top of the slope, at an elevation of ca. 120 m above the modern Alma River flood plain. This setting is more like that of Kabazi I, which was entirely excavated by A. Formozov in the 1950s (Formozov 1959a).

The first Middle Paleolithic flints along this part of the mountain slope at Kabazi V were discovered by the geologists V. Petrun and A. Bilokrys (1962), but the site area was only clearly fixed in 1983 by Yu. Zaitsev. Two years later the site was test excavated by the expedition headed by Yu. Kolosov and was given the name Kabazi V, according to Kolosov's system of new site nomenclature.

In 1986, Yu. Kolosov and V. Chabai undertook the first real excavations at the site. They excavated along the edge of an artificial terrace over an area of 12 m^2 and also dug a narrow trench from the terrace edge to the cliff. As a result of these excavations, the multi-layered nature of the site was revealed, as well as providing a preliminary judgment that Kabazi V was a buried rock shelter. The sequence of sediment accumulation was subdivided into four units, each separated from the others by levels of rock fall.

Within each of these units were located a few horizons of Middle Paleolithic artifacts and bones which were grouped into four cultural layers, according to their position in the stratigraphic sequence. At the time, all cultural layers were considered in situ.

Based on the recovered artifacts, the three upper layers were defined as a Staroselian industry of the Crimean Middle Paleolithic, while the artifact assemblage of the fourth layer, the lowest, was too limited to permit an industrial designation (Kolosov, Stepanchuk, and Chabai 1988). The preliminary excavations failed to reach the back of the cave and they also did not reach the bottom of the site. In addition, the second unit was not clearly seen in the profiles and seemed to wedge out.

In 1990, excavations of Kabazi V were continued by V. Chabai and the author. The trench started in 1986 was extended and deepened. On the whole, the initial recognition of four geological/archeological stratigraphic units was confirmed, but the new excavations revealed that the stratigraphy was more complex than it first seemed. The uppermost two units, I and II, were subdivided by adding a Unit I-A and a Unit II-A for new archeological horizons. The deposits of Unit II were thicker than originally thought and so were subdivided into levels, consisting of several lenses of artifacts and fauna, each separated from the other by sterile deposits. In fact, these new artifact levels in Unit II (II/3, II/4, II/4a) were individual living floors with traces of fireplaces and with concentrations of flints and bone.

During the same season, the vertical back wall of the cave was reached, as well as part of the stepped floor near the back wall. The discoveries gave additional data for the understanding of Kabazi V.

In 1993 and 1995, excavations were continued by A. Yevtushenko in the same excavation area begun in 1990, as well as in a small zone bordering the 1986 excavations (fig. 11-1). The main focus of the new excavations was the lower parts of archeological Units II and III, while a main goal was getting materials to permit absolute dating of the occupations. During these two seasons of excavations, Levels II/4a and II/7 of Unit II and Levels III/1, III/1a, III/2, III/3, and III/4 of Unit III were uncovered. In addition, these excavations provided a good deal of new data which changed some of the previous perceptions. For instance, it was recognized that the sediments containing Units I, I-A, and II-A were disturbed and mixed by slope wash. The upper part of Unit II (Levels II/1 and II/2) was also partly disturbed in the main excavation block.

Unit III was similar to Unit II, as seen in 1990, when the thickness of the sediments increased toward the back wall of the rock shelter. These thicker sediments contained a number of new living floors with rich assemblages of artifacts and faunal remains

STRATIGRAPHIC SEQUENCE (by C. R. Ferring)

The stratigraphy of Kabazi V was not studied by a geologist prior to the 1993 field season. During the 1986/1990 excavations, the sequence of sedimentation was recognized by formal archeological approaches. That is, the strata and lenses of deposits were recorded according to color, degree of scree content, and superposition of various strata and lenses. In 1993 and, again in 1995, the open profiles were studied in the field and the geologic history of the site and its stratigraphic sequence were ascertained.

The Kabazi V rockshelter formed below the hard nummulitic limestone (Ea) that forms the top of the second ridge cuesta of the Crimean Mountains. The formation of the shelter was enhanced by the weathering of the soft clays and fossiliferous clays (Eb) that underlie the nummulitic limestone. Several beds of these clays contain abundant nummulitic fossils which were released upon weathering and are contained as clasts within the shelter sediments.

Below the shelter deposits today is a steep slope that exposes hard, sparsely fossiliferous chalk, and terminates in the small valley of a tributary to the Alma, about 1 km upstream from their confluence. Colluvial deposits below the shelter suggest that a similarly steep slope existed during site occupations, although the Alma valley was not as deep then as now.

The southern exposure of the shelter probably helped maintain warmer temperatures at the site. This would have increased weathering rates, and may have influenced habitats for microvertebrates and molluscs, accommodating woody vegetation and warmer temperatures.

Sediments were described in two sections at the site. The upper deposits (Strata A-E2) were described and sampled along the west wall of the excavation block. The rock slab (E3) and the Stratum F sediments were described in a sondage located in the southeast corner of that block. Due to the slope of the upper surface of the E3 slab, elevations of stratigraphic units are not equivalent between the two profiles. Below, however, the stratigraphy is described as on Figures 11-1, 11-2 and Tables 11-1, 11-2.

The oldest deposits at the site are Stratum F. These light, yellowish brown silts accumulated during weathering of the bedrock clays. They fine upward, with decreasing amounts and sizes of eboulis and fossil fragments. Unit IV is in the upper part of this stratum.

A major rockfall resulted in the placement of a thick limestone slab (E3) above the Stratum F sediments. This slab dips to the west; as a result, the sediments of Strata E2 and E1 are thicker towards the western part of the excavation block. The positioning of the E3 slab and the Stratum F sediments suggests that archeological deposits could be present under the slab

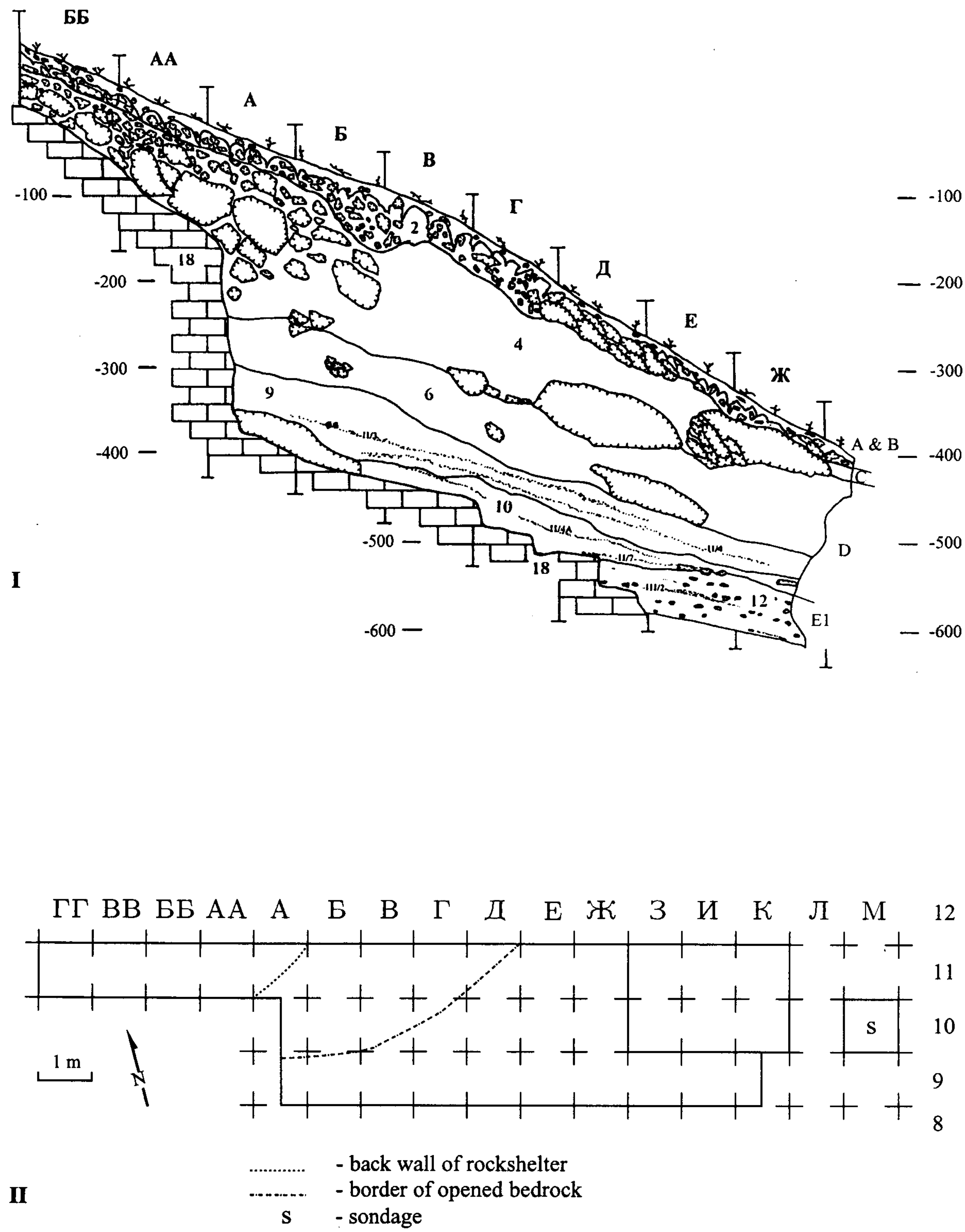


Fig. 11-1—Kabazi V, *I*–Stratigraphic profile along line "12": *2, 4, 6, 9, 10, 12, 18* (back wall)–lithological layers; *A, B, C, D, E1*–geological strata; *II/3, II/4, II/4A, II/7, III/2*–archeological levels. *II*–Plan of excavated area.

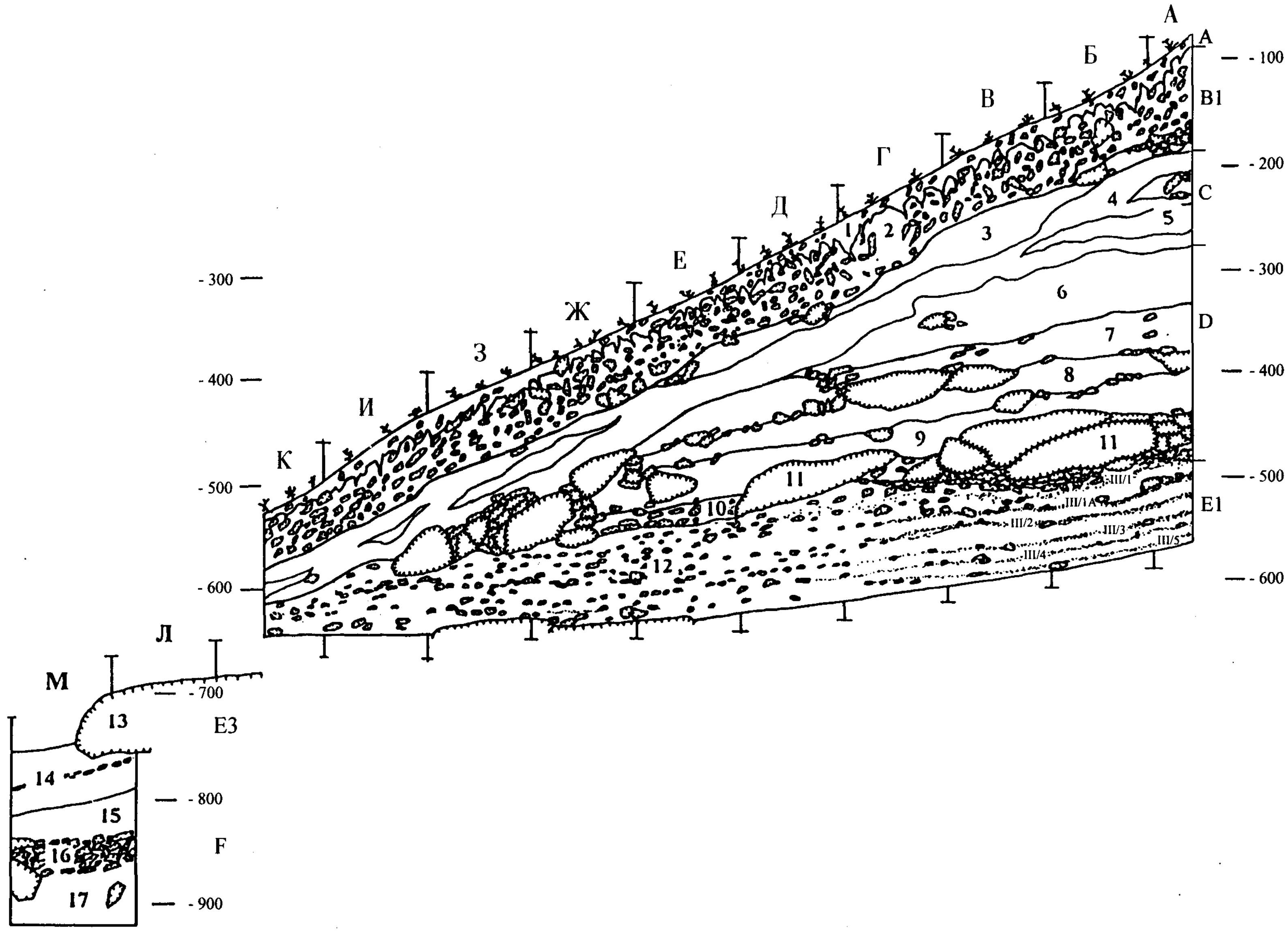


Fig. 11-2—Kabazi V, Stratigraphic profile along line "9": *1-17*–lithological layers; *A, B, D, E1-E2, E3, F*–geological strata; *III/1, III/1A, III/2, III/3, III/4, III/5*–archeological levels.

TABLE 11-1
Kabazi V, Stratigraphic Description (all colors Munsell moist)

Stratum	Description
A	(Soil A horizon): 10YR4.5/1 poorly sorted gravelly silt loam; many angular and many rounded limestone cobbles and pebbles; thick carbonate crusts on clast bases; gradual wavy boundary.
B1	(Soil Ak horizon): 10YR7/2 gravelly silt; clasts, mainly granules, with some rounded pebble to cobble clasts; continuous carbonate coats and some possible concretions; gradual irregular boundary.
B2	(Soil Ak2 horizon): 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.
C	(Soil K horizon): 10YR8/1 silt; massive; contains few granule-size fossil clasts in upper part; thins downslope; upslope it merges with weathered bedrock; faint bedding planes parallel to slope; horizon of common artifacts with chaotic orientations in middle of stratum; lower 10 cm indurated; gradual smooth boundary.
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.
E1	10YR7.5/4 silt with angular cobble to pebble eboulis clasts; some zones clast supported; few thin discontinuous beds of sand-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 bedrock at backwall part of section; unit thins and pinches out to south; abundant artifacts and fauna between 188-200 cm; hearth in lower part, against bedrock back wall; base of unit appears erosional.
E2	10YR5/3 granular silt, with thin lenses of clast-supported granular to pebble eboulis; base of unit is rockfall slab (at 5.85 m below site datum at described section).
E3	(Sediments below rockfall slab in southeast part of block) 2.5YR6/4 granular silt; massive, very hard when dry; clasts are mainly nummulitic fossil fragments; contains bones and charcoal associated with Cultural Layer 4 in upper part. Increase in eboulis content and clast size with depth, with same silt matrix. 1.7m of exposed sediments below rock slab (0.8 m thick).

and under the bedrock exposed in the east and north walls of the excavation block, but this has not yet been investigated.

Sediments of Strata E2 and E1 are located between the major rock slab (E3) and the bases of discontinuous large limestone blocks of Stratum D. Strata E2 and E1 sediments are mainly brown to light brown silts, derived from weathering of the clay bedrock. These contain angular granule to small boulder eboulis that is more abundant near the back (north) and east walls of the shelter. An erosional disconformity appears to separate Stratum E1 from E2, although no evidence of soil formation and prolonged exposure of the erosional surface is evident. Strata E2 and E1 contain abundant artifacts, fauna, and at least one hearth that is located at the back wall of the shelter in the lower part of Stratum E1. The beds of Strata E2 and E1 appear to be subhorizontal in the west wall profile, but dip to the west following the surface of the E3 limestone slab. Strata E1 and E2 contain major occupational debris in cultural Levels III/1-III/5. Cultural Level III/5 has a concave profile in the west wall of the block, suggesting that the shelter opening may have been oriented to the southwest.

The base of Stratum D is marked by large limestone fragments indicating increased (and apparently, final) roof fall at least in the eastern part of the shelter. This changed water flow through the shelter area, as the remainder of Stratum D has thin beds of nummulitic fossils and small eboulis that are flow-oriented to the south-southwest. These were probably oriented by water flowing to the shelter from the slope of the nummulitic limestone (Ea) above the site. Stratum D contains cultural Levels II/1-II/7.

TABLE 11-2
Kabazi V, Correlation of Geological and Archeological Sequence

GEOLOGICAL SEQUENCE†		*ARCHEOLOGICAL SEQUENCE*		
Stratum	*Lithological Layer*	*Unit*	*Level*	*Complex*
A	1	I	I/1	A1
B1	2		I/2	
B2	3	I-A	I-A	
C	4	II-A	II-A	
	5			
D	6 (upper)	II	II/1	A2
	6 (lower)		II/2	
	7		sterile	
	8		sterile	
	9 (upper)		II/3 (II/3a, II/3b)	B
	9 (lower)		II/4	
	10 (upper)		II/4a (II/5, II/5a, II/6)	C
	10 (lower)		II/7	
	11		sterile/roof collapse	
E1	12 (upper)	III	III/1, III/1a, III/2	D
E2	12 (middle)		III/3, III/4	E
	12 (lower)		III/5	F
E3	13		sterile/slab	
F	14 (upper)	IV	IV/1	G
	14 (lower)		IV/2	
	15		sterile	
	16		sterile	
	17		sterile	
	18		sterile (bedrock)	

† See figures 11-1 and 11-2.

Stratum C is a massive white silt that has faint, thin beds whose boundaries have been mostly altered by pedogenesis. This stratum is the K horizon of the soil that has formed in the deposits overlying the last roof fall at the site. Deposition of silt by eolian and/or slopewash is indicated by the burial of cultural Level II-A within Stratum C. Continued erosion of the Alma Valley would have exposed chalk to weathering and subsequent eolian transport up the south valley slope. There is no apparent source for these sediments above the site.

Stratum B is divided into B1-B2 based on pedogenic features. These sediments are much coarser than those in Stratum C. They include cobble to small boulder eboulis derived from the limestone above the site. The lower boundary of Stratum B dips steeply to the south-southwest, suggesting erosion of Stratum C prior to deposition of Stratum B sediments. Redeposited artifacts of cultural Levels I/2 and I-A are contained in Stratum B.

Stratum A is the A-horizon of the surface soil; otherwise these sediments are probably part of the same depositional episode as those in Stratum B. Redeposited artifacts of cultural Level I/1 occur in Stratum A. Together, Strata A and B represent increased weathering of the nummulitic limestone (Ea) above the site, with colluvial deposition on top of the former shelter deposits below.

The sedimentologic record at Kabazi V is largely dominated by slope evolution and shelter formation and collapse. The finer-grained deposits in the lower part of the site (Strata F and E) were derived from bedrock clays. Once the clay bedrock was covered by sediments, and after the two major episodes of roof fall (E3 and lower D), colluvial, and possibly eolian, sedimentation appears to have proceeded in an open site setting. Given the bedrock controls on sediment supply, coupled with the change from shelter to colluvial deposition, it is difficult to derive climatic information from the sediments alone.

ARCHEOLOGICAL SEQUENCE

The archeological occurrences within the stratigraphic sequence are most easily seen in Figures 11-1 and 11-2 and Table 11-2. The major geological Strata A through F consist of lithological layers, archeological units, and levels. During excavations, the archeological sequence was subdivided into 6 main units (Table 11-2). Lithological layers 1 and 2 contain archeological Unit I, with two levels (I/1 and I/2). Lithological layer 3 has Unit I-A. Sediments of lithological layers 4 and 5 include Unit II-A. In this unit, the archeological materials were limited to lithological layer 5 and consisted only of large pieces of flint, a very few chips, and poorly preserved faunal remains.

Unit II is more complicated. Partly disturbed archeological levels (II/1 and II/2) were found in lithological layer 6. The 7th and 8th lithological layers were sterile archeologically. In lithological layer 9 there were two archeological levels (II/3 and II/4), each of which was a true living floor. Another living floor, Level II/4a, was uncovered in the top part of lithological layer 10. Also found in this lithological layer were separate lenses (II/5, II/5a, and II/6) of Level II/4a, which have no independent significance. In addition, another living floor, Level II/7, was found in the lower part of lithological layer 10.

Unit III was separated from Unit II by a level of exfoliated limestone rocks (lithological layer 11), which represents the buried remains of the collapsed roof of the rockshelter. The deposits of lithological layer 12 contain Unit III. The subdivision of Unit III into different levels was based on the recognition of different streaks of ashes and lenses of artifacts which marked living floors. Between these living floors were sterile lenses, separating the archeological levels. During the 1986 excavations, three different archeological levels were recognized, but during the more recent excavations of 1993/95 which opened more of the site, additional levels were noted (III/1, III/1A, III/2, III/3, III/4); excavations of this unit are not yet finished.

Unit IV was first uncovered in 1986 in a sondage under the large exfoliated limestone blocks (lithological layer 13) which separated Units III and IV. In lithological layer 14 were found two archeological levels of Unit IV: one (IV/1) above lenses of scree and the other (IV/2) below these scree lenses. In lithological layers 15 through 18, there were no artifacts or faunal remains. Additional excavations of this unit await completion of Unit III work.

Bedrock was exposed only in a limited area of the excavations, but the back wall and stepped bottom of the rock shelter were uncovered (fig. 11-1).

The living floors of Units III and IV formed during the period when settlement took place within the rock shelter. The sediments of Unit II accumulated after the rock shelter roof collapsed and, so, settlement of this period was situated against a vertical back wall. The disturbed sediments of Units I, I-A, and II-A were deposited by slope wash from some place higher up the slope.

Based upon stratigraphic position and similarities in techno-typological attributes, the archeological units and levels have been grouped into several "complexes" (Yevtushenko 1995). Complex A1 includes the assemblages from Units I, I-A, and II-A which were disturbed and mixed. Complex A2 includes the assemblages from cultural Levels II/1 and

II/2, both from partly disturbed sediments of lithological layer 6 in the top of Unit II. Complex B grouped living floors of Levels II/3 and II/4 together. Complex C joins living floors of Levels II/4a and II/7, while Complex D is defined by Levels III/1, III/1A, and III/2. Complex E includes Levels III/3 and III/4. The living floors from Complexes C, D, and E were excavated between 1993 and 1995.

EXCAVATION METHODOLOGY

As mentioned above, the Middle Paleolithic occupational layers at Kabazi V included both living floors and mixed deposits. Given this, several excavation methods were used. The disturbed sediments of Units I, I-A, and II-A were excavated following the angle of slope inclination, but with subdivisions based on the elevation of artifacts within the geological (lithological) layers. This method was also used for the excavation of the sterile levels between living floors in Units II and III. The real living floors occurred in layers of ashes and charcoal and were excavated using the "carpet" method described by V. Chabai in Chapter 8. Some living floors were from 10 cm to as much as 15 cm thick (especially in Unit III), and in those cases, they were subdivided into sub-horizons of 2-3 cm. Such layers were excavated by using a combination of the "inclination angle" and the "carpet" methods.

In 1986, the excavation grid was oriented perpendicular to the visible cliff face behind the site. In 1990, however, the true back wall of the rock-shelter was located and it had a different orientation. The natural direction of the slope's inclination in Unit II and Unit III, therefore, was diagonal to the established grid system. Because of this, during the excavations of these units, supplementary transversal balks were left for stratigraphic control. This prevented the mixing of finds from different occupation levels.

Beginning in 1990, all noticeable artifacts and bones were mapped in place at a scale of 1:10 and all excavated sediments were passed through 5 mm and 1.5 mm screens, by excavation square and layer. As a result, even the smallest pieces of flint and bone were recovered, including microfauna.

ARTIFACT ANALYSES FROM PREVIOUS EXCAVATIONS

After the 1986 excavations, the artifacts were studied by V. Chabai (Kolosov, Stepanchuk, and Chabai 1988, 1993; Chabai 1991). In this study, assemblages from three different cultural layers, one each from Units I, II, and III, were defined as belonging to an early developmental stage of the Starosele facies of the Crimean Mousterian with bifacial tools (see Chapter 1). This judgment was based on the typology of the tool-kits, which were characterized by the relative occurrence of the following tool classes: scrapers, ≅60%; points, ≅18%; denticulates, ≅12%; notches, ≅5%; while other tools were present only as single examples. The first specific feature of the Staroselian, however, is the presence within the tool assemblages of bifacial tools (5-16%): as a rule, they are bifacial points with leaf or crescent shapes (fig. 11-3: *1-7*) or bifacial scrapers with similar shapes (fig. 11-6: *1,3,5*). The second specific feature of the Staroselian is the presence within the unifacial tool-kit of converging tools (30%-40%): scrapers, denticulates, and points. The morphological characteristics of these convergent scrapers and points include semi-rectangular (fig. 11-4: *1,2,4,5,7,9*), sub-trapezoidal (fig. 11-5: *3,10*), semi-, sub-crescent (fig. 11-5: *1,4,6-9;* 11-6: *2*), semi-leaf (fig. 11-6: *4,6*), and triangular shapes.

Technologically, the studied assemblages of Kabazi V had very low blade indices (Ilam = 4.5-5.4), as well as low faceting indices (IF = 30-35 and IFs = 13-16). Since these indices were lower than those from the studied samples from Starosele itself, it formed the basis of postulating a *Kabazi V industrial type* within the *Starosele facies*.

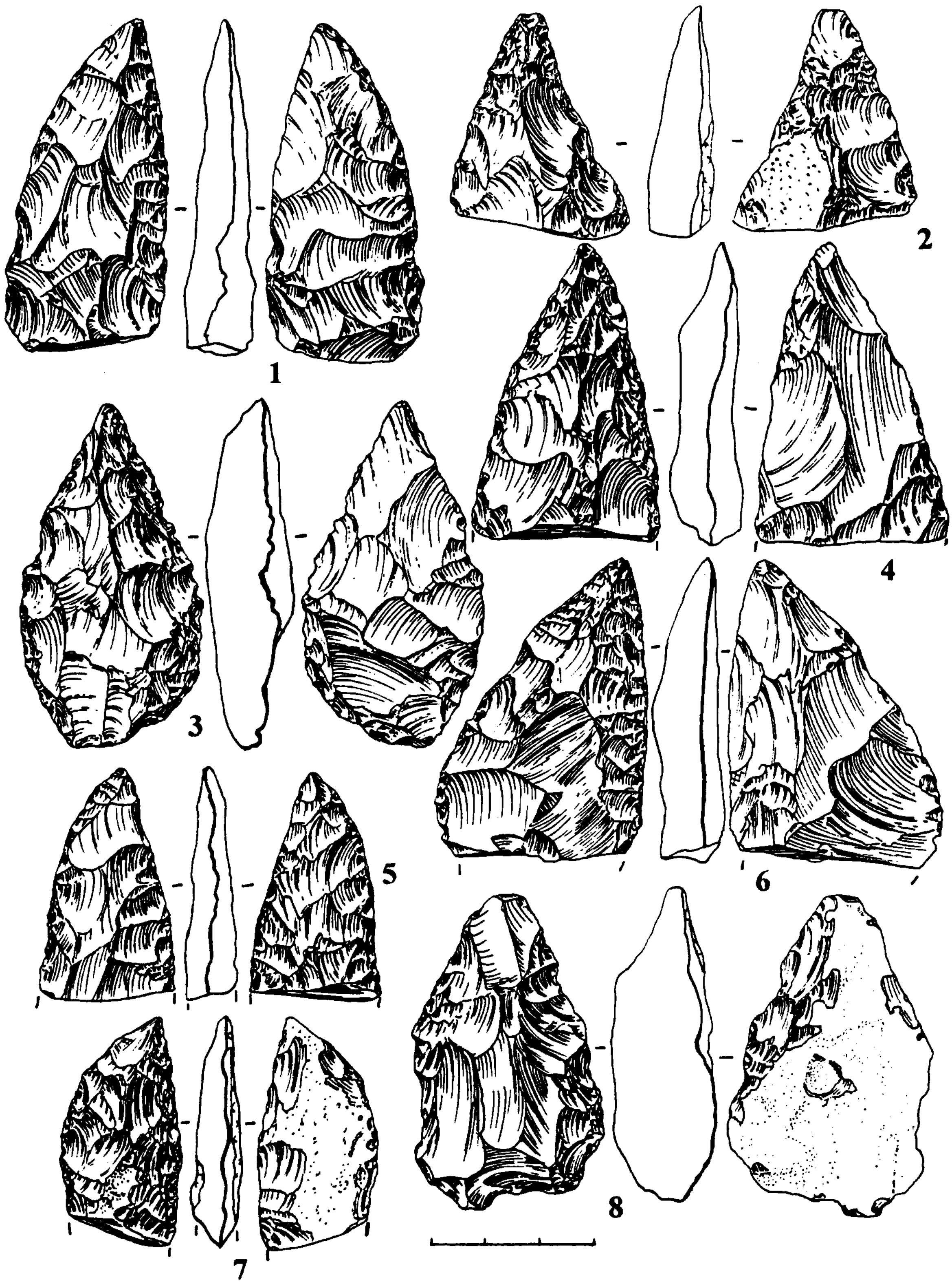


Fig. 11-3—Kabazi V, Unit I *(1-6, 8)* and Unit II *(7)*, Bifacial tools: *1,3,4,5*–leaf-points; *2*–broken point; *6,7*–crescent points; *8*–unfinished bifacial tool.

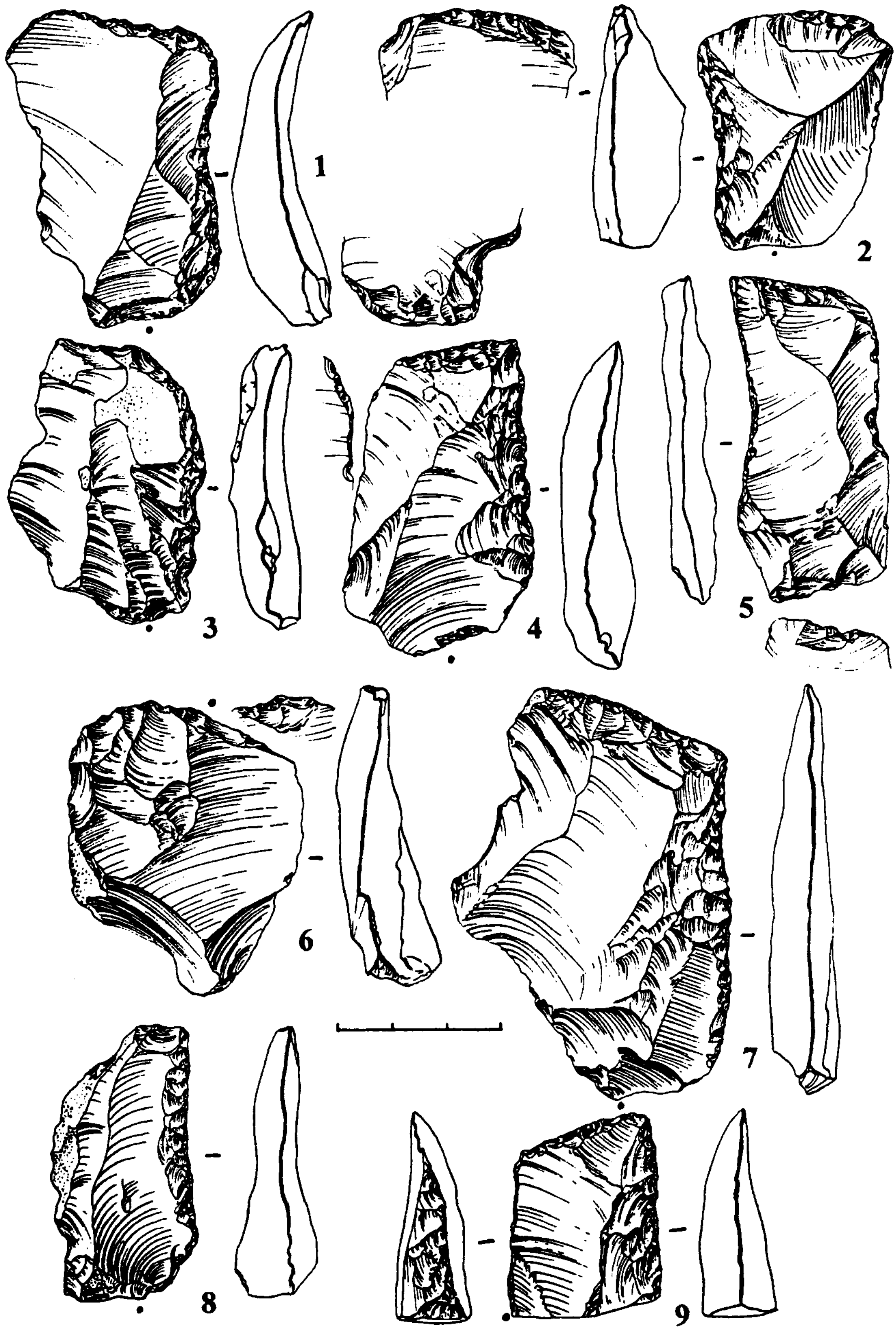


Fig. 11-4—Kabazi V, Unit I *(4, 6, 7)*, Unit II *(3)*, and Unit III *(1, 2, 5, 8, 9)*, Scrapers: *1,4,5,7,9*–semi-rectangular; *2*–semi-rectangular alternate; *3*–simple convex scraper; *8*–simple concave scraper. *6*–Truncated-faceted piece.

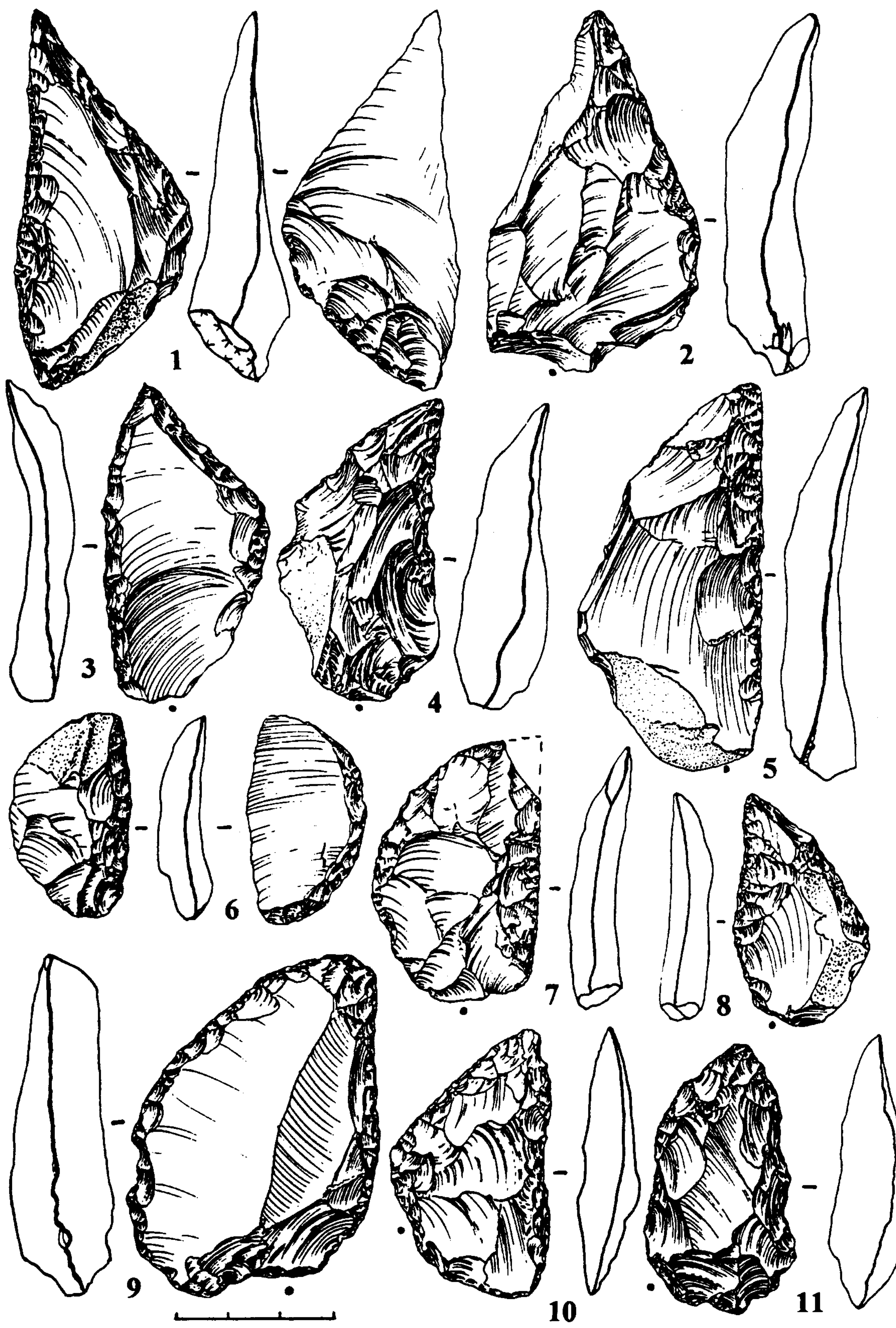


Fig. 11-5—Kabazi V, Unit I *(4, 8)*, Unit II *(5)*, and Unit III *(1-3, 6, 7, 9-11)*, Points: *1*–semi-crescent with thinned base; *2*–lateral; *3*–sub-trapezoidal; *4*–hook-like; *7*–sub-crescent; *8*–semi-crescent; *10*–trapezoidal point. Scrapers: *5*–simple straight; *6*–crescent; *9*–sub-crescent; *11*–sub-leaf.

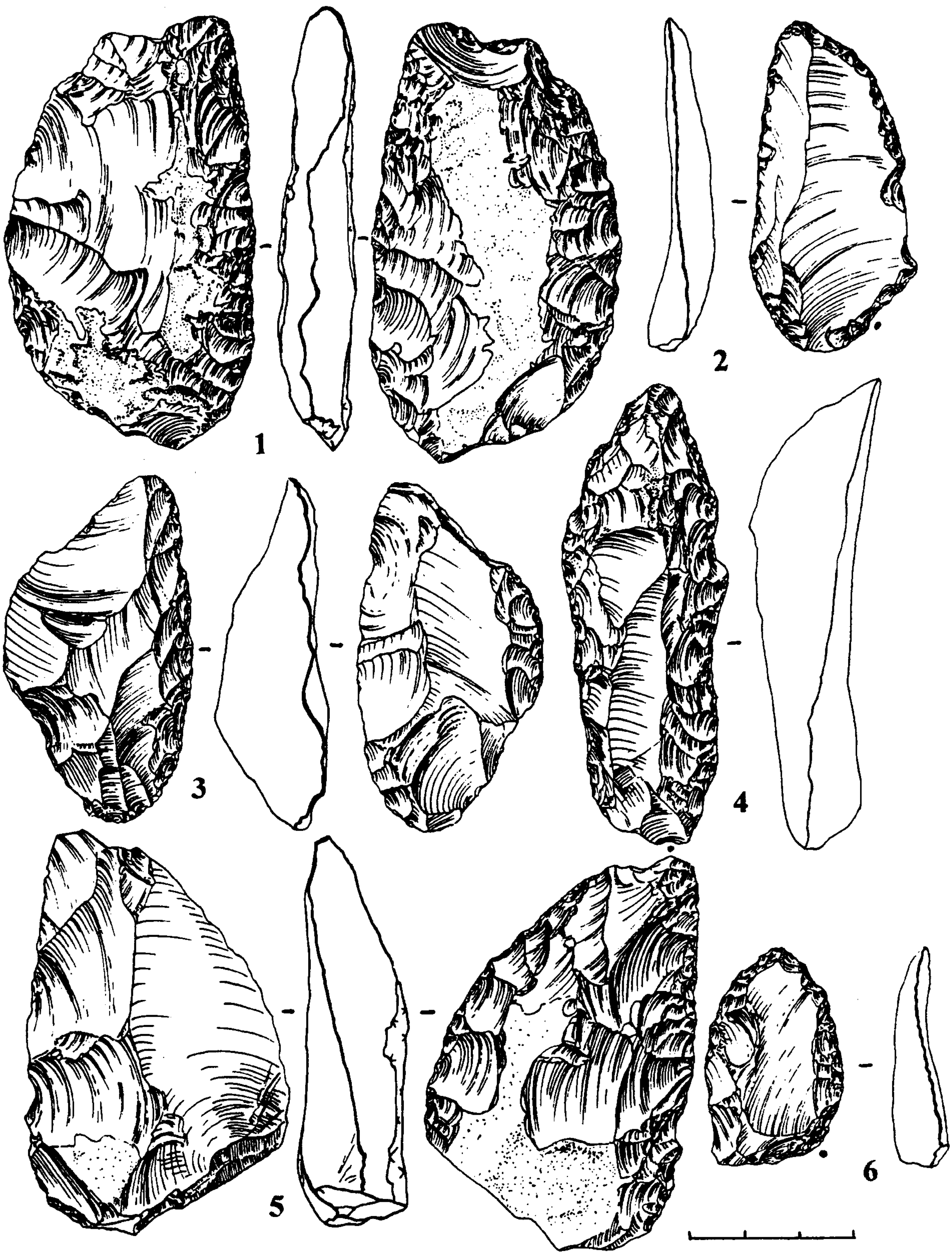


Fig. 11-6—Kabazi V, Unit I *(1)*, Unit II *(5)*, and Unit III *(2-4, 6)*, Scrapers: *1,3*–bifacial sub-crescent scrapers; *2*–unifacial sub-crescent scraper; *4,6*–unifacial semi-leaf scrapers; *5*–semi-bifacial sub-crescent scraper.

The description of the flint assemblages above is supplemented by the 1990 samples. The typological features of the new samples were consistent with the old ones, but the technological indices of some levels are different from those of the earlier excavations. The newly acquired Levels II/3 and II/4 had higher blade and faceting indices (Ilam = 9.0; IF = 44.8; IFs = 22.4). On the other hand, the indices of Units I, I-A, II-A, and Levels II/1 and II/2 were all close to those from the 1986 samples. These differences can be explained by the different nature of these levels. Cultural Levels II/3 and II/4 are real living floors, while the uppermost layers were disturbed and mixed. It is more difficult to explain the technological differences between the new assemblages and the old ones from Unit III recovered in 1986. There are, however, a few possible explanations; as a working hypothesis, it was suggested that these differences represented time differences within a single facies (Yevtushenko 1995). This hypothesis, however, cannot be tested without additional excavations of Unit III and additional absolute dates.

Chapter 12

KABAZI V: ASSEMBLAGES FROM SELECTED LEVELS

ALEXANDER I. YEVTUSHENKO

INTRODUCTION

During the 1993 and 1995 field seasons, seven living floors were excavated at Kabazi V. Two living floors were uncovered in Unit II (Levels II/4a and II/7) and five in Unit III (Levels III/1, III/1a, III/2, III/3, and III/4). As discussed in the previous chapter, the living floors of Unit II were formed in the open, after the collapse of the rock shelter roof, while the living floors of Unit III were formed within a true rock shelter.

Units and levels of Kabazi V were grouped into several complexes according to their stratigraphic position and similarities in technological and typological characteristics (see Table 11-2). Complex A1 consists of the assemblages from Units I, I-A, and II-A, all of which are disturbed and mixed. Complex A2 consists of assemblages II/1 and II/2 from the top part of Unit II, both of which are partly disturbed. Complex B groups together assemblages II/3 and II/4, while Complex C groups assemblages II/4a and II/7. Complex D includes the assemblages from III/1, III/1a, and III/2, and Complex E groups together the assemblages from III/3 and III/4. The living floors cleared during the 1993 and 1995 field seasons all relate to Complexes C, D, and E.

The assemblages were produced on flints of various colors. Most of the artifacts, ca. 90%, are on a gray flint; small numbers of black, gray-green, white, light brown, and yellow flints also occur. In addition, there are some yellow and brown flinted limestones of very poor quality which are found as only isolated examples. In spite of their rarity, these poor quality materials are always found as retouched tools and were probably imported into Kabazi V. The majority of the gray flint has a thin white or bluish patina, which often forms during the excavations.

The flint artifacts from Kabazi V consist mainly of five categories: tools, blanks, trimming elements, cores, and waste (debris). These categories are also subdivided. Tools include unifacial and bifacial tools. Blanks are subdivided into simple flakes, simple blades, utilized flakes, utilized blades, flakes with retouch, and blades with retouch. Trimming elements (or waste from the production of tools) include trimming flakes and trimming blades. Cores are divided into pre-cores and cores, while waste is subdivided into chips (less than 3 cm) and chunks.

ARTIFACT ANALYSES

The flint assemblages are described by occupation level in the following order: the typology of core-like pieces, debitage, typology of tools, and the typology of blanks with traces of use. Waste is excluded from the attribute analyses, although numerically it is the most representative category in each assemblage. The structure of waste is the same in all studied levels. Chips, which are less than 3 cm, are dominant and were produced as by-products of flaking, faceting, or simple shattering when a core was struck.

Most of the chunks are massive pieces of broken flint plaquettes which come from the unsuccessful testing of flint and the first stages of core production. Some of the chunks have fresh traces of limestone cortex—possible signs of flint quarrying or its collection from actively eroding sources.

All artifacts struck from cores are considered blanks for the debitage analysis, provided they are larger than 3 cm in either length or width. In this sense, blanks are composed of flakes, blades, flakes and blades with traces of use, as well as unifacial tools made on flakes and blades. Because there are so few blade blanks, it makes no sense to separate then from the flakes in the following description. The large number of broken pieces were used in the analysis, but only for those attributes which are present on each piece.

Trimming elements are specific debitage products resulting from the production of tools. They are therefore treated separately from the blanks in each kind of analysis and are not part of the technological indices.

Apart from the traditional technological indices regarding faceting, blades, etc., there are some special indices used here for the Kabazi V material:

(1) Index of cortification (Ic) is calculated as the percentage of whole and broken blanks with some dorsal cortex within all broken and unbroken blanks;

(2) Index of primary flaking (Ip) is calculated as the percentage of blanks with more than 75% of their dorsal surface covered by cortex on all unbroken blanks;

(3) Index of uni-directional flaking (Id1) is calculated as the percentage of blanks with parallel and converging scar patterns on all blanks with identifiable scar patterns;

(4) Index of bi-directional flaking (Id2) is calculated as the percentage of blanks with bi-directional and parallel/crossed scar patterns on all blanks with identifiable scar patterns; and,

(5) Index of poly-directional flaking (Id3) is calculated as the percentage of all blanks with radial and bi-directional-crossed scar patterns on all blanks with identifiable scar patterns.

Tool typology follows the methods described in Chapter 3 of this volume. Bifacial tools are subdivided into finished and unfinished pieces. Finished bifacial tools have clear shapes made by bi-convex, plano-convex, or semi-bifacial methods of secondary treatment and retouched edges. Unfinished bifacial tools are missing the final stages of tool treatment, such as edge retouch. The shapes of unfinished bifacial pieces were recognized more or less conventionally.

The Kabazi V assemblages reported in this chapter are described separately, although they are grouped by complex, as noted above. Comparisons among assemblages will be presented at the end of this chapter.

Complex C

The artifacts of Complex C come from Levels II/4a and II/7. Both are living floors, marked by traces of fireplaces and "carpets" of flint and faunal remains. These living floors are separated from each other by a thin sterile level. All the levels of Complex C occur in the lowest lithological levels of Unit II and are separated from the upper levels of Complex B, as well as from levels of Unit III, by clearly sterile deposits.

Level II/4a was discovered and partly excavated during the 1990 field season. In this report, however, only materials from levels recovered during the 1993-95 field seasons will be described.

Level II/4a

The assemblage from Level II/4a consists of 2,072 artifacts: one core-like piece, 44 tools, 9 flakes and 2 blades with traces of use, 129 flakes, 14 blades, 26 trimming pieces, 18 chunks, and 1,829 chips (Table 12-1). Detailed proportional distributions of blank attributes are presented in Tables 12-2 through 12-6. The following text will merely identify the general patterns.

TABLE 12-1
Kabazi V, Artifact Totals

	II/4a		*II/7*		*Total*	
Complex C	*N*	*e %*	*N*	*e %*	*N*	*e %*
Tools	44	19.5	38	17.5	82	18.6
Flakes	138	61.3	141	65.6	279	63.4
Blades	16	7.1	10	4.7	26	5.9
Cores	1	0.4	2	0.9	3	0.7
Trimmings	26	11.5	24	11.2	50	11.4
Chips	1829		1745		3574	
Chunks	18		31		49	
Total	2072		1991		4063	
†E %	225	100.0	215	100.0	440	100.0

	III/1		*III/1a*		*III/2*		*Total*	
Complex D	*N*	*e %*	*N*	*e %*	*N*	*e %*	*N*	*e %*
Tools	46	10.0	57	14.4	77	14.1	180	12.8
Flakes	326	71.0	272	68.5	384	70.3	982	70.0
Blades	26	5.7	22	5.5	31	5.5	79	5.6
Cores	3	0.7	6	1.5	2	0.4	11	0.8
Trimmings	58	12.6	40	10.1	52	9.5	150	10.7
Chips	4224		2746		3651		10621	
Chunks	84		55		49		188	
Total	4767		3198		4246		12211	
E %	459	100.0	397	100.0	546	100.0	1402	100.0

	III/3		*III/4*		*Total*	
Complex E	*N*	*e %*	*N*	*e %*	*N*	*e %*
Tools	22	9.7	2	5.1	24	9.0
Flakes	169	74.5	36	92.3	205	77.1
Blades	21	9.3	1	2.6	22	8.3
Cores	3	1.3	—	—	3	1.1
Trimmings	12	5.3	—	—	12	4.5
Chips	2118		297		2415	
Chunks	17		3		20	
Total	2362		339		2701	
E %	227	100.0	39	100.0	266	100.0

†Essential counts.

Core-Like Pieces. The single example of a core-like piece is on a plaquette. It has a rectangular flaking surface on which a series of blanks were struck from a single, unfaceted striking platform. The core is non-volumetric in concept and the removals are parallel to each other. The core is 4.7 cm long, 4.5 cm wide, and 3.0 cm thick. The longest scar is 4.5 cm and, overall, the flaking surface appears exhausted.

Technology (Tables 12-1, 12-8). The analysis sample for Level II/4a is 193 blanks, of which there are 175 flakes and 18 blades. Among the flakes, the majority are unretouched, while small numbers of utilized flakes (5), retouched flakes (4), and tools on flakes (37) were included, as well. Of this total, 74 are broken and, so, could not be used for all observations. Of the 101 complete examples, 35 are transverse, that is, are wider than long. The blades in the sample include mostly debitage, but also one retouched blade, a utilized blade, and a pair of blade tools. All but 4 are complete. Over all, blades are rare (Ilam = 9.3). A group of 26 trimming elements was analyzed separately.

Dorsal Scar Patterns (Tables 12-2, 12-8). About one-third of the blanks have parallel scar patterns; bi-directional and parallel-crossed are also common. Of the 175 flakes, both broken and unbroken, a majority have some dorsal cortex, while uni-directional and bi-directional patterns are equally represented. For the sample of trimming elements, 37.5% are bi-directional and 20.8% are parallel-crossed. Other patterns occur less frequently: converging, 8.3%; and radial, 8.3%. Cortex occurs on the trimming elements 20.8% of the time.

TABLE 12-2
Kabazi V, Blank Scar Patterns

	II/4a		*II/7*		*Total*	
Complex C	*N*	*%*	*N*	*%*	*N*	*%*
Primary (>75% cortex)	6	5.5	8	8.3	14	6.8
Parallel	33	30.3	34	35.4	67	32.7
Converging	8	7.3	8	8.3	16	7.8
Bi-directional	20	18.4	20	20.8	40	19.5
Parallel-crossed	21	19.3	18	18.8	39	19.0
Bi-directional-crossed	15	13.8	7	7.3	22	10.7
Radial	6	5.5	1	1.0	7	3.4
Total	109	100.0	96	100.0	205	100.0

	III/1		*III/1a*		*III/2*		*Total*	
Complex D	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Primary (>75% cortex)	18	7.4	16	6.9	31	9.1	65	8.0
Parallel	80	33.1	73	31.6	97	28.5	250	30.8
Converging	22	9.1	32	13.9	51	15.0	105	12.9
Bi-directional	34	14.0	41	17.8	47	13.8	122	15.0
Parallel-crossed	51	21.1	44	19.0	68	20.0	163	20.1
Bi-directional-crossed	25	10.3	15	6.5	29	8.5	69	8.5
Radial	12	5.0	10	4.3	17	5.0	39	4.8
Total	242	100.0	231	100.0	340	100.0	813	100.0

	III/3		*III/4*		*Total*	
Complex E	*N*	*%*	*N*	*%*	*N*	*%*
Primary (>75% cortex)	15	9.7	3	9.4	18	9.7
Parallel	43	27.7	10	31.3	53	28.0
Converging	24	15.5	9	28.1	33	17.7
Bi-directional	11	7.1	2	6.3	13	7.0
Parallel-crossed	40	25.8	7	21.9	47	25.3
Bi-directional-crossed	16	10.3	—	—	16	8.6
Radial	6	3.9	1	3.1	7	3.8
Total	155	100.0	32	100.0	187	100.1

Shape (Table 12-3). Only unbroken blanks with clear shapes are used here. Because tool shape is partly determined by retouch, tools are also excluded. In spite of this, almost half have irregular shapes, with rectangular being the most common of the identifiable shapes. Of the trimming elements, 45.8% are irregular, while the other forms occur in equal proportions.

TABLE 12-3
Kabazi V, Blank Shapes

	II/4a		*II/7*		*Total*	
Complex C	*N*	*%*	*N*	*%*	*N*	*%*
Rectangular	20	21.3	13	15.1	33	18.3
Trapezoidal	15	16.0	25	29.1	40	22.2
Ovoid	7	7.5	4	4.7	11	6.1
Triangular	8	8.5	15	17.4	23	12.8
Irregular	44	46.8	29	33.7	73	40.6
Total	94	100.0	86	100.0	180	100.0

	III/1		*III/1a*		*III/2*		*Total*	
Complex D	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Rectangular	59	24.7	31	16.2	61	21.1	151	21.0
Trapezoidal	65	27.2	55	28.8	77	26.6	197	27.4
Ovoid	15	6.3	13	6.8	22	7.6	50	7.0
Triangular	21	8.8	20	10.5	17	5.9	58	8.1
Irregular	79	33.1	72	37.7	112	38.8	263	36.6
Total	239	100.0	191	100.0	289	100.0	719	100.0

	III/3		*III/4*		*Total*	
Complex E	*N*	*%*	*N*	*%*	*N*	*%*
Rectangular	24	16.4	4	14.3	28	16.1
Trapezoidal	37	25.3	6	21.4	43	24.7
Ovoid	16	11.0	3	10.7	19	10.9
Triangular	17	11.6	4	14.3	21	12.1
Irregular	52	35.6	11	39.3	63	36.2
Total	146	100.0	28	100.0	174	100.0

Profiles (Table 12-4). Almost 6 out of 10 blanks have incurvate lateral profiles; other types occur in approximately equal proportions. Two of the incurvate flakes are also overpassed. Of the 24 identifiable trimming elements, 70.8% are incurvate, 54.2% are twisted, 12.5% are flat, and 4.2% are convex.

Platforms (Tables 12-5, 12-8). Almost half of identifiable platforms are unfaceted, but dihedral is also common. The faceting indices for blanks are IF = 49.5 and IFs = 20.8. Among the trimming elements, platforms are usually unfaceted—58.3%, while 12.5% are dihedral and 29.2% are multifaceted.

Lipping. Semi-lipped platforms are most common (54.5%), followed by unlipped (33.6%) and lipped (11.9%). All 24 trimming elements are lipped.

Size (Table 12-6). Excluding debris and broken pieces, almost 80% of the blanks fall between 3.0 cm and 5 cm, with an average greatest dimension of 4.2 cm, and an average thickness of 0.7 cm. Only a single piece exceeds 10.0 cm. Of the 46 blanks less than 4 cm, only one is a tool. For the 44 blanks between 4 and 5 cm, 8 are tools but, of the 18 pieces between 5 and 6 cm, 8 are tools. While the sample size decreases to only 6 for pieces between 6 cm and 7 cm, half, or 3, are tools, while the single piece 10 cm long is a tool. Thus, it seems clear that blank selection for tool production is heavily biased toward the larger pieces but that smaller pieces may also be used.

TABLE 12-4
Kabazi V, Blank Profiles

	II/4a		*II/7*		*Total*			
Complex C	*N*	*%*	*N*	*%*	*N*	*%*		
Flat	19	16.5	27	28.1	46	21.8		
Incurvate	66	57.4	44	45.8	110	52.1		
Twisted	16	13.9	11	11.5	27	12.8		
Convex	14	12.2	14	14.6	28	13.3		
Total	115	100.0	96	100.0	211	100.0		
	III/1		*III/1a*		*III/2*		*Total*	
Complex D	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Flat	55	21.4	48	22.2	75	22.9	178	22.2
Incurvate	136	52.9	115	53.2	172	52.4	423	52.8
Twisted	47	18.3	25	11.6	38	11.6	110	13.7
Convex	19	7.4	28	13.0	43	13.1	90	11.2
Total	257	100.0	216	100.0	328	100.0	801	100.0
	III/3		*III/4*		*Total*			
Complex E	*N*	*%*	*N*	*%*	*N*	*%*		
Flat	46	28.4	6	21.4	52	27.4		
Incurvate	80	49.4	15	53.6	95	50.0		
Twisted	10	6.2	2	7.1	12	6.3		
Convex	26	16.1	5	17.9	31	16.3		
Total	162	100.0	28	100.0	190	100.0		

Tools (Table 12-7). Forty-four tools were recovered, mostly unifacial. Another group of 11 pieces shows traces of use and these will be described separately.

Typology of Unifacial Tools. These include 7 points, 17 scrapers, 3 denticulates, 2 notches, and 10 unidentifiable fragments. Of these, 37 are on flakes and 2 on blades. Twenty-one of the blanks were on-axis, and 18 were off-axis. The vast majority, 34, have obverse retouch; on 4 pieces, retouch is alternate, and on one it is inverse. Of the 63 retouched edges, parallel retouch is most common (16), followed closely by sub-parallel (14), and heavy sub-parallel (14). Scalar (10), marginal (7), and irregular (2) occur less often. Flat and semi-steep retouch are equally present (26), while 11 have steep retouch.

A number of tools exhibit accommodation elements opposite the retouched edges: 2 with cortex backs, and 3 with perpendicular unretouched edges. In addition, 8 tools show some ventral thinning: 4 basal, 2 distal, and 2 lateral.

There is a wide variety of *point* types: 3 semi-crescent (fig. 12-1: *1*) and one each of crescent, semi-leaf (fig. 12-1: *2*), trapezoidal, and unidentifiable forms. One of the semi-crescent points has lateral inverse thinning.

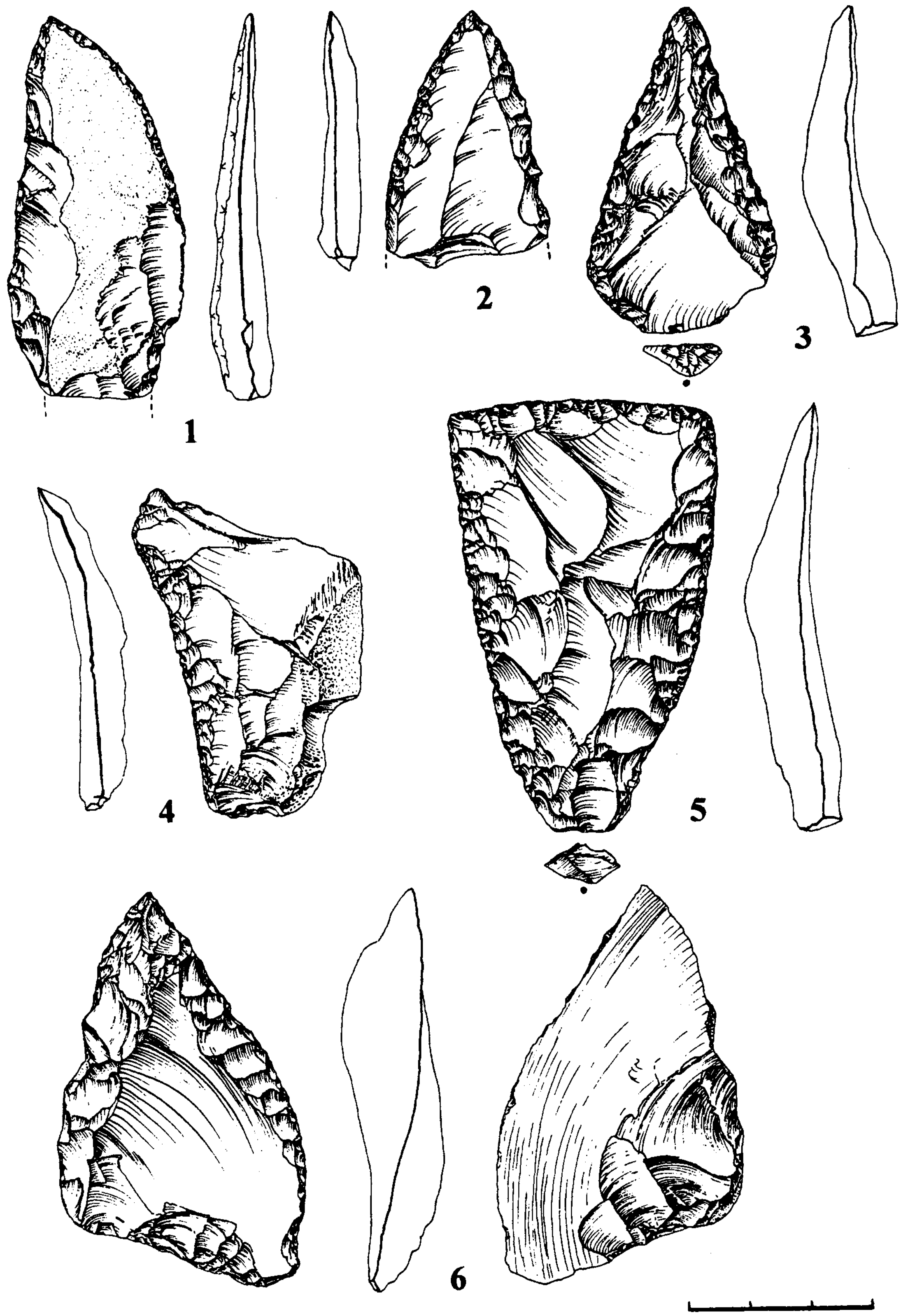


Fig. 12-1—Kabazi-V, Complex C, Levels II/4a *(1, 2, 4)* and II/7 *(3, 5, 6)*, Points: *1*–semi-crescent; *2,3*–semi-leaf. Scrapers: *4*–concave; *5*–sub-trapezoidal; *6*–semi-crescent with ventrally thinned base.

The *scrapers* include 10 simple, 3 transverse, 2 double, and 2 convergent forms. Among the simple examples, 6 are convex, 3 are straight, and one is concave (fig. 12-1: *4*). One of the convex examples is naturally backed, while another has a perpendicular, unretouched back. One of the straight examples is ventrally thinned. All transverse scrapers, one each of straight, convex, and concave forms, are inversely retouched. Double scrapers include one double convex with a thinned base and one straight-wavy example. Convergent scrapers include one semi-crescent and one irregular example with basal thinning and alternate retouch.

The *denticulates* include two simple straight and one transverse convex. All but one simple denticulate is made by alternating retouch, and the transverse example has a back accommodation. There are two *notched flakes*, one struck off-axis. The *unidentifiable tools* include 9 obversely retouched fragments and one inversely retouched piece.

Typology of Bifacial Tools. There are 6 bifacial tools: two bi-convex, three semi-bifacial, and one plano-convex. Three more pieces are recognized as unfinished bifacial pieces. Of the finished tools, there is one semi-bifacial leaf-point (fig. 12-4: *2*), two broken points, one convergent scraper, and two unidentifiable fragments. Both points are distal parts with semi-bifacial preparation. The convergent scraper is plano-convex and ovoid (fig. 12-6: *4*).

The unidentifiable pieces are basal fragments with bifacial retouch on a thin plaquette. The unfinished tools are all bi-convex (fig. 12-8: *1*).

Blanks with Traces of Use-Wear. There are 11 pieces which show either some retouch or irregularities caused by use. The former consists of 4 flakes and a blade with irregular retouch along short sections of their edges. It is not clear whether this retouch is purposeful or the result of edge damage during use. The utilized blanks (1 flake and 1 blade) have more of each edge retouched but it is "ephemeral" and appears to be the result of use alone.

Level II/7

The assemblage from Level II/7 consists of 1,991 artifacts, of which the vast majority, as usual, are chips and only 38 are tools (Table 12-1).

Core-Like Pieces. There are just two core-like pieces: a pre-core and a core, both made on plaquettes with non-volumetric flaking surfaces. The pre-core has a narrow flaked surface with a single unfaceted platform and two working surfaces on the lateral edges of the plaquette. This core is large: 7.5 cm long, 6.0 cm wide, and 3.3 cm thick. The longest flake scar is 4.5 cm.

Technology (Tables 12-1, 12-8). The blank sample includes 30 flake tools and two blade tools, as well as debitage. Given the small blade sample (Table 12-1), they have been merged with the flakes for analysis. Of the 182 pieces, 86 are broken and could be used only for a subset of observations. In addition, the trimming elements will be treated separately.

Dorsal Scar Patterns (Tables 12-2, 12-8). Pieces with parallel scars are most common, followed by bi-directional and bi-directional crossed. More than half of all blanks have some cortex on their dorsal surfaces. Of those classified, uni-directional flaking and bi-directional flaking are rather evenly represented. In addition, 3 crested flakes were recovered in this level.

Most of the trimming elements have parallel (35.0%) or bi-directional (30.0%) scar patterns. Parallel-crossed, bi-directional-crossed, and radial patterns occur 10% each. More than a third of the trimming flakes have some cortex; primary flakes are absent. In this sample, uni-directional and bi-directional flaking is equal (40.0% each), while flaking from three or more directions accounts for only 20%.

Shape (Table 12-3). Trapezoidal shapes are most common, but triangular and rectangular are also present in reasonable numbers. Of 170 flakes, only 17.7% are wider than long.

Among the blades, 5 of the 9 are triangular. For the trimming elements, trapezoidal and irregular account for 35.0% each.

Profiles (Table 12-4). Incurvate profiles account for almost half of the blanks, with flat following. Most of the trimming elements are incurvate (60.0%) or twisted (30%), while 10% are flat.

Platforms (Tables 12-5, 12-8). Again, only unfaceted and dihedral faceted occur in any significant numbers. Of the 22 identifiable trimming elements, 54.5% are unfaceted, 18.2% are dihedral, 13.6% are multi-faceted, and 9.0% are polyhedral. The faceting indices for tools and blanks only are IF = 56.5, IFs = 27.2.

TABLE 12-5
Kabazi V, Blank Platform Types

	II/4a		*II/7*		*Total*			
Complex C	*N*	*%*	*N*	*%*	*N*	*%*		
Cortex	8	7.9	9	9.8	17	8.8		
Plain	43	42.6	31	33.7	74	38.3		
Dihedral	29	28.7	27	29.3	56	29.0		
Faceted straight	2	2.0	9	9.8	11	5.7		
Faceted convex	14	13.9	11	12.0	25	13.0		
Faceted concave	4	4.0	—	—	4	2.1		
Faceted lateral	1	1.0	5	5.4	6	3.1		
Missing	2		6		8			
Unidentifiable	90		84		174			
Total	193	100.0	182	100.0	375	100.0		
	III/1		*III/1a*		*III/2*		*Total*	
Complex D	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Cortex	13	6.1	16	8.6	34	11.8	63	9.1
Plain	87	40.8	77	41.2	125	43.3	289	41.9
Dihedral	65	30.5	51	27.3	52	18.0	168	24.4
Faceted straight	20	9.4	14	7.5	30	10.4	64	9.3
Faceted convex	19	8.9	22	11.8	30	10.4	71	10.3
Faceted concave	4	1.9	4	2.1	8	2.8	16	2.3
Faceted lateral	5	2.3	3	1.6	10	3.5	18	2.6
Missing	10		8		4		22	
Unidentifiable	167		142		193		502	
Total	390	100.0	337	100.0	486	100.0	1213	100.0
	III/3		*III/4*		*Total*			
Complex E	*N*	*%*	*N*	*%*	*N*	*%*		
Cortex	16	11.5	3	14.3	19	11.9		
Plain	68	48.9	12	57.1	80	50.0		
Dihedral	33	23.7	3	14.3	36	22.5		
Faceted straight	11	7.9	—	—	11	6.9		
Faceted convex	8	5.8	2	9.5	10	6.3		
Faceted concave	1	0.7	1	4.8	2	1.3		
Faceted lateral	2	1.4	—	—	2	1.3		
Missing	4		1		5			
Unidentifiable	65		17		82			
Total	208	100.0	39	100.0	247	100.0		

Lipping. Semi-lipped platforms are the most common (69.4%) followed by unlipped (20.8%) and lipped (9.8%). Most of the trimming elements, 81.8%, are lipped.

Size (Table 12-6). The average maximum blank length is 4.3 cm and thickness 0.6 cm. Again, just over three-quarters fall between 3 and 5 cm. Only one in five is between 5 and 7 cm, while only three pieces exceed 7 cm. In the smallest group, 3 to 4 cm, only one out of 50 is a tool. In the next group, 4 to 5 cm, 4 out of 31 are tools. This changes radically in the 5 to 6 cm group, where 8 out of 13 are tools, and in the 6 to 7 cm group, where 6 of 9 are tools. Two of the three longer than 7 cm are also tools. Thus, the criterion for blank selection parallels that already described for the previous assemblage.

TABLE 12-6
Kabazi V, Blank Size Intervals of Maximum Dimension

	II/4a		*II/7*		*Total*			
Complex C	*N*	*%*	*N*	*%*	*N*	*%*		
3-4 cm	46	40.0	50	47.2	96	43.4		
4-5 cm	44	38.3	31	29.3	75	33.9		
5-6 cm	18	15.7	13	12.3	31	14.0		
6-7 cm	6	5.2	9	8.5	15	6.8		
7-8 cm	—	—	1	0.9	1	0.5		
8-9 cm	—	—	2	1.9	2	0.9		
9-10 cm	—	—	—	—	—	—		
10-11cm	1	0.9	—	—	1	0.5		
Total	115	100.0	106	100.0	221	100.0		
	III/1		*III/1a*		*III/2*		*Total*	
Complex D	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
3-4 cm	147	57.0	112	53.3	170	51.8	429	53.9
4-5 cm	63	24.4	71	33.8	99	30.2	233	29.3
5-6 cm	31	12.0	18	8.6	40	12.2	89	11.2
6-7 cm	13	5.0	6	2.9	11	3.4	30	3.8
7-8 cm	4	1.6	3	1.4	6	1.8	13	1.6
8-9 cm	—	—	—	—	1	0.3	1	0.1
9-10 cm	—	—	—	—	1	0.3	1	0.1
10-11cm	—	—	—	—	—	—	—	—
Total	258	100.0	210	100.0	328	100.0	796	100.0
	III/3		*III/4*		*Total*			
Complex E	*N*	*%*	*N*	*%*	*N*	*%*		
3-4 cm	81	50.6	16	57.1	97	51.6		
4-5 cm	52	32.5	8	28.6	60	31.9		
5-6 cm	14	8.8	2	7.1	16	8.5		
6-7 cm	7	4.4	1	3.6	8	4.3		
7-8 cm	3	1.9	1	3.6	4	2.1		
8-9 cm	1	0.6	—	—	1	0.5		
9-10 cm	1	0.6	—	—	1	0.5		
10-11cm	1	0.6	—	—	1	0.5		
Total	160	100.0	28	100.0	188	100.0		

Tools (Table 12-7). In Level II/7, there are 32 unifacial and 6 bifacial tools, and 11 blanks with traces of use.

Typology of Unifacial Tools. There are 5 points, 18 scrapers, one notch, and 8 unidentifiable tool fragments. Of the unifacial tools, 30 are made on flakes and two on blades. Eighteen of the blanks were struck on-axis, 13 off-axis, while one is made on a chunk. All but one tool (with alternate retouch) have obverse retouch. Of the 55 retouched edges, on 8 it is parallel, on 13 sub-parallel, 15 are heavy sub-parallel, on 10 it is scalar, while 4 are marginal, and 5 irregular. For retouch angle, 22 are flat, 26 are semi-steep, and 7 are steep.

Four of the tools have accommodations opposite the working edge; on two it consists of natural backs, on another two, the backs are faceted. In addition, 9 tools have some inverse thinning: 7 basal, and one each distal and distal/lateral.

There are several types of *points*, including semi-leaf (fig. 12-1: *3*) crescent, semi-trapezoidal, amorphous, and unidentifiable forms. In spite of the variety, all are basally thinned. The amorphous example is proximally pointed, and the small fragment appears to have been part of a lateral point. The semi-trapezoidal example is very close to being *déjeté*.

Most of the tools are *scrapers*: 8 simple, one transverse, 2 double, and 7 convergent types. Among the simple examples, all of which are obversely retouched, there are 3 straight, 1 convex, 3 concave and 1 convex/concave. One of the concave examples has a retouched back accommodation, as well as inverse basal thinning. The transverse scraper has a convex/concave retouched edge, prepared by obverse steep scalar retouch, while its back is faceted. This piece approaches a Quina-type scraper. The double scrapers include one straight-convex made with alternate retouch and one straight-convex/concave made by obverse retouch with ventral thinning of the distal end.

The convergent scrapers include 1 sub-crescent, 2 semi-crescent, 2 sub-trapezoidal, and 2 semi-rectangular forms. All have obverse retouch, one of the sub-trapezoidal examples is proximally/laterally thinned (fig. 12-5: *2*), and made on an elongated flake (fig. 12-1: *5*). The sub-crescent example has a proximal point and one of the semi-crescent examples has a laterally positioned point and basal thinning (fig. 12-1: *6*). The semi-rectangular scrapers approach *déjeté* form, while the sub-trapezoidal pieces approach double *déjeté* form.

There is a single *distal notch* on a transverse flake and 8 small *tool fragments* which have obverse, unifacial retouch. Two of the latter also exhibit cortex backs.

Typology of Bifacial Tools. There are 6 finished and 4 unfinished bifacial pieces. Among the finished tools, there are 4 points and two basal fragments; three of the points are only distal parts made with plano-convex retouch. The fourth is sub-triangular with semi-bifacial retouch on a large transverse flake. The basal fragments have semi-bifacial retouch as well.

Blanks with Traces of Use-Wear. These include 3 retouched flakes, 6 utilized flakes, and 2 utilized blades. One of the retouched flakes has alternate irregular retouch, while another has inverse irregular retouch. One of the utilized flakes is inversely treated, while one blade has signs of bilateral, ephemeral retouch.

Complex D

This complex includes the assemblages from Levels III/1, III/1a, and III/2. All of these are living floors, marked by fireplaces and "carpets" of artifacts and fauna. The sterile breaks between these levels are clear in only part of the excavations, near the rocky bottom steps. In other areas, they are missing completely. However, these three levels were deposited separately from the lower Levels III/3 and III/4: this is clearly visible in all excavated units.

TABLE 12-7
Kabazi V, Tool Classification

	Complex C				*Complex D*					*Complex E*			
	II/4a	*II/7*	*Total*		*III/1*	*III/1a*	*III/2*	*Total*		*III/3*	*III/4*	*Total*	
	N	*N*	*N*	*e%*	*N*	*N*	*N*	*N*	*e%*	*N*	*N*	*N*	*e%*
Points	***6***	***5***	***11***	***18.3***	***8***	***2***	***9***	***19***	***13.7***	–	–	–	–
Triangular	–	–	–	–	1	–	–	1	0.7	–	–	–	–
Sub-Triangular	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Leaf-Shaped	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Sub-Leaf	–	–	–	–	–	–	–	–	–	–	–	–	–
Semi-Leaf	1	1	2	3.3	2	–	2	4	2.9	–	–	–	–
Crescent	–	1	1	1.7	–	–	–	–	–	–	–	–	–
Sub-Crescent	–	–	–	–	–	–	2	2	1.4	–	–	–	–
Semi-Crescent	3	–	3	5.0	2	1	1	4	2.9	–	–	–	–
Trapezoidal	1	–	1	1.7	–	–	–	–	–	–	–	–	–
Sub-Trapezoidal	–	–	–	–	1	–	–	1	0.7	–	–	–	–
Semi-Trapezoidal	–	1	1	1.7	–	–	–	–	–	–	–	–	–
Hook-Like	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Amorphous	–	1	1	1.7	–	–	–	–	–	–	–	–	–
Unidentifiable	1	1	2	3.3	2	1	1	4	2.9	–	–	–	–
Scrapers	***17***	***18***	***35***	***58.3***	***16***	***29***	***40***	***85***	***61.2***	***18***	***1***	***19***	***90.5***
Transverse-Straight	1	–	1	1.7	–	2	1	3	2.2	1	–	1	4.8
Transverse-Convex	1	–	1	1.7	–	–	2	2	1.4	2	–	2	9.5
Transverse-Concave	1	–	1	1.7	–	1	–	1	0.7	–	–	–	–
Transverse-Convex-Concave	–	1	1	1.7	1	–	–	1	0.7	–	–	–	–
Straight	3	3	6	10.0	2	7	5	14	10.1	2	1	3	14.3
Convex	6	1	7	11.7	3	5	13	21	15.1	6	–	6	28.6
Concave	1	3	4	6.7	3	2	2	7	5.0	–	–	–	–
Wavy	–	1	1	1.7	1	1	1	3	2.2	1	–	1	4.8
Double-Convex	1	–	1	1.7	–	1	–	1	0.7	–	–	–	–
Straight-Convex	–	1	1	1.7	–	1	–	1	0.7	2	–	2	9.5
Straight-Wavy	1	1	2	3.3	–	–	–	–	–	–	–	–	–
Sub-Triangular	–	–	–	–	–	1	–	1	0.7	–	–	–	–
Sub-Leaf	–	–	–	–	1	–	2	3	2.2	–	–	–	–
Semi-Leaf	–	–	–	–	–	3	3	6	4.3	1	–	1	4.8
Sub-Crescent	–	1	1	1.7	–	–	–	–	–	1	–	1	4.8
Semi-Crescent	1	2	3	5.0	–	2	3	5	3.6	–	–	–	–
Sub-Trapezoidal	–	2	2	3.3	–	2	1	3	2.2	–	–	–	–
Semi-Trapezoidal	–	–	–	–	–	–	2	2	1.4	–	–	–	–
Semi-Rectangular	–	2	2	3.3	1	–	3	4	2.9	–	–	–	–
Semi-Ovoid	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Hook-Like	–	–	–	–	2	–	–	2	1.4	–	–	–	–
Bi-Concave	–	–	–	–	–	–	–	–	–	2	–	2	9.5
Amorphous	1	–	1	1.7	–	–	–	–	–	–	–	–	–
Unidentifiable	–	–	–	–	2	1	1	4	2.9	–	–	–	–
Denticulates	***3***	–	***3***	***5.0***	***1***	***2***	***7***	***10***	***7.2***	***1***	–	***1***	***4.8***
Transverse-Convex	1	–	1	1.7	–	–	–	–	–	–	–	–	–
Transverse-Wavy	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Straight	2	–	2	3.3	1	2	–	3	2.2	1	–	1	4.8
Convex-Concave	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Straight-Wavy	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Semi-Trapezoidal	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Semi-Rectangular	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Unidentifiable	–	–	–	–	–	–	2	2	1.4	–	–	–	–
Notches	***2***	***1***	***3***	***5.0***	***1***	–	***1***	***2***	***1.4***	–	–	–	–
Lateral	2	–	2	3.3	–	–	1	1	0.7	–	–	–	–
Transverse	–	1	1	1.7	1	–	–	1	0.7	–	–	–	–
Combination Tools	–	–	–	–	–	***3***	–	***3***	***2.2***	***1***	–	***1***	***4.8***
Scraper-Denticulate	–	–	–	–	–	1	–	1	0.7	–	–	–	–
Scraper-Notch	–	–	–	–	–	1	–	1	0.7	–	–	–	–
Scraper-Burin	–	–	–	–	–	1	–	1	0.7	–	–	–	–
Denticulate-Notch	–	–	–	–	–	–	–	–	–	1	–	1	4.8
Endscrapers	–	–	–	–	–	***1***	***1***	***2***	***1.4***	–	–	–	–
Atypical	–	–	–	–	–	1	1	2	1.4	–	–	–	–
Unidentifiable Unifacial	***10***	***8***	***18***		***9***	***10***	***16***	***35***		***2***	***1***	***3***	
Total Unifacial	***38***	***32***	***70***		***35***	***47***	***74***	***156***		***22***	***2***	***24***	
Total Essential	***28***	***24***	***52***	***86.7***	***26***	***37***	***58***	***121***	***87.1***	***20***	***1***	***21***	***100.0***

TABLE 12-7 *continued*

	Complex C				*Complex D*					*Complex E*			
	II/4a	*II/7*	*Total*		*III/1*	*III/1a*	*III/2*	*Total*		*III/3*	*III/4*	*Total*	
	N	*N*	*N*	*e%*	*N*	*N*	*N*	*N*	*e%*	*N*	*N*	*N*	*e%*
Bifacial Points	*3*	*4*	*7*	*11.7*	*4*	*5*	*1*	*10*	*7.2*	–	–	–	–
Sub-Triangular	–	1	1	1.7	–	–	–	–	–	–	–	–	–
Sub-Leaf	1	–	1	1.0	2	2	–	4	2.2	–	–	–	–
Semi-Leaf	–	–	–	–	–	–	–	–	–	–	–	–	–
Unidentifiable	2	3	5	8.3	2	3	1	6	4.3	–	–	–	–
Bifacial Scrapers	*1*	–	*1*	*1.7*	*2*	*5*	*1*	*8*	*5.8*	–	–	–	–
Simple-Straight	–	–	–	–	–	1	–	1	0.7	–	–	–	–
Sub-Leaf	–	–	–	–	–	–	1	1	0.7	–	–	–	–
Sub-Crescent	–	–	–	–	–	1	–	1	0.7	–	–	–	–
Semi-Crescent	–	–	–	–	2	–	–	2	1.4	–	–	–	–
Ovoid	1	–	1	1.7	–	–	–	–	–	–	–	–	–
Unidentifiable	–	–	–	–	–	3	–	3	2.2	–	–	–	–
Unidentifiable Bifacial	*2*	*2*	*4*		*5*	–	*1*	*6*		–	–	–	–
Total Bifacial Tools	*6*	*6*	*12*		*11*	*10*	*3*	*24*		–	–	–	–
Essential Bifacial Tools	*4*	*4*	*8*	*13.3*	*5*	*10*	*2*	*17*	*12.2*	–	–	–	–
Total Tools	*44*	*38*	*82*		*46*	*57*	*77*	*180*		*22*	*2*	*24*	
Total Essential Tools	*32*	*28*	*60*	*100.0*	*32*	*47*	*60*	*139*	*100.0*	*20*	*1*	*21*	*100.0*
Unfinished Bifacial	3	4	7		5	4	9	18		–	–	–	–

Level III/1

The assemblage from Level III/1 is composed of 4,767 artifacts, of which 3 are cores, 46 are tools, and 13 flakes and 1 blade which have signs of utilization. The other pieces are debitage and debris (Table 12-1).

<u>Core-Like Pieces.</u> There are 3 cores: 2 multiple platform and 1 unidentifiable broken. One of the multiple platform cores has three main striking platforms and two opposed flaking surfaces. The platform serving the obverse flaking surface has polyhedral preparation. One striking platform for the inverse surface is straight faceted, while the other is dihedral. Both of the flaking surfaces have irregular shapes. The core is 4.8 cm long, 4.5 cm wide, and 1.7 cm thick and appears to be exhausted.

The other core has 4 main striking platforms and 2 opposed flaking surfaces. All platforms have polyhedral preparation. The shapes of both flaking surfaces are oval, exhibiting bi-directional flaking. The flaking axes of the two surfaces are at right angles to each other. The core is 5.6 cm long, 5.0 cm wide, and 1.3 cm thick. Again, the core is clearly exhausted.

<u>Technology</u> (Tables 12-1, 12-8). The sample includes 390 artifacts, including 313 flakes, 25 blades, 13 flakes and 1 blade with utilization, 33 flake tools and 12 blade tools. More than half of these pieces are broken and could be used only for some observations. There are only 213 flake blanks and 26 blade blades which are complete. The trimming elements include 52 flakes and 6 blades. As usual, they will be considered separately.

Dorsal Scar Patterns (Tables 12-2, 12-8). Again, parallel scar patterns are most common. More than half of the blanks have traces of dorsal cortex. Of the analyzed sample, uni-directional and bi-directional patterns are almost equally represented (Table 12-8). Of the 57 identifiable trimming elements, bi-directional is most common (29.8%), followed by parallel and uni-directional with 19.3% each. Converging scars occur on 15.8%, bi-directional-crossed on 10.5%, and radial on 5.3% of the blanks. About one-third of the trimming elements have some cortex, and 35.1% have uni-directional scars, 49.1% have bi-directional scars, and 15.8% have scars coming from more than two directions.

Shape (Table 12-3). Irregular, trapezoidal, and rectangular shapes are common. More than one-third of the flake blanks are wider than long. Most of the blade blanks are rectangular (34.6%) and triangular (30.8%), while 23.1% are irregular and 11.5% are ovoid. The shapes of the trimming elements include trapezoidal (31.4%), rectangular (25.5%), irregular (21.6%), ovoid (11.8%), and triangular (9.8%). One-third of the trimming elements are wider than long.

Profiles (Table 12-4). Incurvate lateral profiles dominate, with flat and twisted each accounting for about 1 in 5 pieces. For the trimming elements, 69.2% are incurvate, 17.3% flat, 9.6% twisted, and only 3.9% convex.

Platforms (Tables 12-5, 12-8). Unfaceted platforms account for almost half of all identifiable pieces; no other type stands out. Of the trimming elements, 39.7% have cortex or unfaceted platforms, 27.6% are dihedral, and 32.8% are faceted. The faceting indices for blanks only (excluding trimming elements) are IF = 53.1 and IFs = 22.5.

TABLE 12-8
Kabazi V, Indices

	Complex C	*Complex D*	*Complex E*
Ilam	7.9	7.6	9.2
IF	52.6	48.9	38.1
IFs	23.8	24.5	15.6
Ic	58.9	59.2	53.1
Ip	6.8	8.0	9.7
Id1	40.5	43.7	45.7
Id2	38.5	35.1	32.3
Id3	14.1	13.3	12.4
IB	11.6	11.5	—

Lipping. Only 2.8% of identifiable platforms were lipped, while 19.7% were semi-lipped and 77.5% were unlipped. Only a single unlipped platform is present among the trimming elements, the rest are lipped.

Size (Table 12-6). The average maximum dimension is 4.1 cm and average thickness is 0.7 cm. Again, more than half of the blanks fall between 3 and 4 cm in maximum dimension, while only 4 pieces exceed 7 cm. Of 147 pieces in the 3 to 4 cm range, only 3 are tools. Of 63 in the 4 to 5 cm group, again, only three were retouched. From there on, however, each of the size groups has about 25% tools. Most of the trimming elements (73.3%) fall between 3 and 4 cm in maximum dimension; all the others are between 4 and 5 cm.

Tools (Table 12-7). In Level III/1, there are 35 unifacial and 11 bifacial tools, as well as 14 pieces with traces of use, and 5 unfinished bifacial pieces.

Typology of Unifacial Tools. There are 8 points, 16 scrapers, 1 denticulate, 1 notched tool, and 9 unidentifiable fragments. In toto, 33 were made on flakes and 2 on blades. Twenty-one are on blanks struck on-axis, 8 on off-axis blanks, while 6 were not identifiable in this sense. Retouch is overwhelming obverse: 32 pieces, as opposed to 3 with alternate retouch. Of the 58 retouched edges present, 13 have parallel retouch, on 22 it is sub-parallel, on 9 it is heavy sub-parallel, 8 scalar, 4 marginal, and 1 edge with irregular retouch. The retouch angle is mainly divided between flat (21) and semi-steep (21), with steep retouch occurring on 9 edges.

Five of the tools have accommodation preparation: 1 naturally backed, 3 with plain backs, and 1 with a faceted back. Ventral thinning occurs on 5 tools; in 4 cases it is basally positioned and on one it is proximal/ bilateral.

Again, *points* exhibit considerable morphological variability, and include 1 triangular, 2 semi-leaf, 2 semi-crescent, 1 sub-trapezoidal, and 2 distal fragments too small be allow shape to be recognized. The triangular point is on a transverse flake and is laterally pointed. One of the semi-crescent points has ventral basal thinning. The sub-triangular point and one of the broken distal parts approach *déjeté* form.

There are 9 simple *scrapers*, 1 transverse scraper, and 6 convergent scrapers. The simple forms include 2 straight, 3 convex, 3 concave and 1 convex/concave. One of the straight scrapers is thinned by a burin blow from the distal end. The convex scrapers include a normal example, one inversely basally thinned, and one with a natural back opposite the working edge. The concave scrapers include one simple example and two with plain backing. The convex/concave scraper is alternatingly retouched and has a faceted back. The transverse scraper is convex/concave and obversely retouched.

The convergent scrapers include 1 sub-leaf, 1 semi-rectangular, 2 hook-like, and 2 unidentifiable types. The sub-leaf is proximally pointed and has a plain/unfaceted accommodation at its back. The semi-rectangular scraper approaches the *déjeté* type. One of the hook-like scrapers is alternately retouched, the other is proximally pointed and has inverse basal thinning. The unidentifiable examples are distal parts with converging scraper retouch.

There is a single *denticulate* with a straight worked edge and notches formed by alternating retouch. A single *notch* occurs on a transverse flake. Nine obversely *retouched fragments* are too small to classify; 5 have single edge retouch and 4 have retouch on more than one edge. One of each group shows inverse thinning of the proximal end of the fragment.

Typology of Bifacial Tools. There are 11 finished and 6 unfinished bifacial tools (Table 12-7). The finished examples include 4 points, 2 scrapers, and 5 unidentifiable fragments. Two of the points are broken plano-convex distal fragments. The third point is plano-convex sub-leaf on a massive flake (fig. 12-6: *1*). The fourth point is plano-convex sub-leaf with an impact fracture (fig. 12-9: *1*). Both scrapers are semi-crescent and truly bifacial. One has a natural basal accommodation. Of the fragments, three are bifacial, one plano-convex, and one semi-bifacial. One of the bifacial fragments has a cortex base.

Blanks with Traces of Use-Wear. Fourteen pieces show traces of use: 8 retouched flakes, 5 utilized flakes, and one utilized blade. One of the retouched flakes has alternating irregular retouch. One of the utilized flakes has light inverse retouch, while on two the retouch is alternating. The utilized blade has bilateral light obverse retouch.

Level III/1a

This assemblage comprises 3,198 artifacts of which 6 are cores, 57 are tools, 14 are flakes with utilization, 2 are blades with utilization, and the rest are debitage or debris (Table 12-1).

Core-Like Pieces. There are five complete and one broken core. The broken example has a faceted platform but the other attributes are unidentifiable. The complete cores include one bi-orthogonal, one radial, one uni-directional parallel, one uni-directional parallel transverse, and one sub-crossed. All are exhausted and two are on plaquettes, the others are unidentifiable in that sense.

The uni-directional parallel core is 6.1 cm long, 5.9 cm wide, and 2.5 cm thick. The single non-volumetric flaking surface is rectangular and the flaking follows the long axis of the piece. The striking platform is acute and faceted. The uni-directional parallel transverse core is 5.1 cm long, 4.0 cm wide, and 2.3 cm thick. Its single non-volumetric surface is semi-ovoid and the parallel flaking is oriented transverse to the long axis. The striking platform is convex faceted and covers about one-third of the core perimeter. There are three unfaceted supplementary platforms opposite the main platform.

The bi-orthogonal core is 7.2 cm long, 7.1 cm wide, and 1.5 cm thick. There are 4 main platforms and 2 opposed ovoid flaking surfaces. One surface has orthogonal removals from two adjacent faceted platforms. The length of both of these striking platforms is about two-thirds of the core perimeter. The inverse surface has the same type of flaking from two other adjacent platforms which are on the opposite core edge. The length of these platforms combined is about one-third of the perimeter.

The radial core is 5.5 cm long, 4.7 cm wide, and 3.0 cm thick. The single ovoid flaking surface exhibits centripetal removals. The faceted striking platform covers about 90% of the perimeter.

Technology (Tables 12-1, 12-8). There are 342 artifacts in this sample: 14 flakes and 2 blades with use wear, 42 flake tools, 6 blade tools, and the remainder is debitage. About one-third of these are broken and are used for only some of the observations. There are 172 flakes and 19 blades which are complete. The trimming elements consist of 37 flakes and 3 blades.

Dorsal Scar Patterns (Tables 12-2, 12-8). Only parallel scar patterns occur in a high percentage; all other types account for no more than 1 in 5 pieces. More than three-fourths of the blanks have some dorsal cortex; few are primary (Table 12-2). Uni-directional and bi-directional flaking dominate (Table 12-2). About half (44.4%) of the trimming flakes have some dorsal cortex, but there are no true primary pieces among them. Of the trimming elements, 62.5% have uni-directional scars, 12.8% have scars from two different directions, and 18.8% have scars originating from more than two directions.

Shape (Table 12-3). Irregular and trapezoidal shapes are common; other forms occur in low percentages. About one-fourth of the sample is wider than long. Most of the blade blanks are rectangular (47.4%) or triangular (21.1 %); other types are single examples. The most common shapes of trimming elements are trapezoidal (42.9%), irregular (37.1%), and rectangular (14.3%); other types are very rare. Of 32 trimming flakes, more than one-third are wider than long.

Profiles (Table 12-4). Over half of the pieces have incurvate profiles, with flat accounting for 20%. Among the trimming elements, incurvate dominates with 60.0%, and twisted is common at 31.4%. Other types are only single examples.

Platforms (Tables 12-5, 12-8). Almost one-half of the platforms are unfaceted; no other type is common. Of the 40 identifiable trimming elements, 45% have unfaceted platforms, while 22.5% are dihedral, 5% are polyhedral, and 27.5% are faceted. The faceting indices for blanks are: IF = 50.3, IFs = 22.9.

Lipping. Unlipped platforms account for 54% of the pieces, followed closely by semi-lipped (40.1%). Lipped platforms occur only 5.9% of the time. Only a single trimming element is unlipped, the remainder are lipped.

Size (Table 12-6). The average maximum dimension is 4.2 cm and the average thickness is 0.6 cm. This assemblage is much like the others already described: over half are less than 4 cm in greatest dimension, about one-third fall between 4 and 5 cm, while fewer than 1 in 10 are between 5 cm and 6 cm. Only three pieces exceed 7 cm. Of 112 blanks less than 4 cm, only 5 are tools. Between 4 and 5 cm, 12 of 71 are tools. This ratio increases in the 5 to 6 cm grouping to ca. 25%, and to 50% in the 6 to 7 cm interval. Only one of the three pieces over 7 cm is a tool. Again, size appears to be a major factor in blank selection.

Among the trimming elements, 82.5% fall into the lowest group, 3 to 4 cm, while the others are in the 4 to 5 cm interval.

Tools (Table 12-7). There are 47 unifacial and 10 bifacial tools, as well as 16 blanks with traces of use and 4 unfinished bifacial pieces.

Typology of Unifacial Tools. There are 2 points, 29 scrapers, 2 denticulates, 3 combination tools, 1 endscraper, and 10 unidentifiable tool fragments. Of these, 42 are made on flakes, 6 on blades, and one on a chunk. Twenty-five are on pieces struck on-axis, 19 are on pieces struck off-axis, and 5 are unidentifiable. Retouch is obverse on 41 examples, inverse on 3, and alternating on another 3. Of the 74 retouched edges, parallel retouch occurs on 15, sub-parallel on 20, heavy sub-parallel on 21, scalar on 10, marginal on 6, and irregular on 2. Retouch angle by retouched edge is dominated by semi-steep with 40 examples, followed by flat with 24, and by steep with 10.

Five tools have accommodation preparation: one with natural backing, three with plain backs, and one with a faceted back. Eight tools have been thinned by inverse retouch: four basally, two distally, one laterally, and one with both lateral and basal thinning. Two others are thinned by burin blows: one distal and one distal/proximal.

Only 2 *points* were recovered: semi-crescent and unidentifiable. The semi-crescent point is regular (fig. 12-2: 2). The second is a broken distal part with signs of distal thinning.

There are 15 simple *scrapers*: 3 transverse, 2 double, and 9 convergent. The simple examples include 7 straight, 5 convex, 2 concave, and 1 convex/concave forms. Two of the straight examples are on blades. One straight scraper has its retouched edge off-axis to the blank, as well as having lateral backing retouch and inverse distal thinning. Only one convex scraper is made on a blade; the rest are on flakes modified by Quina retouch (fig. 12-2: *7*). One of the latter is off-axis and has a plain accommodation and inverse basal thinning. Both concave scrapers are on flakes; one is off-axis. The other piece is inversely retouched and has basal thinning. The convex/concave scraper is typical.

The transverse scrapers include 2 straight and 1 concave. One double scraper is double convex; both edges are inversely retouched, with lateral thinning, and part of the lateral edge has a plain accommodation. The straight-convex example is naturally backed.

There is considerable morphological variability among the convergent scrapers: 1 sub-triangular, 3 semi-leaf, 2 semi-crescent, 2 sub-trapezoidal, and 1 unidentifiable fragment. Most of these are regular forms. There are some varieties, however: one semi-leaf is on a blade blank with basal thinning; both semi-crescent scrapers are on blades, one of which has inverse basal thinning; and the sub-trapezoidal scrapers are on transverse flakes, one of which has a plain accommodation.

Both *denticulates* are made on straight edges; one is inversely retouched, the other alternatingly. The *combination tools* include 1 scraper/denticulate, 1 scraper with a notch, and 1 scraper/burin. The scraper/denticulate is alternately retouched with an inverse denticulated edge and thinned by a burin blow. The scraper/notch combines alternating retouch for the scraper edge and an obverse lateral notch. The scraper/burin combines a simple obversely retouched straight scraper on one lateral edge and two burin facets on the other lateral edge, one distal and the other proximal. The *endscraper* is ovoid and is on a chunk. The *unidentifiable tools* include 10 obversely retouched and 1 alternatingly retouched fragments. There are 5 with a single edge retouched and 5 with two edges retouched.

Typology of Bifacial Tools. There are 10 finished (5 points and 5 scrapers) and 4 unfinished bifacial tools. The finished points include 1 plano-convex sub-leaf with basal thinning (fig. 12-6: 2), 1 semi-bifacial sub-leaf (fig. 12-4: *1*), and 3 broken plano-convex distal parts. The 5 finished scrapers include 1 bi-convex simple straight example with a plain back, 1 plano-convex sub-crescent (fig. 12-8: *2*), and 3 broken distal parts of convergent scrapers (2 plano-convex and 1 bi-convex).

Blanks with Traces of Use-Wear. There are 8 retouched flakes, 5 utilized flakes, and 1 utilized blade. All have very light, generally irregular retouch on one edge. A single example has alternating irregular retouch, and another has light inverse retouch. The blade has bilateral "ephemeral" retouch.

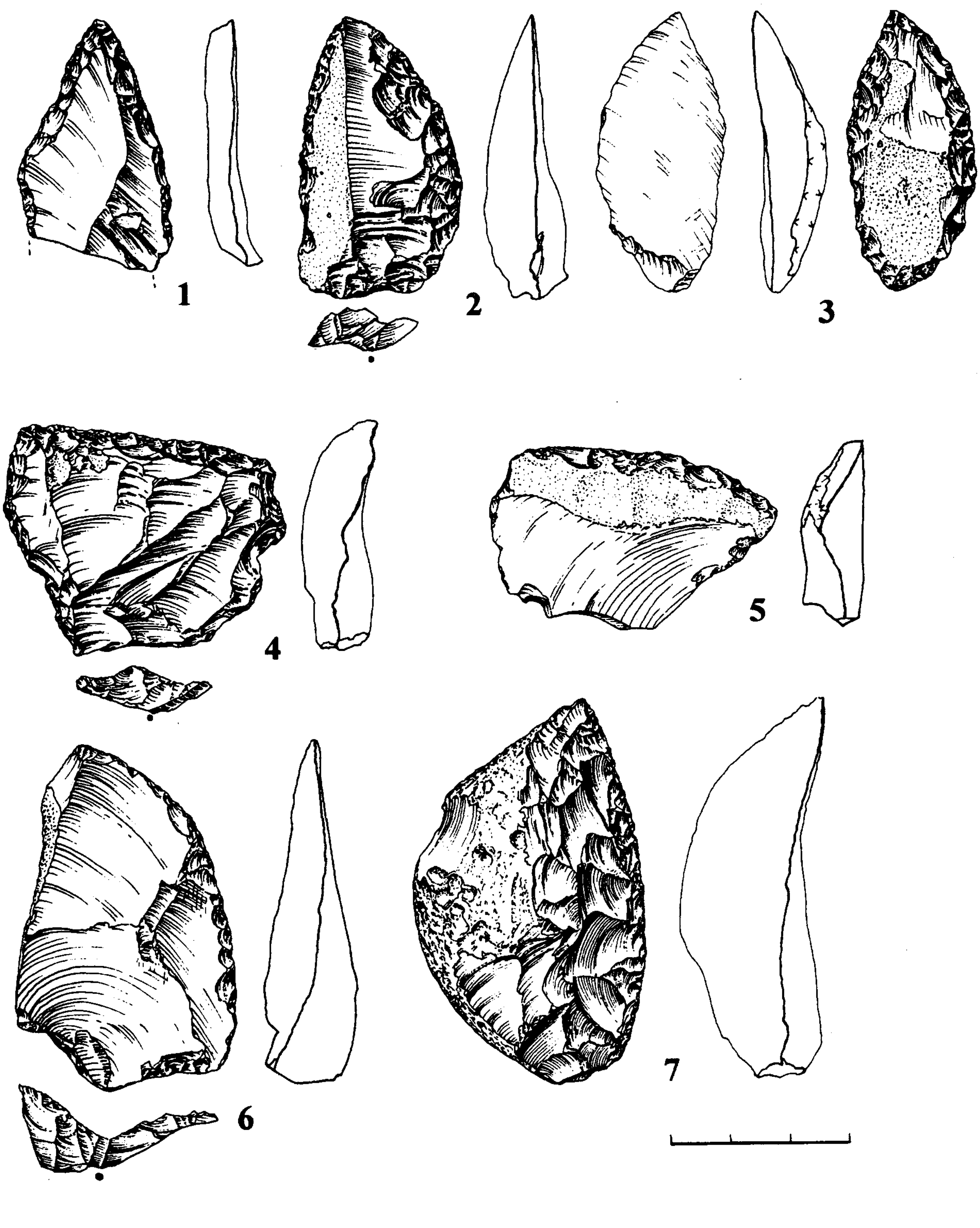


Fig. 12-2—Kabazi-V, Complex D, Levels III/1a *(2, 7)* and III/2 *(1, 3-6)*, Scrapers: *1*–semi-leaf; *4*–sub-trapezoidal; *5*–transversal convex; *6*–convex naturally backed; *7*–convex naturally backed with Quina retouch. Points: *2*–semi-crescent; *3*–leaf.

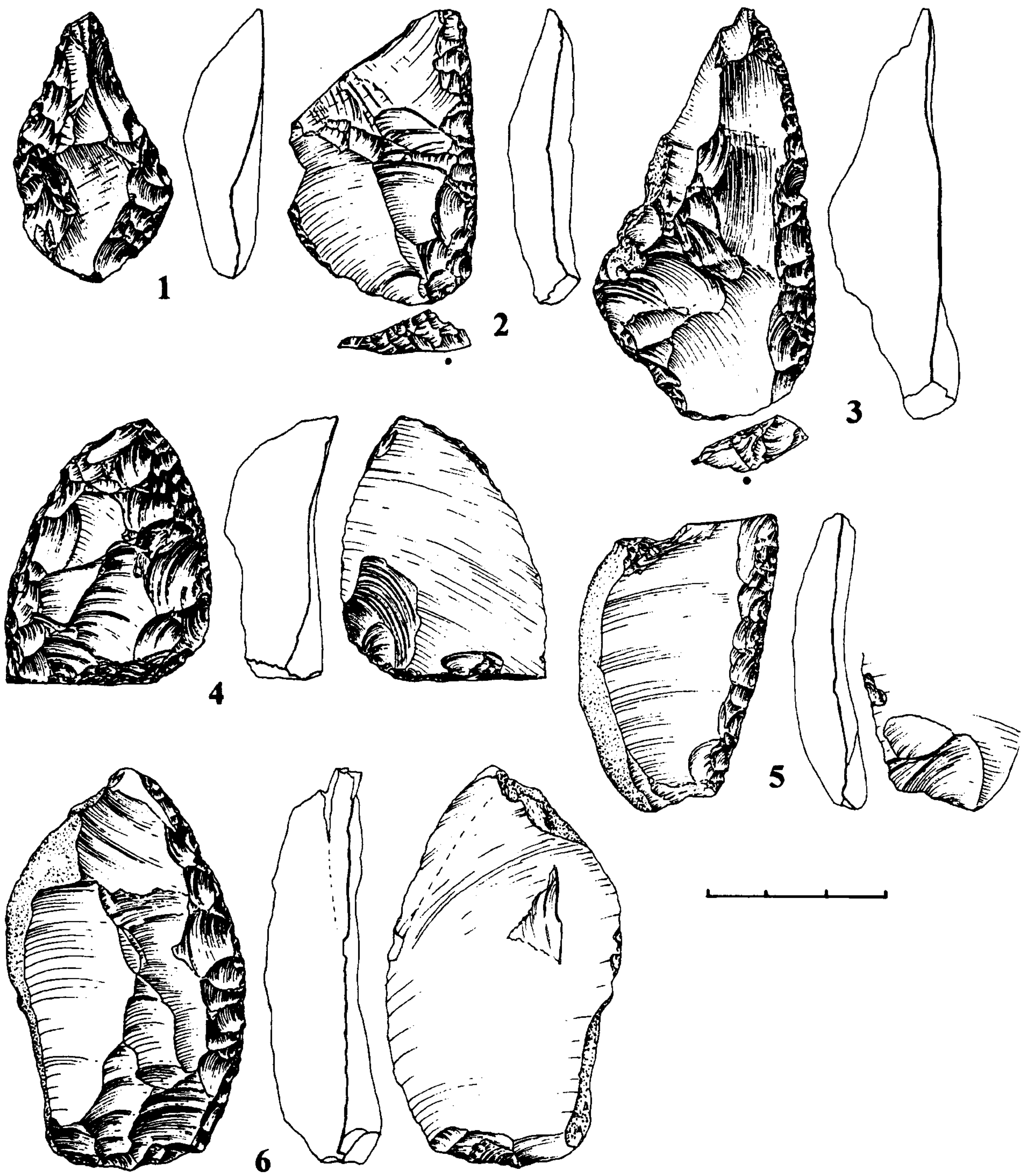


Fig. 12-3—Kabazi-V, Complex E, Level III/3, Scrapers: *1*–hook-like; *2*–straight-convex; *3*–convex; *4*–semi-leaf with thinned base; *5*–straight naturally backed; *6*–convex naturally backed with proximal truncation.

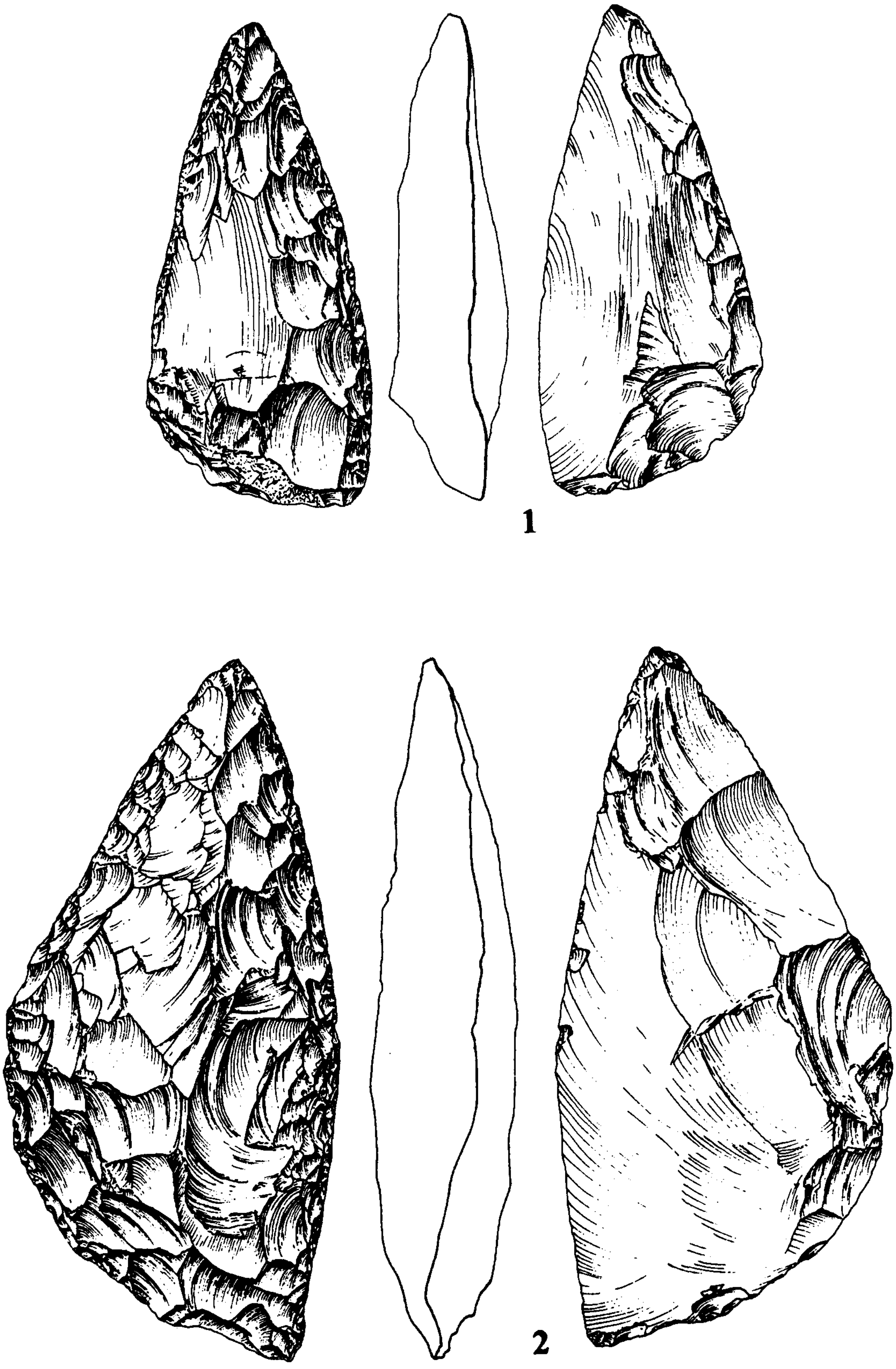
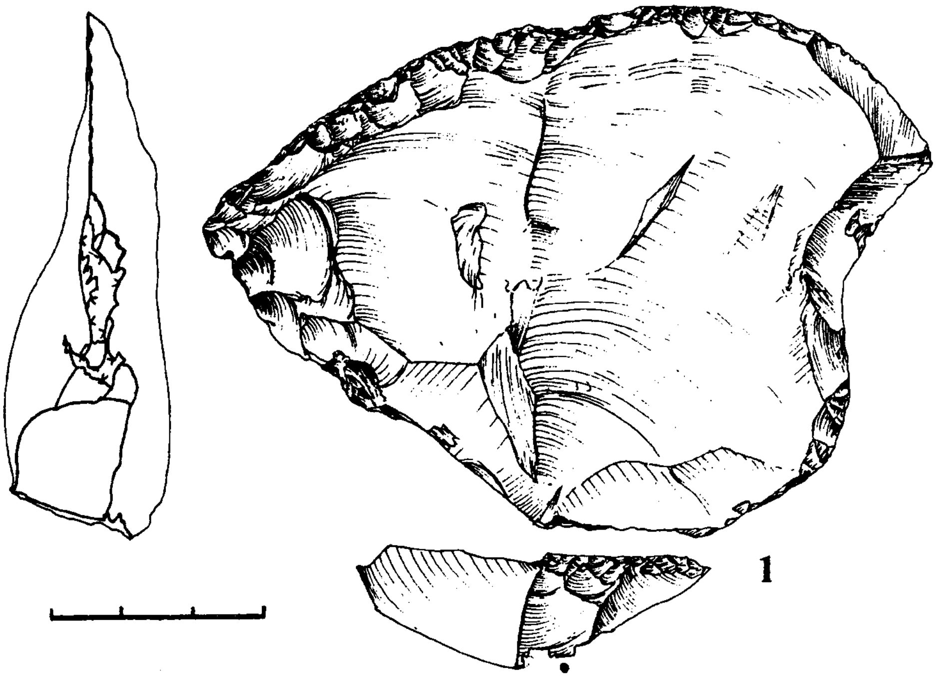


Fig. 12-4—Kabazi-V, Complexes C and D, Levels II/4a *(2)* and III/1a *(1)*, Tools: *1*-2–Semi-bifacial leaf-points made on transverse flakes.



1

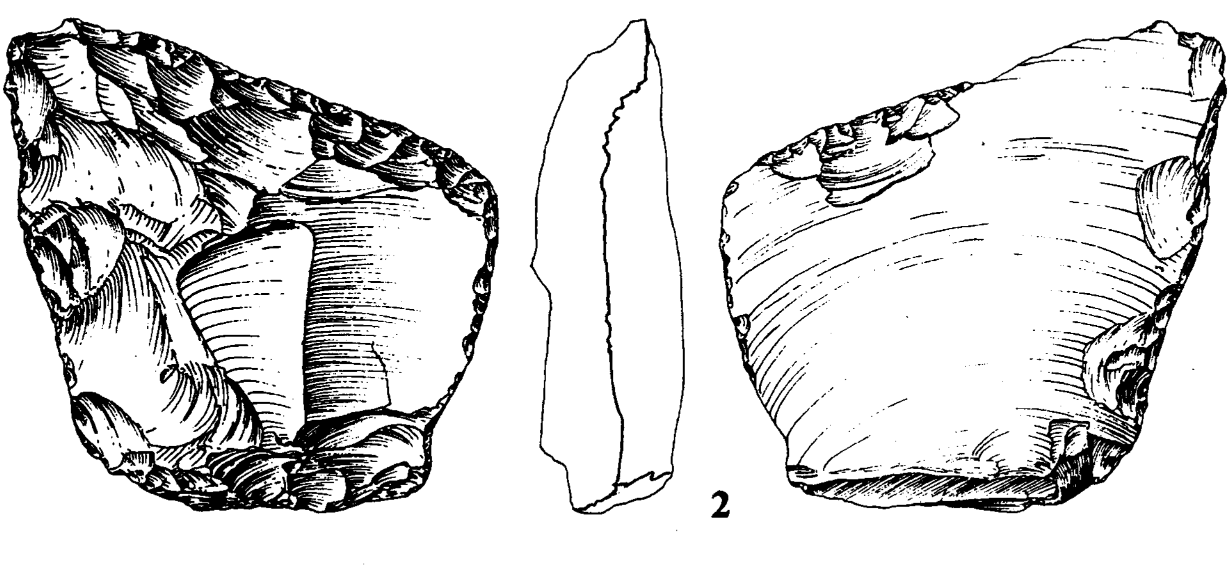


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Fig. 12-5—Kabazi-V, Complexes C and E, Levels II/7 *(2)* and III/3 *(1)*, Scrapers: *1*–transversal convex; *2*–convergent sub-trapezoidal.

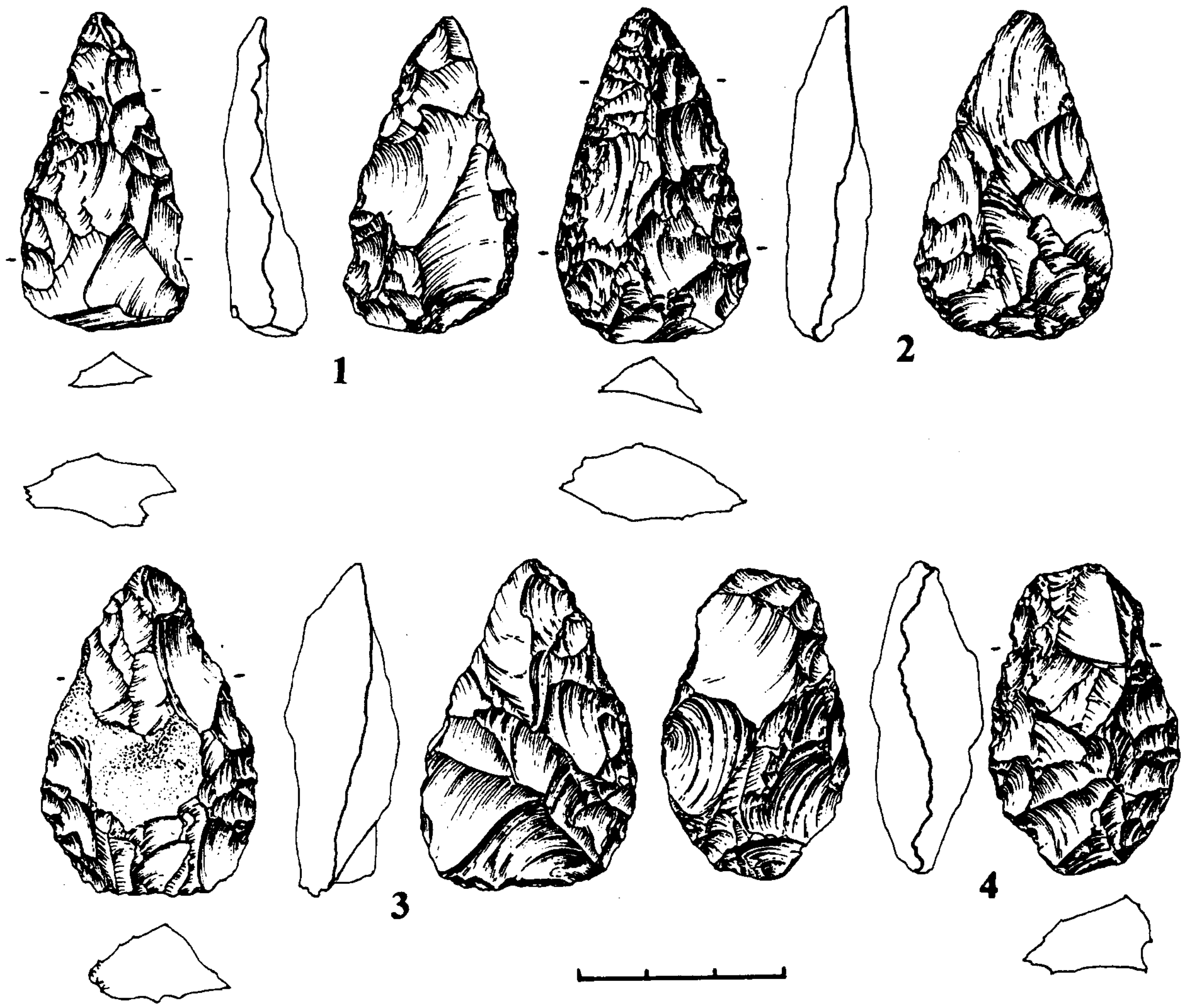

Fig. 12-6—Kabazi-V, Complexes C and D, Levels II/4a *(4)*, III/1 *(1)*, III/1a *(2)*, and III/2 *(3)*, Bifacial Tools: *1-2*–bifacial sub-leaf points; *3*–bifacial sub-leaf scraper; *4*–bifacial ovoid scraper.

Level III/2

This assemblage has 4,246 artifacts, of which 2 are cores, 77 are tools, 31 are flakes with use wear, 1 blade with use wear, and the rest are debitage or debris (Table 12-1).

Core-Like Pieces. There are two cores; one complete and the other broken. The broken example is merely a fragment with a faceted platform. The complete example is uni-directional-parallel on a plaquette with the following dimensions: length, 6.8 cm; width, 4.3 cm; and thickness, 3.1 cm. A single scar takes up almost the whole of the rectangular flaking surface. The core platform is polyhedral, with fine faceting around the point of percussion. There are no supplementary platforms.

Technology (Tables 12-1, 12-8). A sample of 486 blanks was used here; essentially the assemblage excluding the trimming elements, chips, chunks, and 18 tool fragments. Of this sample, 450 are flakes and 36 blades. More than a third are broken and so can be used for only part of the observations. In addition, the 52 trimming elements (49 flakes and 3 blades) are treated separately.

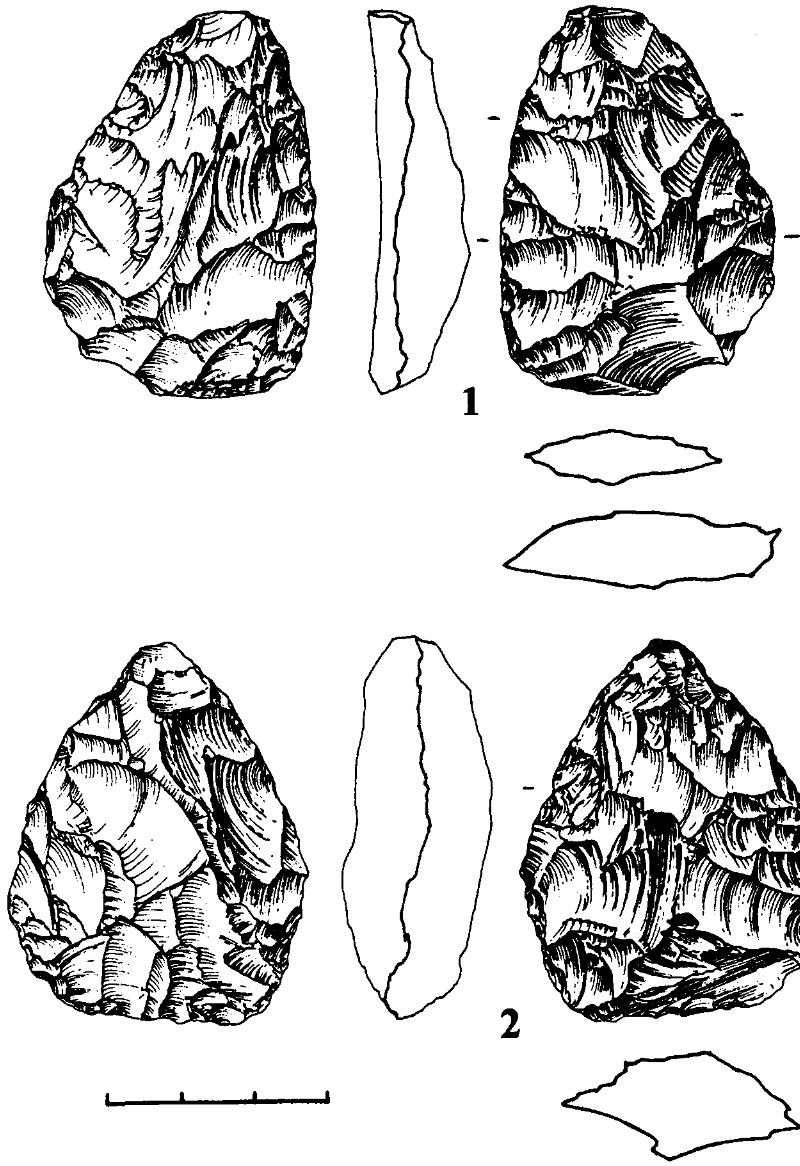

Fig. 12-7—Kabazi-V, Complex D, Level III/2, *1-2*–unfinished bifacial tools.

Dorsal Scar Patterns (Tables 12-2, 12-8). While parallel scar patterns are most common, a number of other patterns occur in low frequencies. More than half of this sample has some dorsal cortex, while uni-directional and bi-directional flaking are, again, rather evenly represented. Among the trimming elements, bi-directional is most common (40.4%), with parallel and parallel-crossed at 17% each, and with bi-directional-crossed at 10.6%. Other types are rare. About half of the trimming elements have some cortex but there are no primary pieces among them.

Shape (Table 12-3). This sample from Level III/2 includes 266 flakes and 23 blades. Irregular shapes are most common, followed by trapezoidal (28.9%) and rectangular. About one-third of the flakes are wider than long. The blades are mainly rectangular in shape (39.1%), trapezoidal (26.1%), and triangular (21.7%). Other shapes are rare. Of the 45 identifiable trimming elements, shapes are irregular (33.3%), trapezoidal (31.1%), ovoid and triangular (13.3% each), and rectangular (8.9%). About one quarter of the trimming elements are wider than long.

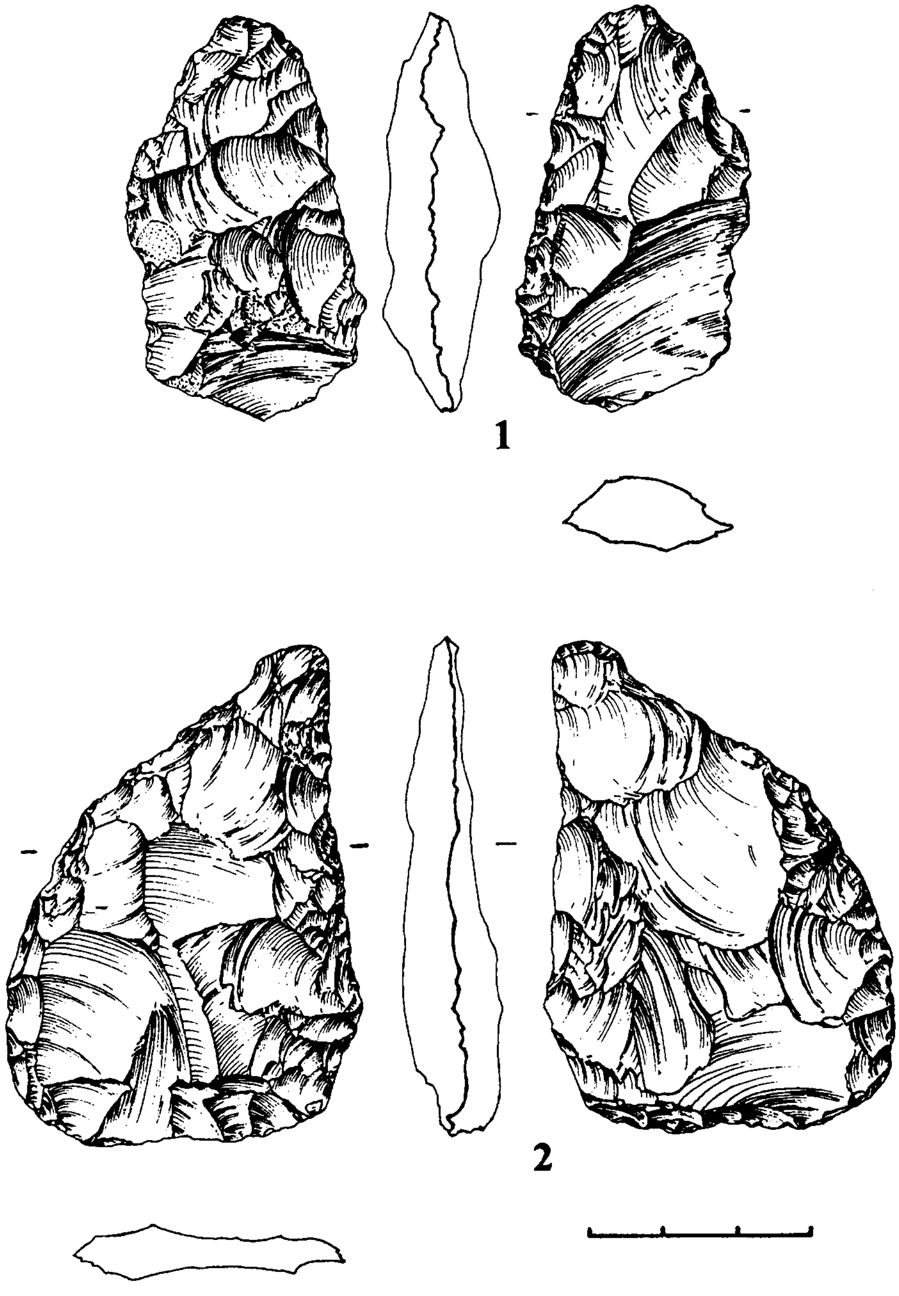

Fig. 12-8—Kabazi-V, Complexes C and D, Levels II/4a *(1)* and III/1a *(2)*, Tools: *1*–unfinished bifacial tool; *2*–bifacial sub-crescent scraper.

Profiles (Table 12-4). As usual, incurvate and flat are the only two types of lateral profiles significantly represented. About two-thirds, 65.9%, of the trimming elements have incurvate profiles, and 25% are flat. Twisted and convex occur in very small proportions.

Platforms (Tables 12-5, 12-8). While unfaceted accounts for nearly half of the platforms, faceted now accounts for almost one in three (27.0%), followed in lesser amounts by dihedral (10.7%) and polyhedral (7.3%). Of the 50 identifiable trimming flakes, 58% are unfaceted, 4% are dihedral, 36% are faceted, and 2% are polyhedral. The faceting indices for the blanks are IF = 44.9 and IFs = 26.9.

Lipping. Unlipped platforms are most common (57.0%), followed by semi-lipped (39.5%) and lipped (3.5%). One trimming element is semi-lipped, all the others are lipped.

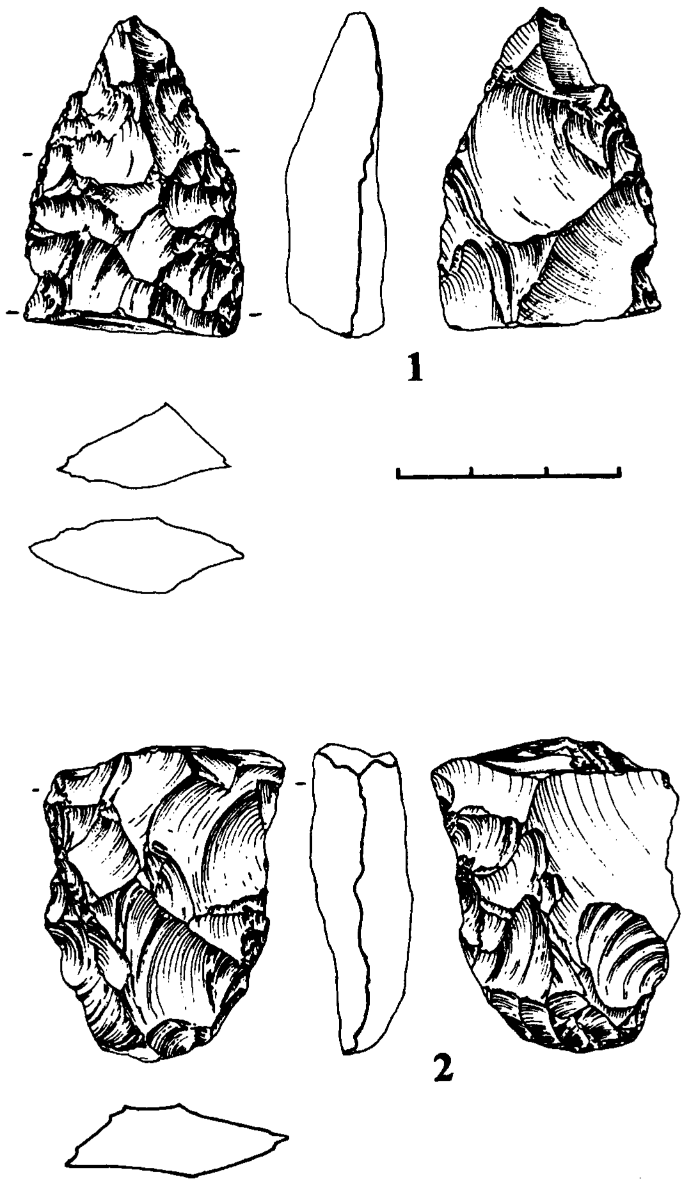

Fig. 12-9—Kabazi-V, Complexes C and D, Levels II/7 *(2)* and III/1 *(1)*, Tool fragments: *1*–bifacial sub-leaf point; *2*–sub-leaf bifacial tool.

Size (Table 12-6). The average maximum dimension of blanks is 4.1 cm, and the average thickness is 0.6 cm. Yet again, more than one-half fall into the 3 to 4 cm category, one-third into the 4 to 5 cm group, one in eight into the 5 to 6 cm interval, and one in thirty into the 6 to 7 cm group. Single examples fall between 8 and 9 cm and 9 and 10 cm. The pattern for tool selection remains as before: 7 out of 170 below 4 cm, 16 out of 99 from 4 to 5 cm, about one-third between 5 and 6 cm, but only one out of 6 is a tool in the 7 to 8 cm interval. Both of the largest blanks have been retouched into tools.

Tools (Table 12-7). In Level III/2, there are 74 unifacial and 3 bifacial tools, as well as 32 pieces with traces of use-wear and 9 unfinished bifacial pieces.

Typology of Unifacial Tools. There are 9 points, 40 scrapers, 7 denticulates, one notch, one end-scraper and 16 unidentifiable fragments. Of these, 66 were made on flakes, 5 on blades, and 4 on chunks. Fifty-nine are on blanks struck on-axis, 10 on off-axis blanks, and 6 cannot be identified to axis. Retouch placement is overwhelmingly obverse (66), with a few examples each of inverse (2), alternate (3), and unidentifiable (4). Of the 112 retouched edges, there are 14 which have parallel/sub-parallel retouch, 41 where the retouch is scalar, and 46 where it is invasively scalar. On another 10 edges it is marginal, and on a single piece it is irregular. Retouch angle is rather evenly divided between flat (46) and semi-steep (49), with only 17 having steep retouch.

Tools with accommodations include 4 with naturally backed edges, 6 with plain-backed edges, while on 1 the backed edge is faceted. There are 6 inversely thinned tools; (2 basal, 1 lateral, 1 bi-lateral, and 2 proximal/distal). In two cases, the thinning was achieved by burin blows from the distal end.

Among the *points*, there are 2 semi-leaf, 1 sub-crescent, as well as 1 each sub-triangular, leaf, semi-crescent, hook-like, and unidentifiable forms. The sub-triangular point has obverse retouch. The leaf point is obversely retouched on a blade blank, has basal thinning and a retouched/backed lateral accommodation (fig. 12-2: *3*). Both semi-leaf points have obverse retouch, one is made on a blade. Both sub-crescent points are off-axis, one has obverse, the other inverse retouch, as well as a proximal point and bilateral thinning. The semi-crescent point is obversely retouched on a blade. The hook-like point is also obversely retouched. The unidentifiable example is a broken, pointed distal part.

There are 21 simple, 3 transverse, and 16 convergent *scrapers*. The simple scrapers include 5 straight, 13 convex, 2 concave, and 1 convex/concave. Among the straight examples, one is on a blade and another on a chunk. One on a flake is naturally backed. All convex scrapers are obverse and made on flakes (fig. 12-2: *2*); four of them have lateral, backed accommodations (2 natural and 2 plain), and one also has inverse, lateral thinning. One of the simple concave scrapers is on a fragment of a naturally backed plaquette, while the other is on a flake which has been thinned by a burin blow. The single convex/concave example has obverse retouch and is on a flake. There are two convex (fig. 12-2: *5*) and one straight transverse scrapers, all of which are obversely retouched on flakes.

Convergent scrapers include 2 sub-leaf, 3 semi-leaf, 3 semi-crescent, one sub-trapezoidal, 2 semi-trapezoidal, 3 semi-rectangular, 1 semi-ovoid, as well as a single unidentifiable fragment. Both sub-leaf scrapers are obverse and proximally pointed on flakes. One of them is proximally and distally thinned. Two of the semi-leaf scrapers have obverse retouch (fig. 12-2: *1*) and one has alternate retouch: all are on flakes. One of the obversely retouched pieces is proximally and distally thinned. The semi-crescent scrapers include 2 on flakes and one on a blade. One of the former has alternate retouch, the other is laterally pointed. The sub-trapezoidal scraper is obversely retouched on a transverse flake (fig. 12-2: *4*). Both semi-trapezoidal pieces are obversely retouched flakes. The semi-rectangular scrapers include two on flakes and one each on a blade and a chunk. One of those on a flake has alternate retouch, the other has obverse retouch and a plain-backed proximal edge. The semi-ovoid scraper has obversely retouched, markedly convex edges which are transverse to the flake axis. The unidentifiable fragment is a broken pointed distal part of a convergent tool.

There are 2 simple, 3 convergent, and one each of double and transverse *denticulates*. All are obversely retouched and made on flakes. Of the simple denticulates, there is one each of straight and convex/concave forms. The transverse denticulate has a wavy edge. The double denticulate has one straight and one convex/concave edge. The convergent pieces include one which is semi-trapezoidal, one semi-rectangular, and one which is only a broken pointed distal part.

A single transversely notched piece is on a chunk with one naturally backed edge and distal thinning made by a burin blow. A single sub-ogival endscraper on a chunk was recovered.

The retouch is restricted to the working edge. There are 16 unidentifiable tool fragments; 15 are obversely retouched and one has inverse treatment. All but two exhibit a single retouched edge; the others have two. A single fragment also shows some basal thinning.

Typology of Bifacial Tools. Three are finished and nine are unfinished (fig. 12-7: *1,2*). Among the finished tools, there is 1 *point,* 1 *scraper,* and 1 *unidentifiable fragment* (Table 12-7). The point is unidentifiable, being a broken plano-convex point distal part. The scraper is sub-leaf, also plano-convex (fig. 12-6: *3*). The unidentifiable piece is a basal part of bifacial tool, prepared in bi-convex manner.

Blanks with Traces of Use-Wear. There are 32 blanks with traces of use: 24 retouched flakes, 7 utilized flakes, and a utilized blade. The retouched flakes include 14 obverse, 2 inverse, and 8 with alternatingly irregular retouch. Only 3 dorsal and 6 alternate flakes have double edges, all the others have a single retouched edge. The utilized flakes include 5 obverse and 2 alternatingly "damaged" pieces. One obverse piece and one of the alternatingly "damaged" flakes are double-edged, all the others are one-edged. The utilized blade has alternate modification on both edges.

Complex E

The assemblages of Complex E come from Levels III/3 and III/4. Both levels are true living floors with traces of ash and clusters of artifacts and faunal remains. The levels occur in the middle Unit III and are separated from the upper levels by clear sterile levels 5 cm to 10 cm thick. Given their stratigraphic positions, as well as their typological traits, there is ample justification for grouping them together.

The assemblages of Complex E were discovered during the 1995 field season in the northwestern section of the excavations. These new levels were uncovered over only a small area (6 m^2 for Level III/3, and 4 m^2 for Level III/4). Additional excavations are needed across the site before significant samples are obtained. Thus, the description and analyses of these levels are preliminary.

Level III/3

This assemblage consists of 2,362 artifacts, of which 3 are cores, 22 are tools, 10 are flakes and 2 blades with traces of use, while the rest is either debitage or debris (Table 12-1).

Core-Like Pieces. There are only 3 cores, one of which is broken and unidentifiable. The two others include a bi-directional-parallel core on a pebble and a sub-crossed bifacial core. The former has a single sub-ovoid flaking surface and two opposed striking platforms. The opposed platforms, one polyhedral and one faceted, are oriented transverse to the long axis of the core. The core is 6.1 cm long, 5.2 cm wide, and 2.7 cm thick. It is exhausted.

The other core has two alternate flaking surfaces and three adjacent striking platforms. Both flaking surfaces are ovoid. The obverse flaking surface has scars of previous removals which come from two adjacent platforms in parallel-crossed directions. There is a supplementary removal to maintain the distal flaking convexity. The main platform is faceted, but the supplementary one was prepared by single blow from the side. The inverse flaking surface has scars of previous removals in one direction from the faceted main platform, which is situated at the opposite core edge from one obverse platform and is adjacent to the other. The core is 4.5 cm long, 4.3 cm wide, and 1.9 cm thick. This core, too, is exhausted.

Technology (Tables 12-1, 12-8). A sample of 212 blanks was used here. This includes all artifacts, minus the debris and the trimming elements. It includes 21 blades (Ilam = 9.9) but given the small number, they have been included with the flakes for most technological observations. About one quarter of the sample is broken. The special debitage group of 13 trimming elements (12 flakes and one blade) is analyzed separately.

Dorsal Scar Patterns (Tables 12-2, 12-8). Only parallel and parallel-crossed occur in any numbers; other types are generally seen on fewer than 1 in 10 pieces. More than half have some trace of dorsal cortex. Flaking direction include 43.2% along a single axis, 32.9% along two axes, and only 14.2% where scars indicate more than two flaking directions. Primary flakes are relatively rare (9.7%). There are only 12 trimming elements, so detailed observations would be meaningless, except that, as with the blanks, about half of them have some dorsal cortex.

Shape (Table 12-3). This sample includes 130 flake and 16 blade blanks with identifiable shapes. As usual, the most common shape is irregular, followed by trapezoidal. About one-third of flakes are wider than long. Most blades are triangular (37.5%) or rectangular (31.3%), but quite a few are irregular (25.0%). A single example was ovoid (6.3%). Of the trimming elements, one-third are trapezoidal, one-third ovoid, while other shapes occur as single examples. More than a quarter are wider than long.

Profiles (Table 12-4). Incurvate profiles dominate, with flat and convex accounting for about 1 in 5 each. The trimming elements follow a similar pattern, with incurvate accounting for 66.7% and the other types occurring in just a few cases.

Platforms (Tables 12-5, 12-8). Over half of the platforms are unfaceted, no other type comes even close. Among the trimming elements, all but three are unfaceted. The faceting indices for the blanks are: IF = 39.6; IFs = 15.8.

Lipping. True lipping is rare, accounting for only 2.1%, as compared with semi-lipped at 36.7% and unlipped at 61.2%.

Size (Table 12-6). The average maximum dimension of blanks is 4.4 cm and the average thickness is 0.7 cm. More than half of the blanks fall into the 3 to 4 cm interval, with a third included in the 4 to 5 cm grouping. Only 1 in 9 falls into the next largest category, 5 to 6 cm, and only isolated examples are larger. One massive blade is 12.3 cm long. The main selection criterion for tool blanks, yet again, is size. Only a single piece from the 81 in the 3 to 4 cm group is a tool. This increases to 7 out of 52 in the 4 to 5 cm group, and increases slightly in the 5 to 6 cm category to 2 out of 14. There are 3 tools out of the 7 pieces in the 6 to 7 cm group, one out of three in the 7 to 8 cm interval, and the single piece in the 9 to 10 cm interval is a tool.

<u>Tools</u> (Table 12-7). There are 22 unifacial and no bifacial tools in the assemblage from Level III/3.

Typology of Unifacial Tools. There are 18 scrapers, one denticulate, one combination tool, and 2 unidentifiable tools, all made on flakes. Of them, 10 are on-axis and 11 off-axis, while one was unidentifiable. Retouch is obverse on 16, inverse on 3, and alternate on 3. Of the 33 retouched edges, most (14) have invasive scalar retouch, followed by scalar (11), and 2 each of parallel, sub-parallel, marginal, and irregular. Retouch angle is evenly divided between flat (16) and semi-steep (16), with only a single steeply retouched edge found.

Seven tools exhibit accommodations: three are naturally backed and 4 have plain backs. Inverse thinning occurs on eight tools: 4 basally, 2 distally, and 1 each lateral and proximal/distal.

There are 9 simple, 3 transverse, 2 double, and 4 convergent *scrapers*. Simple types include 2 straight, 6 convex, and 1 convex/concave. One straight scraper is obversely retouched and has inverse basal thinning and a naturally backed lateral accommodation (fig. 12-3: *5*). The other is inversely retouched. All convex scrapers have obverse retouch and all but two have either backed accommodation or inverse thinning. Two just have laterally backed edges (natural and plain). One has a natural lateral backing, as well as a proximal truncation (fig. 12-3: *6*). Another is laterally backed (fig. 12-3: *3*). The convex/concave example is obversely retouched without any other elaboration. Most of simple scrapers are close to semi-Quina types.

There are one straight and 2 convex transverse scrapers. The straight one has ventral retouch, while the convex examples are obversely retouched (fig. 12-5: *1*). The double scrapers are both straight-convex. One is obversely retouched (fig. 12-3: *2*), while the other is alternately retouched.

The convergent scrapers include one semi-leaf, one sub-crescent, and 2 bi-concave forms. The semi-leaf is obverse and has an inversely thinned base (fig. 12-3: *4*). The sub-crescent is also obversely retouched and has inverse distal thinning. One of the bi-concave examples is obversely retouched (fig. 12-3: *1*). The other is inversely retouched, is laterally pointed and has inverse lateral thinning. The alternately retouched piece also has proximal/distal thinning.

There is a single straight *denticulate* with alternating retouch and a plain lateral backing. The *combination tool* is a lateral denticulate with a notch on an adjacent edge. The *unidentifiable tools* include 2 obversely retouched fragments: on one the retouch is limited to a single edge, while on the other, two edges are retouched. The latter piece also shows evidence of inverse basal thinning.

Blanks with Traces of Use-Wear. Of the 12 blanks with use wear, 9 are retouched flakes, one is a retouched blade, and the others are a utilized flake and blade. Among the retouched flakes, 7 have obverse, 1 has inverse and 1 has alternatingly irregular retouch. Only 3 obversely retouched pieces are bi-lateral; all others have only a single edge modified. Both utilized pieces show edge damage along two edges.

Level III/4

This assemblage consists of 339 artifacts, including 2 tools and 4 pieces with evidence of use. The remaining artifacts are either debitage or debris (Table 12-1).

Technology (Tables 12-1, 12-8). The sample consists of 32 flakes, 1 blade, 4 flakes with traces of use, 1 flake tool, and 1 blade tool. Thus, there are 37 flake blanks and 2 blade blanks.

Dorsal Scar Patterns (Tables 12-2, 12-8). Only 32 blanks have identifiable scar patterns: parallel and converging dominate. More than half (20 of 39) have the traces of cortex on dorsal their surfaces. The small sample size makes any indices meaningless (Table 12-2).

Shape (Table 12-3). As usual, irregular and trapezoidal shapes are most common. Blade shape is rectangular (1) and triangular (1).

Profiles (Table 12-4). Most of the identifiable pieces have incurvate profiles.

Platforms (Tables 12-5, 12-8). Over half are unfaceted, other forms occur in small percentages. The faceting indices are IF = 28.6 and IFs = 14.3.

Lipping. Semi-lipped, 25%; unlipped, 75%.

Size (Table 12-6). Of the 28 blanks, the average maximum dimension is 4.3 cm and the average thickness is 0.7 cm. Most (57.1%) fall between 3 and 4 cm, while another 28.9% are between 4 and 5 cm. Only 2 pieces (7.2%) are between 5 and 6 cm, and only one each (3.6%) fall between 6 and 7 cm and 7 and 8 cm. The single unbroken tool measures 7.2 cm.

Tools (Table 12-7). There are only 2 tools in Level III/4: a simple, straight scraper and an unidentifiable piece. The straight *scraper* is inversely retouched on an overpassed flake. It has a combination of semi-steep sub-parallel and scalar retouch. The *unidentifiable tool* is a blade fragment with sub-parallel flat and semi-steep retouch, as well as some evidence for inverse basal thinning.

Blanks with Traces of Use-Wear. There are 4 blanks with traces of use-wear: 2 retouched and 2 utilized flakes. The retouched flakes have bi-lateral retouch; one obverse and the other alternatingly irregular. The utilized flakes both show inverse modification along a single edge.

Bone and Sandstone Artifacts

In addition to the flint artifacts from the occupation levels, occasional finds were made of broken bones with surface traces of use as "retouchers." This type of retoucher was first described by H. Martin from La Quina in France (Martin 1907-1910). They were studied later by S. A. Semenov (1953, 1957), as well as by P. Chase (1990). These tools are always found with heavily retouched flint tools in Charentian and, often, in Micoquian assemblages. They were recognized by Bonch-Osmolowski (1940) at Kiik-Koba, by Formozov (1958) at Starosele, by Filippov and Liubine (1993, 1994) at Barakayevskaya, and by Kolosov (1986) at some sites of the Ak-Kaya industry, all in contexts which are similar to Kabazi V. While these tools may have served either as retouchers or as anvils, in both cases they were associated with tool production.

In the Kabazi V assemblages discussed here, there were 23 retouchers: 3 in II/4a, 3 in II/7, 11 in III/1, 3 in III/1a, 2 in III/2, and a single example in III/3 (figs. 12-10 through 12-13). Retouchers consist of massive fragments of tubular bone, most are 5 to 8 cm long and from 2 to 3 cm wide. The bone tends to be about 1 cm thick. Only two pieces are longer the 10 cm: 10.8 cm from II/4a and 12 cm from III/1 (fig. 12-10). Two pieces are less than 5 cm in length (4.7 cm from III/1 an 4.0 cm from III/1a).

Traces of use tend to be situated near the ends of the bones (figs. 12-10; 12-11) and are seen as short and deep cuts, perpendicular to the long axis of the bone fragment, which are clustered in small, oval zones 10 to 15 mm in diameter. At times, these short cuts are accompanied by long, shallow scratches along the long axis of the bone (fig. 12-12). These traces do not parallel the types of scratches and grooves made by carnivores or by butchering processes.

In addition to the bone retouchers, there are a few retouchers made of sandstone. A flat pebble of tuff-sandstone from II/3 and two of fine grained sandstone were recovered from III/3. One is a flattish, ovoid pebble 6.3 cm long, 3 cm wide, and 1 cm thick. It has three areas of battering; one each at the ends one surface and one on the opposite face near one end (fig. 12-13). The other is less elongated oval and not as flat. It is 3.9 cm long, 3.2 cm wide, and 1.7 cm thick. One lateral edge and one end exhibit traces of flaking.

Both the sandstone and the bone are of similar hardness and the traces of use are very similar on both materials. The flat limestone pebbles are found often in the occupation levels of Kabazi V but, as a rule, their surfaces are badly preserved and any traces of use would have been lost. Therefore, these sandstone retouchers may have been more common than it appears by the number of identifiable examples.

Although some researchers (Filippov and Liubine 1994: 144) believe that these are used for pressure flaking, this was not the case in Middle Paleolithic contexts. Rather, the large number of short and wide chips with acute and lipped platforms in the lithic assemblages suggest that these were soft hammer-retouchers.

INTER-COMPLEX COMPARISONS

Inter-complex comparisons include both consideration of the internal homogeneity of the complexes, as well as variability across complexes. These may be seen on a number of different levels: assemblage composition by artifact class; raw material selection and core reduction; basic reduction patterns and styles; technological traits, as seen through specific and clustered attributes; tool-kit configurations; as well as types within tool classes. There is

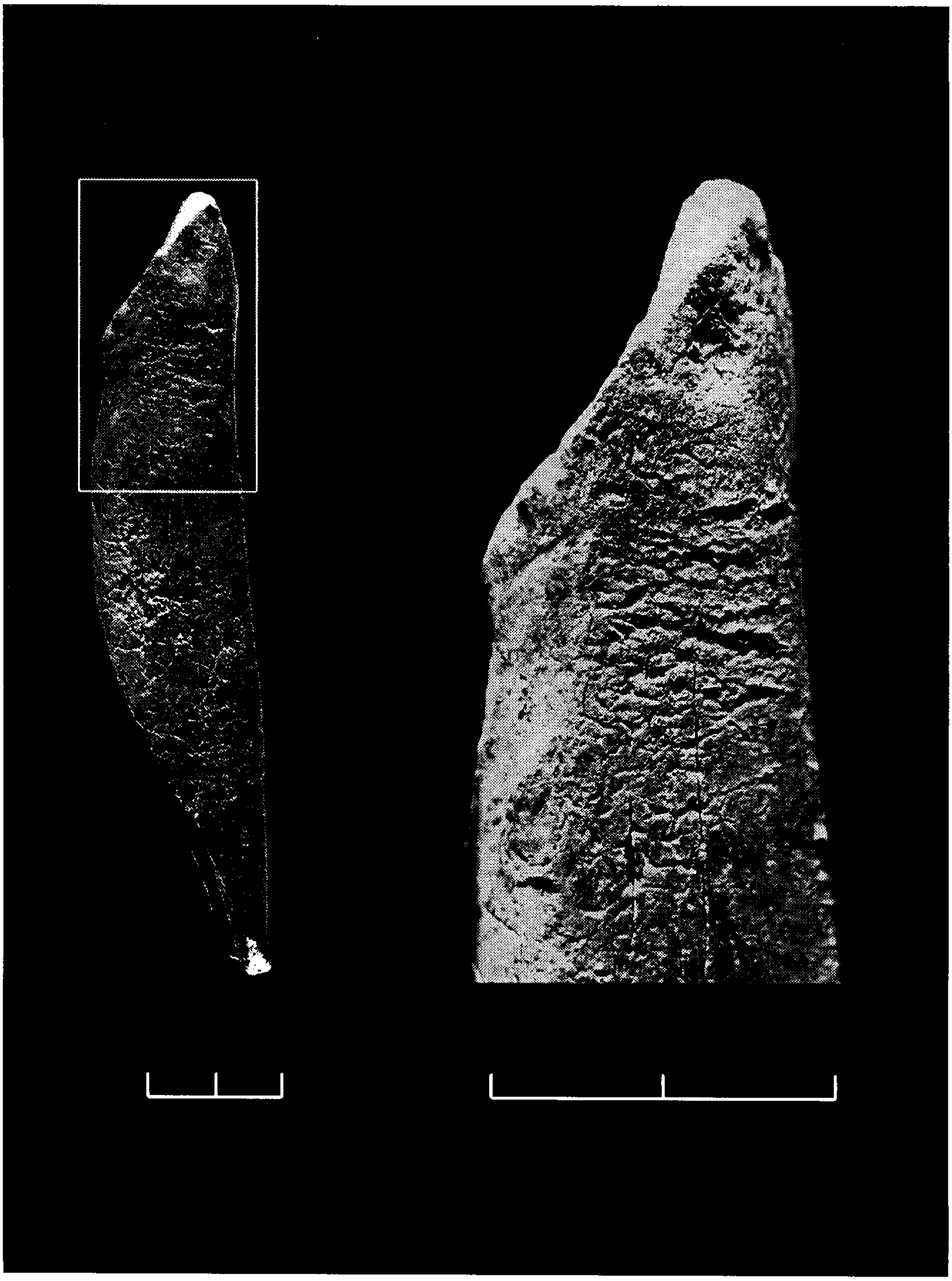

Fig. 12-10—Kabazi-V, Complex D, Level III/1, Bone hammer-retoucher. Photographed by A. Parhomenko.

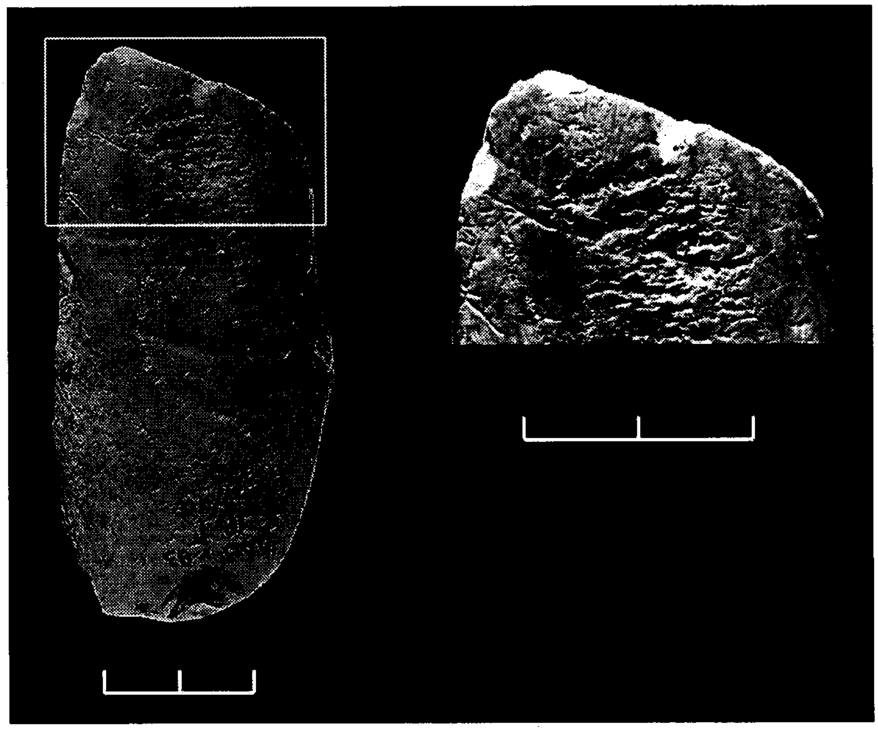

Fig. 12-11—Kabazi-V, Complex C, Level II/4a, Bone hammer-retoucher. Photographed by A. Parhomenko.

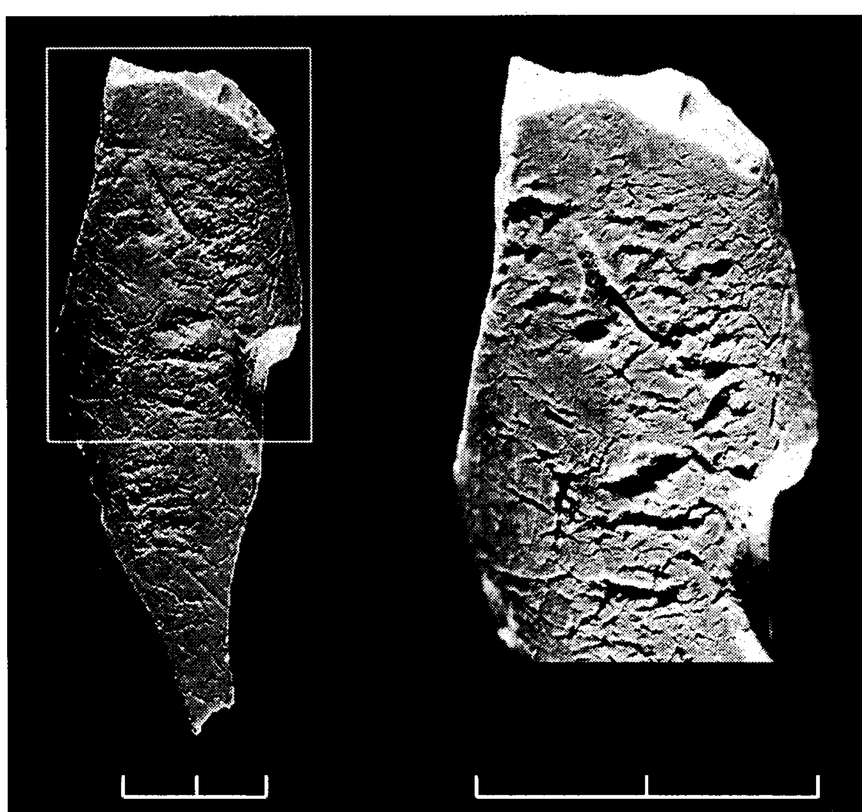

Fig. 12-12—Kabazi-V, Complex D, Level III/1, Bone hammer-retoucher. Photographed by A. Parhomenko.

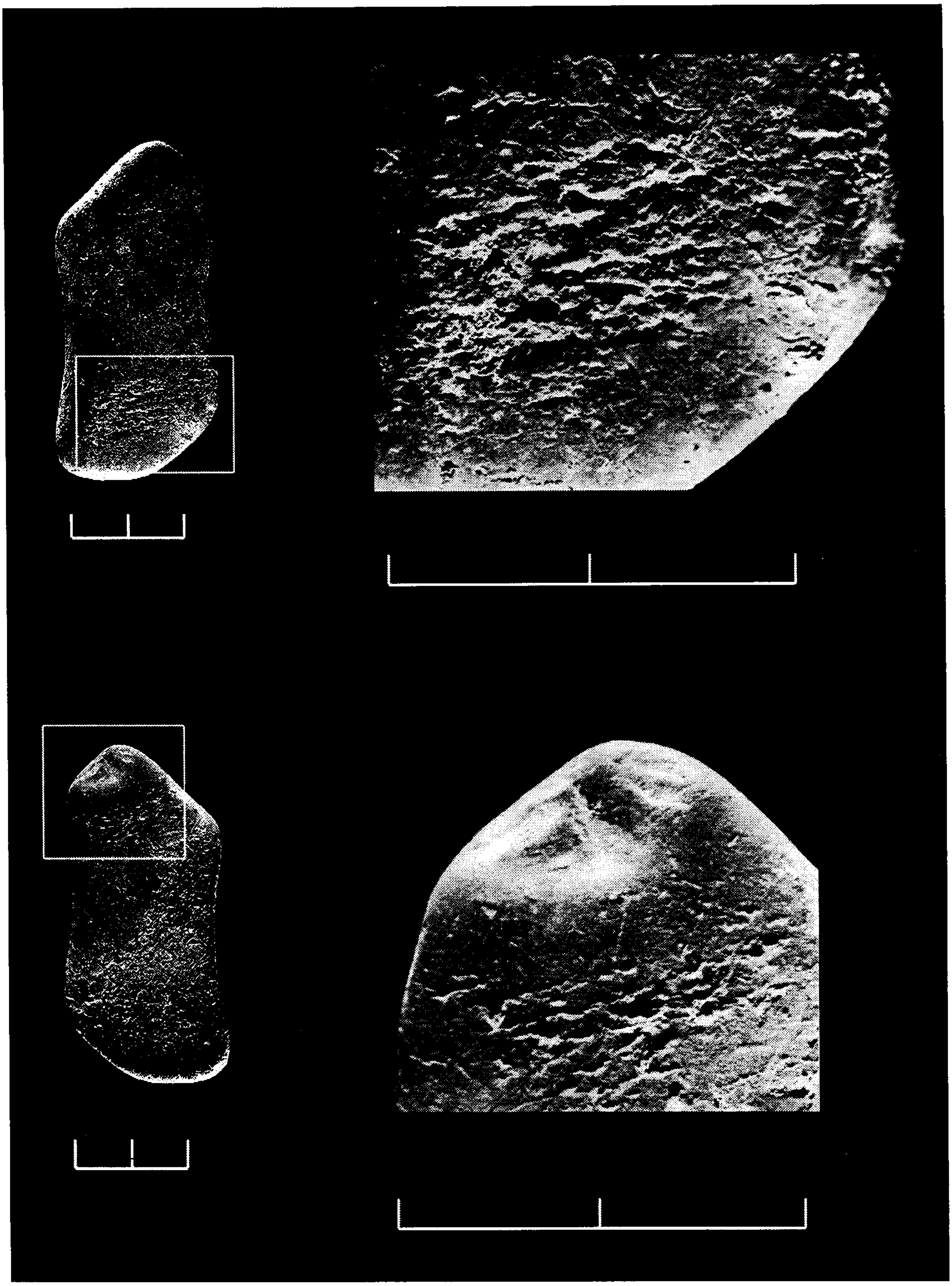

Fig. 12-13—Kabazi-V, Complex D, Level III/1, Stone hammer-retoucher. Photographed by A. Parhomenko.

almost no end of possible comparisons; those chosen are felt to best reflect significant similarities and differences in these specific assemblages.

Assemblage Composition

Even taking into account the different extent of the excavated areas (Complex E was excavated over only 6 m^2, while Complexes C and D were excavated over between 12 to 15 m^2), the numbers of artifacts in each of the complexes are very similar. As is normal at in situ sites, except under the most special circumstances, the vast majority of recovered pieces are chips (Table 12-1). Beyond that, the paucity of cores and precores in all assemblages must be noted (Table 12-1). The number of blades is low in all cases (Tables 12-1 and 12-8). The distribution of scar patterns is characterized by a dominance of bi-directional and poly-directional scars, as well as by considerable numbers of completely and partly cortical blanks (Tables 12-2 and 12-8). The majority of blanks are irregularly shaped; among those with regular shapes, trapezoidal and rectangular dominate (Table 12-3). A high percentage of flakes are wider than long: 20%-25% in each of the complexes. The majority of blanks are not longer than 3-4 cm (Table 12-6). The dominant types of blank profiles are incurvate and flat (Table 12-4). Those differences seen between Complexes C and D, on the one hand, and E, on the other, such as platform preparation (Tables 12-5 and 12-8), the number of trimming pieces (Table 12-1), and the structure of the tool-kits (Table 12-7), may be explained by the different sample sizes for each of the complexes.

Typology

The tool-kit configurations indicate that there are close similarities among tool classes as well as among tool types in Complexes C and D (Table 12-7). At the tool class level, unifacial points account for 20% of tools in Complex C, but only 14.5% in Complex D, both falling within the normal range of the Staroselian. The unifacial scrapers account for very similar proportions in Complexes C and D, reaching somewhat more than half of all tools (ca. 60%). Denticulates also occur in similar amounts (ca. 6%). While notched pieces are rare in Complex D, they reach ca. 5% in the others. Combination tools and endscrapers are always rare, and are absent entirely in Complex C.

There are pronounced differences between the proportions of bifacial points and bifacial scrapers in Complexes C and D. Complex C is characterized by a predominance of bifacial points over scrapers (6:1), while Complex D has almost equal proportions of these tools (9:8). The percentage of identifiable bifacial tools is almost equal in both of these complexes (Table 12-7).

From the point of view of tool shape, unifacial points in both Complexes C and D are equally rare; leaf-shaped pieces (e.g., semi-leaf, sub-leaf, and leaf) account for 3.3% in Complex C and 2.9% in Complex D. The crescent and trapezoidal-shaped points in each complex have similar proportions, as well. Some types of points, such as triangular and hook-like are absent from Complex C, while amorphous points are absent in Complex D.

Unifacial scrapers in Complexes C and D have similar shapes within the transverse and simple forms. The double scrapers also have comparable shapes, although the percentage of this group is higher in Complex C (6.7%) than in Complex D (1.4%). The unifacial convergent scrapers have a predominance of crescent-shaped and canted pieces, but leaf-shaped, triangular-shaped, and hook-like scrapers are absent in Complex C, while the amorphous convergent scrapers are missing from Complex D.

The denticulates and notches in Complexes C and D are commonly simple types (Table 12-7); the absence of more complex forms in Complex C should be noted. Combination tools and endscrapers are represented by a few pieces each in Complex D, and do not significantly affect the general composition of the tool-kit. The similarities between Complexes C and D can also be seen in the morphological analysis of the combined unifacial points/scrapers/denticulates (Table 12-9). The sample of bifacial tools is too small for morphological analysis. Nevertheless, the presence of leaf points and scrapers in each of the complexes must be noted (Table 12-7).

TABLE 12-9
Kabazi V, Tool Morphology

	Complex C %	*Complex D* %	*Complex E* %
One-edge tools	51.1	53.9	73.7
Double-edge tools	8.5	2.9	10.5
Convergent tools	40.4	43.1	15.8

The sample from Complex E was recovered from a significantly smaller area than were the samples of the other complexes. Perhaps because of this, the number of tools is very low: only 24 pieces. This is obviously not enough for meaningful comparisons with Complexes C and D.

The apparent absence of bifacial reduction in Complex E (no bifacial tools were recovered) is probably only a matter of sample size, since there is a relatively high number of trimming elements (Table 12-1). The semi-leaf and sub-crescent scrapers are similar to those from Complexes C and D. Tool retouch in Complex E is the same as used in the other complexes: combinations of scalar, sub-parallel semi-steep, and steep obverse and inverse retouch.

Tool Production

The largest blanks were selected for tool production, an approach which was common for the Middle Paleolithic, and has been noted in many works (e.g., Rolland 1981; Weber 1982; Geneste 1985; Stepanchuk and Chabai 1986; Dibble 1987, 1991; Freeman 1992; Dibble and Holdaway 1993; Demidenko 1996). Most tools from Kabazi V are made on blanks more than 5 cm in greatest dimension, while a majority of flakes and blades fall between 3 and 5 cm. The presence of a relatively high amount of scalar and invasive scalar retouch in tool preparation indicates the use of soft hammers. It should be noted as well that some tools made from specific kinds of raw material were imported into the site. Usually, these imported tools were relatively larger than the others (figs. 12-1, 12-2, 12-5).

As a rule, the longest edge of a blank was retouched without consideration of blank axis. This explains why there are relatively high numbers of "off-axis" tools. Most of the numerous convergent tools have heavy retouch. Points and convergent scrapers were made with both heavy invasive retouch and light marginal retouch. On the other hand, a large number of one-edged scrapers have heavy retouch. A specific feature of the Kabazi V unifacial tool-kits is the small number of double scrapers. Thus, the opinion of M. Baumler and J. Speth (1993) that the "reduction model" proposed by H. Dibble (e.g., 1984) is not a paradigm for the Middle Paleolithic: it merely reflects particular cases in the process of tool production.

The high percentage of bifacial tools in most assemblages is a characteristic feature at Kabazi V. Also, unfinished bifacial pieces are present in significant numbers (Table 12-7). Bifacial tool production included bi-convex, plano-convex, and semi-bifacial techniques, with plano-convex the most common. The use of flint plaquettes as raw material permitted the immediate production of bifacial tools without an initial shaping stage of the nodule. Nonetheless, massive flakes were used for bifacial tool production, too. As mentioned above, cores were utilized intensively: the last removal scars, for the most part, fall into a 3 cm to 5 cm interval. Such scars are smaller than the blanks used for tool production, where pieces more than 5 cm in length were preferred. In other words, core exploitation was prolonged, even when it produced products too short to be used as blanks for tools. A large percentage of the cores are bifacial and multi-platformed, indicating that they many have been in the process of being transformed into bifacial tools. Perhaps, this explains the small number of cores in the assemblages. Such transformations were noted by G. A. Bonch-Osmolowski in the assemblages of the Kiik-Koba rockshelter (1940: 111-112). Thus, bi-convex and plano-convex bifacial tool production followed several paths: immediately from plaquettes, from massive flakes, and from re-utilized cores.

Most of the semi-bifacial tools were prepared by thinning the ventral surface of unifacial convergent tools with the aim of rejuvenating/resharpening their working edges. In a few cases, where the ventral surface was fully exhausted by thinning, the tool looks as if it had been prepared by a plano-convex technique. The difference between these two techniques can be seen in the preparation sequences: for plano-convex, it is typical to first prepare a flat surface, while for semi-bifacial, the first preparation is on the convex dorsal surface.

The tool typologies of Complexes C, D, and E reflect the character of the reduction processes used in the assemblages. The high percentage of cortical and primary flakes, the small size of most blanks, the high frequency of trimming elements, and the paucity of cores, indicate that the reduction systems of these assemblages emphasized the reduction of flint plaquettes to produce blanks for both bifacial and unifacial tool manufacture.

Chapter 13

ELECTRON SPIN RESONANCE (ESR) AND MASS SPECTROMETRIC U-SERIES (MSUS) DATING OF TEETH IN CRIMEAN PALEOLITHIC SITES: STAROSELE, KABAZI II, AND KABAZI V

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INTRODUCTION

The dating program which included the sites of Starosele, Kabazi II, and Kabazi V was carried out during the summer field seasons of 1993 through 1995, with J. Rink doing on-site dosimetry, tooth collection, and making detailed field observations of the site lithologies in 1993 and 1994. Most of the ESR laboratory analyses are complete, but the MSUS dating is still underway. Although the dating of these sites using thermoluminescence of burned flint was also studied, the apparently burned flints from Starosele were not sufficiently heated for application of this method. No windblown sediment was found, which precluded the application of optical luminescence dating at these sites. The sites of Zaskalnaya V and GABO were also studied in this field program, but the results will be reported elsewhere.

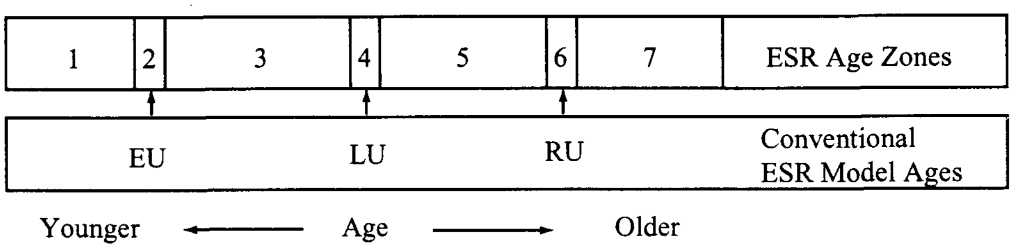
EXPERIMENTAL METHODS

The general approach in this work to ESR dating is the same as that proposed by Grün et al. (1987), with the exception of the beta dose calculations and very slight refinement of the alpha dose calculations. Briefly, the method is based on the measurement of the intensity of a characteristic signal produced by trapped electronic charges in samples of tooth enamel which is detectable on an electron spin resonance spectrometer. The height of the signal increases with the radiation dose. We calibrate its sensitivity to dose by exposing it to additional doses of artificial gamma rays, permitting us to convert the peak height to an equivalent dose (D_e) in grays. The dose rate (that is, the annual dose) is determined from the natural radioactivity of the sample and its surrounding sediment, as well as the calculated cosmic dose (specific details about this dose rate determination are provided along with dating results for each site). The present-day gamma dose rate from the surroundings and the cosmic dose rate are best determined by in situ measurement using thermoluminescence dosimeters (TLD's). The cosmic + gamma and the beta ray dose rate from sediments is assumed to have remained constant through time or, at most, to have varied with water content as a function of climate. The internal dose rate of the enamel and the dose of beta-rays from adjacent dentine and cementum, is attributed to uranium absorbed by these materials. This dose rate is assumed to have increased through time from an initial zero value, as a result of: (a) uptake of U; and (b) growth of the daughter isotopes of ^{238}U. The increase in U content is assumed to be a regular continuous function of time, two possible limiting cases of which are early uptake (EU): acquisition of present-day U content soon after burial; and linear uptake (LU): where the present U content has been acquired at a constant rate through time.

Most ESR dates on tooth enamel published before 1997 have been based on a particular model for calculating the beta radiation doses in tooth enamel (Grün 1986). Early uptake (EU) and linear uptake (LU) ages have both been based on this approach. More recently (Rink et al. 1996a, 1996b; Brennan et al. 1997) have begun to report ESR ages using a new method for calculating the beta radiation doses which is based on One-Group Theory (O'Brien 1964; Prestwich et al. 1997). These ESR age calculations have been dubbed ROSY ESR ages after the name of a hippopotamus who died at the Toronto Zoo and who posthumously lost her teeth to the cause of ESR dating at McMaster University Geology Department. ROSY EU and ROSY LU ESR age calculations differ from those based on the previous approach only with significant respect to the beta dose calculations (Brennan et al. 1997). ROSY ESR ages are almost always older than those of the previous approach, unless the enamel contains very large amounts of uranium, making the internal alpha doses very large with respect to all other doses including beta doses. Most recently, experimental studies of beta attenuation in tooth enamel (Yang 1997; Rink and Yang in prep.) have strongly supported the new calculation method employed in ROSY ESR age calculations, and have shown good agreement with Monte Carlo calculations of beta doses in tooth enamel. These new results are expected to bring about a general revision in past published ESR ages, which will increase these ages from 0-30%. The age results presented in this paper are ROSY ESR ages and will not be subject to further revision except for refinement using mass-spectrometric U-series data which is not yet incorporated into the age calculation package for ROSY ages. These refined ages will appear in future publications.

The MSUS dating reported herein follows the approach of Li et al. (1989). The use of conventional U-series ages based on alpha spectrometry to refine ESR model ages, such as early uptake (EU), linear uptake (LU), and recent uptake (RU) ages, was pioneered by Grün et al. (1988). Over the past decade there has also been an order-of-magnitude increase in the precision of uranium-series (US) dating, through the advent of thermal ionization mass spectrometric (TIMS) analyses of U and Th isotope ratios (Edwards et al. 1986). McDermott et al. (1993) were the first to use this method for mass spectrometric U-series (MSUS) dating of teeth, and greater detail on these studies was provided by Grün and McDermott (1994). The basic approach is to do MSUS dates on the different tissues (enamel, cementum, and dentine) which have absorbed uranium (U) in the teeth. A direct comparison of MSUS ages and ESR early uptake ages provides direct information on the uptake history in the tooth. Coupled ESR/MSUS ages and uptake parameters (p-values) can be calculated (Grün and McDermott 1994) making various assumptions about which tissues should be used as the primary determinant in the uptake history for the coupled age calculation, which has in these earlier works apparently been considered to be the enamel. Although coupled ages are most desirable, this cannot yet be done for ROSY ESR ages as mentioned above. Nonetheless, the ROSY ESR ages reported here can be refined using Figure 13-1, as discussed below.

The U-series age of the dental tissues in a tooth whose enamel has been dated by ESR are a crucial source of information needed to better constrain the ESR results. It is essential to keep in mind that ESR EU and LU ages are simple model assumptions, and cannot be considered definitive age estimates (except in cases where no U has been absorbed into the teeth, where the EU and LU ages are essentially the same and thus they provide a true age estimate, e.g., Rink et al. 1996). The purpose of doing MSUS dating in this work was to refine the simple EU and LU models and obtain the best age estimates available. This was essential for the Crimean sites, where U-uptake into dentine and cementum was large. Figure 13-1 shows how to use U-series ages to refine ESR ages. Simple EU, LU, and in some cases RU, ages can be calculated without U-series data. They provide the reference frame for comparison with U-series data. The aim of the comparison is to decide whether the simple EU or LU model is appropriate, or whether the true age estimate is younger or older than those simple models. In general, the tissue (cementum, dentine, or enamel) which has absorbed the most uranium is the most important tissue to date with MSUS. The ESR enamel age may be refined by placing it into zones 1-6 on this basis. For example, if the MSUS age of the dentine (the dominant U-bearing tissue) in a particular tooth is 60% of the ESR EU enamel age, then the true burial age falls within zone 3, which means that it is between the EU and LU enamel ages (which are known to certain absolute numerical values). Whereas if the MSUS age was only 25% of the ESR EU enamel age, then it would fall into zone 5, and the true burial age would be older than the ESR LU enamel age. For some of the teeth in each of the three sites reported on here, at least three dates are provided for each tooth: ESR EU and LU enamel ages and at least one MSUS age on a dominant U-bearing tissue from that same tooth. The refined ages will be reported using the data of Figure 13-1.



Zone 1: US Ages > ESR EU age (U-loss)
Zone 2: US Ages are within 5% of ESR EU age (True Early Uptake [EU])
Zone 3: US Ages are 55-95% of ESR EU Age (Sub-linear Uptake)
Zone 4: US Ages are 45-55% of ESR EU Age (True Linear Uptake [LU])
Zone 5: US Ages are 5-45% of ESR EU Age (Supra-Linear Uptake)
Zone 6: US Ages are 1-5% of ESR EU Age (True Recent Uptake [RU])
Zone 7: Not Allowed (Recent uptake is maximum possible age)

Fig. 13-1—Refined ESR enamel ages zones in relation to EU, LU, and RU ESR model ages for a given tooth using U-series ages (often referred to as MSUS ages in the text) as constraints. A tooth enamel sample dated by ESR can be placed into one of the zones based on a comparison of the ESR EU age with a U-series age on dentine, cementum, or enamel from the same tooth (note: U-series ages are not shown on the diagram). The refined ESR enamel age is a better estimate of the true burial age than either the EU or LU model on its own.

Although U-series dating of tooth enamel is considered by other workers to be a secure absolute dating method without comparison to ESR dating (e.g., McKinney 1991), it is our view that the assumption of the early uptake model for tooth enamel (as used to support this claim) will only be true under certain burial conditions, but not for all situations.

For all of the teeth in this study, the beta dose from sediment was relatively small because the cementum layers protected the enamel from direct exposure to the nearby sediment, and absorbed much of the beta doses coming from sediment. Nearly all of the beta dose received by most teeth was from U in cementum and dentine. The sediment that was collected from very close to the tooth was used whenever possible to calculate the small doses from sediment, but in some cases, this sediment had been packed into the same bag with the tooth, and became contaminated by the U-rich cementum and pulp of parts of the tooth which broke down. In general, this was less of a problem for the Starosele teeth where preservation was better than at Kabazi II and Kabazi V. Whenever high U was observed in the sediment that was collected with the tooth, the beta dose from sediment to the enamel was reconstructed using the sediment from that level which had been collected from one of the holes made for gamma dosimetry purposes, and we also did this for cases where sediment had inadvertently not been collected with the teeth.

Statistical Methods

The analytical uncertainty in reported MSUS ages are ± 2σ errors based on counting statistics on the ion beams in the mass spectrometer. The analytical uncertainty in reported ESR ages is not based on the root mean square standard deviation of all of the individual terms of analytical uncertainty combined (e.g., estimated error in the equivalent dose, U concentrations, Th concentration, K concentration, thicknesses, densities of tissues, moisture content). Instead, the ESR age is calculated first with the errors subtracted from each value and again after they are added to the value. The quoted uncertainty for a single enamel sample is the spread between these two calculated ages using the same uptake model. Mean ESR ages for a given level are reported with a +/- 1σ standard deviation of the mean age, with no weighting of the individual ages based on their specific reported analytical uncertainty. Reported analytical uncertainties in U, Th, and K values are based on neutron activation analysis counting statistics.

STAROSELE RESULTS

Dating results (Tables 13-1 and 13-2) were obtained using teeth from four different archeological levels of the site designated in descending stratigraphic order as 1, 3, 4, and "Below 4." The considerable degree of U-uptake in these teeth is represented by the large U-content of the dentine and cementum, whereas the enamel had only absorbed tiny amounts of U. This highly radioactive "sandwich" of cementum/enamel/dentine led to a strong divergence of the EU and LU model ages, based on simple assumptions about possible U-uptake. The U-series ages (Table 13-2) can be used to refine these EU and LU ESR enamel ages. All of the teeth were *Equus hydruntinus*, nearly all of which were molars.

Starosele: Ages in Level 1

In this level, U-series ages were obtained on dentine in four different teeth (Table 13-2). Although the cementum has higher U content (Table 13-1), the dentine was considered as a dominant source of U-based radiation because it was much thicker (about 2 mm) than the cementum layers, which ranged from 0.4 to 1.4 mm. The dentine ages range from 4.4 to 8.8 ka, which are only 19 to 44% of the ESR EU ages for the three teeth which have counterparts in Table 13-1. Based on the interpretive data of Figure 13-1, they fall into ESR age zone 5, which means their true burial age is older than the reported LU ages which range from 30-34 ka, and younger than the RU age (not reported). In fact, a mean coupled ESR/MSUS ages was reported for this level (Monigal et al. 1997), but they were based on the old style of beta dose modeling. The reported coupled age was 41.2 ± 3.6 ka, based on the assumption that the cementum U-series ages are similar to those of the dentine. These previously reported coupled ages must be considered minimum ages because they will increase when the new coupled age calculations are made using the ROSY approach, unless the cementum layers are found to have a very different U-series age from those in the dentine. The enamel U-series ages are not important for the refinement of the ESR ages because the enamel has absorbed so little uranium.

Starosele: Dosimetry in Level 1

For these teeth, the approximate ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is quite variable and ranges from 7/35/45/13 % to 5/59/28/8 % (EU model). The EU model is chosen only for the convenience of the calculation here (and elsewhere in this paper), and these ratios simply allow a quick method to see how the dose is generally distributed for a given model (for the LU model, the alpha and beta doses would be about half of what they are in the EU model). The true relative proportions can only be determined when coupled ages are calculated. The total annual doses ranged from 973 to 1589 μGy/a.

TABLE 13-1
Starosele, ROSY ESR Ages on Enamel and Analytical Data

Sample	*Level*	*Square*	*Elev. (cm below datum)*	*Cementum U (ppm)*	*Enamel U (ppm)*	*Dentine U (ppm)*	*Early Uptake ESR Age (ka)*	*Linear Uptake ESR Age (ka)*
94107A	1	H23	-283	51.1	0.6	40.8	20 ± 2	30 ± 3
94108A	1	H23	-292	46.3	0.4	33.1	20 ± 1	29 ± 2
94108B	1	H23	-292	43.5	0.3	32.9	21 ± 2	29 ± 2
94103A1	1	I23	-303	29	0.4	21.9	22 ± 1	30 ± 2
94103A2	1	I23	-303	28.4	0.4	10.3	27 ± 2	34 ± 3
94104B	1	H23	-308	27.7	0.4	29.4	23 ± 2	29 ± 2
	Mean Level 1			**37.6 ± 10.5**	**0.4 ± 0.1**	**28.1 ± 10.6**	**23 ± 3**	**31 ± 3**
95116A	3	F21	-430	41.6	0.4	4.3	29 ± 3	37 ± 3
95116B	3	F21	-430	42.7	0.2	3.5	30 ± 3	38 ± 4
95116C	3	F21	-430	37.3	0.3	6.7	34 ± 3	41 ± 3
95116D	3	F21	-430	44.3	0.4	8.6	35 ± 3	43 ± 4
94118A	3	F21	-431	59	< 0.1	27.7	22 ± 2	33 ± 3
94118B	3	F21	-431	60.7	0.4	11.9	21 ± 2	29 ± 2
95114A	3	F21	-440	9.3	< 0.1	2.8	38 ± 4	42 ± 4
	Mean Level 2			**42.1 ± 17.0**	**0.3 ± 0.1**	**9.4 ± 8.7**	**30 ± 6**	**38 ± 5**
95117A	4	H23	-524	10.6	< 0.1	3	48 ± 4	57 ± 5
95117B	4	H23	-524	10.6	< 0.1	4.7	46 ± 4	55 ± 4
95118A	4	K23	-529	59	< 0.1	27.7	24 ± 1	37 ± 2
95119B	4	J22	-537	27.4	< 0.1	11.6	32 ± 2	44 ± 4
95120AB	4	J22	-537	28.2	< 0.1	21.2	34 ± 2	47 ± 3
	Mean Level 4			**27.2 ± 19.8**	**< 0.1**	**13.7 ± 10.6**	**37 ± 10**	**48 ± 8**
95122AC	Below 4	J22	-559	25.2	< 0.1	13.7	37 ± 2	53 ± 3
95122B	Below 4	J22	-559	22.9	< 0.1	14.7	43 ± 3	58 ± 4
95122D	Below 4	J22	-559	25.8	< 0.1	15.8	42 ± 3	57 ± 4
95121A	Below 4	J22	-590	34.8	< 0.1	30.2	33 ± 2	52 ± 4
	Mean Level Below 4			**27.2 ± 5.2**	**< 0.1**	**18.6 ± 7.8**	**39 ± 5**	**55 ± 3**

The gamma plus cosmic dose (contributing from 36 to 58% of the total annual dose) was determined using a single in situ CaF_2 thermoluminescence dosimeter (TLD 103), which gave an annual dose rate of 539 μGy/a corrected for a burial depth that was assumed to be 1 meter greater than present day. (It is believed that some of the deposit has been stripped off in the recent past.) Neutron activation analysis (NAA) of sediment from the same hole (Gam Hole 10 in square H24, elev. -278 cm) yields a gamma plus cosmic dose rate of 691 μGy/a (micrograys/year), which is about 28% higher than the TLD value which was used in the age determinations. This is expected due to the absence of large lumps of lower radioactivity limestone not present in the NAA sample, but which were detected by the in situ measurement which detects the radioactivity over a sphere of about 30 cm radius (which contained limestone lumps). The in situ measurement value was used for the age calculations and makes up from 36 to 58% of the total dose received by these teeth.

Starosele: Ages in Level 3

Here, U-series ages were obtained on dentine and cementum from four different teeth. These MSUS ages are generally older than in Level 1, indicating that the teeth absorbed the uranium over a longer period of time. The cementum and dentine ages for individual teeth are

TABLE 13-2
Starosele, Mass Spectrometric U-Series Ages for Cementum (Cem) and Dentine (Den)

Sample	*Level*	$^{234}U/^{238}U$	$^{230}Th/^{234}U$	$^{230}Th/^{232}Th$	*U [ppm]*	*U-series Age [ka]*	*% of corresponding ESR EU age*
94107 Den U	1	1.080 ± .007	0.078 ± .001	121 ± 1	31.3 ± 0.2	8.8 ± 0.1	44
94107II Den	1	1.083 ± .007	0.068 ± .001	418 ± 3	41.1 ± 0.2	7.6 ± 0.1	38
94103 Den 5	1	1.081 ± .006	0.044 ± .001	64 ± 1	21.5 ± 0.1	4.9 ± 0.1	18 to 22
94104 Den U	1	1.083 ± .004	0.040 ± .001	260 ± 1	31.7 ± 0.1	4.4 ± 0.1	19
94117 Den U	1	1.089 ± .007	0.046 ± .001	235 ± 7	36.5 ± 0.2	5.1 ± .1	not dated by ESR
95115 Den U	3	1.143 ± .009	0.071± .001	180 ± 1	27.6 ± 0.2	8.0 ± 0.1	not dated by ESR
95115 Cem U	3	1.131 ± .013	0.097 ± .001	199 ± 1	60.4 ± 0.7	11.0 ± 0.1	not dated by ESR
95116 Den 8	3	1.177 ± .005	0.147 ± .001	100 ± 1	7.8 ± 0.1	17.2 ± 0.2	49 to 59
95116 Cem U	3	1.124 ± .008	0.126 ± .001	316 ± 1	54.4 ± 0.4	14.6 ± 0.1	42 to 50
94118 Den U	3	1.137 ± .006	0.070 ± .001	17 ± 1	6.5 ± 0.1	7.8 ± 0.1	37
95114 Den	3	1.152 ± .005	0.194 ± .001	93 ± 1	2.7 ± 0.1	23.3 ± 0.1	61

quite similar, suggesting that this may also be true for Level 1. The cementum and dentine MSUS results range from 7.8 to 23.3 ka, which are 37 to 61% of the ESR EU ages. Based on Figure 13-1, this means that they fall into zones 3, 4, and 5, clustered near zone 4. Thus, the true burial age for this level will lie near the average LU age of 38 ± 5 ka. A mean coupled ESR/MSUS age of 41.9 ± 4.1 ka, based on the old style of beta dose modeling was also reported (Monigal et al. 1997) for this level. As is true for Level 1, these ages will also increase when the new coupled ROSY age calculations are made, but the increase will be greater in this level than in Level 1. This derives from the fact that the influence of the U on the ages is larger here because it has been absorbed over a longer period of time, rather than in Level 1 where it was absorbed closer to the end of the burial period (based on the younger MSUS ages). Thus, the statistically indistinguishable coupled ESR/MSUS ages reported earlier may spread apart enough to discriminate the relative time difference between the deposition of these two archeological assemblages. As in Level 1, this previously reported age must be considered a minimum age.

Starosele: Dosimetry in Level 3

For these teeth, the approximate ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is quite variable and ranges from 3/36/50/11 % to 1/62/30/7 % (EU model). The total annual doses ranged from 873 to 1471 μGy/a (EU model). The gamma plus cosmic dose (contributing from 37 to 61% of the total annual dose) was determined using a single in situ CaF_2 thermoluminescence dosimeter (TLD 100), which gave an annual dose rate of 534 μGy/a using a burial depth assumed to be 1 meter greater than the present day. Neutron activation analysis of sediment from the same hole (Gam Hole 5 in square I22, elev. -443 cm) yields a gamma plus cosmic dose rate of 423 μGy/a, which is about 21 % lower than the TLD value which was used in the age determinations. The hole was in a thin gravelly layer sandwiched by finer grained sediment. The gravel is less radioactive than the sediment, thus explaining the slightly lower value obtained by NAA. The in situ TLD measurement value was used for the age calculations.

Starosele: Ages in Level 4

Four teeth have been analyzed by ESR (Table 13-1) but no MSUS results are yet available in this level. Consequently, the EU and LU ages must be considered more preliminary than those reported above. The mean EU and LU ESR ages are 37 ± 10 and 48 ± 8 ka respectively. The LU model ages are stratigraphically consistent with the rather firmer age estimates for the overlying levels, however, it should be remembered that the true burial ages will most likely range from about 40 to values of greater than 48 ± 8 ka. Considering that the U concentrations are lower in this level than those in the overlying level (especially in the cementum), it suggests that the U-bearing waters that percolated through the site after deposition of the overlying levels were being depleted of U by the teeth and bones in those levels during the later part of the burial history of Level 4. It is not possible to judge what effect this might have on the uptake history in lieu of the MSUS ages. The minimum ages of ca. 41 ka for the overlying levels constrain the minimum age for this level to about 41 ka.

Starosele: Dosimetry in Level 4

For these teeth, the approximate ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is quite variable and ranges from 3/27/52/18 % to 1/70/22/7 % (EU model). The total annual doses ranged from 574 to 1329 μGy/a (EU model). No thermoluminescence dosimetry was done in Level 4. Due to the consistent yearly thefts of TLD's from other levels, it was decided to implant most of the dosimeters in the levels that had yielded the most teeth (many of these were also stolen), namely 1 and 3. The annual dose from gamma and cosmic radiation could have only been constructed from the sediment removed from two holes (Gam

Holes 7 in square I22, elev. -509 cm and Gam Hole 8 in square G21, elev. -519 cm). The relatively large distance from the dated teeth to Gam Hole 8 required that we use the sediment from Gam Hole 7 to reconstruct this dose, which was calculated to be 399 μGy/a, including a cosmic dose based on a burial depth assumed to be one meter greater than that of the present day burial level of the teeth. This gamma plus cosmic dose makes up from 29 to 70 % of the total dose received by teeth in this level.

Starosele: Ages in the "Below 4" Level

Two teeth were dated by ESR from this level, but no MSUS series ages are yet available. Consequently the EU and LU ages are preliminary, just as in Level 4. The mean EU and LU ages are 39 ± 5 and 55 ± 3 ka respectively. Again, these LU ages are stratigraphically consistent with the LU ages in the overlying level and the more refined ages for Levels 1 and 3. It is important, however, to remember that even the teeth from this level might only date to around 40-45 ka, or may date to >55 ± 3 ka. In this level, and in Level 4, the ages have been calculated assuming that the U in the enamel is real zero, as was observed in Levels 2 and 3. The last stage of the normal procedure of testing for U in the enamel is underway.

Starosele: Dosimetry in the "Below 4" Level

For these teeth, the approximate ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is quite variable and ranges from 3/52/31/14 % to 1/71/19/9 % (EU model). The total annual doses ranged from 655 to 1090 μGy/a (EU model). The single TLD implanted here gave uninterpretable results, so we used NAA of sediment to reconstruct the gamma plus cosmic dose rate. The sediment came from Gam Hole 1 (Square J22, elev. -598 cm) and yielded a dose rate of 298 μGy/a based on a burial depth assumed to be one meter greater than that of the present day burial level of these teeth. This gamma plus cosmic dose makes up from 28 to 45% of the total dose received by teeth in this level.

Discussion of Starosele Results

Effects of Moisture on Calculated Ages

One of the most criticized aspects of ESR dating of tooth enamel is the concern over the effect of fluctuating moisture content on the assumption of constant gamma and beta dose rate from the external environment of the tooth. This is much more important in sites where there has been little U-uptake into the teeth because the external dose then dominates over the internal doses. At Starosele, the relatively large U-uptake minimizes this effect, but to show how small the effect is, the ages were also calculated with a different moisture content in order to demonstrate the possible effect posed by inevitable moisture content fluctuations over time. The average moisture content measured for all samples taken from Levels 1 and 3 was 12.9 ± 2.8 %, which was used for ages reported in Table 13-1. For Levels 4 and "Below 4," a similar value of 10 ± 10% was used. For all the levels, the ages were recalculated using a moisture content value of 20 ± 10%. The results are reported in Table 13-3.

The increase in mean age with increased moisture content is only 1-2 ka in all cases, and the same reduction would occur if the moisture content was assumed to have been near zero for most of the burial history. These variations lie well within the standard deviation of the mean ages quoted for each level.

Comparison with other Published Ages for Starosele

Level 1. AMS ^{14}C ages of 41.2 ± 1.8 and 42.5 ± 3.6 ka BP (Hedges et al. 1996; Marks et al. 1997) were obtained on bone collagen from the same vicinity as our teeth, although another bone sample from the collections of Formozov's excavations in the 1950s yielded an age of 35.5 ± 1.1 ka. The former ages are consistent with the coupled ESR/MSUS age of 41.2 ± 3.6

TABLE 13-3
Starosele, Effects of Moisture Content on ESR ages

Level	*Mean EU ESR ESR Age (ka)*	*Mean EU ESR ESR Age (ka)*	*Mean LU ESR ESR Age (ka)*	*Mean LU ESR ESR Age (ka)*
	12.9% Moisture	20% Moisture	12.9% Moisture	20% Moisture
1	23 ± 3	24 ± 3	31 ± 3	32 ± 4
3	30 ± 6	31 ± 7	38 ± 5	39 ± 6
	10% Moisture	20% Moisture	10% moisture	20% Moisture
4	37 ± 10	38 ± 11	48 ± 8	50 ± 9
Below 4	39 ± 5	40 ± 5	55 ± 3	57 ± 3

ka based on old-style beta dose calculations (Monigal et al. 1997) which is a minimum age as mentioned above. The standard EU and LU model ages in Tables 13-1 and 13-3 have clearly been shown to be underestimates of the true age through use of U-series dating. Earlier reported preliminary mean ESR LU ROSY ages of 35.6 ± 3.9 (Marks et al. 1997) were based only on gamma dose reconstructions using sediments, but are statistically indistinguishable from the mean LU ROSY ages reported herein. The best ESR age estimate for this level at the present time is >41.2 ± 3.6 ka, which is entirely consistent with the expectation that ^{14}C ages of this time range should underestimate the true age by only a few thousand years (Mazaud et al. 1991) if they have not been contaminated by younger carbon.

Level 3. A single U-series age of 46.0 ± 2.5 ka on tooth enamel obtained by C. McKinney was reported by Marks et al. (1997). This age is based on a closed system assumption (early uptake) for the alpha-spectrometric U-series dating. This age is consistent with the previously reported coupled ESR/MSUS age of 41.9 ± 4.1 ka, which has to be considered a minimum age because of the beta dose calculation method, as discussed above. Thus the early uptake assumption for the enamel is very likely correct, based on verification through the coupled ESR/MSUS approach. Interestingly, this approach also shows that the correct uptake model for the dentine is near linear (see section above), as would be expected based on its structural and chemical similarity to bone, which is known to absorb uranium in a gradual fashion (linear uptake is a special case of gradual uptake). The early uptake situation for enamel has virtually no effect on the coupled ESR/MSUS ages because there is so little uranium dose within the enamel. The previously reported ESR ROSY LU age of 42.0 ± 4.7 ka (Marks et al. 1997) was a preliminary age based on gamma doses reconstructed from sediment, and is statistically indistinguishable from the ESR ROSY LU value of 38 ± 5 reported herein. In contrast to Level 1, the LU model ages have been shown to be approximately correct. The spread between the ages of Levels 1 and 3 can only be determined once the coupled ESR ROSY/MSUS ages are available.

Levels 4 and Below 4. C. McKinney reported an alpha-spectrometric age of 104.0 ± 8.5 ka using the closed system assumption of early uptake for the U-series dating. Until MSUS dating of our teeth from these levels is completed, it is not possible to properly compare the burial age estimate by ESR with this date. Nonetheless, the existing model ages of 37 ± 10 (EU) and 48 ± 11 (LU) are certainly much younger than this date, and the mean recent uptake (RU) age for this level is only 77 ± 6 ka, which provides an absolute maximum ESR age regardless of the MSUS ages obtained on these teeth (the RU model assumes that all of the U was absorbed in the last day of the burial period). Thus, this very old age will remain inconsistent with the ESR ages for this level, and there is no obvious explanation for this observation.

There are no other existing published ages for the "Below 4" level. The EU and LU model ages of 39 ± 5 and 55 ± 3 are older than those of the overlying levels, but the true burial age cannot be estimated until the MSUS ages are available.

Summary of Starosele Results

At this stage of the dating program, ESR dating results refined using MSUS dating have shown that Levels 1 and 3 are older than about 40 ka, consistent with the results of AMS ^{14}C and U-series dating done by independent laboratories. Through this intercomparison, these results for the first time prove beyond the shadow of doubt that the coupled ESR/MSUS dating approach is accurate even when relatively large amounts of U have been absorbed. Results for the lower Levels 4 and "Below 4" give age estimates which cannot be properly interpreted until the MSUS results are available, but the single U-series age from an independent laboratory on enamel for Level 4 is clearly older than any possible ESR-based age estimates. Based strictly upon the ESR and MSUS dating evidence, the age difference among these four levels may be as small as 1 ka, but may also be somewhat larger than about 5 ka.

Although it is clear that AMS ^{14}C dating of the in situ bone samples would have provided accurate age estimates for Level 1 in the absence of ESR and MSUS dating, only limited confidence could have been ascribed to the AMS ^{14}C dates because they extend beyond the practical range of this method (generally considered to be about 40 ka). Moreover, it would have been difficult to distinguish between the younger AMS ^{14}C age for the Formozov collection Level 1 sample and those ages from in situ material recovered from the recent excavations of Level 1 by Marks and collaborators, which now appear to be more correct. In Level 3, AMS ^{14}C dating was not successful because no bone collagen could be extracted. Thus, here ESR dating was essential and proved useful for confirmation of the single U-series date on enamel from another laboratory. In the lower levels, the ESR results stand in disagreement with the single U-series date on enamel from another laboratory for Level 4, and currently provide the only age estimates for the "Below 4" level.

KABAZI II RESULTS

ESR dating results (Table 13-4) were obtained on teeth from five archeological levels designated in descending stratigraphic order as II/1A, II/7B, II/8, III/2, and III/3. MSUS results (Table 13-5) for a limited number of dentine samples were obtained from Levels II/1A, II/7B, and III/3). Even larger amounts of U were taken up in these teeth than at Starosele, with the U concentration ranging from 47 to 88 ppm in the cementum, and 48 to 117 ppm in the dentine of the uppermost levels in the site. As was seen at Starosele, there is a distinct decrease in U in the teeth with deeper burial. For example, the average U in cementum and dentine were 14 and 19 ppm respectively for Level III/2. The dentine proved to be the dominant source of U-based dose to the enamel for almost every tooth in the site, and thus its U-series age is the most important to the interpretation of the EU and LU model ages. All of the teeth were *Equus hydruntinus* molars.

Kabazi II: Ages in Level II/1A

The mean EU and LU ages were 21 ± 5 and 32 ± 6 ka, respectively. Tooth 94207 had an MSUS dentine age of 15.0 ± 0.1 ka which was 58 and 71% of the two EU ESR ages of this tooth (subsamples A and B). Assuming that the cementum MSUS ages do not prove to be vastly different from the dentine result, this places the sample in the older range of ESR age zone 3 (sublinear uptake), suggesting that the true burial age is somewhat younger than the LU ESR age of 32 ± 6 ka. The large difference of 9 ka between the two subsamples of this tooth may be related to loss of some of the cementum in subsample A, which was quite pitted at the

TABLE 13-4
Kabazi II, ROSY ESR Ages on Enamel and Analytical Data

Sample	*Level*	*Square*	*Elev. (cm below datum)*	*Cementum U (ppm)*	*Enamel U (ppm)*	*Dentine U (ppm)*	*Early Uptake ESR Age (ka)*	*Linear Uptake ESR Age (ka)*
94206A	II/1A	Д9	-265	82.9	0.6	116.6	17 ± 1	28 ± 2
94207A	II/1A	Д9	-270	48	0.8	58.9	26 ± 2	38 ± 3
94207B	II/1A	Д9	-270	46.7	0.7	47.8	21 ± 2	29 ± 2
	Mean Level II/1A			**59.2 ± 20.5**	**0.7 ± 0.1**	**74.4 ± 36.9**	**21 ± 5**	**32 ± 6**
94212A	II/7B	M5	-415	64.5	0.6	53.8	22 ± 2	34 ± 2
94208A	II/7B	M4	-424	88.1	0.3	83.9	18 ± 2	29 ± 3
	Mean Level II/7B			**76.3 ± 16.7**	**0.5 ± 0.2**	**68.9 ± 21.3**	**20 ± 3**	**32 ± 2**
95100A	II/8	H5	-465	36.2	0.9	26.6	27 ± 2	39 ± 3
95105A	III/2	Г8	-671	20.9	< 0.1	25.5	48 ± 3	62 ± 5
95104A	III/2	Г8	-680	7.4	0.1	12.4	53 ± 5	60 ± 6
	Mean Level III/2			**14.2 ± 9.5**	**0.1**	**19.0 ± 9.3**	**51 ± 3**	**61 ± 1**
95101A	III/3	Г8	-698	17.1	0.3	26	53 ± 4	69 ± 5

time of recovery. The state of preservation of the teeth in Kabazi II was not as good as the teeth from Starosele, and we suspect that some of the cementum layer may have disintegrated during the burial period. But the age spread may also be an artifact related to the use of the linear uptake assumption for both cementum and dentine. In any case, the true ages will depend to some extent upon the uptake in cementum, too. The average EU and LU ages in Table 13-4 should not be regarded as accurate age estimates, although it is likely that the LU ages are more correct based on the MSUS dating of the single tooth studied thus far. The coupled ROSY ESR/MSUS ages will provide the best age estimate for this level.

TABLE 13-5
Kabazi II, Mass Spectrometric U-Series Ages for Dentine (Den)

Sample	*Level*	$^{234}U/^{238}U$	$^{230}Th/^{234}U$	$^{230}Th/^{232}Th$	*U [ppm]*	*U-series Age [ka]*	*% of ESR EU age*
94207 Den	II/1A	1.045 ± .011	0.129 ± .001	625 ± 4	60.7 ± 0.6	15.0 ± 0.1	58 to 71
94205 Den	II/7B	1.112 ± .011	0.128 ± .001	3582 ± 24	45.7 ± 0.4	14.9 ± 0.1	75
94209 Den	II/7B	1.039 ± .014	0.131 ± .003	337 ± 7	58.6 ± 0.7	15.3 ± 0.3	77
95101 Den	III/3	1.119 ± .011	0.463 ± .002	2575 ± 7	24.1 ± 0.2	66.7 ± 0.5	126

Kabazi II: Dosimetry in Level II/1A

For these teeth, the approximate ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is quite variable and ranges from 9/63/20/8 % to 3/84/9/4 % (EU model). The total annual doses ranged from 1258 to 2770 μGy/a (EU Model). A CaF_2 TLD (105) located in the same level near the two dated samples gave a gamma plus cosmic dose rate of 361 μGy/a, which was much lower than the values obtained by sediment analyses taken from the same hole, located directly within the thin occupation horizon (Gam Hole 4, square Д9, elev. -270 cm). The sediment gave a value of 897 μGy/a (including a calculated cosmic dose based on depth). This large discrepancy may be due in part to the high levels of U, Th, and K which were also found in the sediment collected with the teeth and used for the beta sediment dosimetry. The TLD sensed the gamma dose from a sphere of 30 cm radius which contained some larger limestone elements of lower radioactivity, but it is clear that the high radioactivity in the closest areas to the teeth should be considered as part of the influence of the dose rate. This high radioactivity was also found in another sediment from the same level (Gam Hole 2, at the corner of square Г8/Г9, elev. -250), which yielded a dose rate of 620 uGy/a. The average of the gamma plus cosmic dose rate of the two sediments from the holes (based on a moisture content value of 10%) and that found using the TLD was 626 μGy, and this average value from the three measurements was used for gamma plus cosmic dose in the age calculations.

Kabazi II: Ages in Level II/7B

The mean EU and LU ages are 20 ± 3 and 32 ± 3 ka, respectively. Thus far, two teeth from this level, which could not be dated by ESR because of crumbling weak enamel, have been dated by MSUS. They gave dentine ages of 14.9 ± 0.1 and 15.3 ± 0.3 ka, which are 75 and 77% respectively of the mean EU ESR age for this level. Normally, the comparison is made with the exact same tooth, but in this case, this is the best available comparison. However, the cementum is a rather more significant contributor of dose in this case, so the MSUS ages on cementum are quite important to the interpretation. These results are similar to those of Level II/1A and suggest that the probable burial age of this level would lie somewhere between the EU and LU ages. These ages, however, may be slightly underestimated due to lack of thermoluminescence dosimetry for this level (see below).

Kabazi II: Dosimetry in Level II/7B

For these teeth, the ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses ranges from 1/67/21/7 % to 2/75/17/6 % (EU model). The total annual doses to the tooth enamel ranged from 1908 to 2369 μGy/a (EU model). The two TLD's implanted in this level were stolen, thus the gamma plus cosmic dose had to be reconstructed from the sediments recovered from these positions (Gam Hole 5, square M3, elev. -428 and Gam Hole 6, square H3, elev. -412). These sediments yielded gamma plus cosmic dose rates of 471 and 630 μGy/a. The average value of 551 μGy/a was used for the gamma plus cosmic dose in the calculations, which constituted between 23 and 28 % of the total dose to the teeth. This level did show significant amounts of limestone rocks which may have caused the teeth to receive somewhat lower dose rates than those represented by the sediments. This would make the apparent ages too young.

Kabazi II: Ages in Level II/8

The mean EU and LU ages of a single tooth studied from this level are 27 ± 2 and 39 ± 3 ka. Although it is only a single tooth, its ages are older than any EU or LU ages in the overlying levels. Should the uptake model for this level be proven similar to that of the overlying levels, its age would lie between the EU and LU ages.

Kabazi II: Dosimetry in Level II/8

No TLD's were emplaced into this level, which was about 40 cm deeper than II/7B. The same sediments that were used in Level II/7B were used to reconstruct the gamma plus cosmic dose rate to this tooth. For this tooth, the ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is 9/53/28/10% (EU model). The total annual dose to this tooth was 1459 μGy/a (EU model).

Kabazi II: Levels III/2 and III/3

These levels are considerably deeper than the overlying levels, separated by a considerable thickness (almost 2 m) of sterile material above III/2. Hence it was expected that the ages might be considerably older than those for the overlying levels, which is probably the case based on the ESR and MSUS results. Taking the lowest of the two levels first, the MSUS age for dentine of tooth 95101 is 66.7 ± 0.5 ka, which is 126% of the EU ESR age. This suggests U-loss from the dentine which indicates that the true burial age lies within ESR Age zone 1 (fig. 13-1), which would make it younger (by an unknown amount) than the EU ESR age of 53 ± 4 ka. Teeth exhibiting U-loss are difficult to date because a reliable coupled ESR/MSUS age will not be calculable.

The teeth in overlying Level III/2 have not yet been dated by MSUS, and consequently their true burial age cannot yet be estimated. Although these EU and LU model ages are apparently older than those in the overlying levels, they should not yet be interpreted as providing confirmed ages for these levels. Nonetheless, the EU and LU ages also closely match the single age in Level III/3. Hopefully these teeth will yield MSUS ages that are younger than corresponding EU ESR ages, which will make ESR/MSUS ages calculable.

Kabazi II: Dosimetry in Levels III/2 and III/3

For the teeth in Level III/2, the ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses ranges from 3/26/66/5 % to 0/42/54/4 % (total annual dose range: 825 to 1023 μGy/a), while the tooth in Level III/3 had a ratio of 6/42/48/4 (total annual dose: 1133 μGy/a) (EU model). In the lower of the two levels (Level III/3) a TLD (107) was placed in Gam Hole 3 (square И9, elev. -700 cm). The gamma plus cosmic dose rate obtained by TLD was 599 μGy/a, which was very similar to the dose rate of 539 μGy/a based on NAA of the sediment taken from this hole and a cosmic dose rate based on an overburden of 8 meters. The age was calculated using the TLD value. In the overlying Level III/2, a reconstructed gamma dose based on sediment alone from a single hole (Gam 1, square K9, elev. -670 cm) was only 317 μGy/a, while the sediment collected with the teeth in both levels (used for the beta dosimetry) gave values closer to the TLD value from the nearby dosimeter in Level III/3. The best estimate of the gamma plus cosmic dose rate to the teeth in Level III/2 is the TLD from Level III/3, which was used for the age calculations in that level.

Discussion of Kabazi II Results

Effects of Moisture Content on ESR Ages

A moisture content of 10 ± 10% was used for the age calculations, which was assumed to be true for the whole burial period. If we assume that the moisture content was only 1% over the whole history of burial, the measured gamma doses would increase slightly, while the relative change in the sediment beta doses would have almost no effect on the ages because the cementum shields the enamel from nearly all of the sediment beta dose in almost every tooth. The slightly increased gamma doses would reduce the calculated ESR ages by 2-5% in the site, with the exception of a single tooth (95104A) where the low U in the cementum and dentine would let the age decrease by 8%.

Comparison with other Published Ages for Kabazi II

A single AMS ^{14}C age of 31,550 ± 600 years BP was reported (Hedges et al. 1996) for Level II/1, which lies in close contact with the overlying Level II/1A containing the dated teeth. This is consistent with the ROSY ESR age of tooth 94207 (see above) of < 34 ka in this level. Chabai (1996b) reported conventional alpha-spectrometric U-series dates by C. McKinney (McKinney and Rink 1996) on tooth enamel from Level II/1A of 30 ± 3 ka and from Level II/1 of 32 ± 6 ka which are based on the closed system assumption for U-series dating. These are also in good agreement with the burial age based on MSUS and ESR dating, which appear then to substantiate the closed system assumption for the teeth dated by that method in this level. In the same publication, Chabai reported our preliminary mean ROSY ESR LU age of 31.7 ± 2.2 for Level II/1A, which is now updated by the results in this paper. Hedges et al. (1996) also reported ^{14}C ages on bone collagen of 35,100 ± 850, 32,200 ± 900, and 33,400 ± 1000 BP for Levels II/2, II/4, and II/5 respectively, which is the sequence just below Level II/1, and an age of 34,940 ± 1020 BP for the cultural layer I/3 which overlies Level II/1A. Although the AMS ^{14}C dates are clearly out of stratigraphic order, there is general agreement among all the methods that the age of these levels in the site (II/1 down to II/5) lies in the range of 30-35 ka.

There are no comparative dating results published for Level II/7a.

Chabai (1996b) reported our (McKinney and Rink 1996) preliminary ROSY LU ESR date of 51.6 ± 4.4 ka (LU) for Level II/8, which is now updated by the new ROSY ESR ages of 27 ± 2 (EU) and 39 ± 3 ka for this same tooth. This significantly younger age results from the problems encountered with the original teeth used in reporting the preliminary age for Level II/8, which had preliminarily included mixtures of different parts of the enamel of a single tooth, a method which has been rejected as inviable through the new work with the beta attenuation studies in tooth enamel. (The Equus enamel from Kabazi II splintered apart very easily, which led us to make this approach in this instance.) The age reported in this paper utilizes a new tooth prepared in the standard way. This age is preliminary since no MSUS dating has been done to refine the true burial age. Chabai (1996b) also reported a conventional U-series alpha spectrometric date of 47.7 ± 7.5 ka by C. McKinney (McKinney and Rink 1996) on enamel from this level, based on the closed system assumption for U-series dating. This age is older than but statistically indistinguishable from our new ROSY LU age of 39 ± 3 ka for this level, but both of these ages are based on assumptions which have not yet been verified.

Chabai (1996b) reported our (McKinney and Rink 1996) preliminary ROSY ESR LU ages of 84.0 ± 1.6 and 82.0 ± 6.4 ka for two teeth from Level III/2, which are updated in this paper by new results for the same two teeth. The new mean ROSY ESR ages of this level (based on the same two teeth) are 51 ± 3 EU and 61 ± 1 LU; thus, the new LU ages are about 20 ka younger than the preliminary ages. This results from refined dosimetry (using a TLD) for this level, whereas the preliminary dates were based on gamma plus cosmic dose reconstructed from nearby sediments. No MSUS dates are available to determine whether the EU or LU model is more correct, but the data for the underlying level (see below) is relevant. Chabai (1996b) also reported a much older conventional alpha-spectrometric U-series age by C. McKinney on enamel from this level of 117 ± 13 ka, which is based on the closed system assumption for U-series dating. This age is much older than any of the ESR ages, but the ESR results cannot be properly compared against this age until MSUS ages are available. This result, however, seems too old in light of the relevant lithological and pollen data (see below).

There are no comparative dating results published for Level III/3, but the MSUS results and ESR results in this level constrain its age to < 53 ± 4 ka. The overlying level must predate this time and thus the mean LU ROSY ESR age in that Level (III/2) of 61 ± 1 ka is too old. The EU ages in that level agree closely with the EU ages in this level, but see the discussion below regarding ambiguities in the ages of these levels.

The reported ages in Levels III/2 and III/3 are based on the best dosimetry available (TLD), but they are somewhat ambiguous in that use of sediment for gamma dosimetry would place them into the 70 (EU), 80 (LU) ka range. In that scenario, the MSUS ages of 66 ka for the dentine of the tooth in Level III/3 would lead to the interpretation that an age of 70 ka is the correct age of burial (see fig. 13-1). It is not clear at the present time whether the true age is < 53 ± 4 (as reported above) or about 70 ± 5 ka. More MSUS dating of the enamel from Level III/2 may help in this regard. The lithology and the pollen data suggest that stratigraphic layer 11, which contains Levels III/2 and III/3, was deposited during persistent cold winters after a warmer wetter period (Chabai 1996b). If we accept that the Crimean temperatures fluctuated directly according to the global climate reflected by the marine oxygen-isotope record, this immediately suggests that the true burial age of the level might lie within the global cold period of oxygen isotope stage 4, but it does not rule out deposition during a colder part of stage 3. This age range of about 75 to 45 ka is consistent with the possible range of ESR ages we have just described.

Summary of Kabazi II Results

There is good agreement between the dating methods in Level II/1A, although the ESR result remains poorly constrained until the ROSY ESR/MSUS coupled ages can be calculated. The lack of thermoluminescence dosimetry in Level II/7B reduces our confidence in the ESR ages for this level, because the lack of dosimetry may bias the ages in the direction of being too young. In Level III/2 and Level III/3, the large discrepancy between independent U-series dating of enamel and our combined efforts with ESR and MSUS dating of dentine is problematic. There is also ambiguity associated with the wide range of results possible in Levels III/2 and III/3 based on choices about gamma dosimetry. Further MSUS dating and gamma dosimetry may possibly resolve these issues.

KABAZI V RESULTS

Dating results (Tables 13-6 and 13-7) were obtained using teeth from two different levels in the site: III/1 and III/1A. The uranium uptake was not as severe as at Kabazi II, but was similar to that observed at Starosele. U concentrations in cementum and dentine ranged from 10 to 50 ppm, while the enamel contained the same low levels (<0.4 ppm) seen in most of the teeth from the other two sites (except for a single saiga tooth in Level III/1A with U = 1.19 ppm in the enamel). All of the other teeth were *Equus hydruntinus* molars.

TABLE 13-6
Kabazi V, ROSY ESR Ages on Enamel and Analytical Data

Enamel Sample	*Level*	*Square*	*Elev.* †	*Cementum U (ppm)*	*Enamel U (ppm)*	*Dentine U (ppm)*	*ESR EU Age (ka)*	*ESR LU Age (ka)*
94301 IIA	III/1	Л9	-539	49.6	0.3	29.5	23 ± 1	32 ± 2
94303 IIA	III/1	39	-571	18.5	0.1	21.4	24 ± 2	31 ± 2
94303 IIIA	III/1	39	-571	33.7	< 0.1	10.2	26 ± 2	30 ± 3
Mean Level III/1				**33.9 ± 15.6**	**0.2 ± 0.1**	**20.4 ± 9.7**	**24 ± 2**	**31 ± 1**
94304 IIIA	III/1a	B9	-538	N/A	1.19	38.0	41 ± 2	55 ± 4

N/A: not applicable (no cementum layer present on the Saiga tooth), † cm below datum.

Kabazi V: Ages in Level III/1

In this level, three teeth were dated by ESR, with supporting MSUS data on dentine and cementum from one of those teeth. The mean ESR ages are 24 ± 2 (EU) and 31 ± 3 (LU) ka. The tooth dated by MSUS gave a cementum age of 22.1 ± 0.1 ka and a dentine age of 10.8 ± 0.1 ka, which were 96 to 47% of the EU ESR age of 23 ± 1 ka for that tooth. Figure 13-1 shows that this places the enamel into the entire range of ESR age zone 3, since the cementum age lies just over the boundary of zone 2, while the dentine is just over the boundary into zone 4. The relative dose contributions are about 50/50 because the cementum is about 1/2 the thickness of the dentine, but has twice as much U in it. Thus the true age should be roughly halfway between the EU and LU ages, which is about 28 ± 2 ka. This will approximately be the ROSY ESR/MSUS coupled age. The other teeth in this level show similar ESR ages, and thus, they might also have the same uptake behavior as the well-studied tooth.

TABLE 13-7
Kabazi V, Mass Spectrometric U-Series Ages for Cementum (Cem), Dentine (Den), and Enamel (Enam)

Sample	*Level*	$^{234}U/^{238}U$	$^{230}Th/^{234}U$	$^{230}Th/^{232}Th$	*U [ppm]*	*Age [ka]*	*% of ESR EU age*
94301AII Cem	III/1	1.029 ± 0.731	0.184 ± .001	736 ± 2	48.8 ± 0.3	22.1 ± 0.1	96
94301AII Den	III/1	1.015 ± .005	0.095 ± .001	424 ± 2	26.6 ± 0.1	10.8 ± 0.1	47
94304III Enam	III/1A	1.069 ± .004	0.325 ± .026	220 ± 18	1.71 ± 0.1	42.6 ± 4.2	104
94304III Den	III/1A	1.063 ± .005	0.421 ± .002	708 ± 2	31.4 ± 0.1	59.1 ± 0.4	144

Kabazi V: Dosimetry in Level III/1

For the teeth in Level III/1, the ratio of time-averaged alpha/ beta/ gamma/ cosmic annual doses ranges from 0/34/53/13 % to 3/49/39/9 % (EU model). The total dose to teeth ranged from 1004 to 1366 μGy/a (EU model). One TLD was implanted within Level III/1 in Gam Hole 2 (square 8Д, elev. -584). It was within 90 cm of tooth 94303, while sediment was extracted both from this hole and another hole in this level (Gam Hole 1, square 83, elev. -544 cm), which was 60 cm away from tooth 94301. The CaF_2 TLD (97) yielded a gamma plus cosmic dose of 663 μGy/a, while the sediments yielded doses based on NAA and moisture contents of 1% (as measured) of 598 μGy/a and 687 μGy/a. The close agreement increases our confidence in the accuracy of the ESR age estimates, and suggests the sediments in the site are very homogeneous with respect to gamma radiation dose. The TLD value was used for the age calculations.

Kabazi V: Ages in Level III/1A

This level is stratigraphically very close to the overlying Level III/1 and thus would be expected to have a similar age. Only a single tooth from this level was dated—a saiga tooth—that did not have a thick layer of outer cementum like most of the Equus teeth. Interestingly, it had the highest U content of all of the teeth, indicating that exposed enamel area is important to the earlier stages of U uptake into teeth. The same tooth was studied using MSUS, which gave an enamel age of 42.6 ± 4.2 ka and a dentine age of 59.1 ± 0.4 ka which are 104% and 144% respectively of the ESR EU age of 41 ± 2 ka. The enamel age is indicative of ESR age zone 2, suggesting early uptake in the enamel. If we were to use the closed system model for U-series dating, as often invoked by C. McKinney, the age of the burial would be considered 41.2 ka, but this is at least 9 ka older than the layer just above and in contact with Level III/1A. Hence, it would appear that the closed system assumption for enamel might not hold in this case. The dentine MSUS ages suggest that there has been U-loss (ESR age zone 1) from the dentine. From Figure 13-1, this suggests that the true burial age would be younger than the EU ESR age (by an unknown amount). This would require that the U-concentration in the dentine of the tooth had been higher than the present-day value of 38 ppm, and that the calculated ESR EU age might then be overestimated (by an unknown amount) due to the unaccounted for additional dose that it had imparted before it was lost. An extreme interpretation would have been that very recent uptake followed by some loss had occurred, which would lead to an interpretation that the ESR EU age would be too young. The best estimate of age is <41-43 ka, based on all of the available evidence, including stratigraphic evidence that suggests no depositional or erosional hiatus between Levels III/1 and III/1A. The ESR LU age can be confidently ruled out as the correct burial age. Because of the U-loss observed here, ROSY ESR/MSUS coupled ages cannot be calculated because the possible modes of U-uptake in the calculation are only allowed to involve U-uptake, but not U-loss.

Kabazi V: Dosimetry in Level III/1A

For this tooth, the ratio of time-averaged alpha/ beta/ gamma/cosmic annual doses is 14/42/36/8 % (EU model). The total dose rate was 1492 μGy/a. No TLD was buried in this level, but a sediment sample just in contact with the tooth was collected for beta dosimetry. This sample had extremely high U content upon analysis in the lab, indicating that breakdown of the tooth during shipment had contaminated the sediment with the high U of the cementum and dentine (the tooth was not well preserved and easily broke apart during preparation for ESR dating). We therefore reconstructed the beta dose using the sediment from Level III/1 and used the TLD value from that level to reconstruct the gamma plus cosmic dose. In the case of this rather homogeneous site, this is not a seriously problematic assumption for reconstruction of the doses. An additional sample of sediment collected from a zone within 10 cm of the tooth is under analysis now to confirm this.

Discussion of Kabazi V results

Effects of Moisture on ESR ages

All of the age calculations were based on a moisture content of 1%, as measured at the site in summer. If we assume that the average moisture content over the entire burial was much higher, then the mean EU ESR ages in Level III/1 increase to 26 ± 2 ka and the mean LU ages increase to 33 ± 2 ka. The age of the single tooth in Level III/1A increases to 43 ± 3 (EU) and 58 ± 4 (LU) ka. These changes are 4 to 6% of the age and lead to very slight increases in the possible ages for the levels discussed above: about 29 ka for Level III/1 and <43 ka for Level III/1A.

There are no published ages for Kabazi V for intercomparison with these ages.

Summary of Kabazi V Results

The best age estimates are about 26 to 30 ka for Level III/1 and <41 ka for Level III/1A. We have strong confidence in the dates from Level III/1 because of the homogeneity of the gamma dose in the sediment and because of the MSUS results. Although the U-loss problem does not allow us to make a confident assessment of the true absolute age of Level III/1A, it appears that it cannot be more than 10-14 ka older than the overlying level, and stratigraphic evidence suggests that this difference is probably less than 9 ka.

Summary of Results for Starosele, Kabazi II, and Kabazi V

Figure 13-2 shows the results of the dating program thus far. The entire site of Starosele is clearly older than Level III/1 at Kabazi V and Level II/1A at Kabazi II. Level III/1 at Kabazi V appears to be slightly younger than Level II/1A at Kabazi II, although they might overlap. The middle range of levels at Kabazi II (II/7B and II/8) may or may not overlap with the lower Level at Kabazi V, and it is difficult to say if these Kabazi II levels post-date the Starosele deposit, or are contemporaneous with it. It is not possible to say if the Level 4 or "Below 4" deposits at Starosele are much older than the rest of the deposit, and hence it is not yet possible to say if they pre-date any of the Kabazi II deposits. Levels III/2 and III/3 at Kabazi II may be older than, but are possibly contemporaneous with, some of the Starosele deposit. Given the data in its present form, we can conclude that there is a large degree of overlap in time among the various Paleolithic industries in the area. We can also conclude that all of the occupational levels which have been studied could have been deposited within a time span as short as 20,000 years (about 30-50 ka) or as long as 40 ka (about 30-70 ka).

At the outset of this program, ESR dating in the time range of 25-40 ka remained completely untested. Through this study, which allowed a number of comparisons with AMS ^{14}C dating, it has been made clear that even under the conditions of significant U-uptake, the combination of ESR and mass spectrometric U-series dating can provide reliable, accurate results. Although there are clearly situations where this approach fails to give results with a sufficiently small uncertainty that render them better than an uncalibrated ^{14}C age, it has become clear that this approach is particularly useful in the time range of 35-45 ka, where ^{14}C results are susceptible to contamination and where no bone collagen or charcoal can be found.

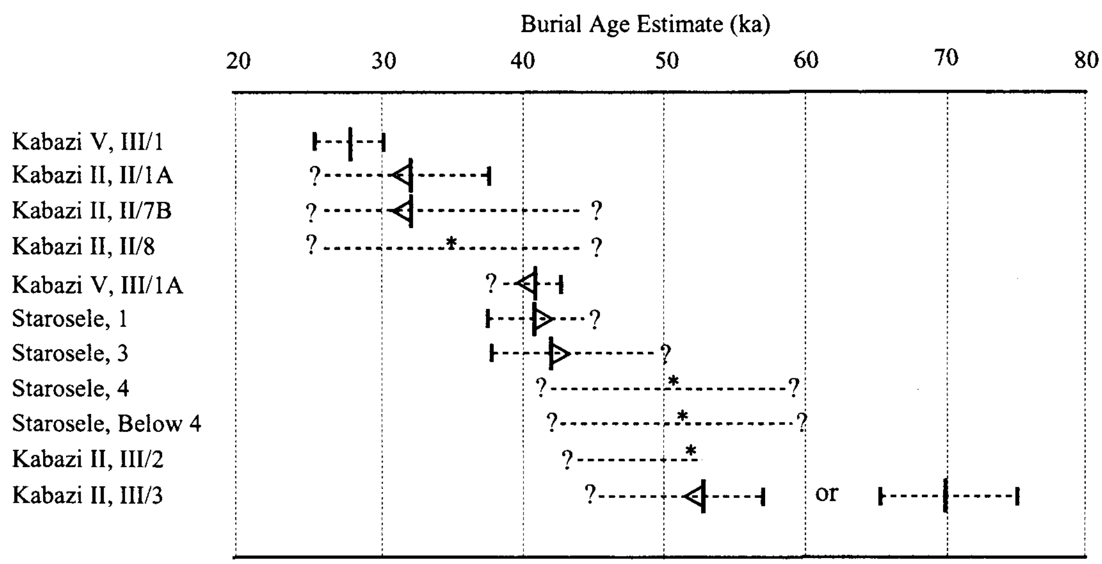


Fig. 13-2—Best estimates of burial age based on ESR and MSUS dating arranged in approximate chronological order. Large solid vertical lines are benchmark ESR ages constrained by MSUS dating (except for Starosele 1 and 3, where this line is the benchmark minimum coupled ESR/MSUS age based on old beta attenuation calculations). The attached arrow on the large vertical lines indicates the direction of the true burial age from the benchmark value. Smaller solid vertical lines represent the uncertainty range of the benchmark ESR age. The question marks on the same side as the arrow indicate that the distance from the benchmark is not yet known but should be better constrained later by coupled ROSY ESR/MSUS ages. The asterisks indicate that the age range (represented by the dotted horizontal line) is essentially constrained by the age in a level above or below it in the same site, because no MSUS data is available for that level. When no arrow is present, the age is the best estimate based on combined ESR and MSUS data that does not have a directional dimension. The dotted line and question mark on the older age side of the Kabazi II, Level II/7B benchmark is related to ambiguity regarding the lack of in situ dosimetry.

Chapter 14

URANIUM SERIES DATING OF ENAMEL, DENTINE, AND BONE FROM KABAZI II, STAROSELE, KABAZI V, AND GABO

CURTIS R. MCKINNEY

INTRODUCTION

One of the focal points of the joint Ukrainian/American project investigating the Middle Paleolithic of Western Crimea was to obtain as many absolute dates on Paleolithic sites in the region as possible. Beginning in 1992, a sequence of teeth from multiple Middle Paleolithic localities, including from the sites of Kabazi II, Kabazi V, GABO, and Starosele, was studied. Each year of the continuing project produced new documented samples from excavated squares. This paper is a review of the uranium series chronology of those localities.

The uranium series analysis of fossil teeth and bone began with Cherdyntsev (1956) who had attempted bone dating in the USSR, including at the site of Starosele, though the paper was not available in the West until later. In the West, Rosholt (1957) independently demonstrated that uranium series dating (USD) of bone was feasible. The dating of bone in general has been shown to produce minimum ages in most sites (Schwarcz and Blackwell 1992). The dating of teeth (enamel, dentine, and cementum) was not attempted systematically until the late 1970's with the work of McKinney (1977). Recently, the subject was re-examined by McKinney (1991), who demonstrated that tooth enamel was the best material in the skeleton for dating, using early uptake assumptions. Schwarcz and Blackwell (1992) have suggested that enamel may show greater variation in age quality beyond the range of radiocarbon dating, based on their assumptions of linear uptake used in electron spin resonance dating (ESR). The different and incompatible assumptions between USD and ESR were discussed by McKinney (1990), who argued that comparisons between radiocarbon and USD of tooth enamel had shown that early uptake of uranium was the primary mode, not continuous uptake (linear uptake), as assumed by ESR researchers.

The determination of uranium series ages is based on the decay of the long lived isotopes ^{238}U to ^{234}U to ^{230}Th with half-lives of 4.5 x 10^9; 250,000; and 75,200 years, respectively (fig. 14-1). For any absolute dating, closed-system conditions are necessary and must meet three conditions:

(1) Uranium must be absorbed rapidly and then be sealed from further absorption or loss;

(2) ^{230}Th must not be present and must accumulate only by production from the decay of ^{234}U; and,

(3) ^{230}Th is only lost via decay to daughter isotopes (Cherdyntsev 1956; Rosholt 1957; Ivanovich 1982).

In the environment, the soluble uranium becomes separated from insoluble thorium. Bone phosphate absorbs uranium readily from ground water after the death of the animal due to conditions generated by the organic decay process (McKinney 1977; Szabo 1980). Under these conditions, reduced uranium is absorbed into the phosphate; but on the completion of the organic loss, this absorption ceases. Tooth enamel has been shown to behave in a closed system manner in geochemically neutral spring environments (McKinney 1977, 1991), but

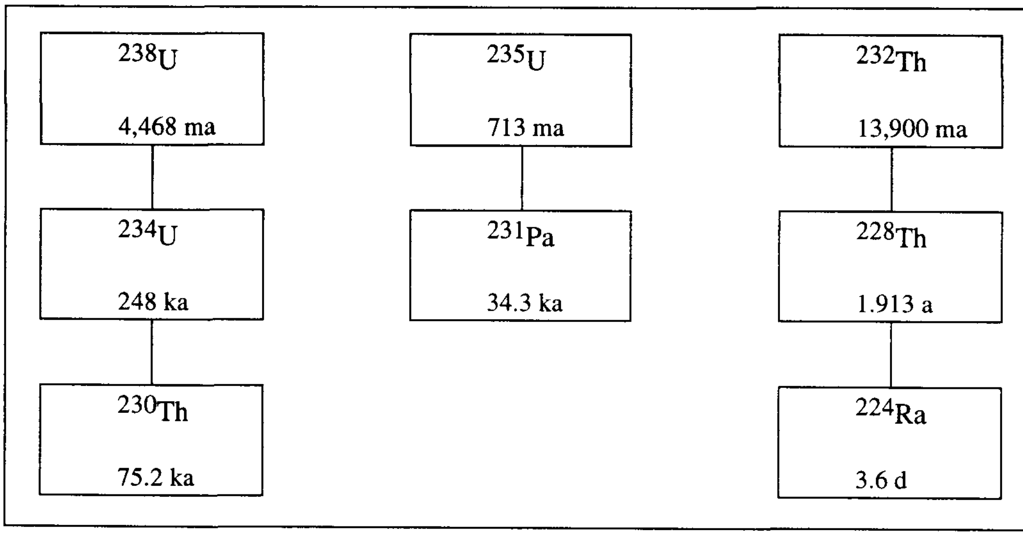


Fig. 14-1—Alpha emitting isotopes and their half-lives which are used in uranium-series dating (McKinney 1991).

produced inconsistent ages in active geochemically arid environments (McKinney 1992) and in interior cave environments (Bischoff and Rosenbauer 1981).

METHODS

The procedures for alpha spectrometry and associated chemical techniques are reviewed in Ivanovich and Harmon (1982, 1992). Briefly, the sample is cleaned of any dirt or preservative by hand. The enamel and dentine must be separated, since dentine contains 10 to 100 times the uranium content of enamel (McKinney 1977, 1991). The separation can be accomplished by hand, or a finely crushed sample may be separated using heavy liquids such as bromoform by density differences between enamel (sp. gr. 3.1) and dentine (sp. gr. 2.5). Density separation is most successful with dentine and enamel that have uranium contents of less than 10 : 1. The bromoform-soaked enamel is cleaned with acetone and dried. The dry enamel is weighed, then ashed at 800° Celsius for about eight hours. The fired sample is re-weighed to determine weight loss on ignition. The dissolution of the sample in 8 N nitric acid and 10% hydrogen peroxide occurs after it is combined with $^{232}U/^{228}Th$ or $^{236}U/^{229}Th$ spikes—whose concentrations are known so that yields can be calculated (the yield must be determined because uranium and thorium behave differently chemically and will have different proportions at the end of the procedure). The nitric acid and hydrogen peroxide oxidize any remaining organic residues, and, to ensure that uranium is in the +four state, the solution is heated and allowed to dry to equilibrate the various spikes with the sample.

By using a combination of ion exchange and co-precipitations, the uranium and thorium isotopes are separated and purified (Rosholt 1957). The dried mixture is dissolved in 8 N hydrochloric acid, and the uranium and thorium are separated by passing the solution through an anion exchange column (dowex 1, 100 to 200 mesh). The procedure is repeated for uranium, whereas the thorium is collected in solution with 8 N hydrochloric acid prepared for co-precipitation with zirconium pyrophosphate. The thorium solution is evaporated to about 15 to 25 mls and diluted to 200 mls with distilled water. After heating to boiling, 20 to 30 mgs of zirconium are added to co-precipitate the thorium with pyrophosphate created during the firing procedure. The precipitate, collected and washed in distilled water, is dissolved in oxalic acid. The oxalic solution is brought to a boil. The thorium is dissolved in 7.5 N nitric acid and passed through a second anion exchange column to remove the remaining non-thorium elements. For some samples, an iron carrier is added to produce iron hydroxides, co-precipitating the thorium. This step is inserted to remove non-thorium elements not eliminated by the anion exchange step. The purified thorium is ready for plating by extracting from 0.1 N nitric acid into 2-thenoyltrifluoroactone (TTA) in benzene (1 ml). The drop of TTA is evaporated on a steel planchette. The uranium is processed using the same procedure after the second anion exchange step. The discs are placed in a vacuum and are counted by an alpha spectrometer. The spectra indicate the total number of alpha counts (400 to 20,000) for each isotope for an interval of time (five to 10 days). These data are reduced to activity ratios, and, from these ratios, the age, concentrations, and yield are calculated.

After the absorption of uranium, the isotopes begin to build toward equilibrium by building the missing daughters in the chain isotopes. By measuring the radioactivity of each isotope, each can be compared (equal activity indicates equilibrium, whereas unequal activity indicates the opposite). Comparisons are made by creating isotopic ratios of adjacent daughters in the chain. Uranium ratios ($^{234}U/^{238}U$) that are greater or lesser than one approach equilibrium with a half-life of 250,000 years. Thorium ratios ($^{230}Th/^{232}Th$) are used to determine the level contamination from pre-existing ^{230}Th in association with natural ^{232}Th in the sample (low ratio <50 contamination is significant, >50 is not significant). The presence of ^{232}Th indicates some contamination. Age ratios ($^{230}Th/^{234}U$) are assumed to start at zero and grow with a half life of 75,200 years to one. The age ratio ($^{230}Th/^{234}U$) is calculated using the spike concentration to eliminate distortions caused by differences in elemental yields during chemical procedures. Since uranium-series dating depends on multiple decaying and growing isotopes, ages are calculated using $^{234}U/^{238}U$ and $^{230}Th/^{234}U$ ratios (fig. 14-2) with the UTAGE3 computer program (Ivanovich and Harmon 1982). The isotopic error is added or subtracted to the isotopic ratio and an age is calculated. The difference provides the error range for the date (the plus error is always larger than the minus error).

RESULTS

The results for each site are presented in Tables 14-1 through 14-4. At Kabazi II and Starosele, a number of the major archeological units were dated, but dates at Kabazi V and GABO are from a single stratigraphic unit each (fig. 14-3). The sample codes represent the spiking number–sample number–material type (enamel=E, dentine=D) –series (1, 2, and 3). The last indicates multiple analysis. The results shown represent complete sets of uranium and thorium data. Samples that were incomplete by not having either a uranium or thorium spectrum, or having low yields (<5%), or low count rates (< one count per six hours), are not presented because of their very high uncertainties.

DISCUSSION

In this study, multiple analyses were conducted on different teeth from each archeological unit and level. The results produced surprises and unexpected problems. The problems were primarily with contamination from tiny amounts of dentine that remained on the enamel and persistent low isotope yields during chemical separations. The contamination can be graphically removed if 232Th is present to provide a tracer; 232Th indicates outside thorium has entered the system since 230Th is always present with natural thorium. Any material that contains thorium that is incorporated into the sample can be graphically removed by plotting the 230Th/232Th and 234U/232Th activity ratios of each. Samples in related groups will produce linear associated samples, the slope of which indicates the corrected 230Th/234U age ratio. The corrected uranium ratio is produced by plotting the 234U/232Th and 238U/232Th and taking the slope of those points. Low levels of 232Th contamination were found in many

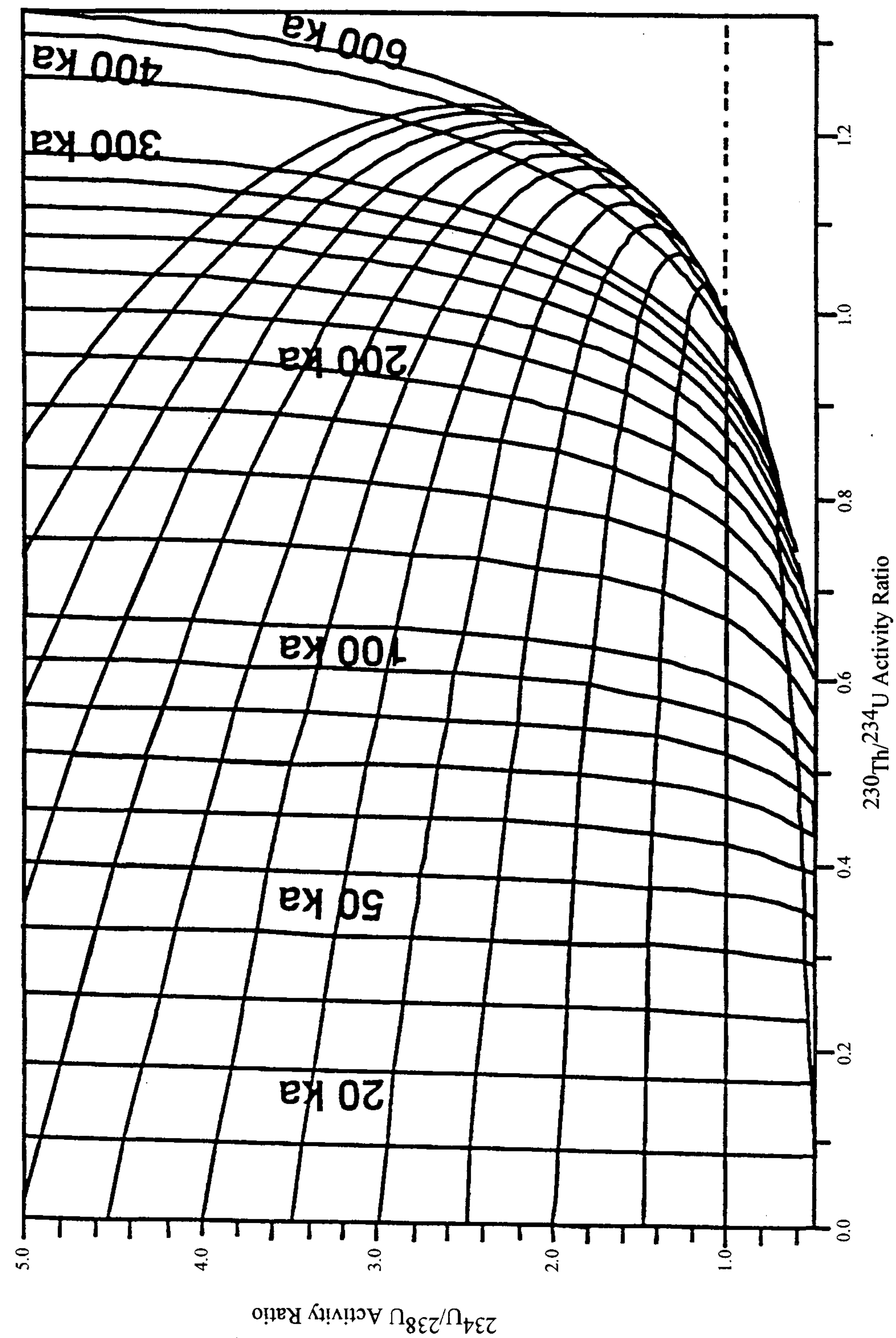


Fig. 14-2—Graph for determining uranium-series ages (McKinney 1991).

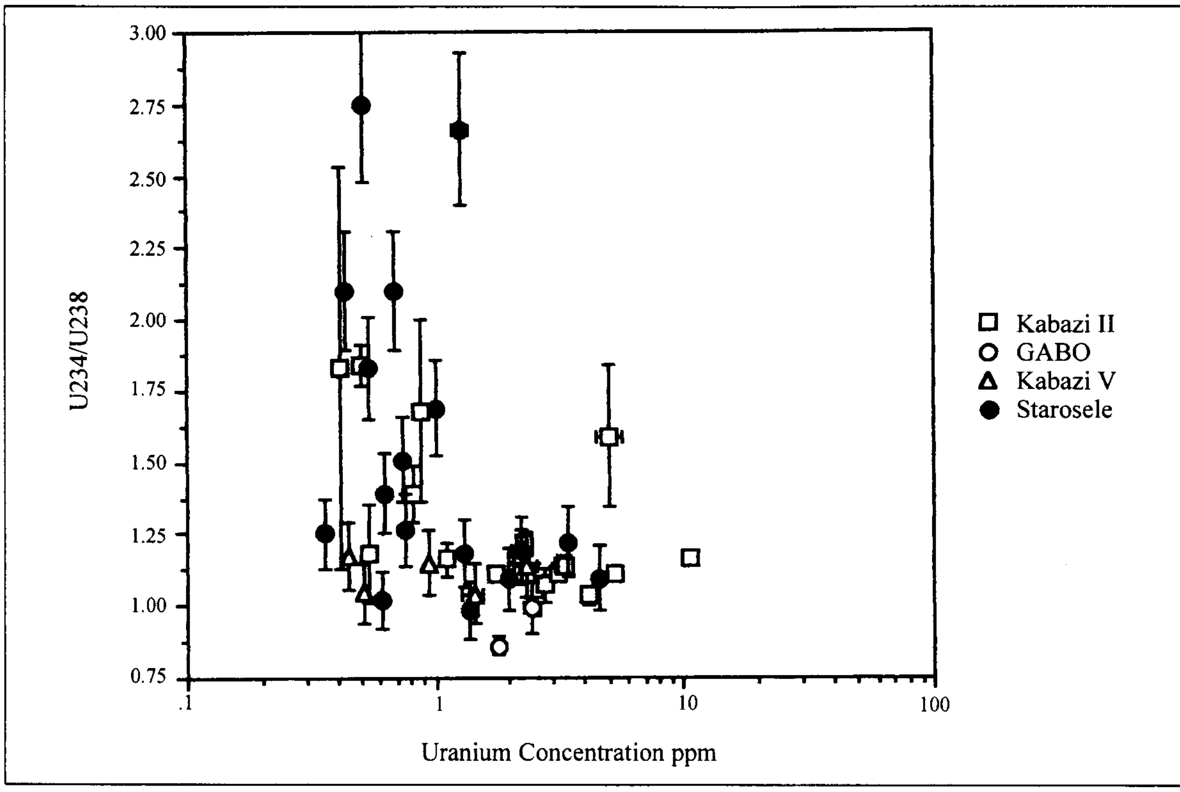


Fig. 14-3—Distribution of samples by their uranium content and uranium ratio for each site.

samples. Generally, low levels of 232Th (230Th/232Th >50) are not considered significant and corrections are not made. In the Crimean samples, dentine can be treated as contamination that contains 232Th but has greater effect of higher uranium than clastic contaminates that are ubiquitous in carbonate deposits. The other problem of low yields was corrected by adjusting the chemical procedures and reanalyzing the samples. Most of the first and second series were lost because of these problems. The third series was the most successful and produced the bulk of the data in this report.

KABAZI II

The uranium series results from each stratigraphic zone show that the Middle Paleolithic cultural deposits at Kabazi II range in age between 35 and 55,000 years BP. Kabazi II is divided into five units, each containing several archaeological levels and horizons. Uranium concentrations ranged from 0.3 to 10 ppm, without any pattern indicating progressive uranium uptake (linear or continuous). Progressive absorption of uranium over time with enamel that shares the same environment should show older enamel having higher uranium contents than younger enamels. At Kabazi II, uranium ratios ($^{234}U/^{238}U$) consistently are less than 1.2, except for a group of similar tooth enamels in Level II/7F8 and Level III/2 that are distinct from all other samples, with uranium contents lower than average, and uranium ratios greater than 1.2. Assuming some contamination from uncleanable dentine, the sample data were plotted by level to determine if any distortions occurred. The results indicate that Kabazi II is a closed system, since average ages and ages produced by the plots are very similar.

Kabazi II, Level I/3

Two tooth enamels and a dentine were processed from Level I/3 (221-281-E-3; 224-289-E-3; 127-289-D-1). In most environments, dentine is unreliable for dating, because of rapid and

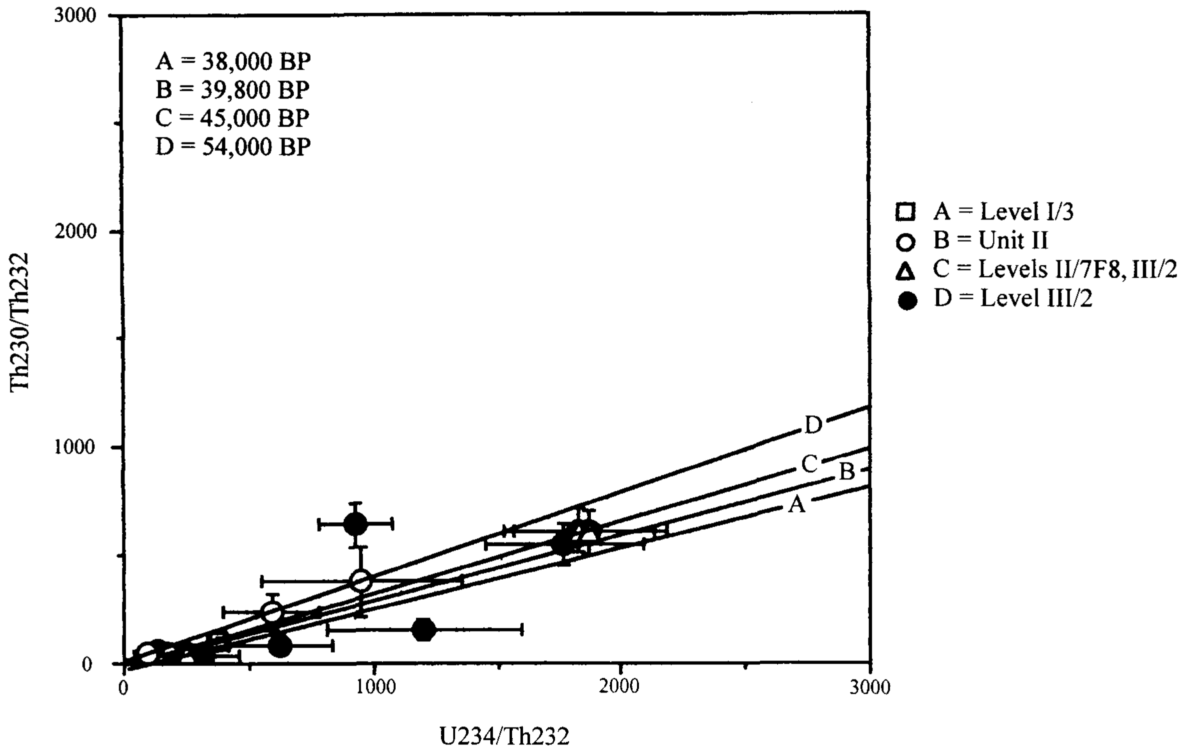


Fig. 14-4—Kabazi II, Plot of Th^{230}/Th^{232} and U^{234}/Th^{232}.

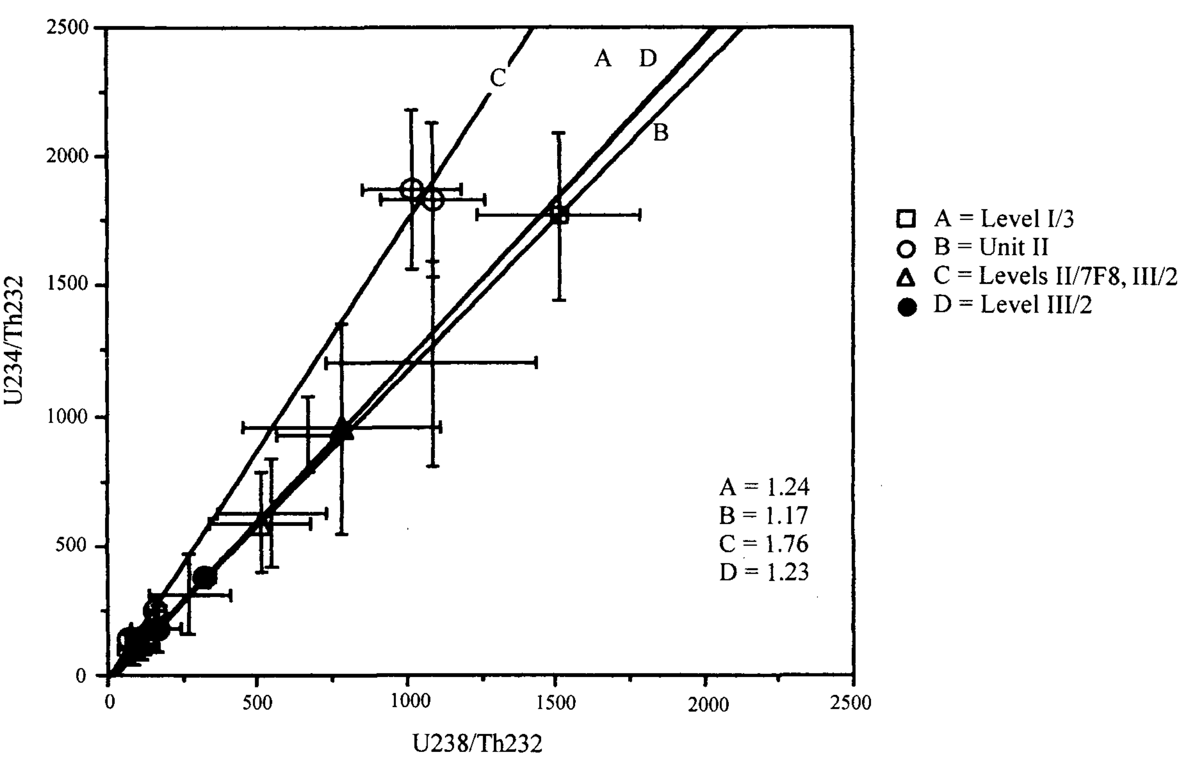


Fig. 14-5—Kabazi II, Plot of U^{234}/Th^{232} and U^{238}/Th^{232}.

TABLE 14-1
Kabazi II

Unit/ Level		Sample Number	Uranium ppm	Thorium ppm	U^{234} $/U^{238}$	Th^{230} $/Th^{232}$	Th^{230} $/U^{234}$	Age K years BP
I	3	221-281-E-3	4.1 ± 0.1	0.12 ± 0.04	1.04 ± 0.03	27.3	0.22 ± 0.02	27. ± 1/1
I	3	224-289-E-3	2.8 ± 0.1	0.04 ± 0.01	1.08 ± 0.03	44	0.25 ± 0.01	31. ± 1.5/1.5
I	3	127-289-D-1	1.1 ± 0.06	<0.01	1.16 ± 0.08	104	0.28 ± 0.03	34.7 ± 4.5/4.4
II	1	58-282-E-2	2.2 ± 0.1	<0.01	1.17 ± 0.04	549	0.31 ± 0.02	40.1 ± 5/4.7
II	1	225-290-E-3	3.3 ± 01	0.02 ± 0.01	1.14 ± 0.03	89.4	0.14 ± 0.01	16.7 ± 0.6/0.5
II	1A	39-291-E-1	2.5 ± 0.2	<0.01	1.06 ± 0.09	43	0.26 ± 0.04	32.1 ± 6.5/6
II	1A	226-291-E-3	5.3 ± 0.1	0.01 ± 0.002	1.11 ± 0.02	153	0.13 ± 0.003	14.7 ± 0.4/0.4
II	7	199-288-E-3	0.6 ± 0.1	0.02 ± 0.01	1.2 ± 0.2	36.7	0.35 ± 0.05	46.5 ± 8/7
II	7F8	222-283-E-3	3.4 ± 0.1	0.03 ± 0.01	1.14 ± 0.03	36.4	0.12 ± 0.01	13.9 ± 0.3
II	7F8	37-293-E-1	0.4 ± 0.1	<0.01	1.8 ± 0.7	50	0.37 ± 0.1	48.3 ± 17/15
II	7F8	228-293-E-3	1.8 ± 0.1	0.04 ± 0.01	1.11 ± 0.02	64.8	0.46 ± 0.01	65.5 ± 2.5/2.4
III	2	63-284-E-2	0.8 ± 0.1	<0.01	1.4 ± 0.1	640	0.69 ± 0.04	117. ± 13/12
III	2	210-284-E-3	2.3 ± 0.04	0.02 ± 0.01	1.22 ± 0.02	379.2	0.40 ± 0.01	53.9 ± 2/2
III	2	56-285-E-2	0.9 ± 0.1	<0.01	1.7 ± 0.3	613	0.34 ± 0.04	43. ± 7/6
III	2	223-285-E-3	10.6 ± 0.2	0.06 ± 0.01	1.16 ± 0.02	240.3	0.41 ± 0.01	55.8 ± 2/2
III	2	65-292-E-2	0.5 ± 0.02	<0.01	1.84 ± 0.07	606	0.32 ± 0.02	41.1 ± 2/2
III	2	227-2923	3.1 ± 0.06	0.1 ± 0.02	1.11 ± 0.03	46	0.48 ± 0.01	69.7 ± 3/3

contiguous uranium uptake, but, sample 127-289-D-1 has the same uranium content as its associated enamel, suggesting a similar geochemical history and indicating the site is stratigraphically a closed system. They had an average age of 31,000 ± 3,000 years BP. The plots (figs. 14-4A and 14-5A) indicated that for Level I/3 (A) an age ratio of 0.3 and uranium ratio of 1.24 is equivalent to an age of 38,000 ± 2,000 (using the average error of the samples).

Kabazi II, Levels II/1, II/1A, II/7, and II/7F8

Six tooth enamels were processed from Level II/1 (58-282-E-2; 225-290-E-3), Level II/1A (39-291-E, 226-291-E-3), Level II/7 (199-288-E-3), and Level II/7F8 (222-283-E-3, 37-293-E-1, 228-293-E-3). Four enamels (58, 39, 199, 228) averaged 46,000 ± 14,000 BP, whereas three enamels (225, 226, 222) had younger ages averaging 15,000 ± 500 years BP. A replicate of 39-291-E-1, sample 226-291-E-3, produced a young age, probably reflecting dentine or other contamination. They were not used in the plots for this level (figs. 4-4B and 14-5B), nor was sample 37 (see below). The plots indicated for Levels II/1, II/1A, II/7, and II/7F8 (figs. 14-4B, 14-5B) an age ratio of 0.31 and uranium ratio of 1.17, equivalent to an age of 39,800 ± 5,000 years BP.

The thickness of the deposits and differences in the cultural remains in Unit II would suggest that the period of accumulation was not a rapid event. Unit II may be split into an upper zone (Levels II/1 and II/1A) and a lower zone (Level II/7 and II/7F8). Plotting these separated zones was not possible, since the data point dispersion was not great enough to form a unique linear association. Grouping Level I/3 with Level II/1 and Level II/1A produces an isochron (not shown) that is not significantly different from that of Unit I alone (41,000 BP), suggesting that these units succeeded each other relatively rapidly. Grouping Level II/7 and Level II/7F8 together with Unit III produces an isochron that has the same slope as the isochron for Unit II (54,000 ± 3,000 years BP). Splitting Kabazi II, Unit II and regrouping the levels with those above and below indicates that Unit II could have been deposited over about 15,000 years.

Kabazi II, Levels II/7F8 and III/2

Four tooth enamels from Level II/7F8 (37-293-E-1) and Level III/2 (63-284-E-2; 56-285-E-2; 65-292-E-2) probably were contaminated by foreign uranium from incompletely cleaned ion exchange resins. They have similar uranium ratios that are higher than the average for the Kabazi II and were all processed at the same time. They had an average age of 44,000 ± 7,000 years BP (excluding 63). The plots (figs. 14-4C and 14-5C) indicated an age ratio of 0.34 and uranium ratio of 1.76 is equivalent to an age of 45.000 ± 7,000 years BP (using the average error of the samples). This age is probably a minimum for Level III since uranium was gained without any ^{230}Th.

Kabazi II, Level III/2

Three tooth enamels were processed from Level III/2 (210-284-E-3; 223-285-E-3; 227-292E3). They had an average age of 60,000 ± 3,000 years BP. The plots (figs. 14-4D and 14-5D) indicated for Level III/2 an age ratio of 0.4 and uranium ratio of 1.23 is equivalent to an age of 54,000 ± 3,000 years BP (using the average error of the samples).

Summary of Kabazi II Results

The age of Level I/3 is 38,000 ± 2,000 years BP. The age of Unit II *as a single unit* is 39,800 ± 5,000 years BP, which, considering the thickness of the deposit, sterile strata separating the cultural levels, and its cultural variability, is probably too short an interval of deposition. Separating Unit II into upper and lower zones produced ambiguous results because of poor data point dispersion. The results of regrouping the upper levels of Unit II with Unit I suggest that these were deposited in rapid succession, since an isochronal age of 41,000 ± 3,000 years BP is generated. On the other hand, when Level II/7, and Level II/7F8 are grouped with Unit III, they produce an isochron that is the same as that generated for Unit III alone (54,000 ± 3,000 BP), thus indicating that Unit II accumulated over as much as 15,000 years.

STAROSELE

Twelve teeth and one bone were submitted for dating from the four levels at Starosele. The analyses were conducted over three years, as each tooth was analyzed up to three times. Previously, Starosele had been unreliably dated with uranium series on bone by Cherdyntsev (1956) because he could not analyze for ^{234}U. In general, Starosele had uranium ratios that were higher than those at Kabazi II, and uranium contents that were lower (fig. 14-3). The uranium content of Starosele dentine (137-314-D-1) when measured was 20 to 50 times the concentration found in the enamels. The difference in uranium content contributed to problems from incomplete separation of dentine and enamel. Generally, use of heavy liquids produce enamel purities of 99+%. At this purity, enamel is usually unaffected by the 1/10% remaining dentine, however, at Starosele the lower uranium content enamels (<1 ppm) would be dramatically affected because the dentine not only had a higher uranium content, but a very young age. Contaminating dentine would thus tend to lower the age of any enamel. The young age of 137-314-D-1 indicates that, unlike Kabazi II where enamels and dentine have the same uranium content and ages, a closed system exists stratigraphically, Starosele has evidence that, at least in the dentine, late uranium uptake occurred. The same techniques to graphically remove the effects of low level contamination as demonstrated in Kabazi II data (figs. 14-4 and 14-5) has successfully removed some of the distortions (figs. 14-6 and 14-7) in the Starosele data.

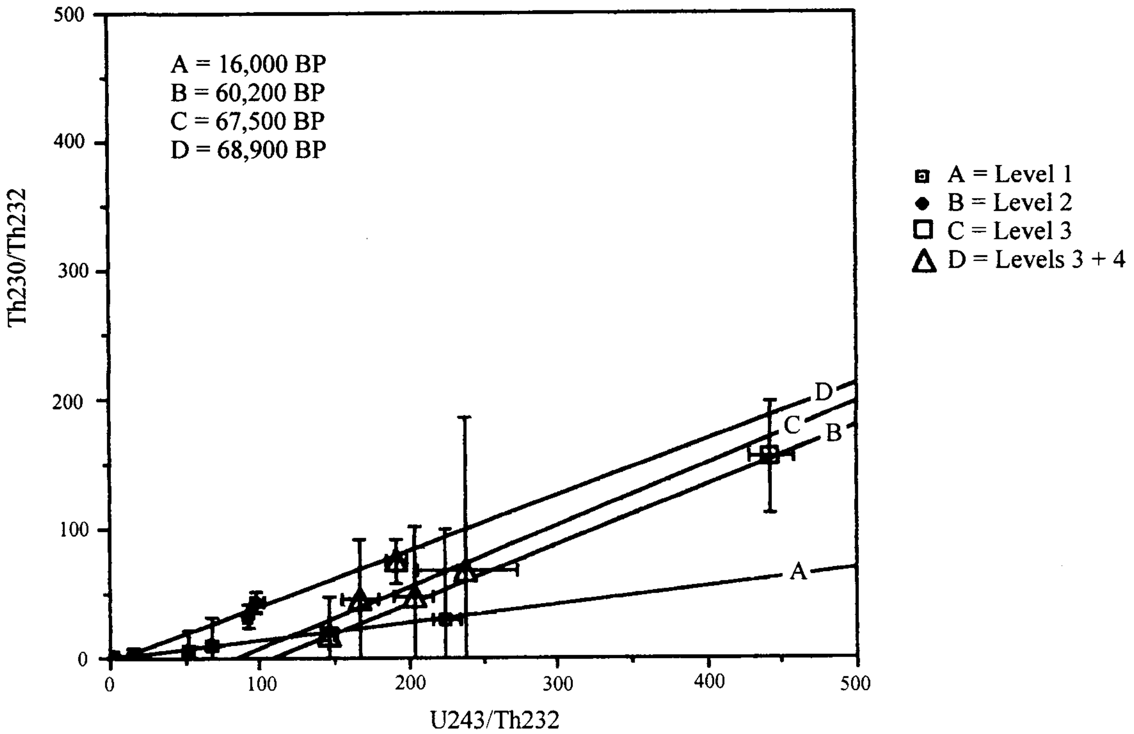


Fig. 14-6—Starosele, Plot of Th^{230}/Th^{232} and U^{238}/Th^{232}.

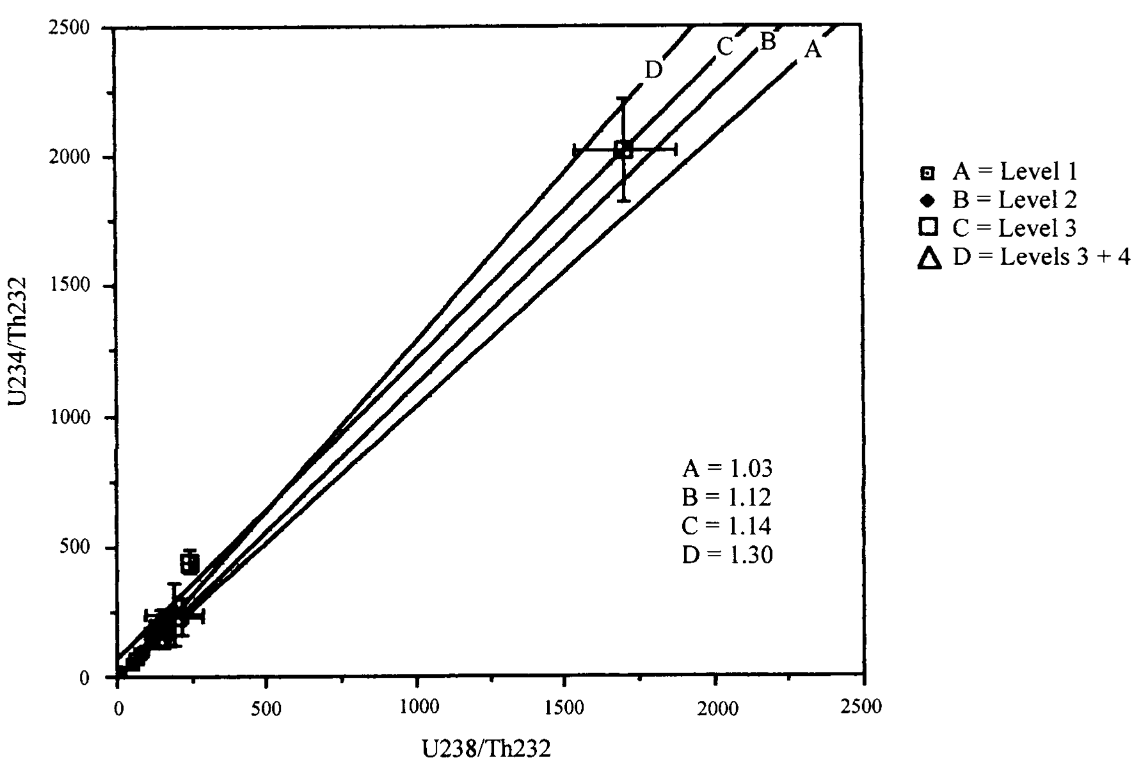


Fig. 14-7—Starosele, Plot of U^{234}/Th^{232} and U^{238}/Th^{232}.

TABLE 14-2
Starosele

Level	*Square*	*Sample*	*Uranium ppm*	*Thorium ppm*	U^{234}/U^{238}	Th^{230}/Th^{232}	Th^{230}/U^{234}	*Age K Years BP*
1	I22	192-271-E-3	2.0 ± 0.1	0.17 ± 0.06	1.09 ± 0.06	9.2	0.14 ± 0.02	15.7 ± 2/2
1	J23	193-272-E-3	3.0 ± 0.2	0.04 ± 0.01	1.04 ± 0.07	31	0.14 ± 0.01	15.7 ± 1.3/1.3
1	I22	211-313-E-3	1.4 ± 0.1	0.08 ± 0.05	1.01 ± 0.10	6.3	0.12 ± 0.03	13.6 ± 3.5/3.4
2	H22	212-275-E-3	0.16 ± 0.02	<0.01	1.08 ± 0.15	33	0.36 ± 0.07	47.5 ± 13/11
2	G22	61-297-E-1	2.3 ± 0.08	0.24+/ -0.06	1.19 ± 0.06	44	0.45 ± 0.07	63 ± 5/4
3	F20	208-315-E-3	1.24 ± 0.08	0.0 ± 0.01	1.23 ± 012	17.5	0.12 ± 0.01	14 ± 1.4/1.4
3	F21	137-314-D-1	21.1 ± 0.5	<0.004	1.18 ± 0.03	222	0.11 ± 0.01	12.1 ± 0.9/0.9
3	F21	57-274-E-1	0.54 ± 0.03	<0.01	1.83 ± 0.03	155	0.35 ± 0.03	45.8 ± 5.1/4.9
4	H21	9-276-E-1	0.75 ± 0.01	0.04 ± 0.04	1.26 ± 0.9	75	0.39 ± 0.05	80 ± 10/8
4	H21	196-276-E-3	0.35 ± 0.02	0.01 ± 0.01	1.23 ± 0.2	67	0.28 ± 0.02	34.9 ± 3/2
4	I23	230-353-E-1	1.28 ± 0.08	0.02 ± 0.01	1.35 ± 0.09	49	0.24 ± 0.02	29.4 ± 2.1/2.0
4	I23	231-354-E-1	0.54 ± 0.03	0.0 ± 0.01	1.27 ± 0.08	45	0.27 ± 0.02	33.1 ± 2.4/2.3

Starosele, Level 1

The geochronology of Starosele begins with Unit III at Kabazi II which dated to 54,000 years BP. Thus a constraining age of Starosele Level 1 should be between 40,000 (Kabazi II, Unit II) and 54,000 years (Kabazi II, Unit III). Results from three enamels, (192-271-E-3; 193-272-E-3; 211-313-E-3) suggest that this level is only about 15,000 years BP, an age that is too young compared to the Kabazi II chronology. Several factors are probably at work here: late uranium uptake in Level 1 related to its position in a geochemically active soil horizon, or simply the inability to purify enamel with current techniques. Plotting these data (figs 14-6A and 14-7) indicates for Level 1 an age ratio of 0.137 and uranium ratio of 1.03 is equivalent to an age of 16,000 ± 3,500 years BP. The young age suggested by these enamels is not supportable by the lithic technology which is, without doubt, Middle Paleolithic.

Starosele, Level 2

Two tooth enamels from Level 2 (212-275-E-3; 61-297-E-1) produced ages from 47,500 to 63, 000 years BP. The plots (figs. 14-6B and 14-7B) indicate for Level 2 an age ratio of 0.42 and uranium ratio of 1.12 is equivalent to an age of 60,000 years BP. Because of only two teeth being plotted, this is an unreliable result. Electron spin resonance dating of tooth enamel and radiocarbon dating suggest this level dates to around 45,000 years BP (personal communication A. Marks). This is consistent with the uranium series results and suggests that the results from Levels 1 and 2 are minimum age.

Starosele, Level 3

Two enamels and a dentine were processed from Level 3 (208-315-E-3; 57-274-E-3, 137-314-D-1). The plots (figs. 14-6C and 14-7C) indicated for Level 3 an age ratio of 0.46 and uranium ratio of 1.14, equivalent to an age of 67,500 years BP. As in Level 2, only two enamels were plotted, too few to produce a reliable result. Only 57 is consistent with Level 2 and ESR data (Marks et al. 1997) at 45.6 ± 5.1/4.9. A published 46,000 years BP uranium series age for this enamel (57) was in error (Marks et al. 1997). The dentine had high uranium content (21 ppm) and a young age (12,100 ± 900 years BP), indicating that late uranium uptake is occurring. This could cause enamel ages to be younger, and is probably causing 208 to be too young either from late uranium uptake, or contamination from dentine, since the uranium content (1.24 ppm) is also higher than other enamels. A simple correction of the uranium content of 208 to that of 57 produces an age of 35,000 years BP, suggesting that late uranium uptake is the problem.

Starosele, Level 4

Four enamels were processed from Level 4 (9-276-E-1; 196-276-E-3; 30-353-E-1; 231-354-E-1). These enamels were geochemically similar, and since they had a poor data point dispersion, an isochron plot could not be generated. The sample data are combined with Level 3 to better define a geochemical association. The apparent ages span the expected duration of Staroselian occupation and have some distortion from initial 232Th either from dentine or clastic contamination (no clastic material was noted during the cleaning phase). The plots (figs. 14-6D and 14-7D) indicated for Levels 3 and 4 an age ratio of 0.47 and uranium ratio of 1.3 is equivalent to an age of 68,900 ± 10,000 years BP. Because of multiple samples (five including 57) this is the most reliable estimate of the age of lower Starosele (Levels 3 and 4). One result (9) suggests that this level began forming more than 80,000 years ago (assuming some post-depositional uranium uptake). An earlier preliminary result from 9, suggesting this level may have started forming as early as 104.000 ± 8,500 years BP (Marks et al. 1997), has been lowered to 80,000 BP after a longer counting period. The formation of the lowest level of Starosele during the Last Interglacial is a possibility since uranium uptake is occurring throughout the site; thus, most, if not all, ages should be considered minimums.

Summary of Starosele Results

The ages for Level 1 are too young since Starosele should be roughly contemporaneous with Kabazi II, Unit II and Kabazi V, Complex C (Levels II/4A and II/7) and Complex D (Levels III/I, III/1A, and III/2) (see Chapter 15). The uranium contents of the Level 1 enamels are three to four times that of the lower uranium content enamels, whose ages are reasonable. Thus, Level 1 enamels have gained uranium recently either by being affected by the same geochemical conditions that are increasing uranium in the dentines, or by the effect of small amounts (1/10 of 1%) of dentine mixed with the enamel from imperfect separation techniques. Levels 2 and 3 do not have enough data points for definitive linear plots, but do produce ages consistent with expectations. Certainly, Levels 2 and 3 have ages at about 45,000 BP, consistent with ESR and AMS dating, but the linear plots suggest that these are minimum ages. Level 4 enamels do not have a unique solution because of low data point dispersion. Combining these points with Level 3, which may represent a continuation of the same occupation with an interval of abandonment, produces an age near 70,000 years BP. At least one sample (9-276-E-1) dates near 80,000 +10,000/-8,000 years BP, indicating that Level 4 may represent a long period of accumulation.

KABAZI V, LEVEL III/1

Four tooth enamels were processed from Kabazi V, Level III/1 (59-300-E-1; 210-300-E-3; 64-304-E-3; 214-312-E-3; 202-311-E-3). Uranium contents were low (<1.5 ppm), as were the uranium ratios (1.04 to 1.2). Enamels 59 and 210 are replicates that are very different; an average of these samples is shown on Figure 14-8. This result indicates that these samples were statistically opposite outliers of a normal distribution. The plots (figs. 14-8 and 14-9) indicated for Level III/1 an age ratio of 0.49 and uranium ratio of 1.15 is equivalent to an age of 73,300 ± 6,000 years BP. Kabazi V, Level III/1 is, therefore, chronologically equivalent to lower Starosele.

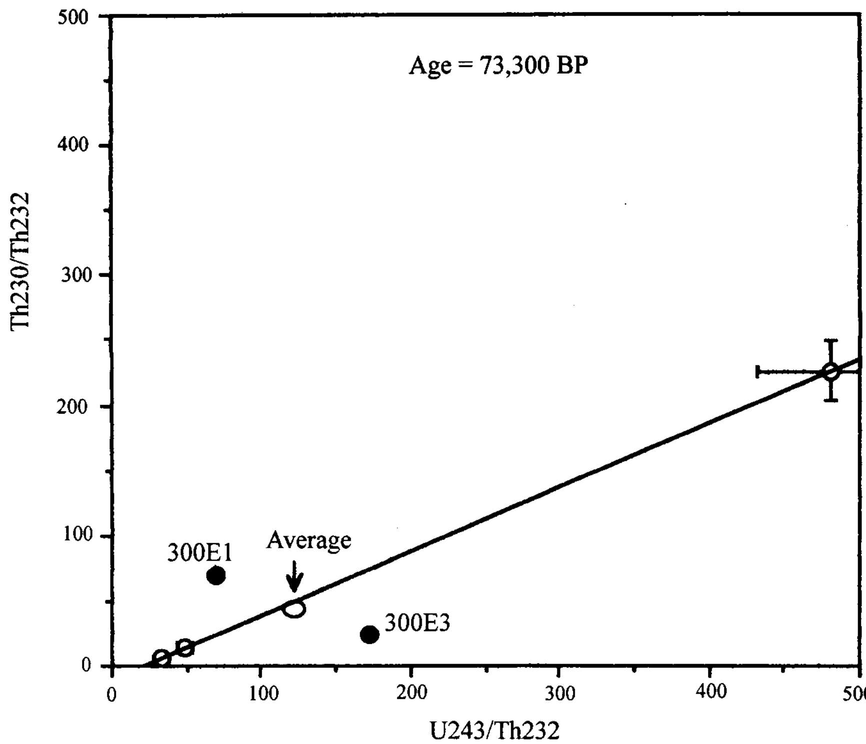


Fig. 14-8—Kabazi V, Level III/1, Plot of Th^{230}/Th^{232} and U^{234}/Th^{232}.

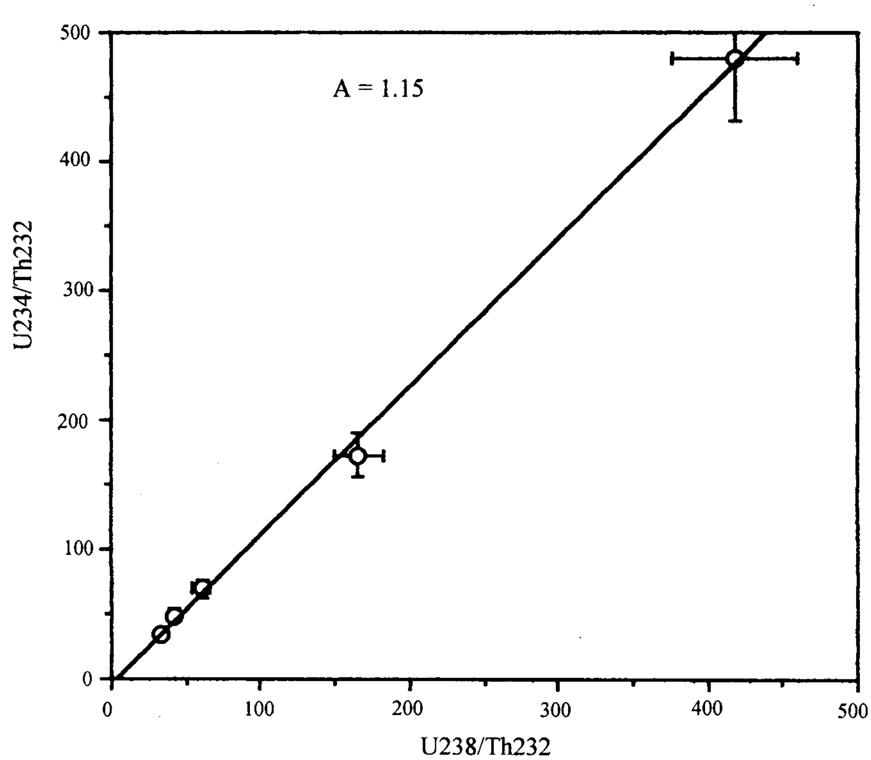


Fig. 14-9—Kabazi V, Level III/1, Plot of U^{234}/Th^{232} and U^{238}/Th^{232}.

TABLE 14-3
Kabazi V

Unit Level	*Sample Number*	*Uranium ppm*	*Thorium ppm*	U^{234}/U^{238}	Th^{230}/Th^{232}	Th^{230}/U^{234}	*Age K years BP*
III 1	64-304-E-3	0.93 ± 0.02	<0.01	1.15 ± 0.04	226	0.42 ± 0.03	58.7 ± 6/5
III 1	59-300-E-1	2.3 ± 0.03	<0.01	1.14 ± .02	75	1.01 ± 0.02	>350,000
III 1	210-300-E-3	1.4 ± 0.1	<0.01	1.04 ± 0.1	38	0.13 ± 0.02	15.4 ± 2/2
III 1	214-312-E-3	0.45 ± 0.03	<0.01	1.2 ± 0.1	14	0.29 ± 0.04	37.2 ± 5/5
III 1	202-311-E-3	0.51 ± 0.04	0.05 ± 0.02	1.04 ± 0.1	6.1	0.18 ± 0.02	21.6 ± 3/3

GABO, Layer 1

A single tooth from Layer 1 of GABO was submitted for dating. Of three replicates, only one had good uranium and thorium spectra for analysis. Uranium content was high (3.4 ppm) and ^{232}Th was low, which suggests this date is undistorted by dentine contaminate or late uranium uptake. The age is 69,600 ± 2,000 years BP; chronologically equivalent to lower Starosele. This result could change with additional analysis of new teeth.

TABLE 14-4
GABO, Layer 1

Sample Number	*Uranium ppm*	*Thorium ppm*	U^{234}/U^{238}	Th^{230}/Th^{232}	Th^{230}/U^{234}	*Age K years BP*
214-287-E-3	3.4 ± 0.04	0.01 ± 0.01	1.23 ± 0.02	514	0.48 ± 0.01	69.6 ± 2./2.

Conclusion

The four Crimean localities presented here represent cultural activity that spans roughly the time from the Last Interglacial to about 35,000 years BP. Kabazi II and Kabazi V are the most reliably dated, whereas Starosele, because of a high uranium content in dentine relative to enamel, has the most problems. Starosele Levels 1 and 2 are constrained by Kabazi II, Unit II uranium series ages and minimum radiocarbon dates. Starosele Levels 3 and 4 are constrained by uranium series to at least 68,900 years BP. GABO is represented by one sample and is tentatively 69,600 years BP.

Chapter 15

PRELIMINARY SYNTHESIS: MIDDLE PALEOLITHIC ASSEMBLAGE VARIABILITY IN WESTERN CRIMEA

V. P. CHABAI and A. E. MARKS

It is unreasonable to expect that all the unanswered questions concerning the Western Crimean Middle Paleolithic could be resolved after only three years of field and laboratory work, particularly since only three of ten known sites were studied. In addition, some information crucial to refining chronological, environmental, and even behavioral questions is still being examined and will be available only with the publication of volume 2 of this series. Still, enough data are now on hand to justify a preliminary synthesis limited to assemblage variability in relation to absolute and relative local chronologies. It is expected that while this synthesis will help clarify some issues, it will also raise additional questions that can be resolved only through additional work.

STRATIGRAPHY AND CHRONOLOGY

While the absolute dating results reported in Chapter 13 are not yet complete (for instance, ESR dates on Starosele, Level 4 are still in progress), sufficient dates have been run so that a quite unexpected temporal framework for the local western Crimean Middle Paleolithic is now available.[1] On the other hand, site-specific geological studies are finished, and the archeological occupations can be placed into specific local geological site stratigraphies. Even with the absolute dates, however, the inter-site geological correlations are not clear, in and of themselves; therefore, such correlations will be attempted with the aid of the archeological assemblages on the premise that very similar assemblages are most likely to be both culturally and temporally related. While this assumption cannot be taken as a universal truth, it is a reasonable hypothesis for a preliminary synthesis, to be tested by the pollen sequences, microfaunal data, and additional absolute dates, all of which are still being studied.

The longest local stratigraphic sequence is found at Kabazi II, where it spans a period from Late Interglacial (Kabazi II, Unit IV) to about 30,000 BP at the top of Unit II. In addition, the absolute dates are consistent with the stratigraphy and, combined with the stratigraphic sequence, appear to cover the shorter stratigraphic sequences seen at Starosele and Kabazi V. At these latter sites, either the overall rate of aggradation was very rapid, as at Kabazi V, or there were periods of rapid aggradation, as at Starosele. Because of this, Kabazi II will provide the best evidence for long term climatic change (Chabai 1996).

Using Kabazi II as a base for a relative cultural sequence, the assemblages from Kabazi V and Starosele have been matched, as well as possible, with only secondary consideration of the absolute dates (fig. 15-1). This makes it clear that while Kabazi II has a long and impressive stratigraphy, it does not contain all the defined assemblage variability seen at the three sites. In fact, both Kabazi II and Starosele contain assemblages that are not found at the other sites. Only the Kabazi V assemblages can be matched well with those from Starosele. In this case, however, the more rapid aggradation at Kabazi V, compared with Starosele, Stratum B, resulted in a series of definably different occupation horizons, while at Starosele, all that could be seen was a palimpsest of comparable occupations.

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[1] The manuscript for Chapter 14 was received too late to be taken into consideration in this synthesis.

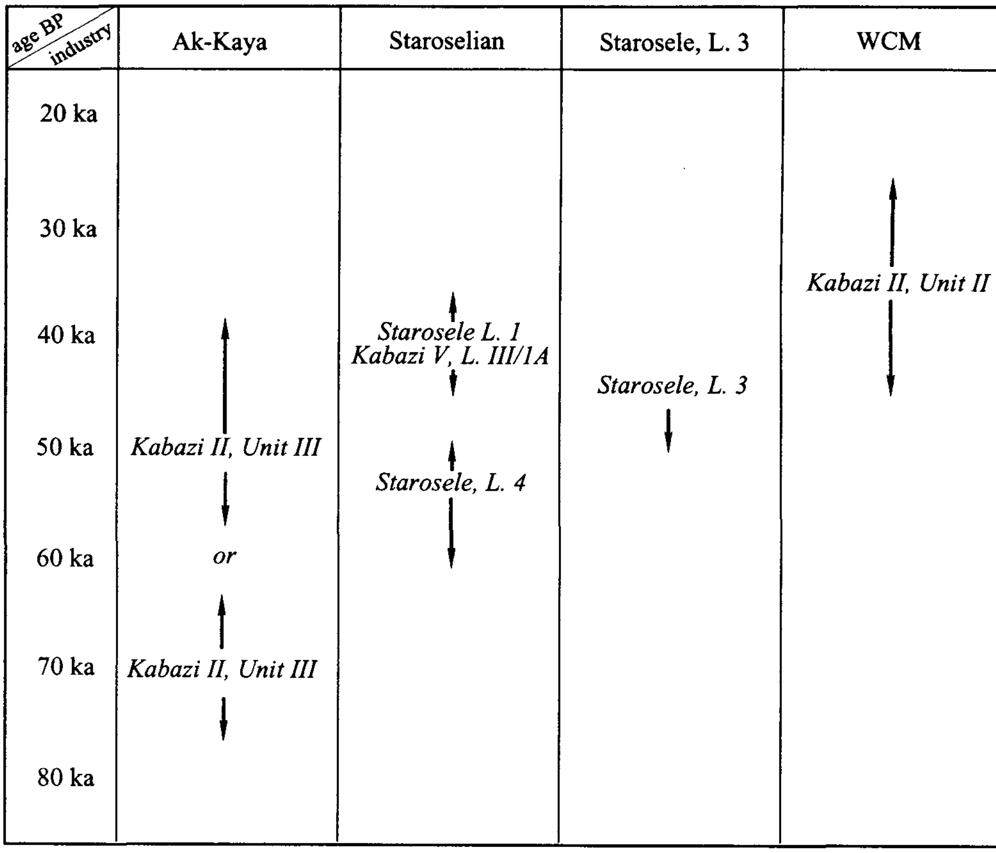

Fig. 15-1—Relative chronological position of Western Crimean Middle Paleolithic assemblages.

When this correlation of lithic assemblages is compared with the absolute dates, it becomes clear that most occupations cluster between mid-40,000 BP and ca. 30,000 BP. A few earlier dates suggest some local occupations might be as old as 70,000 BP, but could also be no older that ca. 55,000 BP. Even assuming that the older dates for Kabazi II, Unit III are correct, it is still clear that in western Crimea, at least, there is no known Middle Paleolithic which is pre-Würm, and that most assemblages tend to fall temporally at the later range of the Middle Paleolithic, *sensu lato*. In addition, it seems well established that there are temporal overlaps among a number of industries.

As usual, there are some ambiguities in the absolute dates which permit different interpretations. The very late dates for Kabazi V, Level III/1 do not match the earlier dates from Kabazi V, Level III/1A. These levels are stratigraphically contiguous, there is no evidence of any geological hiatus, and the geological interpretation is one of continuous rapid colluviation. Thus, a 15,000 year spread seem unreasonable. As discussed in Chapter 13, a maximum date of ca. 41-43,000 BP would seem more logical based on locally derived data. Given the high comparability of the assemblages from these levels with that of Starosele, Level 1, dated to ca. 41-45,000 BP, the older ESR date for Kabazi V, Level III/1A, seems fully acceptable.

Both the stratigraphic sequence and the absolute dates show that the WCM at Kabazi II spanned a reasonably long period, from ca. 50,000 BP until ca. 30,000 BP. While there is certainly no implication of continuous occupation over these 20,000 years, the assemblages do show vectored technological development from earliest to latest. There is no reason to believe that any stratigraphically paired occupations were separated by a significantly longer period than any other pair of occupations. Thus, while continuous occupation is not posited, sporadic but habitual occupations seem to be an appropriate interpretation.

It is during this period that the occupations of Starosele, Levels 1 through 3, and Kabazi V, Complexes B through D, also took place. Thus, within these 20,000 years, there seems to have been no fewer than three quite distinct industries represented in Western Crimea: the WCM, the Staroselian, and that from Starosele, Level 3. If the occupations from Kabazi II, Unit III actually date younger than older, then a fourth industry, the Ak-Kaya, is also included. This multiplicity of industries in a such a small area over a relatively short period needs explanation. This will be attempted after the typological and technological variability is discussed.

TYPOLOGICAL AND TECHNOLOGICAL VARIABILITY

At least four typologically different industries were recognized during our work: the Western Crimean Mousterian (Kabazi II, Units II and IIA, upper), the Staroselian (Starosele Levels 1, 2, 4 and Kabazi V), the Ak-Kaya (Kabazi II, Unit III), and a yet unnamed industry at Starosele, Level 3. In addition, the very small sample sizes from Kabazi II, Unit IIA, lower, made it impossible to recognize what industry might have been represented there. On the other hand, it is clear that this material belongs with one of the Crimean industries with bifacial tools. This industrial variability includes three of the four Crimean Middle Paleolithic industries already defined prior to this new work (Kolosov, Stepanchuk, and Chabai 1993). At least two of them, the Staroselian and the WCM, had been recognized and studied from sites in western Crimea. The assemblage from Kabazi II, Unit III is the first manifestation of the Ak-Kaya industry in western Crimea; quite distant from the area of traditionally recognized Ak-Kaya assemblages in the Biyuk-Karasu and Kuchuk-Karasu River Valleys (fig. 15-2).

The Starosele, Level 3 assemblage does not compare well either technologically or typologically with any of the traditionally defined Crimean Middle Paleolithic industries. Since it is a single assemblage, however, it is inappropriate to give it an industry appellation and so, it will remain unnamed until additional assemblages are located.

The Staroselian, the WCM, and the Ak-Kaya industries are all characterized by specific and different proportional relationships among the major tool classes, such as unifacial and bifacial points and scrapers, which combined account for between 80% and 90% of all tool-kits. Other tool classes, such as denticulates, notched pieces, battered pieces, etc., play little role in any assemblage of these three industries. On the other hand, simple retouched pieces are well represented in each assemblage. Taking into account the marginal, often irregular nature of this retouch which never shapes the tool and may be the result of use, it seems reasonable to exclude them from the comparative analyses.

A different problem exists for the convergent tools—points and scrapers. The distinction between these classes is often arbitrary and no two scholars are likely to agree on all pieces: to avoid this problem, points and convergent scrapers have been combined into one morphological group for comparative purposes.

The Staroselian

The typological structure of the Staroselian may be defined from the following assemblages: Starosele, Level 1 and Kabazi V, Complexes C and D. It is possible that Starosele, Level 4 and Kabazi V, Complex E are also Staroselian, but their small sample sizes preclude their use here. The large sample sizes from Starosele, Level 1 and Kabazi V, Complexes C and D are the best to use for defining the typological features of the Staroselian. In spite of this, the previously studied Staroselian materials, particularly from Formozov's

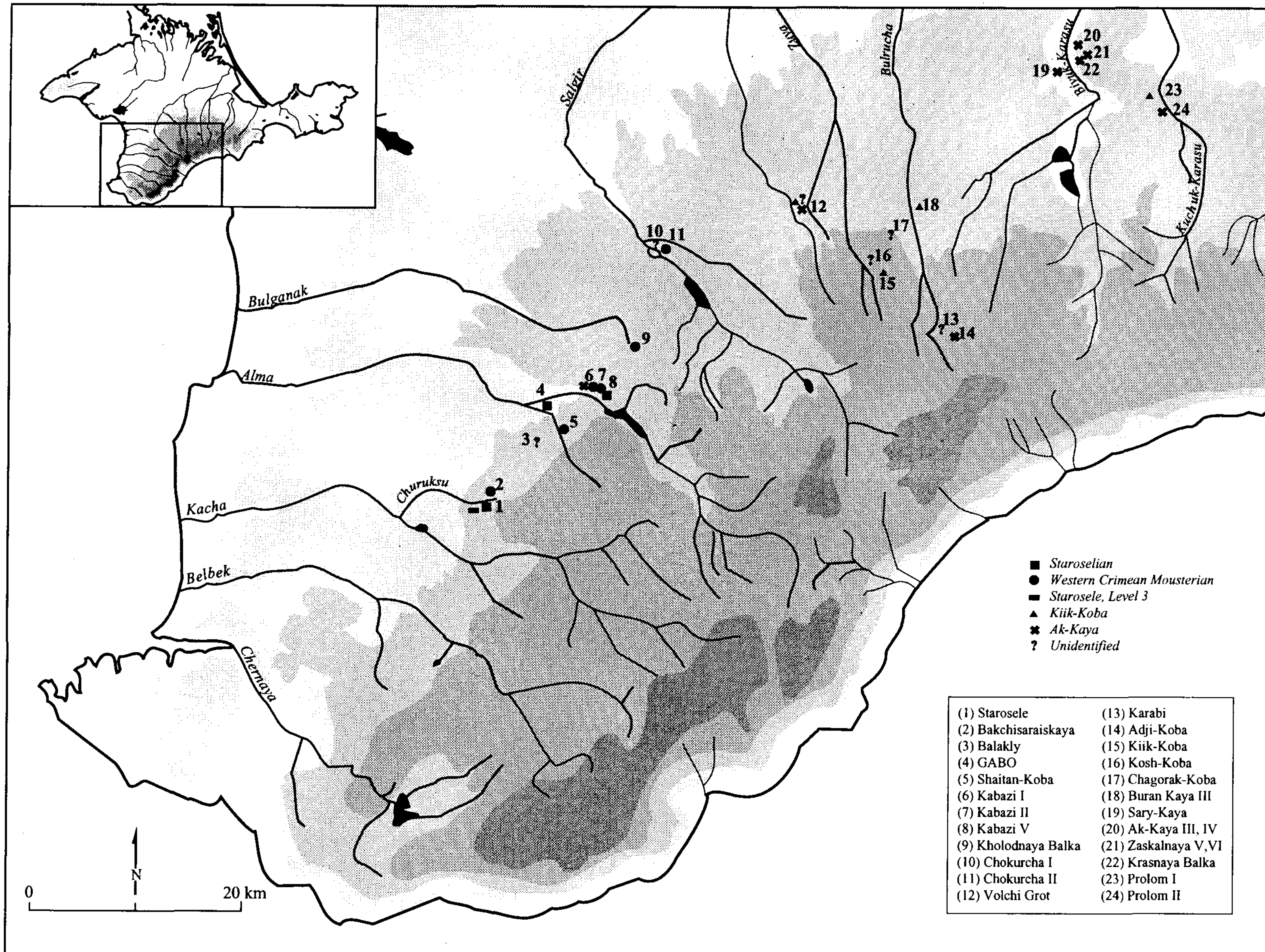

Fig. 15-2—Distribution of Crimean Middle Paleolithic sites by industry type.

Unit I (Chabai 1991), do show many marked similarities with the more recently acquired samples in the percentage of convergent tools and the blade and faceting indices (Table 15-1). There are more differences in Formozov's Unit II materials—which can be explained by his mixing of Levels 3 and 4.

TABLE 15-1
Technological and Typological Characteristics of Crimean Middle Paleolithic Assemblages

	Ilam	IF	IFs	% Levallois Blanks	Simple & Double Scrapers[1]	Convergent Tools[2]	Bifacial Tools
Shaitan-Koba, lower level	9.0	43.2	27.3	0.0	79.2	16.9	3.7
Shaitan-Koba, upper level	16.4	57.5	41.8	about 10% ?	75.5	24.4	0.0
Kabazi II, Levels II/7F8-II/8	21.7	65.8	47.6	4.3	66.3	33.7	0.0
Kabazi II, Levels II/7E-II/7AB	22.9	55.8	45.1	2.6	55.0	45.0	0.0
Kabazi II, Levels II/7-II/5	33.0	67.3	44.5	1.4	67.0	32.9	0.0
Kabazi II, Levels II/4-II/1A	36.5	58.9	32.4	0.0	61.4	38.5	0.0
Kabazi V, Unit III	4.5	30.8	16.7	0.0	44.3	50.0	5.7
Kabazi V, Complex C	7.9	52.6	23.8	0.0	48.1	38.9	13.3
Kabazi V, Complex D	7.6	48.1	24.5	0.0	44.6	42.1	12.2
Starosele, Unit II	20.5	47.9	22.5	0.0	45.1	50.2	4.6
Starosele, Unit I	19.5	40.3	17.5	0.0	51.2	40.7	7.9
Starosele, Level 1	17.6	45.7	42.7	0.0	44.3	43.4	12.3
Starosele, Level 3	14.4	25.0	21.9	0.0	77.9	22.0	0.0
Kabazi II, Unit III[3]	?	?	?	0.0	51.3	20.5	28.2
Zaskalnaya V, Layer II[4]	10.7	42.8	24.6	0.0	58.0	21.3	28.7
Zaskalnaya V, Layer III[4]	5.4	44.5	26.7	0.0	52.5	23.8	23.6
Prolom I[4]	11.4	36.9	26.1	0.0	21.5	54.1	14.3
Kiik-Koba, upper level[4]	11.6	41.9	21.9	0.0	27.5	56.2	16.3
Buran Kaya III, Levels 7-8[5]	?	?	?	0.0	37.0	51.9	11.1

[1]includes transverse, simple, and double scrapers.
[2] includes the different shapes of both unifacial points and convergent scrapers.
[3]calculated from data of 1988, 1995, 1996 excavations.
[4]calculated from data published by Kolosov 1983; Kolosov, Stepanchuk, Chabai 1993.
[5]calculated from data published by Yamada 1997.

Using the noted assemblages, it appears that the Staroselian can be defined as having a moderate number of simple/transverse/double scrapers and generally somewhat fewer convergent tools. Yet, there is some variability: in Kabazi V, Unit III, which was excavated by Chabai in 1986 (Kolosov, Stepanchuk, and Chabai 1993), convergent scrapers reach 50%—a proportion equaled only in the Starosele, Unit II Formozov sample (Table 15-1). Most striking, however, is the uniformity for both simple/transverse/double scrapers and convergent tools among Starosele, Level 1 and Kabazi V, Complexes C and D. Again, this uniformity pertains for the bifacial tools, with a range of less than 1%.

A somewhat different situation exists for the older collections from Starosele and Kabazi V, Unit III. While they fit rather well with the new samples for simple/transverse/double scrapers, two of the three have the highest convergent tool proportions and all have significantly lower percentages of bifacial tools. What accounts for this is not clear. Since the samples from Formozov's excavations have some problems (particularly that of Unit II), these figures should be considered possible, but not proven, for the Staroselian.

Technologically, the Staroselian is considerably less uniform. Using traditional indices, all analytic groups from Starosele share similar blade indices, with less than a 3% range. While slightly higher ranges exist for the two faceting indices, they are strikingly close (Table 15-1). A similar pattern of closely clustering indices exists at Kabazi V for Complexes C and D, but Kabazi V, Unit III is significantly different for these indices. This clustering of indices for Complexes C and D at Kabazi V is markedly different from that of the Staroselian at Starosele. The traditional indices from Kabazi V, Unit III are even farther from those at Starosele than Complexes C and D (Table 15-1).

Prior to these new studies, the difference in the blade indices was recognized and formed the rationale for a two stage sub-division of the Staroselian (see Chapter 1). Now, while these differences have been confirmed, it has also become clear that true core reduction plays little part in the reduction strategies of the known Staroselian sites (see Chapters 7 and 12). Thus, since it appears that bifacial reduction was the norm in the Staroselian, the blade and faceting indices are of questionable significance.

The Starosele, Unit II of Formozov's excavations, however, had a relatively large sample of cores (ca. 50) which mainly exhibited parallel removals from unprepared platforms without any evidence for supplementary platforms. Based on these cores, the core reduction strategy was called "parallel primitive" (Chabai 1991). Based on the new excavations at Starosele, it is clear that Formozov mixed together the Level 3 and 4 assemblages, with these cores actually coming from Level 3, rather than from the probable Staroselian Level 4. Other large core samples associated with seemingly Staroselian tool-kits come from GABO, Layer 1 and Kabazi II, Unit I. In both cases, however, these materials were from derived deposits and, thus, they cannot be used for defining the Staroselian technology. Yet, from the Starosele, Level 1 assemblage, clearly some true core reduction did take place and it is only a matter of time and more excavations before a good in situ example of this will be found. Finally, all Staroselian assemblages are associated with bone retouchers, which is consistent with an emphasis on bifacial reduction, as well as with edge resharpening.

In summary, the Staroselian may be defined technologically by a developed bifacial technology, rare use of true core reduction, and the use of bone retouchers for bifacial flaking. There is no evidence for any Levallois technology, and blades are produced as by-products of bifacial reduction. Typologically, unifacial points and convergent scrapers are significant elements in the tool-kit, comprising about 40% combined. Characteristic tool shapes for all convergent tools include semi-crescent, sub-crescent, semi-trapezoidal, and sub-trapezoidal. Simple scrapers, combined, equal convergent forms, without any one type being dominant. On the other hand, scraper edges are mainly convex or straight, with concave forms rather rare. Bifacial tools mainly account for a bit more than 10% in those assemblages which are secure, with the exception of Kabazi V, Unit III and about half that in Formozov's Units I and II samples from Starosele. Thus, it is likely that the percentage of bifacial tools fluctuated between ca. 5% to ca. 10%. These bifacial tools are mainly sub-triangular, semi-leaf, and sub-leaf, but their final shapes come about only after extensive rejuvenation episodes. Bifacial backed scrapers (knives) are rare but present in the old collections; they have yet to be found in the more recent excavations.

Ak-Kaya

The material from Kabazi II, Unit III is the first Ak-Kaya industrial assemblage found in western Crimea. Because of the pattern of raw material exploitation present, the debitage sample is too small for technological studies (Chapter 10). Still, the presence of preforms, unfinished bifacial tools, biface shaping flakes and chips, as well as abandoned plano-convex bifacial tools, more than adequately documents an extensive use of bifacial technology. The combined artifact samples from 3 years of excavations closely parallel the "archetype" of the Ak-Kaya industry—the assemblages from Zaskalnaya V, Layers II and III (Table 15-1). These similarities mainly relate to the typological structure of the tool-kits. Both layers at Zaskalnaya V and Kabazi II, Unit III are characterized by a dominance of simple unifacial scrapers with rather few transverse and double scrapers, relatively low percentages of convergent tools, and among the highest percentage of bifacial tools for all Crimean Middle Paleolithic industries (Table 15-1). Among the simple, transverse, and double scrapers, a significant number are inversely thinned. The shapes of convergent tools are similar to those in the Staroselian, but the Ak-Kaya has a more pronounced emphasis on semi- and sub-trapezoidal pieces.

According to Kolosov (1983, 1986), the bifacial tools at Zaskalnaya V consist essentially of forms of naturally backed scrapers (knives) similar to the Bockstein, Kläusennische, and Prondnik types. In fact, these specific forms are rare. The backed knives mainly consist of plaquettes which were flaked by a plano-convex technique along one lateral edge but not along the other, resulting in naturally backed bifacial tools. These plaquettes are found in abundance in the Ak-Kaya region. In any case, whatever their specific form, bifacial backed tools are one of the distinctive features of the Ak-Kaya industry and they are also present in Kabazi II, Unit III.

The Western Crimean Mousterian

The recent excavations at Kabazi II uncovered a long sequence of Stages II and III of this industry. The assemblages from Unit II, Levels II/7 through II/8C and Unit IIA, Levels IIA/1 and IIA/2 document the wide variety of technological and typological features of the WCM, Stage II. Specifically, there are a large number of blades with faceted platforms, abundant simple scrapers but very few transverse or double forms, a moderate number of convergent scrapers and points, and, finally, the absence of any bifacial technology (Table 15-1). Unlike the other industries, the characteristic points are lateral and distal, although semi-crescent occur as well. The majority of scrapers are made with flat scalar retouch on blades or elongated flakes, often Levallois.

Technologically, both attribute analyses and refitting show the presence of three different reduction strategies: Levallois Tortoise, Biache uni- and bi-polar, and volumetric in the assemblages of Levels II/7 through II/7F8 (Chapter 9). The volumetric technology, which is close to what has been described for Rocourt (Otte, Boëda, and Haesaerts 1990), becomes the only method used in the next stage, III, of the WCM (Kabazi II, Levels II/4 through II/1A). Thus, technologically, the assemblages described in Chapters 8-10 appear to document a transition from non-volumetric to volumetric core reduction.

Starosele Level 3 Assemblage

In terms of traditional knowledge, this assemblage is most peculiar technologically and typologically (Chapter 7), since it fails to fit into any already defined Crimean Middle Paleolithic industry (Kolosov, Stepanchuk, and Chabai 1993). Technologically, the use of a hard hammer to strike blanks from single platform cores resulted in a series of short, thick flakes. There is neither indication of any bifacial technology, nor evidence for prepared cores. In terms of Starosele itself, it differs from the other levels there in that cobbles were imported into the site for reduction; a honey-colored flint was used extensively which is almost unknown in the other levels. In spite of this, the percentage of tools is very high, ca. 43%: this is comparable to the other levels where really very little true core reduction took place. Thus, the pattern of raw material utilization is unique for western Crimea.

The traditional technological indices and some typological associations show a close similarity with Shaitan-Koba, lower level. In this case, however, these similarities are outweighed by such differences as the presence in Starosele, Level 3 of inversely retouched scrapers, of sub-triangular and semi- and sub-trapezoidal scrapers (most similar to Staroselian), and the high percentage of notched and denticulated tools (ca. 26%); the highest for all Crimean Middle Paleolithic assemblages.

PATTERNS OF RAW MATERIAL EXPLOITATION

In the preceding section, it is clear that there are, technologically at least, three different groups of industries in the Crimean Middle Paleolithic. The first is based primarily on bifacial reduction with some true core reduction from parallel and radial cores and includes the Staroselian, the Ak-Kaya, and the Kiik-Koba industries. The second is the WCM, in which blank production, depending upon the stage, is based on Levallois Tortoise, Biache, and/or volumetric strategies, without any use of bifacial reduction. The Starosele, Level 3 assemblage forms the third possible group, where blank production is based mainly upon single platform cores with the use of a hard hammer.

Typologically, however, five different industries can be defined for Crimea, as a whole (Table 15-1). Using three selected typological attributes, at least three of the industries cluster well (fig. 15-3). The reason that Starosele, Level 3 clusters with the WCM is their shared absence of bifacial tools and this, in and of itself, means little. How, then, can this patterning be explained? We propose that the clustering can be understood, at least partly, as the result of different patterns of raw material exploitation.

A first version of raw material and faunal assemblage patterning for the Middle Paleolithic of the entire Crimea was presented before the results of this project were known (Chabai, Marks, and Yevtushenko 1995). On the basis of non-industrial, structural relationships among categories of artifacts and the density of artifacts per cubic meter, four different patterns of raw material exploitation were proposed, each associated with a different intensity of site occupation: ephemeral stations, short-term stations, short term camps, and base camps. Incorporating the faunal data permitted the recognition of butchering and hunting stations. Here, we will concentrate only on lithic raw material patterning, while awaiting the faunal reports.

Ephemeral Stations

Ephemeral stations were recognized previously for Kabazi II, Unit II and Sary-Kaya (Chabai, Marks, and Yevtushenko 1995). Based upon additional data, these are now sub-divided into two quite different patterns of flint exploitation. The first is found at the WCM occupations at Kabazi II, Unit II and is characterized by low percentages of tools, low blank to core ratios, low tool to core ratios, a medium density of artifacts (Table 15-2), and both on-site core reduction and tool production (Chapter 9). The distance to the nearest flint outcrop is about 1 km.

The second type of ephemeral station is found in the WCM Level IIA/2 at Kabazi II and at the Ak-Kaya occupations at Kabazi II, Unit III and at Sary-Kaya. This is characterized by a high percentage of tools, an absence or rarity of cores, as well as by extremely low artifact densities (Table 15-2). The paucity of cores had a major effect on some ratios: thus, the blank to core and tool to core ratios are extremely high or, in the absence of cores, do not exist at all (Table 15-2). The main distinctive feature of this kind of ephemeral station is the limited on-site production and the high incidence of tool importation. In the case of the WCM occupations, all unifacial tools were imported. The Ak-Kaya occupations indicate the importation of both unifacial and bifacial tools. The other peculiar feature of these Ak-Kaya

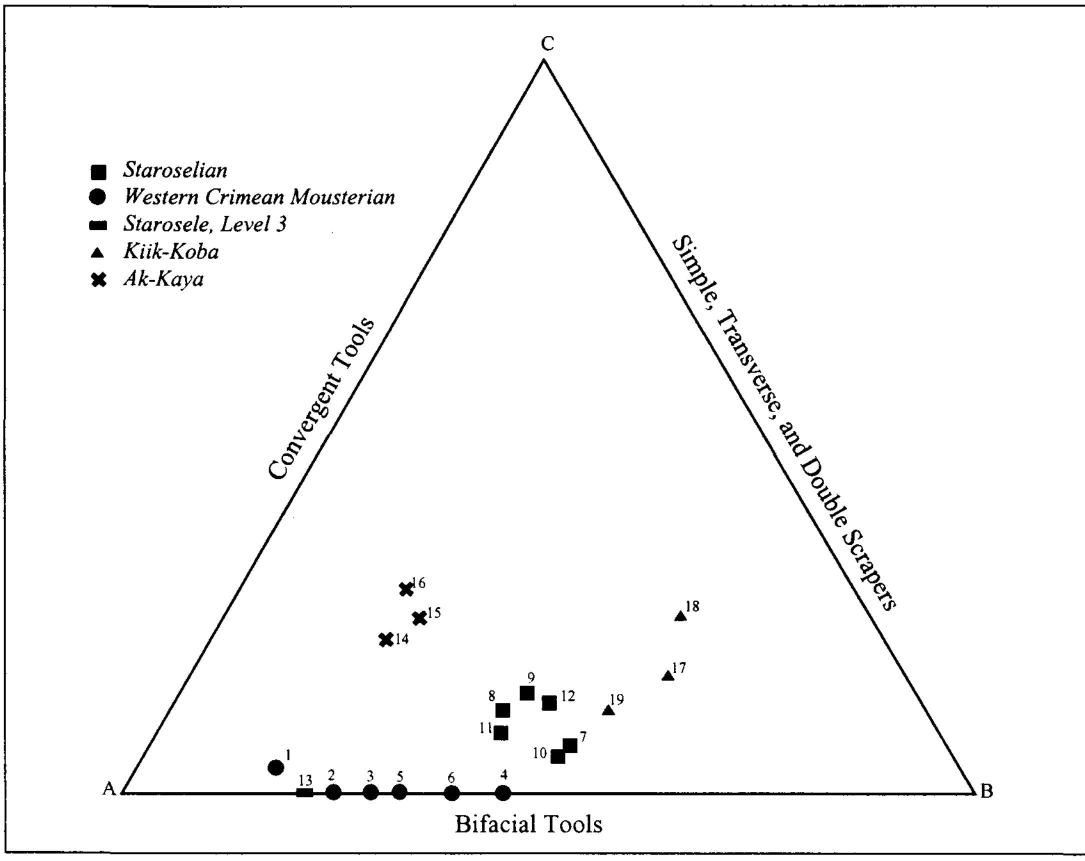

Fig. 15-3—Tripole graph of the relationship of tool types (*a*–simple transverse and double scrapers; *b*–convergent tools; *c*–bifacial tools) according to site: *1*–Shaitan Koba, lower level; *2*–Shaitan Koba, upper level; *3*–Kabazi II, Levels II/7F8-II/8; *4*–Kabazi II, Levels II/7E-II/7AB; *5*–Kabazi II, Levels II/7-II/5; *6*–Kabazi II, Levels II/4-II/1A; *7*–Kabazi V, Layer III; *8*–Kabazi V, Complex C; *9*–Kabazi V, Complex D; *10*–Starosele, Formozov's Unit II; *11*–Starosele, Formozov's Unit I; *12*–Starosele Level 1; *13*–Starosele, Level 3; *14*–Zaskalnaya V, Level II; *15*–Zaskalnaya V, Level III; *16*–Kabazi II, Unit III; *17*–Kiik-Koba, upper level; *18*–Prolom I; *19*–Buran Kaya III, Levels 7-8.

ephemeral stations was the production of unifacial tools on bifacial thinning/rejuvenation flakes. In the case of Sary-Kaya, local flint is available less than 1 km away. The distance of local flint from Kabazi II is less clear. Finally, preliminary data indicate that the main activity at all ephemeral sites was the butchering of megafauna (Chabai, Marks, and Yevtushenko 1995; N. Belan and M. Patou-Mathis, personal communication).

Short-Term Stations

Short-term stations, as a type, were previously postulated only for the four Ak-Kaya occupations at Prolom II (Chabai, Marks, and Yevtushenko 1995). These assemblages are characterized by about the same percentages of tools and the same artifact densities as for the second type of ephemeral station. Also, the blank to core ratios parallel those of the first type of ephemeral station. The distinctions between the short-term stations and the ephemeral stations lie in the consistently high tool to core ratios and the presence of fireplaces, which are present in the former but absent in the latter. At Prolom II, unifacial tool production was based on local raw materials (less than 1 km away), but all bifacial tools were apparently imported, since their raw material derives from the Sary-Kaya flint source, some 10 km distant. Because of very extensive hyena activity at Prolom II, it is impossible to reconstruct what economic activities might have taken place. Thus, it is obvious that the short-term station, as a type, needs additional clarification and definition.

TABLE 15-2
Crimean Middle Paleolithic Sites, Lithic Variability by Occupation

	Tools % [1]	*Blanks : Cores*	*Tools : Cores* [2]	*Density* [3]	*Pattern of Raw Material Exploitation*
Kabazi II, Levels II/1A-II/4	19.9	23.6 : 1	4.9 : 1	145.8	on-site core reduction and
Kabazi II, Levels II/5-II/7	14.1	30.9 : 1	4.4 : 1	232.9	on-site tool production
Kabazi II, Levels II/7AB-II/7E	11.2	18.7 : 1	2.3 : 1	116.2	"ephemeral stations"
Kabazi II, Levels II/7F8-II/8	14.8	18.3 : 1	2.7 : 1	232.8	
Kabazi II, Level IIA/2	29.0	no cores	no cores	19.3	mainly tool importation,
Kabazi II, Level IIA/4	35.4	no cores	no cores	27.1	limited on-site bifacial tool
Kabazi II, Level III/1A-III/1	27.8	no cores	no cores	12.3	production, as well as unifacial
Kabazi II, Level III/2-III/3	54.7	50.5 : 1	18.5 : 1	11.8	tool production on bifacial
Sary-Kaya, 1985-86, levels 1-5	46.8	no cores	no cores	15.5	trimming blanks,
Sary-Kaya, 1977	77.5	76.9 : 1	34.1 : 1	16.5	"ephemeral stations"
Prolom II, layer I	38.6	40.5 : 1	13.8 : 1	40.6	both on-site tool production
Prolom II, layer II	29.9	31.9 : 1	8.5 : 1	69.6	and bifacial tool importation
Prolom II, layer III	40.7	23.1 : 1	8.5 : 1	31.4	"short-term hunting station"
Prolom II, layer IV	39.8	19.2 : 1	7.5 : 1	23.4	
Shaitan-Koba, upper level	12.4	29.8 : 1	3.8 : 1	313.1	both on-site and off-site tool production
Shaitan-Koba, lower layer	11.8	41.7 : 1	4.7 : 1	239.6	"short-term camps"
Kabazi V, Unit III	9.4	99.9 : 1	9.1 : 1	549.6	
Kabazi V, Complex C	18.6	101.7 : 1	29.3 : 1	370.0	
Kabazi V, Complex D	12.8	96.5 : 1	18.4 : 1	56.7	
Starosele, Level 1	28.5	63.8 : 1	17.5 : 1	256.0	
Zaskalnaya V, Layer II	6.6	209.3 : 1	11.3 : 1	2504.8	mainly on-site tool production,
Zaskalnaya V, Layer III	24.6	69.2 : 1	13.5 : 1	692.7	rejuvenation and curation
Zaskalnaya V, Layer IV	21.1	68.4 : 1	12.1 : 1	918.3	"base camps"
Zaskalnaya V, Layer V	30.8	76.3 : 1	19.3 : 1	955.7	
Prolom I	18.1	94.5 : 1	17.9 : 1	min 601.4	
Kiik-Koba, upper level	16.0	95.2 : 1	15.2 : 1	min 372.1	
Starosele, Level 3	42.7	19.1 : 1	8.5 : 1	120.0	

[1] percentage of both unifacial and bifacial tools.

[2] unifacial tools to cores ratios.

[3] density of artifacts per cubic meter.

Short-Term Camps

Short-term camps were first postulated for the Shaitan-Koba occupations (Chabai, Marks, and Yevtushenko 1995). The percentages of tools, the blank to core, and tool to core ratios are about the same as for the ephemeral WCM occupations at Kabazi II, Unit II. The differences lie in higher artifact densities and the presence of fireplaces. Both core reduction and tool production took place on-site. In spite of the number of obvious differences between Shaitan-Koba, on the one hand, and Kabazi V and Starosele, Level 1 on the other, it is possible to classify all of them as short-term camps. The main reason for doing so is their medium artifact densities; that is, they fall between the WCM ephemeral stations and the Ak-Kaya/Kiik-Koba base camps (Table 15-2). In addition, the Staroselian short-term occupations exhibit a proportionately similar range of tools, blank to core, and tool to core ratios. Finally, the Staroselian short-term camps are characterized by both on-site and off-site unifacial and bifacial tool production (Chapter 7).

There is no good information, as yet, on the distance to raw material sources from the Staroselian sites. The nearest flint outcrops of fine-grained gray flint, which dominates both the Starosele, Level 1 and the Kabazi V assemblages, are located in the Bodrak and Alma River Valleys. The former valley is where Shaitan-Koba is located, while the Kabazi sites are in the Alma River Valley. The stratigraphic sequence at GABO, situated on a post-Interglacial terrace in the Bodrak Valley, clearly shows the availability of this flint as nodules since the Last Interglacial in all the local terraces until the Holocene (Chabai, personal observation).

The Alma River Valley flint outcrop is located on the southern slope of Mt. Milnaya (Chapter 2, fig. 2-9), and was exposed by erosion after the Last Interglacial. Thus, it is not excluded that the first use of this outcrop took place during the Kabazi II, Level II/8 occupation: at least, this is the earliest Kabazi II level to document on-site primary flaking. Moreover, this same level marked the border between Kabazi II, Strata 7 and 9, which indicate a period of significant climatic change (Chabai 1996). Taking into account the probable date of Kabazi II, Level II/8 (Chapter 13), it may be that the Alma flint was only available for exploitation after ca. 40,000 BP. Thus, if only the Bodrak Valley outcrop was available for the Staroselians at Kabazi V and at Starosele, then there would have been little good local raw material available in close proximity to those sites.

Base Camps

There are two kinds of base camps. One is seen at the Ak-Kaya long-term occupations at Zaskalnaya V and VI; the other is associated with Kiik-Koba occupations at Prolom I, Kiik-Koba, and Buran-Kaya III. Both types are characterized by high artifact densities, high tool to core and blank to core ratios, and by a low percentage of tools. Another shared element is the presence of features, such as pits, caches, fireplaces, burials, etc. (Chabai, Marks, and Yevtushenko 1995). The main difference between the two kinds of base camps is the distance from raw material sources: Ak-Kaya base camps are located close to such sources, while the distance from flint at Kiik-Koba base camps is no less than 10 kilometers. In spite of this, there is no evidence for off-site tool production for the Kiik-Koba occupations, and the Ak-Kaya occupations clearly document on-site core reduction and flake production.

How are these different site types to be understood by industry? The WCM is known at Kabazi II from both types of ephemeral stations and from a single short-term camp (Shaitan-Koba). Yet, they are not all contemporary. Rather, the short-term camp and the ephemeral stations from the lower WCM at Kabazi II form one group, while the later levels at Kabazi II form another. The earlier group indicates a variability in settlement/raw material exploitation across the landscape not seen in the later occupations, all of which point to highly mobile use of the area.

The Staroselian is associated with short-term camps only, which are situated some distance from raw material sources. It seems as if this had a significant effect on on-site versus off-site core reduction and tool production. It is important to realize, however, that the imported blanks at Staroselian sites must have been produced somewhere and, therefore, it is quite possible that the variability now seen for this industry is not complete.

The Kiik-Koba assemblages are found only as base camps, located more than 10 km from raw material sources. Again, if this industry has, in fact, a historical reality, then there should be Kiik-Koba ephemeral hunting stations, as is the case for the Ak-Kaya, where both ephemeral hunting stations and base camps are documented. For the Ak-Kaya, however, the base camps are near to flint sources, while the ephemeral sites are both near and far from flint. In spite of this, all Ak-Kaya ephemeral sites show evidence for mainly off-site tool production.

DISCUSSION

The presently available absolute dating of the Crimean Middle Paleolithic clearly documents the probability of the coexistence of a number of typologically distinct industries (Chapter 13). On the other hand, at Kabazi II, the stratigraphic sequence shows that the WCM overlies the Ak-Kaya occupation, as well as some small assemblages with bifacial tools, and is therefore younger. While this would suggest that the WCM is later than industries with bifacial technology, the absolute dates indicate that the Staroselian, in part, is contemporaneous with the WCM (fig. 15-1). Recent dates on a Kiik-Koba occupation at Buran-Kaya III in eastern Crimea have produced two dates of ca. 30,000 BP (Marks in press); again, an indication that some assemblages with bifacial technology are as young, if not younger, than the WCM. Based on the current state of knowledge, there appears to be a number of different Middle Paleolithic industries all falling between ca. 40,000 BP and somewhat later than 30,000 BP. To make matters even more complex, there is also an Early Upper Paleolithic at Siuren I (Chabai in press) and even a "Szeletian-like" assemblage underlying the Kiik-Koba occupation at Buran-Kaya III (Marks in press), both of which have AMS dates of about 30,000 BP (Pettitt 1997). Obviously, this seeming profusion of contemporary industries needs additional confirmation, but mostly there needs to be an explanation of how so many "industries" might be in the same very small area at about the same time.

First, is it really true that there was such an abundance of different industries? It is manifest that the WCM, of all stages, stands clearly apart technologically and typologically from all the other industries. The only good analogy for the WCM outside of western Crimea is at Grotto Butesty in Moldova (Kolosov 1972).

The same certainty exists for the "Szeletian-like" assemblage from Buran-Kaya III and the Aurignacian assemblages from Siuren I: they have no demonstrable generic connections with any local Crimean industries, or with each other, for that matter.

The conceptual distinctions among the Staroselian, Ak-Kaya, and Kiik-Koba industries are not so compelling, however. All exhibit marked bifacial technology and basically similar tool-kits, differing mainly in the proportional occurrences of different tool classes and in some tool types present in one or more industries but lacking in another. The real differences lie in how raw material was exploited and its effects on assemblage composition. For instance, Kiik-Koba and Staroselian occupations are only associated with base camps or short-term camps away from raw material, but not with any form of ephemeral station. Ak-Kaya, on the other hand, occurs both at base camps and at ephemeral stations. These locational differences in relation to raw material availability, combined with a similar range in reduction strategies, permits a hypothesis that the typological variability used until now to define each as a distinct lithic industry may only reflect the material correlates of a single complex settlement system through time. Present evidence suggests that through much of its existence it was primarily radiating (*sensu* Mortenson 1972), although in its terminal stages it may have evolved toward a circulating system with a limited number of seasonal camps, habitually revisited. This might well explain the very high artifact densities at Kiik-Koba sites. In the broadest sense, the lithic technology/typology of this system falls reasonably into a Crimean Micoquian (Chapter 10, also Yevtushenko 1995; Chabai 1996), recognizing its general affinities with the Eastern European Middle Paleolithic.

In contrast, the WCM mainly indicates a highly mobile settlement pattern; most known sites indicate butchery as the major activity. While there is some indication of either a more intensive occupation at Shaitan-Koba or, at least, habitual reoccupation, the data from the WCM does not lend itself to an interpretation of a complex settlement system. Also, its distribution—it is restricted to western Crimea—might mean that these occupations are an eastern-most extension of a geographic range centered more to the west, perhaps in Moldova or even farther west.

The present dating makes it possible to say that two different lithic traditions, one represented by the WCM and the other by the Crimean Micoquian, shared southern Crimea over a period of about 10,000 years. The more wide-spread distribution of the Crimean Micoquian, as compared to the WCM, might mean that it should be considered the product of a local population.

Although the majority of Eastern Micoquian sites are found in Crimea, they also occur on the Eastern European Plain (Zhitomirskaya, Rihkta, Antonowka, and Sukhaya Mechetka/Stalingradskaya). Only the last, however, is stratified (Gladilin 1985; Kukharchuk 1993). In addition, it appears that there are related materials in the northern Caucasus (e.g., Liubine 1994). It is still too early to define the geographic limits of the Eastern Micoquian, but it would be truly surprising if it were principally limited to an area in Crimea of no more than 350 square kilometers. It is much more likely that the Eastern Micoquian in Crimea is part of a larger geographic zone, but one which may have seen periods of easy access during cold conditions and highly restricted access during warmer periods, when the transgressions/regressions of the Black and Azov Seas made Crimea into either an island or part of the broader Black Sea Plain. These major changes in access must have had significant impact on the local populations, while inhibiting or permitting movements of other, adjacent populations into Crimea.

In order to understand the archeological variability of the Crimean Middle Paleolithic and the Crimean Early Upper Paleolithic, a full range of environmental and economic data must be available and integrated with the archeological information. Much of this will be presented in volume 2 of this series, when another, more complete synthesis will be presented.

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HS n°4 - M. OTTE (dir.), Les fouilles de la place Saint-Lambert à Liège, 1983, 44 p., 30 fig. (300 FB).

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Une première fournée vous est ici présentée, d'autres titres suivront sans doute, selon le succès de l'opération. Merci pour eux !

Marcel OTTE.

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K.* et *SOBCZYK K.*, Les couteaux micoquiens du Würm Ancien. *DEMIDENKO E.Yu.* et *USIK V.I.*, On the *lame à crête* Technique in the Palaeolithic. *DEMIDENKO E. Yu.* et *USIK V.I.*, Leaf Points of the Upper Palaeolithic Industry from the 2nd Complex of Korolevo II and certain methodical Problems in Description and Interpretation of the Category of Palaeolithic Tools. *RODRIGUEZ RODRIGUEZ A.C.*, L'analyse fonctionnelle de l'industrie lithique du gisement épipaléolithique-mésolithique d'El Roc de Migdia (Catalogne-Espagne). 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SITLIVY*, Le développement du Paléolithique ancien, inférieur et l'apparition du Paléolithique moyen (aspects technologiques et typologiques) I[ère] partie. *M. CARCIUMARU*, *M. OTTE* et *M. ULRIX-CLOSSET*, Séquence Pléistocène à la "Pestera Cioarei" (Grotte des Corbeaux à Borosteni en Olténie). *S. ZUK*, About the Early Palaeolithic of the Crimea. *V. CHABAI*, *A.E. MARKS* and *A. YEVTUSHENKO*, Views of the Crimean Middle Paleolithic Past and Present. *M.-H. MONCEL*, Contribution à la connaissance du Paléolithique moyen ancien (antérieur au stade isotopique 4) : l'exemple de l'Ardèche et de la moyenne vallée du Rhône (France). *Ph.G. CHASE*, Evidence for the Use of Bones as Cutting Boards in the French Mousterian. *M. OTTE*, *V. CHIRICA*, *C. BELDIMAN*, Sur les objets paléolithiques de parure et d'art en Roumanie : une pendeloque en os découverte à Mitoc, district de Botosani. *S. COVALENCO*, The Chronological Division of the Late Palaeolithic Sites from the Moldavian Dniester Area. *M. MUSSI*, *D. LUBELL*, *A. ARNOLDUS-HUYZENDVELD*, *S. AGOSTINI*, *S. COUBRAY*, Holocene Land Snail Exploitation in the Highlands of Central Italy and Eastern Algeria : a Comparison. *S. BALAKIN*, *D. NUZHNYI*, The Origin of Graveyards : the Influence of Landscape Elements on Social and Ideological Changes in Prehistoric Communities. *C.V. CHIRICA*, Les vases anthropomorphes du Néolithique-Enéolithique de la Roumanie. *O.V. LARINA*, *N.N. KUZMINOVA*, The Late Neolithic Farming on the Territory of the Prut-Dnestr Interfluve. *N. SIRAKOV*, *T. TSONEV*, Chipped-Stone Assemblage of Hotnitsa-Vodopada (Eneolithic/Early Bronze Age Transition in Northern Bulgaria) and the Problem of the Earliest "Steppe Invasion" in Balkans - **Volume 8, mai 1996 :** *DEMARS P.-Y.*, Démographie et occupation de l'espace au Paléolithique supérieur et au Mésolithique en France. *LIVACHE M.* et *BROCHIER J.E.*, Deux processus évolutifs de complexes industriels en Provence au Pléni et Tardiglaciaire würmien. *SITLIVY-ESCUTENAIRE C.* et *SITLIVY V.*, Variabilité des technologies laminaires avant le Paléolithique supérieur classique dans la région du lac Baïkal (Sibérie, Russie). Etude complète du matériel. Analyses comparatives avec l'Europe occidentale. *LENNEIS E.*, *STADLER P.* et *WINDL H.*, Neue 14C-Daten zum

Frühneolithikum in Österreich. *NÖ S.*, Grub/Kranawetberg ein Jungpaläolithischer Fundplatz. *LÓPEZ BAYÓN I., TEHEUX E., STRAUS L.G.* et *LEOTARD J.-M.*, Pointes de sagaies au Magdalénien du Bois Laiterie (Profondeville, Namur). *KOUMOUZELIS M., KOZLOWSKI J.K., NOWAK M., SOBCZYK K. KACZANOWSKA M., PAWLIKOWSKI M.* et *PAZDUR A.*, Prehistoric settlement in the Klisoura Gorge, Argolid, Greece (excavations 1993, 1994). *SLJIVAR D. et JACANOVIC D.*, Veliko Laole, Belovolde - Vinca culture settlement in Northeastern Serbia. *VIDOJKO J.*, Mineralogical study of malachite and azurite from the Belovode locality (Veliko Laole). **Volume 9, novembre 1996 :** *YAMADA M.*, Etude préliminaire sur l'industrie lithique de la dernière phase du Paléolithique moyen dans le site de Buran-Kaya III en Crimée orientale (Ukraine). *CHABAI V.*, Kabazi-II in the context of the Crimean Middle Palaeolithic. *DEMIDENKO Yu. E.*, Middle Paleolithic industries of the Eastern Crimea : intepretations of their variability. *SITLIVY V.*, La technologie de type Hermitage : Paléolithique moyen ancien. *SITLIVY V.*, Le Paléolithique moyen ancien : variabilité technologique, typologique et fonctionnelle en Europe. *BORZIAK I., LÓPEZ BAYÓN I.*, Développement de l'industrie osseuse au Paléolithique inférieur et moyen dans la région carpato-dniestrienne. *DAMBLON F., HAESAERTS P., VAN DER PLICHT J.* , New datings and considerations on the chronology of Upper Palaeolithic sites in the Great Eurasiatic plain. *COVALENCO S.*, The Upper Palaeolithic industries in the Dniester zone of Moldavia. *SINITSYN A.A., ALLSWORTH-JONES P., HOUSLEY R.A.*, Kostenki 14 (Markina Gora): new AMS dates and their significance within the context of the site as a whole. *SINITSYN A.A.*, Kostenki 14 (Markina Gora): data, problems and perspectives. *YANEVICH A.A., STEPANCHUK V.N., COHEN V.*, Buran-Kaya III and Skalistiy Rockshelter: two new dated Late Pleistocene sites in the Crimea. *COHEN V., GERASIMENKO N., REKOVETZ L., STARKIN A.* , Chronostratigraphy of Rockshelter Skalistiy : implications for the Late Glacial of the Crimea. *KROTOVA A.A.*, Amvrosievka New AMS dates for a unique bison kill site in the Ukraine. *COHEN V., OTTE M.*, Some chronological problems of Upper Paleolithic Azov-Pontic area in the light of the new radiocarbon data from Crimea. *BORZIAC I., CHIRICA C.V.*, Pièces de marne du Paléolithique supérieur de la valllée du Dniestr. *CÂRCIUMARU M., OTTE M., DOBRESCU R.*, Objets de parure découverts dans la Grotte Cioarei (Borosteni, dép. Gorj-Roumanie). *COHEN V.*, Neolithization of the Crimean mountains (current stage of investigations) - **Volume 10, septembre 1997 :** *MONCHOT H.*, La chasse au mouflon au Pléistocène moyen : l'exemple de la Caune de l'Arago (Tautavel, Pyrénées-Orientales). *DEPAEPE P.*, Lames et bifaces dans la phase récente du Paléolithique moyen de la France septentrionale. *MONCEL M.-H.*, Observations sur la répartition spatiale des vestiges et l'organisation de l'espace dans le site de Payre (Ardèche, France). Reflexions sur les limites de l'analyse spatiale en grotte au Paléolithique moyen. *PATOU-MATHIS M.*, Analyses taphonomique et palethnographique du matériel osseux de Krapina (Croatie) : nouvelles données sur la faune et les restes humains. *RENAULT-MISKOVSKY J.* et *ONORATINI G.*, Les sites du Paléolithique moyen et supérieur dans le Sud-Est de la France ; Préhistoire et environnement, nouvelles données. *BOSSELIN B.* et *DJINDJIAN F.* L'Aurignacien tardif : un faciès de transition du Gravettien au Solutréen ! *RIPOLL LÓPEZ S.*, Algunas reflexiones en Torno al Arte Paleolitico más Meridionale de Europa. *CAVA A.*, L'Abri d'Aizpea. Un faciès à trapèzes et son évolution à la fin du Mésolithique sur le Versant Sud des Pyrénées. *BERTOLA S., DI ANASTASIO G.* and *PERESANI M.*, Hoarding unworked flints within humid microenvironments. New evidence from the Mesolithic of the Southern Alps.*DERWICH E.*, Entre la mort et l'enterrement - défunt dans la culture à céramique linéaire dans le cadre de la médecine légale. *WEINER J.*, Notched extraction tools made of rock and flint from the Late Neolithic Flint-Mine "Lousberg" in Aachen, Northrhine-Westphalia (Germany). *VAN BERG P.-L.* et *CAUWE N. avec la collaboration de LINGURSKI M.* La Vénus du géomètre. *SPINDLER K.*, Summary report on the mummified glacier corpse found at Hauslabjoch in the Ötztal Alps.

IV COLLECTION CARNET DU PATRIMOINE

Volume 20, 1997 "Découvrir la Préhistoire". Sous la direction de Marcel OTTE, Professeur à l'Université de Liège et Président de Préhistoire Liégeoise; Laurence HENRY, Archéologue et Secrétaire de Préhistoire Liégeoise. Edité par le Ministère de la Région Wallonne. Direction Générale de l'Aménagement du territoire, du logement et du Patrimoine - Division du Patrimoine 1997

Au cours de la préhistoire, toute société se constitue : l'homme et ses valeurs se forment progressivement au fil d'un temps extrêmement long. Durant quelques millions d'années apparaissent successivement notre constitution anatomique, notre langage, nos croyances, notre pensée. L'aventure se termine aux confins de l'histoire, lorsque les textes en donnent un reflet biaisé par le choix intentionnel des informations à maintenir. L'Archéologie préhistorique interroge des traces matérielles maintenues spontanément à travers les âges donc objectivement représentatives des modes de vie, des conceptions métaphysiques et des processus évolutifs propres à notre espèce. Cette si longue "histoire" fut souvent négligée par les manuels produits par des historiens orientés vers les grands faits de guerre ou d'expansion, non vers des phénomènes culturels généraux. Cette plaquette a pour vocation de pallier quelque peu cette déficience dans l'attente où les maîtres en histoire des civilisations soient aussi ceux en histoire des peuples. Réalisés par des archéologues qui se veulent historiens, cette publication invite à une réflexion généreuse et attentive sur la nature de l'homme et sa lente transformation.

LA PRÉHISTOIRE : UNE SCIENCE WALLONNE

Sollicité par la Région wallonne, cet ouvrage collectif, réalisé par l'A.S.B.L. Préhistoire Liégeoise, présente les données principales de notre patrimoine préhistorique.

Destiné à un large public et plus spécifiquement au milieu scolaire, la publication est conçue selon les grandes périodes de la préhistoire en insistant sur les caractéristiques propres à la préhistoire wallonne et sur les lieux visitables (sites et musées).

Coordonné par les deux auteurs de cette note, il constitue avant tout le fruit d'un travail d'amis passionnés de préhistoire et anciens étudiants de l'Université de Liège. Dès à présent, nous remercions vivement tous ceux qui ont particpé à cette réalisation.

Enfin, nous tenons à exprimer notre profonde gratitude à la Division du Patrimoine du Ministère de la Région wallonne et plus particulièrement à Monsieur André Matthys, Inspecteur Général, qui nous a donné l'occasion d'éditer ce fasicule dans le cadre des Journées du Patrimoine 1997 consacrées au patrimoine archéologique.

On peut légitimement considérer que la préhistoire fut née en Belgique. Vers 1820, Ph. Ch. Schmerling, Professeur à l'Université de Liège, démontre la haute ancienneté de l'homme contemporain d'animaux disparus (Engis). Dans les années 1860, Ed. Dupont (Bruxelles) établit, grâce à ses fouilles dans le Bassin mosan, la première chronologie correcte du Paléolithique supérieur européen. En 1886, M. de Puydt, J. Fraipont et M. Lohest (Liège) associent les Néandertaliens aux Moustériens et aux sépultures exhumées à Spy (Namur). En 1885, le premier "Néolithique" est découvert à Omal (Liège) par M. de Puydt et son équipe, démontrant la diffusion de la première agriculture dans nos régions.

Entretemps, les tranchées hennuyères prouvent l'importance de l'industrie minière à Spiennes (Hainaut), dès le Néolithique moyen (IV^{e} millénaire) et les nappes alluviales successivement taillées dans le Bassin de la Haine démontrent l'évolution des industries les plus anciennes du pays : de 500 à 100.000 ans environ (E. de Munck, D. Cahen). Plus récemment, le site de la Belle Roche (Sprimont) démontre une présence humaine, d'un style différent, dans les Ardennes et attribuée au "Pléistocène moyen Ancien", vers 500.000 ans (J.M. Cordy, Liège). Les fouilles menées à la grotte Scladina (Andenne) permettent la mise au jour des restes d'un enfant néandertalien, le mieux étudié de ce siècle en Belgique (D. Bonjean, Liège). Des fouilles aussi fructueuses ont concerné également l'Aurignacien (Trou Magrite), le Gravettien (Huccorgne) et le Mésolithique (Freyr) en collaboration entre Liège et Albuquerque (L. Strauss). Le Magdalénien fut approché par les fouilles à Chaleux (E. Teheux), Furfooz (N. Cauwe), le Trou da Somme (J.-M. Léotard). L'Arhensbourgien (8.400 ans) est désormais bien connu par les fouilles à Remouchamps menées par M. Dewez. Dernièrement, la longue séquence du Trou Walou (Trooz) illustre l'évolution complète du Paléolithique supérieur en Région wallonne (M. Dewez, M. Toussaint, E. Teheux, Chr. Draily). Durant les mêmes phases, les sites "tjongériens" de Meer (Anvers) éclairent le comportement de ces "derniers chasseurs de l'Alleröd, vers 9.000 ans (Fr. Van Noten et D. Cahen, Tervuren). Les sites mésolithiques ont entretemps livré les étonnantes découvertes de sépultures collectives (Margaux, Autours, Bois Laiterie par N. Cauwe) et celui de la station Leduc à Remouchamps montre l'organisation spatiale d'un campement de cet âge. Les remous suscités par les fouilles effectuées sur la place Saint-Lambert (Liège) sont trop connus pour en rendre davantage compte ici (M. Otte et J.-M. Léotard). De gigantesques sites du Néolithique ancien (VI^{e} millénaire) ont été explorés systématiquement : Darion (D. Cahen, I. Jadin); Vaux et Borset (J.-P. Caspar et J. Docquier). Ils illustrent des modes d'auto-défense et de protection, probablement liés à la présence des Mésolithiques contemporains. Une série de monuments mégalithiques furent explorés et interprétés récemment, tel l'ensemble de Wéris (Fr. Hubert, M. Toussaint), Lamseul (M. Toussaint et I. Jadin) et Gomery (N. Cauwe et M. Toussaint). Dans les Ardennes, divers sites de refuge ou d'habitat ("oppoda") et de sépulture ("tombelles") complètent le modèle de peuplement celtique de la haute Belgique (A. Cahen-Delhaye, V. Hurt et P.P. Bonenfant).

Un panorama complet de la préhistoire belge a ainsi été renouvelé totalement lors des fouilles récentes. Non seulement, il apporte des informations mises à jour, mais aussi, il facilite l'intégration de ces données dans un contexte international large où, souvent, notre pays a joué un rôle intermédiaire primordial. Ce n'est donc pas ainsi le patrimoine wallon qui y fut illustré mais bien une partie de l'histoire européenne.

Marcel OTTE et Laurence HENRY

BON DE COMMANDE

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